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The Endemic Plants of Micronesia: A Geographical Checklist and Commentary

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Abstract—The Micronesia-Polynesia bioregion is recognized as a global biodiversity hotspot. However, until now estimates regarding the number of endemic plant species for the region were not supported by any comprehensive published work for the region. The results of this study indicate that Micronesia has the world's highest percentage of plant endemism per square kilometer out of all globally recognized insular biodiversity hotspots. A checklist of all endemic plant species for Micronesia is presented here with their corresponding geographical limits within the region. A summary of previous work and estimates is also provided noting the degree of taxonomic progress in the past several decades. A total of 364 vascular plant species are considered endemic to Micronesia, most of them being restricted to the Caroline Islands with a large percentage restricted to Palau. The checklist includes seven new combinations, one new name, and two unverified names that require additional study to verify endemic status. Overviews of each respective botanical family represented in the list are given including additional information on the Micronesian taxa. Recommendations for future work and potential projects are alluded to throughout the text highlighting major data gaps and very poorly known taxa. The following new combinations and names are made: *Cyclosorus carolinensis* (Hosokawa) Lorence, **comb. nov.,** *Cyclosorus gretheri* (W. H. Wagner) Lorence, comb. nov., Cyclosorus guamensis (Holttum) Lorence, **comb. nov.,** *Cyclosorus palauensis* (Hosokawa) Lorence, **comb. nov.,** *Cyclosorus rupiinsularis* (Fosberg) Lorence, **comb. nov.,** *Dalbergia hosokawae* Costion **nom. nov.,** *Syzygium trukensis* (Hosokawa) Costion & E. Lucas **comb. nov.**

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Introduction

The word Micronesia, derived from Greek for "small islands," is geographically apt. This bioregion spans a region of the Pacific Ocean comparable in size to the continental United States, or Australia, but the total land area of all the islands within this area sums to roughly 2,628 km^2. If all the islands of Micronesia were compressed into one land mass it would comfortably fit within the US state of Rhode Island. The sizes of the islands however, do not come even remotely close to reflecting the wealth of biodiversity they contain. The results of the present study indicate that Micronesia contains a higher percentage of endemic plant species per square kilometer land area than the Hawaiian archipelago by ten orders of magnitude. Despite this distinction, their remoteness has rendered them understudied and for the most part un-noticed. The paucity of studies in the region is compounded by its complex geology, having six distinct geological subregions of ages varying from up to 97 million years old in the Marshall Islands, the oldest coral islands and atolls on earth (Coppers 2009), to more recent volcanic events of < 1 million years old in the Northern Marianas (Trusdell 2009). The combination of old age and close proximity to continental land masses of some of the Micronesian islands has enabled them to accumulate a very high richness of distinct plant lineages compared to more remote archipelagos such as Hawaii. The available terrestrial habitat in Micronesia is literally packed with biodiversity, much of which is only known from a few collections.

Micronesia, defined here as the Caroline, Mariana, Gilbert and Marshall Islands, (Fig. 1) is part of the Polynesia-Micronesia global biodiversity hot-spot (Conservation International 2007). These global biodiversity hotspots were determined primarily on the basis of the number of endemic plants contained within them and their degree of threat. Despite Micronesia's noteworthy biodiversity and its long recognized importance for conservation, a complete checklist of endemic plants for the bioregion has been lacking until now. The present study aims to fill this gap by synthesizing all existing taxonomic literature to date for the region. All previous studies have relied entirely on estimates of the number of endemic plants for Micronesia. Estimates on quantity of endemic species may help address global priorities but the lack of a checklist of endemic plant species has prevented an assessment of species that are threatened and in need of priority for local conservation measures. Studies have shown that the Polynesia-Micronesia biodiversity hotspot is the most vulnerable of all the world's biodiversity hotspots to extinctions due to its insular nature (Baillie et al. 2004), and thus such a list is far over-due.

The present study draws primarily upon the extensive work of the eminent Pacific botanist Francis Raymond Fosberg (1908-1993) his collaborator Benjamin Stone (1933-1994), and the work of recent Pacific botanists. Fosberg provided a number of the endemic plants that occur in Micronesia in the abstracts of his geographical checklists (Fosberg et al 1979, 1981, 1987) but did not clearly indicate which taxa he considered endemic. All species listed in the checklists included their known distributions within Micronesia, yet confusion over whether these distributions were considered global or only the distributions of listed taxa within the Micronesia bioregion has abounded ever since. Fosberg's estimates have been rou-

tinely utilized subsequently without further taxon specific and wider geographic verification. We can only speculate why Fosberg indicated that he knew how many endemics that occur in Micronesia but did not differentiate between true insular endemic taxa and species restricted to one archipelago in Micronesia but with wider representation elsewhere. This was done for the families covered in the Flora of Micronesia (Fosberg & Sachet 1975a, 1975b, 1977, 1980a) so it is likely that this task was saved for treatment in in the flora family by family where species concepts could be covered in greater depth. It is also possible that he hoped to inspire someone else to take on this substantial task. Whether or not the latter reason is true we cannot say, but we can say that this was the effect it had. The present study is the final product of an effort extending over seven years that began with the realization of this problem and fundamental gap in knowledge for Pacific botany.

