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Invasive Plants and Their Control in Micronesia

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Abstract—Several plants introduced accidentally or for ornamental purposes have established in Micronesia and are considered invasive species. These include: *Antigonon leptopus* Hooker & Arnott, *Bidens pilosa* L., *Chromolaena odorata* (L.) King and Robinson, *Clidemia hirta* (L.) D. Don, *Coccinia grandis* (L.) Voigt, *Cuscuta* sp., *Eichhornia crassipes* (Martius) Solms-Laubach, *Imperata conferta* (Presl) Ohwi, *Ipomea* spp., *Lantana camara* L., *Leucaena leucocephala* (Lam.) deWit, *Mikania scandens* (L.) Willd., *Mimosa (invisa) diplotricha* C. Wright ex Suavalle, *Miscanthus floridulus* (Labill.) Warburg ex Schum. & Lauterb., *Momordica charantia* L., *Panicum maximum* Jacquin, *Passiflora foetida* L., *Pennisetum polystachyon* (L.) Schultes, *Piper auritum* Kunth, *Pistia stratiotes* L., *Raphidophora aurea* (Linden ex Andre), *Spathodea campanulata* P. de Beauvois, and *Wedelia trilobata* (L.) Hitche. The natural enemies introduced to suppress some of these species will be discussed.

The accidental or intentional introductions for ornamental and other purposes of many herbs, shrubs, vines and trees have had a profound effect on the environment in Micronesia. These plants have become dominant in the ecosystem because of the absence of their natural enemies that normally keep them in check. Lee (1974) stated that invading plants originating in the New World outnumber those from the Old World in Guam. He found the invading species of plants were 3.4% in limestone forest, 9.4% in ravine forest, 13.3% in savanna, 17.3% in strand and 32.4% in wetlands ecosystems. McConnell and Muniappan (1991) listed 12 species of introduced ornamental plants that became weeds in Guam. Space & Falanruw (1999) prepared a list of invasive species in Micronesia. Meyer (2000) listed invasive species of plants in Micronesia by classifying them as dominant, moderate and potential invaders. In this supplement Josekutty et al. (2002) give a list of invasive species in Kosrae. As most of these invaders are exotic species, many of them could be suppressed by classical biological control. Prospects for biological control of some of the exotic weeds in the Pacific (Waterhouse & Norris 1987) and in Southeast Asia (Waterhouse 1994) have been described. In this paper we present the description and control measures taken to suppress the invasive species in Micronesia.

Chain-of love, *Antigonon leptopus* Hooker & Arnott (Polygonaceae)

A native of Mexico this aggressive vine was introduced as an ornamental plant. The flowers are either white or pink. It produces many seeds and it also has underground tubers. This vine has smothered plants in cliff lines, roadsides and disturbed areas in Guam and Saipan. Mechanical cutting and removing the vines has not proven useful as new vines sprout from the seeds and the underground tubers.

Spanish needles, *Bidens pilosa* L. (Asteraceae)

It originated from tropical America but is widespread throughout the tropics. It is common on roadsides, disturbed areas and farms in Micronesia. It is spread mainly by its barbed achenes that attach to clothing, feathers and fur. Hand weeding is effective but the plants need to be properly disposed of. Stems of the cut plants readily root when they touch the soil. Waterhouse & Norris (1987) list a number of natural enemies of this plant but no attempt has been made to suppress this plant by biological control.

Siam weed, *Chromoleana odorata* (L.) R.M. King & H. Robinson (Asteraceae)

A native of Tropical America, it was reported in Guam in 1963. It invades disturbed areas, roadsides and pastures. It has allelopathic properties and it forms thickets in invaded areas. It established in the Marianas, Palau, Yap, Pohnpei and Kosrae in the 1980's, Chuuk in the 1990's and in Majuro, Marshalls in 2001. Only a few clumps of *C. odorata* have established at Laura, Majuro and it could be eradicated by mechanical means if steps were taken immediately.

