

## Notes on *Polyscias* (Araliaceae) from Micronesia

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Several species of the genus *Polyscias* J.R. & G. Forst. are frequently encountered in the vegetation of the Pacific Islands, both as wild plants and as cultivated individuals. Certain forms are also well known in greenhouses and gardens in other parts of the world; most of these were obtained originally from somewhere in the Pacific region. There are several alleged species and varieties distinguished by foliage variation, such as variegation or increasingly fine divisions of the leaflets. Many of these are known only in the sterile condition, or at least bloom but rarely in cultivation. The origins and relationships of these plants are thus obscure. Some of them have been given formal botanical names, ranked as species or varieties, but these they probably do not merit. Although some of them have been known to horticulturists and botanists alike for over two hundred years, there has been very little progress in elucidating their position in the genus. Furthermore there is a surprising lack of material represented in herbaria, at least of flowering and/or fruiting specimens.

During a revisional study of the Araliaceae of Fiji, Samoa, Tonga, and the New Hebrides, it became evident that one of the currently accepted species of *Polyscias*, *P. tricochleata*, is but a modified form of *Polyscias pinnata*, the type species of the genus. An examination of type material of *Polyscias pinnata*, collected by Johann and Georg Forster on Tanna in the New Hebrides, appeared to provide a solution to the problem that had confronted me when I collected an obvious "sport" or chimaera in Ponape, Caroline Islands, in 1957. Chimaeras, like teratological specimens, sometimes display features which are helpful in gaining an insight into origins and relationships. A discussion of this chimaera follows, comprising the first section of this report. The second section records recent collections of *Polyscias* in Micronesia.

I. The Cultivated Forms of *Polyscias pinnata*. This species is described and a flower is illustrated in the Forsters' chief work, *Characteres Generum Plantarum* (1776). Specimens were collected by the Forsters and W. Anderson, in the New Hebrides on the island of Tanna. The type material is now preserved in the herbaria of the British Museum (Natural History) and the Royal Gardens, Kew. These have been studied, as well as more recent collections from the New Hebrides.

Although we accept the name provided by the Forsters for the genus and for the species, they were by no means the first to describe the plant. We need mention only Rumphius, who illustrated and described three species now placed in *Polyscias*. One of these, called by him *Scutellaria prima* (Herb. Amb. 4: 75. t. 31. 1743) was later validated: *Crassula scutellaria* Burm. f. (Fl. Ind. 78. 1768). This has been transferred to *Polyscias* by Fosberg (Univ. Hawaii Occ. Pap. 46: 9. 1948). The same species has been known by several later names: *Aralia cochleata* Lam., *Panax cochleatum* (Lam.) DC., *Panax conchifolium* Roxb., *Panax scutellarioides* Reinw.

ex Bl., *Nothopanax cochleatum* (Lam.) Miq., and *Nothopanax scutellarium* (Burm. f.) Merr. This common garden plant is quickly recognized by its dark, unifoliolate, orbicular, markedly concave bowl-like leaves. It has a very different superficial appearance from typical specimens of *Polyscias pinnata*; however, some specimens of *P. pinnata* exhibit unifoliolate leaves, sometimes occurring on the same branch with tri- or quinque-foliolate leaves.

In comparing floral structures we are handicapped by the lack of flowering specimens of both *Polyscias pinnata* and *P. scutellaria*. There appear a few differences apparent in the materials available. As confirmed by Koorders' illustration of *P. scutellaria* (in Atlas Baumart. Java 4, fig. 697. 1918, sub. *P. cochleata*), the flowers have 5 petals, 5 stamens, and 3-5 styles. In *P. pinnata*, on the other hand, the flowers have 6-8 petals and stamens and 4-5 styles. Since the number of parts in flowers of Araliaceae is usually given taxonomic significance, it seems that, at least for the present, these species may be retained. But it seems quite clear that they are very closely related, and perhaps in time it may be possible to show how close the relationship is, and to decide whether the concept of *P. pinnata* could not be considered to overlap that of *P. scutellaria*. Should it become necessary to recognize both entities as representing but one species, the name *Polyscias scutellaria* would take precedence, being the earlier name.

