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STONE, B. C. The Flora of Guam. A Manual for the Identification of the Vascular Plants of the Island (with a foreword by Pedro C. Sanchez).

THE FLORA OF GUAM

A Manual for the Identification of the Vascular Plants of the Island

by

Benjamin C. Stone

Formerly Chairman, Department of Biology, College of Guam; Reader in Botany in the School of Biological Sciences of The University of Malaya, Kuala Lumpur (Malaysia)

with
numerous photographs
and
line drawings
and
foreword
by
Pedro C. Sanchez,
(President, University of Guam)

MICRONESICA
Vol. 6
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1970

Foreword

by
Pedro C. Sanchez
President, University of Guam

This special edition of MICRONESICA is a commendable effort to put together valuable information and studies concerning the flora of Guam.

It includes both the scattered materials collected and written in the past and the most recent scientific investigations. This publication will, therefore, open new horizons and should stimulate considerable interest in a subject that otherwise would have been ignored for lack of dissemination.

In a sense, what has been accomplished in this edition represents an endeavor similar to the joint effort of Paul Carano and this writer in compiling and publishing a complete history of Guam several years ago. Indeed, THE FLORA OF GUAM is a necessary "companion piece" for anyone who desires a better understanding of the island's history and its indigenous population. For a people's environment contributes a great deal toward explaining their behavior, attitude, and other traits which identify them as different from or similar to, as the case may be, those who inhabit other regions of the world.

The publication of this edition also comes at a time of universal concern over the problem of human survival in the face of unwholesome environments. I would think that the contributions of those whose studies are the source for the materials used in this work would serve to enlighten us on the seriousness of this problem, and awaken us to the need to recognize the abundance of nature and why we must preserve the richness that is in it.

The University of Guam is pleased to provide the readers of *Micronesica* a ready source of information on the flora of Guam, and is grateful to Dr. Benjamin C. Stone, a former professor at the University of Guam, and all those who make this special edition possible. This issue is a fine addition to the literature of Guam.

I hope that this volume would be especially useful not only to scholars and scientists but also to the teachers and students of our schools and all the people of Guam in developing a deeper appreciation of this tiny "island world" around us. To them "The Flora of Guam" is proudly dedicated.

Preface

This book would not have been possible except for the willing cooperation of many friends, colleagues, and students, and in particular the generous assistance of Dr. F. Raymond Fosberg of the U. S. National Museum, Smithsonian Institution, Washington DC. It was his manuscript list of Guam plants which stimulated the present work, his interest which helped see it through to completion, and, to a large extent, his critical reviewing which, many times, provided the correct solution to difficult problems encountered. I have also benefited greatly from the frequent, valuable help of Dr. C. G. G. J. van Steenis, Director of the Rijksherbarium, Leiden, and general editor of the "Flora Malesiana", and the splendid botanical staff of that institution. For special help, and for advice on particular families, I have been generously accorded the advice of Dr. Thomas Soderstrom, of the U.S. National Museum; Dr. T. Koyama of the New York Botanical Garden; Dr. H. St. John of the Bishop Museum, Honolulu; Dr. T. Hosokawa of the Faculty of Science, Kyushu University, Japan; Dr. S. Kurokawa of the Tokyo National Science Museum; Mrs. M. Cushing-Falanruw of Guam; Dr. A. Yamashita of the College of Guam; Dr. D. R. Smith of the College of Guam; Mr. Manny Sproat, Agriculture Dept., U. S. Trust Territory of the Pacific, Saipan; and from many other persons, including several of my students at the College of Guam, too numerous to list, but to all of whom I express my deepest thanks. In the last analysis, it has been my decision whether or not to follow their advice; and any errors ensuing are my responsibility. To all these persons, and to the people of Guam, I am under many obligations. I hope that this book, whatever its failings, will serve to inspire an interest in the floral wealth of Guam sufficient to ensure that omissions and mistakes will be, some day, corrected.

Dedication

To my family,
my friends,
and
my teachers:

Professor Lyman Benson
Professor Edwin Phillips
Dr. Edgar Anderson†
Professor Harold St. John

Benjamin C. Stone
Kuala Lumpur,
Malaysia,
October 1969.

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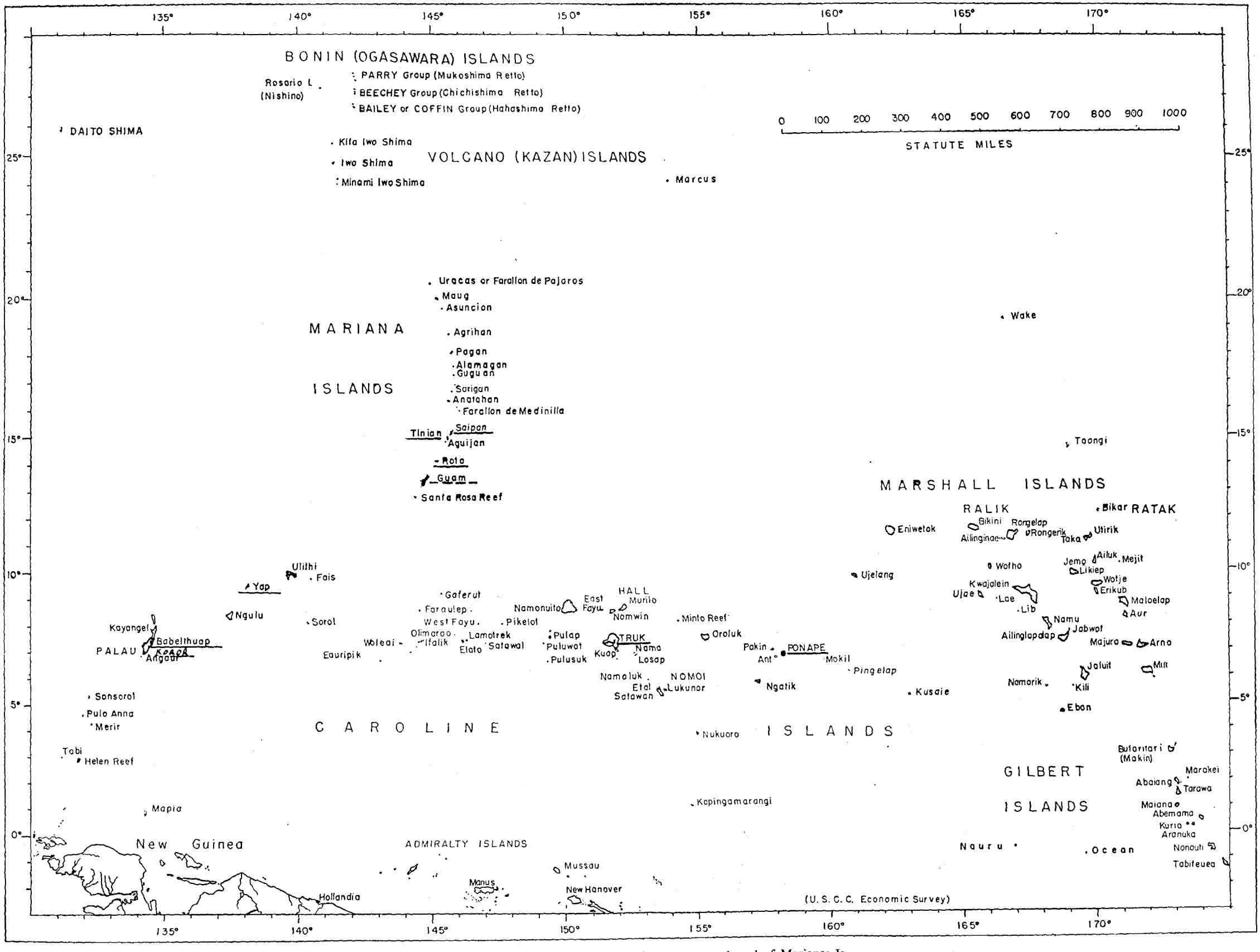
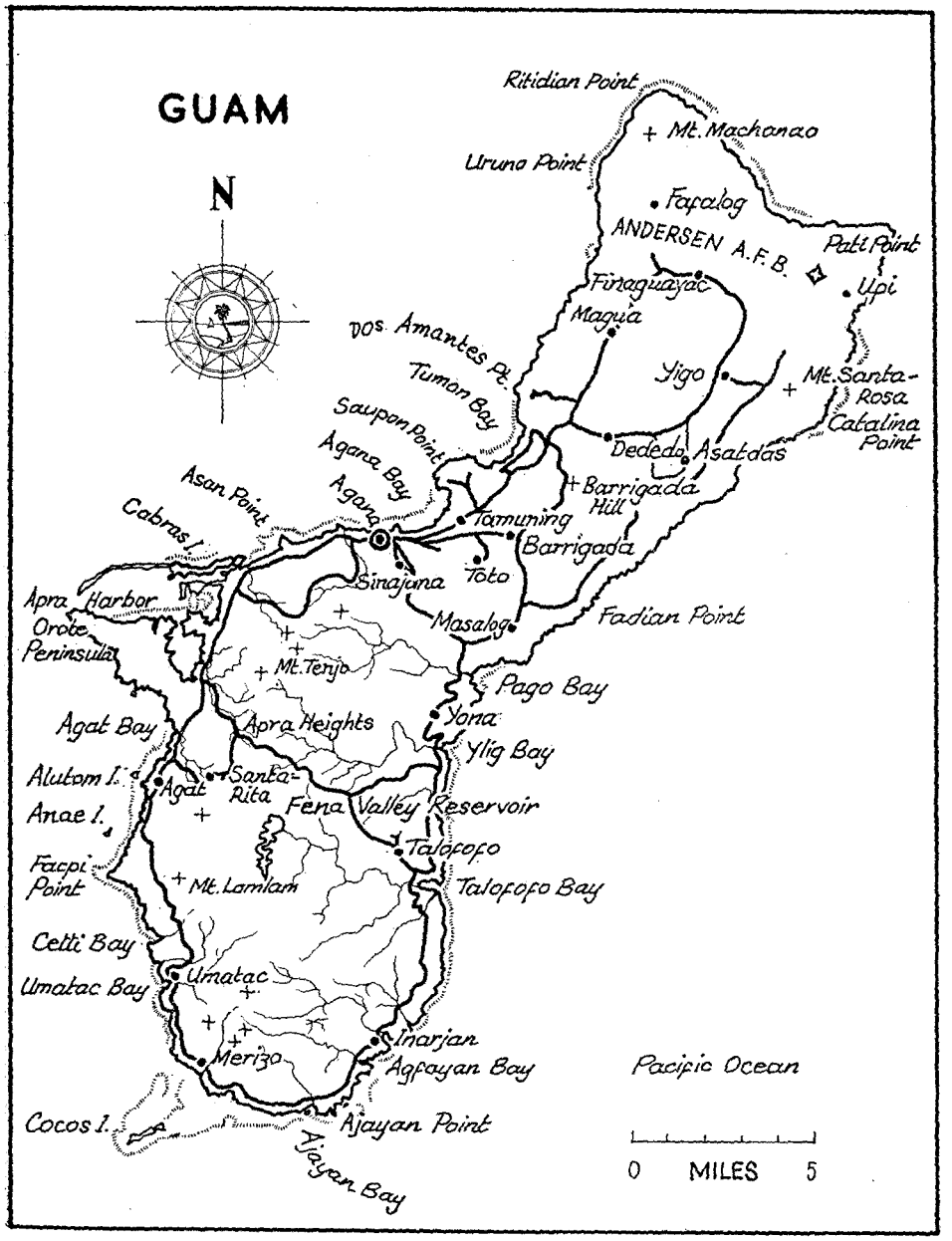


MAP 1. Micronesia; showing location of Guam at south end of Marianas Is.



Map 2. Guam. Main localities and roads.

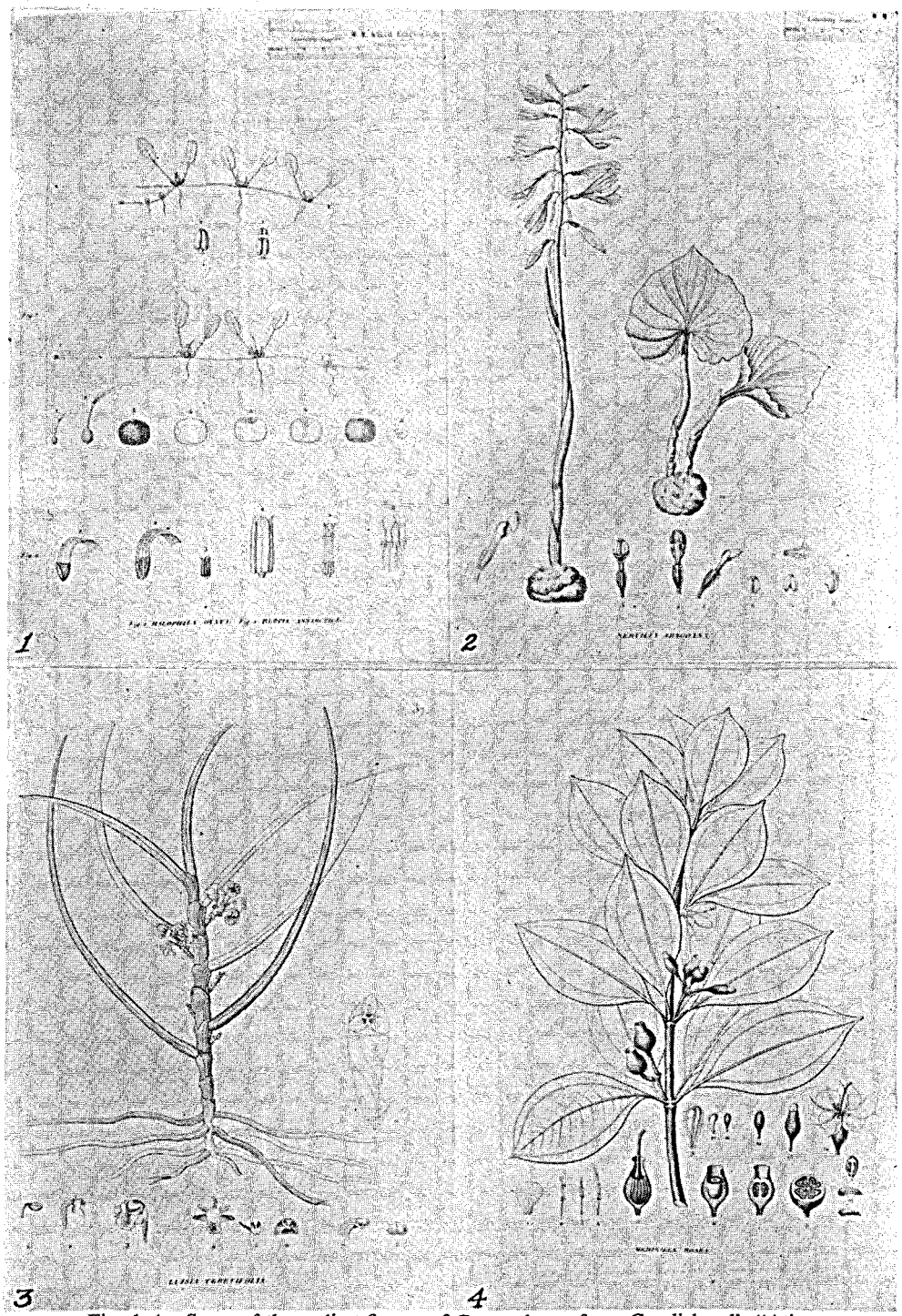


Fig. 1–4. Some of the earliest figures of Guam plants, from Gaudichaud's "Atlas Botanique" of the Freycinet Voyage (1826). 1: *Halophila ovata* (=*H. minor*); 2: *Nervilia aragoana*; 3: *Luisia teretifolia*; 4: *Medinilla rosea*.

PART 1

I. Introduction and Botanical History of Guam

GUAM has had one of the longest histories of European and other foreign contacts of any island in the Pacific Ocean.* Since Magellan landed at Umatac Bay in 1521, Guam has been known to the "Western" World. The island had a very long period—nearly 300 years—of Spanish rule as a colony of Spain. During this time Guam was an intermediate port on the long galleon voyage from Mexico to the Philippines.** The Acapulco-Manila galleons touched at Guam (barring mishap) at first infrequently, later on regularly on a yearly basis, for nearly two hundred and fifty years, from 1665 until 1815. Fresh food, water, and some relief from the sixty or seventy days at sea from Acapulco, and the twenty or so days from Manila, were provided by the island. To Guam the galleons brought supplies for the military garrison and the governor, and for the missions; new arrivals from Mexico or the Philippines; and later, political prisoners captured by the Spanish in Manila. To Guam also there came a succession of pirates, buccaneers, and their ships of prey, often hoping to capture the rich stores of one of the galleons. And, on a few occasions, came expeditions with scientists intent on finding new knowledge.

The first scientific knowledge of Guam's flora came from the reports based on collections made by these early expeditions. The first of these was the Malaspina Expedition of 1792. The botanists were Thaddeus Haenke and Luis Nee. The majority of the plant collections were lost in Lima, Peru, but those remaining were sent to Prague (Haenke) and Madrid (Nee).

In 1817, the Romanzoff Expedition under Captain Kotzebue in the brig "Rurik" touched at Guam. The botanist was Adelbert von Chamisso (who was also a poet). The collections are at Leningrad (St. Petersburg) and some duplicates are at the Royal Botanic Gardens, Kew, England.

In 1819, the botanist Charles Gaudichaud-Beaupré arrived with the French Expedition under Capt. Louis de Freycinet, commanding the corvette "L'Uranie". This was a productive stop, and many plants of Guam were studied and named by Gauchichaud, or by others using his collections. The genus *Freycinetia* was named by Gaudichaud for the expedition commander. Many species in Guam are named after Don José Torres, who lived in Guam at the time of Gaudichaud's visit, for example *Alyxia torresiana.* The genus *Medinilla* was named by Gau-

* For a general history of Guam, see Paul Carano and Pedro Sanchez "Complete History of Guam", Tuttle, 1964.

** For a history of the Galleons, see "The Manila Galleon" by William Lytle Schurz, Dutton, 1939 and 1959.

dichaud for José de Medinilla y Pineda, the Governor at the time. The specimens are kept in Paris, at the Musée Nationale d'Histoire Naturelle.

In 1828, the French returned. This time the commander was Dumont D'Urville, and the ship the "Astrolabe". The botanist was Lesson. D'Urville returned in 1839, with the same vessel and another, the "Zelée". The botanists were Hombron, LeGuillou, and Jacquinot. All their specimens are in Paris.

Towards the end of the 19th century another enthusiastic Frenchman made plant collections in Guam, as well as elsewhere in the Marianas. He was Alfred Marche, who was the first person to explore botanically in the Northern Marianas. He was active in the area from 1887 to 1889.

It is ironic that the vast majority of these French collections remained unstudied until 1957, when Fosberg and Sachet reported on them.*

Yet in all these years rather little was really accomplished in exploring the island for its native plants. The galleon route was the source of many new plants for the island, both Asian species from Manila, and Mexican species from Acapulco. Many of course were deliberately introduced; and the Mexican *tortilla*, made of corn-meal from locally grown white maize, is still a common food in Guam. This is but one example. Several dozen weeds accompanied these purposeful introductions; today, more than forty such Mexican or tropical American plants occur, mostly unwanted, in Guam; and twice as many weeds are from Tropical Asia and the Philippines.

In 1898 shortly after the outbreak of the Spanish-American War, an American warship took command of the island. The Spanish personnel were repatriated, and for the next forty-three years the island was administered as a Naval Station by the United States Department of the Navy. Naval officers served as governors of the island. During the term of office of the first such governor, an enterprising officer, acting as Lieutenant-Governor, undertook exploration of the island, and interested himself in natural history, in language, and in education. This man, Lieutenant William Edwin Safford, later published a book entitled "The Useful Plants of Guam", in 1905. Under this modest title lies a wealth of material on many topics, historical, sociological, meteorological, and zoological, to name a few. For some years this was the only attempt at a complete compilation of the flora of Guam, and even now it is a useful book, although somewhat out of date; and now very rare. Safford zealously sought out all previous records of plants known from Guam, and, with his researches into the Chamorro language and his intimate friendship with the scholarly priest Father Palomo, was able to add to this list many plants known to him only by the Chamorro name. Safford made some plant collections, (some together with Alvin Seale, who was collecting for the Bishop Museum in Honolulu) but not a great number. These are kept in the U.S. National Herbarium (Smithsonian Institution), in Washington, D.C.

It remained for the American botanist Elmer Drew Merrill, who was at that time with the Bureau of Science in Manila to undertake a new, thorough study of

* Bull. du Museum [d'Histoire Naturelle], Paris, ser. 2, 29(5): 428–438, 1957.

the flora of Guam. He encouraged collections to be made by the local Department of Agriculture, under J. B. Thompson, and in November 1910 Mr. Thompson collected or had collected by the Guam Experiment Station staff a suite of 25 specimens, marked 'G.E.S.' The following year the missionary wife Mrs. Joseph Clemens, brought 37 specimens to Manila to her friend Dr. Merrill. In 1911 Merrill arranged for R. C. MacGregor to go to Guam for the express purpose of making botanical collections. He remained from October 2 to Oct. 26, and obtained 282 specimens. He also trained local personnel, and these persons concontinued to collect subsequently. Their collections were forwarded to Merrill by Thompson, and amounted to 480 specimens. Merrill's study of these specimens resulted in his "An Enumeration of the Plants of Guam", published in the Philippine Journal of Science, vol. 9 (no. 1), Feb. 1914. Further collections made by Peter Nelson, also of the Guam Experiment Station, enabled Merrill to publish a supplementary paper, "Additions to the Flora of Guam" in the same journal, vol. 15 (no. 6), 1919.

Merrill's work brought the known flora up to some 560 species. His major contribution, however, was to show that the island had a considerable endemic element, and that it was not covered by forests composed chiefly of widespread strand trees, as had been thought by Safford.

The years between 1920 and the outbreak of war in 1941 were uneventful botanically with the exception of E. H. Bryan Jr.'s collections made in the nineteen-thirties. Mr. Bryan, long associated with the Bishop Museum in Honolulu, was also the first person since Safford to attempt to write an account of the plants of Guam for the general public. His clear style, use of drawings, and keys, made his contribution a very important one. Unfortunately, however, it was issued serially in the now defunct magazine, the 'Guam Recorder', and was interrupted by the war. It was never completed, but after the war it was again started, this time in the newspaper, the "Guam Daily News", but once again, the series remained incomplete, this time due perhaps to lack of space in the newspaper. The present author attempted several times, on behalf of Mr. Bryan, to resume the serial, but nothing came of this attempt, and it may perhaps be assumed that the newspaper was unable to arrange the publication because of adverse financial conditions. In any case, those persons who had foresight enough to preserve clippings from one or both of these serial publications were able to obtain information about a considerable number of plants, and much of it in more up-to-date form than that available in Safford's work. Safford arranged his catalog alphabetically, a system useful for an index but regrettable from the botanical standpoint. He used no keys, but usually included descriptions, and had a number of fine photographs. Finally, Safford's work is made difficult by his use of the then-popular 'American Code' of nomenclature, a temporary rebellion of some American botanists against 'European' practice, which disappeared about forty years ago, but left many an American book with very ephemeral plant-names. I have commented on this in an article in 'Micronesica', vol. 1 (1964).

It is necessary at this point to mention that Guam does not stand alone; rather, it must be considered together with all the islands of the Marianas Archipelago. Further, it is geographically part of Micronesia, of which the nearest islands are in the Carolines, e.g. Yap, Palau and Truk. Therefore it is important for the student of the flora of Guam to realize that the work of many botanists who dealt with plants of other islands in the Marianas group—such as Rota, Tinian, and Saipan—and with islands elsewhere in Micronesia, must be taken into account. In particular, the work of several Japanese scientists, Prof. R. Kanehira, Dr. T. Hosokawa, and Dr. T. Tuyama, being most notable, has considerably advanced our knowledge of the plants in the Marianas. Furthermore, several German botanists, including L. Diels, K. Lauterbach, F. Markgraf, R. Schlechter, G. Volkens, E. Gilg, and C. Benedict, writing in the journal "Botanisches Jahrbücher" in the early 1900's, added much to the accumulating knowledge of Micronesian plants.

The Second World War of course resulted in profound changes in Guam. From this period, however destructive it was, there arose nonetheless an increased biological interest in the island. Several members of the U.S. Armed Forces became interested in the natural history of the region, and some of them published accounts of collections and studies made during or immediately after the war. Some of these deserve especial mention.

In Sidney Glassman's Guam collections, Merrill and Perry found 17 species not before recorded for the island flora. Their study appeared in the Journal of the Arnold Arboretum, vol. 27 (1946). Glassman himself wrote a very useful summary entitled "A Survey of the Plants of Guam" published in the same journal just two years later (1948). Some years later Glassman published his very useful "Flora of Ponape", and has written several other articles on Micronesian plants.

Warren H. Wagner, Jr., and David F. Grether collected extensively in Guam, Rota, and Saipan. In 1948, they published a full account of the ferns and fern-allies, entitled "Pteridophytes of Guam", which appeared in the Bishop Museum Occasional Papers. Very little has been added to the species they cataloged, keyed, and described, and only a few changes have had to be made to make their account up-to-date; their account is the major basis for the treatment of the ferns in this book.

Robert Rodin, collaborating with Egbert H. Walker of the U.S. National Museum, issued a review of the more important items in his and some other wartime collections from Guam, which appeared in the "Contributions from the U.S. National Herbarium" vol. 30, part 3, in 1949.

Several other collectors have worked in Guam since 1946, and although some of them have not published any accounts of their collections, their specimens, kept in various institutions, represent a further resource for the study of Guam's flora. Among these persons the following may be mentioned: Reid Moran (now at the San Diego Natural History Museum); Peter J. R. Hill, of the Education Dept., U.S. Trust Territory; and Donald Andersen, then with the U.S. Commercial Co., later with the University of Hawaii Arboretum.

One of the most indefatigable of all collectors has been Dr. F. Raymond Fosberg. For many years associated with the U.S. Geological Survey, Dr. Fosberg was (besides Hosokawa) one of the first botanists who attempted ecological studies in the Micronesian region. Besides writing many shorter papers on Micronesian plants, including several mentioning Guam or dealing largely with the Marianas Islands, he has produced a longer work (as yet incomplete) called "The Vegetation of Micronesia", the first part of which deals in considerable detail with a qualitative description of the plant associations and general topography and soil conditions of Guam. This work is so thorough, in fact, that much of the descriptive material concerning the ecology of the island which might ordinarily appear in a Flora can be omitted from the present account, while referring the reader to Fosberg's work. This was published in the Bulletin series of the American Museum of Natural History (as Bulletin, Article 1, vol. 119) in 1960. Dr. Fosberg's many trips to Micronesia, and his concern with Guam's vegetation, has also led to the founding of several nature reserve areas in Guam (e.g. Ypiga). The preparation of a general flora of all of Micronesia has been a project of Dr. Fosberg's for many years now. This interest goes back at least to the postwar period, during which time several scientific projects were carried out in Micronesia, under the Pacific Science Board's aegis. This was also the period of a commercial survey made by the U.S. Commercial Commission, to which Fosberg and several other botanists contributed survey reports.

The U.S. Trust Territory has carried out certain projects which require mention in connection with Guam, not the least of which has been the forestry survey made in 1951 by Colin Marshall. Agriculturists and entomologists have sometimes also been of assistance from the botanical standpoint.

The old Guam Experiment Station was replaced by the present Department of Agriculture of the Government of Guam. Despite the heavy emphasis on commercial aspects, members of the Department have assisted in the preparation of an account of the flora in various ways. Several departmental Directors and staff members have provided assistance to visiting botanists or have even made special collections. However, no general herbarium has been maintained by the Department.

The most recent period in the botanical history of the island began with the founding of the College of Guam. Although the institution (now a 4-year government University) began in 1951, it may be said to have entered its first major productive period in 1961, when new buildings on a new campus were completed. The Department of Biology began a program of research designed to facilitate teaching. In 1962, a Departmental Herbarium was established, now the University of Guam Herbarium. The present author over a period of nearly four years, with the able aid of some of his students, built up a reference collection of plants of Guam, as well, later, as plants from other parts of Micronesia. An exchange program was established, which enriched the herbarium with specimens from other countries: Philippines, Japan, Malaya, and Hawaii, for example. These collections have pro-

vided the chief basis for the present book, and are referred to by number herein. [Other collectors are referred by name, e.g. *MacGregor* 360; when numbers alone are cited, they are in the author's collection series; e.g. for 4294 read *Stone* 4294].

Besides books and specimens, two other main foundations for this work must be mentioned. The first of these is extensive field work, not only in Guam, but in much of Micronesia (including the Marshalls, Kusaie, Ponape, Truk, and Palau, as well as the southern Marianas). This has been of great importance expecially for comparative phytogeographic and phytosociological problems. Some of this field work was performed when I was a graduate student at the University of Hawaii, under the program of research (in which I was research assistant) directed by Prof. (now Emeritus) Harold St. John. The rest was carried out while I was Associate Professor and Chairman of the Department of Biology at the College of Guam, and involved many hours, often accompanied by students and colleagues, or by welcome visitors, in every conceivable habitat afforded by the island. In addition, trips to Saipan and Rota, Palau, Truk, and Ponape, all of great use, were made possible through the cooperation of the College and the Administration of the U.S. Trust Territory, especially the Director of Agriculture, Manuel Sproat, and members of his Department in various islands.

The second foundation is the inspiration and advice provided by my several senior colleagues and friends, including Prof. St. John, Dr. Fosberg, Dr. H. A. Miller, and Dr. C.G.G.J. van Steenis. Other friends too numerous to mention deserve thanks also. Dr. A. C. Yamashita, then President of the College, supported the work and helped to make possible some of my longer trips. Jack Fletcher, then of the College of Guam, D. R. Smith, also of the College, and James Long provided of good company during field work. Several colleagues at the College, at the Department of Agriculture, or residents of the island, brought useful specimens. Dr. Paul B. Souder of Agaña provided useful information. Dr. van Steenis, Director of the Rijksherbarium, Leiden (Holland) provided many points of critical scientific advice. Dr. Fosberg was, and is, of virtually continuous assistance in scientific matters as well as for moral support. To all these persons I owe my best thanks. Whatever errors are present in this book, however, are entirely my own.

My hope is that this book will help to arouse a new interest in the plants of Guam. It is a most interesting island, and in many ways a beautiful one. Its oldest inhabitants—the plants—can be a source of pleasure and inspiration to the student, young or old, and more perfect knowledge of them is a worthy goal of every resident of Guam. The preservation and improvement of the vegetation of the island is an important goal of every citizen and of each administration. The beautification of the island is not only aesthetically desirable, but scientifically and commercially valuable. An increase of tourism is a major goal. One of the major interests of tourists is a beautiful landscape. Guam's flora contributes much to this beauty; it is a resource and deserves to be conserved as such. If the reader—resident or tourist—is furthered in his appreciation of the natural green heritage of the island, America's "Asiatic Flora", the hopes of the author will be fulfilled.

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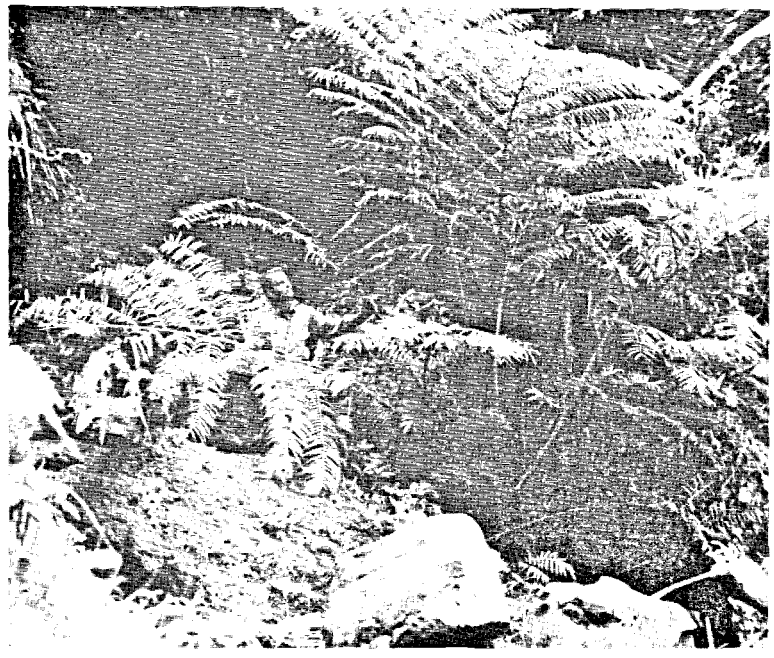

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Fig. 5–7. Guam botanists. 5: William Edwin Safford, in 1922. 6: Edwin H. Bryan Jr., in 1924. 7: Russell Steere, in 1944 (with Angiopteris durvilleana). (5, Smithsonian Institution; 6, E. H. Bryan Jr.; 7, R. J. Rodin).

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Fig. 8–10. Botanists in Guam, 1944–45. 8: R. J. Rodin (with Heterospathe elata). 9: R. J. Rodin and a friend, by the Ylig River, 1944. 10: Some members of the Guam Natural History Society, Lts. Al Vatter, Jim Steere, and Russell Steere, on Mt. Tenjo, 1945. (All photos from R. J. Rodin).

Fig. 11.
Dr. Warren Herbert Wagner, 1969.

Fig. 12. Dr. Francis Raymond Fosberg.

Fig. 13. The author in a stand of limestone forest near Ritidian Point, Guam.

II. Plan of the Work

The purpose of this book is threefold: (1) to provide a means for identifying every plant species known (as of the time of preparation of this account), in the major groups of vascular plants, to occur in Guam; in particular, the indigenous and widespread naturalized species, though cultivated plants, both crops and ornamentals, are also included.

(2) To provide for students (especially high school seniors and University students) a text providing, by example, an introduction to taxonomic botany, and by extension to such fields as ecology; and to provide a handbook for biology teachers, agricultural or forestry officers, government agents who must deal with plants or with land use and vegetation, and for tourists, hikers, and interested islanders who require knowledge of Guam's flora;

(3) To provide botanists and other scholars in other countries a modern account of what is known of the flora of this American Territory.

The book consists of two divisions. The first is a basic orientation, with brief geographic, geological, meteorological, phytosociological, and phytogeographic sections. The second consists of a descriptive, frequently illustrated, manual of the vascular plants, with keys.

Keys. These are "questionnaires" to identify the plants. There are several keys. The first is a Key to Major Plant Groups. Following this are brief and incomplete lists of some groups of Cryptogamic plants. Then comes a Key to Ferns and Fern-Allies, followed by the full account of these plants. Then follows a Key to Families of Seed Plants. After this key comes a Key to Seed Plants of Guam. This key is limited to the Guam flora. It is based as far as possible on vegetative and field characters. Following this key is the full account of the seed-plants of Guam. Herein, each family is briefly described, and a key to the genera of the family which occur in Guam is given. Each genus is described, and a key to its species in Guam is given. If necessary, a key to subspecific taxa (varieties, etc.) is provided. Original habitat, range, and other varied information is supplied, and a few (not necessarily all) specimens are mentioned, particularly those kept in the College of Guam herbarium.

Descriptions are provided, in brief form, for each genus, and species. The descriptions apply of course primarily to the Guam plants of the taxon described. Where several species of one genus occur, the descriptions are usually more complete. Well-known crop and ornamental plants are briefly characterized, while the indigenous species are more fully described.

Illustrations. Photographs and line-drawings are provided for a considerable number of species. Unless otherwise indicated, these are by the author.

Names. All plant names herein follow the rules of the International Code of Botanical Nomenclature (as of 1959). Besides scientific names, vernacular names, when available, are provided in Chamorro and in English. In a few cases other

vernacular names are given, if they are likely to be familiar to some component of the population. For this reason, names in several Micronesian languages are here and there included.

The status of a name is shown by the typography, as follows: endemic species are in italic bold face type; (this category includes Marianas endemics, not just Guam Island endemics); *indigenous species* (occurring in Guam prior to human habitation, but not peculiar to Guam or the Marianas, thus also occurring at least in other parts of Micronesia and perhaps elsewhere) are in erect bold face type; introduced, naturalized species are in plain italics; and introduced crop and ornamental plants which form no part of the wild-growing, spontaneous, vegetation naturally are in small capitals.

Examples:

Guamia mariannae Merrill (Endemic species).

Flagellaria indica L. (Indigenous species).

Leucaena leucocephala (L.) DeWit. (Indigenous genus, introduced species).

Cynodon dactylon L. (Introduced genus and species, naturalized).

ANNONA MURICATA L. (Introduced genus and species, not naturalized).

Synonyms. Older names no longer in use or now deemed incorrect are appended, indented, and in plain italics, after the approved name.

References. Original places of publication for the approved name, and for the synonyms given, are provided; and brief reference to usage in the major works that previously dealt with Guam plants. Since a few of these will be very frequently mentioned, the bibliographic citation has been reduced drastically to the author's surname, the date of publication, and the page reference. The complete reference will be found in the bibliography at the end of the book. The following are the most often mentioned:

—Safford 1905.=Useful Plants of Guam. W. E. Safford. Contrib. U. S. Natl. Herbarium, vol. 9, pp. 1–416. (1905).

—Merrill 1914.="An Enumeration of the Plants of Guam". E. D. Merrill. Philipp. Journal of Science, C. Botany. Vol. 9 (Part 1, pp. 17–95; Part 2, pp. 97–155). (1914).

—Merrill 1919.="Additions to the Flora of Guam". E. D. Merrill. *ibid.* vol. 15 (Part 6, pp. 539–544). (1919).

—Walker & Rodin 1949.="Additional Phanerogams in the Flora of Guam, with notes on unverified records". E. H. Walker and Robert Rodin. Contrib. U.S. Natl. Herb. (U.S. Natl. Mus.). 30(3), pp. 449–468. (1949).

—Merrill and Perry 1946.="Some additional records for the Guam flora". Journ. Arnold Arboretum 27: 323–325. (1946).

—Wagner & Grether 1948.="Pteridophytes of Guam". W. H. Wagner Jr., and D. F. Grether. Bishop Museum, Occasional Papers 19: 25–99. f. 1-12. (1948).

III. Geography, Topography, Climate and Soils

Guam is the largest and most southerly island of the Marianas Archipelago (formerly called the Ladrones Islands). It lies approximately 1200 miles east of the Philippines, and 3500 miles west of the Hawaiian Islands. The Marianas archipelago extends from 13°14′ N. to 20°30′ N. latitude, and from 143°46′ E. to 146°31′ E. longitude. Guam is one of 14 islands in the Archipelago, which from North to South, are called Uracas, Asunción, Agrigan, Pagan, Alamagan, Guguan, Sarigan, Anatahan, Medinilla, Saipan, Tinian, Aguiguan, Rota, and Guam. In addition several associated banks occur, submerged but close to the surface. Guam is one of the Southern Marianas; the dividing line runs between Saipan and Medinilla. There are geological, climatic, and vegetational differences between the Southern and Northern Marianas. In general, the Northern Marianas are relatively recent geologically, and some are active volcanoes. Saipan, Tinian, Aguiguan, Rota and Guam are older, and in general somewhat warmer. The differences in the vegetation of the two groups of islands have been discussed by Hosokawa, e.g. his "Preliminary Account of the Vegetation of the Marianne Islands Group" in Bulletin of the Biogeographical Society of Japan, vol. 5 (no. 2) pp. 124–172, 1934, and a paper in Japanese [Phytogeographical considerations on the Marianne Islands] in Proc. Japan. Assoc. Adv. Sci. 10: 146–151, 1935. Further purely biogeographic remarks will be made later under the heading of phytogeography.

Guam is twenty-eight miles long and four to eight miles wide. Its greatest length is directed NN.E. by SS.W.; its greatest width is from Sumay Peninsula S.E. to Talofofo Bay. It lies at approximately 13°13′ N. and 145°E. In shape it is something like a bowtie, constricted centrally.

Topography. The northern part of the island is a limestone plateau or 'mesa' interrupted by a few low hills, of which two, at Mataguac and Mt. Santa Rosa, are of volcanic nature, the others exclusively coralline limestone, e.g. Barrigada Hill and Ritidian Pt. The plateau shows several levels, evident as cliffs with narrow or broad terraces. The plateau is between 300 and 600 ft. above sea level. The southern part of the island is hilly, largely of volcanic material (basalts, etc.) but in several places capped with a layer of limestone. The highest of these hills rises to 1334 ft. above sealevel, (Jumullong Manglo-Mt. Lamlam) and the hills form a broken terrain of ridges and valleys. Only in the southern and central parts of Guam are there permanent streams. The central 'constriction' is an argillaceous mixture, of soils, of volcanic and limestone types, and is generally less than 200 ft. in elevation.

The volcanic hills have clearly been at different elevations in the past, as is evident by the coral-reef, persisting as limestone rock, which partially surrounds or overlies the volcanic materials in such places as Mt. Almagosa (behind Santa Rita). The terraces mentioned above are further evidence; these mark former sea levels, and are in fact ancient beaches. Mt. Santa Rosa (870 ft. high) is evidence for the resumption of vulcanism after an extensive reef had formed.

In southern Guam, streams have deposited much heavy black soil. More is taken out to sea, as may be seen at Talofofo Bay, where extensive sandy-clay flats of a nearly black color occur. Near the middle of the island, just above Agaña, is a spring; this feeds the swamp (Agaña Swamp, or La Ciénaga), which in turn feeds the Agaña River. Springs occur also at Mt. Almagosa, and two nearby springs, Chepek and Almagosa, emerge from limestone caverns. The Talofofo River System, including the Ugum River (site of the broad cataract known as Talofofo Falls) is one of the major drainage systems, emptying eastward; another is the Fena system, which is dammed to form Lake Fena, situated in the Naval Magazine, and a protected forest reserve. Most of Guam's drinking water is taken from this large, lobed, attractive artificial lake. Various other streams empty to the south-east, the south, and to the west. No streams form in Northern Guam because the rainfall rapidly percolates straight down through the porous limestone to reach the freshwater lens at the island base. There are however temporary streams at Mataguac and Mt. Santa Rosa. Where streams meet the sea, bays are often formed. The largest in Guam is of course Apra Harbor, which however has been improved by the construction of the Glass Breakwater. The largest and deepest natural Bay is Talofofo.

Climate. The climate is almost uniformly warm and humid throughout the year. Afternoon temperatures are typically in high or middle eighties (°F), while during the night towards dawn the temperature drops to the low seventies or high sixties. Relative humidity is usually between 65–75% in the afternoon, rising to 85–100% at night. However, rainfall and wind conditions may temporarily and locally strongly affect these figures. Rainfall, and to a slightly lesser extent, wind conditions, effectively define the seasons.

May through September are the warmest months, with 30–year tables showing average temperatures for these months at 86° or 87°F, and extreme highs of 95°. Extreme low of 59°F was recorded during February.

Rainfall is heaviest from July through October; the thirty year average (based on years 1921–50) for the entire year is 86.45 inches; in July, average 11.42″; August, 14.5″; September, 14.4″; October, 12.9″; or a total of 53.22″; i.e. about sixty-five percent of the total average yearly rainfall comes in these four months. The driest month is usually April, with just over 2″ of rain. The greatest amount of rain to fall in one 24-hour period is however liable to be just before or after the 4 "wet" months—late June and early November. In November as much as 7.26″ of rain has fallen in 24 hours. This is also the month of typhoons. Winds almost invariably come from the East, at an average speed of 7 knots. Occasional winds may blow from NE or SW. On stormy days, wind speeds may rise to 30 knots. The closeness of typhoons or lesser storms is the main reason.

January through April is dry; July through October is wet; and the intervening months may be wetter or drier, varying from year to year.

The East Coast experiences the heaviest rainfall, being windward. The yearly average is 95″. The West coast averages 80″. In the dry season, the winds usually

average 15–25 knots.

Typhoons are large rotating wind-systems. Micronesia seems to be a locality particularly conducive to the generation of these storms. As a consequence, Guam has periodically experienced for whole geological periods the onset or close approach of these often extremely violent winds and their accompanying wave action. During the past 50 years, storms have passed close enough to bring winds and rain during every month except February. Typhoons which actually move across Guam are more rare. A really close approach can happen, with the chances being 1 in 3 for a given year; while the chances that one will touch Guam are about 1 in 8 in a given year. Reasonably severe and destructive typhoons appear to occur every 15 to 20 years; while perhaps once a century there will be an extraordinarily severe storm, with winds up to 200 knots.

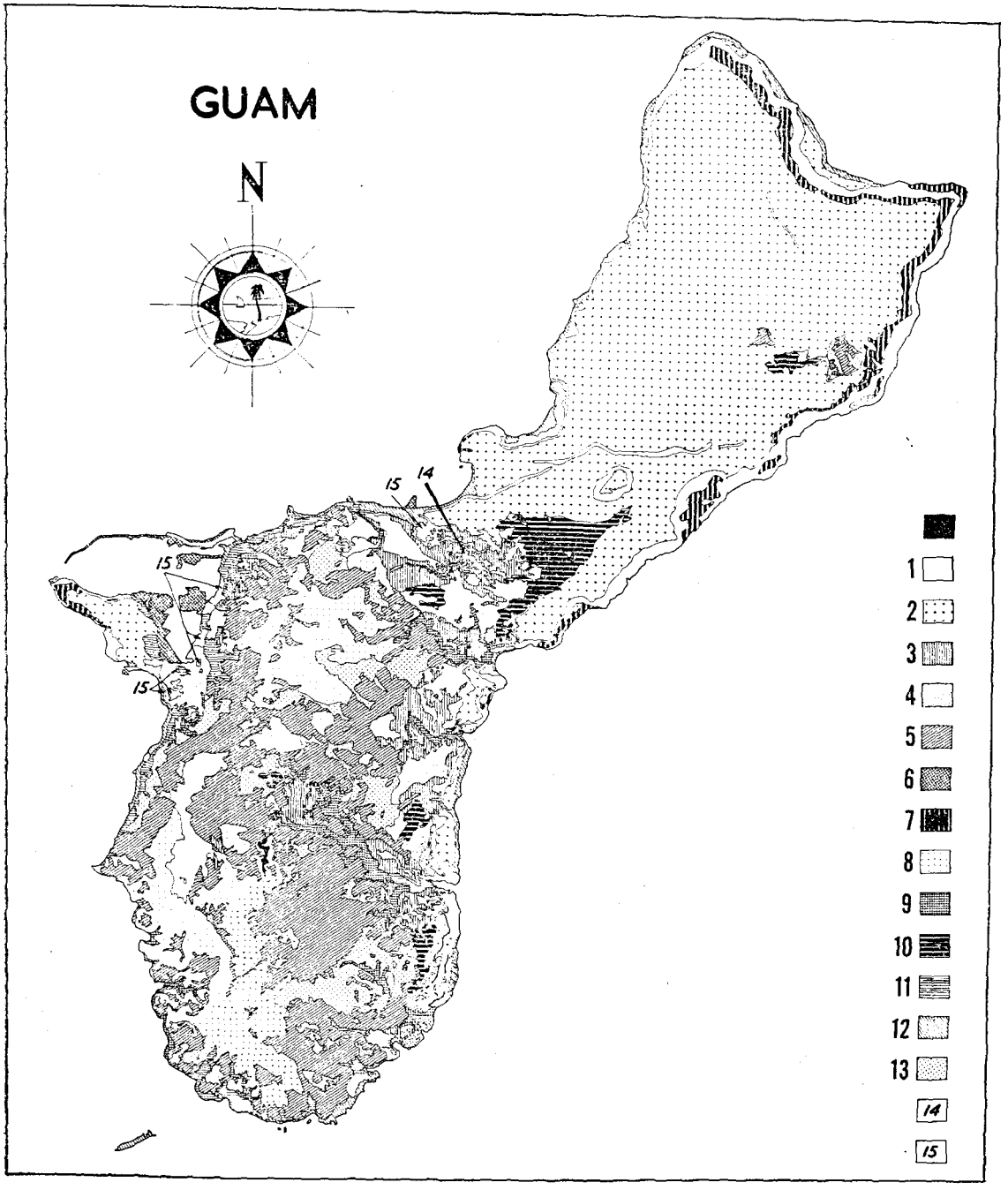
Typhoons are one of the major formative causes of Guam's vegetational aspect, and have led me to coin the term "Typhoon forest" to describe the general physiognomy of Guam's arboreous vegetation.

Soils. There are two basic parent materials for soils in Guam, volcanic and coralline limestone. The former is responsible for laterite soils, and these are derived from various forms of volcanically generated rocks—chiefly basalts. The latter forms a basic soil, the former an acid soil. Soils from the two sources may be mixed, forming argillaceous clays; these are found chiefly in the central and some southern parts of the island. Heavy black soils collect in valley bottoms, along streams, and in estuarial swamps.

Limestone soils are well drained and typically thin; once the upper few inches of clay (reddish, alkaline) is removed, the underlying rock is revealed.

Volcanic soils are poorly drained, reddish, grayish or purplish, rarely pale brown, locally streaked with blue or green, and are acid.

There seems little doubt that the limestone soils support a more varied vegetation, and often a denser one. However, the long term effect of man's activities has no doubt altered the picture very much. Certainly a large part, if not virtually all, of the grassland and savannah, now so characteristic of the volcanic hills, is due to fires and overgrazing by cattle and goats. Therefore it is very difficult to decide just how varied and how dense the vegetation of volcanic soils might have been in times before human habitation. It was certainly denser, and there is good probability that the hills were covered by a forest not much inferior to that now seen in the limestone areas; but there seems to be evidence that there were fewer species involved.



Map 3. Soil Map of Guam. North: limestone. South: laterites, basalts, argillaceous soils, etc. Note extensive limestone 'mesa' in N. Guam.

Map 3
SOIL MAP
Key to symbols

No.

0 Solid black=fresh water.

1 Limestone. (a) Guam clay; reddish, granular, friable, generally shallow.
(b) Gently sloping land with boulders, exposed rock, etc. Soil sparse.
(c) Same, but steep land or cliffs.

2 Toto clay; generally deep on argillaceous limestone; brown to pale yellow, firm, acid, moderately plastic, high shrink/expand cap'y.

3 Chacha clay; or Saipan clay; moderately to very deep on argillaceous limestone; neutral to acid; yellowish to brown or reddish.

4 Chacha and Saipan clay with very shallow Yona clay on convex ridgetops.

5 Yona clay on ridgetops, Chacha clay on intervening slopes, with small areas of shallow stony phase of Saipan clay. Brownish, granular.

6 Latosols. (a) Atate clay; deep reddish mottled, plastic to hard C horizon, pale yellow, olive, or gray in lower part; also Agat clay.
(b) Agat clay and Asan clay; C horixon pale yellow to olive or gray; Atate clay sparse.
(c) Chiefly Agat clay and Asan clay with some rocks.

9 Pago clay; non-calcar eous; deep, firm, plastic. Drainage good to moderate.

10 Inarajan clay; neutral to alkaline, generally with high water-table, poorly drained, often flooded. Shallow or deep, moderately firm.

11 Muck: usu. submerged and highly organic, with 20–50%±decomposed organic matter.

12 Shioya limesand; pale brown to white, with some dark organic color. Fine to coarse grained. *Beaches.*

14 Artificial: chiefly gravel mixed with limesand; also rubble, etc. Includes dumps.

Fig. 14. Limestone cliffs along the north end of Tumon Bay, with Cycads and Pandanus dubius, among other native vegetation.

Fig. 15. Tree-ferns (Cyathea lunulata) on Mt. Tenjo, 1944, where they no longer occur. (Photo by A. Vatter, from R. J. Rodin).

IV. Vegetation

As mentioned above, Dr. F. R. Fosberg's account of the vegetation of Guam in part 1 of his "Vegetation of Micronesia" makes unnecessary a repetition here. Instead, a very brief summary may be justified. For details, the reader is referred to Dr. Fosberg's account.

Type 1. Forests of elevated Hard Limestones—"Typhoon Forest".

Location. Northern half of Guam, the 'mesa', plus small areas elsewhere [e.g. at the ridge area around Mt. Almagosa; along the east coast from Yoña south to beyond Talofofo Bay; hills west of the Fonte River, near Agaña].

Characteristic species.

Subtype (a): *Artocarpus mariannensis* and *Ficus prolixa*; with *Aglaia mariannensis, Ochrosia oppositifolia, Tristiropsis acutangula, Premna obtusifolia, Elaeocarpus sphaericus, Pisonia grandis, Intsia bijuga, Eugenia thompsonii, Pandanus fragrans, Cycas circinalis, Psychotria hombroniana, P. mariana, Jasminum marianum, Morinda umbellata, Guamia mariannae, Bleekeria mariannensis, Randia cochinchinensis*, etc. Introduced, naturalized and abundant adventives: *Triphasia trifolia, Leucaena leucocephala, Cestrum diurnum.*

Subtype (b): Mixed Moist Forest. Similar to (a) but with little or no *Artocarpus.*

Subtype (c): *Mammea*-forest. (*M. odorata*). On cliffs and terraces near the sea, e.g. Mochom. Somewhat mixed with *Barringtonia asiatica.*

Subtype (d): *Cordia*-forest. Behind Tarague Beach. *Cordia subcordata—Pipturus argenteus—Macaranga thompsonii.*

Subtype (e): *Merrilliodendron*-forest.

Merrilliodendron megacarpum locally abundant. Haputo, limestone terraces; with *Ficus prolixa.*

Subtype (f): *Pandanus*-forest. Probably a secondary forest type, temporarily dominant.

Subtype (g): *Halophytic-Xerophytic Scrub.*

Many of the same species; also *Scaevola taccada, Eugenia bryanii, Pemphis acidula, Ischaemum longisetum, Leucaena insularum* var. *guamense, Hedyotis foetida* var. *mariannensis, Heritiera longipetiolata, Colubrina asiatica, Bikkia mariannensis, Pandanus dubius, Guettarda speciosa, Cynometra ramiflora.* On limestone rocks and cliffs receiving ocean spray or winds direct off the ocean.

Type 2. Ravine Forest—chiefly on volcanic soils or on argillaceous or limestone outcrops.

Location: Southern Guam.

Stature: low trees.

Characteristic species: *Hibiscus tiliaceus, Pandanus fragrans, Ficus prolixa, Premna obtusifolia, Glochidion mariannensis, Areca catechu*; also *Cananga odorata, Ochrosia oppositifolia, Pandanus dubius, Oplismenus compositus, Centotheca lappacea.*

Type 3. Marshes.

Subtype (a): Reed Marsh—dominated by *Phragmites karka*, example, Agaña Swamp (La Ciénaga).

Subtype (b): Bulrush-marsh—dominated by *Scirpus littoralis* var. *thermalis*. Bays around Apra Harbor.

Subtype (c): *Cyperus*-marsh.—Usually *Cyperus polystachyos*, or sometimes *C. ferax.*

Subtype (d): *Paspalum*-marsh. —*Paspalum vaginatum*; in brackish areas.

Subtype (e): *Brachiaria*-marsh.—*Brachiaria mutica, B. paspaloides.*

Subtype (f): Rice and/or taro patches.

Subtype (g): *Acrostichum aureum* marshes.

Type 4. Swamps—Mangroves.

Estuarine-tidal flat areas, especially near Apra; small examples also at mouths of streams on S. and S.E. coast.

Subtype (a): True Mangrove Formation. Chiefly in Apra. *Rhizophora stylosa, R. apiculata, Bruguiera gymnorrhiza, Lumnitzera littorea, Avicennia marina, Xylocarpus granatum, Acrostichum aureum, Nipa fruticans.* Marginal species: *Heritiera littoralis, Hibiscus tiliaceus, Phragmites karka.*

Subtype (b): pure *Nipa* stands.

Subtype (c): Riverine Barringtonia Swamp.

Barringtonia racemosa. Known only along the Talofofo River. This merges with a *Hibiscus tiliaceus-Pandanus fragrans* type.

Type 5. Strand Vegetation—sandy beaches. *Ipomoea pescaprae*; *Canavalia maritima*; *Scaevola taccada*; *Messerschmidia argentea*; *Wedelia biflora*; *Triumfetta procumbens*; *Lepturus repens*; *Thuarea involuta*; *Vigna marina; Hedyotis albido-punctata; Sporobolus virginicus; Paspalum distichum; Cocos nucifera; Casuarina equisetifolia.* Curiously absent (often) is *Pandanus.* Occasional or local: *Calophyllum inophyllum*; *Barringtonia asiatica; Sophora tomentosa; Thespesia populnea; Hernandia peltata; Hibiscus tiliaceus.*

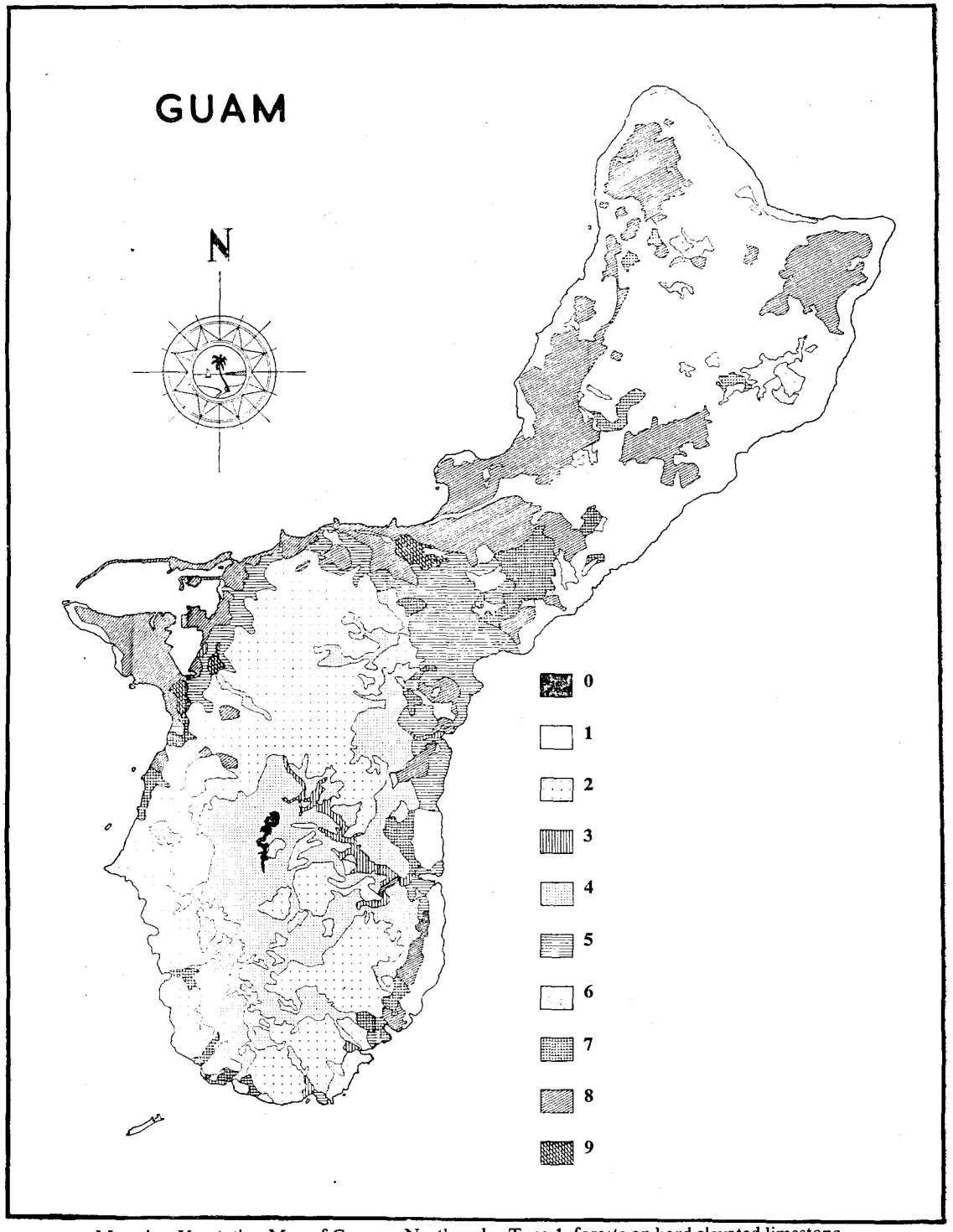
Type 6. Savannas—on volcanic soils.

Subtype (a): *Miscanthus* community. Swordgrass (*M. floridulus*). Sometimes pure stands.

Subtype (b): *Dimeria chloridiformis* community.

Subtype (d): Erosion Scar community.—Pioneer species.

Dicranopteris linearis; Myrtella bennigseniana; Wikstroemia elliptica;



Map 4. Vegetation Map of Guam. North end = Type 1, forests on hard elevated limestone.

MAP 4.
VEGETATION MAP
Key to symbols

Vegetation Type (Cf. Chapt. IV), after Fosberg.

Type 0.	Solid black = fresh water.
Type 1.	Forest of elevated hard limestone.
Type 2.	Ravine Forest, on volcanic soils (latosols, laterite) or on argillaceous or on limestone outcrops.
Type 3.	Reed marsh (Phragmites).
Type 4.	Swamp forest and/or mangrove swamp.
Type 6.	Savanna.
Type 7.	Secondary thickets usually on argillaceous limestone.
Type 8.	Coconut plantations.
Type 9.	Open ground, pasture, etc.; weed communities.
———	Bare ground, urban areas, airfields, paved land, quarries, etc.; vegetation insignificant, mostly sparse, herbaceous or shrubby, mainly weedy.

Decaspermum fruticosum; Blechnum orientale; Xylosma nelsonii; Cheilanthes tenuifolia; Alyxia torresiana (very local); *Melastoma marianum; Geniostoma micranthum; Pandanus fragrans* forma *savannarum; Hedyotis megalantha; Timonius nitidus; Utricularia* spp.; *Schizachyrium; Casuarina equisetifolia.*

Subtype (d): *Phragmites karka* valleys.

Type 7. Argillaceous Limestone Vegetation.

Location: Central Guam.

Dominant (adventive) species: *Leucaena leucocephala, Cestrum diurnum, Triphasia trifolia, Morinda citrifolia, Annona reticulata, Pithecellobium dulce.*

Type 8. Coconut Groves. Planted areas of *Cocos nucifera.*

Type 9. Weed Communities.

(a) Mixed Herb type
(b) *Pennisetum* communities
(c) Mixed grassland
(d) *Nephrolepis hirsutula* type.
(e) *Ipomoea indica* type.
(f) Mixed shrub community [virtually the same as Type 7].
(g) Pure stands of *Leucaena leucocephala* [tangan-tangan].

Notes on the Vegetation of Guam

Guam is a small island; it is not presently a very high one, but it very likely was about 1000–1500 ft. higher at the maximum in the days when its volcanic activity first ceased building mountains.* It has also been subject to alterations of height and of relative sea level, with the result that coral-reef derivative rocks and soils occur now at the very summit areas of the island. At least 4 sea levels [ancient beaches] can be discerned.

There is no evidence that Guam has been connected by overland transitions to the remaining Mariana Islands, but for plant dispersal the islands have been close enough [not over 40 miles] so that no major obstacle to dispersal among the southern Marianas has ever existed.

Guam displays 5 major types of substrate for plant life, excluding the aquatic fresh and the marine. These are: laterite [in the past, also young lavas and ash]; riverine mud, chiefly derived from laterites; coral rock + its derivative clay soils; coral sand, derivative of coral rock by wave action, hence always therefore as beaches; and finally, mixtures of coral and laterite soils [argillaceous soils]. These are mapped.

The coral rock and its derived soil supports a larger number of species than any of the other substrates. This can be viewed in 2 possible ways: (1) the coral

* Based on the premise (rather dubious) that the average height achieved by volcanism in a given locality remains roughly the same from cone to cone, and can therefore be judged on the basis of extent live cones. In the Marianas, the live cone—Pagan—is about 3000′ alt.

rock + soil positively provides a better substrate for plant growth and at the same time provides more niches [via stronger microclimate differences, or varying micronutritional differences], or (2) the laterite is negative in effect, i.e. *prevents* the growth of various plants.

One plausible hypothesis suggests that the laterite soils are more restrictive chiefly because of their tendency to become quickly waterlogged, and to stay thus for long periods. In contrast, the coral soils are well and rapidly drained by vertical percolation, and well aerated.

The coral substrates probably also provide a greater diversity of niches. For example, the various degrees of fragmentation, ranging from essentially solid, though porous and ± brittle, coralline rock, through intermediate stages to fine, alkaline, red clays, seldom of much thickness [up to a few inches] but rich in nutrients.

Finally the abundance of calcium, chiefly as carbonate, with the concomitant slightly to highly alkaline pH of the coralline substrate, provides a significant difference for plants.

It is therefore not surprising to find that the great majority of the endemic plants in Guam's flora are plants of the coral substrate. Only a few occur in other habitats [e.g. *Potamogeton mariannensis*, fresh water; *Pandanus fragrans* forma *savannarum* chiefly on laterite; *Hedyotis megalantha* on laterite]. A number of species which occur on both laterite and coral substrates have slightly different forms, e.g. *Pandanus*. The laterite substrates may however support species endemic in a slightly larger area, e.g. *Myrtella bennigseniana* (Marianas-West Carolines). The really marked and significant endemics, e.g. *Guamia* (Annon.), with 1 sp., *Aglaia mariannensis, Eugenia thompsonii, Heritiera longipetiolata*, etc., are all limestone plants. Even the few peculiar strand forms are chiefly on the hard limestone beach rocks, not on sand alone, i.e. *Leucaena insularum* var. *guamense*.

Heritiera longipetiolata is perhaps derived from *H. littoralis*. It is an example, in my opinion, of speciation of inland endemics of limestone forest, from littoral or riverine species (*Heritiera littoralis*, despite its name, is equally a riverine species or a semi-mangrove type). It may be suggested that the obviously abrupt changes in sea level, especially where the relative sea level rose as is evident from the old, raised beaches [at least 3 levels are well-defined in Guam] provided a means whereby the floating fruits or seeds of these (and various other) species could be dispersed well toward the interior and to a relatively distinct ecological habitat.

Not all cases, however, resulted in changes leading to endemism and distinctness. *Calophyllum inophyllum, Barringtonia asiatica, Barringtonia racemosa, Pandanus dubius,* and *Caesalpinia bonduc* may be cited as examples of species producing floating fruits or seeds which have not shown any trends toward distinctness.

In *Pandanus fragrans* we have an intermediate example; inland forms, sometimes with obvious, if rather trivial, unique characters, do occur.

Possibly *Canavalia megalantha* is a case parallel to the endemic *Heritiera*.

It is of interest to note that *Barringtonia asiatica* is a very common inland plant

in Saipan, forming one of the two or three dominant canopy forming species there even on the island's summit, Mt. Tagpochau. Yet in Guam, this plant is seldom found much above sea level except where it has been planted, and is common on rocky limestone coasts. I can offer no explanation of this difference, since *Barringtonia* is almost certainly naturally dispersed and deliberate planting is rare and possibly of recent occurrence only.

Other species to be considered are *Bleekeria mariannensis* and *Cerbera dilatata*; it is possible that these 2 spp. originated from widespread littoral species, but if so, the latter are no longer found in the Marianas. *Cerbera manghas*, however, still occurs elsewhere in the region, as in Palau.

Safford (1905: 55) states that the pandans in Guam do not occur on the outer beach, but this is not the case; I have often seen *P. dubius* only a few feet from the ocean or lagoon (as at Tumon Bay), and *P. fragrans* also, though less commonly. I have also noticed on many occasions the phalanges of both species washed up on beaches, though whether they originated in Guam or elsewhere it is not easy to tell; they could well have originated from Marianas plants however, since they correspond with the species found there.

Another littoral endemic is *Leucaena insularum* var. *guamense*, found in such localities as Cocos Islet, and at Asanite Bay.

V. Phytogeography

The phytogeographic relationships of the Guam flora are with the Indomalaysian flora, both the strand and the upland elements. The generic relationships have been carefully assessed recently by M.M.J. van Balgooy, in his 'Preliminary Plant-Geographical Analysis of the Pacific' (Blumea 10(2). 1960), and a more detailed consideration by species has more recently appeared in Micronesica vol. 3 (1967) by the present writer, originally read as an invited paper at the 11th Pacific Science Congress in Tokyo, 1966.

Balgooy's analysis pertains to the whole Marianas Archipelago. His results are as follows: (a) the affinity of the flora with that of East (continental) Asia is extremely small; (b) the affinity with the Malaysian tropics is large, and there are many paleotropical genera; (c) the single endemic genus is *Guamia* (Annonaceae); (d) fourteen genera (6.5%) of the Guam total do not occur in Continental Asia; (e) agreeing with Hosokawa, there is a marked disjunction between the Marianas and the Bonin Islands; (f) there is a small but noticeable disjunction between the Southern and Northern Marianas; (g) the Marianas share 6 genera with New Guinea which do not occur in the Philippines, and only share 2 genera with the Philippines which do not occur in New Guinea; hence the Marianas show an affinity with Eastern Malaysia; (h) the relationship with the Caroline Islands is strong, but not overwhelming; the Marianas have 54 genera not found in the West Carolines, and the West Carolines have 182 genera that do not occur in the Marianas.

The Marianas have a total of 217 genera; of these, 134 (61.1%) are of worldwide

distribution; 54 (25.4%) are paleotropic; 13 are Asiatic-Malaysian; 6 are Malaysian; 1 is Malaysian-Australian (totalling 9.2%); 4 (1.9%) are Pacific; 3 (1.4%) are Australian; 1 (0.5%) is Temperate Worldwide; and 1 (0.5%) is endemic. Nearly all the 217 genera have been found in Guam [a few are still missing, e.g., *Drypetes, Styphelia, Croton, Meryta, Boerlagiodendron*; but further collecting may reveal them].

My results based on species show exactly the same picture.

The total flora so far recorded for Guam comes to 931 species, including the native and the introduced vascular plants. There are 6 gymnosperms, 58 ferns and fern-allies, 262 monocots, and 605 dicots. These are distributed among a total of 546 genera, of which 37 are fern genera, 5 are gymnosperms, 142 are Monocots, and 362 are Dicots.

Of this grand total, the introduced element comprises approximately 63% of the total (585 of 931 species). Many of the introduced species are however quite rare. This grand total of 931 exceeds previous estimates by Glassman (of 510 species) and Hosokawa, (of 480 species for the whole Marianas Chain).

The Introduced plants may be arranged as follows:

(1) Crops and experimental plantings.
Monocots 51, Dicots 125. Total 176.

(2) Ornamental plants.
Gymnosperms 5, Monocots 56, Dicots 144. Total 205.

(3) Weeds.
Monocots 36, Dicots 136, Ferns 2. Total 174.

(4) Probably weeds, waifs, and rare escapes—Total 30.

Thus there is a total of 585 species of introduced plants.

This leaves a total of 346 species for consideration as native. Of this group, about 20 species are questionably native, of uncertain derivation, or of uncertain specific status, or are unsatisfactorily determined. Most of them will probably prove to be weeds or escapes. The remainder make up the native flora, which therefore comes to 327 species. This total includes 56 species of ferns and fern-allies, 1 gymnosperm, and 270 angiosperms (86 Monocots, 184 Dicots).

These 327 species are considered under the following 8 headings: (1) Endemic elements, found only in the Marianas Islands, especially the southern Marianas (Guam, Rota, Tinian, Saipan). (2) Endemic Micronesian element; found, in the Mariana Islands and Caroline Islands only. (3) Polynesian element, found in Polynesia and Micronesia. (4) Melanesian element, found in New Guinea, the Solomon Islands, New Hebrides, and environs, and in Micronesia, sometimes, but not necessarily, also in Polynesia. (5) Indomalaysian—Pacific element, found from India, Indian Ocean islands, through Malaysia to most Pacific Islands; sometimes not extending beyond Malaya to the west; sometimes found only in the Philippines in Malaysia. (6) Paleotropical element—Tropics of the Old World, Africa, India, Malaysia, and the Pacific. (7) Pantropical element—tropics generally. (8) Obscure or Special distributions.

The distribution of the 270 native species of Angiosperms is as follows:

(1) One genus (*Guamia* Merr., Annonaceae) is endemic in the Mariana Islands. It has one species, *G. mariannae.* It is close to the Malaysian genus *Polyalthia.*

About 68 species (25.2%) are endemic in the Mariana Islands. [A very few, not counted below, are endemic but do not occur in Guam; for example, *Styphelia mariannensis, Croton saipanensis, Boerlagiodendron rotense* and *Meryta capitata.* Two taxa, *Leucaena insularum* var. *guamense,* and *Balanophora pentamera,* have been found only in Guam].

Glassman (J. Arn. Arb. 29: 183. 1948) concluded that 66 species were endemic in the Marianas.

(2) Micronesian element.—16 species or varieties (6%). A number of these are Marianas-West Carolines (Yap-Palau) or Marianas-West Carolines-Central Carolines (Yap-Palau, and Truk) in their distribution. Very few species show a Marianas-East Carolines (Ponape-Kusaie) distribution.

(3) Polynesian element (including Fiji).—4 species. (1.4%).

(4) Melanesian element.—12 species. (4.4%).

(5) Indomalaysian-Pacific element.—95 species. (35.2%).
(Including a number with Marianas-Philippines distribution).

(6) Paleotropical element.—22 species. (8.2%).

(7) Pantropical element.—39 species. (14.4%).

(8)(a) Obscure or doubtful.—12 species. (4.4%).

(b) Special distribution: Bonin-Marianas.—1 sp.

The distribution of the 56 species of ferns is as follows:

(1) Endemic element.—2 spp. (3.6%).

(2) Micronesian element—combined with

(3) Polynesian element.—4 species. (7.2%).

(4) Melanesian element.—1 species. (1.8%).

(5) Indomalaysian-Pacific element.—total—21 species. (37.8%).

(a) Philippines-Marianas—1 sp.

(b) Philippines-Sumatra-Marianas—1 sp.

(c) Philippines, Borneo, New Guinea—1 sp.

(d) Indomalaysian wide distrib.—15 spp.

(6) Paleotropical element.—18 spp. (32.4%).

(7) Pantropical element.—10 spp. (18%).

Combined distribution of Vascular Plants (58 ferns, 270 Angiosperms), total 328 spp.

(1) Endemic element.—69 spp. (21.3%).

(2) Micronesian element.—16 spp. (5.2%).

(3) Polynesian element.—8 spp. (2.6%).

(4) Melanesian element.—13 spp. (4.4%).

(5) Indomalaysian-Pacific element.—113 spp. (34%).

(6) Paleotropical element.—40 spp. (12.2%).

(7) Pantropical element.—49 spp. (15.2%).

(8) Dubious element.—14 spp. (4.5%).

The native flora of 328 species is distributed in 86 families, of which 10 families are ferns and fern-allies; (the Polypodiaceae taken "sensu lato"); 1 family, the Cycadaceae, is gymnospermous; 16 families are Monocots; and 59 families are Dicots.

Families represented in native flora:

GYMNOSPERMS—1, Cycadaceae

MONOCOTYLEDONS: 16 fams.

Pandanaceae, Zannichelliaceae, Potamogetonaceae, Ruppiaceae, Hydrocharitaceae, Gramineae, Cyperaceae, Palmae, Araceae, Flagellariceae, Commelinaceae, Philydraceae, Liliaceae, Hypoxidaceae, Dioscoreaceae, Orchidaceae. [doubtful: ? Zingiberaceae].

DICOTYLEDONS: 59 fams.

Casuarinaceae, Piperaceae, Ulmaceae, Moraceae, Urticaceae, Olacaceae, Balanophoraceae, Polygonaceae, Amaranthaceae, Nyctaginaceae, Alzoaceae, Portulacaceae, Ceratophyllaceae, Menispermaceae, Annonaceae, Lauraceae, Hernandiaceae, Capparidaceae, Leguminosae, Rutaceae, Meliaceae, Simarubaceae, Euphorbiaceae, Anacardiaceae, Icacinaceae, Sapindaceae, Rhamnaceae, Tiliaceae, Malvaceae, Sterculiaceae, Theaceae, Guttiferae, Flacourtiaceae, Cucurbitaceae, Thymeleaceae, Lythraceae, Rhizophoraceae, Combretaceae, Lecythidaceae, Myrtaceae, Melastomaceae, Araliaceae, Umbelliferae, Sapotaceae, Myrsinaceae, Primulaceae, Loganiaceae, Gentianaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Boraginaceae, Verbenaceae, Solanaceae, Scrophulariaceae, Lentibulariaceae, Rubiaceae, Goodeniaceae, Compositae.

FERN ALLIES & FERNS: 10 fams.

The endemic species of Guam (including those of the Marianas in general) are as follows:

Ferns: 2 spp., *Ceratopteris gaudichaudii* Brongn. *Thelypteris maemonensis* (Wagn. & Greth.) Stone.

Monocots: *Pandanus fragrans* Gaud., *Potamogeton mariannensis* C. & S., *Digitaria mariannensis* Merrill, *Ischaemum longisetum* Merrill, *Digitaria stricta* Gaud., *Dimeria chloridiformis* Gaud., *Dendrobium guamense* Ames, *Taeniophyllum mariannense* Schltr., *Saccolabium guamense* Ames, *Bulbophyllum guamense* Ames.

Dicots: *Peperomia mariannensis* DC., *Piper guahamense* DC., *Artocarpus mariannensis* Trécul, *Ficus microcarpa* L.f. var. *saffordii* (Merrill) Corner, *Ficus prolixa* var. *subcordata* Corner, *Elatostema calcareum* Merr., *Elatostema stenophyllum* Merr., *Dendrocnide latifolia* (Gaud.) Chew*, *Balanophora pentamera* v.T., *Tinospora homosepala* Diels, *Capparis cordifolia* Lamk., *Canavalia megalantha* Merr., *Leucaena insularum* var. *guamense* Fosb. & Stone, *Serianthes nelsonii* Merr., *Tephrosia mariana*

* This is now known to occur in the Solomon Islands.

DC., *Aglaia mariannensis* Merr., *Claoxylon marianum* M.-A., *Euphorbia gaudichaudii* Boissier, *Macaranga thompsonii* Merr., *Phyllanthus saffordii* Merr., *Maytenus thompsonii* (Merr.) Fosb., *Allophylus holophyllus* Radlk.,* *Heritiera longipetiolata* Kanehira, *Xylosma nelsonii* Merrill, *Eugenia bryanii* Kanehira, *Eugenia palumbis* Merr., *Eugenia thompsonii* Merr., *Medinilla rosea* Gaud., *Discocalyx megacarpa* Merr. *Maesa* sp. nov., *Jasminum marianum* DC., *Alyxia torresiana* Gaud., *Cerbera dilatata* Markgraf, *Tabernaemontana rotensis* (Kanehira) Fosberg ex Stone, *Bleekeria mariannensis* (A.D.C.) Koidzumi, *Dischidia puberula* Decaisne, *Ipomoea indica* f. *albiflora* Stone, *Solanum guamense* Merr., *Bikkia mariannensis* Brongniart, *Canthium odoratum* var. *tinianense* (Kanehira) Fosberg, *Hedyotis albido-punctata* (Merr.) Fosb., *Hedyotis megalantha* Merr., *Hedyotis foetida* var. *mariannensis* (Merr.) Fosb., *Hedyotis laciniata* Kanehira, *Morinda umbellata* var. *glandulosa* (Merr.) Fosb., *Psychotria mariana* Bartl. ex DC., *Psychotria hombroniana* (Baillon) Fosberg, *Psychotria rotensis* Kanehira, *Timonius nitidus* (Bartl.) F.-Villar, *Melothria guamensis* Merr.

Of the crop plants, at least 19 species are probably of pre-European aboriginal introduction: *Bambusa vulgaris, Coix lachryma-jobi, Oryza sativa, Saccharum officinarum, Cocos nucifera, Tacca leontopetaloides* (?), *Dioscorea alata, D. esculenta, Musa sapientum* and *M. paradisiaca, Curcuma domestica, Zingiber zerumbet, Maranta arundinacea, Pangium edule, Areca catechu, Colocasia esculenta, Cyrtosperma chamissonis, Artocarpus communis, Piper betle.* To this may be added a few species possibly of aboriginal introduction, i.e. *Cananga odorata, Inocarpus edulis, Canna edulis, Citrus aurantifolia, Luffa acutangula, Momordica charantia, Ipomoea aquatica, Mangifera indica, Boehmeria tenacissima, Ficus tinctoria, Moringa oleifera.*

Some of the ornamental species may also be of aboriginal introduction. These are: *Adenanthera pavonina, Cordyline fruticosa, Acalypha wilkesiana, Codiaeum variegatum, Polyscias fruticosa, P. scutellaria, P. pinnata, Pseuderanthemum carruthersii.* The time of introduction of all of these could however have been after 1521.

A large number of the introduced plants are from Mexico, Central or South America, and may be traced to the Spanish galleon route from Acapulco, Mexico, to Guam, and on to Manila, Philippines. The long Spanish occupation and governance of the island ensured that many crops, ornamentals, and weeds were introduced from the vicinity of Acapulco and from around Manila.

Important crops of American origin include these 20 species: *Zea mays, Annona muricata, A. reticulata, A. squamosa, Persea americana, Vanilla planifolia, Xanthosoma* spp., *Ananas comosus, Hevea brasiliensis, Manihot esculenta, Gossypium barbadense, Ceiba pentandra, Carica papaya, Lagenaria siceraria, Psidium guajava, Manilkara achras, Ipomoea batatas, Capsicum annuum, Nicotiana tabacum, Solanum lycopersicum.*

Some of the weeds of undoubted or probable American origin are the following 42 species:

* Probably a mere form of *A. cobbe* L.

Sagittaria subulata, Cenchrus echinatus, Paspalum conjugatum, Paspalum ciliatifolium, P. fimbriatum, Pennisetum setosum, Cassia alata, C. occidentalis, C. sophora, C. tora, Acacia farnesiana, Crotalaria quinquefolia, Indigofera suffruticosa, Leucaena leucocephala, Mimosa pudica, Zornia diphylla, Tribulus cistoides, Euphorbia cyathophora, E. geniculata, E. glomerifera, Triumfetta semitriloba, Malachra capitata, M. fasciata, Asclepias curassavica, Ipomoea triloba, Stachytarpheta jamaicensis, S. indica, Hyptis capitata, H. mutabilis, H. spicigera, H. suaveolens, H. pectinata, Capsicum frutescens, Physalis angulata, P. lanceifolia, Hippobroma longiflora, Ageratum conyzoides, Elephantopus mollis, Conyza bonariensis, Synedrella nodiflora, Pseudelephantopus spicatus, Tridax procumbens.

Further American species, some weedy, some abandoned, after cultivation, in old fields of Guam are: *Amaranthus spinosus, Passiflora foetida, Jatropha curcas, Calopogonium mucunoides, Crotalaria mucronata, Mitracarpum hirtum, Heliotropium indicum, Ipomoea quamoclit, Blechum brownei, Chloris inflata.*

Therefore of the 150 species of weeds in Guam, about 52 species are of New World origin. The remainder are either of Old World origin, or are pantropical and of obscure or unknown origin.

PHYTOGEOGRAPHIC REFERENCES

Merrill 1914, passim.—Hosokawa, J. Soc. Trop. Agric. 6(2): 201–209; et 6(4): 657–670. 1934.—Glassman, J. Arn. Arb. 29: 169–185. 1948.—Balgooy, Blumea 10(2): 385–430. 1960.—Stone, Micronesica 1: 131–136. 1964; 2(1): 47–50. 1965; 2(2): 133–141. 1966; 3(1): 67–73. 1967, also as abstract in 11th Pac. Sci. Congr. Abstracts of Papers (Biology), Symposium—Botany Div. Meeting, 1966.

VI. Forest and other Plant Resources

Under present conditions of population, employment, economic opportunity, and a chiefly import market, there is very little obvious use of or dependence on plants or locally processed plant products. In past times however, local forest products, especially timber, were in demand and in use. This was due to several reasons; difficulties in transportation made importing both slow and expensive; the local forests were somewhat more extensive, and the better timber species more prevalent; and local demand for timber was smaller, but depended on what was locally available. However, pressures on locally available species increased, and the result is that now larger trees of the most useful species are hard to find. In very recent times of course imported timber has nearly completely replaced locally cut material.

Perhaps one of the most desirable timbers is that of the ifil, *Intsia bijuga.* The heartwood (says Safford, 1905: 297) is heavy and hard, not elastic. "It is very durable, and is used for posts of the best houses". "Although of rather coarse grain, it takes a fine polish." Floors, tables, etc. may be made of ifil; it is exceedingly

durable. Some of the oldest houses in Agaña exemplify the extraordinary durability of this wood. It is resistant to termites. Holes must be bored for nails; they cannot be driven into old wood.

Intsia is not uncommon, but it is rather difficult to find a tree over 1 ft. in diameter. One large tree occurs at Tarzan Falls, Manengon. Difficulty of removal from rugged or inaccessible sites prevents the use of otherwise suitable trees.

There are a number of other useful timber species, both native and naturalized. A brief list of these may be conveniently inserted here:

Native Timber Species

I. Hard, durable timbers

1. ifil — *Intsia bijuga.* (Leguminosae). Discussed above. Limestone soils.
2. faia — *Tristiropsis acutangula.* (Sapindaceae). Limestone or mixed soils.
3. yoga — *Elaeocarpus sphaericus.* (Elaeocarpaceae). Limestone soils.
4. da'og — *Calophyllum inophyllum.* (Guttiferae). Coasts, or limestone soils.
5. ufa — *Heritiera litoralis.* (Sterculiaceae). Estuaries, mangrove areas.
6. mangle. — *Rhizophora stylosa.* (Rhizophoraceae). Mangrove swamps.
7. ——— — *Eugenia thompsonii.* (Myrtaceae). Limestone soils.
8. gago — *Casuarina equisetifolia.* (Casuarinaceae). Savannahs or limestone; coast.

II. Medium to soft timbers

1. dugdug — *Artocarpus mariannensis.* (Moraceae). Limestone soils chiefly.
2. lemae — *Artocarpus communis* (Moraceae). Cultivated.
3. pago — *Hibiscus tiliaceus.* (Malvaceae). Coasts, estuaries, etc.
4. kilulu — *Thespesia populnea* (Malvaceae). Coasts.
5. nonag — *Hernandia peltata.* (Hernandiaceae). Coasts.
6. puting — *Barringtonia asiatica.* (Lecythidaceae). Coasts.
7. ahgao — *Premna obtusifolia.* (Verbenaceae). Coasts; limestone soils.

Introduced and Naturalized Timber Species

1. mamis — *Albizia lebbek.* (Leguminosae). Uncommon.
2. buoy — *Inocarpus edulis.* (Leguminosae). Uncommon.
3. ——— — *Peltophorum pterocarpum* (Leguminosae). Cultivation only.
4. kamachili — *Pithecellobium dulce.* (Leguminosae). Nat'zd.
5. "nana" — *Pterocarpus indicus.* (Leguminosae). Excellent wood; uncommon.
6. "raintree; monkeypod" — *Samanea saman* (Leguminosae). Excellent wood.
7. "lignumvitae" — *Guaiacum officinale.* (Zygophyllaceae). Rare.
8. mango — *Mangifera indica.* (Anacardiaceae). Fairly common.
9. algodon de Manila — *Ceiba pentandra.* (Bombacaceae). Cult.
10. "teak" — *Tectona grandis.* (Verbenaceae). Planted.

11. "yokewood" *Catalpa longissima.* (Bignoniaceae). Planted.
12. talisai *Terminalia catappa.* (Combretaceae). Planted; / native.

This list does not quite exhaust the possibilities, but the other species do not (under local conditions, at least) produce a large enough bole or branches. For special uses, not involving long or broad planks, many other species may be suitable. *Pemphis acidula* (nigas) for example yields an extremely durable wood, very hard and dense; but the stems are rarely more than a few inches thick, and are often very short and twisted. A few species are suitable as timber but are so rare that they should not be used even if trees are located; a prime example is *Serianthes nelsonii* (hayun-lago).

It is clear that exploitation of native or naturalized species can only provide a very tiny fraction of the wood needed in Guam's daily economy. This fact focuses attention on the really important function of trees in Guam, namely, to act as water-shed protection, as forest reserves; to act as shade-producers and beauties of the landscape; to prevent soil erosion; and as ornamental fruit-trees.

There is a tremendous need for afforestation projects. The savannah areas, wherever feasible, should be planted with suitable tree species to prevent the shocking and dangerous erosion floods that have ruptured and disfigured so much of Guam's hilly southern portion.

It still seems to me that it is urgently necessary to create a local Forestry Department, whose chief task would be afforestation.* The scarred, ruined areas south of Dededo, at Dandan, inland from Inarajan, above Merizo, and so on—many localities!—with their ever present flood danger, present a very large and difficult challenge. A careful yet intensive program of tree-planting, both using existing species and experimenting with introduced species, should be delayed no longer. Valuable species could be introduced from suitable tropical regions. This would be soil conservation, among other things.

At one time, many exotics were introduced. A few species became rather widely naturalized; others seem not to be reproducing. In the old planting area above Piti, there are still dozens of trees. But no follow-up of large-scale planting ever seems to have been undertaken, and the entire project will have been wasted unless these old plantings are used at least as examples evidencing their suitability or lack of the same.

The problems of the northern limestone mesa are less obvious but still exist. Since the area lacks streams, and is flatter, the runoff and erosion problems are less than in the south. What seems required is gazetting of forest reserves and parks, the enrichment of existing forests with the better *native species*, and attempted reclamation of disclimax grassland or scrub.

* This was recommended also in 1951 by the forester Colin Marshall, in his 'Report on Forestry in the Trust Territory of the Pacific Islands", Pacific Science Board—Natl. Research Council, S.I.M. series.

VII. Forest Reserves, Protected Areas, and Parks

The largest protected forest area in Guam is that around Lake Fena and the Naval Magazine. Here (since 1946) occurs the finest forest area in the southern half of the island, which is the watershed region feeding Fena, and thereby providing the major source of fresh water in Guam. It also provides a dramatic example of what a forest reserve policy can do for other, presently unprotected, areas. To stand on the cross-island road, looking first south, toward Fena, then north, is to realize suddenly how severely devastated the Guam hills are. In Manengon to the north of the road, grasslands with a large number of bare, gullied slopes occur; the few trees are restricted to the deepest gulches, except for the scattered, fire-susceptible *Casuarina* (gago) and fire-resistant *Pandanus* (kafu) trees, which however are stunted and poor. Through regions such as this there sweep each year uncontrolled, often deliberately started, fires. These fires are sometimes set to burn off the swordgrass (*Miscanthus* or neti) and become out of control; more often perhaps they are set by deer-hunters who hope to bring the Marianas Elk (*Cervus mariannensis*) into the areas a few weeks after the fire, when the swordgrass rhizomes are emitting new, tender green shoots. Some fires are perhaps accidental; others set for the mere enjoyment of watching the destruction. No doubt it is a very ancient practice, as it is certainly widespread in the Pacific Islands, and for that matter, all through the tropics. It represents an early recognition of the use of fire, and is often closely associated with swidden ("slash-and-burn") agriculture of primitive tribes. In an island like Guam it is however anachronistic, and no longer can be tolerated.

Forest reserves can only develop anew when protected from fire. Otherwise, with each successive blaze, the marginal trees are killed and the forests retreat to streamfed gullies. Swordgrass, and associated savannah species, expand their total area. Over many years, this pattern, repeated again and again, has denuded once rich forest areas, until what remains is essentially worthless neti or bare, heavily eroded banks, devoid of topsoil and humus, unable to support (in some cases) any life at all. This is of course accompanied by flooding, as the water-holding capacity of vegetation is reduced, finally, to nothing, during the sequence Forest—Savannah—grassland—bare ground. This is grossly fundamental ecology, but it seems to be appreciated very little. The tragedy of course is that this wasting of resources has largely been ignored by previous generations. Worse still is the sobering fact that *reclamation*—repair of the landscape—is vastly more expensive than *protection.* Alone, the private citizen can usually do very little as to reclamation; but he can do something about protection. The landowner can fence off remaining forest areas to keep them free of cattle and goats; he can utilize fire control; he can enrich his pasture lands so that more stock can be raised on less land; he can rotate grazing areas; he can plant out trees wherever it is possible. Citizens can expect from their governing bodies a sound program of forest reclamation, forest watershed reserves, and recreational parks.

Besides the Fena region there are some other protected areas: the Pago Bay cliffs just north and east of the University of Guam campus are a nature reserve held by the University, and this fine small example of limestone forest can be used by biology students and visitors; it is a rare thing to have such a good reserve within easy walking distance of a College campus. Another protected area is Ypiga in north-central Guam; still another one is Agaña Spring, with its interesting freshwater biota, now controlled by the University of Guam.

These areas were set aside not very long ago by the Government of Guam. Hence, some of them have not had time to recover as fully as the Fena area. More such areas are still required. One use of such areas would be ecological study in quest of a fuller understanding of the indigenous biota.

Guam has several small recreational parks also, but with the exception of the attractive Plaza de España, and the beach areas at several localities such as Agat, much remains to be done to improve existing facilities. New ones are also urgently needed, especially if tourist trade increases. The intelligent use of plants in such parks will of course be one of the chief causes of their beauty and utility. Some parks will be essentially gardens: others should be nature study areas, in which the natural vegetation, with its accompanying fauna of birds, butterflies, and other animals, remains intact for the enjoyment and education of one and all. Here might be mentioned the need for aquatic conservation; marine and freshwater life also require protection. An underwater park, rich in corals, algae, and brilliant tropical fish, such as now exists in Florida, is highly desirable in Guam. The small bay just north of Talofofo, Asanite Bay, is an ideal one for a small park, together with the splendid limestone cliffs behind it.

VIII. Agriculture

The greater number of the agricultural species found in Guam are included in this flora, with at least a minimal description, so that the student can utilize the book as an introduction to agricultural botany. A full survey of Guam agriculture would however be out of place here, as well as redundant. Safford (1905) describes the agriculture of the island residents very thoroughly, and nearly all of his account is still applicable. Of course newer crops have been added, and newer techniques. On the other hand, the *de facto* importance of local agriculture in the modern Guam economy has altered greatly since Safford's time. The number of full-time farmers has decreased, and is still decreasing. Part-time farmers and "home garden" farmers have perhaps remained in about the same proportion.

Perhaps all that need be said here is to point out that Guam no longer makes use, or much use, of many plants which were of importance to the aboriginal population. The consumption of such foods as *suni* (*Colocasia*), *nika* (*Dioscorea*), *gabgab* (*Tacca*) has certainly declined very much since Magellan's time. Even the local cultivation of rice has virtually disappeared. Yet these plants persist, and may be thought of as emergency agricultural resources. Of course, it might be worth-

while using modern agricultural techniques on some of these neglected species.

A fuller account of agriculture is beyond the scope of a flora. The reader should turn to the reports of the Guam Experiment Station and the Guam Department of Agriculture.

IX. Gardens and horticulture

Life without gardens is bare anywhere; in the tropics it is almost easier to have one than not to have one. The weeds will come in anyhow; and even the most indifferent will find that it is better at least to make a pretence than to be adamant. But for those to whom a garden is not a mere extremity or a self-managing process, the tropics present both a challenge and an opportunity. A challenge, because those from temperate climates will find so many plants new to them, with ways of behavior different from those they know; an opportunity, because the plant wealth of the tropics often far surpasses that of colder countries. But do not be misled; a tropical garden can be difficult. It is neither sensible, nor in many cases possible, to grow familiar plants from the temperate zone. The gardener must then learn something of the plants which are suited for his tropical home, and choose among them. Even then there will be problems; this is particularly true in Guam, where the average gardener must cope with the following disadvantages: usually continuous, often fierce, and mostly salty breezes; difficult or impossible soil conditions; and the sometimes formidable array of pests.

This book cannot pretend to cope with the whole field of gardening; a separate book for that is required. Besides, there may be very different approaches for those to whom the garden is purely ornamental and those who like to have a steady home supply of vegetables or fruits. In either case, the reader who is an avid gardener must supply himself with more pertinent advice and instructions, such as the pamphlets devised by the Agricultural Extension service, or the various full-sized manuals on tropical horticulture, of which several very good ones exist. MacMillan's book on tropical horticulture is a useful investment; the Hawaii State Agricultural Extension Service also can provide much useful information in the form of booklets and newsletters. This lies beyond our scope.

All that need be mentioned here is that, despite the general and special problems it is quite possible to have either an ornamental or a vegetable garden in Guam. But precautions must be taken.

As has been pointed out in earlier chapters the soils of Guam are ultimately derived from two sources; reef- building, lime-secreting organisms; and volcanoes. These result in limestones and basalts, respectively, and the soils derived from these two kinds of rocks are quite different. As a result some plants thrive on one kind of soil, but may fail to prosper or even die in the other kind. However, there are different soils (from the standpoint of soil classification as well as from the gardener's pragmatic standpoint) which are, roughly speaking, mixtures of limestone and basalt types. These occur chiefly in south and central Guam, where limestone and basalt

areas occur together. The northern part of the island, with the exception of the Santa Rosa area and a couple of other small areas, are completely limestone.

Most gardeners will find that they are limited to one or another type of soil. Those near the beach will have a limestone sand, rather than a limestone soil, or perhaps both. Those near streams may have a soil which is in the dry season a hard black crackled surface, and in the rainy season is a mass of black mud. Those living in the southern part of Guam, especially inland, will have a red soil, sometimes even purplish; those in the northern plateau, as for instance around Yigo, may have a red, thin clay, but this has very different properties, as it is limestone-derived.

Before attempting a garden of any kind, ascertain what type of soil is available. One must then decide either to let that soil determine which plants are grown; or, to modify the soil itself to make possible the growth of particular plants. For example, if the soil is the hard black mud-forming type, an admixture of sand is necessary for the growth of many plants. Dense basaltic soils are highly acid; to modify and reduce this acidity one must add an alkaline soil and sand. Although modifications such as these are quite possible, it is naturally a difficult matter to alter a large area. One possible routine is to use the modified soils chiefly in pots or boxes. Another possible necessity is sterilization. This is particularly advisable for the growth of home vegetables, such as tomatoes. Most of the difficulties that arise in such home vegetable gardens are due either to the wrong basic soil type, or to the presence of soil pests, principally roundworms (nematodes). Some persons literally bake a sufficient amount of soil to assure that the soil organisms are killed; this soil is then added to a clean pot or box, and that is placed well off the ground to prevent a reinfection. Nematodes may also severely affect some familiar garden flowering herbs, such as zinnias, marigolds, or chrysanthemums. Other pests include mealybugs; these often attack Acalyphas, but are hardly restricted to them.

In general the best approach is to inspect half a dozen or so gardens in various parts of the island, and chat with their owners. This will familiarize the newcomer not only with the array of garden plants which long experience has sifted out through the generations of resident farmers and gardeners; it will also bring one into contact with a considerable field of perhaps immediately valuable human sources of advice!

Another very useful approach is to look around the island outside of gardens, even in weedy fields. It will give the observer a certain kind of basis for judgment if he will notice the correlations between plants or vegetation and the soil type, the slope, and nearness or distance to the sea, the presence or absence of running water, and the prevalence of trade winds. These things, among others, do much to define or limit what a garden can be and what a gardener can do. As an example, try inspecting a garden in Yigo; comparing it with a garden in Sinajaña; then observing a garden near the golf-course off the cross-island road; and finally looking at a garden in Umatac, or in Merizo. These places will share some kinds of plants, but each will also very likely have some unique ones; and they have rather different potentialities. One of these places is liable to be a reasonably close match to the

reader's garden. The resulting comparison can be used both for advice as to what steps to follow, and what steps to avoid.

Remember that the natural vegetation will give many clues for the observant gardener. It is in fact far better to go along with these clues than to ignore them! Better yet, natural stands of vegetation may serve as a source of garden plants. What could be more elegant than a cycad? Yet it is rather surprising how few cycads are grown in Guam gardens, despite the fact that they are quite common throughout the island in undisturbed areas. The value of the gago (Casuarina) is well known; but keep in mind that the litter or leaf-fall which it produces is inimical to many other plants, which can grow in the shade but which cannot tolerate the chemicals released by the slow degradation of Casuarina litter. As other candidates for garden-plants among the wild or naturalized plants in Guam, the following may be recommended (with special cautions as noted);

Triphasia trifolia. This can be a handsome shrub, but remember it is thorny. Generally it thrives best in limestone soils, and appreciates light to medium shade and perhaps a little water besides rainfall.

Citrus. Several citrus trees make excellent additions to gardens even if they are used only ornamentally. Unfortunately the tastiest fruits are borne by the species which require the most care. For an attractive tree which bears pleasant, though not (to some persons) outstandingly pleasant fruits, the lime (*Citrus aurantifolia*) and the sour-orange (*Citrus macroptera*) may be recommended. They are however quite slow-growing.

Calophyllum or palo-maria. This tree when well-grown is superb; large, umbrageous, and handsome. Slow-growing.

Barringtonia asiatica, puting. Like calophyllum a large tree, but faster-growing. Especially good for coastal areas.

Cycads, federico (*Cycas circinalis*); extremely ornamental. The Japanese cycad (*C. revoluta*) is also very handsome, but is rare in Guam. Tolerant of almost any soil type.

Barringtonia racemosa is naturally adapted to fresh-water swamps and hence is excellent for such areas when planted out. It thrives in black mud. In flower, the white or pink hanging festoons are very attractive. They can be seen along the Talofofo River.

Hernandia peltata, nonag; coastal areas and limestone soils; becomes a big tree.

Guamia mariannae, paipai; this native genus would be an unusual addition to gardens; a small tree or shrub, it is native to limestone areas. Its dark glossy leaves make it most attractive, but it requires shade.

Artocarpus mariannensis, dugdug; this native species is not only a handsome tree but provides large seeds which are delicious when roasted.

Wikstroemia elliptica, gapit-atayake, is a shrub that will thrive in several soil types, but is especially useful in basaltic clays. It produces small yellow flowers and handsome, gray-green leaves.

Terminalia catappa, talisai, may not in fact be native, but in any case is a

splendid garden tree, its pagoda-habit making it both attractive and easy to fit in a small garden. Furthermore the nuts are edible, roasted with sugar.

Terminalia littoralis is a kind of miniature talisai (talisai-ganu) that is eminently suited for gardens on the beach or, especially, on rocky limestone coasts.

Decaspermum fruticosum is naturally adapted to growth in the savannas, and thus makes a logical addition to the garden located in the hilly, basaltic areas of southern Guam. It is usually a shrub or small tree and will be appreciated for its compact habit and pretty foliage.

Myrtella bennigseniana is a sort of ready-made bonsai; its tiny, elegant leaves make it ideal for a low hedge or even a pot-plant. It is usually a companion species of Decaspermum.

Eugenia bryanii and *E. palumbis* are handsome shrubs ideally adapted for planting around houses located near the sea on or near limestone rocks.

Polyscias grandifolia is not so finely dissected as some of the other "panax" plants but nonetheless has been planted in some residence areas.

Fagraea galilai is nearly identical to the "pua-keni-keni" of Hawaiian gardens, having smaller but equally lovely-scented large flowers.

Cerbera dilatata is a superb small tree, to me far more attractive than the plumeria. It is certainly Guam's chief (potential) addition to the world of gardening. Yet how few—if indeed any—gardens have it! Look for it along the cross-island road, or on the hill roads behind Yoña or Santa Rita or, especially, Inarajan. Its large white flowers and glossy leaves make an excellent impression.

Ochrosia oppositifolia, fago, is in the same family as Cerbera, but has smaller flowers; however its leaves are larger. Highly recommended for northern Guam, as it thrives on limestone. Furthermore it is resistant to typhoons! After Typhoon Karen I was surprised at how many Ochrosias were still leafy, while many other trees were stripped bare.

Callicarpa candicans, qualitay or hamlag, is a very pretty shrub; the underside of the leaves is pale; the flowers pink; the berries magenta. Recommended for coastal or limestone areas.

Bikkia mariannensis; a shrub with large white "square" flowers, adapted to limestone rocks. Although the flowers are scentless they are very handsome, and the habit is usually compact. If this were to become common in Guam gardens it would be a splendid thing.

Scaevola, nanago, is useful for coastal areas but can be grown on either limestone or savannah areas too. It is a bushy shrub.

Wedelia biflora, masigsig, is a beach shrub which is more like a biggish herb. It is one of the few herbs or herblike plants which Guam can offer to the gardener. Although it has a tendency to ramble it is easily pruned, and the yellow, daisy-like flowers are pretty. Recommended for beach sites and limestone areas, not for savannahs.

Pandanus dubius, pahong, would be an interesting addition to large garden; and grown in pots makes a useful indoor or semi-indoor plant. However it must

be borne in mind that mosquitoes may utilize the water-containing leaf-bases as breeding grounds. Occasional spraying should remedy this. Best for limestone areas.

These few plants mentioned above are probably the most appealing native species which can be considered candidates for cultivation; but many others might be tried (Xylosma, and Elaeocarpus, for example). The experimental gardener utilizing native plants may end up with the most interesting and prosperous garden if he is willing to seek out the plants and devote some care to discovering their requirements.

To conclude this chapter it may be appropriate to set down here a list of the plants which could likely be found in the garden of a typical, moderately large, Guam home.

Trees: probably a mango; a lime or other citrus; possibly a soursop; a kamachile; a poinciana; perhaps a gaogao; perhaps a flor-de-mariposa; probably a cañafistula; a tangan-tangan, though perhaps not intentionally; possibly a yellow-poinciana; possibly a pikue or bilimbines; possibly an iba; of course, one or more coconut palms; probably several betel-nut palms; possibly another kind of palm; almost certainly a gago; perhaps a breadfruit; perhaps a thevetia; probably a plumeria or several; probably an adelfa or oleander; perhaps a ceiba or a teakwood; perhaps a lagundi; quite probably a calabura or manzanilla; maybe a tabebuia, or an African tulip, or a catalpa; perhaps a yellow-elder; and perhaps a moringa.

Shrubs; acalyphas; codiaeums (crotons); "panax" (Polyscias); pseuderanthemums; fire-cracker-flowers; perhaps a lantana; clerodendrum; a granada; caballero; Murraya; a zizyphus (manzanita); several types of hibiscus; achiote or bixa; papaya; an abubo; the shrubby Ipomoea; a lada (morinda); an elderberry (Sambucus); a tithonia; jatrophas of several sorts; pedilanthus; a coccoloba or sea-grape; perhaps a carissa or hedge-thorn. There are many other possibilities.

Vines and climbers; Cryptostegia; passion-fruit; jasmines; bougainvilleas; morning-glories; allamanda; one of the cucurbita or squashes; one of the beans, such as clitoria (capa de la reina), akankan (of several kinds), seguidillas, or abuchuelas; betel-vine (Piper); antigonon.

Herbs and ground-plants: lawn-grasses of various kinds, especially zoysia; various aroids, gingers, cannas, tuberoses, and terrestrial vanda orchids; celosias; globe-amaranths; cucharita; maiana; portulacas; bryophyllum; bananas; sweet basil; tomatoes; chilly-peppers; aphelandra; hemigraphis; cosmos; gaillardia; tagetes; zinnias; and many others.

New introductions. A word must be added about new introductions for gardens in Guam. Remember first of all that this is an action which requires you to pass the agricultural plant quaratine inspection. An exotic plant may bear, unknown to you, an insect or other pest which could devastate similar or even unrelated plants in Guam. The plant itself may turn out to be an aggressive weed that may become a noxious pest by itself. It may harbor disease-causing bacteria or viruses. Soil from other regions should not be brought to Guam; plants should

be in the form of cuttings, rootstocks, or seeds, and devoid of soil. They should if possible be lightly sterilized (as for example by ultra violet light, or in the case of seeds, by a quick bath of dilute Clorox). They should be inspected and passed by plant quarantine inspectors.

Second, remember that Guam is tropical. It is not a land for roses, wisteria, forget-me-nots, shasta-daisies, and other cold-country flowers, nor for cherry, plum, peach, or apple trees!

X. How to collect and preserve plants for study

In order for a plant to be identified, the entire plant (if it is relatively small), several entire plants (if very small), or a representative portion (if a large plant) will be needed. Vegetative structures (stems, roots, leaves, branches, etc.) with *attached flowers* and *fruits* are necessary for identification. A sterile (i.e. leaves only) specimen is not only valueless (except in rare cases) but generally cannot be positively identified.

A specimen should first adequately represent the plant. This is a matter of judgment. Second, the specimen must be properly prepared. Third, it must be documented. Fourth, it must be identified correctly.

The amount to collect must be left to experience and judgment. However as a rough guideline, the size of the standard herbarium sheet or folded newspaper is a reasonable approximation. In some cases it may be necessary to place larger specimens on two or three herbarium sheets. In some cases it may simply be impossible to preserve adequately a specimen in the narrow confines of a herbarium sheet. In such cases boxes or other means of storing the specimen may be required.

Collecting. Take enough material to identify the plant and make a decent specimen; this means hunting for flowers and fruits. On the other hand do not overcollect; remember that the collector is not trying to eradicate plants. In many cases where certain rare species are concerned no collections should be made at all, or only one very small one for a group of students. Place the collections in a plastic bag to keep them moist and relatively intact until the return to the laboratory.

Documentation. A permanent notebook (*not* of the loose-leaf variety) should be kept. Specimens should be numbered consecutively starting from number one. (Never start a new series). Never mix the collections; that is, even when it is apparent that you have two separate collections of the same kind of plant, give them separate numbers, even when they are from the same location. Each collection should have the following information recorded: exact locality; date; name of collector; collector's number; and any other information that might not be apparent in the specimen. (For instance, flower colors frequently change after drying; the living conditions and colors should be noted). Notes on type of soil, whether among rocks, in water, etc. are all useful. Collection labels will be prepared from the information in your notebook.

Drying. Specimens should be dried by placing them in a single sheets of

newspaper between blotters and stiff corrugated cardboards. The number of the specimen should be written on the news sheet or on a tag attached to the specimen for ready identification. The bundle should be tightly strapped in the plant press, which consists of two wooden or metal gridlike frames. The entire press should then be placed in a heater-dryer. Drying will take from two to five days. Specimens should be removed only when completely dry. They should be checked from time to time, and any loose slack in the press straps taken up.

Mounting. Student specimens should be accumulated loose in clean new sheets with a label inserted. In standard museum work such specimens are glued and sewed to stiff white papers, and the label glued on to the sheet.

Organizing. The accumulated specimens should be organized botanically, that is by the relationships of the plants. All specimens of species of the same genus should be together so that the separate news sheets containing each species are placed in a folder. Such folders are then grouped into the proper families, and the families into the correct sequence.

Identification. In general it is easier and more satisfactory to identify living plants. Hence it is often useful to set aside a small but representative portion of each specimen for immediate study, while the greater portion is being dried in the plant press. It should be remembered that the plant materials deteriorate even when kept in the collector's plastic bag (although they may be kept overnight if placed in a refrigerator). Hence it is imperative to dry the specimens as soon as possible.

Dried specimens can be identified by a simple method. The flowers may be boiled until they soften in a small beaker of plain water (sometimes the addition of a few drops of a wetting agent, such as a detergent, is helpful with thick materials). These may then be placed in a small dish and dissected with relative ease. Some allowance should be made for shrinking and of course the colors will usually have changed.

XI. Future Botanical Work in Guam: Unsolved Problems

The appearance of a flora such as this frequently has the effect of slowing or even stopping floristic work. This is most unfortunate, and in fact is just the opposite of the intentions of most writers of manuals and floras. Therefore I believe it is useful to add a chapter on what problems remain unsolved, and it may be of value to point out particular instances, not only of floristic or taxonomic problems, but others which must involve different approaches and techniques.

Indigenous plants. Although it is probable that very nearly all the indigenous plants of Guam have been discovered, it is certain that several of these are exceedingly rare, and the discovery of additional localities and individual plants is therefore of considerable importance. In some cases, existing specimens are inadequate; in all cases, where specimens are few, little can be known of normal variation in a species. Rare species should if possible be cultivated from seeds or cuttings so their continued existence will be assured. The species which need such treatment

are: *Digitaria gaudichaudii*; most of the orchids; *Pisonia umbellifera*; *Hernandia ovigera***; *Serianthes nelsonii*;** *Rhus taitensis; Merrilliodendron megacarpum*;* *Allophylus holophyllus*;** *Grewia crenata; Heritiera longipetiolata*;* *Eurya japonica* var. *nitida; Xylosma nelsonii; Maesa* sp.*; *Lysimachia mauritiana; Fagraea galilai; Tabernaemontana rotensis*;* *Ehretia microphylla; Solanum guamense; Canthium odoratum* var. *tinianense;* and *Glossogyne tenuifolia.* Those marked with an asterisk (*) are very or exceedingly rare.

Another category of species is those which are known to be indigenous in Rota or Saipan, or elsewhere in the Marianas, but which so far have not yet been found in Guam. These include: *Croton saipanensis* (Hosok.) Hosok. of Saipan; *Drypetes dolichocarpa* Kaneh. of Saipan; *D. rotensis* Kaneh. of Rota; *Styphelia mariannensis* (Kaneh.) Sleum. of Alamagan; *Boerlagiodendron mariannense* Kaneh. of Rota; *Meryta senfftiana* Volk. of Rota (and Palau and Yap); *Myoporum tenuifolium* Forst. f., recorded from both Tinian and Rota; and *Psychotria gaudichaudii* Kaneh. of Rota and Sarigan. Some at least of these species probably will be discovered in Guam, as was *Tabernaemontana rotensis* Kaneh., which was known only from Rota until one tree was found in Guam in 1965. (For further details see main text).

Weeds and other introduced plants. It is very likely that with each passing year or decade, other plants will enter Guam, some by accident, others deliberately introduced. Some of these will be waifs; they will not persist. Others will exist only in gardens, and will not be able to survive outside of care and cultivation. But some will become naturalized, either in urban or suburban areas, or in disturbed or waste ground, or in farming areas. Some will be species of Asia or the Pacific; others will be American. They will arrive by ship or by airplane. Some may prove to be harmful, or noxious, or agriculturally undesirable. Hence records should be kept of these incoming plants, and a watch kept on them to establish whether they show signs of becoming naturalized. The identification of these plants may be difficult; specimens may have to be sent abroad to large museums for determination.

Taxonomic problems. The above paragraphs have dealt with floristic problems. But there are others, which involve some uncertainty concerning the true identity of a plant which is already well known in Guam. Usually such a problem involves a hunt for the earliest name which can rightly be applied to the species. An example is *Geniostoma micranthum* DC. This plant, a member of the Loganiaceae, is common on Guam and has frequently been collected. A close investigation of this genus, and an inspection of the type specimen of *G. rupestre* Forst., which is the type species of the genus, showed that no substantial differences could separate the Guam plants as distinct from *G. rupestre*, which was known at first only from the New Hebrides. Therefore the name *G. micranthum* becomes a taxonomic synonym of *G. rupestre*, and the Guam plants can no longer be considered endemics, but are part of the distribution of a species which is rather widespread in the Pacific region. What is learned in such a case is primarily the natural distribution of a species, which may have been obscured by the previous failure to recognize the identity of the plants of

the various regions.

Guam has several species which may well be involved in problems such as this, but which for various reasons are still unsolved. In some cases only further explorations in Micronesia and other Pacific or East-Asiatic islands will solve the problem; in other cases the solution may demand intensive library research or herbarium work. Sometimes more sophisticated techniques may be called for, such as cytogenetic analysis. In any case, it may be useful to call attention to some problems of this sort. *Fagraea* is a good example; although the species found in Guam is here called *F. galilai*, there is considerable evidence to show that it has at least a close relationship with *F. berteriana* Gray, a species originally described from Tahiti. What the real boundaries of the species are may well require an intensive study of the whole genus, a matter which is beyond the scope of a flora, but would form a monograph. But, until such a study is performed, we will have to remain in some doubt as to the correct name of the Guam plants of *Fagraea*.

Still other taxonomic problems may concern variability in a known species or group of species. That is, the name of the species may be known, but there may be exhibited a considerable amount of variation between different plants. Both taxonomy and ecology, and also genetics, may be involved in an investigation. One such problem is the group of *Hedyotis* species with similar appearance (*H. megalantha, H. fruticulosa,* and *H. laciniata*). These are all quite similar in appearance. Do they really deserve distinction as separate species, or are they manifestations of particular subspecific forms? Studies involving controlled experimental growth, deliberate hybridizations, and cytogenetic analyses may be attempted to find a solution.

Ecological studies. Very little ecological work has been done in Guam, but methods exist, and studies of other Micronesian islands have been made, allowing comparative approaches. A flora, such as this book, is a tool in the undertaking of an ecological study. Such a study may be relatively simple; for example, it would be valuable to have full and reliable data on the time of flowering and fruiting, and other activities, of the various species. Careful records, kept up over several years, on the relationship of weather to these fundamental plant activities, as well as appearance of new leaves, falling of leaves from more or less deciduous species, growth rates, and overall changes in the vegetation of particular localities, all can be done and should be done in Guam. Some are simple enough so that the amateur can undertake them. More elaborate studies are suggested for students and staff in the Unversity of Guam, or for visiting scientists. The total ecology of Guam deserves intensive study; that is, the inter-relationships of all the living organisms, including human beings.

Anatomical, morphological, and developmental studies. Many of the plants found in Guam have never been closely studied in these ways. Such studies often have considerable value in taxonomy, or in ecology, or in other fields.

Genetics. Aside from agricultural genetics and plant-breeding, there is the impact of genetical studies on taxonomy. It would be most interesting, for example,

to attempt hybridizations between *Leucaena leucocephala*, the ubiquitous "tangan-tangan", and the pretty wild *L. insularum* var. *guamense*. Such a study would have special pertinence since the generic placement of the latter is a matter of some controversy; it has been placed in the genus *Prosopis*. Genetical studies might elucidate the problem.

Another highly interesting problem is the evident hybridization which occurs between the wild and cultivated breadfruits, *Artocarpus mariannensis* ("dugdug") and *A. communis* ("lemae"), which has already been described by Dr. Fosberg. Further work on this problem is needed and might have most interesting results. Another known natural hybrid in Guam, suitable for genetical studies, is *Pluchea* ×*fosbergii* (*P. indica*×*P. odorata*). Still a futher possibility, needing clear proof, is the possible inter-crossing of *Hernandia peltata* and *H. ovigera.*

Physiology. The physiology of local plants is virtually unknown. Studies offer so many possibilities, so many diverse approaches, that to attempt any summary is vain. Still, it may be mentioned that the relation of ecology and physiology is worth exploring. The physiology of limestone-inhabiting plants could be compared with basalt-soil-inhabiting plants to examine the metabolic differences; such an investigation might be of some practical use too, in regards to plant nutrition. Phytochemical analyses of several species which probably produce alkaloids, resins, terpenes, or other compounds of chemical interest, can be undertaken.

These paragraphs, brief as they are, may help to orient the student, or indicate areas of ignorance to the professional. Many other problems, for example those specifically dealing with ferns or lower plants, or those involving marine studies, could be pointed out, but are hardly within the scope of this book. Suffice it to say that there is no dearth of work to be done! This book should open up to the investigator, whether amateur or professional, the vista of potential studies, as well as providing him with a tool for beginning such studies.

PART 2

I. Keys. How to use these keys

Keys are devices to facilitate the identification of collections or specimens. They are like questionnaires.

The first key following is a Key to the Major Groups of Plants. The terms used may need to be looked up in a botanical text or dictionary. Once the plant is identified to its major group (Class), the next step is to continue with the following keys, which however apply only to the classes PSILOPSIDA, LYCOPSIDA, PTEROPSIDA, GYMNOSPERMAE, and ANGIOSPERMAE. Keys for the more detailed identification of the Bryophyta and of the Algae and Fungi are not given here.

The present keys carry the process of identification down to the level of the family. The following steps would be to identify the proper genus in the family, and then the proper species in the genus. Generally the identification process is completed when the full name of the species is known, although in some cases varieties—divisions of a species—may occur.

The key is constructed on the dichotomous plan; that is, in each case there is found a pair of equally indented headings (usually given the same number, the second member of each pair often further marked with an *a*). The person using the key, starting at the beginning with the first such pair of choices, should read both of the parallel and contrasting statements, and choose the one which truly applied to his plant. Following the chosen lead (which immediately eliminates all steps following the other lead), the user will proceed in the same manner until he arrives at the proper name of the plant family.

The identification should then be continued in other keys until the plant has been identified as to species.

Key to Non-Vascular Plants of Guam
[Algae, Fungi, etc.]

Plants lacking true vascular bundles (xylem and phloem) (except in the sporophytic-capsules of Anthocerotae). Plants reproducing by spores, not producing seeds or flowers. True stems and leaves absent, though the thallus may develop structures similar in appearance.

I. Chlorophyll present, therefore plants green, or a shade or mixture of green, or if not green in gross appearance but a shade of red, purple, or brown, then chloroplasts evident in the cells under microscopic observation.
   A. Chloroplast-containing cells surrounded by but distinct from nonchlorophyllous filamentous hyphae; the chlorophyllous cells being unicellular green or blue-green algae; the hyphae fungal. Lichens; mutualistic organisms.—LICHENES.

A′. Not as above,

B. Plants leafy or thallose, bright, dark, or rarely pallid or yellowish-green, usually moss-like in appearance, terrestrial, or on rocks or moist soil, or epiphytic; leafy structures gametophytic; sporophytes dependent, often inconspicuous, or stalklike, producing spores. Div. BRYOPHYTA.....[not further keyed here]

B′. Plants thallose, some with unicellular, or filamentous thalli, others more complex, a few with structures resembling leaves (e.g. *Sargassum*), green, bluish, brown, red, or shades of these colors, generally aquatic (fresh or salt water), some terrestrial or epiphytic; gametophytic and sporophytic generations, independent, *Algae*. Divisions CHLOROPHYTA, CYANOPHYTA, CHAROPHYTA, EUGLENOPHYTA, CHRYSOPHYTA, PYRROPHYTA, PHAEOPHYTA, RHODOPHYTA. .....[not further keyed here]

II. Chlorophyll absent entirely, therefore plants saprophytic or parasitic; or if chlorophyllus present, then unique in chemical structure, and true nuclei lacking. Fungi, slime-molds, and bacteria.

A. Cells minute, without true nuclei; chlorophylls of unique type present in some types .....SCHIZOPHYTA (Bacteria; not further treated here).

A′. Cells easily visible under moderate magnification, true nuclei present; chlorophyll totally absent.

B. Diploid phase an amoeboid, motile mass. Slime-molds. Div. MYXOPHYTA. Not further treated here.

B′. Diploid phase not amoeboid motile. True Fungi. Food stored as glycogen. Div. MYCOPHYTA.

C. Thallus globose or composed of nonseptate hyphae, aquatic or terrestrial. Class Phycomycetes.

C. Hyphae septate,

D. Meiospores formed in asci. Class Ascomycetes.

D′. Meiospores formed on basidia. Class Basidiomycetes.

(Fungi not further treated here).

Alternative Key to the Major Groups of Plants
(excluding Algae and Fungi, etc.)

Vascular tissues absent; gametophyte (n) generation dominant, photosynthetic, the sporophyte attached to the gametophyte; homosporous.....BRYOPHYTA

Gametophyte consisting of protonema, erect leafy shoot with sex organs, and multicellular rhizoids; sporophyte determinate, consisting of foot, stalk, and capsule; elaters absent.....Class BRYOPSIDA (MOSSES)

Gametophyte prostrate, foliose or thallose, with dorsal and ventral sides; in the foliose forms, leaves without midrib, arranged in two or three rows; elaters found in capsule.....Class HEPATICOPSIDA (LIVERWORTS)

Gametophyte a lobed thallus with little internal tissue differentiation; rhizoids

smooth-walled, scales absent; air chambers and air pores absent; each cell with a single chloroplast and pyrenoid; antheridia in interior chambers, archegonia sunken in dorsal side; capsule elongated, with indeterminate intercalary growth, green at all stages; elaters present..... ..... Class ANTHOCEROPSIDA (HORNWORTS)

Vascular tissues present in sporophyte; gametophyte generation dependent or independent; homo- and heterosporous .....TRACHEOPHYTA

Reproduction by spores only, no seeds produced; generations distinct, the sporophyte dominant, but the gametophyte photosynthetic and independent, or (sometimes) nonphotosynthetic and subterranean.

Sporophyte body dichotomously branched, with minute leafy appendages, but appearing essentially leafless; appendages veinless; sporangia bulbous, trimerous; homosporous .....Class PSILOPSIDA (Psilotum)

Sporophyte body differentiated into stem, leaves, and roots; leaves veined; homo- and heterosporous.

Leaves microphyllous, often ligulate; sporangia on sporophylls, often grouped into strobili; xylem exarch.....Class LYCOPSIDA

Leaves megaphyllous, frondose; sporangia in sori on lower surface of leaf; xylem mesarch to endarch....Class PTEROPSIDA (Ferns)

Reproduction by seeds; sporophyte generation dominant, gametophyte generation highly reduced and nonphotosynthetic. [seed plants].

Sporangia borne in strobili; heterosporous (microspores borne in microsporangia on microsporophylls; megaspores borne in megasporangia in megasporophylls); seeds exposed; endosperm lacking .....Class GYMNOSPERMAE (Conifers, Cycads, etc.)

Sporangia borne in flowers; heterosporous; seeds borne within fruits, with endosperm.....Class ANGIOSPERMAE (Flowering plants)

Artificial Key to Vascular Plants

Major Groups of Plants in Guam—TRACHEOPHYTA

I. Plants without flowers or seeds; reproduction by means of 1-celled spores borne in sporangia.

A. Plants without broad leaves, not free-floating; leaves mostly minute and scale-like (grasslike in *Isoetes*, a genus not in Guam), 1-veined.

C. Stems of hollow joints; leaves forming whorls at the solid nodes; siliceous. Div. CALAMOPHYTA. Single genus *Equisetum* not present in Guam.

C′. Stems not jointed; leaves spiralled or alternating, not whorled, not forming a sheath at the node. Divs. LEPIDOPHYTA, PSILOPHYTA.

D. Stems almost devoid of leaves; leaves minute, scale-like; sporangia globose, of 3 valves. Div. PSILOPHYTA. (1 genus). Order Psilotales. Fam. Psilotaceae.....*Psilotum*

D. Stems leafy, with scale-like leaves; sporangia not 3-valved. Div.

LEPIDOPHYTA.

E. Plants flattened, i.e. leaves mostly in one plane; spores of 2 kinds (micro- and macrospores). Order Selaginellales. Fam. Selaginellaceae. One genus.....*Selaginella*

E. Plants not flattened; leaves all round the stems; erect or pendent plants; spores all alike. Order Lycopodiales. Fam. Lycopodiaceae. One genus .....*Lycopodium*

A′. Plants with large or small (but never minute) fronds, these often finely divided into lobes or leaflets; borne on distinct stalks, on erect or prostrate rhizomes; or, free-floating aquatic plants of fresh-water with small scale-like overlapping leaves; mostly elaborately veined. Sporangia nearly always borne on the fronds. Div. PTERIDOPHYTA.

F. Plants bearing fronds, mostly terrestrial (in Guam the only aquatic fern is *Ceratopteris*). Spores all alike.

G. Sporangia large globose, without an annulus, borne in a stalked spike or panicle from base or surface of frond; rootstock small. Order Ophioglossales. Fam. Ophioglossaceae. Only genus in Guam. ..... *Ophioglossum*

G. Sporangia minute, stalked, with an annulus of thick walled cells on one side, borne on the underside or at margin of frond; rootstock usually well developed. Order Filicales. (See Key to Families of this Order.....Next Key)

F′. Plants not large frondose; floating aquatics, or creeping on mud, producing 2 kinds of spores in round to ovoid bony sporocarps near base of leaf-stalks or on underside of branches.

H. Leaves circinnate, petiolate, blades sometimes lacking; plants mostly creeping on or rooting in mud.....Order Marsileales. Fam. Marsileaceae. Two genera, *Marsilea* and *Pilularia*, not present in Guam.

H′. Leaves not circinnate, sessile, overlapping; usually floating plants. Order Salviniales. Fam. Salviniaceae. Two genera, *Azolla* and *Salvinia*; not yet present in Guam.

II. Plants with seeds produced by cones or by flowers.

A. Seeds not enclosed in ripened carpels, naked, usually borne on megasporophylls or on ovuliferous scales often grouped into coneshaped strobili. Div. CONIFEROPHYTA. *Gymnosperms.* One native genus (*Cycas*) and several introduced genera.

A′. Seeds enclosed in ripened carpels, i.e. fruits; plants producing flowers with perianth parts (calyx, corolla), and pollen-producing stamens, and seed-bearing carpels. Div. ANTHOPHYTA. Angiosperms.

II. Psilophyta, Lepidophyta, and Pteridophyta

Since the comprehensive account by W. H. Wagner Jr. and D. F. Grether, in the Bishop Museum Occasional Papers 19(2): 25–99, 1948, titled "Pteridophytes of Guam," only two additional ferns or fern-allies have been found in Guam. Their account includes keys, generic descriptions, and specific descriptions, illustrations of some species, and a very full synonymy. It is therefore unnecessary to repeat all this data here. Instead, a single key for all species, and a catalog of the genera and species with the briefest of notes, but with supplementary data where available and citation of recently collected specimens, is presented. A very few name-changes are incorporated.

Readers seeking full descriptions are referred to Wagner and Grether's paper, which may be purchased from the Bishop Museum, Honolulu, Hawaii.

The following key is an attempt to utilize the more obvious features, especially field characters, of the ferns in Guam. It does not attempt to emphasize natural relationships unless accidentally so. It may be used on dry herbarium material, provided additional data on habitat is available, but is designed especially for in-the-field use. Terminology has been kept to the optimum. In a few cases, use of a small pocket lens ($\times 5$ or $\times 10$) will be necessary.

The nomenclature reflects the changing status of taxa and the continuously growing knowledge of plants both in the field and in the herbarium. Still, most of the binomials will be the same as in the still excellent treatment by Wagner and Grether. The two additional species found in Guam since their treatment are *Pteris vittata*, and *Nephrolepis exaltata*.

The Psilophyta (*Psilotum*) and the Lepidophyta (*Lycopodium* and *Selaginella*) are here included.

Although the key is largely applicable to the other Marianas Islands, there have been other species reported from Rota, Saipan, Tinian and the Northern Marianas, so far not confirmed in Guam; hence the key should be used cautiously in these other Marianas Islands. It is of some use, but of much less dependability, outside the Marianas; and while nearly all of the species encountered in Guam will also be met with in other parts of Micronesia, the other islands, especially the high islands of Palau, Truk, Ponape, and Kusaie, harbor many different species, the identification of which is beyond the intended scope of this key.

Artificial Key to Ferns and Fern-Allies in Guam

1. Leaves absent or very small and scalelike; or fronds not leaflike, resembling green forked stems. *Schizaea*, and PSILOPHYTA & LEPIDOPHYTA.
   2. Aerial portion of plant bearing a few minute toothlike structures and toward the tips yellow, 3-lobed sporangia..... *Psilotum nudum* (L.) Grisebach (Note: the related *P. complanatum*, an epiphytic plant with flattened pendent stems, has been reported from Rota, but so far not from Guam).
   2. Not as above,
      3. Fronds resembling a small dark green inverted broom, the tips repeatedly

forking; no separate scale-like leaves; sporangia pinnately arranged in apical clusters on tips of segments.....*Schizaea dichotoma* (L.) Smith

3. Stems closely enveloped by small overlapping scale-like leaves; sporangia in narrow spikes.
   4. Pendent epiphytes; scale-like leaves mostly 1 cm long; sporangia 2-valved..... *Lycopodium phlegmaria* L.
   4. Terrestrial in dry savannas; branching plant with sprawling or ascending stems; scale-like leaves only 2–3 mm long; sporangia in short spikes less than 1 cm long.....*Lycopodium cernuum* L.

1. Leaves present as simple or compound fronds borne on stout or slender, erect or creeping, aerial or subterranean rhizomes, these usually clothed with overlapping scales. Sporangia in masses (sori) as round groups, lines, or wide regions on dorsal (under) surfaces of fronds or their divisions..PTERIDOPHYTA
   5. Climbing vinelike ferns with twining stems,
      6. Leaflets palmately arranged, oblong. .....
      .....*Lygodium auriculatum* (Willd.) Alston
      6. Leaflets pinnately arranged, short-oval..*Lygodium scandens* (L.) Swartz
   5. Not climbing vinelike ferns with twining stems (though rhizomes may climb trees or rocks by rhizomes appressed to them).
      7. Tree ferns with evident treelike trunks up to 5 m tall; fronds large in a terminal crown, tripinnate, 2 m long or more. Rare, hills of southern Guam.....*Cyathea lunulata* (Forst.) Copel.
      7. Not tree-ferns; no such trunk present.
         8. Epiphytes; perched on trunks or branches of other plants, especially trees; sometimes also found on porous rocks, fallen logs, old fences, etc.
            9. Rosette plants, not producing an elongated creeping rhizome; fronds entire, elongate, linear-elliptic or linear oboval.
               10. Sori as numerous dots scattered rather uniformly over the dorsal surface of the frond.....*Microsorum punctatum* (L.) Copel.
               10. Sori as straight lines obliquely ascending from the midrib, like a series of chevrons, on the dorsal side of the frond.....
               .....*Asplenium nidus* L.
            9. Not rosette plants; fronds borne on creeping rhizomes, often well-spaced; fronds often lobed or divided.
               11. Fronds pendent or markedly drooping.
                  12. Fronds linear or strapshaped, entire or coarsely forking.
                     13. Fronds strapshaped, fleshy, often forking toward the tips but the lobes mostly sub-parallel; venation obscure; sporangia on a spike (also pendent) arising from the flat surface of the frond .....*Ophioglossum pendulum* L.
                     13. Fronds linear (less than 1 cm wide) with sori in a groove along each edge; root-stocks with slender purplish scales.....

.....*Vittaria elongata* Swartz

12. Fronds once-pinnate, pale tomentose.....
.....*Nephrolepis acutifolia* (Desv.) Christ

11. Fronds erect or ascending,

14. Fronds simple, or dimorphic, the sterile fronds simple, the fertile sporangia-bearing fronds pinnatifid.

15. Fronds dimorphic; sterile fronds elliptic-lanceolate, tips acuminate, on distinct stipes up to 3 cm long; fertile fronds pinnatifid, sometimes only wavy-edged, usually more deeply lobed, also on stipes.....*Humata heterophylla* (Sm.) Desvaux

15. Fronds all alike, or if different, then only in proportions of length and width.

16. Sori in lines on the dorsal side of the frond, or thickly covering the dorsal surface.

17. Sori in oblique lines following the veins; no stellate hairs on plant; fronds broadly elliptic, the stipe obsolete or winged..*Antrophyum plantagineum* (Cavanilles) Kaulfuss

17. Sori covering the dorsal surface of the frond, or at least the upper part of the frond; stellate hairs present, very dense on dorsal side intermixed with sporangia; fronds linear-lanceolate with fairly obvious stipe.....
.....*Pyrrosia adnascens* (Sw.) Ching

16. Sori confined to the abruptly contracted beaklike apex of each frond, the blade margin reflexed over the sori in young fronds; stipes obsolete or broadly winged.....
.....*Belvisia mucronata* (Fée) Copeland

14. Fronds deeply lobed (pinnatifid) or divided into leaflets.

15. Tiny epiphytes with fronds only 1 cell thick (or 2–3 cells thick on major veins); whole frond seldom more than 10 cm long; sori in tubular or obconic involucres.

16. Fronds less than 2 cm long; sori immersed in tips of segments
.....*Gonocormus minutus* (Bl.) v.d. Bosch

16. Fronds mostly 4–9 cm long; sori axillary, involucres obconic, 2-lipped.....*Crepidomanes brevipes* (Presl) Copel.

15. Larger epiphytes with fronds more than 1 cell thick; sori not in involucres.

17. Fronds once pinnate or merely pinnatifid.

18. Sori large round, impressed (concave, with corresponding convex 'bump' on ventral surface); frond deeply pinnatifid, lobes entire, epiphyte or (often also) on rocks or even terrestrial.....
.....*Phymatodes scolopendria* (Burmann) Ching

18. Sori of various shapes but not concavo-convex; fronds

1–3 times pinnate, or if pinnatifid then the pinnae with a narrowed stalk-like base; pinnae often jointed and deciduous; pinnae sometimes toothed.

19. Sori linear; pinnae jaggedly toothed or dimidiate.

20. Sori on surface of frond, not marginal.

21. Rootstock long, creeping; pinnae dimidiate..... .....*Asplenium unilaterale* Lamarck

21. Rootstock short; pinnae partly cut away below but not dimidiate, abundant, crowded; rachis with dark scales..*Asplenium pellucidum* Lamarck

20. Sori marginal.....*Lindsaea repens* (Bory) Thwaites

19. Sori round, dotlike; pinnae entire ....*Goniophlebium percussum* (Cavanilles) Wagner & Grether

17. Fronds 3–4 times pinnate,

22. Sori dorsal.....*Asplenium laserpitiifolium* Lamarck

22. Sori marginal.....*Davallia solida* (Forst.) Sw.

8. Terrestrial or water ferns, not epiphytes, rooting in soil or mud, or among rocks, or floating.

23. Floating ferns of freshwater streams and ponds, or rooting in soft mud or on rocks more or less submerged in ponds or streams; fronds dimorphic, the fertile fronds with almost linear segments; tripinnatifid; edible, sometimes grown for salad vegetable..... .....*Ceratopteris gaudichaudii* Brongniart*

23. Terrestrial or swamp ferns, not floating.

24. Fronds entire, pinnatifid or once pinnate; pinnae entire or crenulate, toothed, or lobed.

25. Sori on surface of frond, not marginal, not in spikes or tubular involucres; fronds more than 1 cell thick.

26. Tall swamp ferns with leathery fronds 1–2 m tall, in fresh, brackish, or mangrove swamps; fertile leaflets completely covered on dorsal surface with reddish sporangia..... .....*Acrostichum aureum* L.

26. Not with above combination of features,

27. Branches repeatedly forking, each fork with 2 basal, backward-directed, short fronds, and two forward-directed longer fronds; pinnae glaucous blue-grey beneath. Savanna ferns with wiry stems....*Dicranopteris linearis* (Burm.) Underw.

27. not as above,

28. Sori linear; forming two lines on each pinna, one on each side of and parallel to the midrib, sometimes confluent over the midrib; stout rosette savanna ferns, new

* May be the same as *C. thalictroides* Brongn.

leaves often pink.....*Blechnum orientale* L.

28. Sori round, dorsal; or reniform to horseshoeshaped.

29. Pinnae entire;

29a. Sori in rows, 1 row on each side of each lateral vein of the pinna; pinnae 3–6 pairs, 30–40 cm long; veins richly anastomosing; fern of shady woods. .....*Tectaria crenata* Cavanilles

29b. Sori confined to lowest veinlets; pinnae 20–24 pairs, 1–2 cm long.....*Thelypteris warburgii* (Kuhn & Christ) B.C. Stone

29. Pinnae slightly crenulate to regularly toothed or lobed; sori various; veings free or anastomosing chiefly between segments.

30. Pinnae, especially lower ones, deeply lobed, the lobes curving forward; indusium absent..... .....*Heterogonium pinnatum* (Copel.) Holttum

30. Pinnae crenulate or toothed; indusium present.

31. Sori reniform to horseshoe-shaped, veins free.

32. Pinnae linear-lanceolate, tapered to the tip; fronds flat.

33. Rachis and midrib of pinnae tawny or rusty wooly; pinnae auricled at base..... .....*Nephrolepis hirsutula* (Forst.) Presl.

33. Rachis and pinnae merely scaly or scurfy, pinnae usually glabrous; pinnae not auricled .....*Nephrolepis biserrata* (Sw.) Schott

32. Pinnae oblong, acute or rounded at tip; frond somewhat trough-shaped; rachis scaly, pinnae glabrous, auricled. .... *Nephrolepis exaltata* (L.) Schott

31. Sori round; veins (or some veins) anastomosing.

33. Basal pinnae of frond strongly reduced.

35. Texture thick; 2 or more pairs of veins united between successive tooth-like segments..... .....*Thelypteris unita* (L.) Morton

35. Texture thin; 1 to 1 1/2 veins united between successive segments. .... *Thelypteris maemonensis* (Wagner & Grether) B.C. Stone

33. Basal pinnae normal, as long or longer than next above,

36. Sori confined to lobes, leaving a wide sterile space along the costa,

37. Texture thin; dorsal costa lacking scales; not marsh plants.....
....*Thelypteris interrupta* (Willd.) Iwatsuki
37. Texture slightly leathery; dorsal costa scaly; marsh ferns.....
....*Thelypteris goggilodus* (Schkuhr) Small
36. Sori not confined to lobes, therefore no sterile space left near costa.
38. Sparsely hairy fronds; indusium with short hairs; segments closest to rachis not enlarged.....*Thelypteris dentata* (Forsk.) E. St. John
38. Hairy fronds; indusium with many long hairs; lobes of basal pinnae nearest to rachis usuallyenlarged .....
.....*Thelypteris parasitica* (L.) Fosberg

25. Sori marginal or in involucres, or in spikes.
39. Sori curved; pinnae dimidiate.....*Adiantum philippense* L.
39. Sori straight, round, or tubular.
40. Fronds 1 cell thick (or 2–3 cells thick on major veins); sori in involucres; small ferns of moist shady soil banks by streams....*Cephalomanes boryanum* (Kunze) van den Bosch
40. Fronds more than 1 cell thick; sori not in involucres.
40A. Sori not in spikes; fronds pinnate,
41. Basal pinnae reduced; indusium formed by the margin; ferns of rocky limestone or part-limestone areas, common.....*Pteris vittata* L.
41. Basal pinnae largest or as large as next above; indusium opening toward the margin; savanna ferns of volcanic soils.....*Lindsaea ensifolia* Swartz
40A. Sporangia in short spikes; fronds entire.....
.....*Ophioglossum nudicaule* L.

24. Fronds 2–4 times pinnate.
42. Giant bipinnate ferns with broad, short, massive, fleshy rootstock; stipes swollen at base; two thich rounded earlike stipules at base of each stipe; pinnae stalked, stalk basally swollen; leaflets entire or nearly so; sori near margin, on lateral veins.....
.....*Angiopteris durvilleana* de Vriese
42. Not with the above combination of features,
43. Dorsal surface of frond covered with silvery or golden waxy powder.....*Pityrogramma calomelanos* (L.) Link
43. No such silvery or gold powder,
44. Sori marginal or very close to margin,

45. Sori continuous, linear, elongated,
46. Veins free; savanna ferns, often in arid grasslands.... .....*Cheilanthes tenuifolia* (Burm.) Swartz
46. Veins anastomosing; ferns of woods, seldom in open sun.
47. Fronds tripartite; veins anastomosing both along costa and in the lobes; mostly of limestone soils..... .....*Pteris tripartita* Swartz
47. Fronds not tripartite; veins anastomosing in lobes but not along the costa; mostly of volcanic soils.
48. Fronds dimorphic, up to 40 cm long; pinnae few-lobed.....*Pteris ensiformis* Burmann....
48. Fronds all alike; up to 1 m long; pinna many-lobed .....*Pteris spinescens* Presl
44. Sori not linear elongate, but round or short oblong.
49. Sori short oblong.
50. Fronds glabrous; sori at tips of segments; fronds with ultimate segments cuneate; shady rock crevices in savannas.....*Sphenomeris chinensis* (L.) Maxon
50. Fronds hairy; sori mostly on surface of rather broad segments; segments not cuneate; semi-arid brushalands. .....*Microlepia speluncae* (L.) Moore
49. Sori round,
51. Fronds 2–3 times pinnate; hairs blunt, with frequent darker tannin-filled cells,
52. Fronds bipinnate; rachis not or only sparsely scaly; ultimate segments 6–9 mm broad..... .....*Ctenitis dissecta* (Forst.) Copel.
52. Fronds tripinnate; rachis scaly; ultimate segments 3 mm broad....*Ctenitis subglandulosa* (Hance) Ching
51. Fronds tripinnate; hairs needle-shaped, all cells clear; sori (?) without indusia..... .....*Thelypteris torresiana* (Gaud.) Alston

PSILOPHYTA
Order PSILOTALES
PSILOTACEAE
PSILOTUM Swartz

Psilotum nudum (L.) Grisebach, Ges. wiss. Gottingen Abhandl. 7: 278. 1857. Merrill 1914: 47. Wagner & Grether 1948: 96.

Indigenous. Tropics and subtropics of both hemispheres; recently reported from Spain. Terrestrial or epiphytic.

Mt. Santa Rosa (obs.) ; Sasa R. mouth (4154–a); Fena (4339; 4469).

LEPIDOPHYTA
Order LYCOPODIALES
LYCOPODIACEAE
LYCOPODIUM Linnaeus

Lycopodium cernuum L. Sp. Pl. 1103. 1753. W. & G. 95.

Indigenous. Terrestrial, in savannahs. Nimitz Hill (1712); Manengon (3866); Fena (4327). Pantropical.

Lycopodium phlegmaria L. Sp. Pl. 1100, 1753. W. & G. 95.

Indigenous; paleotropical. Epiphytic, pendulous, in dense shady woods. Very rare in Guam. CORDON DE SAN FRANCISCO.

SELAGINELLACEAE
SELAGINELLA Beauvois

Selaginella ciliaris (Retzius) Spring, Acad. Sci. Belg. Bull. 10: 231. 1843. W. & G. 98.

Indigenous; India to N. Australia. Rare in Guam; terrestrial, along damp banks in savannahs.

Order FILICALES
OPHIOGLOSSACEAE
OPHIOGLOSSUM Linnaeus

Ophioglossum nudicaule L. f. Suppl. 443. 1781. W. & G. 33.

Pantropical; indigenous. Diminutive, terrestrial, to 8 cm tall, in savannahs; very rare in Guam.

Ophioglossum pendulum L. Sp. Pl. ed. 2, 2: 1518. 1763. W. & G. 34.

Tropical Asia to Polynesia; indigenous. Rather large pendulous epiphyte. Fena (4473). LESTON.

MARATTIACEAE
ANGIOPTERIS Hoffmann

Angiopteris durvilleana de Vriese, Mon. Maratt. 17. 1853. W. & G. 35, fig. 1.

Possibly endemic, though possibly also identical with other Pacific-Philippine forms. Huge terrestrial fern, trunkless, but with erect-spreading basally thick-stipulate, bipinnate fronds up to 3–4.5 m long; in shady moist ravines. Mt. Almagosa (4111); Talofofo (4432). GIANT FERN.

HYMENOPHYLLACEAE
CEPHALOMANES Presl

Cephalomanes boryanum (Kunze) van den Bosch, Syn. Hym. 11. 1859. W. & G. 37–38.

Indigenous; Micronesia and Polynesia. Terrestrial on muddy shaded stream-banks in south Guam. Rather rare.

CREPIDOMANES Presl

Crepidomanes brevipes (Presl) Copeland, Philipp. J. Sci. 67: 1. 1938. W. & G. 39.

Indigenous; also in Philippines, Borneo and New Guinea. Epiphytic in moist woods, especially in N. Guam. Yigo (4263); Manengon (4749); Fena (4490). Common, usually low on tree-trunks.

GONOCORMUS v.d. Bosch

Gonocormus minutus (Blume) v.d. Bosch, Hym. Jav. 7, pl. 3. 1861. W. & G. 39.

Indigenous; Africa to Japan and Polynesia. Very tiny mosslike epiphyte, fronds scarcely 2 cm long, or less.

SCHIZAEACEAE

SCHIZAEA Smith

Schizaea dichotoma (L.) Smith, Acad. Turin Mem. 5: 422, pl. 9, f. 9, 1793. Merrill 1919: 539.

Indigenous. Madagascar, Tropical Asia, Melanesia, Micronesia, and Polynesia. Terrestrial or on rotting logs or at bases of trunks, mostly in S. Guam; erect, dichotomously branched.

LYGODIUM Swartz

Lygodium auriculatum (Willd.) Alston, Reinwardtia 5: 16. 1959.

Lygodium semihastatum (Cavanilles) Desvaux, Prodr. Soc. Linn. Paris, Mem. 6: 203. 1827. Merrill 1914: 46. W. & G. 40.

Indigenous; Marianas and Philippines. Climbing, vinelike, with wiry stems and palmately divided fronds. Fairly common in S. Guam. Cetti Bay hillsides (3897); Sagua R. hills (4205).

Lygodium scandens (L.) Swartz, Schrad, J. Bot. 2: 106. 1801. W. & G. 41.

Indigenous; paleotropical. Climbing, vinelike, with pinnately divided fronds. Manengon (3831); Nimitz Hill (1714); 4943); Tarzan Falls (4207).

GLEICHENIACEAE

DICRANOPTERIS Bernhardi

Dicranopteris linearis (Burmann) Underwood, Bull. Torrey Bot. Club 34: 249. 1907. W. & G. 42.

Indigenous; pantropical. Common in open savannahs. Nimitz Hill (obs.); Sagua R. hills (4210); Manengon (3864); Fena (4329). The dichotomizing fronds are dorsally glaucous. MANA.

CYATHEACEAE

CYATHEA J. E. Smith

Cyathea lunulata (Forster) Copeland, Bull. Bishop Mus. 59: 37. 1929. W. & G. 43–46, fig. 2.

Indigenous; also elsewhere in Micronesia and Polynesia. Exceedingly rare; in hills of S. Guam. Terrestrial; trunk to 5 m tall; tree-fern with large tripinnate

fronds. Seen along hilly banks of Lake Fena; also known from a wet ravine of Mt. Tenjo. TSATSA. TREE-FERN. (Mt. Lamlam, 1684; Fena, obs.)

PTERIDACEAE

ACROSTICHUM Linnaeus

Acrostichum aureum L. Sp. Pl. 1069. 1753. W. & G. 78.

Indigenous; pantropical. In lowland marshes and at borders of mangrove and *Scirpus* swamps. Agaña swamp (4234); Apra (4889; 4947). Fronds 1-pinnate, 1–2 m tall; fertile pinnae entirely covered with sporangia on dorsal side. Common in suitable locations. LANGAYAO.

ADIANTUM Linnaeus

Adiantum philippense L. Sp. Pl. 2: 1094. 1753. W. & G. 79.

Indigenous; paleotropical, also in Central America. Rare, along streambanks. Talofofo R. (4453); Fena R. (4488).

CHEILANTHES Swartz

Cheilanthes tenuifolia (Burmann) Swartz, Syn. Fil. 129, 332, 1806. Merrill 1914:1. W. & G. 79.

Indigenous; Tropical Asia to the Pacific. Common in the savannahs, among grasses. Sagua R. hills (4197).

LINDSAEA Dryander

Lindsaea ensifolia Swartz, Schrad. J. Bot. 2:77. 1801. W. & G. 73, Fig. 9.

Indigenous; paleotropical. In savannahs among grasses. Manengon (4516); Sagua R. hills (4187; 4213). Besides the typical form (subsp. *ensifolia*), subsp. **agatii** (Brackenridge) Kramer, Acta Bot. Neerl. 15(3): 579, 1967, is present, distinguished by its pinnatifid leaf apex.

Lindsaea repens (Bory) Thwaites, var. **lingulata** Kramer, Blumea 18:181. 1970.

L. macraeana sensu W. & G. 71, fig. 8; not of (H. & A.) Copel. 1929.

Indigenous; Tropical Asia to the Pacific. Scandent at bases of trees in deep wooded ravines; Mt. Santa Rosa; Talofofo R. valley. Rare in Guam.—*L. repens* var. *macraeana* is confined to Hawaii (Kramer).

MICROLEPIA Presl

Microlepia speluncae (L.) T. Moore, Index Filicum, xciii (2:93), 1857. W. & G. 71.

Indigenous; paleotropical. Maemon Valley, semi-arid brushland. Rare in Guam.

PITYROGRAMMA Link

Pityrogramma calomelanos (L.) Link, Handb. Gew. 3:20. 1833. W. & G. 74.

Introduced. American Tropics. Sporadic in Guam, in various localities, some in waste ground. Piti junction; Nimitz Hill (1711); Camp Quezon, Mangilao (4123); Fena R. (4487). Terrestrial; easily distinguished by the whitish-yellowish

powder on the dorsal surface of the fronds.

PTERIS Linnaeus

Key to local species

1. Veins anastomosing along costa; frond dull green, tripartite....*P. tripartita*
1. Veins free along costa; frond glossy, pinnate.
   2. Fronds dimorphic with few pinnae, small.....*P. ensiformis*
   2. Fronds uniform, with many pinnae, larger, over 40 cm. long.
      3. Pinnae entire.....*P. vittata*
      3. Pinnae pectinate.....*P. spinescens*

Pteris ensiformis Burmann, Fl. Ind. 230. 1786. W. & G. 75.

Indigenous; Tropical and subtropical Asia to Polynesia. Rare in Guam, once found, on muddy bank of Aguada R., 2 1/2 miles east of Sumay.

Pteris spinescens Presl, Rel. Haenk. 1:56. 1825. W. & G. 76.

Indigenous; endemic in Micronesia. Type from Guam. In shady woods, or along streams, mostly in volcanic soil. Talofofo Valley (3964).

Pteris tripartita Swartz, Schrad. J. Bot. 2:67. 1801. W. & G. 75.

Indigenous; paleotropical. Common in Guam, on limestone, in woods. Mt. Santa Rosa area on limestone (1704).

Pteris vittata L. Sp. Pl. 2:1074. 1753. Stone, Micronesica 1:132. 1964.

Introduced, now abundant; common on exposed roadcuts, on limestone cliffs and banks, and on disturbed rocky ground in N. Guam. Agaña Heights (4233); Nimitz Hill (4945); Ritidian Pt. (obs.). Not recorded by Wagner & Grether; therefore probably introduced after World War II.

SPHENOMERIS Maxon

Sphenomeris chinensis (L.) Maxon, J. Wash. Acad. Sci. 3:144. 1913.

Sphenomeris chusana (L.) Copeland, Bull. Bishop Mus. 59:69. 1929. W. &. G. 70.

Indigenous; Tropical Asia. Common in volcanic hills, among rocks (in crevices) or among grasses. Nimitz Hill (1713); Mt. Tenjo (5159).

PARKERIACEAE

CERATOPTERIS Brongniart

Ceratopteris gaudichaudii Brongniart, Soc. Philom. Paris, Bull. 187. 1821. W. & G. 77.

Endemic; but probably not really distinct from *C. thalictroides* (cf. Safford 1905: 222, 273). Loosely rooted in mud, or more or less floating, in freshwater pools and streams. Almagosa R. near Almagosa Spring (4321; 4900). Agaña Spring (4980). Formerly cultivated for the edible fronds. GUAFAK-UHONG. UMOG-SENSONYAN.

This species should be studied in cultivation and compared with authentic material of *C. thalictroides* (L.) Brongniart, which occurs in Palau, Yap, and Kusaie.

I suspect that the Guam form was introduced by migrating ducks; although it is also possible that early Philippine immigrants deliberately introduced it during the Spanish era.

The sterile and fertile fronds are strikingly different.

DAVALLIACEAE

DAVALLIA J. E. Smith

Davallia solida (Forster fil.) Swartz, Schrad. J. Bot. 2:27. 1801. Safford 1905:256, 273, pl. 3. Merrill 1914:43. W. & G. 86.

Indigenous; Malaya to Fiji. One of the commonest ferns in Guam; epiphytic, with appressed, creeping-climbing rhizomes and deltoid 3–4-pinnate fronds. Highly variable in size. Yigo (4260); Fena (4330). PUGUA-MACHENA.

HUMATA Cavanilles

Humata heterophylla (Smith) Desvaux, Prodr. 323. 1827.

Safford 1905:295, pl. 53. Merrill 1914:44. W. & G. 83, fig. 10.

Indigenous. Tropical Asia, Melanesia, Micronesia, Fiji. Epiphytic, with appressed climbing scaly rhizome; fronds dimorphic, sterile ones entire, fertile ones pectinate. Common over all of Guam in woods. Manengon (3830); Fena (4337).

The genus was named for Umatac (formerly spelled Humata), a village in southern Guam. The Guam plants were originally called *H. pinnatifida* Cavanilles, but have since been found to be the same as the rather widespread plant *H. heterophylla.*

NEPHROLEPIS Schott

Key to local species

1. Fronds pendulous, the plants epiphytic; sori continuous, marginal..*N. acutifolia*
1. Fronds erect; plants usually terrestrial; sori separate, round reniform.
   2. Pinnules linear-lanceolate, attenuate-acuminate at apex; fronds more or less flat.
      3. Rachis and costae tawny- or rusty-woolly-scaly; sori near margin of pinnule upper base of pinnule more or less auriculate..*N. hirsutula*
      3. Rachis and costae merely somewhat scurfy-scaly; sori somewhat distant from margin of pinnule; upper base of pinnule scarcely or not at all auriculate.....*N. biserrata*
   2. Pinnules oblong or oblong-lanceolate, rounded to obtuse or acute at apex; fronds somewhat trough-shaped (not flat); rachises thinly tawny-scaly, but pinnules glabrous.....*N. exaltata*

Nephrolepis acutifolia (Desvaux) Christ, Verh. Nat. Ges. Basel 11:243. 1895. Merrill 1914:44. W. & G. 80.

Indigenous; paleotropical. Epiphytic; fairly common in shady forest. Mt. Almagosa (4106); Yigo (4258).

Nephrolepis biserrata (Swartz) Schott, Gen. Fil. pl. 3. 1834. W. & G. 82.

Indigenous; pantropical. Rather uncommon; mostly in N. Guam. Barrigada

Hill (4035). Possibly hybrid forms occur; specimens are often difficult to place exactly.

Nephrolepis exaltata (L.) Schott, Gen. Fil. pl. 3. 1834.

?Indigenous. Not recorded by Wagner & Grether. Once found in savannahs, Manengon (4520).

Nephrolepis hirsutula (Forster) Presl, Tent. Pterid. 73. 1836.

Safford 1905:273. Merrill 1314:44. W. & G. 81.

Indigenous; pantropical. Very common in Guam; frequently in clearings, coconut plantations, shady roadsides, etc. Nimitz Hill (4946).

ASPIDIACEAE

CTENITIS C. Christensen

Ctenitis dissecta (Forster) H. Ito ex Nakai & Honda, Nov. Fl. Jap. 4:91, 1939. W. & G. 59.

Indigenous; paleotropical. Not found in Guam since Safford and Seale collected it at the turn of the century. "Shaded limestone woods" is the probable habitat. Bipinnate.

Ctenitis subglandulosa (Hance) Ching, Fan Inst. Biol., Bot. Bull. 8:5, 302. 1938. [Not *C. subglandulosa* (Mett. ex Kuhn) Tardieu-Blot, Not. Syst. Paris 15:91. 1955].

Indigenous; Philippines, Ryukyu, Bonin Is., Japan, and Marianas. Rare, though conspicuous; in savannahs with sword-grass, near Geus River. Tripinnate.

HETEROGONIUM Presl

Heterogonium pinnatum (Copel.) Holttum, Sarawak Mus. J. 5:163. 1949.

Stenosemia pinnata Copeland, Philipp. J. Sci. Suppl.. 2:146, 1906. W. & G. 61, fig. 6.

Indigenous; Philippines, Sumatra, Guam. Mt. Santa Rosa, locally common, otherwise rare. Also along the Tolijuice River.

THELYPTERIS Schmidel

(including *Cyclosorus* Link and *Lastrea* Bory, p.p.)

Key to local species

1. Fronds simple pinnate; pinnae entire or pectinate.
   2. Pinnae entire.....*T. warburgii*
   2. Pinnae lobed,
      3. Basal pinnae reduced to mere auricles or abortive.
         4. Two or more pairs of veins united between segments of pinna; texture thick.....*T. unita*
         4. One or 1 1/2 veins united between segments; texture thin.....*T. maemonensis*
      3. Basal pinnae normal, as long or longer than upper pinnae,
         5. Sori confined to lobes (thus a wide sterile space is left along the costa),

6. Texture thin; dorsal costa lacking scales; not marsh plants.. .....*T. interrupta*
6. Texture subcoriaceous; costa dorsally scaly; in marshes.. .....*T. goggilodus*

5. Sori not confined to lobes (thus no such sterile space);
7. Fronds sparsely hairy; indusium with short hairs; segments closest to rachis not enlarged.....*T. dentata*
7. Fronds hairy; indusium with many long hairs; lobes of basal pinnae nearest to rachis usually enlarged.....*T. parasitica*

1. Fronds tripinnate; sori (?) without indusia.....*T. torresiana*

Thelypteris dentata (Forsskal) E. St. John, Amer. Fern. J. 26:44. 1936. Stone, Micronesica 2:135. 1967.

Indigenous; pantropical. Savannahs, along muddy banks of streams, in bamboo thickets. Talofofo Valley (3962).

Thelypteris goggilodus (Schkuhr) Small, Ferns of S.E. U.S.A. 248, t. 475. 1938. Stone, Micronesica 2:135. 1967.

Indigenous; pantropical. Only in marshes, often with *Acrostichum aureum.*

Thelypteris interrupta (Willdenow) Iwatsuki, J. Jap. Bot. 38(10): 314. 1963.

Indigenous; Tropical Asia—Pacific. Very common in Guam, throughout the island.

Thelypteris maemonensis (Wagner & Grether) Stone, Micronesica 2:135. 1967.

Cyclosorus maemonensis W. & G. 54, fig. 5.

Endemic; in woods, along streams, in S. Guam and at Mt. Santa Rosa, very local, not common. Type: Wagner 3746, U.C.

Thelypteris parasitica (L.) Fosberg, Occ. Pap. Bishop Mus. 23(2): 30, 1962. Stone, Micronesica 2: 135. 1967.

Indigenous; Tropical Asia to Pacific. Fairly common in meadows, damp ravines, brushlands.

Thelypteris torresiana (Gaudichaud) Alston, Lilloa 30:111. 1960.

Stone, Micronesica 2:135. 1967.

Lastrea torresiana (Gaud.) Moore; W. & G. 58.

Indigenous; paleotropical. Rare in Guam; Fonte R. tributary; Mt. Santa Rosa.

Thelypteris unita (L.) C.V. Morton, Amer. Fern J. 49:113. 1959.

Stone, Micronesica 2:135. 1967.

Dryopteris cucullata sensu Merrill 1914:43.

Indigenous; Tropical Asia to the Pacific. Very common in Guam, both in savannahs in S. Guam, and on limestone in N. Guam. Mt. Almagosa (4112); Fena (4334); North-west Field (5006); Mt. Lamlam (1986).

Thelypteris warburgii (Kuhn & Christ) Stone, Micronesica 2:135. 1967.

Indigenous; New Guinea and Guam. Rather rare; along stream banks, Maemon Valley, 3 miles E. of Agat; or on rocks in midstream, same locality, near Tolijuice ("natural bridge").

TECTARIA Cavanilles

Tectaria crenata Cavanilles, Descr. Pl. 250. 1802.
Merrill 1914:45. W. & G. 60.

Indigenous (the type from Guam); Malaya, Micronesia, Melanesia. Common in Guam in shady woods, always on limestone soils, or beside streams. Talofofo Valley (3963); Ritidian Pt. (4708).

BLECHNACEAE

BLECHNUM Linnaeus

Blechnum orientale L. Sp. Pl. ed. 2, 1535. 1963.—Safford 1905:273. Merrill 1914:42. W. & G. 63.

Indigenous; Tropical Asia to the Pacific. In Guam, found only in savannahs. Manengon (4206); Fena (4328). Young fronds are reddish or pink.

ASPLENIACEAE

ASPLENIUM Linnaeus

Key to local species

1. Fronds simple; rosette-epiphyte.....*A. nidus*
1. Fronds pinnate or compound,
   2. Fronds 3–4-times pinnate, ultimate segments slender, cuneate, 2–10 mm long.....*A. laserpitiifolium*
   2. Not as above; fronds 1-pinnate,
      3. Rhizome creeping, much elongated; pinnae dimidiate..*A. unilaterale*
      3. Rhizome short; pinnae not or hardly dimidiate,
         4. Pinnae numerous, crowded, narrow; stipes and rachis scaly; frond tapered toward base; epiphyte. .....*A. pellucidum*
         4. Pinnae fewer, more distant, broader; rachis nearly glabrous; frond not tapered toward base; usually terrestrial....*A. falcatum*

Asplenium falcatum Lamarck, Encycl. 2:306. 1786. Safford 1905:273. W. & G. 66.

Indigenous; paleotropical. Abundant in shady forest on limestone, either terrestrial or on limestone rocks. Pago Bay cliffs (4133). This is said to hybridize with *A. pellucidum*; Wagner & Grether show a photograph (their fig. 7) of a putative hybrid.

Asplenium laserpitiifolium Lamarck, Encycl. 2:310. 1786. W. & G. 68.

Indigenous; Tropical Asia to Polynesia. Epiphyte with large lacy fronds in limestone forest. Ypiga Forest Reserve (4687). Not common.

Asplenium nidus L. Sp. Pl. 2:1079. 1753. Merrill 1914:42. W. & G. 64.

Indigenous; paleotropical. Epiphytic, forming large rosettes; resembling *Microsorum punctatum* but with wider fronds and sori as oblique lines. Also terrestrial on rocks in limestone forest. Yigo (4261). GALAK. BIRDS'-NEST-FERN.

Asplenium pellucidum Lamarck, Encycl. 2:305. 1786. W. & G. 65.

Indigenous; paleotropical (excl. Africa, but incl. Madagascar). Common,

usually epiphytic in shady woods. Mt. Almagosa (4107); Yigo (4259). Seemingly this can hybridize with *A. falcatum* (q.v.).

POLYPODIACEAE

BELVISIA Mirbel

Belvisia mucronata (Fee) Copeland, Gen. Fil. 192. 1947. W. & G. 87.

B. spicata sensu Safford 1905: 273, not of (L.f.) Mirbel.

Indigenous; Malaysia east to Polynesia. Epiphytic; fronds simple, with a spikelike sporangiate apex. In forests, especially in N. and C. Guam, but also in S. Guam. Barrigada Hill (3807; 4671; 5157); Manengon (4223).

GONIOPHLEBIUM (Blume) Presl

Goniophlebium percussum (Cavanilles) Wagner & Grether, 1948: 88.

Indigenous (the type from Guam); Tropical Asia to Samoa. On limestone, in forests. Not found since Nee collected it, though well-known from Rota. It should be looked for in N. Guam.

MICROSORUM Link

Microsorum punctatum (L.) Copeland, Bull. Bishop Mus. 93:73. 1932. W. & G. 89.

Indigenous; paleotropical. Big rosette-epiphyte with strap-shaped fronds; sori small, dot-like; resembles *Asplenium nidus*. Usually in limestone forests. Yigo (4262); Talofofo (4308); Fena (4331; 4480).

PHYMATODES Presl

Phymatodes scolopendria (Burmann) Ching, Contr. Inst. Bot. Natl. Acad. Peiping 2:63. 1933.

Microsor(i)um scolopendria (Burm.) Copeland; W. & G. 88.

P. Phymatodes Maxon ex Safford 1905:352, pl. 62.

Indigenous; paleotropical. Very common; terrestrial, epiphytic, or on rocks, throughout the island, inland and coastal. Barrigada Hill (4036; 4173); Dos Amantes Pt. (4046); Fena (4332, 4479). Often fertile when scarcely or not pinnately lobed; highly variable.

PYRROSIA Mirbel

Pyrrosia adnascens (Swartz) Ching, Chin. Bot. Soc. Bull. 1:1, 45. 1935. W. & G. 90, Fig. 11.

Indigenous; Tropical Asia to Polynesia. Epiphytic, often on coconut trees. One of the commonest ferns in Guam; usually exposed to full sun. Fronds simple; pubescence of stellate hairs. Lalo (1671); Barrigada Hill (3786); Dos Amantes Pt. (4045).

VITTARIACEAE

VITTARIA J. E. Smith

Vittaria elongata Swartz, Syn. Fil. 109, 302. 1806. Gaudichaud, Bot. Voy. Freyc. 382. 1826. Safford 1905:273, 398.

Merrill 1914:45. W. & G. 92.

Indigenous; paleotropical. Epiphyte, with narrow linear often pendulous fronds with continuous marinal sori. Barrigada (1699); Manengon (4222); Cetti Bay (3903); Fena (4476).

ANTROPHYUM Kaulfuss

Antrophyum plantagineum (Cavanilles) Kaulfuss, Enum. Fil. 197. 1824. Safford 1905:273; W. & G. 93.

Indigenous; Tropical Asia to Polynesia. Epiphytic, or on limestone rocks, in moist shady localities, not common. Not to be confused with *Asplenium*; although the fronds bear oblique linear sori, they are simple, oblanceolate, and rarely over 50 cm long. Mt. Lamlam (1679); Fena (4338); Talofofo (4454).

III. Class GYMNOSPERMAE

KEY TO LOCAL FAMILIES OF GYMNOSPERMS

Leaves pinnately divided, crowded at apex of stem; microsporophylls forming a cone..... *Cycadaceae*
Leaves undivided.
Leaves and cone-scales spirally arranged; ovuliferous scale free, or adnate to the bract.
Ovuliferous scale and bract completely fused; seed never winged.....
..... *Araucariaceae*
Ovuliferous scale separate or only partly adnate to the bract; seeds sometimes (in some genera) winged.
Cone scales spirally imbricate; ovuliferous scale free or nearly free; ovules 2 per scale.....*Pinaceae*
Cone scales spiral but not closely imbricate; ovuliferous scale much thickened, completely adnate to bract; ovules 2–6 per scale;.....
..... *Taxodiaceae*
Leaves and cone scale opposite or decussate or in whorls of 3–8; ovuliferous scale completely adnate to the bract.....*Cupressaceae*

CYCADACEAE

Stems stout and woody, bearing the leaves in a terminal crown; leaves pirally arranged, usually of two kinds, the first (scales) in several spirals, the second (leaves) large, well-developed, pinnate, rigid or leathery; plants dioecious; inflorescences terminal, staminate cone with nail-shaped scales, bearing sori on the lower surface, each sorus of 2–6 sporangia; pistillate cone or megasporophylls, the megasporophyll in Cycas somewhat foliar in appearance, sporangia lateral. Asia to Australia and the Pacific; Mexico; Cuba; Florida; Africa; etc. Nine extant genera, about 80 species. A single genus locally present.

CYCAS Linnaeus

Stout palmlike trees up to 50 ft. high, but in our species only to about ten or twelve ft. at most; branching rare; leaves pinnate, the leaflets with a midrib but no lateral veins; megasporophylls in a crown through which the axis continues to grow; megasporophylls brown-pubescent, ovules green, lateral; microsporophylls scale-like, borne in terminal cones.

Cycas circinalis L. subsp. **circinalis,** forma **undulata** (Desf.) Schuster, Pflanzenr. 99 (IV, 1): 66. 1932. *C. undulata* Desf., Hort. Par. 1820; Gaud., Voy. Freyc. Bot. 19:434. 1826. "FADANG"; "FEDERICO"; CYCAD.

With the characters of the genus.

Trunks to 6 m tall; leaflets usually 1–2 cm wide, not sharp-tipped.

Common throughout the island, more particularly in undisturbed forests on limestone, esp. near the sea, but reaching the summits of the southern hills; some-

times forming dense understory stands. The trunks furnish an edible pith (called sago) of a starchy nature. The seeds may also be eaten, but being poisonous, must be very carefully washed many times. The resulting flour may be mixed with water and cooked into thin cakes. A steady diet of this preparation is said to be injurious. Mt. Almagosa (4110); Barrigada (4670).

CYCAS REVOLUTA Thunb. Fl. Japon. 229. 1784.

Stout trunks 1–4 m tall, rarely branched; leaves lanate when young, glabrescent, crowded, spreading, pinnate, leaflets linear, to 7 mm wide, with a sharp spinous tip, seeds ovoid, slightly compressed, reddish, about 4 cm long.

Native of Japan and Ryukyu Islands. A very few plants to be seen in Guam gardens; one or two in Agaña; another by a house near the Pago River bridge. Easily distinguished from the native fadang by its stouter shorter trunk, denser crown, smaller and much narrower leaflets.

ARAUCARIACEAE

Trees with evergreen firm needle-like or broader leaves; staminate cones axillary or terminal on short shoots, usually on separate trees; microsporophylls numerous, spiral, each bearing on the underside numerous sporangia; pistillate cones terminal on short shoots; ovuliferous scale and bract fused; scales numerous, closely spiral and imbricate; cotyledons 2.

One genus locally present.

ARAUCARIA Jussieu

Tall dioecious trees with scale-like or needle-like crowded evergreen leaves; seeds adnate to the ovuliferous scale in reversed position; each scale with one ovule. (Arauco, Chile).

ARAUCARIA EXCELSA (Lamb.) R. Br. in Aiton, Hort. Kew. ed. 2, 412. 1810. NORFOLK ISLAND PINE.

Cultivated in gardens; usually sterile. The genus is composed of about 30 species, native in the Southern Hemisphere, in South America, New Zealand, Australia, New Caledonia, New Guinea, etc. The endemic species of Norfolk Island, and various other species are now commonly cultivated. The trees are cone-shaped in general appearance, with horizontal or drooping branches, the leaves crowded and overlapping. In Guam they rarely attain the great height of which they are capable; and seem never to flower or fruit.

PINACEAE

PINUS, Linnaeus

PINUS LUCHUENSIS Mayr, [?] Bot. Central bl. 58: 149. 1894. RYUKYU PINE.
P. loochooensis auctt. sphalm irreg.

Tree to 15 m high, in age with aspreading or flat crown. Old bark flaking. Needles 2 per bundle, 12–16 cm long. Cones ovoid, 3–6 cm long; scales with

short mucro; seed ripe after 1 year.

Native to the Ryukyu Islands, from Akuseki Island southward. Rapid-growing and hardy. The wood is second-grade in quality.

One cultivated tree (but the identification is not certain) exists on Nimitz Hill.

TAXODIACEAE

Trees with scale-like or needle-like leaves; staminate cones with short stalk with expanded tip from which hang 2–9 sporangia; pistillate cones woody, ovuliferous scales either imbricate or thickened upwards and the tips valvate, bearing 2–9 ovules; seeds narrowly winged.

A single genus locally present.

CRYPTOMERIA D. Don

Large trees; leaves linear, awl-shaped; pistillate cone of flattened scales not much thickened toward the tip, imbricate, a spine borne below the deeply toothed tip.

CRYPTOMERIA JAPONICA (L. f.) D. Don, Trans. Linn. Soc. 18: 167. 1841.

SUGI (Japanese); Japanese cedar or cryptomeria.

Cultivated in gardens; introduced from Japan. Trunk erect (at last reaching a great height, up to 60 m in Japan); bark cinnamon red, peeling in thin strips; leaves spirally arranged, triangular in cross-section, persistent for about 5 years; male flowers in short spike-like clusters; cones globose, solitary, each scale with a recurved bract on back and 4–6 sharp points on top, seeds 2–5 per scale. The trunk provides a relatively soft, straight-grained, workable, fragrant, light wood.

CUPRESSACEAE

Resinous, shrubs, or trees; leaves decussate or 3-verticillate, mostly scale-like or acicular; staminate strobili mostly terminal on short branches, solitary, formed of 'stamens' (microsporophylls) each in a bract-axil; megastrobili terminal or falsely lateral on minute side-branches, of decussate or verticillate ovuliferous scales (megasporophylls), each bearing 1–2–20 erect ovules (megasporangia); ripe cones woody, rarely the upper part fleshy.

1. Ripe cone resembling a fleshy berry nearly 1 cm broad; leaves often dimorphic, some scalelike, some acicular ..... *Juniperus*
1. Ripe cones dry, not berry-like; leaves not dimorphic except in Chamaecyparis.
   2. Cone-scales 3–4 pairs, their edges overlapping; branches mostly vertical, much rebranched, thus laterally flattened; leaves opposite ..... *Thuja*
   2. Cone-scales up to 6 pairs, their edges not overlapping.
      3. Leaves dimorphic, those of 2 lateral rows folded, clasping the twig; others flattened, appressed to the twig; seeds resinous, winged .... *Chamaecyparis*
      3. Leaves all alike or nearly so; seeds without resin glands, narrowly margined ..... *Cupressus*

This key is given in the event that various conifers of this family are introduced or become more widespread in gardens. A very few plants of *Juniperus* and perhaps *Cupressus* and *Thuja* are now found in Guam; besides their scarcity, they seem not to flower or set seed. Their exact status has thus not been determined.

IV. ANGIOSPERMAE

KEY TO SUBCLASSES OF ANGIOSPERMAE

Cotyledons (seed-leaves) two; stem (in woody species) of bark, wood, and pith; leaves with reticulate venation; floral parts in 4's, 5's, or more, seldom in 3's or fewer; taproot present.....DICOTYLEDONES
Cotyledon 1; stem without above distinctions, fibrous; leaves usually with parallel veins, or with parallel cross-veins, rarely (in yams, etc.) with network veins; parts of flowers usually in 3's.....MONOCOTYLEDONES

ARTIFICIAL KEY TO ANGIOSPERM PLANTS OF GUAM, BASED CHIEFLY ON VEGETATIVE CHARACTERS

Key I.

TO SEPARATE UNIQUE AND EXCEPTIONAL TAXA.

1. Parasitic leafless vines with orange or green stems, attached to other plants by haustoria.....*Cassytha* (Lauraceae)
1. Otherwise,
   2. Stocky bright red parasitic herbs arising from thick underground tubers attached to subterranean roots of various forest trees and producing numerous tiny white flowers.....*Balanophora*
   2. Otherwise,
      3. Slender herbs with green virtually leafless stems to 15–20 cm high, with slippershaped white or yellow flowers.....*Utricularia*
      3. Otherwise,
         4. Large fleshy shrubs with flat oval stems more or less beset with spines; cacti.....*Cactaceae*
         4. Otherwise,
            5. Trees; leaves reduced to tiny whorled teeth at nodes of jointed elongated needle-like stems; fruit a small woody cone-like aggregate-capsule.....*Casuarina*
            5. Otherwise,
               6. Diminutive epiphytes with flattened slender green appressed roots, no stems, no leaves, flowers tiny, white, followed by slender oblong capsules with innumerable extremely tiny seeds.....*Taeniophyllum*
               6. Otherwise.....Proceed to Key 2.

Key 2.

General Key to Groups based on leaves.

1. Leaves compound, composed of 2 or more *distinctly stalked* leaflets, or (in *Bauhinia*) of two leaflets *fused toward base.*
   2. Leaves of more than 3 leaflets.
      3. Leaves *pinnate* in plan, the leaflets opposite or alternate, with or without an odd-numbered terminal leaflet.
         4. Leaves imparipinnate, i.e. with an odd number of leaflets, hence a terminal leaflet present.....GROUP I.
         4. Leaves paripinnate, i.e. with an even number of leaflets, no terminal leaflet .....GROUP II.
      3. Leaves *bipinnate* or *tripinnate* in plan or further compound; or *palmate* or *digitate.*
         5. Leaves bipinnate, tripinnate, quadripinnate, etc.....GROUP III.
         5. Leaves palmate or digitate, or palmately compound.....GROUP IV.
   2. Leaves of only 3 leaflets or of 2 leaflets.
      6. Leaflets 3, i.e. leaves trifoliolate .....GROUP V.
      6. Leaflets 2 only.....See GROUP II.
1. Leaves *simple*, composed of one blade, though the blade may be variously toothed, lobed, or parted; but not divided into stalked leaflets.
   7. Leaves palmately nerved or triplinerved, or palmately lobed.
      8. Leaves palmately lobed (or parted).....GROUP VI.
      8. Leaves palmately nerved or triplinerved, the margins toothed, serrate, or crenate, but not deeply lobed.....GROUP VII.
   7. Leaves pinnately nerved or lobed, or parallel-nerved.
      9. Leaves with all nerves more or less parallel to midrib or long axis of blade, extending the whole length of the leaf.....GROUP VIII.
      9. Leaves with a distinct midrib from which lateral nerves arise at an acute or obtuse angle.
         10. All lateral nerves more or less parallel to each other, straight or curved; nerves not meshing or if so then forming squares or rectangles.....GROUP IX.
         10. All lateral nerves with intervening smaller veins forming a network of irregular polygonal meshes.....GROUP X.

Group I. Leaves imparipinnate, with 5, 7, 9, or a larger odd number of leaflets.

1. Climbing vines,
   2. Herbaceous, not woody,
      3. Leaflets linear; flowers small dark red trumpetform....*Ipomoea quamoclit*
      3. Leaflets broader; flowers not red,
         4. Flowers blue marked with white; leaflets all alike; fruit a flat pod.....*Clitorea ternatea*
         4. Flowers yellow to white; leaves with alternating large and small leaflets; fruit red globose fleshy (tomato).....*Lycopersicon esculentum*

2. Woody vines,
   5. Flowers star-shaped with 6–8 lobes, white, fragrant; mostly plants of cultivation..... *Jasminum* spp.
   5. Flowers zygomorphic (papilionoid), pink or white, petals 5; wild plants,
      6. Leaflets alternate; leaflet tips notched; climber at fringes of mangroves swamps..... *Dalbergia candenatensis*
      6. Leaflets opposite, acute at tips; climber of rocky coasts or river-banks ..... *Derris* spp.

1. Trees or erect shrubs, or coarse herbs, not climbers,
   7. Leaves gland-dotted; flowers white, fragrant, with a hypogynous disc; shrub of gardens..... *Murraya paniculata*
   7. Otherwise,
      8. Leaflets toothed,
         9. Flowers large yellow tubular bilabiate; cultivated shrub..... ..... *Tecoma stans*
         9. Flowers otherwise,
            10. Herb; flowers in heads, central ones yellow, tubular, marginal ones (if present) white, ligulate; fruit a 2-awned achene..... ..... Compositae (*Bidens*)
            10. Trees or shrubs,
               11. Thorny shrubs of cultivation with showy flowers..... ..... *Rosa* spp.
               11. Unarmed shrubs or trees,
                  12. Leaves often variegated, often aromatic of parsley if bruised; flowers small, greenish; mostly cultivated shrubs.. *Polyscias* spp.
                  12. Leaves green, not aromatic; seedling form of big tree.. *Tristiropsis*
      8. Leaflets entire,
         13. Fruits various, but not a 2-valved pod,
            14. Leaflets opposite,
               15. Leaflets many (usually more than 9),
                  16. Flowers very large, red with yellow edges, obliquely cupshaped; cultivated..... *Spathodea*
                  16. Flowers tiny, whitish; wild..... *Rhus taitensis*
               15. Leaflets usually 5–7 or sometimes 9,
                  17. Young parts rusty-pubescent, hairs stellate; fruits brown-hairy; wild tree..... *Aglaia*
                  17. Otherwise,
                     18. Fruit small globose red baccate, in panicles; naturalized..... ..... *Schinus*
                     18. Otherwise; cultivated,
                        19. Fruit with soft spines or prickles and soft flesh.... *Nephelium*
                        19. Fruit smooth ellipsoid with 3 grooves and edible seed..... ..... *Canarium*

14. Leaflets alternate,
20. Flowers in hairy spikes, fruit yellow buff; rare, cultivated tree.... ..... *Lansium*
20. Flowers pink or white,
21. Flowers pink; fruit edible, sour, cylindroid and terete or 5-ridged .....*Averrhoa* spp.
21. Flowers white, in loose glabrous racemes; fruit inedible; wild tree..... *Tristiropsis*

13. Fruit a 2-valved pod (legume): Family Leguminosae.
22. Pods strongly constricted between the seeds, or jointed, the joints 1-seeded,
23. Pod long cylindric; fllowers yellow, in erect spiciform racemes; softly hairy shrub mostly of beaches.....*Sophora tomentosa*
23. Pod shorter, flattened, each joint with a rough pattern on each face.....*Aeschynomene indica*
22. Pods not so constricted or jointed,
24. Pods curved or coiled; flowers small, pinkish, papilionoid..... .....*Indigofera* spp.
24. Pods straight or slightly curved, flattened,
25. Trees,
26. Flowers yellow; pods nearly circular, flat, 1-2-seeded..... ..... *Pterocarpus*
26. Flowers pink to white with a yellow mark; pod flat, 6–8-seeded..... *Gliricidia*
25. Shrubs,
27. Flowers white or purplish; pods straight or nearly so, silky-pubescent ..... *Tephrosia*
27. Flowers pinkish; pods curved.....*Indigofera*

GROUP II. Leaves paripinnate, with 4, 6, 8 or a larger even number of leaflets.

1. Leaflets 2 or 4 only.
2. Low shrubs,
3. Cultivated; pods subterranean (peanuts).....*Arachis*
3. Weedy; pods on aerial branches.....*Zornia*
2. Trees, large shrubs, or woody climbers,
4. Tree of marginal areas of mangrove swamps; fruit very large globose, woody-shelled, 10–20 cm in diameter.....*Xylocarpus*
4. Not so,
5. Leaflets 2, partly fused at base to form an apparently bilobed leaf; cultivated small trees with showy flowers and flat pods.....*Bauhinia*
5. Not so,
6. Large trees; leaflets 5–10 cm long, about twice as long as broad or less; flower with 1 white petal only; pods long, flattened.....*Intsia*
6. Small trees or shrubs; leaflets usually more than twice as long as

broad, usually less than 10 cm long; flower with 5 white petals; pods thick ellipsoid and rugose-wrinkled.....*Cynometra*

1. Leaflets mostly 6 or more (even number),
   7. Vines, often high climbers, sometimes prostrate, creeping,
      8. Climber; leaflets 12–24, thin, glabrous; flowers pinkish to white, papilionate; fruit a pod, splitting open to reveal globose small red seeds each with a black spot.....*Abrus*
      8. Creeper; leaflets mostly 12–14, pubescent; flowers yellow, rotate, fruit 3–5-lobed, spiny; seeds brown.....*Tribulus*
   7. Trees or shrubs,
      9. Flowers more or less actinomorphic, yellow or pink; cultivated or weedy,
         10. Fruit a pod.....*Cassia*
         10. Fruit fleshy, sour, edible.....*Averrhoa*
      9. Flowers papilionate or caesalpinioid; fruit a pod,
         10. Flowers large, 3 cm long or more, white or pink, papilionate, edible pods very long slender cylindric; slender lacy trees, usually cultivated ..... *Sesbania grandiflora*
         10. Flowers small, yellowish, not edible.
            11. Weedy shrubs; flowers yellow, papilionate.....*Sesbania cannabina*
            11. Cultivated trees; flowers yellow with pink streaks, caesalpinioid; pods thick, pulpy, edible (tamarinds).....*Tamarindus*

GROUP III. Leaves bipinnate, tripinnate, or further divided.

1. Trees or shrubs,
   2. Leaves bipinnate; leaflets 4 to many;
      3. Spines or sharp prickles present (on leaves, branches, or trunks)
         4. Leaves of 4 small leaflets; pods coiled or twisted; naturalized and planted tree.....*Pithecellobium dulce*
         4. Leaves of many leaflets; pods straight,
            5. Prickly or spiny shrubs,
               6. Flowers yellow, in small ball-like heads; pods, thick and fat..... .....*Acacia farnesiana*
               6. Flowers red, or yellow, or both colors; in loose open clusters; pods thin, flat.....*Caesalpinia pulcherrima*
            5. Prickly or spiny trees;
               7. Flowers creamy white, in dense cylindric spikes; petals inconspicuous, but stamens obvious.....*Prosopis*
               7. Flowers yellow, in panicles, with obvious petals..... .....*Caesalpinia sappan*
      3. Not prickly or spiny,
         8. Flowers blue or violet, tubular, 2-lipped; fruit rounded, 5 cm broad; rare cultivated tree.....*Jacaranda*
         8. Flowers not bluish or violet; fruit not as above,
            8A. Fruit a pod (legume); leaflets entire,

9. Pods not dehiscent (not opening at ripeness),
10. Pods thick, black, pulpy inside; flowers pinkish, in tufted heads ..... *Samanea saman*
10. Pods flattened, thin, not black or pulpy; flowers pink, white, or yellow.
11. Buds and new leaves rusty-pubescent; pods pale whitish straw-colored, with slightly wavy edges and bulging seeds; glabrous; flowers white..... *Albizia*
11. Buds and new leaves rusty-pubescent; pods reddish-brown, slightly to densely hairy; edges more or less straight; flowers pink or yellow.
12. Flowers yellow, in racemose clusters; stamens 10, leaves lacking obvious glands; pod sparsely hairy; cult. trees .... *Peltophorum pterocarpum*
12. Flowers pink, in short racemes; stamens many; leaves with conspicuous glands between each pair of leaflets; pods densely hairy; wild tree..... *Serianthes nelsonii*
9. Pods dehiscent when ripe,
13. Pods spirally twisted; seeds lens-shaped, shiny red; flowers small, in slender spikelike racemes, yellowish; medium to big trees.... ..... *Adenanthera pavonina*
13. Pods straight or curved, rarely ever twisted; seeds flattened, brown;
14. Flowers white,
15. Small weedy shrubs with very slender pods, not common.. ..... *Desmanthus virgatus*
15. Tall shrubs or small trees with flat pods, very common (tangan-tangan)..... *Leucaena leucocephala* & *L. insularum*
14. Flowers red or yellow (or both),
16. Flowers yellow, in small ball-like heads; adult trees with curved sickleshaped flattened petioles functioning as leaves (phyllodes); bipinnate leaves appearing only on sucker shoots or on juvenile plants and seedlings; common in Saipan, rare in Guam; pods small 5–8 cm. long..... ..... *Acacia confusa*
16. Flowers large showy, red and yellow, with some white; leaves all normally bipinnate; pods large 30–40 cm long, thick woody; common, cultivated..... *Delonix regia*

8B. Fruit globose, yellowish, with 1 hard seed; lfts. slightly toothed..... ..... *Melia azedarach*

2. Leaves bipinnate or tripinnate or further divided, or if bipinnate sometimes only the lower pinnae further divided; fruit not a 2-valved pod.

17. Leaves with lowest leaflets further divided; otherwise merely 1-pinnate;

17A. Fruit a round fleshy dark purple berry with about 4 seeds..... ..... *Sambucus mexicana*

17B. Fruit globose, yellowish, with 1 hard seed..... *Melia azedarach*

17. Leaves bi, tri, or quadripinnate; fruit not as above,

18. Fruit an elongated 3-valved capsule, splitting open at maturity; flowers large white, resembling legume fls.; small trees with bi- or tripinnate leaves with entire margins ..... *Moringa oleifera*

18. Fruit a rounded flattened 2-seeded hard purple berry (or triangular and 3-seeded); flowers small greenish white; shrubs with ascending branches; leaves 2–4-pinnate, the leaflets usually toothed or lobed.... ..... *Polyscias fruticosa*

1. Vines, usually climbers,

19. Prickly or thorny,

20. Small, often creeping shrubs; flowers pink; leaflets sensitive, quickly folding up when disturbed..... *Mimosa pudica*

20. Large, woody climbers; flowers yellow; leaves not sensitive to touch.... ..... *Caesalpinia major* and *C. bonduc*

19. Not prickly or thorny,

21. Leaves bipinnate, leaflets entire; fruit a giant pod 1 m long or more..... ..... *Entada pursaetha*

21. Leaves with 3 pinnae of 3 leaflets each, the leaflets coarsely toothed; fruit a balloon-like inflated 3-winged structure..... ..... *Cardiospermum halicacabum*

GROUP IV. Leaves palmate (digitate) with stalked leaflets. [See also: Papaya].

1. Medium to large tree; older trees with stout sharp prickles on trunk; deciduous; fruit a cylindric woody structure to 15 cm long, filled with a cottony substance (kapok)..... *Ceiba pentandra*

1. Not as above,

2. Leaves with about 7 sessile or subsessile leaflets, silvery-pubescent beneath when young; sap milky..... *Cecropia palmata*

2. Not as above,

3. Trees,

4. Leaflets elliptic-obovate, rather broad, up to 25 cm long (or more), on petiolules about 1/4 as long as leaflet blade; flowers small, red, in rounded heads borne on long spikes radiating from a common point..... ..... *Brassaia actinophylla*

4. Leaflets narrow, elliptic-ovate, usually less than 15 cm long; petiolules about 1/5 as long as leaflet blade; flowers large pinkish-purple, tubular, 2-lipped ..... *Tabebuia pentaphylla*

3. Herbs or vines,

5. Leaves glandular, rank; leaflets 3 or 5; herb..... *Cleome viscosa*

5. Leaves not glandular; leaflets 3 or 5; climbing vine..... ..... *Dioscorea pentaphylla*

GROUP V. Leaves compound, formed of 3 leaflets only, with distinct stalks.
(Note: some plants of this group may have a few leaves with 4 or 5 leaflets or some with only 1 leaflet also present).
[Note: Plant with thick fleshy crenate leaves, some simple, some trifoliolate.... ..... *Kalanchoe*]

1. Stipules present; stipels often present; flowers papilionate.
  2. Vines or creepers,
    3. Flowers light green; calyx and carpel with tawny or goldenbrown hairs; pods black at maturity, with several large seeds..... *Mucuna*
    3. Flowers not green,
      4. Flowers bright red, dull red, pink, purplish, bluish or white, but not yellow.
        5. Leaflets coarsely toothed or lobed, or distintly angular.
          6. Leaves gray-hairy beneath; flowers purple with a yellowish spot. Cultivated..... *Pueraria thunbergiana*
          6. Leaves glabrous; flowers blue and white. Cultivated..... ..... *Pachyrrhizus erosus*
        5. Leaflets entire, not angled,
          7. Leaflets orbicular or rotund, often notched at apex, rather thick and fleshy; flowers pink with white spot; beach vines usually on sand.. ..... *Canavalia maritima*
          7. Leaflets ovate with a blunt or acute apex; not fleshy; often high climbers.
            8. Flowers pale pink or white,
              9. Prostrate creeping plant usually on dry volcanic soils; leaflets less than 2 cm long.... *Desmodium triflorum & D. heterophyllum*
              9. Creeping or climbing plant, usually on coastal rocks or in riverside forests; leaflets usually 3–6 cm long.. *Derris trifoliata*
            8. Flowers bluish to violet, or red
              10. Flowers bluish or violet, pale,
                11. Pods edible, with 4 angles, these with thin wavy wings. Wingbeans ..... *Psophocarpus tetragonolobus*
                11. Pods not 4-winged,
                  12. Leaves very hairy; creepers or low climbers in savannas and old fields; also used as cover crop or green fertilizer. Fls. bluish-violet..... *Calopogonium mucunoides*
                  12. Leaves glabrous or with fine sparse hairs.
                    13. Leaflets broad ovate; fls. 2–3 cm long, almost white ..... *Dolichos*
                    13. Leaflets narrow sublanceolate; fls. c. 5 mm long..... ..... *Teramnus labialis*
              10. Flowers red, dark red or brick red,
                14. Tall woody climber with red flowers, petals very unequal,

flowers curved, beaklike. Forests.....*Strongylodon*

14. Climbers or creepers with brick-red flowers or dark maroon to reddish-violet flowers. Petals nearly equal....*Canavalia*

4. Flowers yellow or yellowish white.

15. Leaflets with stipels, without resin-dots.

16. Beach or coastal vine, wild; flowers clear yellow; pods subcylindric .....*Vigna marina*

16. Cultivated or naturalized vines, usually climbers; pods flattened ..... *Phaseolus*

15. Leaflets without stipels, but with resin-dots. Creeper in savannas.. ..... *Cantharospermum scarabaeoides*

2. Shrubs or trees, not vines,

17. Low shrubs or coarse herbs with a woody rootstock, seldom over 4 ft. tall; fls. yellow or partly yellow.

18. Gray-tomentose shrubs of cultivation; pods notched between the seeds. Pigeon-pea, lenteja francesa .....*Cajanus cajan*

18. Pale or tawny pubescent or glabrous coarse herbs; pods inflated. Rattle-pods.....*Crotalaria* spp.

17. Tall shrubs or trees; fls. not yellow.

19. Large trees with red flowers; trunks spiny; leaves deciduous in the dry season; flowers often appearing before or during the growth of new leaves; .....*Erythrina variegata*

19. Shrubs or small trees without spines; fls. white or creamy; not deciduous .....*Desmodium umbellatum*

1. Stipules lacking; or stipules spinose; flowers not papilionate.

20. Small soft herbs with obovate apically notched leaflets and yellow flowers; stems sour-tasting.....*Oxalis corniculata*

20. Trees or shrubs,

21. Shrubby; branches armed with axillary pairs of sharpspines; foliage with citrus-like odor; fls. white, 3-petaled; berry red, globose or ellipsoid.... .....*Triphasia trifolia*

21. Unarmed,

21A. Sap not milky,

22. Tall tree; old leaves withering red; fruit edible, large globose (santol).. ..... *Sandoricum koetjape*

22. Small trees or shrubs; old leaves, not red; fruit inedible.

23. Leaflets round or nearly so, crenulate, white-variegated on margins; cult. often as hedge-plants.....*Polyscias pinnata CV. tricochleata*

23. Not as above,

24. Leaves of 3 leaflets or often of only 1 leaflet; prostrate; gray-hairy; fls. purplish.....*Vitex simplicifolia*

24. Leaves of 3 leaflets only; tall shrubs, green subglabrous; fls. white.....*Allophylus timorensis*

21A. Sap milky; tree.....*Hevea braziliensis*

GROUP VI. Leaves simple, palmately lobed.

1. Sap thick milky; shrubs or trees;
   2. Soft-wooded thick-trunked un- or few-branched fleshy trees with about 7 coarsely toothed lobes per leaf; petioles often 1 m long or more; fruits large obpyriform, orange, with numerous gelatinous-coated black seeds in center; papaya .....*Carica papaya*
   2. Not with above combination of features,
      3. Leaves mostly 3-lobed,
         4. Trees; leaves with a whitish powdery pubescence; fls. dull white; some leaves unlobed; .....*Aleurites moluccana*
         4. Shrubs; leaves purplish, sticky, with numerous capitate glands; flowers purple.....*Jatropha gossypiifolia*
      3. Leaves 3–11-lobed,
         5. Leaves with 9–11 slender lobes, these again lobed or coarsely narrow-toothed; flowers coral red.....*Jatropha multifida*
         5. Leaves with 3–7 lobes (rarely some unlobed or merely angled);
            6. Leaves peltate;
               7. Leaf margins serrate; capsules prickly.....*Ricinus communis*
               7. Leaf margins entire; capsules not prickly.....*Cecropia palmata*
            6. Leaves not peltate,
               8. Leaves mostly 3–5-lobed (a few may be unlobed); tubers inedible.
                  9. Lobes shallowly cut, about halfway to midrib or not so far.... ..... *Jatropha curcas*
                  9. Lobes more deeply cut, obovate,
                     10. Lobes moderately deeply cut, half way or three-fourths; fruit edible, top-shaped (figs), developing on branches; flowers completely enclosed within these structures .....*Ficus carica*
                     10. Lobes very deeply cut; fruits inedible; flowers stalked, exposed, in clusters among leaves.....*Manihot glaziovii*
               8. Leaves 3–7-lobed; lobes deeply cut, narrowly elliptic; underground tubers thick, fleshy, white, edible.....*Manihot esculenta*

1. Sap not milky; habit various,
   11. Vines or creepers,
      12. Climbers,
         13. Tendrils present; no tubers,
            14. Flowers unisexual, male flowers usually smaller than females; flower without corona; stamens commonly united; calyx not finely dissected ..... *Cucurbitaceae*
            14. Flowers bisexual,
               15. Leaves 3-lobed; calyx finely dissected; flower with corona..... ..... *Passiflora*
               15. Leaves mostly 5-lobed; calyx lobes entire; cultivated vine....*Vitis*

13. Tendrils none; leaves often cordate; tuberous.....*Dioscorea*
12. Creepers,
16. Flowers unisexual; tendrils present.....*Curcurbitaceae*
16. Flowers bisexual; tendrils none.....*Triumfetta procumbens*
11. Trees, shrubs, or erect herbs,
17. Leaves with serrate marins,
18. Calyx edible, fleshy, red or pink.....*Hibiscus sabdariffa*
18. Calyx green, thin,
19. Inflorescence scapose; bracts like long pendent threads; leaves compound; tuberous .....*Tacca*
19. Otherwise,
20. Tall shrubs; flowers pink, often doubled.....*Hibiscus mutabilis*
20. Low shrubs,
21. Flowers pink-violet, single.....*Urena lobata*
21. Flowers yellow.....*Hibiscus abelmoschus*
17. Leaves with entire margins,
22. Calyx green; petals present; shrubs,
23. Calyx toothed; fruit not a burr; seeds long-hairy.....*Gossypium*
23. Calyx entire; fruit a burr; seeds not long-hairy..*Triumfetta semitriloba*
22. Calyx colored; petals none; tree.....*Sterculia*

Note: Present in Rota (but not so far known in Guam) is *Boerlagiodendron*, (Araliaceae), with large palmate leaves, orange flowers, and purple fruits.

GROUP VII. Leaves palmately nerved, or strongly peltate or cordate, entire or toothed but not palmatifid.

1. Leaves white, gray, or silvery beneath,
2. Margins serrate or crenate,
3. Leaves silvery beneath; margins coarsely crenate; base cordate; rare cultivated shrub.....*Morus alba*
3. Leaves white or gray beneath, serrate or finely crenate, not strongly cordate.
4. Branches spiny; cultivated trees; fruit purple.....*Zizyphus*
4. Branches unarmed,
5. Leaves white beneath; margin crenulate-serrate.....*Boehmeria*
5. Leaves gray or olive-gray beneath, serrate.....*Pipturus*
2. Margins entire; blade rotund-cordate.....*Hibiscus tiliaceus*
1. Leaves greenish beneath,
6. Leaves all falcate asymmetric or inaequilateral.....*Elatostema*
6. Leaves symmetrical,
7. Leaves peltate; trees or aquatic herbs,
8. Aquatics with floating orbicular dentate leaves.....*Nymphaea*
8. Trees,
9. Leaves subcordate or round at base, ovate acute, the peltate insertion often reddish; margins entire.....*Hernandia*

9. Leaves suborbicular; insertion of petiole not red; margins somewhat angular; flowers along stems.....*Macaranga*

7. Leaves not peltate,
10. Vines,
11. Leaves subcordate; flowers not in spikes, not with colored calyx
12. Flowers white.....*Tinospora*
12. Flowers greenish.....*Dioscorea*
11. Leaves mostly not cordate or subcordate; flowers in spikes or with colored calyx,
13. Flowers green, in spikes; cultivated.....*Piper betle*
13. Calyx magenta or pink; flowers not in spikes; wild.....*Medinilla*
10. Erect trees, shrubs, or herbs,
14. Shrubs,
15. Leaves pubescent, narrowly ovate-lanceolate; flowers white, 2 cm wide; shrub of savannas.....*Melastoma*
15. Leaves subglabrous, subcordate, rounded; flowers tiny, in spikes, greenish; shrub of shady limestone woods.....*Piper*
14. Trees, or herbs,
16. Trees,
17. Leaves entire,
18. Flowers yellow, large (like Hibiscus) with many stamens fused into a tube; leaves thinly coriaceous with subcordate base..... *Thespesia*
18. Flowers minute, greenish, stamens free; leaves thin, or slightly fleshy, not coriaceous, base cuneate or acute.....*Dendrocnide*
17. Leaves coarsely toothed.....*Melanolepis*
16. Herbs.
19. Stinging hairs present .....*Laportea interrupta*
19. No stinging hairs,
20. Leaves entire; plants green; leaves thick fleshy with obscure nerves; flowers tiny, in spikes.....*Peperomia*
20. Leaves serrate; plants often reddish; leaves somewhat fleshy, but venation mostly evident; flowers not in spikes.....
.....*Laportea ruderalis*

Note: The camphor tree (*Cinnamomum camphora*) has been reported from Guam. It is very rare if indeed still present. Its leaves have 3 basal veins, but the distal venation is pinnate. Wild species of *Cinnamomum* occur in the Caroline Islands.

GROUP VIII. Leaves all simple; major veins extending the length of the leaf and more or less parallel; cross-veins if present more slender, also subparallel and at right angles to major veins, thus forming regular rectangles. Mostly grasses, sedges, and other monocot plants.

1. Leaves armed on edges and midrib dorsally with stiff curved prickles; trunks woody, erect and branching, and with proproots, or climbing by means of

appressed rootlets; inflorescences subtended by white, yellow or reddish bracts; flowers lacking perianth; monoecious, each individual male or female only ..... *Pandanaceae*

1. Not with the above combination of characters,
  2. Aquatic plants,
    3. Marine plants, not in fresh water,
      4. Leaves hairlike, less than 1 mm broad..... *Ruppia maritima*
      4. Leaves broader,
        5. Leaves mostly 1–1.5 (or up to 2) cm broad..... *Enhalus acoroides*
        5. Leaves commonly less than 6 mm wide,
          6. Leaf apex with 2 minute teeth..... *Halodule uninervis*
          6. Leaf apex smooth..... *Thalassia hemprichii*
    3. Freshwater plants,
      7. Submerged plants with closely spaced short leaves,
        8. Leaves capillary, forked several times..... *Ceratophyllum demersum*
        8. Leaves bifacial, up to 2 mm broad, unforked..... ..... *Hydrilla verticillata* [and *Egeria*]
      7. Emerged plants, with some leaves at least floating on the surface,
        9. Leaves to about 8 cm long and 2 cm broad; flowers in erect spikes, green or reddish..... *Potamogeton* spp.
        9. Leaves longer, and of 2 types, the submerged leaves grasslike, the emerged leaves with an abruptly expanded apical lobe,
          10. Essentially floating plants; petiole inflated bulbous; flowers pale purple patterned with white..... *Eichhornia*
          10. Usually rooted in mud and ascending to surface; petioles not bulbous; flowers with 3 white petals..... *Sagittaria subulata*
  2. Not aquatic plants (though habitat may be swampy),
    11. Stems hollow except for nodes, hard, up to 20 cm diam. or more; tall bamboos, woody canes, and reeds.
      12. Tall bamboos with stems (culms) usually well over 6 cm diameter and up to 15 m tall,
        13. Culms smooth..... *Bambusa vulgaris* [see also *Dendrocalamus strictus*]
        13. Culms spiny at base..... *Bambusa spinosa*
      12. Smaller bamboos or reeds about 2–5 m tall, with culms about 1–4 cm diameter,
        14. Leaves glaucous gray-blue beneath, not more than 10 cm long..... ..... *Bambusa glaucescens*
        14. Leaves longer, glaucous or green beneath,
          15. In freshwater swamps; tall reeds with large plumose greenish or brownish panicles of minute flowers..... *Phragmites karka*
          15. Not of swamps; canes or stout grasses of dry ground or ditches; panicles green to yellowish or silvery white;
            16. Flowers in large plumose silvery white panicles 30–40 cm long..

.....*Arundo, Saccharum, Trichachne*, and *Miscanthus*

16. Flowers in compact cylindrical yellowish spikes about 15 cm long or less.....*Pennisetum*

11. Stems hollow except for nodes, or solid, rarely more than 1 cm in diameter; grasses and sedges.

17. Stems hollow, terete; but solid at nodes; leaves sheathing, sheath enclosing the stem for some distance, jointed to the leaf-blade and with a ligule, flaplike or of hairs, at the insertion; flowers in spikelets, without perianth (except perhaps for minute lodicules).....
.....*Gramineae* (Grass family)

17. Stems usually solid or pithy; often triangular or angled in cross-section (but round and hollow in some Scirpus spp.); leaves sheathing, but often in 3 vertical rows, without ligules; normal perianth may be present or as scales or bristles; sedges, and various other monocots.

18. Stems pentagonal or hexagonal in cross-section.....*Scirpus fuirena*

18. Stems triangular, terete, or lenticular in cross-section,

19. Leaves seemingly absent, present at base as sheaths without (or with very small) blade; culms tall, hollow but pithy; plants of brackish of marine swamps.....*Scirpus littoralis*

19. Leaves present and well-developed;

20. Vines with tough stems; leaves lanceolate, alternate, each ending in a coiled tendril.....*Flagellaria indica*

20. Otherwise,

21. Rosette plants, i.e. leaves radiating from the base; margins often toothed; leaves sometimes very thick fleshy, apex a rigid spine; flowers borne on a central stalk (or scape).

22. Leaves grayish beneath; fruit (the pineapple) capped by short leaves.....*Ananas comosus*

22. Leaves greenish, not borne on apex of fruit,

23. Leaves thick, fleshy, often with marginal teeth.....*Agave*

23. Leaves thin to coriaceous but not fleshy, or if somewhat fleshy then purplish beneath,

24. Leaves purple-magenta beneath.....*Rhoeo spathacea*

24. Leaves green on both sides,

24a. Flowers white, on tall scapes,

25. Flowers in umbels; petals narrow linear,

26. Corona present uniting the petals near their bases .....*Hymenocallis littoralis*

26. No corona.....*Crinum asiaticum*

25. Flowers in dense racemose panicles on tall scape, petals not long—linear.....*Yucca*

24a. Flowers yellow, basal.....*Curculigo*

21. Not rosette plants, or leaves not all radiating from base,

27. Leaves hollow, tubular, with odor and taste of onion..*Allium*
27. Leaves flat, not tasting of onion,
28. Leaves thick, mottled or patterned with dark and light green, the edge often yellowish; stem creeping..*Sanseviera*
28. Otherwise,
29. Shrubs with erect stems, leaves clustered toward the ends of stems; distinct periole present; leaves green, or reddish.....*Cordyline*
29. Not as above,
30. Leaves folded in half lengthwise and flattened,
31. Glabrous plant of savannas; fruit a small globose blue berry .....*Dianella*
31. Woolly around bracts; plant of freshwater swamps; fruit a 3-valved capsule.....*Philydrum*
30. Leaves not folded,
32. Creeping, somewhat grasslike vines; flowers with 3 or 2 petals.....*Commelinaceae*
32. Not creepers,
33. Leaves with broad cordate blades.....
.....*Eurycles amboinensis* & *Nervilia*
33. Not so,
34. Leaves arising from underground bulbs; flowers pink, 6-parted....*Zephyranthes rosea*
34. Leaves on aerial stems, if arising from underground then flowers not pink 6-parted,
35. Leaves terete, solid.....*Vanda* & *Luisia*
35. Leaves flat,
36. Leaves markedly pleated (with 3 or more pleats),
37. Leaves with a large heartshaped blade..
..... *Nervilia*
37. Not so,
38. Leaves with 3 prominent pleated veins; flowers white.....*Calanthe*
38. Leaves with numerous pleated veins; flowers mostly pink....*Spathoglottis*
36. Leaves not pleated (flat or folded),
39. Flowers zygomorphic; stamen 1 (rarely 2) adnate to gynoecium apex.....
..... *Orchidaceae*
39. Flowers regular, waxy white, fragrant, with 6 stamens....*Polianthes tuberosus*

GROUP IX. Leaves simple, with central midrib, lateral veins at right angles or oblique angle to midrib, and subparallel, vein meshes absent or of cross-veins between lateral veins.

1. Vines ..... *Araceae*
1. Not vines,
   2. Giant herbs to 5 m high with stems (pseudostems) formed of concentric leaf-bases; banana plants..... *Musa*
   2. Otherwise,
      3. Flowers in groups enclosed in boat-shaped bracts..... ..... *Strelitziaceae* and *Commelinaceae*
      3. Otherwise,
         4. Leaves with a conspicuous joint midway on the petiole.... *Marantaceae*
         4. No such joint present,
            5. Flowers very large, with red or yellow staminodia; fertile stamen 1.. ..... *Canna*
            5. Flowers generally smaller, white or yellow, usually within bracts (these sometimes colored), or no bracts,
               6. Monocotyledonous herbs..... *Zingiberaceae*
               6. Dicotyledonous trees..... *Calophyllum*

GROUP X. Leaves simple, lobed, dentate, or entire with central midrib and pinnate lateral veins; tertiary veinlets forming reticulations by anastomosis; reticulations polygonal.