A natural enemy, *Pareuchaetus pseudoinsulata* Rego Barros (Lepidoptera: Arctiidae) was established on Guam in 1985, Northern Mariana Islands in 1986-87 (Seibert 1989), Yap in 1988 (Muniappan et al. 1988), Pohnpei in 1988-90 (Esguerra et al. 1991) and Kosrae in 1992 (Esguerra 1998). It has efffectively suppressed *C. odorata* that occur in thickets. It is not effective on isolated patches of *C. odorata* because of the insect induced defense exhibited by the host plant. The eriophyid mite, *Acalitus adoratus* Keifer (Acari: Eriophyidae) was fortuitously introduced to Micronesia from the neotropics via Southeast Asia but it is not effective against this weed (Muniappan & Bamba 2000). The gall fly, *Cecidochares connexa* (Macq.) (Diptera: Tephritidae) is now in quarantine and we are awaiting permission for field release. It causes galls in the terminal shoots resulting in stunting of the plants and reduction in flower production.

Koster's curse, *Clidemia hirta* (L.) D. Don (Melastomataceae)

This plant is a native of the neotropics. It is a coarse, perennial shrub growing up to 2.0 m height. Bluish black berries are dispersed by birds (Waterhouse and Norris 1987). In Micronesia, *C. hirta* occurs only in Palau. It is common in disturbed wet forest areas. To control this weed two natural enemies, a thrips, *Liothrips urichi* Karny (Thysanoptera: Phlaeothripidae) and a moth, *Ategumia ebulialis* (Guenee) (Lepidoptera: Pyralidae) were introduced from Hawai‘i in

1972. Of these only the thrips established (Schreiner 1989). The efficacy of the thrips or the seriousness of the weed in Palau has not been assessed.

Ivy gourd, *Coccinia grandis* (L.) Voigt (Cucurbitaceae)

This aggressive vine, which often entirely covers vegetation, is of African origin. It is a serious problem in Saipan and Guam. This plant has white flowers and the fruit is red when ripe. It spreads by seeds and vegetatively as it readily roots at the nodes that touch the ground. A U.S. Department of Agriculture Tropical and Subtropical Agricultural Research project for the biological control of the ivy gourd in Guam and Saipan has been approved. Three biological control agents, *Melittia oedipus* Oberthur (Lepidoptera: Sesiidae), *Acythopeus burkhartorum* O'Brien and Pakaluk (Coleoptera: Curculionidae) and *Acythopeus cocciniae* O'Brien and Pakaluk from East Africa were introduced to Hawai‘i (Broda 1999, Hennessey 1996) and these agents will be received from Hawaii and host specificity tested at the University of Guam quarantine facility for possible field releases in Guam and Saipan.

Dodder, *Cuscuta* sp. (Convolvulaceae)

Cuscuta sp. is another parasitic vine that climbs over host plants and attaches with haustoria to obtain nutrients. Flowers are small and white, in clusters. Fruits are capsules and contain small, round, minutely muricate, dark brown seeds. Young seedlings have roots, however when the shoot attaches to a host, the roots degenerate. Dodder is found on roadsides, fences, ornamental plants and others in Micronesia.

Water hyacinth, *Eichhornia crassipes* (Martius) Solms-Laubach (Pontederiaceae)

This herb is neotropical in origin. It is distributed in ponds and wetlands. This plant was first reported in the Agana Springs, Guam in 1946. It also occurs in Palau. Even though it is a serious weed in ponds and lakes in many tropical countries it has not yet become a problem in Micronesia. Waterhouse & Norris (1987) reviewed biological control programs carried out to suppress this weed in different countries.

Blady grass, *Imperata conferta* (=*I. cylindrica*) (Presl) Ohwi (Poaceae)

It occurs near the old airport in Yap. It has been reported to occur in Palau, Saipan, Tinian, Rota and Guam by various authors (Fosberg et al. 1987, Swarbrick 1997, Waterhouse 1997). Some attempts have been made to eradicate this plant in Yap by applying herbicides.