*Polyscias tricochleata* was first established as *Nothopanax tricochleatum* Miq. Miquel erected the genus *Nothopanax* to accommodate species with a bilocular (or rarely trilocular) ovary, of which the type is *Panax fruticosum* L. (not *Nothopanax cochleatum* (Lam.) Miq. (= *Polyscias scutellaria*) as stated by Fosberg (Univ. Hawaii Occ. Pap. 48: 9. 1948). However, Miquel enlarged his generic concept to include species with 4-6-locular ovaries, and thus his genus coincided with the limits of *Polyscias*. *Nothopanax* could be retained if deemed necessary, but only in Miquel's original sense. The extension of the genus to include New Zealand species with digitately compound leaves is entirely impermissible; the misinterpretation was fostered by Seemann in the Revision of the Hederaceae (Journ. Bot. Brit. & For. vols. 3-5, 1865-67, and separately printed). Fortunately, the New Zealand species have recently been segregated as a new genus, *Neopanax* (H. H. Allan; in Fl. New Zealand 1: 433. 1961). They could also, perhaps, be considered to be species of the genus *Panax* in the broad sense.

*Polyscias tricochleata* is a common plant in cultivation throughout a good part of the paleotropical regions. The plants are often grown as hedgerows, and since they are often severely trimmed either for ornamental effect or to obtain the leaves, which are useful both in the diet and in ethno-medicine, it is not surprising that they are found so infrequently in flower. It may be also that some of the various races, such as the albino-variegated ones, are genetically sterile. When these plants are found in bloom, the flowers and inflorescences are scarcely distinguishable from those of *Polyscias pinnata*. Various "intermediates" in foliage variation are also known. Previously there has been no more than this inferential proof of the identity of *P. tricochleata* and *P. pinnata*. Recently, the writer collected an anomalous specimen in Ponape, which is almost certainly a spontaneous chimaera. The "tricochleata" form, as we may call it, growing as usual in a hedgerow, had given rise in two separate individuals to chimaeric shoots bearing leaves, inflorescences, and flowers which were indistinguishable in all significant

Table I. Contrasting characters of the "tricochleata" form and the chimaeras produced by two individuals of the hedgerow. (Stone 1800, from Ponape)

"tricochleata"	chimaera
Leaves usually trifoliolate, occasionally uni- or quinque-foliolate.	Leaves regularly 5-foliolate, sometimes trifoliolate, rarely unifoliolate.
Leaflets conspicuously crenate-crenulate and subdentate or with spinulose crenulations.	Leaflets almost entire, but obscurely sub-crenate, with occasional spinules.
Leaves about 30 cm. long.	Leaves about 50 cm. long.
Leaflets generally variegated with white margins of indefinite width.	Leaflets uniformly green.
Leaflets about 5 cm. long.	Leaflets about 15 cm. long.
Midrib and major veins at base of leaflet flattened and fasciate.	Midrib and major veins at base of leaflet distinct and elevated.
Apparently sterile.	Inflorescences numerous, large, with apparently normal flowers.

details from those of *Polyscias pinnata*. The chimaeric shoots were abundant, and produced apparently normal inflorescences; the "tricochleata" form produced no inflorescences, and was said never to flower by native informants. The following table (Table I) shows the comparisons made between "tricochleata" and the chimaera:

The flowers produced by the chimaeras were on large umbellulate-verticillate inflorescences up to 70 cm. long (or more), with 3-4 nodes on the main erect axis, each node with numerous (about 18) verticillately radiating branches up to 35 cm. long, there in turn 3-5-nodose with about 5-6 short umbellules at each node and a large terminal umbellule. The flowers each had a tubular cuplike calyx with a truncate rim; 5-7 free lanceolate-oblong petals; 5-7 stamens with versatile white anthers on short filaments inserted on the inner rim of the calycular disk; 4-5 short erect continous stigmas of stylose form; inferior, 4-5-celled ovary, each cell with a single pendulous ovule. The floral pedicels were usually 5-8 mm. long. Bracteoles subtend the pedicels, and bracts subtend the branches of the inflorescence. The verticils of the axes are probably not true verticils but appear so because of the greatly contracted or undeveloped internodes between opposite or somewhat irregularly disposed branches. The main axis is stout, green, and subterete.

In comparing this chimaeric type with collections of *Polyscias pinnata*, no significant taxonomic differences can be discerned. There are of course some differences in size, especially in the parts of the inflorescence, but these organs are quite variable even on a single plant. In the flower also there are some differences; but in essential points there is no real discrepancy. It thus appears that the chimaera of one "species" is another species. More plausibly, it may be concluded that the "tricochleata" form is but a cultivar of *P. pinnata* which is capable rarely of producing a spontaneous atavistic chimaeric mutation.

With appropriate genetic techniques it should be possible to investigate the cytological nature of such an occurrence.