1. Spiny or thorny plants, with spines, thorns, or stiff prickles on stems or leaves; not including plants with spiny flowers or fruits which are otherwise unarmed.
   2. Sap thick milky,
      3. Shrubs; spines paired, axillary, forked or not; flowers white, with tubular corolla and 5 rotate imbricate lobes; cultivated.
         4. Spines twice forked..... *Carissa grandiflora*
         4. Spines unforked..... *Carissa arduina*
      3. Fleshy shrubs with greenish stems; spines paired or grouped; flowers small, greenish, with red bracts.
         5. Branches thick, 5-angled, leaves few at tips of branches..... ..... *Eurphorbia neriifolia*
         5. Branches cylindric or obscurely angled, leaves scattered..... ..... *Euphorbia milii* var. *splendens*
   2. Sap clear or slightly yellowish,
      6. Herbs,
         7. Glaucous; leaves prickly, also stems and calyx; flowers large yellow; sap yellowish..... *Argemone mexicana*
         7. Dull green; leaves unarmed; spines axillary; flowers tiny, greenish or reddish, in spicate panicles; sap clear..... *Amaranthus spinosus*
      6. Shrubs, trees, or woody vines,
         8. Leaves present only as spines or scales; stems flattened, oval, green,

fleshy (cactus), possibly mistaken for leaves.....*Cactaceae*
8. Not as above,
9. Trees or shrubs; no large colored bracts,
10. Leaves not spiny-edged,
11. Leaves crenulate; petioles never alate; no lemon odor.....
.....*Ximenia americana*
11. Leaves entire; petioles often broadly winged; foliage with lemon or citrus odor.....*Citrus* spp.
10. Leaves spiny on edges.....*Malpighia coccigera*
9. Woody vines (sometimes trimmed to resemble small trees); 3 large usually purplish bracts around each 3-flowered inflorescence; flowers white, tubular .....*Bougainvillea*
1. Plants without thorns, spines, or stiff prickles.
12. Leaves serrate, dentate, or crenate,
13. Leaves in whorls of 3.....*Macadamia*
13. Leaves not whorled,
14. Rosette herbs with aggregate edible fruit (strawberry).....*Fragaria*
14. Otherwise,
15. Trees or shrubs or woody vines,
16. Leaves multicolored red and green; flowers in bracteate spikelike racemes.....*Acalypha wilkesiana*
16. Leaves green,
17. Leaves obscurely crenate; flowers white; fruit of 3 cocci..*Maytenus*
17. Otherwise,
18. Flowers tubular, bilabiate,
19. Flowers bluish-violet or rarely almost white..*Stachytarpheta*
19. Flowers white, pink, orange, yellow.....*Lantana*
19. Flowers white or blue.....*Hyptis*
19. Flowers pink or yellow.....*Lippia, Lindernia, Bacopa*
18. Flowers of free petals and/or stamens, not bilabiate,
20. Stamens many, fused into a tube.....*Malvaceae*
20. Stamens free,
21. Rambling shrub.....*Colubrina*
21. Erect subshrub .....*Corchorus*
15. Herbs or subshrubs or herbaceous vines,
22. Flowers in involucrate heads.....*Compositae*
22. Flowers not in involucrate heads,
23. Flowers spurred; fruit elastically explosive-dehiscent..*Impatiens*
23. Otherwise,
24. Flowers tubular, bilabiate.....*Labiatae*
24. Not so,.....see next 12
12. Leaves with entire margins .....Proceed to KEYS TO FAMILIES.

KEY TO FAMILIES OF MONOCOTYLEDONES

(Including families (in brackets) occurring in Micronesia but not in Guam)

Flowers perfect (with both pistils and stamens), or hermaphroditic.
- Plants aquatic, submerged.
  - Perianth present, of 3 or 4 segments.
    - Plants of fresh water..... *Potamagetonaceae*
    - Plants of marine waters, lagoons..... *Zannichelliaceae*
  - Perianth absent; ovule apical; fruiting carpels stalked..... *Ruppiaceae*
- Plants not submerged aquatics; if aquatic, then with emergent or floating leaves.
  - Ovary with a single internal chamber.
    - Ovary chamber including only one seed.
      - Perianth present.
        - Fruit of numerous flattened achenes; stamens 12–30,..... ..... *Alismataceae*
        - Fruit a capsule or berry, inferior; stamen 1, other stamen-like organs staminodia, these variously petaloid.... *Marantaceae*
      - Perianth absent; flowers enclosed in dry bracts, except in the Araceae.
        - Inflorescence a spadix with spathe; mostly broad leaved vines and herbs..... *Araceae*
        - Inflorescence not a spadix; leaves mostly narrow, plants not vine-like.
          - Flowers each in the axil of a specialized bract (lemma) with a second bract (palea) opposite; fruit a caryopsis; filaments attached to midpoint of anthers; stems mostly round and hollow..... *Gramineae*
          - Flowers in the axils of bracts but not included between two bracts facing each other; fruit an achene; filaments attached to base of anthers; stems 3-angled (or more), rarely terete, often solid..... *Cyperaceae*
    - Ovary chamber including several to many seeds (ovules).
      - Fertile stamens 6 (or more) per flower.
        - Carpels superior; stamens 9 or more; aquatic or marsh plants ..... (*Butomaceae*)
        - Ovary inferior; stamens 6; terrestrial;..... *Taccaceae*
      - Fertile stamens 1–3 per flower.
        - Fertile stamens 3, distinct; ovary superior; flowers slightly irregular, in tight bracteate heads..... (*Xyridaceae*)
        - Fertile stamens 1 or 2, adnate to the pistil; ovary inferior; flowers irregular..... *Orchidaceae*
  - Ovary with more than one internal chamber. (But the fruit rarely 1-celled by abortion).

Each ovary chamber with 1 or 2 ovules.
Ovary inferior; corolla thin and petal-like..... *Musaceae* OR *Strelitziaceae* (See also *Crinum* in the Amaryllidaceae)
Ovary superior.
Perianth none..... *Araceae*
Perianth present.
Corolla thin and petal-like..... *Liliaceae*
Corolla firm and calyx-like.
Leaves forming a crown at summit of stem; or the plant a vine; left tip never a coiled tendril.... *Palmae*
Leaves scattered along the stem; plant erect, the leaf-tips coiled into tendrils..... *Flagellariaceae*
Each ovary chamber with more than 2 ovules.
Fleshy, floating aquatic plants..... *Pontederiaceae*
Not aquatics.
Ovary superior.
Perianth none..... *Araceae*
Perianth present.
Corolla greenish or brownish, stiff, scalelike..... ..... (*Juncaceae*)
Corolla petal-like.
Calyx foliaceous ..... *Commelinaceae*
Calyx not foliaceous..... *Liliaceae*
Ovary inferior.
Fertile stamens 1–2, adnate to pistil; flowers irregular ..... *Orchidaceae*
Fertile stamens 3 or more, or not adnate to the pistil (though sometimes surrounding it, the filaments free); flowers regular or irregular.
Fertile stamen 1.
Staminodia 1–4; ovary strongly tuberculate ..... *Cannaceae*
Staminodium 1; ovary not tuberculate..... ..... *Zingiberaceae*
Fertile stamens 3, 4, 5, or 6.
Fertile stamens 5..... *Musaceae*
Fertile stamens 3, 4, or 6.
Leaves not stiff or rigid.
Stamens 3, opposite the nearest sepals ..... *Iridaceae*
Stamens 6, or rarely 3 and opposite the petals.
Saprophytes with reduced leaves

and 6-lobed tubular perianth.... ..... (*Burmanniaceae*)
Not saprophytes..... ..... *Amaryllidaceae*
Leaves stiff or rigid and often spiny.
Inflorescence a simple spike..... ..... *Bromeliaceae*
Inflorescence a branched spike or panicle.
Calyx and corolla quite dissimilar, calyx lobes often spine-tipped ..... *Bromeliaceae*
Calyx and corolla rather similar, lobes not spiny ..*Amaryllidaceae*

Flowers unisexual.
Flowers not on a simple or branched spicate inflorescence or spadix.
Submerged or floating aquatic plants.
Floating stemless plants.
Minute thallose plants.....*Lemnaceae*
Large leafy plants several cm. wide.....*Araceae* (*Pistia*)
Submerged plants with stems.
Ovary superior .....(*Najadaceae*)
Ovary inferior ..... *Hydrocharitaceae*
Not submerged or floating plants.
Monoecious herbs.
Flowers in involucrate head; ovaries 2–3-celled..... ..... (*Eriocaulaceae*)
Flowers separate, in racemes or panicles; ovary 1-celled..... ..... *Alismataceae*
Dioecious vines.
Ovary superior ..... *Liliaceae*
Ovary inferior ..... *Dioscoreaceae*
Flowers on a simple or branched spicate inflorescence or spadix, rarely the pistillate spikelets encased in hard, bead-like sheaths arranged in panicles on the lower part of the inflorescence.
Leaves none or a few bracts present; saprophytes; flowers racemose or subcorymbose; perianth 1-seriate, with 3–8 segments; sometimes dioecious or rarely polygamous plants..(*Triuridaceae*)
Leaves present; plants not saprophytic.
Leaves not parallel-veined, or flowers 4-sided or in conspicuous spirals on rachis; spike inside a spathe.
Leaves palmately parallel-veined or binerved, palmlike, or bifid at apex.....*Cyclanthaceae*

Leaves pinnately veined, not palmlike.....*Araceae*
Leaves parallel-veined; flowers not 4-sided; spike either with or without a spathe.
Dioecious trees or woody vines.
Perianth present; leaves compound.....*Palmae*
Perianth absent; leaves simple.....*Pandanaceae*
Monoecious trees or herbs (sometimes very large herbs).
Perianth present; trees.....*Palmae*
Perianth absent; herbs or canes.
Fruit a caryopsis, sometimes enclosed in a hard sheath; stems terete; lemma and palea present in flower..... *Gramineae*
Fruit an achene; stems mostly 3-angled; flowers in axil of a bract.....*Cyperaceae*

KEYS TO FAMILIES OF DICOTYLEDONEAE IN GUAM

Key I.
To Eliminate Unusual Types.

1. Parasitic plants with reduced or no chlorophyll, not or incompletely green, arising from or penetrating the tissues of the host plant.
   2. Herbaceous green to orange leafless vines with haustoria..... .....*Cassytha* (Lauraceae)
   2. Stocky dwarf tuberous reddish root-parasites.....*Balanophoraceae*
1. Not parasites,
   3. Trees with needle-like jointed stems with whorls of minute scale-like leaves at the nodes; male flowers apetalous, in catkins; female flowers in headlike catkins; fruit woody, cone-like; carpels 2-valved.....*Casuarinaceae*
   3. Not with above characters in combination,
      4. Aquatic herbs,
         5. Leaves floating, round, peltate.....*Nymphaeaceae*
         5. Not so; leaves much-divided.....*Ceratophyllaceae*
      4. Not aquatics,
         6. Cactoid plants with succulent fleshy stems and few or no leaves.
            7. Stems cylindric; often a few normal leaves present; sap copiously milky.....*Euphorbia* (part) (*Euphorbiaceae*)
            7. Stems flat, padlike, bearing spines (usually); sap clear.... . . ..*Cactaceae*
         6. Not cactoid plants,
            8. Trees of marine to brackish tidal swamps with arching aerial roots; seeds germinating precociously & developing a long radicle while still attached.....*Rhizophoraceae*
            8. Not with above characters in combination,

9. Softwooded, un- or little-branched trees with palmate-compound large leaves, male flowers in panicles, female flowers solitary and sessile; fruit a papaya..*Caricaceae*
9. Not as above,
   10. Flower with superior ovary of a single carpel with marginal placentation; fruit a pod or bean, rarely segmented (loment), sometimes 1-seeded; stipules (and stipels) present; habit various.... .....*Leguminosae*
   01. Not with above character combination,
      11. Creeping herb; fruit a conoid fleshy receptacle with numerous achenes (carpels of 1 flower) embedded in the surface; the strawberry.... .....*Rosaceae* (part)
      11. Not as above; Proceed to Key II.

Key II.
Key to Major Groups.

1. Ovary superior; very rarely half-inferior (*Maesa*, Myrsinaceae)
   2. Corolla of free petals, or petals united only at the extreme base and then often but temporarily; or corolla absent....Group 1, "Thalamiflorae"
   2. Corolla tubular, of united petals, though their tips (corolla-lobes) are commonly free.....Group 2, "Corolliflorae"
1. Ovary inferior or half-inferior (except superior in *Wikstroemia*, Thymel.)
   3. Corolla of free petals, or petals united only at the extreme base and then often but temporarily; or corolla absent.....Group 3, "Calyciflorae"
   3. Corolla tubular, of united petals, though their tips (corolla-lobes) are commonly free.....Group 4, "Ovariflorae"

Key to families of "Thalamiflorae" *

1. Corolla absent or apparently so; calyx sometimes petaloid (colored); or lacking.
   2. Flowers borne in catkins (aments) or catkin-like spikes; or at least the staminate flowers so borne,
      3. Flowers of both sexes borne in aments.....*Myricaceae*
      3. Only the staminate flowers borne in aments, the female flowers variously borne; or the flowers borne in spikes somewhat resembling aments,
         4. Sap milky; calyx present.....*Moraceae*
         4. Sap not milky; calyx present or absent,
            5. Calyx absent;.....*Piperaceae*
            5. Calyx present,

* Also including Myricaceae of Group Amentiferae; and occasional references to Leguminosae or other families which belong in Calyciflorae but are aberrant in some respect (esp. ovary position) or which may easily be mistaken.

6. Calyx perigynous,
  7. Calyx zygomorphic; stamens 3, 6, or 12....*Aristolochiaceae*
  7. Calyx actinomorphic.....*Aizoaceae*
6. Calyx hypogynous,
  8. Woody plants,
    9. Anthers opening by valves; tissues sometimes aromatic by essential oils.....*Lauraceae*
    9. Anthers opening by longitudinal slits,
      10. Ovules several to many per carpel,
        11. Ovary 1-celled; stamens free.....*Flacourtiaceae*
        11. Ovary 2-many-celled; stamens connate.....*Sterculiaceae*
      10. Ovules 1 or 2 per carpel,
        12. Ovary 2-several-celled, ovules mostly pendulous; sap sometimes milky.....*Euphorbiaceae*
        12. Ovary 1-celled,
          13. Stamens incurved in bud, ...*Moraceae*
          13. Stamens erect in bud,
            15. Styles 2.....*Ulmaceae*
            15. Style 1,
              16. Stamens variable in number (1–30); bracts sometimes large, colored.....*Nyctaginaceae*
              16. Stamens 4–10; bracts not conspicuous,
                17. Stamens 4, filaments adnate to calyx; ovary sometimes on a gynophore.....*Proteaceae*
                17. Stamens 8–10, filaments free; gynophore none.. .....*Thymeleaceae* (Calyciflorae)
  8. Herbs or subshrubs,
    9. Ovary 2–4-celled,
      10. Stamens tetradynamous; sepals 4; fruit usually a silique.. . . ..*Cruciferae*
      10. Stamens equal; fruit usually a berry or capsule,
        11. Flowers perfect.....*Aizoaceae*
        11. Flowers unisexual.....*Euphorbiaceae*
    9. Ovary 1-celled,
      12. Stipules membranous, ocreate, enclosing the stem beyond the node; achene enclosed by persistent sepals..*Polygonaceae*
      12. Stipules not as above,
        13. Flowers unisexual,
          14. Ovules basal, orthotropous.....*Urticaceae*
          14. Ovules pendulous, anatropous.....*Moraceae*
        13. Flowers perfect,
          15. Leaves opposite; nodes enlarged; stamens usually twice as many as petals.....*Caryophyllaceae*

15. Leaves mostly alternate, nodes not enlarged, stamens often same number as petals
16. Sepals scarious; stamens united at base; flowers bracteate ..... *Amaranthaceae*
16. Sepals herbaceous; stamens usually free; flowers not bracteate ..... *Chenopodiaceae*

1. Corolla present or apparently so,
17. Complex hypanthium present, a corona of cupular form with numerous marginal lobes, inserted between petals and stamens; tendrillous vines.... ..... *Passifloraceae*
17. Not with above combination of characters,
18. Stamens more than twice as numerous as petals,
19. Carpels more than 1 and free,
20. Filaments united into a long tube..... *Malvaceae*
20. Filaments not united..... *Rosaceae* (Calyciflorae)
19. Carpel single or if 2 or more these then united to form a compound ovary,
21. Sepals 2; leaves simple, fleshy; capsules circumscissile.. *Portulacaceae*
21. Sepals 4 or more,
22. Leaves opposite; stamens often joined in phalanges inserted on receptacle; ..... *Guttiferae*
22. Leaves alternate,
23. Perianth zygomorphic; leaves often compound..... ..... *Leguminosae* (Calyciflorae)
23. Perianth actinomorphic; or leaves simple; or both,
24. Filaments all free,
25. Ovary markedly stipitate..... *Capparidaceae*
25. Ovary not stipitate,
25A. Leaves not gland-dotted;
26. Sepals imbricate in bud,
27. Sap clear; seed not fleshy; ovary mostly 3–5-celled . . .. *Theaceae*
27. Sap reddish; seeds fleshy, reddish; ovary 1–(2–)-celled ..... *Bixaceae*
26. Sepals valvate in bud,
28. Petals 4–5 (rarely 6–7); sepals 4–5; fruit a capsule, burr, or berry..... *Tiliaceae*
28. Petals 6, sepals 3; fruit a large berry with external processes or patterns..... *Annonaceae*
25A. Leaves gland-dotted..... *Rutaceae*
24. Filaments all or partly united at base into a staminal tube,
29. Leaves with pellucid oil-glands..... *Rutaceae*
29. Not so,

30. Sepals imbricate in bud,.....*Theaceae*
30. Sepals valvate in bud,.....*Malvaceae*

18. Stamens just twice as many as petals, or fewer,
31. Carpels 2 or more, distinct,
32. Fleshy plants; carpels subtended by nectary.....*Crassulaceae*
32. Not succulent,
33. Climbers with unisexual flowers.....*Menispermaceae*
33. Shrubs with bisexual flowers.....*Simarubaceae*
31. Carpels 1 or of 2 or more then joined in a compound ovary,
34. Styles 2–5,
35. Leaves opposite or whorled,
36. Sepals 2; fleshy herbs.....*Portulacaceae*
36. Sepals 3–5; petals often clawed,
37. Herbs with entire leaves; ovules 1-many; endosperm present .....*Caryophyllaceae*
37. Shrubs with entire or serrate leaves; ovules solitary; endosperm none .....*Malpighiaceae*
35. Leaves alternate or basal,
38. Trees or shrubs with resin ducts; ovary 1–3-celled; intrastaminal disc present in flower.....*Anacardiaceae*
38. Herbs or shrubs or small trees without resin ducts; ovary usually usually 5-celled; flower lacking disc.....*Oxalidaceae*
34. Style 1 (though stigmas may be distinct),
39. Flowers spurred; ovary 5-celled; herbaceous; capsule dehiscing explosively, the valves coiling and ejecting the seeds..*Balsaminaceae*
39. Not with above character combination,
40. Ovary 2–5-celled,
41. Perianth zygomorphic;
42. Capsule flattened; seed arillate; leaves simple;..*Polygalaceae*
42. Capsule elongate, triquetrous; seed exarillate; leaves compound .....*Moringaceae*
41. Perianth actinomorphic or nearly so,
43. Leaves with pellucid oil-glands.....*Rutaceae*
43. Not so,
44. Climbers with tendrils.....*Vitaceae*
44. Not so,
45. Herbs,
46. Stamens 6, didynamous.....*Cruciferae*
46. Stamens 8–10, equal.....*Zygophyllaceae*
40. Woody plants,
47. Leaves opposite,
48. Stamens opposite petals.....*Rhamnaceae*
48. Stamens alternate with petals.....*Celastraceae*

47. Leaves alternate,
49. Leaves simple,
49A. Resin ducts none,
50. Stamens opposite petals,
51. Ovules pendulous.....*Olacaceae*
51. Ovules ascending.....*Rhamnaceae*
50. Stamens alternate with petals,
52. Ovary surrounded by disc; placentas axile.....
.....*Celastraceae*
52. Ovary without disc; placentas apical....*Icacinaceae*
49A. Resin-ducts present.....*Anacardiaceae*
49. Leaves compound,
53. Ovary deeply lobed.....*Simarubaceae*
53. Ovary not lobed,
54. Stamens free,
55. Stamens on or under rim of intrastaminal disc;....
.....*Anacardiaceae*
55. Stamens within the disc; resin ducts present or absent,
56. Ovary usually 3-celled; petals often with basal appendage .....*Sapindaceae*
56. Ovary 2–5-celled; petals not appendaged.....
..... *Burseraceae*
54. Stamens united at least basally,
47. Leaves digitate; trees with green aculeate trunks; fruit podlike, opening to reveal silky 'kapok'.....
..... *Bombacaceae*
57. Leaves pinnate or trifoliolate,
58. Fruit usually trilocular,.....*Sapindaceae*
58. Fruit usually 4–5-locular,.....*Meliaceae*
40. Ovary 1-celled,
59. Perianth actinomorphic,
60. Stamens 6, didynamous.....*Cruciferae*
60. Stamens 10 or more, equal or at least not didynamous....
.....*Leguminosae* (Calyciflorae)
59. Perianth zygomorphic,
61. Calyx-lobes free; fruit triquetrous, 3-carpellate..*Moringaceae*
61. Calyx-lobes united; fruit a legume.....
.....*Leguminosae* (Calyciflorae)

Key to families of "Corolliflorae"
Group 2.

1. Corolla actinomorphic; see also *Ehretia* (Verbenaceae), *Bacopa*, *Russelia*, and *Scoparia* (Scrophulariaceae).

2. Sap milky,
   3. Stamens joined to styles; pollen grains united into pollinia..... ..... *Asclepiadaceae*
   3. Stamens free; pollen grains free (rarely in tetrads),
      4. Ovary of 2 carpels, these joined by the styles but free below (each a distinct follicle or drupe fruit)..... *Apocynaceae*
      4. Ovary of fully united carpels,
         5. Corolla-lobes 5 or none, often twisted in bud; mainly herbaceous or shrubby climbers..... *Convolvulaceae*
         5. Corolla-lobes imbricate (staminodes sometimes present); trees or erect shrubs..... *Sapotaceae*
2. Sap not milky,
   6. Inflorescence a helical (circinnate) cyme or compounded of such cymes; large shrubs or herbs..... *Boraginaceae*
   6. Inflorescences otherwise,
      7. Stipules present, interpetiolar; leaves opposite; stamens same in number as corolla-lobes..... *Loganiaceae*
      7. Stipules absent; leaves usually alternate; stamens same in number as corolla-lobes or twice as many.
         8. Ovules on axile placentae; sepals and petals not punctate,
            9. Trees; flowers unisexual..... *Ebenaceae*
            9. Herbs, shrubs, or climbers (ours), flowers bisexual,
               10. Ovary bilocular, ovules 1–2 per locule,
                  11. Stamens 2..... *Oleaceae*
                  11. Stamens 5..... *Convolvulaceae*
               10. Ovary bilocular but often with extra false placentae suggesting more locules; ovules numerous or several per locule; stamens 4–5..... *Solanaceae*
         8. Ovules on basal placentae,
            12. Ovules numerous..... *Primulaceae*
            12. Ovule solitary..... *Plumbaginaceae*

1. Corolla zygomorphic, usually bilabiate (rare exceptions)
   13. Fruit of 2 or 4 dry nutlets; mostly herbs or shrubs, often with pungent aromatic scents..... *Labiatae*
   13. Fruit otherwise, mostly capsular, sometimes drupaceous,
      14. Tiny herbs with linear or spathulate leaves, and submerged finely divided organs bearing bladders; inhabiting mud; stamens 2; endosperm none ..... *Lentibulariaceae*
      14. Not with above character combination,
         15. Ovules on axile placentae; leaves simple or digitate,
            16. Fruit a clavate capsule, the valves elastically dehiscent from apex downwards; inflorescence often conspicuously bracteate ..... *Acanthaceae*

16. Fruit dehiscing otherwise; inflorescences with or without conspicuous bracts,
    17. Ovules numerous; leaves simple,
        18. Endosperm little or none.....*Pedaliaceae*
        18. Endosperm present .....*Scrophulariaceae*
    17. Ovules 1–2; leaves simple or digitate.....*Verbenaceae*
15. Ovules on parietal placentae; leaves mostly compound (except *Catalpa*) .....*Bignoniaceae*

Key to families of "Calyciflorae"
Group 3.

1. Stamens dimorphic; leaves tripli-nerved (with 3–5 major nerves arising from the base).....*Melastomataceae*
1. Stamens uniform; leaves either pinnately or palmately nerved.
    2. Ovary-cells superposed in 2 series.....*Punicaceae*
    2. Not so,
        3. Stamens numerous, indefinite
            3A. Stipules none,
                4. Leaves opposite, gland-dotted.....*Myrtaceae*
                4. Leaves alternate or spiralled, not gland-dotted..*Lecythidaceae*
            3A. Stipules present .....*Rosaceae*
        3. Stamens definite in number, as many as or twice as many as the petals (or sepals).
            5. Shrubs or trees (or woody climbers),
                6. Petioles clasping the stem, with adnate stipules; leaves mostly compound, or if simple, usually articulated or the blade saucer-shaped; flowers mostly in umbels.....*Araliaceae*
                6. Not as above,
                    7. Perianth evidently uniseriate, it and lower leaf surfaces covered by tiny silvery-white scales.....*Elaeagnaceae*
                    7. Not so; perianth usu. in 2 series;
                        8. Stipules present; leaves entire, simple, opposite; trees of mangrove swamps.....*Rhizophoraceae*
                        8. Stipules none,
                            9. Fruit indehiscent, a drupe; petals conspicuous petals conspicuous or reduced to scales, or none,
                                10. Fruit a slightly winged firm drupe; ovary completely inferior; flower whitish, or red, ...*Combretaceae*
                                10. Fruit a round red drupe; ovary more or less completely superior; flower yellow .....*Thymeleaceae*

9. Fruit dehiscent, capsular; petals pink or white ..... *Lythraceae*

5. Herbs or subshrubs,

11. Erect herbs; petals yellow; ovary 4-locular; leaves simple, not reniform; seeds sometimes dimorphic..... *Onagraceae*

11. Erect or prostrate herbs; petals usually white; leaves compound or if simple then reniform and long-petioled; seeds uniform ..... *Umbelliferae*

Key to families of "Ovariflorae"
Group 4.

1. Vines with tendrils; flowers unisexual; stamens often united; fruit a pepo.... ..... *Cucurbitaceae*

1. Not as above,

2. Flowers grouped in heads subtended by an involucre of bracts; anthers united in a ring around the styles, but filaments free; style 2-branched; fruit an achene..... *Compositae*

2. Not as above,

3. Herbs with milky sap and elongated corolla-tube,.... *Lobeliaceae*

3. Herbs, shrubs, or trees, with clear sap,..... *Caprifoliaceae*

4. Leaves compound ..... *Caprifoliaceae*

4. Leaves simple,

5. Leaves opposite, stipules always present, interpetiolar.... ..... *Rubiaceae*

5. Leaves spiralled; stipules none..... *Goodeniaceae*

CLASS ANGIOSPERMAE

Div. Monocotyledoneae

ZANNICHELLIACEAE

Submerged aquatic herbs with creeping rhizomes; leaves linear, crowded at nodes, sheathing at base (flowering leaves sometimes reduced to sheath); flowers minute, sometimes unisexual, axillary, solitary or in cymes; perianth of 3 small scales, or lacking; stamens 1–3; anthers 1–2-locular, opening lengthwise; pistil of 1–9 free carpels; style simple, with terminal stigma, or 2–4-lobed; ovule solitary and pendulous; fruit indehiscent; endosperm lacking in seed.
One genus locally present.

Halodule Endlicher

Marine plants with creeping rhizomes and linear leaves; pollen thread-like; style simple; one anther attached higher than the other.

Halodule uninervis (Forskål) Ascherson in Boissier, Fl. orient. 5:24. 1882. Ascherson, Pflanzenfam. Nachträge 1: 37. 1897. (*Zostera uninervis* Forsk., Fl.

Aegypt.-Arab. 159. 1775.—Safford 1905: 290.) CHAGUAN-TASI

Diminutive plants, found rooted in sand or silt in shallow or fairly shallow lagoons, not in brackish water; leaves about 8–12 cm long, about 2 mm wide, *slightly 2- notched at apex.* Native, from Red Sea to Polynesia.

Agfayan Bay (4162); Pago Bay (5148). Sometimes occurring mixed with *Enhalus acoroides.* MacGregor 448.

The 2 anthers of the staminate flower are grown together along their backs. The fruit is ovoid. The 3 teeth of the leaf-tip may be abraded off on old leaves by wave action.

POTAMOGETONACEAE

Aquatics; leaves of 1 or 2 kinds, the submerged leaves thin, the floating ones coriaceous; flowers perfect; perianth parts 4; stamens 4; carpels 4, separate, superior; stigmas sessile; ovule 1 per carpel; fruit an achene.

One genus locally present.....*Potamogeton*

POTAMOGETON Linnaeus

Aquatic herbs with slender flaccid leafy stems; leaves submerged and floating; flowers in dense cylindric spathe—subtended spikes; perianth of 4 concave segments; stamens 4, lacking filaments; carpels 4, each 1-ovulate; fruit drupaceous.—A cosmopolitan genus of perhaps 80 or 90 species.

Two species in Guam.

Leaves rather broadly elliptic, often reddish, on rather short-petioles; submerged leaves mostly lanceolate—oblanceolate, thin, acute or cuspidate; inflorescences stiffly erect, thickish, the peduncles thicker than the stem.....*P. lucens*

Leaves rather narrowly elliptic or linear—lanceolate, green, often pale, on long, slender, flattened petioles; submerged leaves very narrow, elongate; tips acute; inflorescences few, lax, slender, peduncle slender, no thicker than the stem .....*P. mariannensis*

Potamogeton lucens L. Sp. Pl. 126. 1753. var.? PONDWEED.

P. zizii Koch ex Roth, Enum. Pl. Germ. 2:531. 1827; Safford 1905: 360.

P. gaudichaudii Cham. and Schlecht., Linnaea 2:199. 1827.

Floating herb, with both submerged and floating leaves, the latter often reddish. Stipules obtuse, bicarinate. Fruit obliquely—ovoid, the face dorsally tricarinate. Style short, blunt.

Agana Spring (4978). A widespread species. Agana River (MacGregor 424).

Potamogeton mariannensis Cham. and Schlecht., Linnaea 2:228. 1827.

MARIANAS—PONDWEED

P. natans var. *mariannensis* (C. & S.) Nolte, in K. Schum. and Lauterb., Fl. Deutsch. Schutzg. Sudsee, 162. 1901; Graebner, Engl. Pflanzenr. 31:45, 1907; Safford 1905:360.

?*P. fluitans* var. ined. provis. fide Graebner.

Similar to the preceding, but more slender, green, blades elongate, to 10–12 cm

long, much narrower, to 9 mm wide, petioles much longer to 3 cm peduncle slender, lax, 2–3 mm thick, spike 2–4 cm long.

Native, allegedly endemic. Probably a food-plant of the Marianas Mallard.

Manengon (pools below Tarzan Falls) 3874, 4531, 4972, 5138). G. E. S. 231 (Agana River).

RUPPIACEAE

Submerged aquatic herbs of saline or brackish waters; leaves opposite or alternate, linear, sheathing at base; flowers perfect, in spikes at first enclosed by the sheathing leaf base; bracts and perianth parts none; stamens 2, on short broad filaments; carpels 4 or more; ovule solitary, pendulous, apical; fruiting carpels indehiscent, long-stipitate.—Monotypic; 4 or 5 species, all aquatic.

One genus locally present:

RUPPIA Linnaeus

With the characters of the family.

Ruppia maritima L. Sp. Pl. 1:127. 1753.

Slender herb in brackish water, filiform; submerged. Leaves capillary, sheathing at base; flowers very small, axillary, 2 or several together, bisexual, devois of perianth, with 2 stamens (anthers 2-celled), 4 ovaries (rarely 3–6), somewhat stipitate; embryo ovoid.

Our plant is probably the var. *pacifica* St. John & Fosberg, in Bishop Mus. Occas. Pap. 15(16): 176. 1939, which is known from Polynesia (Hawaii, Tonga), Hainan, and the Philippines.

Not recollected; mentioned by Safford 1905: 365, his remark merely quoted by Merrill 1914: 50. Walker and Rodin 1949: 451, state that the record is unverified. It is probable that the plant does occur in Guam, but the record needs confirmation.

ALISMATACEAE

Lactiferous aquatic or marsh herbs; leaves often with distinct petioles; blades sometimes lacking on submerged leaves; leaves sometimes dimorphic; flowers unisexual, monoecious, or rarely perfect; sepals 3; stamens many; carpels many; fruit a winged achene.—About 12 genera.

One genus in Guam:

SAGITTARIA Linnaeus

Perennial stoloniferous herbs, with latex; early leaves lacking blades; later ones normal with blades; flowers unisexual, in whorls of 3, with membranous bracts; stamens often many; ovaries many; fruit a compressed winged achene.—About 30 species in both tropical and temperate regions.

One species in Guam.

SAGITTARIA SUBULATA (L.) Buch. Abd. Naturw. Ver. Bremen 2: 490. 1871.

Stone, Micronesica 1: 132. 1964. ARROWHEAD.

var. KURZIANA (Glück) Bogin, Mem. N.Y. Bot. Gard. 9: 205. 1955.—Fosberg, Phytologia 15: 496. 1968.

Aquatic herb of freshwater ponds, rooting in soft mud or bottom debris. Submerged leaves (phyllodes) linear, up to 30 cm long; floating leaves (usually present) lanceolate to ellipitic, to 5 cm long, 5-nerved; inflorescence 10–40 cm long, emergent; flowers racemosely arranged; each raceme of 2–14 whorls of 3 flowers, all male except the 2 lowest; pedicels bracteate, about 1–3 cm long; sepals 2–3 mm long; petals 3, white, to 1 cm long, very thin, broadly ovate; stamens about 7; fruit an achene, obovate.

A North American species (*Echinodorus subulatus* Engelm. of Gray's Manual of 1848), introduced to the Old World; known from Java. How it arrived in Guam is unknown. Agaña Spring (4979).

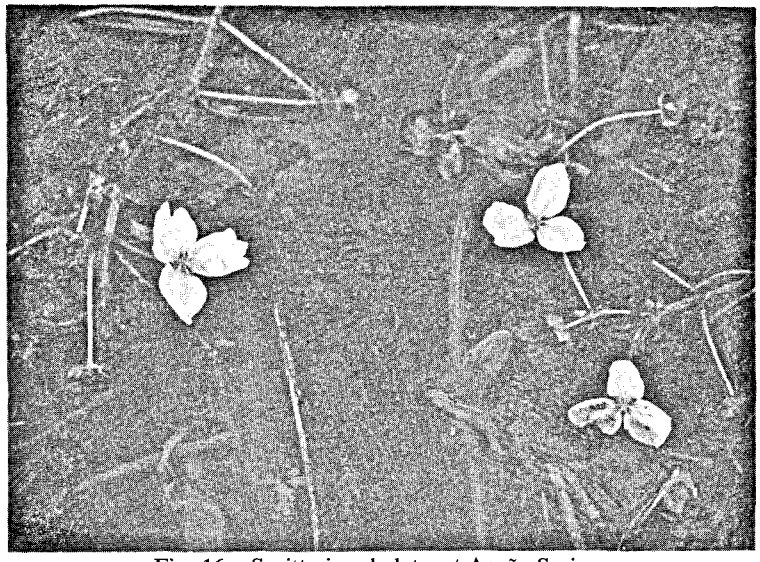


Fig. 16. Sagittaria subulata, at Agaña Springs.

HYDROCHARITACEAE

Submerged aquatic herbs; linear or spathulate leaves; flowers unisexual; sepals 3; petals 3 or none; stamens 3 to many; carpels 2–15; ovary inferior, 1-celled or imperfectly several-celled; stigmas 3–6; fruit somewhat fleshy or capsular.—15 genera and about 100 spp., always aquatic.

1. Leaves 10–15 cm, long, narrow, flattened, strap-shaped; styles 6–12 ; plants more or less erect.
   2. Spathes composed of 1 or 2 free bracts; styles 6–9 and bifid; pollination by floating pollen (the female flowers on a long coiled peduncle); leaves relatively broad (10–20 mm).....*Enhalus*
   2. Spathes composed of 2 bracts connate basally, forming a tube; styles

6–12 and bifid; pollination submarine; leaves relatively narrowed (less than 10 mm broad)..... *Thalassia*

1. Leaves short, usually less than 5 cm long, linear-oblong to ovate or obovate.
   3. Corolla absent; plants creeping, rooted in sandy silt in lagoons (saltwater); leaves in pairs (in ours); leaves elliptic-ovate, petiolate..... *Halophila*
   3. Corolla present; staminate spathe enclosing one flower; plants floating in fresh water; leaves short, linear, sessile;
      4. Style entire; stamens 3..... *Hydrilla*
      4. Style trifid; stamens 3..... *Egeria*

ENHALUS L. C. Richard

Marine herbs; dioecious; leaves linear; sheath transparent; male inflor. pedunculate, with 2-lobed spathe, many flowered; male flowers trimerous throughout. Female inflorescence long-pedunculate, spathe deeply 2-parted, flower solitary; sepals 3, petals 3, carpels 6, these 1-celled; styles 6; seeds obconic.

Monotypic.

Enhalus acoroides (L.f.) L.C. Rich. ex Chatin, Anat. Pl. Aquat. 15, t. 6. 1862.

Stratiotes acoroides L.f. Suppl. 268. 1781. SEAGRASS. CHAGUAN-TASI.

Submerged marine plant, rooting in silty sand, rhizomatous; rhizomes covered with stiffish, black fibers; leaves 2 or 3 from each stem-tip; leaves strapshaped, parallel-veined, parallel-sided, erect, the tips rounded-blunt, the margins slightly thickened; 30–40 cm long (or more), about 1.2 cm wide. Flowers unisexual; on different plants. Male flowers in short pedunculate inflorescence, many within a spathe, very small, white; female infl. long-pedunculate, subtended by two bristly spathes, petals narrow, 2 cm long; fruit bristly, 2.5 cm broad.

Frequent in shallow lagoons, chiefly where estuarine waters occur, Asiatic and Pacific.

Pago Bay (obs.); Mana Bay (4064); Jones Beach (4316); Togcha Bay (4464). Rarely found in flower or fruit; seeing flowering plants is most interesting, as the male flowers detach and float on the lagoon water, moving like tiny boats until they contact the female flowers which are then floating at the surface but still attached to their long peduncles. After pollination takes place, the peduncle contracts spirally, pulling the fecundated ovary down underwater to the base of the plant, where it then matures into the curious, beaked, bristly fruit, with its 6 or 8 seeds.

HALOPHILA Thouars

Monoecious or dioecious marine herbs, with creeping stems. Nodes bearing 2 scales, the upper one supporting an erect or lateral shoot. Leaves opposite, with 3 main nerves, sometimes paired, sometimes several together. Inflorescence bracteate; male flower pedicellate, tepals 3, stamens 3. Female flower subsessile, 1-ovary, 1-celled, rostrate, with 3 (rarely 2–5) styles. Fruit with a few subglobose seeds.—A genus of about 10 species, in tropical or subtropical waters.

One species in Guam.

(Section Halophila)

Halophila minor (Zollinger) den Hartog, Flora Malesiana ser. 1, 5(4): 410. 1957.

H. ovata Gaud. (nom. illegit.) Bot. Voy. Freyc. 430. 1829.

H. ovalis auctt. non (R. Br.) Hk. f.

Lemnopsis minor Zoll. Syst. Verz. 1:75. 1854.

H. lemnopsis Miquel, Fl. Ind. Bat. 3:230. 1856.

Small submerged creeping herb of shallow lagoons free (or nearly so) of freshwater run-off, prostrate and more or less buried in loose sand or silty sand, in depths of a few inches to several meters. Leaves opposed in pairs, up to 2.5 cm long, subovate to subobovate, the apex rounded, base ± acute, pinnately nerved, the blades about 7–14 mm long, berves about 4–8 (–11) on each side of the midrib, joining a marginal nerve; petiole about as long as blade. Flowers very small, greenish, unisexual, on different plants; male flowers with 3 sepals, no petals, 3 stamens, pedicellate; pistillate flowers sessile flask-shaped ovary with 3 long stigmas, sepals minute or obsolete. Fruit of about 20 seeds, 2–4 mm long, seeds 1/2 mm long.

Native. The type of Gaudichaud's species was from Guam; the type of *Lemnopsis minor* was from Indonesia.

Seasonal; usually appearing in early April, disappearing in a couple of months. Fruiting seen fairly often in Guam. Mana Bay (4063); Asanite Bay (4897, 5049). Hoover Beach (V. M. Cone).

Den Hartog has indicated the occurrence in Guam of the very similar species *H. ovalis*, but the numerous colonies of this genus that I have seen in Guam are all clearly *H. minor*.

The pollen grains adhere in long chains.

EGERIA Planchon

Submerged, rooted or drifting aquatics of fresh water. Stems cylindric, simple or branched; lower leaves opposite or in whorls of 3, upper leaves in whorls of 4–8, linear to ovate serrulate; flowerssdioecious; staminate flowers 2–4 together within spathe; petals 3, white; stamens 9; pistillate flowers on slender hypanthium-base; sepals 3; petals 3, stigma trifid; ovary 1-celled; ovules several on 3 linear placentae; fruit a transparent capsule.—2 spp. of South America.

EGERIA DENSA Planchon, Ann. Sci. Nat. Bot. 3, 11: 80. 1849.

Fosberg, Phytologia 15(7): 496. 1968.

Recognizable from the generic description. This species no doubt was introduced to Guam as aquarium material, and was "freed" in the Talofofo River (4305). It resembles *Elodea* and *Hydrilla*.

HYDRILLA L. C. Richard

Dioecious aquatic herbs, stems elongate, leaves generally in verticils, short oblong; staminate flowers solitary, axillary, on short peduncles; spathe subglobose; detaching and floating; perianth 6-segmented, stamens 3; ♀ fls. in cylindrical spathe,

sessile, ovary inferior, 1-locular, beaked, stigmas 3; fruit linear; seeds 1–3, fusiform.—One species of old World fresh waters.

One species in Guam.

Hydrilla verticillata (L.f.) Royle, Ill. Bot. Himal. t. 376. 1839.

Serpicula verticillata L.f. Suppl., 416. 1781.

Loosely branched; submerged or floating just below water surface; leaves in verticils of 4–8, narrowly lanceolate, 1-nerved, to 2 cm×2 mm, edges serrulate, tip spinous; seeds 5–6 mm long.

In ponds, streams and lakes, common in Fena Reservoir.

Fena (4468); Talofofo River (4305).

The pollination mechanism is highly interesting; very briefly, the male bud detaches and floats; the pollen grains then are ejected in a circular area around the floating flower; the grains are then free to move to the stigma, but only those which airborne—since the styles are kept dry by the sepals of the female flower, which have a water—repellent surface. The female flowers just reach the water surface, and the styles are actually below water level, but dry. Apparently the floating pollen grains cannot reach the stigmas.—For a fuller account, see Den Hartog, Flora Malesiana, ser. 1., 5(4): 386. 1957.

THALASSIA Banks.

Marine herbs; dioecious; rhizome creeping, glabrous; leaves few (2–6), distichous, within a transparent sheath, linear, often slightly curved, apex rounded and very minutely serrulate; inflorescence pedunculate, males 1–3-flowered, females 1-flowered. Male flowers shortly pedicellate; perianth of 3 tepals; stamens 3–12; female flower with a single 1-celled ovary (rarely 2–3-celled); styles 6–12; fruit subglobose.—Two species, 1 in the Caribbean, 1 in the Pacific and Indian Oceans.

One species allegedly in Guam.

Thalassia hemprichii (Ehrenberg) Ascherson, in Petermann's Mitt. 17: 242. 1871; Bot. Zeit. 33: 765. 1875. TURTLE-GRASS.

Schizotheca hemprichii Ehrenb. Abh. Berl. Akad. Wiss. (1832), 1: 429. 1834.

Submerged herb of salt water lagoons, rooting in coral sand with little or no intermixed mud; rhizomes scaly when young, glabrous; leaves 10–40 cm long, 4–11 mm wide. Spathes 2-parted, the segments lanceolate acute, unequal, 2–2.5 cm long, 5 mm wide. Male flowers pedicellate, ♀ flowers subsessile. Stamens 3–12. Ovary conical, 1 cm high rostrate, the beak 2–3 cm long, with 6 styles, each bifid. Fruit globose, rugose, opening by about 18 valves, 2–3 cm thick; seeds 3–9, each 8 mm long, thickened at base.

Indian Ocean and Pacific Ocean, in calm, clear water lagoons, up to low tide mark, down to 4–5 m depth.

I have not personally seen this species in Guam, but its occurrence is likely to be on the coral sand bays of either coast.

The pollen grains adhere, forming long chains.

COMMELINACEAE

Herbs with alternate, parallel-veined leaves; flowers perfect; sepals 3, often foliaceous; petals 3; stamens 3 or 6, filaments with long hairs at base; ovary superior with a simple style; stigma 1; fruit a few-seeded capsule.—26 genera, 375 species, chiefly tropical.

1. Inflorescence mainly or entirely terminal.
   2. Infloresecence without boat-shaped bracts or bract-like leaves; fruit capsular; flowers zygomorphic.....*Aneilema*
   2. Inflorescence subtended by 1 or 2 (or more) boat-shaped or foliaceous bracts or bract-like leaves.
      3. Functional stamens 6; corolla more or less tubular.
         4. Sepals united near the base.....*Cyanotis*
         4. Sepals free.....*Zebrina*
      3. Functional stamens 3; petals free.....*Commelina*
1. Inflorescence mainly or entirely lateral (axillary).
   5. Stamens 6, all fertile.
      6. Sepals basally connate.....*Cyanotis*
      6. Sepals free.....*Rhoeo*
   5. Stamens 6 but only 3 of them fertile (with normal anthers)—*Commelina*

ANEILEMA R. Brown

Herbs, usually creeping, with the stems rooting at the nodes, or sometimes ascending, tufted; inflorescences terminal or axillary, branched; flowers white, pink, or blue, trimerous; stamens 6, 3 normal, 3 non-functional or 2 normal, 2 non-functional; filaments hairy; fruit a capsule.

Two species reported from Guam.

Leaves sessile, clasping, rarely much over 1 cm wide; flowers pinkish-purple to violet.....*A. malabaricum*

Leaves short-petiolate, up to 2.5 cm wide; flowers pale blue.....*A. vitiense* var. *petiolata*

ANEILEMA MALABARICUM (L.) Merrill, Philipp. J. Sci. Bot. 7: 232. 1912.

Tradescantia malabarica L. Sp. Pl. ed. 2, 412. 1763.

Aneilema nudiflorum R. Br. Prodr. 271, 1810.

Creeping fine-stemmed herb, with narrow grasslike leaves up to 8 cm long and 1.2 cm wide, sessile, clasping the stem; inflorescences arising from upper leaf axils, few-flowered, about as long as the leaves; fls. c. 6–7 mm wide; petals violet; stamens 2, normal; capsule about 3–4 mm long. (pinkish-purple).

India to Ryukyu Islands and Malaysia. In waste land in Guam, G.E.S. 167, 217. Probably introduced from the Philippines.

Aneilema vitiense Seemann, Fl. Vitiensis 312, t. 96, 1865.

var. **petiolata** C. B. Clarke, in DC. Mon. Phan. 3: 220. 1881. Bryan, 19 March 1958.

Herb with stems to 60 cm tall from creeping stems; leaves lanceolate, up to

8–10 cm long and 2.5 cm wide, shortly petiolate; inflorescences zig-zag, short branches alternating from each side, each with a basal cupshaped bract; petals pale blue; capsule flask-shaped.

Philippines, Indonesia, and Pacific Islands. In Guam, at damp shady spots at bases of limestone cliffs. Back of Sinajana (Nelson 413).

COMMELINA Linnaeus

Slender creeping or erect herbs, with small grasslike leaves; inflorescence short, arising from a green boat—or funnel-shaped spathe; flowers blue or white; sepals 3, dissimilar; petals 3, one smaller than the others; stamens 6, usually 3 non-functional; fruit a capsule, enclosed by the spathe.—About 100 species of wide distribution in warm temperate and tropical regions.

Two species reported from Guam.

Leaves ovate, not over 5 cm long, broad, usually 2.5–4 cm wide; pubescent; spathe of inflorescence funnel-shaped.....*C. benghalensis*

Leaves narrower, suboblong, to 7–8cm long but only 1–2 cm wide; glabrous; spathe of inflorescence boat-shaped.....*C. diffusa*

Commelina benghalensis L. Sp. Pl. 41. 1753. Walker and Rodin 1949:457.

Bryan, 2 Oct. 1937, and 12 March 1958. Merrill 1914: 66.

Safford 1905: 246.

Creeping herb with ascending stems; leaves broadly ovate, up to 5 cm long and 4 cm wide, pubescent, narrowed at base but not distinctly petiolate; spathe funnel-shaped, about 1–1.4 cm wide, green, flattened; flowers bright blue.

Common in Old World Tropics. One mile South of Barrigada, Moore 36.

Commelina diffusa Burm. f. Fl. Ind. 18: t. 7, f. 2. 1768.

SEMPREBIBAN-DAMALONG; DAYFLOWER

C. nudiflora L.; Merrill 1914: 66; Safford 1905: 247.

Creeping herb producing short erect braches; leaves suboblong, up to 8 cm long and 2 cm wide, glabrous; spathe boat-shaped, to nearly 4 cm long; flowers bright blue, or rarely white

Pantropical. In Guam, occasional in abandoned clearings and waste ground. G.E.S. 115.

CYANOTIS D. Don

Herbs with creeping or erect stems and grasslike leaves; inflorescence axillary or from a series of close overlapping crescent-shaped bracts at shoot tips; sepals united at base; petals joined to form a tube; all 6 stamens with functional anthers.

Two species reported from Guam.

Flowers borne from a series of close overlapping bracts; leaves mostly ovate .....*C. cristata*

Flowers in axillary clusters borne from small bracts that do not overlap; leaves lanceolate.....*C. axillaris*

CYANOTIS CRISTATA (L.) D. Don, Prodr. Fl. Nepal 46. 1825.

Zygomenes cristata (L.) Wight ex Safford, 1905: 404.

Stems tufted, lower part creeping, to about 50 cm tall; leaves rather broadly ovate, acute, sessile and somewhat clasping the stem at base, up to about 6 cm long and 2 cm wide, the sheaths and blades marginally pubescent; inflorescence short, borne from a series of crescent-shaped closely overlapping bracts with ciliate margins; flowers blue; stamens 6, all functional, the filaments pubescent; ovary 3-celled, cells usually 2-seeded.

Widespread in Asia and the Pacific. Introduced (?) in Guam, fide Safford.

CYANOTIS AXILLARIS (L.) D. Don, l.c. Merrill 1914: 66. Bryan, 12 March 1958.

Similar to the preceding species but with longer, narrower lanceolate leaves up to 10 cm long and 2.5 cm wide; flowers axillary, grouped, subtended by small, separate bracts; flowers purplish; petals with a stalklike base; stamens 6.

India to tropical Australia, Philippines, and the Pacific. Probably introduced to Guam from the Philippines. MacGregor 554.

RHOEO Hance

A monotypic genus with the characters of the species.

One species in Guam.

RHOEO SPATHACEA (Sw.) Stearn, Baileya 5: 198. 1957.

R. discolor (L'Heritier) Hance, in Walpers, Ann. Bot. Syst. 3: 660. 1852.

Rosette-forming succulent herb, stems short, leaves crowded, elongate, broadly linear-lanceolate, up to 30–40 cm long and 4–6 cm wide, the upper surface green, the lower surface rich reddish-purple; inflorescence axillary, short; bracts subsessile, boat-shaped; flowers white; petals 3; stamens 6; ovary 3-celled, cells 1-ovulate; fruit capsular 3-valved; seeds rugose.

Tropical America; now widely introduced as an ornamental plant. It grows easily, preferring welldrained localities, especially rocks. It may also be grown on walls; the Guam Museum is a good example. Sometimes it is epiphytic. Common in cultivation; but also naturalized, especially on Alupat Island in Agana Bay. Agana (5610).

Of interest to students because of its remarkable chromosome structure; the chromosomes are joined end to end to form a ring.

ZEBRINA Schnizl.

Creeping herbs with succulent leaves and stems; nodes emitting roots; inflorescences terminal subtended by 2 or 3 foliaceous bracts; sepals 3, united, tubular, thin; petals 3, tubular; stamens 6, all functional; ovary 3-celled.

One species in Guam.

ZEBRINA PENDULA Schnizl., Bot. Zeit. 7: 870. 1849. WANDERING-JEW

Trailing ornamental herb; leaves reddish-purple beneath, silvery-green above with narrow purple edges and a central purple stripe, bractlike leaves near stem tips enclose pink flowers. Leaves to 6 cm long; corolla less than 1 cm long.

Mexico and Central America; now very common in cultivation most countries. In Guam only in gardens; commonest as a pot plant.

FLAGELLARIACEAE

Canelike or vinelike plants; leaves (in *Flagellaria*) ending in coiling tendrils; leaf-sheaths embracing the stems, closed; flowers in terminal panicles; perianth hypogynous; segments 6, free, in 2 imbricate series; stamens 6, filaments free; ovary superior, 3-celled, with a 3-lobed style; ovules solitary in each cell; fruit indehiscent, drupaceous.—Three genera of the Paleotropics.
One genus present locally.

FLAGELLARIA L.

Woody vines, the stems climbing by tendril-ended leaves; flowers bisexual; fruit a globose drupe.

Flagellaria indica L. Sp. Pl. 333. 1753.

BEJUCO HALUM-TANO; FLAGELLARIA, FALSE RATTAN.

Recognizable from the family and generic descriptions.

A fairly common plant in Guam, often creeping among shrubs in wetter gullies in the savannahs; also in limestone regions. Barrigada (3808); Barrigada Hill (4037, 5153); Talofofo Valley (3990); Agat (4211); Manengon (4744, 4842).

BROMELIACEAE

Herbs with often stiff leaves, usually epiphytic or growing on rocks, some terrestrial; leaves usually in dense rosettes or clusters, elongated, rigid and dentate; flowers in a terminal head, spike, or panicle, regular, usually bisexual, hypogynous to epigynous, perianth segments in 2 series, the outermost calycine; stamens 6; ovary 3-celled; style slender, elongated, with 3 stigmas; ovules numerous in each cell, on axile placentas; fruit capsular or fleshy and indehiscent.—50 genera, 1500 species, all of S., C. and Warm-temp. America (except 1 African species).
One genus locally present.

ANANAS Linnaeus

Ovary wholly inferior; fruit a large berry (the pineapple); seeds without wings or appendages; fruit compound, of fused ovaries, capped by leaves; petals with funnelform scales.

ANANAS COMOSUS (L.) Merrill, Interpret. Herb. Amboin. 133. 1917.

Bromelia Ananas L. Sp. Pl. 285. 1753.

PIÑA; PINEAPPLE.

Rosette herbs with stiff sword-shaped gray-green leaves, their margins coarsely spiny-serrate. Scape thick, short; the bracts serrate; inflorescence a compact many-flowered head; floral bracts short deltoid, subentire; syncarp 15–30 cm long, fleshy yellow when ripe; usually seedless.

Cultivated in Guam; fruits moderate to good in flavor. A native of Brazil. Smaller, scarcely edible forms may occasionally escape from cultivation.

MUSACEAE

Giant herbs, the stems formed by the imbricating petiolar bases; leaves spirally arranged, large with a thick midrib and numerous pinnate parallel nerves extending to the margin; flowers mostly unisexual, subtended by bracts, male flowers within distal bracts, female ones within the proximal bracts; inflorescence erect or recurved and pendent; perianth more or less 2-lipped; stamens 5, sometimes with a rudimentary sixth present; ovary inferior, 3-locular, each cell with numerous ovules on an axile placenta (the seeds aborted in most cultivated bananas); fruit fleshy, indehiscent (usually).

A single genus in Guam:

MUSA L.

With the characters of the family. About 30 species are recognized, native only to the Old World Tropics. The bananas and plantains, and "Manila hemp", are the most important products. The bracts are purple.

Key to species and cultivars

Fruit edible when ripe, soft, indehiscent, generally seedless; inflor. pendent.

Short, thick trunk, seldom much over 2 m tall; fruit about 10 cm long, yellow, sweet, edible raw..... *M. nana*

Taller trunk, sometimes to 5 m; fruit larger.

Fruit starchy when ripe, not sweet, edible after cooking.. *M.* × *paradisiaca*

Fruit sweet when ripe, edible raw..... *M.* × *sapientum*

Fruit not edible (even if cooked), dry, seeded; inflorescence subhorizontal..... ..... *M. textilis*

MUSA NANA Loureiro, Fl. Cochinch. 644. 1790.

CHINESE or DWARF CAVENDISH BANANA.

Short stocky trunks rarely much over 2 m tall; stout pendent inflorescence the fruits pointing or curved upward; fruits rarely over 10 cm long, usually less, yellow, the skin rather thin.

Frequent in cultivation in Guam. This is an *M. acuminata* type cultivar.

MUSA × PARADISIACA and MUSA × SAPIENTUM. CHOTDA. BANANA. PLANTAIN

L. Syst. ed. 10, 1939. 1759.

Taller plants, occasionally over 5 m., with pendent inflorescences; fruit usually well over 10 cm long; yellow or green; sweet (× sapientum) or starchy (× paradisiaca) when ripe; seedless.

These forms, and many others, are hybrids of *Musa acuminata* Colla and *M. balbisiana* Colla, and are triploids (3n) cytologically.

The plantains are those which are starchy, not sweet, when ripe, and must be cooked. A ripe fruit is 'Aga' in Chamorro.

Cult. in Guam.

MUSA TEXTILIS Née, Anal. Cienc. Nat. 4: 123. 1801. MANILA HEMP

Trunk to 4 m high; inflorescence nearly horizontal; fruit dry, seeded, inedible.

Introduced to Guam from the Philippines, but rarely and only seen in cultivation.

The author of this species visited Guam in 1792.

STRELITZIACEAE

Herbs or trees with distichously arranged (2-ranked) medium to very large leaves; flowers bisexual, in the axil of a spathe. Sepals 3; petals 3, variously connate, sometimes very unequal. Perfect stamens 5 or rarely 6, the 6th often imperfect and petaloid; anthers linear. Ovary inferior, 3-celled, the cells with 1 to many ovules. Fruit capsular, 3-valved or indehiscent.—4 genera.

Key to all Genera

1. Perianth-segments free; ovary with numerous ovules.
   2. Flowers slightly zygomorphic.
      3. Stamens 6; seeds arillate; tree.....*Ravenala*
      3. Stamens 5.....*Phenakospermum* (Brazil).
   2. Flowers very zygomorphic; seeds arillate.....*Strelitzia*
1. Perianth-segments partly united; ovary with 1 basal ovule in each cell; fruit a schizocarp, splitting into three 1-seeded parts; seeds not arillate..*Heliconia*

Of these genera, two are at present in Guam, each represented by a single species, still rare and only in gardens. Of the other two genera, one (*Phenakospermum*) is unlikely to be introduced, while the other (*Ravenala*) consists of the ornamental "travellers'-tree" of Madagascar, and would make a pleasing addition to gardens in Guam.

HELICONIA Linnaeus

HELICONIA HUMILIS (Aublet) Jacquin, Hort. Schoenbr. 1: 23. 1797.

Erect herb less than 2 m tall; leaves few (3–6), petiolate; flowering stalk erect; spathes subdistant, orange; flowers yellow to orange with green tip.

Occasionally cultivated in Guam. [Often miscalled H. psittacorum]

STRELITZIA Aiton

STRELITZIA REGINAE Banks, in Aiton, Hort. Kew. 1: 285. 1789.
BIRD-OF-PARADISE

Erect herb with a few basal leaves, long petioles, blades narrowly ovate-oblong, up to 30 cm long or more, to 15 cm wide, coriaceous; flowering stalk as long as the leaves; basal bract held horizontal, green with reddish margins, enclosing about 6 flowers, up to 15 cm long; flowers with orange sepals, blue lip.

Very rarely cultivated in Guam.

ZINGIBERACEAE

Herbs with pinnately parallel-veined leaves; flowers perfect; calyx of 3 parts, connate; corolla of 3 parts, connate; perfect stamen 1; staminodium 1, with rarely traces of others; ovary inferior, 3-celled or rarely 1-celled; stigma 1; ovules many; fruit a capsule or berry.—47 genera & 1400 species, chiefly tropical.

Key to (Commonly Cultivated) Genera

1. Leaves spirally arranged; nectar gland lacking; plants not aromatic, ovary 3-celled; bractlets folded..... *Costus*
1. Leaves 2-ranked; nectar glands present; plants aromatic (of ginger),
   2. Lateral staminodia large and petaloid,
      3. Anthers spurred at base..... *Curcuma*
      3. Anthers not spurred at base,
         Filaments long; connective small, unmodified; inflorescence terminal on a leafy stem..... *Hedychium*
   2. Lateral staminodia small or lacking,
      4. Lip often 3-lobed; connective prolonged, narrow, trough-like, surrounding the style..... *Zingiber*
      4. Lip not 3-lobed, or connective not as above, horizontal or deflexed, dilated and much longer than the perianth segments..... *Alpinia*

Costus Linnaeus

Long-stemmed, branching plants with spirally arranged, well-spaced leaves; sheaths tubular, not split; inflorescence either terminal on stems or on short shoots near the ground; head of close-set bracteate flowers; outer bracts stiff, sometimes spiny, each enclosing a smaller bract within which is 1 flower; calyx tubular, 3-toothed; corolla with a noticeable lip, this often specialized in shape, often brightly colored, sometimes flaring; filament petaloid; fruit a capsule, 3-angled, opening by lateral slits.—A genus of some 140 species, pantropical.

One species in cultivation in Guam.

Costus speciosus (Koenig) Smith, Trans. Linn. Soc. Bot. 1: 249. 1791.

Tall plant with erect or spreading stems; leaves elliptic, or obovate, up to 20 cm long or more, about 4–6 cm wide, pubescent beneath; shortly petiolate; inflorescence subterminal, large, to 10 cm long, with bracts about 1.5 cm long; flowers white, the calyx red, corolla white, 5–6 cm long; stamen crest yellow; capsule red; seeds black with a white fleshy aril.

Malaysia; now fairly common in cultivation. Agaña (4384); Mangilao, College grounds (obs.).

Curcuma Linnaeus

Rhizome fleshy; roots with tubers; basal leaves bladeless; leaf-sheaths forming pseudostem; leafy shoots to 2 m tall; leaf-blades ascending; petioles short or lacking, or on inner leaves longer and channelled. Inflorescence terminal, on the leafy

shoot or on a separate scape; bracts large, pocket-like, forming a cylindric spike; flowers in 2–7-flowered cincinni. Calyx short, unequally toothed, split about halfway down one side. Corolla + staminal tube tubular at base, above cupular; corolla-lobes thin; dorsal one hooded and pointed. Staminodes elliptic-oblong. Lip obovate, with side-lobes. Stamen with short broad filament; anther versatile, with a spur at base of theca; ovary 3-celled; fruit thin-walled, dehiscing; seeds ellipsoid, slightly arillate.—Indomalaysia.

One species in Guam.

CURCUMA DOMESTICA Valeton, Bull. Jard. Bot. Buitenz. II, 27: 31. 1918.

C. longa of Safford 1905: 252. MANGO HALUMTANO; TURMERIC

Erect herb; rootstock fleshy, branched, orange-colored; leafy stems 60–90 cm tall; petiole elongate, as long or longer than the blade; blades elliptic-lanceolate, up to 36 cm long and 8–10 cm wide; inflorescence emerging from sheath near stem apex, a cylindric spike to 12–14 cm long, of close-set overlapping bracts; bracts green or the upper ones white or pinkish-purple, each slightly connate basally with adjoining bracts; flowers several from behind each bract, about 5 cm long, petals thin, creamy white or pale yellow, the lip with a darker central stripe; filaments petaloid; anther cells each with a spurred base.

India; widely distributed in cultivation; in Guam sparingly naturalized. Mangilao (4164); Umatac (4395). "Wild," acc. to Safford.

Source of a yellow dye (from the roots) and a condiment, turmeric.

ALPINIA Linnaeus

Tall herbs (sometimes 7 m!), inflorescence erect or pendent; of numerous several-flowered cincinni; outer bracts usually small; secondary bracts cupular or funnel-like; calyx cupular or funnel-like; corolla tube equalling the calyx, white or orange; dorsal lobe of corolla with a spur; lateral lobes unspurred; lip white or with orange and/or purple marks, sometimes obscurely 3-lobed; staminodes rather broad; anther crested or not; fruit globose, often pubescent, greenish to orange.—"The essential character is the funnel-like secondary bracts, each of them in turn entirely enclosing that part of the cincinnus which is beyond it, and later persisting more or less intact to the fruiting stage, never deciduous at the base" (Holttum 1950).

A large and complex genus of 225 species, India to the Pacific.

Two species only in cultivation in Guam.

Bracts red, obvious, largely concealing the small white flowers..*A. purpurata*

Bracts greenish or white, inconspicuous, the flowers large, obvious, white, with yellow and red markings on the lip.....*A. speciosa*

ALPINIA PURPURATA (Vieillard) K. Schum., Pfzr. Zing. 323. 1904. RED-GINGER.

Languas purpurata (Vieill.) Kanehira, Enum. Micron. Pl. 293. 1935. (J. Agr. Kyushu U. 4).

Erect herb with leafy stems; leaves lance-oblong; inflorescence up to 30 cm long, bracts rather dark red; flower small, white, about 2.5 cm long, slender.

Apparently native in the Pacific, though probably introduced in Guam. Com-

monly cultivated for the attractive red bracteate inflorescence- not for the small, ephemeral flowers. There are often young plants found well-developed still in the bracts.

ALPINIA SPECIOSA (Wendl.) K. Schum., Bot. Jahrb. 15: 418. 1893.

A. nutans (Andr.) Roscoe, in Sm. Exot. Bot. 2: 93. 1804. SHELL-GINGER

Erect herb to 2.5 m tall with lance-oblong leaves 50–70 cm long, 7–15 cm wide; inflorescence somewhat lax; or pendent; flowers white, waxy, the bract and corolla red-tipped; lip of corolla curved, up to 5 cm long, yellow with reddish lines; staminodes very small; stamen short. Fruit globose, red, 1.8 mm diameter.

Rare in cultivation in Guam. Introduced, probably from Hawaii; originally from S. E. Asia, Okinawa, Taiwan, and Japan.

HEDYCHIUM Koenig

Erect leafy herbs (sometimes epiphytic); leaves short-petiolate, with broad blades; inflorescences subterminal; flowers bracteate, rather large; calyx narrowly tubular, with short unequal teeth; corolla narrowly tubular; limb of narrow segments; staminodia perpetaloid; lip broad, notched, narrowed at base; stamen with a long, narrow filament; capsule dehiscent.

One species cultivated in Guam.

HEDYCHIUM CORONARIUM Koenig, Retz. Observ. Bot. 3: 73. 1783.

Erect herb with stems to 1 m tall; leaves distichous, narrowly oblong or lanceolate, acuminate, about 50–60 cm long, 10 cm wide, petiole short; flowers white, yellowish in age, sweetly fragrant, to 6–8 cm long, the tube very slender, inflorescences dense spikelike, terminal, bracteate; bracts oblong—obovate or oblong, imbricate. The lip has a greenish cordate spot.

Rarely cultivated in Guam. Mangilao (4387). This is an attractive plant that deserves more extensive planting.

ZINGIBER Adanson

Erect terrestrial herbs from a stout rootstock; leaves shortly or not petiolate; inflorescence on a short shoot rising direct from the rootstock, clothed by leaf-sheaths with reduced or obsolete blades; flowering head ellipsoid or conical, or cylindric, of large tightly overlapping bracts, colored, with the margins often infolded; within each bract 1 flower borne from a small hidden basal bracts; calyx thin; corolla tubular, usually white, lip 3-lobed, the center lobe notched and sometimes colored pinkish or purplish; filament broad; anther crested; capsule ripening within the bract; bracts enclosing a spicy, mucilaginous fluid.—Over 50 Indomalaysian and Asiatic species.

Two species in Guam.

Spikes up to 15–16 cm long; leaves 5 cm wide.....*Z. zerumbet*

Spikes to 5–6 cm long; leaves 2.5 cm wide.....*Z. officinale*

ZINGIBER ZERUMBET (L.) Smith, Exot. Bot. 2: 103, t. 112. 1804.

A glabrous erect herb; rootstock tuberous; leafy stems to 2 m tall, usually

shorter; leaves distichous, oblong-lanceolate, mostly 15–30 cm long, subsessile; scape from the rootstock, to 30 cm long, bracteate; inflorescence ovoid to cylindric, reddish or green, 5–20 cm long; bracts many, round, 2–3 cm long; flower about 5 cm long, white to cream, lip 3-lobed.

Old World Tropics, widely cultivated. Introd. in Guam.

ZINGIBER OFFICINALE Roscoe, Trans. Linn. Soc. London 8: 348. 1807.

Merrill 1914: 69. GINGER. ASNGOD. [HASNGOT]

Zingiber zingiber Karsten, Fl. Deutsch. 1: 488, 1905; Safford 1905: 403.

Erect glabrous herb to 90 cm high; rootstock tuberous, edible; leaves lanceolate, to 30 cm long, about 2–3 cm wide, with long sheathing base; flowering stems about as long as the leaves; spike oblong, to 6–7 cm long and 2.5 cm wide; bracts 2.5 cm long; corolla greenish-yellow, about 1.5 cm long.

India and China; now widespread in cultivation.

CANNACEAE

Tall herbs with pinnately parallel-veined leaves; flowers perfect; sepals 3; petals 3; staminodia 1–4, petaloid; perfect stamen 1; ovary 3-celled, inferior, tuberculate; style 1, flat; ovules many in each cell; fruit capsular. Monotypic.

CANNA Linnaeus

With the characters of the family; the only genus of the family.

1. Flowers red, or yellow, or variegated, about 5–7 cm long.
   2. Three to five feet tall; leaves 15–40 cm long; flowers in a simple lax erect raceme; sepals about 6 mm long, green..... *C. indica*
   2. Four to ten feet tall; leaves 30–60 cm long, green or bronzy; flowers in simple or forked loose terminal racemes; sepals 1.2 cm long, dry, overlapping..... *C. edulis*
1. Flowers lemon-yellow, blotched with orange, up to 15 cm long..... ..... *C. flaccida* × *iridifolia*

CANNA INDICA L. Sp. Pl. 1. 1753.

MONGOS HALUM-TANO, CANNA, INDIAN SHOT.

Herbaceous, not usually over 5 ft. high; leaves rather fleshy, with thin margins, usually not more than 1 ft. long and half as broad, lanceolate to sub-orbicular, veins arching-parallel. Flowers red, yellow or variegated, showy, the staminodia highly colored, the petals narrow and relatively inconspicuous. Fruit warty, black, capsular, nearly globose, enclosing a variable number of round, shiny black seeds. An ornamental plant, cultivated in gardens; early introduced from tropical America, where it is native.

CANNA EDULIS Ker-Gawl. Bot. Reg. 9, t. 775. 1823.

QUEENSLAND EDIBLE CANNA.

Coarse herb; leaves often bronzy; flowers larger than in *C. indica*, the style noticeably longer. Introduced by the Guam Agricultural Experiment Station as a possible crop, the starchy tubers being edible, and perhaps persisting.

CANNA FLACCIDA Salisb. × IRIDIFOLIA Ruiz & Pavon (hybrids) SPANISH FLAGS

Coarse herbs; up to 6 ft. high, with leaves 2 ft. long; flowers up to 6 inches long, yellow blotched with orange and red; fruit not set (hybrid sterility). The parent species are of American origin, but the original cross is thought to have been made in Europe. The plant was introduced to Guam from the Philippines, where it was early introduced. Cultivated.

MARANTACEAE

Perennial herbs, leaves in 2 rows, differentiated into basal sheath, stalk, and blade; stalk often winged but terete, pulviniform toward the apex; secondary nerves numerous, parallel, oblique; flowers bisexual; sepals 3; petals 3; staminodia 3–5; perfect stamen 1; ovary inferior. 1-celled by abortion, or rarely 3-celled; style simple; ovule solitary, erect. Fruit fleshy or capsular.

1. Ovary 3-celled, but sometimes 2 loculi undeveloped, 3-ovuled (Tribe Phrynieae) ..... *Donax*
1. Ovary 1-locular, 1-ovuled (Tribe Maranteae)..... *Maranta*

DONAX Loureiro

Outer staminodia 2; bracts arranged in 2 rows; pairs of flowers with small thickened glandular bracteoles; fruit smooth; inflorescence not terminating the leafy shoot; brached shrubs; fruit indehiscent; ligule very small.

DONAX CANNIFORMIS (Forst. f.) K. Schumann, Bot. Jahrb. 15: 44. 1893. SANBAN.

Branching, woody at base, growing to 9 or 10 ft. high; leaves clustered or scattered near ends of branches; blades ovate or oblong, on petioles about 1/2 inch long; flowers in panicles, borne in pairs; fruit smooth, globose, dry, white, about 1.2 cm diam., 1-seeded.

Cultivated and naturalized; native from Malaysia to the Solomon Islands.

MARANTA Linnaeus

Outer staminodia 2; bracts in 2 rows; at length deciduous; flowers in branched clusters, with 2 conspicuous petaloid staminodia; ovary 1-celled with 1 seed.

MARANTA ARUNDINACEA L. Sp. Pl. 2. 1753. ARORU. SAGU. ARROWROOT.

Slender erect herb to 3 ft. high, with 2-forked branches, thin oblong leaves 10–20 cm long with acute tips and rounded bases; flowers few, white, one of each pair longer stalked than the other.

From Tropical America. The name arrowroot arose because juice of the roots is used as antidote for poison from arrow wounds. A fine white starch may be obtained from the roots. Talofofo village farms (4430).

LILIACEAE

Mostly perennial herbs or soft-wooded shrubs; roots from a rhizome, corm, or bulb, sometimes tuberous; stem erect or climbing, leafy or scapose. Flowers

mostly perfect and regular, never borne in umbels. Perianth mostly corolla-like, with or without a tube, segments or lobes 6, rarely 4, mostly in 2 very similar series; stamens usually 6, rarely 12 or 3; hypogynous, opposite the perianth-segments; ovary superior or rarely semi-inferior, 3-celled (very rarely 1-celled); style usually entire; ovules usually numerous in each cell; fruit a berry or capsule.—250 genera, 3000 species, *cosmopolitan.*

1. Leaves well-developed; flowers white, macroscopic.
   2. Leaves radical (in our species white-striped); fruit capsular; anthers opening by slits; in cultivation, rare.....*Chlorophytum*
   2. Leaves cauline, green; fruit a berry; anthers opening by pores; wild, native in savannas.....*Dianella*
1. Leaves reduced to scales called cladodes; branchlets green; flowers submicroscopic .....*Asparagus*

CHLOROPHYTUM Ker-Gawl.

Herbs, mostly with only radical leaves; rosette-forming. Flowers in simple or sparsely branched racemes, regular, the peduncle smooth and usually leafless; flowers solitary or in fascicles, on articulate pedicels, 6-parted, stamens 6, inserted on the torus; ovary sessile, glabrous, 3-angled, 3-celled; ovules 2 or more per cell; style filiform, stigma small; fruit a capsule with flat black seeds.

An African genus with many species some in cultivation.

CHLOROPHYTUM COMOSUM (Nees) Jacques, J. Soc. Imp. Centr. Hort. 8: 345. 1862.

Hartwegia comosa Nees, Nov. Act. Nat. Cur. 15, 2: 373. 1831.

Rosette herb with tuberous rhizomes; leaves rather short, about 15 cm long, coriaceous or thinner, flexible, not fleshy, ensiform, the margins white-banded; scape suberect, sometimes with a few leaves; flowers white, 6-parted; fruit a leathery capsule, 3-angled; seeds flat.

An African species widespread in cultivation. Tumon H. S. (4384–a).

ASPARAGUS L.

Erect or climbing herbs; rootstocks sometimes tuberous; leaves reduced to minute scales, bearing axillary tufts of cladodes (flat green minute branchlets). Flowers small, solitary or fascicled or in racemes, axillary; pedicels jointed; perianth campanulate, 6-parted; stamens inserted on base of segments; ovary triangular and 3-celled; ovules 2 or more per cell; fruit a small globose usually 3–6-seeded berry.

Europe, Africa, Asia; about 100 species. Three species in Guam, all introduced.

"Leaves" narrow but not needle-like, definitely flattened and wides near the middle .....*A. sprengeri*

"Leaves" needle-like, linear.

"Leaves" about 1.3 cm long; fruit red.....*A. officinalis*

"Leaves" about 8 mm long; fruit black.....*A. plumosus*

Note: true leaves are reduced or lacking; "leaves" are green, flattened specialized

stems, called *cladodes*.

ASPARAGUS SPRENGERI Regel, Act. Hort. Petrop. 11: 302. 1890.

Herb with slender, weak stems; "leaves" in whorls of 3–5, lanceolate, up to 2–2.5 cm long; flowers pink-white; berry red 8 mm thick, 1–3-seeded.

S. Africa. Occasionally cultivated in Guam, generally potted. Mangilao (4175).

ASPARAGUS OFFICINALIS L. Sp. Pl. 313. 1753.

Erect herb, the young shoots edible; mature stems to 90 cm tall; "leaves" needle-like, about 1.3 cm long; plants dioecious; flowers yellowgreen; fruit red, 6–7 mm thick, several-seeded.

Europe. The edible asparagus; seldom grown in Guam.

ASPARAGUS PLUMOSUS Baker, Journ. Linn. Soc. 14: 613. 1875.

Very delicate-stemmed herb; "leaves" needle-like, up to 8 mm long; flowers minute, white; fruit black, 1–3-seeded.

S. Africa. Often called "asparagus-fern"; commonly used by florists as decoration. Sometimes cult. as a pot-plant in Guam.

DIANELLA Lamarck

Perennial herbs with stout rhizomes; leaves linear, 2-ranked, basal, flat, subcoriaceous, with prominent dorsal midrib; scapes few-leaves, erect; inflorescence paniculate, with many short racemes; pedicels articulated distally; flowers blue, white, or yellow, rather small, with oblong, nearly reflexed free tepals; stamens 6; anthers opening by terminal pores; ovary 3-celled; cells 3–8-ovuled; style filiform; stigma small; fruit a globose *blue* berry; seeds ovate, compressed, lustrous, black.—

About 20 species, Madagascar to Australia, north to Japan and Hawaii.

Dianella ensifolia (L.) DC. in Redouté, Lil. t. 1. 1802. Safford, 256; Merrill 1914: 66.

Erect herb with 2-ranked leaves, up to 60 cm tall; leaves somewhat stiffly ascending, linear-lanceolate, distally flattened, proximally folded, sheathing at the base, entire, tapering to a long pointed tip, 15–30 cm long, 1–2.5 cm wide; inflorescence erect, terminal, strict, few-branched, 15–60 cm tall; flowers paniculate, pedicels 3–5 mm long; sepals whitish or bluish, about 6 mm long; petals 6, linear, yellow; ovary 3-celled, style filiform, stigma very small, apical; fruit a globose blue berry nearly 1 cm in diameter, with a few glossy black seeds.

Tropical Asia to Madagascar and the Pacific Islands. Native; always in savannas, in volcanic soils, rather frequent. Manengon (3826, 4209-a, 4841). Collected in Guam in 1792 by T. Haenke; found in hills behind Piti by MacGregor (523).

PONTEDERIACEAE

Floating or rooted usually fleshy aquatics; herbaceous; leaves fleshy, petioled; flowers perfect; perianth of 6 similar parts in 2 series; stamens 6; ovary superior, 3-celled; style 1; stigmas 3; ovules many; fruit capsular. Five genera, 40 species, tropical.

One genus locally present.

EICHHORNIA Kunth

Found only in fresh water; floating herbs with inflated petioles; perianth segments partly connate; stamens 6; ovary 3-celled, with many ovules, maturing into a loculicidal capsule with many seeds.

EICHHORNIA CRASSIPES (Mart. & Zucc.) Solms-Laubach in DC. Monog. Phan. 4: 527. 1883. WATER-HYACINTH

Rooted only at flowering time by long slender roots; otherwise floating, with thick, fleshy, more or less horizontal roots; leaves clustered, on bulbously inflated petioles, blades rounded or oblong, up to 3–4 inches wide; flowers showy, pale violet with a spot of bright yellow on the large upper lobe; some forms with pink and yellow flowers; all parts edible.

Tropical and subtropical America, now introduced and cultivated in most warm countries. In some places a serious pest and threat to navigation on inland waters, sometimes choking rivers (Florida and Australia).—Agaña, La Ciénaga, Agaña Spring (4915). Glassman, in 1946.

ARACEAE

Herbs, vines, or rarely shrubs or small trees; leaves pinnately veined, sometimes net-veined; blades often sagittate in outline; flowers on a spadix enclosed by a spathe, perfect or unisexual, monoecious or dioecious; perianth none or 3–8-parted, reduced; stamens 1 to many; carpels 1 to several, with 1 to many ovules; fruit a berry; seeds with fleshy outer integument.—The tissues are usually rich in needle-like crystals of calcium oxalate. In a few spp. the sap is milky. 100 genera, 600 species, tropical.

Key to Genera, based on flowers

A. Plants terrestrial.
1. Perianth present, of 3–8 distinct segments.
2. Spathe reflexed, cordate, waxy, colored (red or white)..... *Anthurium*
2. Spathe enclosing spadix, pointed, green or white..... *Cyrtosperma*
1. Perianth absent,
3. Flowers unisexual,
4. Stamens connate into a peltate body,
5. Blades parallel-veined; sap milky; staminodia present in pistillate flowers ..... *Dieffenbachia*
5. Blades net-veined; sap mostly watery; staminodia lacking in pistillate flowers.
6. Placenta basal,
7. Ovules few and orthotropous..... *Alocasia*
7. Ovule one, anatropous (ovary 1-celled)..... *Typhonium*
6. Placenta not basal,
8. Placentae parietal; ovules orthotropous, numerous; ovary 1-celled..... *Colocasia*

8. Placenta almost central,
9. Ovaries distinct or more or less coherent, 2–3-celled; leaves not pedatifid.....*Caladium*
9. Ovaries distinct at base but thick and coherent above; leaves pedatifid.....*Xanthosoma*

4. Stamens not connate, 2 in number.....*Aglaonema*

3. Flowers bisexual,
10. Ovules solitary; berries free; lateral veinlets of leaf parallel or nearly so; blades lobed or entire.....*Scindapsus*
10. Ovules 2 or more per ovary chamber; berries coherent.
11. Ovules 2 per chamber; leaves with netted lateral veinlets; blades often developing perforations.....*Monstera*
11. Ovules several or many per chamber; leaves with parallel lateral veinlets; blades imperforate (in our sp.).....*Raphidophora*

B. Plants floating in fresh water, rosette-shaped, glaucous.....*Pistia*

Simplified key to the commoner Araceae in Guam

1. Sap watery, clear;
2. Aquatic, floating plants.....*Pistia*

2a. Terrestrial plants with often tuberous rootstock and an ascending or erect caudex (soft trunk); often in swamps; usually no special juvenile leaves.
3. Leaves spotted and patterned with pink, white, green; usually small plants rarely over 60 cm tall.....*Caladium bicolor*
3. Leaves green or tinged with violet only along the petiole and midrib and veins; often large, sometimes 3 m tall.
4. Leaves markedly glaucous, the tips usually pointing downward; caudex rarely developed; small to medium size herbs.....*Colocasia esculenta*
4. Leaves green, tips pointing up or outward, rarely down; caudex often elongated; medium to large herbs.
5. Basal lobes of leaf sharp, deltoid, or steeply tapered if not acute; sometimes very tall but caudex usually very short.....*Cyrtosperma chamissonis*
5. Basal lobes rather blunt or rounded; sometimes tall, with a trunk-caudex sometimes 1 m high.....*Alocasia macrorrhiza*

2b. Climbers, usually epiphytic, with roots at the nodes, often with hanging aerial roots; juvenile leaves sometimes appressed to the supporting surface and often very different in appearance from adult foliage.
6. Leaves with alternating lateral stripes of yellow and green.....*Rhaphidophora aurea*
6. Not as above,
7. Adult leaves deeply lobed and with perforations.....*Monstera*

7. Adult leaves whole, entire.....*Rhaphidophora* sp. n.
1. Sap milky; leaves with whitish-green spots, caudex erect..*Dieffenbachia picta*

AGLAONEMA Schott

Small creeping or erect herbs with entire leaves; inflorescence pedunculate; spathes boat-shaped, caducous; spadix shorter than the spathe or the same length, basal part lacking flowers, apex without appendage; flowers unisexual, pistillate flowers below the staminate, the latter much more numerous; spadix without sterile part between male apex and female base; fruit fleshy, often red.

Two species, cultivated, not naturalized.

Leaf-blade mostly 7–20 cm long, 3–12(–18) cm wide, spotted with light green, usually oblong-elliptic, apex acuminate.....*A. commutatum*

Leaf-blade mostly 15–22 cm long, 6–11 cm wide, dark green, not spotted, ovate, acuminate, acumen 2.5 cm long.....*A. modestum*

AGLAONEMA COMMUTATUM Schott, Synopsis Aroidearum 123. 1856.

Plants erect at first, later becoming ± decumbent; to 1.5 m tall. Petioles mostly 6–25 (–35) cm long, commonly half as long to one and a half times as long as the blade; sheath membranous; blade oblong-elliptic or lanceolate, sometimes ovate or elliptic, mostly 12–35 (–44) cm long and 3–12 (–18) cm wide, usually about 2–4 times longer than wide; base somewhat asymmetric; apex acuminate; main lateral veins about 5–8; leathery. Leaf blades often more or less variegated, with bars or spots. Inflorescence: peduncles 1–6 together, as much as 15–20 cm long; spathe pale green (rarely almost white), mostly 4–9 cm long and 3–4 cm wide, shortly decurrent; stipe about 1 cm long; spadix cylindric, usually 2–6 cm long, included, bearing roughly 10–16 gynoecia in the pistillate part; staminate part commonly 1.5–5 cm long. Fruits yellow to red, elliptico-obovoid, under 25 mm long.

Philippines, Celebes. A commonly cultivated aroid, with many forms differing especially in the patterns of variegation. The form with rather irregular, spaced blotches, is the typical one (f. *commutatum*). Mangilao.

AGLAONEMA MODESTUM Schott, ex Engler, Araceae; in A. & C. de Candolle, Monogr. Phanerogam. 2: 442. 1879.

Plants erect, to about 1/2 m. tall. Petioles mostly 8–20 cm long, mostly shorter than or barely equalling the blade; sheath broad membranous. Blade mostly ovate or narrowly ovate, commonly about 15–22 cm long, 7–11 cm wide, base somewhat asymmetric, apex gradually acuminate; not variegated. Lateral main veins 4–6. Peduncles 1–3 together, up to 12 cm long; spathes usually 5–9 cm long, 2.5 cm wide; stipe none; spadix 3–4 cm long; gynoecia 9–13; staminate part about 3 cm long. Fruits orange, 2–3 cm long.

Philippines, extending to continental Asia according to Nicolson (Smithson. Contr. Bot. 1: 27. 1969). Allegedly cultivated in Guam (Safford) but not verified by me.

ALOCASIA [Necker] Schott

Erect, often large herbs, sometimes with weel-developed "trunk", the leaves erect, long-petiole, blades often sagittate, peltate or not; finlorescence pedunculate; spathe basally tubular, distally somewhat expanded, at last caducous; spadix shorter than spathe; tip with slender appendage; flowers unisexual; fruit a fleshy berry.—Perhaps 30 or more species of Tropical Asia, a few in the Pacific.

ALOCASIA MACRORHIZA (L.) Schott, in Schott & Endlicher, Melet. Bot. 18. 1832. Safford 1905: 179. Merrill 1914: 64.

A. indica (L.) Schott, Oestr. Bot. Wochenbl. 4: 410. 1853.? Safford 1905: 178.

PAPAO-APAKA; PAPAO-ATOLONG; PIGA APE. (Haw'n).

GIANT TARO. [FALSE].

Leaves up to 1–1.5 m tall, petioles thick, fleshy, green; blades satittate-ovate, the basal lobes obtuse; blade to 60 cm long or more; tips usually pointing up or out; stem often trunklike in age, becoming 1 m tall or more, grayish; spathe at first greenish, aging dull yellow; spadix with obtuse terminal appendage; fruits (seldom seen) red. Rootstock tuberous.

Tropical Asia and Pacific Islands. Common in Guam. Mangilao (4006). Very large specimens seen on Mt. Tagpochao, Saipan.

The tubers may provide an emergency food, but are inferior to those of the true taro (*Colocasia*) and the true Giant Taro (*Cyrtosperma*). Like all Araceae, the uncooked tissues are rich in needle-shaped crystals of calcium oxalate, which are irritating and painful; washing and thorough cooking are necessary.

Alocasia indica, reported from Guam by Safford, does not seem to occur there.

CALADIUM Ventenat

Erect terrestrial herbs with short or obsolete stems, tuberous rhizomes, elongate petioles, and usually peltate, sagittate leaves, peduncles elongate, unbranched; spathe tubular at base, expanded distally, constricted at the throat; spadix shorter than spathe, nude basally, then with pistillate flowers, then a sterile portion, then with staminate flowers; flowers unisexual, naked; staminate flowers with 3–5 stamens forming a truncate synandrium; pistillate flowers with 2–3-celled ovary; cells with several ovules in 2 rows, anatropous; fruit a berry with several or many small ovoid seeds.

One species in Guam, in cultivation and sparingly escaped.

CALADIUM BICOLOR (Aiton) Ventenat, Descr. Cels. pl. 30. 1800.

CORAZON DE SANTA MARIA.

Blades with various patterns of pink and white spots or blotches, peltate, sagittate—cordate; mostly 10–20 cm long, occasionally larger; lower surface slightly glaucous.

Probably native of Brazil (Amazon region), now widespread as a cultivated plant. Many color forms are known. In Guam mostly in gardens, sparingly escaped, as at Camp Quezon (4170).

COLOCASIA Schott

Erect herbs with tuberous rhizomes; petioles elongate; blades ovatecordate, peltate, the tip usually pointing down; inflorescence pedunculate; spathe tubular below, constricted at throat, distally expanded, at last caducous; spadix shorter than spathe, apex appendaged or not, flowers unisexual, naked, staminate grouped above the pistillate; stamens connate into a synandrium; ovaries 1-celled with parietal placentae, ovules orthotropous, numerous; fruit a small berry.

One species cultivated in Guam.

COLOCASIA ESCULENTA (L.) Schott, in Schott & Endlicher, Melet. Bot. 18. 1832. Merrill 1914: 64. SUNI. TARO.

Caladium colocasia W. F. Wight ex Safford 1905: 206.

Roots tuberous, often purplish; leaves ovate-cordate, basal lobes rounded, peltate, tips pointing down, apiculate, usually glaucous, up to 60 cm long and 40 cm wide, petioles to 1 m tall; inflorescence shorter than leaves; spathe yellow; spadix shorter, cylindric.

Tropical Asia and the Pacific; a common domestic plant in the region, the tubers edible, starchy, providing a potato-like food or (in Hawaii) a thickish, slightly fermented liquid called poi. The young leaves are also edible when cooked.

Many forms exist, differing in color, ability to tolerate dry ground, size, etc. Flowering is rare, fruiting very rare. Usually cultivated in wet or swampy soil.

CYRTOSPERMA Griffith

Large herbs; leaves long-petiolate, ± sagittate; rootstock ± tuberous. Inflorescences axillary, pedunculate, spathaceous; spadix cylindric with numerous ♀ (sexual) flowers; perianth usually 5–7-parted; style none; ovary unicelled; ovules 1 or 2; fruit usually 1-seeded.

Asia-Malesia; about 18 spp.

One species in Guam.

CYRTOSPERMA CHAMISSONIS (Schott) Merrill 1914: 65. Bryan, 5 Mar. 1958.

Arisacontis chamissonis Schott, Bonplandia 5: 129. 1857.

C. edule Schott, Bonplandia 9: 267. 1861. BABA.

Large to massive herb, rootstock tuberous, stem ascending or shortly erect, leaves large to very large, petioles up to 3 m long, usually less, blades ovate-sagtittate, up to nearly 2 m long but usually less, not or only very slightly peltate, rather dark green, leaf tip pointing upward, lobes at base rather pointed, the sinus deep; inflorescence erect, pedunculate, shorter than the petioles.

New Guinea and the Pacific Islands; often cultivated in the Caroline Islands. G.E.S. 66, Agaña. Not common in Guam. The tuber is of a better quality than that of *Alocasia*, but is not so good as the true taro, *Colocasia*. Several cultivars occur in Ponape.

DIEFFENBACHIA Schott

Terrestrial herbs, often with erect caudex, or accumbent; sap milky; leaves

long-petiolate, sheathing at base, with oblong blades; marginal nerve lacking; inflorescence pedunculate, shorter than the leaves; spathe persistent, convolute below, expanded above and often recurved; spadix slightly shorter than spathe; pistillate portion with many rather distant flowers, staminate part densely many-flowered, separated by an intervening almost naked portion; flowers unisexual, naked; staminate flowers with 4 stamens joined into a synandrium; pistillate flowers with 4–5 staminodes, ovary 2–3-celled (rarely 1-celled), the cells 1-ovulate, ovules anatropous; fruit a berry; seed without endosperm.

One species, in cultivation, in Guam gardens.

DIEFFENBACHIA PICTA (Loddiges) Schott, Oestr. Bot. Wochenbl. 68. 1852. DUMB-CANE.

Erect, with a rather stout caudex usually less than 1 m tall, oraccumbent, the lower part rooting at the nodes; leaves petiolate, petiole to 30 cm long, grooved and winged from the base to beyond the halfway point; blades narrowly oblong-ovate, acute-acuminate with a short, fine, almost thread-like apiculum; base shallowly cordate with rounded lobes; midrib strong, lateral veins curved-ascending; surface patterned with many irregular yellowish or cream-green splotches.

Tropical America; rarely flowering in cultivation. In Guam usually grown in pots, often kept indoors.

The milky sap is very irritating; if part of the plant is chewed, the tongue is paralyzed; hence the West Indian name, "dumb-cane" or the slightly ungracious name "mother-in-law plant". The plants have a rather disagreeable odor.

MONSTERA Adanson

Large epiphytic climbers; stems with roots at the nodes; leaves distichous, juvenile leaves appressed to supporting surface, whole; older leaves free, ovate or cordate, short-petiolate, often perforated, or lobed; petioles grooved to the middle or beyond; peduncles terminal, one or several together; spathe closing after pollination, at last falling off; spadix sessile, cylindric, shorter than the spathe, lowest flowers sterile, remainder perfect, naked, with 4 stamens, ovary 2-celled, cells 2-ovulate; ovules anatropous; fruit a berry; seed often cordate.

Tropical America; a genus of about 30 species.

MONSTERA DELICIOSA Lieberm. Vid. Medd. Naturh. For. 19. 1850. MONSTERA.

Large epiphytic vine with stout stems, nodes often with long aerial hanging roots; petioles to 1 m long; blades (mature) to 60 cm long, ovate, acuminate-long-apiculate, pinnately lobed or parted, usually perforated along the midrib, all green; inflorescence with peduncle to 15 cm long; spathe rather thick, up to 24 cm long, pale yellowish; spadix up to 20 cm long; berry yellow or tinged purplish, to 1 cm long, edible.

Central America and Mexico, now widely cultivated.

In gardens, also sometimes in staked pots indoors. The fruits have not been seen in Guam; they are said to be sweet and tasty.

RAPHIDOPHORA Hasskarl

Vines with hanging aerial roots; leaves petiolate, juvenile ones often quite different from adult; blades entire or lobed, whole or perforated; petiole grooved and winged, the wings falling off; spathe boat-shaped, not constricted, eventually falling off; spadix thick, shorter than spathe, sessile; flowers bisexual, crowded. —About 60–70 Indo-malaysian species.

Key to Species

Leaves variegated green and yellow white (usually not flowering; in cultivation). ..... *R. aurea*

Leaves plain green; flowering not rare; wild..... *R.* sp. n.

RAPHIDOPHORA AUREA (Linden ex. André) Birdsey, Baileya 10: 159. 1962.

Pothos aureus Linden. ex. A. Ill. Hort. 27: 69, pl. 381. 1880.

Scindapsus aureus (Linden. ex. A.) Engler, Pflanzenr. 37: 80. 1908.

Rhaphidophora aurea (Linden. ex. A.) Furtado, Gard. Bull. Singapore 20: 379. 1964.

Epipremnum aureum (Linden. ex. A.) Bunting, Ann. Missouri Bot. Gard. 50: 28. 1964.

Climber, usually on trees, or on stakes, trellises, or walls; leaves petiolate; blades large ovate-subcordate, to 60 cm long, apex subobtuse, to 40–45 cm broad, lateral veins slightly ascending, the tissue between these often yellow, the leaves thus mostly with irregularly spaced yellow bands and green bands on each side of the midrib.

Long known in cultivation as *Scindapsus aureus*, but almost simultaneously, three botanists observed this plant in the exceedingly rare flowering condition, and proceeded to refer it to 2 different genera. The present account merely follows the majority opinion. Occasional in Guam gardens, as at the College campus (5149).

Raphidophora species nova, aff. *R. hollrungii* Engl., foliis latioribus; petiolis usque ad 12 cm. longis, laminis C. 30 × 7 cm, acuminatis. Spatha straminea. Spadix cylindricus. Stigma capitato-discoideum.

A high-climbing vine; leaves green, the petioles to 12 cm long, the sheath open along lowest 4/5 or 5/6; blades lanceolate or narrowly oblong, about 30 × 7 cm; acuminate—acute; spathe broad, thick, pale yellow; spadix without appendix; flowers bisexual; carpels single, separable, each with two short staminodes; stigma capitate-discoid. Guam: Naval Magazine near Maulap Stream. 28 April 1962. *Stone* **4101** (GUAM). Holotype.—Seen only once.

TYPHONIUM Schott

Herbs with subterranean tubers, leaves cordate, hastate, or sagittate, simple, entire or 3–5-lobed; spadix produced into an appendage above the male flowers; neuter in the midregion; ovary 1-celled; ovules 1 or 2, erect and orthotropous; stigma sessile; berry ovoid; seed with endosperm.—20 or 30 Old World Species.

TYPHONIUM DIVARICATUM (L.) Decaisne, Nouv. Ann. Mus. Paris 3: 367. 1834.

Typhonium cuspidatum (Blume) Decaisne, Herb. Timor. 39. 1835.
Merrill 1914: 65. Bryan, 26 Feb. 1958. PANTAKE.

Herb with subterranean tuberous rootstock; stem short, bearing cordate or halberd-shaped leaves up to 15–18 cm long; spathe green, narrowed distally with an apical, pendent tail; fruit ovoid, a berry with 1 or 2 seeds.

Indomalaysia to the Philippines; probably introduced to Guam from Manila. Government House, Costenoble 1183 (cited by Merrill).

The lateral veins of the leaf-blades merge in a marginal 'collecting vein' paralleling the leaf-edge, and about 1 cm in from the edge.

XANTHOSOMA Schott

Large terrestrial herbs, habit resembling Alocasia and Cyrtosperma; rootstock tuberous; caudex short or long, accumbent or erect; petioles long and thick; blades sagittate or pedate-dissected, primary lateral nerves joined to a fairly distinct marginal collecting nerve; inflorescences solitary or clustered, rather short-pedunculate; spathe basally tubular, ovoid, then constricted, then distally lanceoloid, opening at anthesis; spadix shorter than the spathe, with pistillate basal part, sterile middle part, staminate distal part; flowers unisexual, naked; staminate flowers with 4–6 stamens joined to form a synandrium; pistillate flowers with 2–4-celled ovary; berry cylindric, cells with many seeds.—Tropical America; some 40 species.

XANTHOSOMA SAGITTIFOLIUM (L.) Schott, Melet. 1: 19. 1832.

Habit as in above description. YAUTIA

I have not encountered this species in Guam, but include it on the basis of the record by Fosberg.

XANTHOSOMA NIGRUM (Vell.) Mansf., Die Kulturpfl. Beih. 2: 549. 1959.
Xanthosoma violaceum Schott, Ind. Hort. Sem. Berol. 370. 1853.
YAUTIA; SUNI-N-HONOLULU.

Habit as above; petioles to 70 cm long, brownish-violet; blades sagittate-ovate, shortly acuminate-apiculate, up to 50 cm long and 40 cm broad, basal lobes obtuse, deltoid, nerves and midrib somewhat purplish. Spathe pale yellowish. Spadix to 20 cm long.

Tropical America. Introduced for its edible tubers. Probably very rare now in Guam, if still present.

PISTIA Linnaeus

Aquatic, floating, rosette-forming stemless stoloniferous herbs, with sessile, obovate or obcuneate glaucous (water-shedding) leaves. Spathe small, the limb ovate, endosing one gynoecium; anthers 4, sessile, connate, in a spathel. Fruits membranous, few-seeded, the seeds obovoid-oblong.

Monotypic, the single species pantropical.

PISTIA STRATIOTES L. Sp. Pl. 963. 1753.

Recognizable from the generic description.

This water plant is often cultivated. Together with *Eichhornia* it may be used

to feed pigs. Its first occurrence in Guam is not known; at any rate it was only collected in 1968 in the mouth of the Talofofo River by Stone and Cushing-Falanruw (no. 8234).

The genus is a clear example of specialization and reduction from the Aroid "plan" and is a link between the Aroids and the duckweeds (Lemnaceae) which are even further reduced.

Note. Many other aroids are now or are liable eventually to be cultivated, mostly in gardens, for ornament; too many to describe in full. The most important of these are species of *Anthurium* Schott, generally easily recognized by their flat, open, waxy-glossy, bright-colored spathes, often red or pink; *Spathiphyllum* Schott, with narrow, nearly flat, white spathes; *Syngonium*, Schott, with pedatisect leaves.-these are climbing epiphytes; and *Philodendron*, Schott, epiphytic climbers, the leaves entire, lobed, or parted; and often grown indoors.—For more detailed information the reader should consult such books as M. R. Birdsey's "The Cultivated Aroids," M. C. Neal's "In Gardens of Hawaii", and A. Engler's Monograph of the family Araceae.

AMARYLLIDACEAE

Herbs with a layered bulbous rootstock, very rarely a rhizome; leaves few from base of stem or apex of bulb, linear, with parallel nerves and transverse secondaries; flowers showy, perfect, regular, solitary or several to many, umbellate at top of scape, above an involucre of 2 or more or rarely 1 usually membranous bracts; perianth of 6 similar segments, sometimes grown together; stamens 6 or rarely 3; ovary superior or inferior, 3-celled, with axile or rarely parietal placentation; style slender with a capitate or 3-lobed stigma; ovules mostly numerous in each cell; fruit capsular or fleshy.—About 86 genera, and 1000 species, chiefly tropical and warm temperate regions.

1. Ovary superior; rootstock a bulb; corona absent.....*Allium*
1. Ovary inferior,
    2. Corona absent; no scales or teeth between the filaments,
        3. Large herbs; flowers white, in clusters.....*Crinum*
        3. Small herbs; flowers pink, solitary.....*Zephyranthes*
    2. Corona present,
        4. Leaves broad, linear, not petiolate.....*Hymenocallis*
        4. Leaves more or less sagittate and subpetiolate.....*Eurycles*

Allium Linnaeus

Bulbous, pungent herbs, annual, biennial, or perennial. Leaves radical. Scapes bearing bracteate umbels. Flowers lacking corona; stamens 6.—A large northern temperate genus of perhaps 500 species; many are cultivated, including onions and garlic, chives, shallots, leeks, etc. Their classification is made difficult by the presence of vegetatively propagated races. At least 3 forms are grown in Guam.

ALLIUM CEPA L. Sp. Pl. 1: 300. 1753. CEBOLLOS. SEBOYAS. ONION.

Bi- or perennial herb with fleshy, pungent bulbs, these generally single; leaves tubular, hollow.

Planted but not growing particularly well in Guam. The form cultivated chiefly for its small bulbs and leaves is var. *viviparum* Metz. (GREEN-ONION.)

ALLIUM SATIVUM L. Sp. Pl. 1: 296. 1753. AHOS. GARLIC.

Erect herb; bulbs crowded, segmented; leaves flattened, strap-shaped, up to 2.5 cm wide.

Planted on a small scale in Guam.

CRINUM Linnaeus

Large bulbous herbs, leaves rather broad; scape solid; umbel 1-many-flowered; pedicels short; perianth with linear segments; stamens borne on the tube-throat; ovary 3-celled, ovules few per cell; style filiform; stigma small capitate; fruit indehiscent; seeds rounded, green to whitish.—More than 120 species, pantropical. One species in Guam:

Crinum asiaticum, L., Sp. Pl. 292. 1753. PIGA-PALAYI. CRINUM.

Large bulbous herb; leaves many, rather large, linear, lax or erect, strapshaped, 1–2 m long, as much as 25 cm wide, though usually less, rather fleshy, medium green, clasping at the base. Inflorescence at the apex of a thick, fleshy scape; flowers umbellate, bracteate, white, fragrant; perianth tube to 10 cm long, the limb of slender, spreading, narrow segments; filaments slender, white; no corona; styles purplish; fruit subglobose, beaked, 1(–2)-seeded. The juice of the bulb is supposed to be emetic.

S. Asia. Widely cultivated and naturalized. Harmon (4668).

EURYCLES Salisbury

With the characters of the species cited; 1 other species (*E. cunninghamii* Aiton).

EURYCLES AMBOINENSIS (L.) Lindley, Loud. Encycl. Pl. 242. 1829.

BRISBANE LILY.

Erect bulbous herb; leaves long-petiolate, with cordate, broad suborbicular blades; flowers umbellate at apex of a fleshy scape; umbel of about 10 flowers; flowers with slender corolla-tube, limb of 6 spreading subelliptic segments, with a 6-parted staminal tube, odorless; white. Seed 1, in the subglobose fruit.

Malaysia to Australia. Introduced to Guam, where it is commonly cultivated, usually in pots. The big heart-shaped leaves easily distinguish this plant; they are as much as 15–30 cm broad, and nearly as broad as long. Harmon (4171). In Malaya it is believed to have magical properties.

HYMENOCALLIS Salisbury

Large bulbous herbs; leaves sessile, linear, or sometimes petiolate and elliptic; scape erect, flattened or somewhat compressed, solid; umbel of several or many

flowers; flowers white, regular or slightly zygomorphic; stamens connate proximally; ovary 3-celled, somewhat stipitate or not, ovules 1-many per cell; fruit capsular; seeds subglobose.—About 56 species in tropical and subtropical America.

One species in Guam.

HYMENOCALLIS LITTORALIS (Jacquin) Salisbury, Trans. Hort. Soc. 1: 338. 1812. LIRIO. SPIDERLILY.

Pancratium littorale Jacquin, Sel. Stirp. Amer. 99. 1763; Safford 1905: 342.

Erect bulbous herb; leaves erect or lax, somewhat fleshy, strap-shaped, up to 75 cm long and 2–7 cm wide; scape thick, flattened; umbel of sessile flowers; flowers white, with long tube, up to 15 cm long (or more), slender, the limb of 6 narrow linear white segments, the center with an obvious, discoid, thin corona (staminal cup); stamens 5 cm long; fruit green, smooth, 3-celled, cells 2-ovulate.

Tropical America; now widely introduced, cultivated, and maturalized, especially on beaches or in sandy soils. Similar to *Crinum*, but smaller and with an obvious floral corona of membranous tissue joining the bases of the stamens. Camp Quezon (4076).

Safford states that it was rather recently introduced at the time he was in Guam (1899), and that already it covered "acres of coast near Agaña." The flowers are said to open about 4:30 p.m.

ZEPHYRANTHES Herbert

Small bulbous herbs; leaves linear, erect. Scapes 1-flowered, with apical tubular bifid bract. Flowers white, pink, or yellow. [Atamosco of Safford].—About 50 species of subtropical and tropical America.

One commonly cultivated species in Guam.

ZEPHYRANTHES ROSEA Lindley, Bot. Reg. 10. t. 821. 1824. NARDO.

Atamosco rosea (Lindl.) Greene, Pittonia 3: 188. 1897; Safford 1905: 192.

Bulbs 5–7 cm thick, rarely up to 10 cm, often much smaller; leaves linear, rather lax, seldom over 25 cm long, appearing with the flowers. Scape about as long as the leaves or somewhat longer. Flowers pink to rosy-red, about 2.5 cm long, the limb somewhat spreading. Anthers versatile, yellow. Ovary stipitate, with many superposed ovules; stigma 3-lobed; seeds flat, black.

Tropical America. Very common in Guam gardens, often as border plants; also potted. The bulbs are long-lived, and may persist in dry ground for some time; watering or rain may revive them. Camp Quezon (4073).

According to M. C. Neal (In Gardens of Hawaii, 2nd ed., (p. 218) 1965), this species should be called *Z. grandiflora* Lindley.

Several other species, with white or yellow flowers, would be attractive new introductions and would thrive in Guam.

DIOSCOREACEAE

Herbaceous tuber-bearing vines; leaves palmately and reticulately veined; flowers unisexual, dioecious; perianth parts connate, at least basally; stamens in

staminate flowers 6, all fertile or 3 abortive, around a reduced ovary; staminodia of pistillate flowers 6; ovary of pistillate flower inferior, 3-celled; styles 3; stigmas entire or bifid; ovules 2 in each cell; fruit capsular.—10 genera, over 650 species, mainly tropical.

A single genus locally present.....*Dioscorea*

DIOSCOREA Linnaeus

Vines, bearing tubers, sometimes the stems spiny; fruit a 3-winged capsule; seeds winged; with the characters of the family. Yams.—Pantropical; about 600 species.

Key to species

1. Leaves palmately compound, of 3–5-leaflets.....*D. pentaphylla*
1. Leaves simple,
   2. Stems conspicuously winged.....*D. alata*
   2. Not so,
      3. Stems twining to the right (counterclockwise); flowers sessile..... .....*D. nummularia*
      3. Stems twining to the left (clockwise); flowers usually pedicellate.
         4. Stems at least basally prickly, and pubescent with T-shaped hairs; leaves 9–13-nerved.....*D. esculenta*
         4. Stems not prickly, glabrous (or if a few hairs present, they are simple, not T-shaped); leaves 5-nerved,.....*D. bulbifera*

The following account of the yams is heavily indebted to Burkill's treatment of *Dioscorea* in Flora Malesiana, ser. 1, vol. 4(3): 299–335. 1951.

Note. Another yam, *D. latifolia* Benth., is supposed to have been introduced to Guam for experimental planting. It apparently has failed to persist.

DIOSCOREA ALATA L. Spl. Pl. 1033. 1753. Safford 1905: 259.

DAGO. DAGO APAKA. WINGED YAM.

Tuberous vine; tubers club-shaped or globose, often lobed, blackish or brownish-skinned, flesh white or purplish; stems unarmed, glabrous high-climbing, twining to the right (counterclockwise), quadrangular and noticeably 4-winged on the angles; bearing aerial bulbils; leaves mostly opposite, ovate-hastate or ovate-sagittate, about 22×15 cm, 5-nerved, bright green, long-petiolate; male flowers crowded on leafless branches up to 30 cm long; female flowers on similar branches up to 60 cm. long; all flowers sessile; capsules on stipe 3–4 mm long, winged, the wings up to 2×1.5 cm; apex slightly notched; base obtuse.

Asia and Malaysia, widely cultivated now in most tropical countries. Maulap nr. Fena (4094). S. Yona (5151). G.E.S. 32. Planted and naturalized in Guam. "Ubi" (or cognate word) from Malaysia throughout Polynesia. Edible.

Dioscorea bulbifera L. Sp. Pl. 1033. 1753. MAGNAHEUGO. WILD YAM.

D. sativa sensu Safford 1905: 262.

Tuberous vine, tubers usually globose or pear-shaped, sometimes lobed, some

edible (in cultivated races), others (in wild races) causing nausea or fatal; flesh yellowish; stems generally bearing bulbils, twining to the left (clockwise); leaves broadly cordate, 20–30 cm long, 20–30 cm wide, 5-nerved, lower surface duller green than upper, short to long petiolate, petioles sometimes slightly winged, but stems not so; male flowers on pendent inflorescence, from bracteate (rarely leafy) stems, up to 50 (even 100) cm long; whitish or pinkish; female flowers on pendent axillary inflorescences; capsules winged, wings to 20×9 mm, rounded at both ends.

East Africa to Polynesia; the most widespread of all yams (Burkill).
MacGregor 396.

DIOSCOREA ESCULENTA (Lour.) Prain & Burkill, Gard. Bull. Straits Settlements 1: 396. 1917.—*D. aculeata* sensu Safford 1905: 259, non L. 1754.
Merrill 1914: 68. *D. papuana* Warburg, Bot. Jahrb. 13: 273. 1891; Safford l.c.
Oncus esculentus Loureiro, Fl. Cochinch. 194. 1790.

Tuberous vine, the several to many tubers growing downward from a corm lying close to the soil surface; top of corm spiny or not; skin of tuber thin, grayish or brown; flesh white, edible. Stems prickly at base, less so distally or unarmed, twining to the left, pubescence of T-shaped hairs; leaves mostly 10×10 cm, rarely to 15 × 15 cm, slightly acuminate, 9–13-nerved; petiole as long or half again longer than blade; male inflorescences usually solitary, 1–4 flowers cymosely brone or single along the axis; female inflorescences solitary from axils of upper leaves, to 40 cm long; capsules 27 × 12 mm; seed winged all round.

Key to varieties

Roots abundant, thorny.....*var. spinosa*
Thorny roots few or none .....*var. fasciculata*

var. *spinosa* (Roxb.) Prain & Burkill.—
NIKA CIMARRON. GADO. WILD SPINY YAM.
A few cultigens and some races of wild plants.

var. *fasciculata* (Roxb.) Prain & Burkill.—NIKA. YAM.
This var. consists of exclusively cultivated races.

Safford 1905: 262 says of this species: "very abundant in Guam. It is the only species growing wild, forming dense matted thickets . . . in December the leaves turn yellow, then brown, and then fall off, at which time the tubers are ready for digging."—MacGregor 293.

Dioscorea nummularia Lamarck, Encycl. Meth. 3: 231. 1789. DAGO.
D. glabra sensu Safford 1905: 261?

Tubers descending, elongated; flesh white, edible. Stems armed near the bade; glabrous; twining to the right. Leaves distally alternate or (esp. proximally) opposite, cordate to elliptic, 5–7-nerved, to 11 × 9 cm, the petiole up to 7 cm long. Male inflorescences 1–4 together, on downward leafless branches to 4 cm long; female inflorescences 1–2 together, to 15 cm long; all flowers sessile; capsules apically retuse, basally obtuse, the wings 20 × 22 mm, on a stipe 5 mm long.

East Malaysia to Polynesia. I have seen no specimens from Guam.

Dioscorea pentaphylla L. Sp. Pl. 1032. 1753.

Tubers various, some lobed, often with short rootlets; flesh white to yellow, purplish-flecked or not, somewhat nauseating if eaten, or in some races edible. Stem prickly near base, at first pubescent but glabrate, twining to the left. Bulbils numerous. Leaves 3–5-foliolate, pubescent or glabrate; middle leaflet to 15 cm long and 4.5 cm wide; petiolules 5 mm or less. Male inflorescences on leafless branches, to 3 cm long. Female inflorescences 1–3 together, axillary, to 25 cm long. Capsule with wings to 20 × 6 mm, pubescent when juvenile, rounded.

Upper India through Malaysia to Polynesia.

AGAVACEAE

Rootstock rhizomatous; stem short or tall; leaves crowded, narrow, often thick or fleshy, entire or toothed; flowers perfect, sometimes dioecious, regular or nearly so, in racemes or panicles; perianth-tube short or long, segments alike, often petaloid; stamens 6; ovary superior or inferior, 3-celled; ovules 1-many per cell; fruit a capsule or berry.

Key to local (and Micronesian) genera

1. Ovary superior,
   2. Perianth-segments free..... *Yucca*
   2. Perianth-segments united at the base,
      3. Ovules numerous; leaves narrowly elliptic, subpetiolate, often colored with red..... *Cordyline*
      3. Ovules solitary; leaves green or mottled or striped with yellow, narrowly linear,
         4. Plant stemless or apparently so; leaves with transverse bands of color, thick and leathery..... *Sanseviera*
         4. Plant with evident trunk; leaves uniformly green,
            5. Perianth-segments free nearly to the base; filaments dilated and thickened at the middle..... *Dracaena**
            5. Perianth-segments forming an evident tube, united along one-third or more of their length; filaments flattened subulate to filiform, tapered..... *Pleomele**
1. Ovary inferior,
   6. Flowers regular; inflorescence paniculate, large..... *Agave***
   6. Flowers zygomorphic; inflorescence a long terminal raceme with paired flowers..... *Polianthes*

AGAVE Linnaeus

Large rosette-plants; leaves thick, rigid, spine-tipped, sword-shaped, up to

* Not yet known in Guam; present in Micronesia.

** Note: in our species the flowers are often replaced by bulbils (vegetative propagules-plantlets developed by non-sexual means).

180 cm long or more. Inflorescence a tall terminal scape, as much as 12 m tall, with numerous flowers; flowers regular.—Subtropical or warm-temperate regions of America, especially deserts; probably 150 species.

Leaf-margins spiny ..... *A. americana* and *A. fourcroydes*

Leaf-margins smooth; apex a terminal spine..... *A. vivipara*

AGAVE AMERICANA L. Sp. Pl. 323. 1753. MAGUEY; CENTURY-PLANT.

Habit of the genus. Stemless. Leaves to 2 m. long, 15–20 cm wide; margins stoutly spinose. Flowering scape to 12 m tall, bearing yellow flowers; stamens longer than tepals.

Probably a Mexican plant, now common in cultivation.

AGAVE FOURCROYDES Lem., Illustr. Hort. 11, Misc. 65 (sub. t. 419). 1864.

Habit of the genus. HENEQUEN.

Reported from Guam (cultivated). Not seen by the writer.

AGAVE VIVIPARA L. Sp. Pl. 323. 1753. Safford 1905: 176.

Merrill 1914: 67. LIRIO DE PALO.

Habit of the genus. Leaves unarmed except for a terminal spine. Flowers replaced by vegetative bulbils, resembling small green onions; these fall and take root, propagating the species; it is therefore naturalized.

Occasional in cultivation.

CORDYLINE Kunth

Erect woody plants, shrubby or like small trees; leaves petiolate, blades lanceolate or ovate-oblong, entire; inflorescence much-branched, among the leaves; ovary 3-celled; fruit a berry or loculicidal capsule; cells with several flattened seeds. Perianth cylindric at base, segments there connate. Syn. *Taetsia* Medik.

CORDYLINE FRUTICOSA (L.) Goepp. Nov. Act. Nat. Curios. 25: 53, 1855. Stone, Micronesica 1: 128. 1964. BASTON DE SAN JOSE; TI-PLANT.

Cordyline terminalis (L.) Kunth, Abh. Acad. Berl. 20, 1820.

Taetsia terminalis (L.) Wight ex Safford, 1905: 382.

Taetsia fruticosa (L.) Merrill, Interp. Rumph. Hb. Amb. 137. 1917.

Asparagus terminalis L. Sp. Pl. ed. 2, 1: 450. 1762.

Dracaena terminalis (L.) L. Syst. ed. 12, 246. 1767.

Convallaria fruticosa L. ex Stick. Herb. Amb. 16. 1754.

Stems erect, sometimes to 3 m. tall, leaves clustered near apex of branches; leaves lanceolate, up to 60 × 10 cm, green, red or purple, or variously marked, sometimes all unusually narrow; petiole 5–10 cm long; base sheathing. Inflorescence paniculate; flowers sessile, white, pink, or red, supported by 3 bracts; perianth shortly tubular, 6-lobed; stamens 6, inserted on the perianth; ovary 3-celled, cells with many ovules; fruit baccate, globose, about 5 mm diam., thinly fleshy, red or purplish, sometimes pink to white; seeds obovoid, flattened, often somewhat falcate, black, glossy.

Native in the Pacific Islands s. of Guam, but apparently introduced into Guam, as is apparent from the local use of a Spanish, rather than a Chamorro, name. Widely

cultivated and polymorphic, with many attractive color forms. The plants flower seldom and fruit rarely. They are however easily grown from cuttings. The roots yield a sweet extract, which may be fermented, or further distilled; the resulting liquor is the "okole-hao" of Hawaii. Agaña (5101).

Safford, following the renegade American Nomenclatural Rules, used the generic name *Taetsia* for this plant, and called *Sanseviera* by the present name *Cordyline*. This usage is not sanctioned now.

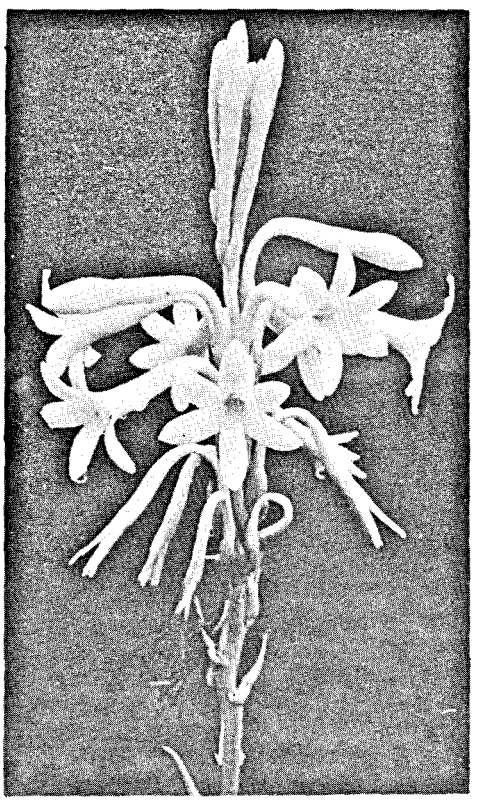


Fig. 17. Polianthes tuberosa.

POLIANTHES Linnaeus

Herbs with tuberous rootstock; leaves both radical and cauline, slender; flowers twinned, on erect, many-flowered spike, each pair subtended by a bract; perianth 6-parted; tube elongate; stamens 6, inserted near tube apex; ovary inferior, 3-celled; ovules many; fruit a capsule, with flattened seeds.

About 13 spp., Mexico and W. Indies. The following one is very common in cultivation in warm countries.

POLIANTHES TUBEROSA L. Sp. Pl. 1: 316. 1753.

AZUCENA; AMIGA-DE-NOCHE; TUBEROSE.

Rhizomes tuberous, fleshy; erect stems to 1–1.5 m tall, leafy; leaves basal and cauline, linear, up to 30 cm long, often spotted beneath; inflorescence terminal, spicate; flowers white, paired, 5 cm long; perianth tubular, lobed at apex; stamens included; flowers sweetly fragrant.

Mexico; introduced to Guam, where it is popular in gardens.

SANSEVIERA Thunberg

Fleshy perennial herbs with ensiform fibrous tufted basal leaves (sometimes terete); flowers racemose at the end of the scape; perianth 6-lobed, shortly tubular; stamens 6; ovary 3-celled, cells 1-ovulate, ovules erect; fruit baccate, subglobose 1–3-seeded.—Asia and Africa; about 2 dozen species.

SANSEVIERA GUINEENSIS (L.) Willd. Sp. Pl. 2: 159. 1800.

Stearn, Hunt Bot. Catal. 2: LII, 1961; Fosberg. Phytologia 15: 501. 1968.

TIGRE. BOWSTRING-HEMP.

Sanseviera zeylanica (L.) Willd. Sp. Pl. ed. 10, 2: 159. 1799?

S. trifasciata

Cordyline hyacinthoides (L.) Wight ex Safford 1905: 249.

Rhizomes creeping, sometimes above ground, sometimes underground; leaves erect, ensiform, to 1 m long, rather thick, fibrous-fleshy, variously striped and banded with white, yellow or shades of green, apex sharp-pointed; scape shorter than or as long as the leaves, slender, erect, strict; flowers yellowish-white or tinged greenish, arranged in a raceme, perianth basally cylindric, lobes revolute; marcescent in age; stamens 6; fruit a small globose orange berry with fleshy seeds.

Africa to India. Our plant, much-named in the past, is still in doubt. Very common in cultivation, both indoors and out, in rocky soil thriving best.

The fibrous leaves are the commercial source of 'bowstring hemp.'

PALMAE

Stems stout or slender, sometimes climbing, sometimes obsolete, often covered by the persistent leaf-bases; leaves in a terminal cluster (or in the viny species scattered), sometimes very large, entire or pinnately or palmately divided, the segments (leaflets) induplicately or reduplicately folded in bud; rachis often expanded at base into a sheath; flowers small, regular, perfect, or dioecious, sometimes polygamous, usually in a panicle subtended by a spathe; sepals 3; petals 3; stamens usually 6, rarely more; ovary superior. 1–3-celled or rarely 4–7-celled, or of 3 separate carpels; ovule solitary in each cell; fruit a berry or drupe.—Perhaps 150 genera and 1500 species, chiefly tropical.

Key to the Tribes

1. Perianth 6-parted (in the pistillate flowers at length enlarging and embracing the fruits).
   2. Leaves palmately nerved or divided.
      3. Leaf-segments induplicate in bud (V-shaped in c.s.).
         4. Flowers mostly bisexual ..... *Corypheae*

4. Flowers dioecious.....*Borasseae*
3. Leaf-segments reduplicate in bud (A-shaped in c.s.).....*Lepidocaryeae*

2. Leaves pinnately nerved or divided.
5. Leaf-segments reduplicate in bud.
6. Pericarp of the fruit composed of imbricate reflexed scales.... ..... *Calameae*
6. Pericarp of fruit not of scales.
7. Endocarp of fruit without pores.....*Areceae*
7. Endocarp of fruit with 3 pores.....*Cocoineae*
5. Leaf-segments induplicate in bud.....*Phoeniceae*

1. Perianth rudimentary in either sex; fruits crowded into a head..... ..... *Phytelephantineae*

Key to the common wild and naturalized palms found in Guam

1. Leaves palmate (fan-shaped).....various cultivated genera (See Moore & Fosberg, Palms of Micronesia, Gentes Herb. 8(6). 1956.)
1. Leaves pinnate (feather-shaped),
2. Stemless palms of swamps.....*Nypa*
2. Not as above,
3. Leaf-sheaths elongate, closed or with only a V-shaped sinus at the top, crowded into a columnar shaft or pseudo-stem below the crown; inflorescences borne below the leaves; solitary pistillate flowers and fruit borne at the base of very slender rachillae crowded with small staminate flowers.....*Areca*
3. Leaf-sheaths splitting opposite the petiole or interspersed with fibrous sheaths but not forming a shaft or pseudo-stem; inflorescences borne among the leaves.
4. Fruits small (pea-sized), red; leaf-sheaths notably glaucous below the petiole; leaflets slender.....*Heterospathe*
4. Fruits large, green or brownish-orange; leaf-sheaths not glaucous; leaflets broader.....*Cocos*

In Guam the following genera are found in cultivation:

Fan-palms; *Sabal; Livistona; Latania.*

Pinnate-palms; *Washingtonia; Metroxylon; Calamus; Dictyosperma; Veitchia; Ptychosperma; Caryota; Arenga; Elaeis; Guilielma; Phoenix; Roystonea.*

Key to Palms based on the vegetative features

(Adapted from Moore & Fosberg in Gentes Herbarum 8(6), 1956, in part).

1. Leaves palmate ("fan-palms").
2. Stems lacking, or very short; panicles arising from the base.....*Sabal*
2′ Stems present, well-developed.

3. Petioles with stout marginal prickles (these rarely reduced); leaf-segment tips slender, dangling.....*Livistona*
3′ Petioles unarmed, or merely rough
4. Leaves and petioles green.....*Sabal*
4′ Leaves bluish-green, or green but petioles red.....*Latania*

1′ Leaves pinnate ("feather-palms")
5. Spiny woody climbers.....*Calamus*
5′ Treelike, not climbing,
6. Leaf-blades bipinnate, segments broader than long, oblique, jagged; first inflorescences toward top of stem, later ones progressively lower .....*Caryota*
6′ Leaf-blades once pinnate; inflorescences not as above,
7. Lower leaf-segments stiff, spinelike; trunk more or less covered by leaf-bases.....*Phoenix*
7′ Lower leaf-segments not spinelike, although petiole may be short-spiny; trunk commonly smooth, or rough to spiny,
8. Stem horizontal, in mud; leaves erect, dark; plants of tidal and riverine swamps.....*Nypa*
8′ Not as above,
9. Leaf-sheaths elongated, closed or with a shallow V-shaped opening at apex; sheaths crowded, forming a columnar crownshaft; inflorescences produced below the leaves.
10. Trunk and rachis covered with long black spines. .....*Guilielma*
10′ Not so,
11. Leaf-segments with jagged, blunt, or oblique and toothed tips,
12. Leaf-segments not plicate; margins thickened,
13. Seeds 5-grooved in cross-section, endosperm uniform; forest palms of Caroline Islands, not in Guam .....*Ptychosperma*
13. Seeds round in cross-section, endosperm ruminate (in our sp.); cultivated..... *Veitchia*
12. Leaf-segments plicate at least at base, and with thin margins,
14. Leaf-segments deeply jagged at tip; inflorescence simply branched, the flowers on long branchlets, in 2 rows; Palau Is. (not in

Guam).....*Pinanga*

14. Leaf-segments toothed at tip; inflorescence with most branchlets basal; cultivated and naturalized .....*Areca*

11. Leaf-segments with acute tips,

15. Leaf-segments diverging from rachis at various angles so that leaf has a ragged look; mature stem usually not ringed; very big palms..*Roystonea*

15. Leaf-segments diverging at same angle, in one plane.

16. Leaf-segments stiffly spreading; trunk ringed, surface dark, splitting.....*Dictyosperma*

16. Leaf-segments drooping or ascending,

17. Sheaths, internodes glaucous; leaf-segments drooping; (not in Guam)..... .....*Clinostigma*

17. Sheaths, internodes not glaucous; leaf-segments ascending; (not in Guam)... ..... *Gulubia*

9. Leaf-sheaths splitting opposite the petiole, or interspersed with fibrous sheaths, never forming a columnar crownshaft; inflorescences borne among the leaves.

18. Petioles armed with spines; leaf-segments with sharp tip; fruit globular, scaly, glossy brown, hard, with bone-hard white endosperm..... .....*Metroxylon*

18. Not with above character combination;

19. Stems clothed with persistent black fibers, spiny; leaf-segments blunt, bases auriculate .....*Arenga*

19. Stems not clothed with black fibers; leaf-segments otherwise,

20. Leaf-sheaths glaucous below the petiole; leaves arching and twisting, the segments with drooping tips; inflorescence much-branched; fruit small, globose, red.....*Heterospathe*

20. Not as above,
    21. Leaves spreading, segments diverging at various angles, not all in same plane; lower segments with thickened bases, and persisting as spiny processes on the rachis; fruits small, oily..*Elaeis*
    21. Not as above; leaf-segments in one plane; petioles smooth; fruit very large.....*Cocos*

ARECA Linnaeus

Monoecious pinnate palms; sheaths forming a crownshaft below the leaf crown, tardily splitting; leaf-segments reduplicate in bud, the tips erose-truncate; inflorescence at base of crown-shaft, subtended by a large, caducous, woody bract, many-branched, mostly from near the base; flowers in groups of 3, 2 of them staminate, the third pistillate, near base of branchlet; staminate flowers with 3–24 stamens; pistillate flowers much larger, with 1 unilocular ovary; fruit ovoid-oblong, smooth, red or green or yellow; endocarp moderately thick; endosperm ruminate; embryo basal.

One species in Guam.

ARECA CATHECU L., Sp. Pl. 1189. 1753. Safford 1905: 187, pl. 35.

Merrill 1914: 63. Moore and Fosberg, Gentes Herb. 8(6) no. 20. 449. 1956.

PUGUA. BETEL-NUT PALM.

Single-stemmed, up to 10 m tall, trunks usually pale gray, straight, slender, with conspicuous well-spaced even paler grayish-white rings; leaves with short petioles, dark green, with about 12 pairs of segments; sheath about 60 cm long, green; segments plicate at the base, blunt and somewhat toothed at the tip, up to nearly 50 cm long and 6 cm wide; inflorescence axis to 30 cm long, with main branches as long; staminate flowers 5 mm long; pistillate flowers 1.5–2 cm long, basal; fruit ovoid-oblong, about 4 cm long and slightly more than half as thick, usually red or orange when mature.

Introduced from Indo-Malaysia probably by the original settlers of Guam; now widespread in cultivation and naturalized. In all villages, and very abundant in southern Guam in valleys of volcanic hills. Mangilao (4165); Barrigada (4894).

The fruit, fresh or dried, is chewed as an astringent and stimulant, often together with a leaf of the betel-pepper (*Piper betle*) and a pinch of lime; this causes the saliva to turn red.

ARENGA Labillardière

Erect monoecious palms, our sp. large, usually single-stemmed. Leaves large to gigantic (over 30 ft. long), 1-pinnate, dark; leaflets trough-shaped, sessile, narrowly oblong, base unequal, apex notched, with firm midrib; uppermost leaflets

remaining ± attached. Leaf-sheaths appressed, decomposing into firm black fibers. Inflorescences among the leaves, branched, occasionally bisexual; spathes imbricate; spikes more or less pendulous. Flowers single or in triads (center female, 2 laterals male) perianth trimerous; stamens many (in male fls.); ovary 3-celled, 3-stigma'd (in female fls.). Fruit 2-3-seeded; endosperm not lobed.— A few species in Tropical S. E. Asia, Indonesia, Philippines.

ARENGA PINNATA (Wurmb) Merrill, Int. Herb. Amb. 119. 1917.

CABO-NEGRO. SUGAR-PALM.

A. saccharifera Labill. Mem. Inst. Par. 4: 209. 1801.

Saguerus pinnatus Wurmb, Verh. Batav. Gen. 1: 351. 1779.

Safford 1905: 368.

Trunk single, stout; leaves of unequal segments; sheaths mostly persistent, fibrous, blackish; leaf-segments pale green beneath; bases auriculate; petiole with spiny margin; inflorescence a large branching spadix, the branches drooping; spathes many, caducous; fruit a yellow-brown 3-seeded drupe, about 6–8 cm thick.

Introduced from the Philippines; rare if still persisting in Guam. The black sheath fibers make a durable, cable-like rope; the sap may be used for its sugar content.

The leaves may bear as many as 100 pairs of segments; these are often somewhat grouped in fascicles of 4 or 5; and blunt or rounded at the tip.

CALAMUS Linnaeus

Shrubs or climbing palms (rattans) with hooks. Leaves pinnate, spiralled, the midrib (in some species) prolonged into a hooked flagella (the cirrus); sheath cylindric, rather long, ligulate at the upper end, sometimes flagellate. Leaflets linear, numerous, sometimes ciliate. Inflorescences unisexual (dioecious), inserted on petiolar sheath, often branched; main axis sometimes prolonged into a flagellate extension. Flowers numerous, in spikelets, female fls. usually beside sterile male fls. Calyx briefly 3-lobed. Stamens 6, filaments somewhat connate, surrounding (usually) a pistillode. Corolla 3-fid, staminodes 6, ovary 3-celled, in female fls. Fruit dry, stylose, within a scaly pericarp.

CALAMUS sp. RATTAN, ROTAN. BEJUKO-N-HALUMTANO.

Woody climbing vine, viciously spiny, the spines often hooked, the sheaths prickly; leaves pinnate, the rachis prolonged into a flagella armed with hooks; fruit covered by imbricate scales.

An unknown species was introduced into Guam but has probably disappeared.

The trunks are the source of rattan, often used in making furniture.

CARYOTA Linnaeus

The only genus of palms with bipinnate leaves; Old World, Asian tropics.

CARYOTA URENS L. Sp. Pl. 1189. 1753. WINEPALM; FISHTAIL PALM.

Erect, single-stemmed, bipinnate palms; leaf-segments cuneate, oblique, the

tips irregularly and jaggedly toothed, often broader than long; entire leaf to 5 or 6 m long; inflorescence below the leaves, each successive one produced from the next lower node; after last, lowest node bears inflorescence, the plant dies. Fruit red.

Introduced to Guam in 1911 by the Guam Expt. Station. One big tree is located on the south inland corner of Marine Drive and the north road leading to Nimitz Hill.

Cocos Linnaeus

Trunk solitary, tall, often curved-ascending at base; leaves pinnate, with reduplicate segments, midrib prominent; sheath coarsely fibrous; inflorescences borne among the leaves, each subtended by a stout, woody, boat-shaped, beaked, subpersistent bract; spadix paniculate, simple branched; flowers in groups of 3, two staminate, one pistillate, but only the staminate flowers produced near tips of branchlets; staminate flowers asymmetric, 12–15 mm long, with 6 stamens and a pistillode; pistillate flowers much larger, subglobose, with a low staminodial ring at base of ovary; ovary 1-celled; fruit large, various in shape, from subglobose to ovoid or ellipsoid, often distinctly 3-angled, blunt or obtuse ot rounded at apex, with a thick fibrous husky; endocarp bony, with 3 pores at the base; endosperm homogeneous, at first liquid, watery, potable; later solid, firm, oily, hollow.—A monotypic East-Asian or Malayo-Polynesian genus; place of origin not known.

COCOS NUCIFERA L. Sp. Pl. 1188. 1753. Safford 1905: 233–243, pls. 43, 44. Merrill 1914: 63. Moore and Fosberg, Gentes Herb., 8(6) No. 20, 472. 1956. (with full bibliography). NIYOG. COCONUT.

Recognizable from the generic description. Of aboriginal introduction, now common nearly everywhere in Guam. The best trees seem to be those of the south-east coast along the beaches. Most of the trees in Guam are sick of an undiagnosed malady, perhaps of virus origin, with many symptoms of the 'cadang-cadang' disease of the Philippines; the growth is arrested, the stem tip grows slender, the leaves are successively smaller, yellower, and more twisted; fruits and inflorescences successively smaller, at last failing to appear; crown apex at last dying, leaving the bare trunk erect until it rots. The trees are also attacked by the Marianas coconut beetle, *Brontispa mariana* which bores into the terminal bud; since each palm has only one bud, and cannot branch or grow from suckers, the tree dies. It is possible that the beetle may spread the virus—if it is a virus. 'Coconut meat' (copra, when dried) is the source of a useful oil, in soap and oleomargarine.

DICTYOSPERMA Wendland & Drude

Erect unarmed monoecious or dioecious clump-forming dwarf palms with slender stems. Leaves imparipinnate, petioles short; leaflets present in moderate number. Inflorescences uni- or bisexual, axillary, simple to branched, spathaceous; Flowers in spikes or spikelets, trimerous, sepals imbricate, partly connate, petals valvate; stamens 6 to 30, shortly connate at base; ovary 3-(or 2-) celled. Fruit

1–3-seeded; endosperm entire.—A North Indian-Indochinese-Malaysian genus of 8 species.

DICTYOSPERMA ALBUM (Bory) Wendl. and Drude, Linnaea 39: 181. 1875. RED PALM.

Slender-stemmed, unarmed, prominently ringed, often splitting into corky sections, dark brown or black; leaves pinnate, the sheaths elongate, forming a crownshaft, segments with sharp tips, spreading stiffly at right angles to the rachis, reduplicate in bud; inflorescence borne below the leaves; flowers unlike, with the pistillate flowers smaller than the staminate ones; in groups of 3, two staminate and one pistillate; staminate flowers with 6 stamens and subequal petals; fruit with persistent remnant of stigma; endosperm ruminate.

Reported to be cultivated in Guam. The trees may attain a height of 10 m, the leaves a length of 4 m, the segments 60–90 cm. Leaf-segments 7-veined.

ELAEIS Jacquin

Erect single-stemmed unarmed monoecious palms. Leaves 1-pinnate, leaflets numerous, linear. Stems with persistent petiolar remnants. Inflorescences unisexual, among the leaves, 1-branched. Spathes 2. Flowers trimerous, crowded, the male and female on separate inflorescences; male fls. in cavities on the axis; females not so, bracteate. Sepals imbricate; petals valvate. Stamens 6, connate; pistillode in male fl. Ovary usually 3-celled, with a stout style and 3 stigmas. Drupe 1–3-seeded, oily, fibrous; endocarp with 3 apertures; endosperm entire.

ELAEIS GUINEENSIS Jacquin, Select. Am. 280. 1763. AFRICAN OIL PALM.

Trunk stout, solitary, covered by the persistent leaf-bases above, bare below, there dark gray-brown, ringed. Leaves large, pinnate, the lower segments as spines on the petiole margin; segments many, irregularly divergent, somewhat fascicled in 4's or 5's; inflorescence large, headlike, with spinose tipped branches, borne close to the trunk, among the leaves.

Africa. Introduced to Guam in 1911; now scarce or? absent. An important commercial plantation palm yielding a valuable oil, extracted from the fruits.

GUILIELMA Martius

Erect, single or several trunked, medium monoecious palms. Leaves paripinnate, petioles thorny; leaflets linear-lanceolate, set at various angles on the midrib. Inflorescences among the leaves, bisexual, unbranched, spikes numerous, bispathaceous. Flowers often in triads (center female, 2 laterals male), trimerous; stamens 6; ovary slightly lobed. Fruits orange, fleshy; endocarp with broad fibers; apical openings 2.

Brazil. A genus close to *Bactris* Jacq.

GUILIELMA GASIPAES (Humboldt, Bonpland, & Kunth) Bailey. Gentes Herb. 2: 187. 1930. PEJIBAYA PALM.

Trunk to 8 m high, ringed with spiny bands; somewhat soboliferous; leaves pinnate, the segments linear, acuminate, usually diverging at various angles from

the rachis; segments pale green beneath, darker above, margins prickly. Fruit yellow and red, about 5 cm long, in pendent bunches; thick outer flesh is edible.

Reported by Bryan (12 Feb. 1958) to have been introduced to Guam experimentally. Not, or very rarely, persisting. A Tropical American palm.

HETEROSPATHE Scheffer

Erect, tall, single-stemmed, pinnate-leaved, monoecious palms. Sheaths not closed, not forming a crownshaft. Leaf-segments reduplicate. Inflorescences among the leaves, richly branched. Outer and inner bracts present. Flowers usually in groups of 3, two staminate and one pistillate; staminate flowers with imbricate rounded sepals; petals valvate; stamens 6. Pistillate flower with similar sepals, basally imbricate petals, staminodes 3, ovary unilocular. Fruit small, subglobose, exocarp thin; seed subglobose; endosperm ruminate.—Philippines, Solomons, and Micronesia—a small genus.

One species in Guam.

Heterospathe elata Scheffer, Ann. Jard. Bot. Buitenzorg 1: 162. 1876.

Moore & Fosberg, Gentes Herb. 8(6) no. 20, 445. 1956. PALMA BRAVA.

Tree to 16 m high, trunk to 20 cm diam., thicker near the base. Crown of arching leaves, resembling coconut lvs. but the segments more slender and numerous. Leaves to 3.5 m long, segments distichous, about 65 pairs. Sheaths glaucous externally, dotted with brown scales, to 75 cm long. Petiole to about 50 cm long, sparsely scaly. Segments up to 60 cm long, 3.5 cm wide. Inflorescence among the leaves; a compressed, slightly curved bract 30–40 cm long at base, at first scaly and its margins woolly; inner bract attached well above outer bract, about 70–75 cm long; whole panicle to 160 cm long, very much branched; branchlets to 20 cm long; flowers in 3's, rarely in pairs, white; staminate flowers about 1.5 mm wide, with a pistillode 1.4 mm high; pistillate flowers about 3 mm long, nearly 5–6 mm wide, with 3 staminodes; ovary ovoid-oblong; fruit white at first, finally red, subglobose, about 6–7 mm thick, with thin exocarp.

Philippines and Guam. This is the typical var. *elata*; in Palau there occurs an endemic variety (var. *palauensis* Becc.). Possibly native in Guam, or of early introduction. In Guam confined to the central part of the island, especially around the Agana-Naval Hospital road, on limestone bluffs; also in the La Cienaga swamp; a few in the hills of the Ylig River behind Yona; common along the Fonte River.

A handsome tall palm worthy of extensive planting for ornament.

LATANIA Commerson ex Jussieu

Tall erect single-stemmed unarmed dioecious palms. Leaves in terminal crown, fan-shaped, costapalmate, leaflets linear acuminate, petiole spiny to hairy. Inflorescences among the leaves, bisexual, branched. Flowers trimerous; stamens mostly about 30 (21–36), more or less connate; pistillode in male fls. Ovary 3-celled with 3 stigmas. Fruit 1–3-seeded; endosperm hard, entire.—A Mascarene genus of 3 species.

LATANIA LODDIGESII Martius, Hist. Nat. Palm. 3: 224. 1838. BLUE LATAN.

Trunk single, erect to 7–10 m high (or more in a few cases); leaves palmate; petiole to 2 m long, up to 20 cm wide, reddish in age; leaf-segments bluish-gray, narrow, pointed, numerous. Young petiole with a close felt-like indument, and when young with a few marginal teeth. Dioecious. Stam. fls. with 15–30 stamens. Fruit subglobose, 4 cm thick.

Mascarene Islands; widely cultivated. Rare in Guam gardens. (Endemic to Mauritius).

LIVISTONA R. Brown

Erect, single-stemmed, with hermaphrodite flowers and palmate leaves; segments bifid or bipartite; inflorescence among the leaves, much-branched; flowers perfect; stamens 6, carpels 3, usually only one maturing into fruit; fruit subglobose or somewhat reniform; endosperm homogeneous.

One cultivated species in Guam.

LIVISTONA CHINENSIS (Jacquin) R. Brown, ex Martius, Hist. Nat. Palm 3: 240. 1838. Moore & Fosberg, Gentes Herb. 8(6) no. 20, 433. 1956.

var. SUBGLOBOSA (Hassk.) Beccari. CHINESE FAN PALM.

Trunk to 10 m (rarely 15–20 m) tall, nearly 25 cm thick; petioles up to 2 m long and 15 cm broad, the margins spiny (on younger leaves); leaf-segments joined mutually about halfway up; midrib of segments yellow; apex bifid; tips abruptly drooping, vertical; fruit dull bluish-green.

China. Cult. in many countries. Fairly common in gardens in Guam.

METROXYLON Rottboell

Massive, erect or obliquely ascending monoecious palms, in most species flowering at old age then dying; leaves along distal end of stem, paripinnate, dark, rather massive, leaflets linear acuminate distichous. Petiole ventral-grooved, armed or not. Inflorescences bisexual terminal or among the leaves. Male fls.: stamens 6; trimerous. Female fls.: staminodes 6; ovary scaly, seemingly 1-celled. Fruit subglobose with down-pointing glossy scales; endosperm very hard, entire.

METROXYLON AMICARUM (Wendland) Beccari, Ann. Roy. Bot. Gard. 12(3): 187. 1918. Moore & Fosberg, Gentes Herb. 8(6) no. 20, 439. 1956.

IVORY-NUT PALM.

Sagus amicarum Wendl. Bot. Zeit. 36: 115. 1878.

Coelococcus amicarum (Wendl.) Warb. Ber. Deutsch. Bot. Ges. 14: 140. 1896; also Wight ex Safford 1905: 244; Merrill 1914: 63.

Tall or very tall (20–50 m), stems single or clumped, with short root-spines; leaves to 5 m long, pinnate, with about 85 pairs of segments; sheaths lepidote and sometimes spiny when young, about 90 m long; segments acuminate, linear-lanceolate, up to 110 cm long and 10 cm wide, somewhat grouped into fascicles of 2–4; inflorescence among the leaves, paniculate, to 125 cm long, branches bracteate; flowers in crowded spikes about 10–14 cm long; staminate flowers maturing first,

to 12 mm long, stamens 6, with basally connate filaments; pistillate flowers similar, with sterile stamens and ovoid ovary with scaly covering; fruit subglobose, 7–12 cm diam., the base concave, exocarp with about 24 rows of glossy, firm, overlapping scales each broadly deltoid, about 2 cm broad and 1.2 cm tall; seed basal; endosperm very hard, white.

Caroline Islands (Truk; Ponape), endemic; a few planted in Guam. The dense endosperm formerly was used in the manufacture of buttons.

Most species of *Metroxylon* are monocarpic, i.e. the terminal bud develops into a massive inflorescence, and when all fruits have matured, the tree dies; but in this species, the inflorescences are axillary. Other species are called *sago* palms; their trunks may be used as a source of edible starch, as in New Guinea and Malaysia.

NYPA Wurmb

Stems prostrate except for briefly ascending tips, rhizomatous, subterranean under mud of riverine or mangrove swamps; leaves large pinnate, 3–5 m long, with about 42 pairs of segments, mostly alternate, linear, acute or attenuate, up to 170 cm long and over 6 cm wide, glabrous except for a few scales dorsal on the midrib; inflorescence axillary, near the ground, pedunculate, erect, up to 75 cm long, monoecious; staminate flowers in dense bracteate spikes, about 3 mm long, stamens 3, fused, no pistillode; pistillate flowers in a globose head, perianth of 6 vestigial scales, carpels 3; fruit a large globose syncarp, the segments cuneate-obovoid, ribbed, capped by a short stigmatic beak.

A monotypic genus of Malaysia.

NYPA FRUTICANS Wurmb, Verh. Batav. Gen. 1: 349. 1779. NIPA.

Safford 1905: 334. Moore and Fosberg. Gentes Herb. 8(6) no. 20, 475. 1956.

With the characters of the genus. The large fruiting heads reach a diameter of 30 cm, the individual segments a length of 10–11 cm. The seed is edible when still young.

Introduced from the Philippines, where it is native, now naturalized at the mouth of most streams in Guam, though not very common except on the east coast; fairly abundant on the Pago River, the Ylig River, and further south, where the water is brackish. Talofofo R. (5135).

Native in the Caroline Islands. Leaves provide a thatch; young inflorescences a sugary sap, from which alcohol can be manufactured.

PHOENIX Linnaeus

Erect single- or several-stemmed palms, dioecious, medium to tall; stems covered by petiolar remnants. Leaves imparipinnate, leaflets numerous; merging by transitional forms to lateral spines lower on the rachis; distal leaflets without midrib but 2 other nerves. Inflorescences unisexual, among the leaves. Spathe 1. Flowers borne in pits on the spikes, trimerous. Male: stamens 3 to 9. Female: ovaries 3, separate, each with terminal stigma. Drupe 1-seeded with thin endocarp,

large seed; endosperm with a median groove, hard, slightly ruminate or not.

Date-palms; India and Africa, to the Canary Islands.

PHOENIX DACTYLIFERA L. Sp. Pl. 1188. 1753. DATE PALM

Trunk single, tall, stout, covered with old petiole bases; leaves large, pinnate, to 5 m long, segments 2-ranked, about 40 pairs, to 45 cm long, grayish-green, stiff, acute, diverging at subequal or unequal angles, vernation induplicate. Inflorescence among the leaves, to 120 cm long, pendent in fruit; flowers white, sweet; fruit oblong, up to 7–8 cm long, usually less, orange-brown, edible if pollinated. Dioecious.

Introduced sometime before 1900, according to Safford. Native of North Africa and the Mediterranean near East. The basal leaf-segments are long spines.

PHOENIX SYLVESTRIS Roxburgh, Hort. Beng. 73; Fl. Ind. 3: 787. 1832.

Similar to the preceding species, but with smaller fruits, and paler leaves.

Native of India.

Source of date-sugar.

According to Bryan (12 Feb. 1958) these species hybridize and some hybrids may be present in Guam.

Neither of these date-palms is at all common in Guam.

ROYSTONEA O. F. Cook

Tall erect unarmed monoecious palms. Leaves paripinnate in a terminal crown; crownshaft distinct, elongate. Leaflets numerous, 1–2-rowed, linear, apex notched. Inflorescences below the crownshaft. Spathes 2, caducous (one earlier). Flowers trimerous, single or in triads, unisexual. Stamens 6 or 9, filaments free. Ovary 3-celled. Fruit 1-seeded; mesocarp thin fleshy; endocarp thin woody; endosperm homogeneous.—Elegant large Tropical American palms (one species indigenous in Florida).

ROYSTONEA ELATA (Bartram) Harper, Proc. Biol. Soc. Wash. 59: 29. 1946.
FLORIDA ROYAL PALM.

Tall, single-trunked, monoecious, pinnate palms. Trunk occasionally to 33 m tall, pale grayish-white; crownshaft long, glossy green; leaves to 3 m long, petiole short, leaflets diverging at various angles, nearly 1 m long; inflorescence below the leaves, many-branched, bracteate with a long, slender, woody, boat-shaped spathe; flowers usually in groups of 3, of which 2 are staminate, 1 is pistillate; sepals 3; staminate flowers with 6 stamens; pistillate flower with 3 carpels, only 1 developing to fruit; fruit oblong-subglobose, less than 2 cm thick, purplish, 1-seeded.—The species was formerly in *Oreodoxa*.

Tropical Florida, U.S.A. Introduced in Guam. Bryan (29 Jan. 1958) states that several trees occur at the Government buildings area around the Plaza in Agana.

SABAL Adanson

Unarmed palmate-leaved palms with erect or creeping, aerial or subterranean stems; leaf-segments with marginal fibres; flowers in panicles, perfect; calyx 3-

lobed; petals 3; stamens 6, filaments connate basally; ovary 3-celled; drupe with thin epicarp and fleshy pericarp; seed subglobose, with osseous endosperm.

SABAL MINOR (Jacquin) Persoon, Syn. 1: 399. 1807. DWARF PALMETTO.

Erect, often short- or dwarf-trunked, solitary, monoecious, palmate palms. Leaves rounded, the segments basally 1/3 joined, stiff, usually split at tip, 20–30, green or slightly blue-green; entire leaf up to 150 cm across; petiole half the length of the leaf, not spiny; inflorescence among the leaves, without a basal spathe but with upper bracts; flowers hermaphrodite, the calyx tubular; stamens 6; carpels 3; fruit firm, globose, usually 1-seeded, about 8 mm thick, black, shiny; endosperm homogeneous.

S.E. U.S.A. (Georgia, Florida, west to Texas). Introduced to Guam, occasional in gardens.

The trunk is usually not developed; the leaves appear to rise direct from the ground or from a short-crown. The young inflorescence is erect and may be longer than the leaves, but in fruit is drooping.

VEITCHIA Wendland

Erect rather slender palms. Leaves pinnate; leaflets elongated, truncate and praemorsely dentate at apex. Crownshaft glossy green. Inflorescences lateral, branched; male flowers leathery, symmetrical, with many stamens, yellowish-white or greenish-white. Fruit symmetrical, smooth, usually red, stigma apical, endocarp thin, seed ovate, albumen uniform or ruminate.—A genus of 6 species from the South-west Pacific; Fiji, New Caledonia, New Hebrides.

VEITCHIA MERRILLII (Beccari) Moore, Gentes Herbarum 8: 501. 1957.
MANILA-PALM.

Adonidia merrillii (Becc.) Becc. Philipp. J. Sci. Bot. 14: 329. 1919.

Erect, tall, single-trunked palm with pinnate leaves; monoecious; trunk to 6–7 m tall, usually less; crownshaft about 50 cm long; leaves to 2 m long, arched, with about 50 pairs of segments, most ascending from the rachis; segments to 60–75 cm long, bright green, lanceolate; inflorescence below the leaves, branched, the branches very pale (nearly white); flowers creamy; fruit ovoid, about 3 cm long, smooth, glossy red.

Philippines (Palawan); introduced to Guam. Beccari regarded this species as constituting a monotypic genus, *Adonidia.*

PANDANACEAE

Trees, shrubs, or woody vines, often with aerial roots; leaves mostly spiralled, cauline, ensiform, sheathing at base, keeled, spinulose-dentate; inflorescences unisexual, the flowers dioecious, paniculate or in compound or simple spadices enclosed by spathes; perianth rudimentary or lacking; male flowers of numerous stamens; female flowers of free or variously united carpels, often forming elongate or globose heads (cephalia); style absent or short; ovary superior; ovules 1-many, basal or parietal, anatropous; fruit drupaceous or baccate.—3 genera, Africa, Asian

tropics, Pacific Islands.

1. Woody climbers; leaves with lateral basal membraneous auricles; ovaries with numerous ovules, maturing into slender-berry-like fruits; spadices commonly 3 (or 1–5) in a cluster.....*Freycinetia*
1. Trees or large shrubs, leaf-bases sheathing and expanded but lacking auricles; ovaries with solitary ovules, maturing into more or less woody drupes or polydrupes; spadices solitary or in bracteate racemes.....*Pandanus*

FREYCINETIA Gaudichaud

Woody climbers with often stout stems emitting clasping aerial roots; leaves narrow, spiralled, the bases with lateral auricles (these often fragile and caducous), the margins commonly denticulate; bracts of inflorescences usually colored (often reddish or pink); spadices on short peduncles surrounded by broad fleshy white or colored spathes; staminodia occasionally present in pistillate spadices. Ceylon to Pacific; about 180 species.

Freycinetia reineckei Warb., Bot. Jahrb. 25: 578, t. 8. 1898. FIANITI

Freycinetia mariannensis Merrill, Philipp. J. Sci. Bot. 9: 48. 1914.

Stone, Gardens' Bull. (Singapore) 21: 140. 1967. Syn. nov.

Woody climber with roots from nodes; leaves linear, to nearly 1 m long, up to 5–6 cm wide; auricles unarmed. Pedicels glabrous; syncarps usually 3, oblong, fleshy; carpels berrylike, very slender, dark red when ripe; seed slightly lunulate, the raphe exceeding the seed slightly at both ends. Stigmas usually 2.

Marianas Islands; Palau. Type from Samoa. This species is very similar to *F. ponapensis* Martelli, of Ponape, which however has the pedicels slightly scabrid and nearly straight seeds. The Palau form has been described as *F. carolinensis* Kanehira; however, Kanehira later (Bot. Mag. Tokyo 51: 906. 1937) reduced it, and undoubtedly correctly so.

On Guam, this plant is found commonly in forests of the southern part of the island, but is also present on the northern limestone forest formation, climbing to considerable heights on tree trunks, or sometimes sprawling and covering the ground.

PANDANUS Stickman

Unisexual trees with aerial proproots; stems sympodial; leaves long, narrow, sword-like, keeled, sheathing at base, in 3 spiral series, margins and keel often toothed, blades M-shaped in cross-section; inflorescences large, commonly pendent, the male infl. of short duration; spathes white or colored; male infl. commonly racemose, or reduced to a single spadix; female fl. racemose or of a single head (syncarp or cephalium); ovaries separate or firmly connate into polydrupes (keys or phalanges), fibrous, with bony endocarp and pulpy pericarp, commonly red or orange or yellow, sometimes edible; ovule solitary in each carpel, but in polydrupes often the outer carpels sterile; seeds with edible endosperm.—500–600 species, Africa, Asia and Pacific Islands, Australia.

As here interpreted, there are two species present in Guam.

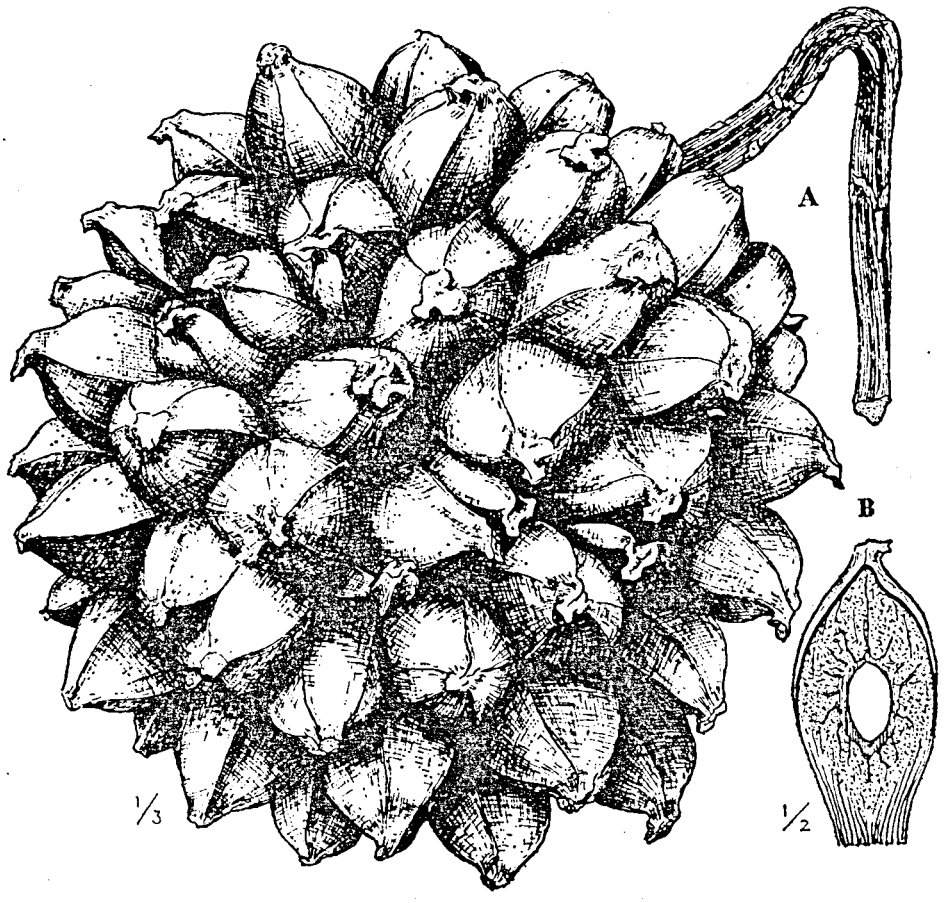


Fig. 18. Pandanus dubius.

1. Leaves usually over 10 cm broad, thick, the tip bluntly rounded with a short pointed projection; male inflorescences with creamy yellow spathes; female inflorescence a pendent solitary head of large waxy slightly purplish mostly 1-seeded drupes..... *Pandanus dubius*

1. Leaves relatively narrower seldom over 10 cm broad, and thinner, the tip produced into an elongate whiplike extension; male inflorescences with white spathes; female heads solitary, pendent, the phalanges mostly polydrupes of 3 or more carpels, sometimes 2 or 1, green apically, ripening to orange in the lower portion.. *P. fragrans*

(Sect. Hombronia)

Pandanus dubius Sprengel, Syst. Veg. 3: 897. 1826. PAHONG.

Tree with aerial roots and thick, forking stems; leaves to 20 cm broad, commonly 1–3 m long but sometimes more, the apex abruptly acuminate and short caudate; male inflorescence pendent, branched, with bright lemon-yellow bracts,

male spikes cylindric, dense, white, fragrant, composed of numerous staminate phalanges, these composed of many (10–20) stamens; perianth absent; female inflorescence always on separate tree, in flower with similar lemon-yellow bracts, these caducous; head globose, of many 1–4-celled drupes, mostly 1-celled, these up to 15–18 cm long, pointed apex with usually 1 or 2 U-shaped stigmas, inner tissue white, pithy, enclosing a central large seed (rarely 2) within a thin, reddish, endocarp; seed with edible white endosperm.

On or near seacoasts from Java to the Pacific Islands. In Guam, occasional or locally abundant on limestone, mostly on the northern plateau, but also scattered in the southern part on limestone-capped hills such as Mt. Almagosa. Yigo-Atdosco (4264, 4265); Barrigada Hill (4672); N.C.S. beach below Harmon, (3801–a); Barrigada-Harmon (4025); Mt. Almagosa (4901).

The very broad abruptly acuminate-caudate leaves, the large fruits with purplish-waxy bloom, the broad, bright lemon-yellow bracts, and the large fruits which are generally 1-seeded, clearly distinguish this species. The edible seeds have a flavor much like coconut meat. The leaves with their waxy coat make a useful water-proof mat material.

(Sect. Pandanus)

Pandanus fragrans Gaud., Bot. Voy. Bonite t. 22. 1851; Martelli, Bot. Mag. Tokyo 48: 117, f. 2. 1934. KAFU.

P. Kafu Martelli, Webbia 4: 405. t. 19, f. 1–3. 1914.

P. charancanus Kanehira, Bot. Mag. Tokyo 50: 523. f. 47–48. 1936.

P. rotensis Hosokawa, Acta Phytotax. Geobot. 13: 163. 1943.

P. pseudomenne Hosokawa, l.c.

Tree with aerial roots and forking trunks; leaves narrow, sublinear, elongated, rarely over 8 cm wide, 1–3 (or more) m long, tip very gradually narrowed and drawn out into a long flagella; margins and midrib with short curved teeth; male inflorescence pendent, a branched spadix with narrow boat-shaped white bracts and white, fragrant, cylindric, multistaminate spikes; staminate phalanges of many (about 20) stamens, borne subracemosely; female inflorescence in flower with white bracts, these soon caducous; bracts withering; fruiting head pendent, globose, composed of numerous 1–12-celled woody polydrupes, with orange pulpy base, greenish tips, fleshy-fibrous, upper mesocarp chambered pithy, seeds several, together enclosed in thick, very hard, reddish, bony endocarp; female phalanges (polydrupes) seldom over 10 cm long.

Marianas Islands, endemic, but very similar to species elsewhere in Micronesia and to *P. boninensis* of the Bonin Islands. A similar species, *P. fischerianus*, is widely cultivated in the Marshall Islands.

A number of different species have been reported from the Marianas, but there is (besides the preceding *P. dubius*) clearly only one, with however a considerable variability, particularly in the fruits. It is possible, however, that the Carolinians formerly residing in Saipan introduced some southern Micronesian plants. In

addition, there are certain strictly sterile plants, pertaining to Sect. Pandanus, which are generally given horticultural names, but whose exact identity is unclear. One of these with conspicuously attractive white-and-green striped leaves (usually called *Pandanus veitchii*) is often found in gardens. It has never been seen to flower or fruit in Guam.

P. fragrans is abundant everywhere in Guam, both on limestone soils and in volcanic soils. It does not occur in brackish or muddy coastal areas, and is quite scarce on the beaches, preferring the plateaus or hills. The fruits of the limestone area plants differ somewhat from those of the volcanic savanna plants, and it may be worthwhile to recognize the following forms.

Key to forms of Pandanus fragrans

(For convenience, those of Rota, Tinian, and Saipan are included)

1. Phalanges mostly 1–3-celled, rarely 4-celled,
   2. Phalanges mostly 2-celled; carpel apices truncate,
      3. Phalange sides vertically ribbed..... *f. marianus*
      3. Phalange sides smooth..... *f. tinianensis*
   2. Phalanges mostly 3-celled; carpel apices conic..... *f. koidzumii*
1. Phalanges mostly 4–6-more-celled, rarely 3- or 7-celled,
   4. Phalanges 7–9.5 cm long, stout, robust, tending to be subterete; usually savanna trees in volcanic soils..... *f. savannarum*
   4. Phalanges mostly 4–6.5 cm long, often compressed; usually trees of limestone soils..... *f. fragrans*

(a) forma **fragrans**.—The commonest form in Guam, chiefly on limestone. Phalanges without lateral sutures; turbinate-pyriform; carpels without ribs or creases, usually 2 to 5 per phalange; stigmas 1 mm broad.—Tumon (3933); Barrigada Hill (4003); Apra (4457); Mt. Almagosa (4357).

(b) forma **marianus** B. C. Stone, Micronesica 3(2): 115. 1967.

Phalanges without lateral sutures; carpels with noticeable longitudinal ribs and creases; carpels 2–3, rarely 1, rarely 4–6; phalanges about 5×2 cm; stigmas 1 mm broad; apex of phalange truncate, with shallow apical sutures.—Limestone regions, Guam. Yigo-Atdosco (4266, type).

(c) forma **savannarum** B. C. Stone, Micronesica 3(2): 115. 1967.

Syn. *P. guamensis* Martelli, Webbia 4: 16. t. 2, f. 4–5. 1914.

P. pseudomenne Hosokawa, Acta Phytotax. Geobot. 13: 163. 1943.

Phalanges with conspicuous lateral intercarpellary sutures; carpel tip conical; carpels mostly 3–5, rarely 6–8; phalanges stout.—Volcanic savanna hills, also occasionally in limestone. Cetti Bay hills (3905); Manengon (3865, type); Upper Harmon (3845).

(d) forma **megastigma** B. C. Stone, Micronesica 3(2): 115. 1967.

Similar to f. *tinianensis* but phalanges 3-celled. Stigmas broad, 2–3 mm wide.—A.F.B. Gate forests, 4248, 4249, 4250.

Note. Pandanus hosokawai Kanehira, Bot. Mag. Tokyo 50: 522. 1936.

This is probably a Caroline Islands cultivated plant, introduced into Saipan; and not a form of *P. fragrans.* It should no doubt be included in *P. carolinensis.*

Safford (1905: 344) mentioned *Pandanus tectorius* Parkinson as occurring in Guam, but says "I am not sure of the identity of the Guam plant." I do not see any reason to suppose that these are anything but cultivated individuals of the wild *P. fragrans.* The name "aggak" applied, however, by local residents, to the cultivated form, suggests a possible difference from the wild "kafu." Another cultivated plant, called according to Safford (345) "paingot", is used as a pot-herb. This is presumably *P. amaryllifolius* Roxb. (*P. odorus* Ridley), a small plant with soft, unarmed leaves with a curious musky odor. It is probably of Spanish-era introduction. The Malay name of this is "pandan wangi" (? = paingot).

It should be mentioned that Safford's excellent photos are mislabelled. His Plate 60 (facing p. 344), with the legend "Pandanus fragrans", is in fact *Pandanus dubius. Pandanus fragrans* is shown however on plates 2, 8, 23; while the "aggak" or textile pandan is shown in plate 7.

Note on blooming time of pandans. Since the fruits are the most commonly seen structures, with male inflorescences occasionally seen and female flowers seldom seen, it is of interest to note that the period of blooming is approximately every other month in *Pandanus fragrans,* beginning in generally in late February or early March, and lasting until the following September, or a few until November. December, January, and most of February are months without flowering. The flowering periods of most individuals coincide, so that a very large number of trees are often simultaneously in bloom, both males and females of course. The female flowers are however rather inconspicuous because the inflorescences are not pendent and the bracts are not widespreading. The bracts open slightly to reveal the apex of the head with its receptive stigmas; at this time pollination occurs. Later the bracts again enclose the head, and it enlarges and matures seed; the white bracts wither and fall, and eventually the maturing fruit nods and at last is pendent. The ripe phalanges drop, one by one or in groups united by part of the fleshy core of the head. The orange pulp of the phalanges is edible, but high in calcium oxalate; the seeds are edible but the difficulty of removing them from the bony endocarp makes them rather valueless, except in emergencies.

CYCLANTHACEAE

Herbs with underground stems; leaves palmately parallel-veined, plicate, palm-like; flowers unisexual, monoecious; pistillate flowers 3-sided, surrounded by 4 staminate flowers, or the two kinds in alternate rings or spirals all together on a thick spike; calyx of staminate flowers many-lobed, that of pistillate flowers 4-lobed; stamens many; staminodia 4 in each pistillate flower; ovary 4-sided, with many ovules; fruit a 4-sided berry. One genus present locally.

CARLUDOVICA Ruiz & Pavon

Male and female flowers arranged spirally on the spadix; leaves deeply parted;

ovary inferior, with sessile stigmas. Tropical America and the West Indies.

CARLUDOVICA PALMATA Ruiz & Pavon, Syst. 291. 1794.

PANAMA HAT PLANT.

Plants clumped; leaves fan-shaped, 3–9 ft. high, on long slender petioles; blades deeply divided into usually 4 parts, these again divided into numerous slender pointed parts; flowers white; fruits red, berrylike.

Cultivated ornamental; the leaves furnish a mat material. From Tropical America.

HYPOXIDACEAE

Rhizomatous or corm-bearing herbs; leaves mostly all radical; flowers solitary, spicate, racemose, or subumbellate, white or yellow, regular, perfect; perianth-tube sometimes consolidated into a long beak on top of the ovary; segments 6, alike; stamens 6 (very rarely 3), opposite the perianth-segments; ovary inferior, 3-celled; ovules numerous in each cell (rarely few); fruit a capsule or a berry.

One genus locally present.

CURCULIGO Gaertner

Rhizomatous; leaves longitudinally plicate; inflorescence racemose or spicate; stigma 3-lobed; fruit fleshy and indehiscent, ending in a long beak; 3-celled; ovules anatropous, 2-many per cell; seeds subglobose, black, crustaceous, the hilum often with an appendage.—A few species, Africa to Tropical Asia and Tropical America.

Curculigo orchioides Gaertn., Fruct. 1: 63, t. 13. 1788.

GOLDEN-EYED-GRASS.

Native. Widely distributed from India to Malaysia.

Herb with radical hairy leaves from a tuberous rhizome; leaves linear, grass-like; scape filiform, hairy, bearing 1–2 flowers; bracts setaceous; perianth yellow within, 6-parted, persistent on the ovary, externally hairy, the outer 3 lobes green on the back; stamens 6, inserted at the base of the perianth-segments; fruit indehiscent.

This plant is very similar to *Hypoxis aurea* Lour., under which name it is mentioned by Safford 1905: 295.). However, the true *H. aurea* (though known from Palau) does not occur in Guam.

Curculigo occurs in savanna areas on volcanic soil, usually among grasses and sedges. Fena Hills (4115). MacGregor 438—hills back of Piti. Mt. Tenjo (Moore 213, Necker 81); east of Agat (Necker 121); Facpi Point (Necker 383); Savanna, Mt. Macajina nr. Agaña, (Safford & Seale 1097).

TACCACEAE

Perennial herbs with a tuberous or creeping rhizome; leaves radical, large, often lobed; flowers regular, perfect, in umbels subtended by involucral bracts (the inner ones narrow to threadlike); perianth with a short tube and 6 lobes; stamens

6; ovary inferior, 1-celled, with 3 parietal placentas; ovules numerous, anatropous; fruit berrylike.
One genus locally present (of 2).

TACCA Forster

Large-leaved herbs with divided leaves and subterranean tubers; fruit a berry; with characters of the family.

Tacca leontopetaloides (L.) O. Kuntze, Rev. Gen. Pl. 2: 704. 1891.
GABGAB. ARROWROOT.

T. pinnatifida Forst., Char. Gen. 70. t. 35. 1776; Safford 1905: 380. Merrill 1914: 68.

Perennial herb with white, starchy, poisonous buried tubers resembling potatoes; leaves radical, annual, palmately 3-parted, each division in turn deeply lobed and divided into acuminate lobes and teeth; petioles 60 cm or more in length; scape 1–2 m tall, pale, hollow; flowers in a bracted umbel, the bracts mostly filiform and threadlike; flowers 10–40, pendent, greenish perianth about 15 mm long; berry 20–25 mm diam., globose, ripening to yellow; stamens 6. Tubers edible when prepared by grating and washing, furnishing a fine starch (Polynesian arrowroot).

Native (or perhaps early naturalized) in Guam; found near the sea from Tropical Africa and southern Asia to Australia, Philippines, Micronesia, and Polynesia. The plants are often used as a crop (especially in emergencies).—Yona, Marine beach, on limestone boulders, (4420). Agat hills (obs.). MacGregor 514.

PHILYDRACEAE

Erect herbs from a short rhizome; leaves linear, radical or crowded at base of the stem; flowers perfect, zygomorphic, solitary in the axil of spathaceous bracts; perianth corolline, 4-segmented; stamen, 1, with flattened filment; ovary superior, 3-celled or 1-celled, ovules numerous; fruit a capsule with 3 valves.—3 genera, a few species, in Australasia and Pacific Is.
One genus locally present.

PHILYDRUM Banks

Flowers in simple or few-branched spikes; inner perianth segments free from filaments; ovary imperfectly 3-celled.

Philydrum lanuginosum Banks ex Gaertn., Fruct. 1: 62. 1788.

Perennial cespitose herb; caudex short; leaves glabrous, thick, soft, 40–80 cm long including the sheath; scape 1 m high or taller, slender, villous towards the woolly inflorescence, with a few leaves passing into alternate bracts; spike terminal; bracts ovate, clasping; flowers sessile, yellow; perianth-segments about 12–15 mm long, villous on the outer surface; stamen 8–9 mm long, glabrous, anther subglobose; ovary woolly, 6–7 mm long, style glabrous, 3–4 mm long; capsule triangular-oblong; seeds numerous, dark red, up to 1 mm broad.

Native. Distribution from South-east Asia to Australia. The genus is mono-

typic (this is the only species).

The plant is to be found in ponds, marshes, rice-fields, and other wet locations at low altitudes. First collected in Guam by Rodin (673) and Steere (67) on 30 Sept. 1945; specimens at UC and US.

ORCHIDACEAE

Herbs, terrestrial, epiphytic, or saprophytic; true bulbs lacking; leaves undivided, often fleshy or leathery; stems leafy or scapose, often thickened at base into pseudobulbs bearing aerial roots; flowers perfect (rarely unisexual), very irregular; perianth parts 6, all petaloid; stamens 1–2, adnate to the pistil; pollen granular or more commonly agglutinated into waxy or mealy masses (pollinia), sometimes the pollinium with a caudicle; ovary inferior, 1-celled (very rarely 3-celled), often produced at the apex into a column; stigmas 3, often only 2 functional, the third transformed into a small growth (the rostellum) lying between the anther and the stigmas; part of the rostellum is sometimes modified into viscidia (disks to which the pollinia are attached). Fruit usually a capsule, opening laterally by slits. Seeds very numerous, minute, lacking endosperm, the embryo not differentiated.—A large, cosmopolitan family of perhaps 600 genera and 20,000 species.

Key to local genera

1. Plant virtually stemless, leafless, consisting of green flattened clasping roots; epiphytes usually on bark; flowers small, white..... *Taeniophyllum*
1. Not with the above combination of characters.
    2. Pollinia granular,
        3. Tall climbing plants, often over 2 m long; inflorescences lateral; each leaf opposite a root..... *Vanilla*
        3. Not as above; small terrestrial plants with ovate-cordate leaves.... ..... *Nervilia*
    2. Pollinia waxy,
        4. Growth sympodial,
            5. Inflorescence terminal or on upper part of pseudobulb,
                6. Leaves convolute in bud..... *Coelogyne*
                6. Leaves duplicate in bud,
                    7. Leaves not articulate to the sheath or stem.... *Liparis*
                    7. Leaves articulate,
                        8. Pollinia 4, each pair packed together into a tight mass; flower with a distinct spur.... *Dendrobium*
                        8. Pollinia 8, not firmly packed together, in two groups of 4..... *Eria*
            5. Inflorescence basal, appearing at base of stem or on lower part,
                9. Leaves plicate (pleated),
                    10. Flower with a spur..... *Calanthe*
                    10. Flower not spurred,

11. Pollinia 2.....*Eulophia*
11. Pollinia 8.....*Spathoglottis*

9. Leaves not plicate,
12. Pseudobulbs present.....*Bulbophyllum*
12. Pseudobulbs lacking,.....*Phreatia*

4. Growth monopodial (apical growth continuing indefinitely),
13. Labellum without distinct sac; leaves cylindrical; inflorescence subsessile .....*Luisia*
13. Labellum with a distinct sac, free from column....*Saccolabium*
(Note: cultivated *Vanda* may be separated here by the following difference:
Stipe of pollinia linear.....*Saccolabium*
Stipe of pollinia broadened upwards or broad throughout....
..... *Vanda*

BULBOPHYLLUM Thouars

Epiphytes, pseudobulbous, usually with creeping rhizomes; pseudobulb of 1 segment bearing 1 leaf; leaves greatly various; scapes 1-many-flowered; scape usually from base of pseudobulb, sometimes from rhizome; lateral sepals joined to column-foot, forming a mentum; petals usually smaller than sepals; lip flexibly attached to column-foot; column short, often armed or winged, or horned; anther 2-celled; pollinia 4 in pairs, members of each pair united or not, with disc.—A very large genus of easily 1000 species; worldwide, but heavily represented in Asia and Malaysia.

Two species in Guam; (possibly 3?).

Pseudobulbs about 5 × 2 mm; leaves 2–5 cm long; scapes very short.....
.....*B. profusum*
Pseudobulbs larger, 2.5 cm long; leaves 10–15 cm long; scapes to 25 cm....
.....*B. guamense*

Bulbophyllum profusum Ames, Philipp. J. Sci. Bot. 7: 128, 137. 1912.
Merrill 1914: 70.

Small epiphytic orchids, with very small 1-leaved pseudobulbs. Branches elongate, diffuse, clothed by sheathing imbricate crowded bracts. Scapes arising from rhizome, at base of bract, remote from pseudobulb, 1-flowered. Pseudobulbs short cylindric, about 5×2 mm, c. 2 cm apart. Leaf oblong—elliptic, fleshy, short-petiolate, 2–5 cm long, 1 cm wide, apically minutely notched. Scapes very short, rather hidden by the rhizome-bracts. Flower solitary, yellow, set above a hyaline bract that partly covers the base of the flower; lateral sepals narrowly deltoid, caudate, 6 mm long; upper sepal similar; petals elliptic-ovate, blunt, much shorter than sepals, 1.75–2 mm long, 0.75 mm wide; lip lanceolate, somewhat fleshy, 3-nerved, smooth, 1.5 mm long; column minute.

Endemic to the Philippines and Guam; possibly the same as *B. myrianthum* Schltr. and/or *B. sessile* J.J.S.

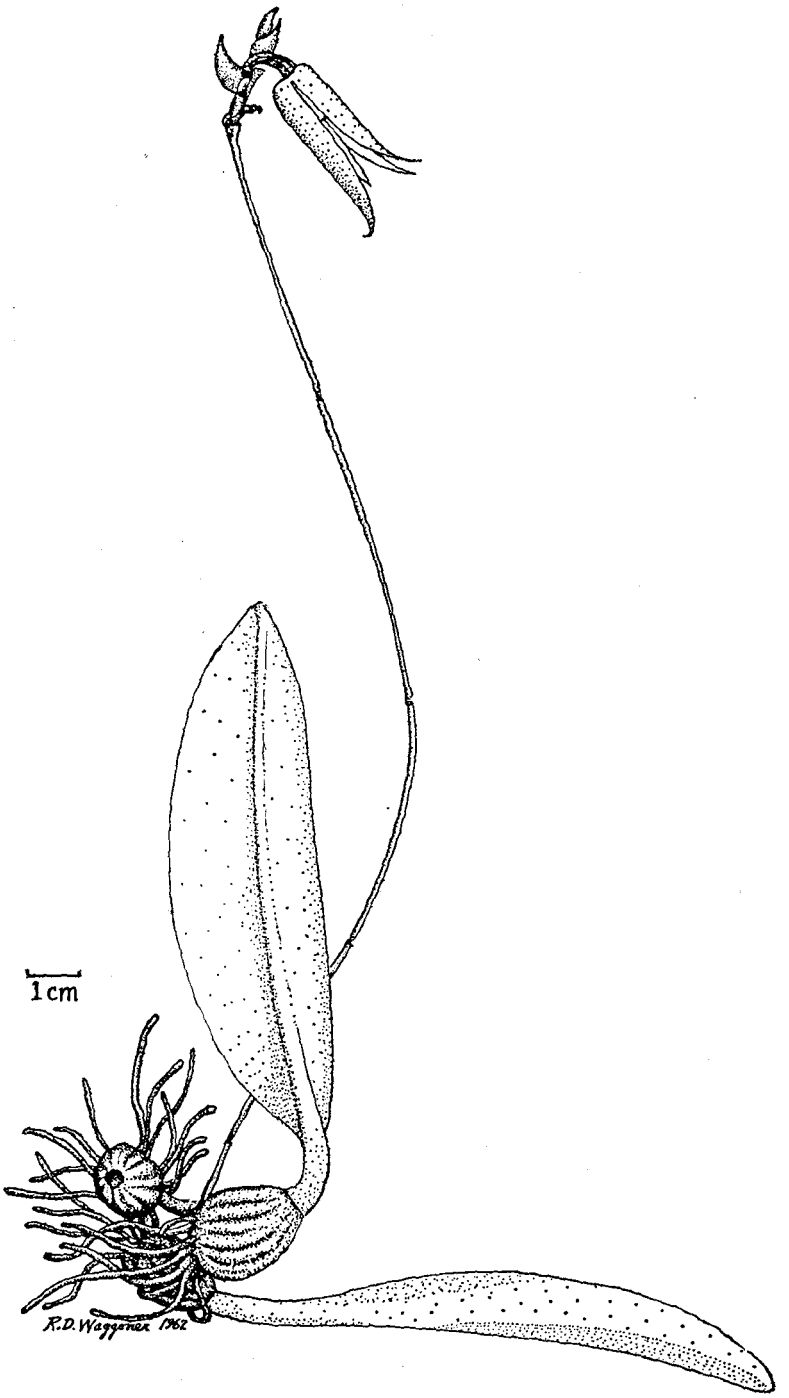


Fig. 19. Bulbophyllum guamense.

Not uncommon, on trees among upper braches in relatively dense forest or thickets.

Bulbophyllum guamense Ames. Philipp. J. Sci. Bot. 9: 13. 1914.

Merrill 1914: 70. CEBOLLO HALUMTANO ("wild-onion").

Epiphytic; pseudobulbs pyriform, about 2.5 cm long, 1-leaved. Leaves oblong, elliptic, 10–15 cm long, 2.6—3.8 cm wide. Scapes elongate, to 26 cm long. Inflorescence bracts deciduous, carinate, cymbiform, acute, 12 mm long, longer than pedicels. Flowers greenish; lateral sepals, deltoid-lanceolate, acute-acuminate, carinate, c. 1.5 cm long; c. 5 mm broad at base; cuspidate at tip; dorsal sepal lanceolate, 11 mm long, cuspidate; petals minute, 3 × 1.5 mm, 1-nerved, quadrate, 4-toothed, abruptly attenuate-caudiculate; lip lanceolate, 1 cm long; column thick, 2-winged above, the wings on both sides produced into an acute, erect extension.

Endemic; R. C. MacGregor 495; Costenoble 1164, 1176; G.E.S. 233.

Note: *Bulbophyllum longiflorum* Thouars has been reported from Guam (per herbarium spm. in Bishop Museum, determined by Louis O. Williams); it is mentioned by E. H. Bryan (Plants of Guam; No. 74. Guam Daily News, June 11, 1958), who states: "I can see no differences between it [a Bryan specimen from Ritidian Point] and . . . *B. guamense* Ames." The flowers were yellowish-cream and green. This African plant (known under various other names) is not likely to be in Guam, but the problem needs further consideration. It is definitely *not* the same as *Bulbophyllum longiflorum* Ridley, Journ. Linn. Soc. Bot. 32: 368. 1896.

CALANTHE R. Brown

Terrestrial, with smallish pseudobulbs; leaf-sheaths persistent; leaves few (or reduced to 1), rather thin, plicate, distinctly petiolate, sometimes deciduous; inflorescence erect, scape arising from leaf-axil; sepals and petals free; lip spurred; column short, completely joined to the base of the lip, forming (with the latter) a tube; stigma sometimes divided in two; pollinia 8, in two quartets.—A large Paleotropical genus.

One species in Guam.

Calanthe furcata Batem. ex Lindl. Bot. Reg. Misc. 28. 1838.

C. triplicata (Willem.) Ames, Philipp. J. Sci. Bot. 2: 326. 1907; Merrill 1914: 70.—*C. veratrifolia* Lindl. Bot. Reg. t. 720. 1823?

Terrestrial herb; leaves lanceolate-oblong, to almost 60 cm long, about 15 cm wide, 3-nerves prominent, also plicate; scapes longer than leaves, clothed with spiralled bracts; flowers pure white; about 2.5—3 cm wide; petals slightly smaller than the sepals; lateral sepals about 15 × 6 mm; lip 4-lobed (i.e. with 2 side-lobes and the median lobe deeply notched); spur 1.5—2.4 cm long; fruit brownish-gray, 3–4 cm long, short-pedicellate.

Indomalaysia—Pacific. There is some doubt as to the identity of *C. furcata* and *C. triplicata*.

Mt. Alifan (Bryan); Mt. Lamlam (Bryan).

Coelogyne Lindley

Epiphytes; pseudobulbs 1- or 2-leaved; leaves broad, elliptic, plicate; inflorescence erect or drooping; flowers few or many, moderate to large; sepals often strongly concave; petals narrower than sepals; lip basally concave, 3-lobed; midlobe longitudinally ridged; column tall, winged round the top; anther hanging by a filament, its tip resting on the large rostellum which over arches the hollow stigma.—Over 150 species from the Himalayas to Malaysia and the Pacific Islands.

One species in Guam.

Coelogyne guamensis Ames. Philipp. J. Sci. Bot. 9: 11. 1914.

Merrill 1914: 71.

Robust herb, generally epiphytic; pseudobulbs large, to 8 cm long, 3 cm thick, 3-leaved, imbricated by sheaths. Leaves lance-oblong, acute-acuminate, to 40 cm long, 7 cm wide, with 3 or 5—obvious nerves; on petiole of 5–6 mm, sulcate, stiff. Scape to 25 cm long, few-flowered; bracts of inflorescence conduplicate, lanceolate, acute, c. 5 cm long, finally deciduous. Flowers about 7 in number, 4 cm long. Pedicel + ovary 2 cm long. Lateral sepals oblong, acute, carinate, 4 cm long, 7 mm broad; dorsal sepal similar. Petals linear, 4 cm long, 3 mm broad. Lip trilobed, bilamellate, 3.5 cm long; with erect, obtuse lateral lobes; from base of lip to tip of lobe = 12 mm. Middle lobe shortly dilated-cuneate, beyond the narrow stipe-like part; suborbicular, 1.6 cm wide. Lamella undulate discoid; lamellula entire. Column 2 cm. long.

Endemic. G.E.S. 195 (type).

Dendrobium Swartz

Epiphytes (very rarely terrestrial); sympodial; greatly various in habit; pseudobulbous or not; inflorescences usually axillary, 1-many-flowered; lateral sepals mostly deltoid, their bases joined to the column-foot and forming a mentum; sepals sometimes spirally twisted; petals slender or ovate, or various; lip 3-lobed (sometimes indistinctly so), usually narrowed at the base and joined to the column-foot, longitudinally striate or ridged; column short, prolonged at base into the column-foot, laterally horned; pollinia 4, not stalked.—A huge genus of perhaps 1500–2000 species, badly in need of thorough revision.

Three species in Guam as native; one or more species in cultivation.

Leaves linear, only 1–2 mm wide, about 10 cm long; flowers yellow. . *D. philippinense*

Leaves considerably broader, at least 7 mm broad, up to several cm broad.

Leaves 7–15 mm broad, c. 10 cm long; flowers white with lip yellow; stem of several pseudobulbous segments. . . . . *D. guamense*

Leaves about 4–5 cm broad, 12 cm long; flowers white, with purplish spots; lip yellow, fimbriate; stem of one pseudobulb. . . . . *D. scopa*

Dendrobium philippinense Ames, Philipp. J. Sci. Bot. 8: 424. 1914.

Epiphyte; pseudobulbs very long and slender; leaves linear, about 10 cm

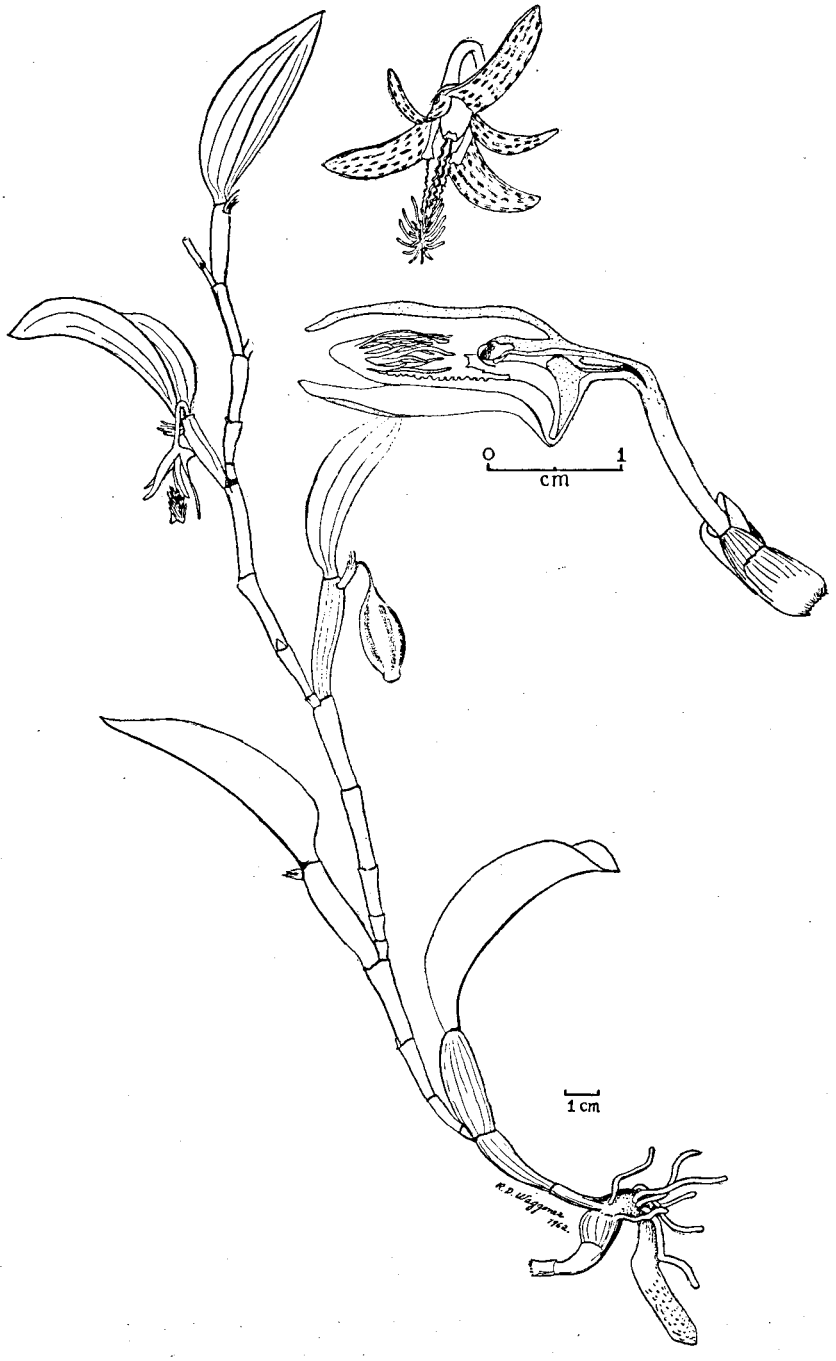


Fig. 20. Dendrobium scopa.

long and only 1–2 mm wide; flowering stalks terminal; flowers very small (8–10 mm long), yellow.

Type from Leyte, Philippines. First collected in Guam in 1946 two miles east of Yigo (Moore 271).

Dendrobium guamense Ames, Philipp. J. Sci. Bot. 9: 13. 1914; Merrill 1914: 71.

Epiphyte, stems crowded, to 60 cm tall, basally terete, above somewhat flattened. Leaf sheaths cylindric, about as long as internode, i.e. 2–3 cm., c. 5 mm diam. Leaves distichous, lance-oblong, to 10 cm long; 7–15 mm wide; apex narrowed, base rounded; apex somewhat unequally 2-lobed, obtuse; sheath subpersistent. Flowering racemes 2-flowered, shorter than the leaves, with 4 shell-shaped scales at base; pedicels + ovary 6 cm long. Lateral sepals forming a blunt mentum 4 mm long, elongate, narrowly deltoid, curved from the base, acuminate subcaudate, slightly externally carinate, 12 mm long, 2.5 mm wide. Dorsal sepal linear-lanceolate, thickened upward, subcaudate, slightly concave, 1–4 cm long, 2 mm wide. Petals linear-lanceolate, narrowed basally and apically, acute-acuminate-subcaudate, very slender basally, 12 mm long, 2 mm wide (near middle). Lip slightly hooked, 3-lobed, the side lobes short, deltoid, scarcely 1 mm long; median lobe deltoid-lanceolate, 4 mm long, 3 mm broad at base, irregularly toothed; entire lip about 9 × 4 mm. Disc of lip in median lobe with 3 papillose lines; lamella not undulate. Column obtuse.

Endemic. G.E.S. 450 (type). Barrigada Hill, on dead *Artocarpus* branches, with *Luisia* and *Bulbophyllum* (4360).

Note: numerous hybrids are to be found in cultivation, at least one of which, *Dendrobium undulatum* × *phalaenopsis* has been collected in Guam.

Dendrobium scopa Lindley, Bot. Reg. Misc. 55. 1842.

Large epiphyte; leaves to 12 cm long. 4–5 cm wide; stem of 1 pseudobulb; Flowers white with purplish spots; lip fimbriate, yellow.

Philippines; Guam. Sometimes brought into cultivation.

Ypiga Conservation Area (4691).

Eria Lindley

Epiphyte (or rarely terrestrial); sympodial, pseudobulbous, leafy at top or throughout; inflorescence spikelike, terminal or lateral; flowers usually greenish, red, or yellow, much like *Dendrobium*, but lip not joined basally to foot of column; pollinia 8 in two groups of 4, with stalks and disks.

One species in Guam.

Eria rostriflora Reichb. fil. ex Seemann, Fl. Vit. 301. 1868.

Epiphyte; stems 7–12 cm tall, bearing a tuft of leaves, these 7–18 cm long, 1.2–1.9 cm wide; flowering peduncles 1–2, 5–15 cm long, bearing several flowers, each bracteate at the base; fruit a slender capsule nearly 2 cm long.

Native; type from Fiji. Polynesia-Melanesia. First collected in Guam by Glassman in 1946; Merrill and Perry 1946: 324. Also known from Samoa.

EULOPHIA R. Brown

Terrestrial herbs, with tuber-bearing rhizomes; pseudobulbs of a few joints; leaves often grass-like, or broader; or very rarely leafless; inflorescence tall, lateral, erect, 1-few-flowered; sepals and petals subequal; lip attached to column-foot, its base with a spur; lip 3-lobed; column with foot; pollinia 2, often deeply divided, on broad stipes.—Chiefly African and Asian.

Two species in Guam, both terrestrial herbs.

Flowers dark-cream-colored; leaves 20 cm long, 1–2 cm wide...*E. macgregorii*

Flowers pale-green, yellow, and lined within with wine-red; leaves 8–30 cm long, about 3–4 cm wide.....*E. macrostachya*

Eulophia macgregorii Ames, Philipp. J. Sci. Bot. 9: 12. 1914; Merrill 1914: 70.

Terrestrial, with tuberous rhizome; tubers subglobose, about 2 cm thick, close-set. Leaves linear-lanceolate, acute, membranous, plicate, 20 cm long, 17 mm wide. Scape erect, about 30 cm long, few-flowered. Inflorescence bracts linear, scarious, about 1–2 cm long; lateral sepals oblong, acute, subfalcate, 5-nerved, 2 cm long, 5 mm wide; dorsal sepal oblong-lanceolate, 1.8 cm long; petals ovate-lanceolate, acute, 2 cm long, 7.5 mm wide; lip subentire, ovate, obtuse, glabrous, 1.9 cm long, 1 cm wide, calcarate (the ridge conic, obtuse, 3 mm long); column clavate, thick.

Endemic; the type (MacGregor 631) from hills s.e. of Piti, at 900 ft. alt., (October, 1911).

Eulophia macrostachya Lindley, Gen. et Sp. Orch. 183. 1833.

E. guamensis Ames, l.c.; *E. marginata* Bl. of Bryan (1958).

Terrestrial; stems about 8 cm long, thick, the internodes 2–2.6 cm long. Leaves 2, long-petiolate; blade lanceolate, acuminate, plicate, 8–30 cm long, 3.5 cm wide. Scapes to 30–50 cm long, longer than leaves. Inflorescence bracts linear, scarious, about 1 cm long. Flowers numerous; pedicel + ovary 1.5 cm long; lateral sepals oblong-lanceolate, subfalcate, about 9 × 3 mm; dorsal sepal similar, 1 cm long; petals ovate-lanceolate, subfalcate, 3-nerved, 9 × 3.5 mm; lip 4-lobed, yellow, apex retuse, apiculate, 7 × 12 mm; at base with calluses; calcarate (calc. 2 mm long); column 3 mm long, foot very short.

Indomalyasia—Australia.

The type of *E. guamensis* is MacGregor 376, Piti hillsides, (Oct. 1911).

LIPARIS L. C. Richard

Some epiphytic, but usually terrestrial; plants low-growing, at base thick and rather stout; leaves 2, spreading; raceme lax, few-flowered; flowers with slender or filiform petals with the lip the largest.—Cosmopolitan; over 300 species.

One species in Guam.

Liparis guamensis Ames, Philipp. J. Sci. Bot. 9: 11. 1914; Merrill 1914: 70.

Terrestrial herb, slender, to 60 cm high. Leaves 3, narrowly lanceolate, 5–22 cm long, up to 2.5 cm wide, sheathing at base, actute-acuminate at tip. Peduncle 8–30 cm long. Flowers pale yellow and brown; lateral sepals elliptic subacute,

slightly falcate, 4 × 2.5 mm; dorsal sepal linear-oblong, obtuse, convex, 7 × 1.5 mm; petals linear 5.5–6 mm long, convex; lip strongly reflexed, oblong, thick, retuse, apiculate, with 2 calluses near the base, 3.5 × 2.5 mm; column arching, rather slender.

Endemic; MacGregor 633 from Piti hills at 900 ft. alt. (type).

Luisia Gaudichaud

Epiphytes, long-stemmed, with cylindric, solid, slender leaves; inflorescence compact, on a very short peduncle; flowers with sepals and petals free subequal; lip fleshy, immovable, attached to column-base, grooved and thus divided into basal and apical segments, basal segment hollow, apical segment larger, grooved or wrinkled; column short; pollinia 2, entire or bilobed, shortly stipitate.—Few species, Burma to the Pacific, Japan, Queensland.

One species in Guam; it is the type of the genus.—The name honors Don Luis de Torres.

Luisia teretifolia Gaud. Bot. Voy. Freyc. 427, t. 37. "1826" (1830).

Safford 1905: 311. Merrill 1914: 70. CEBOLLO-HALUMTANO.

Epiphyte; tufted stems; leaves cylindric, solid, 10–15 cm long; flowers spicate, drooping, very small; sessile; crowded; sepals and petals pale pink or greenish; lip purplish-pink or purple; capsules about 2.5 cm long.

The type was from Guam or Rota, (collected by Gaudichaud), but the species is now known to occur fairly widely in Malaysia to Ceylon. MacGregor 311. Barrigada Hill (4361).

Nervilia Commerson ex Gaudichaud

Terrestrial, tuberous, leaf and scape appearing alternately, not at the same time; leaf single, cordate; inflorescence erect, 1-several-flowered; sepals and petals similar, spreading, slender; lip usually 3-lobed, not spurred, the base clasping the column; column long; anther subhorizontal; pollinia 2, divided, *granular*.—Africa-India-Malaysia-Australia; about 40 species.

One species in Guam.

Nervilia aragoana Gaud. Bot. Voy. Freyc. 422. t. 35, "1826" (1830).

WATER-ROOT ORCHID. SEIYAIHAGON; MAISAULU.

Terrestial orchid with a fleshy globose tuber. Leaves stalked, stalk 15–20 cm; subrotund-cordate, repand, to 15 cm broad, many-nerved, plicate when young, apex acute, basal sinus deep; leaf single (or rarely paired). Flowers borne racemosely on an erect leafless scape 15–30 cm tall, greenish, short-pedicellate, nodding in age; lateral sepals linear-lanceolate, acuminate; dorsal sepal similar; lip 3-lobed, white with purplish veins, median lobe broadest, obtusely crenulate, within slightly villous; stigma broad; column elongated.

Indo Malaya to Samoa.

The type was from Guam, collected by Gaudichaud. Mt. Santa Rosa (Moore 389); Ylig valley (Rodin 636, Steere 34); Sigua valley (Rodin 666);

The fruiting stem outlasts the leaf or leaves, but wither before the new leaves

mature; hence occasional specimens seem to be 'leafless'. The leaves may be blotched light and dark green.

The watery tubers were chewed by thirsty hikers of former days, but the plants are no longer common enough for this to happen now.

PHREATIA Lindley

Epiphytes, with or without pseudobulbs; leaves 2-several; inflorescences lax, many-flowered, several open at the same time; flowers generally white or green; column foot present; mentum developed; lip with a narrow base; anther short, blunt; pollinia 4.—otherwise like Thelasis.—Asiatic-Pacific.

Two species in Guam.

Leaves to 7.5×0.6 cm.....*P. thompsonii*
Leaves to 15×1.5 cm.....*P. samoensis*

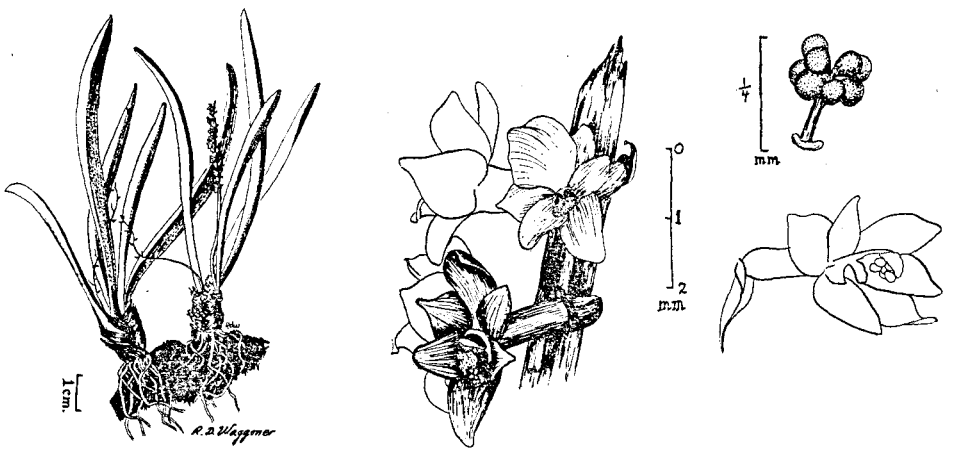


Fig. 21. Phreatia thompsonii.

Phreatia thompsonii Ames, Philipp. J. Sci. Bot. 9: 15. 1914; Merrill 1914: 70.

Small epiphytic herbs, the stems very much shortened, about 1.5 cm tall or a little more; leaf-sheaths persistent. Leaves 4, distichous, complanate, linear-oblong, apex unequally bilobed, 3–8 cm long, (3)–4–8 mm wide; entire plant rarely over 12 cm tall. Flowers on racemes from lower axils, numerous, shorter than the leaves; peduncles slender, up to 8 cm long; flowers borne from nearly at the base to the tip. Floral bracts 3. Flowers white, minute, 1–2 mm apart, the raceme thus somewhat cylindric-spicate in appearance; lateral sepals deltoid-ovate and somewhat oblique, acute, barely 1.5 mm long and 1 mm wide, membranaceous, 1-nerved, slightly concave, forming a short mentum; dorsal sepal oblong, acute; petals deltoid-elongate, smaller than the sepals, c. 1×0.75 mm. Lip slightly concave, obovate, apex retuse, 3-nerved. Disc glabrous. Column minute. Capsule about 3 mm long.

Endemic; the type from Mogfog (G.E.S. 321). Named for J. B. Thompson, then (1914) director of the Guam Experiment Station. Ames considered this species a relative of *P. minutiflora* Lindley. Costenoble 1174. Ypiga Conservation Area (4689).

Phreatia samoensis (Kränzlin) Schlechter, Rep. Sp. Nov. [Fedde], 3: 320. 1907.
Thelasis samoensis Kränzlin, Bot. Jahrb. 25: 607. 1898.

Epiphytes, very similar to the preceding species, but larger, the leaves to 15 cm long, 1–1.5 cm wide; plants usually more than 12 cm tall; leaves somewhat spathulate. Flowering spikes to 18 cm long, the upper 1/3 clothed by the dense small flowers.

Samoa; Guam. First reported in Guam by Walker and Rodin 1949. Mt. Lamlam (Moore 262) at 900 ft. alt.

SPATHOGLOTTIS Blume

Terrestrial, rarely lithophytic; pseudobulbs subovoid; leaves eongate, elliptic-lanceolate, ± stalked, long-tapering below, plicate; inflorescence tall, erect, arising from a basal leaf-axil, many-flowered; sepals and petals subequal; lip 3-lobed; pollinia 8, in 2 quartets, clavate.—Indomalaysia—Pacific; about 40 species.
One (or ?2) species in Guam.

SPATHOGLOTTIS PLICATA Blume, Bijdr. 401. 1825.

Terrestrial, erect, tall herb to 60 cm or more; leaves oblong-lanceolate or elliptic-lanceolate, long-acuminate, base narrowed to petiole, with numerous parallel nerves, of which about 5 are prominent, plicate conspicuously, 50–120 cm long, 5–20 cm wide. Scape tall, erect, flowers mostly apical, shortly pedicellate, racemose; scape to 150 cm long or more; flowers rose-lavender, 2–3 cm wide; lateral and dorsal sepals alike, ovate; petals ovate, broader than sepals but about as long; lip 3-lobed, basally narrowed, joined to base of column; base of lip with 2 calluses; below these, 2 short conic projections; column slender; pollinia 8, in 2 groups of 4, clavate.

Common in the savannas; often along road; sometimes on limestone rocks. Sasa River, (4153); Apra (4458).

Spathoglottis micronesiaca Schlechter, Bot. Jahrb. 52: 9. 1914.

This seems to me to be hardly. different from *S. plicata*, differing only in its narrower leaves and paler pink or even white flowers.

Guam (indigenous).

TAENIOPHYLLUM Blume

Small leafless epiphytes, or with short brownish scale-like leaves; roots elongate, flattened, green, adnate to substrate [bark]; inflorescence very short, compact, less than 5 cm long; flowers minute; sepals and petals free or shortly connate; lip spurred, 3-lobed or entire; column short; pollinia 4, stipitate.—Indomalaysia-Japan-Pacific-Australia; about 170 species.
One species in Guam.

Taeniophyllum mariannense Schlechter, Bot. Jahrb. 52: 13. 1914.
KAMUKE-NANOFE; AMOT-OTDON.

T. fasciola (Gaud. Bot. Voy. Freyc. 427. "1826.") non Reichb. f. ex Seem. Fl. Vit. 296. 1868; sensu Safford, 1905: 381.

Stemless epiphyte, the green flattened creeping-adnate roots the assimilatory organs; leaves occasionally produced, ephemeral; flowering peduncle filiform, short, radical; flowers spicately borne, few, minute, white; sepals and petals similar, with the lip forming a connate perianth; lip boat-shaped, with free flesh edges, base spurred shortly; column very short and broad, no foot; anther 2-celled, of 4 pollinia in superposed pairs, waxy, sessile, pyriform. Fruit a short cylindric-oblong capsule, about 10–12 mm long.

Fairly common in Guam, on tree-trunks and branches, rarely on rocks. Manengon (3832); Sasa river estuary area (4145); Cetti Bay (4742).

VANILLA Swartz

Climbers with jointed stems; leaves alternate; axils with 1 root opposite the single leaf; leaves broad and fleshy or reduced to scales; inflorescences axillary, few-many-flowered; flowers large, white, greenish, yellowish, sometimes with purplish marks on the lip; sepals and petals subequal; lip subtrilobed; column apically bent; pollinia granular.—Pantropical; about 65 species.

One species in Guam only in cultivation.

VANILLA PLANIFOLIA Andrews, Bot. Repos. 8. t. 538. 1808. VANILLA.

Climbers; leaves 8–32 cm long, 2–8 cm broad, elliptic, fleshy; inflorescence a short raceme about 6 cm long; bracts 5–10 mm long; sepals 4–7 cm long, 1–1.5 cm broad; petals similar, slightly smaller; lip 4–5 cm long, 2–3 cm wide, verrucose-lineate; disc puberulent; column 3 cm long, puberulent dorsally; capsule elongate, to 20 cm, about 1 cm thick.

In cultivation, uncommon. The commercial vanilla "beans" are the ripe capsules.