This "problem" however is old news for the Pacific. No less than 30 years ago, Benjamin Stone (1970) lamented in the introduction to his Flora of Guam that the production of a large volume such as a flora or checklist for a bioregion, often only the first stage of coming to grips with a flora and the biota it sustains, usually leads to the end of floristic research for that region. Though it can certainly be said that Fosberg and his collegues proved him wrong in this regard, there was perhaps a grain of truth in Stone's statement. Aside from the baseline work of Fosberg and his collaborators much of the Micronesian flora remains very poorly studied and understood taxonomically. Many of the species Fosberg described have since become synonymized; others have yet to be verified, being known only from the type collection. Some of these have not even been collected since before WWII.

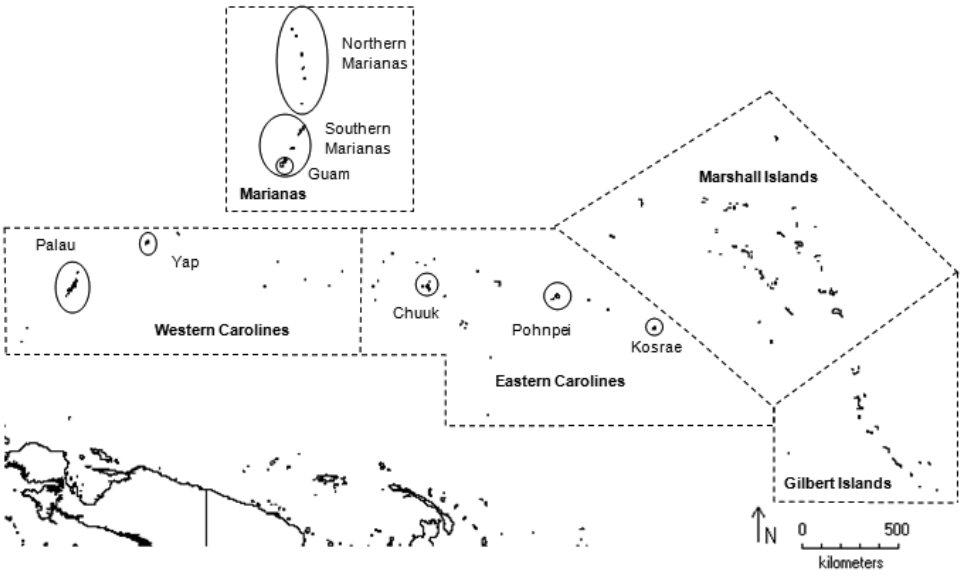

Figure 1: Geographical boundaries of major island groups in the Micronesia region

Stone (1970) commented on this very slow process of taxonomic revision that over the course of decades, leads to new species concepts. This of course directly affects our understanding of what is and what isn't endemic to a region. As Stone correctly predicted, several of Guam's vascular plant species that he treated as endemic, 22% of the total, are no longer considered to be so. Our reassessment concludes that there are about 11 vascular plants endemic to Guam, including two pteridophytes and nine angiosperms. They are as follows: *Ceratopteris gaudichaudii* Brongniart, *Cyclosorus guamensis* (Holttum) Lorence, *Dianella saffordiana* Fosberg & Sachet, *Bulbophyllum guamense* Ames, *Potamogeton marianensis* Cham. & Schltdl., *Eugenia bryanii* Kaneh., *Phyllanthus mariannensis* W.L. Wagner & Lorence, *Hedyotis megalantha* Merr., *Psychotria andersonii* Fosberg, *Psychotria malaspinae* Merr., and *Elatostema stenophyllum* Merr.. Thus the long delay for the checklist presented here may have actually been fortuitous. Though we do expect this slow process to continue, (indeed from the time of submission of this manuscript to the time it reached the press two additional "endemics" from Palau, *Maesa canfieldiae* and *Timonius salsedoi,* have been found to be in need of revision along with others also suspected) we do feel that sufficient taxonomic progress has been made in the last two decades to warrant an authorative list. More importantly, we feel that from a conservation perspective this information is absolutely crucial for guiding policy and helping establish priorities for small island nations with limited resources and funding and that further delay could lead to more unnecessary extinctions in the already compromised Pacific biota.