Morning glory family, *Ipomea* spp. (Convolvulaceae)

Some species of *Ipomea, Merremia* and species belonging to other genera in Convolvulaceae have become serious invaders in Micronesia. *Merremia peltata* (L.) Merrill occurs in Kosrae, Pohnpei and Palau. It is a coarse climbing vine with a large underground tuber. It is abundant in the roadsides and forest

clearings. It often scrambles over and smothers low vegetation (Waterhouse & Norris 1987).

Lantana, *Lantana camara* L. (Verbenaceae)

This thorny shrub is native to Tropical America and is a serious problem in tropical and subtropical regions of Africa, Asia and the Pacific. In Micronesia it occurs in Saipan, Tinian, Aguijan, Guam, Yap, Palau, Chuuk, Pohnpei and Marshalls. It does not occur in Rota and Kosrae. It was introduced as an ornamental to most countries. Birds feed on the berries and disperse the seeds. Several natural enemies have been introduced to suppress this weed in Micronesia (Denton et al. 1991). It is a serious problem in Tinian and Aguijan. A law has been passed in the Commonwealth of the Northern Marianas prohibiting entry of lantana into Rota.

Leucaena, *Leucaena leucocephala* (Lam.) deWit (Mimosaceae)

This small tree is native to Tropical America. Propagation is by seeds and alkaline soils are preferred for its growth. In the recent years, some fast growing varieties of this species have been introduced in Micronesia for agroforestry, fodder and other purposes. A psyllid, *Heteropsylla cubana* Crawford (Hemiptera: Psyllidae), a pest of *L. leucocephala*, was first reported in Hawaii in 1984 and in Guam and West Caroline Islands in 1985. One of the authors (RM) found this insect to have established in 2001 in Marshalls.

Mile-a-minute vine, *Mikania scandens* (L.) Willd. (Asteraceae)

This aggressive vine is originally from Central and South America. It invades disturbed areas, roadsides, horticultural crops and cliff lines. It is extremely fast growing, creeps and twines, roots readily at nodes and also produces abundant small seeds that are distributed by wind. It is widely distributed in Micronesia. Waterhouse and Norris (1987) list several natural enemies of this plant. They also mentioned that a natural enemy, *Liothrips mikaniae* (Priesner) (Thysanoptera: Phlaeothripidae) from Trinidad via England was introduced to Malaysia and Solomon Islands but failed to establish.

Creeping sensitive plant, *Mimosa (invisa) diplotricha* C. Wright ex Suavalle (Mimosaceae)

This plant is neotropical in origin. It is distributed in Palau, Yap and Pohnpei, Commonwealth of the Northern Mariana Islands, and a recent introduction to Guam. This plant tends to dominate where it occurs usually in disturbed areas such as plantations and roadsides. The main problem it creates is the stems are very thorny and a patch is impossible to pass through. *Heteropsylla spinulosa* Muddiman, Hodkinson and Hollis (Homoptera: Psyllidae) a natural enemy of *M. diplotricha* was introduced to Pohnpei from Australia, then from Pohnpei to Yap and Palau (Esguerra et al. 1997).

Sword grass, *Miscanthus floridulus* (Labill.) Warburg ex Schum. & Lauterb. (Poaceae)

This grass is found in the volcanic soils of southern Guam and is not common on limestone soils of northern Guam. Propagation is by rhizomes. It readily burns during the dry season but the fire does not kill the plant. The clumps regenerate rapidly after the rains. It also occurs in the Northern Mariana Islands, Chuuk, Pohnpei and Kosrae (Space & Falanruw 1999).

Wild bitter melon, *Momordica charantia* L. (Cucurbitaceae)

It is native to Tropical Asia or Africa. This vine has yellow flowers and orange fruits. It has spread along roadsides and other disturbed areas. It can also be seen growing on cliffs and orchards. It is propagated by seeds only. It serves as a wild host for the melonfly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae) a serious pest of fruit crops and also of quarantine importance.