VANDA Jones

Terrestrial, erect or climbing; stems elongate; internodes short; leaves normally bifacial, or cylindric; inflorescence suberect, several-flowered; flowers mostly moderate to large; sepals and petals subequal; their margins often crisped, wavy, or reflexed; lip immovable, adnate to the short column—foot, short-spurred, 3-lobed; midlobe usually bicallose at base; column short, thick; anther 2-celled; pollinia 2, divided, stipitate, with large disc.—Indomalaysia; about 40 species.

One sp. commonly in cultivation.

VANDA "Miss Joaquim" [*V. teres* × *V. hookeriana*]. TERETE VANDA.

Erect, rooting at nodes and base; leaves solid, cylindrical; flowers mostly pink to rose-mauve.

The most frequently cult. orchid in Guam, usually tied to upright posts (of tree-fern "wood"), and rooting in chopped coconut husks. Almost always in flower.

This hybrid originated in Singapore in 1893 in the garden of Miss Agnes Joaquim. It is now an important commercial flower, as the cut blooms are long-lasting; it is grown as a farm-crop in Malaya and in Hilo, Hawaii, for air-parcel export.

CYPERACEAE

Grass-like herbs (sometimes large) with terete or often triangular stems; leaves linear, parallel-veined; flowers unisexual or perfect, in heads, spikes, spikelets, each flower in the axil of a bract; perianth none or reduced to bristles or scales; stamens 2–3; carpels 2–4; ovary 1–celled, with 1 ovule; stigmas 2–4; fruit a 2–4-sided achene. Sedges.

Key to Tribes

1. Flowers bisexual (rarely a few flowers with abortive anthers).
   2. Hypogynous scales, when present, filiform, flat (not folded).
      3. Spikelets mostly 1–2-flowered, often 2 or more lower glumes empty ..... *Rhynchosporeae*
      3. Spikelets several- to many-flowered, only 1 or rarely 2 of the lower glumes empty.
         4. Glumes not distichous..... *Scirpeae*
         4. Glumes distichous..... *Cypereae*
   2. Hypogynous scales 2, folded, keeled, free or connate, or several and the outer two folded and keeled; spikelets several- to many-flowered..... ..... *Hypolytreae*
1. Flowers unisexual, the male fls. without pistillode, female without staminodes; no hypogynous setae present.
   5. Female flower not enclosed by a modified glume (utricle).
      6. Female flower solitary at the base of an androgynous spikelet, or the spike unisexual, the female spikelets 1-flowered in lower part of panicle, or rarely at base of plant remote from males, and male spikelets in upper part, 2- or more-flowered..... *Sclerieae*
      6. Female flower terminal in a unisexual spikelet or in the upper part of panicle, lower spikelets male and 2- or more-flowered.... *Cryptangieae*
   5. Female flower enclosed by a modified glume (utricle); female spikelets 1-flowered, spicate; male spikelets 2- or more-flowered, terminal or rarely continuous at the base with the female spike..... *Cariceae*

Key to local Genera

1. Flowers all or some of them perfect,
   2. Scales of spikelet distichous (2-ranked)..... *Cyperus* (incl. Kyllinga)
   2. Scales of spikelet spirally attached,
      3. Spikelets mostly many-flowered, only the lowest scale empty,

4. Achenes subtended by hypogynous bristles or scales,
   5. Achene crowned with the bulbous, firm, persistent style base; stem leafless; spikelet solitary.....*Eleocharis*
   5. Achene not as above, the style base usually deciduous, not thickened; stems leafy at base (at least the short sheaths present).
      6. Bristles present, no scales; stems (in ours) mostly terete.....*Scirpus*
      6. Scales present, sometimes also with bristles; stems 5–6-angled.....*Scirpus* (*Fuirena*)
4. Achenes not subtended by either bristles or scales; style base deciduous .....*Fimbristylis*

3. Spikelets 1- or few-flowered, with the several lower scales empty.
   7. Hypogenous setae none or 1–3,*
      8. Glumes not distichous.....*Machaerina* (Cladium)
      8. Glumes distichous.....*Schoenus*
   7. Hypogenous setae 6, separate and deciduous.....*Rhynchospora*

1. Flowers all unisexual,
   9. Achenes borne in a sac (perigynium), lacking a hardened basal disk..*Carex*
   9. Achenes not enclosed in a sac, borne on a hardened disk.....*Scleria* (incl. Diplacrum)

Tribe Cariceae

CAREX Linnaeus

Leafy herbs, with erect or creeping rhizomes; inflorescence erect, branched; spikelets few to many, with both staminate and pistillate florets, usually the latter proximal below the former, or occasionally the terminal spikelet male and others all female; stam. fls. of 3 stamens; pist. fls. with 1 ovary enclosed in a utricle, the 2 or 3 stigmas protruding from its open tip; fruit a nutlet, trigonal, tipped by the style-base, remaining within the persistent utricle.—A very large and difficult genus of nearly 2000 species, of wide distribution, mostly in temperature regions. Some species and species complexes show aneuploid series of chromosome numbers. One species in Guam.

Carex fuirenoides Gaud. Bot. Voy. Freyc. 412. "1826."

Safford 1905: 215. Merrill 1914: 58. Koyama, Micronesica 1: 109. 1964.

Carex densiflora Presl, Rel. Haenk. 2: 214. 1828.

Erect herb. Leaves linear, 6–13 mm wide, tapered at both ends, mostly basally clustered; culms trigonal, shorter or as long as the leaves, panicle spikelike, axillary and terminal, solitary, long-pedunculate. Spikelets androgynous; pist. fls. with 3 stigmas. Spikelets cylindric, glumes many-veined, mucronate-subaristate, those

* See also *Rhynchospora*. Spikelets capitate or umbellate.....Rhynchospora
Spikelets paniculate or spicate.....Machaerina

of pist. fls. broader; dark hyaline, smooth. Perigynia (utricles) obovate-oblong, apex beaked, ribbed, dark, longer than the glume; nutlet trigonal.

Guam; also Philippines. The type specimen was collected in Guam by Gaudichaud in 1817. In valleys of southern hills; Manengon, in shady woods (4751). G.E.S. 279.

Tribe Cypereae

CYPERUS Linnaeus

Annual or perennial herbs, the culms usually trigonal, and leafy; sometimes leaves reduced to the sheaths. Inflorescence involucrate, densely spicate or clustered, or in compact heads; branched or simple; spikelets mostly flattened, the florest distichous, few to many, rachis terete or winged; glumes concave, imbricate; flowers perfect; perianth none; stamens 1–3; style bifid or trifid; fruit an achene, bifacial or trigonal.—A large, mostly tropical genus, of about 600 species. [incl. *Kyllingia* Rottb.]—15 spp. in Guam.

Key to species

[From Koyama, Micronesica 1: 91. 1964.]

1. Rhachilla of spikelet not articulated.
   2. Achenes trigonal.
      3. Spikelets spicate on elongated rachis.
         4. Rhachilla winged with decurrent glume-bases; styles twice as long as the achene; rhizome with slender elongate stolons.... .....*C. rotundus*
         4. Rhachilla not winged, i.e. glume-bases not decurrent; styles shorter than the achene; annuals with fibrous roots.
            5. Spikelets 5–8 mm long, few-flowered; glumes 1–1.5 mm long, round or slightly notched at apex.....*C. iria*
            5. Spikelets 1–2.5 cm long, many-flowered; glumes 3–3.5 mm long, apex acuminate.....*C. compressus*
      3. Spikelets radiating from apex of umbel rays; rhachis of spikes not developed.
         6. Involucral leaves many, subequal; robust plants, culms 80–100 cm tall; spikelets pale green.....*C. alternifolius*
         6. Involucral leaves few, very unequal; culms slender, to 70 cm tall; spikelets brownish, glumes rounded at apex .....*C. difformis*
   2. Achenes lenticular (biconvex); achenes not grooved.....*C. polystachyos*
1. Rhachilla of spikelet articulate at least at the base.
   7. Achenes trigonal.
      8. Spikelets articulate only at the base.
         9. Spikelets not flattened.
            10. Spikelets spicate, greenish.
               11. Spikelets divergent; spikes cylindric....*C. cyperoides*

11. Spikelets obliquely spreading; spikes narrowed, tapered to the apex.....*C. cyperinus*
10. Spikelets congested in a globose head, brownish.....*C. compactus*
9. Spikelets flattened.
12. Spikelets usually 6–7 mm long, light brown or straw-colored, rather crowded but axis visible.....*C. javanicus*
12. Spikelets 3–6 mm long, light fuscous or grayish, very crowded, axis not visible.....*C. ligularis*
8. Spikelets articulate at base of every glume.....*C. ferax*
7. Achenes lenticular,
13. Glumes not winged on the keel, usually green.....*C. brevifolius*
13. Glumes winged on the keel, often white.....*C. kyllingia*

CYPERUS ROTUNDUS L., Sp. Pl. 45. 1753. Merrill 1914: 59.
Koyama, Micronesica 1: 93. 1964. CHAGUAN HUMATAG.

Perennial herb with long rhizomes; sometimes tuberous; culms up to 60 cm tall; leaves 2–6 mm wide; spikes ovate, on rays to 6 cm long; spikelets linear, 1–2 cm long, 12–30-flowered, the rachilla winged; scales purplish, carinate, obtuse; achene sub-obovoid, trigonal, 1.5 mm long, black, minutely papillate.

A widespread, weedy species. The inflorescences are not common, and seed is infrequently set. It is usually in waste or cultivated ground; often in lawns. MacGregor 445; Moore 156. Barrigada Village (5144).

Cyperus iria L., Sp. Pl. 45. 1753. Walker and Rodin 1949: 455.
Koyama, l.c. 1964.

Cespitose herb, culms to 50 cm tall, few-leaves; leaves shorter than culm; bracts longer than inflorescence; infl. branched, spikes about 2.5 cm long, about 10–12-flowered; spikelets 6 mm long, glumes spreading, scarcely imbricate, apex rounded with a tiny mucro, pale straw-colored, but green-carinate; achene narrowly obovoid, yellow-brown, trigonal, minutely apiculate.

Paleotropical, and weedy in neotropics. North of Agat (Necker 68).

CYPERUS COMPRESSUS L., Sp. Pl. 46. 1753. Merrill 1914: 59. Koyama, l.c. 1964.

Annuals, cespitose, culms to 40 cm high; leaves 1.5–3 mm wide, sheaths often reddish; inflorescence of a few subsessile umbels; spikelets 1–2.5 cm long, 3–5 mm wide, 12–30-flowered; rachilla not winged; achene obovoid, trigonal, the sides slightly concave, brown to almost black.

Pantropical, weedy. G.E.S. 38. MacGregor 381.

CYPERUS ALTERNIFOLIUS L. Mantissa Pl. 2: 28. 1771. Koyama, l.c. 96. 1964.
ssp. FLABELLIFORMIS (Rottb.) Kükenthal, Pflanzenr. 101: 193. 1936.
C. flabelliformis Rottb. Descr. Ic. Rar. Pl. 42, t. 42, f. 2. 1773; Merrill 1914: 59. UMBRELLA SEDGE.

Robust plants, tufted, with culms up to 120 cm tall; involucral bracts large, leaflike, crowded in a close spiralled arrangement at ends of culms, up to 30 cm long and 2 cm wide; umbels to 7 cm broad, on rays up to 10 cm long; spikes about 3 cm

long, spikelets pale green, crowded at the tip of the ray; achenes trigonal.

Tropical Africa, introduced as cultivated plants. In Guam gardens. I have not seen it escaped. Nelson 550. G.E.S. 210. Agaña (4383).

CYPERUS DIFFORMIS L., Cent. Pl. 2: 6. 1776. Merrill 1914: 59.

Koyama, l.c. 95. 1964.

Annuals, tufted, glabrous; culms up to 50 cm tall, sharply trigonal; leaves shorter than culm; bracteal leaves (some of them) longer than inflorescence; inflorescence umbellate, of rays to 5 cm long; spikes subglobose, dense, about 1–1.3 cm in diameter; spikelets with reddish markings on light brown; glumes rounded at apex; achenes trigonal.

Pantropical, usually a weed of wet places such as ricefields, G.E.S. 45; 236. Piti (Moore 144). Aguada (Fosberg 35566). Ylig R. mouth (Rodin 764). Talofofo R. valley (4447).

CYPERUS POLYSTACHYOS Rottboell, Desc. Ic. Rar. Pl. 39, t. 11, f. 1. 1773.

Bryan 5 Nov. 1957. Koyama, l.c. 96. 1964.

Annual, rarely perennial; culms tufted, to 80 cm tall; leaves up to 5 mm wide; inflorescence 1–5-rayed, or headlike, rays to 5 cm long; spikelets 8–16 mm long, 1–1.5 mm wide; glumes just under 2 mm long, yellowish-brown; achene biconvex, 1 mm long, minutely papillose, nearly black.

Cyperus cyperoides (L.) O. Kuntze, Rev. Gen. Pl. 3(2): 333. 1898.

Koyama, l.c. 97. 1964.

Tufted herb, culms to about 50 cm tall, thickened at the base; leaves 10–20 cm long, 3–5 mm wide; inflorescence of several spikes, these up to 10–12 cm long though usually shorter; spikelets crowded, spreading at right angles to the rachis, lanceolate, 4–6 mm long.

A pantropical species. Koyama reports this from Tinian.

Cyperus cyperinus (Retz.) Suringar, Het. Gesl. Cyp. in Mal. Arch.

154, t. 6, f. 10. 1898. Koyama, l.c.

Mariscus cyperinus (Retz.) Vahl, Enum. Pl. 2: 337. 1806. Merrill 1914: 62.

Tufted herb, culms to about 50 cm tall, with small basal tubers; leaves sometimes longer than culm; inflorescence of several short, nearly cylindrical spikes (sometimes sessile); bracts elongate; spikes 5–10, each nearly 2–2.5 cm long; spikelets about 4.5 mm long, 2–3-flowered, crowded, directed obliquely upward; achene shorter than glumes; trigonal, reddish-brown.

Indomalaysia to the Bonin Is. and E. Australia.

The form in the Marianas is a somewhat smaller plant than plants from Tropical Malaysia, with the spikes rather congested and headlike. It has been named forma *pictus* (Nees ex Wight) Ohwi, J. Japan. Bot. 18: 132, 1942. Manengon (3827); Fena R. near headwaters (4104). MacGregor 418. Nelson 239. S. W. of Agana (Moore 109). Merizo (Bryan 1233). Talofofo R. upland (Rodin 675). Fineguayac (Moran 4533).

CYPERUS COMPACTUS Retzius, Obs. Bot. Pt. 5, 10. 1789. Koyama, l.c. 98.

Rather large tufted herb, to 90 cm long; basal sheaths soft-textured; leaves

about as long as culms, scabrid on midrib and margins; bracteal leaves about as long as lower leaves; inflorescence of branching rays, up to 15 cm long; spikelets 10–12 mm long, very slender, crowded in headlike groups, reddish; glumes narrow; achene trigonal, brown, slender.

Tropical Asia. Known from Guam only by the specimen discovered in a weedy coralline flat near OSIR Rd., Apra Harbor, in 1963 (4725). It is rather common in Malaysia, in wet, sandy, or muddy places usually near the sea.

Cyperus javanicus Houttuyn, Nat. Hist. 2: 13, t. 88, f.l. 1782.

Walker and Rodin 1949: 456. Koyama l.c.

Mariscus stuppeus sensu Merrill 1914: 62. *C. pennata* Lamk. 1791.

Robust tufted plants, up to 90 cm tall; leaves firm, to 7 mm wide, midrib and margins scabrid, some leaves longer than culms; bracteal leaves elongated; inflorescence with branched rays up to 10 cm long; spikes to nearly 2.5 cm long, the spikelets broad, compressed, about 6 mm long, green, crowded, spreading at right angles to the rachis (the lowest sometimes reflexed); glumes imbricate, broadly tapered; flowers 6–8; achene about half as long as glumes, sharply trigonal, obovoid, dark brown or black.

Paleotropical, including Hawaii. MacGregor 371. Ajayan Bay area (Necker 174). N. of Agat (Necker 65). Yigo (Bryan 1140). Agaña (4238).

CYPERUS LIGULARIS L., Pl. Jamaic. Pugill. 3. 1759. Koyama, l.c. 99.

Robust plants, rhizomes short, clump-forming, culms to 100 cm tall; leaves 5–12 mm wide; bracteal leaves elongate; inflorescence of several short branches bearing very dense, short subcylindric spikes; spikelets 4–6 mm long, dark reddish-

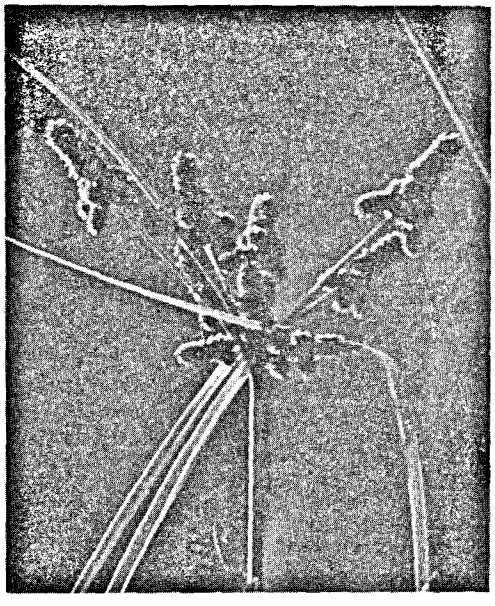


Fig. 22. Cyperus ligularis.

brown, the glumes obtuse; achene obovate, sharply trigonal, 1.5 mm long, slightly papillose, dark brown.

Tropical America and Africa, incl. Madagascar. Of rather recent introduction to Guam, where it has become throughly naturalized. Harmon (4053); Barrigada (4971).

Cyperus brevifolius (Rottb.) Hasskarl, Cat. Hort. Bogor. 24. 1844.

Koyama l.c.

Kyllinga brevifolia Rottb. Desc. Ic. Rar. Pl. 13, t. 4, f. 3. 1773. Merrill 1914: 62.

Slender perennial with creeping rhizomes, up to 40 cm tall; culms green, slender; leaves 2–3 mm wide, usually shorter than culms; only a few from each culm; inflorescence a small subglobose head, sometimes 2 or 3 together, greenish to paler 4–6 mm long; glumes pale green; stamen 1 or 2; achene elliptic, 1–1.5 mm long, pale brown.

Virtually pantropical, weedy, in rather wet places. G.E.S. 232. Moran s.n. Piti (Moore 167). Headwaters of Fena River (4472).

Cyperus kyllingia Endlicher, Cat. Hort. Acad. Vindob. 1: 94. 1842.

Koyama, l.c. 100. CHAGUAN LEMAE, BOTONCILLO.

Kyllinga monocephala Rottb. Desc. Ic. Rar. Pl. 13, t. 4, f. 4. 1773.

Safford 1905: 303. Merrill 1914: 62.

Small herbs with creeping rhizome, culms to 30–40 cm tall, often much less, sharply trigonal; leaves linear, a few on each culm, near its base, almost as long; inflorescence a single subglobose head, rarely 2 or 3, in the middle of the leaflike bracts; head *white*; spikelets flat, tiny, of only 2 glumes; achene brown or black, flat.

Pantropical. MacGregor 440. Necker 343. Nelson 276. Chamisso 167. Agaña (Safford & Seale 1070). Tumon Bay (Conover 592). Talofofo Valley (4306).

CYPERUS FERAX L.C. Richard, Act. Soc. Hist. Nat. Paris 1: 106. 1792.

Koyama, l.c.

Torulinium ferax (L.C. Rich.) Urban, Symb. Antill. 2: 165. 1900.

Merrill 1914: 63—*C. odoratus* L. sensu auctt.

Stout plant, to 100 cm high; leaves 5–12 mm wide, shorter than culm; bracts large, leaflike; inflorescence compound, rays to 15–20 cm long, spikes somewhat crowded; spikelets linear, subterete, 10–20 mm long, yellowish; glumes 2–3 mm long; rachilla obviously winged, breaking up in age at the joints; achene about 2 mm long, often slightly curved, dark brown, finely papillose.

Pantropical, in wet ground. G.E.S. 305. Wettengel Jct. (Fosberg 35302). Sumay, (Conover & Grether 555). Ylig River area (Moore 283, Rodin 772). La Cienaga.

CYPERUS ZOLLINGERI Steudel; Bryan 5 Nov. 1957.

Reported from Guam, but perhaps in error; although it probably occurs elsewhere in the Marianas.

Tribe Scirpeae

ELEOCHARIS R. Brown

Annual or perennial herbs; culms simple, terete or angled, leafless; spikelet solitary, erect, at apex of culm, without basal bracts; glumes spiralled, overlapping; perianth of 1–6 bristles or lacking; stamens 1–3;—A pantropical genus of some 150 species.

Two species in Guam.

Culms stout, to 60 cm tall, transversely septate; corms tuberous, edible; more or less cultivated.....*E. dulcis*

Culms slender, rarely over 30 cm tall, transversely septate; rhizome coarse but not tuberous; inedible; wild.....*E. geniculata*

ELEOCHARIS DULCIS (Burm. f.) Trin. ex Henschel, Vita Rumph. 186. 1833.

Walker and Rodin 1949: 456. Koyama, Micronesica; 1: 77. 1964.

UCHAGA-LANE. GROUND-CHESTNUT; WATER-NUT.

Cyperus dulcis Rumph. Herb. Amb. 6: 7. 1750.

E. plantaginoidea (Rottb.) Wight ex Safford, 268.—Merrill 1914: 60.

E. plantaginea R. Br. Prod. 224. 1810.

Scirpus plantaginodes Rottb. Desc. Ic. Pl. 45, t. 15, f. 2. 1773.

S. plantagineus Retz. Obs. 5: 14. 1789.

Culms robust, 60 (or 90) cm tall, glabrous, transversely septate, stoloniferous; corms globose, edible; sheaths few, truncate; inflorescence a solitary terminal spikelet; perianthoid bristles mostly 6, but 5–8; stamens 1, 2, or 3; style either bifid or trifid; nut obovoid.

Probably introduced; an Asiatic species. Found in marshes (MacGregor 469); in swamp north of Talofofo River (Rodin 689).

Eleocharis geniculata (L.) Roemer & Schultes, Syst. Veg. 2: 150. 1817.

Walker & Rodin 1949: 456. Koyama, Micronesica 1: 79. 1964.

SPIKERUSH

Scirpus geniculatus L. Sp. Pl. 48. 1753 (p.p.).

S. capitatus L. Sp. Pl. 48. 1753.

E. capitata (L.) R. Br. Prod. 225. 1810; Safford 1905: 267; Merrill 1914: 60.

E. atropurpurea sensu Presl, Rel. Haenk. 1: 196. 1828.

Cespitose herbs; rhizomatous; culms to 30 cm tall, terete, transversely septate, 3–8 mm thick; spikelets 1–3 cm long glumes thin; bristle 5–8, as long as or longer than the achene; stamens usually 2; styles 2 or 3 fid; achene brown, granulose to black smooth, 1 mm long.

Pantropical; in marshes, swamps, and at edges of mangrove swamps. Manengon (3868); Apra (4888).

FIMBRISTYLIS Vahl

Annual or perennial herbs with basally leafy usually terete culms; panicle involucrate; spikelets capitate or crowded, rarely solitary; glumes concave, usually spiralled and overlapping; perianth none; stamens 1–3; style bifid or trifid, the base

often enlarged; fruit an achene, biconvex or trigonal.—A genus of about 125 species, chiefly paleotropical. Six species in Guam, one with 2 marked subspecies.

Key to Species

[after Koyama 1964]

1. Leaves at base of culms all normally with blades.
   2. Leaf sheaths bilaterally compressed, with acute keel, subdistichous; floral scales sharply keeled (hence spikelets angled); styles neither compressed nor fimbriate; style trifid.....*F. autumnalis* ssp. *tainanensis*
   2. Leaf sheaths dorsiventrally compressed or with obtuse back, usually tristichous; floral scales with obtuse back (hence spikelets mostly terete); styles somewhat compressed, sometimes distally fimbriate; styles bifid or trifid.
      3. Ligule lacking; achenes dark-colored when ripe; styles bifid or trifid .....*F. cymosa*
      3. Ligule present as a tuft of short hairs; achenes light brown or cream-white when ripe; styles bifid.
         4. Glumes with several parallel nerves; achene smooth; achenes cream-white when ripe; spikelets 5–6 mm broad..*F. tristachya*
         4. Glumes 1-nerved, carinate; achene trabeculate; spikelet ovoid, not more than 7 mm long; glumes somewhat castaneous, rarely pale brown; anthers c. 0.7 mm long.....*F. dichotoma*

1. All or some leaves at base of culm bladeless, consisting solely of a sheath.
   5. Some leaves with laterally compressed blade; some involucral leaves longer than the inflorescence.....*F. littoralis*
   5. All leaves bladeless; involucral leaves shorter than the inflorescence.... .....*F. globulosa*

[Uncertain record: Fimbristylis puberula, sensu Gaud., fide Safford 1905: 277.]

Fimbristylis autumnalis (L.) Roemer & Schultes, Syst. Veg. 2: 97. 1817.

ssp. **tainanensis** (Ohwi) T. Koyama, Micronesica 1: 81. 1964.

F. complanata sensu Safford 1905: 276; Merrill 1914: 61.

Herb; culms from short creeping rhizome to 50 cm tall; sheaths bilaterally, compressed, acutely carinate, distichous, grooved; leaves all with blades, 3–5 mm wides crowded near base of culm and often longer; inflorescence a tight umbel, or 2 or 3; rays crowded, short; spikelets brown 5 mm long, glumes sharply carinate about 1.5—2 mm long; style trifid. achene trigonal, pale, finely warty.

Micronesia and Formosa; the species of pantropic distribution. MacGregor 441, 537. N. of Agat. (Necker 59). Mt. Lamlam, 1000′ alt., (Moore 223).—In moist localities.

Fimbristylis cymosa R. Br. Prodr. Fl. Nov. Holl. 1: 228. 1810.

Koyama l.c. 82.

Cespitose, the rhizome very short; leaves crowded at base, tufted, spreading to suberect, blades linear, rather thick, almost rigid, 5–30 cm long, 1–4 mm wide,

some recurved, somewhat acute at apex; ligule absent; culms, wiry, smooth, 10–60 cm tall, terminating in the open and branched, or congested and headlike inflorescence; achenes grayish or dark brown when ripe, style bifid or trifid.

Key to subspecies

Styles bifid; spikelets solitary or in a cluster of 2–3, glumes rusty-brown ..... ssp. *spathacea*

Styles trifid; spikelets crowded in a globose head, glumes slightly grayish..... ssp. *umbellato-capitata*

ssp. **spathacea** (Roth) Koyama, Micronesica 1: 83. 1964.

F. spathacea Roth, Nov. Sp. Pl. 24. 1821.

F. cymosa sensu Walker & Rodin 1949: 457.

F. atollensis St. John, Pacific Sci. 6: 145. f. 2. 1952.

Inflorescence open, branched. Achenes lenticular, brown, slightly glossy.—Japan, Micronesia.

MacGregor 494. Pati Pt. (Markely & Necker 359). Harmon (4057). Very common in Micronesian atolls.

ssp. **umbellato-capitata** (Hillebrand) Koyama, l.c. 82. 1964.

F. cymosa var. *umbellato-capitata* Hillebr., Fl. Hawaiian Is. 473. 1888. Walker & Rodin 1949: 457.

F. spathacea sensu Safford 1905: 277, non Roth.

Inflorescence congested, often as one dense head. Achenes trigonal, grayish, dull.—Ceylon, Malaysia, Ryukyu Is., Hawaii.

G.E.S. 187. Nelson 389. MacGregor 374. Pati Pt. (Necker 168; 319; 369). Agaña Heights (Moore 398a). Agaña (Safford & Seale 1075). E. of Barrigada on beach (Steere 133). Harmon (4071).

Fimbristylis tristachya R. Brown, Prodr. Fl. Nov. Holl. 1: 226. 1810.

Koyama, l.c. 85.

F. mariana Gaud. Bot. Voy. Freyc. 413. "1826." (excl. vars.)

F. maxima K. Schum. Fl. Kais. Wilhemsl. 24. 1889. Merrill 19: 61.

F. marianna var. *foenea* Kükenthal, Rep. Sp. Nov. 16: 432. 1920.

F. schoenoides var. *foenea* (Kük.) Fosberg; fide Bryan 28 Nov. 1957.

Tufted; rhizome short, woody; culms to 70 cm tall, slender, compressed; leaves many, mostly basal, blades linear, 1–2 mm wide; shorter than culms; inflorescence simple or compound, umbellate, bracteal leaves 2 or 3, shorter than the inflorescence; rays unequal, to 3.5 cm long; spikelets subovoid, 6–10 mm long, 3.5–6 mm wide, lightbrown, many-flowered; glumes elliptic, about 3.5 mm long, 3 mm wide, several-nerved, apex mucronate; achenes obovate-orbicular, slightly over 1 mm long, biconvex, light brown, glossy, slightly raised on a short gynophore, style 2 mm long, flattened, fimbriate, bifid.

Malaysia, Australia. In savannas in Guam. MacGregor 494. Nelson 316. Mt. Tenjo (Bryan 1100). Near Umatac (Fosberg 35434). Talofofo (Hosaka 3133). Manengon (4530; 4844).

Fimbristylis dichotoma (L.) Vahl, Enum. Pl. 2: 287. 1806.

Koyama, Micronesica 1: 86. 1964.

Scirpus dichotomus L. Sp. Pl. 50. 1753.

F. diphylla (Retz.) Vahl, l.c. 289; Merrill 1914: 61.

Very similar to F. cymosa ssp. spathacea. Tufted; leaves mostly basal, shorter than culms; culms to 60 cm tall; leaves to about 3 mm wide, sometimes pubescent; inflorescence branched, branches 10–15 cm long and usually longer than the bracts; spikelets on rays of various lengths, about 6–7 mm long; glumes ovate, dark brown, keel green, mucronate; style bifid, white to purplish; achene biconvex, nearly orbicular, with fine longitudinal ribs and cross-bars [trabeculate].

Pantropical, and in many warm-temperate regions; one of the most widespread of all seed plants. There are more than 400 synonyms. Many collections from Guam. Mangilao (3835). Umatac (4394).

Fimbristylis littoralis Gaud., Bot. Voy. Freyc. 413. "1826."

Koyama, Micronesica 1: 88. 1964.

F. miliacea sensu Safford 1905: 277; Merrill 1914: 61.

Tufted, glabrous annual, up to 60 cm tall; leaves chiefly basal, some bladeless; subdistichous; to 35 cm long; some bracts longer than the inflorescence; spikelets in umbels arranged in an open, rebranched inflorescence; spikelets obtuse, subglobose, brown, 2–4 mm long; achenes trigonal, 1/2 mm long, pale brown.

Pantropical: long known as *F. miliacea*. In moist places. Fena R. headwaters (4477). Piti (Moore 143). Ylig R. Mouth (Rodin 765).

Fimbristylis globulosa (Retz.) Kunth, Enum. Pl. 2: 231. 1837.

Safford 1905: 277; Merrill 1914: 61. Koyama, l.c. 89.

Culms densely tufted, 40–90 cm tall, with 2 or 3 bladeless sheaths oblique at orifice, at the base; inflorescence a simple or partially compound umbel with several spikelets; rays few, to 3 cm long; bracts of involucre 2 or 3, about 1 cm long; spikelets sub-obovoid, or globose, 3–4 mm long, 2.5–3 mm wide, rusty-brown; glumes oblong, 2 mm long, rounded at apex, with broad whitish margins; achene obovate, biconvex, 0.7 mm long, minutely warty; style bifid or trifid. (Koyama).

Indomalaysia to Polynesia. Agaña swamp (Bryan 1081).

This is said to be equal to *F. torresiana* Gaud.

MACHAERINA Vahl

Perennial herbs, often stoloniferous; culms barely trigonal, leafy at base; leaves slender, terete or laterally flattened (rarely bladeless); ligule obscure; inflorescence a slender compound panicle, the partial panicles spicate or paniculate; spikelets bisexual, glumes biseriate, upper one usually perfect; achenes glabrous, slightly beaked, obscurely trigonal; stigmas 3; hypogynous bristles 3 or none.—About 70 species in the Pacific region and Japan.

One species in Guam.

Machaerina mariscoides (Gaud.) J. H. Kern, Act. Bot. Neerl. 8: 266. 1959.

Koyama, Micronesica 1: 102. 1964.

Cladium gaudichaudii Wight ex Safford 1905: 230. Merrill 1914: 59.
Baumea mariscoides Gaud. Bot. Voy. Freyc. 417. 1829.

Culms arising from a thick rhizome, more or less aphyllopodic, to about 90 cm tall, laterally compressed, 3–4 mm wide; normal leaves (with blades) all on the culms, spaced, laterally compressed, 3–8 mm wide, acute at apex, grayish-green, elongated. Inflorescence an oblong panicle, 15–30 cm long; partial panicles 5 or 6, the lower ones interrupted; lower bracts much longer than the panicle. Spikelets in a group of 2–3, rarely solitary, ovoid, 3–4 mm long, with 3–4 glumes of which 1–3 bear flowers, these glumes lance-ovate, acute, rusty-brownish, sparsely pubescent at least distally. Achene only one to each spikelet, about 3 mm long (including the beak), elliptic, 2–2.2 mm long (excluding the beak), obscurely trigonal, glabrous, amber-brown, shiny, with irregular depression; beak subulate-lanceolate, 1 mm long, densely hispid with white hairs; stigmas 3; stamens 3.

An endemic Micronesian species, with a further subspecies endemic in Palau.

In Guam, found in volcanic hills in thickets of trees or shrubs. Nelson 277. Mt. Tenjo (Moore 100; Steere 164). Hills near Sagua River (4216).

Rhynchospora Vahl

Usually perennial, herbaceous, culms terete or trigonal; leaves basal or cauline; inflorescence dense capitate or branched paniculate; spikelets oblong to fusiform; glumes 1-nerved, spiralled and overlapping, distal ones larger; upper flowers staminate, lower flowers bisexual; lowest glumes empty; 4th or 4th and 5th with bisexual flowers; style 2-cleft; stamens usually 3; perianthoid bristles usually 6, sometimes fewer, or absent; fruit an achene, biconvex, capped by the persistent style-base.—A large genus of about 200 species, widely distributed, mostly tropical and subtropical.

Two species in Guam.

Inflorescence of several dense corymbs.....*R. corymbosa*
Inflorescence a single dense subglobose head.....*R. rubra*

Rhynchospora corymbosa (L.) Britton, Trans. N.Y. Acad. Sci. 11: 85. 1892.
Safford 1905: 366. Merrill 1914: 62. Koyama, Micronesica 1: 106. 1964.
Scirpus corymbosus L. Cent. 2: 7. 1756.
R. aurea Vahl, Enum. 2: 229. 1806.

Perennial with scabrous culms up to 90 cm tall; leaves linear, the lowest ones to nearly 90 cm long; tapered to the pointed tip; blades 1–2 cm wide; inflorescence of several to many rather dense corymbs, these subumbellate; spikelets 6–7 mm long, longer than the bristles; glumes mucronate; bristles usually 6, minutely barbed; achene biconvex, 2–3 mm long, obovate, dark brown, faintly reticulate; style base large, rostrate, corky; achene shorter than bristles.

Pantropical, in wet soil. MacGregor 461; along the Talofofo R. (5021).

Rhynchospora rubra (Lour.) Makino, Bot. Mag. Tokyo 17: 180. 1903.
Merrill 1914: 62. Koyama, Micronesica 1: 107. 1964.
Schoenus ruber Loureiro, Fl. Cochinch. 52. 1790.

R. wallichiana Kunth, Enum. 2: 289. 1837.

Culms tufted, to 50–60 cm tall (rarely more); leaves basal, linear, up to 30 cm long. Inflorescence a single dense globular head subtended by a few leafy bracts, about 1.5 cm in diameter. Spikelets slender; about 5 glumes; 6–7 mm long; bristles shorter than the achene; achene biconvex, 2.5 mm long, obovate, dark brown, smooth; style base low conical.

Tropical Africa, Indomalaysia, S. Japan, and the Pacific, incl. N. Australia. In Guam usually in the savannas; Mt. Santa Rosa; Mt. Tenjo; Fena Hills (4114).

SCHOENUS Linnaeus

Tufted herbs with slender leaves (or culms rarely solitary); basal leaves crowded; inflorescence paniculate or fasciculate, spikelets 2–5-flowered; flowers bisexual; glumes biseriate, the lowest few empty; bristles 6 or less or none; stamens 3; achenes somewhat sunken in the concavities of the rachilla, trigonal, ovate; style deciduous, with 3 stigmas.—Australia to S. Asia and Africa.

One species in Guam.

Schoenus punctatus R. Brown, Prodr. Fl. Nov. Holl. 1: 232. 1810.

Koyama, Micronesica 1: 105. 1964.

Cladium aromaticum Merrill 1914: 59.

Machaerina aromatica (Merr.) Koyama ined. in herb.

Densely tufted; culms slender, glabrous, to 60 cm tall, about 1 mm thick; roots aromatic when fresh; basal sheaths somewhat inflated, broad, reddish-brown; leaves narrow, mostly basal, numerous, involute when dry, 30–40 cm long; inflorescence a rather strict panicle 10–25 cm long, branches spikelike, few and distant, to 6 cm long, ascending. Spikelets lance-oblong, compressed, 5 mm long, paired, subtended by sheathing bracts, pedicels 2–5 mm long, bracts 3–5 mm long, glumes 3 mm long, the 3rd and 4th with bisexual flowers, the 5th (and sometimes also the 6th) with staminate flower; stamens 3; the anthers minutely mucronate; ovary ovoid; styles trifid, 3–4 mm long; achene plump, not beaked, sessile.

Known only from Guam and from Thursday Is. (between Australia and New Guinea).

The type of Merrill's description was from hills s.e. of Piti, at 300 m. alt. (MacGregor 492). Collected again on a recently burned-over hillside just north of Fena Dam (4113).

SCIRPUS Linnaeus

Annual or perennial herbs, culms leafy at base (leaves often reduced to sheaths), terete or variously angled; spikelets terete or compressed, single or in branched inflorescences, often apparently emerging from the tip of the culm on one side; glumes spiralled, overlapping; perianth of 1–6 bristles, or lacking; stamens 2 or 3; style bifid or trifid, usually caducous; achene biconvex or trigonal, capped by a small conic style-base.—A genus of over 200 species, widely distributed, usually

in marshes or swamps; very similar to Eleocharis, but the style base without a constriction.

The following account is based on the monographic work of T. Koyama, who defines the genus broadly, including Fuirena, Rottb.

Three species in Guam.

1. Culms pentagonal; plants leafy, with a bluish-green cast; flower with 3 broad tepals; never in mangrove or coastal swamps.....*S. fuirena*
1. Culms terete; plants leafless (excep basal sheaths), green; flower without tepals; in marshes (in standing water), near the coast.
   2. Culms 70–100 cm tall, 4–8 mm thick.....*S. littoralis*
   2. Culms 20–60 cm tall, 1–3 mm thick.....*S. juncoides*

Scirpus fuirena T. Koyama, J. Fac. Sci. Univ. Tokyo III, 7: 361. 1958.
Koyama, Micronesica 1: 75. 1964.
Fuirena umbellata Rottb. Desc. Ic. Pl. 70, t. 19, f. 3. 1773.
Safford 1905: 278; Merrill 1914: 62.

Erect, leafy, culms att. 90 cm tall, bluish-green; the culms markedly pentagonal; leaves flat, att. 20 cm long, 1.3 cm wide, with obvious ligule; inflorescence branched, spikelets clustered, pubescent, to about 6 mm long; glumes 12 or more, strongly nerved, midrib hairy, projecting beyond the rounded, 2-lobed apex; flower with 3 broad tepals; stamens 3; ovary obovoid, style trifid; fruit trigonal, obovoid, bluntly pointed at tip, brown.

Paleotropical. Collected in Guam by Haenke, and later by Lesson; in volcanic hills behind Piti (MacGregor 399); in valleys of Manengon Savanna (3875).

Scirpus littoralis Schrader, Fl. Germ. 1: 142. 1806. BULRUSH.
var. **thermalis** (Trabut) T. Koyama, Micronesica 1: 76. 1964.
S. littoralis var. *thermalis* Trabut, in Battand. and Trabut, Fl. Alger. (Monoc.) 99. 1899.

Rhizomes thick, horizontal; erect culms to 120 cm tall or more, leaves basal and consisting of bladeless sheaths, terete, smooth, glabrous, arising from mud or standing, often brackish water. Inflorescence small, apparently lateral and subterminal on the culm tip, actually terminal and overtopped by a subtending bract; spikelets few (6 or less), brown, lax, glabrous. Spikelets clustered in two or threes, rarely solitary, ovateoblong, 7–12 mm long, 3–4 mm wide, rusty-brown; glumes with pale margins; keel ending a short mucro; achenes broadly obovate, lenticular, 2×1.5 mm, smooth, brown, rounded-mucronate at apex; style bifid perianthoid bristles 4, long-ciliolate, slightly longer than the achene.—Fig. 23.

In Guam these plants are often gregarious and form dense, pure stands; the best localities are along the banks and at the estuaries of the various streams on the south-west coast which empty into Apra Harbor, as at the mouth of the Sasa R. (4150), or the Lasaguas R. (4396), and in Apra Harbor in mangrove swamps with a fringe of Lumnitzera (4887). Also known from Saipan and Tinian.

Scirpus littoralis, in its very marked various varieties, is of broad distribution from Europe through Asia Minor to India and to S. E. Asia and Australia.

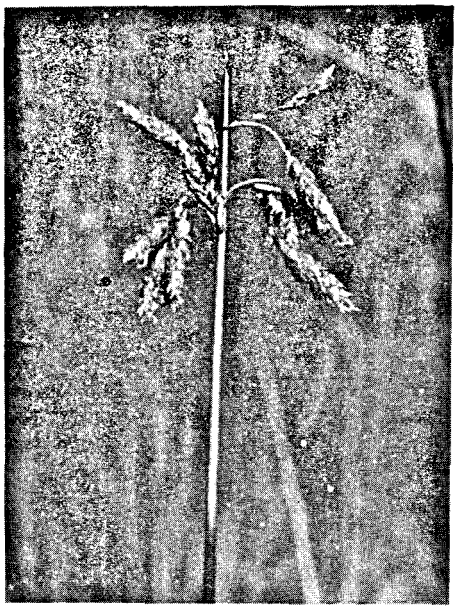


Fig. 23. Scirpus littoralis var. thermalis.

Scirpus juncoides Roxburgh, Fl. Ind. ed. 1, 1: 228. 1820.

Koyama, Micronesica 1: 75. 1964.

S. erectus sensu Merrill 1914: 63, non Poiret.

Tufted annual with fibrous roots only, no rhizomes, culms slender, terete, 1–3 mm thick, 20–60 cm tall, light green, at base with a few bladeless sheaths 3–10 cm long. Inflorescence a pseudolateral head of 2–7 spikelets, involucre to 7 cm long. Spikelets ovoid or subellipsoid, greenish-straw-colored, 6–13 mm long, 3–4 mm wide, many-flowered. Glumes broadly elliptic, 3.5–4 mm long, rounded-mucronulate at apex, with broad green keel. Achenes obovate-orbicular, unequally biconvex, about 2 mm long, about 1.6 mm wide, weakly pitted, brownish-black; style bifid; perianthoid bristles 6.

A species of India, S. China and Indo-China, Japan, Malaysia, and Australia. It has only once been found in Guam (G.E.S. 215). A variety occurs in Kauai, Hawaii.

Scleria Bergius

Perennial herbs with leafy stems, usually trigonal; rhizomes creeping or ascending; inflorescence a panicle or spicate, terminal or axillary; monoecious; fertile spikelets 1-flowered, with several empty glumes; staminate spikelets many-flowered; achene globose or ovoid, crustaceous, usually borne on a hypogynium appearing as a lobate disc; stamens 1–3; style trifid.—About 100 species in the tropics of both hemispheres.

Four species in Guam.

Key to species
(after Koyama 1965)

1. Perennial with ligneous rhizomes; partial panicles borne only on upper part of culms.
   2. Spikelets bisexual; inflorescence a terminal spike; hypogynium lacking.. ..... *S. lithosperma*
   2. Spikelets unisexual; inflorescence a panicle; hypogynium present..... ..... *S. polycarpa*
1. Annual with fibrous roots; partial inflorescences borne all along the culms.
   3. Spikelets congested in small heads in leaf axils; fallen achenes tightly enclosed in 2 scales..... *S. caricina*
   3. Spikelets paniculate; fallen achenes free of any scales.... *S. novae-hollandiae*

Scleria lithosperma (L.) Swartz, Prodr. Veg. Ind. Occ. 18. 1788.

Koyama, Micronesica 1: 71. 1964.

Tufted, up to 60 cm tall, culms slender, leaves well-spaced, along the culm, narrow, about 20 cm long, 3 mm wide; inflorescences slender, axillary, unbranched, or with 1–2 short branches, up to 8–10 cm long, spikelets single or in small groups, interrupted, 4–5 mm long, glumes brownish; nut *white*, smooth, subglobose-obovoid, about 2 mm thick.

Pantropical (except Africa), usually in dry, shaded places. Nelson 308. Manengon (3877).

Scleria polycarpa Böckeler, Linnaea 38: 508. 1874.

Koyama, l.c. 72

S. margaritifera Willd.; sensu Merrill 1914: 63.

Tufted; leaves 6–12 mm wide, along the culms, usually in whorls or close groups, at intervals; inflorescence of axillary panicles; these of few spikelets, the lower ones female; spikelets unisexual, or male flowers distal; nut *white*, hard, smooth, on a distinct hypogynial support.

Malaysia, N. Australia, Polynesia. MacGregor 540. Mt. Lamlam (Necker 380). Tarzan Falls (3829). Mt. Almagosa (Pedrus 57).

Scleria caricina (R. Brown) Bentham, Fl. Austral. 7: 426. 1878. Koyama l.c. 74.

Diplacrum caricinum R. Br. Prodr. Fl. Nov. Holl. 241. 1810.

Merrill 1914: 60.

Tufted, with culms to 30 cm tall; short leaves at intervals along the culms; blades to about 4 cm long, narrowly oblong; inflorescences axillary, spikelets crowded, also terminal; clusters about 6–7 mm wide, of a few short branches, each with a female spikelet with a few male spikelets at the base; male spikelets few-glumed, with usually 1 stamen; female spikelet of 2 subequal glumes 3-toothed at apex; stigmas 3; nut very small, globse, white, *ribbed.*

Indomalaysia to Australia. In moist locations; stream banks, old rice fields, etc. G.E.S. 245. Nelson 234. Mt. Lamlam (Moore 239). (240).

Scleria novae-hollandiae Böckeler, Flora 58: 120. 1875.

Koyama, l.c. 73.

S. Merrillii Palla, Allg. Bot. Zeitschr. 17, Beibl. 8. 1911.

S. laxa sensu Merrill. 1914: 63.

Annual; culms to 60 cm tall; leaves elongate, narrow; inflorescences along the culms, paniculate-racemose; siikelets with persistent glumes; panicles bracteate; achenes ovoid or ellipsoid, 1.5 mm wide (or more), pale gray.

Philippines, New Guinea, and Queensland. G.E.S. 173. MacGregor 483. Mt. Lamlam (Gregory & Necker 381). Mt. Tenjo (Moore 76). Manengon (4523).

GRAMINEAE

Annual or perennial plants, mostly herbaceous, some woody (bamboos), with mostly erect stems, or these sometimes creeping horizontally, either above or below ground (stolons or rhizomes); leaves mostly long and narrow, flat, folded, or sometimes rolled, always simple, of two parts, a tubular sheath and an expanded blade, attached at a node (often thickened and solid), with a ligule at the junction of blade and sheath, and veins parallel; leaves alternate; rarely 2-ranked; branches produced from or through the sheath. Inflorescences compact and small to large and spreading, composed of spikelets, each bearing one or more florets, these distichous, sessile or shortly stalked (pedicellate), with a glume at the base; flowers small, bisexual or unisexual, with 1 to 5 but usually 3 stamens, borne within 2 (rarely 1 or 3) fleshy scalelike lodicules; pistil 1, of one single-celled ovary, with 2 (rarely 1 or 3) styles; fruit a caryopsis, with starchy endosperm, the embryo small and at the base.

Subfamilies

1. Subfamily POOIDEAE (POATAE)

Spikelets with 1 to many florets; florets break off the inflorescence above the glumes, hence older inflorescences show the remaining persistently attached glumes, but the florets lacking; or, if glumes drop off also, the spikelet is *not* of 2-floret structure in which the lower floret is male or nonfertile and the upper floret bisexual; all florets are more or less laterally compressed or terete (circular in cross-section).

2. Subfamily PANICOIDEAE (PANICATAE)

Spikelets each with only 2 florets; spikelets and glumes falling together, leaving only the branches of the inflorescence. Spikelet with an upper floret that is bisexual or female, and a lower floret that is male or that lacks all sex organs. In one tribe, the florets are unisexual, and the entire inflorescence is either male or female (corn and its relatives).

Key to the tribes of Subfamily POOIDEAE found in Guam.

1a. Woody (usually large and treelike) plants; culms persistent; spikelets bisexual; lemma with 5 or more nerves (longitudinal veins); lodicules usually 3 in number; styles 2 or 3.....BAMBUSEAE.

1b. Herbaceous (mostly small, but sometimes large and canelike) plants; spikelets bisexual or unisexual.

2a. Spikelets in open or contracted spikelike panicles, racemes, or spikes, (if in spikes, then both or the lower glume lacking—if the spikelets are alternate on the opposed sides of a continuous rachis—or if on only one side of the rachis, then spikelets have 2 or more fertile florets).

3a. Spikelets with 2 or more fertile florets; if with but 1 fertile floret, then with sterile florets above it.

4a. Lemma and rachilla glabrous (hairless) to hairy but not with long silky hairs which envelop the lemma; small to medium grasses.

5a. Glumes shorter than lowest floret; upper florets distinctly exserted; rarely longer.

6a. Lemmas 5-many- nerved, *entire* or briefly 2–5 toothed at the apex.....FESTUCEAE

6b. Lemmas 1–3 nerved.....ERAGROSTEAE

5b. Glumes equal to or longer than the lowest floret (often as long as the spikelet); lemmas often bearing a bristle-like awn .....AVENEAE

4b. Lemmas (or rachilla-joints) bearing long silky hairs that envelop the lemma; large reedlike plants, with large plumelike panicles .....ARUNDINEAE

3b. Spikelets with 1 fertile floret, with or without 1 or 2 male or barren florets produced below it.

7a. Glumes minute or lacking (suppressed); palea 3—9–nerved; stamens usually 6;.....ORYZAE

7b. Glumes usually well-developed; palea usually 2-nerved; stamens often less than 6.

8a. Spikelet of 3 florets, the terminal one bisexual, the other male or barren.....PHALARIDEAE

8b. Spikelet of only one floret; leaf-blades very narrow or linear, flat or rolled, sessile, without cross-nerves; spikelets bisexual.

9a. Spikelets breaking up at fruiting maturity, the rachilla breaking at the nodes above the more or less persistent glumes; rarely falling entire.

10a. Lemmas 3–5-nerved .....AGROSTEAE

10b. Lemmas 1–3-nerved .....SPOROBOLEAE

9b. Spikelets falling entire at maturity, either separately or in groups; lemmas 1–3 nerved .....ZOYSIEAE

2b. Spikelets sessile or short pericellate along 1 side of rachis of solitary, digitate, or scattered spikes, or spikelike racemes, (with 1 fertile floret and 1–3 neved lemma), or on opposite sides of radius of solitary spikes or racemes.

11a. Spikelets disposed alternately on opposite sides of the rachis....
.....LEPTUREAE
11b. Spikelets in one or 2 rows on *one side* of the rachis..CHLORIDEAE

Key to Tribes of Subfamily PANICOIDEAE

1a. Spikelets all bisexual; or with male or barren and fertile spikelets found in each inflorescence, the male and female spikelets near each other; if unisexual, the lemma very firm and hard.
2a. Spikelets 1 or 2, similar; glumes mostly thin-textured; (lowest glume occasionally lacking); upper lemma mostly awnless
3a. Palea and upper lemma firmer than glumes.....PANICEAE
3b. Palea and upper lemma thinner than glumes.....MELINIDEAE
2b. Spikelets mostly 2 (paired), one sessile, the other stalked (pedicellate); those of each pair often unlike; glumes mostly firm-textured; upper lemma usually bearing an awn.....ANDROPOGONEAE
1b. Male or female spikelets in separate inflorescences, or in different parts of the same inflorescence, and different in appearance; lemmas often thin or translucent..... MAYDEAE

Notes on the Grasses

There are probably close to five thousand species of grasses found throughout the world today. These are grouped into some 500–600 genera, the genera into 12–27 tribes (the numbers depend on what botanical authority is followed), and the tribes into one of two subfamilies, the Pooideae and the Panicoideae.

In Guam there have been recorded about 100 species, in 45 genera; some genera are represented by only one species, others by as many as eight species. Of the roughly 100 species, only about 33 may be considered indigenous, that is, occuring naturally in Guam prior to any human habitation of the island. The remaining seventy species are believed to have entered Guam during and after the settlement of the island by the original inhabitants, the Chamorros, or in other words during the last couple of thousand years. A considerable number of these, in turn, have been brought in, accidentally or by design, since the history of European discovery, that is mainly in the last 450 years. Finally, a fair number of species came in during the relatively recent period of American administration. Hence we may classify the species as indigenous or introduced; and if introduced, as deliberate or accidental, and perhaps as pre-European or post-European introductions.

Of the pre-European introductions we may note especially rice (*fae* in Chamorro), sugar-cane, and job's-tears, and perhaps bamboos. In a list of post-European introductions we may place many weedy species which have unwittingly been brought in, as well as a variety of cereal, forage, and other useful grasses, such as corn, temple grass, Guinea grass, and carpet grass.

Classification of grasses

The arrangement of the tribes of the family is based on that of C. E. Hubbard, who elaborated the family in Hutchinson's "Families of Flowering Plants," and on the works of Hitchcock and Chase.

As with most plants, the natural relationships of the grasses are evinced in the structures associated with reporduction, the flowers. Grass flowers are quite different in general appearance from larger flowers of other plants, such as the hibiscus or the rose. A grass flower is called a *floret* and consists of a seed- (ovule-) bearing female organ, the *pistil*, which contains a single seed (ovule) in a basal *ovary* and bears above this usually two (sometimes three) feathery *styles*. Sur-

rounding the pistil are 3 male pollen-producing organs, the *stamens*, which consist of a threadlike stalk, the *filament*, and a larger terminal structure, the *anther*, which is two-chambered and contains the *pollen*. The pollen grains are blown about by the wind, and when they light on the styles of another (or the same) floret, fertilization of the ovule results, and the ovule develops into an embryo; the structure resulting is a seed. In most grasses, the seed is grown fast to the surrounding tissue, and the type of fruit that results is a caryopsis (examples are grains of corn, unpolished rice grains, etc.).

The florets contain no petals or sepals (only small *lodicules*, which occur at the base of the ovary, may be the remnant of these organs). Surrounding the floret is a series of specialized leaves called *bracts*; by their position and their relative proximity to the ovary they are distinguished as the *palea* (closest to the ovary), the *lemma*, and the *glumes* (one or two may be present). One or more florets together form a structure called a *spikelet*. Spikelets are grouped into various kinds of *inflorescences*, such as spikes, racemes, or panicles. Simple, unbranched inflorescences, in which the spikelets are on stalks (*pedicels*) are called racemes; if stalkless, these are *spikes*; if complex and branched, the inflorescence may be a *panicle*. The structure of the spikelet, and the numbers and positions of the spikelets and the other structures mentioned, are all of the greatest importance in the classification and identification of the grasses.

Grasses in the vegetation of Guam

Vegetation may be defined as the total plant cover of a given area. As such, it may contain many different kinds of plants, among which may occur one or more kinds of grasses.

In general, grasses are more abundant in open, sunny areas. They are few, and fewer kinds occur, in dense shade, and under thick forest. Some vegetation types may be defined by the grasses which to a great extent compose them; others contain no grasses at all or only a few kinds present in small numbers.

Natural grassland—vegetation types of which grasses are the dominant plants—are of several types, but in the tropics are fewer in number (and usually in importance) than in the temperate zones. Further, it is believed by some authorities that very few grasslands in the humid tropics are strictly speaking, "normal"; that is, they are or may be a result of the disturbance or destruction of another vegetation type, usually forest, by such factors as fire, clearing or cutting, overgrazing by goats, and so on.

In Guam, grasslands are most common on the southern portion of the island, where volcanic hills rise to about 1200 feet altitude. These areas have been called savannas, although they do not always show the scattered trees which this term ordinarily implies. In most cases, the association of several characteristic species is a good indicator of soil type. However, there may occur local dominance or even relatively pure stands of a single species, not always on the "normal" soil substrate. A number of characteristic ferns and other flowering herbs and shrubs may characterize the savanna vegetation also. For a fuller description, see Fosberg's *Vegetation of Micronesia* pp. 31–35, and 64–67 (1960). The dominant genera are *Miscanthus* and *Dimeria*.

Besides the savannas, there are three or four other principal vegetation types where grasses play an important role.

Marshes. The Reed Marsh is typified by the abundance of the tall cane-like reed, *Phragmites karka* (*Trichoon Roxburghii* of Safford). Plants may attain a height of 15 feet, and grow into an extremely dense, almost impenetrable stand. A typical example of the Reed March may be found behind Agaña (Agaña Swamp).

Wet Flats. One type of vegetation prevalent on flat areas inundated with (usually brackish) water is that termed *Paspalum Flats* (see Fosberg, p. 61, 1960). The area is covered by the creeping species *Paspalum vaginatum*. Another type of flatland may be *Panicum Flats*, the dominant species being *Panicum purpurascens*. *Paspalum* Flats occur near the coast in southern Guam, especially near ponds. *Panicum* Flats may be used as pastures.

Strand Vegetation. Certain grasses are characteristic of, though they do not dominate, the

sandy beach areas. The most common species are *Sporobolus virginicus*, a sand-binding, creeping species recognizable by the rather short, distichous, rigid, sharp-pointed leaves set at nearly right angles to the erect stems. A bunch-grass, *Lepturus repens*, and a short, rather broad-leaved grass (the leaves however only 1 or 2 inches long) with very small inconspicuous inflorescences, *Thuarea involuta* are indigenous to Guam. Also frequently found on or near beaches are such naturalized or weedy species as *Cenchrus echinatus*, the burgrass, *Cynodon dactylon*, (Bermuda grass), *Eragrostis tenella* (lovegrass), and, under light forest behind beaches, *Oplismenus compositus*, and several weedy species.

Weed Communities. Much of the land in Guam has been at one time or another cleared or burned. In such locations, if neglected, weed communities spring up. Ultimately these return to a forest type of vegetation (though not necessarily of the original type), but for some length of time the area may be populated by grasses, often mixed with a large number of vigorous herbs and shrubs.

When savanna communities are burned, the swordgrass or neti (*Miscanthus*) generally returns rather rapidly, growing from rootcrowns.

When limestone areas are cleared, the invading plants may be quite diverse; however, such grasses as species of *Pennisetum, Panicum, Paspalum, Chloris, Chrysopogon, Digitaria*, and *Setaria* probably will be present. Depending on the species which become dominant, the area may retain a low growth, or meadow-like, appearance, or may be choked with tall species taller than a man.

ECONOMIC GRASSES

Grasses of economic importance may be either beneficial and hence at least potentially valuable; or may be useless or even destructive.

The valuable grasses may be grouped under these headings:

(1) Grasses of direct importance to man; this would include the cereal grasses (wheat, oats, barley, rye, rice, corn, etc.); citronella grass (source of citronella oil); sugar cane; bamboos; grasses used for thatch;

(2) Grasses of direct importance as the basis of raising domestic animals: pasture and forage grasses; fodder;

(3) Grasses of importance in soil conservation: sand or turf-binding grasses which prevent drift and erosion, which reclaim tidal areas;

(4) Grasses of biological importance, such as those which support game or insure the continuity of a vegetation type.

The detrimental grasses may be arranged as follows:

(1) Noxious weeds, which prevent or reduce the growth of any valuable grass;

(2) Plants with irritating or annoying properties (such as burs);

(3) Plants which tend to replace native grasses in any vegetation type.

If the grasses found on Guam are arranged according to this plan, we would find that there are the following useful species:

(1) Edible products of major importance (at least potentially): *Zea mays* (maize or corn); *Oryza sativa* (rice); *Saccharum officinarum* (sugarcane); *Sorghum bicolor*; of minor importance, *Coix lachryma-jobi* (Job's-tears), *Saccharum chinense, S. spontaneum*; *Echinochloa colonum* (jungle-rice). For essential oils (citronella oil), *Cymbopogon citratus* (citronella grass). For construction purposes, *Bambusa* species (bamboos; also these have edible buds).

(2) Pasture and forage grasses: Guatemala grass (*Tripsacum*); *Pennisetum purpureum* (Napier-grass); *Panicum maximum* (Guinea-grass); *Brachiaria mutica* (Para-grass); *Paspalum dilatatum* (Dallis-grass); sometimes *Cynodon* (Bermuda-grass) or *Axonopus* (Carpet-grass) are of value. Napier-grass and *Tripsacum* are especially useful as fodder.

(3) Grasses for soil conservation; in beach areas, *Sporobolus virginicus* and *Thuarea involuta*. In dry volcanic soil, *Miscanthus* or *Dimeria*. In limestone, *Chrysopogon, Pennisetum, Panicum*, etc.

(4) Of biological importance are the native grasses, particularly the endemic species, such as *Digitaria mariannensis*.

The detrimental grasses are:

(1) Noxious weeds; the worst are *Sorghum halepense* (Johnson grass); *Ischaemum rugosum* (Muraina-grass); *Penisetum polystachyum; Sporobolus indicus* (Wire grass); *Chrysopogon aciculatus* (inifuk); *Cenchrus echinatus* (burgrass); *Setaria lutescens*.

(2) Irritating grasses include *Miscanthus*, whose sharp leaves may cut the skin of animals or people; *Cenchrus*, the burgrasses, and *Chrysopogon*, the beard-grass or inifuk, whose fruits may work their way into the clothes, fur, or even skin.

Grasses of possible potential value for Guam. On the basis of agronomic studies and experience in other locations similar to Guam, such as in Fiji and Hawaii, the following species appear well-adapted to tropical areas and of value; *Andropogon nodosus; Andropogon sericeus; Andropogon saccharoides*, (the first species is also called *Dichanthium nodosum*); *Saccharum edule; Sorghum verticilliflorum* (Karirondo); *Bothriochoa intermedia* (Lautoka grass); *Schizostachyum glaucifolium* (a bamboo); *Vetiveria zizanioides* (an important soil-binding species); *Digitaria melangiana* (Woolly-finger-grass, excellent for tropical pastures).

Importance of mixed Grass-Legume Pastures

Because of the frequently low fertility (a result, at least in part, of the highly porous substrate) of many Guamanian soils, it is very important to remember that good pastures require a nitrogen-fixing species, usually a legume. A through discussion of these is not possible here, but such herbaceous or low legumes as *Desmodium* species, *Alysicarpus, Cajanus* (pigeon-pea), *Calopogonium, Medicago, Phaseolus* (beans), and perhaps *Trifolium* (clover) should occur in well-managed pastures.

LAWNS

American Carpet-grass (*Axonopus compressus*), makes the best lawns for ordinary purposes. *Cynodon* and species of *Digitaria* are also useful. *Chrysopogon* forms a good turf, but the abundant spikelets catch in clothing and are difficult to remove. However, many lawns in Guam contain this species. It may be controlled by frequent mowing. For special gardens, the Temple-grasses (*Zoysia* species) from beautiful, tussocky formations and never require mowing. They may however be damaged by walking, and are slow-growing.

I. Subfamily POOIDEAE

1. Tribe BAMBUSEAE

Perennial, woody, arborescent (tree-like) or rarely woody climbers; blades flat, usually with a petiole-like base, articulated with the sheath. Stamens usually 6. Stigmas usually 3.

Key to Bamboos common in Guam

(both Bambusa and Dendrocalamus)

Culms stoutly spiny at base.....*B. blumeana*

Culm branches not spiny,

Leafblades rarely much over 10 cm long, markedly gray-green glaucous on lower surface; slender culms not over 2 cm thick.....*B. glaucescens*

Leafblades often over 10 cm long, green on botn sides; culms often 10–15 cm thick

Culm sheath blade broadly deltoid; auricles markedly bristly, broader than long.....*B. vulgaris*

Culm sheath blade narrowly deltoid; auricles hairy but not bristly....
.....*Dendrocalamus strictus*

BAMBUSA Linnaeus

BAMBUSA BLUMEANA Schultes f. Syst. Veg. 7: 1343. 1830. PIO TITOCA, TITUKA.
Safford 1905: 194. (as Bambos). Merrill 1915: 58. PIAO LAHE.
B. spinosa Blume, ex Nees, Bot. Zeit. 580; 1825: non Roxb.

Culms to 10 cm thick, 5–15 m tall; internodes glabrous; lower branches bearing curved spines (in groups of 3); culm-sheaths to 30 cm long, loosely pubescent dorsally, the hairs dark brown; blade mostly somewhat reflexed, more than half as long as the sheath, narrowly ovate, glabrate, auriculate, the auricles small, bristly; ligule to 5 mm long to the base of fringes; leaf-blades 15–20×1.5–2 cm, not glaucous; spikelets to 4.5 cm long, rachilla hairy, zigzag; spikelets 5–12-flowered; lemmas 6–8 mm long, glabrous; style short; stigmas 3.

Java; planted in various parts of Asia.

MacGregor 542. Introduced from the Philippines. The culms are stronger than those of *B. vulgaris*.

BAMBUSA GLAUCESCENS (Willd.) Siebold ex Munro, Trans. Linn. Soc. 26: 89. 1868.
Merrill 1914: 58. PIAO-PAYO.
Ludolphia glaucescens Willd. Ges. Naturf. Fr. Berl. Mag. 2: 441. 1801.
B. nana Roxb. Fl. Ind. 2: 199. 1832.

Culms up to 2 cm thick, up to 5 m tall; internodes not hairy but white-waxy when young, later smooth and green; culm-sheaths mostly 6–15 cm long, glabrous on the back, blade always erect, slenderly triangular; auricles small, slightly bristly; ligule to 1.5 mm long; leaf-blades 5–12 cm×0.6–1.5 cm, strongly grayish glaucous dorsally, puberulent; spikelets 3–4 cm long; lemmas 10–16 mm long, glabrous; style none, the 3 stigmas borne on the pubescent apex of the ovary.

China and Japan; planted in many parts of Asia, commonly for hedges.

MacGregor 543 (flowering!). OSIR. Road, Apra.

BAMBUSA VULGARIS Schrader, in Wendland, Collect. Pl. 2: 26, t. 47. 1810.
Safford 1905: 195. [unnamed]; Merrill 1914: 58. PIAO PALAOAN.
B. arundinaria Willd. sensu Gaudichaud, fide Merrill.

Culms 5–10 cm thick, up to 20 m tall, green to yellowish; internodes pubescent and waxy when young, but glabrescent; culm-sheaths to 30 cm long, densely pubescent with loose black hairs dorsally, its blade erect or bolique, rarely if ever reflexed; pubescent when young on both sides, broadly triangular, auricles 1 cm tall, with bristles 5–7 mm long; ligule 3 mm tall; leaf-blades 9–30 cm×1–4 cm, glabrous, not glaucous; spikelets 2–3.5 m long, 5–10-flowered; lemmas 8–10 mm long; style slender, up to 7 mm long, stigmas 3.

Asia, of general distribution; widely cultivated.

G.E.S. 374 (flowering); MacGregor 541. Talofofo (3775, det. McClure).

This seems to be the most common bamboo in Guam.

DENDROCALAMUS Nees

Culms crowded in glumps; culm sheaths usually pubescent, the hairs light-colored; culm sheath blades stiffly erect, rather narrow; spikelets crowded in clusters at intervals on nearly leafless flowering branches; spikelets several-flowered, with 1–6 hermaphrodite florets; uppermost floret staminate or empty, sometimes elevated above the others; stamens 6, the filaments sometimes connate-tubular; style elongate, generally undivided.—India to S. China.

One species reported from Guam.

DENDROCALAMUS STRICTUS (Roxb.) Nees, Linnaea 9: 476. 1834. Bryan, 14 May 1957.

Bambos stricta Roxb. Corom. Pl. 1: 58, t. 80. 1798.

Culms to 15 m tall, curved, up to 7.5 cm in diameter; walls thick, sometimes nearly solid; internodes pale-bluish when young, aging to green; culm-sheaths narrow almost oblong up to 30 cm long not much broader than the blade; auricles narrow not bristly slightly hairy; blade narrowly triangular to about 12 cm long erect; ligule 2–3 mm long; leaf-blades to 25×3 cm dorsally somewhat puberulent; spikelets with 2–3 hermaphrodite florets; lemmas about 8 mm long; anthers 3 mm long the filaments free; ovary with hairy apex; style with simple stigma; fruit 7.5 mm long.

An Indian species planted widely. If this species persists in Guam it is uncommon; I have not seen it.

Note on other bamboos.

According to Bryan (14 May 1957) several other bamboos have been introduced into Guam. These are listed here [I have seen no specimens].

Bambusa arundinacea (Retz.) Willd.

B. balcooa Roxb.

B. multiplex (Lour.) Raeusch.

B. polymorpha Munro.

B. tulda Roxb.

2. Tribe FESTUCEAE

Lemmas 5-nerved; leaf-blades flat or folded mostly linear or very narrow.....*Poa*
Lemmas 5–7-nerved; leaf-bladed flat rather short and broad the veins more obvious on the lower surface.....*Centotheca*

POA Linnaeus

Annuals or perennials, with open or contracted panicles. Spikelets 2-to several-flowered; glumes acute, keeled on the back, 1–3-nerved; lemmas slightly keeled, awnless, thin-textured, 5-nerved; rachilla disarticulating above the glumes and between the florets; uppermost floret reduced or redimentary. Over 200 species, chiefly cool temperate and montane regions.

POA ARACHNIFERA Torrey, in Marcy. Rep. Exp. Riv. Louis. Bot. 301. 1853.

Perennial, 30–60 cm high; rhizomatous; leaf-blades about 3–4 mm broad,

rough on upper surface; inflorescence paniculate; spikelets usually with 5–10 florets; plants unisexual.

According to Bryan (Plants of Guam, Guam Daily News, May 21, 1957) this species was introduced for forage by the Guam Agricultural Experiment Station in 1923. It is rare, if in fact it still persists on Guam.

Centotheca Desvaux

Spikelets mostly 1–3 flowered; glumes shortly stalked at maturity; spikelets pedicellate; lemmas awnless, 5–7 nerved. Leaf-blades flat, rather broad (lanceolate to ovate), with numerous cross-veins.—Panicles open.

Centotheca lappacea (L.) Desvaux, Nuov. Bull. Soc. Philom. 2: 189. 1810.

Safford 1905: 222.

C. latifolia (Osbeck) Trinius Fund. Agrost. 141. 1820, nom. illegit. Merrill 1914: 58.

Perennial, the culms to 120 cm high; leaf blades lanceolate, 5–25 cm long and 12–25 mm broad. Spikelets with 1–3 florets, bisexual. Tropical Asia to Polynesia.

A forest grass, usually in moist, shady places. Manengon (3817, 3869); Fena (4096); Manengon (4220, 4513, 4526).

Economic Value: Apparently none.

3. Tribe ARUNDINEAE

Tall perennials (reeds) with large terminal plumelike panicles.

Lemmas dorsally pubescent, rachilla glabrous.....*Arundo*

Lemmas glabrous; rachilla villous with long hairs.....*Phragmites*

Arundo Linnaeus

Robust perennial reeds; panicles large, the spikelets 2–5-flowered; florets bisexual, jointed at base; glumes sub-unequal, membranous, 3-nerved, shorter than or equal to the florets; lemmas lanceolate, membranous, 3–5-nerved, on the back long-white-hairy, lateral nerves ending in minute teeth; midrib excurrent from apex into short erect awn; callus minutes, with short hairs; (or rarely glabrous); rachilla with short internodes; palea shorter than lemmas, —2-keeled; stamens 3; ovary glabrous.—Old World warm countries; a few species.

One species in Guam.....*A. donax*

Arundo donax L. GIANT-REED

Culms 2–4(–5) m long, terete, 2–4 cm diam., smooth; blades flat, 50–70 cm × 2–5 cm, glaucous-green, rounded at base; ligule truncate, 1–2 mm long, ciliate; panicles erect, to 70 cm long, whitish with a purple hue, somewhat shiny, branches scabrous; spikelets 8–12 mm long; glumes equal; lemmas 7–10 mm long, the apex with 2 teeth; and between the teeth a short awn 1–3 mm long; palea shorter than lemma; anthers 2.5–3 mm long.

Introduced, persisting in only a few localities in Guam, rare.

The leaves have a noticeable blue-green color. The giant reed occurs in moist

areas, such as along river banks. It is sometimes cultivated.

Distribution: Native to Europe, but now spread over the world.

Economic Value: The culms provide reeds for musical instruments (clarinet reeds), and could be used for light thatch or construction.

A variety (var. *versicolor* (Miller) Stokes) has white-striped leaves.

PHRAGMITES Adanson

Tall reedy perennial grasses with large panicles of ascending branches; rachilla densely set with long silky hairs; disarticulation above the glumes and between the florets; lowest floret usually staminate; glumes membranous, unequal; lemmas longer than glumes, membranous, 3-nerved, glabrous; palea 2-keeled; stamens 3; caryopsis glabrous, plump.—Old world warm countries, only a few species. [Syn. *Trichoon* Roth; see Clayton, in Taxon 17 (2): 168. 1968.]

One species in Guam.....*P. karka*

Phragmites karka (Retz.) Trin. ex Steud. Nom. Bot. ed. 2, 2: 324. 1841.

Merrill 1914: 57. KARRISO. REED.

Arundo karka Retzius, Obs. Bot. 4: 21. 1786. *Arundo roxburghii* Kunth, Rev. Gram. 1: 79. 1829.

Trichoon karka (Retz.) Roth in Roemer, Arch. 1(3): 37. 1798; et in Catalect. 2: 3. 1800.

A tall species, the culms 3–4 or even 5 m long, at base to nearly 2 cm in diam., blades ± ascending, 40–70 cm long, 2–4 cm wide, firm, flat; ligule only a ridge of short hairs; panicles 30–70 cm long; spikelets usually 5–8 mm long; lemmas 5–7 mm long; spikelets usually 3-flowered; 2 lower glumes empty; 3rd glume empty or ♂; glumes spreading at fruit maturity; caryopsis loose at ripeness. Chromosomes: 2n = 36.

Tropical Africa to Malaysia and the Pacific.

In fresh (rarely brackish) marshes, often forming broad stands as in Agaña swamp (La Ciénaga). The split stems may be made into coarse mats for wall-partitions, etc. The young shoots are supposedly edible. Mostly from Agaña southward, in valley bottoms and along streams.

Agaña Swamp (4117); Fena River (4493); Talofofo River (obs.).

The inflorescences are greenish at first, gradually becoming brownish; never whitish or silvery, never reddish-purple.

In Micronesica 1: 128. 1964, I thought it necessary to take up the name *Trichoon* though it was much less familiar than *Phragmites*; but Clayton has shown that this is not so, and *Phragmites* may be used.

4. Tribe ERAGROSTEAE

1. Spikelets stalked or nearly sessile, the rachis not conspicuously broadened; florets few to many.....*Eragrostis*
1. Spikelets nearly sessile, compressed, closely imbricate, borne in 2 rows along one side of a broad flattened rachis; florets few.

2. Rachis of spike extending beyond the spikelets.....*Dactyloctenium*
2. Rachis not prolonged.....*Eleusine*

ERAGROSTIS [Host ex] P. de Beauvois

Spikelets each with two or more florets; florets usually closely set, imbricated, rachilla disarticulating above the glumes and between the florets, sometimes continuous; lemmas deciduous, but paleas commonly persistent; glumes somewhat dissimilar, 1–3 nerved; lemmas 3-nerved; paleas 2- nerved. Annuals or perennials, the inflorescence paniculate.—About 300 mostly tropical—subtropical species.

1. Annuals; usually dwarfed or very small; spikelets extremely small; paleas ciliate on the keels.
   2. Panicles open, diffuse;.....*E. tenella*
   2. Panicles dense, cylindric; paleas prominently ciliate on keels, cilia usually as long as width of lemma; lemmas oblong.....*E. ciliaris*
1. Annuals but not otherwise as above; paleas not ciliate; lemmas not glandular; spikelets with few (4–10–) florets.....*E. pilosa*

Note: *E. cilianensis* (Stink grass), if present in Guam, may be distinguished by the minutely ciliate keels of the paleas, and the ovate acute lemmas about 2.5 mm. long.

Eragrostis tenella (L.) Roemer & Schultes, Syst. 2: 576. 1817; Merrill 1914: 57. LOVEGRASS

Eragrostis amabilis (L.) Wight & Arnott, ex Hooker, Bot. Beechey Voy. 251. 1838. Walker & Rodin 1949: 452.

Annuals, culms slender, branched, ascending or spreading up to 30 cm. long but often much shorter; leaf sheaths glabrous except at the throat, the blades flat, or often involute, very narrow (less than 2 mm), up to 5–10 cm long; panicles open, rather diffuse, fine, usually 3–10 cm long; spikelets about 1.5 mm long, with usually 6 florets; glumes broad, almost equal, about one-fourth as long as the spikelets; lemmas blunt, about 0.8 mm long; palea with ciliate keel, equal in length to lemma, hairs only 0.4 mm long. Native to the Old World; described originally from India; now found in warm dry locations throughout the world.

Familiar as *E. amabilis,* but the name *E. tenella* is correct according to the International Code of Botanical Nomenclature.

Economic Value: None; though it could be used as forage.

Local occurrence; as a harmless weed of open ground, in sandy and limestone soils. The plants can withstand long periods of drought. Complete flowering specimens can be found that are less than 3 cm long. Harmon (4088). Agaña (Safford & Seale 1074).

Eragrostis ciliaris (L.) R. Brown, in Tuckey, Narr. Exp. Congo App. 478. 1818. LOVEGRASS.

Much like the preceding species, a delicate annual up to 30 cm high, but with dense cylindrical panicles up to 10 cm long; palea with a fringe of stiff hairs along the edges.—The panical may be purplish, and with interrupted groups of spikelets.

Chromosomes: 2n = 40.

Pantropical.

Economic Value: None.

In Guam, found along rocky shores or sandy shores, and in open ground. Introd. Fena (4102). Dos Amantes Pt. (4227).

Eragrostis pilosa (L.) Beauvois, Ess. Agrost. 71; 162; 175. 1812.

INDIAN LOVEGRASS.

Annual, tufted, culms slender, up to 1 m high; leaf-blades relatively short and narrow, up to 3 mm broad; panicle delicate, open, 5–20 cm long, grayish, branches spreading or ascending; spikelets dark, 4–10 flowered, about 6 mm long; glumes and lemmas 3-nerved.

Southern Europe and most tropical or subtropical parts of the Old World.

Economic Value: Probably none; a harmless weed. Naturalized sparingly in Guam.

DACTYLOCTENIUM Willdenow

Annual or perennial; blades flat; inflorescence of 2 or several short broad spikes digitate at the apex of the culm; spikelets 3–5 flowered, sessile, in 2 rows along one side of the narrow rachis; end of the rachis extends beyond the last spikelets. Rachilla disarticulating above the first glume and between the florets. Lemmas broad, keeled, awned or sharp at the tip.—10 species of warm countries.

Dactyloctenium aegyptium (L.) Beauvois, Ess. Agrost. Expl. Pl. 15. 1812. Safford 1905: 255. Merrill 1914: 57. CROWFOOT GRASS.

Culms compressed and spreading, rooting at the nodes, up to 60 cm tall. Blades flat, the edges lined with hairs, rather narrow, as much as a foot long, generally shorter, up to 6.2 mm wide. Inflorescence of 2–6 broad spikes, up to nearly 6 cm long. Lower florets with noticeable awns. [The combination is often attributed to Willdenow, Enum. Hort. Berl., 1029, 1809, but he altered the name to *aegyptiacum*].

A native of the Old World Tropics; now world-wide, in tropical areas. Introd.

Economic Value: None. A weed but rather harmless.

In Guam, rather scarce; mostly around buildings, vacant lots, gutters, and waste spaces. Mangilao (4084).

ELEUSINE Gaertner

Annuals; culms bearing two or more stout spikes at the tip; lateral spikes occasional. Spikelets with several florets, compressed, sessile, imbricate in two rowsalong one side of the rather broad rachis; rachilla disarticulating above glumes and between florets. Glumes unequal, broad, acute, 1-nerved; lemmas acute, 3-nerved. Seed dark brown with transverse ridges.—9 species

Spikelets 3–6 mm long, with 3–6 florets; blades mostly 15–30 cm long. . *E. indica*

Spikelets 6–13 mm long, with usually 6 florets; blades mostly 30–60 cm long . . . . . *E. corocana*

Eleusine indica (L.) Gaertner, Fruct. 1: 8. 1788. Safford 1905: 268. Merrill

1914: 57. GOOSE GRASS; UMOG

Branching erect or prostrate annual, culms flattened, up to 90 cm long; blades up to 30 cm long, 4–6 mm wide. Spikes 2–6 (usually 5) from apex of culm, one slightly below apex, up to 10 cm long. Spikelets few-flowered, up 6 mm long, awnless, dark green. Seed ridged and striated.

Native to the Old World, long naturalized elsewhere. Introd.

Economic Value: A weed of minor importance, though it may be very persistent especially when trampled. Edible to stock only when young.

Local Occurrence: In disturbed areas, especially in sandy soil. The plant is quick-growing and long lived; partial to wetter locations. Harmon (4090).

ELEUSINE CORACANA (L.) Gaertner, Fruct. 1: 8. t. 1, f. 11, 1789. RAGI; RAGIMILLET

A larger, more robust species than the above; spikes longer, thicker, sometimes incurved at the tip, brownish when mature. Culms up to 150 cm tall; blade to 60 cm long. Spikelets to 13 mm long. Spikes usually 6; 5 from summit, 1 given off a good distance below. Spikelets usually 6-flowered.

Africa and S.E. Asia. Sometimes deliberately introduced. Present in Fiji. Introduced to Guam in 1921.

Economic Value: Edible seeds; a minor crop of primitive tribes in parts of Africa and Asia. In Guam rare if persisting at all.

5. Tribe SPOROBOLEAE

Annuals or perennial's spikelets 1-flowered, the rachilla disarticulating above the glumes.

SPOROBOLUS R. Brown

Spikelets small, in open or often contracted narrow panicles. Glumes 1-nerved, unequal, the second glume often as long as the spikelet. Lemma 1-nerved, awnless, thin-textured, as long as the prominent palea. Paleas deciduous. Pericarp of seed overlapping but free.—About 150 species.

1. Lower glume as long, or nearly as long, as the spikelet; habitat in brackish marshes; panicle less than 7.5 cm long, contracted, narrow; leaves hairy around the ligule; blades narrow, stiffly distichous, involute, mostly less than 15 cm long and 3 mm wide.....*S. virginicus*
1. Lower glume as long, or nearly as long, as the spikelet; habitat not in brackish marshes; panicle mostly 20–40 cm long; leaves usually hairless at ligule; blades flat, lax, mostly 10–25 cm long.
   2. Branches of panicle closely appressed, erect; leaf-blades mostly 10–20 cm long.....*S. elongatus* [or S. "indicus"]
   2. Branches of panicle spreading; blades mostly 20–25 cm long....*S. diander*

Sporobolus virginicus (L.) Kunth, Rev. Gram. 1: 67. 1829. Merrill 1914: 57. BEACH-DROPSEED; SALT-GRASS; JATOPA

Creeping perennial of sandy beaches; blades rigid, sharp, inrolled, dark, rather

short, mostly less than 15 cm long. Panicle contracted, spike-like, tapering at the tip or at both ends, usually less than 7.5 cm long. Spikelets pale, at most 4 mm long, the glumes unequal, the nerve obscure, the lower glume about 2/3" as long as the floret, the upper glume about equal to the floret; lemma smooth, the keel obscure.

Sandy beaches in tropics all over the world; originally described from Virginia, U.S.A. Indigenous in Guam.

Economic Value: An important native sandbinding, pioneer grass. It may occur in or near salt marshes or tidal flats.

Local Occurrence: On most beach areas. G.E.S. 117. Mana Bay (4067). Togcha Bay (4463).

Sporobolus elongatus R. Brown, Prodr. Fl. Nov. Holl. 170. 1810. Walker & Rodin 1949: 453. RAT-TAIL DROPSEED

"S. indicus" sensu some authors.

Tufted perennial, with erect glabrous culms up to 90 cm high. Sheaths glabrous; blades flat or somewhat involute, 10–20 cm long, 3–6 mm wide. Panicle spikelike, up to 30 cm long or more, dull lead-colored, the lower branches appressed, the upper ones ascending, densely contracted. Spikelets about 1/32–1/16" long, densely crowded. Lower glume 1/4 as long as floret; upper glume 1/2 as long as floret. Lemma and palea equal. Seed reddish-brown.

A native of Austronesia (Australia to Malaya, part of Polynesia). Known also in Fiji and Hawaii. Introd.

This plant is a minor to moderately harmful weed. It is unpalatable to stock, and should be eliminated from pastures.

Occasional, usually in disturbed or weedy area; not abundant but wide-spread. Pati Pt. (Necker 401).

Sporobolus diander (Retz.) Beauvois, Ess. Agrost. 26; 147; 178. 1812. Stone, Micronesica 1: 131. 1964. WIREGRASS.

Very similar to *S. elongatus* but the panicle branches not so closely appressed but lax and spreading; leaf-blades longer, up to 25 cm long and 6 mm wide, or even larger; panicles sometimes slightly drooping, up to 20×5 cm; spikelets dull gray; first glume truncate; stamens 2.

Economic value: A minor or sometimes troublesome weed, difficult to eradicate when once entrenched. Palatable to stock only when very young leaves are developing and then not to be encouraged.

Local Occurrence: A weed of most disturbed areas, lots and pastures. Introd.

Note: a fourth species, *S. indicus* (L.) R. Br. has been reported (Merrill 1914: 56), but the state of taxonomy in the genus does not allow a definite occurrence of this as yet. (See Bor, Grasses of Burma, Ceylon Pakistan, and India, 630. 1960).

6. Tribe CHLORIDEAE

Annuals or perennials; spikelets few-flowered, usually only the lowest floret

containing an overy (sometimes an intermediate floret fertile rather than the lowest one).

Spikelets lacking sterile florets (all florets perfect).....*Cynodon*
Spikelets with 1 or more sterile (male or barren) florets.....*Chloris*

CYNODON Rich. in Persoon (Nom. conserv.).—Ten species.

Perennial grasses with stolons and rhizomes; low, mostly prostrate, with short blades. Spikes digitate at apex of culm. Spikelets with 1 floret; awnless, sessile in 2 rows on the slender rachis. Rachilla prolonged beyond the palea; disarticulating above the glumes. Glumes. narrow, sharp, 1-nerved; shorter than the floret. Lemma rudimentary or suppressed, if present firm, 3-nerved.—Ten species.

Cynodon dactylon (L.) Persoon, Cyn. 1: 85. 1804. Merrill 1914: 57,

Capriola dactylon O. Kuntze, Rev. Gen. Pl. 2: 764. 1891. Safford 1905: 212.

BERMUDA-GRASS; GRAMA.

Creeping perennial, rooting at the nodes either on the surface of the ground (stolons) or undergound (white rhizomes); culms slightly flattened, prostrate or somewhat ascending or erect; inflorescence purplish, digitate; leaf-blades short, usually 3–10 cm long, 3–6 mm wide, the edges rough. Spikes 2–6, often 5 or 4, 2.5–7 cm long. Spikelets imbricate, sessile, up to 3 mm long. Lemma longer than either glume.

[Also known as Devilgrass; Couchgrass; in Hawaii as Manini or Manienie.]

Native of the Old World, described originally from Southern Europe, now common all around the world. Introd.

Economic Value: Widely used as a lawn grass and as a pasture grass. It can grow in very poor soil; is a useful sandbinder, forming a good turf. Since it is a subterranean creeper and will grown from cutting, it may also play the role of a bad weed. It is a serious pest of pineapple fields in Hawaii. It often dried out above ground in the dry season, but will regrow from rhizomes.

Local Occurrence: Frequent in lawns; occasionally weedy. Mangilao (4081).

Control: To eliminate the plant, every underground portion must be removed and burned or discarded.

CHLORIS Swartz

Annuals or perennials, tufted, with flat blades and few to several digitate spikes, these often feathery in appearance. Spikelets sessile, in 2 rows along one side of the continuous rachis. Spikelets with 1 perfect floret and 1 or more reduced florets consisting merely of lemmas. Glumes unequal, the lower one shorter. Lemmas 1–5 nerved, often hairy on the keel, bearing an awn produced at the sinus of a notched or bifid apex. Sterile lemmas sometimes awnless; awns sometimes reduced to mucro.—About 40 species.

Annuals; leaf blades mostly less than 25 cm long.

Rudiment (formed of sterile lemmas) broad and blunt.....*C. barbata*
Rudiment narrow, sharp.....*C. radiata*

Perennials; leaf-blades 25–50 cm long.....*C. gayana*

Chloris barbata Swartz, Fl. Ind. Occ. 1: 200. 1797. FINGERGRASS

Chloris inflata Link, Enum. Pl. Hort. Berol. 1: 105. 1821.—Merrill & Perry, J. Arn. Arb. 27: 324. 1946.

Tufted annual up to 90 cm tall; culms and sheaths strongly compressed; blades long and lax, 10–30 cm long and up to 6 mm wide. Nodes often purplish, as are the basal sheaths. Ligule membranaceous, jagged. Spikes 2–11, usually 10, purplish, up to 7.5 cm long; spikelets closely imbricate; glumes narrow, sharp; fertile lemma obovate, about 3 mm long, slightly hairy on the keel, long-hairy on the upper margins, awned, the awn about 4–6 mm long. Two rudimentary lemmas borne beyond the fertile lemma, these also awned. Chromosomes: $2n = 20$.

Also (formerly) called *Chloris paraguayensis.*

Native of Central and South America, or perhaps of the East Indies; weedy and widespread. Introd.

Economic Value: A minor or moderately abundant weed. Old plants are unpalatable to stock.

Local Occurrence: Abandoned fields, roadsides, vacant lots, particularly in dryer areas; abundant. Collected in 1946 by S.F. Glassman. Mangilao (4083).

Chloris radiata (L.) Swartz, Prodr. Veg. Ind. Occ. 26. 1788. PLUSH-GRASS.

Loosely tufted annual, the culms branching, up to 60 cm high; often purplish at the nodes; leaf-sheaths glabous, up to 7.5 cm long; blade to 15 cm long and 3 mm wide. Spikes 5–15 usually 10 or more, up to 7.5 cm long, slender, silvery-purplish; rachis slightly hairy. Glumes narrow. Fertile lemma 1.5 long, awned; awn slender, 3–9 mm long; rudiment of 1 reduced sterile lemma with a shorter awn.

Distribution: Native of Jamaica, the West Indies, and Tropical America, now widespread. Introd.

Economic Value: A common weed, sometimes a pest.

Local Occurrence: Abandoned fields, and roadsides; often invading neglected pastures. Chepek Springs, Mt. Almagosa (4325); Yona (4419).

CHLORIS GAYANA Kunth, Rev. Gram. 1: 293, t. 58. 1830. RHODES GRASS

Glabrous perennial, robust, with culms up to 120 cm tall, stout leafy stolons, and leaf-blades 25–50 cm long. Spikes 10–15, digitate, 7–13 cm long; spikelets creamy-brown in color; glumes narrow, the nerves rough; lemmas elliptic, hairy on the margins, about 6 mm long, with a tuft of white hairs at the base, the straight awn up to 9 mm long; rudiment of 2 sterile lemmas, the lower one bearing a short awn, the upper truncate.

An African species, now commonly grown in the Tropics for forage. Introduced to Guam by the Guam Agricultural Experiment Station, 1920.

Economic Value: A highly valued pasture grass, proved in many locations. Useful in crop rotation; it is fairly drought-resistant. It is rather common in Hawaii, where however it is not always claimed to be useful.

Local Occurrence: Occasional in cultivation.

7. Tribe LEPTUREAE

Perennials; spikelets with 1 floret; rachis thickened, the spikelets arranged alternately on opposite sides of rachis in depression.—Monotypic.

LEPTURUS R. Brown

Creeping perennials, the nodes forming tussocks; spikelets when mature falling still attached to the disarticulating rachis. First glume absent except on the uppermost spikelet; second glume closing the cavity of the rachis and flush with the surface, firm, acuminate, longer than the rachis joint. Lemmas adjacent to the rachis, shorter than the glume, 3-nerved. Palea 2-nerved.—Paleotropics; 15 species.

Lepturus repens (G. Forster) R. Brown, Prodr. Fl. Nov. Holl. 207. 1810. LESAGA.

Rotboellia repens Forst. Prod: 9. 1797; *Monerma repens* (Forst.) Beauv. Ess. Agrost. 117. 1812. Merrill 1914: 58.

Culms to 40 cm tall; blades 7–15 cm long, 3–6 mm. wide, glaucous. Spikelets solitary on the single spike.

From Ceylon eastward through Malaya, Australia, Melanesia, and into Micronesia and Polynesia as far as the Leeward Islands. A common widespread indigenous grass of sandy beaches.

Economic Value: A sandbinder.

Local Occurrence: Sandy beaches; also in limestone areas. Mana Bay (4065). Harmon (4086). Recognized by the powdery blue-green color of the leaves and the unusual inflorescences. Two varieties have been reported for Guam; var. *repens*; and var. *subulatus* Fosberg (BMOP 21(14): 290. 1955), which differs in its somewhat thicker spikes, 1.3–1.6 mm diam., and in the subulate glumes 6–15 mm long.

8. Tribe AVENEAE

Annuals or perennials with dense or open panicles. Spikelets with 3 or more florets. Lemma awned or awnless.

AVENA Linnaeus

Spikelets rather large; rachilla bearded, disarticulating above the glumes and between the florets; glumes about equal, with several nerves. Lemmas 5–9-nerved, with a twisted dorsal awn.—Temperate and montane zones; 70 species.

AVENA SATIVA L. Sp. Pl. 79. 1753. OATS.

Culms stout, up to 90 cm tall. Blades flat, up to 12 mm wide. Panicle up to 20–25 cm long. Spikelets with usually 2 florets.

Distribution: The first description of the cultivated oat was from a European specimen. It is found now in much of the temperate zone, on both sides of the Equator. It is rare in Guam and may no longer persist. A specimen mentioned by Bryan (Guam Daily News, June 22, 1957) was in the herbarium of the Root

Agricultural School. It was probably a chance introduction that failed to become established.

Economic Value: A highly important cereal, but not adaptable to the Tropics.

Local Occurrence: Sporadic; probably no longer present.

9. Tribe ZOYSIEAE

Small perennial plants with creeping rhizomes, forming dense turf or hummocks; spikelets 1-flowered, or if unisexual, staminate spikelets sometimes 2-flowered.

ZOYSIA Willdenow, nom. gen. conserv.

Perennials; blades pointed; racemes of spikelets terminal; spikelets shortly pedicellate, 1-flowered, laterally compressed, appressed against the slender rachis, disarticulating below the glumes. First glume absent; second glume usually shortly awned. Old World; 10 species.

Key to species (adapted from N.L. Bor)

1. Plants with rhizomes below the surface of the ground.
   2. Leaves flat, mostly 2–4 mm. wide; racemes 3.5–5 mm. wide; spikelets about 3 mm long, over 1 mm. wide..... *Z. japonica*
   2. Leaves usually folded, narrower; racemes not over 3 mm. wide.. *Z. matrella*
1. Plants with stolons, or if rhizomatous, the rhizomes close to the surface of the ground; leaves numerous, involute, capillary; racemes narrow; spikelets less than 1 mm. wide..... *Z. tenuifolia*

ZOYSIA JAPONICA Steudel, Syn. Pl. Glum. 1: 414. 1855. TEMPLEGRASS

Creeping perennial forming compact turf; blades flat, firm, 1–2.3 cm long, up to 3 mm wide; racemes 3.5–5 mm. wide; spikelets about 3 mm long, just over 1 mm wide; flowering culms up to 15 cm long; racemose inflorescence about 3 cm long.

Native of Japan; now introduced widely for lawns. Introduced to Guam in 1927 by the Guam Agricultural Experiment Station. It forms a uniform, dark green, usually hummocky turf, and does not require mowing. However, it should be rolled if a flat turf is desired.

In Guam, planted experimentally, and cultivated.

Zoysia matrella (L.) Merrill, Philipp. J. Sci. Bot. 7: 230. 1912.
MANILA TEMPLE GRASS

Similar to the foregoing species, but the leaves narrower and folded; the racemes not over 3 mm wide, with greenish spikelets. Rhizomes rather deep under the soil surface.

Asia, Philippines—Micronesia. Possibly native in Guam; collected by Hosokawa in the Northern Marianas, where it must be native [it seems native in its localities in Guam, always by the sea]; unless he confused it with the next species.

Zoysia tenuifolia Willd. ex Trinius, Mem. Acad. Sci. Petersb. ser. 6, 4: 96. 1836.
NARROWLEAF TEMPLEGRASS

Stoloniferous, the stolons above the soil surface, or if rhizomatous, the rhizomes very shallow, just under the soil surface; leaves involute, very slender; spikelets less than 1 mm wide.

Asia; possibly native in Guam. Mochom Bay (4951)

10. Tribe PHALARIDEAE

Spikelets with one terminal bisexual floret and a pair of neuter florets produced below the terminal floret, sometimes only one neuter floret present.

PHALARIS Linnaeus

Panicles narrow, spikelike. Spikelets laterally compressed. Neuter florets represented by 2 sterile lemmas. Rachilla disarticulating above the glumes. Glumes equal. Fertile lemma shorter than glumes.—20 species, temperate N. America and Eurasia.

PHALARIS TUBEROSA L. Mantissa 2: 557. 1771. var. STENOPTERA (Hackel) Hitchcock. HARDING GRASS.

Perennial from rhizomes, loosely branching, up to 120 cm tall; panicle to 15 cm long and 13 mm wide. Glumes less than 6 mm long with a roughened keel. Fertile lemma acute and slightly hairy; sterile lemma usually single, half as long as the fertile lemma. Chromosomes: $2n = 28$.

The species was first described from Europe; the variety was apparently first noticed among specimens growing (after introduction) in Australia. Introduced to Guam in 1923.

Economic Value: Said to be an excellent forage crop. It was tried in Fiji but failed to become established.

Possibly no longer persisting in Guam, or very rare.

11. Tribe ORYZEAE

Spikelets perfect, with one floret, laterally compressed. Glumes reduced absent. Stamens 6. Palea apparently 1-nerved.

ORYZA Linnaeus

Annual or sometimes perennial; tall, with flat blades; spikelets in open panicles, disarticulating below the glumes. Glumes 2, much shorter than the lemma; lemma keeled, 5-nerved, sometimes awned. Palea narrow, keeled, the 2 nerves so close together as to appear like a single nerve; both lemma and palea thinner than the glumes.—Tropics; 25 species.

ORYZA SATIVA L. Sp. Pl. 333. 1753. Safford 1905: 339. Merrill 1914: 56. RICE. FAE.

Culms to 2 m tall, with strong narrow blades 30–60 cm long and 3–6 mm wide; panicle dense, drooping when mature, 15–40 cm long; spikelets about 6 mm long and almost as wide; lemma and palea roughened and slightly hairy; lemmas mucronate or with a long awn.—Fig. 24.

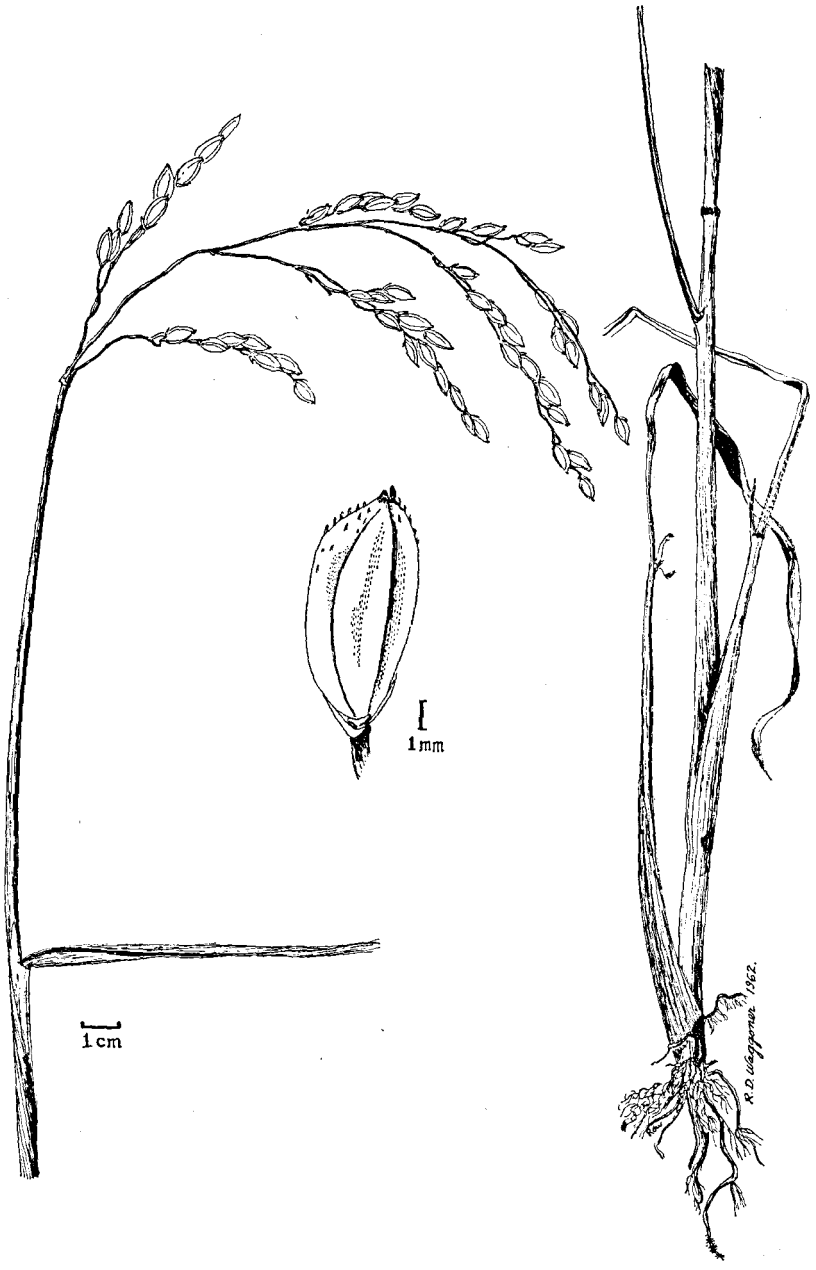


Fig. 24. Oryza sativa.

A native of Africa and India, now widespread in cultivation and with many cultivars, in the Tropics, mostly in wet regions near low altitudes, and in the warmer Temperate Zones. Rice was first introduced to Guam by the aboriginal settlers.

Economic Value: One of the two or three single most important staple crops of the world, providing the major food in the diet of nearly half the world's population.

Local Occurrence: Rice was used and almost certainly introduced by the early Chamorros. According to I. Yawata (of the University of Tokyo), the original Chamorro rice was a long-awned Java type, found nowadays in Java, Bali, the middle southern part of the Celebes, the Philippines, and in Taiwan. "The home and ethnological derivation of the Chamorros who brought the rice are surely to be looked for within these regions", Yawata states in an abstract (10th Pacific Science Congress Abstracts, p. 140, 1961). Rice is mentioned by Magellan, Legazpi, and other voyagers of the 16th century. The name *fae* is probably related to the Malayan word *padi.* Several cultivated varieties were distinguished: *fae malaquid* (with long awns), *fae Guam* (with short awns), *fae papin angle* (awnless), *agaga* (with reddish spikelets), *basto* (with coarse grains), *palay aromatico* (with fine grains and noticeable fragrance). Some varieties are indigenous in the sense of aboriginal introduction, others are of more recent introduction as from the Philippines. For further discussion of rice in Guam, see Safford (pp. 339–340), and C. W. Edwards in *Guam Recorder* vol. 5, pp. 4–5, April, 1928.—Collected at a farm in Talofofo (4683).

SUBFAMILY *PANICOIDEAE*

1. Tribe MELINIDEAE

Glumes and sterile lemma membranaceous; fertile lemma and palea not or scarcely firmed than the glumes; sterile lemma awned from the notched apex. Spikelets disarticulating below the glumes. Glumes unequal, the lower greatly reduced, the second equal to the sterile lemma.

MELINIS Beauvois

Spikelets small, dorsally compressed; with 1 floret, but a sterile lemma below the floret; perennial grasses with dense inflorescences.—Monotypic.

MELINIS MINUTIFLORA Beauvois, Ess. Agrost. 54, t. 11, f. 4. 1812.

MOLASSES GRASS

Branching perennial, the culms to 90 cm long, ascending; foliage viscid (sticky), fragrant, with odor like molasses; blades up to nearly 1 ft. long, often reddish, the ligule a row of hairs; panicles 10–20 cm long, slender, purplish when young; spikelets less than 2.5 mm long; sterile lemmas awned, the awn 12 mm long or less. Chromosomes: $2n = 36$.

Native of Africa; introduced to Brazil, the United States, Hawaii, Fiji and various other regions.

Economic Value: Fodder; palatable to stock; source of insecticide. Because of the oil content, this plant can be a fire hazard. It forms a thick ground cover.

Introduced to Guam by the Guam Agricultural Experiment Station in 1923, and planted experimentally. It seems not to have become established.

12. Tribe PANICEAE

Spikelets with a bisexual terminal floret, below which occur a sterile floret and two glumes. Fertile lemma and palea firmed than the glumes and sterile lemma, usually hardened. Articulation below the spikelet.

A. Upper floret fertile, the lower male or barren; lower lemma usually similar to the glume, not hardened..... *Subtribe Panicinae*

B. Both florets fertile, or the lower male and its lemma similar to the fertile lemma, hardened..... *Subtribe Isachninae*

Key to local genera of Tribe Panicaeae

(Based on St. John and Fosberg, Univ. Hawaii Occas. Pap. no. 41, pp. 24–26).

1a. Axis thickened and corky, spikelets sunk in cavities in its joints.. *Stenotaphrum*

1b. Axis *not* thickened and corky, the spikelets not sunken in cavities of axis.

2a. Spikelets *not* subtended or surrounded by one or more bristles or spines.

3a. Glumes and sterile lemma awned, or if only sharp-pointed, then the apex of the sterile palea not enclosed, and the spikelets crowded in short racemes.

4a. Inflorescences of one-sided racemes along a common axis; glumes usually 2-lobed, the awn produced from between the lobes; fruit hardened, the palea enclosed at summit... *Oplismenus*

4b. Inflorescnce paniculate.

5a. Spikelets bearing long silky hairs; first glume small, distant ..... *Rhynchelytrum*

5b. Spikelets not silky; first glume close, about half as long as spikelet..... *Echinochloa*

3b. Glumes and sterile lemma awnless.

6a. Fertile floret 1, terminal

7a. First glume strongly reduced or absent.

8a. Spikelets solitary, subsessile, placed with back (lemma) of the fruit turned away from the rachis.... *Axonopus*

8b. Spikelets solitary or paired, placed with back (lemma) of the fruit toward the rachis.

9a. First glume absent..... *Paspalum*

9b. First glume strongly reduced..... *Brachiaria*

7b. First glume present, though small.

10a. Spikelets not clothed with long silky hairs, arranged in panicles or spikelike racemes.

10aa. Spikelets in spikelike racemes, mostly digitate

in rosettes at apex of flowering culms, or often a few lower and lateral; fruits cartilaginous, not rigid, papillose, usually dark; lemma with thin white margins (these not inrolled)..... ..... *Digitaria*

10bb. Spikelets in panicles, fruits chartaceous, rigid, the lemma not hyaline-margined.... *Panicum**

10b. Spikelets long silky hairy, in panicles.... *Trichachne*

2b. Spikelets subtended by or surrounded by 1 to many bristles or spines (sterile branchlets), these forming a false involucre.

11a. Bristles attached to spikelet permanently, falling with it at maturity.

12a. Bristles slender, free from each other, often plumose..... ..... *Pennisetum*

12b. Bristles more or less united at base, forming a bur.. *Cenchrus*

11b. Bristles persistent on the rachis, the spikelets falling free of them ..... *Setaria*

Axonopus Beauvois

Annual or perrenial, tufted or creeping by stolons, with usually flat rather short rounded or somewhat pointed blades. Racemes slender and spikelike, digitate or racemose along the axis. Spikelets oblong, blunt, solitary, alternating in 2 rows on one side of a triangular rachis, subsessile. Fertile lemma and palea hardened. Lemma oblong-elliptic with slightly inrolled margins.—Tropical America; 35 species.

Axonopus compressus (Swartz.) Beauvois, Ess. Agrost. 12; 154; 167. 1812.

CARPET GRASS

Stoloniferous perennial, blades from stolons often shorter and broader than those of the culm; flowering culms erect, compressed, up to 30 cm high; blades to 15 cm long, usually shorter, often ciliate at base; spikes usually 3, two apical, one slightly below and lateral, sometimes 2 or 3 in excess. Spikelets about 2.5 mm long, margins slightly hairy, yellowish. Glumes and sterile lemma 2–4-nerved, the mid-nerve absent. Rachis slightly zig-zag.—Chromosomes: 2n = 40.

A native of the warmer parts of America, now widespread. Introduced to Guam in 1923.

Economic Value: an excellent lawn and pasture grass in moist locations.

Local Occurrence: Lawns and pastures. Harmon (4085).

(Note: A similar species, *Axonopus affinis* Chase, with much longer and creamy-green spikelets, called NARROW LEAF CARPET GRASS, is also a good forage and lawn grass, and could well be introduced to Guam.)

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* If some species of *Brachiaria* and *Panicum* are confused, they may be separated as follows: Spikelets in few to many spikelike racemes; first glume turned toward the rachis..... *Brachiaria.* Spikelets in open or contracted panicles or if in racemes, the first glume turned away from the rachis..... *Panicum.*

BRACHIARIA Grisebach in Ledebour

Annual or perennial; blades linear; racemas several, spreading of approximate, along a common axis. Spikelets solitary (rarely paired), nearly sessile, in 2 rows along one side of a triangular narrowly winged rachis. First glume turned towards the rachis, shorter than or nearly, as long as the spikelet. Second glume and sterile lemma about equal, 5–7 nerved; lemma inclosing a hyaline palea (and rarely also a male-floret). Fertile lemma hardened, grooved or papillose, the margins inrolled, apex rarely mucronate (or even shortly awned).—About 50 species, pantropical, many in Africa.

Key to species

1. Rachis flat, ribbonlike; panicles large, to 30 cm long.....*B. mutica*
1. Rachis 3-angled or terete, filiform; panicles seldom so large.
   2. First glume nearly as long as the spikelet. [more than 1/2 as long.]
      3. Spikelets about 3 mm long.....*B. paspaloides*
      3. Spikelets 3.2–3.7 mm long.....*B. miliiformis*
   2. First glume not over 1/2 as long as the spikelet,
      4. Panicle strict, the branches steeply ascending.....*B. eruciformis*
      4. Panicle rather open,
         5. Spikelets 1.2–2.0 mm long; blades 1–8 cm long.....*B. reptans*
         5. Spikelets 2.5–5 mm long; blades up to 30 cm long,
            6. Spikelets 2.5–3 mm long, widest above the middle, tip rounded-apiculate; peduncle softly hairy; racemes often 2 .....*B. distachya*
            6. Spikelets more than 3 mm long,
               7. Peduncle below infl. glabrous; spikelets mostly over 3.5 mm long, not over 4 mm; ellipsoid..*B. subquadripara*
               7. Peduncle often (but not always) hairy below the infl.-spikelets, usually just about 3.5 (3.25–3.75 om) long; obovoid.....*B. miliiformis*

BRACHIARIA REPTANS (L.) Gardner & Hubbard, Hook. Ic. t. 3363. 1938.

Panicum reptans L. Syst. Nat. ed. 10, 2: 870. 1759.

Creeping annual, 10–40 cm tall; culms ascending, usually prostrate basally; sheaths glabrous or pubescent; ligule of short hairs; blades narrow lanceolate or ovate, 1–8 cm long, 5–16 mm wide, rounded at base, acute at apex; inflorescence 2–12 cm long, with several (up to 10 or even more) racemes, these spreading, 1–5 cm long; spikelets elliptic or ovate, up to 2 mm long; first glume about 1/4 as long as the spikelet; second glume longer and 7-nerved; upper lemma with transverse folds.

Virtually pantropical; originally probably from Asia. A rather harmless weed. In cultivated ground or lawns. Mangilao (4186).

BRACHIARIA MUTICA (Forsskal) Stapf in Prain, Fl. Trop. Africa 9: 526. 1919.

PARA GRASS

Panicum muticum Forssk. Fl. Aegypt.—Arab. 20. 1775; *P. purpurascens* Raddi,

Agrost. Bras. 47. 1823.

Culms decumbent, rooting at the base, up to 2.4 m high, with densely hairy nodes, hairy sheaths, blades 10–30 cm long and 13 mm wide, glabrous. Panicle up to 30 cm long, with numerous (about 10) spreading branches, 2.5–10 cm long; spikelets up to 4.5 mm long, elliptic, sometimes purplish rachis more or less *flat, herbaceous, ribbonlike.* First glume 1/3–1/2 as long as the spikelet. Fruit with minute transverse grooves. 2n = 36.

This species is commonly known as *Panicum purpurascens* Raddi, *Panicum barbinode* Trin., and *Panicum guadeloupense* Steudel.

Probably a native of Africa, but first described from Brazilian specimens. It is now cultivated rather widely. Introduced.

Economic Value: A high quality pasture and forage grass, which may however get out of hand.

Local Occurrence: This species thrives best in damp locations such as wet fields, ditches and gullies. Fena (4095).

BRACHIARIA ERUCIFORMIS (J.E. Smith) Grisebach in Ledebour, Fl. Ross. 4: 469. 1853.

P. eruciforme J.E. Smith, in Sibthorp, Fl. Graec. 1: 44. t. 59, 1806.—*P. isachne* Roth ex R. & S. Syst. Veg. 2: 458. 1817.—Merrill 1914: 55.

Annual, with spreading culms rooting at the lower nodes. Flowering culms up to 45 cm high. Blades slightly hairy, flat, usually less than 7 cm long and only up to 4.5 mm wide. Panicle 5–7 cm long with several appressed to ascending racemes up to 2.3 cm long; rachis pubescent; spikelets about 2.5 mm long, slightly hairy; first glume tiny (0.3 mm long), nerveless. 2n = 18.

A native of Greece, North Africa, India, and perhaps part of America. Introd.

Economic Value: None.

Local Occurrence: Rare. G.E.S. 126.

BRACHIARIA DISTACHYA (L.) Stapf in Prain, Fl. Trop. Africa 9: 565. 1919.

Panicum distachyon L. Mant. Alt. 183. 1771.

Similar to the next species, *B. miliiformis*, but spikelets only 2.5–3 mm. long, widest above the middle, tapering to the base, rounded at the apex to an apiculate tip; the blades are more nearly ovate-lanceolate; peduncles are pilose near the apex; racemes usually 2 in number.—India to Australia.

Rare in Guam, introd.

BRACHIARIA MILIIFORMIS (Presl) Chase, Contr. U.S.N.H. 22: 35. 1920.

THURSTON GRASS

Panicum miliiforme, J. Presl ex. C. Presl, Rel. Haenk. 1: 300. 1830.

Perennial; culms slender, spreading, branching, (the nodes glabrous), attaining a length 60 cm. Blades mostly 5–15 cm long and to 9 mm wide, glabrous. Panicle 5–15 cm long, with 2–7 spikelike lateral racemes spreading or drooping. Spikelets all similar 3.25–3.75 mm. long, oblong-obovate, tapering more or less abruptly to a sharp point; 2-flowered, only the terminal floret bisexual; falling entire. First glume well developed, 2/3 or more as long as spikelet.

Distribution: India to Malaysia. Introduced (?).

Economic Value: A good lawn grass.

Local Occurrence: not definitely seen, but possibly introduced; however, see the following species, discussion.

Brachiaria subquadripara (Trin.) Hitchcock, Lingnan Sci. J. 7: 214. 1931.

Panicum subquadriparum Trin. Gram. Pan. 145. 1826.

Perennial, creeping; culms to 60 cm long; blades 2.5–7.5 cm long, up to 1 cm wide; panicle 5–15 cm long, with 3–5 descending spikelike racemes; spikelets similar. First glume slightly less than half as long as the spikelet. [Note: Reeder makes *B. miliiformis* a synonym of this species.]

Type locality, "Inss. Marian. Ind. or."; Known also in New Guinea. Introduced?

Economic Value: A satisfactory lawn grass; less valuable as forage, since it cannot compete with other species to advantage.

Note: This grass is difficult to distinguish from Thurston Grass; but is lighter green and the outer glume is much smaller.

Brachiaria paspaloides (Presl) C.E. Hubbard, in Hook Ic. Pl. (1938), t. 3363.

Panicum ambiguum Trin., Mem. Acad. Sci. Retersb. ser. 6, 3: 243. 1835. (Not of Hausskn); *Urochloa paspaloides* J. Presl. ex. C. Presl, Rel. Haenk. 1: 318. 1830.

Culms erect, branched, up to about 60 cm tall; sheaths long and wide, loose, very sparsely pubsecent on veins of the lower surface 10–25 cm long, up to 1 cm wide, tapered gradually to a point. Flowering shoot erect with 3–5 (or sometime more) spreading or ascending racemes, these 2.5–7 cm long. Spikelets light green, about 3 mm. long, the first glume nearly as long as the spikelet. [Similar to *B. miliiformis*].

Distribution: India to Polynesia. Introd.

Economic Value: a weed of moist localities.

Local Occurrence: Fena (4103). Agaña Spring (4981).

CENCHRUS Linnaeus

Annuals or perennial; low, branching with compressed or turgid culms; blades flat; spikelike raceme composed of burrs (involucres of sterile branchlets fused together); spikelets few or solitary, subglobose, falling attached to the burr.

Spikelike racemes of 5–15 well-spaced nearly sessile burrs;

Spikelike raceme up to 10 cm long.....*C. echinatus*

Spikelike racemes of more numerous, much more crowded burrs; raceme longer; burrs smaller.....*C. brownii*

Cenchrus echinatus L. Sp. Pl. 1050. 1753. BURGRASS; SAND-BUR

Annual; culms compressed, basally branching; up to 1 m. tall. Blades 7–130 cm long, up to 9 mm wide, narrow, slightly hairy on the upper surface near the base. Spikelike racemes 3–10 cm long; composed of fairly large spiny burrs (5–15 in number) well spaced (not crowded), subsessile, broadest at the base; burr usually bearing 4 spikelets.—Fig. 25.

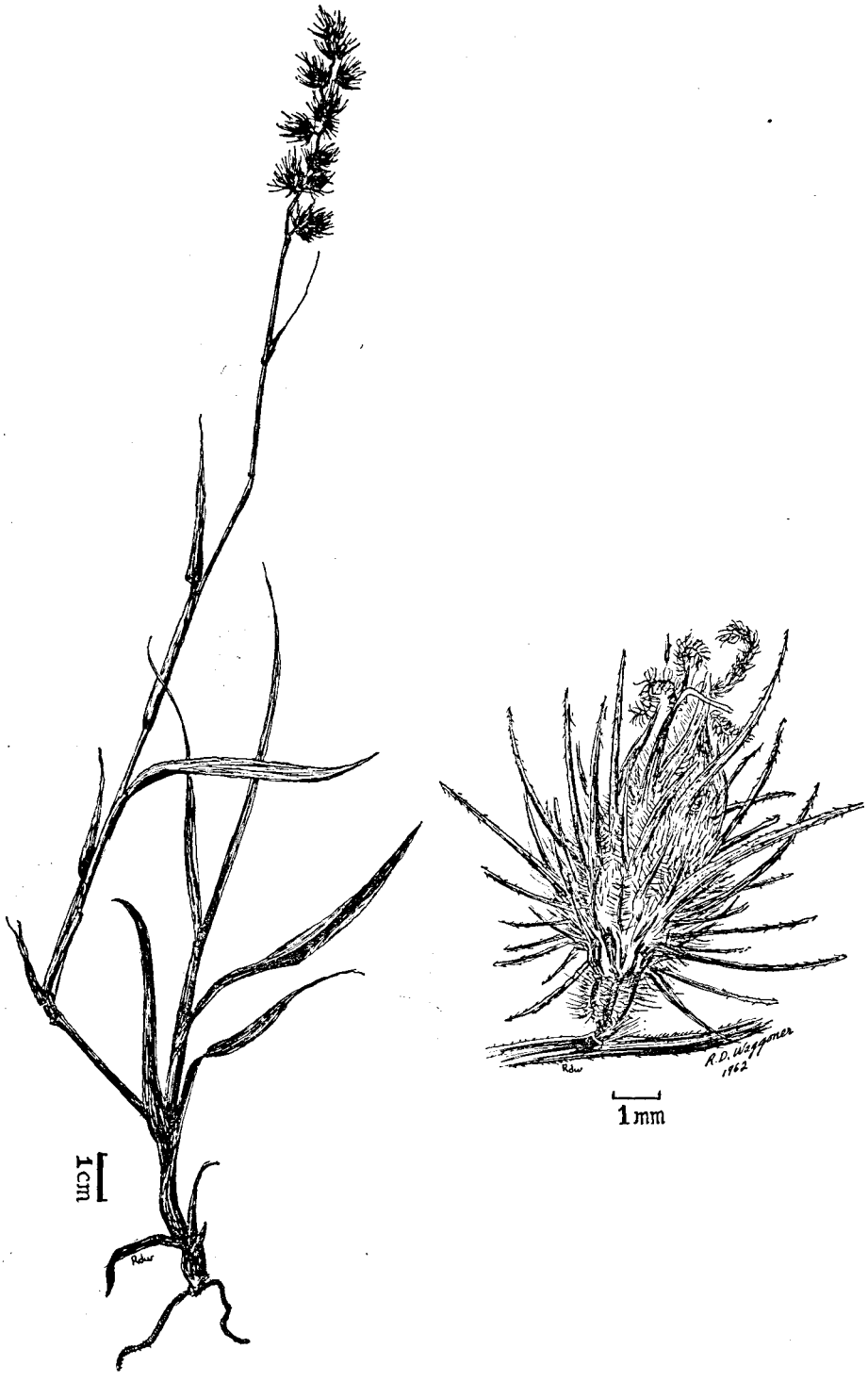

Fig. 25. Cenchrus echinatus.

Distribution: A native of the New World, now weedy in most tropical countries. Introd.

Economic Value: An obnoxious weed. The burrs detach easily from the spike and attach to clothing or animals, assuring distribution.

Local Occurrence: Common in most disturbed places, particularly near the coast or in limestone.

Fig. 26. Cenchrus brownii.

Cenchrus brownii Roemer & Schultes. Syst. 2: 258. 1817. BUR-GRASS; SAND-BUR

Very similar to *C. echinatus*, but with longer, narrower spikes consisting of more numerous, very crowded, smaller and more delicate burrs; leafblades longer also. Culms usually taller.—Fig. 26.

Distribution: Native of Tropical America, now widespread. Introd.

Economic Value: An obnoxious weed.

Local Occurrence: With the preceding species.

DIGITARIA Heister ex Adanson

Annuals or perennials; flowering racemes digitate or paired on the axis; spikelets in twos or threes (rarely solitary), short-pediccellate or subsessile, alternating in 2 rows on one side of a more or less angled rachis; spikelets elliptic to lanceolate, nearly planoconvex; first glume minute or absent; second glume shorter than or as long as the sterile lemma; fertile lemma cartilaginous-rigid, with pale edged. "Grab-Grasses".—Over 100 species, pantropical and warm-temperate.

About one hundred species, chiefly tropical, some temperate.

Key to species of Digitaria.

Leaves small, mostly 1–2 cm long, 2.5–4 mm wide; both first and second glumes entirely absent..... *D. mariannensis*

Leaves considerably larger, mostly (3–)10–15(–25) cm long, (2–)4–9 mm wide; second glume present; first glume present or absent.

First glume present but usually minute and nerveless.

Second glume about 3/4 as long as lemmas; ligules usually 2–2.5 mm long; rachises nearly 1 mm wide..... *D. sanguinalis*

Second glume 1/3–1/2 as long as lemmas; ligules usually 1–2 mm long; rachises 0.6 mm wide..... *D. timorensis*

First glume completely absent.

Spikelets about 1.5 mm long or very slightly longer, always less than 2 mm; dark; second glume about 1/2 as long as lemma..... *D. violascens*

Spikelets 2.5–3.5 mm long; second glume about 1/6 as long as lemma;

Spikes subdigitate, rather numerous (7–16);..... ..... *D. gaudichaudii,* and *D. robinsonii*

Spikes subdigitate or racemose, few (2–4, usually 3–4).. *D. pruriens*

DIGITARIA SANGUINALIS (L.) Scopoli, Fl. Carn. ed. 2; 1: 52. 1772.

Annual; decumbent, spreading; culms geniculate, usually rooting at the lower nodes, ascending, to 1 m long or more; sheaths shorter than internodes, pubescent; ligule a thin truncate membrane 1–2 mm long; racemes digitate or with a second or third node below the apex; rachis narrowly winged, c. 1 mm wide; spikelets 3 mm long, first glume small; second glume 3/4 as long as fruit; sterile lemma slightly longer; usually villous.

Common weed, often maintained as a town grass.

Shores of Tumon Bay (5092).

DIGITARIA CILIARIS (Retz.) Koeler, Descr. Gram. Gallia et Germ. 27. 1802.
Henrard, Monogr. Digit. 129. 1950.

"Spikes subdigitate, approximate, linear, erect, the rachis flexuous; spikelets 2-flowered, one sessile, one pedicellate; glumes ciliate; second glume smaller than sterile lemma, both ciliate."

"Java and China" coll. Wennerberg.

Digitaria gaudichaudii (Kunth) Henrard, Meded. Rijksherb. 61; 18. 1930.
Monogr. Digit. 276. 1950.
Panicum gaudichaudii Kunth, Rev. Gram. 2, t. 106; Enum. Pl. 1: 86. 1833.
Digitaria stricta Gaudichaud, Bot. Voy. Freyc. 1: 409. "1826", non Roth (1801).

Cespitose, 30–60 cm tall, glabrous. Leaves linear, glabrous, to 15 cm long, 4–5 mm wide; sheaths glabrous; ligule very short, erose-subtruncate; spikes 7–16, crowded, sessile, strict, 7.5–10 cm long; rachis linear—subundulate, scabrid, with scabrid central ridge, 0.6 mm wide; spikelets unilateral, alternate, sessile, imbricate-biseriate, oblong-linear, 2.5 mm long. First glume obsolete; second glume against the rachis, about 1/6 as long as the spikelet, 1-nerved, glabrous; sterile lemma oblong, (2.8 mm, subobtuse, about 9-nerved, hispidulous; as long as fertile lemma; fertile lemma 3-nerved, palea 2-nerved, slightly shorter; filaments 3; stigmas plumose, 2; caryopsis oblong.

Type from Rota, coll. Gaudichaud.

Digitaria robinsonii Merrill, Philipp. J. Sci. Bot 15: 540. 1919.
Syntherisma robinsonii (Merr.) Hosokawa, Trans. Nat. Hist. Soc. Formosa, 24: 198. 1934.

Glabrous, erect, tufted perennial; stems to 60 cm tall; leaves rather stiff, linear-lanceolate, 15–25 cm long, 5–8 mm wide; inflorescence of about 15 ascending, somewhat crowded racemosely arranged apikes 6–12 cm long; rachis about 1 mm wide; spikelets numerous, oblong-lanceolate, 2.5 mm long, biseriate. First glume absent; second glume reduced to a minute, hyaline, pilose scale less than 1 mm long; sterile lemma 5–7-nerved, slightly pubescent, acute; fertile lemma yellowish, finely striate, subobtuse, apex ciliate.

Probably not distinct from *D. gaudichaudii*, but kept up by Henrard (p. 630), on the basis of the second glume. In *D. gaudichaudii* it is prominent, 1-nerved, and about 1/6 or 1/7 as long as the spikelet.

Type from Cabras Island, Guam (Nelson 520, April 1919), near the seashore. Also Guerrero 471, Anao Point.

Digitaria pruriens (Trin.) Buse, in Miquel, Pl. Jungh. 379. 1854.
Comprising the following 2 varieties in Guam:
var. **pruriens** (*Panicum pruriens* Trin. Gram. Panic. 77. 1826)
Syntherisma pruriens (Trin.) Arthur, Torreya, 19: 83. 1919.

Densely tufted, culms ascending; nodes glabrous, internodes glabrous; sheaths and blades pubescent; blades linear, up to 15–20 cm long, 5 mm wide; infl. of 3 or 4 racemes, rarely more; these 5–10 cm long, somewhat pubescent; spikelets about

3 mm long; first glume obsolete; second glume about 1/6 as long as the spikelet; its margins pubescent; sterile lemma 5(–7)-nerved.—Fig. 27.

Native; type from Polynesia (Hawaii).,

var. **microbachne** (Presl) Fosberg, Phytologia 5(7): 289. 1955.

Panicum microbachne Presl, Rel. Haenk. 1: 298. 1830.

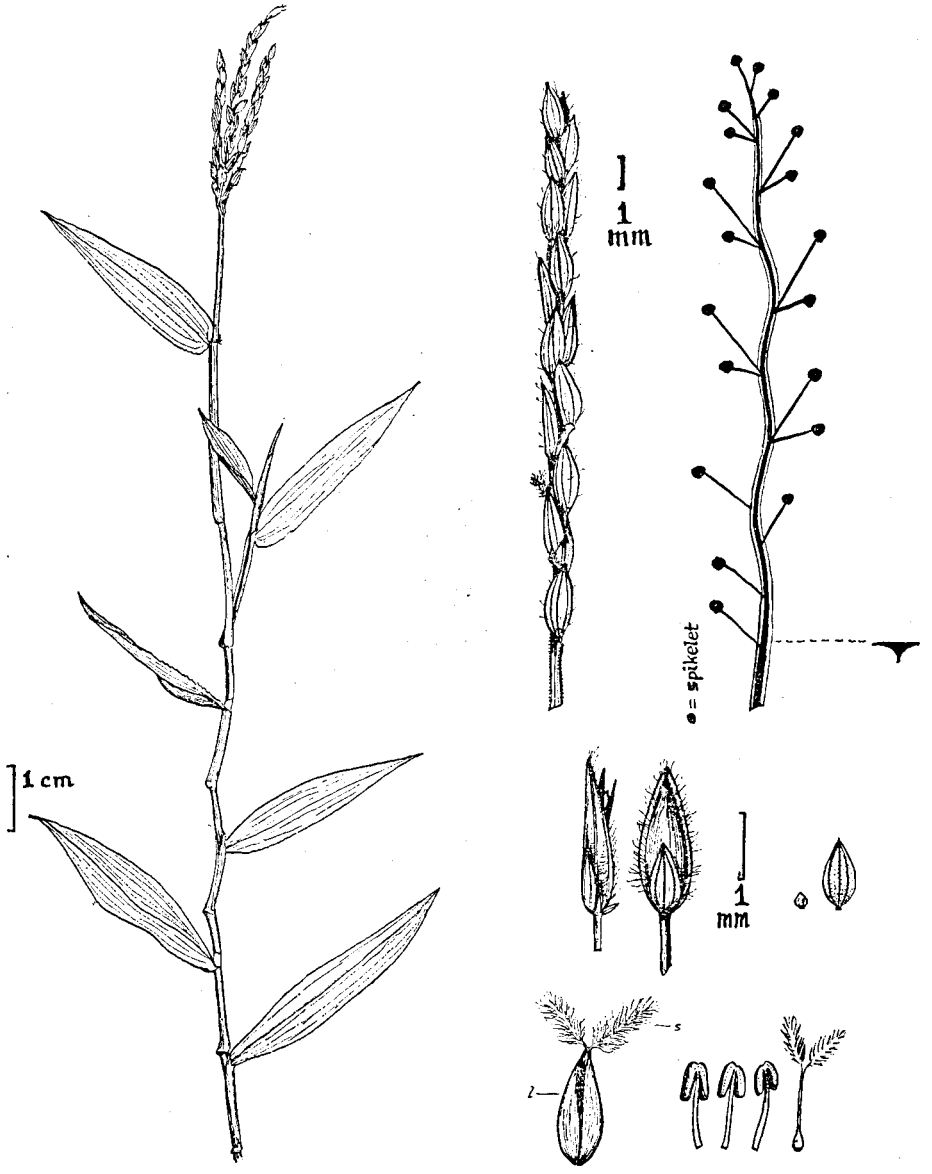

Fig. 27. Digitaria pruriens.

This differs in its shorter spikelets; in the long common axis of the inflorescence; in the many spreading racemes; and in the rather corymbose form of the panicle.

Native.

[*Digitaria insularis* (L.) Mez = *Trichachne insularis* (L.) Nees!]

Digitaria mariannensis Merrill, Philipp. J. Sci. Bot. 9: 54. 1914.

Small prostrate branching plants, rather densely ciliate-pilose, stems very slender, rooting at the nodes and sending up short erect simple flowering branches about 5 cm long; stems creeping 40–50 cm; internodes at 2.5 cm long, glabrous. Sheaths ciliate pilose; ligule membranous; truncate, 0.5 mm long; blades narrowly lanceolate, 1–2 cm long, 2.5–4 mm wide, ciliate-pilose, hairs long, white; spikes paired, slightly pubescent, 1.5–2.5 cm long, few-flowered, connivent-appressed; rachis undulate, 0.5 mm wide; spikelets biseriate, appressed, oblong-lanceolate, 2.5 mm long. *Both first and second glumes entirely obsolete.* Sterile lemma oblong-elliptic, ± pilose, subobtuse, 2.2×1 mm, 9(–10)-nerved, margins inflexed, ciliate. Fertile lemma glabrous, smooth, shining, narrowly lanceolate, acuminate, 2.5× 0.5 mm; palea subequal; caryopsis 1–1.2 mm long.

Type from Cabras Island, Guam (MacGregor 372, Oct. 1911).

[Not = *D. mariannensis* Mez, which is = *D. mezii* Kanehira.]

Digitaria timorensis (Kunth) Balansa, Catal. Gram. Indo-Chin. Frac., J. de Bot. (Morot) 4: 138. 1890.—*D. propinqua* Gaud. Freyc. 410. (non (R. Br.) Beauv.)

Culms substrict up to 60 cm high, leaves faintly puberulent or glabrous; sheaths puberulent; blades 2–10 cm long, 3–7 mm wide; racemes few (2–3) rarely as many as 6 or 8; digitate, 4–9 (12) cm long, puberulent at the axils, but rachis glabrous; spikelets very narrow linear lanceolate, (4–5× longer than broad) about 3×0.6–0.75 mm, acute, on pedicels 2.5–3.5 mm long; first glume minute, nerveless; second glume nearly 1/2 as long as spikelet; 3-nerved; slightly puberulent between thenerves and on the margins; sterile lemma seemingly 3-nerved, actually 5 (rarely 7) nerved, appressed-puberulent along and near the margins, but glabrous near the center; spikelets acuminate, paired, on the flattered, alate rachis.

Possibly native. African Islands through Indomalaysia to Polynesia.

Digitaria violascens Link, Hort. Reg. Bot. Berol. 1: 229. 1827.

Henrard, Monogr. Digit. 790.

Stems decumbent-ascending, up to 60 cm tall; leaves with the sheaths pilose apically; blades scabrid; 2–6(–10) cm long, 3–6 mm wide; often reddish; ligule membranous, 1 mm long; spikes 2–9, up to 12 cm long, digitate or subdigitate toward tip of flowering stalk; rachis narrowly winged, 0.5–0.7 mm wide; spikelets less than 2 mm long (usually 1.6–1.8 mm), slender on scabrid pedicels; first glume-absent; second glume pubescent, *with 2 kinds of hairs* (smooth hairs, and verrucose hairs), 1–1.2 mm long, 3-nerved; sterile lemma similar but longer, 1.5–1.8 mm long; lanceolate, 5–7-nerved, margin ± ciliate; fertile lemma purplish, lanceolate, acute, 1.5–1.7 mm long, dark; caryopsis elliptic-ovate, whitish, 1–1.2 mm long.

Described from Brazilian specimens, but pantropical, probably Indomalaysian originally. Probably introduced to Guam; now naturalized. Manengon (4840).

As a forage grass it is palatable, fairly enduring, and is able to grow well in mixed pastures.

Digitaria radicosa (Presl) Miquel, Fl. Ind. Bat. 3: 437. 1855.

Walker and Rodin 1949: 454.

Lasaga (Guerrero 4). Det. Reeder. Not known to the writer.

ECHINOCHLOA Beauvois

Annual or perennial, often coarse, grasses; spikelets planoconvex, subsessile, often hispid, solitary or irregularly grouped on one side of the rachis, lance-oblong to elliptic or ovate, usually cuspidate or awned, of 2 dissimilar florets, the lower one male or sterile, the upper perfect; glumes membranous, often hispid, lower much smaller than upper; upper (second) glume adjacent to rachis, mucronate or shortly awned; sterile lemma similar to second glume, often awned; fertile lemma coriaceous; apex of palea emergent.—A small genus of perhaps 15 species in warn or tropical regions.

One species in Guam.

Echinochloa colonum (L.) Link Hort. Berol. 2: 209. 1833.

JUNGLE-RICE; CHAGUAN-AGAGA

Tufted annual up to 60 cm tall; culms prostrate to subascending branched, glabrous, nodose; sheaths smooth; ligule obsolete; blades 4–20 cm long, 3–8 mm wide; inflorescence slender, 5–10(–15) cm long, of 4-several racemes, these 1–2 cm long, spreading, or somewhat steeply ascending, subdistant; rachis finely scabrid; spikelets crowded, in 4 rows, subelliptic, 2.5–3 mm long, greenish or purplish; pericels very short, finely scabrid; first glume hispidulous, ovate, acute 1.2–1.5 mm long 3-nerved; second glume 2.5–3 mm long, 7-nerved; sterile lemma similar to second glume, with a palea; fertile lemma 2 mm long, ovate, glossy; caryopsis 1.7–2 mm long, whitish.

First described from Java, now found very widely in the warmer parts of both hermispheres. Weedy in Guam, particularly in wet or sumpy places, near marshes, around waterpipes, etc. Mangilao (3935, 4079).

Cultivated forms of the species are used in India to prepare a kind of porridge. It is also a good fodder grass.

GARNOTIA Brongniart

Erect annuals or perennials; spikelets 1-flowered, falling entire; glumes 3-nerved, awnless; lemmas 3–5-nerved, membranous or hyaline, bifid, awned.—GARNOTIEAE Tateoka, J. Japan. Bot. 32: 277. 1957.—About 30 spp.

One species in Guam.

Garnotia stricta Brongniart, in Bot. Duperry Voy. Coquille, 133, t. 21, 1831.

Usually perennial; culms slender, ascending, 30–90 cm tall, branched; blades linear-lanceolate; spikelets all alike, falling entire from the branches of the narrow, straight or somewhat undulate panicle; whole panicle 5–25 cm long; spikelets 1-flowered, lanceolate, 3–5 mm long; glume awnless; lemma (usually) awned, the

awn up to 1 cm long.

Tropical Asia, Malaysia, and the Pacific Islands, native in Guam, but seldom encountered. To be looked for in humid, shaded localities.

ISACHNE R. Brown.

Usually perennials; spikelets often broad and subglobose, awnless; rachilla disarticulating between second glume and lower floret, or sometimes between the florets; spikelets 2-flowered; florets plano-canvex, the lower male or perfect, the upper female or perfect; glumes subsimilar, membranous, 5–9-nerved; lower lemma membranous to coriaceous; upper lemma and palea always coriaceous, to firm-indurate. Leaf-blades linear or ovate.—Chiefly tropical, in wet or swampy localities.—60 or more species, mostly in tropical Asia.

Two species in Guam.

Spikelets 2 mm long; anthers of the lower floret 3/4–1 mm long....*I. miliacea*

Spikelets 1–1.6 mm long; anthers of the lower floret 1/3 mm long....*I. pulchella*

Isachne miliacea Roth, in Roemer & Schultes Syst. 2: 476. 1817.

Merrill 1914: 55.

Panicum minutulum Gaud. Bot. Freyc. Voy. 410. "1826". (1830).

Isachne minutula (Gaud.) Kunth, Rev. Gram. 2: t. 117. 1829.

Usually prostrate and rooting at the nodes; blades to 2.5 cm long, lance-elliptic, acute; panicle open, of 5–7 branches, slender, pale green. Spikelets 2 mm long or very slightly more; anthers of lower floret nearly 1 mm long.

Indomalaysia to the Pacific Islands; in Guam in wet localities, usually in Southern or central Guam in the hills.

Isachne pulchella Roth, l.c. 1817.—Walker and Rodin 1949: 454.

Delicate, tufted grass with slender, glabrous culms less than 0.5 mm thick, pale; leaves narrowly ovate to lanceolate, 1–2.5 cm long, 2–3.5 m wide; sheaths hairy along the margins especially at the collar; ligule a row of hairs; blades minutely scabridulous on margins, sparsely appressed, puberulent; panicle slender, up to 6 cm long, about 1 cm wide, delicate, open, lateral branches to nearly 1 cm long, about 5–9, spikelet broadly ellipsoid, 1–1.6 mm long, glumes subequal, almost glabrous; fertile lemma densely fine-puberulent; anthers of lower floret only 0.35 mm long.

Malaysia. First collected in Guam by Moore (no. 227) in 1946, at about 100 ft. alt. "near a spring in the Mt. Lamlam area." Fena Headwaters (5050).

OPLISMENUS Beauvois

Annual or perennial; inflorescence of distant racemes; spikelets lanceolate-oblong, *awned*, falling entire at maturity, nearly sessile, along one side of the rachis of a spikelike raceme; spikelets 2-flowered; florets unlike, lower male or sterile, upper perfect; glumes alike, membranous, the lower or both awned; lower lemma broader than glumes, equalling spikelet, awnless or short-awned; upper lemma coriaceous; palea indurated. Usually forest grasses, in tropical regions; about 15

species, tropical and warm-temperate regions.

Two species in Guam.

Leaves mostly small, blades usually less than 5 cm long and 4.5 mm wide, inflorescence of groups of spikelets alternation..... *O. undulatifolius*

Leaves larger, blades usually 5–15 cm long and 1–2 cm wide, infl. of racemes of spikelets .....*O. compositus*

Oplismenus undulatifolius (Ard.) Beauvois, Ess. Agrost. 54. 1812.

Merrill and Perry, J. Arn. Arb. 27: 323. 1946.

Virtually identical in general habit to the following species, but with the smallish blades, and the spikelets fasciculate and these groups alternating along the axis, rather than in racemes.

S. Europe to Asia; a forest grass.

Oplismenus compositus (L.) Beauvois, Agrost. 54, 168–9. 1812. Merrill 1914: 56.

Creeping, accumbent perennial; culms slender, elongate; sheaths ciliate; nodes usually pubescent; ligule short, fringed with short hairs; blades narrowly elliptic, acuminate, 3–16 cm long, 6–25 mm wide, usually thinly pubescent; panicles 10–30 cm long, erect or suberect, of about 10 rather well-spaced racemes, these ascending or spreading and up to 10 cm long, usually shorter; spikelets lanceolate, green or purplish, sparsely puberulent; lower glume with awn to 16 mm long, upper glume with awn 2–3 mm long; lower lemma mucronate.

Eastern Tropical Africa eastward to Polynesia. Native; usually in forests of woods, often among rocks in somewhat dry but shaded localities. Talofofo Valley (3965, 4443).

PANICUM L.

Annuals or perennials; blades linear to ovate; spikelets small, *awnless*, usually falling entire, 2-flowered, the florets unlike, the lower male or sterile, the upper perfect; glumes membranous, the first glume almost always shortest, 3–9-nerved; lower lemma usually similar to second glume,-with a membranous palea; upper lemma coriaceous, its palea rigidly indurated. A large cosmopolitan genus of perhaps 500 species. Formerly Brachiaria was included.

Two species in Guam. [For P. ambiguum, see Brachiaria paspaloides; for P. purpurascens, see Brachiaria mutica.] Panicum distachyum L. of Safford 1905: 345 is perhaps a *Digitaria.*

1. Blades mostly 1.5 cm wide or more.....*P. maximum*

1. Blades 1–1.3 cm wide, rarely more.....*P. luzoniense*

Panicum maximum Jacquin, Coll. Bot. 1: 76. 1786. GUINEA GRASS.

Large tufted perennial, up to 3–4 m. tall, culms mostly erect, often robust, glabrous to pubescent; leaves glabrous or coarsely pubescent; ligule short, hairy; blades linear, 15–100 cm long, up to 1.5–3.5 cm wide, margins scabridulous; erect large panicles 15–60 cm long and to 25 cm wide, richly branched, the branches elongate; spikelets clustered, shortly pedicellate, oblong, rather blunt, plump, 2.5–4 mm long, green or purplish, glabrous; first glume broad, obtuse, less than 1/3

as long as the second glume, 5-nerved; second glume equalling the spikelet; lower lemma enclosing a male floret, 5–7-nerved; upper lemma oblong, with minute transverse wrinkles.

An African species, now widely introduced and naturalized; tolerant of dry areas. Palatable to stock when young, less so when older. Mangilao (4061). Often rather weedy, especially in ditches.

Panicum luzoniense Presl, Rel. Haenk. 1: 308. 1830; Merrill 1914: 55.

Robust perennial; culms yellowish-puberulent; blades up to 25 cm long and 10–13 mm wide; panicles to 25 cm long, rather open, the branches more widespreading than those of the preceding species.

The identification is not certain.

Java, Philippines; probably native in Guam. G.E.S. 162.

PASPALUM L.

Annuals or perennials; racemes spikelike, one to many, solitary, paired, several to many on a single axis; spikelets planoconvex, mostly obtuse, subsessile, solitary or in pairs, in 2 rows on one side of a narrow or dilated rachis; back of fertile lemma towards the rachis; first glume usually absent; second glume and sterile lemma usually about equal, the former rarely wanting. Fertile lemma obtuse, margins inrolled. —A big genus (perhaps 350 species) of wide distribution and occurrence, in warmer regions of the globe.

Key to local species*

1. Spikelets with a broad firm notched fimbriate margin..... *Paspalum fimbriatum*
1. Spikelets with entire or merely ciliate margins,
   2. Spikelets fringed with fine white hairs from the margins of the upper glume,
      3. Perennial with long creeping stolons; spikelets 1.4–2 mm long, yellowish-green; racemes usually 2..... *Paspalum conjugatum*
      3. Perennials, tufted; spikelets 2–4 mm long, dull green or purplish; racemes more than 2.
         4. Racemes 3–5; spikelets 2.8–4 mm long; culms usually geniculate at base..... *Paspalum dilatatum*
         4. Racemes usually 10–18, spikelets 2–3 mm long, culms erect.. ..... *Paspalum urvillei*
   2. Spikelets glabrous or pubescent, not fringed on the margins.
      5. Spikelets broadly elliptic to ovate-elliptic, acute, 2.4–4.5 mm long; perennial aquatic grass with rhizomes and long creeping stolons.. ..... *Paspalum distichum*
      5. Spikelets roundate-elliptic, broadly obovate-elliptic to almost orbicular, obtuse.
         6. Lower lemma chartaceous or cartilaginous, smooth, shining, or some of the lemmas chartaceous, some cartilaginous, or even half

* by Thomas R. Soderstrom, U. S. National Herbarium.

the lemmas chartaceous and the other half cartilaginous.....
.....*Paspalum cartilagineum*

6. Lower lemma membranous,
   7. Spikelets rotundate-elliptic, 2–2.8 mm long; upper glume and lower lemma 5–7-nerved.....*Paspalum commersonii*
   7. Spikelets ovate-elliptic or orbicular, 1.8–2.2 mm long; lower lemma 3-nerved but side nerves often double.....
.....*Paspalum orbiculare*

Paspalum fimbriatum Humboldt, Bonpland, & Kunth, Nov. Gen. Sp. 1: 93. pl. 28. 1815.

Annual; culms to 100 cm tall; galbrous; sheaths compressed, carinate, glabrous or sparsely papillose-pilose; ligule 0.5–2 mm long; blades 5–40 cm long, 5–12 mm wide, margins scabrous, usually prominently papillose-ciliate; racemes 2–8; 3–8 cm long, somewhat distant; rachis narrowly winged, about 1.5 mm wide with a tuft of hairs at base; spikelets broader than long, about 2.2×3 mm; glume fimbriate-winged, ciliate, ovate, apiculate; sterile lemma obtuse, apiculate, winged like the glume, partially winged or very rarely wingeless; caryopsis 2 mm long pale minutely rough.

Tropical America; introduced in Hawaii and Guam; weedy and fairly aggressive. Harmon (4055, 4089).

Paspalum conjugatum Bergius, Act. Helvet. Phys. Math. 7: 129. pl. 8. 1762.

Stoloniferous perennial, culms to 60 (–100) cm long (rarely more), decumbent or suberect, rooting at nodes, glabrous, compressed, often reddish-purple, emitting long leafy stolons pilose on the nodes; sheaths 2–6 cm long, compressed, pilose on the collar; ligule membranous, less than 1.1 mm long; blades 8–12(–14) cm long, 5–15 mm wide, ciliate-scabrous on margins, glabrous or nearly so; racemes usually 2, paired, widely spreading, 4–15 cm long (usually 6–10 cm); rachis 1 mm wide, glabrous; spikelets 1.5 mm long (rarely 2 mm), ovate, pale stramineous; glume silky-ciliate, sterile lemma usually similar; fertile lemma coriaceous, much firmer than the glume and sterile lemma; caryopsis 1 mm long, equally wide, compressed, white or very pale.

Described from Tropical America (specimens from Dutch Guiana) but found throughout the tropics, now a common weed. In Hawaii called 'Hilo Grass'. Relatively unpalatable to stock when mature, but very persistent and aggressive. Mangilao (4082); Barrigada (4140); Talofofo Falls (4444, 4445). G.E.S. 294.

PASPALUM DILATATUM Poiret, in Lamarck, Encycl. Meth. Bot. 5: 35. 1804
DALLIS-GRASS.

Tufted perennials to 180 cm tall, mostly less; culms mostly erect; glabrous; sheaths compressed, lower ones pubescent basally, upper ones glabrous; ligules to 3–4 mm long, membranous; blades 6–25 (rarely to 35) cm long, (3–)5–15 mm wide; flat, pubescent at base, margins slightly scabrous; racemes usually 3–5, nodding, 4–10 cm long; rachises narrowly winged, 1–1.2 mm wide; spikelets paired, 3–4 mm long, green or purplish, plano-convex, ovate, acute; glume and sterile lemma

alike, 5–9-nerved, apiculate, margins ciliate, obscurely pubescent on the back; fertile lemma 2.5×2 mm, indurated; caryopsis 2 mm long, reddish-brown, elliptic.

Tropical America (Brazil-Argentina), now widely introduced as an important forage grass, in many countries, where rainfall exceeds 60″ p.a. Valuable for pastures, though susceptible to ergot; it can withstand heavy grazing. Mangilao (4080); Apra (4716). MacGregor 516.

PASPALUM URVILLEI Steudel, Syn. Pl. Glum. 1: 24. 1854. VASEY GRASS.

Densely tufted robust perennial culms 1–2 m tall erect glabrous basally thickened; sheaths carinate upwards lower ones pubescent purplish upper ones glabrous green 8–27 cm long; ligule very conspicuous (3–)5–8(–12) mm long membranous; blades linear acute 12–55 cm long 4–15 mm wide flat, hairy at base; panicles 10–40 cm long, of 6–25 crowded racemes, these erect or asceding, 5–13 cm long, apical ones shorter than basal ones; spikelets paired, on rachises about 0.8 mm wide, elliptic ovate, broad, subacute, 2–3 mm long; glume and sterile lemma subequal, slightly apiculate, thin, ovate, 3- nerved, green to greenish-purple, piloseciliate; fertile lemma 1.6 mm long.

Tropical America (Brazil), now widely introduced in warm countries. A good grass for grazing, but only when young; old culms are unpalatable; suitable for hay.

Paspalum distichum L., Syst. Nat. (ed. 10) 2: 855. 1759.
SALTGRASS; KNOTGRASS; COUCHGRASS;

P. vaginatum Sw., Prodr. Veg. Ind. Occ. 21. 1786.

Creeping perennial, to 50 cm tall, rhizomatous and stoloniferous, somewhat matted; culms slender, glabrous; ligule rather obscure, truncate; sheaths glabrous except the collar; blades linear, 3–12 cm long, 2–7 mm wide, flat, glabrous or sparsely hairy at base stiff; racemes usually 2 (rarely 3 or 4), apical, somewhat ascending, or at length reflexed, 2–7 cm long; spikelets usually solitary, 2.5–3.5 (4.5) mm long, broadly elliptic, acutish, pale green; first glume occasionally present but minute, usually absent; second glume and sterile lemma similar but the glume obscurely puberulent, or glabrous; 3–5-nerved.

Widespread in warm countries; a useful pasture grass in sumpy areas. Native in Guam. Acho Pt. (4535); Tumon Bay (5093). Usually near the sea or in brackish marshes. sometimes in mangrove regions.

P. vaginatum Sw. is alleged to differ in the slightly longer spikelets (about 4 mm) and the puberulent glumes, but is probably only a variety or form of *P. distichum.*

PASPALUM CARTILAGINEUM Presl, Rel. Haenk., 1: 216. 1830. KODO.

P. scrobiculatum L. Mant. 1: 29. 1767; Safford 1905: 347; Merrill 1915: 53.

An erect annual; glabrous or rarely pubescent; leaves acuminate; up to 30 cm long and 8 mm wide, linear, acuminate; ligule short, membranous; peduncle slender; spikes 2–8, about 6–8 cm long, alternate, erect or ascending, rachis 2–2.5 mm broad, the margins ciliate or serrulate; spikelets usually in two rows, rarely in 3 or 4 rows, imbricate, glabrous or sparsely pubescent, sometimes germinate on a common pedicel, elliptic-rounded, plano-convex, about 2 mm long; sterile lemma

finely ridged and pitted, mostly cartilaginous.

An Indomalaysian species; it is not certain whether it should be considered distrinct from *P. scrobiculatum*, the name used by Safford. First collected in Guam by Thaddaeus Haenke in 1792. MacGregor 519; Thompson 12.

Cultivated forms in India ("kodo" or "Kodra") are eaten, but only after elaborate preparations: the plants, including the grains, are poisonous [especially the husk and testa]. Consequently it is not desirable for pasturage.

Very closely related to the next species.

Paspalum commersonii Lamarck, Tabl. Encycl. Meth. Bot. 1: 175. t. 43, f. 1. 1791.

P. scrobiculatum L. var. *Commersonii* (Lam.) Stapf in Prain, Fl. Trop. Africa 9: 573. 1919.

Loosely tufted perennial up to 70 cm high; culms erect or ascending, sometimes from a prostrate base, slender, glabrous; leaf-sheaths carinate, glabrous or somewhat pubescent; ligule short, truncate; blades linear acute, 6–30 cm long, 4–10 mm wide, flat, firm; racemes usually 2, 3 or 4 (very rarely single); erect or spreading, dense, sometimes slightly curved, 3–8 cm long; rachis 1–2 mm wide; spikelets solitary, rounded-elliptic, obtuse, 2–2.8 mm long, ripening to dark brown, glabrous; second glume and sterile lemma 5–7-nerved.

Old World Tropics. Possibly native in Guam.

Paspalum orbiculare Forst. f., Prodr. 7, 1786. RICE-GRASS.

Tufted perennial up to 120–150 cm tall; culms stout, erect, glabrous, somewhat bulbous at base; sheaths 7–14 cm long, glabrous or with sparse hairs at the collar, compressed, basal ones often purplish; ligule very short, but with a dense row of hairs just behind it; blades flat, 12–40 cm long, 3–12 mm wide, acute, scabrous, glaucous on upper surface; inflorescence of 4–6 racemes, these 2–4 cm long, alternate, distant, their axis 4–9 cm long, villous at base, sometimes pilose in the axils; rachis 1–1.5 mm wide, scabrous, usually reddish on the margins; spikelets paired, 2–2.5 mm long, broadly elliptic, imbricate, glabrous; second glume and sterile lemma 3-nerved; fertile lemma indurated, finely pitted; caryposis 1.5 mm long, compressed-elliptic, pale.—Fig. 28.

Malaysia to Polynesia. Possibly native in Guam. Persistent, tolerant of poor soils, of little value for forage, though new growth may be grazed.

Two other species of *Paspalum* may be in Guam but have not been collected recently and may have disappeared. One of these, *Paspalum longifolium* Roxb., was introduced by the G.E.S. and according to E.H. Bryan one specimen exists of it in the Bishop Museum. The other, *Paspalum notatum* Flugge, was introduced as a lawn grass in 1927 but apparently failed to establish itself.

Pennisetum L. C. Richard

Tufted or creeping annuals or perennials with dense spiciform columnar panicles, generally tawny; spikelets lanceolate or 'oblong, awnless but with tufts of bristles at base (bristles are sterile branchlets), these often scabrid or hispid or vil-

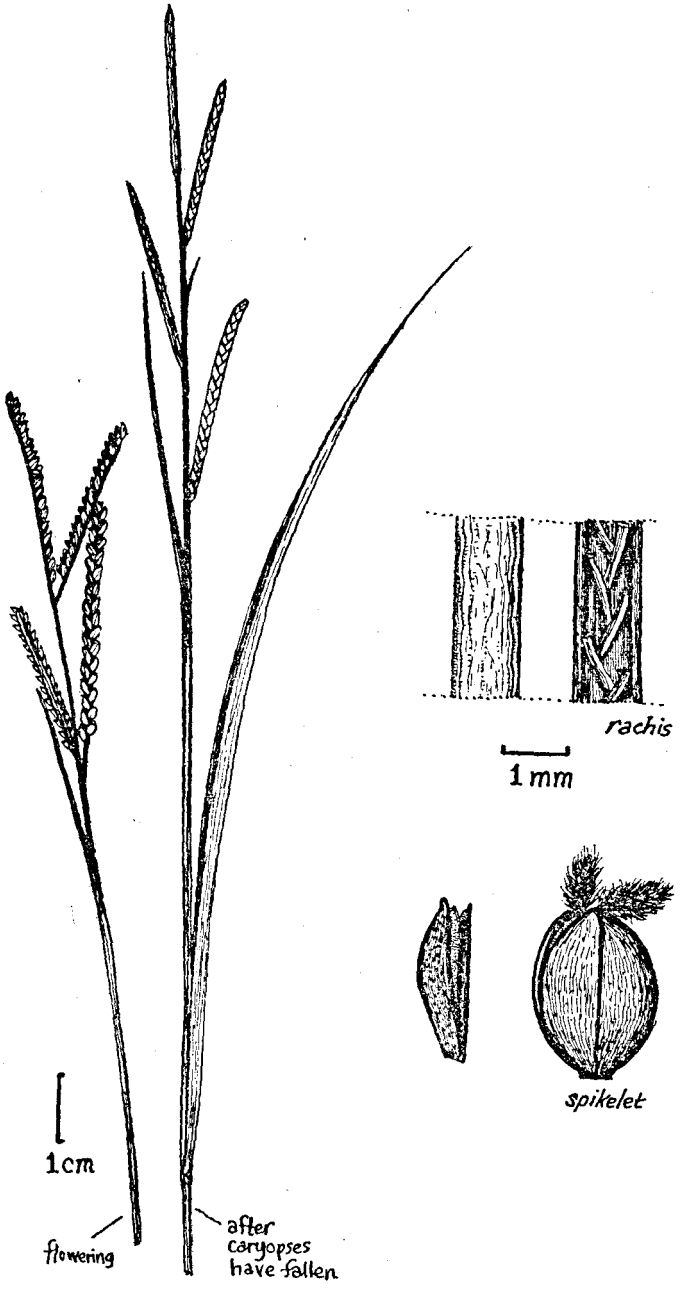

Fig. 28. Paspalum orbiculare.

lous; spikelets 2-flowered, the florets unlike, lower male or sterile, upper perfect; glumes unlike, the first glume shorter or obsolete, membranous or hyaline; lower lemma membranous; upper lemma membranous or thin-coriaceous with thin margins.—About 50 speices, mostly tropical, mostly perennial.

Four species have been recorded from Guam, but only two appear to be common, *P. setosum* and *P. purpureum*, and the former is very common.

Culms robust, 2–4 cm (or more) tall; leaves 15–30 mm broad; panicles 8–30 cm long, usually more than 15 cm; lemmas alike; outer bristles 5–6 mm long, inner ones longer and sparsely short-hairy at base; one longer and stouter than all the others.....*P. purpureum*

Culms usually less than 2.5 m tall; leaves 3–18 mm wide; panicles 10–25 cm long, usually about 12 cm; lemmas unlike; outer bristles 3–4 mm long, inner ones plumose-villous at base with silky hairs, one longer but several others nearly as long.

Spikelets 3.5–4 mm long; inflorescence about 1 cm thick; perennials. .....*P. setosum*

Spikelets 5 mm long; inflorescence 1.3–2.5 cm thick; annuals..... .....*P. polystachyon*

Pennisetum purpureum Schumacher, Beskr. Guin. Pl. 44. 1827.

ELEPHANT GRASS; NAPIER GRASS.

Robust perennial 2–4 or even 6–7 m tall, culms erect and to 2.5 cm thick near base, branched, distally pubescent; leaves usually pubescent; sheaths often bearded at the nodes; ligule densely hairy, rimlike; blades linear, finely pointed, (20–) 30–50(–100) cm long, (1–) 1.5–3 (–4) cm wide, margins finely scabrid and razor-sharp; inflorescence spikelike, dense, yellowish or purplish, 8–30 cm long, usually 15 cm or more, 1.5–3 cm thick (excluding the bristles), main axis hairy; bristles numerous, outer ones short, inner ones longer and sparsely short-hairy at base, one long and stout and 2–4 cm long, the others up to 7–15 mm long; usually 2 spikelets per fascicle; spikelets 4.5–7 mm long; first glume about 1 mm long; second glume 3.5–4 mm long; sterile lemma 5–6 mm long, 5-nerved; fertile lemma 4.5–5 mm long, indistinctly 3-nerved; anther tips usually with tuft of minute hairs.—Fig. 29; Pl. 3e.

Tropical Africa; now widely introduced in warm countries. Useful for fodder; old plants furnish stout reedlike stems. It is nutritious for stock and withstands grazing well.

Fairly common in Guam chiefly on old fields in the northern limestone plateau. Harmon (4050); Ritidian Point (4705).

Pennisetum setosum (Swartz) L.C. Richard, in Persoon, Syn. Pl. 1: 72. 1805.

Cenchrus setosus Sw. Prodr. Veg. Ind. Occid. 26. 1788.

Erect, loosely tufted perennial, culms to 150 cm tall; sheaths usually glabrous; ligule a line of hairs 1 mm long; blades 6–50 cm long, 3–15 mm wide, pubescent on both surfaces, especially at the base; panicles dense, mostly 12–18 cm long, 1 cm thick, (excluding bristles), tawny or purplish; axis glabrous or slightly scabrous; spikelets 1 per fascicle, bristles rather strict, inner ones densely plumose at base and

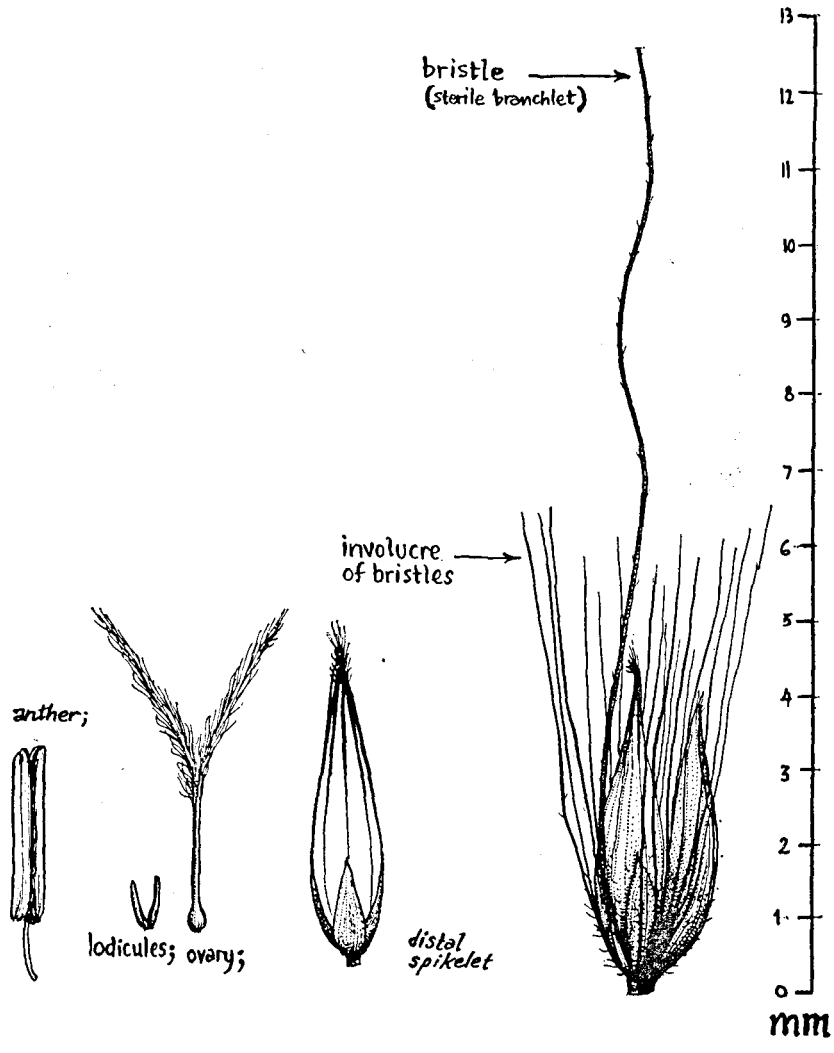

Fig. 29. Pennisetum purpureum.

up to 15 mm long; spikelets 3.5–4 mm long; first glume minute or obsolete; second glume longer than sterile lemma, sometimes slightly lobed; sterile lemma obtuse-truncate (sometimes the palea containing a staminate flower); fertile floret indurate, glossy, olivaceous, 2–3 mm long, lemma and palea slightly apically ciliate.

Florida, West Indies, Mexico, Brazil and Bolivia. Introduced in Guam, probably from Hawaii.

Very common in old fields in north Guam. Ritidian Point (4706).

PENNISETUM POLYSTACHYON (L.) Schultes, Syst. Veg. Mant. 2: 146. 1824.

MISSION GRASS.

Tufted annual; culms slender to moderately stout, up to 2 m tall, usually 1–2 m, simple or few-branched; blades 5–40 cm long, 5–18 mm wide, glabrous or pubescent. Spike dense, yellow brown, 5–25 cm long 13–26 mm wide; spikelets surrounded by bristles these densely hairy at base, unequal, one longer than the others but not greatly exceeding the next one or two shorer ones 12–25 mm long; spikelets 2-flowered c. 5 mm long, upper floret perfect.

Tropical Africa- India, now rather commonly introduced in warm regions. Occurs in Florida, where it has long been in use as a fodder plant; however, only young tender plants are palatable, and the plant is aggressive.

The base of the blade is hairy near the sheath collar and on its rim. The bristle hairs are not as dense and long-silky as in *P. setosum*, but the two spcies are difficult to distinguish.

Reported from Guam by Bryan (Sept. 12, 1957) in Guam Daily News, on the basis of a collection made by Lt. R.L. Steere "along roadsides in central Guam, in coral-soil, in 1945." This record needs confirmation.

RHYNCHELYTRUM Nees in Lindley

Annuals or perennials; culms decumbent, branching, slender; panicle rather lax, fine, silky; spikelets small, surrounded by silky hairs, all similar in shape and sex, upper glume and lower lemma finely awned or mucronate, lower glume minute; upper lemma membranous but rigid.—Africa to Indochina; 37 spp.

One species in Guam.

Rhynchelytrum repens (Willdenow) C.E. Hubbard, Kew Bull. 110. 1934.

NATAL REDTOP.

Saccharum repens Willd. Sp. Pl. ed. 10, 1: 322. 1798.

Tricholaena rosea Nees, Ind. Sem. Hort. Vratisl. 1835.

Tricholaena repens (Willd.) Hitchcock, Man. Grasses W. Indies, 331. 1936.

Rhynchelytrum roseum (Nees) Stapf and C.E. Hubbard, ex Bews, The World's Grasses, 223. 1929.

Perennial; culms up to 90–100 cm high, in age tufted, glabrous, branched; sheaths to 10 cm long, sometimes longer, lower ones often slightly pubescent; ligule of short hairs 1 mm long; blades flat, 5–20 cm long, 2–5 mm wide, usually glaucous, glabrous dorsally; panicles to about 15 cm long, red or purplish at first, later silvery-pink, of fine aseending scabridulous branchlets; spikelets about 5 mm long, clothed with fine silky hairs 3–5 mm long (chiefly on upper glume and sterile lemma); caryopsis ovate, about 1.3 mm long, smooth, light brown.—Fig. 30.

South Africa; now widely introduced; only moderately useful as forage, tough when old, but able to grow on poor or rocky soils. In Guam chiefly weedy. Agaña (4371); OSIR Rd., Apra (4715).

Most American floras discuss this species under the name *Tricholaena rosea* or *T. repens.*

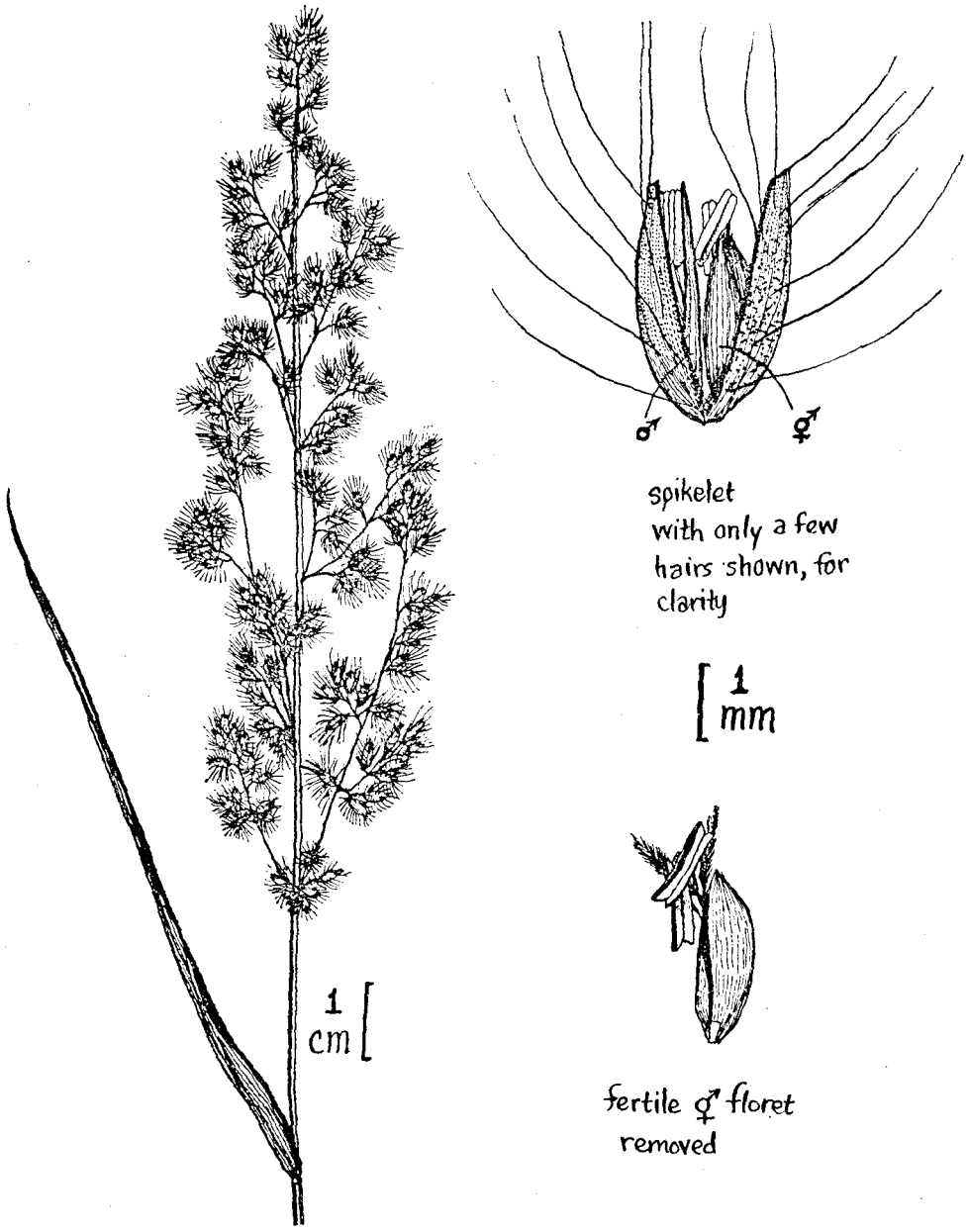

Fig. 30. Rhynchelytrum repens.

SACCIOLEPIS Nash

Annual or perennial grasses with linear baldes; panicles spike-like, of small spikelets deciduous from apex of short thick pedicel, ovate to broadly lanceolate, usually distended somewhat unequally at base; glumes membranous, the first glume smaller than the 2nd; 2nd glume saccate at base; sterile lemma erect, with reduced palea; fertile lemma crustaceous, smooth, ovoid, shining, substipitate; seed with minute hilum.—Worldwide; about 30 speices.

One species in Guam.

Sacciolepis indica (L.) Chase, Proc. Biol. Soc. Wash. 21: 8. 1908.

S. contracta (W. & A.) Hitchcock; *Panicum contractum* Wight & Arnott, ex Nees, Linnaea 10: 117. 1836.

Glabrous, culms tufted, erect, to 40 cm long; blades linear, 4–10 cm × 2–4 mm, glabrous; ligule short, hyaline; sheath short, glaborus; panicle dense, erect, cylindric, up to 6 cm long, green; spikelets about 3 mm long, smooth to sparsely hairy; glumes ovate; fertile lemma 1.5 mm long, yellowish.

Open banks above streams.—Tarzan Falls (4968–A). Uncommon.

SETARIA Beauvois

Annual or perennial grasses with flat or pleated blades; culms simple or branched; panicle sometimes open, more often spikelike; spikelets jointed at base; glumes membranous, the first glume small; sterile lemma membranous. Sometimes male; fertile lemma coriaceous, often rugulose; stamens 3.—Over 100 species in warmer regions of the world.

Two, or perhaps three, species in Guam.

Perennials; first glume about 1/3 as long as spikelet; 6 or more bristles subtending each spikelet; rhizomes knotty, branched.....*S. geniculata*

Annuals (S. verticillata) or perennials (S. pallide-fusca); first glume about 1/2 as long as spikelet; 1–3 bristles below spikelet (S. verticillata) or more than 3 (S. pallide-fusca); rhizomes little or slightly nodose-knotty.

Bristles with reflexed barbs; upper glume as long as spikelet..*S. verticillata*

Bristles with ascending barbs; upper glumer shorter than spikelet.....
.....*S. pallide-fusca*

Setaria pallide-fusca (Schumacher) Stapf & C.E. Hubbard, Kew Bull. 259. 1930.

FOXTAIL

S. glauca (L.) Beauv. of most authors with reference to Guam plants;

S. lutescens (Weigel) F.T. Hubb. as to Guam plants.

Chaetochloa glauca (L.) Scrib. as misapplied by Safford 1905: 223 (as var. *aurea*).

S. flava (Nees) Kunth as misapplied by Merrill 1914: 56.

Nearly glabrous perennial; culms to 50 cm long somewhat branched at base; pubescent just beneath the panicle; blades linear 10–24 cm long with hairs near the ligule the ligule of short hairs; sheaths slightly flattened, glabrous; panicle cylindric, to 10 cm long, yellow, the axils pilose-scabrous with spreading bristles 8–10 mm

long beneath each spikelet; spikelets ovate, 2–2.5 mm long, pale; first glume 3-nerved, half as long as the spikelet; second glume 5-nerved; sterile lemma equalling the spikelet and 5-nerved; fertile lemma ovate, finely rugulose, obtuse, shiny.

Old World Tropics; probably native in Guam. MacGregor 383. G.E.S. 15; 61.

This species has usually been referred to *S. glauca* or to a var. *aurea* K. Schum.; as *Chaetochloa glauca aurea* (Hochst.) Wight ex Safford. It has also been referred to *S. flava*, in an interpretation by Merrill. The problem is a vexed one, but in all probability the only *Setaria* in Guam with antrorsely barbed bristles and second glume twice as long as first glume is this species. The true *S. glauca* (L.) Beauv. is an Old World temperate zone species. For further details, see: Stapf, Kew Bull. 147. 1928; and Reeder, Rhodora 53: 27. 1951.

SETARIA VERTICILLATA (L.) Beauv. Agrost. 51, 178. 1812. Merrill & Perry 1946: 323. Bryan (Aug. 27) 1957. BARBED FOXTAIL

Loosely tufted annual, 50–90 cm high; culms slender, ascending, glabrous; sheaths compressed; ligule very short, hairy; blades linear-lanceolate, 5–30 cm long, 3–12 mm wide, often sparsely pubescent; panicles dense, bristly, cylindric, sometimes lobate proximally, up to 15 cm long, 1–2 cm wide, excluding bristles; bristles with reflexed barbs; bristles about 5 or 6 at base of each spikelet; spikelets elliptic, about 2 mm long, green; first glume about 1 mm long, with 1 nerve; second glume 2 mm long, 7-nerved, equalling spikelet; fertile lemma slightly shorter than sterile lemma, about 1.6 mm long; with fine transverse wrinkles.

Old World Tropics; weedy; abundant in Hawaii, and elsewhere in the Pacific. The fruits, with their retrorsely barbed bristles, are distributed by small mammals; and of late by stockings and trousers.

The only report of this species is that of Merrill & Perry, J. Arn. Arb. 27: 323. 1946, repeated by Bryan in 1957, based on a Guam collection of 1946 made by Sidney F. Glassman. This needs reconfirmation.

Setaria geniculata (Lam.) Beauvois, Ess. Agrost. 51: 178. 1812. FOXTAIL.

Densely tufted perennial; rhizomes knotty; leaf-sheaths carinate, glabrous; ligule densely and iminutely ciliate; blades 5–15 cm long, 4–6 mm wide, acuminate, scabrid, sometimes sparsely villous at base; panicles dense, yellowish, spikelike, rarely purplish, 2–8 cm long; spikelet with about 5 antrorsely barbed bristles at base, 2–2.5 mm long, ovoid, first glume 3-nerved, 1/3 as long as the spikelet, second glume half to 2/3 as long as the spikelet; 5-nerved; sterile lemma 5–7 nerved; caryopsis strongly transversely rugose.

American Tropics, now widespread and weedy. Very similar to *S. pallidefusca* but perennial with short, branched, nodose-knotty rhizomes, shorter first glume, and generally a more greenish or duller yellow spikelike panicle.

Note: *S. glauca* (L.) Beauv. (Syn. *P. lutescens* (Weig.) F.T. Hubb.) if it should turn up in Guam, can be recognized as follows: it would key out to *S. pallide-fusca*, but would differ in the slightly longer (3 mm) spikelets, with the fertile lemma coarsely rugose with a slight keel near tip.

THUAREA Persoon

Annuals or perennials; flowering spike partially or wholly enclosed in uppermost leaf; spikelets without bristles or awns, monoecious, upper 4–6 male, lower 1 or 2 perfect or female. Madagascar to the Pacific; 2 spp.

One species in Guam.

Thuarea involuta (G. Foster) R. Brown, ex. Roemer and Schultes, Syst. Veg. 2: 808. 1817. LAS-AGA

Ischaemum involutum G. Forster, Fl. Ins. Austral. Prodr. 73. 1786.

Perennial; culms prostrate, branching; blades glabrous, to 10 cm long and 10 mm wide; flowering spike terminal, about 2 cm long rachis flattened; spikelets 3–5 mm long, falling entire, florets 5–8 , lowest 1 or 2 with fruit; caryposis enclosed by the thick broad base of the rachis, and at maturity with the axis (from which the upper male florets have fallen) folded over it, forming a buoyant "false-fruit".

Shores of S.E. Asia and most Pacific Islands; the false-fruits easily dispersed by their buoyancy in ocean currents. In Guam, on sandy beaches above the high-tide mark. Mana Bay (4066).

TRICHACHNE Nees

Perennial, often rather large grasses with flat, narrow blades, and plumose contracted many-racemose panicles; spikelets lanceolate, subdistant, paired, biseriate, unilaterally borne on the rachis; first glume reduced, nerveless, glabrous; second glume and sterile lemma subequal, 3–5-nerved, densely silky-tomentose, the hairs tawny or white; caryposis cartilaginous, dark brown (ripe).—About 15 spp.

One species in Guam.

Trichachne insularis (L.) Nees, Agrost. Brasil. 86. 1829.

COTTON GRASS, SOUR GRASS.

Andropogon insularis L., Syst. Nat. (ed. 10) 2: 1304. 1759.

Digitaria insularis Mez ex Ekman, Bot. Arkiv. 13(10): 22, 1913.

Large perennial grass with more or less erect culms, branching up to 1.5 m tall; cataphylls densely-soft-hairy; sheaths apically carinate, longer than internodes, hirsute; ligule 3–4 mm long; blades 10–30 cm long, 2–12 mm wide; margins finely scabrid; panicles 15–30 cm long, slender, congested, tawny to whitish, the branches steeply ascending; spikelets 3.5–4 mm long; first glume 0.5 mm long, glabrous; second glume and sterile lemma both densely silky-hairy with hairs longer than spikelet; fertile lemma dark, 3–3.5 mm long; caryopsis beaked, pale, 1.5 mm long. —Fig. 31, 32.

Tropical America, mostly in waste ground; adventive but not particularly common in Guam, though spreading. Barrigada Hill, near Harmon (4230).

Fig. 31. Trichachne insularis.

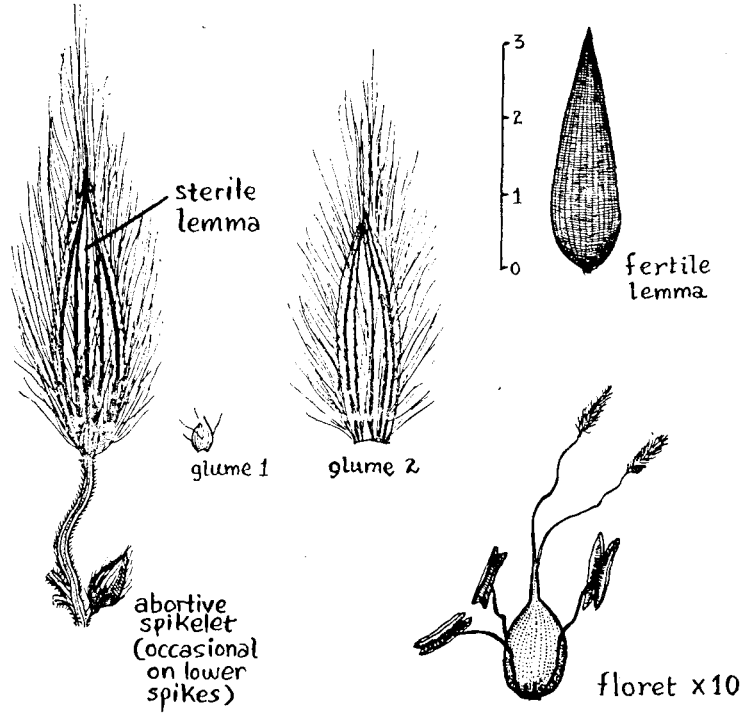

Fig. 32. Trichachne insularis.

13. Tribe ANDROPOGONEAE

Key to the Genera in Guam

(Adapted from Bor, 1960).

1. Spikelets in pairs or triads, on unequal pedicels, one long, one short or obsolete.
   2. Spikelets similar (of each pair) except for the difference of pedicel length; both perfect.
      3. Spikelets in panicles or compound racemes; upper lemma awnless, or if awned, the awn arising from the tip or from between 2 terminal teeth.
         4. Rachis not breaking up into segments; spikelets jointed to pedicels, culms hollow..... *Miscanthus*
         4. Rachis breaking up into segments; culms solid..... *Saccharum*
      3. Spikelets in one or a few simple, sometimes digitate, racemes.
         5. Lower glume furrowed dorsally; spikelets paired.... *Microstegium*
         5. Not so;
            Spikelets in triads, two sessile; lower glume bicarinate.. *Polytrias*
   2. Spikelets dissimilar, sessile hermaphrodite, pedicellate sterile or male.
      6. Joints of the rachis and pedicel of the pedicellate spikelet swollen, triquete, rounded, or flattened.
         7. Sessile spikelet with both a male and a perfect floret; upper lemma usually awned..... *Ischaemum*
         7. Sessile spikelet usually with only a perfect floret; upper lemma awnless..... *Eremochloa*
      6. Joints of the rachis and pedicel narrow, not thickened at apex (flaring), occasionally with a translucent longitudinal groove.
         8. Spikelets in racemes which are not interrupted by spathes or solitary at branch-ends; racemes collected into whorled panicles; joints and pedicels not grooved.
            9. Spikelets dorsally compressed, in panicles of many pairs or triads; tall plants usually over 1 m..... *Sorghum*
            9. Spikelets not dorsally, but laterally compressed, in traids; small plants, more or less prostrate with erect inflorescences to 30–50 cm..... *Chrysopogon*
         8. Panicles made up of racemes which are interrupted by spathes, or if not so, then the racemes digitate or paired or solitary and terminal; sometimes joints and pedicels with a translucent median groove.
            10. Margin of lower glume of the sessile spikelet bicarinate, infolded; awn smooth.
               11. Aromatic grasses, the racemes in spathaceous pairs and collected into panicles; one pair of spikelets in each raceme completely male or sterile.. *Cymbopogon*

11. Non-aromatic grasses, racemes paired or solitary, or digitate; spikelets heterogamous.
12. Racemes solitary.....*Schizachyrium*
12. Racemes almost always paired or digitate.....
.....*Andropogon*
10. Margins of lower glume of sessile spikelet inturned and rounded at the sides, slightly or not carinate; awn rough, pubescent.
13. Upper lemma bifid, awned from the notch.....
..... *Hyparrhenia*
13. Upper lemma not bifid, narrowed directly into the awn..... *Heteropogon*
1. Not as above.....*Dichanthium*

[ANDROPOGON L.: See *Schizachyrium, Dichanthium, Hyparrhenia*, etc.].

CHRYSOPOGON Trinius

Usually perennials; spikelets in triads, dissimilar, one sessile, two pedicellate, the three falling as a unit; spikelets 2-flowered, lower floret reduced to a lemma, upper perfect (in sessile spikelets), male or sterile in pedicellate spikelets; sessile spikelets usually awned; glumes subequal; pedicellate spikelets awnless or short-awned.—Tropics; about 20 species.

One species in Guam.

Chrysopogon aciculatus (Retz.) Trin. Fund. Agrost. 188. 1820. INIFUK. PALAII.
Raphis aciculata (Retz.) Desv. (As acicularis) Opusc. 69. 1831.
Andropogon aciculatus Retz. Obs. Bot. 5: 22. 1789; Safford 1905: 183
Merrill 1914: 53.

Perennial to 60 cm high, with short rhizomes and long leafy usually prostrate stolons; leaves mostly basal; ligule nearly obsolete; blades linear-lanceolate, subobtuse, up to 15 cm long, often very short (2–3 cm), 3–6 mm wide, flat or folded, glabrous but the margins scabrid; panicle rather slender, erect, to 8 cm long, of fine simple branches, ascending; sessile spikelets slender, acuminate, 4 mm long; awn of upper lemma 4–8 mm long; pedicellate spikelets male, 3–6 mm long.—Pl. 3f.

Tropical Malasia and the Pacific; S. India; S. China. A very widespread species with a very effective dispersal mechanism; the sharp spikelets may be carried in the fur of mammals, in feathers, in mud, and in stockings and trousers. An annoying grass for lawns and an aggressive weed; withstands trampling, poor soils, and mowing. Valueless for stock.

Very common in Guam, often in or as lawns; if not frequently mowed, the tenacity of the sharp spikelets will prove vexing to host and visitors. It should be eradicated if possible from pastures, as the sharp fruits can penetrate flesh and work thier way in, causing festering sores; also very hard on dogs. Harmon, lawns (4051).

CYMBOPOGON Sprengel

Aromatic perennials; inflorescences with spathes; spikelets paired, dissimilar, one sessile, one pedicellate; sessile spikelets with upper floret perfect; pedicellate spikelets with upper floret usually male; fertile sessile spikelet usually awned; glumes subequal; upper lemma usually notched at tip, the glabrous geniculate awn when present from this lemma; pedicellate spikelets always awnless.—Chiefly India. Two species reported from Guam, cultivated only, doubtfully or not naturalized.

Sessile spikelets narrolwy oblong or lance-oblong; lower glume flat dorsally.. ..... *C. nardus*

Sessile spikelets linear to narrowly lanceolate, acute; lower glume concave dorsally..... *C. citratus*

CYMBOPOGON NARDUS (L.) Rendle, Cat. Welwitsch. Afric. Pl. 2: 155.

Andropogon nardus L. Sp. Pl. 2: 1046. 1753. LEMON GRASS

Densely tufted perennial to 2 m tall; leaves glabrous; ligule truncate, up to 2 mm long; blades rather long (to nearly 1 m), mostly 5–20 mm wide. Leaves aromatic, yielding aromatic oils.

Safford claims this to be "planted near houses." Not recently collected. Possibly only one of these 2 species is, or was, present. The plants mentioned by Safford could be either species; he lists it under Andropogon. Merrill claims that it must have been the following species.

CYMBOPOGON CITRATUS (DC. ex Nees) Stapf. Kew Bull. 357. 1906.

Andropogon citratus DC. ex Nees, Allg. Gartenz. 3: 267. 1835. Merrill 1914: 53.

Similar in nearly all respects to the preceding species, differing in the key character of the dorsally concave lower glume of the sessile spikelet.

See remarks above. Not recently collected. According to Walker and Rodin 1949: 451. There is no substantiating specimen known to them.

DICHANTHIUM Willemet in Usteri

Annuals or perennials; similar to Andropogon; but upper lemma of the sessile spikelet not lobed or notched; panicles short; spikelets alike, the lowest 1–3 pairs all of the same sex; upper lemma of the sessile spikelet reduced so as to appear merely as the translucent base of awn.

One species reported from Guam.

DICHANTHIUM CARICOSUM (L.) A. Camus, Bull. Mus. Hist. Nat. Paris 27: 549. 1921.

Andropogon caricosus L. Sp. Pl. ed. 2, 1480. 1763.

Perennial with erect culms to 90 cm tall; blades 5–15(–20) cm long, 3–6 mm wide; racemes to 10 cm long, glabrous, usually 1, 2, or 3 together, on the jointed rachis; spikelets paired, 2-flowered, only the upper floret of the sessile spikelet perfect, about 5 mm long; lower glume of sessile spikelet lacking midnerve; awn (upper lemma) up to 2–2.5 cm long.

India and Ceylon, Burma, Malaya, and S. China. Introduced in Guam, locally

persistent, in fields, but not common. South of Agat (Moore 250). Considered an excellent pasture grass in Fiji, for dry zones.

DIMERIA R. Brown

Annuals or perennials with usually slender culms and digitate or approximate, sometimes solitary, racemes. Spikelets strongly laterally compressed, short-pediceled, solitary in 2 rows on one side of a trigonous or flattened continuous rachis; glumes keeled, often winged, only slightly indurate, the margins usually hyaline; glume I usually narrower and slightly shorter than glume II; lemmas hyaline, the sterile one shorter, awnless, the fertile one rarely awnless, usually awned from the bifid apex, the awn geniculate, the basal segment brown and twisted; two stamens.—About 20 species, from Madagascar through Indomalaysia to Australia.

Key to local species

1. Branches of the inflorescence 2, short; blades 1–2 mm wide; glabrous or sparsely pubescent plants..... *Dimeria ornithopoda* var. *tenera*
1. Branches of the inflorescence several (3–6), long; blades 5 mm or more wide; gray-green densely pubescent plants..... *Dimeria chloridiformis*

Dimeria ornithopoda Trinius, Fund. Agrost. 167, t. 14. 1820. var. **tenera** (Trin.) Hackel; Merrill 1914: 51.

Slender, tufted annual; leaves short 1–2.5 cm long, lance-linear, about 1–2 mm wide; flowering stem with 2 spreading spikes; rachis flattend; spikelets about 2 mm long; upper glume awnless; lower lemma with geniculate, basally twisted awn about 7–9 mm long; upper glume deeply forked.

Indomalaysia, the species extending to Australia, dry hills, sandy places, ditches, etc. G.E.S. 247.

Not really uncommon in Guam, but not of general occurrence and easily overlooked. Bryan (18 Sept. 1957) says it occurs in ditches and fallow rice fields. It is easily distinguished from the next species.

Dimeria chloridiformis (Gaud.) K. Schum. & Lauterbach, Fl. Deutsch Schiitzg. Sudsee 165. 1901.—Safford 1905: 257. Merrill 1914: 50.

Andropogon chloridiformis Gaudichaud, Bot. Voy. Freyc. 412. "1826".

Haplachne pilosissima Presl. Rel. Haenk. 1: 235, t. 38. 1828.

Dimeria pilosissima (Presl.) Trin., Mem. Ac. Petersb. 6, 2: 336. 1833.

Densely grayish-green villous annual (or perennial?); leaves slender, up to 10–15 cm long, about 5 mm wide; flowering stem with 3–6 subdigitate spikes; spikelets 1-flowered, almost sessile, inserted in the alternating notches of unilateral rachis; rachis not articulated; a tuft of short hairs at base of each spikelet; glumes awnless; fertile lemma awned from the bifid apex; awn geniculate, twisted below the knee; caryposis narrow.

Endemic; a grass of savannas, often abundant. Manengon (3871). First collected in Guam by Haenke. G.E.S. 139.

SCHIZACHYRIUM Nees

Annuals or perennials; racemes borne in axils of leaflike spathes. Spikelets paired, dissimilar, falling entire, one sessile, one pedicellate; internodes of axis and pedicels flaring distally, hollowed and somewhat toothed at tip; florets 2 per spikelet, lower represented by sterile or even lacking, (in the pedicellate spikelet); sometimes both lacking in the latter. Sessile spikelets awned, the awn brone at the notched summit of the upper glume. Pedicellate spikelet similar or broader or smaller.—Tropics and warm countries; often merged with Andropogon L.

Apparently two species in Guam.

1. Racemes densely hirsute ..... *S. fragile*
1. Racemes glabrous or nearly so..... *S. brevifolium*

Schizachyrium fragile (R. Br.) A. Camus, Ann. Linn. Soc. Lyon 70: 87. 1923. Blake, Proc. Roy. Soc. Queensland 80(6): 80. 1969.

Andropogon fragilis R. Br. Prodr. 202. 1810.—Merrill & Perry J. Arn. Arb. 27: 324. 1946.

Schizachyrium obliquiberbe (Hack.) A. Camus ibid. 89.

Andropogon obliquiberbis Hackel, Flora 68: 117. 1855.

Eulalia simplex Hosokawa, Trans. Nat. Hist. Soc. Formosa 28: 150. 1938.

Annual, small; blades not rounded at base, apex acute to obtuse; racemes hirsute hidden in spathelike leaves; joints equal to pedicels in length; both ciliate; joints flared at apex, with an oblique band of hairs across the back; pedicel uidest below the top; lower glume bicarinate; grain with subtrigonous embryo (sometimes thicker than endosperm).

Dry, usu. almost bare soil. Mt. Alutom, *Fosberg* 35200; Dan Dan, 35558. Mt. Almagosa area, *Stone*.

Schizachyrium brevifolium (Sw.) Nees ex Büse, in Miquel, Pl. Jungh. 359. 1854.

Andropogon brevifolius Sw. Prodr. Veg. Ind. Occ. 26. 1788.

Annual, small; reddish at maturity; leaves linear, with rounded or obtuse tip; each raceme subtended by a spathe; ligule membranous, 0.5 mm long; blades short, 1–4 cm long, 1–5 mm wide, glabrous; racemes solitary, slender, 1–2 cm long nearly glabrous; sessile spikelet 2.5–3 mm long, callus bearded; awn slender, 8 mm long, geniculate, twisted below the knee; pedicellate spikelet reduced to a rudiment with a slender awn.

Pantropical (s.l.). This species may not be present in Guam, but could have been confused with the former sp. (No spms. seen).

EREMOCHLOA Büse in Miquel

Slender perennials with solitary terminal racemes. Spikelets appearing solitary at each node, but actually paired, only the sessile developing, the pediceled reduced to a glume-like or stipiform pedicel; sessile spikelets dorsally compressed, awnless, imbricate along one side of a tardily disarticulating rachis; glume chartaceous, the first broad, flat or only slightly rounded on the back, the margins narrolwy inflexed, 2-keeled, the keels spinulose or rigidly pectinate, at least on the lower part; second

glume 3-nerved, the midnerve sometimes keeled; lemmas hyaline, the lower 3-nerved, triandrous, the palea similar; fertile lemma entire, usually nerveless, the palea similar but narrower.

One species in Guam, possibly by now disappeared.

EREMOCHLOA OPHIUROIDES (Munro) Hackel in DC. Mon. Phan. 6: 261. 1889.

Bryan, Guam Daily News, 2 Oct. 1957. CENTIPEDE GRASS.

Low perennial, creeping, stems rooting at lower nodes; racemes smooth, spikelike, terminal and axillary, slenderly long-stalked, 1–3 cm long.

Experimentally introduced by the Guam Experiment Station in 1927, for a lawn grass; but it has probably disappeared. Native of S.E. Asia.

HETEROPOGON Persoon

Annuals or perennials with rather robust culms and flat blades. Racemes solitary, terminal. Lower part of rachis with paired male spikelets; remainder with perfect sessile spikelets; spikelets paired; pedicellate spikelets with all lowest spikelets awnless; upper sessile perfect spikelets awned from the fertile lemma; awn much elongated, bent and twisted; palea lacking; a barbed callus at base of fertile spikelets.—A small genus of about 7 species; warn tropical areas.

One species in Guam.

Heteropogon contortus (L.) Beauvois, ex Roem. & Schult. Syst. Veg. 2: 836. 1817. TANGLE-HEAD. [PILI; Hawaiian]

Andropogon contortus L. Sp. Pl. 1045. 1753.

Merrill 1914: 53.

Tufted perennial to 100 cm tall, glabrous, except the inflorescences; sheaths 6–10 cm long, compressed, sometimes sparsely hairy at the collar; ligule of hairs or a ciliate rim 1 mm long; blades rolled or flat, 10–30 cm long, 2.5–7.5 mm wide, scabrous, somewhat bluish-green; raceme to 7 cm long, one-sided; basal part with 3–10 pairs of awnless persistent male (or sterile) spikelets; upper part with about 12 pairs of awned dissimilar paired spikelets; sessile spikelet about 6–7 mm long, the awn very twisted, bent, brownish, elongate, to 10 cm long or more. The base or the whole awn puberulent.

Cosmopolitan in the tropics; described from India. Native and common in Guam savannahs. An extremely variable species; in the Himalayas extending to 6000 ft. elevation. Palatable for stock only before fruiting. Animals can be injured by the barbed callus of the spikelets.

Volcanic soils; savanna areas; Sagua R. hills (4201). Back of Piti, MacGregor 413.

In ancient Hawaii used for thatch.

ISCHAEMUM Linnaeus

Annuals or perennials with branching culms, flat blades; inflorescences digitate or flabellate, rachis disarticulating, racemes 2 or several, digitate or aggregate on a short axis. Sessile spikelets perfect, awned; stalked spikelets perfect but not always

fertile.—50 or 60 species, in tropical and warm-temperate regions.

Key to local species*

1. Outer glumes of spikelets transversely rugose.....*Ischaemum rugosum*
1. Outer glumes of spikelets smooth,
   2. Inflorescence densely villous; awns of fertile lemmas more than 2 cm long.....*Ischaemum longisetum*
   2. Inflorescence not villous; awns less than 1 cm long.....*Ischaemum digitatum* var. *polystachum*

Note: *I. chordatum* (Trin.) Hackel, has been reported from Guam by Merrill 1914: 52, with uncertainty. Though common in the Caroline Is. it has never been found in Guam.

Ischaemum rugosum Salisbury, Icones 1, t. 1, 1791. MURAINA GRASS.

Merrill 1914: 51.

Annual; culms 60–120 cm high, branched, purplish, with bearded nodes; sheaths fairly loose, pilose at apical margins; blades up to 30 cm long and up to 12 mm. wide; racemes paired, 4–10 cm long, at first pressed together, later separating; lower glume of sessile spikelet strongly transversely ribbed, hard, with a green ovate tip, yellowish; awn up to 2.5 cm long, slender, spirally twisted in the lower half.

Possibly native, although equally probably an introduced species. A noxious weed in Fiji.

Widespread in the tropics of China, India, and Malaysia. It is easily recognized by the transverse ribs of the glumes, visible to the naked eye. G.E.S. 213.

Ischaemum longisetum Merrill, Philipp. J. Sci. Bot. 9: 52. 1914.

Tufted perennial, to 50 cm tall, culms terete, simple; sheaths glabrous or slightly hairy at the apex; ligule 1 mm long; blades glabrous, 8–12 cm long, 7–12 mm wide, sessile; uppermost sheath usually bladeless; spikes 2, 6–10 cm long, densely villous; rachis and pedicels trigonal, with hairy angles, hairs 2–4 mm long; sessile spikelet and sterile lemma to 9 mm long; fertile lemma hyaline, with awn 3–3.5 cm long; awn stout, twisted; pedicellate spikelets similar but slightly smaller; awn of fertile lemma 1.7–2 cm long.

Guam; an endemic species, the type from Cabras Island, MacGregor 502.

Easily distinguished from *I. rugosum* by the smooth glumes, and from the following species by the long awns and bristly-villous inflorescences. Related to *I. murinum* Forst. of the S.E. Pacific.

A native and endemic species, found on rocky limestone coasts usually near the sea, often forming clumps with Pemphis. Tagachan Bay (3985); Talofofo Pt. (4302) Yona beach (4425).

Ischaemum digitatum Brongn., Bot. Duperry's Voy. 70, t. 29. 1829.

var. **polystachyum** (Presl) Hackel in DC. Monogr. Phan. 6: 233. 1889.

Merrill 1914: 51. (*I. polystachyum* Presl, Rel. Haenk. 1: 328. 1830).

* Key by Thomas Soderstrom, U. S. National Herbarium.

Fig. 33. Ischaemum longisetum.

Native; distribution from the Philippines to the Moluccas and Bismarck Archipelago (New Hanover), known from Palau and Ponape; the typical variety from Yap. Type of the present variety from Guam.

MISCANTHUS Andersson

Large perennial grasses; blades linear; panicle racemose; rachis slender, with numerous articulations; spikelets usually awned, secondary spikelet (and its pedicel) usually lacking, or the pedicel, or rarely also a spikelet, developed only at the lower joints of the rachis; spikelet lanceolate, deciduous; callus hairy; glumes papery; sterile lemma hyaline, palea lacking; fertile lemma hyaline, 2-toothed; palea short, nerveless; stamens 3 or 2.—Old World; about 20 species.

One species in Guam.

Miscanthus floridulus (Labill.) Warburg ex. Schum. & Lauterb. Fl. D. Sch. Suds. 166. 1901. Merrill 1914: 51. SWORD GRASS. NETI.

Xiphagrostis floridula (Labill.) Coville ex Safford, p. 399.

Tall perennial, evergreen; blades finely toothed; rhizomes short and thick; inflorescence paniculate, axis much longer than racemes; culms to nearly 3 m long; blades to 3 cm wide, pale glaucous green, above pubescent near base; ligule truncate, 2 mm long; panicle to 50 cm long, white at maturity, puberulent-scabrous, with axillary tufts of hairs; racemes many, branched at base, to 20 cm long; spikelets in pairs, one sessile, one pedicellate; spikelets 3–3.5 mm long, but the basal hairs longer, to 6 mm; fertile lemma with awn 8–10 mm long.

The usual large grass of burned-over volcanic hills throughout southern Guam; rare and local on limestone soils.—Formerly used for thatch.—Aggressive, forming dense communities. The scabrid-toothed leaf margins can make vicious cuts on the arms or legs of the traveller.—Burning does not kill the plants, as it quickly regenerates from the underground parts.

A frequent savanna plant, often in association with *Dimeria chloridiformis*. MacGregor 391. G.E.S. 356.

MICROSTEGIUM Nees

Annuals or perennials with narrow lanceolate leaves; racemes bearing spikelets along their whole length; spikelets paired, similar, one sessile, one pedicellate; lower glume grooved on the back. (*Pollinia* sensu Trinius). —30 or more species of warmer parts of the globe.

One species in Guam.

Microstegium glabratum (Brongniart) A. Camus, Ann, Soc. Linn. Lyon. n.s. 68:201. 1922.

Hosokawa, J. Soc. Trop. Agric. Taiwan 6: 663. 1934.

Eulalia glabrata Brongn. Bot. Duperry's Voy. 93, t. 19, 1829.

Pollinia glabrata (Brongn.) Trin., Bull. Acad. Petersb. 1: 70. 1836; Merrill 1914: 51.

Annual; culms slender, jointed, to 120 cm high; blades linear-lanceolate,

rounded at base, tapered acute at tip, 4–10 cm long, 5–20 mm wide; panicle 4–8 cm long, the rachis fragile, bearing 4–9 glabrous spreading spikelike racemes; spikelets falling entire at maturity, 2.5 mm long, 2-flowered; sessile spikelet with upper floret perfect, others staminate or empty; lower glume grooved dorsally; awn slender, about 1–1.3 cm long.

Malaya, New Caledonia and the Society Islands. Thompson 24. Not common in Guam; in the hills. Also known in Kusaie.

POLYTRIAS Hackel

Perennials; racemes spikelike; spikelets in triads, two pedicellate, one sessile; lower glume 2-keeled; similar in general to Microstegium.—Monotypic.

Polytrias amaura (Büse) O. Kuntze, Rev. Gen. Pl. 788. 1891.

Polytrias praemorsa (Nees) Hackel, Pfanzenr. 2(2): 24. 1887.

Walker & Rodin 1949:

Eulalia praemorsa (Nees) Stapf. ex. Ridley, Fl. Mal Pen. 5: 197. 1925.

Pollinia praemorsa Nees, J. Bot. Kew Misc. 2: 98. 1850.

Andropogon amaurus Büse ex. Miquel, Pl. Jungh. 360. 1854.

Perennial, with erect, branching culms to 30 cm high; blades pubescent, rather short, to 5 cm long, 2–3 mm wide, narrowed and rounded at base, acute at apex; racemes 1.5–2.5 cm long; spikelets in triads, pubescent, c. 3 mm long, light brown; awn reddish-brown, bent at the middle, about 6 mm long.

Tropical Asia. Often used as a lawn grass in the tropics. Uncommon in Guam. Just west of Agaña (Moore 287).

SACCHARUM Linnaeus

Robust perennials with large, erect, plumose panicles. Spikelets all alike, paired, with one of each pair sessile, the other pedicellate; at base with many long, fine hairs; rachis disarticulating below the spikelets; glumes 1–3-nerved, rather stiff; sterile lemma hyaline; fertile lemma shorter, hyaline, awnless (sometimes lacking).—Asia about 10 species; the sugar cane, and several other species, now widespread. Two species in Guam. A plant called "S. chinense Nees" is supposed to have been introduced to Guam in 1920; it is probably Andropogon chinense (Nees) Merrill, but it may be a form of one of the following 2 species. It has not been collected.

Key

Peduncule hairy below the panicle; rachis very fragile.....*S. spontaneum*

Peduncle glabrous, rachis less fragile.....*S. officinarum*

Saccharum spontaneum L. Mant. Alt. 183. 1771. WILDCANE.

Tall perennials, in habit much like the cultivated cane but somewhat more slender; differing chiefly in the hairy peduncles, and the very fragile rachises.—Fig. 34.

Naturalized in a few localities; possibly arrive in Guam via Saipan, where it was grown by the Japanese sugar companies for experiment. Of wide paleotropical distribution. Apra (4717); Tumon (4287).

Fig. 34. Saccharum spontaneum.

SACCHARUM OFFICINARUM L. Sp. Pl. 54. 1753. Safford 1905: 366. Merrill 1914: 51. SUGARCANE. TUPO, TUPU.

Perennial with erect culms to 2 (or even 4) m tall, glabrous; nodes close together at base of culms, more distant distally; sheaths overlapping, rounded, glabrous or pubescent, densely villous in the throat; ligule firm, truncate-ciliolulate, c. 5 mm long; blades long and rather broad, the midrib broad and pale, margins finely serrulate, base dorsally densely villous; panicle 30–50 cm long (or more), dense, racemosely branched, silvery white or slightly pinkish, the branches long and often drooping; spikelets 4–5 mm long; slender, 2-flowered.

The cultivated sugarcane, aboriginally introduced to Guam. Intensively cultivated in the past on Saipan, Tinian, and Rota, but in Guam mostly around houses.

SORGHUM Moench

Coarse annuals or perennials; blades narrow or broad; panicles often large, of racemes; spikelets paired, one sessile and perfect, the other pedicellate and staminate; rachis at last disarticulating; terminal sessile spikelet of each raceme with 2 pedicellate spikelets; glumes of perfect (fertile) spikelet hard; fertile lemma usually awned; pedicellate spikelets not with hard glumes; first glume distally bicarinate.—Africa to India, more than 100 species.

Two species in Guam.

Perennials with stout rhizome; fruit ovoid, rather slender..... *S. halepense*

Annuals, roots all fibrous; fruit plump globose, yellow-orange.....*S. bicolor*

Sorghum halepense (L.) Persoon, Syn. Pl. 1: 101. 1805. JOHNSON GRASS.

Perennial with strong rhizomes; culms erect, to 1.5 m tall; nodes with short pubescence; sheaths glabrous; ligule ciliate-membranous, 2 mm long; blades elongate, usually 1–1.5 cm wide, the midrib prominent; panicles 15–25 cm long, branches ascending; spikelets 5 mm long, acute; first glume hard; fertile lemma awned or awnless, awn if present 1 cm long or less; (our specimens usually awnless).—Old plants are dangerous to stock, since they contain hydrocyanic acid. Chromosomes: 2n = 40.

S.E. Europe, now widespread as a weed. Our plants all seem to be the awnless form (forma *mutica* C.E. Hubbard). A frequent weed. Barrigada (4054). Supposed to have been introduced to Saipan from Samoa (where it was taken).

SORGHUM BICOLOR (L.) Moench, Meth. Pl. 207. 1794. BROOMCORN.

Annual with broad blades up to 30–60 cm long, 4–8 cm wide; the midrib prominent and pale; panicle stiffly erect; sessile spikelets broadly obovate 4–5.5 mm long, 3–4.5 mm wide, subglobose at maturity; upper lemma awned; glumes coriaceous; caryopsis plump, about 4 mm long, bearly as broad, yellow to orange or reddish, exposed distally.

India. Occasionally cultivated, sparingly naturalized in Guam. Barrigada (4740, 4753).