## II. Recent collections of *Polyscias* species in Micronesia.

Key to *Polyscias* in Micronesia

1. Leaves unifoliolate, orbicular-cordate, concave and saucerlike. Cultivated. . . . . *scutellaria* (5)
1. Leaves generally of more than 1 leaflet, rarely unifoliolate, if so the plant usually also bearing multifoliolate leaves; leaflets not saucerlike, not concave, if not flat then irregularly bullate, crisped or crumpled.
  2. Leaves tripinnate, the leaflets up to 15 or more per leaf, the ultimate pinnules irregularly lobed or parted, the lobes narrow and acute; foliage sometimes variegated (yellow and green); fruits bilocular. Cultivated. . . . . *fruticosa* (5)
  2. Leaves simply pinnate; fruits bilocular to 6-locular.
    3. Fruits bilocular to trilocular.
      4. Fruits mostly bilocular; leaflets numerous, up to 15 or more per leaf, ovate-subcordate to narrowly ovate-cordate or oblong-cordate; inflorescences large and diffuse. Wild in W. Carolines, Marianas. . . . . *grandifolia* (4)
      4. Fruits mostly trilocular, (rarely 4-locular); leaflets 5, 7, or 9 per leaf, ovate to broadly ovate or oblong-ovate, tapered or decurrent at base, dentate, usually variegated with yellowish blotches; inflorescence large and diffuse. Cultivated. . . . . *guilfoylei* (3)
    3. Fruits 4-6-locular.
      5. Leaflets usually 3 or 5, suborbicular to orbicular, subcordate to

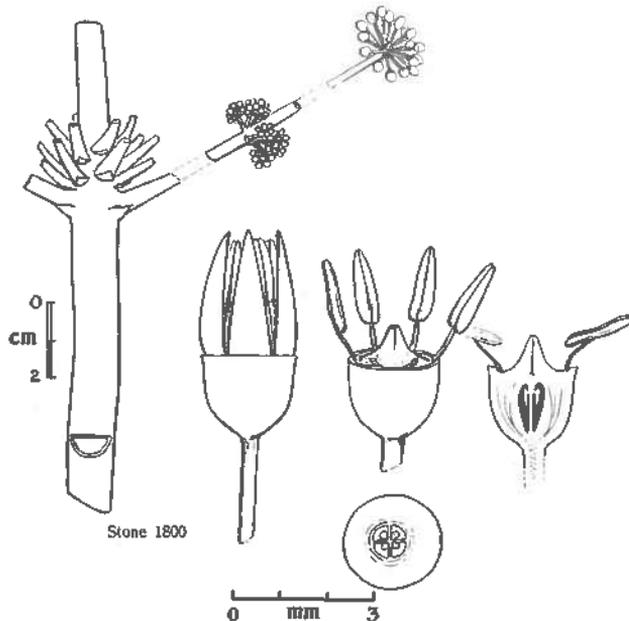


Fig. 1. *Polyscias pinnata* cv. "tricochleata", chimaera form. (Ponape; Stone 1800). Portion of an inflorescence, showing clustered branches at a major node, and middle and terminal umbels (the branch is shown greatly shortened); views and dissections of flowers.

cordate, minutely crenate-denticulate to markedly crenate-dentiuclate, often variegated. Common in cultivation. . . . *pinnata* (1) and cv. 'tricochleata' (1a)

5. Leaflets 5-9 or more, narrowly ovate to oblong sub-lanceolate, acute at apex, margins with a small number of widely spaced dentations. Endemic, Kusaie Island. . . . . *subcapitata* (2)

1. *Polyscias pinnata* J. R. & G. Forst. cultivar "Tricochleata". (Fig. 1).

*Polyscias tricochleata* (Miq.) Fosb.

*Nothopanax tricochleata* Miq.

Caroline Islands: Ponape: Colonia, hedgerow near cafeteria road, May 1957, Stone 1800 (College of Guam Herb., Bishop Mus.) Chimaeric specimens in flower. Observed also in Guam in cultivation. Mariana Islands; Guam: Agana, cult. hedge, March 1962, Stone 3999 (GUAM).

1a. *Polyscias pinnata* cultivar.