Guinea grass, *Panicum maximum* Jacquin (Poaceae)

This grass is native to Africa and occurs throughout Micronesia. This tall grass has yellow green foliage and large panicles. It was introduced as a fodder plant but it has escaped cultivation. Propagation is by seeds and short rhizomes. It is found on roadsides and disturbed areas.

Wild passion fruit, *Passiflora foetida* L. (Passifloraceae)

This vine is Neotropical in origin. It is widespread in Southeast Asia, West Africa and the Pacific (Waterhouse 1994). It is an annual or perennial vine. Stem is cylindrical, hairy, with tendrils next to leaves. It flowers year round and produces orange fruits. Propagation is by seeds. It is common on roadsides, disturbed areas and horticultural crops.

Misson grass, *Pennisetum polystachyon* (L.) Schultes (Poaceae)

This grass is native to tropical Africa from where it has spread throughout Asia and the Pacific (Waterhouse 1994). It is annual or perennial with fibrous roots, but no stolons. It is common in the roadsides and in disturbed areas.

False kava, *Piper auritum* Kunth (Piperaceae)

This plant was brought illegally to Pohnpei from Hawai‘i in 1999 as an alternative to kava (*Piper methysticum*). It has larger light green leaves. It sprouts prolifically from rhizomes and roots from the nodes. Currently an eradication program is in progress by using mechanical and chemical methods (Englberger 2001).

Water lettuce, *Pistia stratiotes* L. (Araceae)

The origin of this plant is unknown. It occurs throughout the tropics in Africa, Asia and the Caribbean. It is found in the waterways of southern Guam. It

was first collected in 1968 in the mouth of the Talofofo River (Stone, 1970). It is a free floating, perennial with a tuft of fibrous feathery roots up to 1 m long with numerous secondary roots (Waterhouse 1994). Stolons produced from the base of the plant develop into new plants. This aquatic plant reduces the flow of rivers by clogging them and causes stagnant pools of water. Several natural enemies of this weed have been recorded. Attempts at biological control of this weed have been made in Australia, Botswana, Zambia, Zimbabwe, Papua New Guinea, South Africa and U.S.A. (Waterhouse 1994).

Rhaphidophora aurea (Linden ex Andre) Birdsey (Araceae)

This high climbing vine has large showy leaves containing specks of yellow and was introduced to Micronesia as an ornamental. When growing in the shade as houseplants, the leaves tend to be small (Neal 1965). The thick ropelike stems are held to trees by clinging roots. It is quite common in yards and often seen choking the supporting plants.

African tulip tree, *Spathodea campanulata* P. de Beauvois (Bignoniaceae)

This large tree can grow up to 70 feet. The flowers are orange-scarlet lined with yellow. The leaves are dark green and one to two feet long. It produces many seeds and can also be propagated by cuttings. It was brought in as an ornamental and is abundant along roadsides and disturbed areas in Guam, Pohnpei, and Saipan.

Wedelia trilobata (L.) Hitche. (Asteraceae)

This creeping vine is of tropical American origin. It is commonly grown as an ornamental ground cover and for its showy yellow flowers. It has escaped cultivation and established in roadsides and disturbed areas.

The invasive species in Micronesia are either of neotropical or tropical Asia and African origin. Some of these exotic species have been targeted for classical biological control in the tropical world. Biological control programs for *L. camara, C. hirta* and *M. diplotricha* have been attempted in the past and for *C. odorata* and *C. grandis* are in progress in some islands of Micronesia. Biological control projects in Micronesia follow the programs developed in Hawai‘i or Australia, as these are too expensive to initiate and implement by the governments in Micronesia. Attempts to eradicate *I. conferta* in Yap, *P. auritum* in Pohnpei and *M. diplotricha* in Guam by mechanical and chemical means are in progress. Promulgation of legislation in Kosrae to prohibit entry of *L. camara* as an ornamental would prevent future introductions and establishment of this noxious weed. A collaborative effort in Micronesia to promulgate and enforce quarantine programs to prevent introduction of invasive species, to eradicate new introductions by chemical, mechanical or other means and to suppress the established ones by biological means is a necessity.

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