Note. Sorghum vulgare Pers. and var. *sudanense* (Piper) Hitchcock, have been introduced (Bryan, 24 September 1957), but they seem not to have persisted. These are annuals similar to *S. bicolor* but without the bright-colored fruits.

14. Tribe MAYDEAE

Key to the Genera (after Bor)

1. Female spikelets completely enclosed in a spherical, bony-textured beadlike modified sheath.....*Coix*
1. Not as above,
   2. Female spikelets not in rows on a thickened axis; fruit partly enclosed in a case formed of both the lower glume and chiefly by the thickened rachis-internode; male and female spikelets mixed in the same spike.... ..... *Tripsacum*
   2. Female spikelets in rows on a thickened axis (cob); case (as defined above) not present; male and female spikes distinct, very different in form, the males terminal.....*Zea*

COIX L.

Broad-leaved annuals with stoutly pedunculate inflorescences, solitary or fasciculate; plants monoecious; staminate spikelets 2-flowered, paired or in triads, 1–2 sessile, 1 pedicellate (or occasionally absent); first glume several-nerved, bicarinate; pistillate spikelets in triads, *all together enclosed* in a sphaerical bony-textured gray or white bead-like structure (a modified sheath), the peduncle of the staminate

raceme emerging from the apical opening of this case.—A few Asiatic species, only the following widely spread.

One species in Guam.

COIX LACHRYMA-JOBI L. Sp. Pl. 972. 1753. Safford 1905: 245. Merrill 1914: 50. BILEN; JOB'S-TEARS.

Culms branching, up to 1 m tall; blades to 50×4 cm, often about 20–30× 2–3 cm, the base rounded to cordate-clasping; spikelets about 1 cm long.

Tropical Asia; widespread as a semi-cultivated plant. Several forms are known, some hard- "shelled" and used for beads; others of softer texture used occasionally for food or (by some people of India) for brewing. The curious bead-like case is often of a glossy white or gray color; it is sometimes called an involucre.

G.E.S. 188. Talofofo Valley (5018).

TRIPSACUM L.

Coarse perennials; blades broad; monoecious; but male and female spikelets occur in each inflorescence; male spikelets 2-flowered, paired, one pedicellate; female spikelets solitary on opposite sides of the lower part of the same rachis, sunken, the rachis thick, disarticulating; sterile floret of a lemma; first glume coriaceous.—Central America; a few species.

One species in Guam.

TRIPSACUM LATIFOLIUM Hitchc. Bot. Gaz. 41: 294. 1906.

Coarse perennial; culms as much as 6 meters high, glabrous, bearing slender branches from the upper nodes; blades 70 cm to more than 1 meter long, 2.5–8 cm wide, acuminate, especially the lower ones narrowed to a petiole-like base, papillose-pilose or papillose-hispid above, nearly glabrous beneath; spikes 2 or 3 in the terminal inflorescences, solitary on the branches, slender, drooping, inflorescences, solitary on the branches, slender, drooping, both staminate spikelets of each pair sessile or subsessile, 4–6 mm long, obtuse, rather densely pubescent, the keels hispid toward the summit; joints of the pistillate part of the spike 5–7 mm long, the spikelet broadly ovate.

Central America. Planted experimentally in Guam, persisting in a few localities (as between Harmon and Dededo). Considered a good fodder grass.

TRIPSACUM LAXUM Nash was introduced by the Expt. Station in 1920 according to Bryan (9 Oct. 1957). I have not seen any collections. It has even wider leaf-blades 7.5–10 cm broad and larger spikelets 6–9 mm long.

ZEA Linnaeus

Tall annual; blades broad, distichous; inflorescences monoecious, male or female; the former terminal, latter lateral; spikelets unisexual; male spikelets 2-flowered, one sessile, one pedicallate; female spikelets in rows on a thick, cylindric axis, paired, usually one sterile; style much elongated ("silk"), stigmatic along its length.—A monotypic genus, developed (?) through aboriginal selection; strictly American; now common in cultivation.

One species in Guam.

ZEA MAYS L., Sp. Pl. 971. 1753. Safford 1905: 402. Merrill 1914: 50.
MAIS; MAIZE; INDIAN CORN; CORN.

Culms stout, 1–2 m tall; blades as much as 10 cm broad, recurved; staminate racemes up to 15 cm long, lateral ones drooping; pistillate inflorescence (the "ear") on a much enlarge axis (the "cob") with many (to 30) rows of spikelets ("kernels"); edible.—Many forms and varieties in cultivation; unknown as a wild plant.

South, Central, and warm N. America.

The forms grown in Guam are usually either a hard, white-kerneled, low-sugar type; or one of the 'tropical' yellow-kerneled "sweet corn" types, such as U.S.D.A. 34. G.E.S. 103.

Popular for corn-meal (in "tortillas"—tetizas) and for corn soups. These are prepared in the Mexican manner (or were) with a stone *metate* and a stone roller, the *mano*; these are occasionally seen in old houses, while modern wives use other techniques.

CLASS *ANGIOSPERMAE*

CASUARINACEAE

Trees; branchlets green, short-lived, cylindrical, jointed, striate, photosynthetic; leaves whorled, reduced to lanceolate or subulate scales at each node; plants monoecious; flowers unisexual, in catkins; the male on the ends of branchlets, either the ordinary or special ones; male flower of a single stamen with a bract, these in whorls, the bracts connate; female catkins condensed, capitate, lateral, each flower in the axil of a bract, protected by 2 lateral bracteoles, with a bicarpellate ovary, one-celled, with 2 long stigmas, 2 ovules, one of which is abortive; the female catkin becoming large, the bracts becoming woody in fruit, forming a cone-like structure; fruit a 1-seeded, 1-winged samara. *Casuarina* the only genus.

CASUARINA Linnaeus

With the characters of the family. Chiefly Australian; about 65 spp.

Casuarina equisetifolia L., Amoen. Acad. 4: 143. 1759. Merrill 1914: 71.
GAGU; GAGO; IRONWOOD, AUSTRALIAN PINE.

Recognizable from the family description. Native to Guam and in the Old World Tropics; widely cultivated. (Harmon, 4247).

This tree, together with *Pandanus fragrans*, is often able to withstand the frequent (and unfortunately often deliberately lit) fires which devastate large areas of savanna each year; and though stunted and deformed, can grow in the waste lands, dominated by swordgrass (*Miscanthus*) and a few neotropical weeds, which have displaced much of the native forest in the hills of southern Guam. Even so, the swordgrass appears finally to overcome even these trees, resulting in highly inflammable, fast eroding, essentially worthless disclimax grass vegetation, unpalatable to

stock, extremely difficult to restore to forest, and grossly wasteful of land.

Although very hardy, both in limestone, sand, and volcanic soils, it is preferable to plant seedlings, as cuttings root poorly and may be blown down. Care should be taken that the trees are planted in areas where little undergrowth is desired, as the fallen "needles" appear to prevent (perhaps from acidity) herbaceous growth.

It is thought that a mycorrhizal fungus develops in the roots of Casuarina and is beneficial or necessary for the growth of the tree.

var. **souderi** Fosberg, Micronesica 2(2): 144. 1966.

Branches very compact, fastigiate, the "needles" only 1–3 cm long, the internodes so short that the whorls of scales are somewhat overlapping; pistillate infructescences reduced, about 8×15 mm, borne at tips of staminate catkins; purely staminate catkins (on the same branch) mostly less than 1 cm long.

Known only from Guam; discovered by Paul B. Souder at the Orote Naval Station (Souder A–1), and named for him by F.R. Fosberg.

PIPERACEAE

Herbs or shrubs, stems tending to be fleshy, often with enlarged nodes; leaves alternate, opposite, or whorled, often palmately nerved, often fleshy, with or without stipules; flowers perfect, borne in spikes, reduced to a 1-celled ovary with 1 basal ovule and 2 or more hypogynous stamens, all borne in the axil of a minute scale-like or peltate bract; fruit a berry or a markedly glutinous achene.—Six genera and more than 1000 species in all tropical countries.

1. Shrubs or vines, more or less woody.....*Piper*
1. Small herbaceous usually fleshy plants.....*Peperomia*

PIPER Linnaeus

Mostly shrubs or small trees or woody climbers; leaves spiralled or distichous; blade sometimes asymmetrical; venation usually palmate; flowers in spikes, staminate, pistillate, or polygamous; bracts peltate; stamens 1–10; ovary sessile, with 2–5 stigmas; fruit a small berry.—About 1000 species; all Tropics.

1. Spikes axillary, solitary; shrubs.....*Piper guahamense*
    2. Lower surface of blade, especially nerves and also usually the petioles, peduncles and young stems, hirtellous.....f. *guahamense*
    2. All parts glabrous.....f. *glabrum*
1. Spikes leaf-opposed, solitary; shrubs or vines,
    3. Fruit globose, free; leaf blades commonly narrowing downward.....*Piper nigrum*
    3. Fruit coalescing and embedded in rachis tissue; leaf blades ovate, commonly cordate.....*Piper betle*
        4. All parts glabrous
            5. Blades deeply cordate.....f. *marianum*
            5. Blades merely subcordate.....f. *betle*
        4. Lower blade surface and petioles puberulent.....f. *densum*

Piper guahamense DC. Prodr. 16, 1: 336. 1869. Safford 1905: 354. Merrill 1914: 71. Yuncker, Bish. Mus. Occ. Pap. 22: 87. Fosberg, Phytologia 13 (4): 235. 1966. PUPULU-N-ANITI; WILD PIPER.

Shrub to 2.5 m; stems with enlarged nodes; leaves broadly cordate, long-pitiolate; spikes axillary, solitary; berry red, juicy.

Common in undergrowth in native forest on limestone. Tumon (4994); Harmon (3782); Mt. Almagosa (4105).

Forma *guahamense* has the leaves, and usually also the petioles, peduncles, and young stems, lightly covered with short hairs.

Forma *glabrum* (Yuncker) Fosb. Phytologia 13(4): 236. 1966. [var. *glabrum* Yuncker, BMOP 22: 87. 1959) is hairless; this is apparently the commoner form of the species in the islands north of Guam.

PIPER BETLE L. Sp. Pl. 28. 1753. Safford 1905: 355. Merrill 1914: 72. PUPULU. BETEL-PEPPER.

A scandent vine with woody stems; leaves ovate, base slightly cordate to rounded, 5–15 cm long, 2.5–9 cm broad; spikes up to 12 cm long; male flowers with 2 stamens; berry rounded, half sunken in rachis.

Frequent in cultivation. The leaves are commonly used to chew with betle nut (fruit of the palm *Areca catechu*, q.v.) and are often sold in village markets. Barrigada, from a market (5126).

Forma *betle* is glabrous throughout, and leaves merely subcordate.

Forma *densum* (Bl.) Fosberg, Phytologia 13 (4): 235. 1966, has puberulent lower leaf surfaces; (the hairs are very short); and is deeply cordate.

Forma *marianum* (Opiz) Fosberg, l.c. [*Piper marianum* Opiz in Presl., Rel. Haenk., 1: 159. 1828] [*P. potamogetonifolium* Opiz, l.c.p. 156. Merrill 1914: 72] This is glabrous and deeply cordate.

PIPER NIGRUM L. Sp. Pl. 28. 1753. BLACK PEPPER.

A woody climber, often in cultivation and trained on stumps or lattices; leaves ovate to oblong, base rounded to cunneate, tip acute to acuminate; lower surface somewhat paler, glaucous; spikes pendent, sometimes very long (to 20 cm); stamens 2 per flower; fls. perfect; ovary 2–5-stigmatose; fruit free, not sunken, ripening through red to black, edible, pungent, pepper-taste.

Occasional in cultivation. Black pepper is made from the whole dried fruit; white pepper is prepared from the seeds, stripped of the pericarp. The plant thrives better in wetter areas, such as Ponape.

PEPEROMIA Ruiz & Pavon

Fleshy herbs, the stems often succulent; leaves opposite or in whorls (or spiralled); fls. in spikes, sessile, usually sunk in rachis, minute, bisexual; stamens 2; ovary subglobose.—Over 600 species in tropics everywhere but perhaps chiefly of tropical America.

Key to species in Guam [and Saipan]

1. Leaves ovate-cordate, alternate, very thin; stems branched, commonly 15–30 cm tall; spikes slender, longer than the leaves; fruit longitudinally ribbed; plants glabrous, often pale.....*Peperomia pellucida*
1. Leaves not ovate-cordate; fruit more or less verrucose but not evidently ribbed; plants sometimes with hairs.....*Peperomia mariannensis*
   2. Stems hairy.....*P. mariannensis* f. *saipana*
   2. Stems glabrous.....var. *mariannensis*

Peperomia pellucida (L.) Humboldt, Bonpland, & Kunth, Nov. Gen. Sp. 64. 1815. (*Piper pellucidum* L. Sp. Pl. 30. 1753). POTPOPOT; PODPOD-LAHE.

Pale, small, fleshy herb; lvs. cordate, thin rarely over 2 cm long; spikes longer than lvs.; frt. with longitudinal ribs.

A native of tropical America, now widely distributed in Micronesia, a harmless weed.

Peperomia mariannensis C. DC. in DC. Prodr. 16 (1): 442. 1869. POTPUPOT-PALAOAN.

P. guamana C. DC., Philipp. J. Sci. Bot. 9: 72. 1914.

P. hoeferi C. DC., Engl. Bot. Jahrb. 55: 505. 1921.

P. mariannensis Hosokawa, Nat. Hist. Soc. Formosa Trans. 25: 120. 1935.

P. tiniannensis Hosokawa, Nat. Hist. Soc. Formosa Trans. 25: 121. 1935.

Marianas Islands and Palau.

Although *P. guamana* was accepted by Yuncker in his recent revision of the Micronesian Piperaceae (Occas. Pap. Bishop Museum 22(8). 1959), more recent

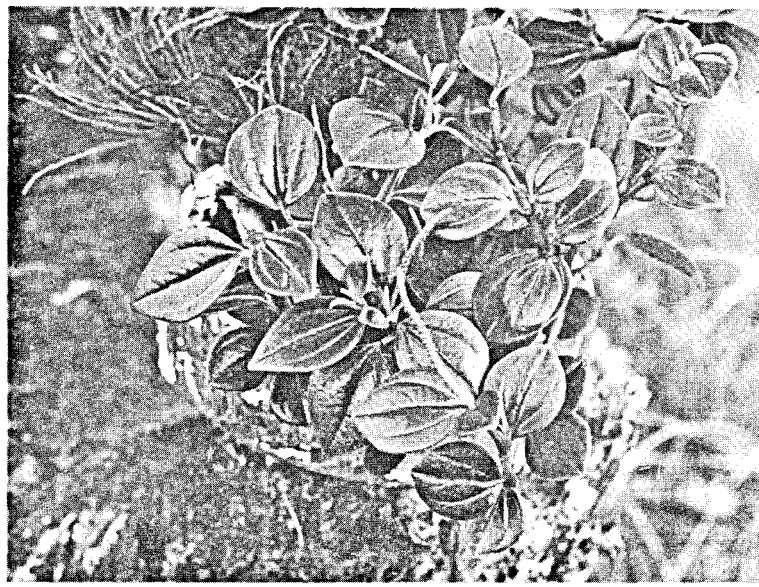

Fig. 35. Peperomia mariannensis.

collections show transitions between the characters supposed to separate the species (the shape of the leaf-base); the opposite leaves and obtuse apex, supposed to be characteristic of *P. mariannensis*, being an unreliable character, the species is merged with *P. guamana*; but the former name is older and has priority.

P. mariannensis f. *mariannensis*. Glabrous throughout, or the leaves slightly ciliolate.—Fig. 35.

Shady spots among dissected limestone boulders, in small crannies; Pago Bay cliffs, College nature reserve (4136, 4406); Ritidian Pt. plateau, (4713).

Peperomia mariannensis forma *saipana* (C. DC.) Fosberg, Phytologia 13(4): 240. 1966.

P. guamana var. *saipana* (C. DC.) Yuncker, Bish. Mus. Occ. Pap. 14(2): 15. 1938. *Peperomia saipana* C. DC., Engl. Bot. Jahrb. 56: 505. 1921. Stems hairy; leaves slightly more abundantly ciliolate than in the typical variety.

MYRICACEAE

Bayberry Family

Trees or shrubs; lvs. alt. simple resinous; stipules lacking; fls. unisexual, monoecious or dioecious, in catkins; perianth lacking; bract (and sometimes 2 bracteoles) below each flower; male fl. with 2 or more stamens; fem. fl. with 1 ovary; stigmas 2; cell 1; ovule single; frt. a drupe, subfleshy.—Two genera and 36 species. One genus reported from Guam.

MYRICA Linnaeus

Trees or shrubs with dentate or lobed, doted with resin-glands; staminate flowes in catkins (aments); stamens 4–8; pistillate aments subglobose or ovoid; ovary subtended by 2–4 small bracts; fruit a waxy drupe.—About 35 species, of wide distribution.

MYRICA RUBRA Siebold & Zuccarini, Abh. Akad. Muench. iv, III: 230. 1846. STRAWBERRY-TREE; YAMAMOMO (Japanese); MUMU (Okinawa).

Small ever-green tree; bark smooth, later cracking; young branchlets puberulent; lvs. clustered at branchlet ends, narrowly obovate, obscurely crenate; fls. in catkins, male and female flowers together; frt. globose, deep red, drupaceous, edible.

Experimentally planted in Guam, but now very rare, perhaps having disappeared. Introduced in 1911. Distributed from Japan and Korea to China, Formosa, Philippines, Ryukyu Is. (Okinawa), through to Malaya and India; an old cultivated plant in China and Japan.

ULMACEAE

Shrubs or trees; leaves alternate simple; stipules present; flowers bisexual or unisexual, regular; tepals 3–7; stamens 3–14; ovary superior, 1–celled, with 1

pendulous ovule; fruit nutlike or a drupe.—Thirteen genera and about 140 species, cosmopolitan.
One genus in Guam.

TREMA Loureiro

Trees or shrubs with alternate dentate leaves 3-nerved at base and often asymmetric; stipules latera; flowers usually monoecious or polygamous in axillary cymes; stamens 4–5; ovary sessile; stigmas 2; fruit a drupe.—About 30 tropical species.
Trema orientalis (L.) Blume, Mus. Bot. Lugd.-Bat. 2: 61. 1856, var.

viridis Lauterbach, Bot. Jahrb. 50: 321. 1913. Walker & Rodin 1949: 459.

Small tree or somewhat shrubby; branchlets finely puberulent; bark reddish, brownish, or grayish, rather smooth; lvs. alt. ovate-lanceolate, crenulate-serrate, up to 10×5 cm, triplinerved; fls. greenish, tiny, in axillary cymes; frt. globose, c. 4 mm diam. apex with remnant of 2 stigmas.

Native but uncommon in Guam. Distribution wide, from s. Japan to China and India, e. to Malaysia and the Pacific Islands.

The general appearance of this plant is very similar to the Panama-cherry or mansanillo, *Muntingia calabura*, which may be distinguished by its larger flowers with 5 white petals, numerous stamens, and fruits with remnants of 5-parted style, 5 cells, numerous small seeds, and pinkish-red skin. Another similar tree is *Grewia crenata*, which also has more obvious petals and numerous stamens.

Tremas may be used for charcoal; the wood is not durable.

Mt. Tenjo (Walker & Rodin cite Moore 299).

MORACEAE

Herbs, shrubs or trees; lvs. alt. simple; stipules present, often large; fls. usu. crowded in spikes or heads, monoecious or dioecious; perianth 4- parted (rarely 2- or 6-parted); tepals imbricate; somewhat united and often fleshy in fem. fls.; male fls. with 4 (2–6) stamens, fem. fls. lacking stamens; ovary 1-celled; ovule 1, pendulous; fruit a drupe or nut, but usually adjacent (to many) fem. fls. fused into a compound fruit. Sap usually thick milky. About 50 genera and nearly 1000 species of wide distribution.
Four genera in Guam, three of them native.

Key to local Genera

1. Lvs. palmately lobed, or simple but palmately veined,
   2. Lvs. all palmately lobed; fls. enclosed in a "fig"..... *Ficus carica*
   2. Lvs. ovate cordate, or some of them palmately lobed; fls. not enclosed.... ..... *Morus*
1. Lvs. simple or pinnately lobed,
   3. Lvs. deeply pinnately lobed..... *Artocarpus incisus*
   3. Lvs. simple entire to somewhat pinnately lobed, lobes few, shallow, or with crenate-serrate marins.

4. Fruit not as described in 4. below,
   5. Lvs. oblong-ovate, narrow, thin; small slender wild tree; frt. small 1 cm oblong-globose soft reddish berrylike; rare..*Streblus*
   5. Lvs. broadly elliptic to somewhat obovate or ovate, thick, entire or somewhat pinnately lobed; large trees; frt. very large 10–40 cm green to brownish-yellow, compound; common.....*Artocarpus*
4. Fruit compound, the receptacle invaginated so that the flowers and matured fruits are entirely enclosed; external appearance fruitlike even when in flower, globose to pyriform; fls. numerous, tiny, crowded on inner surface; leaves simple and entire (in our species).....*Ficus*

ARTOCARPUS Forster

Large evergreen trees with thick milky sap; lvs. large alternate, entire or pinnately lobed, thick; stipules often large, enclosing the bud; caducous; fls. monoecious, males densely crowded in fleshy spikes, fem. aggregated in spikes or globose heads; fls. sometimes with peltate bracts; male fl. with 2–4-parted perianth; stamen 1 pistillode absent; fem. fl. with tubular calyx; ovary 1, stigma 1–3- parted; 1 ovule, pendulous; fruit compound, cylindric to globose, studded with the subconical apices of the carpels; many carpels seed-bearing, or in some cultivars, seeds absent; receptacle and enlarged carpel tissues fleshy, often edible; seed lacking endosperm, with fleshy ctoyledons, often edible.

The breadfruits; natives of Tropical Asia and the Pacific, with about 47 species mostly in Indo-Malaysia. Four species in Guam, only 2 of them common, 1 native.

Key to Species

1. Fruits borne on lower part of main trunks, cylindrical, often 30–40 cm long; in cultivation only, uncommon; leaves quite entire.
   2. Fruits often well over 35 cm long; twigs and leaves with stiff hairs..... .....*A. heterophyllus*
   2. Fruit up to 30 cm long; twigs and leaves glabrous.....*A. integer*
1. Fruits on smaller or medium branches but not on lower part of trunk; short-cylindric or subglobose; wild trees, rather common, or common in cultivation; leaves entire to pinnately lobed.
   2. Lvs. entire, lower surface pubescent; fruit mostly 1–20 cm long, with several normally developed seeds.....*A. mariannensis*
   2. Lvs. pinnately lobed, lower surface glabrous; fruit often over 20 cm long, usually quite seedless.....*A. incisus*

ARTOCARPUS HETEROPHYLLUS Lamarck, Encycl. 3: 209. 1789

NANKA; NANGKA: JAK-FRUIT.

Medium tree; sap thick milky; lvs. entire, simple, oval or oblong, to about 15 cm long (on youngest shoots with a few lobes); fruits borne on lower part of main trunk on lateral branches with a few leaves; fruit oblongcylindric, often 30–40 cm long or sometimes to 60 or even 90 cm long and weighing up to 20 kgs.; rind

studded with hexagonal bluntly conic carpel apices; inner flesh pulpy, whitish-yellow, acid or at over-ripeness swettish; seeds rounded, brown, 2–3 cm long, enclosed in a pulpy jacket.

The *nanka* or Jak-fruit is a native of Indo-Malaysia, where it is commonly planted for the large edible fruits and seeds. The flesh has a stronger flavor than the *lemae* or breadfruit. It is occasionally planted in Guam.

ARTOCARPUS INTEGER (Thunberg) Merrill, Interpret. Herb. Amboin. 190. 1917.
LEMASA; CHAMPEDEN; CHEMPEDAK (Malay).

Medium tree; sap thick milky; lvs. alt. entire or rarely somewhat 3-lobed, elliptic-oblong or oboval, 15+ cm long; male spikes axillary to 8×2.5 cm; fem. head globose-oblong, borne on trunk or large branches near ground, to 50+ cm long.

Similar to the above species and used for the same purposes; an Indo-Malaysian species. Cultivated rarely in Guam. It has often been mistaken for the preceding species.

ARTOCARPUS INCISUS (Thunb.) L.f. Suppl. 411. 1781; Corner, Gard. Bull. 10: 280, 1939.

Artocarpus altilis (Parkinson) Fosberg, J. Wash. Acad. Sci. 31: 95. 1941. *A. communis* Forst. Char. Gen. 191. 1776. Safford 1905: 189, pl. 7, 27, 36; Merrill 1914: 73. LEMAE, RIMAE; BREADFRUIT.

Medium to large tree; sap thick milky; lvs. large (to 90 cm long), deeply pinnately lobed with about 5–7 lobes, glabrous, thick coriaceous, the midrib raised strongly beneath, dark green above, paler beneath; inflorescences axillary on small branches and branchlets; male spike 10–20 cm long (or more); fem. head rounded-oblong, in fruit to 25+ cm long, weighing up to 6 kgs., studded with slightly conic carpel apices, yellowish-green to brownish; inner flesh white or creamy, usually seedless.—Pl. 4a.

This, and the next species, are the most common in Guam, and as is out below, the two species have hybridized extensively; village and garden trees are more or less "pure" *A. incisus*, while in the wild, slightly disturbed, or abandoned areas, hybrids showing various recombinations of features are found. Talofofo Valley (5024).

The breadfruit is native in the Malaysian-Pacific area, but its exact original locality is not known. The fruit sweetens as it ripens, and hence is more "bread"-like when not fully ripe. It may be baked, boiled, or fried.

Artocarpus mariannensis Trécul, Ann. Sci. Nat. Bot. III, 8: 114. 1847.

A. integrifolia sensu Merrill 1914: 73, non L.f.
DOKDOK; DUGDUG, DOGDOG; MARIANAS BREADFRUIT.

Trees similar to A. incisus; but the leaves smaller, 10–30 cm long, half as wide, broadly obovate to broadly elliptic, acute to acuminate, entire to variously lobed in the upper part, but cutting usually not more than halfway to midrib, usually less, and often some leaves quite entire; base cuneata; petiole to 4.5 cm long, usually half this length; upper surface glabrous and somewhat shiny, lower surface with brown hairs on the veins and midrib; staminate spike to about 8–10 cm long; fruit

rather small, shortly cylindric; usually with several large seeds and somewhat scanty pulp.—Barrigada Hill (3934); NCS beach road (5132). (Endemic).

Common throughout the limestone regions of Guam wherever some forest remains, sometimes also cultivated in villages, but extensively hybridizing (as the female parent) with the "lemae", *Artocarpus incisus*; consequently many trees appear intermediate between the two species, with recombinations of the distinguishing features (e.g. trees with entire, yet glabrous leaves; trees with deeply lobed, yet puberulent leaves; trees with puberulent, lobed leaves, yet producing seedless fruits; trees with glabrous, lobed leaves, yet producing seeded fruits; etc.). For a full discussion of this interesting problem, the paper on "Introgression in Artocarpusin Micronesia" by Dr. F.R. Fosberg, in Brittonia 12(2): 101–113. 1960, should be read. It should be mentioned that probable hybrids also occur elsewhere in Micronesia, indicating the activities of man. Quite possibly the early Truk-Guam seagoing canoes carried back and forth cuttings, and seeded fruits, of various breadfruits, assuring on this way the dispersal of both the species or at least some of their genes via hybrids.

A further caution in regard to breadfruits is the prior reporting of such species as *A. integer* or *A. integrifolia*; such records may well be based on *A. mariannensis*.

I have found the cooked seeds of this wild species to be particularly tasty.

Ficus Linnaeus

Shrubs, trees, or climbers, always with thick milky sap; bark usually smooth; twigs with a ringlike scar left by the caducous, large, often budenclosing stipules; twigs sometimes hollow; lvs. simple, entire or lobed, spiralled, alt., or opp. often unequal-sided; fls. borne on the inner surface of an invaginated receptacle (the *fig*), with an apical pore protected by overlapping hidden bracts; fls. of 3 kinds, male (with 1–5 stamens); female (with ovary and long style, 1-ovular); gall-fls. (like the fem. fls. but stipitate, swollen, style very short, unseeded); fruit compound fleshy.—An immense genus of perhaps 900 or more species, pantropical.

Key to species

1. Lvs. palmately lobed; figs edible.....*Ficus carica*
1. Lvs. unlobed; figs not or scarcely edible,
   2. Lvs. often 15–25+cm long, thick coriaceous, glossy, midrib often reddish; stipules large, to 10 + cm long; lateral veins close, numerous; cultivated, often in indoor pots.....*F. elastica*
   2. Not as above,
      3. Creeping, prostrate, lvs. appressed to substrate, distichous; older branches somewhat vinelike; stems and lvs. softly puberulent; in cultivation only.....*F. pumila*
      3. Not as above,
         4. Small tree, usually near the sea, often on cliffs, with very long roots supporting the trunk and appressed to the cliff face; or if

erect on flat habitat then somewhat bushy; lvs. 8–15 cm long, 4.5–8 cm wide, asymmetric at base; figs yellowish when ripe; basal fls. without scales.....*F. tinctoria*

4. Not as above; free standing trees, at least in age; starting life as epiphytes, then strangling host tree with long rigid aerial roots; banyans;
   5. Cystolith cells in upper and lower surface of leaf; basal bracts 2 below fig; often near sea;.....*F. microcarpa*
   5. Cystoliths only on lower surface of leaf, basal bracts 3 below fig; often in savannas.....*F. prolixa*

Alternative Key
to native species only
(From Corner, Gard. Bull. Sing. 21(1): 99 ff. 1965)

1. Dioecious; no interfloral bracts. (Subgenus *Ficus*).....*F. tinctoria*
   (Sect. Sycidium, subsect. Palaeomorphe).
   Added descr.: blade somewhat assymetric, often angled; lateral nerves 3–9 pairs; tepals white.
1. Monoecious; figs often with interfloral bracts; tepals red or white-edged. (Subgenus *Urostigma.*) Banyans, or stanglers; fig often with an outer and an inner layer of sclerotic cells, or with a single inner layer; male fl. with 1 stamen;
   2. Ovary wholly, or the upper half, red-brown; male fls. ostiolar or dispersed; tepals usu. narrow, acute; basal bracts 3, often cupular-connate; cystoliths hypogenous. (Sect. Urostigma). Figs with many internal chaffy bristles; basal bracts persistent (Series Caulobotryeae). Male fls. dispersed; fig 6+ mm wide, on peduncule up to 3 mm long.....*F. prolixa*
   2. Ovary white or with red mark at base; male fls. dispersed; cystoliths on lf. both sides. Basal bracts 3, free or connate-cupular. (Sect. Conosycea). Venation without intercostal nerves; figs usually sessile (Subsect. Dictyoneruron). Fig sessile; orifice closed by 2–3 overlapping bracts forming a disk; figs 4–11 mm wide; blades with spreading lateral nerves; aerial roots copious.....*F. microcarpa*

For further information on the complex and interesting biology of figs, Corner (Wayside Trees of Malaya, 1940) is recommended.

FICUS CARICA L. Sp. Pl. 1059. 1753. HIGO; FIGS.

A small tree with palmately lobed lvs. (3–5 lobes); figs large, edible, borne on the branches, pear-shaped, up to 8–10 cm long.

In cultivation only, not common.

FICUS PUMILA L. Sp. Pl. 1060. 1753. CREEPING-FIG.

F. ramentacea as misapplied by Stone, Micronesica 1: 133. 1964.

A vine, appressed to substrate but in age producing vinelike branches; lvs. and stems some what hairy; lvs. distichous, ovate, somewhat asymmetric at base; figs pear-shaped, up to 5 cm long.

Rare in cultivation; it occurs on the old Spanish Bridge opposite the small-boat basin in Agana (4913). An Asiatic species.

FICUS ELASTICA Roxb. Hort. Beng. 65. 18; Fl. Ind. 3: 541. INDIA-RUBBER

A tree, in age to 30 m tall; more often known as cultivated plants, often indoors in pots; lvs. elliptic, up to 40 cm long and a third as wide, glossy; stipules large, often pinkish or reddish; figs about 1 cm long, greenish.

Cultivated; an Indian species. Occasionally planted, as in Tamuning (5097).

Ficus tinctoria G. Forster, Prodr. 76. 1786. Merrill 1914: 73.
HODA, HODDA, HOTDA; TAGETE; DYERS'-FIG.

A small tree, seldom more than 8 m tall, a strangling epiphyte at first, but often growing on cliffs, where it produces long proproots, often branched, which may climb up or down the cliff-face for long distances; lvs. ovate, about 8–15 cm long and 5–8 cm wide, with slightly asymmetric base; withering to a bright yellow, with purplish veins; figs globose, yellowish and at last dull reddish; about 12 mm diam., on peduncules about 10 mm long.—Pl. 4b.

Not uncommon, native, coastal or inland, usually on limestone; a widespread Polynesian-Philippine species. Dos Amantes Pt. (3945).

Our local form has been identified as *F. tinctoria* var. *neo-ebudarum* (Summerhayes) Fosberg; but it is not upheld by Corner, who has revised the genus.

The ripe fruits are relished by the *sali* bird (*Aplonis opacus guami*) according to E. H. Bryan Jr. (Guam Daily News, Dec. 4, 1958).

Ficus philippensis Miq., cited from Guam by Merrill (1914), is *F. virgata* Reinw. ex Bl.; but the cited specimens are *F. tinctoria.*

Ficus microcarpa Linn. f., Suppl. Sp. Pl. 442. 1781. NUNU.
var. ***saffordii*** (Merrill) Corner, Gard. Bull. Sing. 17(3): 399. 1959.
F. saffordii Merr., Philipp. J. Sci. Bot. 9: 73. 1914; *F. prolixa* var. *saffordii* (Merr.) Fosberg, Phytologia 5: 289. 1955).

A big tree, starting life as an epiphyte; in age with numerous aerial proproots (a banyan); lvs. smooth, coriaceous, ovate, up to 9×5 cm, somewhat cordate at base, apex acuminate; lower surface slightly paler than upper; veins about 10 pairs, the basal ones about 1/3 as long as the blade; marginal vein sinuate; fig globose, about 6 mm diam., single in axils, with a pair of rounded bracts at base.

The variety endemic in Guam, (with a few outliers in the Carolines), representing a species ranging from India and Ceylon through South China to Okinawa, Australia, and New Caledonia. The var. *latifolia* (Miquel) Corner, is present in the Caroline Islands and eastern Malaysia, and in Queensland, Australia.

Named by Merrill for Edwin Safford, author of "Useful Plants of Guam." The plant was first collected in Guam by Haenke in 1792, but was not described until 1914.

Like the other banyan species, this is called "nunu", a name applied to various species of *Ficus* in Micronesia. It is difficult to distinguish easily from *F. prolixa*, but the presence of cystoliths only on the lower surfaces of the leaves in *F. prolixa* allows a distinction. (The cystoliths appear as minute dots). My collections are

both from rocky coastal areas; Tumon Bay (3890); Yona, Marine Beach (4413).

Ficus prolixa G. Forster, Fl. Ins. Austr. Prodr. 77. 1786.

F. mariannensis Merrill 1914: 73. NUNU.

Medium to large tree; lvs. alt. elliptic or oblong, mostly somewhat ovate, cuneate to subcordate at base, up to 15×8 cm; entire; glabrous; cystliths in lower epidermis only; petioles to 2 cm long; primary nerves 5–8 pairs, rarely 9–10 pairs; figs axillary, globose, about 8 mm diam., mostly solitary, with 3 slightly coherent rounded bracts at the base.

A widespread Polynesian species, represented in Guam by 2 varieties, with a third dubious.

1. Blades acute or cuneate at base.....var. *prolixa*
1. Blades subcordate or cordate at base.....var. *subcordata*

(a) var. *prolixa.* This is apparently the form described by Merrill as *F. mariannensis*; as I have seen it, the species is generally found inland, as along the cliffs above the Pago R. bridge (3852); near the headwaters of the Fena River (4485); and at the top of Tarzan falls, Manengon (4858). Thus it occurs in volcanic, as well as limestone areas. It may lose all its leaves except for the new buds protected by their large stipules. The ripening figs may be pure white.

(b) var. *subcordata* Corner, Gard. Bull. Sing. 17: 378. 1959. Blades ovate-elliptic, the base cordate or subcordate or merely very obtuse, up to 15×8 cm; lateral nerves 5–8 pairs; petiole somewhat flattened.

Known from the Marianas, Carolines, and from Fanning Island.

The type is Fosberg 35333 from Guam. Corner states "this has the scattered male fls. of *F. prolixa*, though the more or less cordate leaf suggests *F. virens* (earlier known as *F. carolinensis*). It is possible that the two species intergrade in the Carolines, where some collections (Fosberg 25479) have so few scattered male fls. that the distinction seems trivial. Specimens with ovate-cordate lvs. have not been recorded from the main range of *F. prolixa* in Micronesia."

This remark may throw light on *F. prolixa* var. *carolinensis* (Warburg) Fosberg, also credited to Guam; it is perhaps an intergrade of *F. virens.*

Morus Linnaeus

Trees with milky sap; inflorescence racemose or spicate, unbranched, unisexual; dioecious or monoecious; 4 filaments, incurved in bud; pistillode present in male fls.; seeds 1–2 mm wide, slightly compressed.—About 10 species of which 8 are natives of China.

Morus alba L. Sp. Pl. 986. 1753. Merrill 1914: 73.

SEDA; (*Seda* is Spanish for silk). WHITE MULBERRY.

Small shrubby tree; lvs. cordate, triplinerved, whitish beneath, with toothed or somewhat lobed margins; fls. axillary; fruit purplish, pendent, up to 5 cm long, fleshy, edible, compound (of fused fruits).

In cultivation; rare. Long cultivated in China and Japan as a source of food for silkworms.

STREBLUS Loureiro
(Incl. *Pseudomorus* Bureau)

Unarmed trees with somewhat milky sap; lvs. alt. entire or sl. serrate; stipules short deciduous; male fls. in a spike; fem. fls. in a short spike; perianth 4-parted; stamens 4, inflexed in bud; ovary superior, 1-celled, with 1 pendulous ovule; stigmas 2; frt. a fleshy drupe, free (not compound).—Paleotropical, with 22 species.

Streblus pendulinus (Endlicher) F. von Mueller, Fragm. Phyt. Austral. 6: 192. 1868.

Pseudomorus brunoniana (Endlicher) Bureau, Ann. Sci. Nat. Bot. V. 11: 372, 1869.

A small tree; sap rather watery-milky; lvs. thin, ovate- oblong, rounded at base, paler beneath; about 10–14 cm long; staminate spikes in upper axils; fem. spikes (sometimes on separate trees only) shorter; frt. reddish-purple or bright red, juicy, about 1 cm long, 1-seeded, slightly flattened.—Pl. 4c.

Rare, but native, in the Marianas; as for example from Rota (5194).

For a discussion of the synonymy of *Pseudomorus* and *Streblus*, see Corner, Gard. Bull. Singapore 19: 222. 1962.

URTICACEAE

Trees, shrubs, or herbs, rarely climbers. Leaves alt. or opp., stipulate; sap milky or water; flowers regular, unisexual; perianth of sepals only, or lacking; 2–5, usually 4-merous; free or connate; stamens opposite the sepals, inflexed in bud, dehiscing explosively; ovary superior or inferior, 1-celled, ovule 1, basal, erect; fruit an achene, nut, or drupe, sometimes embedded in the perianth or fleshy receptacle.—42 genera, mostly tropical, a few (e.g. Urtica) in temperate regions; about 600 species. The hairs of some spp. are stinging; siliceous and brittle, containing a highly irritating fluid; as in Nettles.—Pl. 4c.

Key to local Genera

1. Trees or woody shrubs; often fibrous-barked, dark.
   2. Leaves white or gray on under surface; no stinging hairs present.
      3. Leaves not palmately divided,
         4. Leaves bright white on undersurface; flowers in cymose panicles ..... *Boehmeria*
         4. Leaves grayish below; fls. in axillary fascicles..... *Pipturus*
      3. Leaves palmate, of about 7 subsessile leaflets..... *Cecropia*
   2. Leaves glossy green on both surfaces; inflorescence with stinging hairs.. ..... *Dendrocnide*
1. Herbs, often succulent, green-stemmed (or tinged reddish).
   5. Leaves tiny, 3–4 mm long, crowded, mostly obovate..... *Pilea*
   5. Not as above,
      6. Coarse herbs to 60 or more cm tall; leaves dimorphic; fruit hemispheric, sessile, axillary, orange, fleshy..... *Procris*
      6. Smaller herbs, not with above characters,

7. Leaves unequal-sided (or if nearly symmetrical, then narrowly lanceolate, about 5–6 times longer than wide); fls. in axillary fascicles..... *Elatostema*
7. Leaves symmetrical, ovate, only 1–3 times longer than broad; fls. cymose- thyrsoid.....*Laportea*

Boehmeria Jacquin

Shrubs; leaves triplinerved, serrate; stipules free; inflorescences unisexual, axillary, spicate or racemosely clustered. Male fls. with 3–5-lobed perianth, and 3–5 stamens. Female fls. with 2–4-toothed tubular perianth, ovary 1, the single cell with 1 erect ovule; style filiform. Fruit an achene enclosed by the perianth.—About 70 species, chiefly tropical.

One species in Guam.

Boehmeria tenacissima (Roxb.) Gaudich. Bot. Voy. Freyc. 500. "1826" (1830). Safford 1905: 200. AMAHADYAN; SAYAFI; RHEA.

Urtica tenacissima Roxb. Hort Beng. 67. 1814. fl. Ind. 3: 590. 1832.

B. nivea sensu Merrill 1914: 76.

Shrub or small tree; bark of tough fibers. Leaves alternate, broadly ovate, acuminate, dentate, triplinerved, green above, *white beneath.* Panicles axillary. Flowers very small, or green; in axils of lower leaves, with 4-parted perianth, 4 stamens; in axils of upper leaves, perianth 4-toothed, puberulent, apex contracted, the style long-exserted, pubescent; ovary hidden within perianth; stigma papillose, on only one side of the style; achene enclosed, with crustaceous pericarp.

Native. Very closely allied to (and perhaps hardly distinct from) *B. nivea*; both are sources of the fiber called ramie. The bark is supposedly medicinal.

Manengon, near the stream (3814); Fena River (4482).

Cecropia Linnaeus

Unisexual small trees with the aspect of *Macaranga*, fast-growing, soft-wooded, hollow-stemmed (often ant-inhabited), smooth-barked; leaves usually peltate and palmately lobed; flowers in dense catkin-like inflorescences, spicate; sap laticiferous. —Tropical America.

One species in Guam, planted, uncommon. [The genus sometimes placed in Moraceae].

Cecropia palmata Willd., Sp. Pl. 4: 652. 1804.

Small fast-growing tree; lvs. palmately compound into 7 sessile or subsessile leaflets scarcely webbed at base, narrowly ellipticlanceolate, acute; lower surfaces silvery pubescent (at least on youngest leaves); stems becoming hollow, with pithy partitions; fls. monoecious (on separate trees male and fem.); in clustered cylindrical spikes.

Introduced to Guam for experimental planting by the Agricultural Experiment Station, around 1912; but evidently plantings were abandoned. Few if any trees still persist; I saw none between 1956 and 1965.

DENDROCNIDE Miquel

[*Laportea* Gaud. of prev. authors]

Shrubs or trees with stinging hairs. Leaves alternate, simple, entire or serrate, tri- or penni- nerved. Stipules opposed, paired, free or connate. Monoecious or dioecious. Panicled cymes or racemes in axils. Staminate fls. 4–5-merous. Pistillate fls. usually 4-merous. Ovary oblique; style linear, stigmatic unilaterally. Ovule erect. Achene oblique, compressed, on the persistent perianth.—About 40 species, tropical.

One species in Guam. For some reason, it is not mentioned by Safford or Merrill.

Dendrocnide latifolia (Gaud.) W.L. Chew, Gard. Bull. S'pore 21: 203. 1965; 25: 71–74, f. 29. 1969.

Laportea latifolia Gaud. Bot. Voy. Bonite, t. 41. 1843.

L. saipanensis Kaneh. Bot. Mag. (Tokyo) 45: 277. 1931.

L. kusaiana Kaneh. ibid. 46: 449. 1932.

Dioecious small trees. Twigs ± puberulous, soon glabrate. Leaves with petioles mostly 5–10 cm long; blades elliptic, commonly 15×5—30×15 cm, glabrous, with 8–13 pairs of lateral veins. Inflorescence a unisexual branched raceme to 15 cm. long. Male fls. ± sessile, 4-merous; bracts tiny. Female fls. subsessile, 2–3-fascicled, perianth 4-lobed, with irritant hairs; stigma c. 2 mm long. Achene 2.2×2 mm, flat, smooth, not covered by tepals, stigmareflexed.—Pl. 4e.

This species, unlike most in the genus, is harmless and nearly devoid of stinging hairs; only the inflorescences should not be handled; the leaves are glabrous.

In limestone areas, in woods or on cliffs, not common. Pago Bay cliffs (4138); Asanite Pt. cliffs (5096, 5258); Asdonlucas, forest (5512). Marianas, Carolines, Solomon Is., New Hebrides, Loyalty Is., New Caledonia.

ELATOSTEMA Forster

Herbs with alternate, simple, dentate or serrate, sometimes oblique, falcate, or inequilateral, thin or slightly fleshy leaves; stems erect, few- or un-branched; flowers tiny, clustered in axillary, involucrate, unisexual groups; perianth of female fls. shorter than the ovary.

An Asiatic-Pacific genus of perhaps 100 species.

Two endemic Marianas species in Guam.

1. Leaves markedly inaequilateral, subfalcate, 10–15 cm long and 3–4 cm wide; bracteoles below staminate flowers 5.....*E. calcareum*
1. Leaves obscurely inaequilateral, lanceolate, 3–6 cm long, 0.5–1.2 cm wide; bracteoles below staminate flowers 3.....*E. stenophyllum*

Elatostema calcareum Merrill 1914: 77. TUPUN AYUYU.

Erect herb, slightly fleshy, unbranched, to 60 cm tall; leaves subsessile, subfalcate, distinctly unequal-sided, oblong, 10–15 cm long by 3–4 cm wide, acute or acuminate, base with one side acute, the other auriculate; blade triplinerved. Stipules 5 mm long. Staminate flowers in compact heads solitary in axils, 5–7 mm diam., peduncule less tha 2 mm long; involucral bracts 3–4 mm long; 5 bracteoles

at base of each flower, narrowly oblong-obovate, obtuse, ciliolulate distally, 3 mm long. Flowers 4-merous.—Pl. 4 f.

Endemic. Type from coastal limestone cliffs, Madqui (MacGregor 432).

Elatostema stenophyllum Merrill 1914: 76. TUPUN AYUYU.

Erect herb to 25 cm tall; leaves lanceolate, not or scarcely unequalsided, 3–6 cm long, 0.5–1.2 cm wide, tapered at both ends, tip acutish, base not at all auriculate, margins slightly crenulate-serrulate; nerves 3; stipules 3–4 mm long. Staminate flowers in oblate-globose heads, 5–6 mm diam., solitary in axils, on peduncles 2 mm long; involucral bracts 3 mm long; bracteoles below staminate flowers 3, obovate-oblong, truncate-rounded, distally ciliolulate; pedicels 3 mm long; flowers 4-merous.

Endemic. Type from banks of Tolijuice [Tolaeyuus] River, (G.E.S. 159). Also along the Talofofo R. (4552).

LAPORTEA Gaudichaud
[in revised sense of W. L. Chew]

Herbs, some with stinging hairs; leaves alternate, simple, dentate; flowers in clusters, minute, dioecious or monoecious; staminate flowers with 4–5-lobed perianth, 4–5 stamens, and pistillode; pistillate flowers with 4 imbricate perianth-segments, rather oblique, with papillose stigma and one erect ovule; fruit an oblique achene.—About 8 or 10 tropical species; Two species in Guam.

1.. Leaf-blades acuminate; flowers in dense clusters; in slender spikelike inflorescences; plants puberulent.....*L. interrupta*

1. Leaf-blades acute or obtuse; flowers pedicellate, in open panicles; plants glabrous.....*L. ruderalis*

Laportea interrupta (L.) W.L. Chew, Gard. Bull. S'pore, 21: 199. 1965; 25: 145. 1969. PALILOLIA.

Urtica interrupta L. Sp. Pl. 985. 1753.

Fleurya interrupta (L.) Gaud. Bot. Voy. Freyc. 498. 1830. Merrill 1914: 78.

Schykowskya interrupta (L.) Wight ex Safford 1905: 371.

Small, un- or few-branched slightly fleshy herb, usu. puberulent with ± irritant hairs; stem 20–80 cm tall; leaves ovate-acuminate, 6–9 cm long, 5–6 cm wide, on slender petioles up to 8 cm long; blades rounded to subcordate at base; margins coarsely serrate. Inflorescence axillary, pedunculate, spicate; flowers tiny, green, 4-merous; fruit a cordate achene.

Originally paleotropical, now pantropical. Safford & Seale 1063. Pago Bay cliffs (4388); Yona, coastal rocks (4415).

Laportea ruderalis (Forster f.) W.L. Chew, Gard. Bull. S'pore. 21: 203. 1965.

Urtica ruderalis Forst. f. Prodr. 66. 1786.

Fleurya ruderalis (Forst. f.) Gaud. Bot. Voy. Freyc. 497. 1839; Merrill 1914: 78.

Schykowskya ruderalis (Forst. f.) Endlicher, Ann. Wien Mus. 1: 187. t. 13. 1836. 1905: 371.

Habit as in preceding sp. Leaves obtuse, truncate or subcordate at base,

obtuse or acute at tip, ovate, coarsely crenulate, 2.5–10 cm long; flowers in androgynous clusters, axillary, shorter than petiole; male fls. 4-rarely 3- or 5-merous; fem. fls. 4-merous, perianth with unequal lobes, achene partly enclosed in the persistent perianth, obliquely ovate.

Malaysia to the Pacific. Gaudichaud. MacGregor 419; M.S. Clemens; Ritidian Pt. (4696).

PILEA Lindley

Herbs; leaves opposite, usually 3-nerved, sometimes tiny; flowers in axillary cymes; tepals of pistillate fl. unequal, 3.—About 170 species, chiefly tropical America. One species in Guam, naturalized; another (not identified) in cultivation.

Pilea microphylla (L.) Liebmann, Vidensk. Selsk. Skr. 5(2): 302. 1851. Walker & Rodin 1949: 459. Bryan, 10 Jan. 1939.

Parietaria microphylla L. Syst. ed. 10, 2: 1308. 1759.

Small richly-branched succulent glabrous herb; leaves obovatespathulate, only 3–4 mm long, crowded. Flowers unisexual, very tiny, clustered in axils.—Some plants have a reddish tinge.

Described from Jamaica; now widespread, a harmless and even attractive weed. It is found usually on rocks or walls; old stone buildings in the tropics may be more or less covered with tiny, prostrate plants. The flowers open explosively, shooting out the pollen as a fine little cloud —hence the name "gunpowder-plant" or "artillery-plant." Easily naturalized on limestone, as at Ritidian Point (4695), (Necker 372). Mt. Tenjo, rock ledges at 900 ft. alt., Moore 221. Near beach east of Barrigada (Steeve 137).

PILEA *sp. ignot.*

A larger species; seen once as a pot-plant in an Agaña garden; not collected.

PIPTURUS Weddell

Shrubs or small trees. Leaves alternate, 3–5-nerved, simple, crenulate or serrate. Stipules bifid. Monoecious or dioecious. Inflorescence spicate or paniculate, axillary. Staminate fls. 4- or 5- merous. Pistillate fls. borne on fleshy, enlarging receptacle (often white), perianth ovoid, adherent to ovary; stigma linear; ovule 1, erect. Fruit an achene with scant endosperm.—

A small genus of 8 or 10 species, from Malaysia to Australia; commonest in the Pacific Islands; several endemic species in Hawaii.

One species native to Guam.

Pipturus argenteus (Forster f.) Weddell, in DC. Prod. 16(1): 235. 1869. Merrill 1914: 78. AMAHADYAN.

Urtica argentea Forst. f. Prod. 65. 1786.

Shrub or small tree to 5–6 m tall. Leaves ovate-acuminate, obtuse or acute at base, up to 15 cm long by 8 cm wide, margins coarsely serrate; upper surface green, lower surface grayish-puberulent; petiole slender, 5–8 cm long; panicles capitate; flowers tiny; fruit white-fleshy.—Pl. 4d.

Malaysia to Polynesia; a common plant of coral islands. G.E.S. 110. Tumon Bay cliffs (3932); Sumay (4285); Marine beach, Yona (4410).

Procris Commerson

Fleshy glabrous herbs or subshrubs, terrestrial or epiphytic, without stinging hairs; dioecious or monoecious, male fls. in pedunculate cymes, fem. fls. on subglobose sessile fleshy receptacle; fls. 5-merous; (in fem. 4–5-parted perianth). Leaves opposite, but one leaf of each pair very small and caducous; stipules minute, axillary, connate.

A genus of about 20 species, paleotropical.

One species in Guam.

Procris pedunculata (J.R. & G. Forster) Weddell, in DC. Prod. 16(1): 191. 1869. Merrill 1914: 78.

Elatostema pedunculatum J.R. & G. Forst. Char. Gen. 105. t. 53. 1776; Safford 1905: 267.

Sciophila torresiana Gaud. Bot. Voy. Freyc. 493. 1830.

Rather coarse, fleshy, succulent herb, stems decumbent or erect, green; terrestrial, usually among limestone rocks, sometimes epiphytic or on dead logs; leaves alternate, dimorphic, one of a pair very small, the other oblong-lanceolate, 15 cm long, oblique, pinnately veined, base acute, tip acute-acuminate, entire or obscurely sinuate near tip; stipules axillary; petioles short, to 1 cm long; male fls. in short cymes, white, peduncles 1–2 cm long; female flowers in dense hemispheric sessile heads, green, ripening to candy-orange, softly fleshy.—Fig. 36.—Pl. 5a.

Malaysia to the Pacific, on coral limestone. First collected in Guam by Gau-

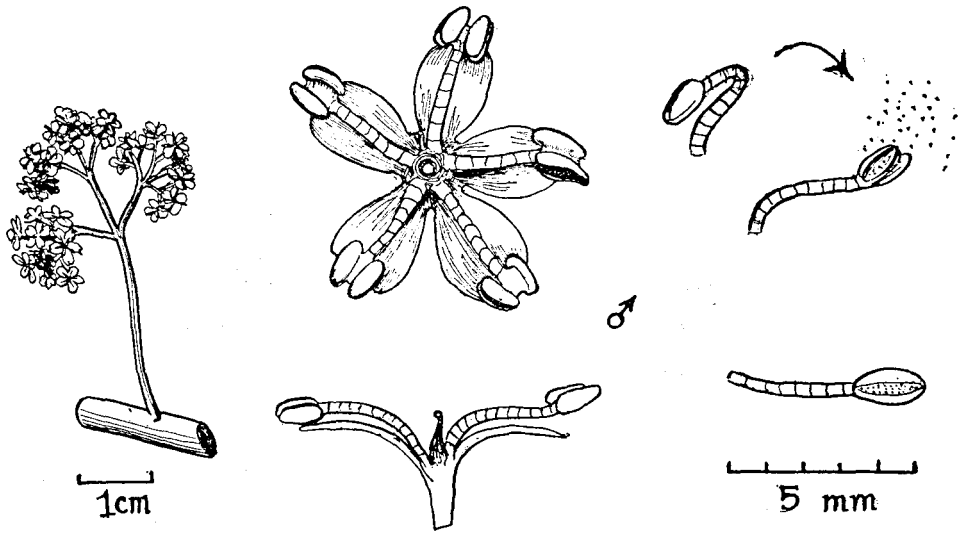

Fig. 36. Procris pedunculata, male flower.

dichaud. Pago Bay, cliffs below the College (3781, 4134); Asdonlucas, in dense forest on dissected limestone (4736); cliffs at Asanite Pt. (5259).

PROTEACEAE

Trees or shrubs without latex; leaves spiralled or verticillate; stipules none; blades commonly incised; fls. regular or zygomorphic; perfect; tepals 4; often colored; anthers 4, 2-celled, adnate on tepals; disk often present; overy inferior, sessile or stalked, 1-celled, often unequal-sided; ovules 1 to many, in 2 rows; fruit capsular, opening or indehiscen.—About 55 genera and 1000 species, chiefly S. African and Australian, a few Asiatic or Pacific (Melanesian).

Two genera cultivated in Guam.

1. Leaves simple, entire, margins serrate (when young), whorled in 3's or 4's; flower white; fruit spherical, very hard, edible (after long baking)... *Macadamia*
1. Leaves deeply cut into narrow lobes, these lobes also 1–3-lobed; flower yellow to orange; fruit thinwalled, opening..... *Grevillea*

MACADAMIA F. von Mueller

Trees with verticillate leaves; flowers paired in racemes; perianth regular, 4-parted; ovary sessile; ovules 2, pendulous; style elongated; stigma terminal; fruit a globose drupe, thick-walled.

One species in Guam.

MACADAMIA INTEGRIFOLIA Maiden & Betche, Proc. Linn. Soc. New South Wales, II, 11: 624. 1897. MACADAMIA-NUT.

M. ternifolia F. v. M. of various authors.

Tree; leaves whorled in 3's or 4's; leaves serrate-spinous when young, later entire; flower white, pubescent (to glabrate) outside; ovary brown-pubescent; style about 1 cm long or slightly longer, glabrous in upper part; fruit globose, hard, bivalved, smooth, about 3 cm diam.

Rare, in cultivation. The Macadamia nut is now planted on large commercial scale in Hawaii (around Hilo). Preparation involves long, hot baking to make the hard nut edible. Once prepared it is delicious. Seen on a farm in Yona (5059).

GREVILLEA R. Brown ex Knight (nom. conserv.)

Trees, often with appressed forked hairs; leaves spiralled, deeply incised; flowers racemose, mostly zygomorphic, perianth sometimes curved, 2–4-parted; ovary sessile or stalked; ovules 2, lateral; fruit unequalsided, thinly woody, dehiscent.

One species in Guam.

GREVILLEA ROBUSTA A. Cunn. ex R. Br. Prot. Nov. 24. 1830.
SILK-OAK, SILKY-OAK, SHE-OAK.

Rather weak-trunked tree; leaves deeply lobed, lobes narrow, again 1–3-lobed; blade up to 40 cm long; perianth orange-yellow; fruit dehiscent, about 1.5 cm broad.

Australia. Rare in cultivation. Barrigada-Mangilao road (4092).

OLACACEAE

Shrubs, trees, or woody vines; leaves usually alternate, simple, and entire; stipules none; flowers in axillary clusters; calyx 4–6-lobed; corolla of 4–6 free or

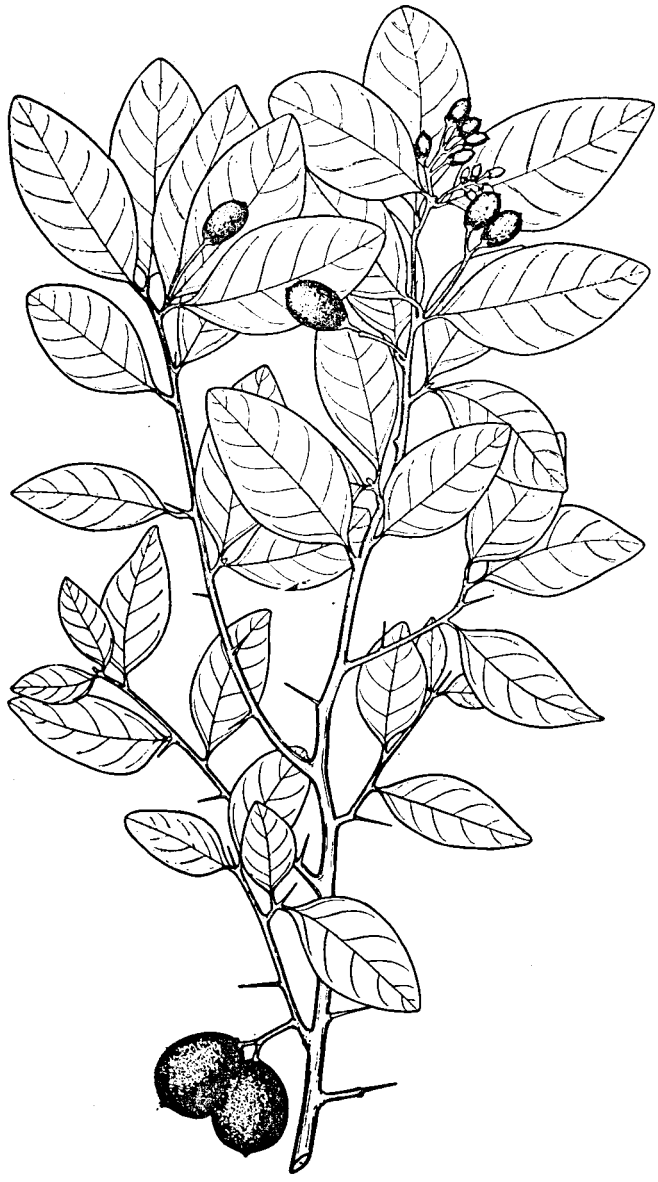

Fig. 37. Ximenia americana.

basally connate petals; disc present; stamens 4–12, free or rarely connate; ovary 1–3-celled, inferior or superior; ovules few, anatropous; stigma entire or 2–5-lobed; fruit a drupe with fleshy endosperm usually present in the seend.—About 25 genera and 140 chiefly tropical species.
One genus in Guam.

XIMENIA Linnaeus

Small tree with spiny branches; lvs. alt. simple 1-nerved; fls. in axillary racemes; 4–5; pet. 4–5, hairy inside; stam. 8–10; ovary superior, 4-celled; ovules 1 per cell, pendulous, anatropous; drupe ovoid 1-celled, 1-seeded.
One species in Guam; a pantropical genus of about 10 species.

Ximenia americana L. Sp. Pl. 1193. 1753. Safford 1905: 399. Merrill 1914: 78. PI'UT.

A small spiny tree; lvs. alt. simple glabrous; apex usually emarginate; blade to 7×3.5 cm; fls. 4-parted, white, fragrant, hairy within, in short axillary racemes; fruit a fleshy drupe, edible.—Fig. 37.

A pantropical strand plant, in Guam along coasts and also on the higher limestone plateaus, occasional, probably planted for the edible, sour fruit. Cocos Is. (4242); Tumon Bay (4991); Barrigada Hill (5104); N.C.S. beach (obs.).

BALANOPHORACEAE

Herbs *lacking chlorophyll*, parasitic on roots of autotrophic trees; commonly *annual*; flowers unisexual (rarely bisexual) in unisexual or bisexual inflorescences; staminate flowers with 3–8-lobed perianth, or this absent; stamens 2 or 1, in flowers without perianth, but 3–8 in others; opposite the perianth-lobes; filaments free or connate; anthers 2–4-celled; opening by slits or pores; ovary 1–3-celled; styles 1–3- or none; ovule one per cell, pendulous, without, or with one, integument; seeds endospermous.—About 17 genera, all but one tropical.
One genus in Guam.

BALANOPHORA Forster

Root-parasites lacking chlorophyll, with rhizomes; stem within a cupular sheath; leaves closely appressed, sessile, short; monoecious or dioecious, spadices unisexual, protruding from uppermost bracts; male fls. inserted on main rachis subtended by a bract, perianth of usually 4 segments, stamens connate-columnar, filaments very short; female spadices with many crowded branches; fls. without perianth.
One species in Guam; another in Saipan. A genus of some 80 species, Madagascar east to Japan, the Pacific Islands, and Australia.

Balanophora pentamera van Tieghem, Ann. Sci. Nat. Bot. IX, 6: 151. 1907. Merrill 1914: 79. CHILI-N-DUENDAS.

Parasitic on roots of forest trees (*Cynometra, Guamia*); underground parts swollen, tuberous, fleshy, with a brown epidermis, whitish-yellow interior; stem

erect, seldom over 10–15 cm high, closely enveloped with sheathing, reduced, overlapping, bright red leaves, lacking chlorophyll; flowers numerous, white, apical, crowded; female inflorescence ellipsoid, 4–5 cm long, 2 cm thick; ovary 0.3 mm long; male flowers racemose in an ovoid head, sessile, on pedicels 8–10 mm long; calyx 4–5-lobed; (rarely 3-lobed); lobes about 5 mm long and 2.6 mm wide; anthers 3 or 4, united, about 3–5 mm long; white.

A curious endemic species so far not found outside Guam. Type collected by A. Marche in 1889. The aerial parts decay quickly; the plant seems rare, but since it spends a good portion of its time as a slowly proliferating underground structure, only occasionally (yearly?) sending up the visible aerial parts with flowers, it may well be quite common. The striking red, stocky shoots with their white inflorescences are often quite attractive. How many tree species it is able to parastize is not known, but both *Cynometra* and *Guamia* are frequent hosts. Limestone cliffs above Pago Bay, College nature reserve (3779, 4512), blooming in November. Observed also along the cliffs brodering the Talofofo River.

A related species, *B. mariannensis* Hosokawa, is found in Saipan and Alamagan, and in Truk; its aerial shoots are dull yellow; fls. white. It parasitizes *Barringtonia asiatica*. Saipan (5255).

ARISTOLOCHIACEAE

Herbs or shrubs, usually twining; leaves alternate; stipules none; flowers regular or zygomorphic, bisexual; perianth tubular, the basal part inflated (utricle), apical part 3-toothed; stamens 6-many, sometimes fused columnar; ovary mostly superior, 4–6-celled; ovules numerous; fruit capsular.—Six genera and 200 species, around the world.

One genus cultivated rarely in Guam.

Aristolochia Linnaeus

Climber; leaves entire or 3–7-lobed and palmately nerved; flowers strongly zygomorphic, curved; stamens united to style; ovary mostly 6-locular.—About 300 species, chiefly tropical.

One species in Guam.

Aristolochia elegans Masters, Gard. Chron, 2, 24: 301. 1885. Merrill 1914: 79. DUTCHMAN'S PIPE.

Leaf blade usually broader than long, somewhat cordate deltoid, rounded; flower greenish, the utricle inflated, the upper part yellow and purple, maculate, about 7 cm long.

Rare, in gardens only. A Brazilian species, now widespread in cultivation. Said to have been introduced into Guam during the administration of the last Spanish governor.

POLYGONACEAE

Herbs or shrubs, rarely arboreous; leaves spiralled, sometimes whorled or

opposite; petiole often clasping the stem; flowers usually perfect, regular; perianth of 4–6 tepals; stamens 4–9; disk present, sometimes of glands; ovary superior, 1-celled (sometimes seemingly 3-celled); ovule 1, basal; styles 2 or 3; fruit dry indehiscent, sometimes surrounded by a fleshy tissue (perigone).—About 40 genera and 800 species of wide distribution.

Four genera in Guam, only one native.

1. Climbing vine, cultivated and naturalized; flowers pink or white, conspicuous, abundant, attractive..... *Antigonon*
1. Not a vine,
   2. Shrubby trees of cultivation; leaves broadly cordate, nerves often reddish; uncommon..... *Coccoloba*
   2. Herbs or shrubs; leaves not cordate, or if so then with wavy crisped edges,
      3. Willowy low shrub of wet localities; wild; flowers mostly 5-lobed; ..... *Polygonum*
      3. Perennial herb of cultivation, uncommon..... *Rheum*

ANTIGONON Endlicher

Perennial herbaceous vines, climbing by axillary tendrils; leaves ovate-somewhat triangular, cordate at base, the margins often undulate; flowers in racemes, perfect, 5–6-parted, stamens 7–9; styles 3.—4 Mexican species.

One species common in cultivation and sparingly naturalized.

ANTIGONON LEPTOPUS Hooker & Arnott, Bot. Beechey Voy. 308. 1841. Merrill 1914: 80. CADENA DE AMOR; LOVE-VINE, CHAIN-OF LOVE.

A vine; leaves angular, textured; broadly ovate, 3–9 cm long, cordate; petioles 1–5 cm long; racemes several-flowered; pedicels 1 cm; flowers pink in some forms, white in others; fruiting very rarely; fruit an achene. A native of Mexico, now common in tropical or warm countries; often cultivated in Guam and escaping into secondary growth areas. Mangilao (4155).

COCCOLOBA P. Browne

Shrubs or trees; leaves coriaceous, suborbicular cordate, entire; flowers bisexual or unisexual, 5-lobed; fruit berrylike by the accrescent perigone, edible.—Tropical America exclusively; over 100 species.

One species cultivated in Guam.

COCCOLOBA UVIFERA (L.) L. Syst. ed. 10, 1007. 1759. SEA-GRAPE.

Glabrous small tree with thick branchlets, firm leaves usually broader than long, the midrib and lateral nerves reddish, base mostly cordate; blade about 12–15 cm broad; flowers fragrant, greenish-yellow; fruiting scarce in Guam; fruit a subglobose or pyriform berrylike drupe about 1 cm thick.—Tropical America and Florida.

Rare in cultivation in Guam, but recommended for wider planting. The small fruits can be eaten. It is tolerant of sand and limestone soils and resistant to salt spray. A native of Tropical America and the Caribbean, now fairly frequent in cultivation in warm countries. College campus (5121).

RHEUM Linnaeus

Robust herbs with thick roots, perennial; leaves in rosettes and on stem; flowers 6-parted; stamens 9; ovary 3-sided, with 3 styles; fruit with 3 wings.

One species, rarely cultivated in Guam.

RHEUM RHAPONTICUM L. Sp. Pl. 371. 1753. RHUBARB

Rosette leaves with thick petioles, strongly ribbed; stem-leaves smaller; flowers greenish-white.

The Bulgarian rhubarb. Sometimes cultivated in Guam, with little success.

POLYGONUM Linnaeus

Herbs or shrubs; leaves clasping stems; flowers bisexual or polygamous, in axils of bracts or leaves, often in spikelike racemes, sometimes compound; flowers with 5 tepals, usually white, pinkish, or greenish; stamens 4–9; ovary with 2–3 styles; fruit 2–3-angled.

One probably native species.

Polygonum minus Huds., Fl. Angl. ed. 1, 148. 1762;

var. **procerum** (Danser) Steward. MAMAKA. MAMACA.

P. barbatum L.; Merrill 1914: 80.

Coarse herb, or half shrubby, in water or wet localities; leaves mostly lanceolate, subsessile; stems often decumbent and ascending, sometimes floating; inflorescence a spicate raceme, flowers pinkish to white; fruit about 1 mm long.—Fig. 38.

Occasional, locally abundant, along freshwater streams. Talofofo River (4446).

Fig. 38. Polygonum minus var. procerum.

CHENOPODIACEAE

Pigweed or Beet Family

Annual or perennial herbs, or shrubs, often halophilous; leaves spiralled or opposed; stipules none; flowers sessile, bisexual or unisexual, regular, perianth 2–5-lobed, sometimes scarious (dry, papery); stamens 1–5, opposite perianth lobes; ovary superior, unilocular, with 1 usually basal ovule; style 1; stigmas 1–5; embryo ringlike or coiled; seeds with endosperm or lacking it.—About 75 genera and over 600 species, of wide geographic distribution.

Three cultivated genera in Guam.

1. Cultivated for edible leaves (spinach); herbs with spiralled, glabrous, soft leaves; petioles obvious; blade oblong, sometimes hastate at base; flowers unisexual, the males in clusters, the fem. solitary..... *Spinacia*
1. Cultivated for edible root (leaves also edible) or as a piquant potherb; flowers mostly bisexual.
   2. Aromatic-glandular, or mealy-vesicular; taproot not red fleshy..... ..... *Chenopodium*
   2. Not aromatic or mealy; taproot subglobose, red, fleshy..... *Beta*

SPINACIA Linnaeus

Annual or biennial herbs; lvs. spiralled, petiolate; flowers unisexual (usually mixed with a small number of bisexual ones); perianth 4–5-parted; male flowers in clusters; fem. fls. axillary, solitary; fruit thin, indehiscent.

One cultivated species in Guam.

SPINACIA OLERACEA L. Sp. Pl. 1027. 1753. SPINACH.

With the characters of the genus. Native of West Asia and Persia. Rare in cultivation. This is the true spinach, not to be confused with other edible plants sometimes also called spinach, such as *Amaranthus*.

CHENOPODIUM Linnaeus

Annual or perennial herbs (rarely small trees); leaves spiralled, blades often lobed or incised; herbage usually mealy-vesicular, in some also glandular and aromatic, then secreting an oil; flowers mostly bisexual or some female, in spikelike clusters; perianth 3–5-lobed; stigmas 2–5; fruit enclosed by perigone.—About 60 species, many weedy, widespread.

Two species occasionally cultivated in Guam, sporadic as weeds.

1. Aromatic-glandular; young leaves without mealy vesicles..... *C. ambrosioides*
1. Mealy-vesicular, not strongly scented..... *C. album*

CHENOPODIUM AMBROSIOIDES L. Sp. Pl. 219. 1753. Safford 1905: 224. Merrill 1914: 80. APASOTES, ALAPASOTES; WORMSEED.

Annual aromatic herb, to 50 cm tall; leaves oblong-lanceolate, short-petiolate, to 9 cm long, somewhat repand-dentate distally; flowers in dense small spikes in axils; perianth 3-lobed, enclosing the fruit; seed glossy.

Rare in cultivation; formerly grown for the oil. Native of America. The oil is anthelmintic (vermifuge).

CHENOPODIUM ALBUM L. Sp. Pl. 219. 1753. Safford 1095: 224. Merrill 1914: 80.
KILITES; KILETES; PIGWEED; GOOSEFOOT; LAMBS'-QUARTERS.
Sparingly naturalized. Asiatic.

BETA Linnaeus

Annual or perennial herbs, with stout fleshy dark red taproot; leaves in basal rosettes, some also cauline; leaves spiralled above; rosette leaves with long (often red) petioles blades ovate undulate; cauline leaves smaller, petioles shorter or obsolete, blades lanceolate; fls. bisexual in clusters; perianth 5-lobed; stamens 5 on a ringshaped disk; ovary semisuperior, with 2 stigmas; fruit adnate to the base of the perianth.—Europe and Mediterranean, 6 species.

One cultivated species.

BETA VULGARIS L. Sp. Pl. 222. 1753.
ASETGA; ACELGA REMOLACHA; BEET, BEET-ROOT.

Taproot subglobose enlarged, fleshy, red or in some forms orange to whitish. Grown for vegetable use (var. *rubra* (L.) Moquin) or as a source of sugar (var. *altissima* Rössig); leaves also edible.

Occasionally cultivated in Guam. A native of southern and southeast Europe.

AMARANTHACEAE

Herbs or shrubs; leaves spiralled or opposite; stipules none; blades simple; flowers bisexual or unisexual usually axillary; tepals 3–5; bracts and tepals more or less scarious; stamens 1–5; stigmas 1–4; fruit utricular or berrylike.—About 40 genera and nearly 500 species, cosmopolitan in warm regions.

Seven genera in Guam two native and five introduced.

1. Tall high climbing woody plants; flowers in racemes; stigmas 3; fruit a bright red berry; native, uncommon in limestone forests..... *Deeringia*
1. Herbs or shrubs, not climbing,
   2. Leaves spiralled,
      3. Inflorescences elongated or fasciate, expanded, pinkish-silvery to dark magenta or maroon, showy; ovary with more than one ovule..... ..... *Celosia*
      3. Not as above; flowers unisexual (both kinds on same plant); stigmas 2–4, slender..... *Amaranthus*
   2. Leaves opposite; flowers usually bisexual, or if unisexual then on separate plants,
      4. Flowers in panicled spikes, unisexual, on separate plants; (rarely bisexual); leaves generally colored with red or yellow and green; cultivated or weedy..... *Iresine*
      4. Not as above,
         5. Stigmas 2; stamens forming a long tube; inflorescence a rounded

head or oblong-cylindric spike..... *Gomphrena*

5. Stigma 1,
   6. Prostrate or low herbs with reddish leaves; cultivated as small border plants; flowers in short spikes in leaf axils.. ..... *Alternanthera*
   6. Erect native or weedy subshrubs with greenish or silvery leaves; flowers in long erect spikes; bracteoles spinelike. ..... *Achyranthes*

DEERINGIA R. Brown

Rambling, scandent or climbing shrubs with spiralled leaves; flowers bisexual, in spikes or racemes, often paniculate; tepals 4–5; stigmas 2–4, sessile; fruit a globose berry, with several seeds.—Paleotropical; about 12 species.

One species native in Guam.

Deeringia amaranthoides (Lamarck) Merrill, Interp. Rumph. Herb. Amb. 211. 1917.

Branches long-clambering; leaves long ovate; flowers in elongate often branched racemes, pendent in fruit; tepals greenish with white margins or reddish; red berries with about 3–6 seeds.

Malaysia, Micronesia.

Occasional in forests on limestone. Asdonlucas (4677, 5511). Earlier known from Rota (5203); first reported for Guam in 1964 (Micronesica 1:133.).

CELOSIA Linnaeus

Erect coarse herbs; leaves spiralled; flowers mostly bisexual but often (in various cultivars) deformed; inflorescences spicate but in cultivars cristate, fasciated, panicled, variously deformed; tepals 5, glabrous; stigma 1; ovary with several ovules.—Perhaps 40 species, chiefly tropical.

One species cultivated and sparingly naturalized in Guam.

CELOSIA ARGENTEA L. Sp. Pl. 205. 1753.

CRISTANGAYO; KRESTAN GAYU; COXCOMB.

C. cristata L. l.c. Merrill 1914: 81.

Stems usually ribbed; leaves subsessile or petiolate, long ovate to lanceolate, up to 16×5 cm, usually smaller; inflorescences commonly pinkish silvery to magenta or maroon, often fasciate and crested (cv. *cristata*).—Pl. 5b.

Cultivated and here and there escaped; native of Tropical America. The leaves are often reddish. Barrigada Village (4870).

AMARANTHUS Linnaeus

Annual herbs, sometimes spiny; leaves spiralled, sometimes edible, green or reddish; flowers unisexual, borne on one plant, in spikes or spicate panicles; tepals 3–5 (rarely 4); filaments free; stigmas 2–4, sessile, filiform; fruit 1-seeded.—Abou 60 widely distributed, often weedy, species.

Three species in Guam, two of them weeds; one possible additional species.

1. Armed with sharp spines in pairs, mostly at base of spikes.....*A. spinosus*
1. Unarmed; flowers clustered in leaf axils,
   2. Foliage reddish or purplish.....*A tricolor*
   2. Green plants or with slight suffused purplish tinge;
      3. Cultivated for edible leaves; rare or possibly now absent..*A. oleraceus*
      3. Weedy or occasionally cultivated; fairly common.....*A. viridis*

Amaranthus spinosus L. Sp. Pl. 991. 1753. Safford 1905: 180. Merrill 1914: 80.

KULITES; KULETES; SPINY AMARANTH.

Erect branched herbs; leaves to 11×4.5 cm; flowers clustered; clusters both axillary and terminal, armed with sharp paired spines about 1–2 cm long; fls. in axils mostly female, those in terminal panicles male; tepals 4–5; styles 2–3; fruit a circumscissile utricle.

A common weed, especially of newly plowed or disturbed ground, found in all hot countries.

AMARANTHUS TRICOLOR L. Sp. Pl. 989. 1753. Merrill 1914: 80.

ENMOSA BIAJA; JOSEPHS'-COAT; PIGWEED; AMARANTH.

Erect unarmed herbs up to 2 m tall; leaves green or usually blotched with red or purple, or entirely red or purple, or patterned red, yellow and green; blades oval,

Fig. 39. Amaranthus viridis.

on long petioles; fls. axillary and terminal; tepals 3, very long-acuminate; utricle 1-seeded.

Cultivated as a potherb and also naturalized, but not common. Found in all hot countries.

AMARANTHUS VIRIDIS L. Sp. Pl. ed. 2, 1405, 1763. Safford 1905: 181. Merrill 1914: 81. KULETES APAKÁ; GREEN AMARANTH; PIGWEED.

Erect unarmed herb; leaves to 10 cm long, ovate, long petiolate, green; fls. green, in axillary and terminal clusters; tepals 3, not long-acuminate; utricle 1-seeded.—Fig. 39.

A weed, but rarely also cultivated (for edible leaves); often prostrate, flattened; waysides, vacant lots, crevices of sidewalks, edge of asphalt strips, etc. A pantropical species. (Also called *A. gracilis* Desf.)

Note: a fourth species, *A. oleraceus* L., was reported from Guam by Safford (1905, p. 000); this plant, with edible young leaves, is often cultivated by the Chinese. However, since *A. viridis* may be put to the same uses, the record is uncertain.

IRESINE P. Browne

Herbs or half-shrubs, erect or ascending; leaves opposite; flowers bisexual or unisexual; tepals 5; stigmas 2, sessile; fruit 1-seeded, indehiscent. About 40 species of warm and temperate regions.

One species in Guam.

IRESINE HERBSTII Hooker, Gard. Chron. 564, 1206; 1864. MAIANA; BLEEDING-HEART.

Leaves rather broad, notched or emarginate at the tip, generally patterned with red and yellow bands and green; flowers in long (up to 60 cm) panicles.

Occasional in cultivation as an ornamental; introduced from tropical America, Brazil.

GOMPHRENA Linnaeus

Herbs; leaves opposite; fls. in heads or short spikes; tepals 5, with long hairs on outer surface near base; stamens united into a narrow tube, bearing 5 one-celled anthers; stigmas 2, within the stamen tube; fruit indehiscent, 1-seeded.

Three species, all introduced, in Guam.

1. Bracteoles with a jagged dorsal crest; flowers in globose heads, purple or pink (rarely white), 20–25 mm diameter..... *G. globosa*
1. Bracteoles with narrow inconspicuous or obsolete crest; fls. white.
   2. Heads small globose, 9–13 mm diameter..... *G. dispersa*
   2. Heads at first globose, lengthening into a short cylindric spike..... ..... *G. celosioides*

GOMPHRENA GLOBOSA L. Sp. Pl. 224. 1753. Safford 1905: 284. Merrill 1914: 81. BUTON AGAGA; PEARLY-EVERLASTING; GLOBE-AMARANTH.

Erect branched pubescent herb to 5 cm tall; leaves obovate-oblong, to 10× 6 cm, petioles clasping; flowers in globose heads about 2.5 cm diam.; usually pink

or purple, sometimes yellow or white; bracteoles with jagged dorsal crest.

Occasional in gardens; a tropical American plant.

GOMPHRENA DISPERSA Standley, Contr. U.S.N.H. 18: 91. 1916.

Small herbs; flowers white, in small globose heads.

Occasional weed, usually in old lawns, as in Harmon Village; from Central Tropical America, the West Indies, and Florida.

GOMPHRENA CELOSIOIDES Martius, Nov. Act. Nat. Cur. 13: 301. 1826.

Low herbs; leaves sessile oblong to 4.5×1.2 cm; flowers white in at length short cylindric spikes to 4 cm long; bracteoles with very narrow inconspicuous crest.

Occasional wayside weeds; Harmon (4176); from South America.

ALTERNANTHERA Forskål

Herbs, annual or perennial, prostrate or erect (some floating); flowers bisexual or female in heads or short spikes, solitary in axil of bract and subtended by 2 bracteoles; tepals 5, usually unequal; stamens 3 or 5, the filaments basally united; anthers 1-celled; ovary with 1 ovule.—About 200 species.

One species in Guam.

ALTERNANTHERA VERSICOLOR Regel, Gartenflora 101, 1869. Merrill 1914: 81.

CHUCHARITA; JOY-WEED.

Low herbs, branched, nearly glabrous, often reddish; leaves opposite, variegated with reds, bronze, yellows, greens; up to 5 cm long, narrow; flowers pale, in small heads sessile in leaf axils.

Occasional in cultivation; used principally for colorful borders. A native of Brazil. Anigua (4288).

There are a number of common tropical weeds in this genus; it is probably only a matter of time until such plants as *A. sessilis* and *A. repens* arrive in Guam.

ACHYRANTHES Linnaeus

Coarse erect herbs; leaves opposite; flowers bisexual in terminal and axillary multiflowered elongating spikes; each flower in axil of an acute bract, this recurved after pollination; bracteoles 2, one spinose; tepals 5; stamens 5; ovary 1-celled and 1-ovulate; fruit indehiscent.—About 45 species, chiefly tropical.

Two species in Guam.

1. Leaves acuminate, glabrous to short pubescent.....*A. aspera*
1. Leaves blunt, densely fuzzy with hairs.....*A. canescens*

Achyranthes aspera L. Sp. Pl. 204, 1753; Safford 1905: 174; Merrill 1914: 80.

CHICHITUN; LASOGADO; LASOCATA; PRICKLY CHAFFLOWER.

Somewhat shrubby, up to 1 m tall; leaves long ovate or elliptic, acuminate; spikes rigid; spinous bracteole often pinkish or purplish; perianth green; fruit adherent to fur or clothing, 5-seeded.

A troublesome, frequent weed of waste ground, trails, etc. Probably native in the Oriental tropics. Merizo (4758); Asdonlucas-Yigo (5269).

Achyranthes canescens R. Brown, Prodr. 1: 417. 1810.

Similar to the former, but the leaves blunter, somewhat larger, densely hairy.

Apparently a native species; less common than *A. aspera*, in somewhat more shady and less disturbed localities.

Note: *A. fruticosa* was reported from Guam by Moquin in DC. Prodr. 13: 314. 1849; this report probably belongs with one of the above species, probably the former.

NYCTAGINACEAE

Herbs, shrubs, trees or vines; leaves usually opposite, sometimes spiralled or in false whorls, simple; stipules none; sometimes spiny; sometimes fleshy or tuberous; flowers variously disposed, mostly regular, bisexual or unisexual, sometimes monoecious; involucre of often showy colored bracts; perianth of 3–5 tepals, tubular; fruit an anthocarp by fusion of part of the perianth tube; stamens 1 to many; ovary semisuperior, subsessile, 1-celled; ovule 1, basal.—30 genera, 290 species. Four genera in Guam, two of them native.

1. Unarmed herbs.
   2. Flowers showy, purple, yellow or white, trumpet-shaped, over 2 cm long; cultivated; involucre surrounding flower.....*Mirabilis*
   2. Flowers small, less than 1 cm long, pale pink; wild; no involucre..... *Boerhavia*

1. Trees or woody vines,
   3. Woody vines with axillary spines; involucral bracts large deltoid colored pink, orange, purple or variously; fls. bisexual.....*Bougainvillea*
   3. Stocky trees with rather soft wood, without spines; no colored bracts present; fls. unisexual.....*Pisonia*

Mirabilis Linnaeus

Unarmed erect herbs; leaves opposite; flowers axillary in leafy corymbs; involucre of green bracts; fls. bisexual; perianth red, purple, white, yellow, or various; stamens 3–6; anthocarp not prickly nor sticky.—About 20 species, all American. One species cultivated in Guam.

Mirabilis jalapa L. Sp. Pl. 177. 1753. Safford 1905: 325. Merrill 1914: 81. MARAVILLA; FOUR-O'-CLOCK.

A glabrous annual herb; perianth to 5 cm long; stamens 5; anthocarp ribbed, black, 8 mm long.

A native of Mexico. Cultivated in gardens for the attractive flowers. The roots are reputed to be poisonous; they contain a substance called trigonellin (Asprey & Thornton 1955: 148). They have been used for a laxative in Jamaica.

Boerhaavia Linnaeus

Erect or straggling herbs; leaves opposite, sometimes those of a pair unequal; flowers axillary and pseudo-terminal, small, in compact cymes, bisexual; perianth

4–5-parted; stamens 1–6; ovary stalked; fruit 3–5-ribbed.—Fifty or more tropical species. One species native.

Boerhaavia mutabilis R. Brown, Prodr. 422. 1810. DAFAO; BOERHAVIA.

B. diffusa sensu Safford 1905: 201 and Merrill 1914: 81.

Diffuse spreading herb; leaves ovate oblong or elliptic, pale beneath, almost 3 cm long; fls. whitish to pink; peduncles long and slender; fruit 3–4 mm long, somewhat sticky, 5-ribbed.

Shores and coastal areas; widespread from Asia to Polynesia.

Previously reported as *B. diffusa* L. The taxonomy of the genus is in some confusion, so identifications are tentative until a monograph is written. Boerhaavias are said to contain an alkaloid, punarnavine.

BOUGAINVILLEA Commerson, emend. Spach. Nom. Conserv.

Stout woody climbers with axillary spines, or arborescent; flowers axillary, in threes (in our species), within 3 colorful involucral bracts; perianth 5-lobed; stamens (in our species) usually 8, unequal; anthocarp 5-angled, not sticky.—18 spp. ,Trop. Am.

One species (of 2 forms) in cultivation.

BOUGAINVILLEA SPECTABILIS Willdenow, Sp. Pl. 2: 348. 1799. Merrill 1914: 81. PUTITAINUBYU; BOUGAINVILLEA.

With the characters given above. The form with nearly glabrous leaves is often considered a distinct species (*B. glabra* Choisy), but is probably only a variety. Camp Quezon (4669).—Pl. 5c.

The variation in color of the involucral bracts in different strains is an effect much sought after by gardeners. The commonest color is a rich purplish-magenta; rosy-pink is also common. Rather rare are the true oranges, pale yellows, and whites. The plant is native in Brazil.

The Chamorro name means "it hurts when you don't have a sweetheart"; perhaps in reference to the spines?

PISONIA Linnaeus

Unarmed trees and shrubs (or armed shrubs); leaves simple opposite to whorled, or semispiralled; flowers in cymes, bisexual or monoecious; perianth 4–6-lobed; stamens 5–13, unequal; style present; anthocarp elongate, glandular, grooved-secretory, or muricate.—About 2 dozen tropical species; in Guam. Two species, both native.

1. Leaves elliptic or ovate, pale, thin, with numerous lateral veins; common stocky trees, often much-broken by winds (typhoons), sometimes nearly leafless; anthocarp short cylindric, spiny, sticky.....*P. grandis*
1. Leaves large obovate, dark, thickish, with wider-spaced lateral veins; rare trees of native forest, leafy; anthocarp curved, narrower near tip, smooth.. .....*P. umbellifera*

Pisonia grandis R. Brown, Prodr. 422. 1810. Merrill 1914: 82.
UMUMU, UMOUNO, AMUMO; PISONIA.

P. excelsa W.F. Wight ex Safford 1905: 356 (non Blume).

Soft-wooded tree with short very stocky trunk and often wind-broken branches; leaves at ends of twigs, pale and thin, up to 20 cm long, but usually shorter; male trees producing only fem. fls. Fruit fusiform or short cylindric, about 1 cm long, with rows of short spines, very sticky.

Common all over the limestone plateau regions, where the gaunt broken trunks often protrude above lesser secondary vegetation (this is also true of the wild breadfruit trees). The broken twigs may root if they fall in a suitable location. Flowering seems to be very rare. Mangilao (3798, in fruit); Pago Bay cliffs (4128–a, 4183).

A widely distributed tree throughout the tropical Pacific to Australia and Jave. The sticky fruits are dispersed by birds (such as boobies) which often build their nests in pisonias.

Pisonia umbellifera (Forst.) Seemann, Bonplandia 10: 154. 1862.

Ceodes umbellifera Forst. Char. Gen. Pl. 71. 1776.

Trees with large dark somewhat fleshy obovate leaves often over 30 cm long; inflorescences on branches on trunks, often near main trunk; flowers salmon-pink or fleshy-color; anthocarps somewhat bottle-shaped, tapered toward tip, smooth. —Pl. 5d.

A rare native tree of moist limestone forests in near-virgin areas; collected on Mt. Lamlam by Reid Moran in 1954, and long ago by the staff of the old Guam Experiment Station (around 1914). Also known from Saipan (Kanehira), Rota (5207); rather widely distributed in the Pacific; Hawaii; Polynesia. (This has been called *Ceodes umbellifera,* and *Pisonia cauliflora*).

For further information on the numerous synonyms of these species see Stemmerik, in Blumea 12(2): 275–284. 1964.

AIZOACEAE
Ice Plant Family

Herbs, mostly with fleshy stems and leaves; lvs. opposit or alt.; no stipules; fls. perfect; sepals 4–8; petaloid staminodia, in 1 or more series, present or not; stamens 7 or more, or numerous, outer ones often sterile; carpels 1–5 or many, united; ovary superior or inferior, 2-many-celled; ovules numerous, on axile or basal placentae; frt. capsular or rarely berrylike; seeds flattened.

Represented in Guam by one native and one introduced genus.

1. Small erect herb of waste ground; calyx green; fls. panicled..... *Mollugo*
1. Fleshy prostrate coarse herb of tidal flats; fls. solitary, axillary calyx pink; ..... *Sesuvium*

Mullugo Linnaeus

Spreading herbs with small axillary flowers; stamens and styles 3–5; flowers regular; calyx persistent in fruit; petals none; fruit a capsule.—About 12 Old World

species; one in Guam.

MOLLUGO PENTAPHYLLA L. Sp. Pl. 89. 1753. Merrill 1914: 82. CARPET WEED.

Rather delicate erect herb; lvs. whorled in groups of 5, about 3–5 cm long; flowers in open terminal racemes or panicles; calyx green; seeds reddish.

An Asiatic species.

Occasionally escaping from cultivation in lawns.

SESUVIUM Linnaeus

Fleshy prostrate herbs with opposite leaves and axillary pink or purplish flowers; calyx 5-lobed, more or less petaloid and colored; petals none; stamens numerous (about 60) or fewer, (to 5); ovary 3–5-celled; styles 3–5; fruit a capsule, circumscissile; seeds smooth, round.—About 3 or 4 littoral species.

Sesuvium portulacastrum L. Syst. ed. 10: 1058. Merrill 1914: 82.
CHARA; SEASIDE-PURSLANE.

Halophyte; succulent, prostrate or spreading herb, stems often reddish; lvs. narrow spathulate, fleshy; fls. axillary, pale rose or lavender, solitary, rarely paired, on pedicels to 1 cm long; stamens about 30; stigmas 3; frt. ovoid, brown or black, 3-celled, capsular; seeds black 1 mm long.

A native species, pantropic in distribution, occurring usually on mudflats, sandy mud, or rocky coasts, always near the sea. It does not occur on pure coral sand, nor has it been seen at any great distance from or altitude above the sea. Apra Harbor (3849a).

The leaves and stems are edible but salty.

PORTULACACEAE
Purslane Family

Mostly succulent herbs or shrubs; lvs. opp. or alt. simple; stipules present, thin; fls. perfect, sep. 2 rarely 5; pet. 4–6 rarely more; stamens mostly 8 or many; ovary 1-celled, half inferior; stigma several-branched; ovules 2 to many on central free placentae; fruit circumscissile or pyxidate; seeds with curved embryo.—About 20 genera and 350 species, chiefly American.

One genus present in Guam.

PORTULACA Linnaeus

Succulent herbs, rarely slightly woody at base, prostrate or ascending; flowers terminal; sepals 2, connate; petals 4–6, usually 5; stamens usually 7 or more; ovary with many ovules; style 3–9-fid; fruit a membranous capsule, circumscissile; seeds often reniform and minutely rugose or tuberculate.—Perhaps 150 species, a few weedy.

Four species occur in Guam, one in cultivation.

1. Flowers pink, red, yellowish or white, sometimes striped, 2.5–3 cm broad; lvs. narrowly cylindric, 2–3 cm long; cultivated..... *P. grandiflora*
1. Flowers smaller, yellow; lvs. fleshy with oboval flattened blade, or narrowly elliptic or cylindric.

2. Lvs. oboval, flattened; petals 5; weedy, usually in recently plowed ground; glabrous..... *P. oleracea*
2. Lvs. elliptic or elliptic-ovate; stems with hairy nodes,
   3. Lvs. to about 6×3 mm, ovate or elliptic-ovate; petals 4; weedy in waste ground..... *P. quadrifida*
   3. Lvs. larger, up to 10 mm long, but relatively narrower, to 2 mm wide; mostly elliptic; petals; native, on rocks near the sea..... *P. pilosa*

PORTULACA GRANDIFLORA Hooker, Bot. Mag. t. 2885.

Fleshy annual; flowers generally pink, purplish, or white.

A larger plant than the wild or naturalized species; usually grown in pots or borders; not common. A native of Brazil.

Portulaca oleracea L. Sp. Pl. 445. 1753. Safford 1905: 359. Merrill 194: 82. BOTDOLAGAS; BODULAGAS; DONKULU; PURSLANE.

A glabrous, prostrate, spreading, fleshy herb; lvs. obovate, entire, up to about 2.5 cm long; flowers yellow, opening in the morning, usually 5-petaled; capsule circumscissile (dehiscent by a hemispherical lid) to reveal numerous small black slightly roughened seeds. Cetti Bay (3895); Merizo (4757).

A European plant, now widespread in all warm and temperate countries. The plant is edible (preferably after parboiling) and is a tasty vegetable.

Portulaca quadrifida L., Mantissa 1: 73. 1767. Safford 1905: 359. Merrill 1914: 82. HIERBA DEL POLLO; HUBA DET POYO; PURSLANE.

Much like the above species, but the leaves much smaller (to 6×3 mm), the nodes hairy, and the flowers with 4 petals (yellow); seeds gray.

A paleotropical weed now widely naturalized.

Portulaca pilosa L. Sp. Pl. 445. 1753.

P. samoensis v. Poelln. Rep. Sp. Nov. 33: 163. 1933.

Small, fleshy-leaved, creeping or prostrate or low herbs; rootstock fleshy, tuberous, often in rock crevices; stems fleshy, cylindric, pinkish, 1.5–2 mm thick. Leaves alternate, fleshy, nearly elliptic, mostly 5–12 mm long and 1.5–4 mm wide, older ones often reddish; petiole less than 1 mm long, thick; blade about 1 mm thick (in life). Leaf axils with curly white hairs 3–7 mm long; plants elsewhere glabrous. Flowers terminal, calyx tube 1.5 m long, obhemispheric, calyx-lobes 2, each about 5×3 mm, acute, translucent; petals 5, yellow, 9 mm long; stamens 20; style 2 mm long, upward enlarged, tip as 5 stigmatic lobes; ovary subconic, 3/4 mm long, the wall less than 0.1 mm thick; seeds black, minutely tuberculate, conchyliform, 3/4 mm wide.

R. Geesink (Blumea 17: 294. 1969) has reduced *P. samoensis* and nearly 60 other names to this Linnean species. Our plants would be subsp. *pilosa*.

Inarajan, on coralline limestone rocks near the sea; 3913; Stone & Falanruw-Cushing 8237.

CERATOPHYLIACEAE

Filiform submerged aquatic herbs, monoecious or dioecious; stems branching;

leaves dichotomously furcate, the segments filiform, slightly toothed; flowers solitary, axillary, sessile, bracteate; bracts toothed; perianth absent; staminate flowers with 10–20 stamens, connective thickened beyond the anther; pistillate flowers with 1 superior ovary; ovules orthotropous, pendulous; styles filiform; stigma terminal; fruit an achene; endosperm none; cotyledons 4.—Monotypic, the one genus present in Guam; 2–3 species, in fresh waters almost everywhere.

Ceratophyllum Linnaeus

With the characters of the family.

One species in Guam.

Ceratophyllum demersum L., Sp. Pl. 992. 1753. Merrill 1914: 82. HORNWORT.

Aquatic, submerged, floating; stems elongate, branched; leaves whorled, in groups of 5, 6, or up to 12; sessile; to 2.5 cm long; much-divided, the ultimate segments filiform, with small teeth; achenes slender ovoid sessile 4–5 mm long, with 2 spines near base; style persisting, spiniform.

Ponds, lakes, ditches, etc., cosmopolitan. Agaña Spring (4974); Talofofo River (5019).

NYMPHAEACEAE

Lactiferous aquatic herbs with submerged rhizomes and usually peltate floating leaves. Flowers solitary, regular, bisexual, often large, with 3–6 sepals, intergrading to many petals; stamens numerous, anthers introrse, opening by slits; carpels 8 to many, either connate into a multilocular ovary or immersed in an obconic receptacle; fruit a berry or nut.

Eight genera of wide distribution, and about 60 species. One genus locally represented, not native.

Nymphaea Linnaeus

Habit as described. Flowers large, showy; sepals 4; carpels united into a multilocular ovary bearing a flat radiate stigma; ovules many, parietal.—about 50 spp.

One species cultivated and occasionally escaped.

Nymphaea sp.

Recognizable from the foregoing descriptions. Flowers yellow or cream.

Cultivated in ponds (Plaza de España, Agana); also escaped and sometimes found in riverine ponds (as at Talofofo Valley).

The identity of the species has not been satisfactorily determined.

MENISPERMACEAE

Woody or herbaceous climbers often with milky or yellowish sap; leaves alternate; stipules none; flowers tiny, usu. unisexual, dioecious; sepals 6, in 2 series; petals 6–3 or none; stamens 3 or 6; carpels 3 or 6, or only 1, each with 1 ovule;

staminodes and pistillodes often present; fruit drupaceous; seed usually curved around an introusion of the endocarp, endospermous or not.

About 75 genera, chiefly of the tropics, or warm temperate regions, and over 350 species.

One genus in Guam.

TINOSPORA Miers

Climbers; stems woody; leaves simple, cordate; flowers in terminal or axillary racemes; or panicles; sepals 3 outer, 3 inner; petals 6. Male flowers with 6 stamens; anthers opening by oblique slits; female flower with 6 staminodia; ovaries 3; styles bifid; fruit drupaceous.—Perhaps forty species, Africa and Asia.

Represented by a single rare native species.

Tinospora homosepala Diels, Philipp. J. Sci. Bot. 8: 158. 1913. Merrill 1914: 83.

Climbing vine; leaves rather long-petiolate, cordate or subcordate, acuminate, entire, palmately 3–5-nerved, chartaceous; up to 10–12 cm long, the petiole about as long; flowers unisexual; in short axillary racemes shorter than the leaves.

Endemic, very rare. G.E.S. 479; McGregor 536. Known only from Guam. Rediscovery of this plant is a prime botanical job for local students!

ANNONACEAE

Trees, shrubs, or climbers; leaves simple, alternate, entire; stipules none. Flowers bisexual or, rarely, unisexual; sepals usually 3, free or slightly connate basally, valvate or imbricate; petals 6, hypogynous, or 3; stamens many hypogynous, closely crowded, filaments short; anthers adnate; connective produced into a knob or disc; carpels 1 or usually many, free (rarely connate), with distinct stigmas; style short or lacking; carpels often stipitate in fruit; ovules 1 to many; endosperm ruminate.

About 120 genera and 1200 species, chiefly tropical, many in the Old World. One genus native and endemic in the Marianas; one possibly native; and one introduced, from Tropical America.

Key to Genera

1. Carpels connate; hence fruit a multilocular unit, large, fleshy; cultivated or naturalized trees..... *Annona*
1. Carpels free in fruit, hence fruit of several-many ripe carpels with stalks, borne on a woody torus.
   2. Petals short and broad, not over 2 cm long; flowers not strongly sweet-scented; carpels when ripe with superposed seeds, cylindric, with slight constrictions..... *Guamia*
   2. Petals narrowly elongate, green to yellow, up to 8 cm long or more, thin and flexible, the flowers strongly sweet-scented; carpels not as above.. ..... *Cananga*

ANNONA Linnaeus

Trees with simple, alternate, entire leaves; inner petals markedly different from outer petals; carpels connate in fruit; ovule 1 per carpel; fruits large, fleshy, often edible.—Tropical America, or more species. Some species now rather widespread in cultivation in the tropics.

Key to species

1. Fruit with moderately hard green, curved spines; flesh pale green, acid, edible ..... *A. muricata*
1. Fruit not spiny, but reticulated or scaly.
   2. Fruit reticulate, i.e. carpel apices slightly convex, lozenge-shaped;..... ..... *A. reticulata*
   2. Fruit globose; carpel apices somewhat bulbous, the basal ones noticeably elongate, curved, sausage-shaped..... *A. squamosa*

ANNONA MURICATA L. Sp. Pl. 536, 1753; Safford 1905: 184, pl. 33; Merrill 1914: 83.
LAGUANA, or LAGUANAHA. SOURSOP.

A small tree, rarely much over 15 ft. tall. Leaves rather pale green, elliptic, rounded but apiculate or obtusely pointed at apex, rounded or narrowed at base, usually about 12–16 cm long and 5–8 cm wide; flowers green, the 3 broadly deltoid sepals quite thick, valvate; outer petals cordate at base; fruit oblong or somewhat curved (mango-shaped), sometimes as much as 30 cm long, the surface beset with regularly well-spaced short slightly curved spines, of moderately firm texture, green; flesh juicy, acid, whitish; seeds abundant.—Fig. 40.

Tropical America; early introduced in Guam, and found in many gardens. It does not appear to escape or become naturalized. Barrigada (4120).

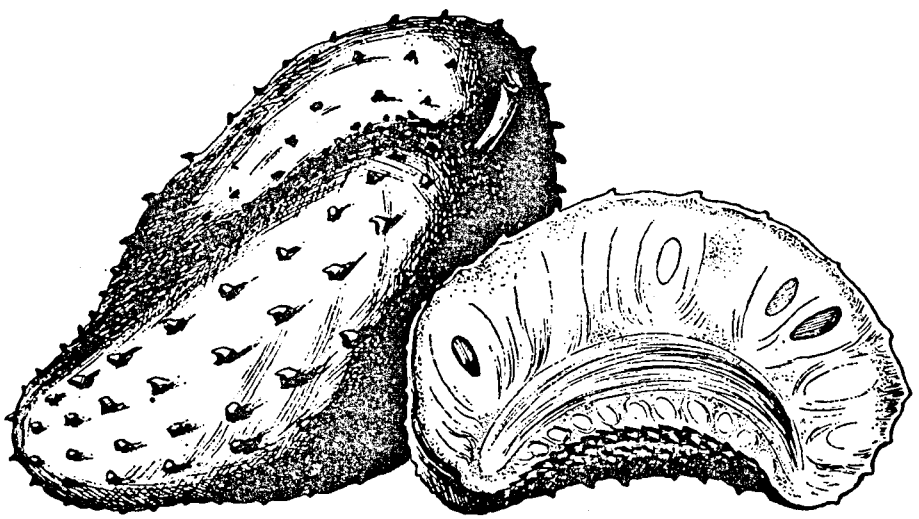

Fig. 40. Annona muricata.

The name of the fruit in Panama is "guanabana" or "guanaba"; hence the Chamorro name is from the Spanish "la guanaba".

Annona reticulata L. Sp. Pl. 537, 1753. Safford 1905: 184. Merrill 1914: 83. ANNONAS: CUSTARD-APPLE, BULLOCKS-HEART.

A larger tree than the soursop, becoming 20 or 30 ft. tall, the leaves larger and darker, up to 20 cm long and 6 cm wide or more, lance-oblong, acute; flowers greenish, in groups of 2 or 3 on lateral peduncles, elongate, columnar, trigonal in bud, about 2.5 cm long, petals narrow. Fruit short ovoid cordate, 7–13 cm broad, pulpy, surface divided by impressed lines into rhomboidal or hexagonal areoles; seeds rather numerous, glossy brown.—Pl. 5e.

Tropical America. This species is cultivated but is also naturalized, often being a component of secondary scrub forest. The fruit is inferior in flavor, and many fail to ripen well, becoming woody. The fruits are usually reddish. Bryan (3 June 1959) states that the fruit is sought by the *fanihi* or fruit-bat.

ANNONA SQUAMOSA L. Sp. Pl. 537. 1753. Safford 1905: 185, pl. 34. Merrill 1914: 83. ATIS. SUGAR-APPLE. SWEETSOP.

A small tree very similar to the soursop; petioles to 1 cm long; leaves thin, glaucous, oblong-ovate, 7–14 cm long, 4–5 cm wide, sparsely puberulent on both surfaces at least when young, glabrescent; flowers solitary, axillary, about 2.5 cm long, pendent, pubescent, trigonal, petals lanceolate, blunt, somewhat concave at base, greenish-yellow, 2.5 cm long; fruit subglobose, about 8–10 cm broad, each carpel apex protuberant; outer surface glaucous; pulp creamy-yellow, soft, sweet; seeds blackish.

Tropical America (perhaps the Caribbean). Cultivated in Guam; a desirable fruit, but not common.

CANANGA Hook. f. et Thomson

Trees with large alternate leaves; flowers solitary or in fascicles, pendent; sepals 3, valvate; petals 6, in 2 series, valvate; stamens many; carpels many; stigma subcapitate; ovules many, in 2 rows; fruit baccate, stipitate (usually); seed surrounded by pulp; testa punctate, with spine-like processes intruding into the endosperm.—4 species, Indomalaysia to Queensland.

Cananga odorata (Lam.) Hook. f. et Thomson, Fl. Ind. 1: 130. 1855.

Uvaria odorata Lamarck, Encycl. 1: 595. 1785. ILANG-ILANG

Canangium odoratum (Lam.) Baillon ex King, J. As. Soc. Beng. 61(2); 41. 1892. Wight ex Safford 1905: 209. Merrill 1914: 83.

A tree to 10–15 m tall; leaves alternate, simple, entire, ovateoblong, acuminate, puberulent below, medium green; flowers rather large, the petals yellowish, narrow, elongate, lax or pendent, very sweet-fragrant; sepals 3; petals 6, up to 6–7 cm long, linear; stamens numerous; connective produced; ovaries several to many, free, style oblong; fruiting carpels stipitate, short-ovoid, black, 6–12-seeded.

Indo-Malaysia. Introduced to Guam from the Philippines, now thoroughly naturalized, mostly in southern hills, and seeming native. The fragrant flowers

yield a sweet essential oil used in perfumes. The fruits are sought out by pigeons. "ILANG-ILANG" is the Filipino name.

Agana Heights (3854); Talofofo hills (3994); Fena (4093).

GUAMIA Merrill

Monotypic; with the characters of the single species. Hutchinson places this genus in the Tribe Unoneae, subtribe Xylopiineae, near *Polyaulax, Oncodostigma, Exellia, Polyceratocarpus,* and *Uvariodendron.*

Endemic to the Marianas Islands; very common in primary forests in Guam, Rota, Saipan.

Guamia mariannae (Safford) Merrill, Philipp. J. Sci. 'C', 10: 243. 1915.

PAI-PAI; PAC-PAC.

Papualthia mariannae Safford, J. Wash. Acad. Sci. 2: 19, figs. 1–2, 1912; Engler's Bot. Jahrb. 52: 16. 1914.

Polyalthia mariannae (Saff.) Merrill 1914: 83.

Oreophea mariannae Merr. ined. ex herb.

Small compact richly branching tree; youngest branches reddish silky-pubescent; leaves alternate, shortly petiolate, simple, mostly distichous, ovate or ovate-

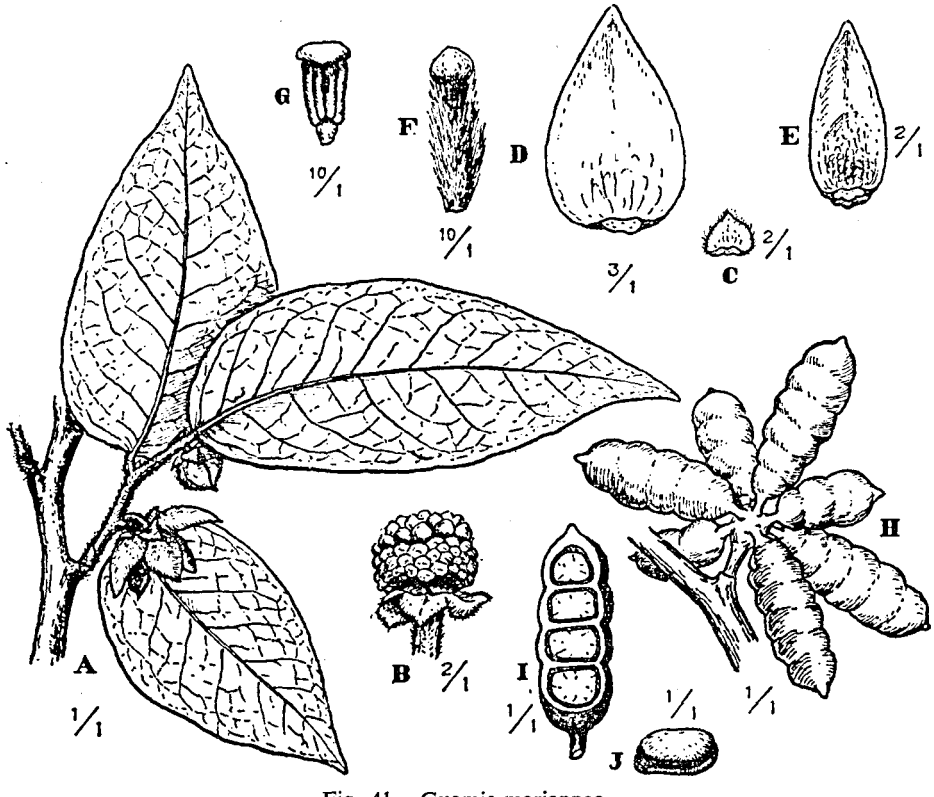

Fig. 41. Guamia mariannae.

elliptic, basally rounded, apically acute, very dark glossy green, midrib impressed ventrally, glabrous or nearly so, mostly to 10 cm long, or sometimes to 15–18 cm long; petioles 2–5 mm long; flowers axillary, on short branchlets, solitary; bracteoles 2, broad, clasping, reddish-pubescent; sepals 3, broadly triangular, thickish; petals 6, the outer ones larger, dirty yellow, thick, valvate, pubescent; stamens many, obconic, the connective obliquely subtruncate; carpels free, about 8–12 (up to 20) shortly stipitate in fruit; stigma glabrous subcapitate; ovules many; ripe carpels brown, short-cylindric, slightly impressed-ringed, about 2–3 cm long, 1-several-seeded; radiating from the woody tous; seeds flattish.—Fig. 41.

Endemic. A rather common, handsome small tree, of limestone soils chiefly, locally abundant, occasionally on mixed soils. Barrigada (3810); Talofofo (3993); Camp Quezon (4075); N.W. Field (5005).

LAURACEAE

Mostly trees, one species a parasitic herb; leaves alternate, simple; stipules absent; flowers regular, perfect or unisexual; perianth of 2 whorls, petals often not different from sepals; stamens in 1–4 whorls, with 3 stamens per whorl (usually); or some whorls staminodial; ovary superior or nearly so, 1-celled, with 1 pendulous ovule; apex of pedicel and receptacle sometimes enlarged; fruit a berry, drupe, or nut.—More than 40 genera and over 2100 species, chiefly tropical.

1. Achlorophyllous (or partly so), orange, leafless, parasitic vines..... *Cassytha*
1. Trees with normal chlorophyllous leaves,
   2. Fruit not borne in a cupule (fleshy enlarged receptacle), globose to pyriform, with yellow-green edible oily flesh and seed to 5 cm thick, globose ..... *Persea*
   2. Fruit embedded in a cupule, not as above..... *Cinnamomum*

CASSYTHA Linnaeus

Epiphytic leafless twiners, with filiform orange or green stems, attached to host plants by holdfasts; foliar organs minute, scale-like, alternate; inflorescence spicate or racemose; flowers bisexual, the 3 outer tepals connate, inner 3 not so; perfect stamens 9, 3 inner ones glandular; staminodes few; fruit enclosed in the fleshy perianth-tube.—Perhaps 12 or 15 tropical species.

Cassytha filiformis L. Sp. Pl. 35. 1753. Safford 1905: 219. Merrill 1914: 84.
AGASI; AGASE; AGACE; MAYAGAS.

With the characters of the genus. Stems varying from green to orange; fruit subglobose, about 6–7 mm long, 1-seeded.—Pl. 5f.

A widely distributed parasite, capable of living upon a variety of host plants, the most common of which in Guam are littoral shrubs such as *Scaevola*, but also in savannahs, sometimes parasitizing grasses.

Tagachan Bay (3986); Yona (4422); Manengon (4851).

The genus *Cassytha* is often considered to form a monotypic family distinct from the Lauraceae.

CINNAMOMUM Linnaeus

Aromatic evergreen trees with subopposite or alternate, often 3-nerved leaves; inflorescence axillary or terminal, paniculate; (rarely racemose or umbellate); flowers perfect; perianth of 6 segments; perfect stamens 9 or less; staminodes stipitate; ovary sessile; perianth-tube persistent; receptacle swollen in fruit; fruit a berry.—About 250 species, Asiatic, a few Australian, 2 or 3 in Micronesia, but none native in Guam.

CINNAMOMUM CAMPHORA Nees & Eberm. Handb. Med.-Pharm. Bot. 2: 480.

CAMPHOR

Tree; leaves 3-nerved (usually), 6–10 cm long, 3–6 cm wide, ovate or elliptic, coriaceous, somewhat glaucous below, shiny above, with 2 impressed glands in vein axils dorsally; petioles 15–25 mm long; inflorescence shorter than the leaves, pubescent; flowers yellowish-green, perianth segments 1.5 mm long; fruit globose, black, 7–8 mm thick.

A native of China, Japan, and Taiwan. Planted for the fragrant wood, from which oil of camphor may be extracted. Introduced to Guam in 1911, but rare if still persisting.

PERSEA Miller

Evergreen trees with alternate leaves; venation pinnate; inflorescences axillary, paniculate; flowers perfect; perianth lobes free, somewhat unequal, some perstisten; stamens with 4-celled anthers; staminodes conspicuous, cordate, stipitate; ovary subglobose; style filiform; stigma terminal; fruit globose or pyriform, with oily flesh, 1 large seed.—A large genus of perhaps 150 species, many in Tropical America, mostly Brazilian.

One cultivated species in Guam.

PERSEA AMERICANA Miller, Gard, Dict. ed. 8. 1786. Merrill 1914: 84.

ALAGETA; AVOCADO.

Compact tree (at last to 15–20 m tall); leaves crowded, petiolate; blades ovate to obovate, to 30×20 cm, usually (in ours) about 20–24×6–10 cm, glaucous (sometimes yellowish) below, dark green above, acute; inflorescences paniculate, puberulent, grayish green, many-flowered, bracteate; flowers about 6–7 mm long, yellowish; fruit up to 20 cm long, dark green or purplish-black, the flesh soft, oily, edible; seed globose, mostly 3–5 cm thick.

A native of Mexico, now rather frequent in tropical countries as a cultivated tree, prized for the nutritious, buttery fruits. Several cultivars are known; these have improved fruits. Old, unkempt trees tend to have small, somewhat dry, fibrous fruits with a slight bitter aftertaste, but pampered trees yield fine-flavored flesh.

Barrigada Village (4121, 4960).

Bryan (24 June 1959) refers to a seedless strain growing in Yona.

The trees in Guam rarely exceed 30 ft. in height.

HERNANDIACEAE

Trees or shrubs; leaves simple, alternate; stipules none; flowers bisexual or unisexual; perianth of similar segments; in 2 series, valvate; staminate flowers with 3–6 stamens, anthers 2-celled; staminodia often present; pistillate flowers with a single, inferior ovary; ovule 1, pendulous; fruit drupaceous or a samara; endosperm lacking.—4 genera, 50 species; tropical. One genus in Guam.

HERNANDIA Linnaeus

Trees with rather soft, whitish wood; leaves entire, long-petiolate; flowers unisexual, but monoecious (borne on the same plant), 2 staminate and 1 pistillate flower making up each cyme of the compound inflorescence; stam. fls. with 6 connate lobes (3 outer), 3 stamens, and 3–6 glandular staminodes; pistillate fls. with 7 connate lobes (4 outer); ovary enclosed in a thin cupule, staminodia 4; fruit a nut, with c. 8 ribs, enclosed in the cupule.—About 19 species, all tropical, mostly coastal.

1. Involucre depressed-globose, opening circular; leaves mostly acute at apex; fruit costate..... *H. nymphaeifolia*

1a. Involucre ovoid, opening bidentate; leaves obtuse; fruit smooth or nearly so ..... *H. ovigera*

Hernandia nymphaeifolia (Presl) Kubitzki, Bot. Jahrb. 90: 272. 1970.

NONAK; NONAG.

Hernandia peltata Meissner, DC. Prodr. 15(1): 263. 1864; Safford 1905: 293. Merrill 1914: 84. Kubitzki, Bot. Jahrb. 89: 153. 1969.

H. sonora sensu various authors, non L.

Biasolettia nymphaeifolia Persl, Rel. Haenk. 2: 142. 1835.

Tree to 20 m tall, with rather dense rounded crown, trunk shortly buttressed, bark smooth, silvery-gray-buff, slightly fissured; leaves alternate sub. cordate, peltate or subpeltate, 12–40 cm long, 10–30 cm broad, softly leathery, medium green (the ventral insertion of the petiole usually red), acute-acuminate, glabrous; petiole about as long as the blade; inflorescence axillary cymosely paniculate, bracteate-bracteolate, longer than the leaves, tomentose; flowers whitish, creamy or silvery; cymule subtended by 4 bracteoles; involucre green to whitish or pinkish slightly fleshy; nut black, ellipsoid, slightly bluntly broad-restrate, somewhat longitudinally ribbed, black, about 2.5 cm long; seed 1.—Pl. 6a, b.

Shores of paleo- tropic seas. Type from Guam (Haenke). Apra (4151); Jones Beach (4295); Talofofo (4451); Tumon Bay (4963, 5094–A). The sap is a painless depilatory.

Hernandia ovigera L., Herb. Amb. 14. 1754. Kubitzki, Bot. Jahrb. 89: 138. 1969.

Hernandia labyrinthica T. Tuyama, Bull. Shigen Kagaku Kenkyu-sho, 1(1): 42. 1943. Stone, Micronesica 2(1): 47. 1965.

Tree to 20 m tall, bark smooth grayish; innovations puberulent; leaves rounded-ovate, mostly obtuse at apex but shortly cuspidataacuminate, subpeltate or not peltate, slightly cordate, glabrous, plamately 5–7-nerved, 9–30 cm long, 7.5–25 cm

wide, commonly about 20×16 cm, the petiole nearly as long as the blade; inflorescence corymbose, axillary, as long as the leaves (in fruiting condition), densely flowered, 15–18 cm long in flower, slightly tomentellous; involucre usually 4- (rarely 3-) leaved; cymules of 3 flowers, the 2 laterals male, the center one female; male fls. trimerous, about 7 mm long; female fls. 4-merous; style to 5 mm long; fruit enclosed in the ovoid inflated involucre, this bidentate at the apical opening; fruit brown, broadly obovoid-subcompressed, c. 22–23 mm long, nearly smooth.

Sumatra, Java, Celebes, Sunda Is., New Guinea, Solomon Is., Marianas; Guam; Rota, where it occurs inland and up to the summit on limestone; found in Guam above Talofofo Falls, rare (4451, 5508).

Supplementary Key to Families CAPPARIDACEAE, CRUCIFERAE, MORINGACEAE

1. Sepals 4; petals 4;
   2. Stamens 4,6, or many; if 6, then all the same length; ovary 1-locular; placetas parietal; corolla often somewhat zygomorphic.... *Capparidaceae*
   2. Stamens 6, 4 long, 2 short; ovary generally 2-locular with a 'false septum", corolla regular..... *Cruciferae*
1. Sepals 5; petals 5; stamens 5, alternating with 3 to 5 staminodia; ovary 1-locular; placentation parietal; flowers zygomorphic..... *Moringaceae*

CAPPARIDACEAE

Herbs, shrubs, or small trees; leaves alternate, simple or palmate; stipules (when present) minute or spinose; flowers regular or zygomorphic. Sepals and petals often 4. Stamens 4, 6, or many. Ovary usually 1-celled, borne on a gynophore. Fruit capsular or baccate. Endosperm none.

About 45 genera of the tropics; besides the following genera in Guam, the genus *Crataeva* occurs in Micronesia, in the Caroline Is.

Key to Genera

Leaves simple; woody shrubs; fruit baccate, many-seeded..... *Capparis*
Leaves palmately compound or dissected; herbs; fruit a 2-valved dry capsule ..... *Cleome*

Capparis Linnaeus

Shrubs, erect or climbing, or small trees; leaves simple; stipules sometimes thornlike; flowers pedicellate, in racemes (some subumbellate), or rarely solitary, bracteate; sepals in 2 series, usually free; petals 4, unequal, in pairs (an upper and a lower), those of the upper pair coherent basally; receptacle (torus) subconic, with an adaxial disc; stamens usually numerous, sometimes only 7–12, free, longer than the petals, often curved; gynophore elongate; ovary 1-celled, with about 4 placentas, ovules many; fruit a berry, the pericarp often leathery; seeds embedded in pulp, obliquely reniform.—A large genus (about 250 spp.) in tropical and subtropical regions around the world; the plants are often characteristic of hot, dry habitats.

One species in Guam.

Capparis cordifolia Lamarck, Encycl. 1: 609. 1789. Merrill 1914: 84. St. John, Micronesica 2(1): 33, f. 2, pl. 1 (a). 1965. ATKAPARAS.
C. mariana Jacq. Hort. Schoenbr. 1: 57, t. 109. 1797. Safford 1905: 212.
C. spinosa L. var. *mariana* (Jacq.) K. Schum. Bot. Jahrb. 9: 201. 1888; Jacobs, Fl. Males. ser. 1, 6(1): 89. 1960.

A rather small, sometimes sprawling, shrub; woody, but the wood rather soft and light; thornless; glabrate; leaves alt., broadly ovate or orbicular, rounded at both ends or truncate ot nearly subcordate at base, sometimes notched at apex, in life slightly fleshy, grayish-green, lateral nerves 5–8 pairs; petiole slender, about 8–14 mm long (rarely to 23 mm); blades mostly 3–5 cm long (rarely to 8 cm), 2.5–5 cm wide (rarely to 6.7 cm); flowers axillary, solitary, the bud opening late in the evening, the flower withering the next morning, large; but asymmetric; pedicel 3–4 cm long; clearly zygomorphic; sepals reflexed at anthesis, galeate, up to 2 cm long; petals equally long, obovate-suborbicular, glabrous, white; stamens numerous (80–108), 3–4 cm long, white but fading to pinkish or even purplish; anthers 3 mm long, purple; ovary clindric; gynophore elongate, in fruit to 5–6 cm long; fruit an oblong or ellipsoid leathery berry, in life with reddish ribs and elsewhere green, ripening to dull yellow, blackish when dried; up to 4–5 cm long; seeds about 3 mm long, dark brown, reniform.—Pl. 6c.

A maritime, littoral species of coastal coral rocks, always near the sea, native from Micronesia (Palau) to Polynesia (Henderson Is.).

Collections from Guam; Safford & Seale 1108; Bryan 1215; Thompson 280; Nelson 517; Stone 5085, 5087.

Best seen at such localities as Mochom Bay, Asanite Point, or the bluffs south of the mouth of the Ylig River.

From ecological and historical considerations, there is no doubt at all that this is a native species, arrived by natural means, and not introduced by man. Its occurrence in communities of purely native elements, its inability to persist in the face of much man-made disturbance, and its restriction to certain localities, all bespeak its indigenous character. In addition the records of the early Spanish indicate the same. I cannot agree at all with Jacobs that it is a post-Columbian introduction in the Pacific. In addition, I agree with St. John that the Hawaiian species is distinct (*C. sandwichiana*); its early collection in Hawaii (1792) shows that it cannot have been introduced there but must be numbered among the indigenous species.

Like the true capers (*C. spinosa* L.) the local species can be used for an edible condiment, prepared usually by pickling the young flower buds; or sometimes the young fruits. The latter formed an export commodity in early Spanish times in Guam. The plants were introduced to the Philippines from *Guam*. The name *atcaparas* is a local version of the Spanish *alcaparro*. However, the use of capers as food, or rather, garnishes, was a Spanish custom and not practiced by the original inhabitants of Guam, prior to the era of Spanish occupation.

CLEOME Linnaeus

Herbs, some suffrutescent; usually glandular-pubescent; some throny; leaves alternate, palmate or rarely simple, leaflets usually few, some serrulate; stipules present or not; inflorescence racemose, few to many-flowered, terminal or lateral, usually bracteate; calyx 4-parted; petals 4, often unequal; disc usually present; stamens 6 or rarely 4, borne on the androgynophore; ovary usually stipitate on the androgynophore; ovules many; fruit a dry silique, opening by 2 valves, often much elongated.—About 150 spp. mostly tropical.

One species in Guam.

Cleome viscosa L., Sp. Pl. 672. 1753. Safford 1905: 231. Merrill 1914: 85.
MONGGOS-PALUMA; MONGOS-PALOMA.

An erect herb; leaves trifoliolate (or rarely with 5 leaflets), long-petiolate; foliage with rank odor; glandular-pubescent; flowers in bracteate terminal racemes, yellow; petals 4; fruit podlike, slender, 3–4 cm long, dehiscent; seeds numerous, reniform, reddish-brown, small.

A pantropic weed, of uncertain origin. Pati Pt. (*Moran*); Mangilao (4159).

PAPAVERACEAE

Herbs or shrubs, rarely trees; leaves alternate, simple, often lobed; stipules absent; flowers perfect; calyx of 2 or 3 sepals, often united and falling together as a calyptra; corolla of 4–6 or more petals, free, rarely lacking; stamens many; ovary superior, 1-celled; placentae parietal; ovules many to 1; fruit capsular.—Some 26 genera and 195 or more species, mostly of the N. temperate zone.

ARGEMONE Linnaeus

Prickly, glaucous, laticiferous perennial herbs; flowers yellow or white, rarely red. Leaves alternate, sessile, pinnatifid to repand-lobate, spinulose-dentate; flowers large, terminal, often on short axillary branches; sepals 2–3; petals 4–6; stamens many; ovary many-ovuled, placentation parietal, style short; fruit capsular, opening at the top by 3–6 valves; seeds cristate, scrobiculate.—Temperate and subtropical America; species 10 or 12, one native in Hawaii.

Argemone mexicana L. Sp. Pl. 508. 1753. Walker & Rodin 1949: 459.
PRICKLY POPPY.

Coarse erect herbs with milky sap and prickly stems and leaves; leaves somewhat irregularly pinnatilobed and serrate, glaucous, the edges crisped-undulate, each tooth spinose; flowers sessile, yellow, showy, up to 6 cm broad.

Mexico and the West Indies. Sometimes cultivated; often naturalized. Agaña (near Perez Bros. Store) (4160); Tamuning; Tumon.

CRUCIFERAE

Herbs or rarely shrubs; leaves simple, alternate, sometimes lobed; stipules absent; flowers perfect; sepals and petals 4; (or petals sometimes absent); stamens

6, *didynamous*, i.e. 4 long and 2 short; ovary superior (1)-2-celled, divided by a false septum, with 1-many ovules, on parietal placentas; fruit usually dehiscent, a silique or silicle.—About 370 genera and 3000 species, of wide distribution especially in N. temperate zone.

Five genera have been reported for Guam.

Key to Genera

1. Fruit a laterally flattened silicle [a short pod], less than 3 times longer than wide. Erect, small, branched herb with white flowers; a weed in waste ground or lawns ..... *Lepidium*
1. Fruit long and slender, [a silique], more than 3 times longer than wide; or if a silicle, then terete or dorsally flattened.
   2. Petals white or purple.
      3. Capsule indehiscent ..... *Raphanus*
      3. Capsule dehiscent.
         4. Capsule an inflated silicle ..... *Cochlearia*
         4. Capsule a silique ..... *Nasturtium*
   2. Petals yellow ..... *Brassica*

COCHLEARIA Linnaeus

Glabrous annual or perennial herbs; leaves alternate, entire or pinnately parted; flowers white or purple (rarely yellow), racemose seeds several to many.—25 species; chiefly of far northern regions of the N. hemisphere.

COCHLEARIA ARMORACIA L. Sp. Pl. 648. 1753. HORSE-RADISH.

Recognizable from the above description. Wellgrown plants up to 50 cm tall. Flowers white.

A native of E. Europe; ill-adapted to Guam, and seldom planted. The pungent grated root is a useful seasoning for meats. As a substitute, the "horse-radish tree", *Moringa*, may be used.

BRASSICA Linnaeus

Erect herbs with pinnately parted leaves, or sometimes pinnate; or in cultigens sometimes entire; flowers yellow; petals clawed; fruit a silique, with a conical beak.—Perhaps 100 species, N. Africa, Europe, and Asia; many known only in cultigen form (e.g. cabbage, mustard, cauliflower, turnip, rape, kohlrabi, etc.)

1. Erect, slender herbs, the upper leaves not or barely clasping the stem .... *B. juncea*
1. Herbs, often compact, in "heads" of leaves ..... *B. pekinensis*

BRASSICA JUNCEA (L.) Coss, Bull. Soc. Bot. France 6: 609. 1859.

Merrill 1914: 84. MOSTAZA. MUSTARD, INDIAN MUSTARD.

Annual herb to 100 cm tall, flowers bright yellow.

A temperate-Asian plant, cultivated for its pungent seeds, one of the cources of mustard powder, or for its edible leaves. Not seen recently in Guam, but oc-

casionally grown in gardens as a potherb.

BRASSICA PEKINENSIS (Lour.) Skeels, U.S. Dept. Agri. Bur. Pl. Ind. Bull. 227, 51. 1911. CHINESE CABBAGE.

Erect herb with pale yellow flowers, cultivated for the edible leaves, these in a compact "head".

A native of China, widely planted now in Asia. This plant will grow fairly well in Guam, while the European cabbage (*B. oleracea*) will not.

A great many cultigens, usually given specific names, have been developed in this genus, and nearly all parts may be eaten in one or another of the various types; tubers (kohlrabi); leaves (cabbages); flowers and inflorescence axes (cauliflower); leafy buds (Brussels-sprouts); seeds (mustard) or roots (mustard and turnip).

NASTURTIUM R. Brown

Perennial semi-aquatic herbs; leaves pinnate; flowers many in ebracteate racemes, the petals white; fruit a slender silique, the many small seeds in 2 series.—About 6 species.

NASTURTIUM OFFICINALE R. Brown ex. Ait. Hort. Kew, ed. 2, 4: 111. 1812.

Glabrous, rhizomatous, to 40 cm long, somewhat coarse-stemmed, leaves petiolate, pinnate, leaflets 3–9, ovate, slightly serrate; racemes elongate; siliques 1–2 cm long.

A Eurasian species, cultivated widely for its edible leaves, sometimes becoming naturalized.

LEPIDIUM Linnaeus

Herbs; flowers small, green or white, in terminal racemes; stamens sometimes 4 or 2; petals often absent; fruit rounded or ovate, flat, wingless; seeds 2, one in each cell.—Perhaps 100 species, of wide, chiefly temperate, distribution.

One species in Guam.

Lepidium virginicum L. Sp. Pl. 645. 1753. PEPPERGRASS

An erect, branched, somewhat bushy herb to 30–50 cm high; basal leaves lobed (terminal lobe the largest), cauline leaves smaller, subentire, alternate, about 2.5 cm long or less, subsessile, serrate; flowers white; fruit about 3 mm wide, subcircular, apically notched.

A widely distributed weed, originally American. Harmon, in lawns (4000); Mangilao (4157).

Another species, *L. sativum* L., may occur in cultivation; I have not seen this plant. It may be distinguished by its larger fruits, about 5×3 mm, of an elliptic shape.

RAPHANUS Linnaeus

Coarse erect herbs; taproot fleshy; leaves pinnatilobed; flowers white or purplish; fruit an indehiscent silique, constricted between the seeds.—Six species

of Europe and Asia.

RAPHANUS SATIVUS L. Sp. Pl. 669. 1753. Merrill 1914: 84. RADISH.

Annual herb, cultivated for the fleshy root, often naturalized in temperate countries, ephemeral.

Occasionally cultivated in Guam.

[*Raphanus raphanistrum* L. Sp. Pl. 669. 1753, a weedy plant; possibly ephemeral in Guam].

MORINGACEAE

Trees, rather soft-woody; leaves bi- or tri-pinnate, alternate; stipules none; flowers perfect, in panicles, irregular; somewhat papilionoid; sepals 5, petals 5, free, stamens 8–10, fertile alternating with sterile; ovary on a short gynophore, 1-celled, with 3 parietal placentae; ovules many; fruit a 3-valved, 3-sided capsule, subcylindric; seeds often winged.—Monotypic.

MORINGA Adanson

With the characters of the family.—About 12 spp., Africa to India.

MORINGA OLEIFERA Lamarck, Encycl. 1: 398. 1785. Merrill 1914: 85.
HORSERADISH-TREE; MARUNGGAI; MALUNGAY; KATDES.

Guilandina moringa L. Sp. Pl. 381. 1753.

Moringa moringa (L.) Millspaugh, Field Columb. Mus. Bot. 1: 490, 1902. Safford 1905: 327, pl. 58. (nom. tauton. illegit.).

A smallish soft-wooded tree with corky bark, pungent roots, bi-tripinnate leaves up to 50 cm long with obovate leaflects about 1–1.5 cm long, somewhat grayish-green; inflorescences axillary, shorter than the leaves, paniculate; flowers white, about 1.5–2 cm long, somewhat zygomorphic; fruit pendent, elongate, 3-angled, up to 30 cm long, 9-ribbed, opening by 3 valves; seeds 3-angled, winged at the angles, many.—Fig. 42.

A native of India, now widespread in cultivation. Besides the edible peppery roots, the tree yields an oil ("ben oil") from the seeds. Leaves and young pods may also be eaten. Mangilao (3843).

CRASSULACEAE

Succulent herbs or shrubs; leaves simple or compound, alternate, opposite, or whorled, or basal and rosulate; stipules none; inflorescences usually cymose; flowers perfect, sepals 5, rarely less or more, imbricate; petals the same number as sepals, free or somewhat connate; stamens as many or twice as many as petals, free; ovary composed of as many carpels as there are petals, free or basally connate; ovules many, axile; carpels each with basal nectary; fruit a group of follicles; seeds very small.—35 genera, 1500 species, compolitan.

One genus in Guam.

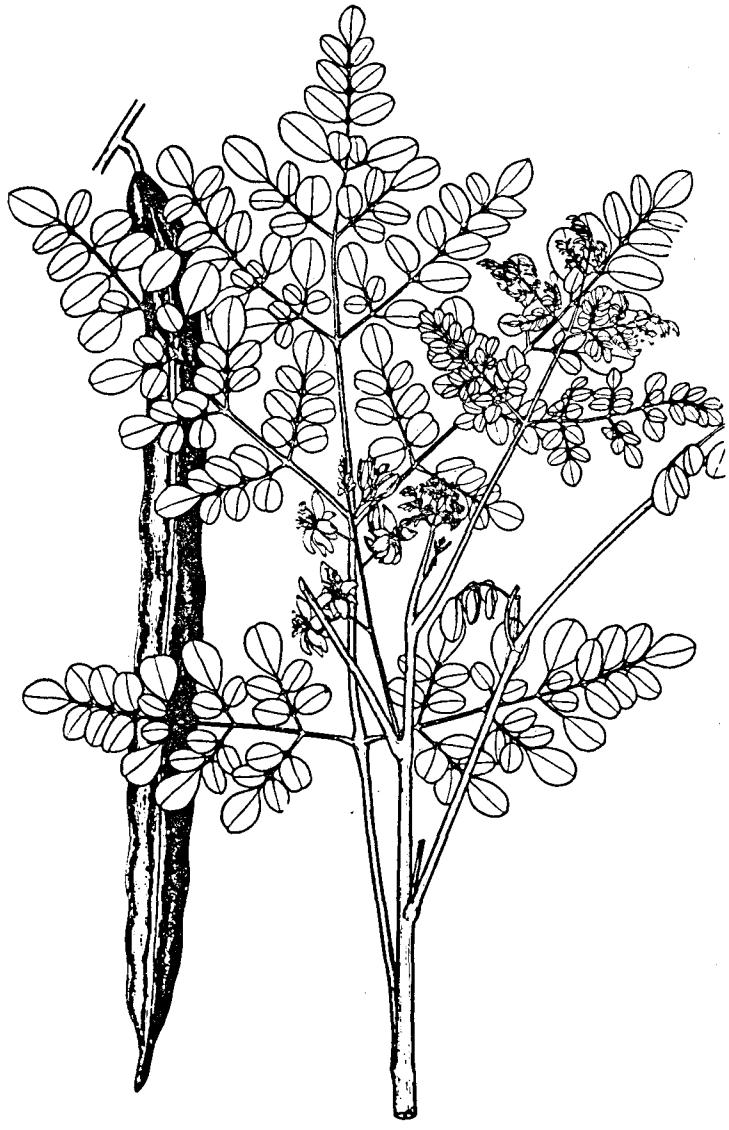

Fig. 42. Moringa oleifera.

KALANCHOE Adanson

Erect herbs with opposite leaves; calyx 4-lobed; corolla 4-lobed, salverform; stamens usually 8; carpels 4; ovules many; fruit a follicle.—About 200 species, mostly African or W. Asian, 1 at least of Tropical America (Brasil).

Key to species

1. Leaves simple or pinnate, leaflets usually 3; blades broadly elliptic, much

broader than thick, margins crenate.....*K. pinnata*

1. Leaves simple, linear or nearly so, subterete, almost as thick as broad, not crenate.....*K. tubiflora*

Kalanchoe pinnata (Lam.) Persoon, Syn. 1: 446. 1805.

Bryophyllum calycinum Salisbury, Parad. Lond. t. 3. 1805.

B. pinnatum (Lam.) Oken, Allg. Naturg. 3, 3. 1841. Kurz, J. Asiatic Soc. Bengal 40 (2): 52. 1871. Safford 1905: 203. Merrill 1914: 85.

Cotyledon pinnatum Lamarck, Encycl. 2: 171. 1786.

SIEMPRE-VIVA. AIRPLANT.

Succulent, suffrutescent, glabrous, erect, un- or sparingly branched; stems pale buff-gray, smooth; up to 1 m tall; leaves opposite, simple or pinnate with 3–5 leaflets; petioles to 10–12 cm long; petiolules 3–5 mm long; blades up to 20×10 cm, broadly elliptic, margins crenate, each crenation bearing at the notch a vegetative bud which (when leaf is detached) may produce rootlets and stem eventually yielding a complete new plant; flowers red and green, cylindric, pendent, 3–5 cm long, 4, parted, in terminal panicles; stamens 8; fruit follicular.

A native of the Indian Ocean islands, now widespread both in cultivation and as an occasional cultivated garden plant. The vegetative propagation of the plant from the leaves is very easy, and often used in biology classes.

In Guam often found naturalized near beaches, as near the Harmon beach.

KALANCHOE TUBIFLORA (Harvey) Hamet, Ann. Mus. Col. Marseilles ser. 3, 2: 125. 1914.

Bryophyllum tubiflorum Harvey, Fl. Cap. 2: 380. 1862.

?*Kalanchoe verticillata* Scott-Elliot, J. Linn. Soc. Bot. 29: 14. 1891.

Succulent erect herb to 60 cm tall; leaves slender, subterete, vegetative buds only at apex, generally purplish-blotched, or transversely striped, leaves to 12 cm long, 6 mm thick, usually whorled in threes on the stem and crowded toward stem end; flowers about 2–2.5 cm long, red, corolla much longer than calyx, 4-parted, pendent.

A native of Madagascar, now cultivated widely.

A few plants of this species have been seen in gardens; none seen naturalized as yet. Tumon High School (4385).

ROSACEAE

Herbs, shrubs, trees, or vines; leaves alternate, simple or compound; often serrate; stipules present; flowers usually perfect and regular; sepals 4–5; petals 4–5 or many, rarely absent; stamens 5-many, or 1 or more series; carpels 1-many, free or connate; each with 1-several ovules; ovary superior, half-inferior, or inferior; receptacle sometimes enlarged and fleshy; fruit a follicle, achene, drupe, pome, or hip.—100 genera, 2000 species, cosmopolitan.

Key to genera [all introduced]

1. Perianth and stamens perigynous, the ovary half-inferior.

2. Trees or shrubs;
   3. Tree; hypanthium cupular, lacking a central column; fruit a drupe ..... *Prunus*
   3. Prickly shrub; hypanthium urceolate; fruit a hip..... *Rosa*
2. Prostrate herb; hypanthium with a central column; fruit a compound of achenes on the enlarged fleshy column..... *Fragaria*

1. Perianth and stamens epigynous; ovary inferior; trees with fleshy fruit..... ..... *Eriobotrya*

ERIOBOTRYA Lindley

Shrubs or small trees; leaves simple, veiny; flowers creamy white, 5-parted, in tomentose terminal panicles; stamens about 20; fruit a pome, fleshy, carpels connate; endocarp thin; seeds 1 or few, large.—30 E.Asian species.

ERIOBOTRYA JAPONICA (Thunb.) Lindley, Trans. Linn. Soc. Bot. 13: 102. 1822. Merrill 1914: 85. LOQUAT.

Tree to 5 m. tall, flowers cream-colored, leaves obovate, 15–25 cm long, 3–5 cm broad, acute at both ends, slightly toothed, woolly-pubescent; petiole to 1 cm long; stipules narrowly deltoid lanceolate; fruit globose or pyriform, 3–4 cm thick, yellow, edible, acid; seeds smooth dark brown.

Native of Japan and China, introduced to Guam around 1910. Doubtfully persisting; not seen in 1962–65.

FRAGARIA Linnaeus

Stoloniferous perennial herbs, pubescent; leaves radical, alternate, trifoliate, margins serrate; stipules partially adnate to petiole; flowers borne on scapes, white, petals 5–8, stamens many; receptacle subglobose, fleshy in fruit; carpels many, free, style lateral, ripening to small achenes partly embedded on the enlarged receptacle.—Perhaps a dozen species, chiefly of temperate regions.

FRAGARIA ?INDICA Andr., [ex Bryan, 12 Nov. 1959]. STRAWBERRY.

With the characters of the genus. The fruit is the well-known strawberry, usually red and sweetly tart. The identity of the strawberry, introduced by the G.E.S. in 1911, is unknown; Bryan thinks it probably was the Indian strawberry. Newer introductions may utilize hybrids, especially *F.* × *annanassa* Duchesne, for their improved, large fruits. I found no evidence of naturalization or persistence.

PRUNUS Linnaeus

Trees or shrubs; leaves stipulate, simple, serrate; flowers red, pink, or white, showy, 5-parted, but stamens many; inflorescences racemose or fasciculate; fruit a drupe, flesh often edible.—400 species, or more, chiefly temperate.

PRUNUS PERSICA (L.) Stokes, Vot. Mat. Med. 3: 100. Bryan, 12 Nov. 1959. PEACH

Small tree to 8 m tall; leaves lance-oblong, serrate; flowers pink or variegated; fruit pubescent, globose, grooved, yellowish; flesh soft, sweet.

A native of China, introduced to Guam in 1910, the peach is ill-adapted to local conditions, but can be grown if careful attention is paid to providing excellent drainage; even so the fruits are not of the best quality.

ROSA Linnaeus

Erect or scandent shrubs, armed with prickles on the stems; leaves pinnate; stipules adnate to petiole; flowers solitary or clustered, red, pink, white, yellow, or variegated, often large and showy, double forms in cultivars; sepals 5; petals 5 or more; stamens and ovaries numerous; receptacle urceolate, at maturity a *hip* enclosing several to many achenes.—More than 200 species; chiefly in the northern hemisphere in temperate regions.

1. Leaflets mostly 5–9; prickles numerous; flowers red or pink, clustered..... .....*R. damascena*
1. Leaflets mostly 3–5; prickles few; flowers pink or white, or yellowish, rarely red, few in a cluster.....*R. indica*

ROSA DAMASCENA Miller, Gard. Dict. ed. 8, no. 15. 1768.

Erect, robust shrub; leaflets ovate-oblong, to 7×5 cm, puberulent beneath on midrib; petiolules obsolete; flowers in corymbs, fragrant; hypanthium pilose within; petals red to white, not yellow or orange.

ROSA INDICA L. Sp. Pl. 492. 1753.

A thorny shrub; see key for differences.

In cultivation in Guam, usually as a pot plant, not common.

LEGUMINOSAE

Herbs, shrubs, tree or vines, twining or scandent, herbaceous or woody, leaves alternate, stipulate, simple or usually compound, pinnate or digitate, the leaflets often stipellate; sepals 5, connate basally; petals 5 (rarely less), actinomorphic or papilionoid or only slightly unequal; usually free, or basally connate, or only some connate; stamens many or 10, free or connate, usually in 2 unequal-numbered groups: ovary usually solitary, 1-locular (a single carpel), superior, with 1-many parietally borne ovules; fruit a legume (pod) of 2 valves, usually dehiscent, rarely fleshy, sometimes jointed between the seeds (a loment); seeds without endosperm (beans).—550 genera, 13,000 species, cosmopolitan.

Key to subfamilies

1. Flowers actinomorphic, small, often congested in heads, calyx tubular; stamens 5- many, exserted.....*Mimosoideae.*
1. Flowers slightly to markedly zygomorphic; often large and showy, rarely congested in heads; sepals 5, imbricate; stamens 10 or less, free, or united.
   2. Flowers barely zygomorphic; stamens free.....*Caesalpinoideae*
   2. Flowers markedly zygomorphic, papilionoid, with 2 petals connate to form the keel; 2 lateral petals (wings); 1 larger petal, often erect or reflexed and with unique pattern or coloration (rarely reduced), the banner

or standard; stamens usually connate in bundles, often 9 together and 1 free..... *Papilionoideae*
[Exception: Inocarpus].

Subfam. Mimosoideae

Key to Genera [Artificial]

1. Trees or erect shrubs;
   2. Flowers yellow; leaves (in some sp.) replaced in adult plants by falcate phyllodes; tree or (spiny) shrubs..... *Acacia*
   2. Flowers white, creamy, or pink; leaves all normal.
      3. Spiny plants,
         4. Leaf with 2 leaflets; each leaflet of only 2 pinnules; pod twisted ..... *Pithecellobium*
         4. Leaflets more than 2, pinnules more than 2; pods straight..... ..... *Prosopis*
      3. Spines absent,
         5. Flowers pink,
            6. Pods thick, elongate, black, glabrous, sweet-pulpy within; cult. tree..... *Samanea*
            6. Pods not pulpy, densely pubescent; wild, very rare, tree ..... *Serianthes*
         5. Flowers white or creamy,
            7. Pods twisted; seeds lenticular, red..... *Adenanthera*
            7. Pods flat; seeds flattened, brown.
               8. Trees or stocky shrubs with stout trunks,
                  9. Pods very pale (nearly white); seeds few (2–4); leaflets 1 cm wide or more..... *Albizia*
                  9. Pods dark brown; seeds rather numerous (6–15); leaflets less than 1 cm wide..... *Leucaena*
               8. Slender-stemmed shrubs less than 2 m tall, flowers in hemisphaeric heads..... *Desmanthus*
1. Woody vines..... *Entada*

MIMOSOIDEAE

Natural Key

1. Filaments free or nearly so,
   2. Stamens numerous (more than 10)..... *Acacia*
   2. Stamens 10 or fewer,
      3. Anthers with no glands,
         4. Valves of pod remaining attached to margins (sutures); prickles none; erect shrubs or trees,
            5. Pods slenderly linear; flowers in semiglobose (hemispheric)

heads; slender shrubs.....*Desmanthus*
5. Pods broadly linear, flat; flowers in globose heads; stout shrubs or trees.....*Leucaena*
4. Valves of pod separating from the marginal futures; prickly plants, low shrubby or creeping.....*Mimosa*
3. Anthers with an apical gland [sometimes falling from older ones]
6. Fruit splitting transversely into 1-seeded segments, these falling from the persistent margins (sutures); pods gigantic; seeds over 2 cm broad; climbers.....*Entada*
6. Fruit opening all along the sutures, twisting to reveal the red lenticular seeds; trees with small pods.....*Adenanthera*
6. Fruits indehiscent, rather pulpy; prickly trees.....*Prosopis*

1. Filaments connate-tubular,
7. Fruits indehiscent, stright or nearly so; no prickles or thorns,
8. Fruit septate between the seeds, rather thick,
9. Flowers in short terminal racemes;.....*Serianthes*
9. Flowers in globose heads.....*Samanea*
8. Fruit not septate, thin.....*Albizia*
7. Fruit dehiscent, coiled; stems prickly-thorny.....*Pithecellobium*

MIMOSOIDEAE

Acacia Miller

Almost all trees or shrubs; often prickly or spiny; leaves bippinnate; adult foliage often reduced to petiolar phyllodes; flowers in cylindric spikes or globose heads, generally yellow; bracts often 2; flowers 5–3-merous, bisexual or polygamous; calyx tubular or of nearly free sepals; petals usually connate, rarely absent; stamens numerous, exserted, free or partly connate; ovary 2-several-many-ovulate; fruit straight or contorted, that or terete, dehiscent or not; seeds sometimes arillate.—About 900 spp., Africa through Asia to Australia and the Pacific.

Two species in Guam, both introduced.

1. Unarmed trees with falcate phyllodes.....*A. confusa*
1. Prickly shrubs with bipinnate normal adult foliage.....*A. farnesiana*

Acacia confusa Merrill, Philipp. J. Sci. C. Bot. 5: 27. 1910.

Stone, Micronesica 2(2): 137. 1966.

Small tree, adult foliage of falcate phyllodes, juvenile and sucker-shoot foliage of bipinnate leaves; trunk up to 1 m thick in very old trees; phyllodes alternate, coriaceous, parallel-curving-veined, 8–10 cm long, narrowed at both ends; flowers yellow, in small globose heads 6–8 mm in diameter; heads 1 or 2 in axil of phyllode; pods few together, linear or somewhat curved, flat or slightly twisted, brown, 5–10 cm long, 1 cm broad or a little more or less, with about 8 seeds; seeds compressed, brown.

A native of the Northern Philippines; naturalized extensively in Taiwan, Okinawa, and Saipan, but scarce in Guam, and so far only present in cultivation, as at the College of Guam Campus, where I planted a few individuals in 1964. It has been in the other Marianas, however, for many years, and in Saipan especially it is one of the commonest trees now present there. It is very attractive and of a good shape and size; planting is recommended.

Acacia farnesiana (L.) Willd. Sp. Pl. 4: 1083. 1806.

Acacia farnesiana (L.) Willd. Sp. Pl. 4: 1083. 1805. AROMA. KLU.

Vachellia farnesiana (L.) Wight & Arnott, Prodr. 272. 1834.

Erect much-branched shrub; leaves with 4–8 pairs of pinnae, pinnae with 10–20 pairs of small leaflets; stipular thorns straight and slender; flowers in pedunculate axillary heads, 1–3-heads together, subglobose; flowers yellow, fragrant; heads about 1.3 mm across; stamens numerous; pods dark brown or black, up to 8 cm long, to 12 mm broad, plump, often slightly curved; pulp within sweetish; seeds compressed, elliptic, brown.

Tropical America; now widely distributed as a weed or by deliberate cultivation. The name *aroma* is from Spanish. This spiny shrub is not especially common in Guam but where it occurs can be a noxious weed.

ADENANTHERA Linnaeus

Unarmed trees with bipinnate leaves; leaflets many; flowers in elongate racemes, 5-merous, white to yellow, bisexual or polygamous; calyx campanulate, toothed; petals coherent or free; stamens 10, free, hardly exserted; anthers each with an ephemeral apical gland; ovary with many ovules; fruit often contorted, 2-valved-dehiscent; seeds scarlet or red-and-black.—12 Asiatic- Australia—Pacific species, one in Guam.

ADENANTHERA PAVONINA L. Sp. Pl. 384. 1753. Safford 1905: 175. Merrill 1914: 86. KOLALES.

Medium sized, deciduous tree; leaves with 2–6 pairs of pinnae; leaflets 6–12 pairs, 2–5 cm long, ovate, obtuse, glabrous, rather pale green, thin; flowers in slender, elongate racemes, borne in axils; flowers yellowish, sweet-fragrant; calyx 4–5-toothed; stamens 8–10; pods slender, linear, curved or contorted, dehiscent, thin, flattened, brown, smooth and shiny inside; seeds lenticular, suborbicular, hard, dark or bright red, about 8 mm wide, 10–12 per pod.

A native of the Malaysian area, but widely cultivated and probably introduced deliberately to Guam, perhaps from the Philippines. It is attractive as a shade tree; but its real interest is the colorful red seeds, which may be strung for necklaces. The seeds have been used as standard weights—they all are nearly the same (about 4 grains) in weight.

It is not common in Guam, but goodsized trees may be seen in La Cienaga,

and along the cliff road above Ipao Beach Park towards Tumon.

The name Kolales is from the Spanish corales, meaning corals or beads.

ALBIZIA Durazzini

Trees or shrubs; leaves bipinnate; petiole and rachis with glands; stipules large, small or obsolete; flowers in globose heads or spikes, often 5-merous, usually bisexual, calyx toothed, petals connate to or beyond the middle, stamens 10, connate basally, exserted; fruit thin, flat, indehiscent, or 2-valved.—About 145 species, tropics and subtropics.

ALBIZIA LEBBECK (L.) Bentham, in Hook. H. Bot. 3: 87. 1844.

Merrill 1914: 86. TRONGKON-MAMES; MAMIS; SIRIS-TREE.

Medium to large tree with gary-brown bark; leaves bipinnate, the primary leaflets subopposite, 2–4 pairs; ultimate leaflets opposite, 6–8 pairs, oblong, slightly asymmetric, blunt, 2.5–4.5 cm long; flowers fragrant, in loose heads, pedicellate, the head 2–4 cm broad, whitish; stamens long-exserted; pods flat, thin, pale straw-colored when mature, 15–20 (rarely 30) cm long, 2.5–3.5 cm wide, few-seeded, the seeds bulging; pods drying, opening slightly or not.

A paleotropical species, Africa to Australia; often planted as a fast-growing shade tree. Not very common in Guam, but very abundant in Saipan. Merizo (4246).

The rattling of the dry pods has given the tree the name 'woman's-tongue'. The wood is moderately heavy and rather difficult to work, but is used in India. The shallow root system makes it liable to topple in typhoons.

DESMANTHUS Willdenow

Trees, shrubs, or perennial herbs; leaves bipinnate; stipules setaceous; persistent; petiolar gland often between lower jugae; flower-heads ovoidglobose, axillary, solitary; calyx campanulate; petals free (or nearly so); stamens 10 or 5, free, exserted; anthers not gland-tipped; ovary subsessile, with many ovules; stigma terminal; fruit linear to falcate, compressed, continuous within or slightly septate; seeds compressed.—22 species, New World and Madagascar; one in Guam.

Desmanthus virgatus (L.) Willd. Sp. Pl. 4: 1047. 1803.

Stone, Micronesica 1: 134. 1964.

A slender erect shrub 1–3 m tall; primary leaflets 2–7 pairs; secondary leaflets 10–25 pairs, very small, about 6 mm long, quickly wilting if picked, narrow; flowers in semiglobose heads, white; lowest flowers in head sterile; pods elongate, narrow, 5–9 cm long, brown, with many-seeds.

Native of Tropical America; known to have reached Hawaii shortly after 1900; first recorded from Guam in 1964. A weed, sometimes noxious. Mangilao (4182).

ENTADA Adanson

Tall woody climbers or shrubs; leaves bipinnate, the terminal pair of pinnae sometimes converted to a tendril; petiolar glands absent; flowers in spipes, these solitary, paired, or racemose; flowers bisexual or polygamous; 5-merous; calyx campanulate, toothed; petals essentially free; stamens 10, free; anthers gland-tipped (the gland deciduous); ovary subsexxile, ovules numerous; fruit straight or curved, large to very large, the sutures woody, persistent, the valves breaking away from them as 1-seeded segments; seeds compressed-orbicular, large or very large.—About 40 species in the Tropics.

Entada pursaetha De Candolle, Mem. Leg. 421.

GAYI. GOYE. BAGOGO. BAYOGON DANGKULO. LODUSONG. SNUFFBOX-BEAN

E. phaseoloides (L.) sensu Merrill, 1914: 86.

Lens phaseoloides L. ex Stickm. Herb. Amb. 18. 1754; sensu Safford 1905: 308, pl. 56.

Woody climber, stems to 5 cm thick; with bipinnate leaves; pinnae a few pairs;

Fig. 43. Entada pursaetha.

leaflets about 4–6 pairs; terminal pinna and leaflet none, a forked tendril in its place; leaflets narrow elliptic or slightly ovate or ovovate, acute or obtuse at each end, mostly 3–6.5 cm long, 1.5–3 cm wide, glabrous. Flowers in elongated spikes, whitish; pods to about 1 m long and 9 cm broad, somewhat incurved between the seeds; seeds 5–6 cm broad, glossy dark mahogany-brown.—Fig. 43.

The enormous pods, some exceeding a length of 1 m, with their big, nearly circular, compressed-convex glossy brown seeds 5 or more cm broad, make this plant very striking. The seeds are sometimes found in drift along open beaches (and may have arrived from distant sources).

Fairly abundant in Guam, though mature pods are not seen easily. Talofofo valley (3967, 3991). Inarajan R. hills (5052).

LEUCAENA Bentham

Unarmed trees or shrubs; leaves bipinnate with many leaflets; flowers in globose heads, these axillary; bracts often 2; flowers 5-merous, usually white; calyx tubular; petals free; stamens 10, free, exserted; ovary with many ovules; fruit stipitate, flat, more or less dehiscent.—About 50 species, mostly of Tropical America, a few in the Pacific.

Two species in Guam.

Leucaena leucocephala (Lam.) DeWit, Taxon 19(2): 54. 1961.

TANGAN-TANGAN.

L. glauca (L.) Benth. in Hook. J. Bot. 4: 416. 1842. Safford 1905: 308. Merrill 1914: 86.

Mimosa leucocephala Lamarck, Encycl. Meth. Bot. 1:12. 1783 (Dec.)

Shrub or small tree, up to 5 (rarely 10) m tall; leaves bipinnate, to 25 cm. long; pinnae about 5 (4–9) pairs, up to 8–10 cm long; leaflets about 12 (11–17) pairs, about (7–) 9–12 mm long, 2–3.5 (–4) mm wide, opposite, lanceolate, acute; somewhat dull, grayish-green; flowers in globose, pedunculate heads, to nearly 3 cm thick; peduncles to 5–6 cm long; corolla and stamens white; calyx 2.5 mm long; petals linear; stamens 10, nearly 1 cm long, anthers hairy; ovary faintly pubescent at apex; pods clustered, linear, flat, 10–15(–20) cm long, 1.8–2 cm wide, dark brown, beaked at apex, with about 20 (18–25) seeds, these glossy brown, oval-oblong, flat, 6 mm long.—Fig. 44.—Pl. 7b.

Native of Tropical America, whre it is not a particularly abundant tree but may reach a height of 10 or even 15 meters; now widespread chiefly as a weed or deliberate introduction, virtually pantropical; in many Pacific Islands having become exceedingly abundant, as it has not natural enemies, is fast-growing, tolerates disturbed habitats, preferring limestone, sets seed prolifically, and is often planted as a shade tree (e.g. in plantations). Although rather unsightly and having a tendency to form pure stands with many crowded slender trunks, it is not as bad a pest as some people believe. It presumably enriches the soil (by nitrogen-fixing bacterial root nodules—but this has not been proved); provides a ready feed for goats, but is not recommended for cattle or horses, as a chemical, *mimosine*, causes hair to

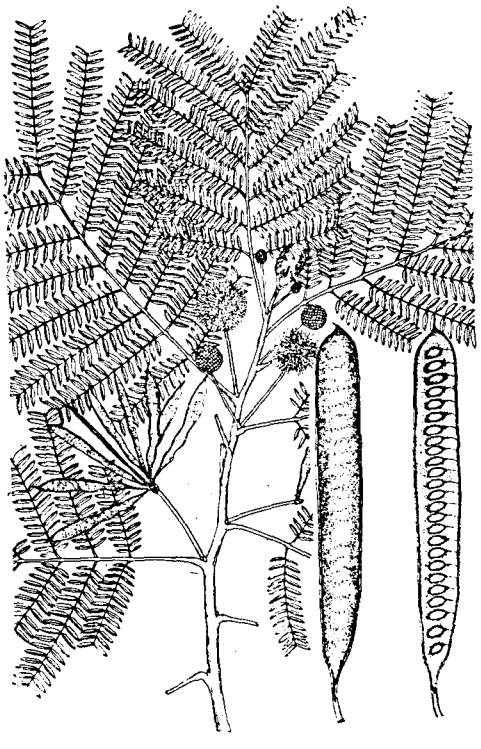

Fig. 44. Leucaena leucocephala.

fall from manes and tails in these animals; is a good source of wood for charcoal, and of leaves for green manure. Furthermore it is not spiny- a trait of many a worse weed. It cannot tolerate volcanic savannah soils, however, and thus is restricted to limestone or mixed soils, though it can spread along the borders of new or repaired roads where coral-gravel is used. Hence it is not found in much quantity in southern Guam; but in central and northern Guam it is probably the single most abundant plant.

Leucaena insularum (Guillemin) Däniker, Vierteljahrsschr. Nat. Ge. Zurich, 77, Beibl. 19, 176. 1932.

var. ***guamensis*** Fosberg & Stone, Micronesica 2(1): 67. figs. 1–2 1965.

Shrub or small tree with rather dense compact crown, in protected places growing up to 10 m. tall, trunk to 20 cm diam., branchlets and leaves glabrate; leaves with mostly 3–8 pairs of pinnae; leaflets mostly 15–50 pairs per pinna, narrowly oblong, mostly 4–9 mm long, 1–2.5 mm wide, slightly unequal-sided, apically blunt, the margins obscurely ciliate or not; flowers in a small globose head, white; head pedunculate, single or 2–4 together, axillary, peduncle up to 4 cm long; bracts peltate; flowers bisexual, subsessile; calyx funnel-shaped, [lobes short], about 2–2.5 mm long; petals slightly longer, white, glabrous; 10 stamens white, 4–6 mm long; anthers with apical gland; ovary shortly stipitate, oblong, compressed, glabrous; pods clu-

Fig. 45. Leucaena insularum var. guamensis.

stered, straight or slightly curved, flat, thin, tapered at base, blunt at apex, when ripe nearly black, tardily dehiscent (valves not separating very widely), obscurely septate, margin very narrowly winged (wing less than 1 mm wide); mostly 6–8 or to 10 cm long and about 1.5 cm broad; seeds mostly 8–14, oblong-ovate, flattened, brown, 3–4 mm wide, 5–7 mm long; cotyledons embedded in scanty albumen (?). —Fig. 45.

Cocos Islet (4243); Asanite Bay (4920); head of Talofofo Bay (5042). Restricted to coastal areas of limestone or corar sand. In open wind swept localities stunted, flat-topped, and sometimes gregatrous, (as to Asanite Point), often only 1 or 2 ft. tall, or in more protected spots up to 1–2 m; in a few spots a tree 10 m tall.

According to F. J. Breteler (Acta Bot. Neerlandica 9: 397–403. 1960) this should be in the genus *Prosopis* because of the gland-tipped anthers, the scarcely dehiscent pods, and the scanty endosperm in the seeds; but if overall appearance counts, this must be a *Leucaena*, since it is difficult at first to distinguish from *L. leucocephala*. In fact, the authorities at the Rijksherbarium, Leiden, first determined

specimen 4243 as *L. leucocephala*. It would be highly interesting to attempt hybridizations between these 2 species of *Leucaena* in Guam; if hybrids resulted, they would have to be considered members of the same genus, whatever its name is.

MIMOSA Linnaeus

Trees, shrubs, or herbs; usually prickly; leaves bipinnate, often quickly mobile by retroflexion at pulvinate joints; rarely replaced by phyllodes; stipels usually present; flowers in spikes or globose heads; fls. 6–3-merous, bisexual or polygamous; calyx very small or reduced to cilia; corolla tubular; stamens twice as many as petals or the same number; anthers not glandular; fruit oblong or linear, more or less compressed, sometimes with prickly hairs; seeds flat.—About 600 species, pantropical and some in warm-temperate regions.

One weedy species in Guam [another, *M. invisa*, is found in Rota, etc.]

Mimosa pudica L. Sp. Pl. 518. 1753. Walker & Rodin 1949: 460.
SENSITIVE PLANT.

More or less prostrate perennial creeper; stems reddish-brown, prickly; leaves immediately folding by pulvini if touched or jarred; pinnae 4, often reddish; leaflets 12–25 pairs, linear, acute, bristly; 9–12 mm long, 1.5 mm wide; flowers pink, in globose heads, nearly 1 cm in diameter, axillary, peduncle up to 2.5 cm long; pods crowded, flat, prickly-bristly, indented between the few (2–4) seeds, to nearly 2 cm long; seeds about 2 mm broad, rounded, brown.

First described from Brazil; now a pantropical weed. Common in rather moist waste ground, in lawns, in open plantations, and weedy thickets. Rather well-known by virtue of the rapid completion of the leaf sleep-movements, and useful in biology classes for experiments. Mangilao; Agana; Merizo; etc.

Note: a related species, *M. invisa* Martius, the "giant sensitive-plant," also of Tropical America, with taller, more rigid, much more fiercely prickly stems, bigger leaves with rather insensitive folding, thicker flower heads, and longer pods, is abundant in Rota. It is a far more pestiferous plant than *M. pudica*, and is a noxious weed; it should be rigorously excluded from Guam if possible.

PITHECELLOBIUM Martius

Trees or shrubs, often armed with spines; leaves bipinnate; petiolar and jugal glands usually present; flowers mostly in globose heads or rarely in oblong heads or cylindric spikes, mostly white, 5–6-merous, bisexual or polygamous; calyx toothed; petals connate beyond the middle; stamens few to many, usually connate; fruit usually twisted and dehiscent.—As conservatively construed, a large genus of over 100 species; for a different treatment see Kostermans, 1955.

One species in Guam.

PITHECELLOBIUM DULCE (Roxb.) Bentham, in Hook J. Bot. 3: 193, 216. 1844. Safford 1905: 356. Merrill 1914: 85. KAMACHILE.

Small to medium tree, the trunk spiny; leaves bipinnate, each pinna with a single pair of leaflets; stipules spinose; leaflets asymmetric, ovateoblong, mostly a little

Fig. 46. Pithecellobium dulce.

over 2 cm long or up to 4 cm long, longer than the petiole; flowers greenish-white, fragrant, sessile in dense heads; calyx grayish-puberulent; stigma minute, capitate; pod irregularly swollen, twisted strongly, up to 12 cm long but seemingly shorter because of coiling, usually 6–8-seeded; pod with an inner sweetish white edible pulp (the funicules); seeds black.—Fig. 46.

Introduced to Guam from Mexico via the Philippines, probably for the tannin content of the bark (25%), and the edible pulp of the fruit. It has been in Asian countries for a long time, and was in fact first described from India by Roxburgh. In Guam it is quite common especially near villages. Cetti Bay (3901); Barrigada village (4985).

This tree is called 'Opiuma' in Hawaii; in Malaya, 'Madras-thorn'; elsewhere, 'Manila tamarind'. These latter two names are misleading and inappropriate.

SAMANEA Merrill

Big trees; leaves bipinnate; rachis with glands; stipules deciduous; flowers pedicellate forming globose heads, 5-merous, bisexual; calyx short-lobed; petals connate up to the middle; stamens many, basally connate, exserted; anthers not

glandular; ovary sessile, with many ovules; fruit straight or slightly curved, indehiscent, thick, but compressed, septate; seeds many, exarillate.—18 species of N. South America.

SAMANEA SAMAN (Jacquin) Merrill, J. Wash. Acad. Sci. 6: 47. 1916.

MONKEYPOD. RAINTREE.

Pithecolobium saman (Jacq.) Benth. in Hook. J. Bot. 3: 216. 1844. Safford 1905: 357.

Enterolobium saman (Jacq.) Prain, ex King, J. Asiat. Soc. Bengal 66: 252. 1897. Merrill 1914: 85.

A large to massive tree, the crown rounded, usually broader than tall; leaves with 2–8 pairs of primary leaflets, these each with 2–7 pairs of ovate to obovate leaflets 3–6 cm long; flowers in loose heads; corolla greenish-yellow, stamens dark pink; pods elongate, to 20–24 cm long, thick but compressed, black, pulpy within; seeds numerous.

Native of Tropical America; introduced to Guam from Honolulu by Safford. Some very big individuals may be seen just above Agaña along the southern, steep side of the road to Sinajaña.

A splendid tree, valued for its grateful shade and the attractive wood, frequently used for household ware, howls, salad spoons, etc., manufactured in Hawaii and in the Philippines. Upper Agaña (4008). The pods may be eaten by cattle. The leaves show fairly rapid folding sleep-movements in the evening and at the onset of a rainstorm; hence the name rain-tree.

The curious name 'monkey-pod' appears to be an inexact translation of Pithecellobium, the genus to which this plant was referred by Bentham, which means "monkey's-ear-ring". "Saman" is a vernacular name used in its native region.

SERIANTHES Bentham

Small to large trees, rarely shrubs; young growth usually with close ferrugineous hairs; lvs. bipinnate, pinnae and leaflets usu. many pairs; rachis with glands; l flts. sessile, usu. slightly unequal at base; stipules obsolete; inflorescence axillary, paniculate; bracts caducous; calyx cupular or tubular, with short lobes; petals 5, equal, slightly coherent at base, externally sericeous; stamens many, the filaments basally fused, exserted; ovary glabrous; pod thick woody indehiscent; seeds compressed, oblong, oval, or elliptic, transversely arranged.—10 species, Malaysia, Micronesia, Polynesia.

One endemic species in Guam; also from Rota.

Serianthes nelsonii Merrill, Philipp. J. Sci. 15: 542. 1919.

HAYUN LAGU. ["foreign" or "northern" tree].

Tree to 20 m; trunk to 2 m diam.; lvs. to 23 cm long, pinnae 10–20 pairs, subalternate; leaflets 22–30 pairs, c. 5×2 mm, glabrous above, glaucous and somewhat tomentellous beneath, bases somewhat unequal-sided; rachis with rusty-colored hairs; 5–10 cm long, paniculate; rusty-tomentellous; calyx narrowly cylindric or slightly dilated, 7–10 mm×2–3 mm, lobes 2 mm; corolla 15–23 mm long; pods

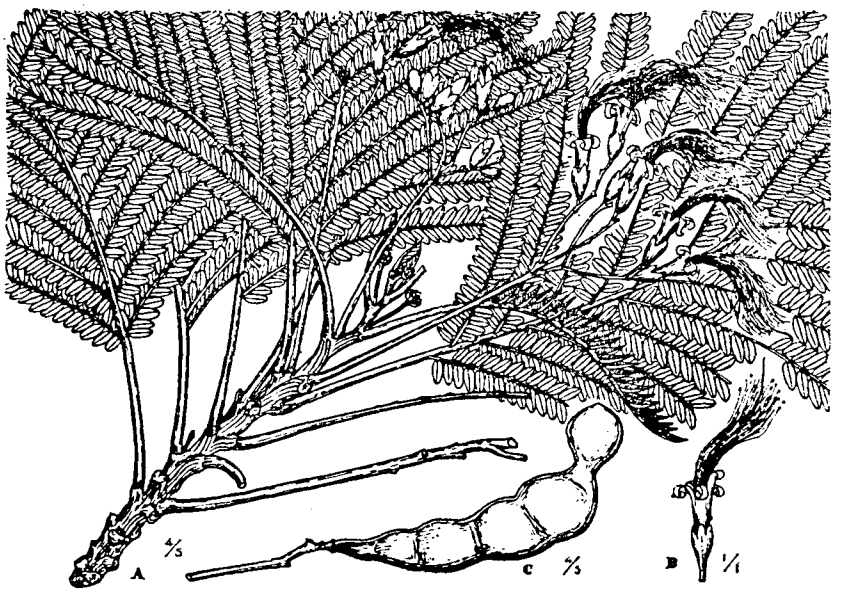

Fig. 47. Serianthes nelsonii.

12×2.3 cm, brownish hairy, slightly constricted between the seeds; seeds hard, shiny, smooth, brown, flattened, elliptic, about 10×8 mm.—Fig. 47.

Endemic, and quite rare in Guam and Rota. The species was discovered by Peter Nelson about 1916 in "Upe District and hills back to Abu"; since then it has been found by four others in Guam, and by Kanehira in Rota. The only known locality to me was pointed out by F.R. Fosberg, who showed me the tree from the lookout tower at Ritidian Point; it was easily half a mile away, and yet could be picked out of the dense surrounding vegetation because of the rusty-brown foliage. Although called "hayun lago" (foreign tree) by the Guamanians quoted by Nelson and by Marche, it is certainly a native species. The name would indicate that it has always been fairly rare. As it is both handsome and provides a superior timber, it should be sought out, and planted from cuttings and seeds, or if necessary, obtained from the Rota population.

The descriptions and notes are taken from a much fuller treatment of the genus *Serianthes* by Dr. Fosberg, in Reinwardtia 5(3): 293–317. 1960.

Subfam. Caesalpinoideae

Key to Genera [Artificial]

1. Leaflets 2, partly connate at base.....*Bauhinia*
1. Leaflets not connate,
   2. Leaflets 2 or 4, no terminal leaflet,
      3. Big trees; leaflets about twice as long as wide; flower with 1 white petal; pods compressed, elongate.....*Intsia*

3. Little, shrubby trees; leaflets 3–4 times longer than wide; flower with 5 whitish petals; pods ellipsoid, rugose..... *Cynometra*

2. Leaflets either 3 or more than 4,
   4. Spiny or prickly plants (shrubs, trees, or woody climbers).. *Caesalpinia*
   4. Unarmed (trees or shrubs),
      5. Leaves bipinnate; trees;
         6. Flowers red-and-yellow; leaflets about 8 mm long; pods dark brownish to black, thick-woody, up to 50–60 cm long and 8 cm wide..... *Delonix*
         6. Flowers yellow; leaflets about 1.5 cm long; pods thin, coppery, or brown, about 8–10 cm long..... *Peltophorum*
      5. Leaves simply pinnate; trees or shrubs,
         7. Flowers inconspicuous, 3 petals yellow with red stripes; pod thick, indented between the seeds, pulpy, indehiscent; cult. tree..... *Tamarindus*
         7. Flowers often rather showy, yellow or pink, petals 5; pod not as above, more or less dehiscent..... *Cassia*

Caesalpinioideae

Natural Key

1. Leaves simply pinnate; or 2 leaflets only joined at base or even entirely,
   2. Anthers opening lengthwise by slits,
      3. Fertile stamens 5 or more,
         4. Sepals free to the base; leaflets distinct..... *Cynometra*
         4. Sepals somewhat basally connate-tubular; leaflets 2, united at least basally..... *Bauhinia*
      3. Fertile stamens 3 or 2,
         5. Stipules large foliaceous; seeds not arillate; petal 1.... *Intsia*
         5. Stipules small, caducous; seeds ± arillate; petals 3.. *Tamarindus*
   2. Anthers opening by terminal pores..... *Cassia*
1. Leaves twice pinnate,
   6. Calyx-lobes imbricate in bud,
      7. Branches and rachises prickly; shrubs or trees, or climbers..... *Caesalpinia*
      7. Not prickly; trees..... *Peltophorum*
   6. Calyx lobes not imbricate; no prickles..... *Delonix*

Caesalpinoideae

Bauhinia Linnaeus

Trees, shrubs, and woody climbers; leaves simple, bilobed or entire, or nearly 2-foliolate; flowers in racemes, rarely corymbs or panicules, terminal or axillary; calyx 5-toothed or -lobed or spathaceous; petals 5, slightly unequal; stamens 10 or less; staminodes sometimes present; ovary usually stipitate; ovules 2-many;

stigma terminal, sometimes oblique; pods linear, oblong or slightly falcate, flattened, dehiscent or not; seeds endospermous, compressed.—570 species, tropics and warm temperate regions.

At least 3 cultivated species occur in Guam, but no native ones.

1. Petals pink or red, or mixed pink, white.
   2. Petals pinkish-white, with purple dots; fertile stamen 1.....*B. monandra*
   2. Petals reddish-magenta.....*B. sp.*
1. Petals yellow; fertile stamens 10.....*B. tomentosa*

BAUHINIA MONANDRA Kurz, J. Asiat. Soc. Bengal 42: 73. 1873.
Merrill 1914: 87. Bryan 9 Dec. 1959.

ORCHID-TREE, ST. THOMAS-TREE

Small, rounded-crowned tree with smooth gray bark; leaves subcordate, rather shallowly cleft at apex into 2 lobes; (the split usually about halfway to base); blades 7–15 cm long, and about the same width; flowers several together on axillary racemes; petals spreading, 4 obovate, 1 ovate, each about 2.5–4 cm long, pink mottled with purple; fertile stamen 1; pod 15–18 cm long, flattened, leathery, rather shiny brownish or black; seeds ovate, compressed, dull brown.

A native of Tropical America now widespread in cultivation. This is the most common Bauhinia in Guam, being present in many gardens. It does not appear to become naturalized.

BAUHINIA TOMENTOSA L. Sp. Pl. 375. 1753. Merrill l.c. Bryan 9 Dec. 1959.

FLORES DE MARIPOSA

Shrub to 4 m tall, branches drooping; leaves bilobed, pubescent beneath, 5–8 cm long; flowers 1–2 in axils, petals pale yellow, about 8 cm wide; fertile stamens 10; pod up to 12 cm long, 1.5 cm wide, pubescent, coriaceous; seeds 6–12, shiny.

Native of India and N. Africa, commonly cultivated. The petals do not spread widely; and the pendent pedicels help to give the flowers a bell-like shape.

BAUHINIA *sp.*—An unidentified shrub with dark reddish fls. seen once in Barrigada.

CAESALPINIA Linnaeus

Trees, shrubs, or woody climbers, often armed with sharp prickles; leaves pinnate; flowers red or yellow in racemose axillary panicles; calyx, 5-toothed, the teeth imbricate, the lowest one often largest; petals 5, usually spreading, subequal; stamens 10, free; ovary sessile; ovules few; style with terminal stigma; pod flattened, ovate, oblong, straight or curved, rarely somewhat turgid, dehiscent or not; seeds transverse, ovate or rounded, or subglobose.—Nearly 300 species, tropics and subtropics.

Four species in Guam.

1. Woody climbers.
   2. Stipules large; pods 5–7 cm.....*C. crista*
   2. Stipules smaller or none; pods 8–12 cm.....*C. major*
1. Trees or shrubs, erect.

2. Shrub; leaves with 4–8 pairs of pinnae; flowers yellow or red-and-yellow ..... *C. pulcherrima*

2. Small tree; leaves with about 20 pairs of pinnae; flowers yellow.. *C. sappan*

Caesalpinia crista L. Sp. Pl. 380. 1753. Safford 1905: 288, pl. 51.

PAKAO. NICKERS.

Woody climber with spiny stems and rachises; prickles of rachises recurved, hook-like; leaves 30–80 cm long, with 4–6 pairs of pinnae (rarely 9 or 10); pinnae each of about 5–10 pairs of leaflets; leaflets elliptic-oblong, 2–5 cm long; slightly pubescent; young growth brownpubescent; stipules foliaceous, flowers dull yellow, about 1 cm long, in simple or panicled racemes; pods oblong, inflated, prickly, 5–7 cm long, usually 1–2-seeded; seeds nearly spherical, glossy gray, about 1–1.4 cm diam.

A pantropical, usually littoral species.

Caesalpinia major (Medic.) Dandy & Exell, J. Bot. (London) 76: 180. 1938.

PAKAO. WAIT-A-BIT.

C. bonduc Roxb. Hort. Bengal. 32, 1814; not Guilandina bonduc L. Sp. Pl. 381. 1753.

C. glabra (Mill.) Merrill, Philipp. J. Sci. Bot. C. 5: 54, 1910, et 1914: 88. Guilandina glabra Mill. Gard. Dict. ed. 8. no. 3. 1768.

C. jayabo Maza, Anal. Soc. Espan. Hist. Nat. 19: 234. 1890.

A woody climber with spiny stems, similar to the above species, but differing as follows: stipules obsolete; leaves larger; leaflets larger and fewer; pods 8–12 cm long, 2–4-seeded, the prickles more slender; seeds rather yellowish-gray.

Often found in weedy secondary jungle, as on the Harmon side of Barrigada Hill (4400, 4503).

CAESALPINIA PULCHERRIMA (L.) Swartz, Obs. Bot. 166, 1791.

Merrill 1914: 89.

CABALLERO. KABAYEROS. PRIDE OF BARBADOS.

Poinciana pulcherrima L. Sp. Pl. 380. 1753. Safford 1905: 358.

Shrub to 3–4 m tall, the branches with short scattered prickles. Leaves alternate bipinnate, pinnae 4–8 pairs, each with 7–11 pairs of elliptic, obtuse, obliquely inequilateral light green leaflets about 2–2.5 cm long; flowers red-and-yellow, or (var. flava) all yellow, the petals crinkly-edged, in long terminal racemes; filaments longer than petals, red; pod coriaceous, oblong, smooth, brown to black, to 10 cm long, several-seeded; seeds compressed, brown, usually 6–8 per pod.

A native of Tropical America, whence it has become dispersed round the world tropics as a pretty ornamental plant. It is virtually ever-blooming. Agaña (4680); Barrigada (4871). It does not seem to become naturalized although it sets abundant seed.

CAESALPINIA SAPPAN L. Sp. Pl. 381. 1753. Merrill 1914: 89.

SIBUKAO. SAPPAN.

Biancaea sappan Todaro, Hort. Bot. Pan. 1: 3, 1876.

Safford 1905: 198.

A small tree to 5–6 m tall, the branches with scattered prickles. Leaves to

50 cm long; pinnae about 20 pairs, each with 10–15 pairs of oblong marked obliquely inequilateral leaflets, less than 2 cm long; flowers showy, 2.5 cm broad, yellow, in racemes; stamens woolly-pubescent on the proximal half; pods hard, indehiscent, glossy, broad, 7.5–10 cm long by 4 cm wide, beaked at apex, beak ± recurved; seeds 3–4.

A native of India; often cultivated for the showy flowers, the red heartwood, which yields a red dye, and takes a high gloss. According to Safford, introduced before 1800. Nowadays it is not at all common.

Cassia Linnaeus

Trees, shrubs, and herbs; leaves paripinnate [very rarely reduced to phyllodes]; petiolar glands usually present; flowers usually yellow, sometimes white or pink, in axillary or terminal racemes; or rarely solitary; calyx with 5 imbricate lobes; petals spreading, sub- to unequal; stamens 10 or 5; anthers opening by short apical slits or pores; ovary sessile or stipitate; ovules many; stigma terminal; fruit terete or flat, membranous to woody, dehiscent or not; seeds usually transverse in position, usually compressed.—About 600 species, chiefly tropical, cosmopolitan in tropics and subtropics. Eight species known in Guam, none of which seems to be indigenous.

1. Trees; pods cylindrical, 30–90 cm long.
   2. Flowers bright yellow; leaflets 4–8 pairs, elliptic, acuminate, 5–15 cm long..... *C. fistula*
   2. Flowers pink or pink and white; leaflets about 12 pairs, ovate-oblong, blunt, 2.5–5 cm long..... *C. javanica*
1. Shrubs; pods compressed or flat, rarely over 30 cm long.
   3. Big shrubs, usually 2–3 m tall.
      4. Flowers crowded in erect, long-pedunculate, thick, oblong spikes; pods thick, black when ripe, winged..... *C. alata*
      4. Flowers long-pedicellate, in open racemes; pods flattened, not winged ..... *C. glauca*
   3. Small shrubs, rarely much over 1 m tall.
      5. Small suffruticose plants; leaflets small and numerous, 15–30 pairs, each leaflet 1–1.3 cm long; flowers few in axils, not in racemes.... ..... *C. mimosoides*
      5. Erect shrubs; leaflets larger and fewer; flowers in racemes or axillary.
         6. Leaflets more or less acute-acuminate; flowers in short axillary racemes.
            7. Leaflets 5–6 pairs, markedly acuminate, up to 7.5 cm long ..... *C. occidentalis*
            7. Leaflets 6–12 pairs, acute or blunt, up to 4 cm long..... ..... *C. sophera*
         6. Leaflets rounded at tip; flowers paired in axil; leaflets 2–4 pairs, each up to about 4 cm long..... *C. tora*

Cassia alata L. Sp. Pl. 377. 1753.

ACAPULCO; ANDADOSE; TAKE-BIHA; CANDLEBUSH.

Herpetica alata Raf. Fl. Tellur. 123. 1838; Safford 1905: 293.

Coarse erect shrub to 3–4 m tall; leaves to about 50–80 cm long, with 8–14 pairs of large leaflets (the distal ones largest), up to 17 cm long, ovate- oblong, obtuse, truncate, or even slightly notched at apex, subsessile; inflorescence a long-pedunculate erect dense oblong spike, the yellow flowers crowded and overlapping; pod ripening black, straight, papery in texture, winged on the angles (2), up tl 15–20 cm long and slightly over 1 cm wide; seeds numerous (to 60), flat.—Pl. 7a.

A native of Mexico (hence the name Acapulco, the Mexican port). The leaves are a well-known remedy for ringworm. Common along roadside, in old abandoned fields, and other weedy localities, in central and northern Guam, rare or absent in the southern hills in volcanic soils. Mangilao (4663); Barrigada (4739). The name *take-biha* is a little coarse and does not translate politely into English.

CASSIA FISTULA L. Sp. Pl. 377. 1753. Safford 1905: 217.

Merrill 1914: 88.

CAÑAFISTULA. GOLDEN SHOWER. INDIAN LABURNUM.

Small to medium tree with rather large pinnate leaves; leaflets 4–8 pairs, ovate or elliptic, acute-acuminate, 5–15 cm long; flowers in drooping axillary racemes; petals bright yellow, subequal, shortly clawed, about 2.5 cm long; pods cylindric, straight, dark brown, 30–60 cm long, 2 cm or less thick, with a sticky pulp in which are embedded many (to 100) brownish seeds.

Native of Tropical Asia, now well-known and wide-spread as a cultivated tree. The pods are a source of a laxative. This is found in many gardens in Guam. One tree is in front of the main entrance to the Legislature Building. Agaña, T.T.H.Q. (4009).

Cassia glauca Lamarck, Encycl. 1: 647. Stone, Micronesica 1: 133. 1964.

A big shrub with widespreading branches; leaves with 8–9 pairs of glabrous, ovate-oblong or obovate-oblong leaflets, each 2.5–5 cm long, somewhat glaucous, notched at tip; flowers in axillary racemes, panicled, yellow or orange; pods flat, linear, somewhat notched between the seeds, or not, brown, about 8–10 cm long, with 10–12 seeds.

Native of Indomalaysia eastward through to Polynesia. Not common. Mangilao (4403).

CASSIA JAVANICA L. Sp. Pl. 379. 1753. PINKSHOWER.

A small tree; leaves to 30 cm long, with about 5–15 pairs of ovate-oblong, obtuse or round-tipped leaflets each 2.5–5 cm long; flowers large and showy, usually produced on short blunt branches and on spurs on larger branches, pink-and-white; pods cylindrical, transversely ridged, without sticky pulp; seeds embedded in transverse segments, numerous.

Native of Java and Sumatra. Sparingly cultivated in Guam, deserving of greater use. Barrigada (4178).

Cassia mimosoides L. Sp. Pl. 377. 1753. Safford 1905: 218.

C. Leschenaultiana DC. Soc. Hist. Nat. Genev. Mem. 2: 132. 1824; Bryan 6 Jan. 1960. JAPANESE TEA SENNA.

A small perennial suffruticose herb, sparingly branched; leaves mostly 2.5–7.5 cm long, with 15–30 or even 50 pairs of small linear leaflets up to about 1.3 cm long or often shorter; midrib close to upper margin of blade; apex obliquely mucronate; green or often suffused with reddish-purple; flowers 1, 2, or 3, in leaf axils, yellow, shortly pedicellate, about 9 mm broad; pod flat, strap-shaped, 3–5 cm long, 3.5 mm wide, brown, dehiscent; seeds about 12, dark brown, almost square, about 4 mm long.

Widely distributed from Africa eastward to Australia and Japan. The seeds are very characteristic. The herbage, under the name Kobo-cha or Nemu-cha, is used as a tea in Japan. In Guam it is a rather uncommon roadside weed. Mt. Almagosa (4902).

Cassia occidentals L. Sp. Pl. 379. 1753; Safford 1905: 218.

AMOT-TUMAGA KARABAO. MUMUTUN-SABLE. COFFEE-SENNA.

Small annual shrub, to 1.2 m tall; stems ribbed, glabrous; petiole with gland at base; leaves to 15 cm long, with usually 4–6 pairs of elliptic or lanceolate acuminate glabrous leaflets each 3–7.5 cm long, the terminal pair largest; flowers in racemes, yellow, nearly 1 cm broad; 3 of the stamens infertile; pod linear, glabrous 10–15 cm long, about 6 mm wide, the margins somewhat thickened, with about 20–30 flat, ovate, brown seeds each 3 mm long.

Probably an originally tropical American plant, but its career as a camp follower weed began long ago, and it is now almost everywhere in the Tropics in places altered by human activities. In Guam it is an agricultural pest, a roadside weed, a back-yard volunteer, and a school-field immigrant. The seeds may be used as a substitute for coffee; the leaves are supposedly medicinal, and antiherpetic.

Mangilao (4158); Barrigada Hill (4500); Mangilao (4734); Barrigada Village (4869).

Cassia sophera L. Sp. Pl. 1: 379. 1753; Safford 1905: 219.

AMOT-TUMAGA. EDIBLE SENNA.

A rather small erect shrub to about 1 m tall; leaves with 6–12 pairs of elliptic-oblong or slightly obovate-elliptic leaflets each about 2.5 cm long; apex acute or obtuse; a large gland on the rachis just above the petiole; flowers in few-fld. axillary and terminal racemes, yellow; 3 of the stamens infertile; pods linear, somwhat turgid, glabrous, keeled along the suture, with many seeds separated by partitions.

Possibly a native of Tropical America; now very widespread as an adventive or weed, often found in company with the preceding and the following species. (Barrigada, 4868). The leaves are edible, and in India are an ingredient of curries. The plant, like *C. occidentalis*, has a rather unpleasant odor.

Cassia tora L. Sp. Pl. 376. 1753. Safford 1905: 219.

MUMUTUN ADMELON; MUMUTUN PALAOAN; AMOT-TUMAGA CARABAO; LOW SENNA.

A small erect glabrous shrub; to 90 cm tall; leaves to 7.5 cm long, with 2–4

pairs of obovate, blunt, or minutely mucronate, ciliate-margined leaflets, each 1–4 cm long; a gland on the rachis between the lowest pair (or lower 2 pairs) of leaflets; flowers paired in axils, yellow, about 9 mm broad, on a 6 mm pedicel; 3 of the stamens infertile; pod very slender, linear, somewhat curved, 12–25 cm long, 3–6 mm wide, beaked, membranous, with broad sutures; seeds about 20–30, nearly 3 mm long, brown, flat.

Now worldwide in distribution. The foliage has a disagreeable odor. Barrigada (4867). With its tough stems, firmly embedded roots, and many-seeded pods, this is a rather important agricultural weed.

CYNOMETRA Linnaeus

Trees or shrubs with paripinnate leaves of few leaflets, mostly 1–8 pairs; stipules soon detaching; flowers in racemes or fascicled racemes, a axillary or on branches or trunks; young leaves often pale or colored (pink or red), limply hanging; calyx-tube short; petals subequal, or the lower ones much reduced; stamens 10 [rarely more], free; ovary sessile or subsessile, usually with only 2 ovules, though sometimes only 1 matures to seed; fruit ovoid or rarely compressed, usually thick, short, and roughly rugose.—Perhaps 150 species of the tropics, only 1 in Guam.

Cynometra ramiflora L. Sp. Pl. 382. 1753. GULOS.

C. bijuga Span. Linnaea 15: 201. 1841; Merrill 1914: 87.

C. carolinensis Kanehira, Bot. Mag. Tokyo 46: 455. 1932.

A small tree, often shrubby and sometimes precociously flowering, the leaves usually with 2 pairs of inequilateral leaflets, the terminal pair usually larger; leaflets from 5 cm long to over 15 cm long; inner edge rather straight, outer edge convex; apex acute to acuminate; the terminal leaflets usually 3 times longer than wide; glabrous, rather dark green, coriaceous; new leaves developing in cylindric, pointed, stipule-covered, brownish shoots, later limply hanging, thin, white, pinkish, or reddish; flowers dull white or slightly whitish-brown, in short axillary racemes, usually fascicled, shorter than leaflets; pedicels puberulent; ovary pubescent; pod 3–4 cm long and about 2/3–3/4 as thick, turgid, brown, irregularly ridged and grooved with rounded ridges, glabrate, not or very tardily dehiscent, usually 1-seeded.—Pl. 6e.—Fig. 48.

A native of Tropical Indomalaysia and many Pacific Islands, often with coherent local insular populations sometimes ranked as species. The classification adopted here is conservative; Merrill considered that *C. ramiflora* and *C. bijuga* were separate species. Kanehira recognized further distinct species in Palau, Truk, and Ponape. A further detailed study is clearly desirable.

In Guam this is a frequently encountered component of the well-developed forests on limestone. However it is also to be found in southern Guam, where it may be of shrubby stature and may bear flowers and produce fruits when only 1–2 m tall, behavior which may be correlated with the more open occurrence of such precocious individuals. Cliffs above Pago Bay (4137); Sagua River near mouth (4194); Ylig River (4529); Manengon, banks of stream on rocks by waterfall (4743,

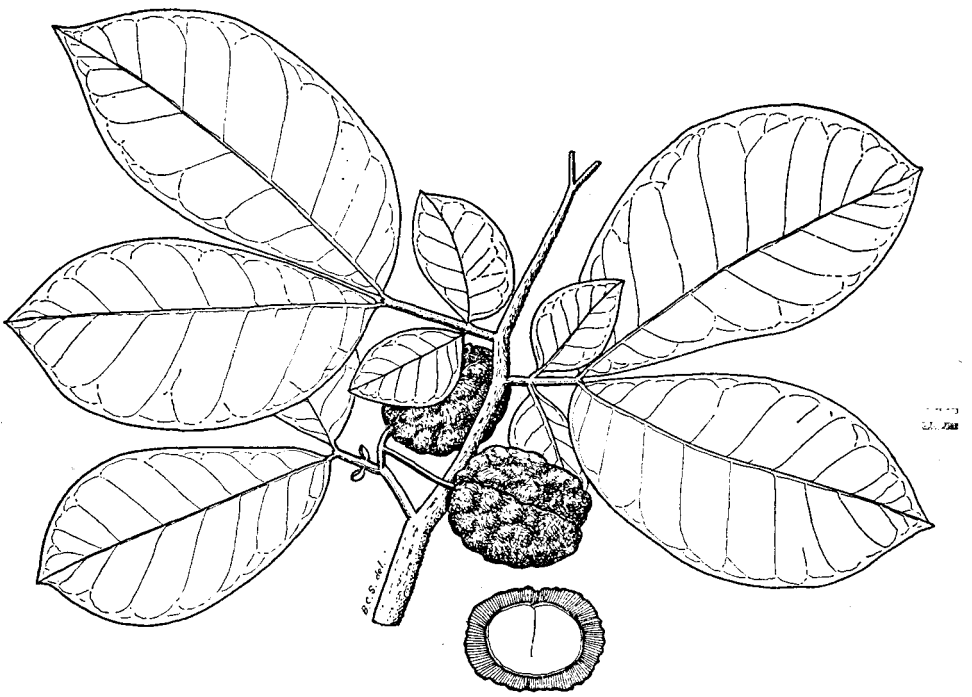

Fig. 48. Cynometra ramiflora.

4857); Manengon-Cotal (5139).

According to Safford the fruits are eaten by fruit-bats (*Pteropus keraudreni*).

DELONIX Rafinesque

Trees with bipinnate leaves and many small leaflets; stipules small; stipels none; flowers large and showy, orange or red, in corymbose racemes; bracts soon falling, bracteoles none; calyx-tube short, its lobes valvate; petals suborbicular, 4 subequal, 1 usually somewhat different; stamens 10, free; ovary sessile, free; ovules numerous; fruit flattened, elongated, many-seeded; seeds transversely oblong, with endosperm.—3 species, Africa, Madagascar, and Asia.

DELONIX REGIA (Bojer) Rafinesque, Fl. Tellur. 2: 92. 1836.

Safford 1905: 246. Merrill 1914: 88.

ARBOL-DEL-FUEGO. POINCIANA. FLAMETREE. FLAMBOYANT.

A medium sized, deciduous, broad-crowned ornamental tree of rapid growth; leaves mostly 30–60 cm long, with 10–20 pairs of pinnae, these about 10 cm long, each with 25–35 pairs of small medium green glabrous slightly oblique oblong-elliptic leaflets each about 1 cm long (thus the whole leaf with anything from 800 to 2400 leaflets); stipules pinnate, with 3–6 leaflets; flowers in corymbose racemes near branch-tips; flowers brilliant red, the uppermost petal streaked with yellow or yellow-and-white; petals stalked, their distal part abruptly expanded, orbicular,

with wavy-crinkled edges, each about 4–6 cm long; stamens declined together, curving out and down; pod woody, up to 50 cm long, flattened, parallel-edged, straight, pendent, dark reddish-brown turning black, filled within between the seeds, many-seeded, dehiscent, shortly beaked at tip; seeds oblong, gray with pale margins.—Pl. 6f.

Originally an endemic in Madagascar, this tree is now found everywhere in the tropics, where it is well-loved as a graceful and handsome ornamental. Lining streets, it makes a splendid spectacle when in flower.

In Guam it often sets seed, and many seedlings spring up; yet it does not seem to spread far from gardens. Mangilao (4122). Highly recommended for planting.

Intsia Thouars

Trees with paripinnate leaves, leaflets 2–5 pairs, opposite; stipules connate basally; flowers in terminal racemes or panicles; calyx-tube somewhat long with only 4 segments, these imbricate; petal 1 only, clawed, [others rudimentary]; fertile stamens 3, the filaments somewhat connate basally; staminodes 4–7; anthers dorsifiifixed; ovary stipitate and adnate to calyxtube; ovules several; fruit flat, with few seeds.—A few (?6) species, from Madagascar eastward to the Pacific.

Intsia bijuga (Colebr.) O. Kuntze, Rev. Gen. Pl. 1: 192. 1891.

Safford 1095: 297, pl. 54. Merrill 1914: 87. IFET. IFIL. IPIL.

A medium-sized, slow-growing, everygreen tree up to 25 m tall, the trunk usually crooked and in Guam often much shorter, without buttresses; bark grayish; glabrous; leaves 7–15 cm long, with 1–2 (rarely 3) pairs of opposite, broadly elliptic to subrotund dark green coriaceous leaflets each about 8–15 cm long on short petiolules; apex obtuse; slightly symmetric sides; flowers in puberulent, terminal, corymbose panicles 6–10 cm long; the single petal white, or slightly pinkish; fertile stamens 3, the filaments about 2.5 cm long; pod 10–30 cm long, thick, rigidly leathery, scarcely opening, narrowly elliptic-oblong; seeds 3–6, rounded-reniform, compressed, brown, nearly 2.5 cm broad.

Native from the Indian Ocean eastward to Polynesia. It does not reach Taiwan or Hawaii. Usually a component of strand vegetation or low elevations; sometimes in or near mangrove swamps; abundant on coral limestone; also found on other soils if rocky. In Guam it is rather common, though it is rare to find a full-grown individual; the reason being the great value of the wood, which in former years led to the logging of every accessible tree. The timber is justly famous for its exceeding weight, hardness, and durability, Though very difficult to saw and plane, the wood is (or was) favored for floors and house-posts. It is almost impervious to termites. Old wood is nearly black. Nowadays it is not actively logged, and many small trees may be found. One large tree may be seen at one side of the first (upper) pool of "Tarzan Falls" in Manengon. Every effort should be made to plant this valuable tree. Barrigada (3805); Barrigada Hill (4502); Manengon (4747).

PELTOPHORUM Vogel ex Walpers

Trees with bipinnate leaves; stipules small and caducous; flowers yellow, in terminal panicles or racemes; bracts often caducous; calyxtube short, 5-lobed, lobes imbricate; petals imbricate, subequal; stamens 10, free; ovary sessile; ovules 2-many; fruit compressed, rather short, linear, indehiscent, 1–4-seeded; seeds flattish.—About 15 species, tropical and subtropical regions.

PELTOPHORUM PTEROCARPUM (DC.) Backer ex Heyne, Nutt. Pl. Ned.—Ind. ed. 2, 2: 755. 1927. YELLOW POINCIANA, COPPERPOD.

P. inerme (Roxb.) Naves in Blanco. Fl. Filip. ed. 3, t. 335, 1880 [1877–83]. V. Bryan, 20 Jan. 1960. Merrill 1914: 89.

A medium-sized, broad-crowned tree; leaves to 50 cm long, rachises brown puberulent, with 7–10 pairs of pinnae, each with 10–20 pairs of oblong, basally obliquely inequilateral, dark green leaflets about 1–2 cm long; flowers showy yellow, in large panicles; bracts, buds, and axes brownish-reddish pubescent; each flower nearly 2.5 cm broad; pods flat, thin, straight or slightly curved, copper-coloured or darker brown when ripe, mostly 5–10 cm long, about 2 cm wide, slightly winged, 1–4-seeded, blackening eventually but persistent on the tree, veiny on the sides; seeds oblong, pale brown.

Native of Malaysia and east to N. Australia. This is a very widely planted ornamental in Tropical East Asia, lining many boulevards in (for example) Singapore and Kuala Lumpur. Both the flowers and pods are attractive, so the tree is worthy of all the months. It is not especially common in Guam, and deserves much greater use. A good-sized tree may be seen just south of Yona near the old Camp Witek area (4292).

TAMARINDUS Linnaeus

Trees with paripinnate leaves; stipules minute and caducous; flowers in racemes, terminal and subterminal; bracts and bracteoles ovate-oblong, caducous; calyx-tube with 4 imbricate lobes; 3 petals conspicuous, 2 much reduced, scalelike; perfect stamens 3, connate; ovules many; fruit linear, thick but subcompressed, indehiscent, with pulpy mesocarp; seeds rounded, compressed.—Monotypic, the single species native in Africa and India.

TAMARINDUS INDICA L. Sp. Pl. 32–4. 1753. Safford 1905: 383, pl. 66. Merrill 1914: 87. Bryan 30 Dec. 1959.

CAMALINDO. KAMALENDO; KALAMENDO. TAMARIND.

Trunk with gray-brown bark; leaves 5–15 cm long, leaflets 10–20 pairs, oblong, obtuse, basally asymmetric, apex notched, thin, glabrous, subsessile, nearly 1.2 cm long; petals 1 cm long, yellowish with pink veins; bracts and bracteoles rosy-red; pod 5–15 cm long, velvety reddish-brown, epicarp brittle, often somewhat constricted between the seeds along one margin; inner pulp acid; seeds 4–8 (–10), rounded-oblong.

In India the tamarind has long been known as an ingredient in foods and condiments and as the basis of a cooling drink. It is an ingredient of many com-

mercially prepared sauces and flavorings. The wood also is valued.

Safford states: "the trees grow well, but as they do not spread spontaneously, they are found only near villages and houses where they have been planted, and on the sites of abandoned ranches". This is still true, and it is not easy to find a tamarind tree in Guam nowadays. Safford published an excellent photo (his pl. 66); Merrill cites two specimens (G.E.S. 148, 154); I have not seen the plant recently.

Sabfam. Papilionoideae

Key to Genera [Artificial]

1. Trailing or climbing vines,
   2. Leaflets 3 only,
      3. Flowers pale green; calyx and ovary with tawny or golden hairs (sometimes detaching, irritant); pods black..... *Mucuna*
      3. Flowers variously colored, not green,
         4. Flowers yellow or yellowish,
            5. Stipels present, resin-dots none,
               6. Pods flattened; cultivated climbers..... *Phaseolus*
               6. Pods compressed, with tawny hairs; wild.... *Mucuna*
               6. Pods subcylindric; wild beach vines..... *Vigna*
            5. Stipels absent, resin dots present, on leaflets; savanna creeper..... *Cantharosperumum*
         4. Flowers white, red, pink, blue, or violet, not yellow throughout,
            7. Leaflets coarsely toothed or lobed or angled,
               8. Leaves gray pubescent beneath; flowers purple with a yellowish spot..... *Pueraria*
               8. Leaves glabrous; flowers blue-and-white..... ..... *Pachyrrhizus*
            7. Leaflets entire, not angled,
               9. Flowers pinkish-white or white; leaflets not fleshy,
                  10. Prostrate herbs, leaflets less than 2 cm long; pod jointed (a loment)..... *Desmodium* (in part)
                  10. Trailing or climbing shrubs, leaflets 3–6 cm long; pod not jointed
                  10A. Leaflets symmetrical,..... *Derris* (in part)
                  10B. Leaflets oblique..... *Dolichos*
               9. Flowers purple, blue, dark red, or dark pink with white spot.
                  11. Flowers blue or purple,
                     12. Pods with 4 wavy-edged wings, edible.... ..... *Psophocarpus*
                     12. Pods not as above,

13. Leaves densely silky-pubescent with long tawny hairs; pods long, narrow
14. Flowers blue..... *Calopogonium*
14. Flowers purple..... *Mucuna*
13. Leaves glabrous or short-puberulent; pods broad
14. Flowers 2–3 cm long, almost white..... *Dolichos*
14. Flowers 5 mm long, blue..... *Teramnus*

11. Flowers pink-and-white or dark red to magenta.
15. Petals dark red, the standard and keel much longer than the wings; large woody climber with pendent inflorescences.... *Strongylodon*
15. Petals pink (standard with a central white mark) or dark magenta, or brick-red; climbers or creepers, inflorescences more or less erect..... *Canavalia*

2. Leaflets more than 3, or sometimes 3, sometimes more,
16. Leaflets 3 or 5 or a higher odd number; seeds not as below,
17. Leaflets 3 or 5..... *Derris* (in part)
17. Leaflets 5 or more,
18. Flowers blue, the standard marked with white; herbaceous climber ..... *Clitorea*
18. Flowers pink or white,
19. Leaflets opposite; pods broad, ± winged.. *Derris*
19. Leaflets alternate; pods narrow, wingless..... *Dalbergia*

16. Leaflets 10 or more pairs, no terminal one; seeds red with a large black spot;..... *Abrus*

1. Erect herbs, shrubs, or tree, or prostrate herbs,
20. Leaflets single [i.e. leaves simple]
21. Pod inflated..... *Crotalaria*
21. Not so,
21A. Prostrate herb..... *Alysicarpus*
21B. Big tree..... *Inocarpus*
21C. Shrub with large bracts..... *Moghania*
20. Leaflets 2..... *Zornia*
20. Leaflets 3 or more,
22. Leaflets 3 only,
23. Trees, armed with spines; deciduous; flowers dark red,.... *Erythrina*
23. Not as above,

leaflets toothed..... *Medicago*
leaflets entire,
24. Pod jointed (loment); fls. pink or white..... *Desmodium*
24. Pod not jointed; flowers yellow
24A. Pod not inflated ..... *Cajanus*
24B. Pod inflated ..... *Crotalaria*
22. Leaflets more than 3,
25. Leaflets 4 in 2 pairs; pods ("peanuts") maturing underground ..... *Arachis*
25. Not as above,
26. Pod jointed,
27. Leaflets 3, or 1..... *Desmodium*
27. Leaflets many..... *Aeschynomene*
26. Pod not jointed,
28. Trees,
29. Pods torulose moniliform (strongly constricted between the seeds); leaflets oboval or elliptic, softly gray pubescent, fls. yellow ..... *Sophora*
29. Pods not moniliform, flowers pink or white,
30. Flowers very large, 5 cm long or more; pods very elongate, slender, pendent ..... *Sesbania*
30. Flowers smaller, about 1.5–2 cm long; pods linear, compressed, at most 16 cm long ..... *Gliricidia*
28. Shrubs,
32. Pods strongly coiled..... *Indigofera*
32. Pods straight,
33. Pods inflated..... *Crotalaria*
33. Pods not inflated,
34. Flowers yellow..... *Sesbania*
34. Flowers white or whitish..... *Tephrosia*

Papilionoideae

Natural Key, after Hutchinson

1. Filaments all free and distinct or merely barely connate at base; not united into bundles
2. Corolla regular, petals equal; leaves simple; big trees with large ellipsoid indehiscent 1-seeded pod..... *Inocarpus*
2. Not as above; flowers with distinctly papilionoid corolla. ..... *Sophora*
1. Filaments connate, either monadelphous (all joined to form a tube), or diadel-

phous (all but 1 joined).
3. Anthers all alike,
4. Free apices of filaments not dilated but threadlike,
5. Fruits not jointed (i.e. not loments).
6. Filaments monadelphous,
7. Racemes or panicles not swollen at the nodes—or the inflor. fasciculate, capitate, or subumbellate
8. Trees and shrubs, rarely climbers; hairs, if present, simple not T-shaped; anthers blunt, not glandtipped.
9. Fruits dehiscent,
10. Fls. in axillary racemes or fascicled at older nodes ..... *Gliricidia*
10. Fls. in terminal racemes or panicles, or simple and axillary.....[Tephrosiae, in part]
9. Fruits indehiscent,
11. Fruits winged along the sutures..... *Derris*
11. Fruits not winged..... *Pongamia*
8. Herbs or little shrubs with T-shaped hairs; anthers gland-tipped ..... *Indigofera*
7. Racemes with swollen nodes
12. Calyx 2-lipped; pod with wing along upper suture..... ..... *Canavalia*
12. Calyx 4-toothed; pod not winged..... *Pueraria*
6. Filaments diadephous,
13. Leaves digitate (or unifoliolate).
14. Leaves gland-dotted below
15. Ovules 4 or more;
16. Seed strophiolate; vines..... *Cantharospermum*
16. Seed not strophiolate; shrubs..... *Cajanus*
15. Ovules 2 (rarely 3); shrubs..... *Moghania*
14. Leaves not gland-dotted,
17. T-shaped hairs present.....[Indigofereae, in part]
17. No T-shaped hairs,
18. Leaflets toothed..... *Medicago*
18. Not so,
19. Style bearded along adaxial surface;.. *Clitorea*
19. Style glabrous or rarely hairy near stigma only ..... [Glycine]
13. Leaves pinnate,
20. Leaves gland-dotted, or pellucid punctate,
21. Little shrubs; fruit not circular, dehiscent..[Cajaneae]
21. Trees; fruit circular, 1-seeded..... *Pterocarpus*
20. Not glandular or punctate,

22. Fruit dehiscent, at least at apex,
    23. Petals very unequal;
        spiny trees ..... *Erythrina*
        vines,
            fls. red..... *Strongylodon*
            fls. green..... *Mucuna*
    23. Petals equal or subequal,
        24. T-shaped hairs present.....[Indigofereae]
        24. Not so,
            25. Rachis of infl, thick (nodose) at insertion of pedicel.
                26. Style glabrous (unless only at stigma). keel petals not twisted.... *Calopogonium*
                26. Style bearded along adaxial surface; keel petals often twisted,
                    27. Keel petals twisted..... *Phaseolus*
                    27. Keep petals not twisted,
                        28. Stigma lateral,
                            29. Stigma oblique..... *Vigna*
                            29. Stigma globose.. *Pachyrrhizus*
                        28. Stigma terminal,
                            30. Style flattened laterally, pubescent adaxially distally.. *Lablab*
                            30. Style terete,
                                31. Fruit not 4-winged..... ..... *Dolichos*
                                31. Fruit 4-winged..... ..... *Psophocarpos*
            25. Rachis of infl. not thickened at insertion of pedicel
                32. Leaf-rachis ending in a bristle or tendril,
                    33. Stamens 10..... *Lathyrus*
                    33. Stamens 9..... *Abrus*
                32. Leaf-rachis not ending in bristle or tendril,
                    34. Stipules adnate to petiole; leaflets toothed.....[Trifoliae]
                    34. Stipules not adnate to petiole; leaflets entire,
                        35. Style bearded,
                            36. Trees or shrubs..... .....[Robinieae ?Gliricidia]
                            36. Herbs, or subshrubs,
                                37. Racemes axillary.....