Although our checklist substantially reduces the number of endemic species that were estimated for Micronesia previously it in no way downlists Mirconesia as a globally important biodiversity hotspot. If anything, now residents in their respective islands will be better informed to prioritize local efforts and actions. Flagging such a huge bioregion as globally important can help raise international attention and funds, but applied conservation can only take place locally. This is especially true in Micronesia which spans millions of square miles of ocean and is divided into six nations or territories further split into at least ten major island state governments each with numerous regional tribal governments. We hope this checklist will serve to help do just that. To better enable this we have organized the checklist with the users in mind, avoiding jargon and technical terms wherever possible and providing a document that is well balanced between providing as much technical data as possible without losing the captive interest of readers by also including some more general facts and notes about plant identification, uses, and biogeography of the region.

All species listed here are considered endemic to Micronesia or otherwise to island groups or single islands within Micronesia. We define endemic as a species that has a geographical range restricted to the region specified here. We classify species as endemic to Micronesia (occurs in the Carolines and Marianas), the Carolines (occurs on at least one island in both the Eastern and Western Carolines), the Marianas (occurs on the Southern and Northern Marianas), the Gilberts (excluding the other islands of the Republic of Kiribati), the Marshalls (endemic to the Republic of the Marshall Islands), the Southern Marianas (Guam, Rota, Tinian, and

Saipan), the Northern Marianas (all islands north of Saipan in the Commonwealth of the Northern Mariana Islands), the Western Carolines (occurs on the Palau and Yap archipelagos), the Eastern Carolines (occurs in more than one of the following island states: Chuuk, Pohnpei, and Kosrae), and finally species endemic to the island nations or states of Guam, Palau, Yap, Chuuk, Pohnpei, and Kosrae. In addition, when known, we have classified species that are restricted to specific soils within these categories. Species are either restricted to volcanic soils (V), limestone soils (L), have a generalist habit occuring on both (G), or are aquatic (A).

We also list the growth forms of species to the best of our knowledge. Species are categorized as either one or two of the following growth forms: herb (H), epiphyte (E), herbaceous vine (HV), woody liana (WL), shrub (S), tree (T), canopy tree (T(c)), and understory tree (T(u)).

Table 1: Soil type, growth form, and relative rarity index coding key

Code Definition	Soils	Form	Rarity
Volcanic	V	--	--
Limestone	L	--	--
Generalist	G	--	--
Aquatic	--	A	--
Herb	--	H	--
Epiphyte	--	E	--
Herbaceous Vine	--	HV	--
Woody Liana	--	WL	--
Shrub	--	S	--
Tree	--	T	--
Canopy Tree	--	T(c)	--
Understory Tree	--	T(u)	--
Dominant	--	--	D
Common	--	--	C
Uncommon	--	--	U
Rare	--	--	R
Range Restricted	--	--	RR

A relative rarity index is provided based on a combined assement of our knowledge of the flora and review of the literature. We provide these data well aware that our knowledge of rarity is far from complete, and hope that the blanks in this or any of the other columns will inspire others to fill them in. In any case, for the species that we do know sufficiently, the relative rarity index can help identify immediate conservation priorities. We classify species as either one or a combination the following qualitative categories:

Dominant (D) = Forms a dominant layer of at least one plant community in Micronesia

Common (C) = Occurs frequently and throughout its known range

Uncommon (U) = Occurs throughout its known range but not in abundance

Rare (R) = Is very uncommon or has been rarely encountered, its range is not well known

Range Restricted (RR) = Its distribution is known to be restricted to a very small area

The example below indicates that the species is a common liana or woody vine, is endemic to Yap, and is restricted to limestone soils. A complete key to the coding scheme is provided in Table 1.

Taxon Name	**Endemic to**	**Soils**	**Form**	**Rarity**
Genus species Author	Yap	L	WL	C

The checklist is organized taxonomically following the most recent Angiosperm Phylogeny Group (APG) classification, subdivided into Gymnosperms, Pteridophytes, Basal Angiosperms, Monocots, and Eudicots. Families are then arranged in alphabetical order, followed by genera and species in alphabetical order. Below each family name we have listed in the following order the number of native *genera/species(endemics)* known from that family for Micronesia. A description is included for each family to briefly introduce the family and provide any other useful and or interesting information for specific taxa where deemed appropriate. Information on the number of species per family and genus was obtained from the Angiosperm Phylogeny Website (Stevens 2001) unless otherwise noted. We follow the classification of Smith et al. (2006) for the family concepts and species numbers of the Pteridophytes (ferns and lycophytes).