Marshall Islands: Jaluit Atoll, Jan. 1915, *Koidzumi* s. n. (TI). This specimen represents a curious plant, perhaps teratological, with pinnately lobed leaflets

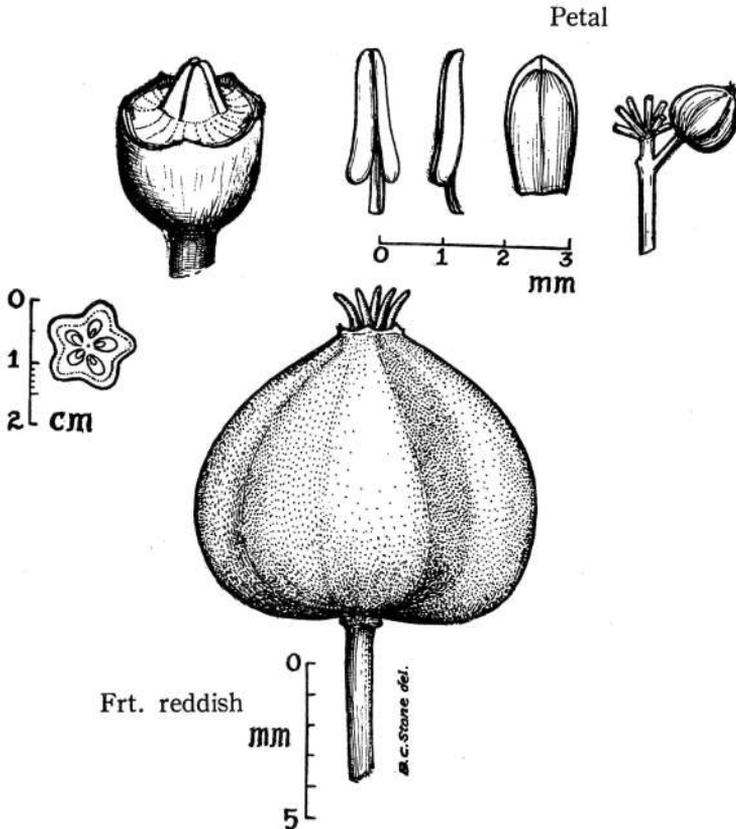


Fig. 2. *Polyscias subcapitata*. (Kusaie; Stone 1926). Above, a flower and dissected parts; a fruit in situ; below, side view of a fruit.

and a long slender inflorescence. It is somewhat reminiscent of *Polyscias grandifolia*.

2. *Polyscias subcapitata* Kanehira. (Fig. 2).

A species endemic to the island of Kusaie. Caroline Islands: Kusaie: Divide s. e. of Lele Harbor, in moist lower forest, 130 m. alt., 1-2 m. tall erect plant