.....[Sesbaniae] (*Cracca*)
37. Racemes terminal or leaf-opposed .....
.....[Tephrosiae, in part]
35. Style glabrous,
38. Trees or shrubs,....[Robiniae]
38. Herbs, or shrublets,
39. Erect.....[Sesbaniae] part
39. Climbing ..[Glycineae] part
22. Fruits indehiscent,
40. Leaflets alternate, more than 3,
41. Anthers versatile.....[Pterocarpeae, in part]
41. Anthers not versatile.....*Dalbergia*
40. Leaflets opposite, or only 3,..[Lonchocarpeae, part] [*Pongamia, Derris*]
5. Fruits jointed or transversely septate often breaking up into 1-seeded segments,
42. Stipels none .....*Aeschynomene*
42. Stipels present.....*Desmodium*
4. Filaments (or 1/2 of them) dilated distally.....[Viciae, part] ?*Lathyrus*
3. Anthers dimorphic, alternately dorsifixed and basifixed, often of different lengths
43. Fruits transversely septate and breaking up into 1-seeded segments,
44. Filaments forming a closed tube
45. Fruits maturing underground.....*Arachis*
45. Not so; leaves of only 2 leaflets.....*Zornia*
44. Filaments forming a split tube or 2 bundles.....*Aeschynomene*
43. Fruits not transversely septate; *or*, if so, *then not* breaking up.
46. Leaves simple,.....*Crotalaria*
46. Leaves compound, or if 1 leaflet then pulvinate,
47. Leaves glandular below.....[Phaseoleae, part]
47. Not so,
48. Style glabrous,
49. Vexillary filament free from the others or nearly so; petals unequal..... *Mucuna*
49. Vexillary filament connate with the others.....*Teramnus*
48. Style pubescent,
50. Fruits turgid-inflated .....*Crotalaria*
50. Fruits not inflated.....[Glycineae, part]

Abrus Adanson

Climbers with paripinnate leaves with deciduous leaflets; flowers in dense axillary racemes; calyx cupular, very small-toothed; corolla exserted; standard ovate,

adhering below to staminal tube; wings narrow, clawed, with a retrorse lobe on the vexillary side; keel arcuate; stamens 9 only, connate in a slit-open tube; ovary subsessile; ovules many; pod flat or turgid, thin-septate, 2-valved; seeds subglobose or ellipsoid.—6 species, pantropical.

ABRUS PRECATORIUS L. Syst. Nat. ed. 12, 472, 1767. Merrill 1914: 91.

CRAB'S-EYE. PRAYERBEAD. CORALBEAN. KOLALES HALOMTANO.

A. Abrus Wight ex Safford 1905: 171, pl. 31. [nom. tauton. illegit.]

Glycine abrus L. Sp. Pl. 753. 1753.

An annual woody, slender climber, sometimes reaching a length of 10 m, branching, deciduous; leaves paripinnate, 5–8 cm long, with 10–20 pairs of thin, pale-green, oblong, very short-petiolulate, blunt-tipped but minutely mucronate leaflets each 1–3 cm long; flowers many on elongated axillary racemes, pink, lavender, or white; pods elliptic, up to 4 cm long, dehiscent, turgid, at first silky-pubescent, beaked; seeds 3–6, globose, scarlet-red with a large black spot, glossy, hard, about 3.5 mm thick, pink when immature.—Pl. 6d.

A cosmopolitan—tropical species, perhaps originally from India. In Guam usually found in central and southern Guam, seldom on limestone except where the vegetation is weedy. Merizo (3919); Inarajan R. hills (5053).

The seeds are handsome, but very poisonous. They may be strung as beads (often as rosaries—hence the name prayerbead); if done as a hobby, care should be taken never to place the needle, which is used to pierce the water-softened beans, in the mouth. Each seed weighs almost exactly 1 grain, hence in India they are used by jewelers and apothecaries. The leaves and roots have a slight licorice-flavor.

[The name KOLALES is a slightly altered Spanish word, corales, meaning a strand of corals or beads, while HALOMTANO indicates "in the forests" or merely "inland".]

AESCHYNOMENE Linnaeus

Herbs or subshrubs; leaves stipulate, pinnate; stipels none; flowers yellow, in axillary racemes; bracts present; bracteoles at base of calyx; calyx bilabiate, upper lip bifid, lower lip trifid; standard orbicular; keel navicular; stamens diadelphous in two groups of 5; pods stipitate, jointed, flat, usually indehiscent, the joints 1-seeded, rugose or tuberculate.—70 species, tropics and subtropics.

Aeschynomene indica L. Sp. Pl. 718. 1753. Safford 1905: 175.

Merrill 1914: 90.

An erect herb with imparipinnate leaves, branching, with scattered spreading hairs on stems, rachises, and peduncles; leaves 5–10 cm long; stipules semisagittate, about 1 cm long; leaflets numerous, 15–30 pairs, linear-oblong, glaucous beneath, 10–15 mm long, rounded at tip; flowers few in racemes, pale yellow; pedicels with 2 bracteoles at base of calyx; bracts like the stipules; flower c. 1 cm long; calyx bilabiate, deeply cleft; pods linear, flat, 6–8-jointed, with a central prominent rugosity on each joint.

Throughout the African, Asian, and W. Pacific-Australian tropics. An

adventive weed in Guam, found in man-disturbed areas and thickets, not very common. The pith for pith-helmets is derived from a related Indian species.

Talofofo R. banks (5086); usually in wet localities.

ALYSICARPUS Necker ex Desvaux

Herbs with unifoliolate leaves; stipels 2; flowers small in terminal or axillary racemes; calyx deeply cleft; standard obovate to orbicular; wings adherent to the incurved keel; stamens diadelphous, 9 connate, 1 free; ovary sessile or subsessile; ovules many; fruit more or less cylindric, constricted between the seeds, jointed, indehiscent; seeds subglobose.—Perhaps 30 species; pantropical. One species in Guam.

ALYSICARPUS VAGINALIS (L.) DC. Prodr. 2: 353. 1825.

Walker & Rodin 1949: 459.—*A. nummularifolius* sensu Merrill 1914: 91 (not of Linn.).

A more or less prostrate, somewhat suffruticose hispid branching herb; leaves somewhat dimorphic, the proximal elliptic, the distal narrower, lanceolate, 'simple', 3–10 mm long, rounded at tips, obtuse, or truncate at base, with short petioles about 1–5 mm long; flowers reddishpurple, in terminal racemes; flower 6 mm long; pods cylindric, rugulose, jointed, nearly 2 cm long, 5–7-seeded; seeds pale brown, 1.5 mm long, oval.

Tropics of the Old World, now adventive in many tropical countries. Usually found in lawns, by roadside ditches, and in waste ground exposed to the sun. G.M.H. (3775); Fena (4336). Apra (4724).

ARACHIS Linnaeus

Low herbs; leaves pinnate with 4 or rarely 3 leaflets; stipules partly adnate to petiole; stipels none; flowers in axillary spikes; bracteoles at base of calyx; calyx-tube slender, 4 upper lobes fused, 1 lower lobe free; petals and stamens arising from apex of calyx-tube; standard suborbicular; wings free; keel incurved; stamens all connate; ovary 3–2-ovulate; fruit maturing underground, thick, subcylindric, somewhat constricted between the seeds; seeds 1–3, ovoid.—Nearly 20 species, all of the tropics.

ARACHIS HYPOGAEA L. Sp. Pl. 741. 1753. Safford 1905: 186. Merrill 1914: 90.

KAKAHUATE. PEANUT. GROUNDNUT.

Subprostrate spreading hairy annual herb, branches 30–60 cm long; leaves 7–14 cm long, usually with 2 pairs of opposite, shortly petiolulate, elliptic-rounded, or obovate leaflets 2–5 cm long; flowers yellow, in short axillary spikes; fruit subterete, subtorulose, 1–3-seeded, maturing underground, pale brownish or stramineous, on the lengthened pedicel; seeds ovoid, mostly 5–10 mm long, edible.

Probably a native of Brazil, very widely cultivated for the oily seeds; an important economic plant in many tropical or subtropical countries. It is not grown in Guam on a commercial scale, but could well be the basis of a local oil-extraction industry. It prefers sandy, loose soil. The name kakahuate is from Spanish.

CAJANUS De Candolle

Erect shrubs; leaves trifoliolate, leaflets resinous-glandular; stipels none; stipules caducous; flowers yellow (often lined purple), in axillary racemes; bracts caducous; 2 upper calyx-lobes connate; standard orbicular; 9 stamens connate, 1 free; ovary subsessile; ovules many; stigma terminal, oblique; fruit straight, compressed, depressed between the seeds, 2-valved; seeds with noticeable oblong hilum.—Only 2 species, both African.

CAJANUS CAJAN (L.) Millspaugh, Field Columb. Mus. Bot. 2: 53. 1900.

Merrill 1914: 94. [nom. gen. em.]

LENTEJA-FRANCESA; PIGEON PEA.

Cytisus cajan L. Sp. Pl. 739. 1753.

Cajan cajan Millsp.: Safford 1905: 206.

Erect pubescent shrub to 2 m tall; leaves of 3 leaflets, each 2.5–10 cm long, ovate-elliptic, acute, dotted beneath with resin-glands, grayishfreen pubescent; flowers yellow (marked with violet); pods 5–6 cm long, pubescent-glandular, pointed, obliquely furrowed between the seeds; seeds 2–7, edible.

A native of India and s.e. Asia, cultivated as a minor crop. Introduced to Guam in 1772 by the French ship "Castaries", hence the name 'lenteja francesa' (French bean). It is grown sparingly as an annual, planted at the start of the wet season. The seeds are tasty either immature or ripe, dried or cooked. This plant is called 'kadios' in Tagalog.

CALOPOGONIUM Desvaux

Herbaceous vines; leaves trifoliolate; stipels present; flowers blue, in fascicled racemes in axils; bracts and bracteoles caducous; upper 2 calyx-lobes sometimes connate; standard obovate; wings adherent to keel; keel shorter than wings; 9 stamens connate, 1 free; ovary sessile; ovules many; stigma terminal; fruit linear, compressed, 2-valved, septate; seeds orbicular compressed.—4 Tropical American species.

Calopogonium mucunoides Desvaux, Ann. Sci. Nat. ser. I, 9: 423, 1826.

Merrill & Perry, J. Arn. Arb. 27- 324. 1946. Bryan 17 March 1960.

AKANKAN-GUAKAG.

Slender creeping and climbing herbaceous vine, coarsely brown-tawny pubescent; leaves each of 3 leaflets, these ovate, acute, densely pubescent, mostly about 3–6 cm long and more than half as wide; flowers medium to pale blue or slightly purplish; pods coarsely pubescent, 2–3 cm long, compressed-convex, slightly constricted between the seeds; seeds 5–7.

This Tropical American species was introduced to Hawaii many years ago as a green-manure and nitrogenating plant for cultivated fields in fallow. It may have arrived in Guam by accident during W.W. II; Glassman first collected it in 1945 in Piti. It is now rather common and has become naturalized in several areas, especially in central and southern Guam. Mangilao (3911); Apra (4726).

CANAVALIA Adanson emend. De Candolle (Nom. cons.).

Trailing or climbing vines; mostly perennials; leaves alternate, trifoliolate-pinnate; stipules caducous; leaflets entire, lateral ones commonly asymmetric, petiolulate; stipels present; flowers in thyrses, pedunculate, infl. nodes enlarged, with 2–6 flowers; 2 bracteoles caducous from base of flower; flowers violet, purple, red, pink, or white, often 2-colored, some marked with yellowish-white; calyx tubular, bilabiate, lower lip 3-toothed, upper lip 2-lobed; banner-petal obovate, reflexed; stamens usually monadelphous, or the vexillary stamen nearly free; stigma capitate; pods generally dehiscent, mostly 4–15-seeded flat or inflated, ribbed or winged; endocarp chartaceous, detaching in age; seeds elliptic, compressed or rarely rotund, the hilum usually obvious and elongated.—51 species of tropics and subtropics. [See Revision by J.D. Sauer, Brittonia 16: 106-181. 1964].

Key to species (after J.D. Sauer)

1. Petals 1.5–3.5 cm long; pods spirally dehiscent [or if indehiscent, then upper calyx lip much shorter than the tube].
   2. Leaflets ovate to lanceolate or elliptic, not emarginate.
      3. Upper calyx lip nearly equalling tube; pod compressed; seeds ivory or white, nearly 2 cm long..... *C. ensiformis*
      3. Upper calyx lip much shorter than tube; lowest tooth subulate, exceeding the lateral teeth; pod inflated; seeds dark reddish-brown ..... *C. cathartica*
   2. Leaflets orbicular, emarginate, fleshy..... *C. maritima*
1. Petals 4–6 cm long; upper calyx lip nearly equalling tube; pods more or less indehiscent..... *C. megalantha*

CANAVALIA ENSIFORMIS (L.) DC. Prodr. 2: 404. 1825. Safford 1905: 211. Merrill 1914: 93. AKANKAN. JACKBEAN.

Vine with large trifoliolate leaves; leaflets up to 20 cm long, ovateelliptic, obtuse or shortly acute, shortly white-puberulent especially on petioles and petiolules; pedicel 2 mm long; calyx puberulent, 14 mm long; standard 2.75 cm long; pod to 30+ cm long, 3.5 cm wide, somewhat compressed, pale tan, spirally dehiscent, each valve with sutural ribs and one extra rib 5 mm beyond the ventral rib; seeds oblong, about 2 cm long, somewhat compressed, ivory-white; hilum about 9 mm long.

Sauer states that this is an ancient cultivar domesticated by the American Indians. It is known from archaeological strata in the S.W. United States mostly since A.D. 1300.

Safford remarks that the plants are common in thickets. Nowadays however they appear to be quite uncommon. The immature pods are edible, as are the ripe seeds when roasted and ground; the outer seedcoat is however quite indigestible. It is useful as a green manure plant.

The flowers vary from pink-purple to nearly white.

Canavalia cathartica Thouars, J. Bot. Desv. 1: 81. 1813 [as Canavali catharticus] LODOSUNG TASI.

C. microcarpa (DC.) Piper, Proc. Biol. Soc. Wash. 30: 176. 1917.

C. turgida Grah. ex A. Gray, Bot. U.S. Expl. Exped. 1: 440. 1854. Merrill 1914: 92.

Creeping and climbing vine with trifoliolate leaflets, these about 20 cm long, ovate, papery, acuminate, whitish puberulent; pedicel 2 mm long; calyx 14 mm long, white-puberulent; upper lip much shorter than tube; lowest tooth of calyx 2 mm long; standard 3 cm long; pod about 12 cm long, 4.5 cm wide, inflated, not dehiscent, tan or dark brown, each valve with sutural ribs and one extra rib 6 mm from ventral rib; seeds about 1.8 cm long, slightly compressed, dark reddish-brown, not buoyant, hilum about 14 mm long.

East Africa, India, Malaysia, north to Taiwan and Ryukyu Is., east to Polynesia; a coastal species, but often penetrating inland to some distance. Known from both Guam and Rota in the Marianas. [Harmon, 3846?]. The Harmon collection has brick-red flowers; and seeds of the plant produced 25% albinos, their entire shoots and leaves lacking chlorophyll.

Canavalia maritima (Aublet) Thouars, J. Bot. Desv. 1: 80 1813.

AKANGKANG-TASI. SEABEAN.

C. obtusifolia (Lam.) D.C. Prodr. 2: 404, 1825. Safford 1905: 211.

C. rosea (Sw.) DC. Prodr. 2: 404. 1825.

C. lineata sensu Merrill 1914: 92, not of (Thunb.) DC. l.c. 1825.

Creeping vine with trifoliolate leaves; leaflets commonly about 12 cm long, fleshy-coriaceous, oblong-orbicular, obtuse or slightly emarginate-notched at tip; petiolule and blade with sparse to rather dense whitish puberulence; pedicel 3 mm long; calyx 12 mm long, whitish-puberulent, upper lip much shorter than tube, lowest tooth 2 mm long; standard 3 cm long pink with a white blotch; pods commonly about 15 cm long, 2.5 cm wide, only slightly compressed, spirally dehiscent, pale tan; each valve with sutural ribs and one extra rib about 3 mm from the ventral rib; seeds about 1.8 cm long, elliptic, slightly compressed, brown with darker marbling, usually buoyant, hilum about 7 mm long.

Tropical seacoasts around the world, usually associated with *Ipomoea pes-caprae*. Abundant in Guam, especially on the sandy beaches; absent or less common on limestone cliffs; not found inland. Apra (3847); Jones Beach (4293); Apra Harbor (4460).

Canavalia megalantha Merrill 1914: 93.

A somewhat woody vine, prostrate or climbing, with brownish stems to 7 mm thick; leaves trifoliolate, the leaflets membranous, broadly ovate (the lateral ones asymmetric), acuminate, to 14 cm long and 11.5 cm wide; pubescence whitish, sparse or absent on blades; flowers pink or purplish, in racemes about 10 cm long; pedicels 3–4 mm long; calyx 15 mm long, upper lip nearly as long as the tube, with its 2 lobes broad and rounded (5–8 mm broad if flattened out); lower lip with 3 ovate-acuminate teeth about 2 mm long; standard 4.5 cm long, obovate; wings as long as keel; pods to 20 cm long, about 5 cm wide, compressed, tardily or not at all dehiscent, pale brown, each valve with sutural ribs and one extra rib about

2 mm from the ventral rib; seeds about 2–2.7 cm long, oblong-elliptic, strongly compressed, reddish-brown, not buoyant, the hilum about 17 mm long.

Endemic in the Marianas Islands; known from Guam (type, McGregor 552, Agiguan (Kondo), Saipan (I Agag, 5210), and Alamagan (Fosberg 31655); several other collections from Guam and Saipan.

Merrill concluded that it was a close relative of *C. turgida* (i.e. *C. cathartica*).

CANTHAROSPERMUM Wight & Arnott

Erect or climbing shrubs or herbs; leaves trifoliolate; stipels none; blades dotted with resin-glands on dorsal surface; flowers yellow to orange, in axillary racemes or panicles; bracteoles none; calyx-lobed acuminate, the 2 upper ones connate; corolla persistent; standard orbicular; 9 stamens connate, 1 free; ovary sessile; ovules 3-several; fruit linear, 2-valved, flattened, septate; seeds ovate-rounded.—About 35 species of the Old World Tropics.

Cantharospermum scarabaeoides (L.) Baillon, Bull. Soc. Linn. Paris 1: 384. 1883.

Merrill 1914: 93.

Atylosia scarabaeoides (L.) Bentham, Pl. Jungh. 245. 1852.

Perennial, prostrate or climbing, wiry-stemmed, pubescent vine with non-stipellate trifoliolate leaves, the leaflets obovate with rounded tips, tomentose on both sides with soft hairs, grayish-green, up to 2.5 cm long and 1.2 cm wide, the lateral leaflets mostly symmetrical; flowers usually in groups of 2 in axils, about 6 mm long, reddish-orange; fruit a densely pubescent brownish pod, slightly constricted between the seeds, about 1–1.3 cm long, and 6 mm wide, with 3–6 brown roundish seeds.

Native from Madagascar eastward to Tropical Asia, but now rather widespread as a weed of open grasslands, in many Pacific Islands. The leaves show dotted resin-glands like those of *Cajanus*.

CLITORIA Linnaeus

Shrubs, herbs, trees, or climbers; leaves pinnate, rarely unifoliolate; stipels present; stipules persistent; flowers red, blue, purple or white, showy; in racemes or paired or solitary, axillary or on older branches; bracteoles + bracts persistent; calyx tubular, with upper 2 lobes connate; standard large, orbicular; keel shorter than wings; 9 stamens connate; 1 free or only partly connate; ovary stipitate; ovules many; style bearded distally; fruit linear, compressed, 2-valved; seeds compressed or ovoid.—About 30 species, warm and tropical regions.

CLITORIA TERNATEA L. Sp. Pl. 753. 1753. Safford 1905: 232.

Merrill 1914: 92.

BUKIKE, PAOKEKE. CAPA DE LA REINA. BUTTERFLYPEA.

Fast-growing climber with pinnate leaves; leaflets mostly 5–9, one terminal, ovate-oblong, obtuse, about 3 cm long, chartaceous; stipules short linear; flowers solitary on pedicels about as long petioles; calyx longish-tubular with narrow acute lobes half as long as the tube; standard bright blue, erect, whitish or yellow at base,

half-tubular, 3 cm long (or more); other petals very small; pod flat, up to 12 cm long, beaked, with about 5 flat rounded seeds about 6–7 mm wide.

Probably a native of Tropical America but found in both hemispheres, and described from a specimen from Ternate Is. in central Indonesia (hence the name). Cultivated and naturalized in Guam for its pretty flowers. Mangilao (4143).

CROTALARIA Linnaeus

Shrubs or herbs with simple or unifoliolate or digitately 3–7-foliolate leaves, and stipules; flowers usually yellow, rarely bluish, in terminal or leaf-opposed racemes; bracts usually small, sometimes absent; bracteoles small or rarely absent; calyx-lobes free, or 2 upper (or rarely 4 upper) ones coherent; standard mostly orbicular; wings shorter than standard; keel incurved; stamens all connate-tubular, this tube longitudinally split on upper side; anthers alternately versatile and basifixed; ovary sessile; ovules 2-many; or turgid, continuous within, 2-valved.—About 350 species in the tropics and subtropics.

Four species in Guam.

1. Leaves of 5–7 leaflets palmately borne..... *C. quinquefolia*
1. Leaves of 1 or 3 leaflets only.
   2. Leaves of 3 leaflets..... *C. mucronata*
   2. Leaves simple or unifoliolate.
      3. Flowers purple; pods to 5 cm long..... *C. sericea*
      3. Flowers yellow (marked with purple); pods shorter..... *C. retusa*

Crotalaria quinquefolia L. Sp. Pl. 716. 1753. Safford 1905: 251.
Merrill 1914: 89. KASKABELES; CASCANETAS. RATTLEPOD.

Coarse erect branching annual herb 1–2 m tall, the stems greenish, grooved; leaves long-petiolate, usually with 5 (rarely 7) leaflets, these lanceolate, elliptic, subsessile, 2.5–12 cm long and 2 cm wide, obtuse, puberulent dorsally; flowers in terminal raceme, yellow, the standard with purplish nerves; calyx glabrous, half as long as the petals; pod oblong, glabrous, stipitate, inflated, about 5 cm long, brownish, with 30–40 seeds.

An Indomalaysian species of marked aggressive-weedy tendencies; in Guam found along roadsides, in old fields and in waste ground.

The leaves with 5 leaflets borne palmately, the yellow flowers, and the inflated pods which when old rattle beacuse of the loose seeds inside, quickly identify this plant. Talofofo (4311).

Crotalaria mucronata Desvaux, J. Bot. Desv. 3: 76. 1814. RATTLEBOX.
C. saltiana Andr. Bot. Rep. t. 648. 1811, sensu Merrill 1914: 89.
C. striata DC. Prodr. 2: 131. 1825.

Erect branched perennial shrub to 1.5 m tall, finely puberulent, with alternate trifoliolate leaves, the leaflets borne digitately, obovate, rounded, basally cuneate, dorsally puberulent, 3–6 cm long, 1.5–3 cm wide, on short petiolules 1–3 mm long; flowers in dense racemes up to 30 cm long; petals yellow, the standard at least with purplish nerves; pedicels short; flower about 1.2–1.5 cm long; pods stramineous-

brownish, puberulent, turgid-inflated, subterete, slightly beaked, nearly 4 cm long, 6–7 mm thick; seeds numerous, pale brown, 1.5 mm wide.

A widespread weed, perhaps originally of Tropical America. First reported for Guam by Merrill; common now in many Pacific Islands. It is unpalatable (possibly even somewhat poisonous) to cattle. In Guam it is found in cultivated ground and other disturbed areas. Tamuning (5142).

Crotalaria sericea Retz. Obs. Bot. 5: 26. 1789.

C. spectabilis Roth, Nov. Sp. 341. 1821.

Shrub with simple narrow obovate leaves; floral bracts cordate leaflike; calyx glabrous, smaller than corolla, cleft more than halfway to base; corolla purple; pods glabrous.

Old World Tropics to Polynesia.

W. J. de Munk (Reinwardtia 6: 214. 1962) has clarified this species, which has often been confused with *C. juncea*, which however has hairy pods. It is included here on the basis of a record by F. R. Fosberg; I have not seen it in Guam.

Crotalaria retusa L. Sp. Pl. 715. 1753. Stone, Micronesica 2(2): 137. 1966.

Coarse subshrub or stiff herb, to about 60 cm tall; leaves simple, alternate; blades obovate, rounded, cuneate at base, about 4–8 cm long and 2 cm wide, finely pubescent, the hairs minute and closely appressed; stipules very minute; petioles 3 mm long; flowers in dense terminal racemes; petals yellow, or marked with purplish veins; flower nearly 2 cm long; pods inflated, 3–5 cm long.

A widespread tropical weed of uncertain (possibly Asiatic) origin. In old fields, waste ground, and roadside areas in Guam. Barrigada (3977); Asanite Bay (4922); Nimitz Hill (Fosberg 39243).

DALBERGIA Linnaeus f.

Trees, shrubs or woody climbers, sometimes spiny; leaves imparipinnate or rarely unifoliolate, leaflets alternate; stipels none; flowers purple or white, in terminal or axillary panicles or cymes; bracts small; lower 3 calyx-lobes longest; standard suborbicular; keel-petals apically connate; stamens all connate in an open sheath or 1 stamen free or lacking; or the stamens in 2 free or partly free bundles; ovary stipitate; ovules 1-several; fruit indehiscent, linear, oblong, or curved, thin, usually 1-seeded; seed reniform, flattened.—Over 100 tropical and subtropical species.

Dalbergia candenatensis (Dennst.) Prain, J. As. Soc. Beng. 70: 49. 1901.

Merrill 1914: 91. Bryan, 24 Feb. 1960.

Cassia candenatensis Dennst. Schl. z. Hort. Malab. 32. 1818.

Woody climbing-scrambling shrub, with alternate pinnate leaves which have 5–7 alternate leaflets, one terminal, each broadly elliptic or obovate, rounded, 2.5–5 cm long, 1–2.5 cm wide, on short petiolules about 4 mm long; stems with purplish-black bark; flowers short-pedicellate in short axillary racemes, clusters about 2–3 cm long; petals white or faintly pinkish; pods thin, slightly curved, glabrous, about 2 cm long, reddish-brown, usually 1-seeded.

A coastal and mangrove-fringe plant native in east Africa, India, Malaya, Indonesia, Philippines, Micronesia, Melanesia, and Polynesia. First reported from Guam by Merrill, but first collected by Luis Haenke in 1792.

In Guam it is often found scrambling up into mangrove—fringe vegetation, as at the mouth of the Sasa River (emptying into Apra Harbor) where it is tangled in *Lumnitzera* (4146); and nearby (5118).

DERRIS Loureiro

Woody climbers or trees; leaves alternate, imparipinnate, the leaflets opposite; stipels none; flowers white or purplish, in racemes or panicles; bracts and bracteoles caducous; calyx truncate-rimmed or with very small teeth; standard suborbicular; stamens all connate or the 10th rarely free; ovary sessile or short-stipitate; ovules 2-several; fruit orbicular, oblong, or linear, flat, indehiscent, style terminal, edges slightly winged; seed 1 or few, flat, orbicular or reniform.—About 70 tropical species.

1. Leaflets 5–7 (rarely 9); 10 cm long or more.....*D. elliptica*
1. Leaflets 3–5 (rarely 7); usually less than 10 cm long.....*D. trifoliata*

DERRIS ELLIPTICA (Roxb.) Bentham, J. Linn. Soc. Bot. 4 [Suppl.] 111. 1860. Stone, Micronesica 2(2): 137. 1966. TUBA. BAGIN.

A climber or creeper with alternate pinnate leaves with 5–7, or 9 leaflets, these acute-acuminate, narrow-elliptic, 10–20 cm long; midrib puberulent dorsally;

Fig. 49. Derris trifoliata.

underside slightly glaucous.

An Indomalaysian-Pacific species; a major source of rotenone, used for stupefying fish. Rarely (and illegally) cultivated in Guam, also useful as an insecticide. It has not been seen to flower here, and flowering is said to be rare elsewhere also.

Derris trifoliata Loureiro, Fl. Cochinch. 433. 1790. Merrill 1914: 91.

BAGIN.

Glabrous creeping and climbing shrub reaching a height of 5–6 m; leaves with 3–5, rarely 7 leaflets, three broadly ovate or elliptic-ovate, acute-acuminate, mostly 4–10 cm long, about 2–4 cm broad, obtuse or rounded subtruncate at base, rather glossy medium-green, slightly paler but not at all glaucous dorsally, on petiolules 4–8 mm long; inflorescences axillary, short-pedunculate racemes; flowers white or faintly pink, on short slender pedicels; calyx 2–3 mm long; corolla 6–7 mm long; pods flat, greenish or tan, elliptic-ovate, thin, veiny, up to 5 cm long and 3 cm wide, 1–2-seeded, sessile, narrowly alate along one edge.—Fig. 49.

Old World tropics on the coasts from E. Africa to Polynesia. Native and rather common in Guam, either scandent on shrubs and trees or creeping on rocks of limestone coasts. Banks of Talofofo R. (4180; 4304); Talofofo-Asanite headland (5043). Its roots also contain rotenone, but in much smaller quantity.

Desmodium Desvaux

Shrubs or herbs; leaflets 1–5, usually 3; stipels conspicuous; stipules present; flowers in terminal or axillary racemes; bracts often caducous; calyx short-tubular, upper 2 lobes somewhat connate, lower 3 pointed; standard oblong to orbicular; stamens all connate or 1 mostly free; ovary sessile or stipitate; ovules 2-many; fruit a loment, i.e. composed of joints, each 1-seeded, flat, usually indehiscent; seeds compressed, broad.—About 350 species of the tropics and subtropics. Four species in Guam.

Note: for illustrations of all our species, see T.S. Liu and C.C. Chuang in Taiwania No. 8, 67–126, 1962.

1. Prostrate or lowly-climbing slightly suffruticose herbs.
   2. Stems conspicuously pilose; leaflets 1.3–2 cm long; peduncle over 1 cm ..... *D. heterophyllum*
   2. Stems shortly pubescent; leaflets mostly 0.7–1.3 cm long; peduncle up to 1 cm long ..... *D. triflorum*
1. Erect shrubs or small trees.
   3. Coarse shrubs about 1 m high; leaves with 1 leaflet ['simple']; inflorescence terminal ..... *D. gangeticum*
   3. Woody shrubs or little trees up to 5 m tall; leaves of 3 leaflets; inflorescences axillary ..... *D. umbellatum*

Desmodium heterophyllum (Willd.) DC. Prodr. 2: 334. 1825.

Merrill 1914: 90. Bryan, 17 Feb. 1960. AGSOM; APSON.

A prostrate spreading sometimes weakly ascending somewhat mat-forming herb with tough woody roots and small trifoliolate leaves; stems pilose; leaflets

elliptic-obovate, rounded or notched at tip, mostly 1.3–2 cm long, short-petiolulate, puberulent dorsally; inflorescences axillary, short; flowers 5–6 mm long, sometimes solitary; peduncle 1–1.5 cm long, pilose; calyx pubescent; corolla pink; standard sessile; pods 4–6-jointed, 1.6–2 cm long, 3 mm wide, constricted between the joints only on the ventral rib, sometimes slightly dehiscent.

Mascarene Islands to India, S.E. Asia, Philippines, Taiwan; and naturalized in other regions.

This species is very similar to the next and has often been considered synonymous. Meeuwen (Reinwardtia 6: 244, 1962); Liu and Chuang in 1962; and Fosberg (Micronesica 2(2): 1966), all agree on keeping it distinct.

In Guam it is often found in lawns and in waste ground.

"Agsom" means sour; however it is improperly applied to Desmodium, since this is not sour; it belongs really to *Oxalis corniculata*, which is sour to the taste. The leaves of these plants are very similar, hence the confusion.

Desmodium triflorum (L.) DC. Prodr. 2: 334. 1825. Merrill 1914: 91.

Meibomia triflora (L.) O. Kuntze, Rev. Gen. Pl. 1: 197. 1891. Safford 1905: 321. AGSOM; APSON.

Creeping herb; much-branched, somewhat mat-forming; leaves of 3 leaflets, the lower leaves sometimes unifoliolate; leaflets obovate, to obcordate, rounded and emarginate at tip, mostly less than 1 cm long, up to 9 mm wide, sometimes with 2 white marks; flowers few in fascicles, opposite leaves, pedicels 3–8 mm long, lengthening in fruit to just over 1 cm; puberulent; corolla reddish-violet, or pale pink, standard obovate, 4–5 mm long; pods up to 17 mm long, about 2.3 mm broad, 3–7-jointed, indehiscent.

Widely distributed in tropics of both hemispheres. Like the preceding species in habitat as well as general form, but with usually smaller leaflets, shorter flower-pedicels or peduncles, standard petal with distinct claw, and indehiscent pods; the stems with less conspicuous hairs; the flowers 2–5, usually in fascicles, not true racemes, leaflets usually obovate-emarginate.

Desmodium gangeticum (L.) DC. Prodr. 2: 327. 1825. Merrill 1914: 90.

Meibomia gangetica (L.) O. Kuntze, Rev. Gen. Pl. 1: 196. 1891.
Safford 1905: 321. TOMATES-ANITI. ATIS-ANITI.

An erect shrub to 1.5 m tall; branches slightly gray-pubescent; leaves simple, oblong-elliptic, 8–10 cm long, 3–4 cm wide, acute, basally obtuse or rounded, thin, puberulent dorsally, closely pinnate-veined, on petioles 1–2 cm long; stipules linear, up to 1 cm long; inflorescence of terminal and also some axillary racemes, up to 15–25 cm long; flowers whitish or pale violet, nearly 5 mm long; calyx puberulent, half as long as the corolla; corolla 3 mm long; pedicels 4–5 mm long; pods 1.3–2.3 cm long, curved, 2–3 mm wide, 5–8–(–10) jointed, the joints separated by deep incisions on one side only, pubescence sparse, of minute hooked hairs.

Paleotropics; a widespread weed. It is said to have medicinal properties as a febrifuge and anticatarrhal. The 2nd Chamorro name means "devil's-sweetsop".

In Guam this is a weed of old fields especially in the southern villages and pastures. Merizo (3926).

Desmodium umbellatum (L.) DC. Prodr. 2: 325. 1825.

Merrill 1914: 91. PALAGA HILITAI.

Meibomia umbellata (L.) O. Kuntze, Rev. Gen. Pl. 1: 197. 1891. Safford 1905: 322.

A shrub, in age a small shrubby tree, with closely-appressed silky white pubescence on younger parts; usually 1–2 m, but as much as 5 m tall; leaves trifoliolate, on petioles 2–4 cm long; leaflets subcoriaceous, ovate-oblong or oblong-elliptic, grayish-canescent beneath but glabrescent, mostly 4–8 cm long and 3–5 cm wide, apically obtuse, terminal leaflet larger than laterals, veins prominulent; flowers in loose axillary umbels of usually 6–12 flowers; peduncle 1–2 cm long; pedicels short; calyx 4–5 mm long, densely silky-pubescent, teeth lanceolate; corolla dull or creamy white; standard obovate; petals longer than calyx; stamens all connate; pods 2–4 cm long, 5 mm wide, mostly 4–5-jointed, thickish, silky-pubescent, indented between the joints on both edges, veiny.

Tropical Asia north to Taiwan and Okinawa, east through Micronesia and Melanesia to Polynesia, a common strand plant; native in Guam.

Cetti Bay (3896; 4741); Ylig R. (4528: 4859); N.C.S. Beach (5133).

Dolichos Linnaeus

Herbs, often twiners; leaves pinnately trifoliolate; stipules present; flowers in axillary or terminal racemes or in axillary fascicles; bracteoles 2, caducous; calyx cleft into two lips, 2 upper lobes mostly connate; corolla glabrous; standard with 2 basal inflexed appendages; 9 stamens connate, 1 free; ovary subsessile; ovules 4-many; style distally hairy; pod obliquely oblong-falcate, beaked, 2-valved; seeds subcompressed, arillate, 3–10.

—More than 100 species, tropics generally. [Including Lablab, Savi, as genus].

Dolichos lablab L. Sp. Pl. 725. 1753. Safford 1905: 264.

Merrill 1914: 94.

CHERIBILLA APAKA. CHUCHUMEKO. HYACINTHBEAN.

Twining climber; leaves trifoliolate; petioles 6–26 cm long; rachis and petiole up to 30 cm; leaflets entire, thinly pubescent, acute-acuminate, 5–15 cm long and wide; terminal leaflet ovate-rhombic, angulate; lateral leaflets asymmetrical; peduncle 5–30 cm long; flowers several together; calyx finely pubescent; tube 4–5 mm long, upper lip 3 mm; corolla violet or whitish; standard to 14 mm long, 20 mm broad; pod oblong, flattened, up to 12 cm long, beaked at tip; seeds 3–5, dark brown or pale tan or white, often speckled; hilum white, linear.

Native of the Old World Tropics; widespread in cultivation.

Cultivated in Guam and occasionally persisting in old fields or escaping to nearby thickets, but ephemeral. The young pods are edible, eaten like green-beans.

GLIRICIDIA Humboldt, Bonpland & Kunth

Trees of shrubs; leaves imparipinnate with many entire leaflets, these opposite or rarely alternate; stipules very small; flowers pink, in axillary racemes, sometimes on older branches; calyx subtruncate or the teeth short; standard suborbicular, claw very short; wings shorter than keel; 9 stamens connate, 1 free; ovary stipitate; ovules many; pod flat, linear, 2-valved.—About a half dozen species of Tropical America.

[The generic name means "rat-killer"].

GLIRICIDIA SEPIUM (Jacquin) Steudel, Nomencl. bot. 688. 1821.

MADRE DE CACAO.

Small tree, semi-deciduous, with pale bark; stems ascending; leaves with 5–15 ovate or ovate-oblong, obtusely acuminate leaflets, 3.5–8.5 cm long and 2–5 cm wide, glaucous beneath, dull green above, glabrate; flowers usually maturing in short racemes on older branches after leaves have fallen; racemes up to about 10 cm long, stiff; pedicels 8–12 mm long, jointed at tip; calyx puberulent, corolla rose or paler pink, up to nearly 2 cm long; standard with a pale yellow central blotch; dorsal side slightly puberulent; pods 8–16 cm long, 1.5–1.9 cm wide, with 2–9 seeds.

Central America, Mexico, and N. South America; introduced as an ornamental and shade tree for coffee (hence the name). It is quick-growing and attractive; the leafy branches resemble Hawaiian "kahilis." Agaña Spring (5261).

The seeds and bark may be used as a rat- or mouse-poison if mixed with rice or some other cereal.

ERYTHRINA Linnaeus

Trees or shrubs, some prickly; leaves trifoliolate; indumentum sometimes of stellate hairs; stipules small; stipels glandulose; racemes axillary or terminal; flowers usually red; bracts and bracteoles small or none; calyx truncate, 5-toothed, or split; petals unequal, the wings sometimes absent; vexillary stamen free or nearly so; ovary stipitate; stigma small, terminal; fruit falcate, linear, usually constricted between the several to many seeds, dehiscent by one or both sutures; seeds ovoid, the hilum oblong.—About 200 species, tropics and subtropics.

Erythrina variegata L. ex Stickm. Herb. Amb. 10. 1754.

var. **orientalis** (L.) Merrill, Interp. Rumph. Herb. Amb. 276. 1917. Walker & Rodin 1949: 460. GAOGAO, GABGAB. CORAL-TREE.

E. indica Lamarck, Encycl. 2: 391. 1785. Safford 1905: 269. Merrill 1914: 92.

E. corallodendron var. *orientalis* L. Sp. Pl. 706. 1753.

A deciduous, stocky tree, the trunk and branches usually set with spiny prickles; leaves trifoliolate, membranaceous; leaflets 10–15 cm long and broad, cuspidate, rounded or truncate at base, on short petiolules; petiole 10–12 cm long; flowers about 6 cm long, in racemes up to nearly 20 cm long; petals dark or scarlet red very unequal; pod torulose, 15–30 cm long, black, glabrous, tardily dehiscent; seeds red, 1.5 cm long.

A native of India, probably also of Malaysia and the Pacific, but often cultivated and introduced as well for its showy flowers, and in the var. *variegata*, the mottled yellow-and-green leaves. The deciduous character is marked; the trees often drop all their leaves, and while bare, the flowers emerge, affording a very attractive sight. The wood is light, rather soft, and easily worked.

Widespread in Guam, though nowhere abundant; both wild and in gardens, along roads, etc. Camp Quezon (4125); Tumon Beach (4746); Barrigada (4956); Asan (Moore 246); etc.

INDIGOFERA Linnaeus

Herbs, shrubs, or small trees; pubescence of forked hairs; leaves imparipinnate, or reduced to 3 or even 1 leaflets; leaflets entire; stipules small; flowers in axillary racemes; bracts caducous; bracteoles none; calyx teeth slender; standard subsessile; keel spurred; 9 stamens connate, 1-free; ovary sessile; ovules 1-many; fruit linear to subglobose, 1-many-seeded, septate; seeds globose, cylindroid, or compressed-quadrate.—Perhaps 750 species, of tropical and subtropical regions.

1. Pods mostly less than 2.5 cm long, with 3–8 seeds almost as broad as long; racemes mostly more than 6 cm long.....*I. suffruticosa*
1. Pods 1.5–3.5 cm long; seeds (3)–6–12, longer than broad; racemes less than 6 cm long.....*I. tinctoria*

Indigofera suffruticosa Miller, Gard. Dict. ed. 8, no. 2. 1768.

Merrill 1914: 89.

I. anil L. Mant. 2: 272. 1771. Safford 1905: 296. ANILES. INDIGO.

Erect branching shrub to 1 m tall, younger parts pubescent; leaves pinnate, 7–13 cm long; leaflets mostly 9 or 11, (but to 17) dark green, lanceolate-oblong or slightly obovate, puberulent at least dorsally, mucronulate, 1.5–3 cm long, about 4–12 mm wide; rachis reddish-bristly; flowers in slender racemes to 9 cm long; pedicels scarcely 1 mm long; flowers about 3 mm long; corolla pinkish-red; standard obovate; pods curved, reflexed, mostly 1–2.5 cm long, 3–8-seeded, terete, borne packed in clusters.

Tropical America; introduced and naturalized in Guam in old fields and along roadsides, as between Barrigada and Mangilao (4864). A source of the dye indigo.

Indigofera tinctoria L. Sp. Pl. 751. 1753. Safford 296. Merrill 1914: 90. ANILIS. INDIGO.

Erect branched shrub; leaflets 5–13, oblong varying to ovate or obovate, 1–2.6 cm long, 4–16 mm wide; rachis + petiole 2.5–6 cm long; flowers in erect subsessile racemes mostly less than 6 cm long; pedicels 1.5–2 mm long; flowers reddish, marked with yellow; standard orbicular-obovate, 4–5 mm long; pods 1.5–3.5 cm long, 2 mm thick, terete, reflexed, nearly straight or very slightly curved; seeds mostly 6–12 (rarely only 3–6), longer than broad.

Tropical America, introduced in Guam; sparsely naturalized.

Neither of these 2 species seems to be used for the blue dye indigo which they both contain.

INOCARPUS Forster

Big trees with alternate, simple (unifoliolate) leaves; stipules small; flowers in axillary spikes; bracts and bracteoles deciduous; calyx short tubular, 2–5-toothed; 5 petals free, linear, subequal, imbricate (not 'papilionate'); 10 stamens briefly connate at base, and often slightly adnate to petals; ovary subsessile; ovules 2–4; fruit obovate, drupaceous, 1-seeded; seed with fleshy cotyledons.—Two species, Old World to Polynesia.

INOCARPUS EDULIS J.R. & G. Forst. Char. Gen. Pl. 66, t. 33, 1776. Merrill 1914: 91. BUDO. BUOY. TAHITIAN CHESTNUT.

Inocarpus fagiferus (Parkinson) Fosberg, J. Wash. Acad. Sci. 31(3): 95. 1941.

Aniotum-fagiferus Park. J. Voy. Endeav. 39. 1773.

Bocoa edulis (Forst.) Baillon, Adansonia 9: 237. 1868.

Safford 1905: 199.

A big, later massive tree, trunk cylindric to fluted, buttressed; branches long, drooping; leaves oblong, coriaceous, glabrous, pinnately veined, shortly petiolate, basally rounded, acute-acuminate, 15–30 cm long, 8–14 cm broad; flowers small, in spikes, whitish to yellowish, fragrant; calyx with 2–3 rounded lobes; petals basally connate; ovary subsessile; style very short; with oblique stigma; pod ovoid or cardioid, hard, 1-seeded, indehiscent, about 7–8 cm long, 5 cm wide, and 4 cm thick; seed large, edible after cooking.—Fig. 50.

Malaysia east to Polynesia. Of late introduction to Guam, from the Caroline Islands. The seeds are a common food (when roasted or boiled) in Polynesia, in flavor much like a chestnut. The wood however is not durable.

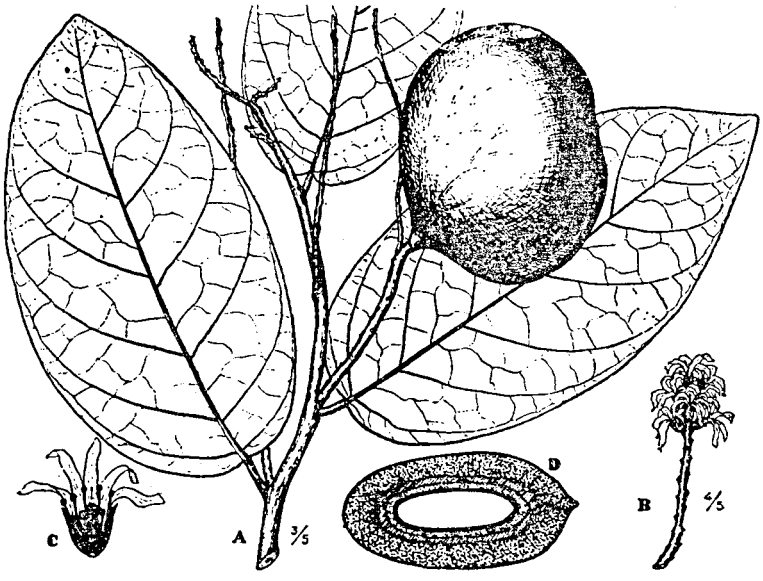

Fig. 50. Inocarpus edulis.

I consider that Parkinson's names are all technically monomials, as they are hyphenated, and hence illegitimate.

MEDICAGO Linnaeus

Herbs or shrubs; leaves pinnately trifoliolate, the leaflets toothed; stipules adnate to the petiole; flowers yellow or violet, solitary or in axillary racemes or in heads; bracts small or absent; bracteoles none; calyx-lobes equal; standard obovate, sessile; keel shorter than wings; 9 stamens connate, 1 free; ovules many; fruit curved, spiralled, sometimes prickly, indehiscent or nearly so; seeds without strophiole or caruncle.—Perhaps 50 species, Africa, Europe, Asia; especially in the Mediterranean area.

One species experimentally introduced in Guam.

MEDICAGO POLYMORPHA L. Sp. Pl. 779. 1753. var. VULGARIS (Benth.) Shinners, Rhodora 58: 00. 1956.

Medicago denticulata Wild. Sp. Pl. 3: 1414. 1803. Merrill 1914: 89.

Annual prostrate glabrous herb; leaves of 3 leaflets, these serrate-toothed, mostly 1–2 cm long; stipules laciniate; pods prickly-hispid, flowers yellow; several-seeded.

A European species, experimentally introduced in Guam by the Guam Experiment Station. It has either entirely disappeared or is now exceedingly rare. [For nomenclature see van Steenis, Blumea 12: 15. 1963].

Note: Other species, including *M. quinquefolia*, have also been attempted, but I believe all have proved unsuccessful.

MUCUNA Adanson

Woody or herbaceous climbers with pinnately trifoliolate leaves, usually with stipels; stipules deciduous; flowers often showy, green, yellow, red, or purple; in fascicles of racemes, pedunculate from axils; calyx with upper 2 lobes connate, shorter than lower lobe; standard shorter than the wings, with inflexed basal appendages; wings often adnate to keel; 9 stamens connate, 1 free; anthers of 2 sorts alternating; ovary villous, sessile; ovules few-several; pod thick compressed, ovate, oblong, or linear, sometimes with detachable irritating hairs, 2-valved, ribbed or not tardily dehiscent; seeds oblong or orbicular-ovate, subcompressed, with a conspicuous oblong or linear hilum.—About 150 species in tropics around the world.

1. Perennial vines; flowers green to yellow.
   2. Leaflets glabrous; flowers green.....*M. gigantea*
   2. Leaflets pubescent; flowers yellowish.....*M. platyphylla*
1. Annual vines with purple flowers.....*M. pruriens*

Mucuna gigantea (Willd.) DC. Prodr. 2: 405. 1825. Merrill 1914: 92.

GAYETAN; BAYOGO DIKIKE. DIKIKI GAOGAO. BAYOGON-DAILAILI. SMALL SEA-BEAN

Dolichos giganteus Willd. Sp. Pl. 2: 1041. 1801.

Stizolobium giganteum (Willd.) Sprengel, Syst. Cur. Post. 281. 1827. Safford 1905: 378.

Slender high-climbing vine, glabrous except for inflorescences and fruits; leaves alternate, trifoliolate, on long petioles; leaflets ovate, the lateral ones asymmetric, all acuminate, truncate or slightly subcordate at base, chartaceous, up to 15 cm. long and 10 cm wide, rather pale green, not shiny, 3-nerved, turning black on drying; flowers pale green; in long-pedunculate axillary clusters; flowers nearly 4 cm long, on long pedicels; calyx golden-tomentose; pods oblong, flattened, the margin 2-winged, irregularly wavy, tomentose with easily detached irritating golden-tawny hairs, (hence very old pods ± hairless), turning dull black, 15–20 cm long, about 5 cm wide; seeds large, compressed, rounded or squarish, dull brown.

India to Polynesia, distributed by ocean currents (floating seeds); common in Guam especially near the sea. Jones Beach (4294), Talofofo Rd. (4307), Pago Bay (4885); Asanite Point (4895). Tumon Beach (4996) (5076). First collected in Guam by Gaudichaud in 1819.

Mucuna platyphylla A. Gray, Bot. U.S. Expl. Exped. 1: 443. 1854.

A coarse herbaceous climber and creeper. Leaves of 3 leaflets; terminal leaflet rhombic-rotund, acuminate, basally obtuse, up to 13×11 cm; lateral leaflets asymmetrical, slightly smaller; main lateral veins 5–7 pairs; petioles 10 cm long or more, tomentellous-strigose with tawny-brown hairs; lateral petiolules 4–5 cm long; terminal petiolule swollen at apex. Undersurfaces of leaflets ± tomentellous on the nerves, ± glabrescent. Inflorescences axillary, paniculate-cymose, over 10 cm long. The axes tawny-brown tomentellous. Calyx-tube 10–13 mm long, densely tomentellous with shorter hairs (to 1 mm long) mixed with fewer much longer hairs (2–4 mm), strigosely appressed; calyx-lobes slender, unequal, the long one c. 5 mm, the short ones 1 mm or less; petals yellowish to pale green, about 5 cm long; standard about 3–3 cm; keel to 5 cm long. Pods not seen.

A Fijian species.

Northwest Field (5004); Chepek Springs (4326)? Saipan (5232).

MUCUNA PRURIENS (L.) DC. Prodr. 2: 405. 1825. Merrill 1914: 92.

AKANGKANG DANGKULO.

Dolichos pruriens L. ex Stickm. Herb. Amb. 23. 1754.

Stizolobium pruriens (L.) Medicus, Vorles. Churpf. Phys. Ges. 2: 399. 1787. Safford 1905: 378.

Annual vine, grayish-pubescent; leaflets ovate to oblong, acute-acuminate, thin, pubescent-gray below, 5–13 cm long, the lateral leaflets asymmetrical; flowers purple, in drooping racemes of many flowers; each flower 3.5–4 cm long; calyx grayish-pubescent; pods stout, compressed, 5–10 cm long, 1.5 cm broad, densely pubescent, the brownish hairs easily detachable and highly irritating to skin; one longitudinal rib on each valve; seeds about 6 mm wide, compressed-ovoid, brownish with black mottling, hilum less than 3 mm long.

Indonesia and Philippines. I have not seen this plant in Guam, so the record of Safford needs reconfirmation.

PACHYRRHIZUS Richard ex De Candolle

Climbing herbs with pinnately trifoliolate stipellate leaves, leaflets angulate or lobed; flowers fasciculate-racemose on axillary peduncles; bracts and bracteoles small, caducous; upper 2 calyx-lobes connate; standard obovate, with 2 basal inflexed appendages; wings and keel of equal length; 9 stamens connate, 1 free; ovary subsessile; ovules many; style distally hairy; stigma globose subterminal; fruit linear, flat; seeds compressed, the hilum short.—2 tropical species.

PACHYRRHIZUS EROSUS (L.) Urban, Symb. Antill. 4: 311. 1905. Merrill 1914: 94.
HIKAMAS. YAMBEAN.

Dolichos erosus L. Sp. 726. 1753.

Cacara erosa (L.) O. Kuntze, Rev. Gen. Pl. 1: 165. 1891.
Safford 1905: 205.

Climber reaching several m. in height; root tuberous, up to 15 cm in diameter; stems pubescent with down-pointing hairs; leaflets large membranous, acute, coarsely lobed, finely pubescent on both surfaces, the terminal leaflet 7–20 cm long, 6–20 cm wide; lateral leaflets slightly smaller; all deltoid-ovate; petiole 7–12 cm long; racemes usually several together, lax, drooping, 20–60 cm long, pubescent; flowers bluish-violet; calyx 2-lipped, about 11 mm long; standard with a greenish blotch at base, 1.5–2 cm long; style with a crenulate nectary-ring round the base, spirally incurved at apex, the stigma oblique, round; pod sessile, 7–13 cm long, about 1.3 cm wide, pubescent, turgid but compressed, linear, transversely depressed between the seeds, dark-brown; seeds orbicular, compressed, smooth, 4–9 per pod.

A native of Tropical America, introduced to Guam from Mexico and both here and in the Philippines known by its Mexican name 'hikamas'. In Guam it is not uncommon in farm-gardens. It is the tuberous starchy root for which the plant is cultivated. These may be cooked, pickled, or eaten raw. There appears to be a good deal of variation in quality of tubers from various sources. According to some authors, some parts of the plant are poisonous. It is also naturalized in Guam.

PHASEOLUS Linnaeus

Herbs, shrubs, or climbers; leaves pinnately trifoliolate; stipels present; stipules persistent; flowers 1 or few on 1-many tubercles of axillary racemes; bracts and bracteoles mostly caducous; upper 2-calyx-lobes free or connate; standard orbicular, sometimes twisted; keel and wings adherent, terminated by a spiralled-beak; 9 stamens connate, 1 free, this sometimes thickened basally; ovary subsessile; ovules many; style within keel-beak and twisted with it, bearded distally; stigma oblique; pod linear—ensiform, straight or curved, 2-valved, septate, compressed or thick; seeds several, with short hilum.—150 species, of both hemispheres in the warmer parts.

Four species in Guam, of which 3 are cultivated and one is possibly native.

[Synopsis of flower-colors]

Corolla white, aging yellowish-purple; cultivated;..... { *P. lunatus*, *P. vulgaris*
Corolla white or purplish, not yellow; wild plants..... *P. adenanthus*
Corolla yellow or yellowish, sometimes tinged reddish or greenish or purplish; always cultivated..... *P. radiatus*

Key to species

A. Cultivated plants.
1. Stipules produced below their insertion. Flowers yellow or yellowish. Plants twining or erect..... *P. radiatus*
1. Stipules not so produced; flowers white or whitish to purplish-white. Plants twining or erect.
2. Standard dorsally pubescent, green, but lilac within ventrally; up to 1 cm wide; pods 5–12 cm long, 2–4-seeded..... *P. lunatus*
2. Standard dorsally glabrous or only distally puberulent, white or purplish; up to 2 cm wide; pods over 10 cm long, 4-manyseeded... ..... *P. vulgaris*
A′. Wild or naturalized plants ..... *P. adenanthus*

Phaseolus adenanthus G.W.F. Mey. Prim. Fl. Esseq. 239. 1818.
Merrill 1914: 93. AKANGKANG-KALATUN.

Herbaceous twining vine with slender often pubescent stems; leaves alternate, trifoliolate, the leaflets firm, oblong-ovate, silky-pubescent, acute, obtuse or acute at base; up to 14 cm long, 6–7 cm wide, 3-nerved from base, thereafter pinnately-veined; racemose clusters axillary, elongate, flowers crowded toward ends of peduncles, short-pedicellate, each about 3 cm long, white tinged with purple; calyx green or purple; corolla whitish; pods linear, curved, flat, about 7–10 cm long and 1 cm wide; seeds many.

Adventive in Guam, or perhaps native.

PHASEOLUS LUNATUS L. Sp. Pl. 724. 1753.
P.l. [var.] *inamoenus* (L.) Wight ex Safford 1905: 350, unranked. LIMA BEAN

Twining long-lived vine; stipules to 2 mm long; stipels 1–2 mm long; leaflets deltoid-ovate, acute-acuminate, at last obtuse and mucronate, 5–11 cm long, 3–8 cm wide; peduncles to 4 cm long; racemes to 12 cm long, shorter than leaf; flowers borne several together on tubercles; pedicels 5–9 mm long; calyx puberulent, 2 upper teeth very short, rounded, lower 3 teeth acute; corolla white or pale purple; standard dorsally puberulent, broader than long, up to 1 cm wide; pods glabrous, yellow-brown, 5–12 cm long, 1.5–2.5 cm wide, 2–4-seeded; seeds white or brown, rarely reddish or nearly black.

Native of Tropical America; cultivated in Guam.

PHASEOLUS VULGARIS L. Sp. Pl. 723. 1753. ABUCHUELAS. BEAN.

Erect or twining herb; annual; leaflets ovate, rounded basally, acute-acuminate, 5–12 cm long, 3–9 cm wide, puberulent on both surfaces; racemes with peduncle

2–6 cm long; flowers in 1 or 2 pairs; bracteoles 3–9 mm long; upper calyx teeth very short; corolla white, aging yellowish, or pale purplish; standard to 1.4 cm long; pods linear, only slightly curved, or straight; seeds white, yellow, red, brown, purplish, or blackish.

Native of Trop. America, cult. in Guam.

PHASEOLUS RADIATUS L. Sp. Pl. 725. 1753.

P. mungo L. sensu Safford 1905: 350. MONGOS. MUNGBEAN.

Erect or twining herb; annual; stems hispid yellowish-brown; stipules up to 1.5 cm long, narrowly obovate; stipels 3–7 mm long; leaflets rhombic-ovate, or rhombic-oblong, shortly acuminate, hispid, 4–12 cm long, 2–8 cm wide; bracteoles deciduous, ovate; peduncle 10–30(–40) cm long; flowers on 2–6 tubercles, on pedicels about 2 mm long; calyx 3–4 mm long, upper teeth partly connate; standard about 1 cm long, yellow, or reddish-tinged; pods straight, compressed, 4–6 cm long, hispid or scabrous, 8–15-seeded; seeds ellipsoid, dark brown or green, sulcate on hilum.

A native of India, cultivated in Guam. The wild form is thought to be *P. sublobatus* Roxb. A form or variety, sometimes considered a distinct species, is *P. aureus* Roxb. (*P. radiatus* forma *aureus* (Roxb.) Hara). This plant has yellowish-green flowers and is erect, not twining. *P. mungo* (sensu Savi) also pertains here.

These cultivated beans and their wild relatives form a very difficult group because of their variability and the long, involved taxonomic history of the group.

This is said to be very extensively cultivated by Safford, and this is still true. The beans are a feature of markets in Guam in season.

PONGAMIA Ventenat

Tree with imparipinnate leaves, leaflets few, stipels none; leaflets opposite; flowers in axillary racemes; bracts caducous; bracteoles none; calyx truncate-rimmed; standard suborbicular, with inflexed basal appendages; wings slightly adherent to keel; 9 stamens totally connate basally; 10th stamen free at base, but connate with remainder from middle onward; stigma terminal; fruit oblong-oblique, flat, somewhat hard, indehiscent, 1-seeded, beaked; seed reniform, the hilum small.—Monotypic; Malaysia west to Mascarene Is. and east to Polynesia.

Pongamia pinnata (L.) Merrill, Interp. Herb. Amb. 271. 1917.

Walker & Rodin 1949: 460.

Cytisus pinnatus L. Sp. Pl. 741. 1853.

Medium tree, more or less deciduous, to 8–10 m tall, with stout trunk, dull gray bark, smooth or slightly fissured, and broad crown; leaves to 25 cm long; 5–9 leaflets mostly 8–15 cm long, glabrous, elliptic or ovate, acuminate, petiolulate, light green; flowers white or pale pink or lilac, in racemes to 20 cm long; flower 1.5 cm long; pods 3–5 cm long, elliptic-oblong, with curved beak, thickened, pale brown, with 1 (very rarely 2) seed, each about 2 cm long.

A coastal plant, on beaches or rocky shores; or along rivers or on rocky headlands, seldom far from the sea, from the Indian Ocean to the Pacific.

An attractive tree, suitable for roadside planting. The wood is not of much

value. The seeds can be treated to extract a reddish oil supposedly useful in treating skin diseases.

First collected in Guam 1/2 mi. N. of Asan in 1946 by Moore (234). It is not common.

PSOPHOCARPUS Necker ex De Candolle

Herbaceous climbing vine; leaves pinnately trifoliolate; stipels present; stipules produced below the base; inflorescences axillary racemes, or the racemes with distal fascicles of flowers; bracts small, caducous; bracteoles larger and subpersistent; 2 upper calyx-lobes connate; standard suborbicular with basal appendages; 9 stamens connate from the base, 10th free at base but connate with remainder from middle onward; style bearded, with globose stigma; fruit squarish in cross-section, 4-winged, the wings somewhat wavy or frilled; seeds many or several, transverse-oblong, with oblong hilum.—5 Old World species.

PSOPHOCARPUS TETRAGONOLOBUS (L.) DC. Prodr. 2: 403. 1825. Merrill 1914: 94. SIGIDIYAS. SEGUIDILLAS. WINGBEAN.

Dolichos tetragonolobus L. ex. Stickm. Herb. Amb. 23. 1754.

Botor tetragonoloba (L.) O. Kuntze, Rev. Gen. Pl. 1: 162. 1891.

Safford 1905: 201.

Twining climber with tuberous roots; leaflets deltoid-ovate, acute, glabrous; petiole about 8 cm long; leaflets 7–14 cm long, the terminal one broadest; flowers in racemes, light blue to lilac; peduncle 7.5–15 cm long; calyx 12 mm long; glabrous; petals subequal in length; keel incurved; pods mostly 15–22 cm long, square in section, 4-winged, the wings frilly or somewhat wavy; distinctly partitioned between seeds; seeds suboblong.

An Indomalaysian cultivar, probably of great antiquity, long ago introduced to Guam as a vegetable. The pods may be prepared in various ways, cooked or pickled, and are excellent in flavor. It is often found in gardens and fields and around houses; it may persist for a time as an escape also. The tuberous root is edible also. G.M.H. (4399).

PTEROCARPUS Linnaeus

Trees with alternate imparipinnate leaves; leaflets alternate or subopposite; stipules sometimes large; stipels none; flowers yellow, whitish or violet-tinged, in racemes or panicles; calyx turbinate, with more or less connate upper 2 teeth; banner-petal broadly ovate; keel-petals as long as or shorter than wings; stamens mono- or diadelphous, in 2 bundles of equal numbers of stamens, or all but one in one bundle and one free; ovary with 2–6 ovules; stigma small, terminal; pod flattened, orbicular or ovate, indehiscent, style usually lateral; seed central, bulging; pod margins samaroid; seeds rarely 2–3.—About 30 species, mostly paleotropical, but a few American.

Pterocarpus indicus Willd. Sp. Pl. 3: 904. 1803.

Bryan, 24 Feb. 1960. NANA. ANGSANA (Malay.), NARRA (Filip.)

A medium to big tree; trunks stout, sometimes buttressed; leaves up to 30 cm long; leaflets 5–11, broadly elliptic or ovate, bluntly acuminate, 5–10 cm long, alternate or only subopposite, petiolulate; panicles axillary pendent; flowers yellow, fragrant; pods orbicular, with thin winglike edges and a central rounded, 1-seeded expansion; (rarely with 2 seeds).

Tropical Asia, Malaysia, Philippines. 'Narra' is the Philippine name.

The only reported speciemen is that from near Fineguayac, collected by Reid Moran, on 27 July 1954, and mentioned by Bryan. I have not seen the specimen, nor the tree in Guam.

This species produces a superior cabinet-grade timber.

SESBANIA Scopoli

Small trees, shrubs, or herbs; leaves paripinnate with many leaflets; stipels small or none; stipules caducous; leaflets opposite; racemes axillary; flowers small to large, on slender pedicels; bracts and bracteoles usually caducous; calyx-tube truncate or lobed; standard orbicular or ovate; 9 stamens connate, 1 free; ovary stipitate (usually); ovules many; fruit linear, subterete, or oblong, compressed, subtorulose, rarely 4-winged, dehiscent or not; seeds oblong or quadrate.—About 70 species around the world in warm countries.

1. Erect subshrubs; flowers yellow, scarcely 1 cm long..... *S. cannabina*

1. Slender trees; flowers pink or white, nearly 10 cm long.... *S. grandiflora*

Sesbania cannabina (Retz.) Persoon, Syn. Pl. 2: 316. 1807;

Walker & Rodin 1949: 461.

Glaucous erect subshrub, annual, up to about 1 m tall; leaves up to 30 cm long; leaflets small and numerous, oblong, about 1 cm long and 3.5 mm wide, shortly petiolulate, opposite, grayish-green, blunt, in about 20–40 pairs; flowers rather small, about 1 cm long, pale yellow; pods slender, curved, round in section, pendent, 15–20 cm long, 3–4 mm thick, slightly constricted between the seeds; these numerous, scarcely 3 mm long.—Pl. 7c.

Native of India and elsewhere in Asiatic Tropics; now rather widespread as a weed. In Guam it is not found everywhere but may be locally abundant. Sinajana (4156); Ritidian Pt. Road (4704); Barrigada Village (4866). First collected in Guam near Piti in 1945.

SESBANIA GRANDIFLORA (L.) Persoon, Syn. Pl. 2: 316. 1807. KATURAI.

Merrill 1914: 90.

Agati grandiflora Desv. J. Bot. 1: 120, t. 4, f. 6. 1813; Safford 1905: 175.

Small, open-branched tree with drooping branches; rarely much over 5–6 m tall; bark thick, gray, cracked; leaves to 30 cm long, glaucous; leaflets 20–40 pairs, oblong, obtuse, about 2–3 cm long; inflorescences lax axillary racemes; flowers white or deep pink, quite large, 7–8 (even 9) cm long; pods pendent, slender cylindric, green, many-seeded, 25–55 cm long, edible when young.

India and Tropical Asia; introduced to Guam from the Philippines, and known by its Tagalog name. Both the flowers and young pods are edible and of good

flavor. The bark is astringent.

This is a frequent little tree in villages and is quickly recognized by its greyish foliage and very big flowers. There are two color forms, one with white, the other with pink–nearly red–flowers. Agaña (3784).

SOPHORA Linnaeus

Trees, shrubs, or perennial herbs; leaves imparipinnate; leaflets many, rarely few; stipels often lacking; flowers white or yellow, rarely purplish, in terminal racemes or leafy panicles; bracts and bracteoles often lacking; calyx with short teeth; standard obovate or orbicular, often shorter than the keel; keel nearly straight; stamens free or connate only at extreme base; ovary stipitate; ovules many; fruit moniliform subterete, late or not dehiscent; seeds subglobose; strophiole none. —About 80 species in tropical and warm-temperate regions of both hemispheres; 1 in Guam.

Sophora tomentosa L. Sp. Pl. 373. 1753; Safford 1905: 376; Merrill 1914: 89.

A medium to big shrub with silvery-pubescent foliage; up to 3–4 m tall; branches velvety gray-pubescent; leaves alternate, odd-pinnate, with about 15 to 21 leaflets, these obovate or nearly orbicular, silvery-gray pubescent, rounded at tip, obtuse or rounded at base, 2.5–5 cm long and 2–4.5 cm broad, on petiolules barely 3 mm long; flowers bright yellow, in terminal erect racemes; pedicels 5 mm long; flower about 2 cm long; pods 8–16 cm long, grayish-pubescent, strongly constricted between the subglobose seeds, appearing rather like a stiff string of beads ("moniliform").

A pantropical strand species, generally on sand beaches. It is a very attractive bush and makes a useful addition to the garden plants available to the person whose house is near a beach or on sandy soil.

The root and seeds, in particular, are bitter, yielding the alkaloid sophorine, which is poisonous in large amounts; but in small amounts is said to be medicinal as a purgative.

Safford believed (on the basis of local informants) that the plant was of recent introduction. This is however unlikely, as it is not generally in use and is not cultivated. It is probably native, but not common, purely because sandy beach formations in Guam are uncommon. It can be seen easily on the main road south from Yona at several places, especially near Asanite Bay. Tagachan Bay (4021); Yona, Marine Beach (4421).

STRONGYLODON Vogel

Woody climbers; leaves pinnately trifoliolate; stipels present; stipules small; flowers on elongated axillary racemos, fascicled; bracts and bracteoles inconspicuous; calyx-lobes usually obvious; standard ovate-oblong, reflexed, with 2 lateral appendages; wings much shorter than standard; keel as long as standard, curved and beaked; 9 stamens connate, 1 free; ovary stipitate; ovules 1 or few; fruit ovate, elliptic, or oblong, flat, dehiscent, with 1–2 thick round compressed seeds with linear,

long hilum.—About 20 species from Madagascar east to Polynesia.

Strongylodon lucidus (Forst.) Seemann, Fl. Vit. 61. 1865–8. Merrill 1914: 92.

Glycine lucida Forster, Prodr. 51. 1786.

Strongylodon ruber Vogel, Linnaea 10: 585. 1836.

A strong woody climber with trifoliolate leaves; leaflets glabrous, membranous, ovate, entire, acuminate, obtuse at base, 6–13 cm long, 5–8 cm wide, glossy green, the lateral leaflets somewhat asymmetrical, on obvious petiolules; flowers scarlet-red, slender, curved and beaked, grouped in triads; pedicels 2–3 cm long; pods flat, smooth, 5–10 cm long, 6–7 cm wide, subelliptic, slightly beaked, 1–2-seeded; seeds black.

Ceylon to Polynesia; a climber in lowland forests.

This plant seems to be very rare in Guam. I searched for it, without success, in many places. In bloom, it is unmistakable, with the hanging racemes of scarlet flowers, each curved like the bill of some unusual bird, making the forest canopy rich with color. MacGregor's specimen, 553, (from the "Upi Road") is the only one known to me. It is worth searching for, and planting on a trellis-backed garden plot. Other species too are handsome, especially the extraordinary *S. macrobotrys* or *jadevine*, native of the Philippines, which with its blue-green flowers, is a rare, almost startling, sight, when in flower.

Tephrosia Persoon

Shrubs or herbs with imparipinnate leaves (rarely unifoliolate); stipels none; racemes terminal, axillary, or leaf-opposed; bracteoles none; flowers red, purple, or white; calyx with subequal teeth; standard suborbicular; stamens all connate, or 9 connate and 1 free; ovary sessile; ovules 1-many; fruit linear to oblong, compressed, dehiscent; seeds usually several.—400 species, most either African or Australian, remainder Asiatic or American.

Tephrosia mariana DC. Prodr. 2: 253. 1825.—Hosokawa, J. Jap. Bot. 13: 276. 1937.

Cracca mariana (DC.) D. Kuntze, Rev. Gen. Pl. 1: 175. 1891.

Safford 1905: 250.

A low shrub with erect villous terete stems and pinnate leaves; leaflets 9 or 11, sessile, narrow oblong, glabrous above, silvery-canescent beneath, about 5 cm long and scarcely 1 cm broad; stipules lanceolate, elongate, pubescent; flowers subsessile in axils or shortly racemose, terminal, white; pods slender, upright, velvety pubescent, 10–12-seeded.

Apparently found only in Guam and Truk. Hosokawa gives a very complete description: 'leaf-rachis to 10 cm long; leaflets up to 6×2.2 cm, distal ones largest; petiolules 2 mm long; calyx lanate, tube 3 mm, lobes 1.5 mm; standard 2×1.5 cm; wings 1.4 cm long; keel 1.6 cm long; stamens diadelphous; pod 6 cm long, 6 mm wide, 12-seeded, apiculate and slightly recurved at the tip.' The type is evidently a Gaudichaud collection from Guam.

Tephrosia hookeriana Wight & Arnott, Prodr. 212. 1834, *fide* Bryan, 3 Feb. 1960.

Erect shrub with ascending pubescent stems; leaves with 13–19 linear-oblong, obtuse leaflets, each 1.8–3.8 cm long, glabrous above, silvery-pubescent beneath; flowers white or purplish in open erect or lax terminal racemes; petals 9–12 mm long; pods to 5 cm long, about 4–5 mm wide, brownish silky-pubescent, 6–10-seeded.

This species may not be distinct from *T. purpurea* (L.) Persoon. Unfortunately I have not located either of these species in Guam and an unable to add therefore to our knowledge of them.

Teramnus Swartz

Slender herbaceous climbers; leaves pinnately trifoliolate; stipels present; racemes axillary, or flowers 1-few in axils; bracts and bracteoles small; upper 2 calyx-lobes free or joined; standard obovate, without appendages; keel shorter than wings; all stamens (10) connate; anthers unlike, 5 normal alternating with 5 sterile; ovary sessile; ovules many; style short; stigma capitate; fruit linear, dehiscent, with hooked persistent style.—About 6 tropical-subtropical species.

Teramnus labialis (L.f.) Sprengel, Syst. 3: 325. 1826,

Merrill 1914: 92. Bryan, 10 Feb. 1960. CHAGUAN CACAGUATES.

A slender herbaceous annual twiner; leaves with 3 elliptic-oblong leaflets, pubescent dorsally, 2.5–4.5 cm long; racemes panicled, axillary, pubescent; about as long as the leaves or shorter; flowers very small, purplish-blue; pods mostly 3–4 cm long, slender, flat, nearly straight, slightly curved or hooked at the tip, with about 10 small red rectangular seeds.

A pantropical weed. In Guam often found in old fields, or climbing on fences. It is rather inconspicuous, and the flowers are often difficult to see. Mangilao, College Campus (3795).

Vigna Savi

Prostrate or climbing herbs with pinnately trifoliolate leaves; stipules and stipels present; flowers white, yellow, or purplish, in axillary fascicled-racemose inflorescences; bracts and bracteoles caducous; calyx with 2 upper lobes more or less connate; standard orbicular, with basal inflexed appendages; 9 stamens connate, 1 free; anthers uniform; ovary sessile; ovules many; style bearded distally; stigma oblique; fruit linear, subterete, slightly curved or straight dehiscent; seeds reniform or subquadrate, the hilum short.—About 150 pantropical or tropical species.

Vigna marina (Burm.) Merrill, Interp. Herb. Amb. 285. 1917. Walker & Rodin 1949: 461. AKANGKANG MANULASA; AKANGKANG MALOLUSA.

V. lutea (Sw.) A. Gray, Bot. U.S. Expl. Exped. 1: 452. 1854.

Safford 1905: 297; Merrill 1914: 94.

Phaseolus marinus Burmann, Index Univ. in Herb. Amb. Auct. 16. 1755.

Creeping herbaceous perennial of strands; leaves trifoliolate; stipules minute, lanceolate; petioles 5–10 cm long; leaflets broadly ovate, or suborbicular, somewhat fleshy, entire, glabrous, (rarely somewhat obovate), 5–10 cm long; racemes

axillary, often just shorter than the leaf; flowers crowded distally on the peduncle, yellow, 1.5 cm long; pedicels short; pods short, subcylindrical, slightly curved, 3–6-seeded, green or brown, 5–7 cm long, 6–7 mm wide; seeds ellipsoidal, 6.5 mm long, brown.

A pantropical strand plant, often a common or abundant and conspicuous member of the beach plant-association. Tagachan Bay (4018); Yona (4427); Togcha Bay (4461); Mochom (4953).

VIGNA SINENSIS (L.) Endlicher ex Hasskarl, Pl. Jav. Rar. 346. 1848.

Safford 1905: 396. Merrill 1914: 94.

var. SESQUIPEDALIS L. SITAO. COWPEA; BLACKEYE BEAN.

Climbing annual herb; stipules large, produced below the base attachment; leaflets 3, each ovate-rhombic, acute, entire, 5–15 cm long; venation sometimes suffused with purple; racemes axillary, few flowered, with long peduncles; flowers white or pale purple; in clusters of 3–6; calyx campanulate; corolla much exserted; keel truncate; stamens diadelphous; anthers uniform; pods very long, often 45–90 cm, slender, about 1 cm wide, many-seeded.

A cultivar of Asiatic origin; introduced to Guam for its edible pods, and cultivated in farm gardens.

ZORNIA Gmelin

Herbs; leaves of 2 or 4 leaflets; blades often with pellucid dots; stipels none; stipules lanceolate to foliaceous; flowers solitary or in interrupted spikes; paired bracts enclosing each flower; bracteoles none; calyx often subhyaline, ciliate, 2 upper lobes connate, 2 lateral lobes small, lowest lobe developed; standard suborbicular; stamens 10, all connate; anthers of 2 alternating kinds; ovary sessile; ovules many; fruit compressed, straight along upper suture, sinuately indented along lower suture; segmented; segments indehiscent; seeds rounded-reniform.—About 40 species in all warm countries.

Zornia diphylla (L.) Persoon, Syn. Pl. 2: 318. 1807; sensu Safford 1905: 404. Merrill 1914: 90.—*Hedysarum diphyllum* L. Sp. Pl. 747. 1753.)

Slender erect or spreading wiry-stemmed glabrous annual herb with bifoliolate leaves; leaflets 2, lanceolate, acute, up to 2.5 cm long; stipules lanceolate; racemes slender, 3–15-flowered; flowers yellow, each within a pair of persistent lanceolate bracts, these about 8mm long; pods of 2–6 prickly rounded segments about 2mm wide.

A pantropical weed, usually of grassland. Safford & Seale 1123. Naturalized and infrequent in Guam.

OXALIDACEAE

Herbs, shrubs, or trees; leaves opposite or alternate, palmate or pinnate, mobile at the joints (sleep-movements or some more rapid as in *Biophytum*); stipules present or not. Flowers perfect, regular, sepals 5, imbricate, petals 5, free or slightly connate at base, stamens 10, basally connate, sometimes only 5 fertile; ovary superior, 5-

celled, styles 5, free, ovules 1 in each cell; ffuit a capsule or berry.—8 genera, 900 species; many characterized by presence of oxalic acid.

1. Trees with pink flowers borne on branches and trunks.....*Averrhoa*
1. Herbs with yellow or pink flowers borne in leaf axils.....*Oxalis*

AVERRHOA Linnaeus

Recognizable from the specific descriptions.—2 species.

1. Leaflets about 4–5 pairs; fruit 5-ridged; flowers axillary; pink-mauve.. .....*A. carambola*
1. Leaflets about 10–18 pairs; fruit unridged; flowers in fascides on branches; dark red.....*A. bilimbi*

AVERRHOA CARAMBOLA L. Sp. Pl. 428. 1753.

CARAMBOLA. STARFRUIT. BILIMBIN.

Small tree; leaves about 15–20 cm long, imparipinnate, leaflets 4–5 pairs; flowers panicled on branches and trunks, red or pink, some almost white; fruit oblong, 5-ridged, star-shaped in cross-section, waxy, yellow, crisp, acid, edible, up to 10–12 cm long.

Tropical; now widespread in cultivation. Inarajan hills (5027). For some reason, the names of these two similar fruits have become muddled. The word 'carambola', itself a vernacular name, is never used in Guam, the fruit being instead called "bilimbines"; while the species *A. bilimbi* is called "pickles", or "pickle-tree", or "pikue"; and never bilimbi or bilimbines. How this mix-up occurred is unknown.

AVERRHOA BILIMBI L. Sp. Pl. 428. 1753. BILIMBI. PIKUE. PICKLE.

Small tree; leaves up to 60 cm long, with 20–36 leaflets, these 3–9 cm long; flowers red and white, cauliflorous; fruit oblong-cylindric, smooth, subterete, to 7 cm long, yellowish, acid (very sour), crisp.—Pl. 7d.

Pantropical, widely cultivated. This tree is called "kamia" in Tagalog, "iba" in Visayan (Philippines).

OXALIS Linnaeus

Herbs or subshrubs with long-petiolate palmately divided leaves; flowers in cymes; sepals 5; petals 5; stamens 10; ovary elongate; styles free; fruit a capsule.—About 150 or more species, chiefly tropical American.

Oxalis corniculata L. Sp. Pl. 435. 1753. Safford 1905: 341.

AGSOM. APSOM. YELLOW WOOD SORREL

O. repens Thunb. Oxal. 16. 1781; Merrill 1914: 95.

Procumbent herb, pubescent with appressed hairs; leaves digitately trifoliolate, the leaflets obcordate; stipules united to base of petiole; petiole much longer than leaflets; flowers on 1–5-flowered peduncles, yellow, 5-merous, stamens 10; fruit an oblong pubescent capsule with compressed, cross-ridged seeds.

Paleotropical and in warm-temperate regions, now wide-spread, weedy. The characteristic sour taste explains another name for it, "sourgrass". It is often mis-

taken for a "four-leafed clover" or normal clover; clovers are legumes (Trifolium). Harmon village (4732).

First collected in Guam in 1819.

ZYGOPHYLLACEAE

Herbs, shrubs, or trees; leaves opposite, pinnate; stipules present; flowers perfect, sepals 4–5, petals 4–5, free, stamens 8–10, free, ovary superior, 2–5-celled, ovules 1–8 in each cell, axile; fruit a capsule or schizocarp.—26 genera, 250 species, tropical or of deserts.

1. More or less prostrate subshrubs; flowers yellow.....*Tribulus*
1. Trees; flowers blue.....*Guaiacum*

TRIBULUS Linnaeus

Trailing, basally somewhat woody herbs or subshrubs; leaves paripinnate (no terminal leaflet), opposite; flowers yellow.—About 20 species.

Tribulus cistoides L. Sp. Pl. 1: 387. 1753. Safford 1905: 390.

Merrill 1914: 95. CALTROPS.

Prostrate trailing subshrub, branches subascnding; leaves paripinnate, leaflets about 8 pairs, oblong; silky-pubescent about, 1 cm long; stipules falcate acuminate; flowers solitary, yellow, sepals 5, silky; petals 5, obovate; stamens 10, on base of annular 10-lobed disc, 5 longer ones opposite the petals, 5 shorter ones each with a dorsal gland; ovary sessile, hirsute, style short, stigmas 5; fruit of horned woody cocci, tuberculate, pubescent, partitioned within, compartments 1-seeded.

A tropical American somewhat weedy strand plant. Reported by Safford from the east coast, "between Pago and Talofofo." I have not seen it in Guam; it may thus have disappeared. Alternatively, I suspect that Safford could have mistaken this for Triumfetta.

GUAIACUM Linnaeus

Small trees with opposite pinnate leaves; wood heavy and dense, hard, olive-brown to nearly black.—A few species of Tropical America.

GUAIACUM OFFICINALE L. Sp. Pl. 381. 1753. GUAYACAN. LIGNUM-VITAE.

Small short-trunked tree, leaves paripinnate, leaflets usually 3 pairs, obovate, subsessile, 1–2.5 cm long; flowewers clustered, pubescent, blue, the petals about 1 cm long; fruit capsular, obcordate, 2-celled, compressed, about 2 cm long.

From Tropical America; cultivated both for the ornamental qualities and the extremely hard wood suitable for bearings, rotors, axles, etc.

A few plants seen in gardens, Agaña.

RUTACEAE

Citrus family

Herbs, shrubs or trees, usually aromatic with punctate glands; lvs. opp. whorled

or alt. compound or with 1 leaflet, exstipulate; fls. bi- or unisexual; sepals 4–5; petals 4–5, free or slightly coherent at base; stamens 4–15 or rarely more, inserted at base of hypogynous disk; ovary entire or 2–5-lobed, superior, 2–5- (or more-) celled with 2-many ovules per cell, axile; styles free or connate; fruit a berry, capsule, or follicular.

A family of 7 subfamilies, 12 tribes (containing 29 subtribes), about 150 genera, and 1600 species (Swingle, in Webber & Batchelor, 1943).

The three genera in Guam are all members of the Subfam. Aurantioideae.

1. Spineless; leaves with alternate (usually 5) leaflets; petals 5; stamens 10; shrub of cultivation ..... *Murraya*
1. Spines present (or sometimes obsolete or failing to develop); leaves simple (unifoliolate), some with expanded blade-like petiole, or of 2 opposite leaflets and 1 terminal leaflet; petals 3–8; stamens 6, or more than 10.
   2. Leaves of 3 leaflets; fruits 1–2 cm wide, red; petals 3; stamens 6; spines paired; shrub ..... *Triphasia*
   2. Leaves unifoliolate, the petiole often expanded (alate) and jointed to the blade; spines single, but in some forms reduced or absent; fruits mostly more than 3 cm wide, sometimes much larger, green, yellow, orange, rarely pinkish; petals 4–8, usually 5; stamens usually 4–5 times as many as petals (sometimes more); small trees ..... *Citrus*

MURRAYA Koenig ex Linnaeus

Unarmed shrubs or small trees; leaves pinnate, leaflets alternate; fls. 5-parted; sepals basally somewhat united; petals 5; stamens 10; ovary 2–5-locular, each cell with 1–2 ovules; fruit a small berry with 2–10 seeds. (*Chalcas* L., 1767).

One species in Guam

MURRAYA PANICULATA (L.) Jack, Malay. Misc. 1: 31. 1820.

Chalcas paniculata L., Mant. Pl. 68. 1767.

Murraya exotica L., 1774.

A shrub or small tree; leaves pinnate, leaflets usually 5, alternate, glossy, obovate, petiolules very short; fls. white; ovary usually 2-locular, stylose, with capitate stigma; berry somewhat oblong, about 12 mm long, reddish-orange, 1–3-seeded; seeds villous.

Native of Malaya, S. Thailand, often on limestone.

Rather common in gardens; sometimes used for hedges. Agaña (5091).

TRIPHASIA Loureiro

Shrubby; paired spines in axils; leaves 1–3-foliolate; petioles not winged; leaflets opposite, with 1 terminal; when 3-fol.; calyx and corolla 3–5-parted; stamens 6 (10 in *T. brassii*); ovary 3–5-locular; seeds 1–2 per locule; fruit a small berry.

One species in Guam.

Triphasia trifolia (Burm. f.) P. Wils., Torreya 9: 33. 1909.

LIMON-CHINA; LIMONCITO, LIMEBERRY.

Limonia trifolia Burm. f., Fl. Ind. 103. 1768.

Triphasia aurantiola Lour., Fl. Cochinch. 1790.

Shrub; glabrous; spines paired in leaf axils; leaves 3-foliolate, the terminal leaflet largest (2–4 cm long); petiolules and petioles short (5 mm or less); fls. 1–3 in axils on peduncles 3–4 mm long; flowers 3-parted, white; stamens 6; ovary 3-locular; locules 1-seeded; fruit ovoid, 1–1.5 cm long, reddish to crimson, 1–3-seeded; flesh mucilaginous. $2n = 18$.

Common naturalized (or possibly native?) shrub of limestone, in undergrowth, sometimes forming dense, spiny thickets. Fls. fragrant; fruits edible, but acrid; best used for preserves; flavor like limes.

Native of s.e. Asia and Malaysia, now widely cult. and naturalized; occasional in Florida west to s. Texas. A tetraploid form (with thick leaves and larger flowers; $2n = 36$) is known in Mexico.

CITRUS Linnaeus

Small trees; young twigs angled, afterward terete; spines single, axillary; older branches often spineless; leaves 1-foliolate, petioles usually somewhat to markedly winged; leaflet jointed to petiole; flowers single or few, axillary, bisexual or staminate; calyx 4–5-lobed; petals 4–8, usually 5; stamens 4–6 (–10) times as many as petals; ovary subglobose, 8–18 (usually 10–14)-locular, with 4–8 ovules per locule in 2 collateral rows; stigma spheroidal; fruit a hesperidium, seeds near inner angle, surrounded by stalked pulp-vesicles filled with watery tissue; around each segment a whitish endocarp; exocarp richly gland-dotted, secreting an essential oil(s); fruits green, yellow, orange, rarely pinkish; seeds pale, often flattened-angular, often polyembryonic; embryos white or green.—E.–S.E. Asia, 20–30 species.

Ten species reported from Guam, all but one in cultivation only.

Key to species

1. Petioles wingless, without obvious joint at leaflet; fruits large with very thick peel, usually bumpy..... *C. medica*
1. Petioles winged, wings narrow to broad and leaf-like; obvious joint between petiole and leaflet; fruits various.
   2. Stamens more than 4 times as many as petals; fls. bisexual or staminate; petiole-wings very narrow..... *C. limon*
   2. Stamens 4 times as many as petals; fls. usually bisexual; petiole-wings broad or narrow.
      3. Fruits very large, somewhat oblate, 10–15 cm diameter; petioles broadly winged..... *C. grandis*
      3. Fruits smaller, up to 10 cm diameter,
         4. Peel loose, easily detaching; fruits usually oblate.... *C. reticulata*
         4. Peel firmly adhering; fruits mostly globose.
            5. Stamens cohering in bundles; pulp-vesicles with few or no oil droplets; acrid oils lacking; petiole wings narrow to

moderately broad.

6. Pulp sweet, orange; peel orange.....*C. sinensis*
6. Pulp sour, green to orange; peel green or orange.
   7. Fruits 4–6 cm broad, green; pulp green; peel green to slightly yellow.....*C. aurantifolia*
   7. Fruits 5–9 cm broad, orange or reddish; pulp pale orange.....*C. aurantium*

5. Stamens free; pulp-vesicles with acrid oil droplets; petioles broadly winged.
   8. Wings entire; frt. smooth.....*C. macroptera*
   8. Wings crenulate; frt. bumpy.....*C. hystrix*

CITRUS MEDICA L., Sp. Pl. 2: 782. 1753. Merrill 1914: 98.

SETLAS (corr. citrus); CITRON.

Small tree; twigs angled, purplish when young, soon rounding; axillary spines short, stout; leaves ovate, blunt to rounded at tip, rounded or cuneate at base, the margins serrate; petioles with very narrow wings, or wingless, not conspicuously jointed to blade; fls. bisexual or staminate; petals 5, exterior pinkish; stamens 30–60; ovary 10–13-locular; fruit ovoid to oblong, the surface usually bumpy, yellow when ripe, the rind very thick; segments greenish, sour to slightly sweet.

Rare, in cultivation. The citron is generally candied for eating; often used in marmalades, fruit-cakes, etc.

The original home of the citron is probably in southern Arabia, according to Swingle (1943, p. 397). It was probably introduced to Greece by Alexander the Great about 300 B.C. The name "citrus" was apparently applied to an entirely different plant (*Callitris quadrivalvis*), the wood of which is used (medically) for the same purpose as the citron fruit, by the Medes (Persia). Later the word became applied to other citus fruits.

CITRUS LIMON (L.) Burm. f., Fl. Ind. 173. 1768. LIMON REAL; LEMON.

Small thorny tree; leaves pale green, ovate, acute, serrate; petioles narrowly winged, obviously jointed to blade; petals white within, but purplish outside; stamens 20–40; ovary barrel-shaped; fruit ovoid, with a low apical papilla, 8–10-locular; peel yellow.

Rare, in cultivation. Original home uncertain; probably E. Asia.

CITRUS GRANDIS (L.) Osbeck, Dagb. öfwer en Ostind. Resa, 98. 1757.

KAHET MAGAS; LALANGHA; PUMMELO; POMELO; SHADDOCK.

C. decumana (L.) Murr. Syst. ed. 13: 580. 1774. Safford 1905: 228. Merrill 1914: 97.

Goodsized tree, often pubescent; leaves oval or elliptic, blunt, rounded at base, or subcordate; petiole broadly winged, cordate; fls. large, with 20–25 stamens; ovary globose; fruits 15 cm diameter approx., oblate or slightly pyriform; seeds flattened, rough or wrinkled.

Occasional, in cultivation. Seen on farms at Talofofo and Inarajan.

The name pummelo is said to derive from the Dutch word pomplemouss.

The name shaddock is taken from an Englishman, Shaddock, who introduced this Oriental plant to the West Indies.

The grapefruit (*C. paradisi* Macf.) is sometimes thought to be conspecific. (The grapefruit may be distinguished easily from the pomelo by its somewhat smaller, 9–13 cm. broad, yellower fruits, with inseparable pulp-vesicles, more acid flavor, and broad-winged but not cordate petioles. It thrives poorly in Guam.)

CITRUS RETICULATA Blanco, Fl. Filip. 610. 1837.

KAHE NA KIKIKI, LALANGHITA; TANGERINE, MANDARIN.

Small spiny tree; leaves lanceolate; fruits oblate, depressed-globose, often somewhat concave at apex and base, the thin loose peel easily detachable from the segments, bright orange or reddish.

Rare, in cultivation. There are several cultivars of the Mandarin orange, including a very sour type (var. *austera* Swingle), as well as the sweeter forms. The tangerines in Guam markets are generally imported.

The type of Blanco's species is from the Philippines; but this is not necessarily the original home of the plant, though it is no doubt Asiatic.

CITRUS SINENSIS (L.) Osbeck, Reise Ostind. China, 250. 1765.

KAHET; SWEET ORANGE.

Small or medium tree; spines slender, flexible; leaves acute at tip, rounded at base; petioles narrowly winged, articulated both to the blade and to the stem; fls. 5-parted; stamens 20–25; ovary 10–13-celled; fruit subspherical, with firmly adherent peel, orange, the segments orange, sweet; seeds usually polyembryonic.

Rare, in cultivation. Original home probably south China. Unknown in Europe until about 1500 A.D.

CITRUS AURANTIFOLIA (Christm.) Swingle, J. Wash. Acad. Sci. 3: 465. 1913.

LIMON; LIME.

Limonia aurantifolia Christm. in L. Pflanzensyst. . . nach d. Houttuyn Werk. übersetzt, 1: 618. 1777.—*C. lima* Lunan, Hort. Jamaic. 451. 1814. Merrill 1914: 98.

Small tree; spines short, stiff, sharp; leaves to 8 cm long, ovate; margins somewhat crenulate; petioles narrowly winged, spathulate; fls. small, white, 4–5-parted; stamens 20–25; ovary 9–12-locular; fruit 4–6 cm broad, ovoid to subspherical, green or slightly yellowish; peel thin, glandular, adherent; pulp greenish, sour.

Frequent in cultivation; persisting in older abandoned farm areas; occasionally spontaneous from seeds of planted trees. Camp Quezon (4074).

The lime is well adapted to Guam and thrives readily. Several minor cultivars are present. Both imported and local limes are available in markets.

Original home: probably Indonesia. The Tahitian lime is triploid. Lime trees hybridize freely with other citrus species, and also graft well.

CITRUS AURANTIUM L. Sp. Pl. 2: 782. 1753. Safford 1905: 226. Merrill 1914: 97. KAHET; SOUR-ORANGE; SEVILLE ORANGE.

Tree; spines slender, usually short; but stout spines up to 7–8 cm long on youngest fast-growing shoots; leaves ovate, blunt, on petioles 2–3 cm long, rather

broadly winged, narrowing toward base; fls. bisexual with a few staminate; fruits subspherical, 5–10 cm broad, orange, slightly rough; pulp orange, but very sour; center becoming hollow at last, hence fruit able to float.

Frequent in cultivation; large trees may be seen along the Fonte River not far from the Naval Hospital (4232).

Originally from somewhere in S.E. Asia; introduced into the Mediterranean region by Arabs about 1100 A.D.; for about 500 years this was the only orange known in Europe. Its cultivation in Spain brought it the name of Seville Orange. In earlier books it is called *Citrus Bigarradia.* It can quickly be distinguished from the sweet orange (*C. sinensis*) by the longer (usually 2–3 cm) petioles, with broader wings, as well as by the flavor.

The plant described by Safford as *C. aurantium* subsp. *saponacea* is actually *C. macroptera*, described below.

Citrus macroptera Montrouzier, Fl. de l'Ile Art, Mem. Acad. Lyon, Coll. Sci., 10: 187. 1860. KAHET; WILD ORANGE; MELANESIAN PAPEDA.

C. aurantium subsp. *saponacea* Safford, Useful Pl. Guam, U.S.N.H. Contr. 9: 226. 1905.

Medium sized tree; leaves with broadly winged petioles and distinct joint at blade and petiole junction; blade about twice as long as petiole, minutely subcrenulate, up to 14 cm long; spines axillary; fls. few in axils; fls. 4–5-parted; stamens about 20; ovary 10–12-locular; pubescent; locules 1–2-seeded; fruit greenish or pale yellow, about 6–7 cm broad, the rind about 1 cm thick; pulp rather dry, greenish, scarcely edible; containing saponins.

Apparently but not certainly, wild and native in Guam. The fruits are hardly edible, but were used for their soapy quality, as described by Safford, for washing hair and clothing. It is not uncommon, at least in certain areas, such as Barrigada Hill (5007). It may also be planted. It should be used as a graft rootstock for other citrus varieties. According to Swingle (1943, p. 438) this species hybridized readily with the pummelo, the mandarin, and perhaps others.

CITRUS HYSTRIX DC., Cat. pl. Hort. bot. Montp. 97. 1913. Merrill 1914: 98. LIMON ADMELO, MAURITIUS PAPEDA.

Small tree; spines short, stiff, 1 cm long or less; leaves broad ovate, somewhat oblong, or sublanceolate; base rounded to subcordate; apex obtuse; margins serrate-crenate; blade up to 15 cm long; petiole broad-winged, wing subcordate; fls. 1–5 in axils; petals white to pinkish; stamens 24–30; fruit bumpy, greenish-yellow or yellow when ripe, pulp yellowish-green, very sour, slightly bitter.

Rare, in cultivation. Original home: Indonesian Archipelago, westward (naturalized?) to Ceylon; n. to Philippines.

The fruits usually have 10–12 (rarely 13–14) segments. This species has much the same uses as *C. macroptera* and *C. aurantium.*

BURSERACEAE

Trees or shrubs with alternate, compound leaves; stipules none; flowers perfect

or unisexual, small, sepals 3–5, petals 3–5, free, stamens 6–10, ovary superior, 2–5-celled, ovules 2 per cell, axile; fruit drupaceous or capsular, with hard endocarp.

Note. Although Safford discusses a species of *Canarium* (identified later in his private notes as *C. luzonicum* Miq.) in Guam, with the name *brea blanca*, he saw no living examples. Merrill (1914: 98) thinks the species would have been *Canarium ovatum* Engler, a Philippine tree (Manila elemi) that could well have been introduced to Guam. As far as I know, however, there is still no real reason to think the plant exists in Guam, if it ever did. Until it is definitely found in Guam, the record of *Canarium*, and with it the presence of the family Burseraceae, should be considered extremely doubtful.

MELIACEAE

Trees or shrubs with rarely simple, generally compound, alternate leaves; stipules none; flowers usually bisexual and regular; sepals usually 4–5, free, connate, or adnate to stamens; stamens 5, 8, or 10, free or connate-tubular; ovary superior, usually 2–5-celled, cells 1–2 (rarely several-) ovulate, ovules w. arils; fruit a drupe, berry, or capsule; seeds sometimes winged.—50 genera, 1400 species.

1. Leaves trifoliolate, pubescent, withering red..... *Sandoricum*
1. Not as above; leaves with more than 3 leaflets,
   2. Leaves 1-pinnate; leaflets entire.
      3. Glabrous leaves; fruit not densely tawny-tomentose,
         4. Mangrove-swamp trees; fruit large globose woody, seeds large irregularly wedge-shaped (terminal leaflet absent)..... *Xylocarpus*
         4. Cultivated trees only in gardens, never in mangrove areas; fruit yellowish velvety with a translucent acid edible pulp (terminal leaflet present)..... *Lansium*
      3. Leaves, at least the younger ones, reddish-pubescent; fruit reddish to tawny-tomentose; slender wild trees of limestone forest community ..... *Aglaia*
   2. Leaves bipinnate (or some lower pinnae further divided), leaflets serrate ..... *Melia*

AGLAIA Loureiro

Trees or shrubs, often lepidote or stellate-pubescent; leaves 1-pinnate, leaflets 3 or more; entire; flowers small or minute, polygamo-dioecious, often many together in large panicles; calyx 5-lobed, lobes imbricate in bud; stamens connate, tubular, forming a cuplike or subglobose toothed or entire structure; ovary 1–3-celled; ovules 1–2 per cell; style very small; fruit a dry 1–2-seeded berry; seed integument fleshy.—Over 100 Indomalaysian, S. Chinese, and Pacific species.

One species in Guam.

Aglaia mariannensis Merrill 1914: 99. MAPUNYAO; MAPUNAO.

A small understorey tree up to 7–8 m tall, the youngest parts all conspicuously reddish brown or tawny-brown lepidote; branchlets soon glabrate; leaves alternate,

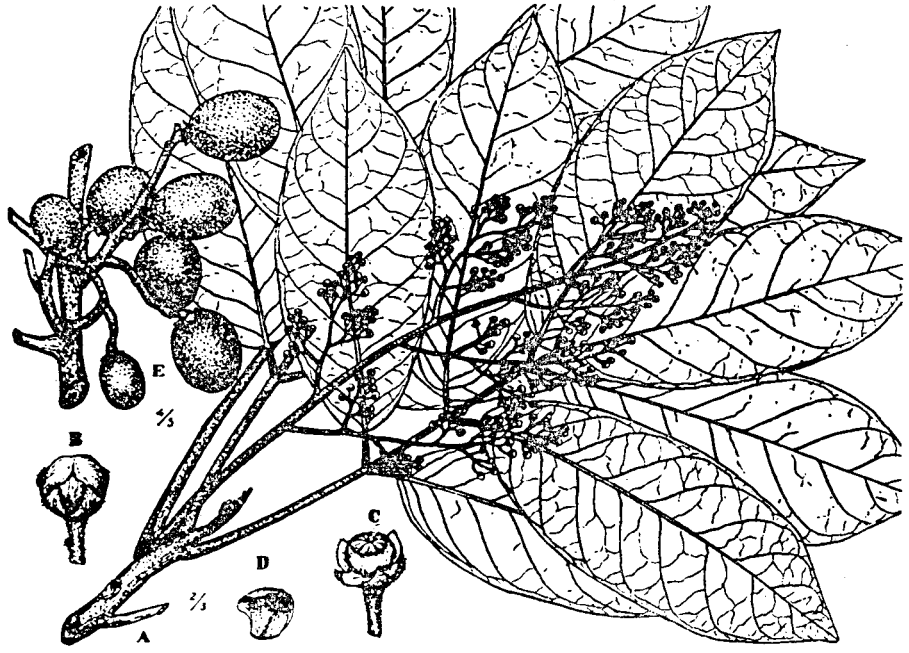

Fig. 51. Aglaia mariannensis.

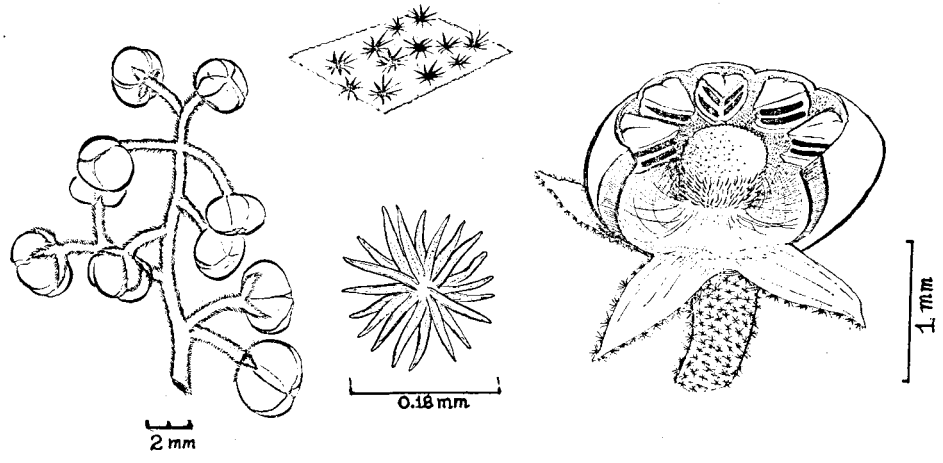

Fig. 52. Aglaia mariannensis, flowers and hairs.

1-pinnate, leaflets most 5 or 7, rarely only 3, rarely 9, the terminal leaflet longest; leaves up to 40 (or in young plants even 50) cm long; leaflets mostly 10–15 cm long, 3–6 cm wide, chartaceous, lepidote when young; petiolules up to about 1 cm long; leaflets oblong to elliptic, rounded or acute at base, acute or acuminate at apex, sometimes slightly inequilateral. Flowers in axillary panicles nearly as long as the

leaves, at least half as long; flowers racemose, on pedicels up to 1.5 mm long; calyx brown-stellate-lepidote with 5 acute lobes, about 1 mm long; petals 5, glabrous, about as long as the calyx; staminal tube free from petals, shallow-cupuliform, 1 mm broad, 0.5 mm high, obscurely 5-toothed; the 5 anthers about 0.3 mm long; fruit ellipsoid to obovoid, densely lepidote, to nearly 2 cm long.—Fig. 51, 52.

Endemic in the Marianas Islands. Type G.E.S. 465. Restricted to limestone forest communities. Hospital Pt. above Ypao, Tumon (3889); Dos Amantes Pt. (4041); Yigo (4251); Ritidian Pt. (5038); Asanite Pt. (5260).

The reddish-tawny-brown, stellate-lepidote indument, and the tiny flesh- or salmon-colored flowers make this an attractive wild tree.

LANSIUM Correa

Trees with spiralled, imparipinnate leaves; inflorescences spikelike racemose, axillary or on branches or trunks; calyx 5-lobed, lobes imbricate; petals 5, fleshy, free or slightly adnate at base to stamen tube; stamens 10, filaments connate; anthers in 1 or 2 series; disk reduced or obsolete; ovary 3–5-celled, cells 1–2-ovulate; style short, stout, stigma truncate; fruit a subglobose berry, the pericarp with milky sap; seeds with a fleshy aril.—About 6 Indo-Malesian species, some with edible fruit. One species occasionally cultivated in Guam.

LANSIUM DOMESTICUM Correa, Ann. Mus. Hist. Nat. Paris 10: 157, 1810.

t. 10, F.I. 1807. Bryan, 8 June 1960. LANSON, LANGSAT

A middle-sized tree, leaves 1-pinnate, 20–40 cm long, with 5–7 alternate leaflets; leaflets entire, oblong-elliptic, acute, 7–18 cm long, with veins prominent beneath; flowers in small spikes on branches and trunks, yellowish, small, sessile; fruit subglobose or ovoid, 3–4 cm long, the calyx persistent at the base, skin velvety; pulp translucent, acid, edible; seeds 1 or 2, with 2–4 abortive ovules; separable into 2–5 segments, juicy.

An Indomalaysian fruit tree, introduced from the Philippines by the G.E.S. in 1911. It may be persisting in Guam.

The fruit is a dessert type and of excellent flavor. The trees require abundant water.

MELIA Linnaeus

Trees with bi- or tripinnate leaves; pubescence when present sometimes stellate or powdery; calyx 5–6-lobed; petals 5–6, oblanceolate or spatulate; staminal tube cylindric, 10–12-toothed, anthers 10 or 12, apical; disc annular; ovary 3–6-celled; style long; stigma terminal; ovules 2, superposed; fruit drupaceous; seeds with scanty endosperm; cotyledons foliaceous.—About 15 paleotropical species.

MELIA AZEDARACH L. Sp. Pl. 384. 1753. Safford 1905: 322. Merrill 1914: 100. PARAISO. CHINABERRY.

Small to medium tree; leaves bipinnate, the lowest pinnae sometimes once more divided (thus partly tripinnate); leaves up to 40–50 cm long; leaflets serrate, oblong-ovate, acuminate, 3–4 cm long, less than half as wide; 5–7 per pinna; base somewhat

inequilateral; inflorescence an axillary open panicle to 20 cm long; flowers pale lavender (lilac), nearly 2 cm broad; calyx 5–6-parted, puberulent; petals 5–6, oblanceolate, about 8 mm long; stamen-tube lilac, as long as a petal, 10 anthers; ovary with a small disc, 5–6-celled; ovules 2 per cell; fruit subglobose, yellow, to 1.5 cm long.

A native of E. Asia, but widely cultivated, and probably of early introduction to Guam, where it occurs in old fields, abandoned lots, thickets, along roads and near houses. Some large specimens may be seen on the Chalan Pago Road near Sinajana. This is an excellent ornamental and shade tree. The wood is attractive and easily worked; the leaves are said to have insecticidal properties; the fruit, with its hard stone, is reputedly poisonous to at least certain animals.

SANDORICUM Cavanilles

Trees with spiralled, trifoliolate leaves, leaflets entire to obscurely serrate; inflorescences axillary, paniculate; calyx 5-lobed; petals 5, linear-oblong; stamens 10; hypogynous disk surrounded by the filament-tube; ovary 5-celled, cells biovulate; style shorter than stamens; stigma 5-lobed; fruit a rather large subglobose drupe with 2–5 pyrenes; testa brown.—About 10 species, Mauritius and Indo-Malesia. One species cultivated in Guam.

SANDORICUM KOETJAPE (Burm. f.) Merrill, Philipp. J. Sci. C. Bot. 7: 237. 1912; 1914: 100. SANTOL.

Melia koetjape Burmann fil., Fl. Ind. 101. 1768.

Sandoricum indicum Cavanilles, Diss. 4: 359, t. 202, 203. 1787; Safford 1905: 369.

A medium to rather bulky tree, somewhat deciduous, the leaflets withering red; leaves and young branches velvety-pubescent; leaves of 3 leaflets, each oblong-ovate, acute at apex, rounded at base, 10–20 cm long, slightly asymmetric or not; flowers in axillary panicles, yellowish, fragrant; calyx 5-toothed, pubescent; petals 5, linear, 1 cm long; stamen-tube elongate, anthers 10; stigma 5-lobed; fruit globose, fleshy, with thin pubescent skin, 8–10 cm thick, usually 5-celled and 5-seeded; flesh acid, edible. [2n = 22 or 44; Ramirez, Philipp. Agric. 45: 275. 1961–62]. —Fig. 53.

Native of Malaysia (S.E. Asia, Philippines, Indonesia), introduced not long before 1900 to Guam; still not common, but there is a fine large tree just outside Harmon Village (on the back road to Finegayan N.S.) (3891), and several more in fields near Yona (5067). The fruit makes a tasty cold drink. Safford mentions a tree in Lalo on the old Jose de Leon Guerrero farm. The wood (heartwood) is reddish and of good quality, and when burned, yields a pleasant aroma.

The fruit is said to make excellent jelly.

XYLOCARPUS Koenig

Maritime and sub-mangrove trees with spiralled, pinnate leaves; leaflets 1–7, opposite, entire; inflorescences axillary, paniculate, sometimes all pistillate; calyx

Fig. 53. Sandoricum koetjape.

deeply 4-lobed; petals 4; stamens 8, surrounding the disk, filaments connate; disk cupular; ovary 4-locular, locules with several (4–8) ovules; style with a round, peltate stigma; fruit a subglobose large capsule, to 20 cm diameter, opening by 4 valves; seeds large, irregularly 4-sided, moderately numerous.—(Syn. *Carapa*).—Three species from E. Africa through Ceylon into the Pacific Islands.

One species in Guam, native.

Xylocarpus moluccensis (Lamarck) Roemer, Syn. Hesper. 124. 1846.

LALANYOK; LALANYOG. CANNONBALL-TREE.

Carapa moluccensis Lamarck, Encycl. 1: 621. 1783.

Xylocarpus granatum sensu Merrill 1914: 100; Safford 1905: 400. non Koenig, Naturf. 20: 2. 1784.

Small tree to about 5 m high, in and near mangrove swamps; leaves alternate, 1-pinnate, without a terminal leaflet; leaflets, 4 to 12, rarely only 2, glabrous, coriaceous, bluntly pointed at apex, obliquely rounded and abruptly acute at base, to 12 cm long and 7 cm wide, pinnately nerved; flowers whitish or creamy, in loose axillary panicles, small and fragrant; calyx 4-lobed; petals 4, reflexed; staminal tube urceolate-globose, 8-toothed, each tooth bifurcated; anthers 8; stigma discoid; ovary 4-celled, 4-grooved; cells with 2 or more (to 8) ovules; fruit globose, brown,

to 10–15 cm thick or more, with a thin rind, and 6–12 irregularly angled, more or less wedge-shaped, hard corky seeds; dehiscing by 4 valves.

A widespread Indomalaysian—Pacific tree, generally found in river estuaries or near or in fringes of mangrove areas, never far from the sea or a tidal estuary. Apra Harbor (4438-a; 5119). Cabras Isl. (MacGregor 446).

The wood is fine-grained, dense and heavy, hard, durable, reddish-brown often with beautiful black stripes; suitable for tool handles, floors, wheel-spokes, and the like. The fruit is sometimes a toy for children, as after taking the seeds out, the difficulty of replacing them in the same manner constitutes a pleasant puzzle. The seeds when treated yield an oil, used in India for a fuel.

MALPIGHIACEAE

Trees, shrubs, or vines; leaves opposite, entire, stipulate, often with jointed petiole, often with 2 glands at base of blade; flowers perfect; sepals 5; petals 5, free, clawed; stamens 10 or less, usually connate basally; ovary superior 2–3(–5)-celled, styles usually free; cells 1-ovulate; ovule pendulous; fruit a schizocarp, or drupaceous or samaroid.—56 genera and about 800 species chiefly of the tropics; represented in Guam only by a few cultivated species, in the following genera:

1. Petals yellow.
    2. Climbers..... *Tristellateia*
    2. Shrubs ..... *Thryallis*
1. Petals white, or pink..... *Malpighia*

THRYALLIS Martius

Shrubs with simple opposite leaves; flowers yellow or reddening in age, in racemose panicles; bracts and bracteoles deciduous; calyx of 5 sepals; petals 5; clawed; stamens 10; filaments slightly connate at base; ovary 3-lobed, styles 3; stigmas minute; capsule 3-lobed.—Tropical-subtropical America, 12 spp.

THRYALLIS GLAUCA (Cav.) O. Kuntze, Rev. Gen. 1: 89. 1891.

Galphimia glauca Cavanilles, Anal. Hist. Nat. 1: 37. 1799.

Merrill 1914: 100.

Small ornamental shrub; youngest stems red, pubescent; older stems gray, glabrate; leaves ovate, acute, cuneate at base, 1.5–5 cm long, with 2 (or 4) lateral glands at base of blade; petiole red, 5–15 cmm long; flowers in terminal racemes or panicles; flower nearly 2 cm wide; petals clear bright yellow; stamens 10; styles 3; pedicel red; fruit a 3-lobed capsule; seeds 1 in each lobe, brown.

A native of Central America and Mexico, introduced as a garden plant, and found occasionally in Guam gardens; probably introduced indirectly from Hawaii. Not yet common.

TRISTELLATEIA Thouars

Woody vines with opposite leaves with paired connate stipules; blade with 2 basal glands; inflorescence a terminal raceme; flowers with yellow petals, 10

stamens, 1 style; fruit a star-shaped samara with about 7–8 lobes,—22 species, all of Madagascar except the following and one E. African species.

TRISTELLATEIA AUSTRALASIAE Rich., Voy. Astrolabe, Atlas, Sert. Astrol. Pl. 15, 1833; Bot. 2, Sert. Astrol. 38 [as *australis*] 158, 1834. Fosberg, Micronesica 2(2): 147. 1966.

A woody climber; stems light brown, glabrous, dotted with raised lenticels; leaves 2–7 cm long (rarely to 10–12 cm), glabrous rather pale green, ovate, acute or obtuse, rounded or subcordate and with 2 glands at base; petiole green, 5–20 mm long; flowers in terminal racemes; petals bright yellow, 4 of them very slightly falcate, each about 1 cm long excluding the pinkish-orange 2 mm claw; stamens usually 10 of unequal lengths, yellow turning red; style 1; fruit samaroid, winged, with 5–8 slender flattened lobes each about 1 cm long or a little less.

A native of Malaysia and Australia. I introduced this plant (as seed to Paul Souder (Land Management) in Sept. 1966, expecting it to prove an attractive ornamental, as it has in various other places (including Hawaii). It is found as a native plant in Palau, but apparently never reached the Marianas.

A somewhat similar relative, *Ryssopteris cumingiana* A. Jussieu, is native in Truk and Palau. It may quickly be distinguished from the above by its pubescent young branches and free stipules.

MALPIGHIA Linnaeus

Small trees or shrubs with opposite leaves often with stinging hairs; corymbs axillary; flowers red, pink, or white; calyx persistent, with 6–10 glands; petals 5; stamens 10; filaments basally connate; ovary 3-lobed, with distinct styles; fruit a fleshy drupe.—30 or 40 Tropical American species.

1. Leaves less than 4 cm long, spine-toothed marginally..... *M. coccigera*
1. Leaves up to 7–8 cm long, entire, flat..... *M. glabra*

MALPIGHIA COCCIGERA L. Sp. Pl. ed. 2, 426. SINGAPORE-HOLLY.

Small erect compact shrub with small spines on leaves; blades crisped-wavy, stiff, dark green, 1–3.5 cm long; flowers 1 or 2 in axils; pedicels slender, often longer than leaf; flowers up to 2 cm broad; petals pink, with frilled margins; fruit a small dark red drupe, 2 or 3 parted; seeds crested, 2 or 3.

A West Indian shrub of considerable ornamental interest. It is cultivated in several gardens, as in Barrigada (4948) and in Agaña.

The common name is a misnomer.

MALPIGHIA GLABRA L. Sp. Pl. 425. ESCOBILLO. BARBADOS CHERRY.

A medium erect open shrub; leaves smooth, glabrous, plane, entire, ovate, mostly 3–7.5 cm long; flowers in clusters of 3–8, about 1.3 cm broad; petals pink or white; fruit a small red drupe with thin acid pulp around the 3 somewhat squarish seeds.

A native of Florida, the Caribbean Islands, and Venezuela. Evidently introduced for the edible fruits; it is rare. I have seen it only in Yoña on the Leon Guerrero farm (5062).

According to Pal (Proc. Ind. Acad. Sci. 60, B, 347–350, 1964) the chromosome number is n = 20.

POLYGALACEAE

Herbs, shrubs, or trees, with alternate, entire, simple leaves; stipules none; flowers perfect, irregular, subtended by 3 bracts each; stamens borne on a disc and alternate with the unequal petals; ovary 2-celled; fruit a capsule, nut, or drupe.—11 genera and about 700 species; of wide distribution.

1. Stamens 8; leaves linear.....*Polygala*
1. Stamens 6; leaves ovate.....*Salomonia*

POLYGALA Linnaeus

Erect shrubs or herbs; flowers often in racemes; sepals 5, the inner two larger and petaloid ['wings']; petals 3, connate at base to stamens, the central one keel-like, crested; stamens 8, connate into a sheath; anthers opening by pores; fruit a 2-celled, 2-seeded capsule.—Worldwide; perhaps over 450 species.

Polygala paniculata L. Syst. ed. 10, 1154.

A small, erect, glandular, annual herb up to 60 cm tall; leaves linear, 1–1.8 cm long, less than 3 mm wide; flowers in terminal racemes up to 8 cm long, small white, crowded; flower nearly 3 mm long; fruit about 3 mm long; seeds very small (less than 3 mm long) black but with tiny white hairs.

Virtually panpaleotropical; possibly native in Guam. With a slight tendency to weediness, but a harmless plant. Manengon, by the stream (3861).

SALOMONIA Loureiro

Small herbs; leaves sometimes scale-like; flowers in terminal spikes; sepals subequal or inner 2 larger; petals 3, connate, split on upper side; stamens 6 (or 5), anthers opening by pores; ovary 2-celled; capsule flat; seeds globose.—10 Asiatic-Australian species.

Salomonia cantoniensis Loureiro, Fl. Cochinch. 14. 1790;

Walker & Rodin 1949: 461.

Slender delicate annual herb of marshes; roots aromatic; stems with a narrow wing; leaves ovate, up to 2.5×1.8 cm, short-petiolate; fruit transversely oval with a few small hooklike spinules; seeds black.

An Asiatic-Australasian species, first reported from Micronesia (Yap and Palau) by Hosokawa in 1938; possibly native.—2 mi. E. of Mt. Tenjo (Moore 319); west of Yona between Ylig R. and Pago R. (Steere 26, 27).

SIMARUBACEAE

Shrubs or trees; leaves simple or (usually) pinnate; alternate (rarely opposite); stipules none; flowers perfect or unisexual; sepals 3–7; petals 3–7 (or none); stamens 3–14; carpels 2–5, free or variously united, superior; ovules usually 1 (rarely a few) per cell on axile placentae; fruit a drupe, berry, or samara.—20 genera.

Only the following one species in Guam.

SURIANA Linnaeus

Small tree or shrub; leaves alternate, simple, entire; flowers perfect, in clusters or solitary, terminal; calyx of 5 perstistent sepals; petals 5, imbricate; stamens 10; disc small or obsolete; carpels 5, free, each with 2 collateral ascending ovules; styles lateral; stigmas capitate; fruit like an achene; embryo hippocrepiform.—Monotypic.

Suriana maritima L. Sp. Pl. 284. 1753.—Bryan, 18 May 1960. NIGAS. NIETKOT.

Shrub or small tree, often dwarfed, wind-trimeed when exposed to sea wings; young growth pubescent; leaves alternate, crowded, linear-spathulate, very short-petiolate, decurrent at base, acute at apex, at most 3 cm long by 3–5 mm wide; flowers in racemose clusters; petals yellow, about 8 mm long; fruit a capsule, 5-parted, pubescent, brownish, enclosed in the green bracts.

A pantropical strand plant. Reported from Guam by Bryan, who first collected this plant in Guam in 1936 at Tarague Beach. It is also known from Saipan and Rota.

In appearance this wiry shrub is easily mistaken, when not in flower, for the much more common *Pemphis acidula*, which however has white petals.

EUPHORBIACEAE

Trees, shrubs, or herbs, many with white, milky latex; leaves alternate or opposite, simple or rarely lobate or compound, usually with stipules; inflorescences of various types, some (the cyathium) highly specialized and more or less simulating a flower; flowers usually small often unisexual; monoecious or dioecious; sometimes within an involucre; perianth in 1 or 2 series or absent; stamens many, or few and regular, or only 1; ovary superior, usually 3-celled, or with 2 or rarely 4 cells, or of 1-celled free carpels, very rarely single; styles 1 per carpel, free or united, simple or forked; ovules 1 or 2 per carpel, pendulous, arillate or not; fruit fleshy (drupe), or dry (capsule) and dehiscent; seeds with endosperm.

A large, important, and difficult family, of about 280 genera and 7000 species, worldwide, both tropical and temperate; 17 genera in Guam, of which 7 are indigenous; including 43 species, of which 12 are indigenous.

Key to Genera

1. Inflorescence not a cyathium (described below); bracts not boat-shaped,
   2. Ovules 2 per ovary-cell; laticiferous tissue none, therefore sap watery; leaves simple, alternate, pinnately veined.
      3. Male flowers not in spicate racemes; leaves usually distichous,
         4. Flower without disc; capsule usually 6-segmented; seeds orange, arillate; shrub or small tree.....*Glochidion*
         4. Flower with disc; fruit capsular or in *P. acidus* pale, fleshy, indehiscent, acid; seeds not arillate; herbs or shrubs except

P. acidus.....*Phyllanthus*

3. Male flowers in spicate racemes; leaves not distichous....*Antidesma*

2. Ovules 1 per cell; laticiferous tissue usually present, therefore sap usually milky; leaves various.

5. Filaments inflexed in bud; leaves variegated or multicolored..... ..... *Codiaeum*

5. Filaments erect in bud; leaves usually green, not variegated (except in *Acalypha*)

6. Roots tuberous; leaves 3-lobed; cultivated.....*Manihot*

6. Roots not tuberous; leaves various; wild, weedy, or cultivated.

7. Fruit indehiscent, rather large; leaves simple, entire or 3–5-lobed, mealy-white when young.....*Aleurites*

7. Fruit dehiscent, usually rather small (except Hevea),

8. Leaves of 3 distinct petiolulate leaflets.....*Hevea*

8. Leaves simple, lobed, or parted,

9. Filaments distinct; inflorescences usually spicate, axillary,

10. Anthers 2-celled; leaves not peltate,

11. Connective normally developed between anther-cells,

12. Capsule usually 2-locular; leaves coarsely toothed; inflorescences brown-pubescent.....*Melanolepis*

12. Capsule 3-locular; leaves entire; inflorescence glabrous...*Excoecaria*

11. Connective rudimentary, the anthers each of 2 nearly free cells;

13. Female flowers subtended by conspicuous toothed cupular bract; style deeply divided into several fine filamentous segments; anther-cells variously curved; leaves (in *A. wilkesiana*) variegated red; shrubs or herbs.....*Acalypha*

13. Female flower subtended by a small bract; style simple or merely fringed; anther-cells straight, divergent; leaves not variegated, newest ones purplish; small trees ..... *Claoxylon*

10. Anthers 4-celled; leaves peltate,

14. Stamens borne on an erect central clavate receptacle.....*Endospermum*

14. Stamens not so borne....*Macaranga*

9. Filaments united or some of them united; infl. a terminal panicle,

15. Leaf-lobes serrate; capsules spiny..*Ricinus*

15. Leaf-lobes not or scarcely serrate; capsules smooth.....*Jatropha*

1. Inflorescence either a cyathium or enclosed in boat-shaped bracts; [Cyathium: involucrate group of flowers, consisting of a terminal female flower, itself merely a single 3-celled ovary, usually stipitate, surrounded by several or many staminate flowers, each merely a single stamen; involucre bearing 1 or more nectaries, these often colored and resembling petals]. Milky sap copious.

16. Flowers enclosed in boat-shaped red bracts; stems markedly zigzag; cultivated shrubs.....*Pedilanthus*

16. Flowers in a cyathium; cyathia often grouped in cymes or heads; stems not markedly zigzag; wild or cult.....*Euphorbia*

Alternative key to commonest genera and species

1. Herbs or merely suffruticose plants, mostly less than 1 m tall; leaves distichous,

2. Flowers in cyathia, cyathia cymose.....*Euphorbia* (in part)

2. Flowers axillary, not in cyathia...*Phyllanthus* (in part), and *Acalypha indica*

1. Woody shrubs or trees,

3. Succulent, spiny shrubs.....*Euphorbia* (in part)

3. Not spiny; woody or succulent,

4. Stems not at all succulent, not green except at extreme tips, not zigzag,

5. Leaves simple, pinnately veined, or the midrib at least pinnately branched,

6. Leaves entire, not toothed or lobed,

7. Leaves not colored,

8. Flowers in thickish catkin-like spikes.....
.....*Excoecaria* (see also: *Antidesma*)

8. Flowers not in spikes, axillary

9. Fruit whitish, fleshy, indehiscent, edible (acid); small tree.....*Phyllanthus acidus*

9. Fruit greenish, dry-capsular, dehiscent; small trees or shrubby,

10. Small tree; leaves large (over 6 cm long usually); seeds orange.....*Glochidion*

10. Shrublets, erect, unbranched or few-branched; leaves less than 6 cm long; seeds brown.....*Phyllanthus* (in part)

7. Leaves colored, variegated red, purple, yellow, etc.....
..... *Codiaeum*

6. Leaves serrate or crenate or lobed,
   11. Leaves reddish etc.
      12. Leaves particolored, usually red, serrate-crenate ..... *Acalypha wilkesiana*
      12. Leaves varicolored, not serrate but coarsely toothed or 3–5-lobed subpinnatiform.. *Codiaeum*
   11. Leaves green or youngest ones purplish..... ..... *Claoxylon & Acalypha hispida*
5. Leaves palmately nerved, usually palmately lobed, or trifoliolate.
   13. Leaves of 3 distinct leaflets..... *Hevea*
   13. Leaves simple, though perhaps deeply lobed,
      14. Leaves peltate.... *Macaranga* (see also: *Endospermum*)
      14. Not peltate,
         15. Leaves coarsely toothed; pubescence brown-stellate..... *Melanolepis*
         15. Not as above,
            16. Trees with large indehiscent fruits; leaves some simple, some 3–5-lobed, pale-mealy beneath..... *Aleurites*
            16. Not as above,
               17. Leaves and inflorescences with sticky, green-topped, glandular hairs; leaves purplish..... ..... *Jatropha gossypiifolia*
               17. Not so,
                  18. Leaves deeply parted into 7, 9, or 11 narrow segments, these pinnatiform-toothed.. ..... *Jatropha multifida*
                  18. Not so,
                     19. Capsules smooth; leaf-lobes entire..... ..... *Jatropha curcas*
                     19. Capsules spiny; leaf-lobes serrate... *Ricinus*
4. Stems succulent, green, zigzag; leaves simple, entire; often whitish; involucre red, boatshaped..... *Pedilanthus*

ACALYPHA Linnaeus

Trees, shrubs, or herbs; leaves alternate, simple, usually dentate or crenate, pinnately nerved; flowers in axillary or terminal spikes; male flowers small, in axils of small bracts; female flowers at base of male spikes or in distinct female spikes, each in the axil of a rather large toothed and more or less cuplike bract; male flowers

with 4 sepals and usually 8 (but sometimes numerous) stamens, borne on a convex receptacle; filaments free; anther cells 2, flexuous; disc absent; pistillode none; female flowers with 3–5 sepals; ovary 3-celled, each cell with 1 ovule; styles laciniate or fimbriate, (hence apparently many) 3; smooth capsule 3-coccous, each occus bivalved; seeds subglobose.

—A large, complex genus of over 400 species, pantropical. No native species occurs in Guam, but one is a common weed, while the others are garden and hedge plants. A few native species occur in the Caroline Islands.

1. Shrubs 0.5–3 m tall, of gardens.
   2. Leaves suffused or blotched with a beef-red color; spikes more or less erect or spreading, whitish-green to pinkish, rather inconspicuous.. ..... *A. wilkesiana*
   2. Leaves green; spikes pendulous, elongate, thick-cylindric, red, resembling an animal's tail..... *A. hispida*
1. Suffrutescent weedy herbs with erect spikes..... *A. indica*

ACALYPHA HISPIDA Burm. f. Fl. Ind. 303, t. 61, f.1, 1768.

Stone, Micronesica 2(2): 138. 1966.

RED CAT-TAIL. RED TASSEL BUSH.

A shrub with large or medium ovate dentate-crenate petiolate leaves 10–18 cm long; female spikes tassel-like, pendent, cylindric, bright red, 1.5–2.5 cm thick, up to 50 cm long, resembling a cat's tail; fruits? (in our cultivated forms fruit is never seen).

A cultivar of considerable ornamental value, perhaps a native of Indonesia. In Guam the plants are often stunted by severe infestations of mealybugs. Barrigada Village (4269).

Acalypha indica L. Sp. Pl. 1003. 1753; Safford 1905; 173;

Merrill 1914: 100; Bryan 1 Sept. 1960. HIERBA DEL CANCER.

A small erect herb up to 60 cm tall or a little more, with a few ascending branches, these angled and pubescent; leaves broadly ovate, subdeltoid, rather coarsely toothed, on petioles as long as or longer than the 3–5 cm long blades; nerves 3–5 from base, thereafter pinnately arranged; stipules minute; flowers sessile on erect axillary spikes longer than the leaf; male flowers minute, crowded distally; stamens 8; female flowers scattered along the infl. axis, each subtended by a conspicuous semicupular foliaceous toothed green bract nearly 7 mm long; capsule hispid, 1 mm broad, 3-locular.

A paleotropical weed of long establishment in Guam. Agaña (4001). Abundant in waste ground, and in towns.

ACALYPHA WILKESIANA Mueller—Argoviensis, in DC. Prodr. 15(2): 817. 1866.

COPPERLEAF. BEEFSTEAK-PLANT. JOSEPH'S-COAT.

A shrub to 2 m tall (rarely 2.5–3 m); young branches pubescent; leaves ovate, crenate-serrate, rather curved and coarsely crisped, green or usually suffused or blotched with various shades of red, often dark red, 5–18 cm long, 3–15 cm broad, on petioles about 1/4 as long as the blade; male spikes slender, elongated; female

spikes somewhat shorter; bracts mostly 5–7-toothed, about 3–4 mm long, only slightly cupular; ovary green, puberulent, 1.5–2 mm wide; styles deeply laciniate, 6–8 mm long, pinkish; fruit unknown.

Evidently an ornamental that was developed in domestication in the Pacific Islands or E. Malaysia; named for Capt. Charles Wilkes, commander of the U.S. Exploring Expedition (1838–1842), one of the alleged purposes of which was to discover an opening near the South Pole that would permit access to an "inner sphere" (!). Described from specimens collected in Fiji.

This exceedingly common ornamental decorates virtually every garden, path, roadside, and public building in Guam. The colors are greatly varied from plant to plant, and from shade to full sun. Harmon (4023).

It apparently never sets fruit.

ALEURITES Forster

Trees with spiralled palmately nerved or 3–7-lobed leaves; flowers in terminal panicles, monoecious; male flowers numerous, peripheral; female flowers few, terminal; sepals 2–3; petals 5; stamens many; ovary bilobed; styles 2, each bifid; fruit 1–3-seeded, indehiscent.—5 Asiatic-Pacific species.

1. Leaves simple or 3-lobed; fruit rounded, 1–2-seeded.....*A. moluccana*
1. Leaves simple; fruit ridged, 3-seeded.....*A. trisperma*

ALEURITES MOLUCCANA (L.) Willd. Sp. Pl. 4: 590. 1805. Safford 1905: 177; Merrill 1914: 100. LUMBANG. RAGUAR. CANDLENUT. KUKUI.

Tree 10 m tall or more, bark gray-brown to blackish; leaves and inflorescence with a mealy-scurfy whitish to light brown indument; leaves simple and ovate or trilobed or rarely 5-lobed, or sublanceolate, or subdeltoid, acute at apex, rounded, truncate, or subcordate at base, 3–5-nerved from the base, midrib thereafter pinnately branches; blades mostly 10–20 cm long, on an equally long slender petiole; 2 glands at junction of blade and petiole; flowers small, greenish-white, in panicles, ♂ and ♀ on same plant; panicles 10–15 cm long, many-flowered, terminal; petals pubescent, elliptic-spathulate; stamens of unequal lengths; ovary pubescent; fruit globose or bi-globose, 1–2-seeded, olivaceous, glabrescent, 4–6 cm long, indehiscent, with bony endocarp and oily seeds.

Native in Malaysia and W. Polynesia. A commonly cultivated tree in E. Polynesia. Said to have been introduced to Guam from the Caroline Islands (Safford); "raguar" is a Carolinian word. "Kukui" is the Hawaiian name. "Candlenut" refers to the use of the oily nuts as candles throughout Polynesia. The oil is similar to tung oil, produced from *Aleurites fordii* of China.

This is a handsome tree, but it does not seem to thrive in Guam, and is quite uncommon. It does not occur on limestone but may be seen on farms in south Guam, as near Merizo (3921).

The seeds are edible but purgative and cathartic so should be eaten only in small quantities. Seedling and juvenile leaves are mostly lobed; leaves of old trees are often simple, deltoid-ovate.

ALEURITES TRISPERMA Blanco, Fl. Filip. 755. 1837. Walker & Rodin 1949: 461.

A small tree similar in appearance to the above species; the leaves are unlobed; the fruits have a prominent ridge and are 3-seeded.

A native of the Philippines, introduced to Guam. One tree has been reported from North-west Field (Rodin 809), collected in 1945. It is not known whether others occur or whether this one has survived.

ANTIDESMA Burmann

Trees or shrubs with alternate entire leaves and axillary or terminal simple or paniculate spikes or racemes; male flowers with 3–5 sepals; stamens 2–5; disc present, entire or lobed, or reduced or absent; female flowers with 3–5 sepals, ovary 1–2-celled, stigmas 2–4, (bifid), ovules 2 per cell; fruit drupaceous, compressed, with persistent stigmas.—About 160 Asiatic-Australasian species.

One introduced species in Guam; one or two indigenous species in the Caroline Islands.

ANTIDESMA BUNIUS (L.) Sprengel, Syst. 1: 826. 1826. BIGNAY.

A small glabrous dioecious tree to 10 m tall; leaves dark green, oblong-elliptic, acute-acuminate, rounded at base, pinnately nerved, entire, 8–20 cm long; inflorescence spicate, axillary or terminal, 5–15 cm long, simple; flowers small, subsessile; male flowers with 3 stamens, anthers purple; female flowers shortly pedicellate, green, calyx cupular; fruit a red ovoid acid fleshy drupe with compressed seeds.

A Philippine plant introduced to Guam in the early years of this century (before 1911) by the Guam Experiment Station for its edible fruits; and known by its Tagalog name. It occurs throughout Malaysia and west to India, in villages and apparently wild. In Malaya it is known as "buni".

CLAOXYLON Jussieu

Trees or shrubs with alternate simple leaves, toothed or entire; racemes or spikes azillary or terminal; male flowers with 3–4 valvate sepals; disc absent; stamens numerous, interspersed sometimes with glands or scales; pistillode none; female flowers with 3–4 sepals; disc absent or represented by 5 hypogynous scales; ovary 3-celled, each cell with 1 ovule; fruit a capsule of 3 bivalved cocci; seeds globose arillate; axil red.—About 60 paleotropical species.

Claoxylon marianum Mueller-Argoviensis, in DC. Prodr. 15 (2): 783. 1866. Safford 1905: 230. Merrill 1914: 100. PANAO. CATOR.

A small tree with rather stout, smooth, terete, grayish branches; leaves crowded, the younger ones purplish, pubescent, older ones dark green; petioles 3–5.5 cm long, firm; blades membranous, scaberulous, elliptic-oblong, shortly cuspidate-acuminate, or obtuse, obtusely acute at base, 8–16 cm long, 4.5–9 cm broad, the margins distantly denticulate with obtuse teeth, secondary nerves 7–10 pairs; inflorescence racemose-fasciculate, axillary, bluish-green, waxy, pubescent, elongate; male flowers with about 25 free stamens, anthers 2-celled, erect, adnate to top of filament, pistillode none, sepals usually 3, valvate; female flowers with petaloid

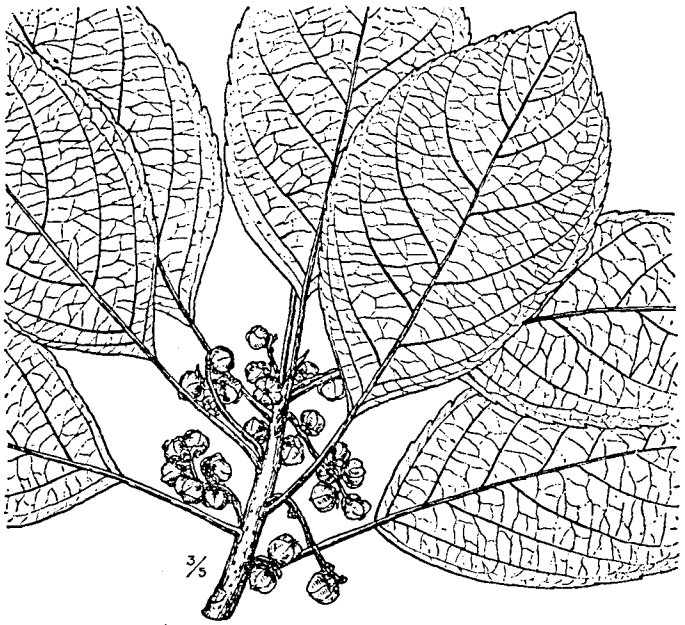

Fig. 54. Claoxylon marianum.

sepals, ovary 3-celled, styles 3 free, simple, lacerate; fruit purplish, 7–8 mm thick. —Fig. 54. Pl. 7e, f.

Endemic to the Marianas Islands; a member of the limestone forest community, not uncommon in Guam; N.C.S. Finegayan (3940); Dos Amantes Pt. (4040); Ritidian Pt. (5040, 5041); Barrigada Hill (5058).

First collected by Gaudichaud in 1819. It is quickly recognized by the toothed leaves, with the youngest ones of a purplish color, the bluish-green inflorescences, and the purple fruits. It is suitable for cultivation on limestone soils.

Codiaeum Jussieu

Trees or shrubs with spirally arranged simple or lobed leaves; racemes axillary; one male and one female raceme together; male flowers clustered; female flowers fewer scattered; male fls. pedicellate; sepals 5; petals 5; disc glands 5–15, stamens 20–30 (or more); female flowers short-pedicellate; petals absent; capsule 3-locular; locules 1-seeded.—About 12 Malaysian-Pacific species.

Codiaeum variegatum (L.) Blume, Biijdr. 606. 1825; Merrill 1914: 101.

SAN FRANCISCO. LESTON PUYITOS. BUENAVISTA. CROTON.

Croton variegatum L. Sp. Pl. 1199. 1753.

Phyllaurea variegata (L.) Wight ex Safford 1905: 352.

Glabrous multicolored shrub with simple entire or lobed variegated variably formed leaves, longer than wide, flat or twisted, linear-lanceolate, or oblong, or ovate to obovate, in one form with the blade interrupted, sometimes 3-more-lobed, pat-

terned with green, yellow, red, purple, and sometimes white, up to 20 cm long or more, pinnately veined, petiolate; flowers in lax axillary racemes; male flowers chestered, females scattered; racemes unisexual or males with a few female flowers at base; male flowers white, about 6 mm wide, with 5–6 sepals and petals and many fine free stamens; female flowers lacking petals; fruit a small 3-celled capsule.

Native country unknown, but probably somewhere in Malaysia or Melanesia; now very widespread in cultivation. A large number of infra-specific forms exist, possibly clones, each with markedly varied leaf form or color; some are linear-leaved, green with yellow blotches; others have lobed, reddish-purple leaves; some have helically twisted leaves; one curious form has the midrib extended beyond the blade, pendent, and at its slender tip a rounded or cupular partial blade is formed. As in the "cultivated" animals, the variation within the one species often exceeds that between wild species.

Around houses and along paths almost everywhere in Guam. Harmon (4004); Mangilao (4185). I have never seen fruits, but male flowers are not infrequent.

ENDOSPERMUM Bentham

Trees with palmately nerved simple spirally arranged leaves; dioecious; spikes simple or branched, axillary; male flowers clustered in groups, sepals 3–4, stamens 8–12, borne on a prominent stalklike central column; female flowers arranged singly along the female spike, sepals 5; fruit a capsule with 2 cells, each 1-seeded, capped by the persistent stigma.—About 5 Asiatic-Malaysian species; closely related to *Macaranga.*

Endospermum moluccanum (Teysmann & Binnendijk) Beccari, Malesia 2: 38. 1884. Walker & Rodin 1949: 462.

Walker & Rodin report this tree from Northwest Field (*Rodin* 806) collected in 1945. I have not seen this or any further collections.

EUPHORBIA Linnaeus

Shrubs or herbs, woody or succulent, with thick milky sap; leaves simple, entire or toothed, alternate or opposite; inflorescence a cyathium, i.e. several to many staminate flowers surrounding a single female flower, the staminate flowers commonly 1-staminate, the female flower terminal, consisting of a single 3-celled ovary; the whole inflorescence subtended or surrounded by an involucre which usually bears 1 or more nectaries, these sometimes petaloid; cyathia sometimes clustered; perianth absent; styles 3, simple or bifid, free or united; fruit a capsule, 3-celled, each cell a bivalved coccus separating from the axis and dehiscent; seeds various, sometimes minute. [incl. Poinsettia, Chamaesyce, etc.]—A very large genus of perhaps 1600 species of very diverse form, some common as weeds; the African species are often succulent, cactus-like plants; the leaves may be reduced or absent. Fourteen species occur in Guam, of which 4 are indigenous; but several are imperfectly known.

Note. The following account is rather tentative; the classification and identity

of some of the species listed is in doubt and reports of some as occurring in Guam have not been substantiated. Fully to settle these problems would however require a disproportionately great task, and especially would involve a study of many related forms chiefly of Tropical America. The species in doubt are: *E. glomerifera, E. geniculata, E. cyathophora, E. heterophylla; E. chamissonis—E. atoto;* and *E. ramosissima. E. mcgillivrai* Boissier has also been reported from Guam (see Bryan, 11 Oct. 1960).

Key to Species

1. Tall or stout perennials, woody, slender or succulent.
   2. Leaves reduced to sparse scales or absent; stems terete, dark green, articulated; unarmed.....*E. tirucalli*
   2. Not as above,
      3. Succulent cactus-like plants with or without leaves, stems ridged and grooved, armed with spines, green or gray.
         4. Branches subterete, with many spines....*E. milii* var. *splendens*
         4. Branches deeply grooved; spines paired; branches 5-angled.....*E. neriifolia*
      3. Woody shrubs, not succulent, branches becoming light brown; bracts leaflike, bright red; female flower large, involucre with 1 prominent yellow gland.....*E. pulcherrima*
1. Herbs, prostrate, ascending, or erect, some suffruticose or dwarf-shrubby,
   5. Erect herbs; to 1 m tall; leaves not distichous,
      6. Bracts leaflike, red or pink to white at base; leaves not serrate, often 5–6 (even to 10) cm long
         7. Leaves lyriform; bracts red at base.....*E. cyathophora*
         7. Leaves entire, ovate-elliptic; bracts pink or white at base.....*E. geniculata*
      6. Bracts not colored at base; leaves serrate or not, less than 2 cm long.....*E. glomerifera*
   5. Ascending or low prostrate herbs with distichous leaves,
      8. Stems suffruticose, nodose, ascending
         9. Leaves entire,
            10. Leaves elliptical, about 2.5 cm long; markedly glaucous plants of sandy or rocky coasts, with ascending stems.....*E. chamissonis*
            10. Leaves orbicular, up to 2.5 cm long.....*E. ramosissima*
         9. Leaves serrulate, ovate-elliptic, 2–5 cm long....*E. gaudichaudii*
      8. Stems herbaceous, ascending or prostrate,
         11. Prostrate plants with tiny leaves usually less than 1 cm long,
            12. Capsules uniformly pubescent;
               13. Dry leaves olivaceous; stipules elongate fimbriate.. ..... *E. thymifolia*

13. Dry leaves coppery; stipules deltoid..*E. chamaesyce*
12. Capsules glabrous except the angles; dry leaves grayish .....*E. prostrata*

11. Ascending or erect stemmed plants with leaves 1 cm long or more,
14. Hispid; leaves inequilateral; cyathia in compact clusters; common weed.....*E. hirta*
14. Glabrous; leaves oblong-linear; cyathia in cymes; native; .....*E. reinwardtiana*

Euphorbia chamaesyce L. Sp. Pl. 455. 1753.

Procumbent annual herb, stems forking, cauline leaves stipulate; leaves chartaceous, on filiform stems, leaf-base asymmetric (with one auricle), margins crenulate; pubescence variable, from subglabrous to nearly villous; leaves mostly 3–7 mm long, ovate-rotund; petiole 1 mm; stipules 1 mm; cyathia solitary in axils, round, with whitish outer wing; capsule 1.5–2 mm; seeds 1.2 mm, rugulose, grey, slightly 4-angled.

A Mediterranean species, naturalized in various warm countries. Once reported from Guam. Mangilao (3927). Det. F.R.F.

Euphorbia chamissonis (Klotsch & Garcke) Boissier, in DC. Prodr. 15(2): 14. 1866. BEACH-SPURGE.

E. atoto sensu Safford 1905: 270, and Merrill 1914: 101, not of Forst.

A glaucous subshrub, with decumbent or ascending stems, branched, thickened at the nodes, with opposite, petiolate, ovate-oblong leaves, mostly 1.5–3 cm long and nearly 2 cm wide, entire, glabrous, obtuse at both ends; cymes of cyathia in upper axils and also terminal on short branches; nectaries small, with very narrow appendages; capsule glabrous; seeds smooth.

A widespread strand plant in the Tropical Pacific, perhaps not distinct from *E. atoto* Forster; found on sandy beaches. Its bluish-gray-green glaucous appearance is very conspicuous.

Tagachan Bay (3982); Jones Beach (4891).

Euphorbia cyathophora Murray, Comm. Goettingen 7: 81 t. 1 1786.

E. heterophylla sensu Merrill 1914: 101. DWARF POINSETTIA.

Erect herb with green stems to nearly 1 m tall; leaves alternate; petioles slender, 1–4 cm long; blades mostly pandurate with 2 or 4 obtuse or subacute lobes, those of basal leaves sometimes simply ovate, entire or obscurely distantly serrate, 4–7 cm long, 1.5–3 cm wide; uppermost bracteal leaves with basally red-blotched blades; cyathia compact in cymes; involucre with 1 or 2 nectaries between 2 or 3 of the 5 ovate-oblong laciniate lobes; ovary 3-lobed, stipitate; capsule 3 mm long, 4 mm wide, glabrous; seeds dark brown, tuberculate, obovoid, basally flattened, apically subconic, 2×1.5 mm.

Native of Tropical America; now a common weed in many warm countries. Barrigada (3978), in waste ground. This is probably only a form of *Euphorbia heterophylla* L.

Euphorbia gaudichaudii Boissier, Cent. Euphorb. 7, 1860. Safford 1905: 270. Merrill 1914: 101.

Erect subshrub, velvety pubescent, usually unbranched, to 30 cm tall; leaves petiolate, subcordate, linear-lanceolate, subacute, sharply denticulate; stipules small, linear, reddish; blades about 18 mm long, 8–10 mm wide; cymes of cyathia in uppermost axils, subsessile, corymbosecapitate; with linear bracts; involucre sparsely hairy externally, densely hairy inside; lobes deltoid-lanceolate; nectaries substipitate, orbicular, with a white obovate-oblong appendage of greater width; styles bifid; capsule puberulent.

Endemic; first collected by Gaudichaud in 1819. It is similar to *E. reinwardtiana.* (Bryan, 11 Oct. 1960, states that the leaves may be 2″ long and 1/2″ wide (5 × 1.25 cm), and the stems reddish-brown.) I have not seen the plant.

Euphorbia geniculata Ortega, Nov. Pl. Rav. Hort. Matr. Decad. 18. 1797.

An erect herb to about 1 m tall with somewhat hairy green stems; basal and apical leaves opposite, other leaves alternate; stiqules glandlike; leaves alternate; petioles 1–3 (–5) cm long; blades all green, (the bracteal leaves basally white or pink-blotched), glaucous beneath, ovate or oblong-rhomboidal, acute-acuminate, obscurely dentate toward base, up to about 8 (–10) cm long; involucre cylindric-turbinate, with 5–7 oblong-lanceolate lobes; seeds about 3–3.2 mm long, angular, sharply keeled on one side, slightly tuberculate.

Native of Mexico, Texas, the W. Indies; introduced to Guam presumably unintentionally; now a rather common weed of waste ground. Barrigada (3979).

Euphorbia glomerifera (Millspaugh) Wheeler, Contr. Gray Herb. n.s. 127, 78. 1939. Bryan, 11 Oct. 1960.

A low herb with slender stems and elliptical leaves about 1.3 cm long, usually shorter, distally serrulate-denticulate, usually reddish-purplish, and the stems reddish; cyathia in small cymes in upper axils; bracts white; capsules with forked styles.

A weedy Tropical American species first described from Guatemala.

Euphorbia hirta L. Sp. Pl. 454. 1753. Safford 1905: 271. Merrill 1914: 101. GOLONDRINA

Annual herb with ascending stems to 40 cm high, hispid-pubesent, hairs multicellular, spreading; leaves narrowly ovate-rhomboidal, inequilateral and slightly asymmetric, subacute, rounded or obtuse at base, dark green and often purplish above, paler green beneath, pilose, serrulate; stipules pectinate, caducous; blades 2–4 cm long; petiole about 1 mm; cyathia many in short dense axillary subcapitate cymes; involucre sparsely pilose externally; nectaries obsolete; capsule minute, adpressed-pilosulous, 1.2 mm wide; seeds 0.7 mm long, ovoid, 3-ridged, with transverse wavy lines, light brown.

A weed in all tropical countries; around towns in waste ground. Mangilao (3908).

EUPHORBIA MILII des Moulins, ex DC. Prod. 15, 2: 79. 1862. CROWN-OF-THORNS

var. SPLENDENS (Bojer) Ursch & Leandri

E. splendens Bojer; Stone, Micronesica 1: 134. 1964.

An erect branching shrub with hard-succulent subterete or slightly ridged stems, sometimes twining, beset with many slender spines; leaves crowded toward branch tips, soon falling, obovate, thinly fleshy, to 5 cm long; cyathia long-pedunculate, each subtended by two suborbicular-mucronate opposite red bracts 8–10 mm long; in leaf axils.

A native of Madagascar, introduced as an ornamental; rare in Guam gardens.

EUPHORBIA NERIIFOLIA L. Sp. Pl. 451. 1753. LENGUA-I-BACA. HILA-I-BACA.

An erect shrub with hard-succulent branches with 5 distinct angled ridges, with paired spines; leaves thick, in rows, 6–15 cm long, obovate, long-petiolate, soon falling; spines short, dark-colored, contrasting with the green stems, borne on tubercles; cyathia in cymes; involucre yellowish.

A native of India, introduced as an ornamental. It may attain a height of 5 m. With its green, hard-succulent stems, branching and erect, it resembles a cactus, even to the spines; an excellent example of parallel evolution. Occasional in Guam gardens.

Euphorbia prostrata Aiton, Hort. Kew. 2: 139. 1789. Merrill 1914: 101. BODULAGAS-CHACA.

Prostrate, branching annual herb, minutely puberulent; leaves opposite, on petioles about 1 mm long, blades oblong-elliptic to oblong-obovate, slightly inequilabteral, obtuse or rounded, margins slightly denticulate, often sparsely puberulent dorsally, 2–6 mm long; stipules on upper side of stem distinct, linear, pilose, those of lower side fused, apically toothed; cyathia in axillary capitula; involucre campanulate or turbinate, usually glabrous, 0.5–0.65 mm long; nectaries 4, minute, appendage obscure; lobes 5; capsule nodding, whitish-ciliate only on its angles, elsewhere glabrous, 1.1 mm tall; styles very short; seeds narrowly ovoid, truncate basally, apically obtuse, tetragonal, reddish or grayish, 0.8 mm long, 5–7-grooved transversely.

Native of tropical America; now a widespread weed.

EUPHORBIA PULCHERRIMA Willd. ex Klotsch in Otto & Dietrich, Allg. Gartenzeit. 2: 27. 1834. POINSETTIA

Poinsettia pulcherrima (Willd.) R. Graham, Edinb. New Phil. J. 20: 412. 1836.

Erect branching shrub to 2–3 m tall; leaves elliptic to elliptic ovate, acute, entire or slightly sinuate or even lobed, to 25 cm long and 10–15 cm broad; petioles up to 8 cm long; uppermost bracteal leaves bright red (or white); cyathia rather large; involucre green, about 6 mm wide, with 5-laciniate lobes, with 1 large yellow nectary about 4 mm long; stamens dark red; styles bifid, red; capsule long-stipitate, about 1.5 cm long, glabrous, nodding; seeds pale, subglobose, about 6 mm broad, smooth.—Fig. 55.

A native of Mexico, now widespread in cultivation; often used for Christmas decorations. The copious milky sap is a cogent poison. Common in gardens.

The generic name Poinsettia is now considered a synonym, but is still the best

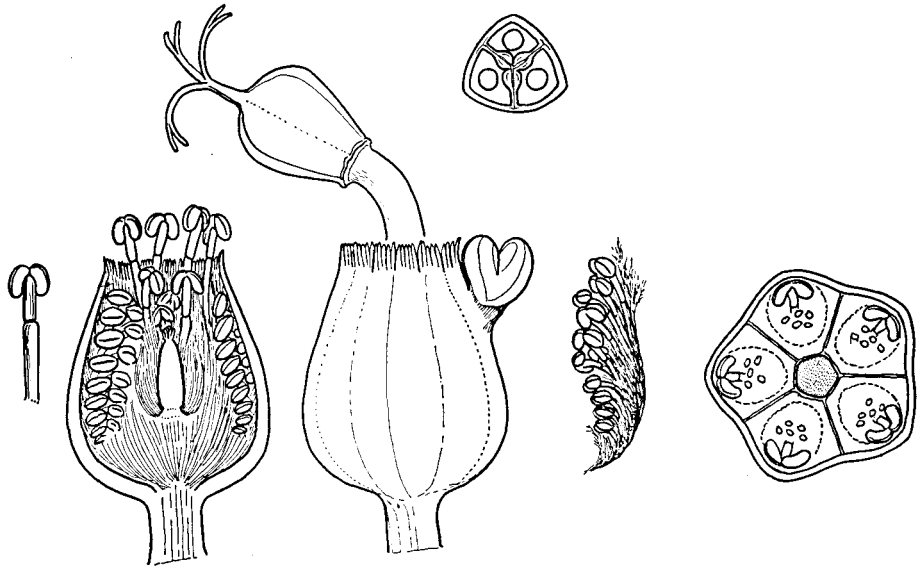

Fig. 55. Euphorbia pulcherrima.

common name. It is taken from J. R. Poinsett, who was the American minister to Mexico in 1829, when he introduced it to cultivation.

Euphorbia ramosissima Hooker & Arnott, Bot. Beechey Voy. 69. 1832.

Boissier, in DC. Prodr. 15 (2): 14. 1862; Merrill 1914: 101.

E. sparrmanii Boissier, sensu Index Kewensis.

E. tinianensis Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 29. 1935.

Dwarf shrub with short decumbent stems and slender ascending branches; glabrous, somewhat glaucous; leaves opposite, elliptic-ovate, obliquely rounded subcordate at base, or suborbicular, mostly about 1–2 cm long and nearly as wide, very shortly petiolate (2 mm), obtuse or rounded at apex, coriaceous, midrib and 2 side-veins obscure; cyathia in small cymes, terminal and in upper axils, capitate, equalling the leaf, the involucre 1 mm wide, glabrous, its linear-lanceolate lobes laciniate, with suborbicular substipitate plane glands, with a white petaloid appendage slightly notched at tip; bracteoles linear-lanceolate bifid, glabrous; stamens 0.5–1 mm long; anther globose; ovary stipitate, 3-celled, globose, glabrous, styles 3, each bifid, reflexed; capsule globose 3-grooved, crowned by stylar remnant, about 1.6 mm high.

Limestone terraces in Guam; Guae (Moran in 1954). Type from Henderson Is.

Perhap's Bryan's record of *E. mcgillivrai* Boissier belongs here.

Euphorbia reinwardtiana Steudel, Nom. ed. 2, 614–5. 1840.

E. serrulata Reinw. ex Bl. non Thuill. 1790.

Glabrous annual, usu. procumbent, with shortly petiolate opposite linear firm obtuse oblique somewhat denticulate leaves, slightly cordate at base, mostly 2–4 cm

long; cyathia in shortly pedunculate axillary cymes; bracts very small; glands with small appendages.

S. E. Asia to Australia and the Pacific. This species is very similar to *E. macgillivrayi* Boiss. (reported from Guam by Bryan) which has broader leaves and stouter stems. Possibly both species are present, but further field study is needed.

Euphorbia thymifolia L. Sp. Pl. 454. 1753.

Small annual prostrate herb, hispid, branches with opposite obliquely oblong obtuse crenulate leaves, glabrous or puberulent, coppery, about the size of lvs. of E. prostrata; stipules elongate fimbriate; inflorescences minute axillary compound pubescent; cyathial gland small or none; capsule shortly stalked, seeds 4-angled, blunt, with 5 or 6 shallow transverse furrows.

A weedy species of nearly pantropical distribution. Occasional in Guam. Native of India. Very similar to *E. prostrata.*

EUPHORBIA TIRUCALLI L. Sp. Pl. 452. 1753. Stone, Micronesica 1: 134. 1964.

Shrub of medium to large stature, up to 5 or even 10 m tall, composed of leafless, green, cylindric articulated branches; leaves reduced to linear scales on youngest branch tips, early caducous; cyathia in sessile clusters; involucre with 5 nectaries; capsule 3-valved, with smooth ovoid seeds.

An East African and Indian species introduced as an ornamental. The leafless appearance and the green stems, about the thickness of a big pencil, quickly distinguish the plant. Camp Witek; Ypan (3915).

EXCOECARIA Linnaeus

Trees or shrubs with copious milky sap, acrid and poisonous; leaves alternate, or opposite, entire or subserrate; flowers small in axillary or terminal ament-like spikes or racems; petals none; disc none; pistillode none; male flowers in bract-subtended groups of 1–3, bracts 2; sepals 3; stamens 3, free; anthers globose, 2-celled; ovary 3-locular, locules 1-ovulate; styles shortly connate, entire, recurved; capsule crustaceous, the valves elastically twisting; seeds globose.—About 35 species of the paleotropics; one species indigenous in Guam.

Excoecaria agallocha L. Syst. Nat. ed. 10, 1288. 1789. Safford 1905: 271.

var. **orthostichalis** Muell.-Arg. in DC. Prodr. 15 (2): 1221. 1866.

Merrill 1914: 101.

A small littoral tree with fleshy-coriaceous alternate leaves; petioles 1–2 cm long; blades glabrous, ovate or elliptic, or oblong-ovate, 3–11 cm long, 2–6 cm wide, bluntly acuminate, or rounded, at apex, obtuse or rounded at base, glossy green; spikes with a few female flowers at base, the remainder male; some spikes entirely of male flowers, calyx of 3 sepals; petals none; stamens 3 or 2; ovary 3-celled, style simple; bracts densely imbricate; capsule about 3–6 mm broad, subglobose, smooth, 3-seeded; seeds subglobose.

Native on sea shores from Asia to Australia and the Pacific Islands, often near the fringes of mangrove swamps, sometimes on sandy beaches, or on rocky seacoasts.

In Guam rather scarce; Sumay (4283).

The thick latex is said to be dangerously irritating especially if it gets in one's eyes, hence the name "blinding-tree". Even smoke from the burning wood is acrid and painfully irritating.

The somewhat fleshy, rather dark leaves, the oldest ones withering red, and the thick, witish spikes, distinguish this plant.

GLOCHIDION Forster

Trees or shrubs with alternate, more or less distichous leaves, simple and entire; flowers small, in axillary clusters; petals none; disc none; male flowers with 6 (or 5) sepals, imbricate in 2 series; stamens 2–8, connate, forming a column, the anthers linear, the connective slightly produced, or connate; pistillode none or obsolete; female flowers with 6 imbricate sepals, or the calyx tubular and unequally lobed; ovary 3–15-locular; styles connate in a column or cone, rarely free; ovules 2 per locule; capsule of 3–15 segments, these 2-valved, subglobose or depressed; seeds hemispherical or compressed.

—A large genus of about 300 species, most of them in Asia, a few in Africa or America, tropical. One indigenous species in Guam; one or two more in the Caroline Islands.—Similar to *Phyllatnthus* (a few species in each very similar); much in need of taxonomic revision.

Glochidion marianum Mueller-Argoviensis, Linnaea 32: 65. 1863.

Safford 1905: 283. Merrill 1914: 102.

CHOSGA. CHOSGO. ABAS DUENDES.

Phyllanthus gaudichaudii M.A. var. *marianus* M.A. in DC. Prodr. 15 (2): 300. 1866.

A shrub or little shrubby tree with alternate distichous simple leaves; petioles very short (1–3 mm); blades elliptic or oblong-elliptic to subovate or subobovate, entire, pale or medium green (slightly paler beneath and subglaucous), bluntly rounded at both ends or apically subacute, or briefly blunt-acuminate, mostly 5–15 cm long and 3–8 cm broad; flowers short-pedicellate in axils; calyx of 2 larger and 3 smaller sepals; male flower smaller than female, yellow; petals none; pistillode none; anthers 3, connate, short-columnar; female flower with mostly 5-locular ovary, glabrous; styles forming a slender subulate column; capsule pale green, usually slightly pentagonal, dehiscent; seeds 2 per locule, orange-brown. (Note: the leaves wither reddish-orange).—Fig. 56.

Apparently endemic, although it has been reported from Samoa and Tonga; but until the genus is thoroughly studied, at least in the Pacific—Malaysian area, its actual distribution must remain somewhat doubtful. The type is from Guam, collected by Gaudichaud in 1819.

This is a quite common plant, often volunteering in old fields; it appears equally at home on limestone and on basaltic soils. The male flowers, though quite small, are of a bright yellow; the capsules dehisce to reveal the noticeable orange or orange-brown seeds. With their 5 (or sometimes 6) loculi, these capsules resemble a mallow-

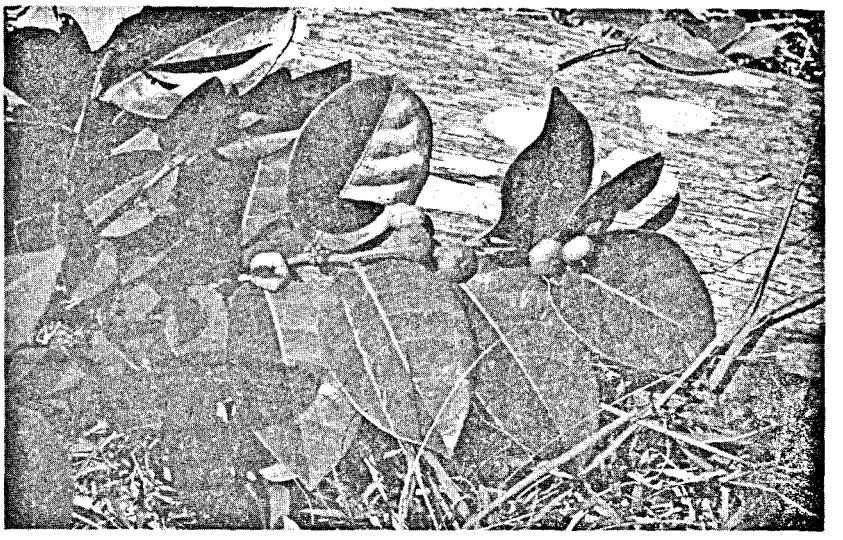

Fig. 56. Glochidion marianum.

fruit or a Dutch cheese. The wood is allegedly strong and hard; but since the plants rarely reach 5 m height and the trunks are seldom over 10–20 cm thick, only rods and shafts can be formed.

Manengon savannah (3820; 3856; 4849); Cetti Bay (3898); Sasa R. (4149); Apra (4675–a).

HEVEA Aublet

Trees with copious white latex; leaves trifoliolate spirally arranged; flowers male and female in the same panicle; panicles crowded toward branch tips in axils or emerging before the new leaves; female flowers few; male flowers many; smaller; calyx 5-lobed; yellowish; petals none; stamens 10 consisting of sessile anthers set in 2 series of 5 on a slender central column; ovary with 3 sessile stigmas; fruit a large trilocular capsule explosively dehiscent; locules 1-seeded; seeds large obolong.—12 Amazonian species.

HEVEA BRASILIENSIS (Juss. ex Willd.) Mueller-Arg., Linnaea 34: 204. 1856.
PARA RUBBER TREE.

A more or less decidous tree to 20 m tall with smooth grayish trunk; leaves of 3 distinct, elliptic entire, petiolulate leaflets, each 10–20 cm long, narrowed-acute at both ends; flowers in open axillary panicles half as long as the leaf; flowers small, greenish-yellow; calyx 5-lobed; white-tomentose; petals none; capsules subglobose 3-lobed, woody, 5–7 cm thick, brown; seeds oblong, mottled brown, nearly 2.5 cm long.

Native of Brazil's Amazon region; the trunk is tapped for its copious milky latex, the source of commercial rubber. Introduced to Guam by the Experiment Station in 1911. I saw no trees in Guam, so it may no longer persist there.

JATROPHA Linnaeus

Shrubs, sometimes with swollen stems, with spirally arranged palmately lobed leaves; panicles terminal, with few central-terminal female flowers and peripheral numerous male flowers; sepals 5; petals 5; stamens 10, or more, in 2 series; ovary 3-celled; style 3, bifid; fruit slightly fleshy but capsular-dehiscent; locules 1-seeded; seeds black, each with a white aril (caruncle).—Tropical America.

Three species in Guam, none native.

1. Leaves 3–5-lobed, or merely palmately nerved; lobes entire or ciliate,
   2. Leaves glabrous, dull green; lobing shallow, less than halfway to midrib ..... *J. curcas*
   2. Leaves with large capitate glandular hairs (sticky), often purple; lobing moderately deep ..... *J. gossypiifolia*
1. Leaves 7–11-parted, the segments very slender, sometimes dentate or lacerate; glabrous ..... *J. multifida*

JATROPHA CURCAS L. Sp. Pl. 1006. 1753. Safford 1905: 301, pl. 55. Merrill 1914: 102. TUBA-TUBA. PHYSIC-NUT.

A big shrub to 3 m tall; leaves usually 3–5-lobed, rarely simple, cordate, palmately nerved, dull olive green, the lobes acute, rather short; petioles 10–14 cm long; blades 10–19 cm long; panicles terminal or axillary; flowers yellow-green; sepals somewhat petaloid; petals basally coherent; male flower with internally pubescent corolla; stamens many; disc of 5 unequal glands; ovary 3-(sometimes 2 or 4–)celled; capsule gray-brown; seeds oily, compressed elliptic-oblong, overy 1 cm long, nearly black.

A native of Tropical America, now widespread in tropical regions. Often planted or naturalized in villages and along roads, where it may form a hedge. The seeds are purgative and, in quantity, poisonous; they have an agreeable flavor, so children should be warned against them. The sap of the plant is soapy. The oil was formerly, at least, of some commercial value. Barrigada Village (obs.), and throughout the island.

JATROPHA GOSSYPIIFOLIA L. Sp. Pl. 1006. 1753.

Shrub to about 1.5 m tall; leaves membranous, 3–5-lobed, purplish, sticky with capitate glandular hairs, slightly serrate, on petioles about 6–9 cm long, blades about 10 cm long and wide or somewhat larger, ciliate; panicle axes purple, 10–15 cm long, sticky-hairy; flowers dark red, just overy 1 cm broad, petals free; disc lobed; fruit oblong, 2–3-lobed, brown when ripe, about 1.3 cm long.

A native of Brazil, now widespread in tropical regions. The purple leaves, with their sticky, green-headed glandular hairs, and the dark red petals quickly distinguish this plant. It is planted and has become sparingly naturalized in a few places, such as the roadside near the west of the College of Guam entrance road (3997). Like the former species this has soapy sap, which is probably poisonous.

JATROPHA MULTIFIDA L. Sp. Pl. 1006. 1753. Safford 1905: 301. Merrill 1914: 102. CORAL PLANT.

A glabrous shrub to 2–3 m tall; leaves deeply palmately parted with 7, 9 or 11

linear-lanceolate, coarsely dentate or lacerate segments, up to 30 cm long, petioles nearly 20–30 cm long; undersurface waxy-powdery; stipules fimbriate; panicles cymose, elongate, the axes coral red; cymes subcorymbose; flowers coral-red; capsule rounded trigonal, over 2 cm long.

A tropical American plant, introduced as an ornamental shrub. Rather uncommon in Guam gardens. Camp Witek (4047). Probably poisonous.

MACARANGA Thouars

Trees or shrubs; leaves alternate, stipulate, usually large and palmately nerved and lobed, often peltate; flowers in axillary racemes or panicles; male flowers numerous and crowded; calyx cupular, with 2–4 valvate lobes; stamens 1, few, or rarely many, the anthers 4- or 3-celled; pistillode none; female flowers few or solitary in axils of usually dentate subtending bracts; calyx 2–4 lobed; ovary 1–6-celled, cells 1-ovulate; styles entire; capsules usually of 1–6 bivalved cocci, smooth or echinate, glandular or waxy; seeds globose.—A large characteristic genus, of perhaps 250 species, from Africa to Asia and the Pacific; some forms are "ant-plants" with hollow stems in which ants live (as in the Moraceous *Cecropia* of South America); several are weedy; many have large or even very large leaves.

Macaranga thompsonii Merrill 1914: 102. PENGUA.

A small tree with thickish (1 cm) reddish-brown branches marked by the conspicuous leaf-scars and stipule-scars, pubescent at tips, glabrate; leaves alternate, peltate, harshly coriaceous, suborbicular to deltoidsubcordulate-ovate, margins faintly lobed or sinuate or entire, briefly acuminate, mostly 15–20 cm broad and long, with about 9 major veins from the peltation, bright or slightly olivaceous green, the vein reticulations evident, beneath with scattered yellow dotlike glands each in a tiny pit, glabrate or quite glabrous; petioles 10–14 cm long; stipules lanceolate, nearly glabrous, acuminate, 2–3 cm long, deciduous; male flowers in axillary panicles, up to 16 cm long, many-flowered, narrowly pyramidal, lowest branches to 3 cm long, upper ones shorter; bracts lacking; flowers subsessile, crowded; sepals 2 or 3, oblong-obovate, just over 1 mm long, subacute, slightly pubescent; stamens 4 or 5, filaments just over 1 mm long, anthers 4-celled or 3-celled, about 0.2 mm long; female flowers. . .—Fig. 57.

Endemic to the Marianas Islands, not rare in limestone forest community, where, with its thick stems and broad peltate leaves it is almost unmistakeable. The only other plant in such areas with peltate leaves is *Hernandia peltata*, which is a big tree, and its leaves are cordate and unlobed, with the junction of the petiole a red spot; it has not yellow dotlike glands.*

Barrigada Hill (4058); Asdonlucas, s. of Yigo (4735).

It is curious that no other Macarangas occur in Guam, since some such as *M. tanarius* are both widespread and rather weedy. In the Caroline Islands there

* *Ricinus communis* often has slightly peltate leaves, but the terminal racemes, serrate leaf-lobes, and spiny fruits distinguish it easily.

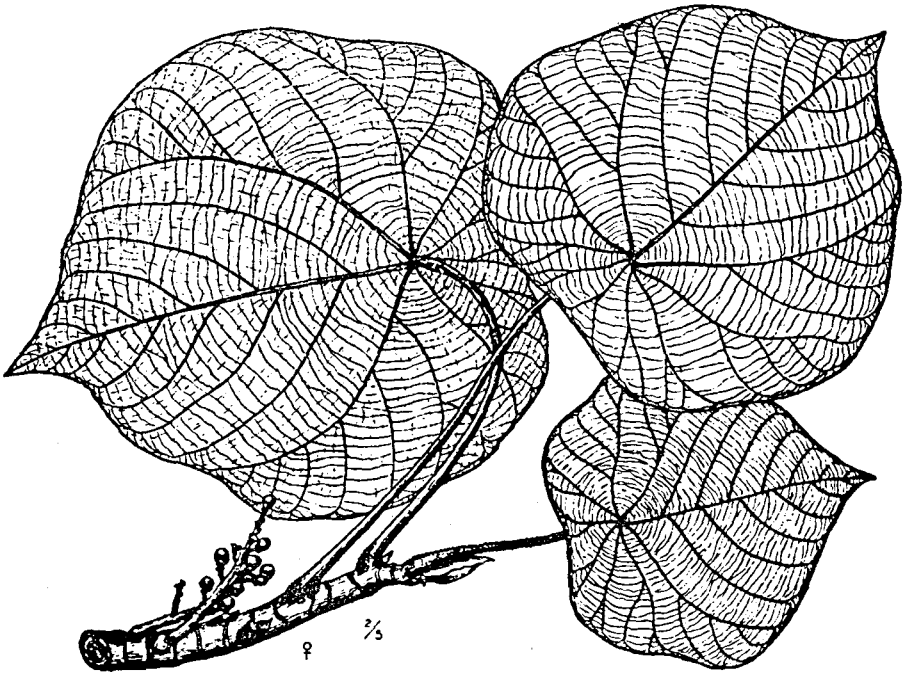

Fig. 57. Macaranga thompsonii.

is a different species, *M. carolinensis*, with the leaves 3-lobed, the 2 lateral lobes very slender-acuminate.

MANIHOT Linnaeus

Shrubs or small trees, often with starchy tuberous roots and copious milky latex; leaves spirally arranged, deeply palmately lobed; panicles terminal, of many male flowers and a few basal female flowers; calyx cupular, 5-lobed; petals absent; stamens 10, on separate slender filaments; capsule 6-angled or—winged, 3-seeded.—About 100 species all of Tropical America.

Two species reported from Guam, both introduced, only one being common.

1. Leaf-lobes lanceolate-elliptic, narrow; shrubs seldom over 3 m tall..*M. esculenta*
1. Leaf-lobes broadly obovate; a shrubby tree to 10 m tall.....*M. glaziovii*

MANIHOT ESCULENTA Crantz, Inst. 1: 167. MENDIOKA. CASSAVA. TAPIOCA.

M. utilissima Pohl, Pl. Brasil. Ic. 1: 32, t. 24, 1827.

Merill 1914: 103.

Jatropha manihot L. Sp. Pl. 1007. 1753.

Manihot manihot (L.) Karst. Deutschl. Fl. 588. 1880–83;

Safford 1905: 316. nom. tautonym. illegit.

An erect glabrous slightly glaucous shrub, generally unbranched (when in cultivation), with somewhat pendulous 3–7-lobed leaves (usually 5-lobed), the

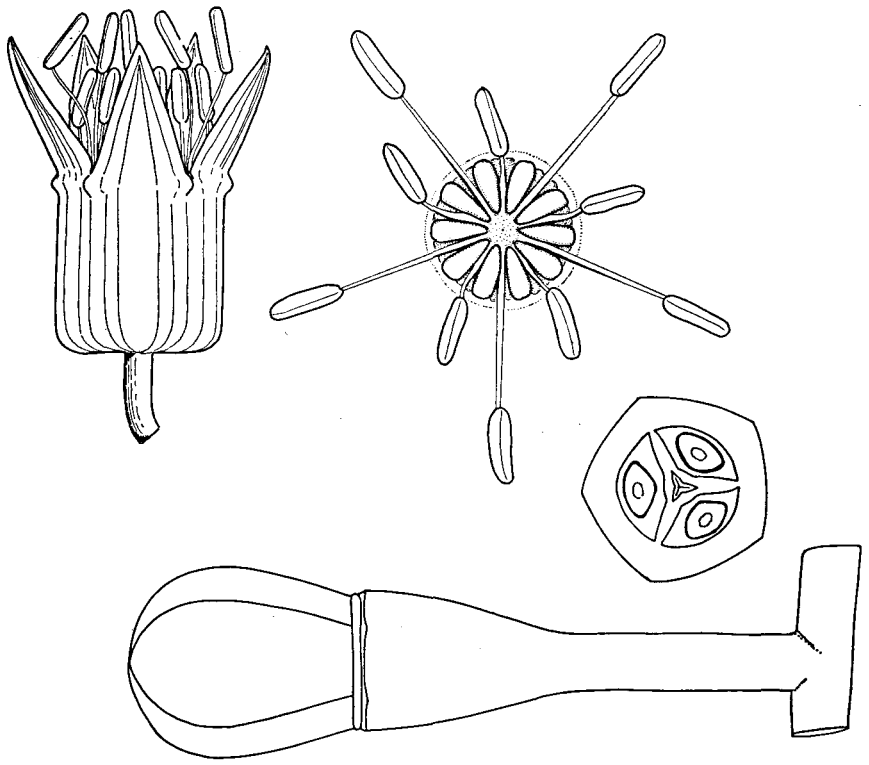

Fig. 58. Manihot esculenta, flowers.

lobes very slenderly lanceolate-elliptic, deeply separated; mostly 10–20 cm long; panicles axillary, lax, few-flowered; flowers about 1 cm long, pendulous, pinkish-green; capsules ellipsoid, almost 2.5 cm long, with 6 narrow wings.—Fig. 58.

Supposedly a native of Brazil, but widespread in Tropical America (where it is commonly called *yuka*), and now of pantropical distribution. In Asia these plants have mostly replaced the yams (Dioscorea) as a source of starchy food, except in certain places (such as Ponape) where traditional yamgrowing contests persist; together with the sweet-potato (*Ipomoea batatas*) and the taro or suni (Colocasia) the mendioka provides a major item in the diet of many people in the Tropical Pacific. As a food, mendioka is almost pure starch, and lacks much of the value of yams or other more proteinaceous tubers; it is very fattening; furthermore the extensive cultivation of the plants quickly exhausts the soil, and a farm plot will rarely yield more than 2 or 3 crops, after which it ought to lie fallow, or rather be planted with a nitrogenating legume.—Fig. 58.

There are two forms of mendioka, one (mendioka amarilla) with edible succulent tubers*, the other with inedible poisonous tubers; these however, when washed and cooked for a prolonged period, may also be eaten. Many cultivars are known.

* Perhaps *M. dulcis*.

The species, and its closest relatives, form an exceedingly interesting problem for ethnobotanists; it is presently being studied by Dr. D. J. Rogers of the New York Botanical Garden.

Manihot is supposedly a word in some Brazilian native language.

MANIHOT GLAZIOVII Mueller-Arg. in Martius, Fl. Brasil. 15 (2): 446. 1874.

CEARA RUBBER.

A small, broad-crowned tree attaining a height of 10 m, glabrous, the trunk with thin papery bark; leaves palmately 3–5-lobed, the lobes broadly obovate, 8–40 cm long; underside waxy-powdery; panicles hermaphrodite, bractolate; flowers about 1 cm long, bell-shaped; calyx 5-lobed; capsule nearly 2.5 cm long, 3-celled and 3-seeded, ovoid, smooth; seeds mottled.

A native of Brazil, introduced in Guam (and Hawaii) as a possible commercial crop; whether trees persist or not is uncertain. I saw none between 1957 and 1965.

MELANOLEPIS Reichenbach fil. & Zollinger

Small trees; leaves spiralled, simple, subpalmately nerved, coarsely toothed; stipules small; panicles terminal, with spicate branches, male, female, or mixed; male flowers with 4–6 sepals; petals none; stamens numerous, distinct, anthers 2-celled; disc none; staminal receptacle bearing stellate hairs; pistillode none; female flowers with 5 sepals; disc annular crenate; ovary 2-celled (rarely 3-celled), styles free, divaricate; capsule 2-lobed (rarely 3-lobed), cocci bivalved, 1-seeded; seeds sublobose, arillate.

—A monotypic genus of S.E. Asia, Malaysia, Australia, and the Pacific Islands, very close to *Mallotus*.

Melanolepis multiglandulosa (Reinwardt) Reichb. f. & Zoll., Linnaea 28: 324. 1856.

var. **glabrata** (Muell.-Arg.) Fosberg, Phytologia 5(7): 289. 1955. ALOM.

Mallotus moluccanus var. *glabratus* Muell.-Arg., Linnaea 34: 186. 1865.—Merrill 1914: 103.

"*Echinus* sp.": Safford 1905: 265.

A rather shrubby small tree with alternate orbicular-deltoid-ovate leaves 10–35 cm long, coarsely toothed, palmately 5-nerved, the midrib upwardly pinnately branched, stellate-pubescent, furfuraceous; petioles nearly as long as or shorter than blade; some blades coarsely 3–5-lobate; panicles terminal and in uppermost axils, pendulous, densely brown-stellate pubescent; male flowers fascicled in axil of bract; female flowers solitary in axil of bract; sepals 4–6, usually 5, densely brown-stallate-pubescent, reflexed at anthesis; stamens as many as 200 per male flower; capsules nearly or quite 1 cm broad, 6–7 mm long, 2- or rarely 3-lobed, stellatepilose (though in age somewhat glabrate); seeds brown.—Pl. 8a.

Native in partial range of the monotypic genus. This variety is found almost throughout the Marianas Islands. It is usually in limestone soils or mixed argillaceous soils in central and northern Guam. The coarsely toothed leaves, pendent infloresences, and dark brown stellate hairs easily mark the plant. The hairs can

best be discerned with a small hand-lens. Mangilao, near entrance to College (3996, 4280). Talofofo R. (8228).

There is supposed to be a tradition of medicinal use locally, the details of which are unknown to me.

PEDILANTHUS Poitier

Fleshy shrubs with copious milky sap, the stems often more or less zigzag from node to node; leaves alternate, entire, slightly fleshy (or absent); cyathia in cymes or clusters, axillary or terminal; involucre oblique, slipper-shaped, the tube fissured above and notched below at the bilabiate apex or throat; the tube with an appendage on the upper side of its base; the fissure closed, or nearly, by 2 lateral and 1 median accessory lobes; appendage of tube gibbous, glandular within, its lip notched or 2–3-lobed; flowers pedicellate, males many, without calyx but sometimes bracteolate; female single, the style exserted; stigmas 3, connate and usually bifid; seed without caruncle.—N. Tropical America, about two dozen species.

PEDILANTHUS TITHYMALOIDES (L.) Poit. Ann. Mus. Paris 19: 389. 1812.
SLIPPER FLOWER.

A shrub, with erect or somewhat decumbent slightly fleshy, often markedly zigzag stems, 0.5–2 m high; leaves fleshy, ovate, subsessile, sometimes variegated white or yellow, or in some forms completely albino together with the stems; 5–10 cm long; soon falling; flowers borne with in narrow boat- or slipper-shaped red bracts (involucre); 1 female and several male flowers in each involucre forming the cyathium; flowers inconspicuous, yellowish; involucre about 12 mm long; appendage with 4 glands; capsule 7.5×9 mm; seeds ovate, 5 mm long.—Pl. 8b.

A native of the Caribbean region; an ornamental plant, not uncommon in Guam, chiefly in Agaña and Barrigada (5090). The milky sap is caustic and emetic.

PHYLLANTHUS Linnaeus

Trees, shrubs, or herbs; leaves alternate, entire, simple, distichous, membranous, symmetrical (usually); flowers small or minute, apetalous, clustered in axils; male flowers with 4–6 sepals imbricate in 2 series; stamens 3–6, free or connate; pistillode absent; disc present; female flowers with 4–6 sepals; ovary 3- or 4-celled; cells 2-ovulate; styles free or connate, usually bifid; capsules of 3 or more crustaceous cocci, rarely of osseous bivalved cocci, rarely the fruit drupaceous and fleshy; seeds 3-angled.—A large genus of over 500 species throughout the tropics. [Including *Cicca, Breynia,* and *Emblica*]. 8 species in Guam, of which 2 (possibly 3) are indigenous; 1 is endemic.

Key to Species

1. Herbs or shrubs; fruit capsular dehiscent,
   2. Woody (though small) shrubs,
      3. Leaves green; wild plants.
         4. Leaves not punctulate beneath, mostly over 1 cm long; of lime-

stone soils.....*P. marianus*

4. Leaves punctulate beneath, 5–12 mm long; of savannah laterite-basaltic soils.....*P. saffordii*

3. Leaves variegated pink and white; cultivated bush.....*P. nivosus*

2. Herbs, or somewhat suffruticose at base,

5. Flowers pedicellate; leaves various; capsule smooth, or slightly rugose,

6. Branches flattened; pedicels of female flowers 4–7 mm long; leaves narrow sublinear or oblong-elliptic.....*P. simplex*

6. Branches terete; pedicel of female flower about 2 mm long; leaves broader than linear,

7. Cymules unisexual; calyx-lobes obtuse.....*P. debilis*

7. Cymules bisexual; calyx-lobes acute.....*P. amarus*

5. Flowers (females) sessile; leaves rounded at base and rounded-mucronulate at apex; capsule echinate-ridged.....*P. urinaria*

1. Trees; fruit pale green or whitish, thin-fleshy, indehiscent, slightly grooved, edible.....*P. acidus*

PHYLLANTHUS ACIDUS (L.) Skeels, U.S. Dept. Agric., Bur. Pl. Ind. Bull. 148: 17. 1909; Walker & Rodin 1949: 462. IBA. TAHITIAN GOOSEBERRY.

A small tree up to 8–9 m tall, sparingly branched, the crown open, the leaves mostly 2–8 cm long, 1–4 cm wide, ovate or elliptic, pinkish when young, rounded or subcordate, somewhat asymmetric or not, slightly glaucous beneath, thin-chartaceous, drooping; petioles about 2 mm long; inflorescences on branches maturing after leaves have fallen, racemose, up to about 7 cm long, single or fasciculate, simple; male flowers with red calyx; anthers yellow; female flowers with pink calyx; ovary green, styles pale yellow; fruit obscurely pentagonal or hexagonal, each with 2 shallow rounded lobes, pale green or whitish, thin fleshy with crisp slightly juicy sour pulp, 1.5–2 cm thick, pendent, the calyx embedded at base of fruit; seeds within a small central stone; pedicel 2–4 mm long.

Native of the East Indies; introduced for its sour fruits, much favored by children. Rather frequent in farms and villages. Agaña (Moore); Barrigada (4048).

Phyllanthus amarus Schum. & Thonn., Beskr. Guin. pl. 421. MAIGO-LALO.

P. niruri sensu Merrill, 1914: 104.

Small herbs, usually under 30 cm tall, with numerous small oblong-elliptic or squarish leaves, glabrous, about 6–12 mm long; flowers very small, in cymules hidden under the leaves; cymules bisexual, of 1 male and 1 female flower; calyx-lobes 5, acute; pedicels 2 mm long; capsule small, depressed-globose; seeds 5–7-ribbed.

Apparently native of the New World but widespread now and weedy; in waste ground. Tagachan Bay (3984). The name means "sleeping-flies". Very similar to *P. debilis* and *P. niruri.*

Phyllanthus debilis Klein ex Willd., Sp. Pl. 4: 582.

Bryan, 11 Aug. 1960. MAIGO-LALO (?).

Suffruticose, branching, leaves elliptic, acute or subacute at both ends, 6–18 mm long, symmetrical; stipules persistent; flowers shortly pedicellate, hidden below the leaves; cymules unisexual; capsule small subglobose; seeds 5–7-ribbed.

Said to be in Guam; easily confused with *P. amarus*. I do not know the species.

Phyllanthus marianus Mueller-Argoviensis, Linnaea 32: 17. 1863; Safford 1905: 351; Merrill 1914: 103. GAOGAO-UCHAN.

(Not: *P. marianus* M.A. Flora 48: 379. 1865 = *Glochidion marianum*.)

An erect sparsely branched shrub 1 or rarely 2 m tall, branches ascending, leaves distichous, moderately dark glossy green, on branchlets mostly less than 20 cm long, subsessile, blades ovate, acute, obtuse, or rounded, or even slightly emarginate at apex, rounded at base, the midrib prominent, symmetrical or very slightly inequilateral, venation rather evident, usually 1.5–3 cm long and half or two-thirds as wide, set at a slight angle and not quite parallel to the branchlet; flowers shortly pedicellate in axillary clusters; male flowers with disc-glands; 3 stamens connate; anthers erect, free; female flowers with 3 bifid styles; capsules small subglobose, of 3 crustaceous 2-valved cocci; seeds brown, coarsely undulate-ribbed transversely on the back.

Marianas and W. Caroline Is., common on limestone cliffs and terraces. Abundant in Guam; attractive and worthy of cultivation as a low hedge or border plant. Cliffs at Tagachan Bay (3983); Dos Amantes Pt. (4044); Yona (4426); Barrigada Hill (4507); Ritidian Pt. (4698); Mochom Bay (4952).

PHYLLANTHUS NIVOSUS Bull, Catal. 9. 1873; W.G. Smith, Flor. Mag. n.s.t. 120 1874.—Safford 1905: 352. SNOWBUSH.

Breynia nivosa (Bull) Bailey.

A shrub with variegated, usually pink and white ovate-elliptic leaves, 2–5 cm long; flowers long-pedicellate, greenish; capsules small, trigonal, turbinate.

Apparently native somewhere in the Pacific Region; now widely cultivated. A few plants are in gardens, as near the Agaña Post Office (4375).

This was introduced to Guam by Safford, in 1899 or 1900, from Honolulu.

Phyllanthus saffordii Merrill 1914: 104.

An erect, low woody shrub, sparsely branched, with terete stems to 30–40 (rarely 60–70) cm tall, sometimes accumbent from prostrate bases; branches dark reddish-brown; side-branchlets to 10–12 cm long, with many small distichous, shiny dark green, imbricate, oblong leaves 5–12 mm long, 1.5–3 mm wide, acuminate, base obtuse, slightly inequilateral, the margins thickened, cartilagineous, puncticulate on both surfaces; about 9 pairs of lateral nerves, obscure; petioles scarcely 1/5 mm long; stipules 2.5–3.5 mm long, filiform-acuminate; flowers 6-merous, axillary; male flowers on pedicels 1/2 mm long, sepals 1.1 mm long, stamens 3, free, disc of 6 free glands; anthers globose, opening by vertical slits; female flowers, sessile sepals oblong 1.2 mm long, ovary glabrous, ovoid or depressed-globose; styles 3, divaricate, connate only at base, bifid; disk saucerlike, scarcely 1/2 mm high; capsule depressed-globose, 2.2 mm broad, glabrous, glossy, 6-grooved, smooth, cocci 1-celled; seeds with minute longitudinal lines.

Endemic; in south and south-central Guam, in savannahs. Type locality is in the hills back of Piti. Manengon (3824; 4845); Agat hills (4214; 4392; 4517). Similar to but smaller (though not necessarily shorter) than *P. marianus*; the leaves usually half as big or less.

Small plants are to be seen in Plate 36, fig. 2, of Fosberg's "The Vegetation of Micronesia", Bull. Am. Mus. Nat. Hist. vol. 119, art. 1, 1960.

Phyllanthus simplex Retzius, Obs. Bot. 5: 29. 1789. Merrill 1914: 105.

Slender, branched, glabrous suffruticose herb to 60 cm tall; leaves alternate, elliptic-oblong or sublinear, subsessile, prominently nervose, blunt at both ends, about 1–1.5 cm long and 2 mm wide; stipules peltate, sagittate; flowers pedicellate; male flowers on shorter (2 mm) pedicels, with oblong sepals and free stamens; female flowers on longer (4–7 mm) pedicels, often associated with 1 or 2 males; disc in male fl. glandular, in female fl. annular; styles free, short, recurved; capsules depressed-globose, about 3 mm wide, smooth or slightly rugose.

Paleotropical; a weed of grassy fields. First collected in Guam in 1819 by Gaudichaud.

Phyllanthus urinaria L. Sp. Pl. 982. 1753; Safford 1905: 352.

Merrill 1914: 105.

Glabrous erect herb, often reddish, to 30 cm tall, few-branched; leaves borne on slightly flattened branchlets, these about 10 cm long; leaves oblong or oblong-obovate, 7–18 mm long, 3–7 mm wide, rounded mucronate, obliquely rounded at base, subsessile, margins minutely scabrous, pale beneath; flowers subsessile, about 4 mm wide, sepals 6, oblong, stamens 3, anthers transversely opening, filaments connate; capsules depressed-globose, about 2.5 mm wide, pendulous, transversely rugose-echinate; styles free, minutes, bifid; seeds transversely rugulose, 2.5 mm broad.

Pantropical weed, in waste ground. G.E.S. 108. Collected also by Gaudichaud, in Guam, in 1819.

Ricinus Linnaeus

Monotypic, with the characters of the single species; probably a native of Africa, but now pantropical and in most warm temperate countries also.

Ricinus communis L. Sp. Pl. 1007. 1753. Safford 1905: 364. Merrill 1914: 105.

AGALIYA. CASTORBEAN. CASTOR-OIL PLANT.

A coarse subshrub, erect, branching, glabrous, somewhat glaucous, the leaves alternate, palmately lobed, purplish when young, subpeltate, lobes usually 5 or 7, serrate, sharply acute; blades 20–60 cm long; petiole about the same length, a gland at apex; panicles terminal, or some axillary; flowers monoecious, apetalous, male flowers with 3–5 calyx-lobes, very numerous stamens variously connate in branching clusters; female flowers with caducous, spathaceous calyx, ovary 3-celled, styles spreading usually bifid; capsule ovoid, softly spiny, 1–1.5 cm long, purplish-brown, dehiscent; seeds oblong-ellipsoid, variously mottled with brown, black and grey.

The well known castor-oil plant is sporadic in Guam along roadsides, as near

Pago Bay (4181). The purgative oil is contained in the seeds.

ANACARDIACEAE

Cashew Nut Family

Shrubs or trees; bark resinous; leaves alt., simple or compound; stipules none; fls. bi- or unisexual, regular; sepals 2–5; petals 3–7, free or rarely slightly connate, sometimes lacking; stamens mostly 5–10, rarely more; staminodia occasional; hypogynous disk usu. present; ovary superior, 1–5-celled (usually 1); cells with 1 ovule; fruit drupaceous or nutlike, seldom dehiscent.—About 60 genera.

Four genera in Guam:

1. Leaves simple
   2. Lvs. lanceolate; pedicel thin, woody.....*Mangifera*
   2. Lvs. broad; pedicel swollen, fleshy.....*Anacardium*
1. Leaves pinnate.
   3. Leaflets mostly 5–7 pairs, not serrate; shrub.....*Schinus*
   3. Leaflets mostly 9–15 pairs, serrate only in young lvs, small tree.....*Rhus*

ANACARDIUM Linnaeus

Shrubs or trees with alt. simple entire lvs.; fls. in terminal panicles; sepals 5; petals 5; stamens 8–10 (all or only some fertile); filaments slightly connate and adnate to the hypogynous disk; ovary 1, obovoid or obcordate, with 1 ovule; style excentric.

A tropical American genus. One species reported from Guam.

ANACARDIUM OCCIDENTALE L. Sp. Pl. 1007. 1753. Safford 1905: 182; Merrill 1914: 105. KASOY; KASOE; CASHEW-NUT.

Tree; lvs. broad, elliptic, oval or oboval; fls. 5-parted, pinkish-yellow; frt. short oblong, rounded, with much swollen pedicel and apical curved fruit; red to yellow; epidermis and flesh resinous, toxic.

Rare in cultivation only; reported long ago by Safford; but I have seen no trees. The seed (cashew-nut) must be roasted before eating. The flesh is resinous (as also in mangoes) and may be highly toxic. The shell of the nut contains gallic acid, anacardic acid, and cardole, this latter being caustic. The seeds contain about 50% edible oil.

Native of tropical America, now widespread in cultivation.

MANGIFERA Linnaeus

Trees, often with dense broad crowns. Leaves simple, spiralled. Fls. 4–5-parted; stamens mostly 1–5, within or on a disk, but disk sometimes reduced or absent; ovary 1-celled, with lateral style; ovule 1, pendulous; fruit a fleshy drupe with compressed seed.—About 40 Asiatic species.

1. Disk obvious, somewhat lobed; fertile stamens 1.....*M. indica*
1. Disk obsolete; fertile stamens 2.....*M. odorata*

MANGIFERA INDICA L., Sp. Pl. 200. 1753. Safford 1905: 182. Merrill 1914: 105. MANGGA; MANGO.

Large tree with broad dark crown; bark roughened, dark; lvs. 10–30 cm long, lanceolate, glabrous; fls. c. 4 mm long; disk fleshy; frts. fleshy-fibrous drupes 8–20 cm long.

Fairly common, in villages and on farms. Barrigada (3936); Talofofo (3968).

Though several improved varieties have been planted in Guam, the common kind is the 'wild' form with small green mangoes, sweet only at extreme ripeness. These are frequently eaten when green. The flesh is scanty and fibrous. The 'Carabao' mango, a Philippine variety, is seen in markets, but these are usually imported fruits. The mango is attacked by a fly (*Dacus dorsalis*) which is a serious pest. The resinous fruits may cause an allergic rash reaction, especially around the lips of those who eat them.

A tropical Asiatic species, now widely introduced in all tropical countries. The wood though attractive is not durable.

MANGIFERA ODORATA Griff., Notul. 4: 417. 1854; Merrill 1914: 105.

SAIPAN MANGO

A glabrous tree; lvs. oblong to elliptic-lanceolate, reticulations evident esp. below; petiole to 4 cm long; sep. and pet. 5; disk obsolete; frt. oblong.

Rarely cultivated.

An Asiatic species. According to Griffith, the fruit is "oblong, stinking, yellow-green, with yellow spots, filled with a sticky gum; the flesh yellow, fibrous, sweet, not turpentiny." I have not seen the plant.

RHUS Linnaeus

Shrubs or trees usu. with alt. imparipinnate lvs. (rarely simple); sap acrid; fls. polygamous; sepals 4–6; petals 4–6; stamens 4–10, at base of hypogynous disc; ovary 1-celled; styles 3; ovules pendulous; frt. a small drupe. Worldwide, 250 spp. One species in Guam.

Rhus taitensis Guillemin, Ann. Sci. Nat. Bot. 11, 7: 361. 1837.

LEMAYO; LAMAHU; SUMAC.

A tree, the lvs. alternate, imparipinnate, with mostly 15–21 leaflets; new foliage puberulent; leaflets oblong-ovate, the base unequal-sided, to 10 cm long or more, petiolules very short, margins serrate or in adult lvs. subentire; fls. white, very small, clustered in large terminal inflorescences 30+ cm long.—Fig. 59.

Described from Tahitian specimens (taitensis). Rare in Guam; occurring also elsewhere in Micronesia, Philippines, Polynesia, and Melanesia.

SCHINUS Linnaeus

Small trees with acrid resinous sap; leaves alternate, simple or imparipinnate, rachis winged (or not); flowers regular, small; sepals 4–5; petals 4–5; stamens 8 or 10; disc prominent; ovary 1-celled, usually with 3 styles; fruit a small oily drupe; plants often dioecious.—About 15 Tropical American species.

Schinus terebinthifolius Raddi, Mem. Mod. 18. Fis. 399. 1820.

CHRISTMAS-BERRY.

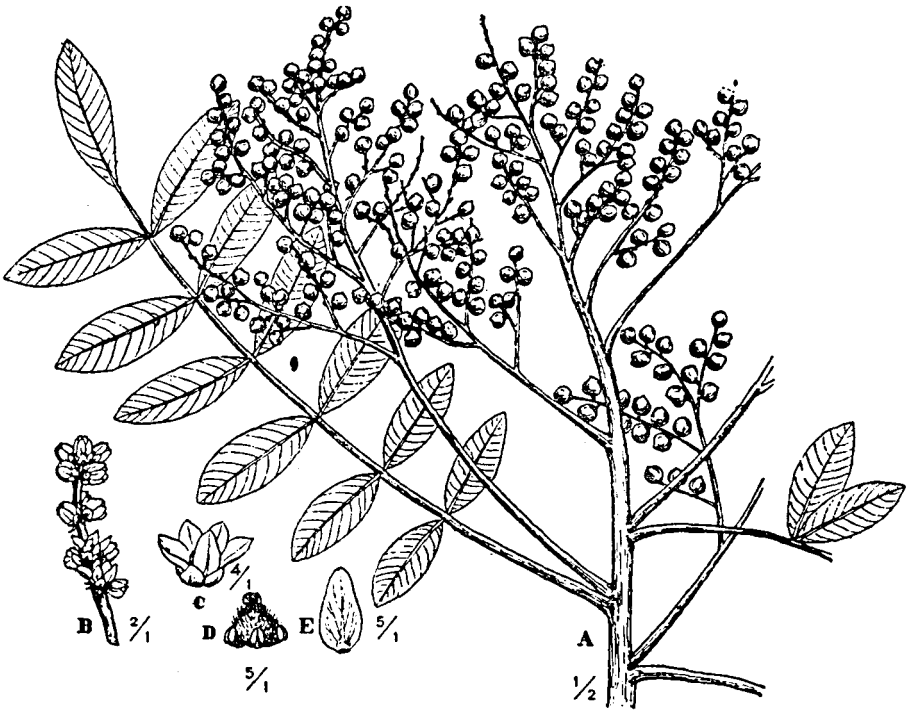

Fig. 59. Rhus taitensis.

Shrubby or a small tree; lvs. alt., with 5–9 leaflets about 3–8 cm long, rachis slightly alate; fls. tiny whitish; frts. red, berrylike, 3–5 mm broad, globose; endocarp crustaceous; seed yellow, reniform.

Rare naturalized shrub, probably indirectly introduced via Hawaii, where it is not uncommon in disturbed areas; native of Brazil.

CELASTRACEAE

Trees or shrubs with alternate simple leaves; stipules deciduous; flowers small and unisexual; sepals 4–5, petals 4–5, free; stamens 4–5, alternate with petals; disc present; ovary superior, 2–5-celled, cells 1–2 ovulate; ovules erect; style evident; fruit a berry or capsule, rarely a samara.—About 40 genera and 400 species, both tropical and temperate. One genus in Guam.

MAYTENUS Molina

Mostly shrubs or small trees sometimes spinese; stipules small; fls. bior unisexual; fls. mostly 5-parted, with disk; stam. 4–5; ovary 2–3-locular; frt. capsular. One species present in Guam.

Maytenus thompsonii (Merr.) Fosb., Phytologia 5(7): 290. 1955.

Gymnosporia Thompsonii Merrill, 1914: 105. LULUHUT.

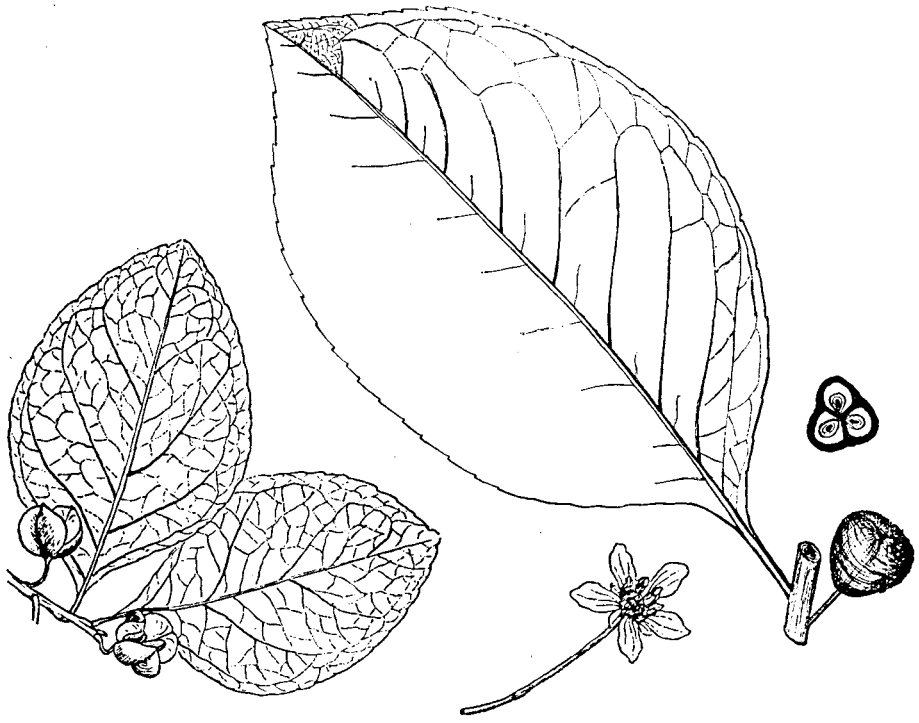

Fig. 60. Maytenus thompsonii.

Shrub 1–2 m, glabrous except the minutely puberulent inflorescence. Petioles 5–10 mm long. Leaves elliptic or ovate, mostly 6–10 cm long by 3–7 cm wide, apex rounded or obtuse, base acute, margins slightly crenate; flowers in axillary clusters, white, 5-merous. Calyx-lobes jagged-ciliate on margins. Styles 3 (rarely 4). Fruit a 3-valved dehiscent capsule, up to 1 cm long.—Fig. 60.

Endemic; common on limestone. Pago Bay (3853); Dos Amantes Pt. (3944, 4043); Agaña Swamp, La Ciénaga (4236); Yigo (4252); Barrigada Hill (4366, 4497, 5154); Ypiga (4692); Asdonlucas (5266).

This attractive shrub, with its glossy leaves, small white flowers, and usually reddish capsules, would make a pleasant addition to gardens which have limestone soil.

ICACINACEAE

Trees or shrubs with simple alternate leaves; stipules none; flowers regular and perfect; sepals 5 or 4 (rarely 3), free or connate; petals 5 or 4; stamens 5 or 4, borne on the corolla, alternate with the lobes; ovary 1–2-celled; ovules 1 or 2; fruit a drupe, or rarely a samara.—About 38 genera in the Tropics.

One genus in Guam.

MERRILLIODENDRON Kanehira

Tree; fls. bisexual; sepals 4–5 or rarely 3, united halfway; petals 5, valvate, early caducous; stem. 5, filaments thin, short, broad, anthers introrse; narrowly elliptic, connective broad; ovary sessile, 1-locular, ovoid, narrowed to a style with punctiform stigma; ovules 2, anatropous, usually 1 only developing; fruit stony, large elliptic. (*Peekeliodendron* Sleum. 1937).

One species.

Merrilliodendron megacarpum (Hemsley) Sleumer, in E. & P. Pflanzenfam. 206: 367. 1942. FANIOK.

Stemonurus? *megacarpus* Hemsley, Hook. Ic. pl. 24, t. 2398. 1895.

Peekeliodendron missionariorum Sleumer, Notizbl. B.G. Mus. Berlin-Dahlem, 13: 509. 1937.

Gonocaryum angulare Elmer, ms. ex Sleumer, l.c. 1942.

Merrilliodendon rotense Kanehira, Bot. Mag. Tokyo 48: 920. f.7. 1934.

The fruit is 4–6 cm long × 2–3 cm broad and can float; dispersal thus probably oceanic.—Pl. 8c.

Hemsley's description is based on a Comins specimen from San Cristoval, Solomon Islands. The type of Sleumer's *Peekeliodendron* is from New Ireland collected by Rev. Peekel; Elmer's species is based on his own collections from Palawan, Philippines. Kanehira's type is from Rota. The seed is edible.

Rare in Guam, in forests on limestone. Mt. Lamlam (Fosberg); Haputo (Fosberg). First collected in Guam by Glassman, at the base of Mt. Tenjo; reported in 1946 by Merrill and Perry, as *M. rotense*. Kanehira states that the common name 'faniok' is used in Rota.

SAPINDACEAE

Trees, shrubs, or herbs, sometimes climbing; leaves spiralled or alternate, usually paripinnate, sometimes imparipinnate to trifoliolate, or simple; leaflets usually alternate if more than 3, often serrate, flowers small, in panicles of racemes or thyrses, sometimes unisexual and the plants polygamo-dioecious, or male and bisexual flowers mixed in one inflorescence; sepals 4–5; petals 4–5 or none, free, often with a scale-like appendage or flap at the base; stamens 5–8, often slightly connate, sometimes excentric; disc annular or of free glands; ovary superior, 2–3-celled, cells sometimes diverging and free at maturity, 1-seeded, the fruit a berry or capsule.

—A big family of 150 genera and more than 2000 species, chiefly of the tropics. Three genera are indigenous in Guam, and two others are of fairly recent introduction (but both are rare).

Key to Genera

1. Herbaceous climbers with pairs of tendrils on the inflorescence axes and inflated membranous capsules..... *Cardiosperumum*
1. Trees or shrubs,

2. Leaves trifoliolate or simple,
   3. Leaves trifoliolate.....*Allophylus*
   3. Leaves simple.....*Dodonaea*
2. Leaves pinnate with more than 3 leaflets or bipinnate,
   4. Leaves once pinnate.....*Nephelium*
   4. Leaves bipinnate.....*Tristiropsis*

ALLOPHYLUS Linnaeus

Shrubs, scramblers, or trees; leaves usually trifoliolate, rarely with 1 or 5 leaflets, the leaflets entire or serrate. Inflorescence axillary, racemose-thyrsoid, 1-few per axil, the flowers polygamous, both types in each inflorescence, on basally jointed pedicels. Sepals 4, basally united; petals 4, each with a bifid scale ventrally at base; disk small, unilateral, glandular; whole flower sometimes laterally compressed; stamens 8, sometimes excentric; male flower with abortive ovary; female flower with 2–3-celled ovary, sometimes slightly bi-tri-lobed, cells 1-ovulate. Fruit 2–3-lobed, rarely 1-lobed; seed without aril.—A rather large genus of nearly 200 species, pantropic in distribution.

Two species in Guam, one rare or dubious.

Leaflets elliptic, usually less than 5 cm wide, margin entire.....*A. holophyllus*
Leaflets elliptic to ovate, often 6 cm or more wide, margin coarsely serrate .....*A. timorensis*

Allophylus holophyllus Radlk., ex. Merrill, Philip. J. Sci. Bot. 9: 106. 1914.

A shrub; leaves trifoliolate, the lateral leaflets ovate-lanceolate, asymmetric, the outer basal part relatively broader, the central leaflet lance-oblong; all leaflets shortly and bluntly acuminate, entire, glabrous, slightly firmer than chartaceous, pellucid-punctualate; petiole c. 4 cm long, petiolules 5–10 mm long; leaf about 15 cm long; leaflets each 7–11 cm long, 3–4.5 cm wide. Thyrse 6–7 cm long, with branches 3–4 cm long. Flowers with glabrous, marginally glandular-ciliolulate sepals; disc of 4 gland-tipped lobes, glabrous; stamens villous; ovary puberulent.

Endemic; type is G.E.S. 470.

Not found recently, rare; probably not really distinct from *A. timorensis*, from which it is supposed to differ in the densely puberulent axes of the thyrses, besides the characters mentioned in the key. *A. timorensis*, in turn, may be merely a variety of *A. cobbe L.*

Allophylus timorensis (DC.) Blume, Rumphia 3: 130. 1847. Merrill 1914: 106. NGER.

Schmidelia timorensis DC. Prodr. 1: 611. 1824.

A shrub or small tree, reaching a height of 5 m, but on windswept coasts often much shorter; leaves alternate, trifoliolate; leaflets elliptic, acute at both ends, pinnately nerved, subentire or usually with obscure and distant or coarse teeth, up to 15 cm long and 7 cm broad; flowers in glabrous thyrses, in axils, with racemose branches; flowers minute, whitish; male flower with 4 sepals, 2 slightly larger; petals 4, obovate, fimbriate hairy; stamens 8, connate at base, excentric; disc of

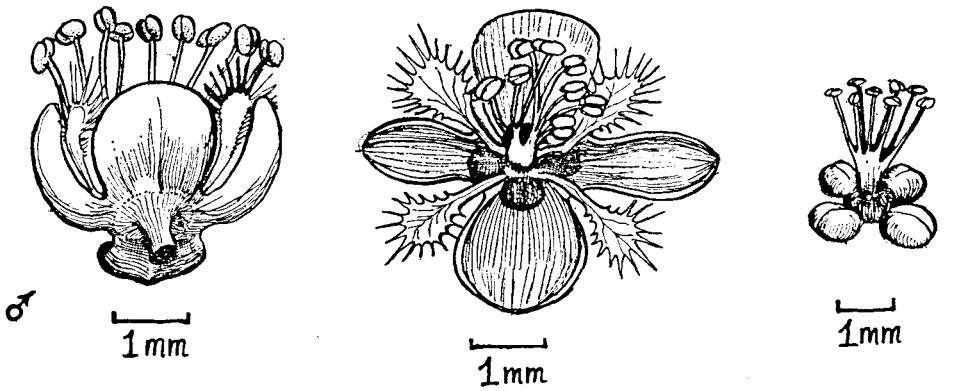

Fig. 61. Allophylus timorensis.

4 distinct yellow glands; ovary of female flower 2–3-celled; fruit ovoid, reddish or red-orange, 4–6 mm long.—Fig. 61. Pl. 8d.

Malaysia and the Pacific Islands; very common as a strand plant, generally on rocky limestone coasts or at the top of sandy beaches, never in volcanic savannahs.—See remarks under the above species.

Dos Amantes Pt. (3943; 4226); Asanite Pt. (4300); Yona (4418); Talofofo Pt. (5125).

CARDIOSPERMUM Linnaeus

Herbaceous vines; leaves alternate, pinnately compound; flowers polygamodioecious, in tendrillous axillary corymbs; sepals 5 or 4, equal or unequal; petals 4, unequal; stamens 8, unequal, free or slightly connate; disk glandular; ovary 3-celled; cells 1-ovulate; style trifid; fruit a 3-celled, 3-lobed membranous capsule; seeds black with pale (usually) cordiform hilum.—About 15 species in Tropics and subtropics, especially of the American continent.

Cardiospermum halicacabum L. Sp. Pl. 366. 1753.

Merrill 1914: 107. BALLOON VINE.

Delicate, branching, herbaceous climber with trifoliolate leaves and tendrils in pairs on the inflorescences; leaflets coarsely toothed and lobed; terminal leaflet to about 4 cm long; flowers minute, greenish white, about 3 mm wide; sepals 4; petals 4; stamens 4 longer, 4 shorter; fruit inflated, like a three-sided balloon, pendent, about 1–1.4 cm long, eventually dehiscent; seeds black with a pale heart-shaped hilum.

A pantropical weed. Although reported from Guam, I never saw it there; however it is still very common in Saipan, and probably occurs here and there throughout Micronesian volcanic islands. It is to be seen climbing on grasses and forbs in old fields.

DODONAEA Linnaeus

Trees or shrubs; generally with resinous exudate; leaves simple (rarely pinnate), alternate; stipules none; flowers polygamous or dioecious, regular, in panicles, racemes or solitary; sepals 3–7; petals none; disc obsolete; stamens usually 8, distinct; ovary superior, 2–6-celled; seeds with spiral embryo.—About 60 species in all warm and tropical regions. The resinous sap, exuding onto the leaves, generally gives them a recently varnished look. All but two of the species are Australian.

Dodonaea viscosa (L.) Jacquin, Enum. Pl. Carib. 19, 1760.

Safford 1905: 263. Merrill 1914: 107. LAMPUAYE

A shrub with simple, entire, elliptic-lanceolate, resinous-varnished, slightly sticky, olive-green leaves, on short (1–2 mm) petioles, the blades firm, mostly 5–12 cm long and 1–3 cm wide, the margins sometimes wavy; fruit a membranous 3-lobed usually reddish capsule, or brownish or green, or often only 2-lobed and flattened, slightly inflated; seeds 1 or 2 per lobe, black.—Fig. 62.

Pantropical, very polymorphic, near coasts or on lowlands. In Guam found chiefly in the southern savannahs, where it is not uncommon, appearing usually as a small bush about 1–2 m tall. The varnished appearance of the leaves and the

Fig. 62. Dodonaea viscosa.

little 2- or 3-lobed capsules are easily noticed. Agat, hills near Sagua R. (4390); Hills along Inarajan R. (5055).

The wood is said to be very hard; however few plants attain a suitable size for use.

NEPHELIUM Linnaeus

Trees with alternate paripinnate leaves, leaflets alternate or opposite; petiole with 2 lateral grooves at base; flowers in terminal panicles, usually polygamo-dioecious; sepals 4–5; petals 4–5 or none; stamens 6–8; ovary 1–3-lobed, lobes divergent and free at maturity, 1-seeded; fruit usually bristly, softly echinate, or tuberculate; seed embedded in pulp, this usually white or yellowish.—About 70 Asiatic-Australian species. The best known are fruit trees, i.e. rambutan, longan, and (unless it forms a monotypic genus), the lychee.

NEPHELIUM LONGANUM Cambess. Mém. Mus. Paris 18: 30. 1829.

Euphoria longan (Lour.) Steud. sensu auctt. LONGAN.

A tree reaching 12 m height; leaflets oblong, glossy, coriaceous; fruits subglobose, about 2 cm thick, with a thin purplish rind; pulp acid, semitranslucent, edible; seed large, single.

India to South China. This species thrives best in temperate-subtropical countries. It has been reported from Guam, but I have not seen it. The rambutan, *N. lappaceum*, would be a far more suitable and a very useful introduction; it differs in the red fruits which are covered with rather soft spinous processes.

TRISTIROPSIS Radlkofer

Tall trees. Leaves bipinnate, the pinnae alternate (rarely opposite), without terminal leaflets; leaflets alternate or subopposite, entire (*but in juveniles and seedlings serrate*); usually glossy. Inflorescence an axillary panicle, with polygamous flowers on jointed pedicels. Sepals 5, imbricate; petals 5, with 2 ventral pilose scales each; disk subpentagonal, glabrous; stamens 8 to 10 (or more), filaments distally pubescent; ovary trigonal, 3-celled, each cell with one ovule. Fruit a 3-seeded drupe, ellipsoid or obovoid, sometimes abortively 2–1-celled. Seed crested, exarillate.—A small genus of about half a dozen species, mostly in the Pacific Islands (Philippines, New Guinea, Solomons).

One species in Guam.

Tristiropsis acutangula Radlk. in Engler's Pflanzenreich 98d (IV. 165): 863. 1932. FAIA.

T. obtusangula Radlk. l.c. syn. nov.

Walker and Rodin 1949: 462, pl. 9.

A tree to 50 ft. tall; leaves bipinnate, pinnae 5–7, glabrous, rachises 8–11 cm long, leaflets alternate, 6–9 cm long, 1.5–3 cm broad, elliptic to oblong-elliptic, secondary nerves 8–10; inflorescence terminal, racemose-paniculate, fulvous-pubescent, 12–15 cm long; bracts small setiform; staminate flowers on pubescent pedicels about 6 mm long; outer sepals slightly smaller and more concave than inner ones,

3 mm long, margins ciliolate; inner ones 5×4 mm, margins ciliolate; petals stipitate-orbicular, 4 mm long; scales on ventral side of petals, nearly half as long as the petals; stamens 12–13, 5 mm long, the filaments hirsute, anther 1 mm long; ovary rudimentary. Pistillate flowers with substipitate ovary. First globose-ellipsoid, 3-4-celled; sepals for a while persistent. [Note: leaves of seedlings and very young trees are conspicuous by their *sharply serrate leaflets*!].—Pl. 8e,f.

Known elsewhere in the Marianas (e.g. Rota; see Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 30. 1935). Solomon Islands; New Guinea.

Not uncommon in Guam, chiefly on limestone but also in mixed soils; native. I believe that Radlkofer's *T. obtusangula*, allegedly endemic in the Marianas, is not distinct from *T. acutangula* Radlk. of the Solomon Islands. Northwest Field 5003; Rodin 800; Steere 7, 8, 119); Ritidian Point plateau (4703, 5039; Markley & Necker 153); Talofofo, Ugum River (obs.); headwaters of Ylig River (Rodin 612).

On the route to "Talofofo Falls" (actually on the Ugum River) there is at one point a barge-ferry, operated by ropes, to cross the Talofofo River, not far upstream from its mouth. On the north side the path leads past a tree of this species, to which the ropes are attached, on the very edge of the River.

BALSAMINACEAE

Succulent herbs with whorled, opposite, or alternate simple often serrate leaves; stipules none or as small glands; flowers perfect, irregular, in axils; sepals 5 or 3, one usually spurred; petals 5 or 3 distinct or partially connate; filaments free; ovary superior, 5-celled, cells with several ovules each, axile; stigma sessile; fruit a capsule, explosively dehiscent, the valves incurling instantly as soon as separated; seeds subglobose, usually brown, finely pitted.—Four genera and about 400 species chiefly of Tropical Asia and Africa.

IMPATIENS Linnaeus

Succulent, watery herbs; leaves serrate; petiole usually glandular at base; flowers showy, white, pink, purple, or yellow; petals 3, the lateral ones bifid; capsules loculicidal.—Nearly 400 species, Asia and Africa, a few in temperate N. hemisphere countries.

IMPATIENS BALSAMINA L. Sp. Pl. 938. 1753. Safford 1905: 296.
Merrill 1914: 107. KAMANTIGI. BALSAM.

Recognizable from the above descriptions. The flowers may be white or pink, single or double.

Native of India, now widespread in cultivation. This is a very common garden plant in Guam. Ordot (4664).

RHAMNACEAE

Trees, shrubs, or vines; leaves alternate or opposite, simple, stipulate; flowers bisexual or unisexual; sepals 4–5; petals 4–5 or none; disc present; ovary superior,

2–5-celled, rarely 1-celled; cells 1-ovulate; ovule erect; stamens 4–5; stigmas 2–5; fruit a drupe or capsule.—About 50 genera in both hemispheres.

Two genera in Guam, one indigenous.

Key to Genera

1. Woody vines; leaves pinnately veined, green on both sides; flowers yellow; fruit a 3-celled capsule..... *Colubrina*
1. Trees with thorn-like stipules; leaves 3-nerved, white-tomentose on lower surface; flowers greenish; fruit a 2-celled indehiscent sweet-fleshed drupe ..... *Zizyphus*

COLUBRINA L.C. Richard ex Brongniart.

Trees or shrubs or woody climbers, unarmed; leaves opposite or alternate, 3-nerved or penninerved; stipules minute; flowers usually in axillary cymes; flowers bisexual; sepals 5; petals 5; stamens 5; disc annular; ovary 3-celled; styles 3; fruit dehiscent into 3 cocci; seeds 3, smooth.—About 15 species, all but two restricted to Tropical America; one pantropical-Asiatic; one endemic in Hawaii.

Colubrina asiatica (L.) Brongniart, Ann. Sci. Nat. 1, 10: 369. 1827.

Safford 1905: 246. Merrill 1914: 107. GASOSO.

A rambling or climbing shrub; leaves alternate, ovate, dentate, acuminate, mostly 4–8 cm long and 2–4 cm wide, glossy green; petioles about 1 cm long; flowers yellow, in small axillary cymes, on short 3 mm pedicels; sepals acute; petals hoodlike; stamens less than 1 mm long; disc broad saucer-like, yellow; ovary very short; fruit nearly 1 cm long, 3-coccous, brown, depressed-globose; seeds dark brown, nearly 1/2 cm long.

Paleotropical, possibly in Tropical America also; the floating seeds govern its distribution. Very common in thickets all around Guam and in the interior in the northern half especially, often near the sea. Marine Beach, Yona (4428); Asanite Pt. (4923).

ZIZYPHUS Linnaeus

Deciduous small trees with alternate simple entire or serrate 3–5-nerved leaves; stipules spinous; flowers bisexual or both male and bisexual, in axillary cymes; ovary 2–4-celled; styles simple to bifid; fruit a drupe.—About 40 species, usually in dry hot countries.

ZIZYPHUS MAURITIANA Lamarck, Encycl. 3: 319. 1789.

Skeels, U.S. Dept. Agric. Bur. Pl. Ind. Bull. 208: 67. 1911.

MANZANAS; MANZANITA. JUJUBE.

Z. jujuba L. Sp. Pl. 194. 1753, sensu Safford 1905: 403; et Merrill 1914: 108.

Small tree with prickly thorn-like stipules and small simple alternate 3-nerved leaves white (or tawny) tomentose beneath, dark green above, ovate or subelliptic, or slightly rhomboid, mostly less than 6 cm long, finely serrulate; flowers bisexual or male, greenish, in small cymes to 10 cm long; about 5 mm wide; calyx 5-toothed;

petals 5; disc large; ovary with 2 styles; fruit a drupe with sweet sour mealy flesh and a 2-seeded stone, orange when ripe.—Pl. 9a.

Native of Asia, apparently introduced to Guam long ago for its small edible fruits. It should not be confused with *Muntingia calabura*, the small reddish several-seeded berries of which, like the trees, are called MANZANILLA or MANZANITA.

Occasional in gardens, as along Marine Drive near the Panciteria (4034) and in Inarajan (5031).

VITACEAE

Shrubs, herbs, or woody vines with tendrils; leaves alternate, simple or palmately compound, stipulate; flowers perfect or unisexual, regular, small, in cymes or panicles often leaf-opposed; sepals 4–5 (or rarely 3, 6, or 7); petals the same number as the sepals, valvate; stamens, one opposite each petals; disc annular or lobed; ovary superior, 2–6-celled, cells 1–2-ovulate; style simple or the stigma sessile; fruit a berry (e.g. grape); seeds endospermous.—About 10 genera and 500 species, chiefly tropical, a few temperate. Two genera, both exotic, in Guam.

1. Leaves entire; stems thick fleshy; flowers 4-merous..... *Cissus*
1. Leaves palmately lobed and serrate; flowers 5-merous..... *Vitis*

Cissus Linnaeus

Differs from Vitis chiefly in that the petals are distinct and do not form a calyptra; and the leaves are often rather fleshy; flowers 4-merous.

Cissus sp.

A thick-stemmed vine with cordate leaves has been observed in a garden, but flowers were not seen. Unfortunately specimens were not collected and I am unable further to identify the plant. (Agaña).

Vitis Linnaeus

Tendril-bearing vines; leaves simple or palmately compound; usually serrate; flowers bisexual and male, 5-merous, in panicles; petals apically connate, falling as a calyptra; disc of 5 glands; ovary 2-celled, cells 2-ovulate; fruit a berry.—About 60 species, many in temperate N. hemisphere countries, others tropical.

Vitis rotundifolia Michaux, Fl. Bor. Am. 2: 231. 1803.

UBAS. MUSCADINE-GRAPE.

A cultivated grapevine with smooth bark and unforked tendrils, native of the Southern U.S.A., introduced to Guam, but not very successful there; the plants grow well enough but the fruits are poor, and very sour. A big trellis-borne plant apparently of this species is in Merizo.

A second species is apparently cultivated (Safford 1905: 398), with the Spanish name "parra", which I have not seen.

TILIACEAE

Trees, shrubs, or herbs, often stellate-pubescent, with alternate or rarely

opposite leaves, simple or lobed, often serrate, stipulate; flowers regular, bisexual, usually with 5 sepals (rarely 3 or 4), and 5 petals (3–4); or petals rarely absent; stamens numerous or 10, distinct or connate; anthers 4-celled; ovary superior, 2–10-celled; cells 1-several-ovulate; style 1 with a radiate stigma; fruit a capsule or an indehiscent drupe or nut, or a berry; seeds endospermous. (Including Elaeocarpaceae).—About 50 genera and over 500 species, both tropical and temperate. Five genera in Guam, four represented by indigenous species.

Key to Genera

1. Trees of medium or large stature.
   2. Leaves sticky-glandular-pubescent; fruit a pinkish edible berry; small cultivated and naturalized tree..... *Muntingia*
   2. Leaves not sticky-pubescent; fruit otherwise,
      3. Leaves glabrate; racemes usually from axils of fallen leaves; fruit blue, ovoid; venation of blade pinnate..... *Elaeocarpus*
      3. Leaves slightly pubescent beneath; flowers 1–3 in leaf axils; fruit pubescent, brownish-orange; blade 3-nerved from the base..... *Grewia*
1. Herbs or shrubs mostly less than 1.5 m tall,
   4. Prostrate, creeping suffruticose herbs or erect shrubs; fruit a bristly burr; flowers with androgynophore..... *Triumfetta*
   4. Erect shrubs; fruit stellate-pubescent or smooth; androgynophore lacking in flower..... *Corchorus*

CORCHORUS Linnaeus

Small shrubs or herbs with alternate simple serrate leaves; flowers solitary or clustered, axillary or leaf-opposed; sepals and petals 5, or rarely 4; stamens many or 10–8; ovary superior, 2–5-celled, cells with many ovules; stigma dilated, undulate; fruit a linear or oblong many-seeded capsule.—About 50 tropical and subtropical species, of which a few are of some economic importance; e.g., *Corchorus capsularis* L. and *C. olitorius* L. are the source of jute fiber.

Although only one species is reliably reported in Guam, there is a second known in (and described from) Rota, which also occurs in Tonga, Tuamotu Is., and in Lau Is. (Fijian Group), which is included here on the assumption that it may yet be discovered in Guam.

1. Small subshrubs, nearly glabrous, with minute flowers crowded.... *C. aestuans*
1. Coarse small shrubs about 1/2–1 m tall, densely white-tomentose; flowers large, 2 cm wide, in terminal or axillary subumbellate clusters.. *C. torresianus*

Corchorus aestuans L. Syst. ed. 10, 1079. 1759.

BILIMBINES CHAKA; TUBAN CHAKA.

C. acutangulus Lam. Encycl. 2: 104. 1786; Merrill 1914: 109.

A small herb or suffruticose plant with erect, sparingly branched stems to about 40 cm tall; leaves green, ovate, acute, serrate; flowers 1–3 in clusters, very shortly pedicellate, very small, leaf-opposed; sepals 5; petals 5, yellow, 2–3 mm

long; capsule hexagonal-cylindric.

A paleotropical weed of waste ground. Mangilao (3787-a); Apra (4719).

Corchorus torresianus Gaudichaud, Voy. Freycinet, Bot. 477. "1826". [1830]

Cf. Fosberg, Micronesica 2(2). 1967.

C. tiniannensis Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 125. 1935.

Subshrub to 1 m tall, densely white stellate-pubescent; leaves obovate, rounded, obtuse at base, distally serrate, about 2–3 cm long and 1–2 cm wide, palmately 3-nerved, midrib pinnately branched above the base; petiole less than 1 cm long; flowers yellow, 2 cm wide, in terminal or axillary few-flowered subumbellate clusters; fruit 2 cm long, terete, grooved, rounded at apex, densely stellate-pubescent.

A Pacific species, described from Rota; Hosokawa redescribed it from Tinian; a variety (var. *yunckeri* Fosberg) in Tonga; also (as the typical variety) known from Lau Is. in Fiji Group, and Anna Atoll in the Tuamotu Is. (Cf. Yuncker, Plants of Tonga, B.P. Bishop Mus. Bull. 220: 179. 1959).

Not yet found in Guam, though logically to be expected; it should occur on limestone rocks near the sea. A profitable locality for search would be from Mochom northward along the cliff-lined coast to the Northern tip of the island.

ELAEOCARPUS Linnaeus

Trees with alternate or rarely opposite simple usually serrate leaves, stipulate, often withering red, branching in pagoda form; mucilage canals absent; flowers in racemes often on older wood, perfect or rarely unisexual, with 4 or 5 sepals, 4 or 5 free often bifid or fimbriate petals and numerous stamens with 2-celled anthers, the cells opening apically or rarely the stamens only 8 to 12; ovary superior, 2–5-celled; cells 2-several-ovulate; stigma 2–5-lobed; fruit a drupe with hard rugose or pitted endocarp enclosing 1 (or rarely 2–5) bony pendulous seeds.—A large genus of perhaps 75 species, from Madagascar east through Malaysia and S.E. Asia N. to Japan, into Melanesia and Australia, N.E. to Hawaii.

One endemic species in the Marianas Is., several others elsewhere in Micronesica.

Elaeocarpus sphaericus (Gaertn.) K. Schumann, Pflanzenfam. 3, 6: 5. 1890.

YOGA.*

Elaeocarpus joga Merrill 1914: 108. Safford 1905: 401 (under YOGA).

A tree with tiered, pagoda-form branching, up to 15 m tall or more, with a dense crown of dark green leaves relieved here and there by the bright red withered leaves about to fall, the newest growth also reddish; leaves crowded on the reddish to grayish terete branchlets, 5–12 cm long, 1.5–3.5 cm wide,elliptic-oblong, crenulate-margined, obtuse or subacute, cuneate at base, slightly appressed-puberulent when young but soon glabrate, moderately glossy, slightly paler beneath, lateral nerves 8–10 pairs, reticulations evident, vein axils with domatia-like glands; petioles 5–14 mm long, glabrate; racemes many, developing in leaf axils but usually maturing after the leaves have fallen, nearly or quite as long as the leaves, about 12–16-flowered, the rachis, pedicels and sepals sparsely appressed-pale-puberulent; flowers

* Pronounced *dzoga*.

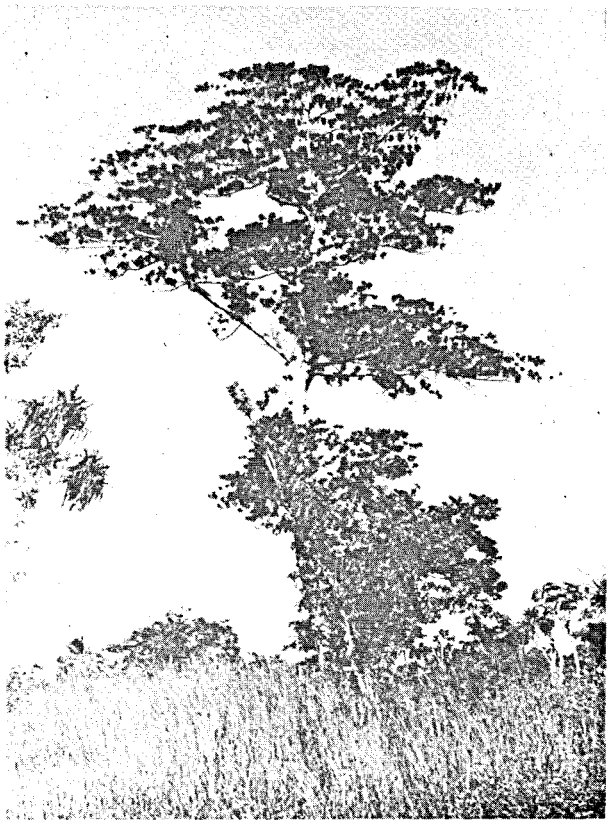

Fig. 63. Elaeocarpus sphaericus.

5-merous, about 1.5 cm long, on pedicels 8–12 mm long; sepals lanceolate acuminate, to 11 mm long and 2.5 mm wide; petals white, 15 mm long, 5–6 mm wide, slender obovate, puberulent only on margins along basal third, apically 4–5-fid, these divisions each trifid or laciniate; stamens about 30, the anthers scabrid, about 4 mm long, apically hairy; ovary pubescent, ovoid, 5-celled; style proximally puberulent, nearly 15 mm long; fruit blue, ovoid, smooth, about 15 mm long, thin-fleshed, 1-seeded.—Fig. 63, Pl. 9b.

A native tree, known in Micronesia both in the Marianas Islands and Palau, restricted to limestone or part-limestone soils, hence in Guam common north of Agaña. It is rather abundant and is one of the handsomest trees of the island, easily recognized because of its pagoda-branching, its limbs arranged in distinct nearly horizontal tiers, as in *Terminalia* and *Ochrosia* and to a lesser extent in *Muntingia*; the old leaves turn bright red just before falling; the flowers are creamy-white; and the fruits resemble blue olives. Curiously, as E.J.H. Corner points out in "Wayside Trees of Malaya," the blue color is an optical phenomenon, the result of reflection of blue light owing to the shape of the epidermis cells, and is not due

to a blue pigment; a thin piece of the epidermis is green in transmitted light.

The fruit is sought by birds, probably fruit-pigeons; the wood is light and not very durable.

This tree is highly recommended for gardens, as an ornamental, and for reforestation.

Barrigada Hill near summit (4026, 4026–a, 5103); Yigo-Asdonlucas forest (4253).

GREWIA Linnaeus

Trees or shrubs usually pubescent with stellate hairs; leaves simple, usually crenate or serrate, 1–9-nerved from the base and upward penninerved; flowers solitary or clustered or paniculate in axils; sepals distinct; petals 5 or none; stamens many on a torus; ovary 2–4-celled, cells 2-many-ovulate; stigma slightly lobed; fruit a drupe, fleshy or fibrous, with 1–4 stones 1–2-seeded; seeds erect, with endosperm.—About 150 chiefly paleotropical species, one in Guam.

Grewia crenata (J.R. & G. Forster) Schinz & Guillaumin, in Sarasin & Roux, Nova Caledonia 179. 1921. ANGILAO.

G. mariannensis Merrill 1914: 109.

G. multiflora sensu Safford 1905: 287, (not of Jussieu 1804).

A small tree with appressed-hirsute branchlets, leaf-veins, and inflorescences, the hairs simple or rarely fascicled, not stellate; branches terete, brownish; leaves alternate, ovate to elliptic-ovate, very slightly inequilateral at base, acuminate, rounded to subcordate at base, 10–15 cm long, 4.5–8 cm wide, margins crenate-serrate, lower surface slightly paler, on petioles 1–2 cm long; inflorescences axillary, single or 2–3 together, much shorter than the leaves peduncle to 1.5 cm long; pedicels 6–7 mm long; bracteoles lanceolate, pubescent, caducous; 7 mm long; sepals 5, about 11–12 mm long, 4–4.5 mm wide, acute, hirsute with appressed hairs; petals dull white, narrow-ovate, 3×2 mm, with a prominent semicircular ciliate scale at the base of each; stamens numerous, about 5 mm long; ovary densely hirsute; fruit nearly 1 cm broad, dull orange or yellowish, slightly lobed.

Native of Polynesia (Society Is., Samoa, Tonga, Fiji) and Micronesia, typically on limestone soils.

Merrill, in describing the Guam specimen from Tumon (G.E.S. 133) as the new *G. mariannensis*, indicated that it might not be distinct from *G. malococca* L.f., which is evidently the same as the Forsters' species.

The angilao is not especially common, but may be seen on Barrigada Hill (4509).

MUNTINGIA Linnaeus

A monotypic genus, with the characters of its one species. This effectively links the Elaeocarpaceae and Tiliaceae, here considered as one family Tiliaceae.—Native of tropical America, described from Jamaican specimens.

MUNTINGIA CALABURA L. Sp. Pl. 509. 1753. Merrill & Perry, J. Arn. Arb. 27: 324. 1946. PANAMA-CHERRY. MANZANILLA. CALABURA.

Small tree with tiered slightly drooping branches with crowded distichous simple alternate strongly asymmetrical sticky-pubescent oblong acuminate obliquely subcordate thin serrulate leaves, soon wilting, 2.5–15 cm long, 1–6.5 cm wide; stipules linear, about 5 mm long, caducous; flowers bisexual, 1 or few in axils, on pedicels about 2–3 cm long; sepals 5 (rarely 6 or 7), each about 1 cm long, lanceolate-caudate, tomentose-hirsute; petals white, [or pink], broadly spathulate-deltoid, about 12–13 mm long, rotate; stamens about 75; filaments slender, distinct, 6 mm long, white; anthers small yellow; disc annular, around the ovary; hirsute; ovary stipitate, glabrous, 5-celled; stigma capitate 5-ridged; fruit 5-celled baccate, sub-globose, light red, 1–1.5 cm wide, sweet-juicy, with many small (1/2 mm) elliptic grayish yellow seeds; stigma persistent.—Fig. 64, Pl. 9c.

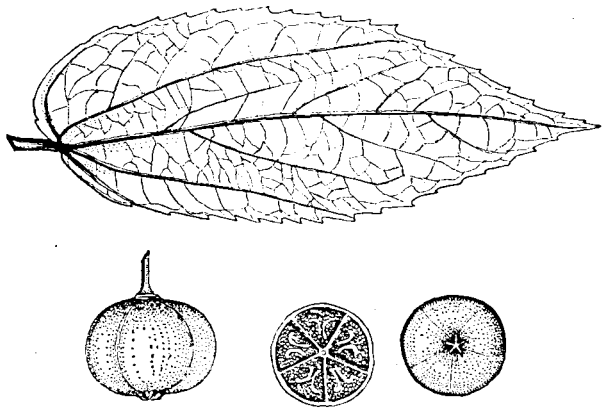

Fig. 64. Muntingia calabura.

Introduced to Guam sometime ago, but not mentioned by Safford. It is now quite common. The fruits are a favorite of children, and make an excellent jam or preserve. The small, soft-wooded trunks seldom survive high typhoon winds. The flowers open in the morning and fall off in the afternoon of that day. All our Guam trees have white petals, but in Central America apparently the pink form is more common. Mangilao (3793).

A drink like tea may be brewed from the leaves. The bark is fibrous and tough, suitable for cordage.

TRIUMFETTA Linnaeus

Shrubs or herbs, often with stellate hairs; leaves simple, dentate, entire or 3–5-lobed; flowers in cymes, singly or fasciculate, axillary; sepals 5, free, with a cornute protuberance at tip; petals 5, with a gland or pit at the base, or rarely absent; stamens numerous and distinct; ovary 2–5-celled, the cells 2-ovulate, style with a 2–5-fid stigma; fruit spinulose burrlike, sometimes separating into segments; seeds with endosperm.—About 40 tropical species.

Two species in Guam, one native.

1. Prostrate plant of hot sandy beaches with large (1 cm) yellow flowers..... .....*T. procumbens*

1. Erect weed of waste ground with small (4 mm) yellow flowers....*T. semitriloba*

Triumfetta procumbens G. Forster, Fl. Ins. Austr. Prodr. 35. 1786.

Safford 1905: 392. Merrill 1914: 110.

KAMANG UNAI. MASIGSIG HEMBRA.

T. fabreana Gaud. Bot. Freyc. Voy. 478. t. 102. 1830.

Prostrate subshrub with elongate branches, pubescent with stellate hairs; leaves ovate or 3-lobed, rounded, subcordate, crenate-serrate, up to 6×6 cm, palmately 5–7-nerved, on petioles about as long as the blade; flowers usually in pedunculate subumbellate axillary clusters; corolla bright yellow, 10–12 mm broad; fruit a spiny burr 6–12 mm wide, subglobose, stellate-pubescent.

A paleotropical strand plant from the islands of the Indian Ocean east to Polynesia. It thrives at the top of sandy beaches in the open where it is really hot or in light, sporadic shade; it is never found at any great distance from the sea. The stems have a tough fibrous bark and an astringent mucilage. Tarague Beach (4168); Cocos Island (4244); Ritidian Beach (4707); Tumon Bay (5077).

Triumfetta semitriloba Jacquin, Enum. Pl. Carib. 22. 1760. Merrill 1914: 110.

DADANGSI. MASIKSIK LAHE.

?*T. rhomboidea* sensu Safford 1905: 393.

?*T. tomentosa* sensu Safford l.c.

An erect shrub to 1.5 m tall; leaves ovate-oblong, 3-lobed; serrate; flowers small yellow axillary clustered; fruits with scattered reflexed hairs on the hooked spines.

Native (probably) of Tropical America, but for long a pantropical weed.

This might be confused with *Urena lobata*, also called "dadangsi", but that has pinkish-violet flowers, with the stamens connate and forming a tube.

Cetti Bay (3904); Merizo (3920).

MALVACEAE

Trees, shrubs, or herbs, often stellate-pubescent, leaves simple, entire or lobed, palmately or pinnately veined, alternate, stipulate; generally with mucilage-canals in bark; flowers perfect, regular, usually rather large, typically 5-merous except for the many (rarely 5) stamens; epicalyx often present just below calyx; sepals mostly connate; petals slightly connate with the stamens at extreme base (corolla and stamens falling as a unit); stamens connate, forming a tube; anthers reniform and 1-celled; ovary superior, 1-many-locular, locules 1-many-ovulate, stigmas 1-many (same number as locules); fruit a capsule or schizocarp, rarely indehiscent-fleshy or dry; seeds often pubescent, endosperm little or none.

—About 60 or 70 genera and 1500 species in warm temperate and tropical regions everywhere; several genera of great human value, Gossypium (cotton), Hibiscus (okra, roselle, rope fiber, ornamentals), etc. Nine genera in Guam, of which 2

or 3 have indigenous species, among the 21 species present (two of these being ornamental hybrids).

Key to Genera

1. Petals not opening or spreading, corolla remaining closed and tubular, red or dark red.
   2. Corolla bright red, pendulous; stigmas twice as many as carpels; leaves narrowly long-ovate..... *Malvaviscus*
   2. Corolla very dark, almost blackish-red; not pendulous; stigmas the same in number as carpels; leaves broad ovate (often)..... ..... *Hibiscus* "Flores-Rosa" (hybrid H. rosa-sinensis × H. schizopetalus)
1. Petals opening and widely spreading, red, yellow, white, pink or bicolored.
   3. Fruit spiny; flowers pinkish-violet..... *Urena*
   3. Fruit smooth or merely hairy; flowers variously colored, usually yellow or red,
      4. Flowers in involucrate heads, often mixed with bracteoles.... *Malachra*
      4. Flowers not in heads,
         5. Fruit dry, woody, indehiscent or very tardily splitting open, coastal tree; flowers pale yellow with purple "eye" at base; leaves cordate, entire, green on both sides..... *Thespesia*
         5. Fruit dehiscent either as a capsule or by splitting as a schizocarp.
            6. Fruit a capsule; trees, shrubs (rather large), or coarse hispid herbs; flowers of various colors, chiefly yellow, red, pink, or white;
               7. Epicalyx of 3–7 cordate toothed or laciniate bracts; seeds densely pubescent with 2 types of hairs (long and short); leaves usually 3–5-lobed..... *Gossypium*
               7. Epicalyx of 5 or more usually simple lanceolate bracts; seeds with short hairs (all alike) or glabrous; leaves entire or slightly lobed or crenate
                  8. Calyx not spathaceous; mostly shrubs.... *Hibiscus*
                  8. Calyx spathaceous; mostly herbs.... *Abelmoschus*
            6. Fruit a schizocarp, the ripe carpels separating from the central columella; flowers (in our species) all yellow or yellow with a darker eye, or orange-yellow.
               9. Carpels more than 10, each with 2 or more seeds..... ..... *Abutilon*
               9. Carpels 10 or fewer, commonly 5, each with 1 seed.
                  10. Epicalyx of 3 bracts; seeds erect; pubescence of appressed 4-rayed hairs..... *Malvastrum*
                  10. Epicalyx absent; seeds pendulous; pubescence different, spreading..... *Sida*

ABELMOSCHUS Medicus

Herbs, subshrubby, with palmately lobed leaves. Flowers solitary and axillary or in racemes (by reduction of upper leaves); pedicel not jointed. Epicalyx of 14–16 segments. Calyx at apex 5-toothed, but splitting along 1 side like a spathe, persisting, sometimes fleshy, sometimes falling with the corolla. Corolla usually yellow but sometimes white or pink. Staminal column shorter than petals, with anthers all along it. Ovary 5-celled, with a 5-lobed style and discoid stigmas. Capsule loculicidal, with many reniform seeds in each cell. Six spp. of S.E. Asia, the genus reaching N. Australia.

Key to species

Stems coarsely hispid; weedy plant, rarely over 1 m tall, with fruit 6–8 cm long ..... *A. moschatus*

Glabrate; cultivated plant, to 2.5 m tall, with fruit 10–20 cm long, villous ..... *A. esculentus*

Abelmoschus moschatus (L.) Medicus, Malv. 46. 1787. Merr. 1914. KAMANG.

Hibiscus abelmoschus L. Sp. Pl. 696. 1753.

Coarsely hispid herb to 1 or 1.5 m tall, leaves ovate-suborbicular, usually 3–5-lobed, to 15 cm long; stems hirsute; calyx greenish, spathe-like, caducous; corolla bright yellow with a darker or purplish eye, 8–10 cm wide; fruit a hirsute capsule 6–8 cm long, ovoid-cylindric; seeds musky-scented.

A native of India and tropical Asia, rather widespread now as a weed, occasionally in cultivation. In Guam it occurs in marshy locations, as along the Talofofo River (4312, 4449). The word abelmoschus is derived from the Arabic hab-el-miskh (referring to the musky scent of the seeds).

Abelmoschus esculentus (L.) Moench, Meth. 617. 1794. Safford 1905: 171. Merrill 1914: 111. OKRA. GUMBO.

An erect coarse subshrubby herb to 2 m tall, pubescent; leaves cordate, 3–9-lobed, serrate, to 30 cm broad; stems glabrate; calyx caducous; corolla yellow with dark red eye, to 5 cm long; fruit long cylindric, ridged, shortly villous, 10–20 cm long, with many seeds, mucilaginous, edible.

Probably a native of Tropical Africa, now well known in cultivation in most hot countries, providing the familiar "okra" or "gumbo"; sparingly cultivated in Guam, as at Barrigada (4892). The capsules should be picked while green. They may also be pickled. Like other malvaceous plants, the fibrous bark provides a cordage material.

ABUTILON Linnaeus

Shrubs or herbs; leaves angled or palmately lobed; inflorescence terminal or axillary; epicalyx absent; calyx 5-lobed, campanulate or cupular; petals 5, slightly adnate and to the staminal tube at base; filaments shortly free at apex of staminal tube; anthers reniform; ovary (8–) 10–20-celled, with the same number of styles; fruit a schizocarp, carpels with 2–9 reniform seeds.—A large genus of over 150

species, in the warm and tropical regions of both hemispheres.

One species in Guam.

Abutilon indicum (L.) Sweet, Hort. Brit. 54, 1826. Safford 1905: 172. Merrill 1914: 111. MALBAS. MATBAS.

An erect velvety-pubescent subshrub with suborbicular-ovate cordate coarsely crenate-serrate long-petiolate alternate leaves; pubescence of soft stellate pale hairs; flowers solitary in axils, on long pedicels, (4–7 cm) usually longer than the petioles; petals orange-yellow, imbricate, deltoid-obovate, 1 cm long or slightly more; staminal-tube hirsute with stellate hairs; fruit circular, of 11–20 radiating carpels, hirsute, brown when dry; each carpel flattened, somewhat boat-shaped, apiculate by the short persistent style-remnant, about 8 mm long; seeds reniform and stellate-pubescent.

A native of southeast Asia, now rather widespread as a tropical weed. The plants yield a fiber of fair quality and a mucilage; the seeds are allegedly laxative; and the flowers are attractive. In Guam this is a rather uncommon plant, appearing in waste ground or around buildings, as at Merizo (4756) or on the College campus. The word *malbas* is the Spanish word for mallow.

GOSSYPIUM Linnaeus

Shrubs or suffruticose herbs with alternate, palmately lobed leaves; flowers rather large, axillary, usually yellow or yellow and purple; epicalyx of large subfoliaceous usually broad cordate toothed or laciniate bracts; tips of filaments free; fruit a 3–5-valved loculicidal capsule; seeds densely pubescent with long hairs, often also/or with short hairs.—About 35 species, chiefly African, but pantropical; the cotton plants.

Two introduced species in Guam.

1. Corolla yellow, more or less purple-veined, a purple eye at base; staminal column elongate (3–4 cm); nude toward the tip; leaves glabrate; bracts of epicalyx fimbriate ..... *G. barbadense*
1. Corolla pale yellow, slightly purple-veined, without a basal purple eye; staminal column short (1–2 cm); leaves pubescent; bracts of epicalyx deeply laciniate ..... *G. hirsutum*

GOSSYPIUM BARBADENSE L. Sp. Pl. 693. 1753, emend. J.B. Hutchinson et al.; Safford 1905: 285. ALGODON. ATGODON. SEA-ISLAND COTTON.

G. brasiliense Macf. Fl. Jamaic. 1: 72. 1837: Merrill 1914: 111.

G. peruvianum Cav. Diss. 6: 313. 1788.

Shrub; pubescence stellate on novelli; leaves rotund to ovate, cordate, 3–5 (rarely 7–) lobed, or entire; stipules foliaceous, lanceolate or ovate, auriculate. Flowers terminal; epicalyx with 10–15 long acuminate segments; calyx briefly 5-toothed, at base with 3 nectaries; corolla of 5 obovate lobes; staminal column erect; fruit an ovoid capsule; seeds ovoid, with a covering of fine white hairs.

In Guam occasionally seen escaped from cultivation. Barrigada.

GOSSYPIUM HIRSUTUM L. Sp. Pl. ed. 2, 975. 1763; var. "*Marie-galante*" (Watt) Hutch. ALGODON. ATGODON. UPLAND COTTON

?*G. arboreum* sensu Safford 1905: 285. Cf. Merrill 1914: 111.

Shrub or subshrub; leaves rotund, entire or 3-lobed, rarely 5-lobed, 5–7-nerved; petiole 2–10 cm long, blade 3–15 cm; stipules ovate to lanceolate. Flowers axillary. Epicalyx deeply laciniate, auriculate at base, with usually 7–9 (rarely 10–11) segments. Calyx with 5 usually rounded lobes, and 3 external nectaries. Corolla of 5 obovate lobes; staminal column erect, only 1–2 cm long. Capsule ovoid or subglobose; seeds ovoid, with white or tawny hairs.

Occasionally escaped from cultivation; rare.

Hibiscus Linnaeus

Trees, shrubs, or herbs, usually with fibrous, mucilaginous bark; pubescence often of stellate hairs; leaves mostly alternate, palmately 5–11 nerved or palmately lobed, entire or crenate-serrate, stipulate; flowers solitary, axillary, mostly large, red, yellow, or white, sometimes orange or pink, often with a darker eye at base of corolla; staminal tube truncate or 5-fid at apex; filaments apically free, numerous; anthers reniform, 1-celled; ovary 5-celled; style 5-branched at apex with capitate stigmas; ovules 3-several in each ovary-cell; capsule loculicidal or with false septa 10-celled apparently; seeds glabrous or pubescent, reniform.—A large genus of perhaps 400 species, chiefly African, but pantropical. Five species in Guam, only one indigenous.

Key to species

1. Corolla white on opening in the morning, changing through the day to pink; leaves downy-tomentose..... *H. mutabilis*
1. Not as above,
   2. Petals deeply laciniate into fine segments; flowers pendulous..... ..... *H. schizopetalus*
   2. Petals entire or merely ruffled, pendulous or erect,
      3. Petals not opening, rolled, short, very dark almost blackish red, pendulous..... *H. "Flores-rosa"* (hybrid)
      3. Not as above,
         3A. Woody shrubs,
            4. Leaves grayish or whitish tomentose beneath, entire or obscurely crenate, deeply cordate; flowers yellow with purple eye; staminal tube not longer than petal..... *H. tiliaceus*
            4. Leaves glabrous, green on both sides, conspicuously serrate; flowers usually red; staminal tube longer than petals..... ..... *H. rosa-sinensis*
         3B. Herbs..... *H. sabdariffa*

Hibiscus mutabilis L. Sp. Pl. 694. 1753. Safford 1905: 294. Merrill 1914: 111.

MAPOLA.

A big shrub, to 5 m tall, downy pubescent with both simple and stellate hairs; leaves cordate, 5–7-lobed, long-acuminate, 5–11-nerved, tomentose beneath; flowers

opening white, changing to pink, single or double, about 10 cm broad; capsules subglobose, 2.5 cm wide, setose-lanate; seeds reniform, villous on one side.

A native of S. China, cultivated as an ornamental in many warm regions. Often called "changeable rose-mallow", or "variable rose."

HIBISCUS ROSA-SINENSIS L. Sp. Pl. 694. 1753. Safford 1905: 294.
Merrill 1914: 112. GUMAMELA. RED HIBISCUS.

A woody shrub 2–4 m tall, richly branched, the branches erect or drooping, glabrous, leaves ovate acuminate crenate-serrate, green on both sides, about 6–10 cm long, subcordate, on petioles shorter than the blades; flowers axillary, large and showy; epicalyx of 5 or more ovate-lanceolate bracts; calyx green, 5-(or more)-lobed; Corolla campanulate or broadly funnelform, mostly 8–10 cm broad, usually bright red; staminal tube considerably longer than the corolla, often nodding or pendulous, or the flower pendulous; corolla (some forms) may be doubled; capsule (rarely produced) ovoid rounded, 5-valved, 15-seeded (or less).

A native of Tropical Asia, now one of the commonest and most widely spread of all ornamental plants in tropical regions. It is grown almost everywhere in Guam, as bushes or as hedges. Many hybrids have been bred from this as one of the parent species; two at least are common in Guam, and others are likely to be seen, some with pink, white, orange, yellow or varicolored flowers.

(1) *Hibiscus*×*archeri* Wats. Gard. and Forest, 324. 1896. Large red flowers, widely opening. Harmon-Barrigada (4015).

(2) *Hibiscus* "Flores-rosa" (*H. rosa-sinensis*×*H. schizopetalus*). Small red, very dark (almost black) short tightly rolled flowers that do not open. Harmon Village.

HIBISCUS SABDARIFFA L. Sp. Pl. 694. 1753. ROSELLE.

A glabrous erect herb to about 2 m tall, with red stems; leaves ovate, entire or 3-lobed or coarsely toothed, the lobes deeply separated, sometimes with 2 small basal lobes; flowers solitary in axils; calyx red or maroon-magenta, crisp-juicy; epicalyx present; petals pink or sometimes yellow; fruit red or greenish-white.

Native of Indonesia (probably); cultivated for its juicy calyces, which may be used to flavor cold drinks or for jams or jellies; or as a red coloring agent. Not common in Guam. Also cultivated in the Caroline Islands.

HIBISCUS SCHIZOPETALUS (Masters) Hooker fil. in Curtis's Bot. Mag. 106: pl. 6524. 1880. CORAL HIBISCUS.
Walker & Rodin 1949: 462.

Very much like *H. rosa-sinensis* but the flowers pendulous, petals pink-and-white, deeply laciniate; staminal tube longer than petals.

An East Africa species now widespread in cultivation. Harmon (4161).

Hibiscus tiliaceus L. Sp. Pl. 694. 1753. Merrill 1914: 112.
PAGO. HAU. SEA—HIBISCUS.
Pariti tiliaceum (L.) A. St. Hilaire Fl. Bras. Mer. 1: 256. 1825.
Safford 1905: 347, pl. 61.

A small tree, in age intricately branched with many spreading low branches

without a tall central trunk; youngest branches gray-pubescent, older ones glabrate with grayish rather smooth very fibrous and mucilaginous bark; reaching a height of 10 (rarely 15–18) m, broadcrowned, dense; leaves on petioles 3–12 cm long; blades cordate, acuminate, to 20 cm long, equally wide, velvety-pubescent when young, glabrate and dark green above, grayish-white stellate-tomentose beneath, and slightly glaucous; several major nerves with linear basal glands dorsally; flowers terminal or axillary, about 10 cm wide, yellow with a maroon-purple eye, cupular-campanulate, aging (after falling) to orange-red, single or usually in few-flowered open cymes of panicles; stipules, bracts, and 10–12-bracted epicalyx conspicuous; pedicels 1–3 cm long; calyx 5-lobed; staminal tube shorter than corolla; free tips

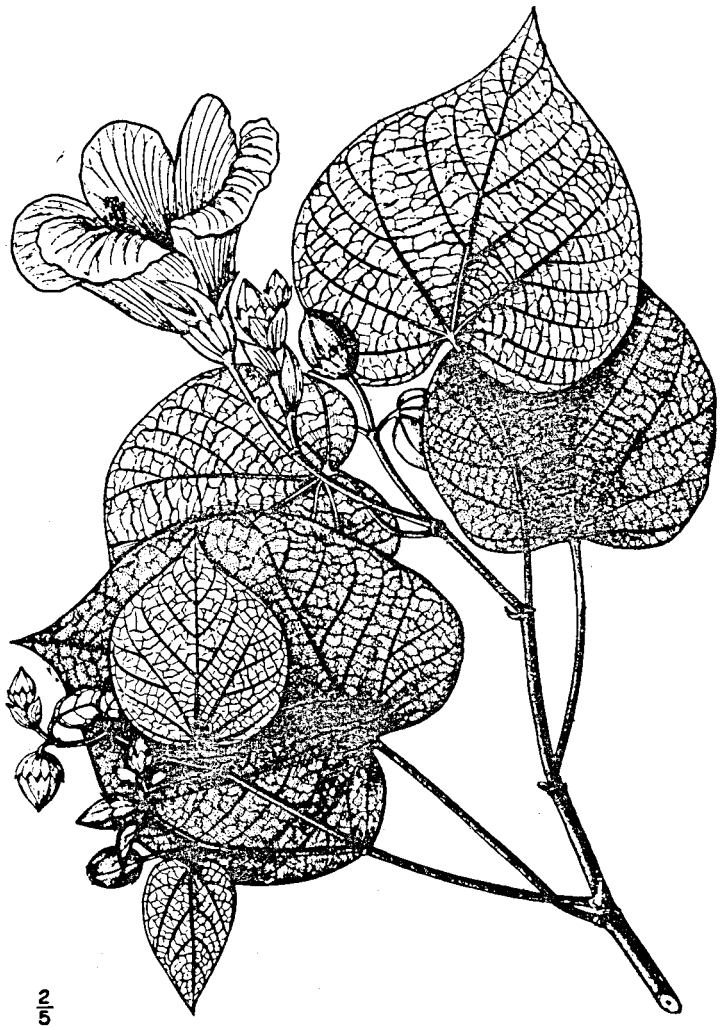

Fig. 65. Hibiscus tiliaceus.

of filaments along whole length of staminal tube; ovary 5-celled with false septa, seemingly 10-celled; capsules ovoid-globose 2.5 cm long, 2 cm wide, pubescent, grayish-brown; seeds brownish-black, generally 15.—Fig. 65, Pl. 9d.

A pantropical strand plant favoring sandy or somewhat muddy coasts, also on limestone rocks, often at the edges of mangrove swamps, inland along estuaries, sometimes on terraces to a few hundred feet above the sea, wild or planted. The wood is light, fairly tough, pale; when freshly cut the heartwood is reddish but soon darkens; easily finished but not very durable. The fibrous bark is a source of cordage all over the Pacific Region. The trees often form a nearly impenetrable thicket with interlacing low horizontal branches. In Guam this is a common plant and has lent its name to several localities (e.g., Pago Bay). It is sometimes cultivated. If trimmed it makes a useful shade tree; it can form a natural "arbor" or roof of leafy twigs. The flowers last only 1 day (as is true of Hibiscus in general) but the tree flowers all year. In Ponape, mucilage from the bark is added to the ceremonial *sakau* drink prepared from the roots of *Piper methysticum* (kava). Manengon, beside the stream above Tarzan Falls (3881); Barrigada Hill (4504).

MALACHRA Linnaeus

Coarse suffruticose herbs, usually stellate-pubescent; leaves simple, alternate, long-petiolate; flowers in axillary or terminal heads subtended by cordate bracts of an involucre; coral white, yellow, pink, or purple; ovary 5-celled; fruit a schizocarp separating into the 5 reticulate carpels; style-branches twice as many as carpels i.e. 10.—About 10 Tropical American species.

1. Leaves angled; stellate hairs present; corolla yellow.....*M. capitata*
1. Leaves mostly 3–5-lobed; stellate hairs lacking; corolla white.....*M. fasciata*

Malachra capitata L. Syst. ed. 12, 458. 1767. Merrill 1914: 112. PAGAGO.

Erect subshrub with pubescence of mixed simple and stellate hairs; leaves ovate-orbicular, cordate, slightly lobate or only angled, up to 9 cm long, crenate-serrate, long-petiolate; stipules hispid, filiform, 10–15 mm long. Flowers in groups of heads in axils, bracteate; calyx 3.5 mm long; corolla 10–15 mm long, yellow; staminal column 3 mm long. Fruit a schizocarp, 5–6 mm long, breaking up into mericarps. Seeds covered with stellate hairs.

A native of tropical America; now in all tropical countries, weedy in old fields. G.E.S. 28. Cetti Bay (3902).

Malachra fasciata Jacquin, Coll. 2: 352. 1797. Merrill 1914: 112.

var. *lineariloba* (Turcz.) Gürke, Bot. Jahrb. 16: 355. 1892.

Erect (annual) subshrub; pubescence of simple hairs only; leaves orbicular-ovate, truncate-subcordate, to 14 cm long, 3–5-lobed or parted (rarely 7-lobed); stipules filiform, 2–3 cm long, ciliate; flowers in groups of heads in axils; calyx 4 mm long; corolla 10–15 mm long, white (turning pink); schizocarp 3–4 mm long; seeds glabrous except for a few branched hairs on the hilum.

A tropical American weed, sporadic in Guam.

MALVASTRUM Gray

Subshrubs with ovate, dentate or palmately lobed leaves; flowers solitary in axils or in terminal racemes; epicalyx of linear-subulate bracts; calyx marcescent-foliaceous in fruit, 5-lobed; corolla of 5 usually yellow petals slightly unequally bilobed at apex; filaments aringing only near apex of staminal tube; carpels 10; style-branch filiform with capitate stigma; fruit discoid, a schizocarp; ripe carpels dry, compressed, reniform, setose.—3 N. American species; about 70 others in S. America and Africa (possibly distinct generically).

Malvastrum coromandelianum (L.) Garcke, Bonplandia 5: 297. 1857.

Walker & Rodin 1949: 462, as *coromandelinum*.

Tough-stemmed, woody-rooted herb to 1 m high, usually less, pubescent with characteristic 4-rayed hairs; leaves ovate or ovate-elliptic, 3–6 cm long, 1–3.5 cm wide, acute or obtuse, margins serrate, 3-nerved from base, petioles 1.5–4 cm long; flowers solitary in axils; peduncle 5 mm long; stipules subulate about 1 cm long; epicalyx of 3 free subulate bracts; calyx pubescent; corolla yellow, about 1.3 cm broad; flowers occasionally paired or terminal; fruit about 6 mm broad; seeds reniform; ripe carpel with a few stiff hairs and 2 stubby points on the convex (outer) side.

A native of N. America (S. U.S.A., Mexico, Central America), now a pantropical weed. In waste ground, by roadsides, in abandoned city lots, etc. Mangilao (3792). Very similar to Sida, and sometimes called *escobilla*, as are the species of Sida, but easily distinguished by the 3 bracts of the epicalyx (rather than none—the epicalyx absent in Sida).

MALVAVISCUS Cavanilles

Small trees or shrubs, with alternate simple usually serrate to lobed leaves; flowers red, with epicalyx; calyx 5-lobed; petals 5, connivent; staminal column truncate or 5-toothed, filaments many; ovary 5-celled, each cell with 1 ovule; style 10-fid; stigma capitate; fruit baccate, but the carpels late separating from each other, though indehiscent.—About a dozen Tropical American species, 1 or 2 in cultivation.

MALVAVISCUS ARBOREUS Cavanilles, Diss. 3: 131, t. 48, f.l, 1787.

var. PENDULIFLORUS (DC.) Schery, Ann. Mo. Bot. Gard. 29: 223. 1942.

A tall shrub with narrowly ovate or ovate-oblong acute serrate leaves; flowers solitary, axillary, pendulous; pedicel slightly longer than the petiole; epicalyx of usually 7 narrow bracts; calyx green; corolla bright red, remaining rolled and closed, about 4 cm long; staminal tube slightly exerted; fruit a schizocarp but fleshy, red, globose, 5-seeded, rarely seen in cultivation.

A native of Tropical America, rather well distributed in tropical gardens; an ornamental shrub. It is sparingly cutlivated in Guam, as on the College campus (5120).

SIDA Linnaeus

Small shrubs or herbs, usually stellate-pubescent, with alternate simple serrate leaves; flowers solitary and axillary or in racemes, spikes, or headlike inflorescences in axils; epicalyx absent; calyx 5-lobed; corolla of 5 nearly free obovate obliquely tipped imbricate usually yellow petals, rotate; staminal tube short, the filaments free from about their midpoint; ovary 5 or 10-celled, styles 5 or 10, ovules solitary in each cell; stigmas capitate; fruit a schizocarp; ripe carpels beaked or bristly with barbed bristles, generally one rising from each side, opening or not; seeds pendulous or horizontal, glabrous or pubescent, black.—Nearly 200 species, pantropical, mostly American; two in Guam.

Key to species

1. Leaves lanceolate or linear-lanceolate, green beneath.....*S. acuta*
   Stipules (of a pair) dissimilar.
1. Leaves rhombic-ovate, dull whitish-tomentose beneath.....*S. rhombifolia*
   Stipules (of a pair) similar.

Sida acuta Burmann fil., Fl. Ind. 147. 1768. Safford 1905: 374. Merrill 1914: 112. ESCOBILLA PAPAGO; ESCOBILLA ADUMELON.

A low shrub to 1 m tall (rarely 2 m) with slender tough stems; leaves lanceolate or linear-lanceolate, acute, obtuse or rounded at base, 1.5–6 cm long, 5–20 mm wide, sharply serrate, stellate-pubescent beneath; petioles 3–5 mm long; blade 3-nerved from base, pinnately branched above the base; stipules linear-acute, about 1 cm long; flowers 1 or 2 in axils, pedicels to about 1 cm long; corolla about 6–14 mm broad, yellow; fruit 4–5 mm broad, 6–8-carpellate; seeds dark reddish-brown, 1.5 mm long; ripe carpels with 2 beaks, grooved on the back.

Place of origin unknown; a pantropical weed. Brooms (for temporary use) are made from the stems. It is common around villages in waste ground. Barrigada (4142). Tumon Bay (4995).

Sida rhombifolia L. Sp. Pl. 684. 1753. Safford 1905: 375. Merrill 1914: 112. ESCOBILLA DALILI. E. APAKA. E. ADUMELON.

Small tough-stemmed shrub to 1 m tall, stellate-pubescent; stipules linear, 6–9 mm long; leaves; ovate or rhombic-ovate, acute, serrate near the apex, glabrous above, pubescent beneath, 1.5–5 cm long, 7–22 mm wide, on petioles about 2–6 mm long (rarely longer); flowers 1 or 2 in axils, pedicels 1–4 cm long; calyx-lobes deltoid apiculate; corolla yellow, about 6–10 mm wide, rotate; schizocarp nearly 1 cm broad; ripe carpels deltoid, apiculate, 8 or 10 or rarely to 12, stellate-pubescent dorsally, 2-lobed, about 3–4.5 mm long; seeds black.

Native place uncertain; now pantropical. A good quality fiber can be produced from the stems, variously called "cuba-jute", "Australian hemp," etc. It is weedy and rather aggressive. Like the former it is used as a handy broom. Mangilao (3791).

Note. Safford (1905: 374) mentions two other species as possibly present in Guam, *Sida glomerata* Cavanilles and *Sida maura* Endlicher; the first was identified

by Gaudichaud, but he probably mistook *S. rhombifolia* for this; the latter is very uncertainly attributed to Guam, suppposedly collected by Chamisso. I have only found the two species accounted for above in Guam. Others, however, occur elsewhere in Micronesia.

THESPESIA Solander ex Correa

Trees or shrubs, lepidote or stellate-pubescent; leaves alternate, entire or 3-lobed; flowers solitary or in cymes, axillary; epicalyx of 3 or 5 bracts; calyx 5-toothed or rimlike; corolla campanulate; staminal tube cylindric, toothed at apex; filaments paired; anthers 1-celled; ovary 5-celled; style club-shaped, grooved; fruit indehiscent or loculicidal, subglobose or pyriform, dry and woody; seeds glabrous or pubescent, ovoid.—A paleotropical genus of 12 or 15 species.

One species in Guam.

Thespesia populnea (L.) Solander ex Correa, Ann. Mus. Hist. Nat. Paris 9: 290, t. 8, f. 2, 1807. Safford 1905: 388. Merrill 1914: 112.

BANALO. KILULU. KULUK. MILO.

A small or medium tree to 10–12 (rarely 20) m tall, with fairly stout trunk, rough corrugated gray bark, dense crown, and glabrous branches; branch-tips silvery-brown lepidote, glabrescent; leaves rather crowded, long (3–12 cm) petiolate, cordate, acuminate, entire, green above, only slightly paler green beneath, glabrous 5–15 cm long, longer than broad, usually at a right angle to the petiole, the tip pointing down; midrib yellowish; texture very slightly fleshy-coriaceous; surface glossy; flowers solitary from leaf-axils, on pedicels about half as long as the petiole; epicalyx bracts caducous; calyx rimlike, not or scarcely toothed, persistent; corolla pale yellow with maroon eye, fading pinkish-purple, rather persistent, about 8 cm broad; staminal column shorter than corolla, pale yellow; stigmas yellow; fruit depressed-pentagonal-globose, coriaceous-woody, indehiscent or sometimes splitting open very tardily, glabrous, brown, with a yellowish gum, about 3 cm broad, usually 4–5-celled; calyx persistent at base; seeds silky-pubescent.

A paleotropical strand plant (now in Tropical America too), on sandy shores, rocky coasts, tidal inlets, estuaries, and adjacent lowlying cliffs and terraces never very far from the sea. Rather common in Guam: Tamuning (3887); Yoña (4412); Tumon Bay (4993). It often occurs in company with *Hibiscus tiliaceus* and *Hernandia peltata.*

This is a well-known tree throughout the Pacific tropics; "milo" is the Hawaiian name, often used by Americans; it is also called the Portiatree; the wood is sometimes given the name "rosewood" because of its handsome reddish color. The bark and fruits yield a yellow dye.

URENA Linnaeus

Subshrubs or herbs; leaves palmately 3–7-nerved and lobed or sinuate, basally rounded; midrib with basal gland; flowers 1 or few in axils or terminal; epicalyx of 5 connate bracts; calyx-5-lobed; corolla pinkish-or violet, stellate-pubescent

dorsally; staminal tune as long as corolla; ovary 5-celled; cells 1-ovulate; styles 10, reflexed; stigmas disciform; fruit a schizocarp, the ripe carpels indehiscent, hirsute and with hooked bristles or spines; seeds glabrous.—About 10 tropical-subtropical species, one in Guam.

Urena lobata L. Sp. Pl. 692, 1753.

var. *sinuata* (L.) Gagnepain, in Lecomte, Fl. Gén. Indochine 1: 414. 1910. Merrill 1914: 113. DADANGSI. D. APAKA. D. MACHINGAT.

U. sinuata L. l.c.; Safford 1905: 394.

Erect subshrub to 1 m tall; leaves palmately lobed or angled, downy grayish

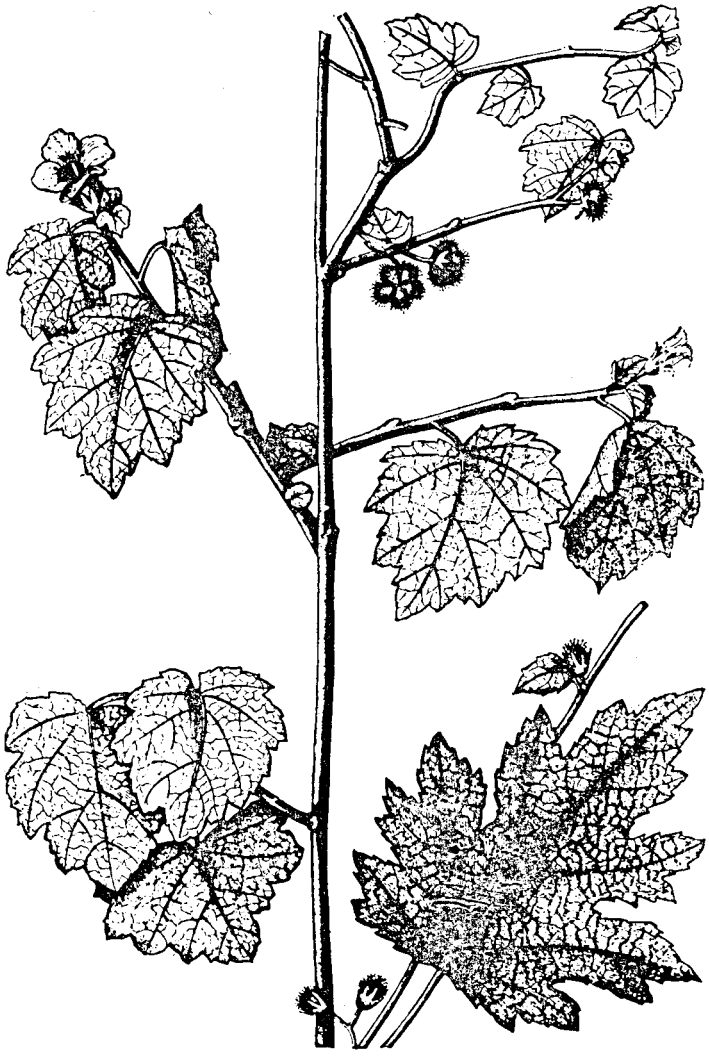

Fig. 66. Urena lobata.

pubescent with stellate hairs, 4–8 cm long, usually 5-lobed with the lobes again pinnatifid, or sometimes subentire but angled; flowers clustered; corolla pinkish-violet, about 1 cm broad; fruit pubescent and beset with hooked bristles (glochidia). —Fig. 66.

A pantropical weed, place of origin not certain; in waste ground and old fields, along roadsides, and vacant lots in Guam. Not to be confused with *Triumfetta semitriloba,* also called "dadangsi."

Merizo (3918); Talofofo (4685).

BOMBACACEAE

Trees, often very large or bulbous in form, sometimes spiny; pubescence often of stellate hairs; flowers perfect; sepals 5, valvate; petals 5, free or slightly connate; stamens 5-many, distinct or connate; anthers 1-or 2-celled; ovary superior, 2–5-celled; ovules 2-many in each cell; fruit dry or fleshy, dehiscent or not opening.—About 25 genera and 150 species of the tropics.

One genus introduced in Guam.

CEIBA Medicus

Trees with spiny trunks; leaves palmately divided into petiolulate leaflets; fruit a smooth oblong capsule, the inner wool densely cottony-pubescent.—10 species all of Tropical America; or the following perhaps Afro-Indian.

One species in Guam.

CEIBA PENTANDRA (L.) Gaertner, Fruct. 2: 244, t. 133, 1791.

ALGODON DE MANILA. KAPOK TREE.

A large or immense tree, the turnk with gray bark, buttressed, usually spiny, cylindrical and smooth far up, deciduous; branches in horizontal tiers; crown of leaves open; leaves of 5–9 leaflets palmately borne, each lanceolate, acuminate, glaucous beneath, entire or obscurely toothed, 7–18 cm long, 1–3.5 cm wide, distinctly petiolulate; petiole 7–20 cm long; flowers clustered on branchlets, cream-white or pale pink; 5 petals about 2.5 cm long; stamens in 5 bundles, anthers twisted; fruit oblong-ellipsoid, smooth, pendulous, 7–15 cm long, 5-celled, eventually dehiscent, the interior filled with soft long copious hairs ("kapok" or silk-cotton); seeds many, brown.

Widely cultivated and naturalized in the tropics; perhaps native in India and/or Africa. Well-known as the source of kapok. Found here and there in Guam, not attaining anything like the great size it can potentially reach; rather conspicuous over much of the year when the branches, which spread horizontally, are leafless; the hanging fruits are just the size and shape of cucumbers. Chalan Pago (4005).

STERCULIACEAE

Trees, shrubs, or herbs; bark fibrous; leaves alternate, simple or palmately divided, stipulate; flowers perfect or unisexual, usually in many-flowered clusters; sepals 5 (rarely 3 or 4); petals 5, free, sometimes rudimentary or lacking; stamens

5, 10, 15 or many, if 10 or more the outer whorl of 5 sterile, the inner whorl connate and sometimes branched; anthers 2-celled; ovary superior, 2–5-celled, cells with 2-many ovules, these axile; fruit a schizocarp, follicular, or baccate, or a capsule; sometimes winged.—A big family with about 50 genera and 700 species, chiefly tropical; important for the genera *Theobroma* (source of chocolate) and *Cola* (source of the cola in Coca-Cola).

Key to Genera

1. Petals absent; flowers unisexual or polygamous. Trees.
   2. Stamens, 5 fertile with anthers; fruit indehiscent, keeled; leaves simple, entire; wild trees of mangrove areas, riverbanks, or limestone terraces ..... *Heritiera*
   2. Stamens many; fruit dehiscent; rare cult. tree..... *Sterculia*
1. Petals present; flowers perfect; trees or shrubs.
   3. Ramiflorous or cauliflorous cult. tree; fruit pendulous, cylindric, 10-ridged, 15–30 cm long, leathery ..... *Theobroma*
   3. Not as above,
      4. Small shrubs with grayish leaves and small yellow flowers..... ..... *Waltheria*
      4. Small or big shrubs, or little trees, with white, pink, or red flowers.
         5. Large pink flowers 2.5 cm broad, in headlike clusters, corollas persistent after withering; uncommon, cult..... *Dombeya*
         5. Small or pink or white corollas in panicles or in small axillary headlike groups; corolla 1 cm wide or less, persistent (?), common, wild or weedy..... *Melochia*

HERITIERA Dryander in Aiton

Trees, often buttressed. Leaves unifoliolate or digitate, often triplinerved; lower surface usually closely set with minute fimbriate scales. Inflorescence axillary, paniculate, proximally scaly, distally usually stellate-tomentose, the pedicels jointed, the flowers unisexual. Calyx of 4–6 segments; petals none; male flowers with 8–10 stamens (anthers at apex of androgynophore), ringlike or irregularly arranged; ovaries suppressed. Female flowers usually with 4–6 ovaries, these sessile and somewhat laterally compressed; sterile anthers grouped at base; style short, above spreading or incurved, stigmas small; fruit podlike, usually winged, dehiscent, with 1-few seeds.—A small genus of some 30 species from Africa through S.E. Asia to the Pacific Islands.

Two species in Guam.

Petioles 4–6 cm long; blades mostly elliptic-ovate; keel of fruit about 5 mm high; fruit-wall about 6–7 mm thick; tree of limestone cliffs..... ..... *H. longipetiolata*

Petioles shorter, 2 cm long or less; keel of fruit 7.5–8.5 mm high; fruit-wall about 4 mm thick; tree of fringes of mangrove swamps or along muddy

river-banks.....*H. littoralis*

Heritiera longipetiolata Kanehira, Bot. Mag. Tokyo 46: 487. 1932; Fl. Micron. 299. f. 103. 1933. Stone, Micronesica 2: 47. 1965. UFA-HALOMTANO.

A stout, short tree, the trunk often twisted, rising from crevices in dissected limestone plateaus and slopes; leaves often ovate or ovate-oblong, sometimes elliptic, acuminate, obtuse or rounded at base; petiole usually 4–6–(–8) cm long, rather abruptly enlarged at the base of the blade; blades mostly 15–30 cm long, mostly 8–15 cm wide; upper surface dark green, subglossy, the midrib and main lateral veins paler; lower surface silvery-tawny, minutely scaly-indumented; margins entire, somewhat undulate-crisped; flowers in axillary open panicles shorter than the leaves; fruit keeled, keel about 5 mm high; fruit-wall about 6–7 mm thick. —Fig. 67.

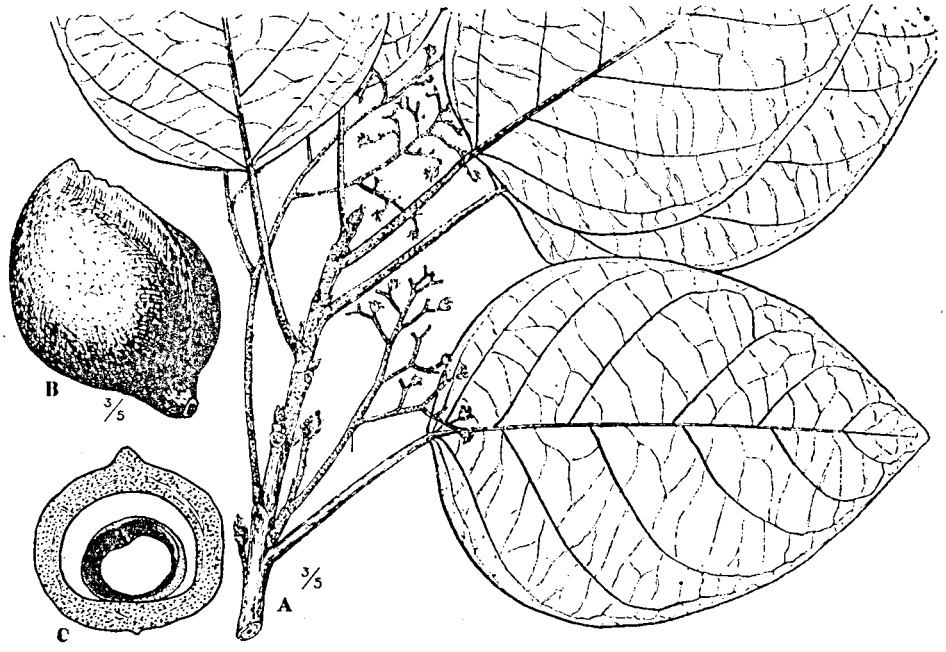

Fig. 67. Heritiera longipetiolata.

Endemic in the Marianas Islands (Guam-Rota-Saipan), restricted to the limestone cliffs and plateaus, never riverine or coastal; often wind-stunted. The trunk is often rooted at the base of a deep crevice, and at the top puts forth numerous, gnarled, twisted branches. Rarely found in flower or fruit. Cliff tops above Asanite Bay (5015, 5096A, 5257), Ritidian Pt. (Fosberg).

Heritiera littoralis Dry. in Aiton, Hort. Kew. 3: 546. 1789.

Safford 1905: 292, pl. 52. UFA.

A tree to 40–50 ft. tall, the trunk often with short buttresses. Leaves alternate,

9–30 cm long, usually 12–18 cm long, rather narrowly elliptic, or ovate-oblong, mostly about 6–9 cm wide, coriaceous, glabrous and light green or medium grayish-green above, beneath with a silvery-tawny scaly indument of very minute crowded fimbriate—peltate scales, apex acute, base obtuse or rounded. Inflorescences axillary, paniculate, unisexual, shorter than the leaves. Calyx of 5 lobes; petals none; male flowers with staminal column, with 5–7 subterminal anthers; female flowers with 5 nearly free ovary-lobes, each lobe 1-ovulate. Fruit podlike, 5 cm long, boat-shaped, with a keel usually 7.5–8.5 mm high, prolonged at one end into a short wing.—Fig. 68, Pl. 9e.

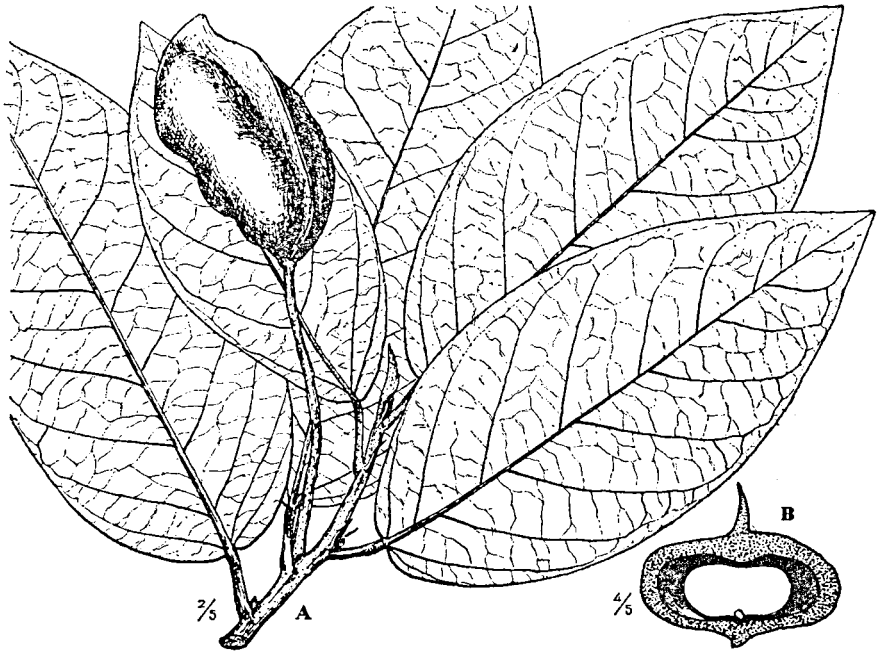

Fig. 68. Heritiera littoralis.

A widespread coastal tree, found throughout the Pacific Islands and southern Asia, northward to the Ryukyu Islands (Amami-Oshima), at the edges of mangrove swamps and along tidal estuaries and muddy river banks. Dispersal by the durable floating fruit.

In Guam not uncommon in suitable localities, though seldom flowering. In Okinawa it is said to flower in July, and ripen fruit by October. Apra Harbor (4433); OSIR Rd. area (4718, 5117); Ajayan River banks near mouth (5029).

The tree is easily recognized by the pale, silvery indument of the leaf under-surface. The individual scales making up this indument must be viewed with a good powerful handlens or dissecting microscope. The wood is hard and durable,

reddish, siliceous, hard to work, but strong. The bark is reputed to have medicinal properties.

DOMBEYA Cavanilles

Trees or shrubs with spiralled simple or palmately 3-lobed leaves; flowers in pedunculate axillary more or less headlike clusters; bisexual; sepals 5; petals 5; stamens 15 with anthers, 5 without, connate; ovary 5-celled, sessile; style short 5-fid; fruit capsular.—About 100 species, all African. One cultivated in Guam.

DOMBEYA WALLICHII Bentham & Hooker, Gen. 1: 221. 1862.

Stone, Micronesica 2(2): 139. 1967.

A big shrub with cordate angulate pubescent long (to 30 cm) petiolate leaves to 30 cm wide (or more); flowers pink, 2.5–5 cm wide, crowded in globose drooping heads, persistent even after withering; stamens 20; capsule pubescent.

E. African and of Madagascar. Rare in Guam gardens. Agaña P.O. (5080). The flowers have a faintly unpleasant odor.

MELOCHIA Linnaeus

Shrubs or herbs, often stellate-pubescent, with simple alternate leaves; flowers clustered or in panicles; calyx 5-parted; petals 5, spathulate, marcescent; stamens 5, connate basally; anthers 2-celled; ovary 5-celled; cells 2-ovulate; styles 5; capsule loculicida, 5-valved; seeds erect, endospermous.—About 65 tropical species.

1. Flowers tightly crowded in leaf-axils; small subshrubs.....*M. corchorifolia*
1. Flowers in rather open branching panicles from branch tips; small to big arborescent shrubs.....*M. compacta*
   2. All parts somewhat glabrate.....*M. compacta* s.s.
   2. All parts densely villous.....*M. compacta* var. *villosissima*

Melochia corchorifolia L. Sp. Pl. 675. 1753.

A small shrub with ovate-oblong serrate leaves 3–8 cm long, stellatepubescent beneath; petioles 2–3 cm long; inflorescences axillary, densely congested; calyx-lobes lanceolate, pubescent; corolla pink (or white), petals spathulate; ovary pubescent; capsule glabrate, 5 mm thick.

A weed from Tropical Asia, apparently established in Guam. G.E.S. 240.

Melochia compacta Hochreut. Ann. Conserv. Jard. Bot. Genèv. 21: 429. 1920.

Goldberg, Contr. USNH. 340: 220; 236. 1967.

M. odorata sensu Merrill 1914: 113. SAYAFE.

Large, arborescent shrubs, soft-wooded; bark light gray or reddishbrown, more or less pubescent throughout, glabrate or not; leaves cordate ovate subcoriaceous 5–15 cm long, 3–10 cm broad, hirsute when young at least, 3-nerved from the base, the midrib with about 4 or 5 pairs of pinnate branches above the base; margins finely serrulate-denticulate; pubescence of mixed simple and stellate hairs; petioles hirsute, 1–3 cm long; panicles cymose from uppermost axils, many-flowered; peduncles to 10 cm long; flowers rather crowded; bracteoles 2.5 mm long, ciliate-hirsute, caducous; calyx 6–7 mm long; petals pink, obovate-spathulate, nearly

1 cm long; stamens 4–5 mm long; ovary hirsute; capsule ovoid, hirsute, 7–8 mm long, 5-coccous, cocci 2-bristled; seeds 3.5 mm long, rounded trigonal, ovoid.

(1) var. **compacta**.—Pl. 9f. The more glabrate form, also larger and more arborescent; chiefly on limestone. Barrigada Hill (3833; 4505).

(2) var. **villosissima** (Presl) B.C. Stone, comb. nov. ATMAHAYAN.
Melochia villosissima (Presl) Merrill, Philipp. J. Sci. Bot. 15: 543. 1919.
Riedliea villosissima Presl, Rel. Haenk, 2: 146. 1835.
Melochia hirsutissima Merrill 1914: 113–114.

This appears to be a smaller, stunted, much more densely hirsute form of savannas in volcanic soils, as at Agat Hills. Goldberg retains this as a species, but there are too many intergrades.

STERCULIA Linnaeus

Trees or shrubs with simple or palmate entire leaves, the petiole usually with a swelling near its junction with the blade; trunks sometimes buttressed; bark grey to brown, inner bark pink; flowers male or female, or bisexual; calyx 5-lobed; petals none; stamens connate as a column; ovary 5-carpellate; fruit follicular, the 1–5 carpels spreading and pod-like; seeds arillate, black or brown, often pendulous on long funicles from the dehisced fruit.—A big pantropical genus of perhaps 200 species.

STERCULIA ACUMINATA Beauvois, Fl. Oware 1: 41. t. 24. 1804.

I have not seen this plant in Guam; it may have died out.

THEOBROMA Linnaeus

Recognizable from the species description.

A Tropical American genus renowned chiefly for the following species, which is now rare or absent in cultivation in Guam:

THEOBROMA CACAO L. Sp. Pl. 388. 1753. Safford 1905: 385, pl. 67.
Merrill 1915: 114. CACAO.

A small tree to 5–6 m tall with large simple leaves, limply pendent and reddish when young, up to 30 cm long, oblong, short-petiolate, firm in age; inflorescences on trunk and older branches, several-flowered, fasciculate; pedicels short; calyx pink, 5-parted; corolla yellow, the 5 petals concave at base, at apex with a strap-like appendage; stamens 10, only 5 fertile, connate; style filiform, stigma 5-lobed; fruit oblong-cylindric, 15–25 cm long, longitudinally ribbed, yellow or red, the rind thick and leathery; seeds numerous, embedded in pulp, compressed, oily, bitter.

A native of South America. The cacao, cocoa, or chocolate tree; the seeds are the source of chocolate.

In Safford's time, the cacao was evidently rather common. Today it is rare if persisting.

WALTHERIA Linnaeus

Trees, shrubs, or herbs, with simple or stellate pubescence; leaves simple, ser-

rate; flowers perfect, in axillary cymes or fascicles; involucel of 3 caducous bracts; sepals 5; petals 5, spathulate, convolute, persistent after withering; stamens 5, connate at base; ovary 1-celled, sessile; style excentric, with clavate or brushy stigma; ovules 2; fruit a 2-valved follicle, usually with 1 seed with fleshy endosperm.—About 40 species of Tropical America.

Waltheria americana L. Sp. Pl. 673. 1753. Safford 1905: 398. Merrill 1914: 114. ESCOBILLA SABANA.

W. indica L. l.c.

A perennial subshrub with erect branched tomentose stems, to 1 m tall; leaves grayish-tomentose, ovate-oblong, serrate, 1–3.5 cm long, 1/2-2 cm wide; petioles about 1–1.5 cm long; pubescence of mixed stellate and simple hairs; stipules narrow, caducous; flowers small on axillary peduncles to 4 cm long, with linear bracts; calyx 5-lobed, about 6 mm long; petals 5, yellowish-orange, slightly longer than the calyx, clawed; stamens 5, connate at base; ovary sessile, tomentose, 1-celled, with 2 erect ovules; style excentric; stigma fringed; capsule 2-valved, with 1–2 small seeds.

A pantropical weed. In Guam it is virtually always found in the southern savannahs, but it can occur elsewhere sparingly. The juice of the root is said to have an effect something like aspirin. Mangilao (3799).

THEACEAE

Trees or shrubs with alternate, simple, entire or serrate leaves; stipules none; flowers solitary or few in axils or terminal, regular, usually bisexual; sepals 5–7 (rarely more), imbricate; petals usually 5 (rarely 4 or many), imbricate; stamens many or few (to 5), distinct or connate; ovary superior or half-inferior, 2–10-celled; cells 1-many ovulate; styles 1 or 2–10; fruit a berry or capsule.—About 25 genera and 400 species, mostly tropical or sub-tropical, a few in temperate regions. Important for tea (Thea, or placed in Camellia). One genus in Guam.

EURYA Thunberg

Trees or shrubs with often serrate leaves; flowers usually dioecious; sepals 5; petals 5, slightly connate at base; stamens 5–15; ovary 2–5-celled, cells several-ovulate; fruit a many-seeded berry.—An Asiatic-Pacific genus of about 80 species.

Eurya japonica Thunb. Nov. Gen. Pl. 68. 1783; Fl. Jap. 191, t. 25. 1784.

var. **nitida** Korthals, Verh. Nat. Ges. Bot. 118, t. 17, f. 3. 1839–42.

(Fosberg, ined.).

A small glabrous tree with small glossy elliptic or oblong-lanceolate leaves 2–6 cm long, 1–2 cm wide, acute, attenuate at base, subentire or serrulate toward apex; petioles 2–4 mm long; flowers few in axils, greenish; fruit globose, purplish-black, 4–5 mm wide.

Native; very rare.

GUTTIFERAE

Trees, shrubs, or herbs, usually with yellowish sap. Leaves opposite or whorled, simple, generally without stipules. Flowers perfect or unisexual. Sepals 4 or 5; petals 4 or 5 (or 6–8) ,distinct; stamens many, free or united into 3–5 bundles, or all connate; ovary superior, 1–5-celled; ovules 1-many, axile or parietal. Fruit a capsule, berry, or drupe.—A chiefly tropical family of 42 genera and more than 800 species.

Two genera in Guam.

1. Leaves with parallel secondary nerves, reticulations not evident... *Calophyllum*
1. Leaves with evident reticulations..... *Mammea*

CALOPHYLLUM L.

Medium to very large trees, the trunks often massive, seldom buttressed. Leaves simple, the secondary nerves close and parallel. Flowers regular, petals (where present) white; stamens yellow, numerous; ovary superior; fruit a globose drupe, the flesh thin, pale to purplish-black; endocarp woody; seed one.—About 70 species of the Asiatic and Pacific tropics.

One species in Guam.

Calophyllum inophyllum L. Sp. Pl. 513. 1753.

Safford 1905: 208. Merrill 1914: 114.

DA'OG. DA'OK. PALOMARIA. ALEXANDRIAN LAUREL.

Large tree, the crown broad; sap yellowish; leaves opposite, ovate to oblong, rounded or emarginate at apex, up to 16×9 cm; secondary nerves 0.6–1 mm apart, at an obtuse angle to the midrib; texture stiffly leathery; glossy green; petioles 1–2 cm long. Flowers in racemes to 10 cm long, on pedicels to 3 cm long, about 2 cm broad; sepals 4, concave-orbicular, the outer pair smaller, 8 mm long, inner pair 10 mm long; petals 4 or 5 (rarely 6–8), the outer ones with imbricate slightly concave margins, up to 11 mm long, 8 mm broad; inner petals flatter, up to 14×6 mm; stamens numerous, 8–9 mm long, the anthers 2 mm long. Fruit nearly sphaerical, 3–4 cm thick, purplish-black, rather hard and heavy.—Pl. 10a.

Indomalysia-Pacific; a strand plant, the floating fruit being the dispersal mechanism. Also planted for its hard wood, deep shade, attractive leaves and fragrant, showy flowers. The wood is of excellent quality.

Part of Marine Drive, Agaña, from, roughly, the Bank of Hawaii to Moylan's store, is lined with these trees. Agaña (3841); Tumon Bay (5076-a).

A slow-growing but exceedingly handsome tree, resistant to salt spray.

MAMMEA Linnaeus

Recognizable from the species description.—About 50 tropical species.

One species in Guam.

Mammea odorata (Raf.) Kostermans, Djawatan Kehutanan [Indonesia], 9–15, 1956. CHOPAK.

Calysaccion obovale Miquel. Fl. Ind. Bat. Suppl. 1: 500. 1860.

Ochrocarpus obovalis (Miq.) Safford 1905: 335, pl. 59.

Ochrocarpus excelsus (Zoll. & Mor.) Vesque, DC. Mon. Phan. 8: 525. 1893. Merrill 1914: 115.

Calophyllum excelsum Zollinger & Moritzi, Nat. Geneesk. Arch. Neerl. Ind. 2: 582. 1845.

Ochrocarpus odoratus (Raf.) Merrill, J. Arn. Arb. 26: 94. 1945.

Lolanara odorata Rafinesque, Fl. Tellur. 2: 34 (1837) 1836.

A small to middle-sized tree; branches stiff, with opposite shortly petiolate leaves; blades obovate to oblong-obovate, rounded at apex, narrowed to base, smooth, leathery, 10–18 cm long, 6–8 cm broad, pinnately veined and reticulate, upper surface dark green, lower surface lighter, midrib broad; petiole to 13 mm long; flowers on the branches often below the leaves, fragrant, polygamous, 1 or a few together; sepals 2, persistent, 12 mm long, broad-ovate; acute; petals 6, white, oblong, about 13 mm long; stamens numerous, filaments united at base; anthers elongated, fertile only in male fls.; female fls. with sterile stamens, pistil with a peltate broad stigma; fruit oblong, often curved, woody.—Pl. 10b.

Malaysia to the Pacific Islands. In Guam found on the limestone mesas, especially near the sea, occasionally very abundant (as at Mochom) and forming groves. The wood is hard and durable, suitable for housebeams. Flowers may be seen in November.

Talofofo Valley (3966); Pago Cliffs (4135); Sumay (4284); Mochom (4957–A).

BIXACEAE

Shrubs or trees; leaves alternate, simple, stipulate; flowers perfect (in our species); 5-merous, but with many stamens and 1-celled ovary; ovules many, parietal; fruit a capsule; seeds arillate.—One genus, Bixa, with 2 species, natives of Tropical America.

Bixa Linnaeus

With the characters of the family. Of its 2 species, one is an Amazonian tree; the other a shrub, widely cultivated, common in Guam, sometimes called "lipstick tree."

Bixa orellana L. Sp. Pl. 512. 1753. Safford 1905: 199, pl. 39.

Merrill 1914: 115. ACHIOTE. ANATTO.

An arborescent shrub with dark ovate acuminate subcordate leaves 5–15 cm long, 4–11 cm wide, entire or angled, on moderately long petioles about 1/3 the length of the blade; flowers showy, white or pink, nearly 5 cm broad; fruit 2-valved, ovoid, red, spiny, 2.5–5 cm long; seeds many, ovate, with a scarlet covering.—Pl. 10c.

Planted in Guam for the reddish-orange dyestuff obtainable from the seeds, commonly used to impart a bright orange color to rice. Barrigada (4017).

FLACOURTIACEAE

Trees, shrubs, or climbers; leaves usually alternate, distichous, simple, entire

or dentate, stipulate; flowers usually bisexual, regular, solitary and axillary or in terminal or axillary racemes or clusters; sepals 2–6; petals none or 2-many, distinct; stamens distinct, many or as many as petals; disc hypogynous or perigynous; ovary superior or nearly so, often 1-celled, or incompletely divided; placentae parietal; ovules many; fruit a capsule or berry; seeds commonly arillate, endospermous.—A chiefly tropical family of about 85 genera and over 800 species. One genus indigenous, two introduced.

1. Branches armed with slender sharp spines ..... *Aberia*
1. Branches unarmed,
   2. Leaves 15–25 cm long, ovate, cordate or subcordate; fruit large subpyriform, 15–30 cm long..... *Pangium*
   2. Leaves mostly 3–8 cm long, elliptic; fruit small subglobose..... ..... *Xylosma*

ABERIA Hochst.

[*Dovyalis* E. Mey. ex Arn.]

ABERIA HEBECARPA (Gardn.) Kuntze, Rev. Gen. 43. 1891.

Doryalis hebecarpa (Gardn.) Warb. Pflanzenfam. 3 (6a): 44. 1893.

KETAMBILLA. CEYLON GOOSEBERRY.

A shrub or small tree with ovate-oblong obscurely denticulate pubescent acute leaves 5–10 cm long; petioles about 1–1.5 cm long; sharp axillary spines 2 cm long; flowers male or female, on separate plants; petals none; fruit baccate, subglobose, about 2.5 cm thick, purplish, pubescent, pulpy, several-seeded.

A native of Ceylon, sometimes cultivated for the edible sour fruits.

ABERIA CAFFRA Harv. & Sond., Fl. Cap. 2, Add. 584. 1859–65.

Doryalis caffra (Hooker f. & Harvey) Warb. l.c. 1893. KEI APPLE.

A shrub with obovate leaves about 4 cm long; spines numerous; fruit baccate, yellow.

South Africa. The edible fruits may be used for jam and pickles.

PANGIUM Reinwardt

Trees with spiralled-alternate long-petiolate leaves, with pagoda-form branching; flowers large, green, unisexual, on different trees; calyx cupular, 2–4-lobed; petals 5–8, each with a basal scale; stamens many; ovary with sessile stigma; fruit indehiscent, many-seeded, the seeds superposed, rich in prussic acid.—Three spp. The species below is a Malayan-Indonesian domesticate, but not (probably) much altered from the wild form. Not only the seeds, but all parts of the plant, appear to be rich in the prussic-acid yielding glucoside.

PANGIUM EDULE Reinwardt ex Blume, Cat. Gew. Buitenz. 112, 1823; Syll. Ratisb. 2: 12. 1828. Safford 1905: 435. Merrill 1914: 115.

RAUAL. LASRET.

A medium to large tree; leaves entire (or in saplings 3-lobed), cordate or subcordate, ovate, commonly 15–25 cm long, acuminate, faintly 5 cm wide; pubescent

beneath on the nerves; petioles nearly as long as blade; flowers dioecious; male flowers to—5 cm wide; with 2–3 calyx-lobes; petals 5 or 6, with a basal scale; stamens many; female flowers similar, but without stamens, and 5–6 staminodes alternate with the petals; [male fls. clustered, females solitary]; ovary long-ovoid, 1-celled, with 2–4 placentae, each many-ovuled; stigma sessile; fruit large, ovoid-subpyriform, indehiscent, rough, brown, generally 15–30 cm long, and about half as thick; seeds many, compressed ovate, grayish, 5 cm long, embedded in creamy-white or yellowish pulp.

Native of Malaysia; introduced into Micronesia for the edible pulp, which has a very pleasant flavor. The seeds however should not be eaten (or even tasted) as they contain prussic (hydro-cyanic) acid and are lethally poisonous. I can vouch personally for the good flavor of the pulp, which is quite juicy and is eaten as a dessert fruit, having eaten it in Palau and Ponape. However, I have not seen the tree in Guam; though of course it may persist in a village or on a farm.

Xylosma Forster

Trees or shrubs, some spiny; leaves dentate or crenate; flowers small, dioecious (or rarely polygamous); sepals 4–5, imbricate; petals none; stamens many; ovary 1-celled; parietal placentae 2–6; stigma capitate; fruit a berry with 2–8 coriaceous obovid seeds.—A pantropical genus of 40 species.

Xylosma nelsonii Merrill, Philipp. J. Sci. Bot. 15(6): 543. 1919.

Flacourtia integrifolia Merr. 1914: 115. [non Clos].

A small unarmed tree with alternate, elliptic, chartaceous, entire or very obscurely glandular-denticulate, leaves, 5–8 cm long, 2.5–5 cm wide, rounded or slightly retuse at apex, subacute to rounded at base; 2 glands at or near the insertion of the petiole; petioles about 5 mm long, glabrous or slightly puberulent; blades glabrous, somewhat glossy above, slightly paler beneath; lateral nerves 5 or 6 pairs; reticulations fine; flowers unisexual; male flowers in axillary solitary or fascicled racemes, these few-flowered, 1–1.5 cm long, slightly pubescent; peduncles 5–7 mm long, articulate; pedicels 1 mm long, bracteate, the bract 1 mm long, ovate; sepals 4, ovate, imbricate, obtuse or subacute, faintly pubescent, 2–3 mm long, 1.5–2 mm wide; stamens many, the filaments 1–2 mm long, anthers not quite 1 mm long.

Endemic; known only from Guam and Rota (cf. Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 33. 1935). In my experience this plant is rather shrubby, not much over 3–4 m tall, and the branches often ascending. It appears to be more frequent in, if not restricted to, the southern half of the island, where I have found it in savannahs, as at Manengon (4854), or very near the coast, as on slightly higher ground adjacent to a mangrove area at the mouth of the Lasaguas River (4673) near Apra. Hosokawa's Rota specimen also came from the coast, "in a thicket along a tidal line."

CARICACEAE

Pachycaul, few-branched, soft-wooded, lactiferous trees; leaves palmate,

large, spiralled; stipules none; petioles very long and stout; flowers monoecious or dioecious; calyx 5-parted, corolla of 5 free or (in male flowers) connate petals; stamens 5–10; ovary superior, 1-celled, ovules many, on parietal placentae (usually 5); styles 5; fruit a berry, sometimes very large and like a pepo (melon). —4 genera and perhaps 50 species, all of Tropical America and Africa. The papaya and its relatives (Carica and Jacaratia).

CARICA Linnaeus

With the characters of the family; about 45 species.

Carica papaya L. Sp. Pl. 1753. Safford 1905: 215. Merrill 1914: 116. 1036.
PAPAYA. PAWPAW.

A softwooded, un- or few-branched rather palm-like tree with copious, thick, sticky, irritating milky sap; leaves very large, palmately divided into about 7 to 11 lobes, these in turn irregularly pinnatifid and toothed; petioles longer than blade, often over 1 m long; trees usually male or female, or some bisexual but with separate male and female flowers; male flowers about 2 cm wide, white, numerous on long (30–90 cm) panicles; female flowers about 4–6 cm wide, white, subsessile, solitary of few together in leaf axils; fruit variously shaped, from subglobose and only 3–5 cm long in wild types, to cylindric and 1 m long, green turning yellow, orange, or red; flesh orange to red; seeds many, around the edges of the central cavity, small (3–4 mm thick), black, wrinkled, enclosed in a firm gelatinous membrane.

A tropical American plant, really a sort of huge herb rather than a tree; seldom over 10 m tall (though one tree—seen near Kona, Hawaii, a few years ago—was at least 15 m tall, was about 12-branched, and had a trunk over 1 m thick.) In Guam papayas are quite common as naturalized plants in abandoned farm clearings. Generally they have small fruits, less than 5 cm long in some cases, which have an insipid or even bitter taste and are quite worthless for fruits. The finest quality cultivars are rather scarce in Guam.

Harmon (3892).

The sap contains a meat-digesting enzyme, the principal ingredient (papain) in commercial meat-tenderizers.

The fruit are sought by fanihi (fruit-bats), pigeons, and perhaps other birds.

PASSIFLORACEAE

Shrubs or vines; leaves alternate, simple or compound, entire or lobed; often tendrillous; stipules small, caducous; petioles often with glands; flowers regular, bisexual or rarely otherwise; sepals 3–5; petals 3–5 or absent; corona usually present, composed of variously ringed or fringed bodies interposed between petals and stamens; stamens 5 or more, sometimes adnate to gynophore; ovary superior, 1-celled; placentae 3–5, parietal; fruit a berry or capsule; seeds many or few or one, embedded in pulp, enclosed in a gelatinous sheath.—12 genera and over 500 species, tropical or subtropical, many in Tropical America.

PASSIFLORA Linnaeus

Subshrubs, usually vines, climbing or trailing, some herbaceous, with axillary tendrils; leaves entire or lobed; flowers axillary, bracteate; calyx tubular, 5-lobed, often ciliate or laciniate; petals 5 or none; corona ring-like, in series, with various appendages; radially rymmetrical; stamens 5, borne from the gynophore; styles 3; fruit a berry, the rind often firm, sometimes capsular and tardily dehiscent.—About 400 species, all but 40 tropical American, the others from Madagascar, Asia, and the Pacific. Two species in Guam.

1. Petals present; leaves usually 3-lobed, hirsute; fruit orange.... *P. foetida*
1. Petals absent; leaves 3-lobed or entire; glabrous; fruit purple.. *P. suberosa*

Passiflora foetida L. Sp. Pl. 959. 1753.

var. *hispida* (DC.) Killip. Merrill & Perry, J. Arn. Arb. 27: 325. 1946.

LOVE-IN-A-MIST.

Perennial vine, the stems hispid, with tendrils; leaves 3-lobed, the lobing shallow to halfway to the midvein; lobe-apices acute; leafbase subcordate; both sides hispid-hirsute; blades 5–10 cm long, equally wide; petiole 2–5 cm long; flowers solitary in axils, 4–5 cm wide, purple and white on pedicels 3–7 cm long; fruit yellow to orange, subglobose, thin leathery-skinned, nearly 2 cm thick, with many seeds; pulp scanty, sweetly tart.—Fig. 69.

A pantropical weed, probably of American origin; in waste ground, secondary thickets, and abandoned fields. The leaves have a rather unpleasant odor, hence the name. The fruit pulp is edible, but very scanty. Barrigada Hill (4012).

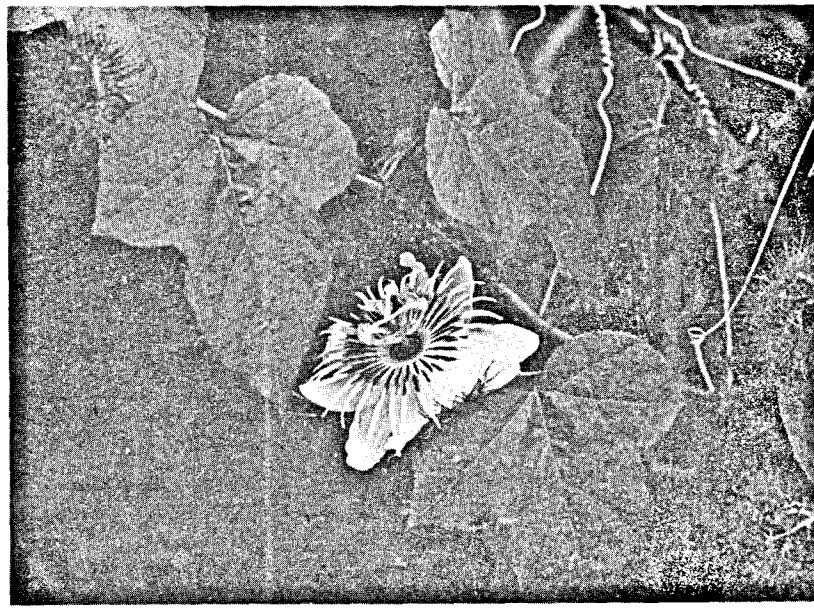

Fig. 69. Passiflora foetida var. hispida.

The very finely laciniate sepals enclosing the fruit probably gave rise to the curious name 'love-in-a-mist.'

Passiflora suberosa L. Sp. Pl. 959. 1753. Stone, Micronesica 1: 134. 1964.

Perennial tendrillous vine; glabrous; stems commonly purplish; leaves 3-lobed or entire, 4–8 cm long, if lobed the central lobe largest, acute; petiole 1–2.5 cm long, with 2 opposed glands; flowers solitary in axils; sepals yellow-green; inner coronal fringe purple; petals absent; flower 18–25 mm broad; pedicel 1.5–2.5 cm long; fruit subglobose, purple, nearly 1 cm thick; seeds wrinkled, 3–4 mm long.

A native of Tropical America, this is an aggressive weed; it seems to have appeared in Guam after 1945. It was first recorded from Fiji in 1942; and is also in Hawaii.

La Ciénaga Pond (4235); Tamuning (4754).

Note. The family BEGONIACEAE is probably represented in Guam by cultivated forms of *Begonia*, grown in pots or in gardens. The family consists of 5 genera and 800 species, almost all of which are in the genus Begonia. The Begonias are easily recognized by their succulent stems, usually asymmetrical simple and sometimes toothed and varicolored leaves, and their usually pink or white flowers, 2–5-merous, male or female; the fruits are berries or capsules with tiny seeds.

CACTACEAE

Succulent trees, shrubs, vines, or herbs, commonly spiny; stems thickened, sometimes flattened; leaves simple, caducous, or reduced, or absent; axils with spines and spinules; flowers perfect; sepals and petals many, spiral, intergrading; stamens many; ovary inferior, 1-celled, with many ovules on parietal placentae; fruit a berry.—Genera perhaps 100 (but very uncertain); species 1200; all of the American Continent, except *Rhipsalis* also in Africa, Madagascar, and Ceylon. One genus in Guam.

NOPALEA Salm-Dyck

Recognizable from the specific description.

A Mexican genus of a few spp.

NOPALEA COCHINELIFERA (Miller) Salm-Dyck, Cact. Hort. Dyck, ed. 2, 64. 1845. Merrill 1914: 116. *Opuntia* sp. of Safford 1905: 338. LENGUA-DE-VACA.

A succulent branching shrub 2–4 m tall with flattened oboval joints, these about 40 cm long or less, smooth or with a few minute spines; areolae pubescent and bristly; bristles soon caducous; leaves ephemeral, subulate, tiny; flowers marginal on stem-joints, 5 cm long, red; ovary with rhombic processes; stamens pink, longer than petals; fruit a red berry 5 cm long.

Tropical America. Formerly used as the host plant for the cochineal insect, source of a red dye. A few plants are grown in gardens in Merizo and Umatac. The fruit is juicy and edible.

THYMELAEACEAE

Trees, shrubs, or herbs; bark fibrous and tough; leaves alternate or opposite, simple, entire; flowers bisexual or unisexual; axillary or terminal, in various types of inflorescences; perianth 4–5-lobed, sepaloid or petaloid, tubular, 1 series, lobed imbricate, often with 1–2 scales at base; stamens 10, 8, 5, 4, or 2; anthers 2-celled; hypogynous disc of scales or annular; ovary superior, 1-2-celled; style sometimes excentric; ovules 1 per cell, pendulous, anatropous; fruit usually indehiscent drupaceous.—About 45 genera, both temperate or tropical. One genus in Guam.

WIKSTROEMIA Endlicher

Trees or shrubs; leaves usually alternate; flowers bisexual or sometimes unisexual; in spikes or racemes, terminal; perianth tubular, petaloid, 4-lobed; stamens 8; disc of scales; ovary 1-celled; stigma globose; fruit a drupe, 1-seeded.—About 20–25 species, Malaysia, S. China, Pacific Is., Hawaii.

Wikstroemia elliptica Merrill 1914: 116. GAPIT ATAYAKE.

A glabrous shrub, only the youngest branchlets appressed-pubescent; bark reddish-brown, tough and fibrous; leaves rather crowded, opposite, elliptic or ovate-elliptic, glaucous, 4–6 cm long, 2–3 cm wide, rounded at both ends or subacute at apex; lateral nerves about 9 pairs; petioles to 2 mm long; flowers in short axillary racemes; perianth yellow (with a tinge of green); fruit ovoid, vermilion red, not quite 1 cm long.

Native in Micronesia; the type from Guam; also in Rota, Saipan, Yap, and Palau. A shrub, seldom over 2 m tall, usually in savannahs, as in Manengon (3818; 3860; 3882; 4846); Agat (4215); but also in limestone, though much more scarce, as at Asdonlucas (5268) and near Ritidian Pt.

Easily recognized by the glaucous leaves, reddish, easily stripped but very tough bark, the 4-sided yellow apetalous flowers, and the small red drupes. The drupes are poisonous.

ELAEAGNACEAE

Trees or shrubs, silvery or tawny lepidote; leaves simple, entire; stipules none; flowers regular, bisexual or unisexual, white or yellow; cymes or fascicles axillary; perianth 1 series, petaloid, 2–6-lobed; stamens 4–12 or 2; ovary superior or inferior; 1-celled; stigma lateral; ovule 1, erect, basal; fruit a drupe.—3 genera of North temperate regions, a few in subtropics; some spp. have edible fruit.

ELAEAGNUS Linnaeus

Small trees or shrubs, sometimes spiny; leaves alternate, silvery-brown lepidote beneath (the scales peltate); flowers bisexual; perianth 4-lobed; stamens 4, inserted near apex of perianth-tube; ovary 1-celled, 1-ovulate; fruit indehiscent.—About 40 species.

ELAEAGNUS sp.—Stone, Micronesica 2(2): 140. 1967.

One plant, of an unidentified species, has been collected on the F.D. Leon Guerrero farm in Yona (5060) in 1964. The leaves are densely silvery-lepidote beneath; the flowers white.

PUNICACEAE

A monotypic family, with the characters of the single genus.

PUNICA Linnaeus

A genus of 2 species, with the essential characters of the species.—Iran, and Socotra, an island S. of Arabia.

PUNICA GRANATUM L. Sp. Pl. 472. 1753. Safford 1905: 362. Merrill 1914: 118.
GRANADA. POMEGRANATE.

A shrub 1–3 m tall, armed with a few spines; leaves ovate-oblong, glossy light green, 2–8 cm long, shortly petiolate, subopposite, margins slightly sinuate, apex blunt or retuse, base acute; youngest leaves reddish; flowers terminal, 1-few together; calyx tubular, thick, reddish, 5–8 lobed; petals vermilion-red, wrinkled, 5–8, about 2.5 cm long; stamens many, included; ovary inferior; fruit globose, 5–12 cm wide, capped by the persistent calyx, coriaceous, red, or yellow; seeds many, each enclosed in pink, crisp, translucent, edible, tart tissue.

A native of Iran, now widespread in cultivation, well-known for its edible fruit—actually the pulp around the seeds. The flowers and fruit are very handsome. It is occasional in Guam gardens. Barrigada (4016).

LYTHRACEAE

Trees, shrubs, or herbs; leaves opposite or whorled, or alternate, simple, entire, stipulate; flowers perfect; sepals 3–16, inserted on the margin of a tubular receptacle; petals and sepals free, equal in number, inserted on margin of receptacle; stamens usually twice as many as petals, inserted on the inner side of the receptacle; ovary superior, 1–6-celled; placentae axile; ovules 2-many; fruit a capsule.—About 20 genera and nearly 500 species, tropical and subtropical, a few warm-temperate. Four genera in Guam, one native.

Key to genera

1. Low suffruticose herb..... *Ammannia*
1. Shrubs or small trees,
   2. Petals 6, white; stamens 12 white; flowers solitary, axillary; leaves narrowly elliptic, fleshy; wild shrubs of rocky limestone coasts..... *Pemphis*
   2. Petals 4 or 6, white or pink; stamens 8 or more; flowers in terminal panicles, leaves not fleshy; cultivated shrubs.
      3. Petals 4; stamens 8; flowers white or pink, less than 1 cm long..... *Lawsonia*
      3. Petals 6; stamens many (c. 40); flowers pink, 2 cm long or more..... *Lagerstroemia*

AMMANNIA Linnaeus

Annual herbs, branches often 4-angled, leaves opposite, sessile, 1-nerved; flowers in cymes, 4–6-merous; stamens 2–8; ovary incompletely 2–4-locular or 1-locular; fruit a globose or ellipsoid capsule, irregularly dehiscent; seeds tiny, numerous.—About 20 species, of wet locations in tropics and N. temperate regions.

Ammannia coccinea Rottboell, Pl. Hort. Univ. Harn. Progr. Descr. 7. 1773. Merrill 1914: 117. ASTETEMA

Low herbs, slightly woody at root and stem-base, stems erect, to 50 cm tall; leaves linear-lanceolate, 2–5 cm long, 3–6 mm wide, acute, the base sessile and somewhat auriculate-clasping; flowers axillary in fascicles, pedicels scarcely 1 mm long; calyx 2.5 mm long, elongating to 4 mm in fruit; petals pink, obovate, very tiny; stamens very slightly exserted; capsule globose, enclosed by calyx, 3–4 mm thick.

N. and S. America; a weed in Asia; in ditches, grassy marshes, etc. Apra—O.S.I.R. Rd. (4723).

LAGERSTROEMIA Linnaeus

Trees or shrubs with simple, entire, alternate or opposite, sometimes distichous leaves; panicles terminal and axillary; calyx of 6 lobes (rarely 7–9); petals 6 (–9), clawed; stamens many; ovary sessile, 3–6-celled; capsule 3–6-valved; seeds winged.—About 25 paleotropical species, only the following ornamental one in Guam.

LAGERSTROEMIA INDICA L. Syst. ed. 10, 1076. 1759. Safford 1905: 305. Merrill 1914: 117. MELINDAES. CRAPE-MYRTLE.

Glabrous shrub or small tree 3–4 m tall; branchlets slightly 4-angled; leaves alternate, elliptic to oblong-subobovate, obtuse to acute, 2–6 cm long, subsessile; flowers pink or white in terminal panicles; flowers with campanulate 6-lobed calyx; petals wrinkled, clawed, 12–15 mm long; stamens about 40; fruit ovoid, 5 mm long, capsular; seeds winged.

A native of S. China, now widespread in cultivation for its showy flowers. Agaña (5089).

LAWSONIA Linnaeus

A monotypic genus with the characters of its species; Africa to Asia.

LAWSONIA INERMIS L. Sp. Pl. 349. 1753. Safford 1905: 306. Merrill 1914: 117. CINNAMOMO. HENNA.

A shrub to 3–4 m tall with opposite short-petiolate leaves to about 4 cm long, ovate or ovate-lanceolate; panicles terminal; flowers white or red, fragrant; sepals usually 4 (or up to 7); petals clawed, usually 4 (or to 7); flower about 6 mm broad; stamens usually 8; fruit a globose capsule 5 mm thick, partly clasped by the persistent calyx.

Native of Africa and W. Asia. The henna is a well-known dye, in the East applied to skin or hair. This is occasional in Guam gardens.

PEMPHIS Forster

Shrubs or small trees of rocky or sandy coasts throughout the paleotropical—Pacific region. With the characters of the species.—2 spp.

Pemphis acidula Forst., Char. Gen. Pl. 68, t. 34. 1776.

Safford 1905: 348. Merrill 1914: 117. NIGAS.

A shrub or small tree, often richly-branched, sometimes rather strict, often severely wind-and-spray-pruned and assuming a semi-prostrate habit; pubescent on young growth; leaves opposite, oblong-elliptic, slightly silky, narrow but fleshy, sessile, commonly 1–2.5 cm long, and seldom as much as 1.5 cm wide, usually only 5–12 mm; crowded on the branches; rather dull or slightly grayish-green; flowers single in axils, white, not fragrant, rather ephemeral, usually 1.5 cm wide; calyx-tube campanulate, ribbed (ribs about 12 or more), 6-toothed, often with 6 smaller alternating teeth; petals thin, white, clawed, wrinkled, rotate, 6 in number, inserted at apex of calyx-tube; stamens 12, in 2 series, inserted within the calyx-tube near the middle; ovary superior at base of calyx-tube, 3-celled; ovules numerous, erect; fruit an obovoid coriaceous capsule, opening by a lid (circumscissile), about 6–7 mm long, partly clasped by the calyx-tube, reddish-brown; seeds many, angular, cuneate-obovoid, smooth.—Pl. 10e.

Frequent on rocks and shores from E. Africa to the Pacific; indigenous and abundant in Guam, where it usually is shrubby and windswept. In some localities, the low limestone terraces near the sea are covered by a nearly pure stand of almost prostrate Pemphis plants (as near Asanite Bay). In quiet localities they may form trees with slender trunks 3–4 m tall, but I have never seen this form in Guam (it is sometimes seen in the Marshall Islands). The wood is very hard and suitable for spears.

Tagachan Bay (3987); Apra (4720).

The plants may be small in appearance but some have a very large woody root-system embedded in the nooks and chambers of the coral.

RHIZOPHORACEAE

Trees or shrubs with opposite, simple leaves; stipules interpetiolar; flowers bisexual, axillary; calyx stiff tubular, 4–16-lobed, valvate; petals the same number as sepals, entire, bifid, or laciniate; stamens usually twice as many as petals, or more; ovary 2–12-celled (rarely 1-celled), styles usually connate; cells 2-ovulate; ovules pendulous; fruit indehiscent, 1-seeded; seed often precociously germinating, the embryonic root emerging. About 17 genera, 80 species, throughout the tropics.

Key to Genera

1. Leaf-tip mucronate; proproots many; erect knee-roots lacking; calyx 4-lobed; petals entire; anthers multicelled..... *Rhizophora*
1. Leaftip not mucronate; proproots fewer, erect knee-roots common; calyx 8–16-lobed; petals bifid; anthers 4-celled..... *Bruguiera*

BRUGUIERA Lamarck

Trees with coriaceous leaves; flowers solitary or few in cymes; calyx 8–16-lobed, adnate to base of ovary; lobes narrow, pointed, valvate; stamens 16–32; ovary 2–4-celled; stigma slightly lobed; fruit turbinate, crowned by calyx; hypocotyl extruded prior to lapse of fruit from branch.—About 6 species, paleotropical.

Bruguiera gymnorrhiza (L.) Lamarck, Encycl. Tableau, 2: 517, t. 397. 1793; Encycl. Meth. 4: 696. 1797. Safford 202, pl. 40.

MANGLE MACHU. M. LAHE.

B. conjugata (L.) Merrill 1914: 118.

Tree of mangrove swamps, up to 25 m high but in Guam much less, seldom 10 m; stems slightly nodose, bark smooth; trunk with dark fissured bark, commonly with arched stilt-roots; leaves thick coriaceous, glossy dark green, elliptic-oblong, 10–20 cm long by 3–7 cm wide; leaves: petiole to 4 cm long; blade acute-acuminate at both ends; quite glabrous; stipules linear-lanceolate, reddish, caducous, to 3–5 cm long; flowers solitary in axils, somewhat nodding, on pedicel 1 cm long; calyx usually glossy red, firm, divided into 10–14 slender subulate lobes nearly 2 cm long, as long as the tube; petals 10–14, narrowly oblong, notched at apex, each lobe bristly; stamens many [or as few as 20], about 1 cm long; anthers linear 4–5 mm long; pollen dirty white; ovary 3–4-celled; style nearly 2 cm long; fruit turbinate 2 cm long, 1.5 cm thick, crowned by calyx-limb; hypocotyl 2 cm long, 1.5 cm thick, crowned by calyx-limb; somewhat extruded, cylindric, ribbed.—Pl. 10f.

From E. Africa to Polynesia in mangrove area. This is the handsomest of the mangrove trees because of the glossy red calyx. The petals are dull orange, but scarcely visible in the flower. Agfayan Bay (3923); Apra (4438); Ajayan R. mouth (5028).

RHIZOPHORA Linnaeus

Trees with stilt roots; leaves simple opposite mucronate; flowers usually in cymes; calyx 4-lobed with basal bracteoles; petals 4, entire, inserted on a fleshy disc; stamens 8–12; ovary 2-celled, half-inferior; ovules 2 per cell; stigma bilobed; fruit coriaceous, turbinate, commonly germinating while attached.—About 6 or 7 species, along all tropical coasts in mangrove swamps.

Key to species

1. Cymes always 2-flowered, shorter than petiole.....*R. apiculata*
1. Cymes several-flowered (always more than 2), longer than petiole.
   2. Style 1.5 mm long.....*R. mucronata*
   2. Style 4–6 mm long.....*R. stylosa*

Rhizophora apiculata Blume, En. Pl. Jav. 1: 91. 1827. MANGLE.

R. candelaria DC., sensu Merrill 1914: 118.

Tree to 30 m tall (ours always much shorter) with arching proproots often branched downward; leaves elliptic-oblong, 7–18 cm long, 3–8 cm wide, acute-apiculate, cuneate at base; stipules 4–8 cm long; cymes 2-flowered; flowers sessile;

calyx-lobes 4, 10–14 mm long; petals lanceolate, 8–11 mm long, stamens usually 12, 6–7.5 mm long; style 0.5–1.5 mm long, bilobed; fruit obpyriform, rough brown, 2–2.5 cm long; hypocotyl up to nearly 40 cm long.

Ceylon, tropical S. E. Asia, e. to Micronesia and New Britain, always in mud of tidal estuaries.

Rhizophora mucronata Lamarck, Encycl. Meth. 6: 189. 1804.

Safford 1905: 364, pl. 64. Merrill 1914: 119. MANGLE HEMBRA.

Small to medium trees with proproots, always in mangrove swamps; stipules conspicuous 5–8.5 cm long, caducous; leaves opposite, thickly coriaceous, glabrous, glossy, dark green, slightly paler below, 8–18 cm long, elliptic, obtuse but minutely acuminate and mucronate; petioles 2–5.5 cm long; cymes axillary, stout, usually 4–6–(or to 12) flowered, axes green, peduncle to 5 cm long; pedicels to 4–8 mm; nodes expanded; flowers nodding; calyx-lobes 13–19 mm, petals dull white 9 mm long, pubescent on edges; stamens 8; ovary 2-celled, cells 2-ovulate, style very short; fruit turbinate 3–7 cm long dark brown, rugose, germinating precociously, the hypocotyl cylindric-clavate often 30–60 cm long.—Fig. 70.

Fig. 70. Rhizophora mucronata.

Paleotropical mangrove tree. The wood is hard, durable in seawater, and reddish in color. Both bark and wood are rich in tannin. This species prefers slightly firmer, more sandy sites than *R. apiculata*, but not as sandy as those which suit *R. stylosa*.

Rhizophora stylosa Griffith, Not. Pl. As. 4: 665. 1854.

Ding Hou [in letter to Stone, 1963]. MANGLE.

Tree to 10 m tall with arching proproots; leaves broadly elliptic, 6.5–12.5 cm long, 3.5–6.5 cm wide, apex blunt, base cuneate; petiole 2.5–3.5 cm long; stipules 4–6 cm long; inflorescence forked 3 or 4 times, mostly 5–8-flowered; calyx-lobes 9–12 mm long; petals 8 mm long, pubescent on the edges; stamens 8; ovary depressed-conic; style 4–6 mm long; fruit obpyriform, apex strongly contracted, not rugose, 2.5–4 cm long; hypocotyl to 54 cm long.

Malaysia, Formosa, Melanesia, Micronesia, N. Australia, always along sandy shores and coral terraces facing the sea. Apra (4437; 4886).

COMBRETACEAE

Trees, shrubs, or woody climbers; leaves simple, opposite or alternate, or spiralled; stipules none; flowers bisexual or unisexual, in spikes or racemes; sepals 4–5, connate; petals none or 4–5, distinct; stamens 4–5, opposite the sepals, or 8–10, or 12–15, or many; ovary inferior, or superior, 1-celled, with (1)-2-several or many pendulous ovules; fruit a drupe or samara; seed usually single.—About 18 genera in the tropics.

Two genera in Guam.

Key to local genera

1. Mangrove swamp tree; with rather large red flowers, the petals obvious; fruit ellipsoid ..... *Lumnitzera*
1. Strand or upland trees, not in mangrove swamps; flowers tiny, in slender spikes; fruit compressed, narrowly winged, obovate ..... *Terminalia*

LUMNITZERA Willdenow

Small glabrous trees of mangrove swamps. Leaves thick leathery. Flowers in racemes; calyx 5-lobed, persistent; petals oblong; stamens 10 in 2 series (or less); ovary 1-celled; style simple; ovules 2–5; fruit woody, striate.—Two paleotropical species.

One species in Guam.

Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calcutt. 39. 1845.

Merrill 1914: 120. NANA. BACAWAINE.

Pyrranthus littoreus W. Jack, Malay Miscellany 2(7): 7. 1822.

Lumnitzera pedicellata Presl, Rel. Haenk. 2: 23. 1830.

Lumnitzera purpurea Presl, Repert. 1: 155. 1834.

Laguncularia purpurea Gaud. Bot. Voy. Freyc. 481, t. 104. "1826" (1830).

Glabrous, small mangrove swamp tree; leaves crowded at branch ends, obovate, leathery, apically rounded, usually notched; up to 8 cm long; subsessile; flowers scarlet to crimson red, about 1.5–2 cm long, in spicate racemes; calyx green; fruit ellipsoidal, aging black, crowned by the persistent calyx, 2 cm long, slightly ribbed. —Fig. 71, Pl. 11a.

Indomalaysia to the Pacific, always in mangrove swamps. Sasa R. mouth,

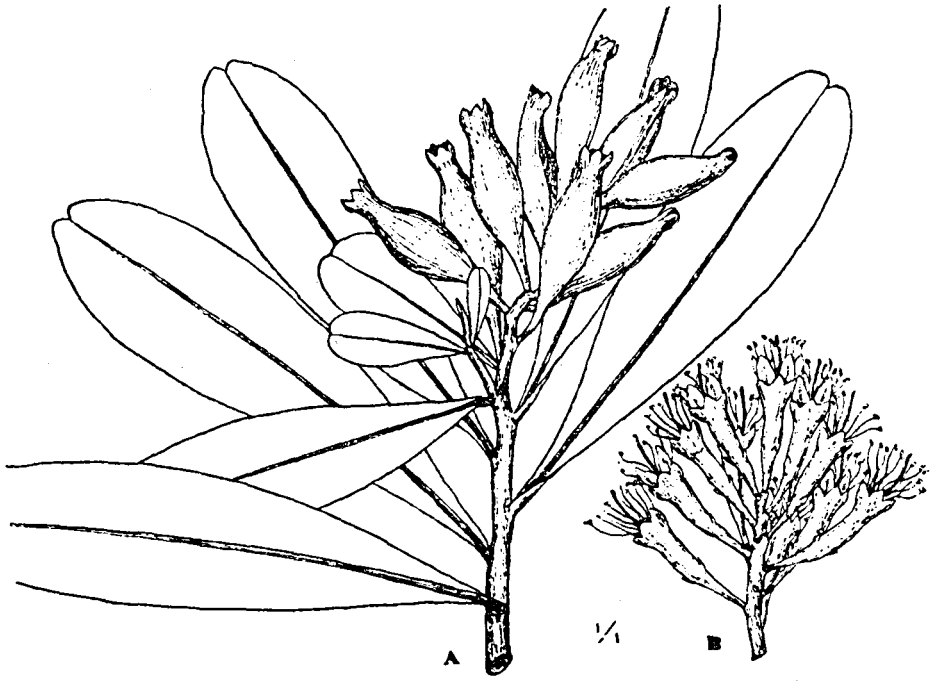

Fig. 71. Lumnitzera littorea.

(4147); Laguas R. mouth (4397); Apra Harbor (4435). When in flower this is exceedingly handsome.

TERMINALIA Linnaeus

Small, medium or large trees with 'pagoda' branching, branches in whorls, radiating horizontally; leaves spiralled, entire or slightly crenulate; flowers in slender, spikelike racemes or spikes, or panicles; flowers small bisexual or both staminate and bisexual on the same spike; calyx 5-lobed, the lobes caducous; petals none; stamens 10, borne on the calyx-tube; pubescent epigynous disc present; fruit coriaceous, ovoid or obovoid, angled or alate; seed one.—About 130 species; pantropical.

Two species in Guam.

1. Medium to big trees of uplands, generally cultivated, but also on edge of beaches; leaves sometimes 15–30 cm long.....*T. catappa*
1. Shrub or small tree, always littoral, on the beach or among coral boulders; leaves generally less than 20 cm long, or smaller;.....*T. littoralis*

Terminalia catappa L., Mantissa Pl. 1: 128. 1767. Safford 1905: 385.
Merrill 1914: 119. TALISAI.

Medium to large tree, semi-deciduous [at some seasons nearly leafless], with pronounced 'pagoda'-type branching; leaves clustered toward ends of branchlets,

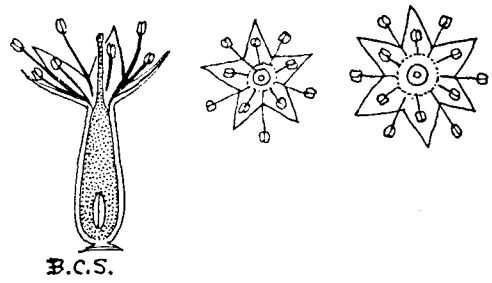

Fig. 72. Terminalia catappa.

large, coriaceous, obovate, short-petiolate, 20–30 cm long, 8–12 cm broad, 2 glands at base, apex rounded, *withering reddish*; midrib slightly pubescent; inflorescence an axillary, slender spike, about 10–15 cm; flowers polygamous, calyx puberulent inside; fruit an ovoid, subelliptic, or obovoid, compressed, very narrowly winged 1-seeded drupe up to 5 cm long; seed edible.—Fig. 72.

Paleotropics; a strand species. Also introduced as a cultivated plant. The edible seeds are excellent, roasted with caramel. Agaña (4007).

Talisai is the Philippine name for this species.

A very characteristic tree, with pagoda-branching; large obovate leaves turning red when old; and narrowly winged drupes. It is not particularly common in Guam but is being planted now more extensively.

Terminalia littoralis Seemann, Fl. Vit. 94. 1865. TALISAI GANU.

T. samoensis Rechinger, Rep. Sp. Nov. 4: 229. 1907.

T. saffordii Merrill, 1914: 119.

Shrub or little tree; leaves crowded near ends of branches, pubescent, obovate, about 10–15 (rarely 20) cm long, 8–12 cm broad, apex rounded, base rounded or obtuse; a gland near apex of petiole on each side of midrib; lateral nerves 9–10 pairs; petioles 1 cm. Inflorescence axillary, spicate, up to 8 cm long, slightly pubescent; flowers white, tiny; fruit oblong-ovoid to narrowly ovoid, glabrous, red, to 2 cm long, about 8 mm wide, compressed, not keeled.—Pl. 11b.

Pacific Islands, on sandy beaches or rocky coasts.

Always on the strand, in sand or among coral rocks, very similar to *T. catappa* but smaller throughout. Marine Beach near Yona (4414).

As Merrill himself suggested this species included the Guam plants which he discriminated as a new species.

As in most Terminalias, the leaves wither bright red.

LECYTHIDACEAE

Trees (rarely shrubs) with spiralled alternate simple usually entire leaves; stipules none; flowers bisexual; solitary or in racemes; sepals (2–) 4–6; petals 4–6 or absent; stamens many, in several series, slightly connate at base; some may lack anthers; disc often present, intrastaminal; overy inferior, 2–6-(more)-celled; ovules

1-many per cell; on axile placentae; fruit a berry or drupe, or a circumscissile capsule; seeds without endosperm.—About 18 genera in S. America, Africa, Malaysia, and the Pacific; one genus in Guam.

BARRINGTONIA Forster

Trees with simple leaves; flowers in racemes or spikes, axillary and/or terminal; calyx 2–5-lobed; petals 4 or 5, imbricate; stamens very many, shortly connate basally; ovary 2-4-celled, crowned by the annular disc; style long filiform; cells 2–8-ovulate; ovules pendulous; fruit fibrous-coriaceous, ellipsoid, globose, or 4–5-angled, crowned by the calyx-limb, 1-seeded by abortion of all but 1 ovule; seed ovoid or ellipsoid, large.

—45 paleotropical species, two in Guam.

1. Leaves obtuse or rounded; flowers in shoot erect terminal racemes; fruit boxy, 10–12 cm long; sandy or rocky coasts.....*B. asiatica*
1. Leaves acuminate; flowers in elongate pendent axillary spikelike racemes; riverine—fresh water swamp trees
   2. Flowers sessile, calyx closed in bud.....*B. racemosa*
   2. Flowers pedicellate, calyx open at top in bud.....*B. samoensis*

Barringtonia asiatica (L.) Kurz, J. Asiatic Soc. Bengal. 45(2): 131. 1876; 46(2): 70. 1877. Merrill 1914: 120.

B. speciosa Forster, Char. Gen. Pl. 76, t. 38, 1776; Safford 1905: 196, pl. 38. PUTING.

A tree to 25 m tall (much shorter in Guam); bark gray; branchlets rather stout; leaves crowded near branch ends, glabrous, glossy, large, entire, 15–50 cm long, 8–24 cm wide, obovate, subcoriaceous, subsessile, rounded-obtuse, base long, tapered, "pinkish-olive" when young (Corner); old leaves withering yellow to pale orange; flowers in more or less erect cymes about 10 cm long, very large (15 cm broad); calyx 2-lobed; petals white 7.5 cm long; stamens white at base, pink at apex; fragrance sweetly pleasant; fruit usually square boxlike (rarely pentagonal), subturbinate, 10–12 cm long, brown when mature, exterior fibrous, crowned by the calyx, pendent and heavy when ripe, usually 1-seeded; seeds with a stupefying effect on fish.—Fig. 73.

Shores of the Indian and Pacific Oceans in tropics; a wide-spread, typical paleotropical strand plant, quite common in Guam and well-known by its name *puting* (which seems to mean a poultice). The flowers are extremely attractive and very fragrant, but one must be up early to see them. The fruits are common in sea drift, especially on the W. coast; explaining the littoral distribution of the species. Seldom over 15 m tall in Guam, often bushy on the E. coast. Yigo-Atdosco (4274); Asanite Pt. (4301); Tumon Bay (4962). Planted on College Campus.

Barringtonia racemosa (L.) Blume ex DC. Prodr. 3: 288. 1828; Roxb. Fl. Ind. 2: 634. 1832. Safford 1905: 196. Merrill 1914: 120. LANGASAT.

A tree to about 10 m tall; leaves 15–45 cm long, 6–18 cm wide, elliptic-obovate, acuminate, subsessile or very shortly petiolate, margins finely crenulate-serrate,

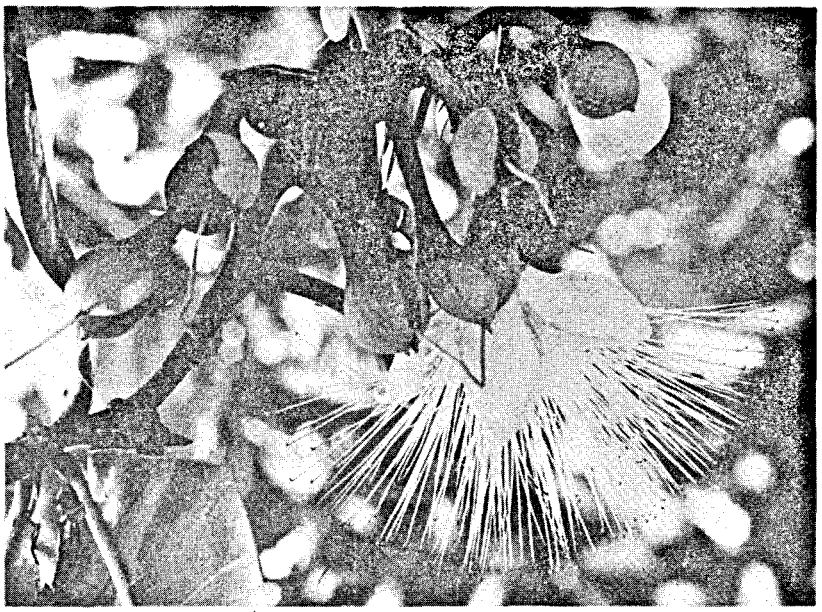

Fig. 73. Barringtonia asiatica.

thinly coriaceous; reddish when young, withering orange-red; flowers pink or white, subsessile on elongated hanging spikelike racemes to 60 cm long from axils; calyx 2–3-lobed reddish; petals white or pink, nearly 2 cm long, or even larger; stamens many, pink; rarely white; fruit ovoid-ellipsoid, not much angled but sometimes obscurely 4-grooved, crowned by calyx limb, mostly 5–8 cm long and 3–5 cm thick, reddish to brown.

Native from E. Africa through Indo-malaysia to Polynesia; generally a tree of rivers, freshwater swamps, or lowlands by ditches; occasionally also on rocky shores; rarely if ever on sandy beaches. In Guam virtually restricted to rivers and their adjacent flood-plains; very common along the Talofofo, and other rivers of S. Guam, commonly forming nearly pure stands. White-flowered and pink-flowered forms occur intermixed. As in *B. asiatica* the seeds and fruit, also the bark, contain a saponin that seems to stun fish. The bark contains tannin.

Talofofo River flood plain (3969; 3992).

Barringtonia samoensis A. Gray, Bot. U. S. Expl. Exped. 1: 508. 1854.

Payens, Blumea 15(2): 201–3. 1967.

A tree in almost every respect similar to *B. racemosa* (q.v.) but differing as follows: flowers pedicellate; calyx closed, or nearly so, in bud; leaves chartaceous; stamens in 3–4 whorls; sepals at anthesis 5–7.5 mm long, 3–10 mm wide; fruit 4.5–7 cm long, 2.5–5 cm thick, 6-ribbed, pedicellate.—Fig. 74.

Freshwater swamps and estuaries; Celebes and Moluccas, New Guinea, Caroline Is. to Polynesia (Samoa and Tahiti).

S. Guam (R. J. Rodin).

Fig. 74. Barringtonia samoensis.

Note: Although these 2 species (*B. samoensis* and *B. racemosa*) appear to be distinct, there are some cases of intergrading in Guam and the differential characters may not all hold up well. It is possible that some hybridization occurs; perhaps the Guam populations are intermediate. A detailed field study of this problem would be most valuable.

MYRTACEAE

Trees, shrubs, or rarely herbs; leaves usually opposite, simple, usually entire, pinnately nerved or rarely 3-nerved, mostly pellucid-glandular; stipules none; flowers bisexual (very rarely otherwise), regular, solitary or in inflorescences; calyx tubular and 4–5-lobed or -toothed; or entire; petals free, 4 or 5, alternate with sepals, rarely absent; sometimes connate to form a caducous calyptra; stamens many, free or connate in bundles; anthers small; ovary inferior or half-inferior, with disc, 1-celled, with 1-more ovules, or 2-many-celled with many ovules; placentae axile; fruit a berry, drupe, nut, or capsule, 1-celled or 2-many-celled, 1-seeded or many-seeded; seeds without endosperm.

—Nearly 100 genera in both tropical and subtropical regions of both hemispheres; more than 2800 species. Seven genera reported for Guam, of which three are indigenous.

Key to Genera

A. Flowers (or stamens) red, white or pink, not in dense spikes; fruit fleshy, except Eucalyptus.
  1. Leaves alternate; fruit dry, dehiscent, capsular; leaves etc. pungent-odorous ..... *Eucalyptus*
  1. Leaves opposite; fruit indehiscent, more or less fleshy or pulpy.
    2. Fruit large (to 6–8 cm long), dull yellow, fleshy and edible; seeds many ..... *Psidium*
    2. Fruit smaller, red or purple-black, edible or not; seeds few (6).
      3. Microphyllous shrub with decussate leaves about 1 cm long; fruit globular, 3–4 mm wide, purple-black, with 3 seeds; savannahs ..... *Myrtella*
      3. Not as above,
        4. Tree (rare in cultivation) with pungent-odorous leaves; inflorescence a branched, open subterminal panicle.. *Pimenta*
        4. Wild trees or shrubs or cultivated trees with no or faint fragrance; inflorescence various, usually axillary.
          5. Shrub with pubescent branchlets; fruits 4–5 celled, usually 10-seeded (or 4–10); savannahs.... *Decaspermum*
          5. Shrubs or trees, usually glabrous; fruit 1–3-seeded; limestone or mixed soils..... *Eugenia*

A. Flowers (stamens) bright red, in dense spikes; cult. tree fruit capsular..... ..... *Callistemon*

CALLISTEMON R. Brown

An Australian genus of 25 species, in Guam only in cultivation.

Callistemon lanceolatus DC. Prod. 3: 223. 1828. RED BOTTLEBRUSH.

A small shrubby tree 3–10 m tall; leaves stiff, grayish-green, lanceolate, sharply acute, 3–8 cm long, about 6–7 mm wide, pinnately-veined, veins conspicuous, with a marginal nerve; inflorescence a dense cylindrical spike 5–10 cm long in upper axils; flowers crowded, sessile; calyx tube short, the lobes caducous; petals ephemeral; stamens many, bright red, the anthers too, about 2 cm long; fruit a 3–4-celled capsule 3–4 mm long.

An Australian species now well-known in cultivation. The resemblance of the dense flowering spike to a bottle-(or test-tube-) brush accounts for the name. Agaña garden (4682).

DECASPERMUM J.R. & G. Forster

Small trees or shrubs with opposite pinnately-nerved leaves; flowers in sub-

terminal axillary racemes forming leafy panicles, usually bisexual; calyx campanulate, barely or not at all extended beyond the ovary, 4–5-lobed; petals usually white or pink, 3–5; stamens many and distinct; ovary 4–5-celled; cells usually 2-ovulate (rarely more); false partitions sometimes present; stigma peltate; fruit a berry crowned by calyx; seeds few (usually 6–10), reniform, the testa firm.—About half a dozen Indomalaysian, Pacific and Australasian species, 1 in Guam, native.

Decaspermum fruticosum J.R. & G. Forster, Char. Gen. Pl. 74, t. 37, 1776.

D. paniculatum (Lindl.) Kurz, J. Asiatic Soc. Bengal 46: 61. 1877; Merrill 1914: 120.

?*D. raymundii* Diels, Engl. Bot. Jahrb. 56: 530. 1921.

A small tree or shrub usually appressed-pubescent on at least the youngest parts (hairs reddish or grayish); new leaves pink or pale pinkish violet; leaves opposite, narrowly elliptic or elliptic-ovate, acute and sharply acuminate, mostly 3–7 cm long and 1–3 cm wide, base slightly obtuse, petiole 1–4 mm long; flowers in bracteolate cymes forming leafy clusters at branch tips; peduncules and pedicels pubescent; last bracteoles of pedicel linear; calyx 4–5-lobed, pubescent; petals 4 or 5, white or at base tinged pinkish, 3–4 mm long, the margins ciliate, tips acute; stamens many, white or pinkish; fruit depressed-globose, about 1 cm wide, slightly juicy, purple, crowned by the tiny calyx limb, with as many as 10 seeds, or fewer.

Native (in the conservative concept here adopted) from Burma eastward to Australia and in many Pacific Islands. The species recognized by Merrill seems only one of the variants in a widespread and variable population; as is perhaps true also of the hairy, small, pink-flowered form in Palau named *D. raymundii* by Diels. In Malaya, and in the Solomon Islands this plant becomes 10–15 m tall, but in Guam it seems always to be shrubby. It is a savannah plant, rather common, often in company with *Myrtella*, and is not found on limestone. Manengon (3823; 4848).

EUCALPYTUS L'Heritier

Trees, often with peeling smooth bark; leaves opposite in young plants but often alternate in older ones; crushed leaves redolent of spices (e.g. menthol, cinnamon, etc.); flowers similar to those of *Eugenia* but the calyx-limb caducous as a lid (calyptra); fruit a woody capsule, opening by slits; seeds small and numerous.—A big genus, almost entirely Australian except a few outlying species in New Guinea and W. Irian; probably 200 species.

EUCALYPTUS sp.—One or more species have been on occasion planted in Guam; and one grew well (in the garden of Paul Souder) but perished during typhoon "Karen" in 1962. I know of no other plants presently in Guam.

EUGENIA Linnaeus

Trees or shrubs, usually quite glabrous; leaves opposite, pinnately nerved, usually with distinct marginal nerves; petioles short; flowers usually in inflorescences (cymes, racemes, or panicles), rarely solitary or fascicled; flowers generally small;

calyx tube globose or cylindric, 4–5-lobed; petals 4–5; distinct or connate as a calyptra; stamens numerous, usually showy (20–200 or more), free or connate in bundles; anthers small; ovary inferior, the style elongate, 2–3-celled; ovules few to many in each cell; but seeds few; fruit rounded or oblong, or subpyriform, or discoid-turbinate, usually fleshy and juicy, crowned by calyx, usually red, purple, or white (rarely yellowish), often edible with a characteristic faintly sweet, often rather insipid, flavor; seeds few, often 2 or only 1, sometimes large; embryo with distinct cotyledons.—(incl. *Jambosa, Jossinia,* and *Syzygium*).—A large and important genus with over 1000 species, in tropics and subtropics around the world.

Key to Species

[Note: one undet. sp. is omitted; a big tree with magenta berries; 1 tree seen in Piti].

1. Leaves cordate at base, oblong-elliptic-ovate, 8–20 cm long; big tree of limestone forests; flowers borne on trunk or big branches near the ground, often accompanied by a few pairs of leaves..... *E. thompsonii*
1. Not as above, in all respects,
   2. Flowers solitary or 2–3 together and fascicled in leaf axils; wild (except E. uniflora) plants on limestone, shrubs or small trees.
      3. Flowers often several in fascicles; fruit conspicuously grooved and ridged; leaf margin often irregularly wavy; apex acuminate but blunt ..... *E. uniflora*
      3. Flowers nearly always solitary; fruit globose, not at all grooved or ridged; leaf margin entire; apex various.
         4. Pedicels 1 cm long or less, commonly about 5 mm; petiole 1–2 mm; leaves bluntly acute or obtuse or rounded, medium green, not or very obscurely acuminate; shrubs.
            5. Small shrub less than 1 m tall, sometimes only 20 cm tall; ..... *E. bryanii*
            5. Medium shrub (1–2 m)..... *E. palumbis*
         4. Pedicels 2–2.5(–3) cm long; petiole 3–4 mm; leaves elliptic, acute, usually slightly blunt-acuminate, dark green; little trees or shrubs..... *E. reinwardtiana*
   2. Flowers in cymes or panicles; or if fascicled, then on branches bare of leaves; introduced plants (or one? wild); big tree.
      6. Stamens red; flowers in fascicles on branches behind the leaves; fruit large, crisp-fleshy, edible, pink or white, 5–7 cm long; often striped; calyx-tube 1–3 cm long; lvs. 5–9 cm wide.... *E. malaccensis*
      6. Not as above; stamens white or pinkish; flowers in cymose panicles in axils of leaves; fruit smaller; calyx-tube similar or smaller.
         7. Flowers rather large, 2.5–3 cm wide; fruit whitish, about 3–5 cm wide; leaves usually 6–10 cm wide..... *E. javanica*
         7. Flowers smaller, 1–1.5 cm wide; fruit purplish-black, oblong,

1.3–2.5 cm long; leaves usually less than 7 cm wide. . *E. cumini*

Eugenia bryanii Kanehira, Bot. Mag. Tokyo 51: 913, f. 68, 1937.

Jossinia bryanii (Kanehira) Hosokawa, J. Jap. Bot. 16(9): 542. 1940.

Shrub 2–3 m tall with terete branchlets, cinerous-puberulent only on youngest parts; adult structures glabrate; leaves opposite, often crowded and subverticullate, 1–2 cm long, 5–7 mm wide, narrowly elliptic, acute at both ends but apex at last minutely blunt, light or medium green, puncticulate beneath, margins slightly rolled down, nerves (except midrib) obscure, petiole 1 mm long or shorter; flowers solitary or 2–3 together in axils of upper leaves, broadly funnel form, gland-dotted, 4-lobed, 6 mm broad; lobes ovate, spreading, 3.5 mm long; petals 4, white, fugacious, orbicular-reniform, 6×5 mm, gland-dotted; stamens about 30, equalling petals; ovary ovoid, 2-celled, ovules many; fruit a bright red crisp-succulent thin-fleshed usually 1-seeded globose-truncate berry 5–8 mm thick.

Endemic, known only from Guam. The species is named for E. H. Bryan Jr. of the Bishop Museum, Honolulu, a former resident of Guam and author of many magazine and newspaper articles about Guam plants. Achugas Pt. (Bryan 1229, holotype in Herb. Kyushu Univ.), Ritidian Pt., on edge of cliff (4964).

This species is controversial. Its relationship is with *E. palumbis*, and I suspect that *E. bryanii* is just an extreme dwarf form of Merrill's species. The following specimens appear to me to be more or less intermediate, linking the two alleged species: Dos Amantes Pt., limestone cliff, 3946; 4042; 4228. These have rather wide leaves.

A thorough study of this problem would be most revealing, but needs much fieldwork and first-hand experience in the native haunts of these plants.

EUGENIA CUMINI (L.) Druce, Bot. Exch. Cl. 418, 1918. JAMBOLAN.

A tree to 20 m tall with scaly gray bark; leaves opposite, dark green, 5–15 cm long, 2.5–8 cm wide, acuminate, elliptic-oblong, narrow; petioles 1–2.5 cm long; flowers in cymose clusters, axillary or in axils of fallen leaves, white or pink, 12 mm wide; calyx 4–6 mm wide, up to 8 mm long; petals caducous; stamens many (c. 50), exserted, white or pinkish, to 7 mm long; fruit oblong, 2–2.5 cm long, deep purplish-black, juicy; seed 1, large, green.

An Indo-Malaysian species, presently rather widespread in cultivation. This is the large tree planted on the slopes around the Governor's residence, and elsewhere in Agaña Heights (4281).

EUGENIA JAVANICA Lamarck, Encycl. 3: 200, 1789. Merrill 1914: 120.

MACUPA. WAX-APPLE.

A big or medium tree; leaves opposite, 10–25 cm long, 5–12 cm wide, acute, rounded or obtuse basally, oblong-elliptic, coriaceous; petiole 3–5 mm long; flowers in axillary cymes, white, 2.5–3.5 cm wide; fruit subglobose or somewhat pyriform, 2.5–3.5 cm long. 2.5–5.5 cm wide, greenish or white, waxy in appearance.

A Malaysian species known also from the Caroline Islands, but whether wild or introduced is not certain. It may possibly be native in Guam, but this is much in doubt. The fruits are edible.

EUGENIA MALACCENSIS L. Sp. Pl. 470. 1753. Merrill 1914: 121. MACUPA (?).

Caryophyllus malaccensis (L.) Wight ex Safford 1905: 217.

A tree to 15 m tall; leaves opposite, elliptic to oblong-obovate, commonly 10–18 cm (or upto 25 cm) long and 6–8 cm (to 12 cm) wide, glossy, glabrous, paler beneath, obscurely punctate, bluntly acuminate, basally acute; petiole to 10 mm long; flowers in cymes on older branches and on the trunk, cymes about 5 cm long; calyx-tube turbinate, about 1 cm long; 4-lobed, lobes rounded, wider than long; petals red, fugacious, 4, 8 mm long and slightly wider, concave, obovate; stamens many (c. 125) erect, red, 1–2 cm long; anthers small, yellowish; ovary discoid red apically, style dark red, nearly 2 cm long; fruit obovoid, about 7×6 cm, glossy and slightly waxy in appearance, crisp-succulent, red or white or striped, usually 1-seeded, edible; seed large, about 2 cm broad.

An Indomalaysian cultivar of great antiquity, planted in many parts of the tropics, carried about in the Pacific by island peoples. It is known in Hawaii as 'mountain-apple' and elsewhere as 'Malay-apple'. The fruits are rather bland but pleasant. The existence of this plant in Guam is uncertain.

Eugenia palumbis Merrill 1914: 122. AGATELANG.

Jossinia palumbis (Merr.) Diels, Engl. Bot. Jahrb. 56: 531. 1921. Hosokawa, J. Jap. Bot. 16: 542. 1940.

A shrub, nearly glabrous, only the youngest branchlets and calyx slightly

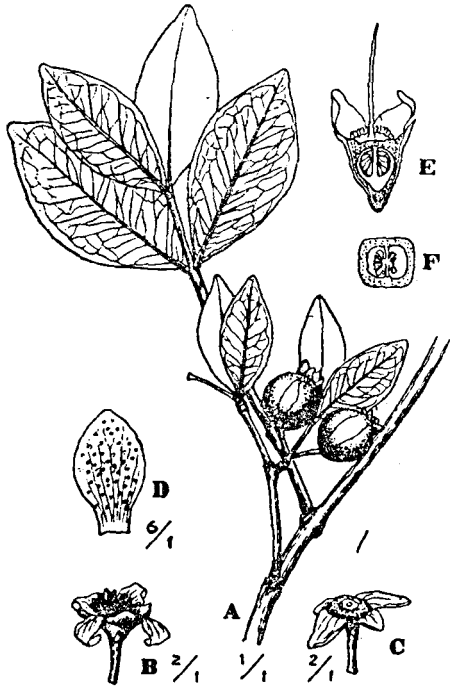

Fig. 75. Eugenia palumbis.

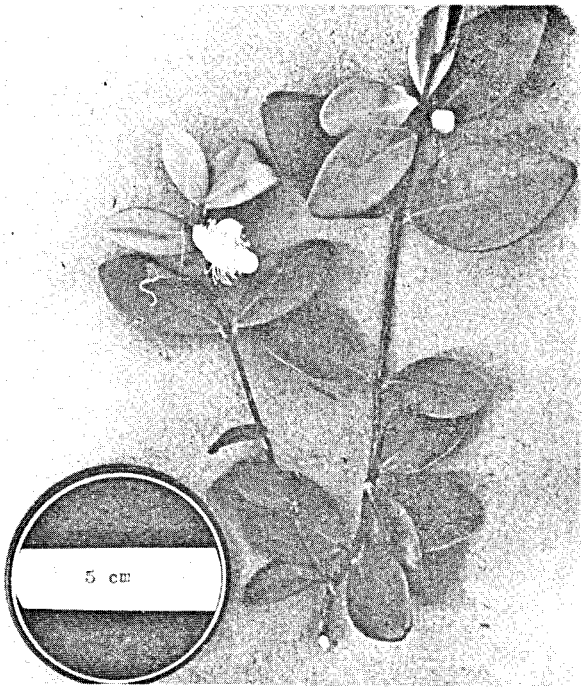

Fig. 76. Eugenia palumbis.

pubescent but glabrate; branches slender, erect or spreading, light brown; leaves elliptic to ovate-elliptic or a few sub-obovate, coriaceous, rather light green, 3.5–6 cm long, 1–2.5 cm wide, apically obtuse sometimes emarginate, basally subacute, margins slightly rolled down, the dorsal surface faintly gland-dotted, lateral nerves 4–6 pairs, obscure; petioles 1–3 mm long; flowers solitary, axillary, rather shortly pedicellate (2–5 mm); calyx funnelform, slightly puberulent, 4-lobed, lobes about 3 mm long, broadly ovate, glandular; petals 4, white, thin; about 7 mm long, broadly obovate; stamens many, white, equalling petals; fruit subglobose, truncate, crowned by the calyx, bright red, succulent, edible, about 1 cm thick, 1–2-seeded. Fig. 75, 76.

Endemic in the Marianas Is. (Guam, Tinian, Rota, Saipan). This attractive shrub is rather common, usually in openings in the forest or near the sea on cliffs, always on limestone. The white flowers, bright red fruits, shrubby stature, and rather small, blunt or notched, pale green leaves easily identify this species. It is very closely related to *E. bryanii* (and see remarks under that species). The name *palumbis* commemmorates Padre Jose Palomo, a respected and knowledgeable Guamanian who was of much aid to Safford. Talofofo Bay, N. headland (5045).

Eugenia reinwardtiana DC. Prodr. 3: 267. 1828. Walker & Rodin 1949: 463. Hosokawa, J. Jap. Bot. 16: 542. 1940. A'ABANG

Jossinia reinwardtiana (DC.) Blume; Diels, Engl. Bot. Jahrb. 56: 531. 1921.

E. costenoblei Merrill 1914: 123; sub *Jossinia* in Diels l.c.

A small tree or shrub, young parts very slightly pubescent, soon glabrate; branchlets slender, terete, pale; leaves opposite, elliptic or oblong-elliptic, 6–9 cm long, 3–5 cm wide, dark rather glossy green, acute and briefly blunt-acuminate, base subacute, lower surface duller, nerves 7 or 8 pairs; petiole 3–4 mm long; texture of blade thin coriaceous; flowers solitary in axils on pedicels about 2–2.5 cm long (faintly pubescent), slender; bracts 2, very small; or up to 4.5 mm long, appressed to base of calyx; calyx pubescent, 4-lobed, lobes pubescent on both sides, deltoid-ovate, up to 8 mm long and 6 mm wide, reflexed in age; petals (white) 4, *ephemeral*, obliquely ovate, about 1.5 cm long; stamens many, to 12 mm long, the anthers 1–1.2 mm long; fruit subglobose fleshy, red, capped by calyx limb, 10–12 mm thick.

Native of Malaysia (Molucca Is.) and some Pacific Islands.—Fig. 77.

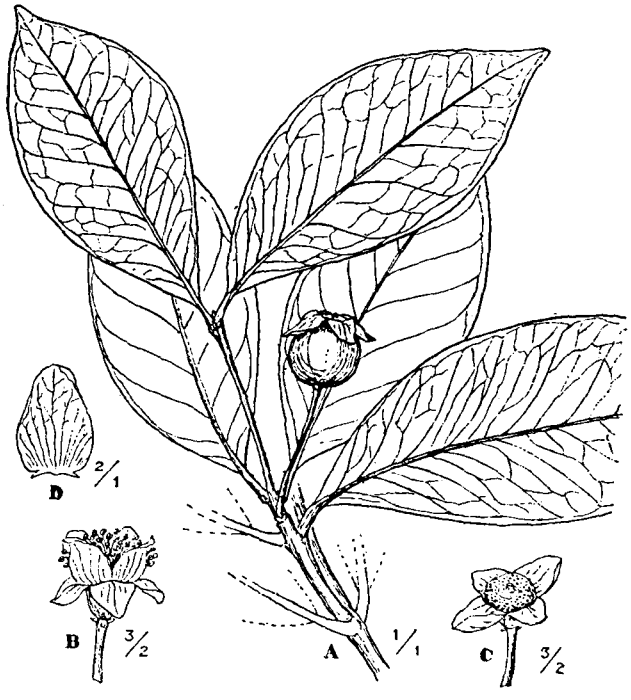

Fig. 77. Eugenia reinwardtiana.

This little tree is perhaps the most common species of the genus in Guam (though *E. palumbis* is also rather abundant). It is a component of the limestone forest community and can be found in almost any good stand of native forest in the northern half of the island. It is easily seen in the College of Guam nature-reserve, where it occurs with cycads, *Guamia, Bleekeria, Cordia,* and other typical limestone plants. It is a handsome tree mainly for its foliage and fruit; the flowers are pretty but the petals are very fugacious, and fall off almost as soon as the flower

opens. Good specimens (with petals) are few! The fruit, like those of nearly all eugenias, is edible. Pago Bay cliffs (4128); Ritidian Pt. (5037); Asdonlucas (5267).—The flowers are often slightly supra-axillary, and turned 180° from the plane of the leaves; the fragrance of the flowers I have noted as "not quite pleasant."

Eugenia thompsonii Merrill 1914: 12. ATOTO.

Jambosa thompsonii (Merr.) Diels, Engl. Bot. Jahrb. 56: 533. 1921. Hosokawa, J.J.B. 16: 542. 1940.

A big tree, glabrous throughout, with rough reddish-brown bark; leaves opposite, oblong-ovate or oblong-lanceolate, rather deeply cordate, apex acute or obtuse, 8–18 cm long, 3–8 cm wide, coriacous, lateral nerves about 10 pairs, glossy above, slightly paler and dull beneath; petioles very short (3 mm); flowering panicles fascicled on the main trunk or its first branch, 10–20 cm long, with a few basal pairs of leaves (or none), branches about 4–8 cm long, opposite; flowers in triads, on short (1–3 mm) pedicels; calyx funnel form, 8–10 mm long, 4-lobed, lobes short and broad; petals 4, suborbicular, 6–7 mm wide, prominently glandular; stamens many, filaments 6–8 mm long, anthers 1 mm long; fruit subglobose-ovoid 1.5 cm long, truncate at apex, calyx-limb persistent, dark red; seeds 1 or 2.—Fig. 78.

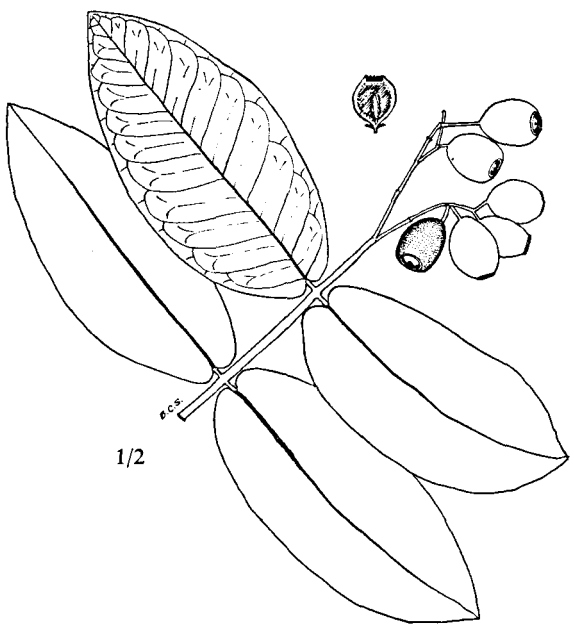

Fig. 78. Eugenia thompsonii.

Endemic in the Marianas Is., known from Guam (type locality), Saipan (source of the vernacular name), and Rota; a member of the limestone forest community; therefore found chiefly in the northern half of Guam. The only trees I located were in the dense forests at Asdonlucas (S.E. of Yigo) (4257; 4676), and at Ritidian Pt.

on the high mesa (4693). This is a fine, handsome species worthy of cultivation. It may be related to *E. stelechantha* of the Caroline Islands.

EUGENIA UNIFLORA L. Sp. Pl. 470. 1753. Diels, Engl. Bot. Jahrb. 56: 532. 1921.
E. decidua Merrill 1914: 12. PITANGA. SURINAM-CHERRY.

Small tree or shrub; young leaves coppery-pink; mature leaves opposite, ovate or narrowly ovate, subglossy, paler beneath, 3–7 cm long, 1.5–3 cm wide, lateral nerves about 7–9 pairs, margins often slightly and irregularly wavy, or entire; petioles 1–3 mm long; flowers commonly axillary, solitary or fascicled, peduncles slender, 1.5–3 cm long, with small bracts; calyx 4-lobed, lobes 3–4 mm long; petals 4, white, thin, fugacious, nearly 1 cm long, obovate; stamens many (about 50), 8 mm long; ovary slightly ridged; fruit a succulent berry with usually 8 deep longitudinal grooves and as many ridges, 1.5 cm long, 2 cm wide, red or very dark red when ripe, 1–2-seeded, crowned by calyx-limb, juicy, edible, acid.

A native of Brazil now widespread in cultivation; whence also the name 'pitanga'. It has become naturalized in some regions (Hawaii for example); but in Guam I have never seen it outside farms or gardens, as in Yona (5057).

It is curious that Merrill was quite misled by the G.E.S. 469 specimens, on which he based the species *E. decidua*; he evidently did not know this S. American plant, and the specimens had no data as to its occurrence (a warning to both collectors and taxonomists!).

EUGENIA (?) sp. ignot.

A large tree with a dense rounded crown; flowers in axillary cymose panicles among the leaves; fruit magenta, juicy, edible, 1–1.5 cm long.

I have been unable to identify this plant, which I know only as a single, planted tree in Piti, not far from the Piti School (south) and now on the edge of the new housing area. The fruits are conspicuous in season and are sought by children. I am not quite certain that it is a *Eugenia*, though it appears to be.

Piti (4890), edge of new housing area.

MYRTELLA Diels
(*Saffordiella* Merrill 1914: 124).

With the characters of the species.—New Guinea and Micronesia; 3 spp.

Myrtella bennigseniana (Volkens) Diels, Engl. Bot. Jahrb. 56: 529. 1921.
Leptospermum bennigsenianum Volkens, Engl. Bot. Jahrb. 31: 470. 1901.
Saffordiella bennigseniana (Volkens) Merrill 1914: 124.

A small shrub 1–2 m tall, trunk up to 5 cm thick; branches many, slender; leaves opposite, decussate, linear-oblong or linear-lanceolate, 3-nerved, margins slightly recurved, midrib grooved ventrally, slightly prominent dorsally, subsessile, blade dark green, less than 1 cm long, about 1–1.5 mm wide, brown-dotted beneath, obtuse or acute; young growth whitish-pubescent; flowers single in axils of upper leaves, on pedicels 5 mm long; bracts 2, linear, 4 mm long; calyx-lobes 5, nearly 3 mm long; petals 5, white, narrowly obovate, 3 mm long; stamens many, equalling petals; style filiform glabrous, just exceeding the petals; stigma minute; fruit thin

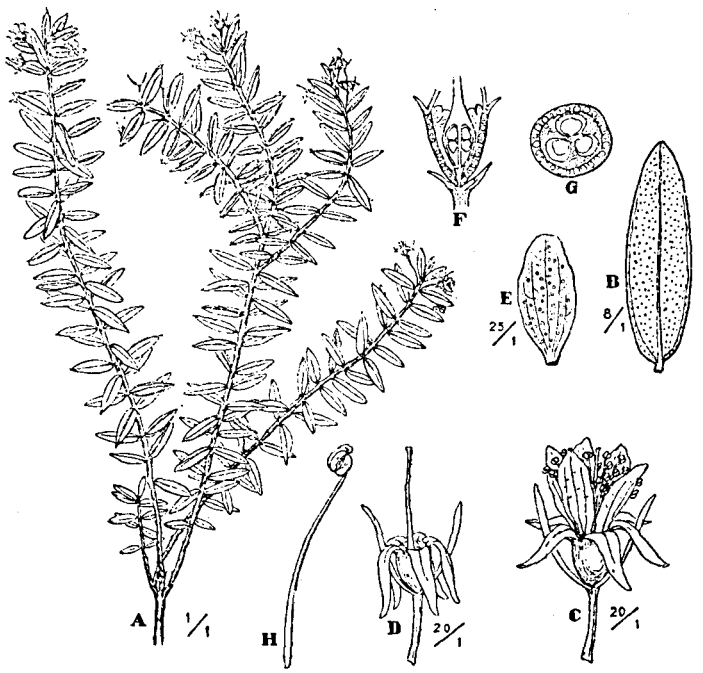

Fig. 79. Myrtella bennigseniana.

fleshy, subglobose, reddish-purple to purple-black, about 4 mm thick, 3-celled, each cell with 1–3 seeds.—Fig. 79.

Endemic in the Marianas and Carolines, where it is a typical savannah shrub, usually in company with *Decaspermum*. It is not found on limestone. With its elegant tiny leaves and white flowers it is exceedingly attractive and should be tried as an ornamental or border plant by those whose homes are on savannah soils. Manengon (3822; 4847).

PIMENTA Lindley

A tree with nearly smooth bark; leaves aromatic; cymes axillary, compound; flowers 4-merous; calyx campanulate wit spreading persistent lobes; petals spreading; stamens many in several series; ovary 2-celled; stigma peltate; ovules usually solitary; seeds subglobose with spiral embryo.—A West Indian-Central American genus with 18 spp.

PIMENTADIOICA (L.) Merrill, Contrib. Gray Herb. No. 165: 37. 1947.

ALLSPICE.

A tree to 12 m tall with opposite leaves, petioles about 1 cm long, blades narrowly elliptic, bluntly acute, obtuse to rounded at base, coriaceous, highly aromatic, 5–20 cm long; flowers in panicles about as long as leaves, from subterminal axils, small, white, 4-merous, about 6 mm wide; stamens many; fruit a small berry 6–7 mm wide.

A native of the West Indies and parts of Tropical America; the source of allspice; related to Bay-rum (*P. racemosa*). Apparently introduced to Guam some years ago; but I do not know if trees still persist.

Psidium Linnaeus

Trees or shrubs with opposite simple entire leaves; flowers 1 or 2–4 in leaf-axils, 4–5-merous; stamens numerous; calyx irregularly lobed, entire in bud, lobate at anthesis, persistent; petals commonly fugacious; fruit indehiscent, baccate, 2-more-celled, many-seeded, pulpy.—About 100 Tropical American Species.

Psidium guajava L. Sp. Pl. 470. 1753. Safford 1905: 361. Merrill 1914: 124.
ABAS. GUAVA.

A shrub or small tree; bark smooth, light reddish-brown, with pubescent 4-angled young branches; leaves opposite, ovate-elliptic or oblong-elliptic, acute-acuminate, pubescent beneath, often rather brittle, prominently nerved, lateral nerves 10–20 pairs; blades mostly 7–15 cm long and 3–5 cm wide, rounded at base, dull green; flowers solitary or 2–4 together in leaf axils, rather large (2.5 cm wide); peduncle about 1–2 cm long, pubescent; calyx 4–5-lobed (anthesis, not before) about 6–8 mm long; petals white, 10–15 mm long, fugacious, usually 4 or 5, obovate,

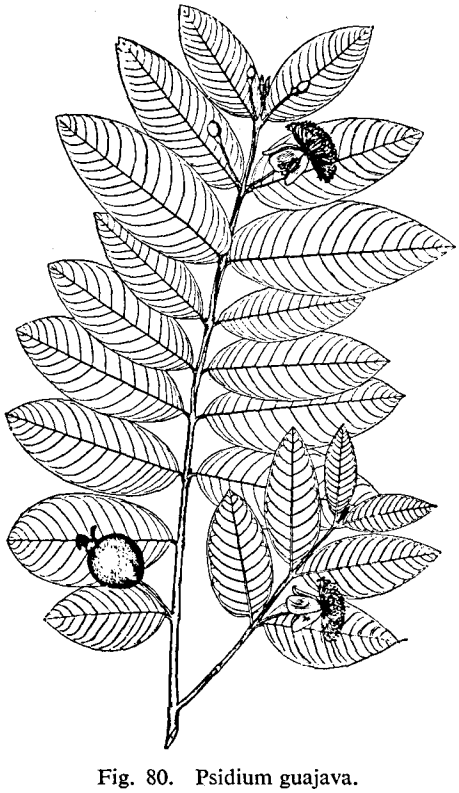

Fig. 80. Psidium guajava.

slightly concave; stamens numerous (c. 200–250), white, about as long as petals; style 10–12 mm long, stigma peltate; fruit globose, ovoid, or pyriform, whitish-yellow or faintly pink, sweet-sour pulpy, many-seeded, 2.5–10 cm long; pulp granular-juicy; seeds yellowish, reniform.—Fig. 80.

A native of Tropical America, introduced very early to Guam by the Spanish galleons, thence to the Philippines and throughout Asia, where it is now common both in gardens and as a naturalized sometimes almost weedy shrub. Many varieties of horticultural interest exist; unfortunately most of the Guam plants seem to have rather inferior fruits. It is often encountered in abandoned fields, forming small thickets seldom over 2 m tall, with a thickish trunk. It is common in Hawaii, where it is used to make guava jams and jellies, and the juice is canned. Cetti Bay (3900); Barrigada (5130).

MELASTOMATACEAE

Trees, shrubs, herbs, or climbers, terrestrial or epiphytic; branches usually 4-angled; leaves opposite or whorled, simple, usually palmately nerved; stipules none; flowers regular, bisexual, mostly 4–5-merous (some 3-merous), solitary or in cymes or cymose panicles; calyx tubular, sometimes free, usually adnate to the then inferior ovary, often scabrid, scaly, pubescent, or tuberculate, sometimes smooth; petals distinct, imbricate, rarely very slightly connate basally, white, pink, purple, or yellowish; stamens twice as many as petals or the same number, often of 2 distinct kinds, sometimes distinguished by color as well as form, usually inflexed, the anthers 2-celled, basifixed, usually opening by 1 or 2 pores or by short slits, often appeandaged or/and the connective elongated or elaborated; ovary 4–5-celled, placentae axile, ovules many; fruit a capsule or berry; seeds small or minute.—A large tropical family of 150 genera and perhaps 4200 species. Two genera are in Guam, both indigenous.

Key to local genera

1. Terrestrial shrubs; leaves opposite, strigose-pubescent; flowers with scaly calyx and white petals..... *Melastoma*
1. Climbing epiphyte; leaves whorled, glabrous; flowers with smooth magenta-pink calyx and pink petals..... *Medinilla*

MEDINILLA Gaudichaud

Shrubs, often climbing and/or epiphytic; branches 4-angled, or some terete, or some winged; leaves whorled or opposite, often fleshy and glabrous; 3–9-nerved; flowers in terminal or axillary simple or compound cymes, usually white, pink, or magenta, some orange-salmon; calyx-tube subtruncate; petals 4–6; stamens 8–12, anthers opening by an apical pore, connective with 2 appendages on one side and a spur on the other side; ovary inferior, 4–6-celled; ovules many; fruit a berry.—A genus of about 160 species, from E. Africa to Polynesia, north to Taiwan.
One endemic species in the Marianas Is.

The genus is named in honor of the Governor of Guam at the time of Gaudichaud's visit (1819), Don Jose de Medinilla y Pineda.

Medinilla rosea Gaudichaud, Bot. Freyc. Voy. 484, t. 106 "1826" (1830).

Safford 1905: 320. Merrill 1914: 125. GAFUS.

A climbing shrub, commonly epiphytic, with ascending main branches and dropping later branches, these terete, light brown, smooth; leaves whorled in groups of 3 or 4, slightly fleshy, glabrous, 3-nerved, elliptic-obovate, acutely acuminate, tapered and decurrent at base, commonly 6–8 cm long and 3–4 cm wide; flowers in subcorymbose cymes of 6–9 flowers; calyx magenta-pink, urceolate, about 7–10 mm long, the limb free, truncate; petals 4, pink, inserted at the edge of the ovarian disc; stamens 8; ovary inferior, 4-celled, many-ovuled; fruit a berry.—Pl. 11c.

Endemic in the Marianas Is. (from Guam N. to Sarigan). This is a handsome plant, with its vividly-colored berries usually borne on leafless branches. It appears to be relatively common on capped ridges, where it may clothe the trunks of trees with its ascending and drooping branches.

Manengon (3813; 4219); Mt. Almagosa (4108; 4356; 4358); Fena River headwaters (4484).

MELASTOMA Burmann

Villous or strigose terrestrial shrubs; leaves 3–7-nerved; flowers terminal, solitary or clustered, 5–7-merous; petals white, pink, or purple; calyx tube pubescent or scaly; stamens 10 (–14), very unequal, half of them longer with purple anthers (with produced connective and bilobed base), the other half shorter with yellow anthers (connective not produced, base with 2 tubercles); ovary inferior, 5(–7)-celled; ovules numerous; fruit irregularly subdehiscent, coriaceous or subfleshy; seeds tiny, strongly curved.—Perhaps 50 species, Asia to the Pacific and Australia.

Melastoma marianum Naudin, Ann. Sci. Nat. 3, 13: 276. 1849.

Safford 1905: 322. Merrill 1914: 125. GAFAU.

An erect strigose-pubescent shrub with reddish-brown branches; leaves opposite, oblong-elliptic or oblong-ovate, acutely acuminate, obtuse or rounded at base, 5-nerved, appressed-pubescent and ciliate, 2.5–7 cm long, slightly less than half as wide, petioles to 1 cm long; flowers few, close, in terminal corymbose cymes; calyx densely pubescent with closely appressed flattened subulate hairs; lobes 5, almost as long as the tube, c. 8–9 mm; petals 5, white, obovate, notched, about 12×12 mm; anthers short and obtuse; connective of longer ones only slightly produced and not obviously bilobed at base; fruit brown hirsute, globose-truncate, 5-celled.

Endemic in Micronesia, but perhaps not distinct from the widespread, usually pink-petaled, *M. malabathricum* L. (*M. polyanthum* Bl.). Common and characteristic of the southern savannahs. Manengon (3815; 4852).

ONAGRACEAE

Shrubs or herbs; leaves simple, opposite or alternate; stipules deciduous or

lacking entirely; flowers regular, perfect, commonly solitary in axils; calyx-tube adnate to ovary; lobes 4–5, valvate; petals 4–5, distinct, sometimes white or pink usually yellow, sometimes lacking; ovary inferior or rarely half-inferior, 2–6-celled; ovules 1-many, axile; fruit a berry, nut, or capsule.—About 35 genera and nearly 500 species, in tropical and temperate regions. One genus represented in Guam by two naturalized species.

LUDWIGIA Linnaeus
(incl. *Jussiaea* L.)

Shrubby or herbaceous plants often woody at base; many species more or less aquatic, in fresh water; leaves commonly entire, opposite or alternate, membranous; flowers solitary or in clusters; sepals 3–7, persistent; petals 3–7 or none white or yellow; stamens 3–7 or 6–14; pollen single or in tetrads; nectaries present; summit of ovary conical; ovary 3–7 (rarely more-) celled; ovules usually many on axile placentae; capsule irregularly dehiscent; seeds all alike or in some cases of 2 kinds in one fruit.—About 75 species in both hemispheres.

Ludwigia hyssopifolia (G. Don) Exell, Garcia de Orta 5: 471. 1957.

Raven, Reinwardtia 6: 385. 1963. TITIMO. CHARGUAN ASUSUYAN.

Jussiaea linifolia Vahl, Eclog. Amer. 2: 32. 1798. Merrill 1914: 125.

Annual herb to 1 (rarely 2–3) m tall, young growth and inflorescence minutely puberulent; leaves lanceolate, up to 9 cm long and 3 cm wide, acuminate, cuneate basally, lateral nerves 11–17 pairs; petiole up to 1.8 cm long; sepals 4, 2–4 mm long, lanceolate; petals 4, yellow, 2–3 mm long, elliptic; stamens 8, slightly unequal, 0.5–2 mm long (excl. anthers); fruit capsular, finely puberulent, 1.5–3 cm long, about 1 mm thick, subsessile; seeds of 2 kinds, those of lower section of capsule 0.7–0.85 mm long, those in upper section 0.35–0.5 mm long.

Africa, Asia, and the Pacific, a weed of ditches, ponds, rice-fields, etc., up to 500 m. altitude.

La Ciénaga; mouth of Ylig R. (Rodin 819).

Ludwigia octovalvis (Jacquin) Raven, Kew Bull. 15: 476. 1962; Reinwardtia 6: 356–362. 1963.

Jussiaea suffruticosa L. Sp. Pl. 388. 1753. Walker & Rodin 1949: 463.

Branching herb 1–2(–4) m tall, subglabrous or faintly puberulent; leaves linear to narrowly ovate, to 14 cm long and 4 cm wide, acuminate or acute, cuneate at base; lateral nerves 11–20 pairs; petioles to 1 cm long; sepals 4, up to 1.5 cm long, ovate-lanceolate; petals 4, yellow, obovate, to 1.5 cm long; stamens 8, unequal, 1–4 mm (excl. anthers); capsule 1.7–4.5 cm long, 2–8 mm thick, 8-ribbed; seeds all alike 0.6–0.75 mm long.

Cosmopolitan in the tropics, in moist locations as high as 1500 m altitude.

La Ciénaga (4925); Talofofo R. (5022). 1 mile e. of Piti (Moore 178).

ARALIACEAE

Trees, shrubs, or woody climbers; wood often with resin canals; leaves alternate

or rarely opposite, usually compound, palmately or pinnately, or simple, often stellate-pubescent; stipules adnate to base of petiole, or intra-petiolar, or absent; petiole hence ligulate; flowers commonly but not always in umbels or heads, sometimes in racemes or epiphyllous, perfect, polygamous, or dioecious; calyx tubular, entire or toothed; petals 3-more, commonly 5, distinct or connate, imbricate or valvate; stamens many or as many as petals, distinct; anthers 2-celled; ovary inferior 1-more-celled, with free or connate styles; stigmas mostly subdistinct; ovule single in each ovary-cell, pendulous; fruit a berry or drupe; seeds endospermous.—About 60 genera and 700 species in tropics and subtropics, some also in temperate regions, in both hemispheres. Two genera in Guam, one represented by indigenous species.

1. Leaves digitately palmate, with about 7–9 leaflets.....*Brassaia*
1. Leaves simple or pinnate or pinnately decompound.....*Polyscias*

BRASSAIA Endlicher

With the characters of the species.—Australia.

BRASSAIA ACTINOPHYLLA Endlicher, Nov. Stirp. Dec. 1: 89. 1839.

Stone, Micronesica 2(2): 141. 1967. IVY PALM

A megaphyllous tree to 6–8 m tall with ascending thick branches marked by conspicuous leaf-scars, sometimes epiphytic; leaves palmate, of 7–15, usually of 9 leaflets, main petioles 15–45 cm long, petiolules 2.5–8 cm long, leaflets mostly 10–20 cm long, elliptic-obovate, subacuminate, the central ones longest, all glabrous, dark green, coriaceous; flowers in small heads arranged more or less spicate-racemosely along stout elongate axes to 80 cm long, several of which radiate from a central hublike axis; flowers red; fruit 10–12-seeded, nutlets purple.

N. Australia, now rather widely grown as an ornamental. A few plants occur near the Flores Memorial Library in Agaña (4730) but have not yet been seen to flower.

POLYSCIAS J.R. & G. Forster

Trees or shrubs with pinnate, pinnately decompound, or simple (unifoliolate) leaves; leaves spiralled alternate; flowers in heads or umbels, these in racemes umbels or panicles; flowers commonly rather small, greenish, yellowish, or whitish, calyx mostly 5-lobed (lobes very small); petals 5 or 4, 6, or 7; ovary mostly 2–10-celled; stamens the same number as petals or up to nearly twice as many; fruit usually 2–5-celled (sometimes more); seeds flattened semicircular.—Africa to Polynesia, tropical; about 160 species. (Incl. *Nothopanax* Miq.)

1. Leaves commonly pinnately decompound, at least bipinnate with the leaflets toothed, laciniate, or pinnatifid; fruit mostly 2-celled, orbicular, flattened.....*P. fruticosa*
1. Leaves 1-pinnate, trifoliolate, or unifoliolate.
   2. Leaves commonly simple (unifoliolate), orbicular, concave, saucerlike, green.....*P. scutellaria*

2. Leaves commonly pinnate or trifoliolate, or if unifoliolate then not concave saucerlike.
   3. Leaves usually trifoliolate; margins of leaflets white or yellow; dentate or minutely crenate.....*P. pinnata* CV "tricochleata"
   3. Leaves usually with 5–7 leaflets, sometimes only 3, sometimes 9.
      4. Leaflets narrowly elliptic-ovate or oblong-ovate acute, subentire or minutely denticulate; fruit 2-celled, flattened, orbicular; leaves not variegated.....*P. grandifolia*
      4. Leaflets broadly ovate-elliptic or ovate or even sub-obovate, rounded, coarsely toothed to subentire, uniformly green or usually the margins yellow; fruit usually 3–4-celled.....*P. guilfoylei*

POLYSCIAS FRUTICOSA (L.) Harms, Pflanzenfam. 3, 8: 45. 1898. Stone, Micron. 2: 59. 1965. PAPUA.

Panax fruticosum L. Sp. Pl. ed. 2, 1515. 1753.

Nothopanax fruticosum (L.) Miquel, Fl. Ind. Bat. 1, 1: 765. 1856.

Safford 1905: 333. Merrill 194: 125.

An erect rather few-branched shrub 1–3 m tall; leaves pinnately divided, usually bi- or tripinnate, with the leaflets toothed, laciniate, or pinnatifid, green or variegated, 5–10 cm long; umbels paniculate; flowers 5-merous except the 2-celled ovary; fruit flattened orbicular 2-xeeded.

Indomalaysian, widespread in cultivation; common in gardens but not as often planted as *P. guilfoylei* or *P. scutellaria* in Guam. The leaves, as in many species of *Polyscias*, have an anise scent. Harmon Village (3802).

Polyscias grandifolia Volkens, Engl. Bot. Jahrb. 31: 471. 1901.

Merrill 1914: 125. Stone, Micronesica 2: 57, f. 3. 1965. PEPEGA.

A shrub, few-branched, to about 3 m tall; leaves 1-pinnate, 30–90 cm long, leaflets usually 5–9, shortly petiolulate, narrowly oblong-ovate or subelliptic, acute subacuminate, green, young ones obscurely marginally denticulate, older ones entire, leaflets opposite, about equal, lateral ones sometimes slightly asymmetric, blades mostly 8–13 cm long, 4–6 cm wide, petiole 10–20 cm long, petiolules about 1 cm long; umbels racemose-paniculate, inflorescences as long as leaves or somewhat less; flowers 2–3 mm long; calyx 5-toothed; petals 5, greenish-white; stamens 5; styles 2; fruit 2-celled orbicular flattened 2-seeded, styles more or less persistent; fruit about 5–7 mm wide.—Fig. 81.

Endemic in Micronesia; known from Palau, Yap, Guam, Rota, Saipan, Tinian, and Sarigan, also in Truk. Exclusively found on limestone. It is wild and not, or not much, cultivated, but like most species of *Polyscias* is easily grown from stem cuttings; and one collection was made in the abandoned residential area of camp Quezon.

The name 'Pepega' is from Rota (acc. to Kanehira).

POLYSCIAS GUILFOYLEI (Cogn. & March.) Bailey, Rhodora 18: 153. 1916.

Walker & Rodin 1949: 463. Stone, Micron. 2: 57. 1965.

Nothopanax guilfoylei (Cogn. & March.) Merrill, Philipp. J. Sci. Bot. 7: 242.

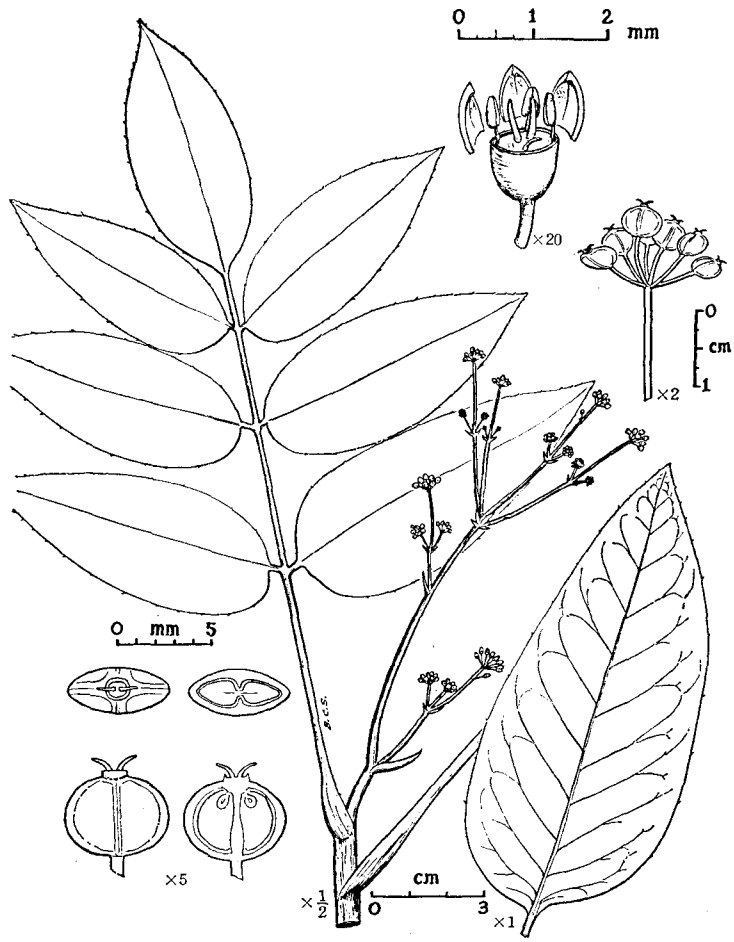

Fig. 81. Polyscias grandifolia.

1912; 1914: 126.

Aralia guilfoylei Cogn. & March. Pl. Ornam. 2, t. 58. 1874; Safford 1905: 186.

Shrub with erect branches, 2–7 m tall; leaves mostly 15–50 cm long, 1-pinnate, leaflets opposite, petiolulate, petiolules up to 2.5 cm long; blades variable, but commonly broadly ovate or elliptic (even suborbicular to obovate) and coarsely dentate or lacerate, rarely subentire, commonly variegated with white or pale yellow margins, or sometimes all dark green; leaflets mostly 5–10 cm long; inflorescence a compound panicle, thyrsoid, flowers in umbels; flowers mostly 5-merous except the 3–4-merous ovary; petals 2.5×1.2 mm; fruit usually 3–4-celled and -seeded, 4× 5 mm.

A cultivar from Polynesia, its exact origin unknown; now widespread in cultivation. Common in Guam gardens, often as hedge plants, as in Harmon village

(3838; 4030; 4031), and Camp Quezon (4072). Older plants 5–7 m tall often bloom; the inflorescence axes may have a bronzy-purplish color.

As in other forms of the genus, cultivars may put forth "sports", i.e. genetic chimaeras, sometimes atavistic. One such form is characterized by its exceedingly dark all green leaves which have small, crumpled wrinkled leaflets. A plant of this beside the Pirate's Cove has a mutant branch with ordinary leaves of the all-green form of *P. guilfoylei.* This phenomenon should be watched for in all forms of *Polyscias.* It is seen also in *P. pinnata* (q.v.).

POLYSCIAS SCUTELLARIA (Burm. f.) Fosberg, Univ. Haw. Occ. Pap. 46: 9. 1948.
Stone, Micron. 2: 59. 1965. PLATITOS.
Nothopanax cochleatum (Lam.) Miq. Fl. Ind. Bat. 1: 766. 1855; Safford 1905: 1905: 333; Merrill 1914: 126.
Aralia cochleata Lam. Encycl. 1: 224. 1783.

A shrub with erect stems, 1–3 m tall; leaves simple (unifoliolate), orbicular-cordate, concave and saucer-like, all green, subentire, 5–10 cm wide; or rarely with 2 lateral similar but smaller leaflets; some forms with toothed leaflets; others with variegated leaflets; ours generally uniformly green; umbels of flowers in panicles; calyx 5-toothed; petals 5; stamens 5; ovary 2-celled; fruit flattened, 2-seeded (rarely 3-celled and -seeded).

A Malaysian-Indonesian cultivar, now widespread in the tropics in gardens. It is rarely seen in flower. Common in Guam gardens; the leaves are used as the name platitos suggests—for little dishes. Harmon (4029).

POLYSCIAS PINNATA J.R. & G. Forster, Char. Gen. Pl. 64, t. 32. 1776.
Cultivar TRICOCHLEATA: Stone, Micronesica 2: 55, f.l. 1965.
Nothopanax tricochleatum Miq. Fl. Ind. Bat. Suppl. 340. 1862.

A shrub 1–2 m tall, leaves usually trifoliolate (rarely 1 or 5 leaflets), the leaflets orbicular, white-margined, shortly petiolulate. Flowers and fruits unknown.

Known to be a mutant form of *P. pinnata* because of atavistic chimaeras which have 3–7 leaflets of uniform green, considerably larger, and which produce inflorescences; in these the umbellets are terminal and lateral at nodes on a long (35 cm) axis, these axes radiating from nodes of a main axis 60–90 cm long, 3–5-nodose; flowers with truncate calyx; petals 5–7; stamens 5–7; stigmas 4–5; ovary 4–5-celled; cells each with 1 pendulous ovule. (Frts. not seen). [This form seen in Ponape].

Polynesia, Melanesia, Micronesia. Not very common in Guam. Agaña (3999).

UMBELLIFERAE

Herbs, sometimes subshrubby, with grooved stems and central pith in stems; leaves alternate, usually compound; petioles ligulate; flowers perfect or rarely unisexual, usually in compound or simple umbels or heads; calyx 5-lobed; petals 5; stamens 5, inflexed in bud; anthers 2-celled; ovary inferior, 2-celled; cells 1-ovulate; ovules pendulous; fruit dry 2-celled, splitting into 2 segments; seeds endospermous. Usually aromatic pungent and spicy tissues, especially the seeds.—

About 200 genera and 3000 species, chiefly in temperate regions, cosmopolitan. One indigenous species, two introduced, in Guam.

Key to local genera

1. Creeping herbs with cordate-orbicular or reniform leaves, toothed but undivided..... *Centella*
1. Erect herbs with divided leaves,
   2. Ultimate segments of leaves deeply toothed or pinnatifid but with a distinct bifacial lamina, not filiform.....*Petroselinum*
   2. Ultimate segments of leaves linear filiform.....*Foeniculum*

CENTELLA Linnaeus

Creeping herbs rooting at the nodes, with erect simple leaves; umbels compact, axillary, shorter than the leaves; flowers small, subsessile; calyx subtruncate; corolla white or pink; fruit laterally compressed, 7–9-ribbed, lacking oil-canals.—About 20 S. hemisphere species.

Centella asiatica (L.) Urban, in Martius, Fl. Bras. 11: 287. 1879. Safford 1905 221. Merrill 1914: 126.

Creeping herb; petioles commonly 1–15 (or up to 30) cm long; blades orbicular-cordate or reniform, coarsely and shallowly toothed, 2–5 cm long and usually broader than long; inflorescence 1–7 cm long; secondary umbels of 2–4 flowers; petals pinkish-purple, 1 mm wide; stamens shorter; fruit 4–5 mm broad and 3 mm high, 7–9-ribbed.

Pantropical. The leaves are edible, and tender young ones make a nice addition to a green salad. It is probably indigenous in Guam, occurring in a variety of open situations both coastal and inland. Manengon (3819).

FOENICULUM Linnaeus

Erect herbs from a woody taproot, biennial or perennial, aromatic; leaves pinnately decompound, dissected finally into filiform segments; flowers yellow compound umbels; calyx subtruncate; petals blunt; stylopodium conic; fruit oblong subterete.—S. Europe e. to Asia, 3 or 4 species.

FOENICULUM VULGARE Miller, Gard. Dict. ed. 8, no. 1. 1768. Gaertn. Fruct. 1: 105, t. 23, f. 5, 1788. ANIS HINOHO. FENNEL.

Foeniculum foeniculum (L.) Karst., Deutschl. Fl. 837, 1880–83; Safford 1905: 277. (nom. tautonym. illegit.).

Perennial herb, erect, glaucous, to 20 cm tall, highly aromatic; leaves to 20 cm. long, finely dissected, ultimate segments filiform; umbels terminal, 5–15 cm wide; umbellets with 20–50 tiny flowers, these on filiform pedicels; fruit 4–9 mm long, half as wide or less, grooved.

S. Europe to S.W. Asia. Cultivated in Guam in house-gardens.

PETROSELINUM Hill

Erect biennial herbs; leaves pinnately tricompound, ultimate segments ovate to linear; flowers greenish-yellow or yellowish-red, in compound umbels; calyx subtruncate; petals obovate; stylopodium depressed-conic; fruit ovate, laterally compressed.—Europe and Asia (temperate regions), about 6 species.

PETROSELINUM CRISPUM (Miller) Nym. in Kew Hand. Herb. Pl. 3: 122. 1925. PARSLEY.

Apium petroselinum L. Sp. Pl. 264. 1753.

Petroselinum petroselinum (L.) Karst. Deutschl. Fl. 831. 1882.

Safford 1905: 349 (nom. tautonym. illegit.).

Erect herb, biennial in temperate regions, longer-lived in subtropics; strongly aromatic throughout; leaves 2–3-pinnate, dark green glossy, ultimate segments deltoid-ovate but deeply toothed; umbels compound; umbellets 10–20-flowered; flowers greenish-yellow; fruit 2–3 mm long, ribbed.

Europe and W. temperate Asia. Sparingly grown (not successfully, according to Safford) in Guam. A well-known garnish and potherb.

SAPOTACEAE

Trees or shrubs with milky sap; leaves alternate, simple, entire; stipules mostly lacking; flowers perfect, regular; calyx 4–8-lobed, the lobes imbricate, often in 2 series; corolla 4–8-lobed, similar; stamens epipetalous, the same number as the petals and opposite them, or more and in 2 or more series; staminodia sometimes present; ovary 2–8-celled, superior; ovules 1 in each cell; fruit an indehiscent leathery or succulent berry; seeds elliptic, often without endosperm.—Tropics of both hemispheres; 40 genera and over 600 species; several species important for fruit or latex. One indigenous genus in Guam.

Key to local genera

1. Fruits commonly 2.5 cm long or more (up to 20 cm); brown-skinned, juicy; cultivated trees of gardens or farms.
   2. Fruit 2.5 cm long, green or orange; ovoid; 1 seed; leaves 15 cm.. *Mimusops*
   2. Fruit subglobose, 2.5–7 cm wide; seeds usually several (to 12), rarely 1; leaves mostly 10–15 cm long..... *Manilkara*
   2. Fruit usually ovoid, 8–20 cm long; seed solitary; leaves mostly 15–30 cm long ..... *Calocarpum*
1. Fruits oblong-ellipsoid, about 1 cm long, purplish-black; wild trees of limestone forests ..... *Planchonella*

CALOCARPUM Pierre

Trees with milky sap. Six species of Mexico and Central America.

CALOCARPUM SAPOTA (Jacquin) Merrill, Enum. Philipp. Fl. Pl. 3: 284. 1923.

Lucuma mammosa (L.) Gaertn. f. SAPOTA

A large tree to 30 m tall with milky sap; leaves oblanceolate-obovate, 15–

30 cm long or more, deciduous, short-petioled, pubescent or glabrous beneath; flowers small, subsessile, axillary; calyx 8–10-lobed; corolla 5-lobed; inflorescences ramuline or on trunks; fruit ovoid or subglobose, 8–20 cm long, with rough brown skin and pinkish-red flesh, 1-seeded, the seed large, brown, glossy,

Tropical America and Southern Mexico. Usually known as "sapota" though in Panama called "mamey", a name otherwise applied to *Mammea americana* (Guttiferae). The fruit is eaten out of hand; it is mildly sweet and juicy.

MANILKARA Adanson

Trees with milky sap; leaves spiralled, densely crowded; flowers mostly 6-merous; corolla-lobes sometimes dorsally with 2 petaloid appendages, the entire corolla seeming of 18 lobes; stamens 6, staminodes 6; ovary pubescent, 6–14-celled; seeds compressed.—A pantropical genus of 60–70 species.

MANILKARA ZAPOTA (L.) van Royen, Blumea 7: 410. 1953. CHICO. CHICLE.

Manilkara achras (Miller) Fosberg, Taxon 13 (7): 255. 1964.

Achras zapota L. Sp. Pl. ed. 2, 470. 1762; not of Sp. Pl. ed. 1, 1190. 1753.

Achra zapota zapotilla Jacquin, Sel. Stirp. Am. Hist. 57. 1763.

Sapota zapotilla (Jacq.) Coville ex Safford: 369. 1905.

Sapota achras Miller, Gard. Dict. 1768.

Achras zapotilla (Jacq.) Nuttall, Sylv. Am. 3: 90. 1849.

Manilkara zapodilla (Jacq.) Gilly, Trop. Woods 73: 20. 1943.

Trees with dense crowns of dark green leaves; petioles 1–3.5 cm long; blades oblong-lanceolate, acute to obtuse, below brown-pubescent, subglabrate, 4–15 cm long, 2–7 cm wide; flowers solitary, axillary; peduncle about 2 cm long; calyx lobes 6, pubescent, 8 mm long; corolla without appendages, white-cream; fruit subglobose, brownish, scaly, mostly 3–8 cm long, juicy, several-seeded.

A native of Tropical America, commonly cultivated as a fruit tree in many tropical regions. The species has had, as the list of synonyms shows, an involved and confusing nomenclatorial history. It is perhaps best known as 'chicle' or the variant 'chico'. In farm-gardens in Guam, as at Yona (5058).

MIMUSOPS Linnaeus

Trees with milky sap; leaves alternate; flowers axillary; calyx 4-lobed, in 2 series; corolla 8-lobed, lobes dorsally often with 2 petaloid appendages as in Manilkara; stems 8, staminodes 8; ovary 8-celled, pubescent; fruit a 1–2-seeded berry.—About 55 paleotropical species.

MIMUSOPS ELENGI L. Sp. Pl. 349. 1753. ELENGI. BULLETWOOD.

Trees with well-spaced alternate leaves, thin-coriaceous, ovate-elliptic, obtuse-acuminate, 5–15 cm long, 2–6 cm wide, petioles 2–4 cm long; flowers solitary or in fascicles of 2–6, pedicels to 2 cm long; calyx pubescent; corolla dull white, 14 mm broad; ovary pubescent; fruit ovoid, orange, 2.5–3 cm long, 1–2-seeded.

A native of Malaysia and Indonesia. A few trees may be planted in Guam, but it is quite rare.

PLANCHONELLA Pierre

Trees or big shrubs; leaves alternate or spiralled; flowers axillary, among the leaves or on leafless branches, solitary or in small fascicles; calyx 5-lobed; corolla 5-lobed; stamens 5; staminodes 5; ovary 5-celled; berry commonly ellipsoid, 1–5-seeded, often coriaceous.—Perhaps 80 Indomalaysian-Pacific species. The genus is very close to *Pouteria* Aubl. of Tropical America, under which name the following species is also known. *Sideroxylon* Dill. is a synonym. One indigenous species in Guam, also known very widely in the Pacific region and Malaysia; another species known in Kusaie.

Planchonella obovata (R. Brown) Pierre, Not. Bot. Sapot. 35. 1890.

LALAHAG. LALA.

Sideroxylon glomeratum Volkens, Engl. Bot. Jahrb. 31: 472. 1902; Merrill 1914: 127. (Many synonyms: see van Royen, Blumea 8: 235 ff. 1957.)

Pouteria obovata (R. Br.) Baehni, Candollea 9: 324. 1942.

Small trees with thin, scanty milky sap; bark dark brown, inner bark pink; young growth finely rusty-pubescent, glabrate; leaves mostly well-spaced, petioles to 3 cm long; blades obovate or rounded-elliptic, mostly decurrent at base, mostly obtuse or rounded (rarely acute) at apex, above rather dark green, below paler and in younger leaves copper- or rusty- colored; old leaves withering dark yellow-orange; blades commonly 5–20 cm long, 2–10 cm wide; flowers usually fascicled, sometimes solitary or sometimes up to 10 or 20 together; pedicels shorter than petiole; flowers white, about 7 mm wide; fruit ellipsoid-oblong, about 1 cm long or slightly more, ripening to dark purple-black; seeds 1 or sometimes 2, oblong.—Pl. 11d, e.

Widespread, native from Malaysia to Polynesia; a common littoral tree. It is variable, and local populations have been described as distinct, which they are not; e.g. Volkens' species from Yap.

In Guam it is found on limestone both near the sea and inland, sometimes on mixed soils if near the coast. When more or less in the open, trees can often be recognized by the coppery-rusty color of the lower surfaces of the leaves. Flowering is not common in Guam, fruiting even less so, hence the most useful features are the milky sap and the rusty pubescence. The leaves are commonly slightly fleshy; this character, and that of leaf shape, is extremely variable however.

Manengon (3876); Dos Amantes Pt. (3947); Sagua R. (4199); Asanite Pt. (4297, 5095).

Safford (305, under "lalahag") states that the wood was used for charcoal. In Malaya, according to Corner, the trees may become 30 m tall; but never so tall in Guam.

EBENACEAE

Trees or shrubs, often with blackish bark or wood; leaves usually alternate, entire, simple; stipules none; flowers mostly unisexual, often dioecious; female flowers usually solitary; calyx 3–6-lobed, persistent, often enlarging as fruit ripens; corolla 3–7-lobed, lobes imbricate; stamens hypogynous or basally epipetalous, 2–4-times as many as corolla-lobes or rarely the same number and alternate with them; ovary superior, 2–16-celled; ovules 1 or 2 per cell, pendulous; fruit a leathery or fleshy berry, mostly partly enclosed by or seated upon the calyx; seeds with thin testa.—About 6 genera and 400 species, throughout the tropics, a few temperate. Important for ebony (wood) and the persimmon. Although one might expect *Diospyros* (e.g. *D. ferrea*) to occur in Guam, the family is represented only by introduced species.

Diospyros Linnaeus

Trees or shrubs; leaves alternate; flowers unisexual, 3–5-merous; ovary 3–16-celled; calyx accrescent in fruit; fruit fleshy or hardcoriaceous. (Incl. *Maba* L.)—The largest genus of the family, with over 300 species.

1. Fruit orange, fleshy, edible, thin-skinned.....*D. kaki*
1. Fruit brownish-red, or black, edible or not.
    2. Fruit black, smooth.....*D. ebenaster*
    2. Fruit brownish-red, velvety.....*D. discolor*

Diospyros discolor Willd. Sp. Pl. 1108. 1805. MABOLO.

A small tree to 10–12 m tall; bark blackish; young growth silky-pubescent; young leaves pinkish; petiole 1–1.5 cm long; blades oblong, coriaceous, dark green above, pale subglaucous and milky pubescent beneath, 10–24 cm long, 10 cm wide; flowers nearly 2 cm broad, subsessile, creamy-white; petals 4; fruit globose, 5–8 cm thick, covered with silky irritant hairs, reddish-brown or purplish; 4 persistent sepals at base. (*D. philippensis* (Desr.) Gurke; correct name?).

Native of the Philippines, occasionally planted in other tropical regions. Malaya called 'butter-fruit', or 'buah mentegah'. The flavor of the fruit said to be something like a peach.

Diospyros ebenaster Retzius, Obs. Bot. fasc. 5; 31. 1789. BLACK SAPOTE.

A tree to 15 m tall; leaves 10–20 cm long, glabrous, blunt; fruit globose, glarous, red or black, to 10 cm thick.

Mexico and the West Indies, occasionally cultivated. Fruit edible if preserved.

Diospyros kaki Linn. fil. Suppl. 439. 1781. PERSIMMON.

A small tree; leaves broad, suborbicular or ovate, or sometimes narrowly ovate, decurrent, obtuse to rounded, pubescent beneath, 5–25 cm long, 2.5–15 cm wide; male flowers pale yellow; fruit subglobose to pyriform, yellow-orange or red-orange, fleshy, mostly 3–7 cm thick, thin-skinned, juicy.

Native of Japan and probably temperate China; cultivated widely. The fruits of the best varieties are excellent, and taste somewhat like a papaya. Though presumably tried in Guam it seems an unsuitable (because temperate) species.

MYRSINACEAE

Trees, shrubs, or woody climbers; leaves simple, mostly alternate, rarely opposite; stipules none; inflorescence axillary or terminal, panicled, racemed, or the flowers fascicled; flowers regular, perfect, or monoecious or dioecious, mostly 4–5- (rarely 6–) merous; calyx-tube subpersistent; corolla bearing stamens at base or middle; stamens opposite lobes of corolla, 4–5 (rarely 6); anthers mostly opening by slits, sometimes by pores; ovary superior (except half-inferior in Maesa), 1-celled, with basal free placenta with few to many ovules; fruit a drupe or berry, rarely a capsule, 1-few-seeded; seeds endospermous.—About 35 genera and perhaps 900 species throughout the tropics, a few temperate. Two indigenous genera in Guam.