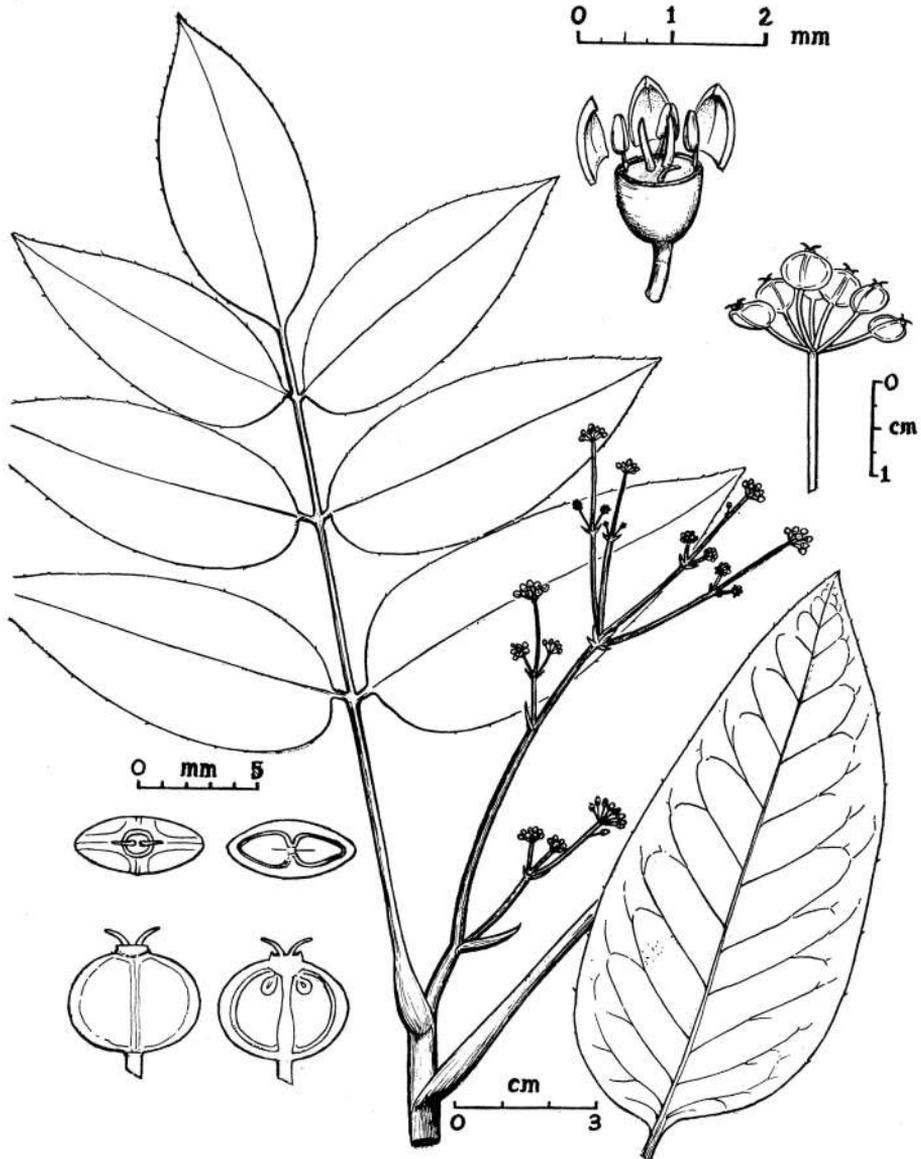


Fig. 3. *Polyscias grandifolia*. (Truk; Stone 2049). Leaf and inflorescence; leaflet, showing venation; view of umbel; flower, partly dissected; side and top views of fruit, whole and in cross-section.

with green flowers, 25 Dec. 1945, *St. John* 21445 (BISH, US). Lele Islet, sealevel, ten foot shrub in coconut grove, flowers white, local name "fohluke", 23 July 1949, *Glassman* 2715 (US). Sruusr, alt. 500 ft., May 1957, *Stone* 1926 (BISH). Lowest slopes of south side of Mt. Matanta (Buache), north head of Lele Harbor, occasional on wooded ridge, 19 August 1946, *Fosberg* 26565 (BISH). Without locality, July 1931, *Kanehira* 1327 (BISH).

The petals are pale green with faint reddish nerves; the fruits are reddish, with 4-5 styles.

### 3. *Polyscias Guilfoylei* (Cogn. & Marché) L. H. Bailey

An erect shrub about 3 m. tall, leaves with 3-4 pairs of leaflets on petiolules c. 25 mm. long; leaves variegated with creamy-white irregular patches on the margins; margins bluntly toothed; leaves becoming reddish with age. Inflorescence a terminal cluster of thyrsoid panicles on a short rachis; flowers externally bronze, pale within, the petals 2.5 mm. long and 1.2 mm. wide, ovate unguiculate within at apex, the inner surface medially carinate; petals soon reflexed; stamens 5, exerted on filaments 2 mm. long; anthers bluntly sagittate; styles usually 3, forming a column, but separating and reflexed on the summit of the trigonal black fruit; fruit c. 4 mm. long and 5 mm. broad. The flowers scatter pollen, and only then do the styles open. (Fosberg, in herb.)

The flowers of *Polyscias Guilfoylei* are but rarely found. In one other collection seen at the Bishop Museum (from a plant cultivated at 2061 Kakela Drive, Honolulu), the flowers showed generally 3-4 styles).

Recent collections from Micronesia:

Caroline Islands: Palau: Koro, Ngarmid, around old temple grounds, 100 m. alt., planted, 8 March 1950, *Fosberg* 31945 (BISH).

Mariana Islands: Guam: Harmon Village, 20 ft. tall, flowering Jan. 1962, *Stone* 3838 (GUAM, BISH, US). Camp Quezon, Mangilao, 10 ft. tall, flowering, April 1962, *Stone* 4072 (GUAM). Yona Village March 1962, *Stone* 4031 (GUAM).

#### 3a. *Polyscias Guilfoylei?* cult. form.

Leaves not variegated, very dark green, crumpled and bullate, nearly orbicular, finely dentate, veins prominent beneath. Leaves commonly with 5 or 7 leaflets. This hedgerow form not infrequently gives rise to a sport or chimaera which bears considerably larger, flattened, nonbullate leaves, quite similar to those of *P. Guilfoylei*. It is always sterile.

Mariana Islands: Guam: Tamuning, Jan. 1962, *Stone* 3840 (GUAM).

The bullate form is probably a polyploid.