Key to local genera

1. Erect shrub with lanceolate or narrowly elliptic leaves; ovary superior; fruit subglobose, bright red, 1 cm wide..... *Discocalyx*
1. Tall shrub with relatively broad leaves; ovary half-inferior; fruit small.. *Maesa*

DISCOCALYX Mez

Shrubs or small trees, leaves usually alternate, simple, or closely spiralled, mostly entire; inflorescences axillary; flowers rarely bisexual, mostly dioecious, 4–5-merous; sepals imbricate; petals basally connate, imbricate; anthers generally sessile and shorter than the petals; ovary subglobose or ovoid; style evident or reduced or obsolete; stigma rather broadly discoid; placenta with a single series of 3–5 ovules; fruit globose umbonate, thinly fleshy, commonly red or purple; endocarp globose, thinly woody, 1-seeded; embryo transverse.—Philippines and Pacific Islands. About 50 spp.

Discocalyx megacarpa Merrill 1914: 126. OTOT. OTUG.

Icacorea sp. Safford 1905: 295.

Erect glabrous shrub, branches terete, brownish, ascending, up to 1–2 m tall; leaves alternate, lanceolate-elliptic to lanceolate-oblanceolate, or even oblong-oblanceolate, chartaceous, medium or dark green, 10–22 cm long, 3–6.5 cm wide, acute subacuminate, attenuate-decurrent at base; petiole to 1.3 cm long; lateral nerves about 8–12 pairs; flowers in panicles on short branches to 5 cm long, panicles usually several together with a few small leaves; panicle 5–10 cm long, many-flowered; male flowers pink-salmon ("flesh" color) on short pedicels 4–5 mm long, about 5 mm wide, 5-merous, calyx punctate shallowly lobed, lobes ovate obtuse, glabrous; corolla deeply lobed, elliptic-ovate lobes glandular 2.5–3 mm long; anthers almost 1 mm long; pistillode small; female flowers similar, overy relatively larger, stamens reduced; fruit bright red, thin fleshy, about 1 cm diameter, 1-seeded. —Fig. 82.

Marianas Islands, endemic (Guam, Rota, Saipan). A characteristic shrub of limestone mesa forests. The red fruits are most attractive and edible, with a "flavor like tamarinds" (Safford).

Fig. 82. Discocalyx megacarpa.

Note: Another Discocalyx (*D. ladronica* Mez) is said to come from the Marianas, but the exact island locality is unknown; the type was collected by Gaudichaud, so presumably it would have been from Guam, Saipan, Rota, or Tinian. Although I have found *D. megacarpa* quite a common plant, I have never found *D. ladronica*, which according to Merrill is very different. It is certainly rare; and I suspect it may not really be a Marianas plant at all, but is somehow mislabelled.

Maesa Forsskål

Small trees or shrubs, sometimes straggling or climbing; leaves simple, alternate, entire or dentate; racemes or panicles terminal or axillary; flowers bisexual or unisexual, 5-merous; calyx-lobes valvate, mostly persistent; corolla tubular, glandular; stamens epipetalous; ovary half-inferior, 1-celled, with many ovules on the central basal placenta; fruit subglobose baccate with several or many angled seeds.—About 100 species, paleotropical.

Maesa sp. (near *M. carolinensis*).

Fosberg, Checklist (mimeo.) ined. 1960.

A straggling shrub or little tree with alternate, dark, ovate leaves, at base obtuse to slightly cordate, sometimes asymmetric; margins very slightly crenate or almost entire; apex bluntly acuminate; nerves 4–6 pairs; blades c. 6–10 cm long, on petioles 1/4 to 1/6 as long. Inflorescences axillary, simple racemes, shorter than the leaves, rather many-flowered. Fruits small pinkish globose (pea-size or less).—Pl. 11f.

S. Guam, hills, in forest, Mt. Lamlam.

Known to me only from collections by Reid Moran (no. 4708). It is probable that this is very near *M. carolinensis* and may not be distinct, but it may well be a new species or variety.

PRIMULACEAE

Shrubs or herbs; leaves alternate, or opposite or whorled, or radical, simple, entire or lobed; stipules none; flowers solitary or in panicles or umbels, terminal or axillary, perfect, usually regular; calyx usually 5-lobed; corolla tubular, usually 5-lobed, imbricate; or rarely absent; stamens 5, opposite the corolla-lobes, sometimes with alternate staminodes; ovary superior, 1-celled; placenta free basal, with many ovules; fruit capsular, usually many-seeded.—About 30 genera and 700 species, chiefly in the northern hemisphere in temperate or subtropical regions. One genus in Guam, indigenous.

Lysimachia Linnaeus

Shrubs or herbs with opposite or spiralled leaves; flowers solitary or in inflorescences, terminal or axillary, usually 5-merous; corolla deeply lobed; lobes contorted in bud; ovary globose, with filiform style and obtuse stigma; capsule 2–5-valved, sometimes not dehiscent.—About 110 species, mostly of the N. temperate regions, a few subtropical.

Lysimachia mauritiana Lamarck, Encycl. 3: 572. 1789. Walker & Rodin 1949: 463. Merrill 1914: 127 (prediction). Pax & Hoffm., Pflanzenr. 20: 275. 1905.

Glabrous slightly fleshy herb, few-branched or simple, to 40 cm tall; leaves obovate-oblanceolate to spathulate, 2–5 cm long, 1–2 cm wide, obtuse or rounded, entire, subsessile; flowers in erect terminal racemes or racemose panicles, crowded, small, white or pink, nearly 1 cm wide; calyx-lobes obtuse lanceolate; corolla-lobes oblong-deltoid; fruit a globose capsule about 5 mm wide.

Native in the N.W. Pacific (Japan, Korea, Ryukyu Is., Taiwan), Hawaii, China, and India; also New Caledonia and certain other Pacific Islands. In Micronesia known only from the Marianas (Pagan southward to Guam). In Guam it is very rare, found on limestone rocks near the sea. Gaudichaud collected it (cf. Pax & Hoffmann) probably on Rota or Tinian. The first collection known to be from Guam was made on "rocky coral ledges east of Barrigada" (probably on the cliff-lined coast from the north side of Pago or perhaps around Marine Beach, Yona) on 27 Oct. 1945 by Russell Steere (no. 126).

Rediscovering this rare plant in Guam would be a useful and interesting botanical project.

PLUMBAGINACEAE

Herbs or shrubs, sometimes climbing; flowers perfect, regular, in racemes or umbels, 5-merous; stamens opposite the corolla-lobes, inserted on the tube; ovary superior, 1-celled, styles 5, ovules solitary, pendulous; fruit a utricle sometimes circumscissile.—About 10 genera, S. Europe and N. Africa, Central and W. Asia, a few in N. America; species perhaps 300.

PLUMBAGO Linnaeus

Shrubs or herbs, some scandent; leaves spiralled, usually with 2 basal clasping auricles; flowers subsessile or sessile in spikes or spike-like racemes terminal or in axils; calyx tube slender, glandular (often sticky); corolla long-tubular with spreading lobes; stamens distinct, free from corolla; style 5-fid; fruit 5-valved or circumscissile; seeds with scant endosperm.—About 20 species, in most warm countries.

PLUMBAGO AURICULATA Lamarck, Encycl. 2: 270. 1786.

Erect shrub with slender branches; leaves oblong-obovate 2–7 cm long, with basal auricles 2–3 cm wide, reniform; flowers in corymbose spikes, densely pubescent, the calyx sticky-glandular; corolla light blue, 3 times longer than the calyx; fruit (rare) clavoid, 8 mm long.

A native of South Africa, now widely cultivated. The pale blue flowers (about 3.5 cm long) with their conspicuously sticky calyx are quickly noticed features. Fruiting is rare, at least in cultivation outside Africa.

Occasional in gardens. Agaña (5099). Sometimes called *P. capensis.*

OLEACEAE

Trees, shrubs, or woody climbers with usually opposite, simple or pinnate entire or toothed leaves; stipules none; flowers perfect or sometimes unisexual, regular, in terminal or axillary cymes, panicles, racemes, or fascicles; calyx 4-lobed; corolla 4–12-lobed, often 6-, 8-, or 9-lobed, or sometimes lacking; lobes imbricate or valvate in bud; stamens 2, inserted on the corolla between lobes; ovary bilocular, locules usually biovulate; style simple; stigma simple or bilobed; fruit a drupe, berry, capsule or samara with 1 or 2 seeds per cell.—A family of over 20 genera and more than 400 species in most temperate and tropical regions.
One genus in Guam.

JASMINUM Linnaeus

Climbing or sometimes erect shrubs with usually opposite simple or trifoliolate leaves; flowers usually in terminal or axillary cymes; calyx minutely 4–9-toothed or subentire; corolla salverform, white (or sometimes pink or yellow), the tube slender and straight, the lobes mostly 4–10, imbricate in bud; stamens 2, included; ovary bilocular; locules biovulate; style with 2 linear stigmas; fruit a berry; endosperm scanty or none.—A genus of about 300 species found in all warm parts of the world excluding cool North America.

Key to Species

1. Leaves compound,
   2. More or less deciduous leaves; flowers under 2.5 cm wide..*J. officinale*
   2. Evergreen; flowers 3 cm wide or slightly more.....*J. grandiflorum*
1. Leaves simple,
   3. Cultivated plants; corolla tube shorter than lobes or equal.
      4. Corolla-lobes acute .....*J. multiflorum*
      4. Corolla-lobes obtuse .....*J. sambac*
   3. Wild plants; corolla tube longer than lobes or equal; lobes lanceolate .....*J. marianum*

JASMINUM GRANDIFLORUM L. Sp. Pl. ed. 2, 9. 1762. HASMIN.

An evergreen — erect shrub with reddish-tinged flowers 3 cm wide or more; glabrous or nearly; leaves opposite, pinnate, with rhomboid-oblong leaflets; calyx with linear lobes 5–6 mm long; corolla-lobes to 14 mm long.

A native of India, now widely cultivated. Occasional in Guam gardens.

Jasminum marianum DC. Prodr. 8: 357. 1844. Merrill 1914: 128. BANAGO.

A sprawling shrub; branches terete; leaves simple (unifoliolate), opposite, elliptical with acuminate apex, pinnately veined, mostly 7–11 cm long; petiolate, the petiole jointed below the middle and the base persistent; flowers white, in terminal trichotomous corymbs; calyx 5–6-toothed (lobes subulate, as long as the tube); corolla-tube 8–10 mm long, lobes 6–8 mm long, linear-lanceolate. Fruit purplish-black.

Marianas Islands, endemic. Frequent and fairly wide-spread, especially in

open forests on limestone.

JASMINUM MULTIFLORUM (Burm. f.) Andr. Bot. Repos. 8, t. 496, 1811.

Pubescent evergreen climber with simple ovate leaves c. 5 cm long, acute at apex, reounded to cordate at base, shortly petioled; flowers c. 2.5 cm wide, fragrant or odorless, the corolla-lobes acute, half again (or more) longer than the tube; calyx with spreading yellowish hairs.

A native of India, now widespread in cultivation. There are several horticultural forms, with variations in flower size, fragrance, and number.

JASMINUM OFFICINALE L. Sp. Pl. 7, 1753. HASMIN DIKIKE.

Glabrous or nearly so; leaves more or less deciduous; opposite, pinnate, leaflets 5 or 7, rhomboid-oblong, actute; calyx teeth long linear (up to 2 cm); corolla white, up to 2.5 cm long, with oblong acute lobes as long as the tube.

Native from Iran to China. This species is often considered to include *J. grandiflorum* as a variety (var. *g.* Bailey). Occasional in cultivation in Guam.

JASMINUM SAMBAC (L.) Aiton, Hort. Kew, 1: 8. 1789. Merrill 1914: 128. SAMPAGITA.

Pubescent climbers with angular branchlets, simple elliptic to ovate leaves up to 10 cm long, acute or obtuse, base rounded or cuneate, nearly glabrous, with evident veins; petiole pubescent, short, arched; flowers fragrant; calyx-lobes linear, c. 6–7 mm long, ciliate or glabrous; corolla white, often doubled, the lobes oblong to nearly orbicular, obtuse, as long as the tube.

A native of India, widely planted in cultivation.

LOGANIACEAE

Trees, shrubs, or climbers, sometimes with tendrils or spines, pubescent with simple or stellate hairs or scales, or glabrous; leaves opposite or whorled; simple, entire or serrate; stipules usually conspicuous, free paired or connate, sometimes reduced; flowers mostly perfect and regular, in cymes or spikes or solitary; calyx tubular, 4–5-lobed; corolla tubular, 4–10-lobed; lobes valvate, imbricate, or contorted in bud; stamens as many as corolla-lobes and alternate with them, or rarely fewer (to 1), inserted on the corolla; ovary superior, 2–5-celled; styles simple or 2–5-fid; cells usually with many ovules; fruit a capsule, berry, or drupe; seeds endospermous.—About 35 genera and 400 species, chiefly tropical. Three genera in Guam, two indigenous.

Key to local genera

1. Shrubs; fruit capsular; flowers small (less than 1 cm wide).
   2. Flowers crowded in elongate dense terminal and axillary spikes; leaves narrowly lanceolate..... *Buddleja*
   2. Flowers few in short axillary cymes, often fascicled; leaves ovate or ovate-oblong..... *Geniostoma*
1. Trees with fleshy orange berries, and large fragrant white flowers over 2 cm broad..... *Fagraea*

BUDDLEJA Houston ex L.

Trees, shrubs, or herbs with glandular pubescence; leaves simple, usually opposite, entire or serrate; stipules reduced to a line; calyx 4-lobed; corolla 4-lobed; stamens 4; fruit a bivalved capsule.—About 100 species throughout the tropics except lacking in Australia and W. Africa.

BUDDLEJA ASIATICA Loureiro, Fl. Cochinch. 1: 72. 1790.

Shrub 2–3 m tall, the branches lax, young growth stellate-pubescent; leaves lanceolate, mostly 7–15 cm long and up to 3 cm wide, entire or obscurely denticulate-serrulate, dull often somewhat olive-gray green, tawny or whitish pubescent beneath, acuminate-caudate; petiole 3–9 mm long; flowers in dense terminal and axillary elongate bracteate often nodding spikes, up to 20 cm long, dull white; calyx 1–2 mm long, pubescent; corolla white, villous; ovary 2–3-celled; capsule 3–4 mm long subglobose, calyx persistent at base, with many seeds about 0.3 mm long (microscopically winged).

A native of Eastern Asia, now widespread either through cultivation or as a weed. It is abundant in Guam especially along roadsides in central and northern parts. Harmon (3803).

GENIOSTOMA J.R. & G. Forster

Small trees or shrubs; leaves opposite, interpetiolar stipules conspicuous; flowers in cymes or fascicles of cymes, rarely panicles of cymes, axillary or from ramuline or cauline nodes; flowers usually polygamo-dioecious; calyx 5-lobed; corolla tubular 5-lobed, usually pubescent in the throat; stamens 5; ovary 2-celled with subglobose or clavate stigma (of 2 appressed lobes); fruit a 2-valved capsule, opening widely to reveal the many seeds within thin orange or reddish pulp.—About 50 species, Indomalaysia to the Pacific.

Geniostoma rupestre J. R. & G. Forster, Char. Gen. Pl. 24, t. 12. 1776.

MAJLOCJAYO. ANASSER.

G. micranthum DC. Prodr. 9: 27. 1845. Merrill 1914: 128. Syn. nov.

Erect woody shrubs with slightly nodose stems; leaves rather dark green, glabrous, mostly 6–14 cm long and 3–6 cm wide, acute or obtuse, obtuse at base, lateral nerves about 7 pairs; petioles to about 1 cm long; interpetiolar stipules ridge-like and shortly deltoid; axillary cymes single or few in fascicles, 2–3 cm long, mostly 1–3-flowered; pedicels about 3 mm long; flowers about 5 mm long; corolla white, beard in the throat; ovary superior; fruit oblong-ellipsoid, 1–1.4 cm long, the valves widely spreading after dehiscence; seeds in orange pulp.

Marianas Islands; Melanesia; Indonesia; Philippines. This is predominantly a shrub of the volcanic savannas, but is also to be found in limestone soils, where indeed it may be a taller shrub or even arborescent 2–3 m tall. The leaves are thinner and paler green in protected shady habitats; but in the open savannas they are subcoriaceous. The wood is rather soft. Manengon (3816; 3859; 4514; 4843); Sasa R. mouth (4148); Ritidian Pt. (4710).

There are too many species of *Geniostoma* proposed for the Marianas flora;

Geniostoma glaberrima Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 34. 1935, is certainly synonymous with the above species; the type was from Agrigan. *G. saipanense* Kanehira, Enum. Micron. Pl. 392. 1935 (nom. nud.) is another. *G. longistylum* Gilg, Notizbl. Bot. Gart. u. Mus. Berlin-Dahlem 12: 221. 1934, is merely a sexual form; the type from Saipan. *G. hoeferi* Gilg & Benedict in Engl. Bot. Jahrb. 56: 541. 1921, the type from Saipan, is probably only a pubescent variety of *G. micranthum* (*rupestre*), while *G. hoeferi* var. *glabra* Gilg, Notizbl. Bot. Gart. u. Mus. Berlin-Dahlem 12: 221. 1934, is nothing more than *G. micranthum* again, i.e.=*G. rupestre*.

However, *Geniostoma sessile* Kanehira, Bot. Mag. Tokyo 45: 342. 1931, of Palau, appears to be a distinct species. *G. stenurum* Gilg & Benedict (l.c.) is probably not distinct from *G. kusaiense* Kanehira, Bot. Mag. Tokyo 46: 491. 1932, but appears weakly distinct from "*G. micranthum.*"

Finally, *G. micranthum* is in my opinion indistinguishable from *G. rupestre* J.R. & G. Forster, of the New Hebrides. A.C. Smith and I have discussed this species previously (Smith & Stone, Contrib., USNH. 37: 34, pl. 1, f. 14. 1962.) See also Leenhouts in Flora Malesiana.

Fagraea Thunberg

Trees or shrubs, or climbers, some epiphytic; flowers in cymes or cymose corymbs or panicles; perfect, 5-merous; calyx rather deeply lobed; corolla usually white but fading yellow or orange, often sweetly fragrant, tubular with 5 spreading imbricate lobes, fugacious; stamens 5, inserted in the tube or throat; ovary superior, 2-celled (sometimes imperfectly) with many ovules; stigma often peltate; fruit a 1–2-celled berry (sometimes late dehiscent), with many seeds immersed in pulp.—Perhaps 50 species, S.E. Asia to the Pacific and Australia.

Fagraea galilai Gilg & Benedict, Engl. Bot. Jahrb. 56: 555. 1921. Walker & Rodin 1949: 464.

F. sair G. & B. l.c.; Merrill & Perry, J. Arn. Arb. 27: 325. 1946.

A tree with opposite, oblong, slightly fleshy, glabrous leaves 8–20 cm long, 5–10 cm wide, rounded, obtuse, or subacute-acuminate blunt, at tip, cuneate or decurrent at base, lateral nerves many and somewhat obscure; branches thickish, with conspicuous leaf-scars; petioles 0.5–3 cm long; stipule a short intrapetiolar flap; cymes terminal and subterminal, the nodes bracteate with deltoid-ovate short bracts; calyx-tube about 1 cm long, lobes deltoid-rounded, persistent; corolla about 2.5 cm long, the lobes spreading, over 1 cm long (so flower nearly 2.5 cm wide), white but fading yellow or orange, very fragrant-sweet; lobes overlapping to the right; stamens included; fruit globose or subglobose, about 2 cm long and thick, slightly apiculate, orange, rather succulent, with many seeds.—Fig. 83.

Endemic in Micronesia ("galilai" in Palau; "sair" or "seir" or "sour" in Ponape and Truk; vernacular name in Guam not known), but perhaps not distinct from *F. berteriana* A. Gray of Tahiti. In combining *F. galilai* and *F. sair* I depend on my own experience of plants in Guam. There is certainly only a single species

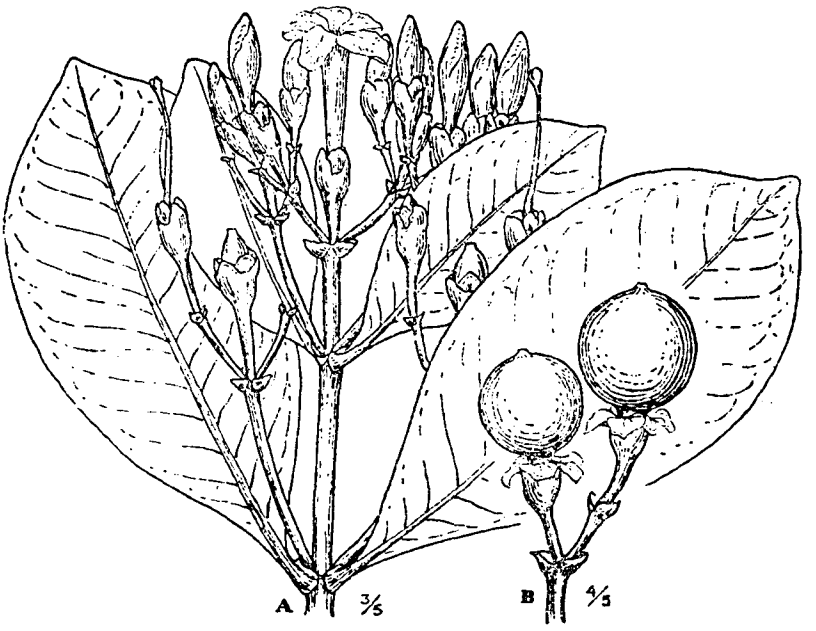

Fig. 83. Fagraea galilai.

in Guam, and of the several trees I have seen, some have leaves with acute-acuminate tips (as in *F. sair*), some with rounded tips (as *F. galilai*), indeed sometimes both kinds on the same tree. This difference is therefore of no significance. The fruits, however, are always more or less globose, and do not assume the long obovoid shape of *F. ksid* G. & B. of Palau, which may therefore be a valid species. The flowers seem to be smaller than is normal in *F. berteriana*, but this may not be important; and the fruits are also a little smaller. The Guam plants would seem to be at least a distinct form or variety, if not a separate species from the Polynesian plants.

The only known localities in Guam are in the southern hills; Glassman collected specimens (his no. 233) on Mt. Lamlam; Moore (260) collected it in the same general locality in the same month (January). My collections are from Mt. Almagosa, just above the Almagosa Spring, nos. 4109; 4340; and 4899. It is also known from Rota.

Flowers of *F. berteriana* are known in Hawaii as "pua kenikeni" (ten-cent flower) and are favorites for their rich perfume. The Guam plants are equally desirable in gardens, but I know of none so planted. The rich orange or even vermilion fruits are also very handsome.

The genus *Fagraea* has occasionally been considered to be in the family Gentianaceae rather than in Loganiaceae.

APOCYNACEAE

Trees, shrubs, or climbers, rarely herbs, *with milky sap*; leaves opposite or whorled, simple (rarely alternate); *stipules none*; cymes terminal or axillary; flowers regular, perfect; calyx 4–5-lobed, lobes imbricate; corolla 4–5-lobed, lobes imbricate and convolute in bud; stamens 4–5, adnate to the corolla; ovary 2-celled, the cells free as separate carpels (at least in fruit) but contiguous in flower, the apices (style) usually connate; a disc sometimes present at base; ovules mostly rather numerous; fruit generally of the two matured carpels, these follicular (or 1 aborting), divergent, usually dehiscent by the upper suture, rarely baccate or drupaceous; seeds generally with a tuft of hairs.—A large family of about 130 genera and more than 1200 species, chiefly of the tropics. Twelve genera in Guam, of which four include indigenous species.

Key to local genera

1. Shrubs armed with spines; leaves opposite..... *Carissa*
1. Unarmed herbs, shrubs, or trees; leaves opposite, whorled, or spiralled.
   2. Herbs with opposite decussate leaves..... *Catharanthus*
   2. Trees, shrubs, or woody climbers; leaves variously arranged.
      3. Leaves opposite or whorled.
         4. Woody climbers or shrubs, with whorled leaves;
            5. Flowers large, yellow, slightly zygomorphic; corolla with fimbriate scales in throat..... *Allamanda*
            5. Flowers small, white (the throat yellow inside only); scales absent..... *Alyxia*
         4. Trees or shrubs; leaves opposite or whorled.
            6. Leaves opposite, the petiole with a basal flange clasping the stem; calyx with basal yellow glands; corolla white... ..... *Tabernaemontana*
            6. Leaves whorled, or if sometimes opposite, then whorled on other stems of the same plant; calyx with or without basal glands; corolla red, pink, or white.
               7. Corolla with 10 or more exserted scales; red, pink, or white; calyx with basal glands; leaves whorled in groups of 3..... *Nerium*
               7. Corolla without scales; white or at least white-lobed; calyx without basal glands; leaves variously whorled.
                  8. Disc present at base of ovary; corolla-lobes overlapping to the left; leaves opposite or whorled in groups of 3; corolla reddish externally, but the lobes white..... *Rauvolfia*
                  8. Disc absent; corolla-lobes overlapping to the right or left; leaves whorled in 3's or sometimes more, or sometimes opposite; corolla white.
                     9. Leaves rather consistently in whorls of 3;

oblanceolate; fruit red, compressed obovoid-ellipsoid; leaves narrowly lanceolate-spatulate ..... *Bleekeria*

9. Leaves whorled or opposite; obovate; fruit yellow, ellipsoid; leaves broadly obovate-elliptic ..... *Ochrosia*

3. Leaves spirally arranged,

10. Flowers greenish-yellow or salmon-color; calyx with basal glands; corolla with scales..... *Thevetia*

10. Flowers white, pink, or red, or yellow in the throat but white elsewhere; calyx without basal glands; corolla with (Cerbera) or without (Plumeria) scales;

11. Corolla throat with scales; calyx lobes large but caducous; stamens near apex of corolla-tube; fruit a drupe.. *Cerbera*

11. Corolla throat without scales; calyx lobes small and persistent; stamens near base of corolla-tube; fruit an elongate follicle..... *Plumeria*

ALLAMANDA Linnaeus

Shrubs, sometimes climbing; leaves whorled; flowers in terminal corymbs, 5-merous, yellow corolla very slightly zygomorphic; calyx without basal glands; corolla with fimbriate scales in throat; lobes spreading; stamens concealed by scales; ovary set on cupular 5-lobed disc; ovary 1-celled; fruit a globose often shortly spiny capsule with many seeds.—S. Trop. Amer. and W. Indies, 15 spp.

ALLAMANDA CATHARTICA L. Mantissa 2: 214. 1771. Merrill 1914: 128.

ALLAMANDA.

Climbing shrub; leaves whorled, oblong-lanceolate, acute-acuminate, 8–15 cm long, mostly 4–5 cm wide; inflorescence of about 10 flowers; corolla tube 4 cm long (or more), the spreading lobes totalling 6–7 cm wide (or more), bright yellow; stamens very short; capsules (very rare in cultivation).—Pl. 12a.

A native of Brazil, now cultivated throughout the tropics. There are several forms; one, usually called var. *hendersonii* (Bull) Bailey & Raff., has very large flowers nearly 14 cm wide and brownish buds. Both the small and the large flowered forms are cultivated commonly in Guam, the former at the Spanish Plaza in Agaña (for example). Barrigada (4271); Mangilao (4404).

ALYXIA R. Brown

Shrubs, often scandent; leaves in whorls of 3 or 4; rarely opposite; flowers usually in axillary cymes, rather small; calyx short, 5-lobed; corolla with tube longer than lobes; no scales in throat; stamens adnate in throat at or above middle; disc obscure or absent; ovary of 2 free carpels united by styles; ovules few (2–6), biseriate; carpels baccate or drupaceous when mature, with 1–4 seeds; seeds not tufted or winged, often superposed in the moniliform carpel.—About 30 species from tropical

Asia to Australia and the Pacific Islands.

Alyxia torresiana Gaudichaud, Bot. Freyc. Voy. 451. "1826" (1830). Merrill 1914: 128. NANAGO. LODOSONG LAHE.

Gynopogon torresianus (Gaud.) K. Schum. & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee 504. 1901; Safford 1905: 289.

Erect or scandent shrubs; leaves whorled in groups of 3 or 4, glossy, elliptic or narrowly obovate-elliptic, obtuse or subacute, coriaceous, 3–6 × 1–3 cm, cuneate-tapered at base; lateral nerves many pairs; petioles 1–3 mm long; milky sap copious; cymes shorter than leaves, peduncles to about 1 cm long; short puberulent; flowers few (2–6), salverform; calyx puberulent, about 3 mm long, with 5 narrow acute 2 mm lobes; corolla white externally but yellow-orange within, about 6–8 mm long, the lobes about 1/3 as long as the tube or less, slightly bulbous just below the limb, stamens 5, included; carpels glabrous, 4-ovulate, style 2.5 mm; fruit ellipsoid, purplish-black, 10–13 mm long, if more than 1-seeded then strongly constricted between the seeds and up to 20 mm (or more) long.—Fig. 84.

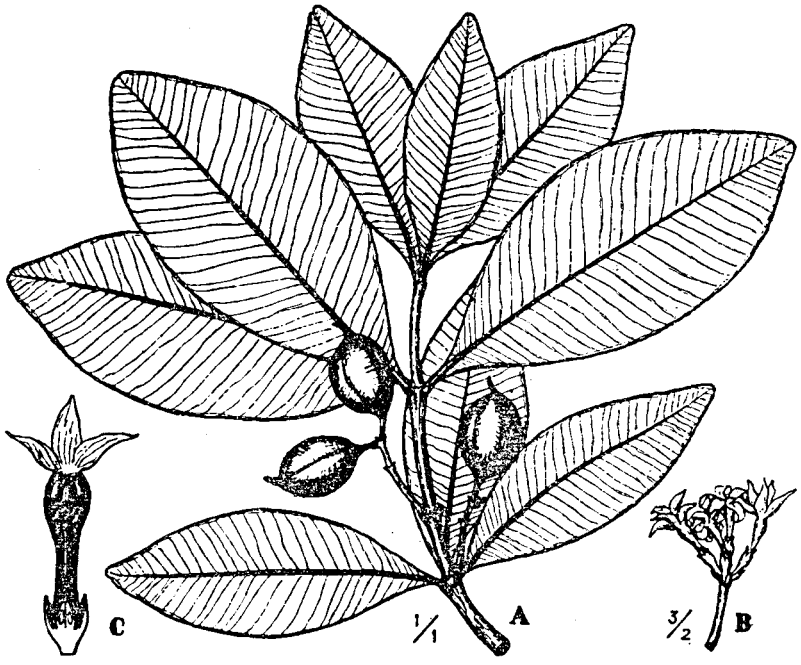

Fig. 84. Alyxia torresiana.

Marianas Islands, endemic; first collected and described by Gaudichaud. Safford remarks that it was (in his day) "common on rocky cliffs, especially on the promontory between Asan and Tepungan"; it occurs both on limestone and on the limestone-capped southern hills, and in savannas where there is shade and

(probably) a mixed soil; in the latter case it is usually erect, while in limestone forest communities it is usually scandent. The specific name honors Don Luis de Torres, sergeant-major of the island at the time of Gaudichaud's visit in 1819. The foliage (when dry) has a coumarin-like odor, though not so strong as in the Hawaiian alyxia called "maile", *A. olivaeformis*. The species also occurs on Rota, Tinian, and Saipan. Related species occur in other parts of Micronesia.

Agat hills (4212); Asdonlucas (4255); Lasaguas R., Apra (4675).

BLEEKERIA Hasskarl

Recognizable from the specific description below. A small paleotropical genus of about 10 species, occurring in the Mascarene Islands through Tropical Asia to Polynesia.

Bleekeria mariannensis (DC.) Koidzumi, Bot. Mag. Tokyo 37: 52. 1923.

LANGITI.

Ochrosia mariannensis A. Dc. Prodr. 8: 357. 1844. Safford 1905: 336. Merrill 1914: 129.

Excavatia mariannensis (DC.) Markgraf, Engl. Bot. Jahrb. 63: 284. 1930.

A small to medium tree with milky sap; leaves whorled in groups of 3; blades oblanceolate-oblong, blunt or acute at apex, attenuate or acute at base, about 12–20 cm long and 2–5 cm wide; petioles mostly less than 1 cm long; lateral nerves many pairs, closely spaced and subparallel; glabrous; glossy green above, slightly paler beneath; inflorescence a rather short few-flowered cyme about 2–4 cm long; calyx 5-lobed, lobes elliptic, c. 5 mm long; corolla narrowly tubular about 15 mm long, with 5 spreading obliquely oblong lobes nearly 9 mm long, white, glabrous outside, puberulent within; stamens 5, inserted in the tube, small, about 3 mm long; disk none; ovary of 2 appressed carpels, united by the slender elongate styles, the capitate stigma just exserted; ovules few (2–6) in each carpel; carpels diverging as they mature (or 1 abortive); fruit thus commonly of 2 twinned compressed-obovoid bright or dark red drupes, slightly keeled on the margins, about 4×3 cm; seeds mostly 1 or 2, within a woody endocarp; testa thin; embryo straight with plane cotyledons.—Pl. 12b.

Endemic to the Marianas Islands, where it is a rather frequently met component of the limestone forest community, occurring also but less commonly along rocky streams in the southern hills of Guam. Distinctive in fruit by reason of the twinned, red drupes, the narrow nearly spathulate leaves whorled in threes, and the copious milky sap, which thickens and coagulates on exposure. The type of this species was collected in Guam by Gaudichaud. It has since been found on Rota, Saipan, Pagan, and other islands in the Marianas. Manengon (3811; 4856); Pago Bay (3917); Pago cliffs (4129; 4405); Ritidian Pt. (4702).

Some plants have rather regularly acute-acuminate leaves; others have blunt or round leaves.

CARISSA Linnaeus

Shrubs with opposite, bifid, pungent, spines; leaves opposite, pinnately nerved; cymes in axils or terminal; flowers 5-merous; calyx without basal glands; corolla salverform; corolla-throat lacking scales; stamens near apex of tube; disk none; ovary 2-celled, cells 4-ovulate; fruit a berry; seeds not tufted.—Africa and Asia.

Two species introduced in cultivation in Guam.

1. Spines twice-forked; flowers 3 cm broad; fruit 2.5–5 cm.... *C. grandiflora*
1. Spines unforked; flowers 1.2 cm broad; fruit 1.2 cm long..... *C. arduina*

CARISSA GRANDIFLORA (E. Mey.) DC. Prodr. 8: 335. 1844. Merrill 1914: 128.
NATAL PLUM.

A densely branched shrub; nodes with twice-forked spines 2.5–5 cm long; leaves elliptic, coriaceous, 2.5–7.5 cm long; cymes short, terminal; flowers white, 2.5–5 cm broad, the tube very short, much exceeded by the oblong lobes; fruit a red ovoid berry 2.5–5 cm long, with a reddish sweet pulp and 2–4 seeds.

Native of S. Africa, now widely cultivated. Merrill states that this plant was introduced to Guam from Hawaii. Its dense growth and spines recommend it for hedges.

CARISSA ARDUINA Lamarck, Encycl. 1: 555. 1783.

Similar to the above but smaller throughout; flowers about 1.2 cm broad; fruit 1.2 cm long; spines unforked.

Native of S. Africa. Possibly in Guam in cultivation (not verified).

CATHARANTHUS G. Don

Erect, sometimes suffruticose, herbs with milky sap; leaves opposite, pinnately nerved; flowers axillary, single or paired, 5-merous; calyx without basal glands; corolla salverform; throat thickened and pubescent; corolla-lobes overlapping to the left; anthers connivent into a cone above and free from the stigma; 2 glands at base ovary; ovary of 2 distinct carpels; ovules many; fruit follicular; seeds not tufted.—Tropical America, Madagascar, 5 spp.

CATHARANTHUS ROSEUS (L.) G. Don, Gen. Syst. 4: 95. 1838.
CHICHIRICA. PERIWINKLE.

Lochnera rosea (L.) Reichenbach, Consp. 134. 1828. Safford 1905: 310. Merrill 1914: 129.

Vinca rosea L. Syst. ed. 10, 944. 1759.

Erect herbs less than 1 m tall; leaves oblong or oblong-obovate, obtuse or rounded, slightly cuspidate, finely puberulent on both surfaces, 2.5–9 cm long; midrib pale; flowers pink or white (the throat darker); pedicels 1–2 mm long; calyx about 6 mm long; corolla-tube 2.5–3 cm long, lobes 1.5–2 cm long; fruit 2–2.5 cm long, with many small black cylindrical seeds.

Introduced from, perhaps, the West Indies; originally from Madagascar; now grown around the world in gardens. There are several color-forms, mostly varying from pink to white and in the color of the throat or 'eye' of the flower. The plants bloom continuously and require little care. Barrigada village (4268).

Although this plant is sometimes said to escape and become naturalized, I have never seen it so in Guam.

CERBERA Linnaeus

Trees with milky sap; leaves spirally arranged; blackening when dry; cymes terminal; flowers 5-merous, subtended by large caducous bracts; calyx without basal glands; corolla salverform; throat with 5 scales; lobes overlapping to the left; anthers included; ovary of 2 free carpels; stigma slightly 2-lobed; fruit drupaceous, the 2 ripe carpels twinned, or single by abortion, with a fibrous- woody endocarp, 1–2-celled; seed single in each cell, not tufted.—About 5 paleotropical and Pacific species.

One indigenous species in Guam.

Cerbera dilatata Markgraf, Engl. Bot. Jahrb. 63: 285. 1930. CHIUTE.

C. lactaria sensu Merrill 1914: 129, non (G. Don) Hamilt. ex DC. Prodr. 8: 353. 1844.

A small tree with copious milky sap, the leaves rather crowded toward the ends of the thickish branches, spirally arranged; young stems with crowded semicircular leaf-scars 2–3 mm wide; leaves drying nearly black, with darker reticulations, in life dark green but the petioles and midribs reddish; blades convex ventrally, mostly 7–15 cm long, 2.5–5 cm wide, elliptic or oblong, bluntly acute-acuminate, decurrent at base, quite glabrous, lateral nerves many (12–18 pairs), close and subparalled, diverging from midrib at 60°–70° angle; petioles 1–2.5 cm long; inflorescence terminal, nodose, branched, 15 cm long or more; flowers large, showy, subtended by deciduous bracts 12 mm long; calyx tube 1–1.5 cm long and with 5 equally long narrowly obovate lobes; corolla tube 1.5 cm long, lobes overlapping to the left in bud, obdeltoid, very slightly oblique, the truncated tip with a concave notch, rotate, glabrous, but densely pubescent and yellow-orange in the throat; stamens near middle of tube; anthers 3 mm long; ovary glabrous, 2 mm high, style filiform, 6 mm long. Stigma large cylindric-conic, 3 mm; fruit speckled green, brown, and white; ellipsoid, single or twinned, about 5×4 cm, indehiscent, fibrous externally under a thin skin, with woody endocarp.—Pl. 12c.

Endemic in the Marianas Islands; the type from Guam; Rota, Tinian, Saipan, Pagan. In Guam this is found chiefly in the southern hills, sometimes in considerable numbers, sometimes as scattered individuals. In the moist valleys of hills back of Inarajan there are thickets composed entirely of 'chiute'. I have not seen it on limestone in Guam, but it must occur on limestone in some areas, as it is known from Tinian, Rota, and Saipan. The trees are often rather shrubs, 2–3 m tall. In flower, they are exceedingly handsome, the large white fragrant flowers more attractive, to this writer, than the plumeria-flowers.

Manengon (3886); (4855); Talofofo valley (3961); Inarajan hills (5056).

NERIUM Linnaeus

Shrubs with milky sap and whorled leaves; corymbs terminal; flowers 5-merous,

calyx with many basal glands; corolla funnelform; throat with incised scales; lobes overlapping to the right; anthers adhrent to stigma but readily separating; connective with an apical appendage disk none; ovary of 2 free carpels; ovules many; fruit follicular; seeds hairy with apical tuft of hairs.—Mediterranean region to Japan, 3 spp.

NERIUM INDICUM Miller, Gard. Dict. ed. 8, no. 2. 1762. Merrill 1914: 129.
ADELFA. OLEANDER. ROSA-LAUREL.

N. oleander sensu Safford 1905: 331, non L.

Large shrubs; leaves whorled in groups of 3, linear-lanceolate, acute at both ends, 10–30 cm long 1.5–3 cm wide, finely puberulent, firmly chartaceous or thin coriaceous, rather dull slightly grayed green; young branchlets slightly 3-angled; flowers pink or white, sometimes with double petals, commonly 4–5 cm wide; fruit (seldom seen) 15–25 cm long.

Native of continental Asia, now widely cultivated. Abundant in Guam gardens. The milky sap is highly poisonous if it happens to enter the blood stream. (Barrigada, 4141).

The species *N. indicum* Mill. is so similar to *N. oleander* L. that it has been reduced to a variety of the latter (Degener). Possibly both varieties are in Guam.

OCHROSIA Jussieu

Trees with milky sap; leaves opposite or whorled; cymes axillary; flowers 5-merous; calyx without basal glands; corolla salverform, white, the throat without scales; lobes overlapping to the right; stamens inserted in the tube; disk none; ovary of 2 free carpels or the carpels basally connate; ovules 2–4; fruit drupaceous, 1 or 2, free or slightly connate, fleshy or fibrous; seeds not tufted.—About a dozen species, from the Mascarene Islands (Indian Ocean) eastward through Malaysia to the Pacific.

Ochrosia oppositifolia (Lamarck) K. Schumann, Nat. Pflanzenfam. 4: 156. 1895. Merrill 1914: 130. FAGO.

A tree with milky sap and conspicuous pagoda-form branching; leaves obovate or oblong-obovate or nearly elliptic, rounded, obtuse or briefly acuminate, obtuse but slightly decurrent at base, glossy rather dark green, usually somewhat concave dorsally, lateral nerves numerous, crowded, straight; petiole 2–6 cm long; blade 10–36 cm long, 6–13 cm wide; most leaves whorled in groups of 3 or 4 (rarely 5), others opposite; cymes 5 cm long or more; pedicels 2–3 mm; flowers white, fragrant, rather small (1–1.2 cm wide), corolla-lobes longer than tube; fruit of twinned or single drupes, oblong-ellipsoid, about 8 × 5 cm; ripening dull yellow, slightly beaked, fibrous under the thin pericarp, the pyrene usually 2-seeded.—Pl. 12d.

Native of sandy sea-shores and limestone coasts from Malaysia into the Pacific. This tree seems to be rare in parts of Malaysia (as Java), but it is certainly one of the commonest trees in the tropical Pacific. In Guam it is scattered everywhere on the coralline mesas as well as on the coast. The pagoda-form branching, with the intervals between the groups of horizontally radiating branches quite long, the old

leaves withering yellow, the rather small white flowers, the milky sap, and the generally smooth grayish bark all afford easy recognition of this plant. The pericarp of the fruit is said to be edible. The fibrous pyrenes are a frequent drift object in the flotsam thrown up on sandy beaches. Barrigada Hill (3785; 4498); Mochom (4954). It is highly resistant to typhoons.

PLUMERIA Linnaeus

Small thick-stemmed trees with milky sap and spirally arranged leaves; branches pithy; corymbs terminal; flowers 5-merous, fragrant; calyx without basal glands; corolla funnelform; lobes overlapping to the left; scales none; stamens inserted near base of tube; ovary of 2 free carpels; ovules many; fruit follicular, cylindric-fusiform; seeds many, flat, with a broad wing at one end, not tufted.—About 8 or 9 Tropical American species, the following ones now cultivated everywhere in the tropics.

1. Leaves acute-acuminate, rather dull green.....*P. rubra*
1. Leaves rounded spathulate, very dark and glossy.....*P. obtusa*

PLUMERIA RUBRA L. Sp. Pl. 209. 1753. PLUMERIA. FRANGIPANI.

P. acuminata Aiton, Hort. Kew ed. 2, 2: 70, 1811. Walker & Rodin 1949: 464.

A shrubby branching tree with distinctive thick fragile branchtips and crowded spiralled large leaves; copious milky sap; blades mostly elliptic, acute-acuminate, tapered at base, commonly 20–35 cm long and 6–12 cm wide; petioles 4–9 cm long, stout; peduncles 4–15 cm long; flowers white, pink, or red (if white, the eye yellow); large, fragrant. Fruit seldom seen; single or twinned cylindric-fusiform follicles widely divergent, green later black, 15–20 cm long, with many flat winged overlapping seeds.

A native of Tropical America now widespread in cultivation. This is probably the easiest of all plants to grow; a branch stuck in the ground and ignored thereafter usually grows indefinitely. Flowering is nearly continuous. Fruits however are a rare sight; these developed shortly after typhoon Karen of 1962, in both species. Harmon (4290).

PLUMERIA OBTUSA L. Sp. Pl. 210. 1753.

In habit similar to P. rubra; differing in the more knobby branches; the dark glossy obovate-rounded leaves; the slightly larger inflorescences; the more obovate corolla-lobes, all white, with a central yellow eye; the larger size of the flowers, and their fainter scent; and the slightly larger fruit.

Tropical America. Guam Memorial Hospital grounds (3850); Agana (5100, in fruit).

RAUVOLFIA Linnaeus

Trees or shrubs with milky sap; leaves whorled or rarely opposed; cymes terminal, axillary, and suprapetiolar; calyx without basal glands; corolla salverform; scales none; lobes overlapping to the left; stamens inserted in the wide part of the

tube; disk present; ovary of 2 free or connate carpels; fruit drupaceous, either as twinned free carpels or as a bicarpellate entire or bilobed drupe; pyrenes 1 or 2.—About 60 species in the tropics of both hemispheres. One introduced species in Guam; 1 or 2 indigenous species elsewhere in Micronesia (Caroline Is.).

RAUVOLFIA SERPENTINA (L.) Bentham ex Kurz, Forest Flora Brit. Burma 2: 171. 1877.

Shrub to 2 m tall; leaves opposite or whorled in 3's; petiole to 2.5 cm blade to 7–25 cm long, 2–9 cm wide; glabrous; cymes many-flowered, axes often red; corolla-tube reddish externally, white inside, 1.3–2 cm long; lobes white, 4–6 mm long; ovary of 2 free carpels; fruit of 1 or 2 globose black drupes.

Native of India; the source of reserpine, the relaxant drug. One plant of this species or a nearly related one was seen at the Experiment Station in Lalo in 1955–56.

TABERNAEMONTANA Linneaeus

Trees or shrubs with milky or watery sap and opposite leaves; petiole on upper side with a basal appendage; cymes terminal; flowers 5-merous; calyx with basal glands; corolla salverform, lobes overlapping either to right or left; stamens inserted in the tube; disk none; ovary of 2 free carpels; ovules many; fruit follicular, single or twinned; follicle widely dehiscent; seeds surrounded by bright red pulp, not tufted.—(Incl. *Ervatamia* Stapf).—Perhaps 175 species throughout the tropics.

1. Leafy garden shrub without milky sap; the flowers often doubled with fluffy, crinkled corolla-lobes; sepals broadly deltoid; corolla-lobes obovate..... ..... *T. divaricata*
1. Slender wild tree with milky sap; flowers single; sepals narrowly deltoid; corolla-lobes oblong-acute, very slightly ruffled;..... *T. rotensis*

TABERNAEMONTANA DIVARICATA (L.) R. Brown ex Roemer & Schultes, Syst. Veg. 4: 427. 1819. Merrill 1914: 130.

CRAPE-JASMINE. PAPER-GARDENIA.

A shrub 2 or 3 m tall strongly resembling a Gardenia with scanty *clear* sap; leaves opposite, 6–14 cm long, 2–4.5 cm wide, elliptic-oblong, acute or obtuse, acute at base, glabrous, glossy; petioles short, mostly about 1 cm long; flowers usually several (to about 8) together or rarely solitary, white, the clusters corymbose (flat-topped); calyx about 5 mm long, segments rather broad deltoid and obtuse; corolla-tube 1.5–2 cm long, lobes about 2 cm long, often doubled and ruffled or crinkled; fruit (rarely seen in cultivation) oblong, pubescent, red within, 3–7 cm long, with 1–3 ridges.

Possibly a native of India; at any rate of Asia; now widespread in cultivation. This is rather a popular garden shrub in Guam; I have seen only the double-flowered forms. Mangilao (4369). It is deceptively like a Gardenia, but can quickly be distinguished by the short, obtuse calyx-lobes, the superior ovary of 2 free carpels adnate by the styles, and the near absence of a sweet floral odor. The absence of milky latex is a curious feature of this species.

Tabernaemontana rotensis (Kanehira) Fosberg, ex Stone, Micronesica 2(1): 48. 1965.

Ervatamia rotensis Kanehira, Bot. Mag. Tokyo 50: 600, f. 57. 1936.

A slender tree to 8–10 m tall with thin, light green, opposite, shortly petiolate elliptic-oblong leaves 15–30 cm long, 5–10 cm wide, acute and shortly somewhat blunt acuminate, obtuse and briefly decurrent at base; sap copious *milky*; inflorescence an elongate slender open rather few-flowered cyme about as long as the leaves, branched 3–4 times, pedicels 1–2 cm long; calyx with 5 narrow lance-deltoid lobes about 5 mm long (the calyx-tube about 2.5 mm long); lobes overlapping to the left; glands at base of calyx-lobes yellow, minutely deltoid, about 5 to each lobe; each about 0.3 mm high; corolla white, the tube slender, 1 cm long, slightly expanded at the apex, the lobes about 1.4 cm long and 4 mm wide, lanceolate, overlapping to the left in bud, when at anthesis rotate, the apices slightly twisted and the margins slightly ruffled; stamens inserted at the apex of the tube, included, the filaments much shorter than the narrowly sagittate anthers, these about 1.4 mm long, acute; fruits twinned or single, each follicle ellipsoid, conspicuously beaked, nearly 3 cm long and 1 cm thick; seeds embedded in bright red pulp; about 4 mm long.—Fig. 85.

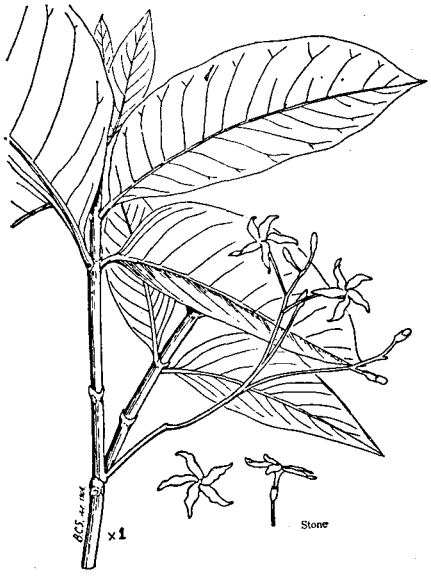

Fig. 85. Tabernaemontana rotensis.

Marianas Islands, endemic; known so far from Rota and Guam. Only one plant of this species has so far been reported in Guam (from the limestone ridge above Asanite Pt., slender 25 ft. tree among *Heritiera longipetiolata*, flowering and fruiting 6 January 1965, *Stone* 5256). It is probably restricted to limestone.

THEVETIA Linnaeus

Big shrubs with milky sap; leaves spirally arranged; cymes terminal and leaf-opposed; flowers 5-merous; calyx with basal glands; corolla with 5 narrow pubescent scales; lobes overlapping to the left; stamens inserted near apex of tube; annular disk present; ovary 2-celled; cells 2-ovulate; stigma conic; fruit a subglobose drupe with a woody 2-celled pyrene, but usually 1-seeded; seed not tufted.—Tropical America; about 10 species.

THEVETIA PERUVIANA (Persoon) K. Schumann, Pflanzenfam. iv (II): 159. 1895. Merrill 1914: 130. BE-STILL TREE. YELLOW OLEANDER.

An arborescent shrub; leaves linear-lanceolate, acute or subobtuse, acute at base, coriaceous, dark green somewhat glossy above, paler beneath, petiole very short (3 mm), blade 8–14 cm long, less than 1 cm wide, glabrous; cymes many-flowered; calyx 1–1.3 cm long, lobes acute-acuminate; corolla 5–7 cm long, yellow (rarely light orange); fruit a juicy black drupe 4–5.5 cm broad.

A native of Peru now widely cultivated. All parts of this plant are very poisonous, especially the sap and the oily seeds; hence, no doubt, the name "be-still" tree, the stillness implied being the ultimate stillness.

Tamuning garden (5145).

ASCLEPIADACEAE

Rarely trees, mostly shrubs, erect or climbing, or herbs, erect or climbing; leaves opposite or whorled; stipules none or very minute; flowers perfect, regular; usually in cymes; 5-merous, except that the ovary is of 2 separate carpels; a corona present or rarely absent, entire or of free scales; stamens inserted near base of corolla-tube, the filaments connate into a tube; anthers connivent above the stigma; pollen adherent in waxy pollinia (as found elsewhere only in Orchids); carpels appressed but distinct, joined only by the single stigma; ovules many; fruit follicular, dehiscent on the ventral suture; seeds usually flattened, often somewhat winged, usually tufted with a crown of hairs; endospermous.—A large family; in its conservative delimitation, with about 200 genera and over 2000 species. Nearly all have copious milky sap; many are important economically. The family is represented in Guam only by 4 genera, one of which indigenous. (Others are probably present in some gardens as ornamentals).

Key to local genera

1. Erect perennial herbs with red-and-yellow flowers..... *Asclepias*
1. Herbaceous or woody climbers or epiphytic creepers; flowers not red-and-yellow.
   2. Leaves very thick, hard-succulent, small (less than 2 cm long); epiphytes with creeping appressed or hanging stems and tiny greenish-yellow flowers (in our sp.)..... *Dischidia*
   2. Not as above,

3. Flowers reddish-purple; leaves oblong, pinnately nerved. . *Cryptostegia*
3. Flowers yellow-green; leaves cordate, palmately nerved. . . . . *Telosma*

ASCLEPIAS Linnaeus

Suffrutescent erect herbs with milky sap; flowers in lateral umbel-like cymes; calyx with 5–10 internal basal glands; corolla 5-parted; corona of 5 scales inserted on the stamen-tube, hood-shaped with an incurved horn; stamens inserted on the corolla-tube; anther cells each with one pollinium; ovary of 2 free carpels; stigma 5-angled; fruit follicular; seeds flat, with tuft of long hairs.—About 120 spp., mostly N. Amer.

One species in Guam.

Asclepias curassavica L. Sp. Pl. 215. 1753. Safford 1905: 91; 191.
Merrill 1914: 130. ASUNCION. MILKWEED.

Erect branched herb to 1.5 m tall; leaves opposite, oblong-lanceolate, acute at both ends, 6–15 cm long, 1–3 cm wide; cymes on peduncles 3–6 cm long, 4–15-flowered; flowers bright red-and-yellow; calyx-lobes to 4 mm long; corolla to 9 mm long; corona-scales to 4 mm long; stamen-tube to 3 mm long; follicles ovoid-oblong, 5–7.5 cm long; seeds 6–7 mm long, with silky-white tuft of hairs 2–2.7 cm long.—Pl. 12e.

Native of Tropical America, now widespread and naturalized in many tropical regions. This is the host-plant for larval stages of the well-known Monarch Butterfly (*Anosia plexippus* Fabr.). Naturalized widely in Guam. Cetti Bay (3894).

The silky tufts of the seeds can be used for stuffing pillows like kapok (Ceiba).

CRYPTOSTEGIA R. Brown

Shrubs, climbing and twining; sap milky; leaves glabrous; cymes terminal; flowers rather large; calyx with 10 internal basal glands; corolla campanulate; corona of scales inserted on the corolla; stamens with free filaments inserted at base of corolla-tube; pollen loosely coherent in 2 masses in each anther-cell; stigma convex; follicles trigonal; seeds tufted.—Madagascar; 2 spp.

CRYPTOSTEGIA GRANDIFLORA R. Brown, Bot. Reg. t. 435. 1819.
Stone, Micronesica 1: 134. 1964. INDIA RUBBER VINE.

Woody ornamental lactiferous climber with opposite simple oblong shortly acuminate short-petiolate leaves 4–10 cm long, 3–5 cm wide; cymes of about 6–12 large reddish-purple flowers (sometimes lighter pink-violet); calyx-lobes about 1.2 cm long; corolla about 5 cm long (in bud); follicles 7.5–8.5 cm long.

Native from Madagascar to India; introduced to Guam (probably via Hawaii) as an ornamental. Living plants on trellises first seen in Mr. Paul Souder's garden in Agaña Heights.

The flowers resemble those of the purple *Allamanda* (*A. violacea*).

DISCHIDIA R. Brown

Epiphytic herbs, climbing by clasping appressed roots, stems later pendulous;

leaves opposite or whorled, usually fleshy, sometimes concave; flowers in terminal racemose clusters or lateral between petioles of a pair of leaves; flowers small, violet, red, or white; calyx with basal internal glands; corolla urceolate, fleshy, 5-lobed; corona of 5 scales inserted on the stamen-tube; 5 stamens shortly connate, inserted at base of the corolla-tube; anther cells each with 1 pollinium; stigma flat or conic; follicle slender conic; seeds flat, tufted, commonly provided with an elaiosome [edible for ants, which distribute the seeds].—Indomalaysia to Australia and Polynesia, 80 spp.

Dischidia puberula Decaisne ex DC. Prodr. 8: 631. 1844.

Safford 1905: 263. Merrill 1914: 131.

Epiphytic fleshy herb; sap milky, copious; stems flatly appressed to tree trunks, or the upper branches spreading and hanging; leaves opposite, elliptic-ovate, acute, convex-compressed, light or slightly yellowish-green, somewhat glaucous, very short-petiolate, about 1–2.2 cm long and 2/3 as wide; 2–4 mm thick; flowers very small, yellowish-green, in small axillary umbels; corolla-lobes obtuse, pilose; stamens connate, anthers with apical membrane; corona-scales bifid. Fruits? —Pl. 12f.

Endemic; found in limestone-community forests, not common. Barrigada Hill (4038); Ypiga (4688). The fruits have apparently never been found.

CONVOLVULACEAE

Mainly vines, sometimes small trees or erect herbs; leaves alternate, simple, exstipulate, rarely absent; flowers perfect, regular or nearly so; sepals 4–5; corolla tubular, somewhat 4–5-lobed, often trumpet-shaped; stamens 4–5, alternate with the corolla-lobes, borne adnate to the corolla, usually near the base; ovary superior, 1–4-celled; ovules 1–2 in each cell, basal, erect; fruit a capsule or berry; seeds often hairy.—About 50 genera and more than 1000 species, cosmopolitan.

Key to local genera

1. Pollen grains spinulose.
   2. Calyx in fruit much enlarged, completely enclosing the ripe fruit; leaf-blades with minute black dots (glands) beneath..... *Stictocardia*
   2. Calyx in fruit sometimes enlarged in fruit but never completely enclosing the fruit; leaf-blades without black dots beneath..... *Ipomoea*
1. Pollen grains not spinulose.
   3. Capsule circumscissile (the apex separating as a lid); upper part of the epicarp separating from the lower part and from the endocarp; corolla white or pale yellow, without purple center; stems terete or winged..... *Operculina*
   3. Capsule opening by 4 valves or more or less irregularly dehiscent; corolla white, pale yellow, or bright yellow, sometimes with a purple center; stems not winged..... *Merremia*

IPOMOEA Linnaeus

Herbs or shrubs, usually vinelike, twining to the right, rarely floating, sometimes prostrate, usually climbing or erect; leaves petiolate, entire or often palmately divided; inflorescences mostly axillary, cymose, 1-few-flowered; flowers with 5 sepals, tubular red, pink, white, blue, or yellow corolla, 5 stamens, and 2–4– (rarely 3–) celled ovary; fruit a globose or ovoid capsule, mostly 4 (rarely 6) -valved, with 4–6 seeds.

A large genus of about 500 species, widely spread in the tropical and sub-tropical regions of both hemispheres. The species are often widely distributed. Ecologically restricted to lowland areas, rarely above 1600 m. alt. (5000 ft.); they are generally capable of aggression into disturbed habitats. All species avoid shade, preferring open sunny habitats. Some species (such as *I. pes-caprae*) are restricted to sandy beaches. (–S.J. van Ooststroom).

Key to local species

1. Sepals distinctly awned at or below the apex; awn straight or curved; corolla salver-shaped with a long narrow tube; stamens and style mostly exserted from the corolla-tube.
   2. Corolla about 3–4.5 cm long, scarlet or rarely pure white; day-blooming; outer sepals 2–4.5 mm long (not including the awn), inner ones 3–6 mm long (not including the awn); leaves pinnately parted into numerous linear or filiform segments..... *Ipomoea quamoclit*
   2. Corolla larger, white or purplish; night-blooming; outer sepals 5–12 mm long (not including the awn), inner ones 7–15 mm long (not including the awn); leaves not pinnate..... *Ipomoea alba*
1. Sepals obtuse, acute, or acuminate, whether or not mucronulate but not distinctly awned at or below the apex; corolla mostly funnel-shaped, or campanulate, sometimes salver-shaped; stamens and style usually included (not protruding from the corolla-tube).
   3. Corolla large (10 cm long or more), white, with a long narrow tube, blooming only late at night..... *Ipomoea tuba*
   3. Corolla usually smaller, usually opening in the early morning.
      4. Sepals entirely glabrous.
         5. Sepals at least 14 mm long, the outer ones with lanceolate to broad lanceolate base, long and gradually attenuate toward the apex..... *Ipomoea indica*
         5. Sepals not as above, and usually shorter.
            6. Ovary densely to sparsely hairy..... *Ipomoea batatas*
            6. Ovary entirely glabrous.
               7. Stamens exserted; leaves deeply palmately lobed; corolla salver-shaped, red or purplish; outer sepals distinctly concave, elliptic..... *Ipomoea horsfalliae*
               7. Stamens included.

8. Leaves palmately lobed to palmately divided; corolla pink or purple; edible subterranean tubers present; cultivated, sometimes escaped and ephemerally naturalized.....*Ipomoea batatas*
8. Leaves not palmately cut.
    9. Plants of marshy places or aquatic, mostly with trailing and rooting, or floating, thick, soft often spongy stems; leaves with truncate, cordate, sagittate or hastate bases; outer sepals 7–8 mm long; corolla pink or pale lilac, often with a purple center (but rarely white), 3–5 cm long.....*Ipomoea aquatica*
    9. Not with the above combination of characters.
        10. Stems mostly twining; leaves mostly herbaceous, attenuate towards the apex, acute, acuminate, or obtuse; corolla pink, blue, or purplish.....*Ipomoea gracilis*
        10. Stems trailing and mostly rooting at each node, mostly thick; rarely twining.
            11. Leaves herbaceous, attenuate towards the acute or obtuse apex Cultivated.....*Ipomoea batatas*
            11. Leaves coriaceous or fleshy, mostly obtuse to broadly rounded or emarginate; wild, on sandy beaches.....*Ipomoea pes-caprae*

4. Sepals hairy on the outer surface, or fimbriate at the margins.
    12. Outer sepals orbicular, broadly rounded at apex; ovary puberulent.....*Ipomoea fistulosa*
    12. Outer sepals narrower, mostly acute.
        13. Sepals long-attenuate to long and linear-acuminate, herbaceous, hairs appressed; corolla 5–8 cm long, blue or bluish-purple, changing to pinkish.....*Ipomea indica*
        13. Sepals acute or subobtuse, often mucronulate, not long-attenuate toward the apex, sometimes coriaceous.
            14. Plants with edible subterranean tubers; stems mostly prostrate and rooting at each node..*Ipomoea batatas*
            14. Plants without tubers; stems mostly twining
                15. Corolla only 1.7–2 cm long..*Ipomoea triloba*
                15. Corolla 5 cm long.....*Ipomoea hederacea*

Ipomoea alba L. Sp. Pl. 161. 1753. ALAIHAI-TASI. MOONFLOWER
Calonyction album (L.) House, Bull. Torrey Bot. Club 31: 591. 1904. [as to basionym]. Merrill 1914: 131.

Climbing perennial vine with cordate, ovate, entire or slightly trilobed leaves, glabrous or nearly so, on long petioles (5–15 cm), blades mostly 6–20 cm long and 3/4–4/5 as wide, acuminate or rarely obtuse; inflorescence axillary, several-flowered; flowers large, white, *blooming only at night*, withering in the dawn or early morning, rarely as late as 11 a.m.; corolla 7–15 cm long, 11–15 cm wide across the expanded, webbed lobes; sepals 5–15 mm long, mucronate; ovary 2-celled; capsule 2.5 cm long. seeds glabrous.

Pantropical; but perhaps introduced in Guam. This interesting moon-flower can quickly be distinguished from the other white-flowered night-blooming species by the slender, mucronate calyx-lobes; in *Ipomoea tuba* these are rounded and broad. *I. alba* is extremely abundant on Guam's east coast, from Yona southward, especially along the roadside, and inland along the first half-mile of the Cross-Island Road, climbing on the road-fringing "tangantangan" (*Leucaena leucocephala*) trees. To see the flowers in full bloom one must drive along this stretch of road at 10.00 p.m. or later. This species blooms a little earlier than *I. tuba*, which must be viewed well after midnight. Their large white flowers are pollinated by long-tongued moths.

IPOMOEA AQUATICA Forsskal, Fl. Aegypt.—Arab. 44. 1775. CANCON.

I. reptans (L.) Poir. ex Lam. Encycl. Suppl. 3: 460. 1813. Merrill 1914: 132.

Creeping or floating commonly subaquatic vine; only in fresh water; leaves variable, commonly oblong-lanceolate, the base hastate or truncate, commonly 5–15 cm long and 2–10 cm wide, on long petioles 3–10 cm long; flowers several in cymes, peduncles to nearly 20 cm, pedicels 2–6 cm; calyx-lobes obtuse, ovate-oblong, just under 1 cm long; corolla usually 4–5 cm long, pinkish-violet, darker in the throat (rarely nearly white); fruit to 1 cm long; seeds finely pubescent.

Tropics of both hemispheres, cultivated for edible leaves, also escaped in ditches, ponds, etc. The leaves are an excellent "spinach" best eaten cooked.

IPOMOEA BATATAS (L.) Poiret ex Lamarck, Encycl. 6: 14. 1804.
KAMOTE. SWEET-POTATO.

Safford 1905: 297. Merrill 1914: 131.

Creeping vine with milky sap, glabrous or pubescent, with enlarged tuberous edible roots; leaves ovate-orbicular, entire or palmately 3–7-lobed or -parted, cordate or subcordate, 4–15 cm long, 3–11 cm wide, on petioles commonly 3–15 cm long; flowers several to many in long-peduncled cymes; calyx-lobes briefly mucronate, about 10–15 mm long; corolla usually pale rose-violet, rarely albino, 3–5 cm long; darker (purplish) in the throat; ovary mostly pubescent; fruit a capsule.

Native of Tropical America; long ago introduced to Asia and the Pacific, throughout Polynesia; still known in many places by a form of its Aztec name "kamotli". Cultivated for the edible tubers, which in Southern U.S.A. are often called 'yams' (in error, as they are not at all related to Dioscorea).

IPOMOEA FISTULOSA Martius ex Choisy in DC. Prod. 9: 349. 1845.
BUSH-MORNING GLORY.

I. crassicaulis (Bentham) B.L. Robinson, Proc. Am. Acad. 51: 530. 1916.

A shrub with rather stiff but rambling branches (not a vine); up to 3 m tall; leaves ovate, acuminate, 6–25 cm long, 4–17 cm wide, petiole 3–15 cm long, midrib dorsally with 2 basal glands; calyx-lobes ovate-orbicular, about 5 mm long; corolla mostly 8–9 cm long, rather pale pink but darker within the tube; dayblooming; ovary densely pubescent; fruit ovoid, 1.5–2 cm long; seeds brownish pubescent.

A native of Brazil, now widespread in cultivation. Immediately recognizable from other morning-glories by its shrubby, not vine-like, habit. Barrigada Village (4987); not very common.

IPOMOEA HEDERACEA (L.) Jacquin, Coll. 1: 124. 1786. Merrill 1914: 132.
FOFGU. JAPANESE MORNING-GLORY. ASA-GAO.

Pharbitis hederacea (L.) Choisy, Mem. Soc. Phys. Genev. 6: 440. 1833. Safford 1905: 349.

Climbing, twining vine, stems slender, pubescent; leaves cordate, 3-lobed (middle lobe largest), 5–12.5 cm long, as broad or broader than long dorsally pubescent on nerves; flowers 1–3 in axils; calyx-lobes 18 mm, linear, acute, pubescent; corolla 5 cm wide across the limb, light blue or pink; ovary 3-celled; fruit 12 mm long, surrounded by the calyx; seeds usually 6, ovoid-deltoid, glabrous, dull black, about 6 mm long.

A native of Tropical America; common, with many forms, in Japan (where it is called *asa-gao*, "morning faces").

If found (still) in Guam, it is evidently rare; I did not find it. Hence Merrill's statement that the plant might really be *I. nil* (L.) Roth still needs to be checked.

IPOMOEA HORSFALLIAE Hooker, Bot. Mag. t. 3315. 1834.

Fosberg [ined.]

Glabrous twining vine with palmately 3–5-parted leaves, 5–20 cm long and as wide, lobes acute or obtuse, sometimes serrate or crenate; petiole to 10 cm long; cymes several-flowered, peduncle to 10–12 cm long; flowers large, showy; calyx-lobes ovate, obtuse, nearly 1 cm long; corolla dark red, 5–7 cm long; *style and stamens exserted*; fruit?

Native of Porto Rico; cultivated as a garden ornamental.

I have not seen this plant in Guam; but it is likely to occur in a few gardens.

Ipomoea indica (Burmann fil.) Merrill, Interpret. Rumph. Herb. Amb. 445. 1917.
BLUE MORNING-GLORY.

Fosberg, Micronesica 2(2): 151. 1967.

I. congesta R. Brown, Prodr. Fl. Nov. Holl. 484. 1810.
Safford 1905: 298. Merrill 1914: 131.

Pharbitis insularis Choisy, Mem. Soc. Phys. Genev. 6: 439. 1833.

Pubescent vine, sap slightly milky (scanty), stems twining, climbing; leaves ovate-orbicular, cordate, acuminate, conescent, 9–12 cm long, equally wide or nearly, petioles 5–15 cm long; flowers single or few on peduncles about as long as petioles; calyx 1–3 cm long, lobes lanceolate, pubescent or glabrate; corolla blue in the morning, fading to pink in afternoon [or albino], about 6–7 cm long; stamens included; ovary glabrous; fruit subglobose, 8 × 12 mm; seeds 2, dark brown, pubes-

cent but glabrate, about 5 mm wide.

Pantropical; very abundant throughout the Pacific. This is the commonest morning-glory in Guam. The fragile flowers change from blue to pink in about 6–8 hours, after opening in the very early morning. These vines are aggressive, quickly coverning old fields, especially on limestone areas, and sometimes smothering the shrubs and trees in a dense mat of stems. Barrigada (4495).

I. indica forma **albiflora** Stone, Micronesica 2(2): 139. 1967.

Identical except for the pure white flowers. Harmon (4729). This has recently been found in Okinawa.

The leaves of juveniles and seedlings of this species are 3-lobed. This is probably also true of other morning-glories.

Ipomoea littoralis Blume, Bijdr. 713. 1826. Fosberg, Micronesica 2(2): 151. 1967.
LAGUN-TASI.

I. denticulata (Desr.) Choisy, Mem. Soc. Phys. Genev. 6: 467. 1833, not R. Brown, Prodr. 1810.

I. choisyana Wight ex Safford 1905: 298; not Wight & Arnott, ex Hallier fil., 1894.

I. gracilis sensu Merrill 1914: 131, and other authors; not of R. Brown, Prodr. 494. 1910.

Maritime creeping or twining vine with glabrous stems; leaves ovate-cordate to reniform, entire or 3-lobed, acute (or acuminate) to obtuse, sometimes emarginate, subglabrous, to 10×8 cm, petiole to 7 cm; cymes 1-few-flowered, peduncle 1–5 cm; calyx-lobes broad, apex slightly mucronate, inner lobes as wide as long, all approaching 1 cm; but unequal; corolla dark pink, slightly purplish, darker in throat, mostly 3–4 cm long; capsule glabrous, 2-celled; seeds glabrous.

Malaysia and the Pacific. *Ipomoea gracilis* is according to Fosberg, confined to N. Australia.

First collected in Guam by Gaudichaud. It is presently rather rare. Manengon (4837).

Ipomoea pes-caprae (L.) Roth, Nov. Pl. 109. 1821.

Safford 1905: 299. Merrill 1914: 132.
ALALAG-TASI. BEACH-MORNING-GLORY

ssp. **brasiliensis** (L.) v. Ooststroom, Blumea 3: 533. 1940.

Maritime somewhat fleshy creeper, rarely or not climbing; leaves ovate-orbicular, cordate to rounded (rarely decurrent) at base, notched more or less deeply at apex, 3–12 cm long and wide, glabrous; petioles 2–10 cm long, with 2 glands at apex; flowers 1 or several in cymes, peduncle to c. 15 cm long; calyx-lobes ovate, blunt or notched at apex, to 1 cm long; corolla dark rosy-pink, purplish in throat, 5 cm long; capsule subglobose, about 1.3 cm long; seeds densely pubescent.—Pl. 13a.

Pantropical but the present subspecies replaced in India & Ceylon by ssp. *pes-caprae*. Common on sandy or rocky beaches, never far from the sea. Tagachan Bay (4019); Togcha Bay (4462). Usually found in company with *Canavalia maitima*; both these plants show the same manner of growth, with long stems creep-

ing over the sand or rocks.

IPOMOEA QUAMOCLIT L. Sp. Pl. 159. 1753.

CABELLO DE ANGEL. CYPRESS-VINE.

Quamoclit pennata (Desr.) Bojer, Hort. Maurit. 224. 1837.

Merrill 1914: 133.

Quamoclit quamoclit (L.) Britton & Brown, Ill. Fl. 3: 22. 1898.

Safford 1905: 363. nom. tautonym. illegit.

Convolvulus pennatus Desr. in Lam. Encycl. 3: 567. 1791.

Slender climber with milky sap; leaves apparently pinnate, with small linear segments, actually pectinate to the midrib, with 8–20 pairs of segments, less than 1 mm wide; leaf up to 10 cm long×6 cm wide overall; glabrous; cymes with 1–4 flowers, these small, dark red; calyx lobes less than 6 mm long, awned; corolla 3–4.5 cm long, (rarely white), limb 1.7–2 cm wide, deeply lobed; fruit ovoid, 6–8 mm long; seeds tufted with very small hairs.

Native of Tropical America; introduced as an ornamental, now escaped and sparingly naturalized.

Ipomoea triloba L. Sp. Pl. 161. 1753. Merrill 1914: 132. FOFGU-SABANA

I. mariannensis Choisy, Mém. Soc. Phys. Genev. 6: 468. 1833.

Safford 1905: 299.

Usually small, herbaceous twiner, often on grasses or low shrubs, not high-climbing, with milky sap and rather small flowers; leaves cordate, acuminate, entire or 3-lobed, mostly 2–5 cm long (but up to 12 cm), longer than wide; petiole as long as blade or longer by half; stems somewhat angled, glabrous or pubescent; flowers 1 or few on peduncles as much as 10 cm long; calyx-lobes lanceolate acute, limb not broad; capsule about 6 mm wide, pubescent; seeds glabrous or with a few minute hairs.

Native of Tropical America, now weedy all through the tropics, except Africa. In Guam usually in old pastures or in savannahs, chiefly in southern hilly regions, locally abundant. Ritidian Pt. (4712); Manengon (4838).

Ipomoea tuba (Schlechtendahl) G. Don, Gen. Syst. 4: 271. 1838.

ALAIHAI. MOON-FLOWER.

Convolvulus Tuba Schlecht., Linnaea 6: 735. 1831.

Stout, somewhat woody creeper or climber; *blooming after midnight*; leaves ovate-suborbicular, entire 5–16 cm long and about equally wide, on petioles about as long as the blade; glabrous; flowers 1-few on long (to 12 cm) peduncles; calyx-lobes subequal, 1.5–2.5 cm long, broadly suborbicular, rounded; containing slimy sap; corolla white, with pale greenish bands, 10–12 cm long, opening about midnight; faded and wilted by morning; stamens included; capsule globose, 2–2.5 cm thick, in the persistent calyx; seeds densely pubescent with marginal hairs longest, to 3 mm long.

Circumtropical. This handsome night-bloomer may be seen along the cross-island Road between Manengon and Apra Heights, (4662). It blooms later than *I. alba*, and seems to wilt sooner.

MERREMIA Dennst. em. Hallier fil.

(*Skinneria* Choisy; *Spiranthera* Bojer)—Herbs or shrubs, usually twiners; leaves variable in shape and size; flowers axillary, solitary, or in few to many-flowered clusters; bracts small; sepals 5; corolla regular, mostly glabrous, white, or yellow to orange; stamens 5, included, the anthers often contorted; ovary 2–4-celled; capsule generally 4-valved; seeds usually 4, often villous at the margins.

A genus of some 80 species, widespread in the tropics.

Key to local species

1. Leaves palmately 5–7-lobed or divided nearly to the base, entirely glabrous; corolla yellow, about 5.5 cm long.....*Merremia tuberosa*
1. Leaves entire, crenate, or at most 3-lobed.
   2. Leaves peltate; sepals about 18 mm long.....*Merremia peltata*
   2. Leaves not peltate; sepals much shorter.
      3. Outer sepals mostly hairy, 4–7 mm long, broadly obovate to orbicular, emarginate, not or only slight mucronulate; inner sepals 6–8 mm long; corolla 1.5–2 cm long (rarely longer), yellow; capsule depressed-globose, the valves coarsely wrinkled; petioles generally lacking tubercles.....*Merremia gemella*
      3. Outer sepals usually glabrous, 3.5–4 cm long, broadly obovate to spathulate, broadly notched at the apex and distinctly mucronulate; mucro directed outwards; inner sepals up to 5 mm long; corolla about 1 cm long, yellow; capsule depressed-globose or broadly conical, slightly 4-angled, finely or moderately wrinkled; petioles often with small tubercles.....*Merremia hederacea*

Merremia gemella (Burm.) Hallier fil. ex Koorders, Meded. 'Lands Plantent. 19: 544. 1898. Merrill 1914: 132. NYETCOR.

A small creeping or twining vine; stems rather slender; leaves entire or 3-lobed, 2–12 cm long, 1–10 cm wide; petioles not tuberculate; cymes several-many-flowered; calyx-lobes 8 mm long or less, ± pubescent; distinctly notched at apex with mucro in the notch very small or none; corolla 1.5–2 cm long, yellow; capsule depressed-globose, valves coarsely wrinkled, brown.

Indomalaysia; probably weedy in the Pacific. Partial to disturbed and moist localities. In our plants the leaves are commonly less than 6 cm long. Talofofo (5023).

Merremia hederacea (L.) Hallier fil., Engl. Bot. Jahrb. 16: 549. 1892.

Merrill 1914: 132.

In habit very similar to the preceding species; but petioles tuberculate; leaves entire or 3-lobed, 1–5 cm long, 1–4 cm wide; outer calyx-lobes 3.5–4 mm long, essentially glabrous, obviously mucronate, obovate-spathulate and notched; inner calyx-lobes to 5 mm long; corolla 1 cm long, yellow; capsule depressed-globose, or subconic, often obscurely 4-angled, finely wrinkled; brown.

Indo-malaysia; probably introduced in Guam. Weedy in wet localities in

disturbed areas, such as near Apra Harbor (OSIR Road) (4722).

Merremia peltata (L.) Merrill, Interp. Rumph. Herb. Amb. 441. 1917. LAGUN.

Operculina peltata (L.) Hallier fil., Engl. Bot. Jahrb. 16: 549. 1892. Safford 1905: 338. Merrill 1914: 133.

A stout, subwoody twiner, with large tuberous roots; milky sap; and peltate leaves; 6–30 cm long and wide, ovate-orbicular, acuminate, sometimes subcordate; peduncle shorter than the petiole, several-flowered; flowers large, dull white to bright yellow, 5–7 cm long; calyx-lobes broad, obtuse, about 2 cm long; capsules large.

E. Malaya to Polynesia, near the sea. Guam record *fide* Safford; needing verification. It is probable he mistook this plant for *Operculina ventricosa*, which see.

MERREMIA TUBEROSA (L.) Rendle, in Dyer, Fl. Trop. Afr. 4(2): 104. 1905. WOOD-ROSE.

Operculina tuberosa (L.) Meissner in Martius Fl. Brasil. 7: 212. 1869. Merrill 1914: 132.

Glabrous climber with tuberous roots; leaves 6–20 cm long and wider than long usually palmately 7-parted, 2 basal lobes smallest, laterals larger, central lobe longest and obovate-acuminate; petiole about as long as blade; peduncles few flowered, as long or longer than petiole; calyx-lobes broad, rounded, obovate, in flower 2–3 cm long, enlarging as fruit matures to 5–7 cm long; corolla about 4–5 cm long, 5–6 cm wide across the limb, bright-yellow; ovary glabrous; capsule 2 cm long, 3 cm wide approx., pale brown, thin-walled, enclosed in calyx; seeds 1.5 cm long, ovoid, dull black, pubescent on angles.

Probably a native of Tropical America. Introduced in Guam for its ornamental fruits, often used in "dry" floral arrangements. (McGregor 551, near Agaña).

OPERCULINA Silva Manso

Large herbaceous twiners, the stems often winged; leaves petiolate, entire, angular or digitate, often cordate at base; flowers large, in 1-few-flowered axillary peduncled cymes; sepals 5; corolla white or yellow, regular, with hairy midpetaline bands outside; stamens 5, included; ovary glabrous, 2-celled; capsule, circumscissile, large, the upper part or lid (operculum) more or less fleshy; seeds usually 4.

A genus of about 20 spp. in the tropics of both hemispheres, one in Guam.

Operculina ventricosa (Bert.) Peter, Pflanzenfam. iv (3a): 32. 1891. ALALAG.

?*O. peltata* sensu Safford 1905: 338; non (L.) Hallier fil., Engl. Bot. Jahrb. 16: 549. 1892; quoted by Merrill 1914: 133.

A large pubescent maritime vine with milky sap; leaves broadly ovate to suborbicular, to 20×20 cm, on long hirsute petioles; peduncles to 12 cm long; sepals ovate, 3 cm; corolla white, 5–7.5 cm long; capsule w. 4 smooth black seeds.

Adventive; native of Surinam and Guadeloupe. Agfayan Bay (4911). [Saipan, Mt. Tagpochao, 5163]

STICTOCARDIA Hallier fil.

Woody or herbaceous often hairy twiners; leaves ovate to orbicular, mostly cordate at base, the lower surface with many minute black dot-like glands; flowers in axillary 1-many-flowered cymes; sepals 5, equal or nearly so; corolla large funnel-shaped, red or purple; stamens and style included; ovary glabrous, 4-celled; fruit enclosed by the much enlarged calyx; seeds 4, pubescent.

A genus of 6 (or perhaps 7) species, circumtropical in distribution, some cultivated. One species present in Guam.

Stictocardia tiliifolia (Desr.) Hallier fil., Bot. Jahrb. 18: 159. 1894.

S. campanulata (Hallier fil.) Merrill 1914: 133. ABUBO.

A large woody twiner, pubescent but glabrescent; leaves broadly ovate to orbicular, 6–20 × 5–20 cm, cordate at base, shortly acuminate with a usually obtuse mucronulate apex; inflorescences axillary, of 1–2–3 flowers; sepals orbicular with a rounded or shallowly emarginate apex, subequal or the inner ones slightly shorter, 12–18 mm long, much enlarged in fruit and then up to 4-5 cm long. Corolla funnel-shaped, 8–10 cm long, reddish purple with a darker center; ovary glabrous; filaments hairy at base; capsule enclosed by the enlarged sepals, 2–3.5 cm in diam. Seeds 8–9 mm long, black to dark brown, pubescent.

Distribution circumtropical, usually near the coast. Mochom (4955). Barrigada (s.n.). Edge of La Ciénaga (obs.)

BORAGINACEAE

Trees, shrubs, or herbs; leaves alternate or rarely opposite, simple; stipules none; flowers often in helicoid cymes (one-sided, curved cincinni), or otherwise, sometimes solitary; flowers mostly regular and perfect; calyx 4–8-lobed; corolla 4–8, usually 5-lobed, tubular, sometimes with internal scales; stamens alternate with corolla-lobes and the same number; ovary superior, 2–4-celled (false partitions), often 4-lobed; ovules paired; style terminal or gynobasic; fruit a drupe, or 4 one-seeded, or 2 two-seeded nutlets.—About 90 genera and 1600 species, cosmopolitan. Four genera in Guam, all indigenous, some with introduced species as well.

Key to local genera

1. Herbs, erect or prostrate, or low shrubs under 1 m tall.
   2. Style with 2 branches; fruit a red globose drupe; woody but low, small shrub ..... *Ehretia*
   2. Style simple, with annular stigma; fruit sooner or later breaking up into 2 or 4 dry nutlets; herbs, sometimes woody at base ..... *Heliotropium*
1. Trees or big arboreous shrubs to 10 m tall (or more).
   3. Flowers pale orange or dark reddish-orange, or white; style 4-parted; fruit a drupe with a hard stone ..... *Cordia*
   3. Flowers small, white; style simple or slightly 2-lobed; fruit dry, breaking up into 2 two-seeded nutlets ..... *Messerschmidia*

CORDIA Linnaeus

Trees, shrubs, or vines; leaves alternate, simple, entire or repand-serrate; flowers in axillary cymes, perfect or male; calyx irregularly 2–6-lobed; persistent; corolla tubular with 4–7 spreading lobes; no scales; ovary entire, 4-celled; style twice forked, i.e. 4-branched; fruit a drupe with 1 hard 1–4-seeded stone [pyrene].—More than 200 species, throughout the tropics, most in Tropical America.

Key to local species.

1. Flowers white; fruit pink or cream-white..... *C. dichotoma*
1. Flowers pale to dark orange or red.
   2. Flowers pale orange; fruit greenish or yellowish to brown.... *C. subcordata*
   2. Flowers dark vivid orange or vermilion; fruit white..... *C. sebestena*

CORDIA DICHOTOMA Forster fil. Prodr. 18. 1786.

C. myxa Roxb. sensu various authors.

A tree to 10 m high or more; leaves ovate to oblong acute to acuminate, acute to subcordate at base, glabrous or sparsely puberulent, up to 20 cm long by 10 cm wide, shallow-toothed in distal part, or repand, or entire; petioles 1–5 cm long; flowers small, whitish, about 8 mm long, corolla 4–6-lobed; calyx truncate; fruit ellipsoid, 1.5–2 cm long, with a thin creamy or pink skin and pulp; pyrene 1-seeded.

Malaysia- Polynesia; introduced in Guam; rare in cultivation.

CORDIA SEBESTENA L. Sp. Pl. 190. 1753.

A small tree; leaves mostly 7–20 cm long, ovate, stiff, subscabrous, rather dark green; entire or repand-dentate; flowers vermilion, 2.5–4.5 cm long, ruffled; in compound cymes, on pedicels 5–15 cm long; fruit ovoid, about 2.5 cm long, white, somewhat 5-lobed, thin-fleshed.

Native of Tropical America (West Indies). Planted in Guam as a street tree, for example near the Police H.Q. in Agaña (3916).

Cordia subcordata Lamarck, Illustr. 1: 421, no. 1899. 1791.

Safford 1905: 248. Merrill 1914: 134. NIYORON.

A small tree with pale grayish slightly fissured bark, to about 1–12 (rarely 15) m tall; leaves 5–20 cm long, 4.5–15 cm wide, (petiole 2–8 cm), glabrous, ovate, base obtuse or truncate, apex acute; lateral nerves 4–6 pairs; texture thinly coriaceous; rather pale green; flowers few to several in leaf-opposed or terminal corymbs; calyx about 15 mm long, 3–6-lobed, lobes short deltoid, pubescent ventrally; corolla pale orange [or somewhat orange-pink], 2.5–4 cm long, exceeding the calyx, limb plicate in bud, but spreading, 3–5.5 cm broad, 5–7-lobed, lobes 15–25 mm long, rounded; stamens usually 6, included or barely exerted; ovary glabrous, 4-celled; style terminal, forked, each fork bifid, ultimate segments short-spatulate; fruit ellipsoid, 2.5–3 cm long, brownish, apiculate-acute, 1–2 (rarely 3 or 4) seeded, somewhat corky; seed coarsely muricate (subspinose).—Pl. 13b.

An Indomalysian-Pacific strand plant (also in E. Africa and Madagascar). Distribution both by the ocean-borne fruits and by Polynesian introduction (in Hawaii, etc.). Native but not common in Guam, usually near the sea, on coral

sand or on coralline boulders or on the limestone cliffs and terraces. Curiously, Safford does not give a Chamorro name; "niyoron" is used in Saipan (fide Kanehira). This is the "kou" or "tou" of Polynesia; it is valued for its wood.

The leaves of juveniles and seedlings are conspicuously toothed. The fruit may be yellowish; it is usually enclosed partly by the enlarged calyx.

Mangilao, Pago Bay cliffs (4279); Sumay (4286); Pago Bay (4407); Talofofo Pt., limestone headland (5044).

EHRETIA Linnaeus

Shrubs or trees; leaves alternate, entire or serrate, simple; flowers small, 5-merous, white, in terminal or axillary panicles or corymbs; ovary superior, 2- or 4 celled; fruit a globose drupe, with a pair of 2-celled, or 4 one-celled, nutlets.—About 50 species.

One species in Guam:

Ehretia microphylla Lamarck, Encycl. 1: 425. 1783.

Safford 1905: 266. CHA-CIMARRON.

Shrub to just over 1 m tall, with numerous branches; bark reddish brown, crackled; leaves sessile, 6–25 mm long, fasciculate on short branchlets, obovate, cuneate, basally acute, apically obtuse or truncate, sometimes very slightly crenulate at apex, pubescent with short, stiff hairs ("with a white spot round each one, when dry"), underside paler, veiny. Flowers solitary or in pairs, on very short pubescent pedicels in leaf axils. Calyx puberulent, 5-parted; lobes oblong-spathulate, acute. Corolla white, rotate, campanulate, 6–9 mm diam., 5-lobed, lobes ovate subacute, somewhat spreading. Stamens 5, erect, exserted, borne on corolla-tube. Ovary 2-celled; cells 2-ovuled. Styles 2, longer than the stamens. Fruit a small drupe, globose, 6 mm long, apiculate, scarlet-red, with a 4-celled pyrene.

Collected in Guam by Luis Nee, in 1792, but not found by me. Distrib.: India to Philippines, Formosa, Ryukyu.

HELIOTROPIUM Linnaeus

Shrubs or herbs, erect or prostrate; leaves spiralled or opposite; flowers in helical cincinni, or rarely solitary; calyx 5- (rarely 6) lobed; corolla 5- (rarely 6) lobed; stamens 5 (rarely 6); ovary 4-lobed and 4-celled, stigma annular; fruit a drupe or of nutlets (2 or 4); nutlets 1-seeded (if 2-celled, 1 cell empty).—About 220 species; cosmopolitan.

Key to local species

1. Erect shrubs or herbs; leaves with obvious petioles; flowers purplish or lilac.
   2. Cincinni simple or rarely 1-forked; erect herbs of waste ground.. *H. indicum*
   2. Cincinni repeatedly forked; cultivated subshrubs..... *H. peruvianum*
1. More or less prostrate or accumbent, or low, subshrubs or herbs; flowers white or whitish; leaves with decurrent bases and obscure petioles, silky-pubescent.
   3. Very grayish-silvery; leaves mostly 2–3 mm wide; calyx-lobes obscured

by hairs, 3 mm long, or more.....*H. anomalum*

3. Greenish-gray; leaves more oboval, mostly 3–6 mm wide; calyx-lobes sparsely hairy, evident, at most 3 mm long..*H. ovalifolium* var. *depressum*

Note. Safford's report of *H. curassavicum* L. is believed to be a misindentification of specimens of *H. ovalifolium* var. *depressum.*

Heliotropium anomalum Hooker & Arnott, Bot. Beechey Voy. 66. 1841.

Walker & Rodin 1949: 465.

Prostrate perennial herb with silvery-white pubescence; leaves oblanceolate, subsessile, about 1–1.5 cm long and mostly 2–3 mm wide; pubescence silky, appressed; coiled cincinni commonly forking once or twice; flowers white with yellow throat; calyx 2–2.5 mm; lobes unequal; corolla to 6 mm long, silky, 5–6-lobed, one lobe longer than the others; anthers 5 or 6; nutlets 4, rarely 5 or 6, strigose.

Pacific Islands (Ryukyu to Hawaii). Steere 127. Pagat, coastal bluffs, Cushing-Falanruw 163.

Heliotropium indicum L. Sp. Pl. 130. 1753. Safford 1905: 291. BERBENA.

Merrill 1914: 134.

Herb, slightly woody at base, with a long taproot, stem erect, unbranched or branches few, 30–80 cm tall; leaves alternate or sometimes subopposite, distinctly petiolate, petioles to 5 cm long, blade long-decurrent on petiole from a subtruncate base, ovate-deltoid, margin slightly wavy-crisped, 2.5–10 cm long, 1–5 cm wide, acute (blunt), lateral veins 4–7 pairs; inflorescence terminal, simple or rarely once-forked, flowers along one side, sessile, tip coiled, axis up to 20 cm long; lowest flowers opening first; flowers pale violet (lilac) with a yellow throat, but fading to dull white, calyx-lobes linear-lanceolate, ciliate, 2 mm long; corolla-tube 4–5 mm long; lobes rounded; fruit 3.5 mm long, ovoid, ribbed, separating into 2 nutlets each 2-celled, 3–3.5 mm long.

A paleotropical herb now weedy all over the tropics. First collected in Guam by Chamisso; also by Lesson.

HELIOTROPIUM PERUVIANUM L. Sp. Pl. ed. 2, 187. 1762. HELIOTROPE.

Safford 1905: 292. Merrill 1914: 134.

Perennial erect subshrub to 1 m tall or more; stems softly hirsute; leaves spiralled, ovate-oblong, rugose, entire, gradually tapering from blade to petiole up to 7–8 cm long; cincinni repeatedly forked; flowers purple or lilac, rarely white; 3–6 mm long; fragrant; fruit breaking up into 4 nutlets.

South America; introduced to Guam as an ornamental, fide Safford. I have not seen the plant.

Heliotropium ovalifolium Forsskal, Fl. Aegypt.—Arab. 38. 1775.

Var. **depressum** (Chamisso) Merrill 1914: 134. HUNING-TASI.

H. gracile var. *depressum* Cham. Linnaea, 457, 1829.

H. coromandelinum var. *depressum* (Cham.) DC. Prodr. 9: 542. 1845.

H. curassavicum sensu Safford 1905: 291, not of L. Sp. Pl. 130. 1753.

A prostrate branched perennial herb from a stout taproot; leaves oblanceolate or linear-oblong, subsessile; rarely almost oboval; greenish-gray pubescent; blades

to 3 cm long, mostly 3–6 mm wide. Cincinni slender, forking, to 5–6 cm long overall; flowers, only moderately crowded, rather sparsely pubescent, calyx-lobes unequal, lanceolate, the longest to nearly 3 mm; corolla 1.5–2 mm long, white. Fruit globose, breaking into nutlets about 1 mm high.

Mangilao (3910; 4959). A rather weedy plant, usually if not always on limestone.

MESSERSCHMIDIA L. ex Hebenstreit

Trees, shrubs, or herbs with spiralled simple leaves; flowers in dichotomous coiled cincinni; 5-merous; perfect; fruit dry, separating into 2 nutlets, each 2-seeded, with corky mesocarp.—Three species; Europe, Asia, Australia, and South America. The following one is arboreous; native in Guam.

Messerschmidia argentea (L. f.) Johnston, J. Arnold Arb. 16: 164. 1935. HUNIG.

Tournefortia argentea L. f. Suppl. 133. 1781. Safford 1905: 389, pl. 68. Merrill 1914: 134.

A small shrubby tree to 5–6 m tall with rather stout twigs; leaves crowded, obovate-oblanceolate, densely appressed-silvery-pubescent on both sides, decurrent at base, rounded-obtuse to acute (blunt) at apex, softly coriaceous somewhat fleshy, 10–30 cm long, 3–12 cm wide, petiole stout, winged; short; inflorescence paniculate-subcorymbose, cincinni many, tightly coiled, crowded, densely pubescent, flowers sessile; peduncle to 20 cm long (or more); calyx pubescent, lobes broadly

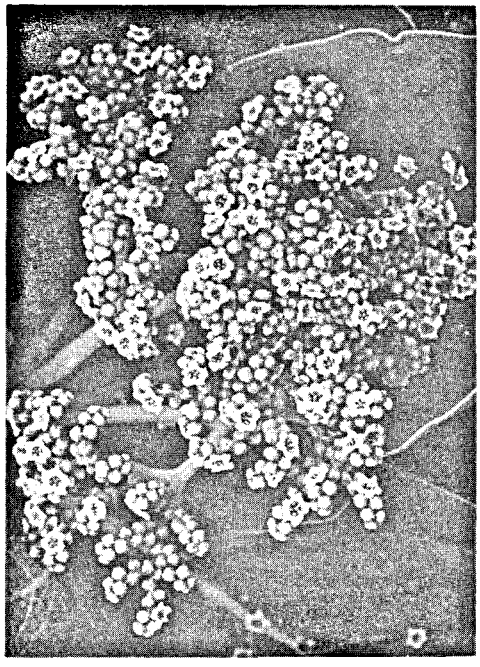

Fig. 86. Messerschmidia argentea.

ovate, imbricate; corolla white, rotate, 6 mm wide, tube 2 mm long (as long as calyx), pubescent dorsally; lobes imbricate in bud, obtuse; anthers in throat; ovary glabrous; stigmas subsessile, obscurely bilobed; fruit smooth brown globose, 5–8 mm long, minutely apiculate; nutlets 2, corky.—Fig. 86.

An Indomalyan-Pacific strand plant, on sandy or rocky coasts, never far from the sea. Easily recognized by the silvery-hairy leaves, the thick twigs with obvious large leaf-scars, the large panicles of tiny sessile white flowers on helically coiled spikelike axes.

The wood is not durable. Tamuning (3888).

VERBENACEAE

Trees, shrubs, climbers, or herbs; stems mostly 4-angled; leaves opposite; or whorled, simple or compound: inflorescences racemes, spikes, heads, corymbs, or cymes; calyx tubular, 4–8-lobed; stamens 8–4, or 2, *unequal*; anthers versatile, 2-celled; small staminodia rarely present; disc none; ovary 2–8-celled; cells 1–2-ovulate; style simple or bifid; fruit a drupe, capsule or schizocarp; seeds 1–8, endosperm none.—Many spp. somewhat to very fragrant-pungent (foliage, etc.) owing to essential oils.—76 genera and about 3000 species, tropical and in the temperate zone of the Southern Hemisphere.

Key to local genera

1. Leaves simple.
    2. Creeping herbs with serrate leaves; flowers in oblong heads..... *Phyla*
    2. Shrubs or coarse erect herbs, or climbers, or trees; leaves various;
        3. Trees.
            4. Fertile stamens 4; leaves 5–25 cm long.
                5. Leaves whitish beneath, entire; flowers regular, yellow, in spikes; tree of mangrove swamps with erect peg-like roots around base of trunk in mud..... *Avicennia*
                5. Leaves green beneath; flowers bilabiate, greenish-white, in paniculate corymbs; coastal or limestone-mesa tree, never in mangrove swamps, not with peg-roots..... *Premna*
            4. Fertile stamens 5–8; leaves 30–70 cm long..... *Tectona*
        3. Shrubs, climbers, or erect herbs.
            6. Erect subshrubs; leaves ± serrate; flowers sessile on long erect unbranched spikes; fertile stamens 2; corolla purplish, lilac, or white..... *Stachytarpheta*
            6. Not as above; shrubs, or woody climbers; inflorescence otherwise; fertile stamens 4.
                7. Flowers in compact, headlike, corymbs, oldest flowers on the periphery of a different color than youngest, or sometimes all the same; stems prickly or not; stamens included.. *Lantana*
                7. Not as above;

8. Stamens long-exserted; corolla 5-lobed; ± zygomorphic; shrubs or woody climbers..... *Clerodendrum*
8. Stamens included or only barely exserted; corolla 4-or 5-lobed; regular
9. Flowers 5-lobed, light blue or white; fruit yellow or orange; cult. shrub..... *Duranta*
9. Flowers 4-lobed, light pinkish-lilac; fruit purplish-black or magenta; wild..... *Callicarpa*

1. Leaves digitately 3–7-foliolate (in one sp. occas. of 1 lflt.); flowers zygomorphic, bilabiate ..... *Vitex*

Avicennia Linnaeus

Mangrove-trees with erect peg-like pneumatophores; leaves opposite, entire; flowers yellow, in heads or spikes; sessile; calyx 5-lobed; corolla 4-lobed; stamens 4, included; ovary imperfectly 4-celled; ovules 4; style bilobed; fruit ovoid, asymmetric, compressed, 1-celled.—About 14 species, one native in Guam.

Avicennia alba Blume, Bijdr. 821. 1826.

A. marina var. *alba* (Bl.) Bakhuizen, Bull. Jard. Bot. Buitenz. 3, 3: 103. 1921.

A tree (ours rather small) of the saline and seaward margin of mangrove swamps; leaves oblong-elliptic or lanceolate, acute or rarely obtuse, acute at base, medium or olive green above, white beneath, 3–16 cm long, 1.5–5 cm wide; flowers 10–30 per spike, yellow, paired, spikes 2–3 cm long; corolla 4–7 mm long, 5–8 mm wide; stamens 1.5–2 mm long; style obsolete; stigma erect; ovary short-puberulent distally; fruit floating.

Malaysia and adjacent Pacific islands.

Common in the Apra mangrove areas, apparently absent elsewhere (4439; 5116), associated with *Rhizophora* and *Bruguiera*. The corolla is dark yellow—nearly orange. A pioneer species, its seedlings often standing out to sea in suitable locations, but like all mangroves absent on surf-swept rocky or sandy coasts.

Callicarpa Linnaeus

Trees or shrubs, pubescence often (not always) of stellate hairs; leaves opposite, petiolate, often serrate, commonly glandular; cymes axillary or subterminal; calyx subtruncate or 4-lobed (very rarely 5-lobed); corolla regular, commonly short-tubular and 4-lobed (very rarely 5-lobed), often pinkish-violet; stamens ovary 2-celled, glandular; cells 2-ovulate; style slightly exserted; fruit a drupe, mostly with 4 1-seeded pyrenes, usually magenta or purple, or sometimes white.—About 140 species, chiefly Asiatic or S. Pacific, a few in Central America.

Callicarpa candicans (Burmann fil.) Hochreutiner, Candollea 5: 190. 1934.

QUALITAY. PALAPA-JALITAY. HAMLAG.

C. paucinervia Merrill 1914: 134.

C. cana L. Mant. 2: 198. 1771.

C. glabra Lam, Verb. Mal. Arch. 82. 1919.

A shrub, 1–3 m tall, young growth, incl. inflorescences, densely stellate-pubescent, the hairs pale, dull white or slightly tawny; branches terete, glabrate; leaves ovate to oblong-ovate, thin coriaceous or chartaceous, acute-subacuminate at apex, cuneate or decurrent at base, dark or medium green above, densely dull or tawny white-pubescent beneath, 7–12 cm long, 3–6.5 cm wide, slightly crenulate distally or entire, glands on lower surface hidden by pubescence; lateral nerves about 5 pairs; petioles 10–15 mm long; cymes short, axillary, peduncle less than 1 cm long, remainder not much over 1 cm long, densely stellate-pubescent, rather many-flowered; flowers small, calyx minutely 4-toothed, 1.5–2 mm long; corolla mauve or pinkish-lilac, 3–3.5 mm long, 4-lobed, lobes elliptic, 1.3–1.5 mm long; stamens slightly exserted; anthers with yellow glands on the connective, 1.2–1.3 mm long; fruit magenta-purple, 2–4 mm wide, subglobose.

Pacific Is.

Common, usually coastal; Pago Bay (3834); Inarajan (3914); Tumon Bay (3931); Asanite Pt. (4298); Marine Beach, Yona (4417); Asanite Bay (4924). This is a very attractive shrub worthy of cultivation.

Clerodendrum Linnaeus

Big shrubs, erect, or woody climbers; leaves usually opposite, sometimes whorled, entire, serrate, or lobed; cymes axillary or paniculate-corymose and terminal; calyx 5-lobed or -toothed; or truncate; corolla *zygomorphic* often the tube *curved*; the limb 5-lobed; stamens 4, *long-exserted at anthesis*; ovary imperfectly 4-celled, cells 1-ovulate; stigma bilobed; fruit a drupe, often 4-lobed; pyrenes 1–4.—More than 300 species in all tropical regions. One wild and two cultivated species in Guam.

1. Woody climber; flowers white, the corolla-lobes pale pinkish, filaments red; leaves opposite or whorled in groups of 3 ..... *C. inerme*
1. Erect shrubs; some older branches twining in C. thomsonae; flowers: calyx white to red; corolla red; leaves opposite
   2. Leaves ovate, large, 10–30×9–25 cm, densely pubescent beneath; usually serrate; calyx red; corolla red ..... *C. speciosissimum*
   2. Leaves glabrous, small, 4–15×2–10 cm, entire; calyx white, changing to red; corolla red ..... *C. thomsonae*

Clerodendum inerme (L.) Gaertner, Fruct. 1: 271, t. 57. 1788.

Safford 1905: 231. LODUGAO.

C. commersonii (Poir.) Sprengel, Syst. 2: 758. 1825.

Merrill 1914: 135.

A woody climber, sometimes shrubby; leaves opposite or sometimes in whorls of three, elliptic to obovate, somewhat blunt, entire, glabrate; thinly fleshy; dotted beneath and with a few sunken glands basally; mostly 3–12 cm long, 1–7 cm wide; petiole to nearly 2 cm long; cymes axillary or pseudoterminal, of 3–7 flowers; peduncle usually 1–4 cm, pedicels 3–6 mm long; calyx minutely 5-toothed, enlarging somewhat as fruit matures; corolla white, the tube slender, mostly 2–3 cm long, limb 5-lobed,

lobes white or pinkish, subequal, 5–8 mm long; stamens 4, long-exserted, 1 cm, inrolled in bud, filaments red; style exserted, red; fruit black, obovoid, of 4 nutlets, about 1–1.4 cm long; seeds oblong.—Pl. 13c.

Indomalysia, Australia, and the Pacific. Common in Guam along the coasts or a little way inland. Apra (3849); Asanite Pt. (4921); Tumon Bay (5078).

The leaves are used as a poultice to prevent swelling after bruises. The roots etc. are bitter and may be still in use as a treatment for fever.

CLERODENDRUM SPECIOSISSIMUM Van Geert, Hort. Belg. Jard. Amat. 3: t. 68. 1836. PAGODA-FLOWER.

An erect pubescent large-leaved ornamental shrub; 1–2 m tall; leaves ovate, 10–30 cm long and nearly as wide, usually serrate, pubescent beneath, long-petiolate; inflorescence 3–15-flowered; calyx 8–10 mm long, *red*; corolla-tube 2–3 cm long, *red*, lobes 1.5–2.5 cm long, red; stamens exserted 4–5 cm; drupe blue, 1.3 cm wide.

A Malaysian species, introduced as an ornamental shrub. S. of Yoña (5068).

CLERODENDRON THOMSONAE Balfour fil., Edinb. New Philos. J. 2, 15: 233. 1862.

Shrub, older branches twining; leaves ovate, subcordate or rounded at base, acute, entire, glabrous (or nearly), mostly 5–15 cm long, 3–10 cm wide; calyx white in flower, red-violet in fruit, 2–2.7 cm long, deeply 5-lobed; corolla pubescent, 2.2 cm long, red, lobes 1 cm long; drupe black except for red grooves; nutlets 4.

Native of Tropical Africa; now widely cultivated. Common in Guam gardens. It has not become naturalized.

DURANTA Linnaeus

Trees or shrubs, often spiny; leaves simple, opposite or whorled; racemes axillary or terminal; calyx truncate or 5-toothed; corolla tubular, 5-lobed; stamens 4; ovary 8-celled, cells imperfect, 1-2-ovulate; fruit 8-seeded, juicy, drupaceous enclosed by the enlarged calyx.—About 36 species of Tropical America.

DURANTA REPENS L. Sp. Pl. 637. 1753. GOLDEN EARDROPS.

Shrub to 4–6 m tall; spines axillary or suppressed; leaves opposite or 3 in a whorl, elliptic or ovate, rarely elliptic-obovate, 1.5–7 cm long, entire or distally serrate, acute, very short-petiolate; racemes 5–15 cm long; flowers subsessile; calyx 3–4 mm long; corolla pale purplish, with 2 slightly small lobes each with a purple stripe, and 3 slightly larger plain lobes; fruit globose, 6–12 mm broad, yellow, beaked.

A Tropical American species now widely cultivated in warm countries. It is not common in Guam.

LANTANA Linnaeus

Shrubs, more or less pungent-odorous, often prickly with opposite or whorled leaves glandular dorsally; flowers in axillary spikes or heads; bracteate; calyx 2-lobed; corolla 4–5-lobed, slightly zygomorphic; stamens 4, included; ovary 2-celled, cells 1-ovulate; fruit a drupe, with 1 two-celled pyrene.—Some 150 spp., Trop. Amer. and W. Africa.

LANTANA CAMARA L. Sp. Pl. 627. 1753. var. ACULEATA (L.) Moldenke, Torreya 34: 9. 1934.

Erect or with branches rambling, prickly or not; leaves ovate, hispid, commonly 4–8 cm long, 2–5.5 cm wide, on petioles 1–3 cm long, blades serrate, stiff chartaceous, spicy-pungent if rubbed; spikes headlike or corymbose; flowers crowded, youngest ones central, pale, older flowers orange, oldest ones red (or white); corolla tube pubescent internally, 10–12 mm long; limb about 8 mm across, with darker eye; drupe purple-black, 5–6 mm thick, slightly juicy, the pyrene with an air-cavity between the 2 cells.

Native of Tropical America; widespread in cultivation and as a weed. The prickly form (var. *aculeata* (L.) Moldenke) is naturalized in Guam, but sparingly, chiefly on the east coast near the southern end, between Merizo and Inarajan. Merizo (4759); Ajayan R. (5032). Barrigada Village (3981).

Several cultivated varieties or species of Lantana may be found in a few gardens, including one with white flowers each with a yellow eye (*L. camara* var. *nivea* (Ventenat) L.H. Bailey); a dwarf shrub with pure yellow flowers (*L. camara* var. *hybrida* (Neub.) Moldenke); a dwarf shrub with pure pale lilac-violet flowers (*L. montevidensis* (Sprengel) Briquet; syn. *L. sellowiana* Link & Otto); and typical, non-prickly var. *camara.*

PHYLA Loureiro

Creeping herbs with opposite usually serrate leaves and pubescence of medifixed hairs; spikes axillary; flowers crowded in headlike apex of spike; flowers small, bracteate; calyx 2-lobed; corolla 4-lobed, one lobe larger than the other 3; stamens 4, included; ovary 2-celled, cells 1-ovulate; fruit dry, of 2 separating nutlets.—10 spp.. Trop. Amer.

Phyla nodiflora (L.) Greene, Pittonia 4: 46. 1899.

Lippia nodiflora (L.) Rich. in Michx. Fl. Bor. Amer. 2: 15. 1828. ex Schauer in DC. Prod. 11: 585. 1847.

Creeping herb, rooting at the nodes, with angled stems; leaves obovate, distally serrate, usually 1–4 cm long, and 0.5–2 cm wide, base decurrent; petiole to about 5–6 mm; peduncle of spike 1–5 (rarely 6–8) cm long; bracts obovate; calyx 1.5 mm; corolla 2 mm long, white or pale violet; fruit about 1.8 mm long.

Native of Tropical America; a common tropical weed. Occasional in Guam, in lawns or wasteground in wet places. Mangilao (3906).

PREMNA Linnaeus

Trees, shrubs, or woody climbers; leaves simple, opposite, crenateserrate or entire; corymbs terminal and/or axillary; flowers small; calyx truncate or subtruncate, usually somewhat bilabiate; corolla greenish to yellowish or white, bilabiate; stamens 4, included; ovary 2–4-celled; cells with 1 pendulous ovule; style bifid, exserted; drupe thin-skinned, with 1 pyrene of 1–4 cells, 1–4 seeds.—About 40 Tropical Asiatic and Pacific species.

One indigenous in Guam.

Premna obtusifolia R. Brown, Prodr. Fl. Nov. Holl. 512. 1810.
Fosberg, Taxon 2(4): 88. 1953. AHGAO.

P. Gaudichaudii Schauer in DC. Prodr. 11: 631. 1847. Safford 1905: 360. Merrill 1914: 136.

P. mariannarum Gaud. ex Schauer in DC. l.c. Safford 1905: 361. Merrill 1914: 136.

P. integrifolia L. Mant. 2: 253. 1771, nom. superfl.; H.J. Lam, Verb. Mal. Arch. 140. 1919, et auctt. var.

Small tree or shrubby, nearly glabrous; but youngest branchlets minutely puberulent; leaves ovate, subacuminate to blunt, rounded- or obtuse to subcordate at base, chartaceous, rather dark green, slightly shiny, entire usually ventrally concave, glabrate or minutely puberulent dorsally on the narves, commonly 6–12 cm long and 2/3 as wide, with 4–7 pairs of lateral nerves; petiole 1–3 cm long (or somewhat more); corymbs richly branched, terminal, many-flowered, up to 12 cm broad or more; flowers small, greenish, crowded; calyx bilabiate; minutely 5-toothed or subtruncate 2 mm long; corolla 4-lobed, bilabiate, the tube about 3 mm long; stamens 4, two longer, two shorter, very slightly exserted or included; fruit 3 mm wide, green, becoming purple-black, subglobose.

A common strand plant of Malaysia and the Pacific Islands, exceedingly variable and much-named. The two "species' from Guam are identical with R. Brown's Australian plants; also with "Premna corymbosa" usually ascribed to (Burm. f.) Rottler & Willd., of Indonesia, which however is not the same (probably) as *P. corymbosa* Rottl. (not of Burm. f.), an Indian plant.

This little tree is plentiful all over the northern limestone half of Guam, and all along the coasts. It is also quite aggressive and can quickly invade old fields, vacant lots, and roadsides. Our plants frequently have diseased, distorted, gall-infested leaves. Harmon (3844); Tumon Bay (3930); Barrigada Hill (4496).

Another species, *P. paulobarbata* Lam, Verb. Mal. Arch. 139. 1919, is reported from Saipan.

STACHYTARPHETA Vahl

Subshrubs or herbs; leaves opposite, distally crenate-serrate; flowers in elongated erect terminal spikes, axillary to a bract, a few opening at a time, evranescent and soon falling, sessile, purple to white; calyx dorsally compressed; 4–5-toothed; corolla tubular, subcurved, 5-lobed, pubescent internally; fertile stamens 2, included; staminodes 2 or none; ovary 2-celled; cells 1-ovulate; fruit enclosed in the calyx, 2-segmented.—Tropical America, about 100 spp.

1. Leaves rather pale green, flat; flowers (in ours) usually pale violet [but rarely whitish]; lateral nerves not prominent dorsally;.....*S. indica*
1. Leaves dark subglossy green, bullate (convex between veins); flowers dark or medium violet; lateral nerves prominent dorsally.....*S. urticifolia Sims*

Stachytarpheta indica (L.) Vahl, Enum. 1: 206. 1804. FALSE VERBENA

Erect, sparsely-branched shrub with pale green flat leaves 4–11 cm long, 2.5–5 cm wide, acute, or subobtuse, elliptic-oblong, decurrent on the petiole; spikes thick, purplish, 15–40 cm long; flowers (in ours) usually pale violet or whitish; bracts with scarious margins, 4–5 mm long; corolla 5–10 mm long, 4–12 mm wide; fruit 4–5 mm long.—Pl. 13d.

A Tropical American, now pantropical, weed. Mangilao (3928, 4184).

This is the common weedy species in Guam. The next is very local.

Stachytarpheta urticifolia Sims, Bot. Mag. 44: t. 1848. 1816.

Erect shrub, much like the preceding species, but with dark green bullate leaves, greenish spikes, and dark lavender flowers. Leaves usually 4–10 cm long, ovate-elliptic, or ovate; leaf teeth ciliate; spikes 20–40 cm long; otherwise as above.

Tropical American weed, rare in Guam. Collected by M. Cushing in Tamuning (Stone no. 5141). Det. F.R.F.

TECTONA L. f.

Trees with large opposite leaves and pubescence of branched hairs; panicles terminal, of dichotomous cymes; flowers 5–8-merous, usually 6–7-merous; corolla regular; corolla short-tubular, regular; stamens as many as corolla-lobes, inserted at base of corolla, exserted; ovary 4-celled; cells 1-ovulate; stigma bilobed; drupe with 1 pyrene of 1–4 seeds.

TECTONA GRANDIS L.f. Suppl. 151. 1781. TEAK.

Big. trees up to 30 m tall (but smaller in ours); branchlets± angled, leaves very large, ovate-elliptic to obovate, decurrent, acuminate, 30–75 cm long, 15–40 cm wide, pubescent with branched hairs dorsally; petiole to 6 cm; panicles 30–50 cm long, pedicels of each flower very short; calyx tube 3 mm long; corolla 1 cm wide, white or pink; ovary densely pubescent; calyx accrescent in fruit, to 3 cm wide; drupe 1.5 cm thick.

S. E. Asia and Indonesia, a very valuable timber tree. Introduced in Guam after 1900, and to be seen in villages and farms. Several fine trees are in Talofofo Village, (4429). The huge leaves and large panicles are unmistakeable. Our trees are usually rather short, however. The timber is commonly considered one of the finest in the world, and is highly preferred for wooden ships.

VITEX Linnaeus

Trees or shrubs with opposite, digitately 1–7-foliolate leaves; leaflets entire or serrate; cymes axillary, or in axillary or terminal racemes or panicles; flowers blue-purple or yellow; calyx 5-toothed; corolla bilabiate, upper lip bifid, lower lip trifid; stamens 4, two longer; ovary incompletely 4 or 2-celled; cells 1-ovulate (or 2-); style bifid; fruit a dry or succulent drupe, with a woody pyrene.

1. Leaves of 1 or 3 leaflets.
   2. Leaves of 3 leaflets, glabrous or minutely puberulent dorsally on the midrib; petiolule 8–25 mm long..... *V. parviflora*
   2. Leaves of 3 leaflets, or of 1 leaflet, appearing simple, sometimes both

kinds together on same branch; densely whitish-tomentose on the dorsal surface; petiolule less than 8 mm long..... *V. trifolia*

1. Leaves of 5 or 7 (rarely 3) leaflets, densely puberulent dorsally..... ..... *V. trifolia* var. *bicolor*

Vitex parviflora Jussieu, Ann. Mus. Paris 7: 76. 1806.

A tree or shrub; leaves of 3 leaflets, main petiole 2–10 cm long, leaflets oblong-lanceolate, 6–15 cm long, glabrous or fine-puberulent dorsally only on the midrib, petiolules 8–25 mm long; panicles terminal and upper-axillary; to 20 cm long; calyx-tube 2 mm, corolla-tube 5–6 mm long; filaments basally hairy; ovary glabrous or distally with a few hairs; drupe glabrate.

A Philippine species evidently introduced lately to Guam.

Vitex trifolia L. Sp. Pl. 638. 1753. Safford 1905: 397. Merrill 1914: 136. LAGUNDI.

Vitex rotundifolia L.f. Suppl. 294. 1781.

A creeping shrub; leaves of 1 or 3 leaflets, main petiole 2–4 cm; central leaflet on petiolule about 1 mm long, others subsessile, all variable-elliptic, less than 10 cm long and not over 7 cm wide, all densely white-tomentose dorsally; panicles mostly 5–15 cm long, sometimes longer; cymes tomentose; flowers blue-violet; calyx 3–4 mm long; corolla 7–8 mm long; filaments basally hairy; ovary basally glandular; drupe subglobose, black, about 6 mm wide.

A paleotropical strand plant, probably native in Guam, but uncommon. The foliage is aromatic.

Vitex trifolia L. var. **bicolor** (Lam) Moldenke, Known Geogr. Dist. Verb. 79. 1942. LAGUNDI.

Vitex negundo L. Sp. Pl. 638. 1753. Safford 1905: 397. Merrill 1914: 136. var. *bicolor* H.J. Lam, Verb. Mal. Arch. 191. 1919.

An erect, branched shrub; leaves 3- occasionally 5- (or 7-) foliolate, the leaflets lanceolate, acuminate, the central one longest (to 11 cm), with petiolule to 1–2 cm long, other leaflets smaller and on shorter petiolules, all densely puberulent dorsally; petiole 2.5–6 cm long; branchlets 4-angled and puberulent; flowers in terminal panicles; on puberulent cymes; calyx about 3 mm long, grey-puberulent; corolla blue-violet, about 4 mm long; puberulent; drupe black, 5–6 mm long, subglobose, 1-seeded.

An E. African—Indo-malayan-Pacific species; it is possibly native in Guam, but its occurrence is against this, and it is probably introduced, though no doubt long ago, as it was collected in Guam by Gaudichaud and by Lesson. The foliage is aromatic, and parts of the plant have medicinal uses.

LABIATAE

Shrubs or herbs; branches often quadrangular; leaves simple, opposite or whorled, often aromatic-spicy; stipules none; flowers solitary or in verticillasters, these in racemes, spikes, heads, or panicles; flower subtended by bract(s); calyx 5-lobed, bilabiate; corolla 4–5-lobed, bilabiate; stamens 4 or 2, inserted on the

corolla; ovary superior, 4-lobed, 2-carpellate, cells 1-ovulate (carpel bicelled), style usually *gynobasic*; stigma bilobed; fruit usually of 2 or 4 dry nutlets, rarely drupaceous.—About 160 genera and 3000 species, cosmopolitan, but chiefly of temperate or arid regions. No native species in Guam, but 11 exotic species in five genera are present.

Key to local genera

1. Succulent-stemmed herbs with coarsely crenate, variegated or multicolored leaves; calyx bilabiate, shorter than the corolla..... *Coleus*
1. Not as above,
   2. Densely stellate-pubescent herbs with subsessile linear-lanceolate leaves; calyx bilabiate, shorter than corolla..... *Lavandula*
   2. Not as above,
      3. Stamens declinate, on or inside the lower lip of the corolla.
         4. Calyx enlarged in fruit; flowers in dense globose heads or in axillary cymes in stems with reduced leaves..... *Hyptis*
         4. Calyx not enlarged in fruit; flowers in terminal spikes.. *Ocimum*
      3. Stamens erect or spreading, not within the lower lip of the corolla ..... *Mentha*

COLEUS Loureiro

Herbs, sometimes ± succulent, with crenate leaves; flowers in 6-many flowered cymules or verticilasters combined in terminal panicles; calyx bilabiate, accrescent in fruit; corolla blue-violet, longer than calyx, bilabiate; stamens 4, 2 longer, declinate; filaments basally connate; anthers 2-celled; disc asymmetric; ovary 4-lobed, glabrous; nutlets smooth.—About 150 spp., Paleotropics.

COLEUS SCUTELLARIOIDES (L.) Bentham, Wall. Pl. As. Rar. 2: 16. 1831.

C. blumei Benth. Labiat. Gen. et Sp. 56. 1832.—Merrill 1914: 136.

Erect or ascending commonly succulent green-stemmed cultivated herb, leaves variously colored (green, yellow, purple, white), crenate or doubly crenate, 5–15 (–20) cm long, about 1/2–2/3 as wide, broadly ovate; panicles erect, 10–40 (–60) cm long; calyx 10-nerved; corolla blue-violet, about 1 cm long, lower lip darker.

Malaysian-Australian, now widespread in cultivation, abundant in Guam, as pot plants or in borders; rarely escaping but ephemeral. Harmon (4289).

HYPTIS Jacquin, nom. cons.

Low shrubs or herbs, with glandular, aromatic, crenate-serrate leaves; flowers in heads or cymes, these axillary or in terminal leafy panicles; flowers subsessile or sessile; calyx 5-lobed, lobes subulate, subequal, accrescent; corolla not or not much longer than calyx, usually white to blue-violet, bilabiate, upper lip 2-4-lobed, lower lip 3-lobed saccate and deflexed; stamens 4, declinate; anthers 2-celled; ovary 4-lobed, glabrous; nutlets ovoid, glabrous.

Tropical America; a big genus of over 300 species. All ours are weeds.

Key to local species

1. Flowers in dense globose heads.....*H. capitata*
1. Flowers in cymes or spikes.
   2. Fully-developed calyx 4–5 mm broad; leaves aromatic....*H. suaveolens*
   2. Fully-developed calyx 1–2 mm broad.
      3. Bracts (at base of cymes) ovate-oblong.....*H. mutabilis*
      3. Bracts filiform.
         4. Cymules axillary, subtended by reduced leaves....*H. pectinata*
         4. Heads terminal, oblong, densely many-flowered...*H. spicigera*

Hyptis capitata Jacquin, Coll. 1: 102. 1786. Merrill 1914: 136. BOTONES.

Mesosphaerum capitatum (Jacq.) O. Kuntze, Rev. Gen. Pl. 2: 525. 1891. Safford 1905: 342.

Hyptis mariannarum Briquet, Pflanzenfam. 4 (3a): 343. 1897.

H. capitata var. *mariannarum* Briquet. Ann. Cons. Jard. Bot. Genève, 2: 225. 1898.

An erect subshrub 1/2–2 m. tall, with ovate-oblong, acute, serrate, petiolate leaves, commonly 5–15 cm long and 2–6 cm wide; petiole to about 2–3 cm; blades glabrate or puberulent and dorsally glandular; peduncles axillary, commonly 2–9 cm long; heads subglobose, 1.5–2.5 cm in diameter; flowers sessile, white, subtended by oblong-obovate bracts up to 8–12 mm long; calyx-lobes subulate, nearly equal, calyx-tube glabrous at extreme base, hirsute medially, pubescent distally, 3–4 mm long in flower, enlarging to nearly 1 cm in fruit; corolla 5–6 mm long, white with faint purplish spots on upper lip; filaments pubescent basally; nutlets brownish-black with a narrow white hilum, about 1 mm long.

Tropical America; a widespread weed. This is by far the commonest *Hyptis* in Guam, scattered everywhere in the southern savannahs, sometimes covering very large areas mixed with other weedy forbs and grasses. Manengon (3855).—Keng (Gard. Bull. Singapore 24: 92–94. 1969) points out that the plants in Malesia which have generally passed under the name *H. capitata* are really *H. rhomboidea* Mart. & Gal. (Bull. Ac. Bru. 11: 188. 1844). Possibly this also applies to the Guam plants.

Hyptis mutabilis (A. Rich.) Briquet, Bull. Herb. Boiss. 4: 788.

Herbs to 1–2 m, leaves ovate to rhomboid, acute, serrate, truncate-obtuse at base, 6 cm long, 3.5 cm wide, pubescent, petiotes up to 2.5 cm long; inflorescences several-flowered verticils, shortly pedunculate, bracts leaflike; flowers with lanceolate pubescent bracteoles 5 mm long; calyx 2–6 mm (ripe), 10-ribbed, toothed; corolla lavender, tube 4–5 mm long, with exserted stamens; filaments pubescent; nutlets brown, 2 mm long.

Tropical America; now widely distributed as a weed; sporadic in Guam.

Hyptis suaveolens (L.) Poit. Ann. Mus. Paris 7: 472, t. 29, f. 2, 1806. MUMUTUN.

Strong-scented herb to 1.5 m tall with quadrate hairy stems and ovate to obovate leaves 3–5 cm long and 2–4 cm wide, the margins serrulate, lower surface densely hairy; petioles up to 3 cm long. Flowers in small cymes along branch ends with

reduced leaves. Calyx 5 mm long in flower, 10 mm long in fruit, ribbed. Corolla blue. Nutlets about 1.2–1.5 mm long, slightly notched at the end.

Tropical America; now widespread as a weed, usually in dry open locations not at high altitudes. Manengon (3862), Umatac (4393).

Hyptis pectinata (L.) Poit., Ann. Mus. Paris 7: 474, t. 30. 1806.

Merrill 1914: 137.

MUMUTUN LAHE. M. PALAOAN. M. ADEMELON.

Nepeta pectinata L. Syst. ed. 10, 1099, 1759.

Mesosphaerum pectinatum (L.) O. Kuntze, Rev. Gen. Pl. 2: 525. 1891.

Safford 1905: 324.

Slender erect herbaceous subshrub with 4-angled puberulent stems; foliage aromatic if rubbed and crushed; leaves ovate or ovate-elliptic, cuneate to rounded (even subcordate) at base, acute or blunt at tip, puberulent or glabrescent dorsally, crenate-serrate, 2–9 cm long, 1–6 cm wide; flowers subsessile, white to pale violet, in cymules axillary to reduced leaves, subtended by linear pubescent bracts 1–3 mm long; calyx about 2 mm, enlarging in fruit to 4 mm; corolla 2.5 mm, lower lip darker; filaments somewhat pubescent; nutlets oblong, 1 mm long, black.

A Caribbean plant, now widespread as a tropical weed. First collected in Guam by Gaudichaud, and by Lesson. Robust plants may reach 4 m tall!

Hyptis spicigera Lamarck, Encycl. 3: 185. 1789. Merrill 1914: 137.

Erect branching subglabrous herbs to 1.5 m tall with quadrangular scabrous stems, petiolate leaves with oblong-lanceolate acuminate serrate blades to 6 cm long with decurrent base. Spikes oblong, terminal, dense, 2–6 cm long, of many crowded flowers. Corollas purplish, 3–4 mm long; calyx accrescent (to 6 mm long in fruit), ribbed and reticulate, with subulate teeth.

A tropical American species now of wide distribution. Weedy, sometimes gregarious, in dry grassland.

LAVANDULA Linnaeus

Aromatic shrubs or perennial herbs, stellate-tomentose; leaves entire; verticillasters grouped into a false terminal spike; calyx 13-nerved, 5-toothed; corolla blue or violet, longer than the calyx, bilabiate; stamens 4, included; filaments glabrous; ovary 4-lobed; nutlets glabrous.—Europe and Atlantic Is., 28 spp.

LAVANDULA VERA DC. Fl. France Suppl. 398. 1805. LAVENDER.

L. officinalis Chaix, Vill. Hist. Pl. Dauph. 363.

Erect slightly shrubby herb, stems quadrangular, leaves subsessile, linear-lanceolate, white-glandular, stellate-tomentose, 2–6 cm long, 2–6 mm wide; false spikes long-stalked; flowers crowded; bracts 4–5 mm long; calyx 5 mm; corolla 8 mm long.

A European species occasional in cultivation.

MENTHA Linnaeus

Aromatic herbs with entire or serrulate leaves; cymes axillary, many-flowered,

sometimes forming a terminal inflorescence; calyx obscurely bilabiate; corolla violet, obscurely bilabiate, 4-lobed; stamens 4, glabrous; style bifid; nutlets glabrous, ellipsoid, smooth.

A mainly N. temperate zone genus of perhaps 25 or 30 species but with an immensely inflated content of synonymy and minor variants (named as species) due, probably, to cultivation.

MENTHA ARVENSIS L. Sp. Pl. 577. 1753. Safford 1905: 323. Merrill 1914: 137.
YERBA BUENA. MINT.

Erect herb with mint-odorous foliage; stems 4-angled, pubescent; leaves ovate or lanceolate, serrate, puberulent on the nerves dorsally, usually 2–5 cm long; flowers in dense verticillasters; calyx densely puberulent externally, about 2 mm long, the 5 teeth slender deltoid; corolla pale violet, puberulent externally and internally, 4–5 mm long; nutlets 0.75 mm long, brown.

A European plant, often cultivated elsewhere, for its aromatic leaves.

OCIMUM Linnaeus

Shrubs with entire or serrate usually aromatic leaves; flowers in terminal and axillary racemes composed of 6-flowered verticillasters; calyx bilabiate, 10-nerved; upper lip with decurrent margins, entire, lower lip 4–6-toothed; corolla-tube shorter than calyx, puberulent within (or not), bilabiate, lower lip longer; stamens 4, declinate, exserted, the 2 posterior filaments with a basal hairy bar, or a tuft of hairs; style bifid; nutlets subglobose, usually minutely tuberculate.—Tropics and warm temperate zone, 150 spp.

Key to local species

1. Corolla 3–5 mm long, the tube 1.5–2 mm; calyx internally glabrous or with a few short hairs; 2 posterior filaments without a basal bar at right angles to the filament..... *O. sanctum*
1. Corolla 5–9 mm long, the tube 2.5–3.5 mm; calyx with long hairs inside; 2 posterior filaments with white-hairy bar at right angles to filament.
   2. Corolla 7–9 mm, tube 3.5 mm, long;..... *O. basilicum*
   2. Corolla 5–6 mm, tube 2.5 mm long..... *O. americanum*

Ocimum basilicum L. Sp. Pl. 597. 1753. Safford 1905: 336. Merrill 1914: 137.
ATBAHAKAT. BASIL.

Herbs to about 1 m tall; leaves at most 7 cm long by 2.8 cm wide, serrate or entire; calyx with inside whorl of long hairs; bracts petiolate; flowers white or pinkish; corolla-tube 3.5 mm long, overall 7–9 mm; upper lip 4-toothed, lower lip entire; calyx in fruit 5–9 mm long; nutlets brown or black, 1.5–2 mm long, obovoid, when moistened swelling and becoming slimy. [2n=48; Morton, J. Linn. Soc. Bot. 58: 232. 1962].

Pantropical, cultivated and weedy; used as a condiment, "sweet basil". G.E.S. 98.

Ocimum americanum L. Cent. Pl. 1: 15. 1755; Amoen. Acad. 4: 276. 1759. ATBAHAKAT.

O. canum Sims, Bot. Mag. t. 2452, 1824. Safford 1905: 336.
Merrill 1914: 137.

Erect herb to ± 1 m tall; leaves ovate, to about 7×2.5 cm, serrate or entire, ciliate, glandular; racemes to 18 cm long; flowers white; calyx green, in fruit 4–6 mm long, with an internal whorl of long white hairs; upper lip entire, lower 4-toothed; corolla white, 5–6 mm long, tube 2.5 mm, lower lip 2–3 mm, rounded, upper lip 4-lobed, lobes rounded; stamens 4, declinate, the 2 posterior filaments each with a basal transverse hairy bar; nutlets jet black, 1.5–2 mm long, swelling and becoming slimy when wetted.

Pantropical, cultivated or weedy; used as a condiment. First collected in Guam by Gaudichaud. [2n=24 *fide* Morton, l.c.].

Ocimum sanctum L. Mant. 1: 85. 1767. Safford 1905: 337. Merrill 1914: 137. YERBA BUENA. SACRED BASIL.

Erect herb or subshrub with aromatic foliage; leaves oblong, obtuse or acute, serrate or entire, upper bract-like leaves ovate to cordate; pubescent, glandular; blades not over 7.5 cm long or 2.8 cm wide; calyx 2.5–3.5 mm long, often purple, sometimes green, internally glabrous or with few short hairs only, enlarging in fruit to 5 mm long; lower lip of calyx 4-toothed, two teeth setose-awned; corolla purple or white, 3–5 mm long, the tube 1.5–2 mm, upper lip with rounded lobes, lower lip entire; stamens 4, declinate, the 2 posterior filaments with a basal tuft of hairs but no transverse bar; nutlets brown, subglobose—compressed, nearly smooth, 1.5 mm long, *not swelling or slimy if wetted.*

Pantropical, cultivated or weedy; used as a condiment or medicine. McGregor 422.

SOLANACEAE

Shrubs (some climbers) or herbs (sometimes stellate-pubescent), with leaves mostly alternate simple and entire or dentate or pinnatifid; stipules none; flowers perfect, regular; calyx usually 5-lobed, (or 4 or 6) sometimes enlarging in fruit; corolla tubular rotate to campanulate, the lobes usually 5, usually plicate in bud; stamens 5, inserted on the tube, alternate with the lobes of the corolla; anthers 2-celled, either opening by longitudinal slits or by terminal pores; ovary superior, 2-celled (cells sometimes divided by false partitions); ovules many on axile placentae; style terminal; stigma globular or briefly lobed; fruit a berry or capsule, many-seeded; seeds endospermous.

—About 75 genera and 2000 species, mostly Tropical, around the world. Eight genera reported from Guam, only one (one species) indigenous.

Key to local genera

1. Flowers long tubular, trumpet-like, very large (commonly 10–18 cm); fruit a spiny capsule..... *Datura*

1. Flowers much smaller, either tubular or rotate-campanulate; fruit not spiny.
   2. Fruit enclosed by the enlarged balloon-like calyx.....*Physalis*
   2. Fruit not enclosed in the calyx.
      3. Corolla long-tubular, with a comparatively small flaring limb.
         4. Woody shrubs; leaves mostly about 6–20 cm long, petiolate, elliptic-oblong; flowers white, about 1.5–3.5 cm long; fruit a juicy blackish-purple berry, or a white berry.....*Cestrum*
         4. Coarse macrophyllous herbs; leaves often 30–40 cm long, sessile; flowers pink, 3–5 cm long; fruit a capsule 2 cm long..*Nicotiana*
      3. Corolla rotate-campanulate, or if with a tube then the tube shorter than the breadth of the limb.
         5. Large woody shrub to 3–4 m tall with large (20–30 cm long) cordate leaves; flowers pink.....*Cyphomandra*
         5. Smaller shrubs or herbs; flowers mostly purplish, yellow or white.
            6. Anthers free, dehiscent by longitudinal slits; fruit of hot-peppery flavor (except in the "Bell" peppers)....*Capsicum*
            6. Anthers connivent.
               7. Anthers opening by slits; leaves pinnatifid, pinnate, or bipinnate; .....*Lycopersicon*
               7. Anthers opening by terminal pores; leaves entire or lobed..... *Solanum*

CAPSICUM Linnaeus

Erect shrubs or herbs, spineless, with alternate simple entire leaves; flowers terminal or (pseudo-) axillary, solitary or few together, *pendulous*; calyx campanulate; corolla rotate-campanulate with very short tube; stamens glabrous; anthers not inarched or connivent, opening by longitudinal slits; ovary 2–4-celled; fruit a berry with leathery pericarp and commonly peppery-hot flavor; calyx persistent at base of berry; seeds flat.—Tropical America; about 50 spp.

1. Flowers usually 1.5–2 cm wide; herb.....*C. annuum*
1. Flowers 0.75–1.5 cm wide; shrub.....*C. frutescens*

CAPSICUM ANNUUM L. Sp. Pl. 188. 1753. Safford 1905: 214. Merrill 1914: 137. DONI. CHILI-PEPPER, etc.

Annual nearly glabrous herb; leaves ovate-elliptic to lanceolate, acute-acuminate, up to 12×5 cm, usually smaller; petiole to 2.5 cm; flowers usually solitary or paired; calyx 2–3 mm long; but larger in fruit; corolla white, 1.5–2 cm wide; anthers purplish; berry highly variable in shape and flavor according to cultivar, 2–15 cm long, subglobose to ellipsoid or narrowly conic or ovoid, usually bright red, drooping.

A native of Tropical America now widespread in cultivation, with many special forms; possibly not distinct from the following species. Among the best-known cultivars; are: CV. "Grossum", the bell-pepper, with large sweet fruits; CV. "Cerasiforme", the cherry-pepper, with globular very pungent often yellow-purple fruit; and CV. "conoides" with erect conical hot fruit, the tabasco-pepper.

Capsicum frutescens L. Sp. Pl. 189. 1753. Safford 1905: 214. Merrill 1914: 137. DONI-SALI. DONI-HALOMTANO. CHILI-PEPPER.

Somewhat puberulent branched perennial shrub 1–3 m tall; leaves ovate-oblong to lanceolate, 2–8 (–12) cm long, acute-acuminate, entire or slightly undulate; petioles to 3 (rarely 4) cm long; flowers about 1 cm wide, on 1–2 cm long pedicels, one or two (rarely three) together; calyx 2.5–3 mm long; corolla greenish-white or purplish-white; anthers purple; berries variable, often ellipsoid-ovoid or subconic, red, very hot-pungent, 3×1 cm.

Tropical America. This is the pepper which is naturalized in Guam. Mangilao (3789).

In Guam a spicy sauce called "finadeni" is prepared with these peppers, vinegar, soy-sauce and the juice of a lemon or lime.

CESTRUM Linnaeus

Trees or shrubs with spiralled leaves; blades entire; cymes axillary or terminal, or compound in leafy panicles; flowers usually 5- (rarely 4- or 6-) merous; calyx persistent; corolla tubular, narrowed at the throat, widened at apex, with small spreading limb; stamens included; anthers opening by slits; ovary 2-celled, with rather few ovules; fruit a berry with 1 to 10 seeds.—Tropical America; a large genus of perhaps 150 species.

1. Fruit black; corolla white, 1.5 cm long; leaves mostly less than 10 cm long.... ..... *C. diurnum*
1. Fruit white; corolla greenish-white, 2–2.5 cm long; leaves mostly 10–20 cm long..... *C. nocturnum*

Cestrum diurnum L. Sp. Pl. 191. 1753. Merrill 1914: 138. TINTA'N-CHINA. INKBERRY.

C. pallidum sensu Safford 1905: 223, not Lamarck, Encycl. 1: 688.

Glabrous branching shrub to 2.5 m tall; leaves elliptic-oblong or oblong-ovate, obtuse, mostly 5–10 cm long and to 2.5 cm wide, medium green, not glossy, paler beneath, short-petiolate; cymes combined in racemes in axils and terminal; flowers subsessile, about 1–1.5 cm long, calyx green, 5-toothed, corolla white, with 5 short rounded reflexed lobes (rarely 6); stamens 5 (rarely 6), included; style filiform, stigma capitate and almost or slightly exserted; berry purple to black, ovoid, juicy (purplish), few-seeded, with the calyx persistent at base.—Pl. 13e.

A native of Tropical America, long ago introduced to Guam, perhaps accidentally, and now very common in the central and northern parts of the island in mixed or limestone soils, rare or absent in savannahs, mostly in weedy lots, abandoned fields, roadsides, etc. The local name, which means "china-ink" refers to the purplish juice of the berry, which can indeed be used as ink; but the plant is emphatically not Chinese. Barrigada (3777; 4508; 4986).

CESTRUM NOCTURNUM L. Sp. Pl. 191. 1753. Safford 1905: 222. Merrill 1914: 138. DAMA-DE-NOCHE. LADY-OF-THE-NIGHT

A glabrous shrub with ovate-oblong petiolate obtuse leaves mostly 10–20 cm

long; cymose racemes longer than petiole; flowers greenish-white or pale greenish-yellow, *emitting a strong sweet fragrance at night*; calyx green, 5-toothed, about 1/3 as long as the 2.0–2.5 cm corolla; corolla-lobes 5–6 mm long, obtuse, erect or spreading; 5 stamens included, puberulent at base; berry about 8–10 mm long, white, with 1–3 seeds.

Native of the West Indies, now widely cultivated. The noctural fragrance is delightful (unless one is too close).

CYPHOMANDRA Sendt.

Tall or arborescent shrubs with alternate simple leaves; flowers in raceme-like cincinni, (simple or branched), pedicellate; calyx 5-lobed; corolla deeply 5-lobed; stamens 5 on short filaments inserted in throat of corolla; connective between anther cells dorsally enlarged; anther-cells opening by terminal pores; ovary 2-celled, many-ovulate; fruit a berry with many compressed reniform seeds.—Tropical America, 30 species.

CYPHOMANDRA BETACEA (Cav.) Sendt. Flora 28: 172. 1845.

Fosberg (ined.) TREE-TOMATO.

Small tree 2–6 cm tall; leaves ovate-oblong, cordate, acute-acuminate, pubescent on both sides, 6–25 cm long, 4–16 cm wide, petioles pubescent, 2–12 cm long; inflorescence pubescent, 5–10 cm long; calyx 4–5 mm (in fruit 7 mm) long; corolla pink, 1.2–1.5 cm wide, lobes ciliate; fruit ovoid, purplish, 3–5 cm long, edible.

Native of Tropical S. America. This is cultivated occasionally in Hawaii, and supposedly in Guam.

DATURA Linnaeus

Shrubs or herbs with ± paired unequal leaves, larger ones lobed; flowers solitary, terminal; calyx 5-lobed, circumscissile after anthesis; corolla tubular, 5-lobed, with 5 stamens at apex of tube; anthers 2-celled, opening by longitudinal slits; ovary imperfectly 4-celled, ovules many; fruit a berry or capsule, often spiny but sometimes smooth, subglobose, 4-valved or otherwise dehiscent or indehiscent; seeds compressed, slimy when wetted.—About 12 species of the Tropics, especially Central America.

DATURA METEL L. Sp. Pl. 179, 1753. JIMSON-WEED.

D. fastuosa L. Syst. ed. 10, 932. 1759. Safford 1905: 256.

Merrill 1914: 138.

Herb, 1–2 m tall; leaves narrowly ovate, acute, sinuate-repand to lobed, glabrous or slightly puberulent, 4–25 cm long, 2–20 cm wide; petiole 1–16 cm long; flowers large, erect, yellow or purplish, or white (fa. *alba*), single or double (or triple) (f. *pleniflora*); calyx 1/3-1/2 as long as corolla; corolla trumpet-like, commonly 12–18 cm long; anthers 1.3–2 cm long; fruit prickly or spiny, dehiscing irregularly; seeds yellow-brown.

Native of S.E. Asia. There are several cultivars of this species:

(1) f. *metel*.—Corolla purplish, simple double or triple.

(2) f. *pleniflora* Degener, Fl. Haw. Fam. 318, 1934.—Corolla yellow, double or triple.

(3) f. *fastuosa* (L.)—Corolla purplish, single.

(4) f. *alba* (Nees) comb. nov. [*Datura alba* Nees, Trans. Linn. Soc. 17: 73 1834; as var. *alba* C.B. Clarke, in Hooker, fil., Fl. Brit. Ind. 4: 243. 1883; Merrill 1914: 138.]—Flowers pure white, simple; foliage puberulent. This is often found wild in Asia and Java.

There are other forms besides these.

The flowers expand, and yield their heavy fragrance, at night. Daturas are poisonous and narcotic.

LYCOPERSICON Miller

Herbs, more or less viscid-pubescent, erect or creeping or climbing, with pinnate or bipinnate leaves with terminal leaflet, with equal or with unequal lateral leaflets (small ones alternating with larger ones), these entire or usually toothed or incised; inflorescence extra-axillary, racemose or cymose, simple or branched, bracteate or not; calyx 5-lobed (rarely with additional lobes), often accrescent in fruit; corolla *yellow*, 5-(rarely more-) lobed, lobes reflexed at anthesis; stamens usually 5, *subsessile anthers with apical appendages and opening by longitudinal slits*; anthers connivent and connate or sub-connate in a ring through which passes the included or slightly exserted style; ovary 2-(or more) celled, with several to many seeds; fruit a berry, fleshy, red, yellow, or greenish-white-and-purple; seeds flat, glabrous or pubescent, enclosed in gelatinous sheath.—Six Tropical American species; one, the TOMATO, in Guam, in several forms.

LYCOPERSICON ESCULENTUM Miller, Gard. Dict. ed. 8, (Lycopersicon no. 2). 1768.—Merrill 1914: 138. TOMATE. TOMATO.

Solanum lycopersicum L. Sp. Pl. 185. 1753.

Lycopersicon lycopersicum (L.) Karst. Deutschl. Fl. 996. 1880–83. Safford 1905: 312.

Pilose herb (hairs articulate), glandular with capitate hairs on youngest parts; stems slightly succulent, green; leaves 10–30 cm long, 6–15 cm wide, pinnate or bipinnate, puberulent; flowers in racemes; pedicels 10–15 mm; calyx 5–8 or 10-lobed, lobes very slender, about 1 cm long; corolla yellow, 5–8 or 10-lobed, lobes lanceolate, about 1 cm long; stamens 5–8 or 10; anthers 5 mm long, apical appendage 2 mm; ovary glabrous; fruit 3–10 cm diam. (or more) 3–12-celled, subglobose, sometimes lobed, red or yellow, juicy, edible; seeds flat, 3 mm long, silvery-pubescent.

A native of Tropical America, now widely cultivated in many countries. There are several major cultivar forms, and many minor ones. The large-fruited tomato is grown in Guam, but most of those found in markets are imported. The next form, however, is naturalized and also cultivated; it seems better adapted to local conditions.

var. CERASIFORME (Dunal) A. Gray, Syn. Fl. 2(1): 226. 1886.
TOMATES CAPUTI. T. UBAS. CHERRY-TOMATO.

This form differs chiefly in its small globose fruits, about 1 cm wide, which are borne on rather long racemes; they are 2-celled, usually red though sometimes yellow, and the seeds may be only 2 mm long. The flowers are generally 5-merous. It is probably close to the primitive form of the species. It is rather weedy, and prefers loose, sandy or limestone soils. Asanite Bay (obs.). Barrigada village (4865).

There are possibly other cultivars of the tomato also in Guam.

Note. To grow tomatoes successfully in home gardens it is best to use sterilized soil, and to protect the plants from strong winds; however they should be in full sun. Soil for pots may be sterilized by dumping it (when thoroughly dry) in boiling water. Pot-grown plants should be kept above the ground and fertilized. Plants grown in unsterilized soils usually succumb to attack by nematodes. A light rather sandy soil is best.

NICOTIANA Linnaeus

Shrubs or herbs, some viscid-pubescent; leaves spiralled, lowest ones forming a rosette; flowers in terminal racemes or racemose panicles; calyx tubular-campanulate, 5-lobed, accrescent; corolla tubular, slightly zygomorphic, 5-lobed; stamens 5, included or slightly exserted; anthers opening by slits; ovary 2–4-celled, many-ovulate; stigma bilobed; fruit a capsule with persistent calyx at base, 2–4-valved, many-seeded; seeds tuberculate.—Nearly 100 species; Tropical America; Australia.

NICOTIANA TABACUM L. Sp. Pl. 180. 1753. Safford 1905: 331. Merrill 1914: 138. CHUPA. TOBACCO.

Coarse erect herb with large oblong-ovate to lanceolate leaves 30–60 cm long by 10–20 cm wide, subsessile, sometimes shortly decurrent on the stem; apex acute; surfaces pubescent; inflorescence pubescent; flowers pink; calyx 1–2 cm long, puberulent; corolla 3–5 cm long, puberulent; filaments puberulent at base; corolla-lobes ovate; ovary glabrous; capsule 1.5–1.7 cm long.

Native of Tropical America, now in general cultivation. Safford gives a lengthy account of the way the tobacco was cultivated in Guam. It is still seen in villages and around houses, but not as commonly as it was at the turn of the century when Safford observed it.

Inarajan (5162). Barrigada village (obs.).

PHYSALIS Linnaeus

Erect herbs with simple leaves, proximally spiralled, distally paired, unequal; entire or repand-dentate; flowers terminal, solitary; regular; calyx 5-lobed, campanulate, accrescent; corolla 5-lobed, campanulate; stamens 5, glabrous; anthers opening by longitudinal slits; ovary 2-celled, ovules many, stigma capitate; fruit a berry with many seeds, enclosed in the enlarged inflated calyx.—Tropics; 100 spp.

1. Leaves 2.5–10 cm wide; petioles to 10 cm; corolla over 6 mm long..*P. angulata*
1. Leaves rarely over 2 cm wide; petioles rarely over 2.5 cm; corolla less than 6 mm long .....*P. lanceifolia*

Physalis angulata L. Sp. Pl. 183. 1753. Safford 1905: 353. Merrill 1914: 139.
TOMATE CHACA.

Branched erect nearly glabrous herb; stems angled, hollow; leaves ovate to ovate-oblong, obtuse or acute or rounded (somewhat asymmetric) at base, acute-acuminate, often repand-dentate, rather dark dull green, very short-puberulent on both sides on the nerves, 3–15 cm long, 2.5–10 cm wide, on long petioles 2–10 cm, calyx 4–6 mm long in flower, 2–4 cm long in fruit, short-puberulent; corolla nearly 1 cm long, yellowish-green, partly puberulent externally; anthers blue, 1–2 mm; fruit about 1–1.8 cm long, ellipsoid, within the balloon-like calyx (which has a small apical opening); seeds about 1.7 mm long, flat, yellowish, reniform.

Possibly a Tropical American plant. It is now a common tropical weed. Pago Bay (4314).

Physalis lanceifolia Nees, Linnaea 6: 473. 1831. Merrill 1914: 138.
TOMATES CAPUTI.

Herb to 1 m tall, glabrous or nearly so, stems angular; leaves lanceolate to ovate-lanceolate, mostly 10–12 cm long, 2–2.5 cm wide; petioles 5–15 (–25) mm long; blades entire to coarsely remotely serrate, acute to subacuminate at both ends; flowers solitary in axils on filiform pedicels to 2 cm long, nodding, calyx-tube broad cylindric, truncate at base, puberulent, lobes deltoid to subacuminate, whole calyx 2–3×2 mm; corolla pale yellow or whitish, campanulate, 4–5 mm long; fruit q subglobose berry 10–12 mm long within the enlarged, reticulately veined pointed inflated 3×2 cm calyx.

Said to be from Peru or Mexico; but according to F. R. Fosberg, there is no material in the U. S. Natl. Herbarium, although there are specimens from Sumatra and the Philippines. The plant was collected by Lesson (cited by Endlicher in Ann. Wien. Mus. 1: 174. 1835). Other specimens include: *McGregor* 512; *G.E.S.* 202; *Fosberg* 43448; *Anderson* 22; *Hosaka* 3190. Localities include Asan Pt., Agat, and Piti.

Solanum Linnaeus

Trees, shrubs, herbs, or climbers, sometimes prickly, often with stellate hairs, leaves simple to pinnatifid, spiralled or paired; inflorescences few-many-flowered, or flowers solitary, terminal or lateral; flowers perfect, or sometimes ♂♀ on same plant; usually regular; calyx usually 5-lobed (or 5–10–), often accrescent; corolla campanulate, 5–(–10–) lobed; stamens 5(–10), with short filaments; anthers free, erect, dehiscent by apical pores (sometimes these enlarging to very short slits); ovary 2(–6–) celled; ovules many; fruit a berry with many compressed seeds, sometimes poisonous.—A very large genus of over 1200 species, all around the globe in both tropics and warm temperate regions.—[The genus *Lycopersicon*, including the tomato, (see earlier) is often considered part of *Solanum*].

Three species occur in Guam, one of which is endemic in the Marianas.

Key to local species

1. Herbs, with simple hairs, or glabrous.....*S. nigrum*

1. Shrubs or herbs with stellate hairs.
   2. Leaves usually pinnately lobed; anthers 5–7 mm long; fruit large or quite large, 2.5–15 cm long, subglobose or cylindric, yellow or purple, edible; cult. herb.....*S. melongena*
   2. Leaves entire or obscurely repand; anthers 2–3 mm long; fruit red globose, 5–10 mm thick; wild shrub.....*S. guamense*

Solanum guamense Merrill 1914: 139. BERENGHENAS HALOMTANO.

S. saipanense Bitter, Engl. Bot. Jahrb. 56: 559. 1921.

An erect branching stellate-tomentose shrub with branches 3–4 mm thick and crowded leaves on petioles 1–3.5 cm long; blades chartaceous, ovate to elliptic-oblong, stellate-tomentose on both surfaces but densest beneath, the hairs whitish or pale yellowish, apex acute or obtuse, base rounded to obtuse or subacute, usually slightly asymmetric, margins entire or obscurely repand, 5–15 cm long, 3–11 cm wide, lateral nerves 4–7 pairs; inflorescence ± supra-axillary, stellate-tomentose, cymose, drooping, 3–5 cm long, forking, many-flowered; flowers 5-merous; calyx 2.5 mm long, lobes 1/5 as long; corolla 12 mm broad, white, with ovate lobes; anthers yellow, blunt, 2.5 mm long; fruit red, globose, c. 5–7 mm wide, glabrous, fleshy, with many flat subreniform to elliptic 2 mm long seeds.

Endemic to the Marianas Islands; the type from Guam (Cabras Island, G.E.S. 446). This is a plant of limestone cliffs and terraces near the sea. It may reach a height of 1–2 m. Asanite Pt. (4299; 5016). The fruits resemble tiny tomatoes.

SOLANUM MELONGENA L. Sp. Pl. 186. 1753. Safford 1905: 375. Merrill 1914: 139. BERENGHENAS. EGGPLANT.

Erect, stellate-tomentose herb; leaves ovate to elliptic-oblong, 3–25 cm long, 4–15 cm wide, obtuse to subcordate at base, obtuse to acute at apex, usually shallow-pinnately-lobed, petiole 1–10 cm long; both surfaces of blade densely or sparingly stellate-tomentose; stems sometimes prickly; inflorescence sessile, 1–4-flowered; lower flowers bisexual, upper ones male; calyx and corolla both stellate-hairy; fls. often 6–9-merous; corolla white or usually pale to medium purple; anthers 5–7 mm long; fruit highly variable in size and shape, greenish to whitish or dark purple, subglobose or cylindric, 2.5–15 cm long (or more), 2–4 cm thick, edible.

Probably of E. or SE. Asiatic origin, the eggplant is now general in cultivation. It sometimes occurs as temporary escaped plants in Guam. Mangilao (4929).

Solanum nigrum L. Sp. Pl. 186. 1753. Merrill 1914: 139. NIGHTSHADE.

Annual herb, glabrous or slightly pubescent; hairs if present simple (not stellate); leaves ovate to lanceolate thin, flexible, entire or obscurely toothed, acute, at base somewhat asymmetrically obtuse or rounded and decurrent; petiole to 3 cm long; blades to 10 cm long; inflorescence supra-axillary, shorter than leaf, several-flowered; flowers 7 mm wide, nodding; calyx campanulate, the obtuse 1 mm lobes becoming reflexed; corolla white or yellowish, lobes 2.5 mm long; stamens 2.5 mm long, yellow; anthers poricidal; ovary glabrous but the style puberulent; berry glabrous, purpleblack, juicy, about 6 mm diam., many-seeded; seeds flat, 1.5×1 mm.

A pantropical weed, some forms of which (at least) are characterized by the poisonous fruit. In waste ground and newly cultivated soil; weedy but not especially troublesome.

SCROPHULARIACEAE

Trees, shrubs, vines, or herbs, autotrophic or some partly parasitic, with opposite or whorled (rarely alternate) leaves, simple, entire or toothed; stipules none; inflorescences various; flowers perfect, rarely regular but almost always zygomorphic, usually 4–5– (rarely 6–8–) merous; corolla often bilabiate; stamens 4, didynamous, rarely 5, sometimes 2; sometimes with staminodes; filaments inserted on the corolla-tube; anthers 2-celled, opening by slits; ovary superior, 2-celled, with axillary placentation, ovules many, rarely few; stigma sometimes bilobed; fruit a 2–4-valved capsule (sometimes poricidal); seeds endospermous.

—A large family, rich in herbaceous forms, principally of temperate regions, with perhaps 200 genera and about 3000 species. In N.E. Asia the main arborescent form is the "kiri" tree (Japan), Paulownia. Six genera occur in Guam, of which three appear to have indigenous species.

Key to local genera

1. Ornamental green slender shrubs with linear scale-like leaves and bright red flowers..... *Russelia*
1. Not as above,
   2. Stamens 5, or if 4, then a conspicuous staminode present..... *Bacopa*
   2. Stamens 4, not staminodes; or stamens 2, staminodes 2 or none.
      3. Corolla regular, of 4 equal lobes..... *Scoparia*
      3. Corolla bilabiate, upper lip entire or 2-lobed, lower lip 3-lobed, purplish or yellow.
         4. Anthers coherent in pairs; capsule 2–3-valved; stamens 4 or 2, + 2 staminodes
            5. Calyx with 3 or 5 broad wings or ribs; stamens 4, filaments sometimes basally spurred; capsule 2-valved; cult. herb.. ..... *Torenia*
            5. Calyx not ribbed or winged, or if so, then with 5 narrow ribs; stamens 4 or 2, not spurred; capsule 2–3-valved; wild herbs ..... *Lindernia*
         4. Anthers free; capsule 4-valved; stamens 4..... *Limnophila*

BACOPA Aublet

Diffuse or prostrate herbs with opposite entire or serrulate palmately nerved leaves; flowers usually single, axillary; two bracts at base of calyx; calyx 5-parted, upper segment broadest; corolla subregular with cylindric tube; limb 5-lobed, lobes subequal; stamens 5 (or 4 with a large staminode representing the 5th), didynamous, included; ovary with many ovules, slender style, and capitate or 2-lobed stigma;

capsule many-seeded, enclosed by the calyx.—About 10 species in all warm and tropical regions. [*Monniera* P. Br.; *Bramia* Lam.]

Two species in Guam.

1. Corolla lilac or pale violet or white; calyx with 2 bracteoles at base..... .....*B. monnieri*

1. Corolla yellow; calyx without basal bracteoles.....*B. procumbens*

Bacopa monnieri (L.) Pennell, Proc. Acad. Nat. Sci. Philad. 98: 98. 1946.

Lysimachia monnieri L. Cent. Pl. 2: 9. 1756.

Gratiola Monniera L. Amoen. Acad. 4: 306. 1759.

Herpestes monnieria H.B.K. Nov. Gen. 2: 294. 1817.

Bacopa Monnieri (P. Browne) Wettstein, Pflanzenfam. 4, 3b: 76. 1891. Safford 1905: 193. Merrill 1914: 140.

Bramia monnieri (L.) Pennell, Proc. Acad. Nat. Sci. Philad. 71: 243. 1919.

Bramia Monniera (L.) Drake del Castillo, Pl. Polyn. Franc. 142. 1892.

Monniera Monniera (L.) Britton, Mem. Torrey Bot. Club 5: 292. 1894.

Fleshy glabrous perennial herb, prostrate, rooting at the nodes; leaves spathulate or obovate, obtuse, sessile or nearly so entire or distally crenulate-serrulate, up to 2 (–2.5) cm long, 5 mm wide; flowers few, axillary; peduncles compressed; with 2 bracteoles subtending calyx; calyx 6 mm long; corolla about 1 mm long and wide, obscurely bilabiate, lower half of tube pale yellow but the lobes white or pinkish-lilac; stamens 4, anthers brownish; pollen white; ovary 2 mm long, style 3 mm long, stigma bilobed; capsule deflexed, slender-conic, enclosed by the calyx, late loculicidal, 2-valved; seeds few, blackish, reticulate, less than 1 mm long, obovoid.

A pantropical herb, perhaps originally American, of wet, and sometimes brackish places.

Bacopa procumbens (Miller) Greenman, Field Columb. Mus. Bot. Ser. 2: 261. 1907.

Herpestis chamaedryoides H.B.K. Nov. Gen. Sp. 2: 369.

Suberect herbs similar to the preceding species; stems quadrangular, glabrous; leaves elliptic or shortly ovate-elliptic, crenulate-serrulate, 1–2.5 cm long, 6–12 mm wide; calyx without basal bracteoles; pedicels 4–6 mm long at anthesis, elongating in fruit to 18 mm; corolla yellow, slightly longer than calyx; capsule 2-valved.

Native of Tropical America, now a widespread weed of wet or brackish localities. Apra Harbor (4674).

Limnophila R. Brown

Herbs, some aromatic when bruised, stems with air-cavities, leaves opposite or whorled, serrate or laciniate; flowers solitary or in racemes or spikes; calyx with or without a pair of bracteoles subtending, 5-lobed; lobes subequal or lowest one largest; corolla bilabiate; upper lip entire or bilobed; lower lip 3-lobed; stamens 4, didynamous, included; anthers free; ovary many-ovulate; stigma bilamellate; capsule septicidally 4-valved, the valves bifid; seeds many, ribbed, small.—Paleotropics; about 30 spp.

Key to local species.

1. Leaves all opposite or ternate.....*L. fragrans*
1. Basal leaves whorled, 6 or more (to 12–13) at a node, some deeply incised into several narrow segments.
   2. Flowers on distinct pedicels 3–5 (–8) mm long; corolla light purple; bracteoles more than 1/2 mm long.....*L. indica*
   2. Flowers sessile; corolla white with purple lines; bracteoles less than 1/2 mm long.....*L. sessiliflora*

Limnophila fragrans (Forster f.) Seemann, Fl. Vit. 180. 1865–73.
Merrill 1914: 140. GEGE SENSONYAN.

Ruellia fragrans Forst. f. Prodr. 44. 1786.

Limnophila serrata Gaudich. Bot. Voy. Freyc. 448, t. 57, f. 2. 1830.

Ambulia fragrans (Forst. f.) Drake del Castillo, Fl. Polyn. Franc. 140. 1892. Safford 1905: 181.

Procumbent aromatic herb of marsh coastal localities, with sessile, oblong-lanceolate, serrate leaves, subamplexicaul at base; calyx smooth, lobes lanceolate-subulate; corolla barely longer than calyx.

Native of Polynesia, also somewhat weedy.

Limnophila indica (L.) Druce, Rep. Bot. Exch. Cl. Brit. Is. for 1913, 3: 420. 1914. GEGE.

L. indica (L.) Merrill 1914: 140.

Hottonia indica L. Syst. ed. 10, 919. 1759.

Ambulia indica (L.) Wight ex Safford 1905: 181.

Limnophila gratioloides R. Br. Prodr. 442. 1810.

Herbs with somewhat 4-angled stems, lowest leaves verticillate, puberulent, and divided into short narrow segments; upper leaves 3-lobed or entire; linear-lanceolate, secrate, to 2 cm long and 3 mm wide; flowers axillary on pedicels 3–5 mm long (in fruit to 8 mm), puberulent; calyx 5-lobed, 3–5 mm long, accrescent in fruit, tube longer than lobes; in fruit hemispheric; corolla light purple, 8 mm long, cylindric; stamens 4, included; style deflexed at tip, bilamellate at the stigma; capsule containing numerous small truncate angled reticulate seeds.

Tropical Africa and Asia to Australia. First collected in Guam by Gaudichaud. Aromatic (odor of turpentine), growing in wet marshy places, the stems often partly submerged.

Limnophila sessiliflora Blume, Bijdr. 750. 1826. Merrill 1914: 141. LUMUT.

Herbs with rounded stems, pilose on younger parts, lowest leaves in whorls of 8 to 13, up to 4 cm long, 3-parted and the segments dissected into linear segments; upper leaves in whorls of 6 to 8, less divided and with broader segments; flowers subsessile; calyx 5–6 mm long (in fruit 8 mm), tube shorter than lobes; sparsely pilose; corolla white, tube 6–8 mm long, with pale violet nerves; lobes pale violet.

Tropical Asia and Malaya, in still, shallow fresh water, rooting in mud.

LINDERNIA Allioni

Herbs with opposite simple leaves; flowers axillary or terminal in racemes; bracteoles none; calyx 5-toothed or -lobed, sometimes with *narrow* wings; corolla bilabiate, upper lip entire or bilobed, lower lip 3-lobed; stamens 4 or 2 (if 4 then didynamous), if 2 sometimes two staminodes present; filaments sometimes bearing a basal appendage; anthers coherent in pairs, 2-celled, cells divergent or parallel; stigma bilamellate; capsule globose to linear, 2–3-valved, septicidal, with many seeds.—About 100 species in both Old and New World Tropics.

1. Fertile stamens 4; flowers all axillary.....*L. procumbens*
1. Fertile stamens 2; flowers in terminal raceme.....*L. antipoda*

Lindernia procumbens (Krock.) Philcox, Taxon 14: 30. 1965; Kew Bull. 22: 29. 1968.

L. pyxidaria Allioni, Misc. Taur. 3: 178. 1755.

Vandellia pyxidaria (All.) Maxim., Bull. Acad. Petersb. 20: 449. 1875. Merrill 1914: 141.

Ascending or erect branching herb with glabrous stems (these with internal air-cavities); leaves oblong-ovate or oblong-obovate, obtuse, subentire, margins finely bristly, 3–5-nerved, to 3 cm long and 1.5 cm wide, subsessile or short-petiolate; flowers solitary in axils, on pedicels 1–2 cm long; calyx 3–5 mm long, with linear lobes; corolla-tube white, 3–4.5 mm long, upper lip pale lilac, 1.5–2 mm long, lower lip 3–4 mm long, white but purple-edged; longer filaments with linear basal appendage; all 4 stamens with anthers; capsule ellipsoid, about 4 mm long, fibrous. Seeds yellow, flattened-cylindric, 0.3 mm long, ± smooth.

S. Europe to Polynesia. G.E.S. 238. In wet places, in the open, near ditches, ponds, etc.

Lindernia antipoda (L.) Alston, Fl. Ceylon 6 (Suppl.): 214. 1931; Philcox, Kew Bull. 22: 57. 1968.

Ruellia antipoda L. Sp. Pl. 635. 1753.

Ilysanthes antipoda (L.) Merrill, Interp. Herb. Amb. 467. 1917.

Bonnaya veronicaefolia (Retz.) Sprengel, Syst. 1: 42. 1825. Merrill 1914: 140.

Gratiola veronicaefolia Retzius, Obs. 4: 8. 1786.

Ilysanthes veronicifolia (Retz.) Urban, Deutsch. Bot. Ges. 2: 336. 1884.

Creeping and ascending tufted herb; leaves oblong-obovate, serrulate to subentire, sessile or nearly, to nearly 4 cm long and 1.5 cm wide; flowers single in axils and in terminal raceme, at right angles to main stem, pedicellate, opposite, pairs widely spaced; calyx lobes subulate; corolla flattened-bilabiate, about 1 cm long, twice as long as the calyx, tube pale bluish, limb darker blue-violet; stamens 2; staminodes 2, projecting; capsule linear acute, about 1 cm–2 cm long. Seeds yellow, ridged, ± 4-angled.

Tropical Asia and Malaya; in damp grassy spots.

RUSSELIA Jacquin

Shrubs with longitudinally ribbed stems, opposite or whorled leaves, often strongly reduced in size, and bright red flowers in paniculate cymes; calyx 5-parted; corolla long-tubular with a small 5-lobed limb; stamens 4, didynamous, included; style filiform with obscurely bilobed apex; capsule septicidally 4-valved, the valves bifid; seeds many, oblong.—Mexico and C. Tropical America.—About 40 spp.

RUSSELIA EQUISETIFORMIS Chamisso & Schlechtendahl, Linnaea 6: 377. 1831.

FIRE-CRACKER-FLOWER.

Ornamental shrub with long straggling ribbed branches; branches whorled; leaves whorled (in groups of 5–8), on the main stem up to 2×1.5 cm, but on branches minute, scale-like; panicles narrow, with pedicels about 1 cm long; corolla-tube bright red, usually 1–2 cm long; fruit rostrate, 5 mm long.

A Mexican plant now common in Tropical gardens. Harmon (4731).

SCOPARIA Linnaeus

Small shrubs or herbs with opposite or whorled leaves *glandular beneath*; blades entire or serrate; flowers solitary in axils, pedicellate; bracteoles none; calyx 4–5-lobed; corolla 4-parted, *regular*, hairy within; stamens 4; stigma slender; capsule subglobose, 2-valved, septicidal, or 4-valved loculicidal and septicidal; seeds many, tuberculate.—Trop. Amer., 20 spp.

SCOPARIA DULCIS L. Sp. Pl. 168. 1753.

Branched herb with wiry stems, up to 1 m tall; leaves opposite or whorled in threes, narrowly elliptic, subsessile, 3–4 cm long, 1–1.5 cm wide, distally serrulate or serrate; flowers pedicellate, axillary; calyx 4-lobed; corolla 5 mm wide, white, hairy within; stamens greenish; ovary green; capsule subglobose.

A Tropical American (now pantropical) ubiquitous weed, of waste ground.

TORENIA Linnaeus

Erect or creeping herbs with 4-angled stems and opposite, serrate-crenate leaves; flowers axillary, solitary or cymose or racemose; calyx 3–5-toothed; tube angular-winged; corolla bilabiate; stamens 4, didynamous, the 2 anterior ones sometimes with basal appendages; anthers coherent in pairs; anther cells parallel; stigma bilamellate; fruit a 2-valved septicidal many-seeded capsule.—Tropics; 50 spp.

TORENIA FOURNIERI Linden ex Fourn. Ill. Hort. 23: 129, t. 249. 1876.

Glabrous branched ornamental herb; leaves ovate, subcordate at base, acute; serrate, to 6 cm long and 4 cm wide; petioles to 3 cm long; pedicels 1–2 cm long, calyx 2 cm long, with 5 broad wings; corolla tube 2.5 cm long, pale purple but yellow dorsally; limb 3–4 cm across, midlobe of lower lip with yellow blotch, otherwise dark purple.

A native of Indochina now widespread as a garden plant. Observed in Agaña.

PEDALIACEAE

Shrubs or herbs, often aromatic, some with short-stalked 4-lobed hairs becoming slimy when wet; leaves opposite or uppermost ones alternate; stipules none; flowers in terminal racemes or solitary in leaf axils, zygomorphic, perfect, usually with 2 glands at base of each; calyx deeply 5-lobed; corolla 5-lobed, lobes imbricate in bud, one larger than the others; stamens 4, didynamous, with 1 staminode, or 3, with 3 staminodes (*Trapella*); anthers 2-celled; fleshy hypogynous disk present; ovary superior (or rarely inferior), 4-celled or 2-celled (rarely 1-celled), sometimes with false partitions; cells with 1 to several ovules; fruit a drupe or capsule; seeds with little or no endosperm.—Tropics and Subtropics of the Old World, a few in Temperate Regions; 12 genera; about 60 species.

SESAMUM Linnaeus

Erect herbs; lower leaves opposite, upper leaves spiralled; flowers solitary, axillary; corolla-tube curved; stamens 4; ovary usually 2-celled; each cell with a flase partition; ovules numerous, superposed; seeds oily. —About 20 species.

SESAMUM ORIENTALE L. Sp. Pl. 634. 1753. Safford 1905: 373. Merrill 1914: 141.
AHONHOLI. SESAME.

S. indicum L. Sp. Pl. 634. 1753.

Pubescent annual herb (hairs of 2 types; long articulate, and short 4-lobed mucilaginous); stem to 1–2 m high; leaves 3-foliolate or pinnatisect, upper ones simple, ovate-oblong to lanceolate, 4–20 cm long, to 15 cm wide, on petioles 2–15 cm long; flowers single (sometimes paired) in axils, very shortly pedicellate; calyx pubescent, green, about 6 mm long, lobes sharply acute; corolla pinkish-purple (rarely white), about 3.6 cm long; stamens included; capsule erect, oblong, rounded, 4-grooved, pubescent, about 2.5 cm long, 2-valved; seeds black, brown or white, 2.5–3 mm long, smooth or minutely reticulate.

Native of Tropical Asia, now widespread in cultivation; source of the well-known edible *sesame seeds*.

LENTIBULARIACEAE

Erect or twining herbs or moist terrestrial locales or in ponds, ditches, or lakes, floating; leaves cauline or basal (rosettes) or both, often of 2 kinds: submerged leaves finely divided and bearing vesicles (traps or bladders); aerial leaves normal, or reduced, or absent; stipules none; flowers usually in scapose racemes or spikes, rarely branched; or sometimes axillary; flower subtended by bracteole; perfect, zygomorphic; calyx 2- or 5 (rarely 4) -lobed; corolla 5-lobed, bilabiate, spurred behind; stamens 2; staminodes 2, small, or absent; anthers 2- or 1-celled; disk none; ovary superior, 1-celled; ovules many on basal placenta, rarely only 2; fruit a capsule, circumscissile or 2–4-valved or irregularly dehiscent; seeds 1-many, lacking endosperm.—Four or five genera in Tropics and Temperate Regions, mostly facultatively carnivorous; over 250 species.

UTRICULARIA Linnaeus

More or less aquatic herbs, rarely epiphytic, some twining, some tuberous, rooted or floating; flowers in scapes or rarely cauline; calyx of 2 lobes, accrescent; corolla spurred; anthers dorsifixed; ovary many-ovulate; stigma unequally bilobed; capsule 2-valved or irregularly dehiscent.—A large paleotropical genus of 300 or more species.—(Bladderworts).

1. Flowers yellow; infl. bracts not prolonged; calyx brown..... *U. bifida*
1. Flowers white; infl. bracts prolonged beyong insertion; calyx green.... *U. nivea*

Utricularia bifida L. Sp. Pl. 26. 1753. Merrill 1914: 141.

A small erect herb of temporary small pools or runnels in grasslands; roots short, among a few trap-bladders; leaves slender, narrowly spathulate or lanceolate, basal, entire or divided into linear-segments, 1–4 cm long, 1/2 mm wide or less; scape to 15 cm long, bearing well-spaced shortly pedicellate very small yellow flowers; calyx light brown, with rounded lobes; corolla 4–6 mm wide, with a long (3–5 mm) spur; fruit subglobose, 3–4 mm long, enclosed by the calyx; seeds oblong, ribbed and tuberculate.

Tropical Asia, Malaya, and adjacent Pacific Islands. In savannas, on slopes among grasses, in or near the course of streamlets or erosion runnels, particularly where small pools of a few inches depth occur, and especially on the blue-green clays of Manengon (3821; 4534); usually intermingled with the following species, but invariably somewhat smaller.

Utricularia nivea Vahl. Enum. 1: 203. 1805. Merrill 1914: 141.

Herb with minute spathulate leaves; scape erect, bearing 3–15 flowers, the apical ones rather closely spaced; bracts prolonged beyond the insertion, 2–3 mm long; calyx (and fruit) densely papillose; calyx light green; corolla pure white (in ours); 5–6 mm long, the spur 2 mm; capsule globose, 2 mm long; seeds ribbed, oblong.

India and Ceylon, southern Asia, Malaya; in the same localities in Guam as the former species, the two often intermixed.

Note: The Utricularias or bladderworts are carnivorous plants which trap various small animals, such as water fleas, protozoans, mosquito larvae, and nematodes, by means of "bladders" or vesicles, which are extremely small (0.3–5 mm wide), and are borne, sometimes in great profusion, on slender modified leaves, either in the water of pools and ditches or in moist clay soils. These traps have 2 valves ("doors") at the narrow end, which are opened when sensitive hairs are contacted; when the "door" is opened, the walls of the vesicle instantaneously expand, creating an inrush of water that brings in the animal; which is later digested, and its nitrogenous components incorporated into the plant. Like other carnivorous plants the Utricularias are characteristic of wet, marshy places with a highly acid water environment.

BIGNONIACEAE

Trees or shrubs, or woody climbers; leaves opposite or whorled, or spiralled;

simple or compound; stipules none; tendrils sometimes present; flowers solitary or several together in inflorescences; usually zygomorphic; perfect; calyx 5-lobed or -toothed, or truncated; corolla 5-lobed, bilabiate (2 lobes above, 3 below); stamens 4 (rarely 5) or 2; staminode 1 or 3 or none; anthers free or usually connivent in pairs; ovary superior, 2-celled, with 2 placentae in each cell, or 1-celled with 4 placentae; style bilobed; ovules many; fruit a berry or capsule; seeds winged or not; lacking endosperm.—About 100 genera and 650 species, both tropical and temperate; none native in Guam.

Key to local genera

1. Leaves compound.
   2. Leaves 1-pinnate.
      3. Leaflets toothed; flowers yellow; shrub.....*Tecoma*
      3. Leaflets entire; flowers red; small tree.....*Spathodea*
   2. Leaves 1-palmate.
      4. Leaflets 3; flowers greenish yellow with brown stripes..*Crescentia*
      4. Leaflets 5; flowers pink.....*Tabebuia*
1. Leaves simple; flowers white-and-pink.....*Catalpa*

CATALPA Scopoli

Trees with simple leaves; flowers showy, in terminal panicles, white, pink or yellow; corolla campanulate; stamens 2, with divergent anthers; capsule long, cylindric, 2-valved.—Ten species, N. America, W. Indies, and E. Asia. One species introduced in Guam.

CATALPA LONGISSIMA Jacquin,

Sims, Bot. Mag. t. 1094. 1808. YOKEWOOD.

A tree to 15–16 m tall; leaves opposite or whorled, simple, narrowly oblong, acute-acuminate, 8–16 cm long, on long petioles about 2–4 cm long; flowers in clusters; calyx deeply 2-lobed; corolla bilabiate, white tinged with pink, about 2 cm long; capsules long, slender, cylindric, 30–60 cm long, pendent.

Native of the West Indies, introduced to Guam for its useful wood. Barrigada-Harmon Rd. (4172).

CRESCENTIA Linnaeus

Trees or shrubs with simple or 1-palmate leaves alternate or fascicled; flowers single or fascicled, on old wood, opening in the evening; calyx coriaceous, 2–3-lobed; corolla fleshy, subcampanulate, 5-lobed or lacerate; stamens 4; didynamous, slightly exserted; ovary 1-celled; fruit subglobose, indehiscent, large, with hard shell; seeds many, flattened, wingless, immersed in the spongy placentae.—Five Tropical American species.

CRESCENTIA ALATA H.B.K. Nov. Gen. Sp. 3: 158. 1818.

HIKARA. JOUACA. CALABASH

Small tree; leaves usually of 3 leaflets (rarely of 5, very rarely of 2 or 1); petioles

distinctly winged, up to 15 cm long and 1.5 cm wide, widest near apex; leaflets sessile, lanceolate or obovate, to 15 cm long and 2.5 cm wide; calyx 2.5 cm long; corolla 6–7 cm long, at base yellow-green, limb brownish-violet-striped; staminode 1.5 cm long; fruit 5–12 cm thick.

A native of Mexico, now widely cultivated. The rind of the fruit is suitable for use as a bowl or container (similar to a gourd). This is found in a few gardens (i.e. Agana Heights).

SPATHODEA P. de Beauvois

Trees with opposite or ternate 1-pinnate leaves; flowers in terminal racemes; calyx closed in bud, containing a watery fluid, splitting on one side and spathaceous—recurved as corolla opens; corolla obliquely campanulate, gaping, segments crisped-undulate, red and yellow; stamens 4, included; fruit an oblong capsule, woody; seeds with a circular wing.—Africa; two species.

SPATHODEA CAMPANULATA P. de Beauvois, Fl. Oware 1: 47. 1804.
AFRICAN TULIP TREE.

Trees to 20 m tall, with fluted trunks; leaves to 45 cm long, leaflets usually 3–9 pairs and a terminal leaflet, elliptic or ovate, acute-acuminate, entire, pubescent dorsally on nerves, 4–12 cm long, 2.5–5.5 cm wide; petiolules 1–3 mm long; racemes erect, dense; flowers large, showy, erect, about 10–13 cm long; calyx 4–7 cm; corolla red or vermilion, the margins dark yellow; stamens with yellow filaments; capsules flattened, black, 15–20 cm long, 4–5 cm wide; seeds with a wide chartaceous wing.

Native of Tropical Africa. This tree is now ubiquitous in cultivation and is often sparingly naturalized. It begins to flower when quite young; the large flowers are very handsome. Easily grown in Guam, but the trunks are weak. Barrigada (4179). Fruit is rarely set in cultivation, but the cuttings will root. The usual pollinating agent is a species of bat. The large, scentless flowers are typical of bat-pollinated species.

TABEBUIA Gomez

Trees or shrubs with opposite simple or 1-palmate leaves; flowers showy in terminal cymes or panicles; calyx tubular, coriaceous, truncate or irregularly splitting; corolla funnelform or campanulate with spreading bilabiate or subregular limb of 5 rounded lobes; stamens 4, didynamous, included; ovary sessile; ovules many in 2 series; capsule linear or oblong, subterete, loculicidally dehiscent, with convex valves; seeds many, oblong, winged at both ends.—Over 100 Tropical American species.

TABEBUIA PENTAPHYLLA (L.) Hemsley, Biol. centr. Am. Bot. 2: 495. 1879.
PINK TABEBUIA.

Small tree reaching 20 m at last; leaves usually with 5 leaflets, radiating from the end of the 3–10 cm long petiole, ovate, acute, slightly grayish-green, up to 10–15 cm long, on petiolules 5–20 mm long; flowers clustered; calyx about 1 cm

long; corolla 5–7 cm long, pink or pink-purple, rarely almost white; capsule 12–28 cm long.

Tropical America; introduced to Guam as an ornamental. It has been planted as a street tree in Agaña, (4752), and is also in some gardens as in Yona (5061).

TECOMA Jussieu

Trees or shrubs with opposite pinnate or rarely simple leaves; flowers in racemes or panicles at branch tips; calyx tubular, campanulate, 5-toothed; corolla funnelform-campanulate, slightly bilabiate, 5-lobed, lobes subequal; stamens 4, didynamous; ovary sessile; ovules many 1-serrate; capsule linear, loculicidally dehiscent; seeds many, winged.—About a dozen species of Tropical and warm-temperate America.

TECOMA STANS (L.) H.B.K. Nov. Gen. 3: 144. 1818. YELLOW-ELDER.

Bignonia stans L. Sp. Pl. ed. 2, 871. 1763.

Stenolobium stans (L.) Seemann, J. Bot. 1: 88. 1863.

A shrub to about 6–8 cm tall, glabrous; leaves to 30 cm long; leaflets 5–13, lanceolate or elliptic-oblong, serrate, acute-acuminate, cuneate below, short-petiolulate; flowers in racemes, yellow; pedicels to 1 cm long; calyx 3–5 mm long; corolla 3.5–5 cm long; capsule 10–20 cm long, 5–6 mm in diameter, rostrate.

Native of Tropical America; in cultivation throughout the Tropics.

ACANTHACEAE

Small trees, shrubs, climbers or herbs, rarely spiny, with usually entire simple opposite leaves; stipules none; flowers axillary or terminal, solitary or in racemes or panicles, often bracteate; often bracteolate; calyx usually 4–5-lobed, sometimes a truncate rim, or rarely with 8–18-lobes; corolla tubular, usually bilabiate; stamens 4 or 2, with or without staminodes, rarely 5; anthers 2-celled or 1-celled; sometimes anthers basally spurred; ovary superior, sometimes on a hypogynous disk, 2-celled; cells 1–2-ovulate, or ovules 3-many; style single, bifid (rarely trifid or simple); capsule usually 2-valved, with 2 to many seeds, valves elastic; or rarely fruit drupaceous; seed usually with a jaculator (the hard funicle), often with hairs which become slimy if wetted; endosperm usually lacking.—A large family of 180 genera and more than 2000 species throughout the Tropics. None of these is native to Guam, but 13 or more species are found in cultivation (all as ornamentals) or escapes.

Key to local genera

1. Stamens 4, all with normal polleniferous anthers [see also Barleria].
   2. Herbs with flowers in dense bracteate terminal spikes.
      3. Entire plant, including bracts, more or less purplish; flowers partly white; creeping herb..... *Hemigraphis*
      3. Plants erect, green, or the bracts whitish..... *Blechum*
   2. Shrubs or climbers,

4. Anthers 1-celled, pubescent; shrub with long (7–8 cm) red corollas ..... *Aphelandra*
4. Anthers 2-celled,
   5. Corolla-lobes not spirally twisted in bud; one lobe overlapped on both sides by others; leaves usually mottled with yellow on green or purple; flowers purplish; erect shrub.... *Graptophyllum*
   5. Corolla-lobes spirally twisted and imbricate, all lobes overlapping on one side and overlapped on the other side; leaves usually green without mottling; flowers variously colored; climbers or erect shrubs..... *Thunbergia*

1. Stamens 2, or if seemingly 4, then only 2 with polleniferous anthers.
   6. Stamens 2, staminodes 2, very small; corolla red; calyx 5-lobed.
      7. Stamens inserted in throat of corolla; flowers in panicles; corolla obviously bilabiate; shrub with mottled leaves..... *Graptophyllum*
      7. Stamens inserted near middle of corolla-tube; flowers in racemes; corolla scarcely bilabiate; small shrub..... *Odontonema*
   6. Staminodes lacking, or very small; flowers not red (though perhaps reddish-violet).
      8. Creeping herb with flowers in dense spikes; corolla obviously bilabiate ..... *Fittonia*
      8. Shrubs,
         9. Bracts and bracteoles small, inconspicuous; calyx 5-parted, lobes subequal; corolla 5-lobed, white or reddish-purple, or both; leaves sometimes variegated magenta and white or pink; glabrous shrub ..... *Pseuderanthemum*
         9. Bracts conspicuous; calyx 4-parted, 2 larger lobes with their margins spinulose; 2 lobes much smaller; corolla 5-lobed, white or pink or pale bluish-violet, or yellow; pubescent shrub (our species) ..... *Barleria*

APHELANDRA R. Brown

Erect shrub; leaves opposite, entire or obscurely crenate; flowers in spikes; bracts decussate, imbricate; calyx 5-fid, segments imbricate, unequal; corolla bilabiate; lobes 5; stamens 4, inserted near base of corolla; anthers 1-celled; ovules 2 per cell; capsule 4- (or fewer-) seeded; seeds suborbicular compressed.—Trop. Amer., 200 spp.

APHELANDRA TETRAGONA (Vahl) Nees in DC. Prod. 11: 295. 1847.

Fosberg (ined.). APHELANDRA

Shrub with puberulent young growth; leaves 10–30×4–6 cm, ovate-oblong, acuminate, usually decurrent on the 1–6 cm, petiole; spikes to 20 cm long, squarish because of the tetrastichous bracts; simple or 1-branched; rachis white-tomentose; bracts ciliate, to 8 mm long, dorsally somewhat pubescent; calyx 1 cm long; corolla red, about 5–8 cm long; capsule glabrous.

Native of Tropical America. I have not seen this plant in Guam, but according to Fosberg it is occasionally found in gardens.

BARLERIA Linnaeus

Small shrubs or herbs, erect, with leaves sometimes accompanied by axillary spines; flowers axillary, single or in inflorescences; bracteoles present, calyx 4-parted, 2 segments very narrow; corolla 5-lobed, lobes imbricate; stamens 4 or 2, the anterior ones always with normal polleniferous anthers, the posterior (included) ones commonly sterile; ovary with 1 or 2 ovules in each cell; capsule compressed, 2–4-seeded; seeds with slime-making hairs.—All tropics; 230 spp.

BARLERIA CRISTATA L. Sp. Pl. 636. 1753. Merrill 1914: 141...

PHILIPPINE VIOLET

Small erect shrub to about 1 m tall; leaves 2.5–10 cm long, shortly (less than 2 cm) petiolate, blades pubescent, ovate, margins minutely ciliate, acute to subacuminate; flowers 1–3 in axils; bracts narrow lanceolate; calyx about 2 cm long, the 2 larger lobes ovate, their margins bristly-spinulose; corolla violet, or white and violet (rather pale in some forms), about 5–7 cm long, glandular-puberulent; filaments pubescent; fruit—

Native of India, in cultivation in many regions. Agaña Spring (4982).

BLECHUM P. Brown ex Jussieu

Perennial herbs with entire or repand-toothed leaves and erect dense terminal bracteate spikes; bracts decussate, subfoliaceous; calyx 5-parted; corolla subequally 5-lobed; stamens 4, didynamous, inserted near or above the middle of the corolla-tube; anthers 2-celled; style subulate; capsule ovate or subglobose, narrowest at the base, with few rounded compressed seeds.—All ten species natives of Tropical America.

Blechum brownei Jussieu, Ann. Mus. Paris 9: 270. 1807.

Nees, in DC. Prodr. 11: 466. 1847. Merrill 1914: 141.

forma *puberulum* Leonard YERBAS BABUI

Erect or ascending, mostly less than 50 cm tall, branched; leaves ovate, 2–7 cm long, acute, obtuse or rounded at base, acute at apex, petioles short; spikes dense, squarish because of the tetrastichous bracts, 3–6 cm long; bracts ovate, foliaceous, strigose, ciliate, 1–1.5 cm long, greenish or whitish; corolla white or pale violet, scarcely longer than bract; capsule shortly oblong, puberulent, about 6 mm long.

A weed of Tropical America; in Guam usually in lawns or waste ground. The bracts give the appearance of being "stacked".

Ritidian Pt. beside road (4711).

FITTONIA Coem.

Herbs with simple opposite cordate leaves; flowers in dense spikes, terminal and axillary, bracteate; bracts decussate; bracteoles narrow; calyx deeply 5-parted; corolla bilabiate, the lobes imbricate in bud; stamens 2, exserted; anthers 2-celled;

staminodes none; ovary 2-celled, cells 2-ovulate; capsule valvate, 4-seeded; seeds flat, tuberculate.—South America.

FITTONIA ARGYRONEURA Coem. Fl. des Serres 16: 103. 1865–67.
Fosberg (ined.). SNAIL-PLANT.

Creeping herb with ornamental leaves, ventral surface with white reticulations; blades ovate, rounded at apex, cordate, short (0.5–3 cm) petiolate, 5–10 cm long, 2.5–6 cm broad; margins ciliate; dorsally pubescent; petioles pubescent; spikes to 6 cm long; bracts obovate, less than 1 cm long; flowers yellow; calyx about 0.5 cm long; corolla 1.5–2 cm long; stamens pubescent on the filaments.

A native of Peru, well known in horticulture; reported by Fosberg as in cultivation. Some forms have red, rather than white, reticulations; both have these on a very dark green background. Propagation is generally by stem-cuttings which easily root.

GRAPTOPHYLLUM Nees

Arborescent shrubs with simple opposite entire leaves; inflorescence a terminal panicle; bracts and bracteoles rather inconspicuous; calyx 5-parted; corolla 5-lobed, bilabiate; fertile stamens 2, but 2 short antheriferous staminodes present also; ovary 2-celled, cells 2-ovulate; capsule oblong from a narrowed base; seeds usually 2, rounded.—W. Africa to Polynesia; 10 spp.

GRAPTOPHYLLUM PICTUM (L.) Griffith, Notul. 4: 139. 1854. Safford 1905: 285. Merrill 1914: 142. SAN FRANCISCO. CARICATURE-PLANT.
Justicia picta L. Sp. Pl. ed. 2, 21. 1762.

A medium to large erect shrub with variegated leaves; petioles 1 cm long or less; blades elliptic oblong, acuminate, decurrent, mostly 8–20 cm long and 3–13 cm wide, either green, or reddish-purple, or either with cream to yellowish blotches along the midregion; margins somewhat wavy or crisped; panicles to 12 cm long; calyx 3 mm long; corolla dark reddish, 2–3 cm long; posterior stamens rarely fertile.

Native of E. Melanesia, but probably not known as a wild plant. G.E.S. 312; 352; 367. It is grown for its multicolored foliage. Fruit is unknown in Guam.

HEMIGRAPHIS Nees

Herbs with entire to serrate or incised leaves; spikes terminal and axillary, bracteate; calyx 5-lobed; corolla 5-lobed, lobes twisted in bud; stamens 4, bases membranously interconnate; anthers 2-celled; ovary-cells 4–6-ovulate; stigma unequally bilobed; capsule fusiform; seeds pubescent.—S. China to the Pacific, 100 spp.

HEMIGRAPHIS ALTERNATA (Burmann fil.) T. Anderson, J. Linn. Soc. 7: 114. 1864.
Hemigraphis colorata (Blume) Hallier fil., Nov. Act. Acad. Natur. Cur. 70: 204. 1897. Merrill 1914: 142.

Creeping perennial herb, entirely purplish except the whitish (but purple-streaked) corollas; leaves bronzy-purple above, reddish-purple beneath, ovate,

subcordate, serrate-crenate, 2–8 cm long, on petioles nearly as long as the blades; spikes erect, 2–3 cm long bracteate; bracts purple, crowded, 1 cm long, overlapping; calyx purple, lobes 5, narrow, less than 1 cm long; corolla 2 cm long; capsule slender; seeds 4–20.

A native of Java, now common in cultivation in tropical regions. G.E.S. 343. Easily propagated from cuttings.

ODONTONEMA Nees

A genus of Mexico, W. Indies, Trop. Amer. with some 40 spp.

ODONTONEMA STRICTUM (Nees) O. Kuntze, Rev. Gen. Pl. 494. 1891.

O. nitidum (Jacquin) O. Kuntze, Rev. Gen. Pl. 494. 1891, sensu Merrill 1914: 142.

Glabrous erect shrub to 2 m tall; leaves 7–15 cm long, ovate to ovate-lanceolate, faintly dorsally puberulent, acute-acuminate, decurrent on the very short, nearly obsolete, petiole; margins entire or obscurely wavy; flowers in terminal spikes; bracts very small; corolla red, slender, 2.5 cm long, the limb only about 5 mm across; stamens included; fruit?

Native of Tropical America. Only in gardens in Guam. G.E.S. 54; 308; 309.

PSEUDERANTHEMUM Radlkofer

Herbs or shrubs; leaves opposite; flowers borne in terminal or axillary bracteate spikes, racemes, or panicles, bracts and bractlets subtending the flower clusters usually small; calyx with 4–5 subulate segments; corolla white, blue or pink, occasionally purplish, tube slender, limb with 5 spreading slightly unequal lobes; stamens 2; staminodes 2 (minute); anther cells muticous or acute at base; capsules long-stipitate; seeds 2 or 4 per capsule.—Tropical, chiefly American.—120 spp.

Two species in Guam, only in cultivation.

1. Flowers in 3–1-flowered cymes in axils of leaves.....*P. bicolor*
1. Flowers in terminal or subterminal racemes or panicles....*P. carruthersii*

PSEUDERANTHEMUM BICOLOR (Schrank) Radlkofer ex Lindau Sitzb. Math.-Phys. Cl. Akad. Wiss. Muench. [1883] 13: 282. 1884.

Ornamental erect shrubs to 1 m tall, leaves ovate-oblong or lanceolate-oblong, acuminate, decurrent on the petiole, glabrous or finely puberulent, mostly 5–15 cm long and up to 6 cm wide; cymes axillary, or uppermost ones sometimes racemose, puberulent; calyx puberulent, up to 1 cm long; corolla puberulent, 3.5 to 4 cm long, the throat red, one lobe with a red blotch, otherwise lobes white; capsule 2.5–3 cm long.

Native of E. Malaysia, now widespread in cultivation; rather common in local gardens; fruit not common.

PSEUDERANTHEMUM CARRUTHERSII (Seemann) Guillaumin, Ann. Mus. Colon. Marseilles 6(5–6): 48. 1948. Fosberg, Phytolotia 5(7): 290. 1955.

Glabrous ornamental shrub, leaves often variegated magenta-purple with

or without pink and/or white, elliptic-ovate, acute, decurrent on the 1–3 cm. petiole, 5–15 cm long; racemes spikelike; calyx green or reddish, up to 8 mm long; corolla white to rosy-purple, glabrous or merely slightly ciliate; capsule clavate, 4-seeded.

Native of Melanesia.

Shrubs, usually cultivated for hedges. Two varieties occur; one with green leaves (var. *carruthersii*), and one with dark purplish-red leaves (var. *atropurpureum* (Bull) Fosberg, l.c. [Syn. *Eranthemum atropurpureum* Bull, Gard. Chron. n.s. 3: 619. 1866). Harmon (3938); Mangilao (4370-a).

THUNBERGIA Linnaeus

Erect shrubs or climbers (twining clockwise); leaves opposite, entire or lobed or toothed; flowers axillary or in terminal racemes; bracteoles 2; calyx either truncate, or few lobed, or 10–18-segmented; corolla 5-lobed, twisted in bud, almost regular; stamens 4, inserted near corolla-base; anthers 2-celled, often spurred at base; ovary-cells with 2 ovules; stigma bilobed; capsule rostrate.—Paleotropical, with about 50 species.

Key to local species

1. Erect shrub, not climbing; corolla violet to white..... *T. erecta*
1. Climbing (or creeping) plants.
   2. Calyx with 10–16 narrow segments; corolla-tube purple, lobes yellow-orange; petiole winged..... *T. alata*
   2. Calyx truncate or with very short broad lobes; corolla-tube whitish, lobes violet to whitish; petiole not winged.
      3. Leaves broadly ovate-cordate, angled; calyx truncate.. *T. grandiflora*
      3. Leaves narrowly ovate, obtuse at base, entire; calyx with a few short broad acute lobes..... *T. laurifolia*

THUNBERGIA ALATA Bojer ex Sims Bot. Mag. pl. 2591. 1825; Hook. Exotic Fl. t. 177, 1823–7. Merrill 1914: 142.

Pubescent vine, climbing or trailing; leaves deltoid-ovate or ovate, 4–8 cm long, sagittate or hastate at base, entire or with a few coarse teeth, acute; petioles winged, about as long as blade; peduncles usually longer than petiole; bracteoles about 2 cm long; calyx 2–3 mm long, with 11–14 segments; corolla tube purple, limb yellow orange, rarely white, 2 cm long, 3–4 cm wide across the limb; capsule depressed-globose, about 1 cm wide, the beak 1 cm long; seeds warty and ribbed.

Native of Tropical Africa; cultivated and naturalized in Guam.

THUNBERGIA ERECTA (Bentham) T. Anderson, J. Linn. Soc. 7: 18. 1864.

Fosberg (ined.). BUSH-THUNBERGIA.

Erect ornamental shrub with 4-angled stems; leaves elliptic or ovate, up to 10 cm long, usually less; acute to obtuse, cuneate or obtuse at base, subentire or distally with a few coarse teeth; petiole less than 6 mm long; flowers axillary, solitary or paired; bracteoles to 2 cm long, caducous; calyx 3–6 mm long; corolla with very short tube but broad (3.5–5 cm) limb, violet or white; capsule 2–2.5 cm long.

Native of W. Tropical Africa. Agaña, cult. (4681).

THUNBERGIA GRANDIFLORA (Roxb. ex Rosse) Roxb., Bot. Reg. 6, t. 495. 1820. Fosberg (ined.).

Climbers with broad cordate 5–7-nerved palmately lobes or merely angled leaves to nearly 20 cm long, almost as broad, pubescent, on petioles 4–12 cm long; flowers in pendent racemes, large and showy; calyx pubescent, truncate; corolla violet or whitish, the tube pale yellow, 3–3.5 cm long, 6–8 cm wide across the limb; ovary on a yellowish disk; seeds smooth on one side, warty on the reverse.

Native of S.E. Asia. Barrigada Village, cult. (4270).

THUNBERGIA LAURIFOLIA Lindley, Gard. Chron., 260. 1856. Fosberg (ined.). PURPLE ALLAMANDA

Climbers with ovate-oblong or sublanceolate subentire to slightly crenate leaves, obtuse or subcordate, acute-acuminate, pinnately nerved, glabrous, mostly 7–18 cm long, and 2.5–6 cm wide, on petioles up to 6 cm long; bracteoles persistent, 4–5 cm long; calyx truncate; corolla blue-violet to white, tube 3.5–4.5 cm long, limb 6–8 cm broad; capsule up to 1.5 cm wide, the beak to 3 cm long.

Native of S.E. Asia. Occasional in gardens.

RUBIACEAE

Trees, shrubs, herbs or climbers; leaves simple, opposite, entire or toothed; stipules interpetiolar, commonly conspicuous, foliaceous or variously formed, entire bifid, laciniate, etc., rarely reduced to a linear ridge; flowers in inflorescences or heads, or solitary, regular, usually 4–5-merous, perfect or unisexual or dioecious, or polygamo-dioecious, always bracteate, sometimes also bracteolate; calyx usually 4–5 (rarely 2–3– or 6–9–) lobed, basally at least connate to the inferior ovary; corolla tubular, 3–9-lobed; stamens (or staminodes) usually as many as corolla-lobes and alternate with them, nearly always free; ovary 1–12-celled, commonly 2-celled; cells 1-many-ovulate; stigma simple or lobed, on simple style; fruit a capsule, berry, or drupe, free or fused to each other; seeds sometimes winged; usually endospermous.—A very large predominantly Tropical family of nearly 500 genera and nearly 6000 species, around the world, a few in Temperate cold regions. Important for coffee, quinine, tannins, and other products.

Key to local genera

1. Trees, shrubs, or woody climbers.
   2. Flowers in subglobose heads, calyces sunken in and fused with the receptacle, this ripening to a fleshy consistency in fruit; shrubs (often large), or woody climbers.....*Morinda*
   2. Flowers not in such heads, though sometimes in congested inflorescences; trees or shrubs, not climbers.
      3. One (or more) of the calyx-lobes large, foliaceous, white; flowers with dark yellow corolla.....*Mussaenda*
      3. Not as above,

4. Flowers large (over 5 cm long) 4-merous, trumpetlike; corolla pure white, rather coriaceous; limestone cliff shrubs..... *Bikkia*
4. Flowers otherwise,
   5. Inflorescence terminal, cymose.
      6. Fruit a drupe; flowers red, pink, yellow or white; cult. or wild shrubs..... *Ixora*
      6. Fruit a berry; flowers white; wild plants.
         7. Corolla-lobes twisted in bud; style apparently simple, clavate, the 2 lobes appressed.... *Tarenna*
         7. Corolla-lobes not twisted, either valvate or imbricate in bud; style bilobed, the lobes diverging.... ..... *Psychotria* (in part)
   5. Inflorescence axillary, or flowers solitary if terminal.
      8. Flowers usually 6–8-lobed corolla.
         8a. Flowers over 5 cm wide, white withering yellow, very sweetly fragrant, commonly 6–8-lobed; calyx-tube winged or ribbed; cult. shrubs with resinous leaves; ovules many per cell..... *Gardenia*
         8b. Flowers about 1.5–2 cm wide; calyx not winged; lvs. not resinous; wild coastal tree; ovules 1 per cell..... *Guettarda*
      8. Flowers commonly small, 4–5-parted, fragrant or not; leaves not resinous; calyx not winged.
         9. Fruit with only 2 seeds (pyrenes).
            10. Flowers subsessile, crowded in axils of leaves; corolla tube shorter than lobes; lobes 5 or 6–8; fruit dark red, 12 mm long; cult. or naturalized..... *Coffea*
            10. Not as above,
               11. Ovule erect from near base of cell.... ..... *Psychotria* (in part)
               11. Ovule pendent from near top of cell.. ..... *Canthium*
         9. Fruit with more than 2 seeds
            12. Anthers included; flowers 1–3 in axillary cyme ..... *Timonius*
            12. Anthers exserted; flowers in panicles in axils ..... *Randia*

1. Small subshrubs or herbs,
   13. Creeping shade-loving herb with cordate leaves and watery red fruits ..... *Geophila*
   13. Not as above; creeping (Dentella) or erect herbs,
      14. Cells of fruit unlike, one cell dehiscent, the other indehiscent;

stamens inserted nr. base of corolla.....*Spermacoce*

14. Not so,
    15. Ovules (hence seeds) many in each cell, (rarely only 3).
        16. Creeping herb; stipules broadly ovate, entire; leaves 1-nerved; flowers 5-merous.....*Dentella*
        16. Creeping or usually erect or shrubby; stipules laciniate; leaves usually with lateral nerves from costa; fls. 4 or 5-merous .....*Hedyotis*
    15. Ovules (hence seeds) 1 (rarely 2) in each cell
        17. Fruit not circumscissile.....*Borreria*
        17. Fruit circumscissile.....*Mitracarpus*

BIKKIA Reinwardt, nom. gen. conserv.

Shrubs with opposite leaves; stipules broad interpetiolar; calyx-tube angulate to costate, 4-(or 5-) lobed, persistent, sometimes unequal; corolla campanulate or funnelform, long-tubed, 4-5-angled, 4-5-lobed, lobes deltoid; stamens 4 or 5, inserted at base of corolla-tube, anthers basifixed; ovary 2-locular, style filiform, stigma clavate or bifid; ovules numerous on bipartite placentae; fruit a septicidal capsule with numerous seeds.—About 15–18 species of Polynesia, Melanesia, the Moluccas, and the Philippines.

Bikkia tetrandra (Forst. f.) A. Rich., Mém. Fam. Rubiac. [in Mém. Soc. Hist. Nat. Paris 5: 231. 1834], 151. 1830. GAUSALI.

Portlandia tetrandra Forst. f. Prodr. 15. 1786.

Bikkia mariannensis Brongniart, Bull. Soc. Bot. France 13: 42. 1866. Merrill 1914: 142.

Cormigonus mariannensis (Brongn.) Wight ex Safford 1905: 249.

An erect branching shrub with pale bark and medium to light green leaves; stipules small deltoid; leaves crowded, opposite, obovate, rounded or obtuse, cuneate-decurrent on the petiole, usually 6–12 cm long and nearly half as wide, glabrous, the midrib paler than the blade; lateral nerves 4–8 pairs; flowers 1 or few in axils; pedicels about as long as petiole or less; calyx 4-angled, 4-lobed, green, slender, the lobes much shorter than the tube (5 mm vs. 28 mm), slender, acute; calyx with 2 short deltoid bracteoles at base; corolla 8–10 cm long, square in cross-section, pure white, long-tubular, 4-lobed, lobes broadly deltoid, spreading-trumpetlike; limb 4–5 cm wide; capsule fusiform, capped by calyx limb, 2-celled, cells many-seeded, blackish, 2.5–3 cm long.—Fig. 87, Pl. 13f.*

Endemic. This handsome shrub deserves to be cultivated; the flowers, though scentless, are exceedingly handsome and quite large. It ought to be the floral symbol of the island. It is restricted to limestone rocks, almost always on cliff-faces or open spots, facing the sea; hence it is common on the northern coasts, and southward

* The identity of Brongniart's *Bikkia mariannensis* and G. Forster's *Portlandia tetrandra* was realized too late for the appropriate alterations in the phytogeographic calculations given earlier in this work.

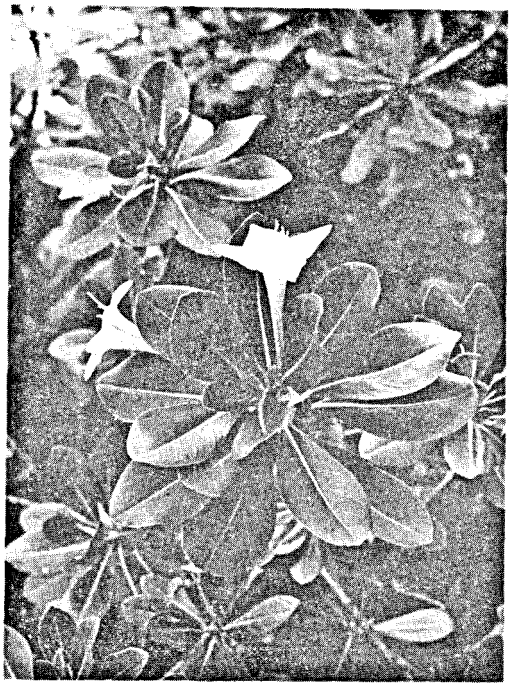

Fig. 87. Bikkia tetrandra.

beyond Talofofo on the east coast, but is rare on the west coast except north of Tumon. The conspicuous, often profuse, white trumpetlike flowers are easily discerned and recognized.

Tagachan Bay (4022); Ypan Pt. (4296); Yona, Marine Beach (4409); Asanite Pt. cliffs (4896). Often on vertical cliffs (Dos Amantes Pt.)

Other species of *Bikkia* are found in S. Polynesia, Tonga, Melanesia, and in Palau.

CANTHIUM Lamarck

Trees or shrubs, sometimes thorny; leaves with bearded nerve-axils; stipules interpetiolar; flowers axillary, in cymes or fascicles, or solitary, bisexual or unisexual; calyx 4–6-toothed; corolla white or green, throat with 1 or 2 rings of hairs; corolla-lobes 4,5, or 6, valvate; stamens same number; ovary 2-celled, cells each with 1 pendulous ovule; drupe with 1 or 2 pyrenes.—Paleotropics, about 200 spp.

Canthium odoratum (Forster fil.) Seemann, Fl. Vit. 132. 1866.

var. ***tinianense*** (Kanehira) Fosberg, Phytologia 5: 289–291. 1955.

C. tinianense (Kanehira) Kanehira, Bot. Mag. Tokyo 49: 354. 1935.

Randia tinianensis Kanehira, Bot. Mag. Tokyo 46: 494. 1932.

Small tree or shrub seldom over 3–4 m tall; stipules short, entire; leaves usually 4–5 cm long, 2–3 cm wide, elliptic (obovate) subrotund, stiffly coriaceous, medium

green, bluntly obtuse, subsessile (petiole 3–5 mm); lateral nerves usually 4–5 pairs; blade cuneate-decurrent at base; cymes paniculate, axillary, shorter than or nearly as long as the leaves; pedicels 1–2 mm long; calyx subtruncate, 4–5-toothed, 1–1.5 mm long; corolla white-greenish, 4–5-lobed, tube 1–2 mm long, lobes as long, throat with a ring of hairs at level of filaments' insertion; stamens 4–5, about 2 mm long, anthers slightly longer than filaments; ovary 2-celled; fruit obcordate, ripening black, 5–7 mm wide, 2-pyrened (hence 2-seeded).—Fig. 88.

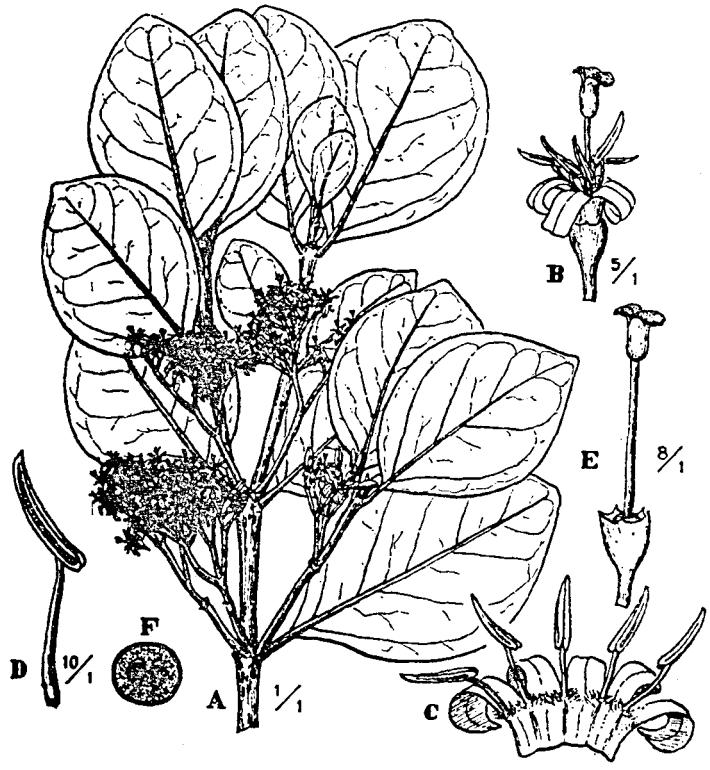

Fig. 88. Canthium odoratum.

The variety is endemic (Guam, Rota, Tinian, Saipan); the species is found in S.E. Polynesia, New Caledonia, New Hebrides, and Tonga.

The plants are restricted to limestone, usually on seaward-facing cliffs. They are rare in Guam.

COFFEA Linnaeus

Trees or shrubs; stipules usually interpetiolar; youngest branchlets compressed; cymes axillary or terminal; flowers bisexual but often dimorphic; bracteoles connate in an epicalyx; calyx 5–8-toothed; corolla tubular, 5–8-lobed; lobes twisted in bud; filaments very short; ovary-cells 1-ovulate; stigma bifid; drupe with thin

pericarp, 2-pyrened (rarely more), these plano-convex, grooved on the flat side.—Paleotropics, 40 spp.

1. Ripe fruit 0.5–1.5 cm long, with thin mesocarp..... *C. arabica*
1. Ripe fruit 1.8–3 cm long, with thick fleshy mesocarp..... *C. liberica*

COFFEA ARABICA L. Sp. Pl. 172. 1753. Safford 1905: 244. Merrill 1914: 143. CAFÉ. ARABIAN COFFEE.

Small tree or shrub (the apex pruned in most cultivated plants); leaves dark glossy green, oblong-elliptic or oblanceolate-oblong, acute to acuminate, acute at base, midrib prominent on both surfaces, lateral nerves 7–13 pairs, commonly 5–20 cm long, on petioles about 1 cm long; axils with several short triflorous cymes, pedicels about 4 mm long; bracts deltoid 3 mm long; corolla white, fragrant, 7–10 mm long, usually 5-lobed; anthers 7–8 mm long; fruit red, ellipsoid or oblong, 2–3 (–5) -celled (rarely 1-celled).—Pl. 14a.

A native of Abyssinia; the most common species of cultivated coffee. At one time commonly grown in Guam, the local coffee said to be good (Safford); now uncommon, though encountered occasionally. Naturalized (?) in a few places, e.g. Mt. Almagosa. Seen on a farm in Talofofo (4402).

COFFEA LIBERICA Bull ex Hiern (em. Chevalier), Encycl. Biol. 28: 117–263. 1947. Miers, Trans. Linn. Soc. 2: 171, t. 24, 1876.
Safford 1905: 245. Merrill 1914: 143. LIBERIAN COFFEE.

A robust small to medium tree (when not pruned); leaves oblong-obovate, very coriaceous, acuminate, base acute, 15–35 cm long, 6–15 cm wide, on petiole of 1–2 cm; lateral nerves 6–12 pairs; cymes few together; flowers solitary on peduncle; pedicels 2–5 mm; calyx-tube 4 mm; corolla 2.5–3 cm long, 6–11-lobed; ripe fruit large, 1.8–3 cm long, red, with thick mesocarp.

Native of W. Tropical Africa. Sparingly cultivated in Guam; perhaps no longer persisting.

DENTELLA J. R. & G. Forster

Creeping, mat-forming herb; stipules interpetiolar; leaves narrow, 1-nerved; flowers solitary in axils of leaf-pair; bisexual; bracts none; calyx 5-lobed, the tube subglobose or oblong, 5-ribbed, persistent; corolla tubular, 5-lobed, hairy inside, lobes very short, bifid-trifid (or entire); stamens 5, included, subsessile; ovary 2-celled, cells many-ovulate, style bifid; fruit dry indehiscent asymmetric; seeds angled. —Indomalaysia to Australia, 10 spp.

Dentella repens (L.) J.R. & G. Forster, Char. Gen. 26, t. 13. 1776.
Fosberg, Bishop Mus. Occ. Pap. 15(20): 215. 1940. BORDUEGAS.

D. serpyllifolia Wall. ex Craib.

Creeping low herb; leaves elliptic or oblong or oblanceolate but short, acute at both ends, 1-nerved, 1 cm long, 4 mm wide, on petiole 3 mm long; stipules ovate-subrotund; stems somewhat 4-angled; pedicels 1–2 mm long; calyx 2–3 mm; corolla about 1 cm long, tube yellowish, limb white (lobes each with a basal small purplish spot); throat pilose; fruit 3–4 mm, glabrous or beset with glassy hairs (these hollow),

with many small angular seeds.

A Tropical weed. First reported from Guam by Fosberg (Agaña, *Seale*). In lawns at Harmon Village (4091).

The flowers are often borne between branches in the V-shaped fork and are nearly sessile.

GEOPHILA D. Don. nom. gen. conserv.

Creeping herbs with palmately-nerved usually cordate leaves; stipules entire, interpetiolar; flowers in terminal few-flowered head-like umbels; calyx 4–7-parted; corolla 5–7-lobed; stamens 4–7, the filaments obsolete, ovary 2-celled, cells 1-ovulate; fruit a 2-pyrened drupe.—Tropics, 30 spp.

Geophila repens (L.) I.M. Johnston, Sargentia 8: 281. 1949.

TAMANES-HATING.

Carinta herbacea (Jacquin) Wight ex Safford 1905: 216.

Psychotria herbacea Jacq. Enum. Pl. Carib. 16, 1760.

Rondeletia repens L. Syst. ed. 10, 928.

Geophila herbacea (Jacq.) O. Kuntze, Rev. Gen. Pl. 300. 1891; Merrill 1914: 143.

Geophila reniformis D. Don, Prodr. Fl. Nepal. 136. 1825.

Geocardia herbacea (Jacq.) Standley, U. S. Nat. Herb. Contrib. 17: 445. 1914.

Creeping herb with cordate-orbicular to reniform 7–9-nerved leaves, usually 2–4 cm long and about equally wide, on slender petioles up to twice as long as the blade; stipules reniform, broader than long; peduncle about 2–4 cm long; flowers few, distal; calyx usually 5-parted (or 6–7–), obovoid, persistent; corolla white, salverform, glabrous or puberulent, throat hairy, 4–7-lobed; stamens 4–7, included; ovary puberulent; style 5 mm long; stigma bifid; ovary 2-celled; fruit a red 7–8 mm watery subglobose drupe with 2 plano-convex pyrenes; seeds not grooved.

Apparently pantropical or nearly so. Found in dense moist shade in forests. McGregor 397. It is reminiscent (in its leaves) of *Centella asiatica*, q.v. It has not been found recently.

GARDENIA Ellis

Trees or shrubs with opposite or ternate often resinous leaves; stipules interpetiolar; flowers large, fragrant, solitary, axillary or terminal, white or yellow; calyx tube ribbed or winged; corolla tubular with spreading limb of 5–9 lobes (rarely 4), twisted in bud; stamens 4–9, subsessile; ovary 1-celled, with 2–8 parietal placentae and numerous biseriate ovules; fruit a leathery irregularly dehiscent capsule with many compressed seeds.—About 60 species of the Tropics and subtropics; only one introduced species present in Guam.

GARDENIA JASMINOIDES Ellis, Philos. Trans. 51(2): 935, t. 23. 1761. GARDENIA.

Erect shrub with dark glossy ovate or elliptic-oblong leaves, 5–10 cm long, acute or somewhat acuminate, decurrent at base on the short petiole, this commonly 2–4 mm long; calyx 6-lobed, lobes linear; 2–3 cm long; corolla white, 5–9 cm long,

very sweetly fragrant, aging yellow, 6-lobed (or in *doubled* cultivars with additional lobes); fruit 2–3 cm long, 5–6-ribbed, crowned by the calyx.

Native of China (and Japan?), now widespread in cultivation. Always in gardens; fruiting is rare. Mangilao (4368). The flowers become nearly orange when they fan off.

GUETTARDA Linnaeus

Trees or shrubs with opposite or ternate leaves; stipules interpetiolar, caducous; inflorescence a cymose axillary panicle with sessile flowers; calyx-tube short subtruncate; corolla long-tubular with a spreading 4–9-lobed limb of imbricate lobes; anthers subsessile, 4–9, inserted in the throat, included; ovary 4–9-celled; style filiform; stigma capitate-oblong; ovules solitary in each cell, pendulous; fruit a drupe.—Chiefly Tropical American, with some 50 species, but the following one is pantropical, native in Guam, and throughout the Pacific (except Hawaii).

Guettarda speciosa L. Sp. Pl. 991. 1753. Safford 1905: 288.
Merrill 1914: 143. PANAO.

Small tree with thick branchlets and broad obovate leaves commonly 10–25 cm long and 8–18 cm wide, acute (subacuminate) to obtuse, rounded, or emarginate, obtuse to subcordate at base, rather dark green above, paler and usually puberulent beneath, with 7–10 pairs of lateral nerves; petioles 2.5–4 cm long, pubescent; leaving large scars on the twigs when they fall; stipules ovate; cymes on 5–10 cm long peduncles, several times forked; axillary but usually produced after leaf-fall; calyx

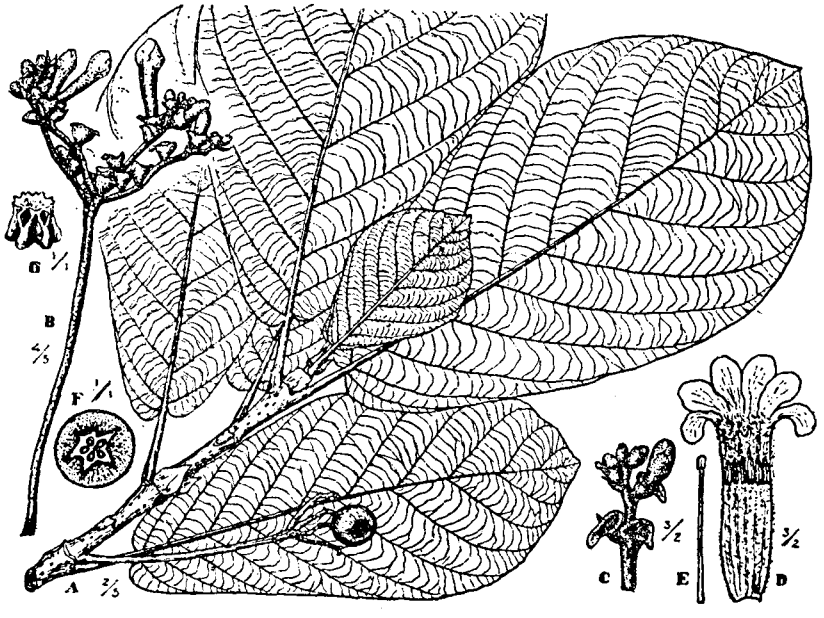

Fig. 89. Guettarda speciosa.

pubescent, truncate, about 1 cm long; corolla 2.5–4(–5) cm long, dull or yellowish white, fragrant, villous within; flowers dimorphic, some with short styles not reaching the anthers, others with exserted styles; drupe woody, depressed-globose, with circular rim at apex, 2.5–3 cm wide, whitish or pinkish, faintly ribbed, usually 4–6-seeded.—Fig. 89.

Littoral tree of coasts in Tropical Asia east to the Pacific Islands, north to Taiwan. In Guam on sandy coralline or rocky limestone coasts, also scattered over the northern limestone plateau, not common but widespread, Barrigada Hill (3806). The fruits float. The flowers are pollinated at night by moths, and fall off in the morning.

HEDYOTIS Linnaeus

Shrubs, herbs, or straggling subshrubs, with entire opposite leaves; stipules connate at base, adnate to base of petioles, sheathlike, the free edge apiculate, trifid, or laciniate into narrow segments; flowers generally 4–5-merous, perianth-lobes valvate; ovary 2(rarely 3–) celled; ovules several to many per cell; stigma bilobed; fruit capsular, with the accescent calyx capping it, seeds many. (Including *Oldenlandia*, *Kadua*, etc.)—A large genus, pantropical, with perhaps 500 spp.

Key to local species.

1. Leaves commonly less than 5 cm long (though in robust or shade-grown plants up to 7.5 cm); low herbs, the stems ascending, usually not stiffly erect; often mat-forming; usually of open rocky or waste ground, or in dry open thickets; not strongly foetid.
   2. Leaves usually rounded at apex, white-dotted on both sides; plants of coastal rocky or sandy areas..... *H. albido-punctata*
   2. Leaves usually acute; not dotted; plants usually of waste ground, weedy.
      3. Fruit 3–4 mm long, ribbed; cymes many (to 40–) flowered; petioles well developed; blades slightly fleshy; flowers with corolla 2.2–2.5 mm long ..... *H. biflora*
      3. Fruit 2 mm long (or less), not winged; cymes few- (to 8–) flowered; petioles very short; blades chartaceous; flowers with corolla 2 mm long..... *H. corymbosa*
1. Leaves commonly more than 6 cm long, up to 10–12 cm; erect rather coarse herbs or subshrubs of savannas or limestone soils; not mat-forming; foetid or not; not weedy.
   4. Stipules apiculate or obscurely trifid, never laciniate; foliage and flowers with foetid odor; plants of limestone cliffs.. *H. foetida* var. *mariannensis*
   4. Stipules deeply laciniate into several or many linear segments; plants not foetid; habitat in savannahs.
      5. Plants subshrubby,..... *H. fruticulosa*
      5. Plants ± herbaceous,

6. Corolla-tube 2.5 mm long; leaves mostly 3–4 cm long.....
.....*H. laciniata*
6. Corolla-tube 9–11 mm long; leaves mostly about 10 cm long....
.....*H. megalantha*

Hedyotis albido-punctata (Merrill) Fosberg, Lloydia 3: 123. 1940.

Oldenlandia albido-punctata Merrill 1914: 147.

Low ascending annual herb, glabrous, 20–30 cm high or more or less prostrate and mat-forming, diffuse or dense, branchlets subterete; leaves narrowly oblong-obovate or oblanceolate, usually 1–2 cm long, 5–8 mm wide, slightly fleshy, subcoriaceous, rounded at apex, rarely minutely subapiculate, acute at base, white-puncticulate on both sides, lateral nerves slender, 2–3 pairs, obscure, or obsolete; petioles less than or just 2 mm long; stipules broad, abruptly acuminate, the acumen 2–3 mm long, rarely briefly trifid; flowers small, white, many in a leafy panicle, peduncles 2–5 cm long; flowers solitary or paired, or in triads, on pedicels 1–2 mm long, bracteoles acuminate, 1–2 mm long, (lengthening to 3 mm in fruit); calyx urceolate, 2.5 mm long, 4-lobed, lobes reticulate, acute, ovate, 1.5 mm long, accresent in fruit; corolla white, the tube 1.5 mm long, villous inside, limb short; anthers 0.8 mm long; capsule obovoid, slightly compressed, about 4×4 mm, very obscurely 4-ridged, narrowed stipitiform at base, the ridges lateral in pairs, or absent in the distal 2/3, calyx limb persistent 2 mm long; seeds numerous, globose-angular, pitted, brown, 0.4–0.5 mm broad.

Endemic. This is a very characteristic herb of rocky limestone coasts. The midribs are often faintly purplish-red. The plants are associated with *Pemphis acidula, Ischaemum longisetum, Capparis cordifolia*, etc. The holotype was collected on Cabras Island in 1911 (McGregor 375). It is common at Apra (3848); Cocos Islet (4241); and at Asanite Point. I have found it also on Saipan (5249–a). Kanehira reports it from Anatahan.

Hedyotis biflora (L.) Lamarck, Encycl. Tabl. 1: 272. 1791.

Oldenlandia biflora L. Sp. Pl. 119. 1753.—Merrill 1914: 146.

O. paniculata L. Sp. Pl. ed. 2, 1667. 1763.—Safford 1905: 338.

Herb with ascending to erect sharply 4-angled stems, diffusely branched; leaves elliptic to oblong-elliptic or subovate, thinly fleshy, mostly 2–4 cm long (rarely 5–8 cm), 6–15 (–25) mm wide, acute or acuminate, acute at base, petiole 2–10 (–15) mm long; panicles many-flowered, axillary and/or terminal; flowers 3–4 mm long; calyx accrescent in fruit; corolla white or purplish, 2.25–2.5 mm long; stamens inserted below or at middle of tube; capsule exalate, ribbed, 3–4 mm long; seeds many.

Tropical Asia and the Pacific Islands, probably native in Guam. This is very similar to *H. albido-punctata* but can be distinguished by the acute-acuminate leaves without white dots and the usually much longer petioles. Mangilao (4665). The anthers are purple; pollen pale yellow.

Hedyotis corymbosa (L.). Lamarck, l.c. 1791.

Oldenlandia corymbosa L. Sp. Pl. 119, 1753.—Merrill 1914: 146.

Annual herb with ascending or erect 4-angled stems; leaves acute at both ends, linear-oblong or narrowly elliptic, 1–3.5 cm long, 1.5–7 mm wide, subsessile or petiole very short, blade pale beneath, midrib prominent; flowers few (2–8) in axillary cymes shorter than the leaves; flowers white or faintly pinkish-purplish, on slender pedicels 4–8 mm long; calyx not exceeding ovary; corolla about 2 mm long; stamens inserted just above the base of the tube; capsule about 2×2 mm, exalate, flattened at apex, slightly laterally compressed.

A pantropical weed. G.E.S. 39.

Hedyotis foetida (Forster) J.E. Smith, ex Rees, Cyclop. 17(2): sub H. 1811.

var. ***mariannensis*** (Merrill) Fosberg, Phytologia 5(7): 291. 1955. PAUDEDO.

H. mariannensis Merrill 1914: 144.—sub. *H. foetida*, Fosberg, Bish. Mus. Occ. Pap. 15: 214. 1940.

Erect shrub (or accumbent) with foetid odor, woody at base but the branches herbaceous; glabrous; branches grayish-brown, terete or slightly 4-angled; leaves

Fig. 90. Hedyotis foetida var. mariannensis.

oblong-elliptic, thin-fleshy to membranous, 5–10 cm long, rather dull green, acute-acuminate, acute at base, lateral nerves about 5 pairs, rather obscure; petioles to 5 mm long, slightly winged by the decurrent base of the blade; stipules wider than long, bluntly apiculate, sometimes with 2 lateral teeth but never laciniate; inflorescence terminal, up to 12 cm long, paniculate, many-flowered; pedicels slender, 6–8 mm long; lowest bracts linear-acuminate, 6–7 mm long; flowers crowded, white; calyx obconic, 1.5–2 mm long, glabrous, 4-toothed, teeth deltoid; corolla pure white (but black when dried), 7–9 mm long, 4-lobed, lobes slightly spreading, 1/3 as long as tube, acute; anthers nearly 2 mm long, purplish, oblong-lanceolate, subsessile; capsule turbinate, 3.5 mm wide, narrowed at base, flattened at apex, the calyx-limb small, apical.—Fig. 90.

The variety is endemic; the species is Polynesian (including Tonga, Fiji, and New Caledonia). In Guam this plant is encountered on the faces or tops of limestone cliffs, or on rocky coasts, usually near the sea, not in thick forest. It is never in the savannah regions. The flowers and leaves emit an unpleasant odor. The holotype of the variety was collected on Cabras Island (Apra Harbor) in 1911 (*McGregor* 572). It has also been found at Asan (G.E.S. 239); Dos Amantes Pt. (top of cliff) (3941; 3942); Tumon Bay (4992; 5079). Also in Saipan (5249); Rota (Kanehira); Alamagan (Kanehira); Pagan (Fosberg); Tinian (Hosokawa).

Hedyotis fruticulosa (Volkens) Merrill, 1919: 544.

Oldenlandia fruticulosa Volkens, Engl. Bot. Jahrb. 31: 475. 1902.

Much-branched shrublet to nearly 1 m high; leaves glabrous, elliptic acute, slightly narrowed at base, petioles 2–10 mm long, blades to 4–9 cm long, 1.5–4.5 cm wide; stipules with 3 or 4 bristly points; flowers lilac, sessile, in many-flowered panicles; clayx-lobes linear-lanceolate, 1.5 mm long; corolla-lobes slightly longer; fruit semi-globose, dehiscent.

Originally described from Yap. Possibly not distinct from the next species. Open savannahs.

Hedyotis laciniata Kanehira, Trans. Nat. Hist. Soc. Formosa 25: 6, f. 7, 1935.

H. alamaganensis Hosokawa, Trans. Nat. Hist. Soc. Formosa 25: 37. 1935.

Coarse erect or subshrubby herb to 30 cm tall or more; stems glabrous, slightly 4-angled; stipules 5-fid, segments setose; leaves ovate or ovate-lanceolate, 3–4 cm long, 1–1.5 cm wide, acute, briefly decurrent on the nearly obsolete petiole; blades chartaceous, glabrous or minutely somewhat scabrid, midrib and nerves ventrally impressed, dorsally prominent, lateral nerves 4–5 pairs; panicle terminal, congested, branches decussate, leafy at base; peduncles to 3 cm long, glabrous, trichotomously branched; flowers shortly pedicellate, or sessile; bracts linear, 4–7 mm long; calyx slightly pilosulous, 6 mm long, 4-lobed, lobes 3 mm long, ovate, acute; corolla-tube 2.5 mm long, pilose, white, 4-lobed, lobes oblong-ovate, acute, reflexed at anthesis, 2.5 mm long, puberulent; stamens 2 mm long, glabrous, anthers 1 mm long; style filiform, 6 mm long, bilamellate at apex, the lamellae 1.5 mm long; capsule globose, crowned by the calyx, and with that 5–6 mm long, glabrous.

Endemic in the Marianas Islands; holotype from Alamagan Is. (Kanehira),

as is also the holotype of Hosokawa's species. Savannahs, in volcanic soil. The leaves and flowers may be tinged with purple.

Hedyotis megalantha Merrill 1914: 143.

Oldenlandia megalantha (Merrill) Valeton, Engl. Bot. Jahrb. 63: 293. 1930.

Erect herb to 70 cm tall or more, branched, glabrous, stems 4-angled (sulcate when dry); leaves oblong-elliptic or ovate-elliptic, chartaceous, mostly 9–11 cm long and 3–4.5 cm wide, shortly acuminate, acute to obtuse or rounded at base, moderately glossy, dorsal surface with scattered cystoliths, lateral nerves about 6 pairs, reticulations very lax; petioles about 1 cm long; stipules short and broad, pectinate, segments 10–15, stiff, linear, 3–4 mm long; inflorescence a lax divaricately branched leafy panicle, terminal; leaves of the panicle 1–3 cm long, ovate, sessile; whole panicle up to 30 cm long; flowers 4-merous, cymosely arranged; calyx obconic, nearly glabrous, 2 mm long, the 4 lobes each 4×2 mm, acute, oblong-ovate, somewhat accrescent and persistent in fruit (calyx suburceolate); corolla white, 12–14 mm long, 3 mm wide, 4-lobed, lobes spreading, 3 mm long, subacute; filaments exserted, 4 mm long; anthers 2 mm long purplish; style filiform; capsule obovoid, 3 mm wide, crowned by the calyx lobes (these 6×3 mm); seeds black, sharply 3-angled, about 1 mm long.

Endemic, known only from Guam; holotype collected at about 100 m. alt. in hills back of Piti in October, 1911 (McGregor 458).—Savannahs, often in thickets on slopes, somewhat sprawling; never on limestone; not foetid. Agat hills (4391); Manengon (5137). Associated with *Dimeria chloridiformis* and *Miscanthus floridulus*.

IXORA Linnaeus

Small trees or shrubs; leaves opposite or rarely ternate; stipules interpetiolar, entire, acuminate; inflorescences terminal, corymbose-paniculate or cymose; flowers bisexual, protandrous; calyx 4-toothed; corolla tubular, limb 4-lobed; lobes twisted spirally in bud; anthers linear; ovary 2-celled (rarely 3); cells 1-ovulate; style apically swollen, with 2 stigmas; fruit a red or black 1–2-pyrened drupe; pyrenes plano-convex.—Over 400 species, chiefly paleotropical; one native in Guam, three introduced as ornamentals.

Key to local species

1. Panicles many-flowered; flowers red, orange, pink, yellow or white. Cultivated shrubs.
   2. Flowers bright red or vermilion, 5 cm long..... *I. casei*
   2. Flowers pink, yellow, or white, 2.5–3.5 cm long,
      3. Flowers pink or white; leaves acute-obtuse; corolla-lobes obovate-rounded ..... *I. chinensis*
      3. Flowers (in ours) yellow; leaves rounded-obtuse; corollalobes narrow, acute..... *I. coccinea*
1. Flowers sessile in triads, white; wild shrubs..... *I. triantha*

IXORA CASEI Hance, Walpers Ann. Bot. Syst. 2: 754. 1852.

Cf. Glassman, Bishop Mus. Bull. 209: 94. 1952, for synonymy.

Big shrub with large dark green glossy leaves, up to 30 cm long, petiolate, narrowly oblong, acute; cymes terminal, many-flowered, not at all fragrant, axes red; flowers deep vermilion-red to scarlet, about 5 cm long; corolla-lobes 4, ovate, more or less acute; fruit (rare in Guam) 2-seeded.

Native of the Caroline Islands, the holotype from Kusaie; wild and common in Palau, Truk, Ponape; but only in cultivation in the Marianas. Barrigada Village (4049), fruiting in mid-April, 1962.

IXORA CHINENSIS Lamarck, Encycl. 3: 344. 1789.

Erect shrub with glabrous branches and opposite chartaceous to coriaceous subsessile obovate-elliptic leaves mostly 6–10 cm long and 2–5 cm wide, acute to obtuse, at base to truncate; cymes terminal, pedunculate; peduncle about 2 cm long; flowers red, pink, or white; calyx 4-toothed, less than 2 mm long; corolla 2.5–3.5 cm long, 4-lobed, the lobes obovate and rounded, 6–7 mm long, 3–5 mm wide; style bifid; fruit?

Native of China; widely cultivated in various forms for its ornamental flowers. The plants in Guam always (?) have either pink or creamy-white flowers and seem not to set fruit. Camp Witek (4291).

IXORA COCCINEA L. Sp. Pl. 110. 1753.

Small shrub; leaves sessile, oblong-obovate, subcordate and slightly amplexicaul, obtuse, coriaceous 3–10 cm long, 2–5 cm wide; inflorescence corymbose, terminal, dense; flowers red or yellow, 3–4 cm long; calyx puberulent; corolla 4-lobed, lobes 10–15 mm long, ovate-lanceolate, acute; stigmas 3–4 mm long, red; fruit?

Native of India, now widespread in cultivation.

Ixora triantha Volkens, Engl. Bot. Jahrb. 31: 476. 1901.

Erect shrub; leaves glossy oblong-elliptic, 8–15 cm long, 4–6 cm wide, acute or obtuse at both ends, on petioles 3–6 mm long; leaf-pair at base of inflorescence short, ovate, sessile; inflorescence of 3 sessile flowers, terminating the stem; flowers white, about 16–19 mm long; corolla tubular, 4-lobed, lobes acute, about 7 mm

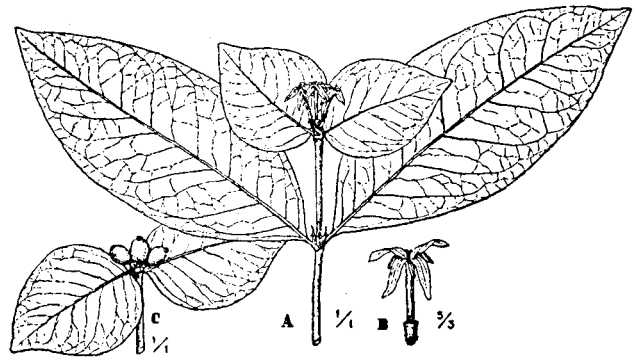

Fig. 91. Ixora triantha.

long; 3 mm wide; fruit ellipsoid-oblong, about 8×5 mm, purplish-black.—Fig. 91.

Native of Yap and the Marianas, not known elsewhere. Very common in limestone forest area.

Barrigada Hill (3776; 3851; 4011; 5008); Harmon (4276); Asdonlucas (4738).

MITRACARPUM Zuccarini

Herbs with perennial rootstocks; branches quadrangular; leaves opposite, narrow; stipules forming a setose sheath connate to petioles; flowers in densely multiflowered heads, calyx-tube turbinate to subglobose, 4–5-toothed; corolla funnelform to hypocrateriform, tube pilose within, 4-lobed, lobes valvate; stamens 4, inserted in the corolla throat; anthers dorsifixed; ovary usually 2-locular; style shortly bifid; fruit circumscissile at or below the middle; seed 1 per locule, oblong to globose.—About 40 spp. of S. America, W. Indies and Trop. Africa.

Mitracarpum hirtum (L.) DC. Prodr. 4: 572. 1830. Safford 1905: 325.

Merrill 1914: 145 (sphalm. irreg.).

Mitracarpum torresianum Chamisso & Schlechtendahl, Linnaea 3: 360. 1828.

Erect annual herb with oblong-lanceolate leaves, subsessile; stems simple or sparingly branched, pubescent at tips; stipules bristly; flowers white, minute, crowded in dense axillary headlike clusters; calyx 4-parted, with 2 of the segments subulate-lanceolate and in fruit exceeding the capsule, the other 2 segments shorter; corolla 4-lobed; stamens 4; ovary 2-celled; capsule membranous or coriaceous, opening by a lid (circumscissile), with 2–4 seeds.

Native of Tropical America, accidentally introduced to Guam at least before 1818, when it was collected by Chamisso.

MORINDA Linnaeus

Trees, shrubs, or woody climbers; leaves opposite, nerve axils with domatia; stipules interpetiolar, sheathing; flowers in heads, these umbellate or paniculate; calyx tubes connate; calyx-limb truncate or with 1–2 lobes; corolla usually 5-lobed but also 4- or 6-lobed; lobes valvate; stamens 4, 5, or 6; style dimorphic, glabrous; stigmas 2; ovary 2–4-celled, cells 1-ovulate; fruit a 1-pyrened drupe, but the compound fruit fleshy (because of the accrescent calyces); seeds reniform or obovoid.—Over 50 species, chiefly paleotropical, east to Hawaii.

Key to local species

1. Shrubs or trees, erect; mature fruit (compound fruit) to 5 cm broad or more; leaves very dark, glossy, mostly more than 10 cm long..... *M. citrifolia*
1. Slender woody climber; mature fruit 1–2 cm broad; leaves mostly under 10 cm long..... *M. umbellata*

Morinda citrifolia L. Sp. Pl. 176. 1753. LADA.

"M. indica L. Sp. Pl. 176. 1753"; Safford 1905: 326; Merrill 1914: 145.

Big shrub or small tree, glabrous, with dark glossy broadly elliptic leaves commonly 15–25 cm long, acute or obtuse, 6–18 cm wide, shortly petiolate; bran-

chlets quadrangular; stipules large, entire, deltoid, sometimes bifid; heads solitary, axillary, on 2–3 cm long peduncles, to 2.5 cm, irregularly subglobose; calyx truncate; corolla pure white, about 1 cm long, pilose in throat, with usually 5 acute glabrous lobes about 5 mm long; anthers included or slightly exserted; style 15 mm long; fruit (syncarp) fleshy, creamy to yellowish white, somewhat waxy, slightly foetid, 2.5–6 (rarely to 8) cm broad, subglobose or somewhat oblong: pyrenes bony.—Pl. 14b.

Widespread and native, or often planted, throughout Tropical Asia and the Pacific. The fruit is more or less edible (flavor rather like bad cheese); the roots are the source of a useful red or yellow dye. The seeds are buoyant and maintain their viability for long periods while floating in salt water (see Guppy, Dispersal of Plants, etc., Trans. Victoria Inst. 1890). Yigo (4254); Manengon (4853). Limestone *and* volcanic areas.

In var. *bracteata* (Roxb.) Hooker fil. the calyx bears 1 or 2 foliaceous lanceolate lobes about 1–2.5 cm long.

Morinda umbellata L. Sp. Pl. 176. 1753.

var. **glandulosa** (Merrill) Fosberg, Bishop Mus. Occ. Pap. 15: 220. 1940.

M. glandulosa Merrill 1914: 146.

A woody climber with elliptic or elliptic-oblong acute-acuminate leaves commonly 5–10 cm long and 2–4 cm wide, chartaceous to thinly coriaceous, acute at base, on petioles 1–2.5 cm long; stipules truncate, 2 mm long, caducous, acuminate, entire; nerve-axils with villous domatia; lateral nerves about 6–8 pairs; heads few or several, umbellate at terminus of branch, (commonly 4 together), each on 1–2 cm slender peduncles; heads dark green, subglobose, 1–1.5 cm in diameter; flowers densely crowded; calyx truncate or very minutely denticulate; corolla white, the tube 2 mm long, lobes 5 (or rarely 6) and 3 mm long, glabrous; throat villous; anthers 2 mm long; style thickened distally into the 1 mm long stigma-lobes;

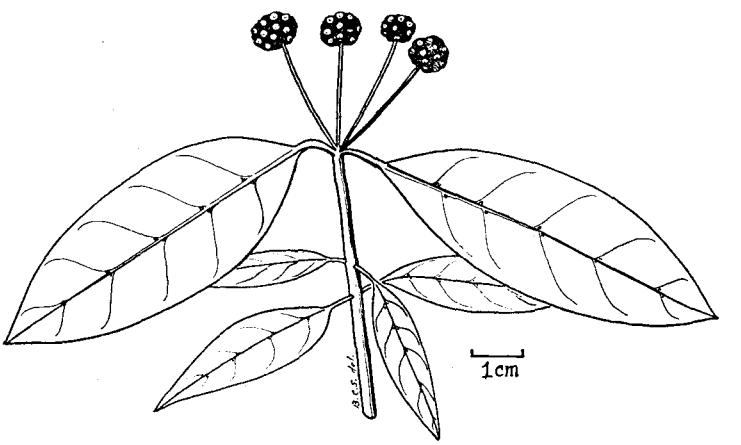

Fig. 92. Morinda umbellata var. glandulosa.

syncarp fleshy subglobose, up to 2 cm broad, with many horny pyrenes 3–4 mm long.—Fig. 92.

This variety is endemic in Micronesia and is known only from the Marianas and Kusaie. The species is widely distributed from Tropical Asia, north to China, Taiwan, and S. Japan, and east to Australia. In our variety the ripe syncarp is red or red-orange. It is found in limestone forest areas. Pago Bay cliffs below college (3780; 4130; 4408); Barrigada Hill (4010; 5155); N.W. Field (5001).

MUSSAENDA Linnaeus

Shrubs or climbers; leaves opposite, or ternate, with or without domatia in nerve axils; stipules paired or solitary, entire or bifid, concealing a band of hairs, but caducous; cymes terminal, corymbose; bracts and bracteoles caducous; flowers dimorphic (functionally male or female, though seemingly perfect); calyx 5-lobed, *one of the lobes (rarely more than one) foliaceous and colored or white*; corolla tubular, 5-lobed, yellow to red (or rarely white); throat villous; lobes valvate; stamens 5, anthers always normal but devoid of pollen in the "female", long-styled flowers; ovary 2-celled, cells many-ovulate; style bifid; berry or capsule with many seeds.—Perhaps 200 species of Tropical Africa, Asia, and the Pacific Islands.

MUSSAENDA FRONDOSA L. Sp. Pl. 177. 1753. Safford 1905: 330.

Merrill 1914: 147.

Erect shrub with drooping or rambling branches; leaves ovate to lanceolate, acuminate, basally obtuse or rounded, slightly puberulent, mostly 5–15 cm long, on petioles 1–3 cm long; enlarged foliaceous calyx-lobe usually single, white; flowers dark yellow, mostly 2–3 cm long; fruit a berry, truncate at apex, ellipsoid, black when ripe, 1–1.5 cm long; seeds numerous, reticulate.

Native of Malaysia, now rather widespread in cultivation. Probably introduced via or from the Philippines. Safford does not say so but this plant is only cultivated in Guam. The Tagalog name is "agboy." Backer calls the enlarged calyx-lobe a "decoy-leaf". In an African species (*M. erythrophylla*) these are dark red.

PSYCHOTRIA Linnaeus

Trees, shrubs, or woody climbers, very rarely creeping herbs; leaves opposite or rarely whorled; nerve axils sometimes with domatia; stipules interpetiolar, bifid or entire; flowers in cymes, simple or compound, usually terminal but sometimes axillary, sometimes congested in head-like inflorescences; bisexual or unisexual (though seemingly perfect); calyx 4–6-toothed or lobed; corolla 4–6-lobed; anthers included or exserted; ovary 2-celled; style filiform, di-or trimorphic; stigmas 2; ovules solitary, erect, anatropous; drupe with 2 unlike pyrenes, sometimes splitting into 2 parts in age.—A very large and important tropical genus found in all continents, with over 600 species.

Key to local species.

1. Leaves more or less elliptic, acute; flowers sessile or shortly pedicellate in

axillary cymes; stipules bifid.

2. Cymes usually simple, 3-flowered, flowers sessile; or sometimes only 2-flowered or 1-flowered; rarely the peduncle not developed; calyx pubescent; ovary pubescent.....*P. hombroniana*

2. Cymes usually compound, usually 9–27-flowered, flowers shortly pedicellate; calyx and ovary glabrous.....*P. rotensis*

1. Leaves more or less obovate, rounded or obtuse; cymes compound, terminal; stipules entire, low-deltoid.....*P. mariana*

Note: an interesting characteristic of most *Psychotrias* is that they often take on a noticeably *pinkish* cast *after being dried.*

Psychotria hombroniana (Baillon) Fosberg, Phytologia 5(7): 291. 1955.

APLOKATING-PALAOAN

Uragoga hombroniana Baillon, Adansonia 12: 333. 1879.

Psychotria malaspinae Merrill 1914: 148.

Small tree or shrub with terete reddish-brown branches (youngest branchlets with obvious cystoliths); leaves chartaceous, moderately dark glossy above, slightly paler and duller beneath, elliptic-oblong to obovate-oblanceolate, mostly 6–10 cm long, 2–4 cm wide, acute-acuminate, acute and decurrent on the 5–15 mm long petiole; lateral nerves about 8 pairs; stipules 4×2 mm, bifid into 2 narrow sharply acute segments 1–2.5 mm long, soon caducous; cymes 1–3-flowered, either long-pedunculate (1–2 cm long) or the peduncle shorter or even obsolete; tiny caducous bracts at base of peduncle; pedicels nil or obscure, the flowers sessile; peduncles glabrous; calyx 4–5-toothed, turbinate, pubescent with simple multiseptate hairs, about 2 mm long (including the teeth); corolla white or yellowish-greenish, shortly tubular, glabrous externally, with or without hairs in the throat; lobes 4 or 5, deltoid, blunt, 1 mm long, i.e. 1/3 as long as the tube; anthers on short filaments, finely pubescent,

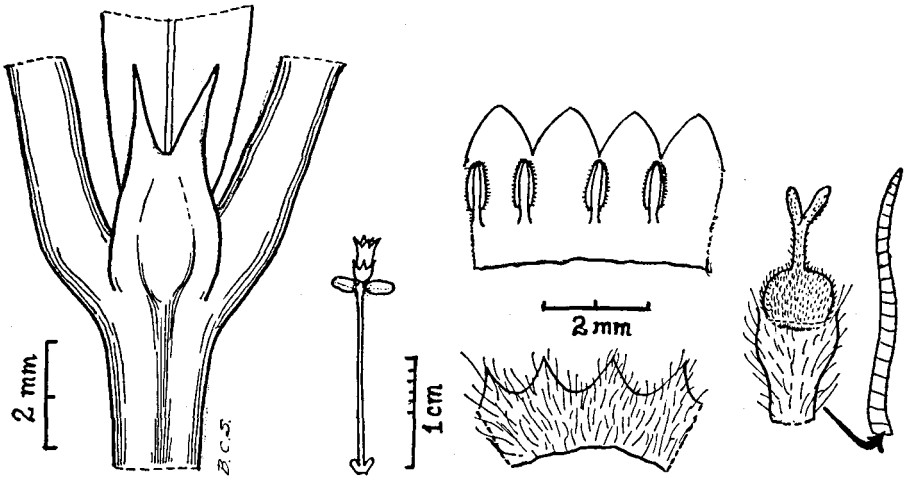

Fig. 93. Psychotria hombroniana.

streaked with purplish-brown, 8/10 mm long; ovary pubescent, subglobose, 1 mm high and nearly as wide, style bifid, with the 2 stigmatic clavate lobes 1.5 mm long; drupe red, 7–8 mm long, oblong-obovoid, smooth, fleshy (pericarp), truncate, with 2 plano-convex hard pyrenes 6×4 mm, rugose, obscurely keeled, not grooved.—Fig. 93.

Endemic in the Marianas Islands. Its full distribution is obscured by the excessive number of species proposed from Micronesia, both in Psychotria and Amaracarpus; it may be (according to Fosberg) not distinct from *P. carolinensis* (Valeton) Fosberg, and if this be true, it is also found in Palau, Truk, Ponape, and Truk. Fosberg (Phytologia 5: 291. 1955) suggests that if the peduncle-length is a variable character, then these 2 names are synonyms. In my experience the peduncle may or may not be developed on the same branch! and therefore *P. carolinensis*, on the basis of peduncle-length anyway would be synonymous with *P. hombroniana.* (Observations of my collection 5262).

This is exclusively found in limestone community forests, which are not disturbed, and is shrubby or forms a small understorey tree with trunks to 4–5 cm thick. Yigo-Atdosco (4273); Ritidian Pt. mesa (5134); Asdonlucas (5262; 5263; 5264).

Psychotria rotensis Kanehira, Bot. Mag. Tokyo 47: 678. 1933.

Small tree or shrub, very similar in general appearance to *P. hombroniana*, 2–4 m tall; leaves elliptic, acute or shortly acuminate, the apex minutely blunt, base acute and slightly decurrent; rather dark; blades mostly 6–8 cm long, 2–3.5 cm wide; lateral nerves 4–7 pairs, in living leaves rather obscure; petioles 5–15 mm long; stipules about 3–4 mm long, narrow, shortly bifid at apex, soon caducous; inflorescences cymose, rather many-flowered, pedunculate, about 1–3 cm long, axillary; flowers usually in triads, pedicellate; pedicels 0.5–1.5 mm long, glabrous; calyx 4–5-toothed, glabrous, the teeth 0.5 mm, subulate-acute, the tube about 1 mm long; corolla white, short-tubular, glabrous externally, bud densely villous in the throat, the tube about 1.5–2 mm long, the 4–5 lobes about equally long, deltoid subacute, glabrous; anthers nearly sessile, 1 mm long; *ovary* glabrous, 1.5 mm high and wide; style 3 mm long, shortly bilobed at apex into 2 diverging papillose stigmas each 0.5 mm long; drupe bright red, thinly fleshy, truncate-globose, slightly laterally compressed, crowned by the minute calyx limb, 1 cm long, nearly as broad; pyrenes 2, plano-convex, the convex side with 3 or 4 sharp longitudinal ridges with deep intervening grooves, elliptic in outline, 5–6×4.5–5 mm.—Figs. 94–95.

Endemic in the Marianas Islands; the holotype collected on Rota. Although on limestone soils, I have not found this species in northern Guam; instead, it is known from the mixed soils of seaward slopes south of Agat, due west of Mt. Lamlam, at about 100 m. alt. in stream valley thickets, adjacent to savannah soils, with trees of *Ficus prolixa, Cynometra ramiflora, & Planchonella obovata.*

These Guam plants differ slightly from Kanehira's Rota plants in their narrower leaves and broader corolla-lobes.

Psychotria mariana Bartl. ex DC. Prodr. 4: 522. 1830.

Merrill 1914: 148. APLOKATING.

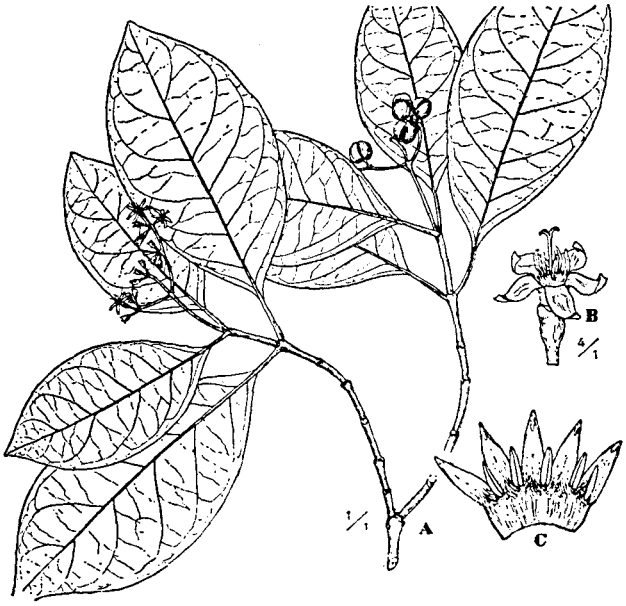

Fig. 94. Psychotria rotensis.

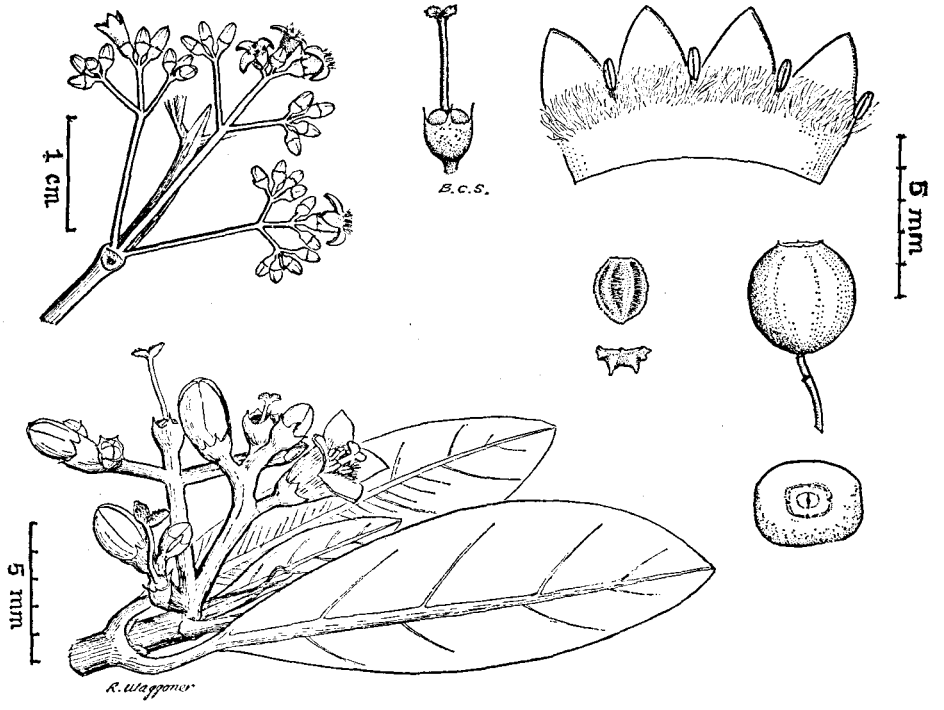

Fig. 95. Psychotria rotensis, flowers, fruit, and seeds.

A small tree up to 10 m tall with glabrous branchlets; leaves opposite, obovate or obovate-oblong, commonly 7–10 cm long, 2.5–4 cm wide, obtuse or even rounded at apex, acute-obtuse at base, rather thickly coriaceous; lateral nerves 6–8 pairs, *quite distinct and prominent on both surfaces*; petiole 3–5 mm long; stipules irregularly deltoid, 2-angled, pubescent within especially at the base, early caducous, leaving a rather broad scar, up to 5 mm long; inflorescences cymose, paniculate, *terminal*, axes glabrous; with opposite bracts 3 mm long; calyx tubular, 5-toothed, (rarely only 3–4-toothed) 3 mm long; corolla white, 5-lobed, tube 6–8 mm long; lobes 4–5 mm, oblong; throat villous; stamens 5, in the throat; style exserted 4 mm, slender, stigmatic lobes 2 very short; drupes red to purplish, 5–8 mm long, ellipsoid-subglobose, crowned by the rather conspicuous rimlike calyx limb; pyrenes 2, or often only 1.—Fig. 96.

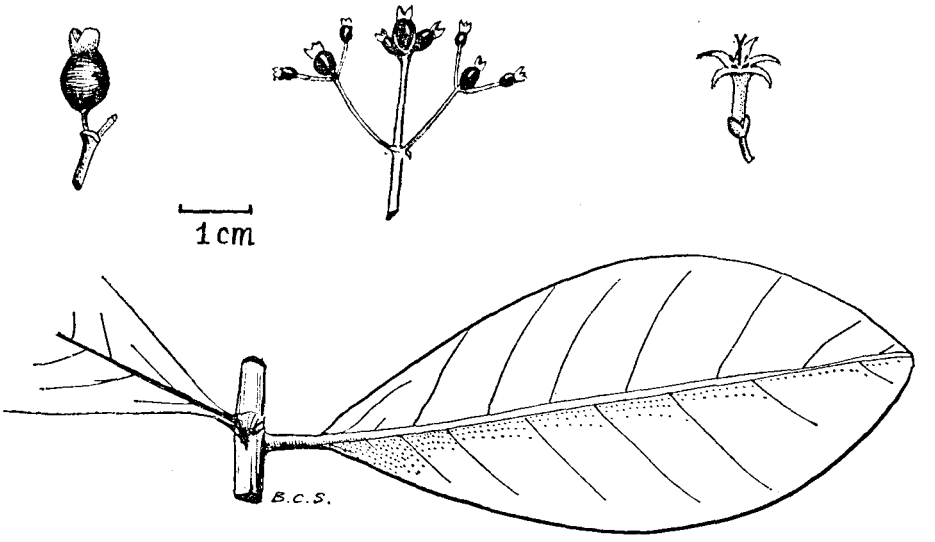

Fig. 96. Psychotria mariana.

Endemic and common in limestone forests in the Marianas Islands; much the most abundant *Psychotria* in Guam, and taller and more tree-like than the other species.

Barrigada Hill (3809; 4039; 5010); Yona, Marine Beach (4411); Asdonlucas (4737); Inarajan River (5051); Manengon (5136). The fruits as they ripen turn from green to orange and finally dark, almost purplish red, but the calyx at apex of the drupe stays green.

The tree from Manengon, in basalt soil, was very short and stunted, rather shrubby.

RANDIA Linnaeus

Trees or shrubs, sometimes armed with spines; leaves opposite, but one leaf

of a pair sometimes smaller or not developed; stipules interpetiolar; entire; inflorescence cymose-corymbose, or of few flowers in fasicles, or solitary; calyx-tube short, lobes short or long, usually 5 (or 6–10); corolla tubular, 5 (or 6–10) lobed, lobes twisted in bud; stamens 5 (or 6–8), the anthers nearly or quite sessile; ovary 2-celled (rarely 3-celled); style entire or bifid; fruit a berry with many or several seeds (rarely only 1–3 seeds).—Over 200 tropical species.

Randia cochinchinensis (Lour.) Merrill, Am. Phil. Soc. Trans. n.s. 24: 265. 1935.
SUMAC.

R. racemosa (Cavanilles) F.—Villar, Novis. App. 108. 1880.

Merrill 1914: 149.

Stylocoryne racemosa Cav. Ic. 4: 45, t. 368, 1797.

Small tree or shrub; stems smooth, glabrous; leaves lanceolate-oblong, acuminate, acute at base, thinly coriaceous, rather glossy, mostly 9–12 (–18) cm long, 3–4 (–6) cm wide, on petioles 0.5–2 cm long; cymes axillary, rather dense, many-flowered, rather richly branched, very short-pedunculate, the whole inflorescence not longer than the adjacent leaf, glabrous or minutely puberulent; bracts shortly deltoid; calyx short, 5 (rarely 4–) toothed; corolla creamy-white, tube and lobes about equally long, lobes usually 5, about 7.5×3 mm; throat pubescent; anthers linear, exserted, nearly as long as corolla-lobes; style rather thick, exserted, 7.5 mm long; fruit globose, 7–9 mm thick, with several to many seeds, reddish or purplish-black, crowned by calyx-remnant.—Fig. 97.

A widespread and quite variable species of Tropical Asia and the Pacific Islands,

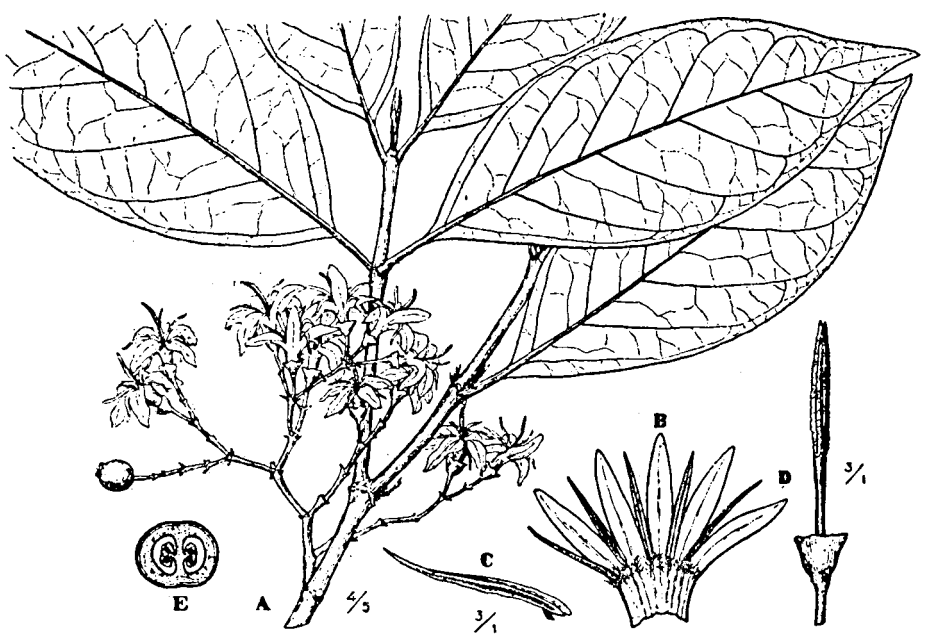

Fig. 97. Randia cochinchinensis.

east to Polynesia (not in Hawaii). It is characteristic of limestone and is absent from savannahs (though in Indonesia sometimes on rocky but not limestone soils). It is often found on seaward-facing rocky or sandy slopes, but is also scattered on the limestone mesa; in Taiwan it ascends to 1000 m. altitude. It occurs throughout Micronesia on the high islands.

Asdonlucas, S. of Yigo (4256); Harmon, NCS Beach Rd. (4275); Fena headwaters (4333); Barrigada Hill (4506), profusely flowering on 3 November 1962.

SPERMACOCE Linnaeus

Herbs with opposite leaves; stipules sheathing and fimbriate-lobed; flowers clustered and axillary; calyx-4-lobed; corolla 4-lobed, valvate; stamens 4, the filaments short, included; ovary 2-celled, cells 1-ovulate, style short, stigmas 2; fruit 2-valved, one cell opening, the other closed by the septum; seeds oblong with a longitudinal ventral groove.—Tropical America; 100 spp.

Spermacoce suffrutescens Jacquin, Hort. Schoenbr. 3: 40, t. 322. 1804.

Recognizable from the generic description.

An uncommon weed in Guam. I have not seen the plant; it may be an erroneous record intended for *Borreria laevis* which is *S. suffruticosa* Aucct. non R. Br.

TARENNA Gaertner

Trees or shrubs with opposite leaves with axillary domatia on the blades; stipules interpetiolar, persistent, entire, the costa of each stipule divided at its base; corymbs terminal; flowers bisexual, usually 5-merous; calyx-lobed often alternating with glands; stamens 5 (rarely 6) on very short filaments; ovary 2-celled, cells with many ovules; style exserted; stigmas 2 but tightly coherent; fruit a berry with many seeds.—370 or more Tropical species.—Trop. Afr., Mascarene Is. to Pacific Is.

Tarenna sambucina (Forster fil.) Durand ex Drake, Ill. Fl. Ins. Mar. Pac. 6: 190, 1890. SUMAC-LADA.

T. glabra Merrill 1914: 149 (not T. glabra Ridley, Journ. Fed. Malay States Museum 10: 141. 1920).

Stylocoryna sambucina A. Gray, Proc. Am. Acad. 4: 309. 1859.

Small tree, or shrub, to 6–8 m tall, with 4-angled younger branchlets, glabrous or minutely puberulent; leaves elliptic or ovate-elliptic, acute at both ends, 10–20 cm long, 5–9 cm broad, entire, on petioles (1)–2–3 cm long; lateral nerves usually 7 or 8 pairs; stipules deltoid, entire and persistent; flowers creamy-white, rather many, in terminal corymbose cymes; calyx about 2 mm long; corolla 6 mm long; villous within; style exserted 3.5 mm; berry globose, 5–6 mm in diameter, purplish-black, with about 8 seeds each 2 mm long.—Fig. 98.

Native in the Pacific Islands (Melanesia, Micronesia, and S. Polynesia). Uncommon in Guam, in the southern hills; Tolijus R.; Manengon (5150); Mt. Almagosa (*Pedrus, Stone* 4116–a).

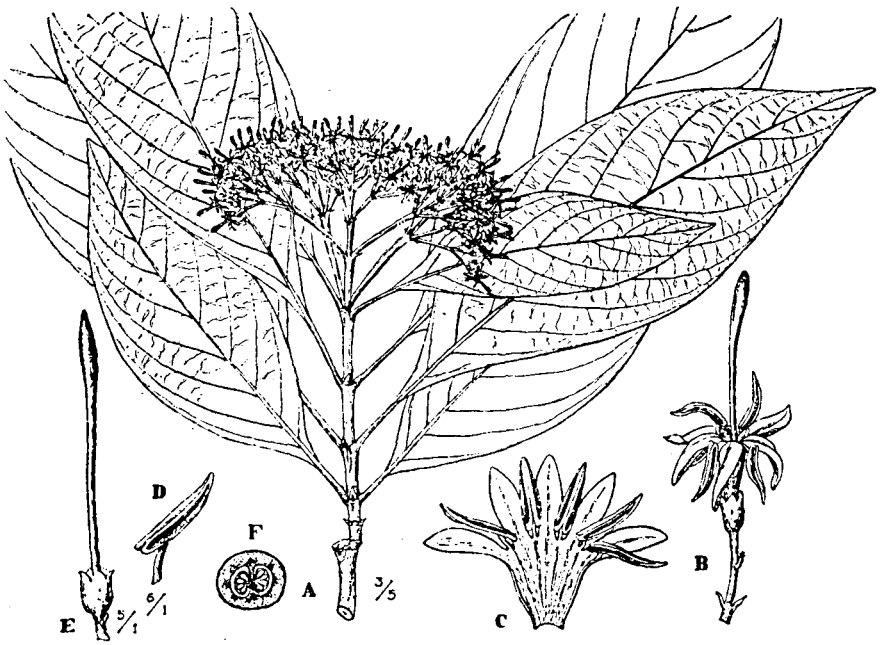

Fig. 98. Tarenna sambucina.

TIMONIUS DC. nom. gen. conserv.

Trees or shrubs with opposite leaves and entire caducous interpetiolar stipules; flowers unisexual, in axillary cymes or solitary on peduncles; pedicels bibracteolate; calyx 4–5-toothed or subtruncate; corolla 4–5 (rarely 6–12–)-lobed; anthers 4–5 (–12), subsessile, sterile in female flowers, slightly exserted in male flowers; ovary abortive in male flowers, 4–5(–12), subsessile, sterile in female flowers, slightly exserted in male flowers; ovary abortive in male flowers, 4–5(–12)-celled in female flowers; style pubescent, 4–12-fid, slightly exserted only in the female flowers; cells 1-ovulate; ovule pendulous; fruit a drupe with 4–12 pyrenes; seeds with scanty endosperm.—About 130 species of the Mascarene Is., Tropical Asia and the Pacific Islands.

Timonius nitidus (Bartling) F.—Villar, Novis. App. 109. 1880. Merrill 1919: 544.
MAHOLOC LAYU. SUMAC-LADA.

Petesia nitida Bartl. ex DC. Prodr. 4: 395. 1830.

A shrub to 2 m tall with dark elliptic leaves commonly 8–10 cm long, the midrib paler; petioles short (to 1 cm.). Flowers in axillary few-flowered (or 1-flowered) cymes; corolla cream to slightly yellowish. Fruit ripening dark purple-black, depressed-globose, under 1 cm wide.—Pl. 14c.

Endemic; known only from Guam, where it is a fairly common and characteristic treelet or big shrub of the southern volcanic hills and savannahs; never on the limestone mesa. Manengon (3812; 3857; 3838; 4850); Cetti Bay (3899).

CUCURBITACEAE

Climbing or trailing herbs with tendrils; leaves alternate, cordate, often lobed or angled; flowers generally 5-merous, unisexual; corolla cupular, saucershaped, or tubular; anthers sometimes connate; ovary inferior, usually 3-celled or 1-celled with 3 parietal.

A family of perhaps 90 genera, and 660 species; tropics and subtropics. Besides the 9 in Guam mentioned here, another occurs in Palau, *Trichosanthes*, with fimbriate petals.

Key to the local genera

A. Ovules and seeds several, horizontal,
  1. Anther-locules straight, the connective produced; flowers less than 1 cm. broad; fruit globose, purplish-black, less than 1 cm. wide; leaves thin, glabrous; flowers white..... *Melothria*
  1. Anther-locules vermiform conduplicate.
    2. Flowers white; male fls. with long calyx-tube; anthers mostly included; petiole biglandular at distal end..... *Lagenaria*
    2. Flowers yellow; male fls. usu. with short calyx-tube; anthers mostly exserted.
      3. Anthers not cohering; stamens borne near the rim of the calyx-tube.
        4. Corolla divided only about halfway, or less; flowers solitary. tendril divided ..... *Cucurbita*
        4. Corolla divided nearly to the base.
          5. Male flowers racemose; fruit cylindric, smooth or angled, opening at the end, fibrous..... *Luffa*
          5. Male flowers solitary; fruit ellipsoid, indehiscent fleshy ..... *Benincasa*
      3. Anthers more or less cohering; stamens borne below the rim of the calyx-tube.
        6. Fruit subglobose or oblong-cylindric, buff-colored, green, or flecked with brown on white; cultivated, usually trailing vines with hispidstems
          7. Male flowers crowded in groups on short pedicels; tendril simple..... *Cucumis*
          7. Male flower solitary; tendril divided..... *Citrullus*
        6. Fruit pyriform slender or ellipsoid, yellow, orange, or dull red, dehiscent; usually wild or naturalized; slender climbers with short pubescence; male flowers racemose and usually bracteolate..... *Momordica*

A. Ovule 1, pendulous..... *Sechium*

BENINCASA Savi

Pubescent annual vine with palmately 5-lobed leaves; tendril divided; flower large yellow, monoecious or bisexual; calyx campanulate, 5-lobed; corolla rotate, 5-lobed; stamens 3, inserted at rim of tube, free; nectaries within tube; female flower with 3 staminodes; ovary with 3 stigmas, 3 placentae. Fruit thick, hispid, indehiscent; seeds many, compressed.—Monotypic.

One species in Guam.

BENINCASA HISPIDA (Thunb.) Cogniaux, in DC. Monogr. Phan. 3: 513. 1881. Merrill 1914: 150.

B. cerifera Savi, Bibl. Ital. 9: 158. 1818.—Safford 1905: 197.

Cucurbita hispida Thunb. Fl. Japan. 322. 1774.

Herbaceous pubescent climber; leaves rounded-cordate, pubescent, palmately lobed with 5 or 7 lobes, to 25+ cm long; tendrils branched, slender, short; flowers yellow 8–10 cm long; male flowers long-pedunculate; female flowers subsessile; corolla limb about 5 cm wide; anther 4–5 mm long, 7–10 mm broad; fruit globose or oblong to 40 cm long, white, waxy, hairy when young, glabrate; white-fleshed; seeds several, central, oblong, smooth, 1 cm long.

This is thought to be a native of the Indo-Malayan region.

Cultivated for the edible fruit which may be boiled as a vegetable, or preserved with sugar as a kind of candy. The tender leaves are also edible. Growth is rapid; plants come into fruit about 4 months after sowing.

G.E.S. 157.

CITRULLUS Schrader

Monoecious, hispid or scabrous prostrate creeper; leaves deeply pinnatifid; tendrils branched; flowers pale yellow, campanulate, deeply parted; anthers free or nearly so; fruit very large, edible.—4 species of tropical Africa and W. Asia.

CITRULLUS LANATUS (Thunb.) Matsum. & Tanaka, Cat. Sem. Hort. Bot. U. Imp. Tokyo 30, 1916. WATERMELON. CHANDIA.

Citrullus vulgaris Schrader, ex Eckl. & Zeyh. Enum. 279.

Colocynthis citrullus (L.) O. Kuntze, Rev. Gen. 1: 256. 1891.

Cucurbita citrullus L. Sp. Pl. 1010. 1753.

Momordica lanatus Thunb., Fl. Capensis, 13. 1794.

Annual herbaceous villous creeper, prostrate. Leaves 8–20 cm long, scabrid, deeply pinnatifid, the lobes again pinnately lobes; pubescence harsh; tendrils bifid, pubescent; flowers axillary, short-pedicellate; male fl. greenish, 1.5 cm long; fem. fl. longer-pedunculate, 1.5 cm long; Fruit large rounded or oblong (to 25 cm diam. or more) green or patterned, flesh red, [rarely yellow], watery, sweet; seeds black, flattened, 4–6 mm long, soemtimes white-mottled.

Described from Africa; now widespread in cultivation.

The qualities of the fruit are almost too well known to mention.

CUCUMIS Linnaeus

Monoecious, scabrid or hispid annual or perennial trailing vines; tendrils unbranched; leaves simple, 3–7-lobed or -angled; flowers yellow, the male fls. in groups, stamens 3, the female fls. solitary; connective produced beyond anther cells; fruit fleshy, glabrous or pubescent or echinate.—About 30 species, African or a few Asiatic.

Two species in Guam.

1. Fruit not prickly, often grooved; odor musky.....*C. melo*
1. Fruit sometimes prickly, not grooved; odor not musky.....*C. sativus*

CUCUMIS MELO L. Sp. Pl. 1011. 1753. CANTELOUPE. MELON.

Annual trailing vine, hirsute; petiole 8–16 cm long; blade suborbicular or subreniform, villous, 8–15 cm long and wide, 5-angled or slightly 3–7-lobed. Fruit spherical-oblate, the skin roughened, buff-colored, or flecked with green. Flesh pale orange, moderately sweet or tart. Seeds 10–12 mm long, in a central cavity with fleshy placentas.—An Old World plant.

Apparently rare in cultivation in Guam. (4203).

CUCUMIS SATIVUS L. Sp. Pl. 1012. 1753.—Merrill 1914: 151. CUCUMBER. PEPINO.

Scabrid annual climber, or trailing; petiole to 20 cm long, hispid; leaves cordate, scarcely angled, unlobed or slightly 3–5-lobed, 12–18 cm long, 12–18 cm wide; villous on both surfaces; male fls. fasciculate; corolla 2–3 cm long; fem. fl. solitary or few; fruit slenderly oblong or cylindric, green-skinned, flesh green, 15–25 cm long; seeds whitish, oblong, 8–10 mm long.

Generally eaten as a salad vegetable, but can also be boiled. The basis of the best pickles, flavored with dill.

G.E.S. 2, MacGregor 453. A native of India. Common in cultivation.

CUCURBITA Linnaeus

Monoecious hispid annual vines; leaves cordate, 5-angled or palmately 5-lobed; tendrils branched; flowers solitary, yellow, petals joined to form a broadly campanulate corolla; stamens 3; ovary 1-celled, placentae 3–5; fruit fleshy, with a firm rind, edible.—About 20 species of tropical and warm temperate America.

Three species in Guam, in cultivation only.

1. Petiole with stiff sharp hairs beneath; lobes of calyx narrow subulate; leaves deeply 5-lobed with broad sinus between the lobes.....*C. pepo*
1. Petiole with soft hairs on both surfaces.
   2. Calyx-lobes narrow-subulate; leaves not deeply lobed, and sinus between the lobes narrow.....*C. maxima*
   2. Calyx-lobes broad spathulate; leaves variously lobed....*C. moschata*

CUCURBITA PEPO L. Sp. Pl. 1010. 1753. PUMPKIN.

Prostrate creepers, rarely somewhat erect. Tendrils usually branched. Leaves palmately 5-lobed, rather finely toothed, 10×10 cm, central lobe longest; flowers solitary, yellow; males 5–6 cm long; fruit orange-brown, spherical-oblate, sides

radially round-ridged; flesh orange. Young fruit eaten boiled; or, sweetened and with spices, in pumpkin pie.

Native of Tropical America (?); unknown in the wild state.

CUCURBITA MAXIMA Duchesne, in Lam. Encycl. 2: 151. 1786. Merrill 1914: 151.
SQUASH. KALAMASA.

Prostrate annual creeper; petiole to 15 cm long; blade shallowly 5-lobed, subreniform, 6–19 cm long, 7–20 cm wide; coarsely pubescent; margins denticulate; male flower 4–7 cm long on peduncle 10–17 cm long; fem. fl. on peduncle thickening in fruit to 7 cm long and thicker than stem. Fruit various in shape, rather fibrous; seeds ovate, 2–2.4 cm long, dull white.

G.E.S. 22. Occasional in cultivation.

CUCURBITA MOSCHATA (Duchesne) Poiret, Dict. Sci. Nat. 8: 234. 1818.
MUSK-SQUASH. KALAMASA.

Robust creeping annual. Leaves 5-lobed (some 6-lobed), to 16×24 cm; tendril much branched; calyx-tube 5–6 mm long, lobes broad, corolla pale yellow, 4 cm long; male fl. with anthers 1.5 cm long; fem. fl. solitary; peduncle stout, angled; fruit usually oblong, with median constriction, or oblate-globose, hollow inside, with large (12–13 mm) seeds; medium -sized fruits are 20 cm broad 12 cm long. Used primarily in soups; may also be cooked with banana slices in coconut milk-sugar liquid.

Native of Tropical America. There are many, strikingly different, forms.

LAGENARIA Seringe

Coarse annual vine; leaves ovate to orbicular, cordate, coarsely serrate; tendrils branched; petiole biglandular at junction with blade; flowers solitary, white; stamens 3; anthers somewhat coherent; fruit fleshy, becoming dry.—Six spp. paleotropical.

LAGENARIA SICERARIA (Molina) Standley, Field Mus. N.H. Bot. ser. 3: 435. 1930.
GOURD. TAGOA; KALAMASA.

L. vulgaris Ser. Mem. Soc. Phys. Genev. 3(1): 16. 1825.

L. lagenaria (L.) Cockerell, Bull. Torr. Bot. Club 19: 95. 1892; Safford 1905: 304.

L. leucantha (Duchesne) Rusby, Mem. Torr. Bot. Club 6: 43.—Merrill 1914: 151.

Annual herbaceous climber, with white flowers, petiole (often hollow) up to 30 cm long; blade cordate orbicular, angled or slightly 3-lobed, 10–40 cm long, and wide, soft; male fl. on peduncle about as long as petiole; calyx tube 2–3 cm long; corolla pubescent; 3–4 cm long; ovary densely villous. Fruit variously shaped, often flask- or bottle-like, the ripe fruit when dried with a firm, impervious skin, capable of holding water. Young fruits edible (but with a laxative effect if eaten in large amounts). Seeds with a medical value, white, somewhat rounded-deltoid, 1–2 cm long.

Rarely cultivated in Guam; Safford remarks that it is occasionally spontaneous.

I have not seen it either naturalized or in gardens.

LUFFA Adanson

Monoecious annual vines; leaves palmately 5–7-lobed or -angled; pistillate flowers solitary; staminate, flowers in racemes; petals almost completely distinct; stamens 3–5; anthers not coherent; ovary 3-celled; fruit becoming dry.—Eight species of Asian tropics.

Two species in Guam:

1. Fruit very narrowly obovoid, with generally 10 acute longitudinal ridges; leaves shallowly lobed; stamens 3.....*L. acutangula*
1. Fruit nearly cylindrical, smoothly rounded; leaves deeply lobed, or some shallowly lobed; stamens 5.....*L. cylindrica*

LUFFA ACUTANGULA (L.) Roxb. Hort. Bengal 70; Fl. Ind. 3: 713. 1824.
VEGETABLE SPONGE.

Annual climber; stems pentagonal, glabrous; leaves glabrous, rounded, 15–20 cm long and wide, rather shallowly lobed, and coarsely, shallowly toothed; tendrils forked; flowers yellow (pale), male + fem. together in same axil; male peduncle 10–15 cm long; corolla 2 cm long; fruit 10-angled 15–30 cm long; seeds 11–12 mm, black.

Widespread in Asian tropics. Rarely cult. in Guam.

When still unripe the fruit is edible; when ripe, and dried, the coherent fibrous skeleton may be used as a sponge and scouring cleaner. The black, wrinkled seeds should be sown on ridges of rich soil about 18″ apart; a trellis is required (horizontal) for the growing plants.

Luffa cylindrica (L.) Roem. Syn. Pepon. 2: 63. 1846. Merrill 1914: 151.

var. **insularum** (Gray) Cogniaux. VEGETABLE SPONGE. PACHODAG.

L. insularum Gray, Bot. U.S. Expl. Exped. 1: 644. 1854.

Annual climber, usually somewhat puberulent; stems pentagonal; leaves orbicular-ovate to subreniform, acuminate, base deeply cordate, blades to 20 cm long and nearly as wide, much longer than the petiole, 5–7-angled or lobed; flowers yellow, the male fls. terminal, grouped, on axillary peduncles; female fls. solitary. Fruit smooth or slightly ribbed, oblong-cylindric, to 30 cm long.

This plant may be used just like the previous species. It has a tendency to become naturalized. Pago Bay (4315). G.E.S. 409.

Widespread in Tropical Asia; the variety in the Pacific.

MELOTHRIA Linnaeus

Monoecious slender climbers; leaves deltoid-ovate, orbicular, or reniform; flowers usually clustered; corolla 5-parted; stamens 3; fruit ovoid or globose, indehiscent.—About 70 species in all warm or tropical regions.

One species in Guam.

Melothria guamensis Merrill, 1914: 151. (Solena). AHGAGA.

A slender glabrous climber or creeper, monoecious. Stems 1–2 mm thick.

Leaves thin, very thin and fragile when dry, orbicular, somewhat reniform, or slightly orbicular-ovate, 6–9 cm long, nearly as wide, the tip slightly acuminate, base cordate, with a broad, deep sinus, lobes rounded, margins sparsely and distantly apiculate-dentate, very slightly undulate between the teeth; blades dark green, the upper surface with numerous small whitish rough punctations, the lower surface smooth. Tendrils simple, up to 15 cm long. Petioles 3–5 cm long. Male flowers in racemes, axillary, 3–4 cm long, few-flowered, open; pedicels slender, 5 mm long; perianth campanulate, 8–10 mm long; calyx 5-lobed, 5 mm long, lobes only 1.5 mm long; corolla 5 mm long, white, lobes 5×3 mm, oblong-ovate, obtuse, margins minutely ciliate; corolla-tube very hairy within; stamens 3, anthers rounded, 1 mm long, filaments glabrous 2 mm long; apex of anthers minutely ciliate. Fruit fleshy globose, dark purplish-black when ripe; about 1 cm broad; seeds numerous, flat, elliptic-obovate, about 4×2 mm and 0.5 mm thick, margins obscurely thickened.

Type: G.E.S. 11, Tumon. An endemic species; near coasts on limestone, usually low and often in partial shade, creeping or somewhat climbing (never very high).

Ritidian Point (4700); Tumon Bay cliffs (4997).

MOMORDICA Linnaeus

Monoecious slender climbers; leaves cordate, palmately 5–7-lobed, lobes undulate or coarsely toothed; flowers yellow or white; pistillate fl. solitary, its peduncle bearing a large bract; staminate fls. single or racemose; corolla deeply lobed; anthers free; fruit rugose or echinate, dry, some dehiscent; aril red.—35 species of Africa & Asia.

One species in Guam.

Momordica charantia L., Sp. Pl. 2: 1009. 1753.

Safford 1905: 326. Merrill 1914: 152.

ALMAGOSA. BALSAM-APPLE; BITTER-MELON. ATMAGOSO.

Herbaceous, slender climber with slightly pubescent stems and leaves; petiole= blade; leaves to 10–12 cm long, palmately 5–7-lobed; the lobes ± sinuate-dentate; flowers yellow; peduncle with a reniform bracteole; corolla 1.5–2 cm long; fruit oboid or oblong-cylindric, coarsely ridged and bumpy-tuberculate, to 20 cm, orange or dark yellow when ripe, splitting open to reveal the seeds, these black but covered with a soft, fleshy red aril, 12–16 mm long.

Cultivated and naturalized; very common. The better forms have fruits up to 9″×2″, but the spontaneous plants generally bear far smaller ones. The fruits are eaten (though they must first be soaked in brine), and also (with other parts of the plant) are considered a tonic.

Camp Quezon (4124), and observed throughout the island. G.E.S. 21. MacGregor 468. Widespread, semi-cultivated, in many warm countries.

SECHIUM P. Browne
[Chayota, Jacquin]

Herbaceous climbers; leaves entire or angular; tendril 3–5-fid; monoecious; 3 anthers free, but filaments united into a columnar synandrium; style 1; fruit fleshy; seed 1, *pendulous*.—Monotypic; Central American.

SECHIUM EDULE (Jacquin) Swartz, Fl. Ind. Occ. 2: 1150. CHAYOTE.

Chayota edulis Jacq. Am. Sel. ed. pict. t. 245. 1780.

Perennial climber; somewhat resembling the cucumber plant; leaves slightly rough, broadly cordate entire or somewhat angled 10–20 cm long; staminate flowers pale green, in long racemes; pistillate fls. solitary; corolla 12–17 mm broad; ovary 5-grooved; fruit pyriform, (*containing one seed*), pale green to white, in some forms set with soft spines, with a few shallow, narrow, longitudinal grooves, usually slightly bumpy, 7–20 cm. long.

The fruits are eaten, usually boiled. The root also is edible. Well-tended plants may provide fruit yearly for many years. A large horizontal trellis, and soft, fertile soil, are required.

CAPRIFOLIACEAE

Trees, shrubs, herbs, or climbers; leaves opposite, simple or compound; stipules present or not; flowers in panicles or corymbs or solitary or paired, terminal or axillary; calyx usually 5-lobed; corolla usually 5-lobed, regular or bilabiate; stamens 5, inserted on the corolla, alternating with its lobes; anthers 2-celled; ovary inferior or half inferior, 1–5-celled, cells 1-several-ovulate, ovules pendulous; fruit a drupe or berry; seeds with endosperm.—About 18 genera and 300 species chiefly in the Temperate regions of the N. hemisphere; none native in Micronesia. Perhaps best known for the honey suckle (*Lonicera*).

SAMBUCUS Linnaeus

Small to arborescent shrubs or large herbs; leaves pinnately compound with serrate leaflets; petioles sometimes beset with disc-like glands; flowers inconspicuous but crowded in large umbellate corymbs; calyx 3 to 5-toothed; corolla rotate campanulate, 3–5-lobed, white to yellowish or reddish; stamens 5; ovary 3–5-celled; style short, 3-lobed; ovule solitary in each ovary-cell; fruit drupaceous, 3–5-seeded.—About 30 species, in N. temperate zone countries, extending into some Tropical mountains.

SAMBUCUS MEXICANA Presl, ex DC. Prod. 4: 322. 1830.

var. BIPINNATA (Schlecht. & Cham.) Schwerin (?)
(Fosberg ined.) MEXICAN ELDER.

Arborescent, at last reaching 10 m high; leaves with 2 to 4 pairs of leaflets plus the terminal leaflet, these narrowly elliptic or elliptic-ovate, serrate, acute-acuminate, up to about 9–10 cm long, the lowest leaflets sometimes themselves compound (often only on the proximal side); petiolules to 1 cm long; corymbs dense, sometimes 24 cm wide; flowers creamy-white; berry purplish-black, 5 mm thick,

subglobose, usually 4-seeded.

Native of Mexico. Cult. shrub. Yoña (5065); Mangilao (5161). The variety is doubtful.

LOBELIACEAE

Trees with soft wood or shrubs or herbs; sap usually a milky latex; leaves alternate or spiralled, simple, entire or serrate, rarely pinnately lobed or even 1-pinnate; stipules none; flowers perfect or unisexual; calyx 5-lobed; corolla strongly or moderately zygomorphic, uni- or bilabiate, resupinate, 5-lobed; stamens 5, the anthers mutually united to form a tube embracing the apex of the style; ovary inferior, adnate to calyx, usually 2-celled (rarely 1- or 3-celled); style simple or bilobed; ovary cells many-ovulate; fruit a berry or capsule; seeds endospermous, numerous.—About 20 genera and over 600 species, chiefly Tropical or Subtropical; none native in Guam.

LAURENTIA Michaux ex Adanson

Herbs with milky sap; leaves spiralled, dentate or pinnatifid; flowers solitary in axils, scarcely zygomorphic; calyx 5-lobed; corolla long-tubular with spreading limb, the 5 lobes subequal; stamens 5, inserted on the corolla; stigma 2-lobed; fruit a capsule, dehiscing by 2 pores; seeds ribbed.—About 28 spp., Trop. Amer., Medit., Afr., Australia.

Laurentia longiflora (L.) Peterm. Pflanzenr. 444, t. 118, f. 665. 1845.

STAR-OF-BETHLEHEM

Hippobroma longiflora (L.) G. Don, Gard, Dict. 3: 717. 1834.

Isotoma longiflora (L.) Presl, Prod. Mon. Lob. 42. 1836.

Herb with rosette of narrow sessile oblanceolate coarsely pinnatilobed leaves mostly 10–15 cm long, up to 3–4 cm wide near apex; flowers white, on 2 cm pubescent pedicel; calyx to 3 cm long; corolla usually 8–11 cm long, plus the 2–2.5 cm long lobes; anthers apically bearded; capsule campanulate, pubescent, 2-celled, nearly 2 cm long, over 1 cm thick; seeds many, ovate, reticulate, light brown, minute.

A native of the West Indies, now rather common in tropical regions, weedy. This is attractive and sometimes planted; in some localities weedy, as at Barrigada, by road, (4267). The milky sap is very poisonous, and may be lethal; cattle have been killed by eating the plants.

GOODENIACEAE

Shrubs or herbs with simple spiralled leaves; stipules none; flowers axillary, solitary or in inflorescences, strongly zygomorphic; calyx 5-lobed; corolla 5-lobed, but split along one side and appearing somewhat flattened; stamens 5, free; ovary superior, half-inferior, or inferior, 2-celled; cells 1-many-ovulate; style simple; fruit a drupe or capsule with flat, endospermous seeds.—About 13 genera and 300 species, of extreme South America, New Zealand, Australia, the Pacific Islands,

and Tropical Asia, with one species in the Caribbean region.

SCAEVOLA Linnaeus

Shrubs or fleshy herbs; leaves mostly entire, or slightly serrate; flowers solitary or in forking cymes; calyx-lobed linear or reduced; corolla white or bluish-purplish, the lobes marginate, tube split to the base on one side; stamens epigynous; ovary inferior, the 2 cells with solitary ovules (or rarely 1-celled); stigma surrounded by a ciliate cuplike structure (involucre or indusium); ovules erect: drupe thin—fleshy, with bony 1–2-seeded endocarp.—About 80–90 species, one Caribbean (S. Plumieri), the remainder Pacific-Asiatic.

Scaevola taccada (Gaertner) Roxburgh, Fl. Ind. 1: 527. 1820. St. John, Taxon 9: 200. 1960. NANASO.

Lobelia Taccada Gaertn. Fruct. sem. Pl. 1: 119, t. 25, f. 5. 1788.

Scaevola sericea Vahl, Symb. Bot. 2: 37. 1791; Fosberg & Sachet, Taxon 5: 7–10, 1956.

S. sericea var. *taccada* Makino, Bot. Mag. Tokyo 18: 68. 1904.

S. frutescens (Miller) Krause, Planzenr. 4, 277: 125. 1912. (sensu Krause non Miller); Merrill 1914: 152.

S. Koenigii Vahl, Symb. Bot. 3: 36. 1794.

Lobelia koenigii (Vahl) Wight ex Safford 1905: 310.

S. frutescens var. *sericea* (Forster) Merrill, Philipp. J. Sci. Bot. 7: 354. 1912. [Based on S. sericea Forst., nom. nud., Prodr. 89. 1786.]

Bela-Modagam, Rheede t. v. Drakenstein, Hort. Malab. 4: 131. 1673 [1683]. [Plate is type].

Erect branching somewhat succulent soft-wooded pithy-stemmed glabrous to pubescent shrub; leaves slightly fleshy, green or the midvein dorsally faintly purplish, spiralled, crowded, obovate, glabrous or somewhat puberulent, 10–20 (–25) cm long, 4–10 (–12) cm wide, venation obscure, apex rounded or emarginate; base cuneate or decurrent, short-broad-petiolate, petiole with basal tuft of silky white hairs; cymes 3–9-flowered; calyx lobes 5 mm long; corolla white or tinged purplish (on veins), the tube 1–1.5 cm long, limb spreading; throat villous; style to 2 cm long; fruit white, dry-fleshed, subglobose about 1 cm thick; seeds 1 or 2 (rarely lacking).—Pl. 14d.

Native on rocky or sandy coasts from India east to Polynesia, north to Hawaii. In Guam found both along the coasts and in the interior in savannah areas, variable—glabrous or pubescent (sometimes villous or velvety-tomentose); flowers pure white varying to faintly purple or with conspicuous purple veins; midribs of leaves green or purplish. The variation would make an interesting topic for analysis.

Manengon (4208; both flowers and stems purplish); (4225, flowers white, leaves glabrous; 4224, flowers white, leaves pubescent).

COMPOSITAE

Trees, shrubs, herbs, or woody or herbaceous climbers; leaves alternate or

opposite, simple or compound, entire or variously lobed, toothed, parted or sinuate; stipules absent; flowers borne in heads (*capitula*) subtended by an involucre of seriate free or connate bracts; sometimes capitula of only one flower; receptacle convex or flat, sometimes concave; receptacular bracts usually present; flowers (*florets*) of 2 kinds, one or both kinds present in the capitulum, *ray-florets* ligulate, i.e. the corolla split along one side, more or less flattened, often enlarged and specially colored, these generally peripheral; *disc-florets* tubular, corolla merely toothed or lobed, usually regular, these generally central; florets perfect or unisexual, sometimes dioecious, the disc- and ray-florets often differing sexually; calyx present as a *pappus* of filaments or bristles; corolla 4–5-lobed, valvate, sometimes bilabiate; stamens 5 (rarely 4), inserted on the corolla, with free filaments, but the anthers laterally connate and forming a tube surrounding the style (or very rarely free), 2-celled, longitudinally dehiscent; ovary inferior, 1-celled, with 1 erect ovule; style bifid and usually with pilose stigmatic regions; fruit an achene, 1-seeded, often capped by the plumose pappus; seed without endosperm.—A very large World-wide family of about 900 genera and 13,000 species, divided into 13 tribes (some of which have been regarded on occasion as separate families). Alternate name: Asteraceae.

There are 32 genera reported from Guam (usually represented by but a single species); however only 3 can be considered indigenous while another 15 genera are fairly frequently encountered as naturalized weeds. The remaining 14 genera are found only in cultivation, or are weedy but quite rare.

Indigenous genera: *Adenostemma; Glossogyne; Wedelia.*

Naturalized weeds; *Ageratum; Bidens; Conyza; Crassocephalum; Eclipta; Elephantopus; Emilia; Mikania; Pluchea; Pseudelephantopus; Synedrella; Tridax; Vernonia; Youngia.*

Naturalized but rare weeds: *Artemisia; Blumea; Erigeron; Eupatorium; Sonchus.*

Cultivated: *Artemisia; Aster; Chrysanthemum; Coreopsis; Cosmos; Cynara; Gaillardia; Lactuca* [also occasionally weedy]; *Tagetes; Zinnia.*

Local Genera Arranged in Tribes

ANTHEMIDEAE

Chrysanthemum, Artemisia.

ASTEREAE

Aster, Erigeron, Conyza.

CICHORIEAE

Sonchus, Lactuca, Youngia.

CYNARAEAE

Cynara.

EUPATORIEAE

Adenostemma, Ageratum, Eupatorium, Mikania.

HELENIEAE

Gaillardia, Tagetes.

HELIANTHEAE

Eclipta, Tithonia, Wedelia, Zinnia, Synedrella, Coreopsis, Bidens, Glossogyne, Cosmos, Tridax.

INULEAE

Blumea, Pluchea.

SENECIONEAE

Crassocephalum, Emilia.

VERNONIAE

Elephantopus, Pseudelephantopus, Vernonia.

Key to local Tribes

1. Heads bearing ray-florets only, no disc-florets present; sap often milky or bitter..... CICHORIEAE
1. Heads bearing disc-florets; sap not milky.
   2. Corolla cleft into slender elongated lobes; ray-florets none; anthers basally with tail-like appendages; leaf-margins usually spiny.....CYNAREAE
   2. Corolla-lobes mostly short, deltoid; anthers not basally appendaged, or the appendage short, not tail-like; ray-florets present, or not; leaf-margins usually not spiny.
      3. Pappus of numerous soft slender usually white bristles, fluffy ....SENECIONEAE
      3. Pappus otherwise,
         4. Inner bracts of involucre mostly scarious,
            5. Pappus none or of scales; anthers not caudate; usually strongly scented plants.....ANTHEMIDEAE
            5. Pappus of bristles; anthers caudate; usually not scented... ..... INULEAE
         4. Bracts of involucre not scarious (or only their margins),
            6. Each disc-floret subtended by a chaffy bract, (or at least all the peripheral disc-florets so subtended).... ..... HELIANTHEAE
            6. Receptacle usually naked, devoid of chaffy bracts,
               7. Style-branches clavate; ray-florets absent; stigmatic surface dorsal.....EUPATORIEAE

7. Style-branches not clavate; ray-florets present or not;
   8. Style-branch with linear dorsal stigmatic surface extending to extreme tip; bracts of involucre usually 1-seriate.....HELENIEAE
   8. Style-branch with a dorsal-marginal stigmatic line on each side, but not extending to the extreme tip; bracts of involucre several-seriate and imbricate
      9. Ray-florets present; corolla white, yellow, or other colors; style-branch flattened, hairy at tip.....ASTEREAE
      9. Ray-florets absent; corolla white or purplish; style-branches terete, puberulent... ..... VERNONIEAE

Key to local genera by Tribes

ANTHEMIDEAE

1. Heads small, yellow-green, in axillary and terminal spikelike panicled branches, nodding; leaves densely white-woolly beneath.....*Artemisia*
1. Heads large, conspicuous, showy, terminal, solitary or corymbose, yellow, white, purplish, etc., up to 20 cm wide, erect; leaves grayish-pubescent beneath ..... *Chrysanthemum*

ASTEREAE

1. Ray-florets absent (in ours).....*Conyza*
1. Ray-florets present,
   2. Style-branches acute; cultivated ornamentals, involucre of unequal bracts ..... *Aster*
   2. Style-branches deltoid obtuse; weeds; involucre of subequal bracts..*Erigeron*

CICHORIEAE

1. Achenes beaked, ribbed; heads with up to 30 florets.....*Lactuca*
1. Achenes not beaked; heads with 5–30 florets (Youngia) or up to 100 (Sonchus)
   2. Achenes laterally compressed; leaves alternate, the upper leaves amplexicaul.....*Sonchus*
   2. Achenes terete or angled; leaves in basal rosettes below, alternate above ..... *Youngia*

CYNAREAE

One genus present.....*Cynara*

EUPATORIEAE

1. Erect herbs or with rambling branches, but not twining; leaves pinnate-nerved.
   2. Pappus of scales; involucre of bracts in 1–3 series,
      3. Pappus of 3 or 4 clavate viscid scales; involucral bracts in 1 or 2 series..... *Adenostemma*
      3. Pappus of 5 awned serrate often basally connate scales; involucral bracts in 2 or 3 series..... *Ageratum*
   2. Pappus of hairs; involucre of bracts usually in more than 3 series.. *Ageratum*
1. Twining vines with palmately nerved cordate leaves. Heads of only 4 florets ..... *Mikania*

HELENIEAE

1. Corolla of ray-florets with a palmately toothed ligule; pappus scales 10, awn-tipped; upper leaves alternate; involucral; bracts free, usually more than 1 series..... *Gaillardia*
1. Corolla of ray-floret with obovate ligule; pappus scales not awned; leaves opposite; involucral bracts connate-cupular, in 1 series..... *Tagetes*

HELIANTHEAE

1. Pappus none (although achene may be awned).
   2. Ray-florets sessile, indurated and persistent on the achene; leaves entire ..... *Zinnia*
   2. Not so, marginal flowers caducous after anthesis,
      3. Chaffy-bracts embracing the disk-florets or achenes..... *Wedelia*
      3. Not so,
         4. Leaves simple, entire or dentate; ray-florets many, slender, 2-seriate, white..... *Eclipta*
         4. Some or all leaves pinnate or at least deeply pinnatisect.
            5. Achenes beaked; awns 2–3, retrorsely barbed; leaves pinnate or bi-tri-pinnate with filiform segments; ray-florets pink, purple, orange, or white..... *Cosmos*
            5. Achenes not beaked; awns 2–4, barbed; leaves with broad leaflets, or narrow lobes; ray-florets white or yellow.
               6. Awns 2–4, retrorsely barbed; achenes not winged.
                  7. Leaves divided into narrow lobes; ray-florets pistillate..... *Glossogyne*
                  7. Leaves of broad, ovate, toothed leaflets; ray-florets neuter if present..... *Bidens*
               6. Awns none; leaves bi-tri-pinnate with narrow segments ..... *Coreopsis*
1. Pappus present,
   7. Prostrate herb with accumbent flowering stems; ray-florets white, pistillate; pappus of plumose hairs..... *Tridax*

7. Otherwise; pappus of scales or bristles, or cupular,
   8. Chaffy bracts embracing the disc-florets or achenes
      9. Leaves opposite, not lobed..... *Wedelia*
      9. Leaves alternate, lobed..... *Tithonia*
   8. Chaffy bracts not embracing the disc florets or achenes,
      10. Leaves 1–3 times pinnate; ornamentals..... *Coreopsis*
      10. Leaves simple; weeds..... *Synedrella*

INULEAE

1. Disc-florets staminate, with a simple or merely bifid style and rudimentary ovary..... *Pluchea*
1. Disc-florets perfect, with normal elongate style-branches and functional ovary ..... *Blumea*

SENECIONEAE

1. Involucral bracts in one series ..... *Emilia*
1. Involucral bracts 2-seriate, outer ones much shorter ..... *Crassocephalum*

VERNONIEAE

1. Heads terminal, solitary or few in a cluster, pedunculate; involucre campanulate; corolla 5-lobed, actinomorphic..... *Vernonia*
1. Heads terminal or axillary, solitary or several to many together, all sessile; involucre oblong; corolla 5-lobed, somewhat zygomorphic.
   2. Heads many together, terminal; involucral bracts foliaceous; pappus-hairs straight..... *Elephantopus*
   2. Heads few (1–6) together, axillary, spicate; involucral bracts narrow, lanceolate; pappus-hairs unequal, the 2 longest ones S-curved at apex.. ..... *Pseudelephantopus*

Tribe ANTHEMIDEAE

ARTEMISIA Linnaeus

Shrubs or herbs with alternate, often dissected, bitter-pungent leaves; heads in panicles of spikelike branches, small, heterogamous; ray-florets none; disc-florets at periphery pistillate, central ones perfect or staminate; involucral bracts in several series, inner ones longer; receptacle flat or convex, glabrous or pubescent, naked (devoid of chaffy bracts); corolla 5-lobed (or in peripheral florets 2–3-lobed); anthers obtuse at base, acute at apex; style bifid or in staminate florets simple; achenes oblong or ovoid, ribbed or striate; pappus usually lacking.—About 250 species, chiefly of the N. hemisphere, particularly in dry regions.

Artemisia vulgaris L. Sp. Pl. 848. 1753. Safford 1905: 188. Merrill 1914: 153.

YERBA DE SANTA MARIA. MUGWORT.

Perennial herb; young stems woolly-pubescent, often purplish; leaves pungent-aromatic, dorsally densely woolly-pubescent (white arachnoid hairs), pinnately

dissected into oblanceolate toothed slender segments; sessile; blades to 10 cm long; segments to 1–7 mm wide; heads small, crowded in axillary and terminal narrow panicles, sessile, yellowish-green, about 4 mm long, with about 12 (5–20) disc-florets; corolla 1–2 mm long; achenes glabrous.

A native of Europe, widely cultivated for its aromatic foliage used in cooking. It is closely related to the wormwood (*A. absinthium*) formerly used in the alcohol drink *absinthe*, still used in *vermouth*. McGregor 423.

CHRYSANTHEMUM Linnaeus

Shrubs (rarely) or herbs with alternate leaves; heads solitary or in corymbs, terminal; usually heterogamous; ray-florets and disc-florets present; ray-florets pistillate; disc-florets perfect; involucral bracts in 3 or more series, broadly scarious-margined; receptacle naked; corollas usually yellow; anthers basally obtuse, apically acute or obtuse; style-branches truncate; achenes glabrous; pappus absent or of a ring of short scales.—About 200 spp. of Asia, Africa, Europe, and America.

CHRYSANTHEMUM MORIFOLIUM Ramatuelle, J. Hist. Nat. Paris 2: 240. 1792.

ROSAS DE JAPAN. MANZANILIA. YERBA DE SANTA MARIA.

C. indicum sensu Safford 1905: 225; et. sensu Merrill 1914: 153 (non L.)

Aromatic perennial cultivated ornamental herb; leaves ovate, pinnatifid with serrate segments, basally cuneate, greyish-pubescent dorsally, on petioles 1–2 cm long; blades 5–15 cm long; heads corymbose, 3–20 cm wide; involucre hemispherical; bracts pubescent, to 1 cm long or more; florets many; corolla white, yellow, pink, or purplish; receptacle convex, naked; pappus none.

Ancient E. Asian cultivar widespread now in cultivation. G.E.S. 326. Many garden forms are known, differing in size, color, and amount of doubling of the flowers.

Tribe ASTEREAE

ASTER Linnaeus

Perennial (rarely annual) herbs, the stems branched and leafy or sometimes scapose, leafless; leaves alternate, entire or lobed; heads with both ray- and disc-florets, corymbose or solitary; involucre of 3–4-seriate imbricate bracts; receptacle nearly flat, naked; ray-florets white or purple, pistillate, 1–2-seriate; disc-florets many, bisexual, yellow, regularly 5-toothed; anthers blunt at both ends; style-branches flat, deltoid or lanceolate; achenes compressed, 4-angled, obovate, ribbed; pappus of hairs or bristles in 1 or 2 series, scabridulous.—Several hundred chiefly N. hemisphere species, a few also in Africa and S. America.

ASTER NOVI-BELGII L. Sp. Pl. 877. 1753. ASTER.

Erect, tufted, glabrous-stemmed ornamental herb with the cauline leaves sessile, or the lowermost slightly petiolate, oblong, linear, to oblanceolate, entire or slightly dentate-serrate, the higher leaves clasping the stem, acuminate, glabrous, somewhat glaucous, 5–16 cm long, 1–3.5 cm wide; heads many, pedunculate, in corymbose panicles, 2.5–3.5 cm wide; bracts of involucre acuminate-lanceolate, 5–7 mm long;

ray-florets pale or medium purple, corolla 3-fid, about 13 mm long; disc-florets with yellow corolla; achenes 1.5 mm long, glabrous; pappus of dull white hairs 5–6 mm long.

Native of North America, common as a cultivated ornamental herb in various countries.

ERIGERON Linnaeus

Perennial or animal herbs with erect sometimes branched stems and alternate, entire or dentate, mostly sessile leaves; heads terminal, solitary, in panicles or solitary, with or without ray-florets, always with disc-florets; heterogamous; bracts of involucre equal, 1-seriate, (or very rarely in several series, linear-lanceolate, inner ones longer); ray-florets (when present) pistillate, white or bluish-purple; receptacle flat, naked; discflorets with 5-lobed corolla, bisexual, yellow; anthers entire at base, apically acute; style-branches obtuse at tips; achenes flat, 4-angled, elliptic or obovate, usually pubescent on the margins; pappus bristles in 1 (rarely 2) series, slender, scabridulous.—About 150 species, mostly of temperate regions.

Erigeron annuus (L.) Persoon, Syn. 2: 431. 1807.

Annual herb to 1 m tall, coarsely hirsute, branched distally; lower leaves ovate or ovate-lanceolate, 4–15 cm long, 1.5–3 cm wide, pubescent on both surfaces, coarsely dentate, membranous, narrowed at base and decurrent on the winged petiole; upper leaves lanceolate, acute at both ends, dentate; heads corymbosely disposed, about 2 cm broad; involucres pilose; ray-florets purplish to white, linear, 7–8 mm long, scarcely longer than the involucre.

A North American weed introduced to Guam by accident and now more or less naturalized, though not common.

CONYZA Linnaeus

Shrubs or herbs with alternate mostly sessile leaves; heads corymbose or paniculate, heterogamous; ray-florets if present pistillate, or absent; marginal disc-florets pistillate; central disc-florets bisexual; involucre campanulate, bracts inwardly longer, linear-lanceolate, acute, in 2–4 series; receptacle naked, glabrous, or pubescent; corolla of marginal flowers segmented into capillary lobes; disc-florets 5-toothed; anthers entire or obscurely indented at base; style-branches obtuse or subacute, flattened; achenes laterally compressed; pappus hairs or bristles 1–2-seriate, denticulate, sometimes basally shortly connate.—More than 50 species, largely subtropical, some temperate.

1. Involucre 4–5 mm long; receptacle (of fruiting head) 2–4 mm wide..... ..... *C. bonariensis*
1. Involucre about 3 (2.5–4) mm long; receptacle (of fruiting head) 1.5–2.5 mm wide..... *C. canadensis*

Conyza bonariensis (L.) Cronquist, Bull. Torrey Bot. Cl. 70: 632. 1943.

Annual herb to 50 cm high or more, pubescent, with the lower leaves oblanceolate, more or less coarsely dentate; upper leaves linear; heads in racemes or

racemose panicles; involucre gray-pubescent, about 5 mm long; ray-florets usually rather many, white, with the corolla shorter than the pappus.

A pantropic weed described from S. American material.

Conyza canadensis (L.) Cronquist, l.c. supra.,

var. *pusillus* (Nuttall) Cronquist, ibid.,

Erigeron pusillus Nuttall, Gen. 2: 148. 1818.

Conyza parva Cronquist, Bull. Torrey Bot. Club 70: 632. 1943.

Erect herb to 1 1/2 m tall; basal leaves oblanceolate; upper leaves linear, entire, ciliate at base, up to 10 cm long; heads numerous, filiform-pedunculate, in elongated axillary racemes combined into a terminal panicle; involucre 2.5–4 mm long, the bracts somewhat puberulent, with narrow scarious margins and a purplish apical spot; florets rather few, white, very small; achenes smooth, less than 1 mm long, the pappus 3 mm long.

A native of N. America, now widespread as a weed. Very common in waste ground in Guam, especially on limestone. Many plants seen in Guam were fasciate-stemmed, i.e. there was a bilateral expansion of the stem, and fusion with its branches; and frequently these plants had such stems over 5 cm wide though only 6 mm thick. Plants are highly variable in size also, some reaching nearly 2 m height, others flowering when only 3 cm tall. Mangilao (3788); Agaña (4239).

Tribe CICHORIEAE

LACTUCA Linnaeus

Herbs with thinly milky sap; leaves in rosettes or on stems; heads homogamous, panicled or corymbose, with perfect florets, all ray-florets, disc-florets none; involucre tubular-cylindric; bracts in few series, imbricate, scarious-margined, inner ones longer; corolla yellow or purplish, 5-fid; anthers sagittate and caudate at base, obtuse at apex; style-branches short, pubescent; achenes beaked, compressed, ribbed, pappus of many fine minutely barbellate hairs in several series.—About 70 species of the N. hemisphere in temperate regions, a few on tropical mountains.

LACTUCA SATIVA L. Sp. Pl. 795. 1753. LETTUCE.

Herb with basal rosette of sessile oblong-obovate rounded cordate dentate leaves mostly 5–15 cm long and 2.5–10 cm wide, and cauline leaves on the glabrous pale stem mostly narrower; heads corymbose, about 8-flowered, about 1.5 cm long; involucre of blunt lanceolate bracts; corolla exserted; achenes compressed, ribbed, 4 mm long with beak about the same length; pappus 3 mm long.

Native of Europe, cultivated widely for the edible leaves; rather variable. A waif, escaped from occasional cultivation in Guam, but ephemeral.

SONCHUS Linnaeus

Herbs with alternate leaves, usually amplexicaul, and milky sap; heads homogamous, pedunculate, paniculate, corymbose, or umbellate; involucre campanulate, the bracts lanceolate, imbricate in many series; florets all perfect; disc-florets none; receptacle flat, naked; corolla yellow, 5-fid; anthers caudate basally, blunt apically;

style-branches filiform; achenes somewhat compressed, 10–20-ribbed, slightly narrowed toward each end, glabrous; pappus of many slender white hairs connate at base and caducous.—About 45 species, chiefly of the Old World temperate regions, Europe and Asia, also N. Africa; a few widely distributed.

Sonchus oleraceus L. Sp. Pl. 794. 1753. Merrill & Perry 1946: 325.

Annual or longer-lived herb, to 50(–100) cm high, unbranched or with a few branches, glabrous or nearly so, stems often hollow; leaves at base oblong-oblanceolate, pinnately parted, spine-toothed, 15–50 cm long, 5–8 cm wide; middle and upper leaves sessile, basal ones with winged petiole; heads about 2 cm wide; corolla about 1 cm long; achenes slender obovate, about 2.5–3 mm long, transversely scabrously ribbed; pappus about 6–6.5 mm long.

Native of N. Europe, N. Africa, N. Asia, widely naturalized. Occasional but ephemeral in Guam in moist waste ground.

YOUNGIA Cassini

Herbs, with milky sap, usually branched, with both basal rostte-leaves and alternate cauline leaves; heads homogamous, paniculate-corymbose; involucre tubular-campanulate, with bracts in 2 series, the inner ones longer; receptacle flat, naked, and glabrous; disc-florets none; all florets ligulate and perfect; corolla yellow, 4–5-fid; anthers caudate at base, obtuse at apex; style-branches filiform and obtuse; achenes linear-oblong, terete or angled, ribbed, usually not beaked; pappus of

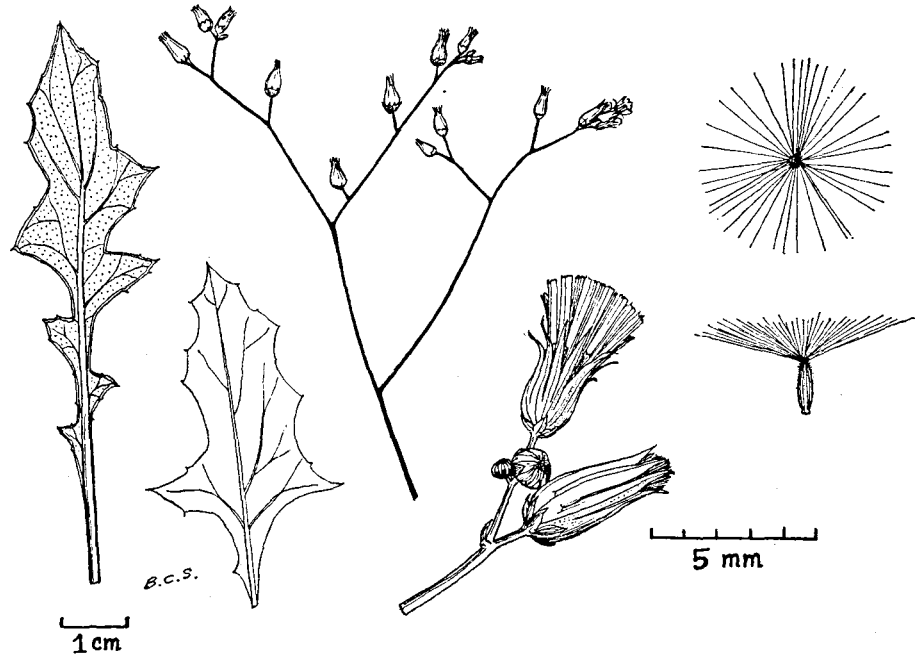

Fig. 99. Youngia japonica.

many slender hairs, caducous individually or persistent.—About 50 species in N. Asia, also India and Australia.

Youngia japonica (L.) DC. Prod. 7: 194. 1838.

Erect, pubescent herb, the leaves mostly in basal rosett, stem with a few cauline leaves; basal leaves petiolate, oblanceolate, pinnately parted, lyrate, finely dentate, usually puberulent, about 3–15 cm long and up to 5 cm wide, the terminal lobe largest; cauline leaves usually only 1–3, subsessile, much smaller; heads several to many in a panicle, 7–8 mm wide; involucre 5–6 mm long, with about 8 inner (longer) bracts; florets about 10–25; corolla about 5–6 mm long, yellow; achenes brown, about 1.8 mm long, with slender scaberulous ribs; pappus soft, white, 3 mm long, persistent.—Fig. 99.

Native of E. Asia, Malaysia, India, to Australia and some Pacific Islands. Probably introduced in Guam, where it is found usually in shady spots near houses. Harmon Village (4070).

Tribe CYNAREAE

CYNARA Linnaeus

Erect herbs with alternate pinnately-tripinnately parted spiny leaves; heads terminal and axillary, homogamous, solitary; involucre subglobose; florets all perfect; receptacle flat, densely long-pilose; corolla tube with 5 linear lobes; anthers sagittate at base, obtuse at apex; style-branches acute; style distally with a ring of hairs just below the branches; achenes glabrous, compressed or 3–4-angled; pappus of many fine hairs, connate at extreme base and caducous.—Europe to W. Asia; 14 spp.

CYNARA CARDUNCULUS L. Sp. Pl. 827. 1753.

var. SCOLYMUS (L.) Hegi. ARTICHOKE.

Large perennial thistle-like herb; stem grooved; lower leaves 30–70 cm long, 10–30 cm wide, higher ones smaller, all sessile, deeply lobed and the segments lobed, the segments spine-tipped; heads large (4–10 cm wide); bracts of involucre with thick (edible) base; corolla 3.5–5 cm long, white, bluish at apex; style-branches bluish; achenes obpyramidal, 3-angled, with 2–3 cm long pappus.

Native of S. Europe—N. Africa—Asia minor; cultivated for the edible heads. Rarely cultivated in Guam.

Tribe EUPATORIEAE

ADENOSTEMMA J.R. & G. Forster

Herbs; lower leaves opposite and petiolate, upper leaves alternate and sessile; heads in panicle-like inflorescences, 20–40-flowered, homogamous; flowers bisexual; involucral bracts 2(or 1)-seriate; receptacle usually flat, glabrous; corolla tubular, white or purplish, 3–5-lobed; style-branches exserted; achenes with an apical ring bearing 3–4 thick clavate viscid pappus hairs.—About 10 species of tropical and subtropical, chiefly American regions.

Adenostemma lavenia (L.) O. Kuntze, Rev. Gen. Pl. 304. 1891.

BULAK-MANUK. CHAGUAN-MANUK. CHAGUAN-CHIBA.

A. viscosum J.R. & G. Forst. Char. Gen. Pl. 90. 1776.
Safford 1905: 175. Merrill 1914: 153.
Verbesina lavenia L. Sp. Pl. 902. 1753.

Erect or accumbent herb to nearly 1 m tall; leaves ovate to oblong to linear-lanceolate, margins serrate, acute at apex, puberulent on the nerves below, thin, commonly 5–15 (rarely 20) cm long and 3–5 (–8) cm wide, on petioles up to 3 cm long, or the upper lvs. subsessile; involucre 3–4 mm long; heads 3–7 mm long, 5–7 mm wide, in corymbose panicles; corolla 1–2 mm long, distally pubescent; anthers truncate at base, apically with a short deltoid prolongation of the connective; style-branches dilated distally; achenes oblong-obovoid, obtuse, 5-ribbed, covered with glands and thereby tuberculate, mostly 2.5–4 mm long.

This is said by some authors to be a pantropic weed, by others to be of American origin. At any rate it has been in Guam for a long time, as it was collected by Chamisso in 1816. The name "bulak manuk," given by Safford, is of Philippine origin.

These plants may be found along shady water-courses in the southern part of the islands.

AGERATUM Linnaeus

Shrubs or erect herbs; lower leaves opposite; upper leaves alternate; leaves mostly serrate; heads in cymose or corymbose inflorescences; homogamous; disc-florets only; involucre campanulate, bracts 2–3-seriate; receptacle flat to conic, glabrous; corolla 5-lobed, white or purple or blue; anthers subacute at apex; style-branches long-exserted, clavate; achenes 5-angled; pappus of 5 awned scales, serrate, and basally connate, sometimes free.—Perhaps 30–35 species of the Tropics.

Ageratum conyzoides L. Sp. Pl. 839. 1753. Safford 1905: 176. Merrill 1914: 152.
MUMUTUNG.

Erect herb; young stems pubescent; leaves ovate or rhombic-ovate, acute at apex, acute to obtuse or subcordately rounded at base, pubescent on both surfaces, glandular dorsally, 2–10 cm long, 1–5 cm wide, on petiole 1–5 cm long; heads corymbose 4–6 mm long; involucre subglabrous; bracts acute-acuminate, 3 mm long; florets about 75 per head; corolla about 1 mm long, white or blue-purplish, included in the involucre; style-branches exserted; achenes 1.5–2 mm long, nearly glabrous.

Native of Tropical America, now world-wide as a weed. In waste ground, particularly in Central and Southern Guam. Manengon (3878).

EUPATORIUM Linnaeus

Shrubs or herbs; leaves usually opposite; heads in corymbose panicles; homogamous; involucre 1-many-seriate, outermost shortest; florets 5 to about 80 or more per capitulum, perfect, all alike (disc-florets); chaffy bracts lacking; corolla 5-lobed; anthers blunt; style-branches colored like the corolla and exserted; achenes slender, 5-angled, blunt; pappus hairs in one series, denticulate.—Over 600 species; chiefly tropical or subtropical.

Eupatorium odoratum L. Syst. ed. 10, 1205. 1759.—Stone, Micronesica 2: 141. 1967.

Big bushy herb or subshrub with long rambling (but not twining) branches; stems terete, pubescent; leaves opposite, flaccid-membranous, velvety-pubescent, deltoid-ovate, acute, 3-neved, very coarsely toothed, each margin with 1–5 teeth, or entire in youngest leaves; base obtuse or subtruncate but shortly decurrent; petiole slender, 1–1.5 cm long; blade mostly 5–12 cm long, 3–6 cm wide; capitula in subcorymbose axillary and terminal clusters; peduncles 1–3 cm long, bracteate; bracts linear, 2–3 mm long, the lowest ones longer and leaflike; capitula oblong, rather slender, 10–12 mm long; involucre of about 4–5 series of bracts, pale with green nerves, acute, the lowest ones about 2 mm long, upper ones 8–9 mm long, all acute, distally ciliate, flat, appressed except the extreme divergent tip; florets all alike, (disc-florets), pale purple to dull off-white, the styles extending about 4 mm beyond the apex of the involucre, spreading radiately; receptacle very narrow; florets about 20–30 or a few more, 10–12 mm long; ovarian portion 4 mm long; corolla slender trumpet form; pappus of dull white hairs 5 mm long; achenes glabrous or nearly so.

A native of Tropical America, common now almost everywhere in Tropical regions as a weed. It is common in Saipan, but is (as yet) very scarce in Guam, though no doubt it will spread rapidly, in its usual aggressive manner, throughout waste ground, vacant lots, roadsides, etc. *A. Wade* in 1963; [Saipan, *Stone* 5172].

The foliage and flowers are odorous; the crushed leaves emit a strong fragrance, somewhat resinous and slightly unpleasant (to some persons).

Mikania Willdenow

Climbing, twining shrubs or herbs; leaves opposite, petiolate, often palmately nerved; inflorescences axillary and terminal; heads 4-flowered, homogamous; involucre oblong, of 4 bracts in 2 series, or sometimes one or two accessory outer ones; florets all perfect; ray-florets absent; receptacle naked; corolla 5-fid; anthers blunt at both ends; style-branches long-exserted; achenes trunctate, angled; pappus of many denticulate hairs in one series, rarely 2 series.—About 150 species, all of Tropical America, some as weeds elsewhere.

Mikania scandens (L.) Willd. Sp. Pl. 3: 1743. 1804. Fosberg (ined.).

A glabrous vine with ovate to cordate or hastate leaves, acuminate, coarsely dentate or repand, 5–10 cm long, 2–5 cm wide; petioles slender, shorter than the blades; heads in terminal clusters; involucre about 5–6 mm long, bracts lanceolate-acuminate; corollas white; achenes resinous.

Native of Tropical America. Apparently of fairly recent introduction in Guam (not mentioned by Merrill, Safford, or earlier authors); now very common and often abundant. Talofofo (3995); Fena R. (4481); Mt. Almagosa (4903).

Probably the Guam plants should be referred to *M. cordata* (Burm. f.) B.L. Robinson, as the name *M. scandens* has been used rather indiscriminutely. However, my specimens may also fit the descriptions of *M. micrantha* H.B.K. I am unable to resolve this problem satisfactorily at this time.

The crushed leaves are supposedly useful for diminishing the pain of insect stings, according to J.W. Parham (Weeds of Fiji, 111, 1958).

Tribe HELENIEAE

GAILLARDIA Fougeroux

Erect branching herbs with alternate leaves; heads solitary on long peduncles, with disc-florets and often also with ray-florets; ray-florets (when present) neuter; disc-florets perfect; involucral bracts in about 3 series; receptacle convex, paleaceous; corolla of disc-florets 5-lobed; anthers at base sagittate, at apex obtuse; style-branches long, acute; achenes obpyramidal, 5-angled, pubescent at base; pappus of 6–12 scales awned at apex.—N. America, 26 spp., S. Amer., 2 spp.

GAILLARDIA PULCHELLA Fougeroux, Mém. Acad. Sci. Paris 5. 1788. GAYADEA.

Branching herb; leaves sessile or the lowest ones winged-petiolate; blades spathulate or linear, up to 20 cm long, to 3 cm wide, upper leaves smaller, coarsely toothed or pinnately lobed or parted; peduncles hispid, elongated (to 20–30 cm); heads about 5 cm wide; ray-florets with red or yellow ligule; disc-florets with yellow or red corolla; style-branches dark red; achenes 4 mm long; pappus-scales 5–8 mm long.

Native of N. America, cultivated as an ornamental for the cut flowers. Only in gardens.

TAGETES Linnaeus

Herbs with a strong odor (if crushed), with opposite or alternate serrate leaves; heads terminal, solitary or corymbose, with both ray- and disc-florets, the former pistillate, the latter perfect; involucre campanulate-cylindric, the bracts 1-seriate, connate, glandular; receptacle convex, naked, or bristly; corolla of disc-florets 5-lobed; anthers at base sagittate, at apex acute; style-branches distally pubescent; achenes linear, compressed, angled; pappus of 3–10 thin ciliate unequal scales.—Trop. & subtrop. Amer. 50 spp.

TAGETES ERECTA L. Sp. Pl. 887. 1753. MARIGOLD.

Few-branched herb with lower leaves opposite, upper ones alternate, pinnately parted or pinnate, up to 12 cm long, the segments more or less oblong, acute, distally dentate, up to 9 cm long and 1.5 cm wide; peduncle flaring distally; involucre about 2 cm long; head solitary, 5–7 cm wide; florets yellow or orange; pappus of one long (1 cm) and several short (3–4 mm) scales.

A native of Mexico, now found in gardens around the world, cultivated for its flowers. Not escaping; seeds very rare in Guam.

Tribe HELIANTHEAE

BIDENS Linnaeus

Erect branching herbs with opposite, simple or trifoliolate or pinnate mostly serrate leaves; heads solitary or paniculate, homogamous or heterogamous, with

both ray- and disc-florets, or the rays sometimes lacking; rays when present neuter, white or yellow; disc-florets perfect, usually yellow; bracts of involucre 2–3-seriate, basally connate; receptacle flat, paleaceous; ligule of rays dentate or entire; corolla of disc-florets 5-toothed; anthers nearly entire; style-branches acute, distally pubescent; achenes angled or compressed, awned at the apex; awns 1–8, commonly 2 or 4; pappus none.—About 230 species in all warm temperate and tropical regions.

Bidens pilosa L. Sp. Pl. 832. 1753.

Walker & Rodin 1949: 466. BEGGAR'S-TICK. SPANISH-NEEDLES.

Erect branched herb (in big plants sometimes the branches straggling), with the lower leaves simple, ovate, and serrate, but the upper leaves trifoliolate or imparipinnate, leaflets ovate or ovate-oblong, acute, basally decurrent, petiolulate, serrate; blades 1–12 cm long, up to 6 cm wide; petioles to 6 cm long; heads few in panicles; involucre of about 7 or 8 linear-spathulate bracts; heads 6–8 mm long, 6–8 mm wide; ray-florets usually lacking, but occasionally present, if so, few, in 1 series, white or creamy-white, 5–8 mm long; disc-florets yellow; achenes linear, 7–13 mm long, black or dark brown, about 1 mm wide, flat, 4-angled, short-strigose or glabrous; awns mostly 2, or sometimes 3, very rarely 4, about 3 mm long, retrorsely barbellate.—Pl. 14e (var. *radiata*).

Native of Tropical America, but for several centuries weedy in parts of Asia and the Pacific. It was first collected in Guam by Johnson & Necker at Haputo Point, in 1945; however it probably has been in Guam for a much longer time. At any rate it is extremely common now, all over the island, not only in waste ground but sometimes at the fringes of forest, sometimes forming dense thickets nearly 1 m tall. Plants with white ray-florets are distinguished as var. *radiata* Schlz.-Bipontinus. Some freak individuals with broad, flat, ribbed stems have been seen similar to those of *Conyza canadensis*. Mangilao (3794); Barrigada (5048).

Coreopsis Linnaeus

Shrubs or herbs with mostly opposite pinnate or pinnately parted leaves; heads solitary, corymbose, or paniculate, rather large, pedunculate, homogamous, with both ray- and disc-florets; bracts of involucre in 2 series; receptacle flat or convex, paleaceous; ligules dentate; disc-florets with 5-lobed corolla; anthers slightly sagittate basally, blunt apically; achenes dorsally compressed, often with winged margins, not beaked; pappus lacking or of scales or bristles.—About 70 species, chiefly of Tropical America and Africa.

Coreopsis tinctoria Nuttall, J. Acad. Philad. 2: 114. 1821.

Merrill 1914: 153. COREOPSIS

Annual ornamental herb, aromatic, branched; leaves subsessile, lower ones 2–3-pinnate, upper ones simple, 5–10 cm long, segments linear, less than 5 mm wide; peduncle to 10 cm long; heads numerous, about 3–4 cm wide; ligules subcuneate, trifid, yellow (or marked also with purple), 1–1.5 cm long; achenes not or scarcely winged.

Native of S. Central U.S.A., widespread in gardens; not escaping. G.E.S. 316.

COSMOS Cavanilles

Erect, branched, usually aromatic herbs; leaves mostly opposite, pinnately lobed or parted, or bi-tri-pinnate; heads solitary or panicled; involucral bracts 2-seriate; heterogamous; receptacle flat, paleaceous; ray-florets with obovate subentire or dentate ligule; disc-florets with 5-fid corolla; anthers blunt at both ends or slightly sagittate at base; style-branches acute-deltoid and puberulent at apex; achenes fusiform-linear, compressed, grooved, beaked at apex and there with 2–3 divaricate barbed awns.—About 20 Tropical American species, several in cultivation.

COSMOS SULFUREUS Cavanilles, Icon. 1: 56. t. 79. 1791.

Merrill 1914: 153. COSMOS.

Erect annual herb to 1–2 m tall; stem glabrous; petiole to 7 cm long; leaflets or segments linear or linear-lanceolate, ciliate, glabrous; leaves mostly 5–16 cm long (excluding petiole); peduncles to 20 cm long; outer bracts of involucre linear-lanceolate, acute; inner ones broader, subacute; receptacular chaffy bracts subacute; ligules golden-yellow to orange, up to 3 cm long; achenes long-beaked, hispidulous, about 2 cm long, 2–3-awned.

Native of Central America, now widely cultivated; occasional in Guam gardens, not escaping. McGregor 442; G.E.S. 267; 348.

ECLIPTA Linnaeus

A monotypic genus with the characters of its only species, or possibly 2–4 very similar species.—Probably originally Asiatic, now pantropical.

Eclipta prostrata (L.) L. Mant. 2: 286. 1771. TITIMA.

E. alba (L.) Hasskarl, Pl. Jav. Rar. 528. 1828.—Safford 1905: 266.
Merrill 1914: 153.

E. erecta L. Mant. 2: 286. 1771.

Verbesina alba L. Sp. Pl. 902. 1753.

V. prostrata L., l.c.

Strigose, branching, accumbent to erect or prostrate, node-rooting annual herb; leaves lanceolate, elliptic, or oblong, acute-acuminate, acute at base, subsessile, subtrinerved, entire or serrulate, pilose, mostly 2–10(–15) cm long and 1–4 cm wide; heads terminal and axillary, semiglobose, to 1 cm wide, pedunculate, several to many together, heterogamous; peduncle to 7 cm long; ray-florets 1–2-seriate; involucre of ovate, acute, appressed-pubescent bracts about 6 mm long; receptacle convex, paleaceous; chaffy bracts linear; disc-florets with 4–5-fid corolla; ligules 2.5–3 mm long, entire or bifid; ray-florets pistillate, disc-florets perfect; anthers apically blunt, basally slightly sagittate; style-branches obtuse; achenes of ray-florets 3-angled, of disc-florets 4-angled, all tuberculate, black, glabrous except for a few apical hairs, depressed-truncate at apex, with 1–3 minute marginal teeth, about 2.8 mm

long, marginally ribbed.

Now a pantropical weed of open, sunny, wet localities. Agfayan Bay (3922); Talofofo (4310). G.E.S. 30.

GLOSSOGYNE Cassini

Perennial herbs, woody at base, few-branched, with a basal rosette of petiolate leaves and alternate cauline leaves; blades pinnately parted; heads heterogamous, small, solitary; bracts of involucre slightly connate; receptacle paleaceous; ray-florets in 1 series, fertile, ligule trifid, yellow; disc-florets 4-fid, yellow; anthers obtuse; achenes glabrous, dorsally compressed, linear, truncate; awns 2, with retrorse barbels.—Eight tropical Asiatic—Australian species.

Glossogyne tenuifolia (Lessing) Cassini, Dict. Sci. Nat. 51: 475. 1857.

Safford 1905: 284. Merrill 1914: 154.

Perennial herb with short woody caudex and basal rosette of petiolate pinnately parted leaves mostly 3–9 cm long, with stiff linear segments 8–20 mm long, entire or 2–3-lobed; stem to 30 cm high; cauline leaves few, 3–4 cm long, pinnately parted, or the uppermost linear; heads on slender peduncles; involucre 3 mm long; ray-florets pistillate, ligule 3.5 mm long, 2 mm wide, trifid; disc-florets perfect, usually with 4-toothed corolla; style-branches subulate, acute; achenes about 6.5–7 mm long, linear, dorsally flattened, 3-ribbed on each face, with 2 suberect apical awns, these minutely retrorsely barbellate.

Native from S. China to Formosa and Japan, the Bonin Islands, Malaysia, and Australia. A pretty but easily overlooked plant of Guam's southern hills and savannahs, locally abundant. Manengon (4209). McGregor 406. G.E.S. 444 (back of Piti).

SYNEDRELLA Gaertner

Annual herbs with opposite leaves; stems branching; heads sessile or pedunculate, axillary, solitary or dichasial, radiate, heterogamous; ray-florets few in 1 series, pistillate; disc-florets perfect; involucre globose, bracts few, outer ones leaf-like; receptacle flat, paleaceous, the outermost chaffy bracts longer than inner ones; ligules 2–4-toothed, yellow; corolla of disc-florets, 4–5-lobed, yellow; anthers blunt at both ends; style-branches pubescent except at the acute tip; achenes of ray-florets dorsally flattened, winged, the wings lacerate and apically awned; achenes of disc-florets trigonal, linear, not winged, with 2 (or 3) apical awns.—50 tropical species, Asia, Africa, and America.

Synedrella nodiflora (L.) Gaertner, Fruct. 2: 456, t. 171, 1791.

Safford 1905: 380. Merrill 1914: 154. SAIGON.

Erect herb to 50–90 cm tall, branched dichotomously, leaves ovate or elliptic, mostly 5–15 cm long and 2–9 cm wide, crenate-serrate, acute, abruptly narrowed at base to the 1–5 cm long petiole mostly pubescent on both surfaces, usually 3-nerved; heads solitary or several together, subsessile or pedunculate, cylindric-campanulate, 10–20-flowered, 8–10 mm long; involucral bracts 2-seriate, usually

only 4 or 5, nearly 1 cm long; all corollas yellow, about 3.5–4 mm long; ligules bifid; achenes of 2 kinds, those of ray-florets winged, glabrous, those of disc-florets unwinged, often puberulent, all nearly black, 4–5 mm long, awned.

Native of Tropical America, now a pantropic weed. In Guam abundant, usually around houses and along roadsides. Mangilao (3907; 4666).

TITHONIA Desf. ex Jussieu

Shrubs or herbs with alternate 3-nerved entire or 3–7-lobed leaves; heads terminal, solitary (in ours), radiate, heterogamous, on long distally thickened and hollow peduncles; ray-florets neuter, with yellow or orange ligule, 2–3-toothed, glandular; disc-florets perfect, corolla 5-lobed, yellow; receptacle conical, hollow, paleaceous; chaffy-bracts embracing the disc-florets; achenes subcompressed, oblong-cuneate; pappus of a few scales and 2 or 3 awns.—About a dozen Tropical American species.

TITHONIA DIVERSIFOLIA (Hemsley) A. Gray, Proc. Amer. Acad. 19: 5. 1883.

Stout shrubby herb or shrub 2–3 m tall; stoloniferous; leaves mostly subovate, acute, serrate, 10–40 cm long, long (2–10 cm) petiolate, simple or mostly 3–7-lobed with acute serrate lobes, somewhat glandular, slightly grayish beneath, puberulent on both surfaces; petiole slightly bilobed at base; peduncles 10–30 cm long; heads large and showy, 5–15 cm wide; involucre of bracts in 4 series; ray-florets about 12–15, with yellow ligules to 6 cm long; achenes cuneate, 4-angled, appressed-puberulent, 5 mm long, 2-awned.

Native of Mexico and Central America; cultivated in Guam. Mangilao (4928).

TRIDAX Linnaeus

Herbs with prostrate-ascending stems and opposite leaves; heads solitary, terminal, long-pedunculate, radiate, heterogamous; ray-florets pistillate; disc-florets yellow, perfect; receptacle convex, paleaceous; ligules trifid; style-branches pubescent; achenes turbinate, angled; pappus of plumose bristles.—Mexico to S. Amer., 26 spp.

Tridax procumbens L. Sp. Pl. 900. 1753. COAT-BUTTONS. WILD-DAISY.

Pubescent herb with prostrate ascending stems and erect peduncles with terminal heads; leaves opposite, broadly lanceolate, coarsely toothed, acute or subacute, cuneate at base, hispid on both surfaces, 1–5 cm long, 1–3.5 cm wide, on petioles 5–15 mm long; peduncle pilose, 10–30 cm long, erect; head about 1 cm long, 2 cm wide; bracts of involucre 3-seriate, puberulent; ray-florets few (about 6), with white ligule about 4–5 mm long; disc-florets yellow; achenes pilose, 2 mm long; pappus 5–6 mm long.

Native of Tropical America, now a pantropic weed. Common in waste ground, especially limestone, as at Mangilao around the College Campus.

WEDELIA Jacquin

Perennial, sometimes vine-like herbs with opposite entire or dentate often pal-

mately nerved leaves; heads terminal and axillary, few together, or solitary, pedunculate, radiate, heterogamous; ray-florets pistillate, yellow; ligules 2–3-fid; disc-florets yellow, with 5-lobed corolla; involucre subglobose-hemispheric or campanulate, the bracts 2–3-seriate; receptacle convex, paleaceous; anthers basally obtuse, apically acute; achenes somewhat compressed, those of ray-florets 3-angled, those of disc-florets mostly 4-angled; pappus of 1–2 awns, or cupular and rimlike, or absent.—Over 50 species in the Tropics of both hemispheres.

Wedelia biflora (L.) DC. in Wight, Contrib. 18. 1834.—Merrill 1914: 154. —Walker and Rodin 1949: 467. MASIGSIG. M. CHUNGE.

Verbesina biflora L. Sp. Pl. ed. 2, 1271. 1763.

Wollastonia scabriuscula DC. ex Decaisne, Nuov. Ann. Mus. Paris. 3: 414. 1834; Prodr. 5: 547. 1836.

Stemmodontia biflora (L.) Wight ex Safford 1905: 377.

Wedelia canescens (Gaud.) Merrill 1914: 155.

Verbesina canescens Gaudichaud, Bot. Freyc. Voy. 463. 1826.

Wedelia chamissonis Lessing, Linnaea 6: 161. 1831.

Stemmodontia canescens (Gaud.) Wight ex Safford 1905: 377, pl. 65.

Wollastonia canescens (Gaud.) DC. Prodr. 5: 547. 1836.

Wedelia argentea (Gaud.) Merrill 1914: 155.

Verbesina argentea Gaud. l.c.; Safford 1905: 395.

Wedelia biflora var. *canescens* (Gaud.) Fosberg, Phytologia 5(7): 291. 1955.

Coarse herb with branches often straggling and vine-like (but never twining) and angled, sparsely pubescent stems; leaves petiolate, ovate, serrate-dentate, or rarely subentire, cuneate or rounded at base, acute-acuminate at apex, 3-nerved, appressed-hispidulous and rough on both surfaces, commonly 3–15 cm long by 1–10 cm wide, petioles 1–3.5 cm long; peduncles to 7 cm; heads yellow; involucre 5–7 mm long; pubescent; ligules about 8, nearly 9 mm long; disc-florets about 20–30, corollas 5 mm long; achenes obpyramidal, truncate, to 3.5 mm long, awn-tipped.—Pl. 14f.

Indigenous; also throughout Tropical Asia on seacoasts and beaches. Common in Guam.

Tagachan Bay (3988); Yoña (4424).

ZINNIA L. nom gen. conserv.

Erect herbs with opposite leaves; heads solitary, terminal, pedunculate, radiate, heterogamous; ray-florets pistillate; disc-florets perfect; involucre of imbricate bracts in about 3 series; receptacle convex, paleaceous; chaffy-bracts embracing the disc-florets; ligules persistent and hardened in fruit; corolla of disc-florets 5-lobed; achenes 3-angled compressed, with 1–3 awns at tip, or these lacking; pappus none.—N. & S. America; about 20 spp.

ZINNIA ELEGANS Jacq., Coll. 3: 152. 1790. ZINNIA.

Erect ornamental herb; stems branched; leaves ovate to elliptic or oblong, obtuse or acute, hispid, to 15 cm long by 10 cm wide, sessile; heads 3–7 cm wide;

ligules violate, pink, orange, yellow or white; chaffy bracts longer than disc-florets; achenes awnless or nearly so.

A native of Mexico; found in gardens; not escaping; doubled forms are frequent.

Tribe INULEAE

BLUMEA DC. nom. gen. conserv.

Herbs with alternate leaves; heads paniculate in axillary or terminal inflorescences; many-flowered; heterogamous; ray-florets pistillate; disc-florets perfect; receptacle naked, glabrous or pubescent; corolla yellow or violet; ray-florets with 3-lobed corolla; disc-florets with 5-lobed corolla; anthers sagittate basally, obtuse apically, with basal-lateral appendages; achenes oblong, ribbed; pappus hairs in 1 series, denticulate, caducous.—Paleotropical; 50 spp.

1. Leaves petiolate; receptacle glabrous;
   2. Disc-florets 10–30; corolla 5 mm long.....*B. lacera*
   2. Disc-florets 8–15; corolla 3.5–4 mm.....*B. mollis*
1. Leaves sessile; receptacle hairy; disc florets 8–12.....*B. laciniata*

Blumea lacera (Burm. f.) DC. in Wight, Contr. Bot. Ind. 14. 1837. Fosberg (ined.).

Viscid aromatic herbs to 2.5 m. tall; leaves petiolate, petiole 1–1.5 cm long; lower leaves lobed or parted, lyrate, dentate, densely pubescent-glandular dorsally; heads in spikelike axillary panicles, 7–9 mm long; involucre purplish; disc-florets 10–30; corolla yellow; 5 mm long; achenes 1 mm long.

Rare; introduced in Guam.

Blumea laciniata (Roxb.) DC. Prodr. 5: 436. 1836. Merrill 1919: 544.

Erect herb; stems glandular-pubescent; leaves sessile, oblong-ovate or oblong-spathulate, acute, dentate, thin, sparingly puberulent, lobed or not, 1–30 cm long, 1–15 cm wide; heads in a large terminal panicle, 6–8 mm long; involucre pale and puberulent; disc-florets 8–12; corolla glabrous; achenes sparingly puberulent.

Tropical Asia and Malaysia. Nelson 338, near Abu.

Blumea mollis (D. Don) Merrill, Philipp. J. Sci. Bot. 5: 395. 1910; ibid. 9: 153. 1914.

Erect herb, younger stems hispid; leaves ovate, petiolate; sharply dentate, thin, dorsally gray-pubescent, glandular; petioles 0.5–1.5 cm long; heads in spikelike panicles; involucre purplish; heads 5–6 mm long; disk-florets 8–14; corolla 3.5–4 mm long pale but apically purplish; achene 0.5 mm long.

Tropical Africa and India, S.E. Asia, and Malaysia. G.E.S. 341, in wet waste ground.

PLUCHEA Cassini

Shrubs with alternate, usually dentate leaves; heads heterogamous, mostly in corymbs; marginal florets female, many; central florets male, few; involucre of thin imbricate bracts in many series; receptacle flat, naked; corollas tubular, white or pinkish-violet, 3–4-toothed (marginal fls.) or 5-lobed (central fls.); anthers with

acute basal appendages; style bifid; achenes angled; pappus of minutely serrulate hairs.—About 40 species of wide distribution in warm regions.

1a. Leaves elliptic obovate, glabrous, bright pale green, dentate, 3–4 cm long; petiole ± obsolete; corolla rose-purple; achenes with about 18–20 pappus bristles.....*P. indica*

1b. Leaves elliptic-ovate, narrow or lanceolate, pubescent, dull grayish-green, entire, 10–15 cm long; petiole evident; corollas pink or white; achenes with about 10–12 pappus bristles.....*P. odorata*

[See description of interspecific hybrid].

Pluchea indica (L.) Less., Linnaea 6: 150. 1831.

Erect shrub, glabrous (or nearly so) throughout; leaves bright pale green, obovate or subelliptic, 3–4 (rarely 5) cm long, 1.5–2 (rarely 2.3) cm wide, nearly sessile, margins dentate, base cuneate, apex ± obtuse; inflorescence compact, compound, terminal and subterminal, somewhat corymbose in appearance; heads of relatively few flowers; involucral bracts subdeltoid, in 3–4 series; heads c. 5 mm long, 2 mm broad; perfect flowers 1–3; corolla rose-purple, the 5-lobes evident, deltoid; pappus bristles mostly 18–20 per achene; mature achenes reddish-brown. Chromosomes: n = 10.

Native of India, south China, throughout Malaysia, south to Australia; possibly native in Guam, but weedy in appearance. Widespread but not abundant. Harmon Village (4033).

Pluchea odorata (L.) Cass. Dict. Sci. Nat. 42: 3. 1826.

Erect shrub, pubescent throughout; leaves dull gray-green, elliptic-lanceolate or narrowly elliptic-subovate, 8–16×3–6 cm, petiolate, entire, base acute or tapered, apex acute or subobtuse; inflorescence compound, terminal and subterminal, somewhat corymbose in appearance; heads of rather numerous flowers; involucral bracts broadly deltoid; heads slightly urceolate, about 7×5 mm; perfect flowers 12–17 per head; corollas pink or pinkish to white, the 5 lobes very small, toothlike; pappus bristles mostly 10–12 per achene; mature achenes brownish-black. Chromosomes: n = 10.

A Tropical American species, native from Mexico through Central America, to northern South America and in the West Indies Islands, now widespread as a rather aggressive weed in many Pacific Islands. It may be found frequently growing together with *P. indica*. The occasional result is an interspecific hybrid, intermediate in virtually all features, but with approximately 97% sterile pollen.

Pluchea × fosbergii Cooperrider & Galang. Amer. J. Bot. 52: 1025. 1965.

A sprawling shrub, "the lax branches often piling on top of one another," up to 2 m tall; older parts glabrate, younger parts short-puberulent; leaves yellowish-green, elliptic to narrowly obovate, 2–10×0.5–4.5 cm, ± denticulate, sparsely puberulent; heads narrowly campanulate, 5–8×2–5 mm; perfect flowers 5–13 per head; pappus of 11–16 bristles; corollas pale purplish-rose. Achenes abortive. Pollen (all but about 3%) sterile. Chromosomes: 8 pairs and 4 univalents.

Described from Hawaiian plants (from Oahu); found also in Molokai, Kauai,

Hawaii, Palmyra, Canton Island, Kwajalein, and Guam: base of Glass Breakwater, Cabras Island, (Fosberg 43409).—To be expected wherever both species occur together.

A fuller description of the hybrid is given in Cooperrider & Galang.

Tribe SENECIONEAE

EMILIA Cassini

Annual herbs, often glaucous, with alternate leaves, the upper ones amplexicaul; lower ones crowded in basal rosettes or congested at base of stem; heads few in long-pedunculate lax terminal inflorescences; ray-florets none; involucre cylindric to sub-campanulate, bracts narrow, equal, in 1 series; heads homogamous; receptacle flat, naked; disc-florets bisexual; corolla 5-lobed, lobes narrow, acute; anthers blunt at base, acute at apex; style-branches filiform, deltoid and strigose at tips; achenes linear-oblong, truncate, 5-angled; pappus of copious soft fluffy white capillary minutely barbellate hairs.—Paleotropical, 30 spp.

1. Florets at anthesis with corolla brilliant vermilion, aging to dark magenta-red; florets about 90 per head..... *E. javanica*
1. Florets at anthesis with corolla pinkish-violet, aging to magenta; florets 50–60 per head..... *E. sonchifolia*

Emilia javanica (Burm.) C.B. Robinson, Philipp. J. Sci. Bot. 3: 217. 1908.
Walker & Rodin 1949: 467.
Hieracium javanicum Burmann fil. Fl. Ind. 174, pl. 57, f. 1. 1768.

Erect, somewhat branched herbs up to 50 cm (rarely 1 m) tall, stems nearly glabrous, leaves partly in basal rosettes, the lower ones oblong-spathulate, slightly alate-petiolate, with a few faintly lobed coarse teeth; glabrous, up to 15 (or 20) cm long and 5–7 cm wide; upper leaves clasping at base, sessile, subhastate, oblong-oblanceolate, coarsely and irregularly toothed, at first faintly puberulent beneath but quickly glabrate, slightly glaucous or, especially in lower leaves, somewhat suffused with purple beneath, dark or medium green above; heads 10–12 mm long, 6–9 mm wide, in lax inflorescences; involucre glabrous; florets about 90, when just opened vermilion, aging to dark magenta-red, corolla about 9 mm long; achenes 3 mm long, 5–6-ribbed; pappus of many fluffy capillary hairs about 5 mm long.

A native of Tropical Africa, long established in Asia, weedy, or occasionally cultivated. In Guam it is a weed, usually around houses. Harmon Village (4027, 4126).

Emilia sonchifolia (L.) DC. ex Wight; Prodr. 6: 302. 1838.

Very similar to the preceding species but usually shorter; stems usually purplish; lower leaves with a broadly winged petiole and subdeltoid dentate blade, 5–10 cm long, 2.5–6.5 cm wide; upper leaves amplexicaul, basally only slightly narrowed, lyrate-pinnatifid or repand-dentate, purplish beneath on midrib, glaucous slightly on the lamina, at first softly puberulent but glabrate; heads few in lax terminal inflorescence, 8–13 mm long, 4–5 mm wide; bracts of involucre usually about 8,

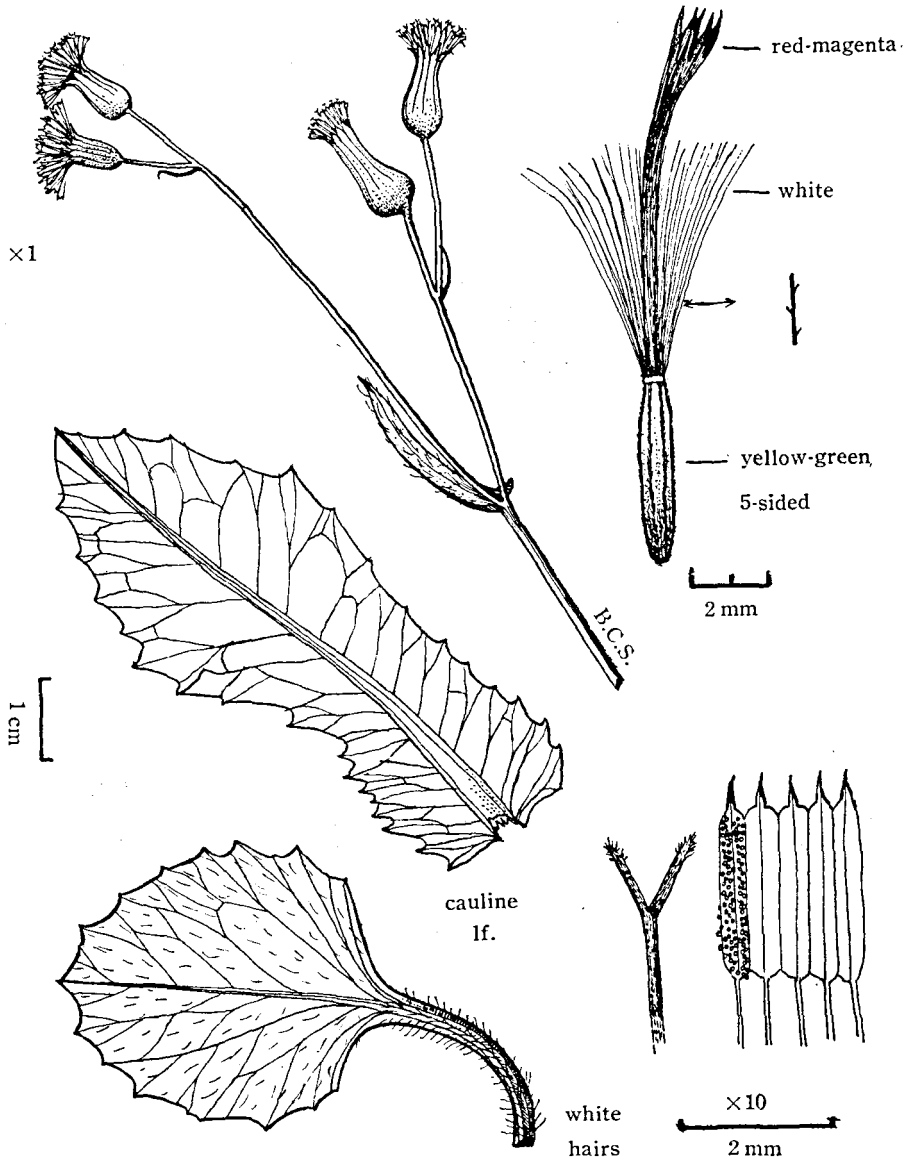

Fig. 100. Emilia sonchifolia.

linear, acute; florets when just opened pinkish-violet, soon aging to magenta; achenes about 3 mm long, 5-angled, the angles puberulent; pappus about 8 mm long.—Fig. 100.

A paleotropical species, now rather widespread as a weed. In waste ground

usually near houses. Harmon Village (4028; 4127).

CRASSOCEPHALUM Moench

Herbs or subshrubs with alternate leaves, entire or dentate to lobed; heads discoid, homogamous; flowers hermaphrodite; outer bracts of involucre very short, linear; inner bracts longer, coherent-tubular, linear-lanceolate; receptacle flat, nude; corolla long-tubular, limb 5-fid; anthers acute; style-arms elongated, truncate, penicillate, appendaged.—A genus closely similar to *Gynura*, of about 40 spp. in Africa and Madagascar.

Crassocephalum crepidioides (Bentham) S. Moore, J. Bot. 50: 211. 1912.

Gynura crepidioides Bentham.

An erect little-branched herb to 1 m tall, glabrous or finely puberulous; leaves lyrate-pinnatifid, coarsely serrate, petioles 5–30 mm long, blades 4–16 cm long, 1–7 cm wide, decurrent at base; upper leaves more or less sessile; heads terminal on axes of corymbose inflorescences; axes puberulent; involucre with outer short subfiliform bracts about 2 mm long, more numerous longer inner bracts (slightly coherent) 14–15 mm long; pappus of numerous silky yellowish to white slender hairs; corollas yellow with darker tips; anthers purplish; style-arms purplish; achene linear-cylindric, smooth, brown, faintly lined, 2 mm long.

A Tropical African weed now widespread.

Tribe VERNONIEAE

ELEPHANTOPUS Linnaeus

Erect perennial herbs with alternate subsessile leaves, the lowest in a rosette; heads many, fasciculate, sessile, homogamous, few-flowered; florets all tubular and perfect; bracts of involucre decussate; receptacle naked; anthers basally auriculate; achenes oblong, 10-ribbed; pappus of several to many straight bristles.—Tropics; 32 spp.

Elephantopus mollis H.B.K. Nov. Gen. Sp. Pl. 26. 1820.—Merrill 1914: 153. Walker & Rodin 1949: 466. PAPAGO VACA; P. HALOMTANO.

E. scaber L. sensu Safford 1905: 268, and Merrill 1914: 154.

Erect herb to about 1 m tall with pilose stems and alternate elliptic-oblong or obovate-elliptic leaves 5–15 cm long, 3–6 cm wide, crenate or serrate, acute, decurrent at base, petioles winged, very short and broad, upper surface of blade pilose-scaberulous; lower surface villous and resinous-gland-dotted; heads usually white, clustered; bracts below involucre deltoid-cordate, hirsute; bracts of involucre acuminate, strigose; corollas white, all tubular, 4 mm long, glabrous outside; achenes black, 3 mm long, puberulent; pappus 4 mm long, the 5 bristles with dilated base.

Native of Tropical America, now a widespread tropical weed. Abundant in Guam chiefly in the southern part where it is an obnoxious weed of overgrazed savannah lands; usually mingled with *Hyptis capitata* ("botones"). The detachable hairs are irritating to a person's skin. Young plants have leaves in basal rosettes, but erect leafy stems are soon produced. The achenes usually adhere to clothing

or animals' fur, and are also wind-blown. In Fiji this is a "Declared Noxious Weed."

PSEUDELEPHANTOPUS Rohr

Erect perennial herbs; leaves alternate, the lowest in a rosette; subsessile; heads axillary, few together; homogamous, 4-flowered, florets perfect; bracts of involucre decussate, inner ones longer; receptacle naked; corollas all tubular and 5-lobed; anthers auriculate at base; achenes oblong, 10-ribbed; pappus of several bristles with 2 exceeding the others and sigmoid near apex.—S. Aer., 3 spp.

Pseudelephantopus spicatus (Aublet) Rohr, Skr. Selsk. Kobenh. 2: 214, 1792. PAPAGO.

Elephantopus spicatus Aublet, Pl. Guian. 2: 808. 1775.

Safford 1905: 268. Merrill 1914: 154.

Coarse erect herb with tomentose stems to 60 cm tall, and linear-lanceolate leaves 2–8 cm long, up to 1.8 cm wide, apically blunt, margins undulate, surface pilose, dull olive-green; base tapered; lowest leaves somewhat obovate; heads clustered in leaf axils, sessile, combined into a seemingly terminal spike; involucral bracts oblong, acute-apiculate, the inner ones longer (about 1 cm); corollas all tubular, white, 7 mm long, with linear lobes; achenes pubescent, glandular, 6–7 mm long; two longest pappus bristles S-curved at the apex.

A native of Tropical America, now a pantropic weed. In Guam chiefly in the savannahs in overgrazed areas.

VERNONIA Schreber, nom. gen. conserv.

Trees, shrubs or herbs with alternate leaves; heads small, paniculate or corymbose, homogamous; all florets tubular and perfect; involucre of many bracts; receptacle flat, naked; corollas usually violet or pink, sometimes white, 5-lobed; anthers basally sagittate, apically blunt; style-branches puberulent; achenes oblong or turbinate, angled, mostly ribbed, sometimes glandular; pappus of hairs or bristles in 1 or 2 series, or the outermost scale-like.—Worldwide; about 1000 spp.

Key to local species

1. Heads 20–25-flowered; involucral bracts 4–5 mm long; pappus hairs 2-seriate, the outer ones less than 1 mm long..... *V. cinerea*
1. Heads 40–100-flowered; involucral bracts 6–7 mm long; pappus hairs in 1 series..... *V. patula*

Vernonia cinerea (L.) Lessing, Linnaea 4: 291. 1829.

Safford 1905: 396. Merrill 1914: 154. CHAGUAN-SANTA-MARIA.

Erect branching annual herb to 60 cm tall, with ovate acute, or variably shaped leaves, mostly 1–5 (rarely to 7–8) cm long, 1.5–2 (–3) cm wide, the upper ones narrower, smaller, and subsessile, the lower ones with petioles 1–3 cm long, surfaces minutely puberulent, base decurrent; heads 20–25-flowered, more or less corymbose, shortly pedunculate, 6–7 mm long; bracts of involucre acute-acuminate, 4–5 mm

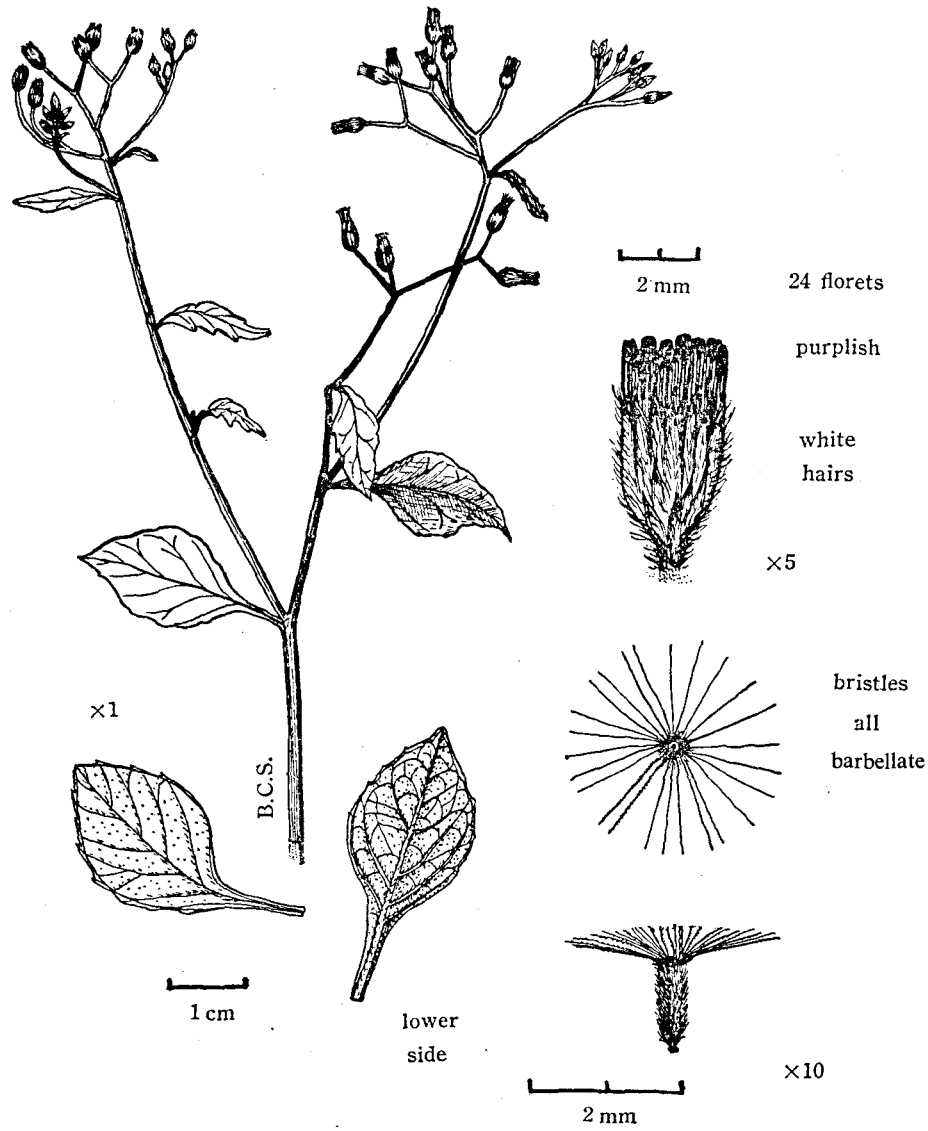

Fig. 101. Vernonia cinerea.

long, in 4 series, puberulent; corollas violet or pinkish-violet, about 4 mm long, exserted; achenes appressed-pubescent, 1.5–2 mm long; inner hairs of pappus 4–5 mm long, outer ones very short.—Fig. 101.

A polymorphic common weedy herb native of Tropical Asia, abundant in Guam chiefly in waste ground. The achenes are wind-dispersed. Mangilao (3909).

Vernonia patula (Dryander) Merrill, Philipp. J. Sci. Bot. 3: 439. 1908; 1914: 154.

Conyza patula Dry. in Aiton, Hort. Kew. 3: 184. 1789.

Vernonia chinensis Lessing, Linnaea 6: 105. 1831.

V. villosa Wight ex Safford 1905: 396.

var. *pubescens* J. Koster, Compositae of Malay Archip., Blumea 1:430–435. 1935.

Erect branching herbs; stems ribbed; leaves mostly ovate-elliptic, cuneate at base, acute or obtuse, apiculate, subentire or obscurely toothed, villous dorsally, up to 10–12 cm long and 4–5 cm wide, on petioles up to 2.5 cm long; heads many, paniculate-corymbose, 40–100-flowered; bracts of involucre lanceolate, puberulent, 4–5-seriate, 6–7 mm long; corollas slightly exserted, violet or rarely paler to white, 4–5 mm long; anthers and style-branches violet; achenes obovoid-oblong, mostly 5-angled, glabrous, glandular, 1–1.5 mm long; pappus hairs 2–3 mm long, 1-seriate, caducous, white.

A native of Tropical Asia, now widespread in the Pacific as a weed, but much less common than *V. cinerea*.

Umatac (4910).

ACKNOWLEDGEMENTS

MAP 1—courtesy of the Trust Territory H.Q., Saipan.

MAP 2—Mr. Terry Nolan.

MAPS 3 and 4—courtesy of the Department of Land Management, Government of Guam.

Figures: 5—courtesy of C. V. Morton, Smithsonian Institution; 6—courtesy of Mr. E. H. Bryan Jr., Bishop Museum; 7—courtesy of Dr. R. J. Rodin, Calif. State Polytechnic College, San Luis Obispo; 8–10—all from Dr. Rodin. 11—courtesy of Dr. W. H. Wagner Jr. University of Michigan. 12—courtesy of Dr. F. R. Fosberg, Smithsonian Institution. 15—R. J. Rodin.

Figures 18, 40, 41, 47, 50, 51, 54, 57, 59, 62, 67, 68, 71, 75, 77, 79, 83, 84, 88, 89, 91, 94, 97, 98, are from R. Kanehira, "Flora Micronesica" (Tokyo, 1933).

All photographs and other figures are original, except for those photographs in the Plates indicated as RVM, which are from transparencies courtesy of Dr. R. V. Moran of the San Diego Museum of Natural History; Figures 19, 20, 21, 24, 25, 26, 33, and part of 95 are by the late Richard D. Waggoner; and Figures 37, 39, 44, 46, 53, 65, 66, 80, are redrawn from a few early publications of the former Government Laboratories and Bureau of Science of the Philippines (between 1904 and 1921).

ADDITIONAL REFERENCES

In addition to those works mentioned on p. 11, a few others are referred to by author and date in the main text; the sources are given in detail here.

Asprey, G. F., and Thornton, P. 1953–55. Medicinal Plants of Jamaica. Extracts from the West Indian Medical Journal (vol. 2, pp. 233–252, 1953; vol. 3, 17–41, 1954; vol. 4, 69–82, 1955; and vol. 4, 145–168, 1955.).

V. INDEX TO SCIENTIFIC NAMES

(FAMILIES, TRIBES, GENERA, SPECIES, VARIETIES)

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VII. INDEX OF CHAMORRO VERNACULAR NAMES

Note. Many of the names in this list are derived from Spanish; some others are from Tagalog or certain other languages. The pronunciation is often more or less altered by Chamorro speakers. The spellings adopted herein are simply those of the numerous sources, published and unpublished, and reflect a variety of practices regarding the writing of Chamorro. In most cases J is pronounced as in English, but sometimes it is aspirate as H (i.e. like Spanish). The letter Y is usually pronounced as *j* or as *dz* except in the word YERBA (=hierba, Span.). The *s* sound is sometimes spelled with S, sometimes with C, e.g. CEBOLLO and SEBOYO (two spellings of the same word). A linguistic study of Chamorro is being undertaken by scholars which may yield a standardized spelling, but this is not available at the time of this writing.

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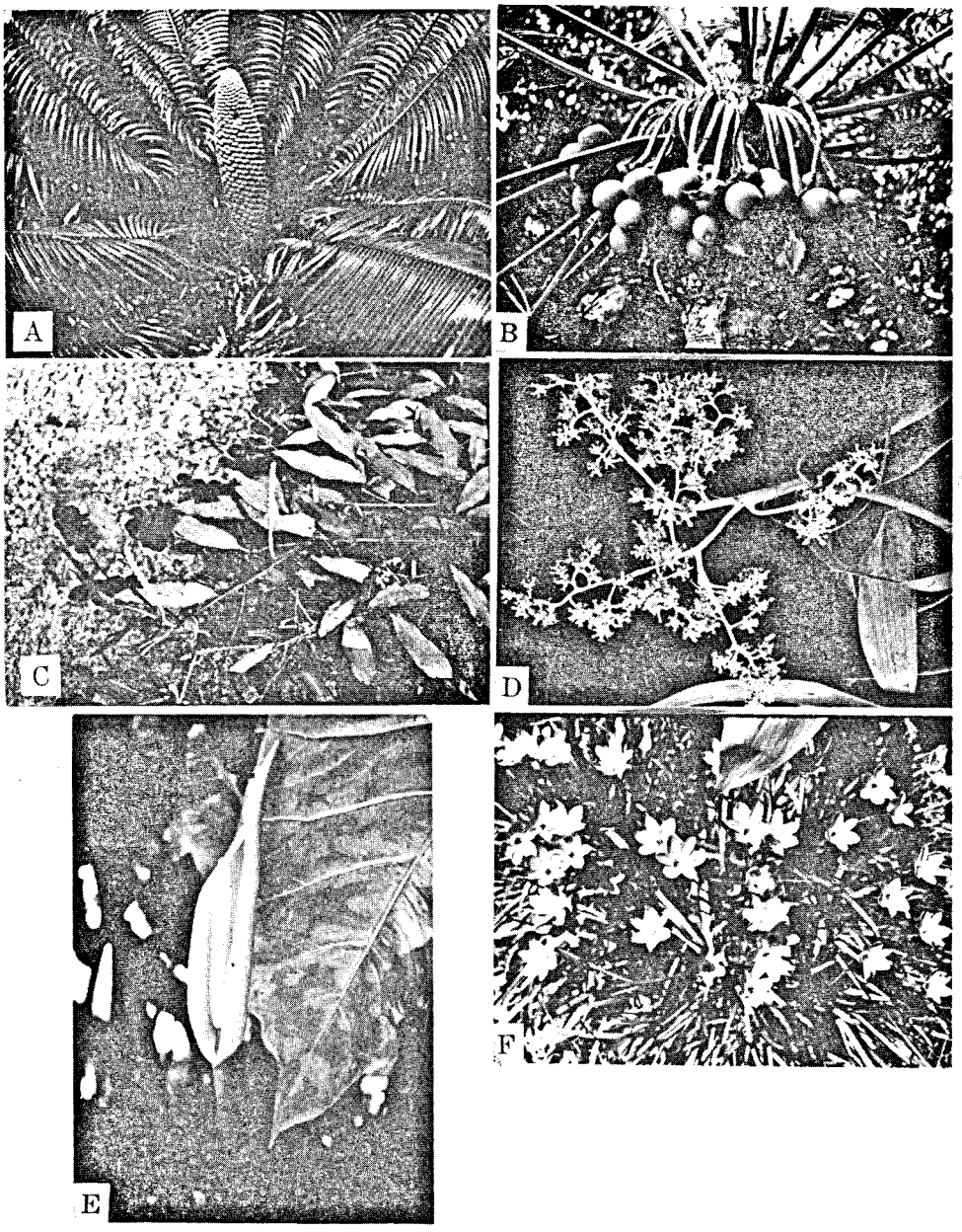


Plate 1. Cycads and Monocotyledons.
a. Cycas circinalis, male cone. RVM.
b. Cycas circinalis, female. RVM.
c. Potamogeton lucens.
d. Flagellaria indica. RVM.
e. Cyrtosperma chamissonis.
f. Zephyranthes rosea.

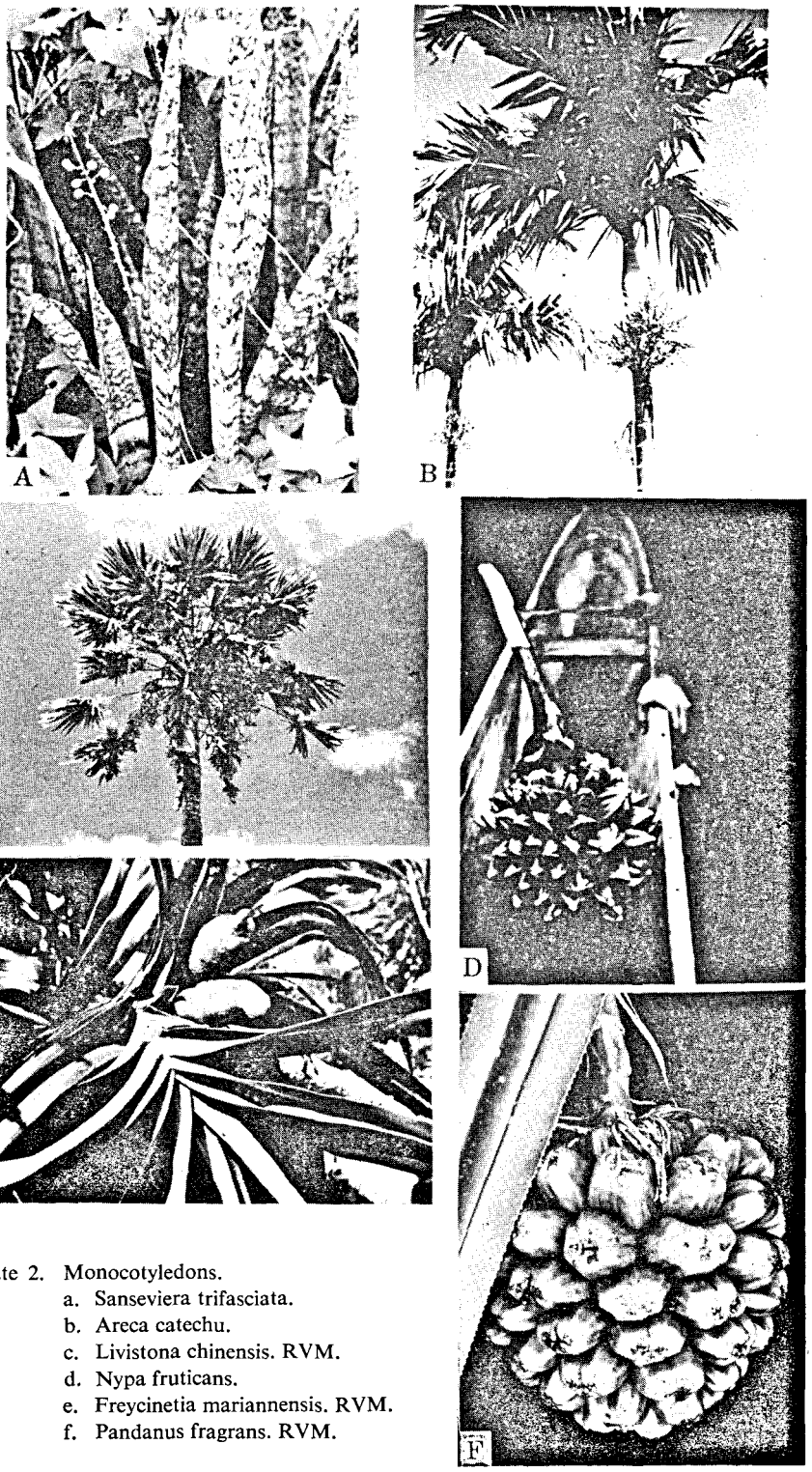


Plate 2. Monocotyledons.
a. Sanseviera trifasciata.
b. Areca catechu.
c. Livistona chinensis. RVM.
d. Nypa fruticans.
e. Freycinetia mariannensis. RVM.
f. Pandanus fragrans. RVM.

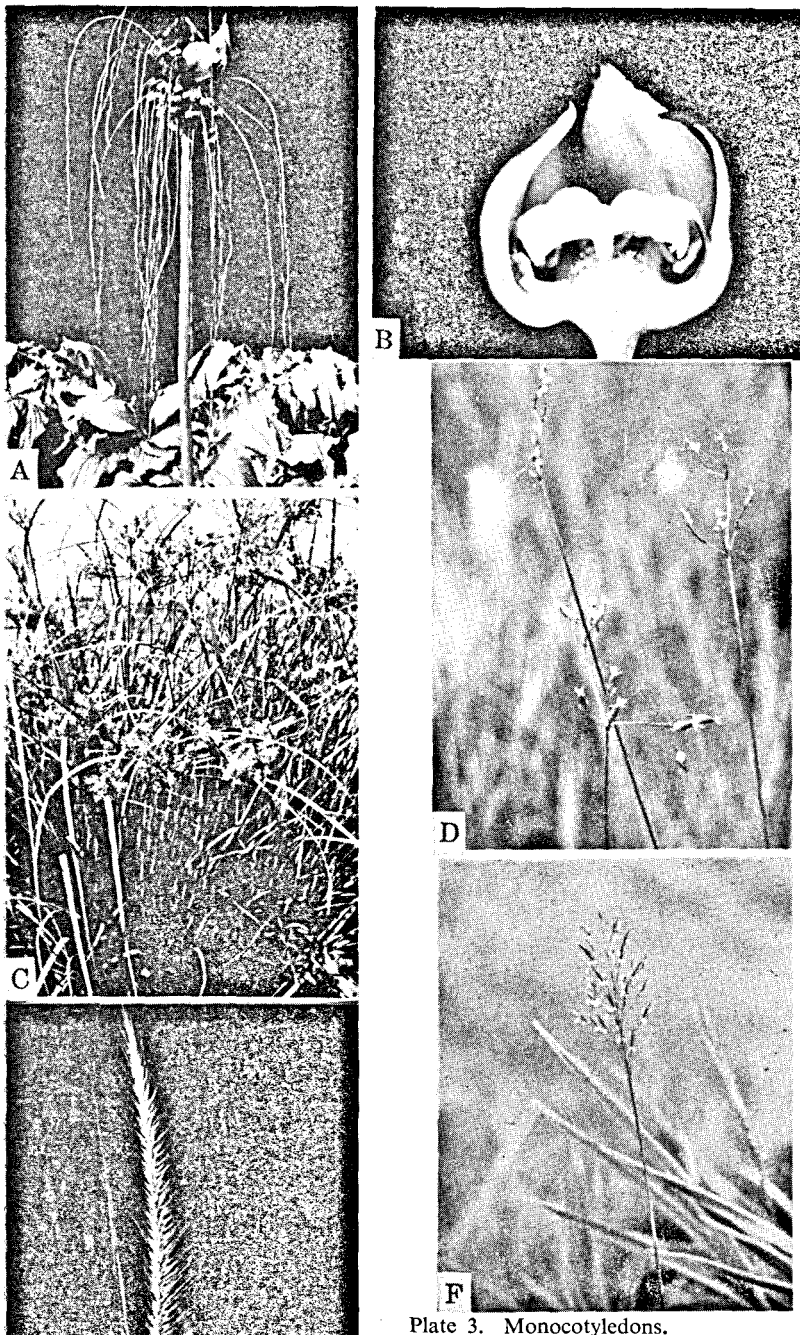


Plate 3. Monocotyledons.
a. Tacca leontopetaloides. RVM.
b. Tacca leontopetaloides, flower in longi-section. RVM.
c. Cyperus ferax.
d. Fimbristylis tristachya.
e. Pennisetum purpureum.
f. Chrysopogon aciculatus.

Plate 4. Dicotyledons: Moraceae and Urticaceae.

a. Artocarpus incisus.
b. Ficus tinctoria. RVM.
c. Streblus pendulinus. RVM.
d. Pipturus argenteus. RVM.
e. Dendrocnide latifolia. RVM.
f. Elatostema calcarea. RVM.

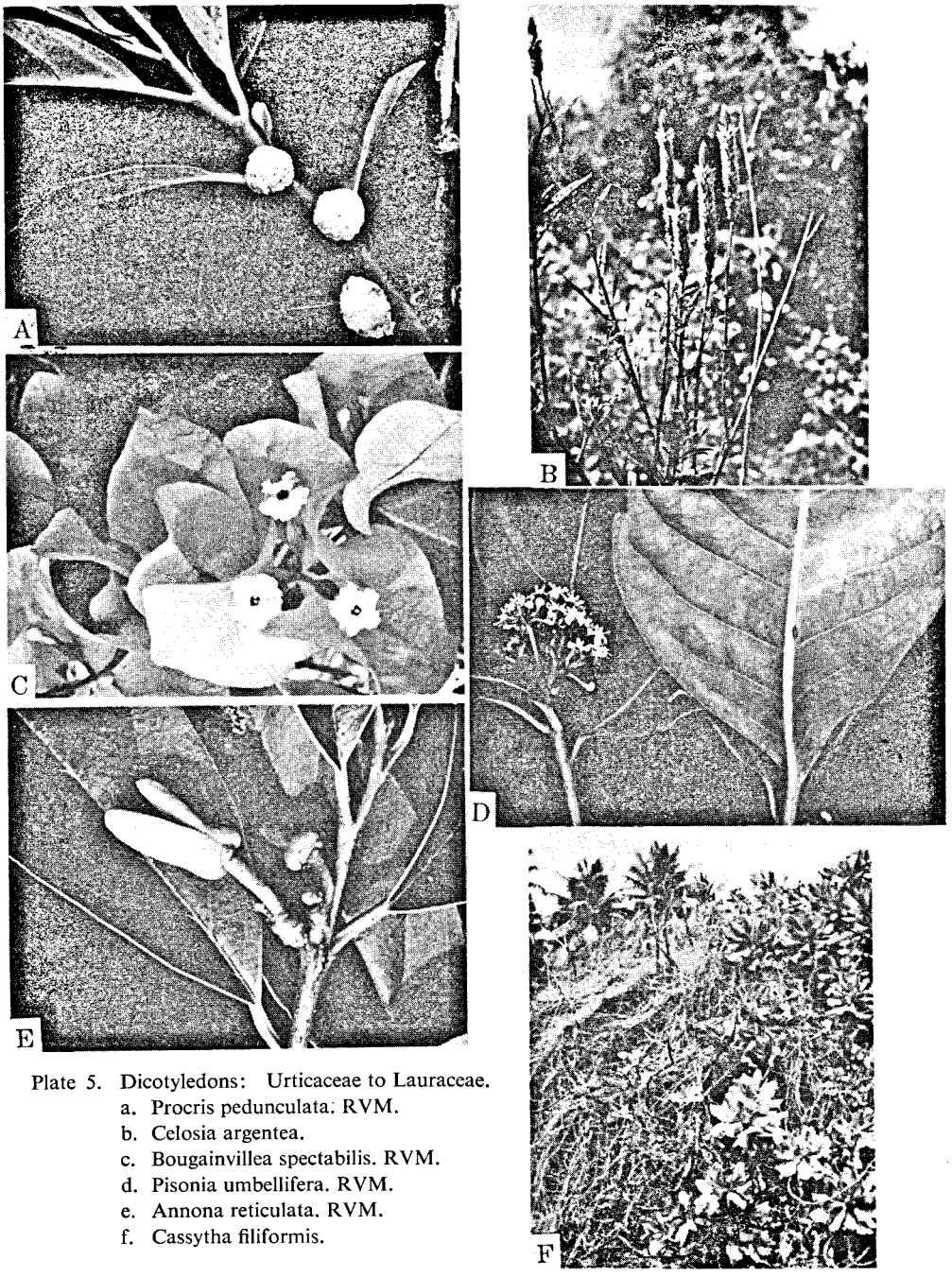
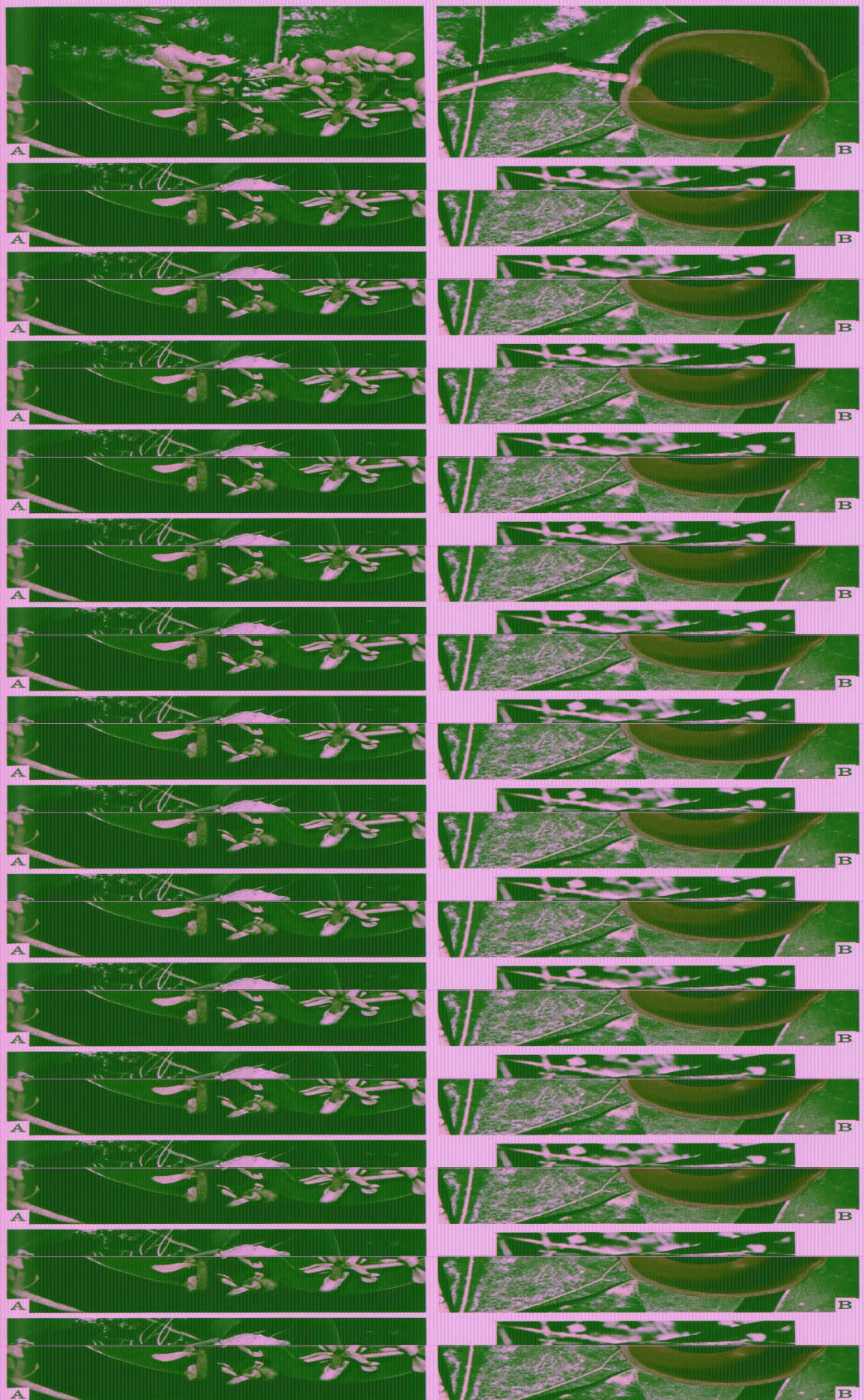


Plate 5. Dicotyledons: Urticaceae to Lauraceae.
a. Procris pedunculata. RVM.
b. Celosia argentea.
c. Bougainvillea spectabilis. RVM.
d. Pisonia umbellifera. RVM.
e. Annona reticulata. RVM.
f. Cassytha filiformis.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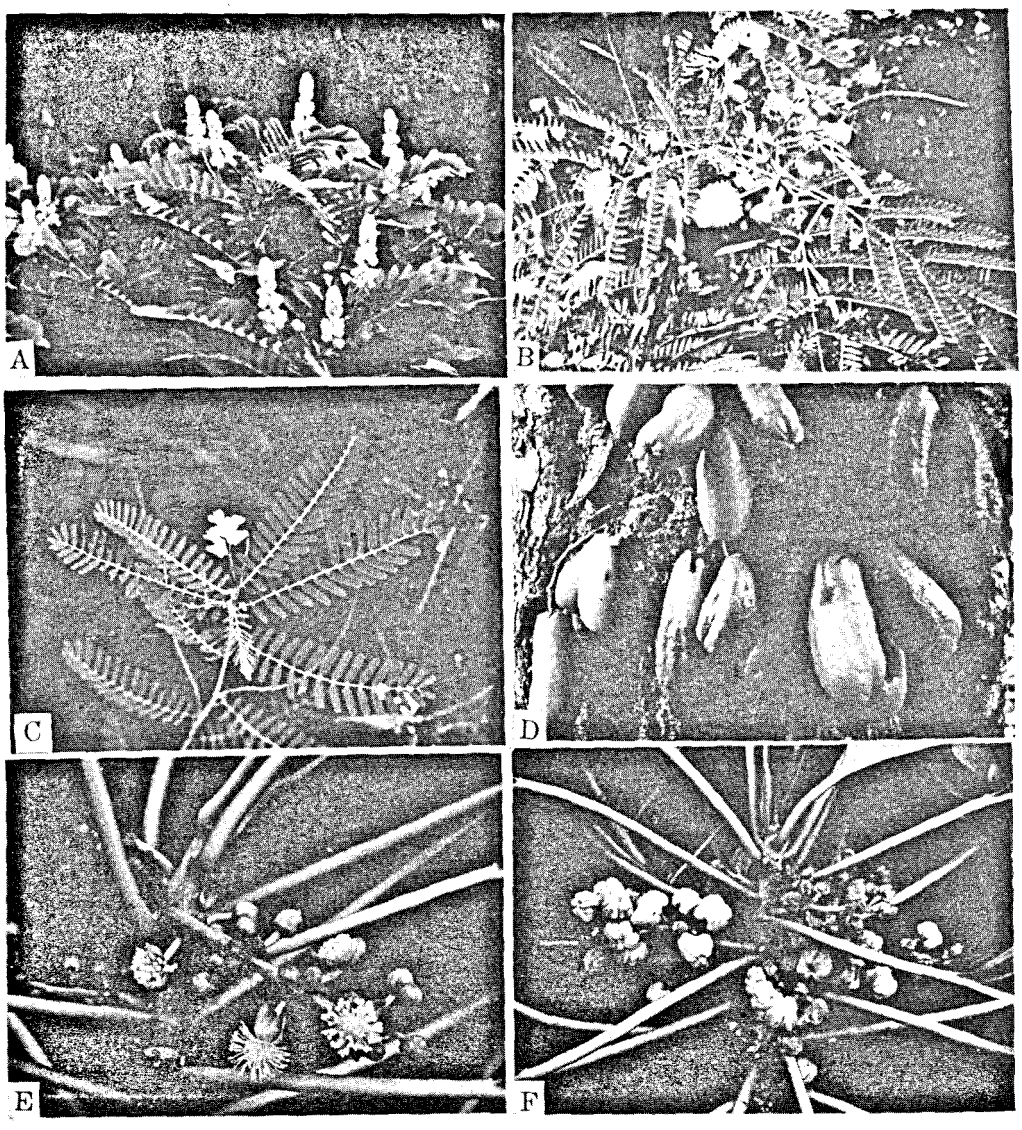


Plate 7. Dicotyledons: Leguminosae to Euphorbiaceae.

a. Cassia alata.
b. Leucaena leucocephala.
c. Sesbania cannabina.
d. Averrhoa bilimbi. RVM.
e. Claoxylon marianum, male. RVM.
f. Claoxylon marianum, female. RVM.

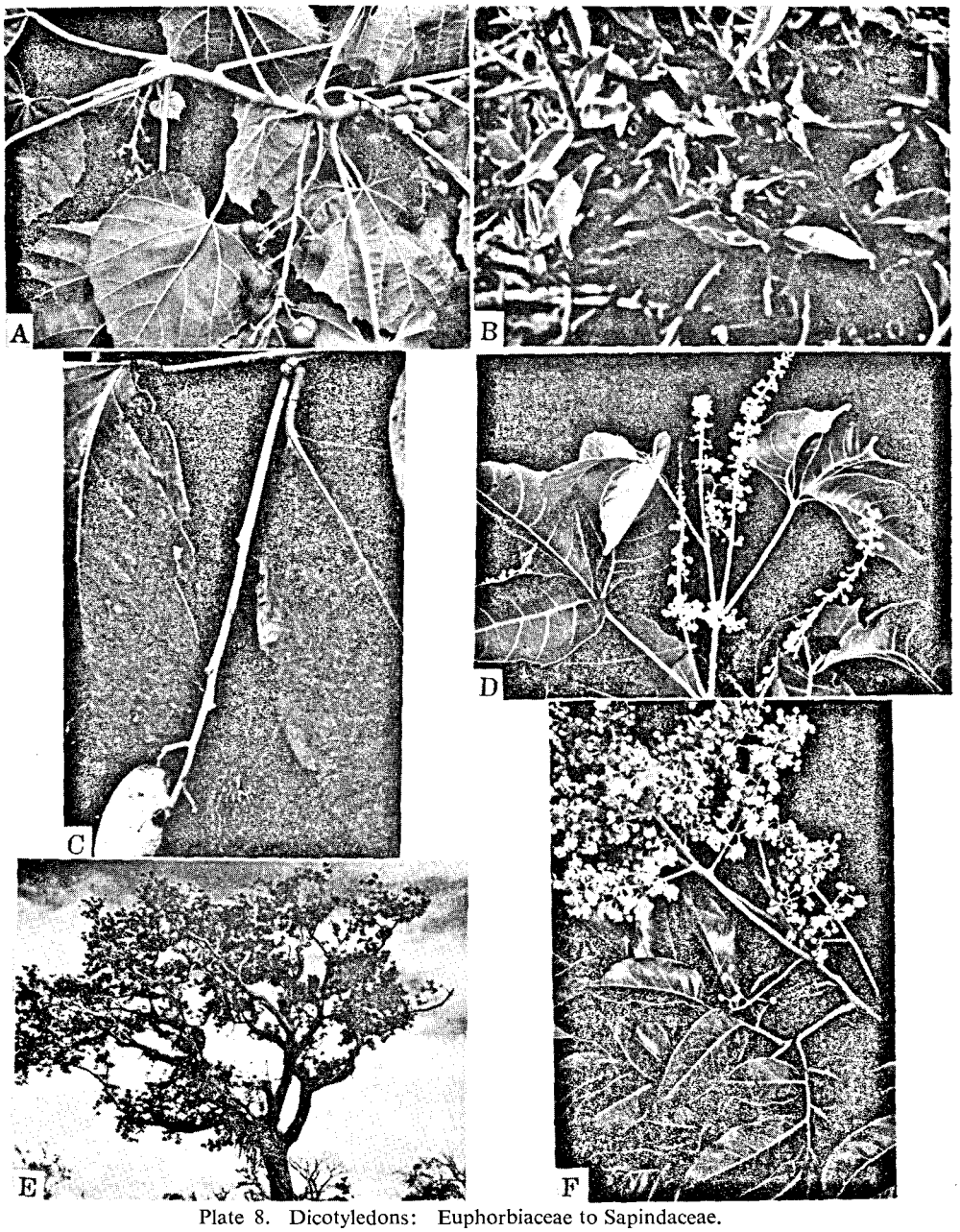


Plate 8. Dicotyledons: Euphorbiaceae to Sapindaceae.
a. Melanolepis multiglandulosa var. glabrata. RVM.
b. Pedilanthus tithymaloides.
c. Merrilliodendron megacarpum. RVM.
d. Allophylus timorensis. RVM.
e. Tristiropsis acutangula. RVM.
f. Tristiropsis acutangula. RVM.

Plate 9. Dicotyledons: Rhamnaceae to Sterculiaceae.

a. Zizyphus mauritiana. RVM.
b. Elaeocarpus sphaericus. RVM.
c. Muntingia calabura. RVM.
d. Hibiscus tiliaceus. RVM.
e. Heritiera littoralis. RVM.
f. Melochia compacta.

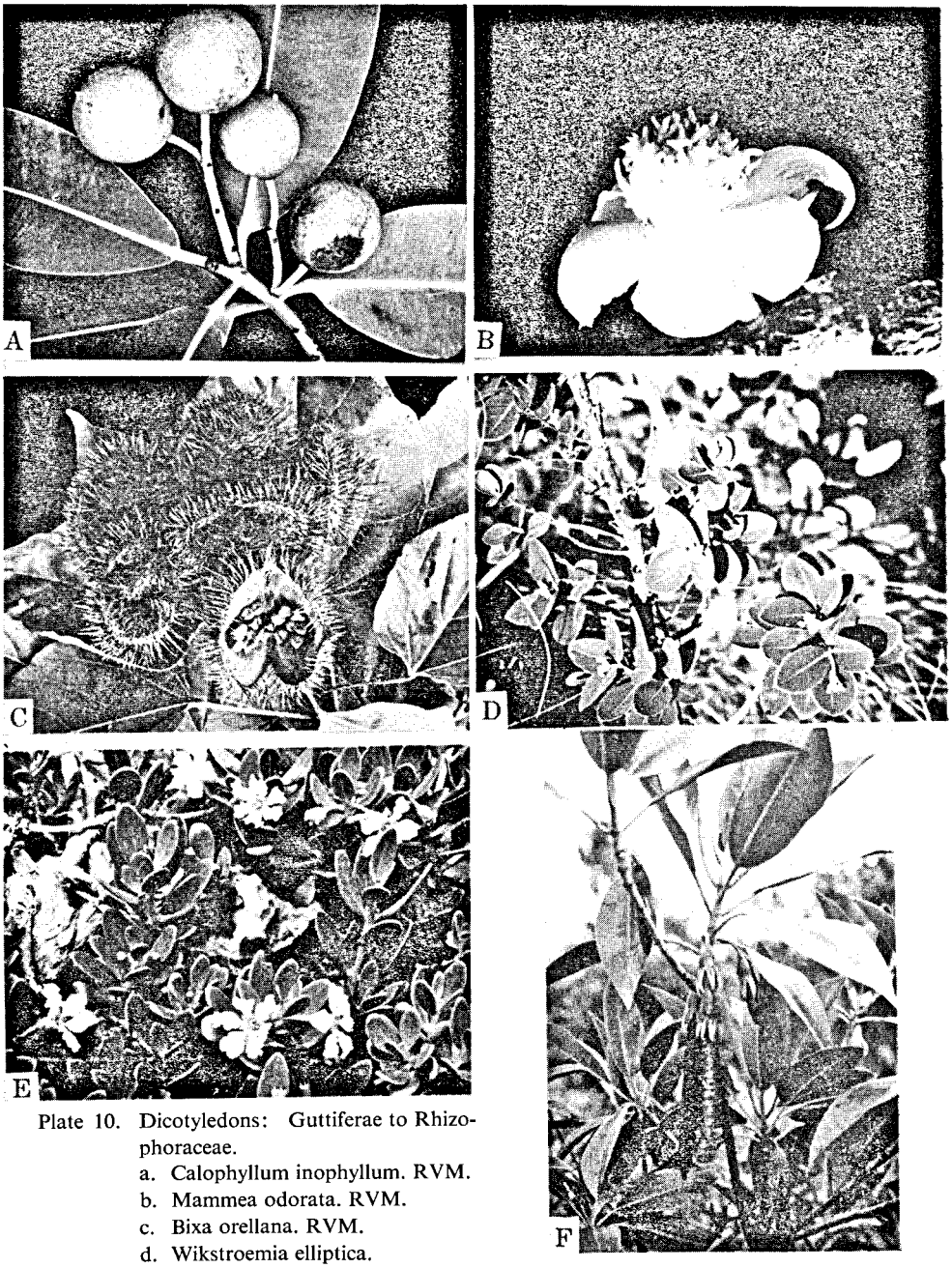


Plate 10. Dicotyledons: Guttiferae to Rhizophoraceae.

a. Calophyllum inophyllum. RVM.
b. Mammea odorata. RVM.
c. Bixa orellana. RVM.
d. Wikstroemia elliptica.
e. Pemphis acidula. RVM.
f. Bruguiera gymnorrhiza.

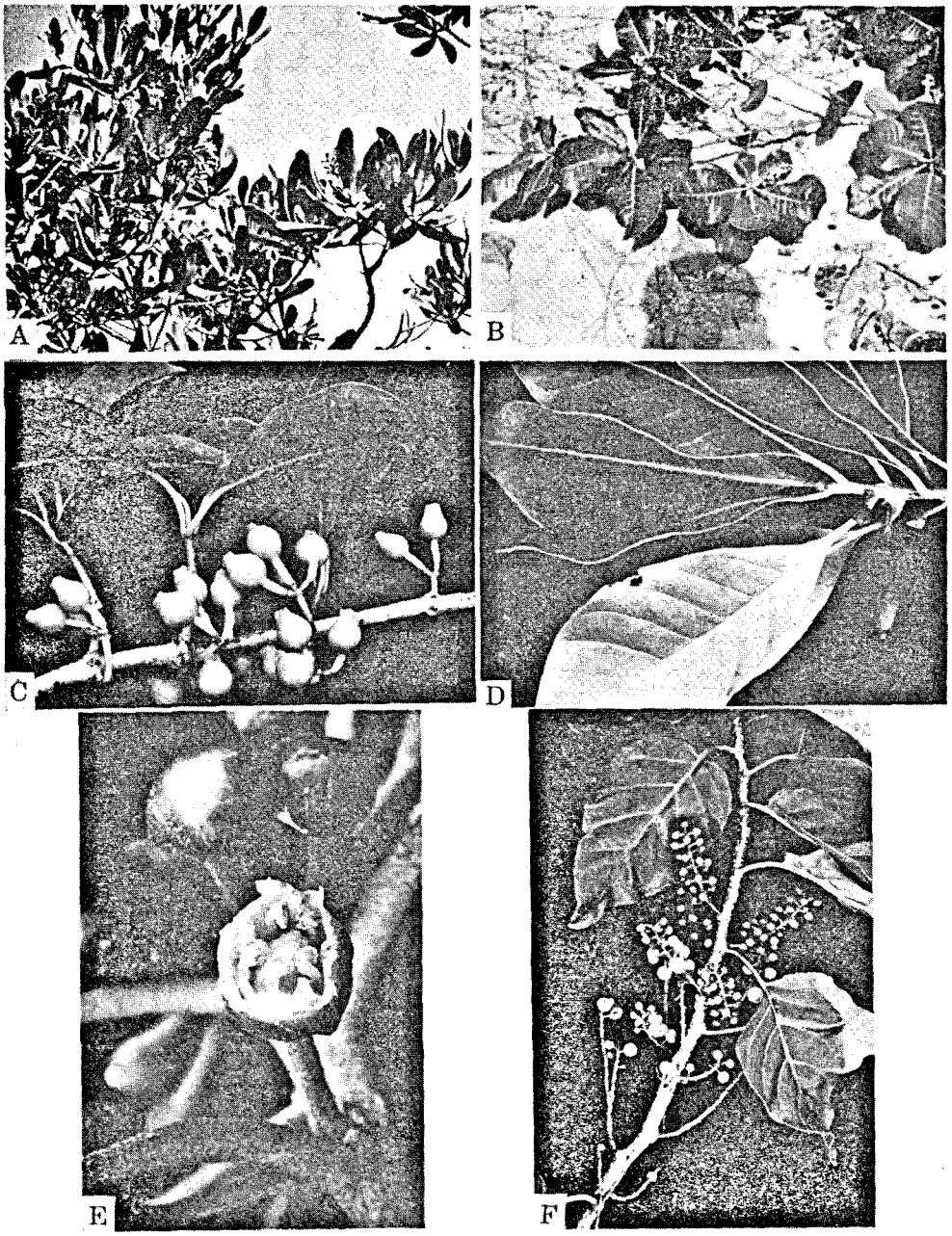
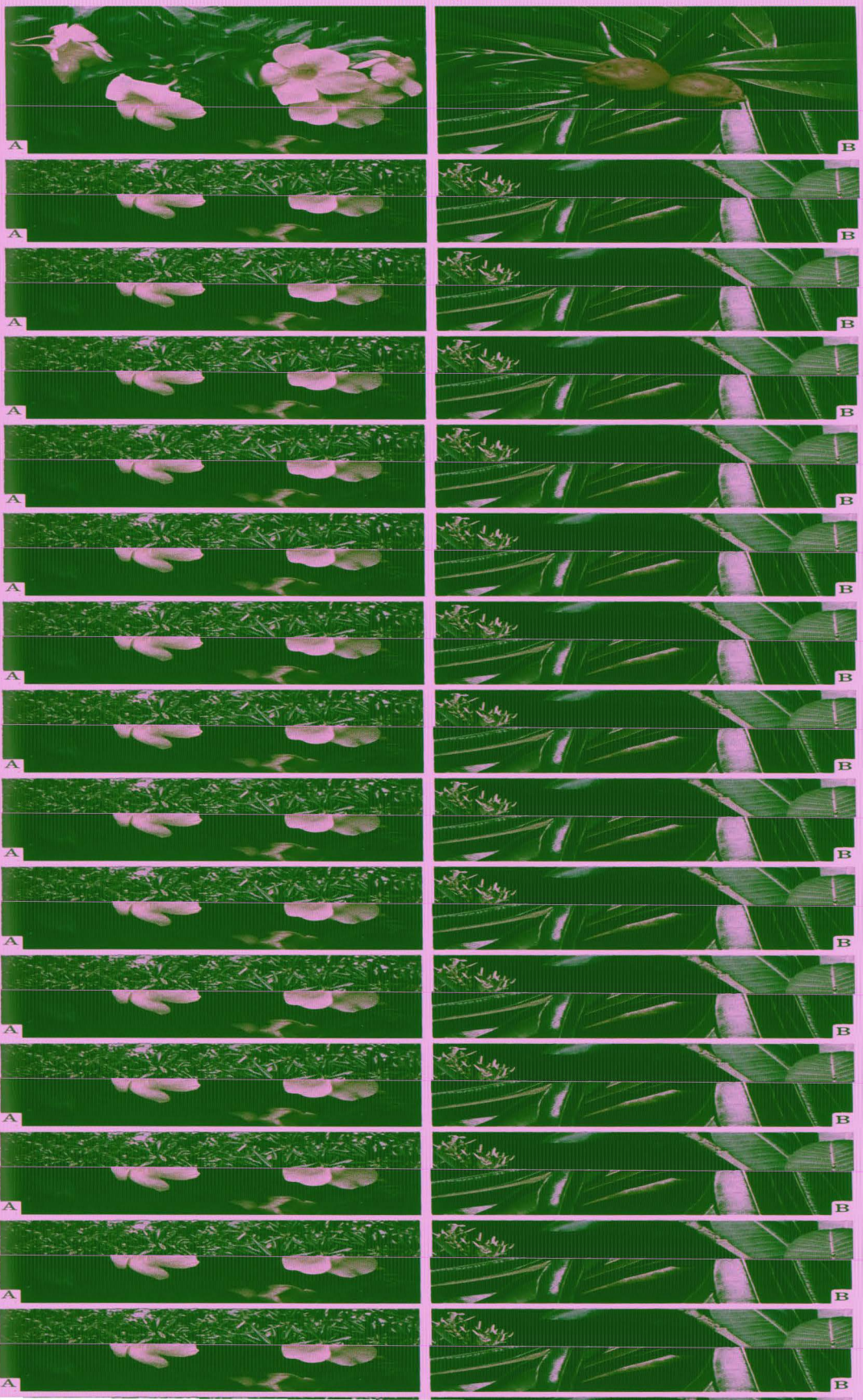


Plate 11. Dicotyledons: Combretaceae to Myrsinaceae.
a. Lumnitzera littorea.
b. Terminalia littoralis.
c. Medinilla rosea. RVM.
d. Planchonella obovata. RVM.
e. Planchonella obovata, flower. RVM.
f. Maesa sp. RVM. 4708.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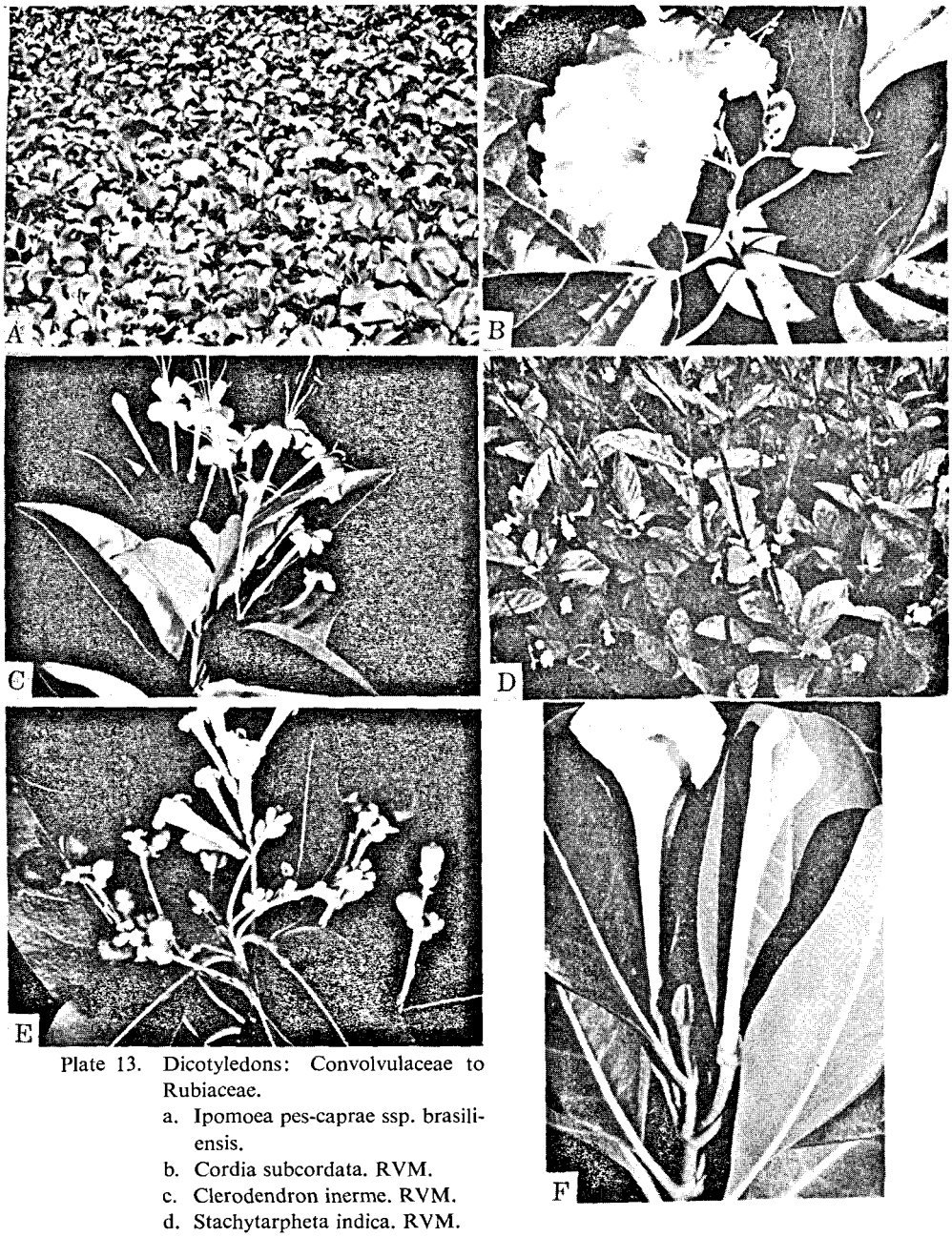

Plate 13. Dicotyledons: Convolvulaceae to Rubiaceae.

a. Ipomoea pes-caprae ssp. brasiliensis.
b. Cordia subcordata. RVM.
c. Clerodendron inerme. RVM.
d. Stachytarpheta indica. RVM.
e. Cestrum diurnum. RVM.
f. Bikkia mariannensis. RVM.

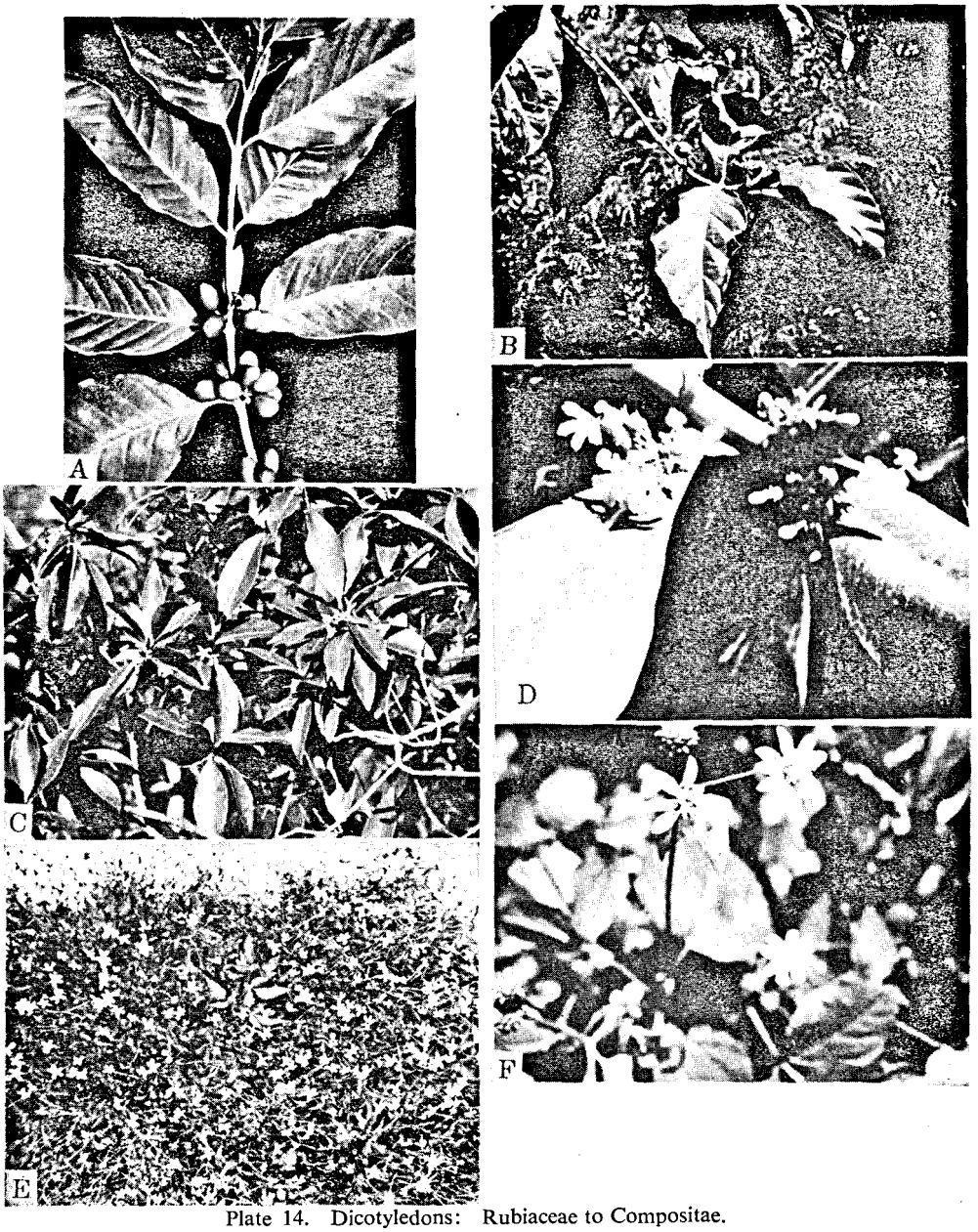

Plate 14. Dicotyledons: Rubiaceae to Compositae.

a. Coffea arabica. RVM.
b. Morinda citrifolia.
c. Timonius nitidus.
d. Scaevola taccada.
e. Bidens pilosa var. radiata.
f. Wedelia biflora.