### 4. *Polyscias grandifolia* Volken. (Fig. 3).

Mariana Islands: *Pagan*: Isthmus, 25 Sept. 1949, *Anderson* 541 (BISH). Agiguan: Without locality, 1952, *Y. Kondo* (BISH). *Saipan*: Mt. Tagpochau, c. 500 m. alt., 23 Feb. 1950, *Fosberg* 31779 (BISH); north slope, 19 June 1946, *Hosaka* 2942 (BISH); *Kanehira* 967 (US). *Tinian*: Mt. Lasso, c. 175 m. alt., June 1946, *Fosberg* 24887, *Hosaka* 2808 (BISH). *Guam*: Mt. Alifan, 1936, *Swezey* (BISH); North-east of Agana, March 1946, *Moore* 390 (US); Cliff near Agana, Sept. 1949, *Anderson* 176 (BISH); Near Naval H. Q., Sept. 1949, *Anderson* 118 (BISH); Near Fadian Point, limestone flats, alt. 115 m., Jan. 1950, *Fosberg* 31220 (BISH); cliff



Fig. 4. *Polyscias Guilfoylei* cv. *chimaera*; upper portion with large normal dark green non-variegated leaves; lower portion with small, very dark, bullate, crumpled leaves. (Pirate's Cove, Guam).

south of Tarague Bay, Aug. 1954, *Moran* 4566 (BISH). Tamuning, Jan. 1962, *Stone* 3839 (GUAM, BISH, US, L.). Camp Quezon, Mangilao, April 1962, *Stone* 4059 (GUAM). Ritidian Pt., Feb. 1963, *Stone* 4714 (GUAM).

Caroline Islands: *Palau*: No locality, "Coral rock", July 1921, *Kanehira* 221 (BISH); Angaur, Feb. 1915, *Koidzumi* (TI); *Tuyama*; Peleliu, north end, between outer beach and mangrove swamp, July 1946, *Fosberg* 26001 (BISH); Peleliu, Aug. 1037, *Tuyama* s. n. (TI); Ngeanges (Gaianges) Island, in Yoo (Sar) Passage, just west of south point of Urukthapel Island, sealevel, July 1946, *Fosberg* 25802 (BISH); Urukthapel Island, south-east peninsula, March 1950, *Fosberg* 32191, 32151 (BISH); Urukthapel, Todai-yama, Aug. 1939, *Tuyama* s. n.; Ngatpang, *Tuyama* s. n. (TI). Aurupushekaru Island, 15 ft. tall, fruiting, Dec. 1962, *Stone* 4537 (GUAM, BISH, L). *Yap*: Low east ridge of Mt. Matade, July 1946, *Fosberg* 25573, 25576 (BISH); Clay soil, 1948, *Wong* 328 (BISH), without locality, *Kamiya* 200 (TI). *Truk*: Fanan Islet (reef), Dec. 1949, *Anderson* 806 (BISH); Pueles Islet, near South Pass, Dec. 1949, *Anderson* 801 (BISH); Pis Islet, north side of barrier

reef, June 1946, *Fosberg* 24633 (BISH); Dublon Island, Mt. Tolomen (Tolowan), 200-360 m. alt., May 1946, *Fosberg* 24541 (BISH); Natsushima, mangrove area, July 1933, *Hosokawa* 6538 (BISH); Uoala, Feb. 1900, *Moore* 115 (US); no locality, Jan. 1915, *Koidzumi*, (TI).

This species, a common strand or limestone plant throughout most of Micronesia, should be compared with *Polyscias sorongensis* Gibbs (in *Phytogeogr. Arfak Mts.* 216. 1917), which was collected on the island of Sorong on the strand.

5. *Polyscias fruticosa* (L.) Harms.

Mariana Islands: *Guam*: Harmon Village, Dec. 1962, *Stone* 3802 (GUAM, BISH, L, US). Flowering and fruiting; flowers in compact umbels on long peduncles.

Possibly a form of *P. fruticosa* is the following:

Mariana Islands: *Guam*: Barrigada village, hedgerow, dwarf, flowering May, 1962, *Stone* 4167 (GUAM). Flowers in smaller, looser umbels, and the entire inflorescence greatly contracted; leaflets highly irregular and asymmetrical.

6. *Polyscias scutellaria* (Burm. f.) Fosberg.

Mariana Islands: *Guam*: Harmon Village, March 1962, *Stone* 4029 (GUAM). Easily recognized by the saucerlike orbicular leaves. It has not been observed to flower here in Guam.