Summary of Taxonomic Revision of Micronesia's Endemic Flora

A summary of revised percentages of Micronesia's endemic flora is provided in the following table (Table 2). Changes of endemic status can be grouped into two categories; changes made due to revised species concepts and changes made due to herbarium records found outside Micronesia for particular taxa. To confirm endemic status we reviewed the literature for Micronesia. Primary resources included the checklists of Fosberg et al. (1979, 1981, 1987) and all of his subsequent publications, the Flora of Guam (Stone 1970), Flora Malesiana, the Kew's World Checklist of Selected Plant Families (2010) online resource, and GrassBase (Clayton et al. 2002). Recent checklists have been published for Pohnpei (Lorence & Flynn 2009; Herrera et al. 2010). Another modern checklist exists for Palau (Hillman-Kitalong et al. 2008). We also scanned the the literature for family and generic level taxonomic revisions that applied to the Micronesian flora. Distribution records were scanned using additional online resources including the Global Biodiversity Information Facility (GBIF), herbarium records made available by request to the authors, or other reports and publications that cited distribution data. A complete list of species that were formerly considered endemic, such as in the Flora of Guam, with the accompanying citations or reasons for delisting is not provided here but is available upon request from the authors. If a species was listed in any of Fosberg's publications or the Flora of Guam, we checked its endemic status, though we do apologize if anything has escaped our attention and welcome corrections, new records, and updated species concepts from other researchers. Endemic subspecies and varieties are not included in this list. We also excluded

phrase names or species only identified to genus level such as Oberonia sp. aff. podostachys Schltr. (Fosberg et al. 1987) to avoid falsely applying names of poorly understood or misidentified collections. Although we do expect new records and a few new species to be found in Micronesia, more cases of taxonomic revision over time are expected. This will lead to the incorporation of some currently recognized endemic species into broader species concepts and the opposite process of splitting widespread taxa into endemics with smaller distributions for others. This will require updating of our checklist periodically.

Table 2: Summary of revised endemic species concepts for Micronesia

No. of Endemics in Former Treatment	**No. of Endemics in Current Treatment**	**Percent of Change**
Fosberg et al. (1979-1987)	Endemic to Micronesia	
Dicots (369)	Dicots (212)	Dicots: 43%
Monocots (166)	Monocots (121)	Monocots: 27%
Pteridophytes (31)	Pteridophytes (30)	Pteridophytes: 3%
Gymnosperms (0)	Gymnosperms (1)	
Total (566)	**Total (364)**	**Total: 36%**
Guam (Stone 1970)	Endemic to Marianas	
Total (69)	**Total (54)**	**Total: 22%**
Palau (unpublished estimates)	Endemic to Palau	
Total (200-260)	**Total (135)**	**Total: 32-48%**

Checklist of Endemic Species

Taxon Name	**Endemic to**	**Soils**	**Form**	**Rarity**

LYCOPHYTA (6)

SELLAGINELLACEAE
1/7(6)

Sellaginellaceae can be overlooked being small, uncommon herbs, often occurring along rocky stream banks or moist rocky outcroppings. They are related to the Lycopodiaceae and together form a distinct lineage that branched off before the radiation of ferns. One species occurs along edges of savannas in Palau. *Selaginella kanehirae* is known from Pohnpei and Kosrae, and *S. volkensii* is known from Yap and Chuuk. The rest are endemic to specific island states with the exception of *S. ciliaris* which is widespread in northern Australia and Southeast Asia. Currently, the relationships and species delimitations between the following taxa and the robustness of the species concepts are poorly understood and require further study.

Selaginella dorsicola Hosok.	Palau	V	H	--
Selaginella kanehirae Alst.	E. Carolines	V	H	--
Selaginella kusaiensis Hosok.	Kosrae	V	H	--
Selaginella palauensis Hosok.	Palau	V	H	--
Selaginella pseudo-volkensii Hosok.	Palau	V	H	--
Selaginella volkensii Hieron.	Carolines	--	H	--

PTERIDOPHYTA
(24)

CYATHEACEAE
1/3(2)

There are three native tree fern species in Micronesia, formerly placed in *Cyathea*. Two of them are considered endemic. They are both locally abundant but *Sphaeropteris aramaganensis* is only known from three small islands in the N. Marianas on high volcanic slopes. *S. nigricans* occurs commonly in open savannas and in the forest understory of the Caroline Islands. *S. lunulata* is less common, but also occurs in Southeast Asia.

S*phaeropteris aramaganensis* (Kaneh) R. M. Tryon	N. Marianas	V	T	R
Sphaeropteris nigricans (Mett.) R. M. Tryon	Carolines	V	T	C

DRYOPTERIDACEAE
7/12(2)

Dryopterdidaceae is a diverse family with over 1,700 species worldwide. Although they are cosmopolitan they are most abundant in temperate regions and the higher elevation mountain floras in the tropics. *Elaphoglossum*, Greek for serpent tongue, is mostly a tropical group with over 600 species. It was formerly placed in Lomariopsidaceae. Only two endemic species are known from Micronesia. One of these, *E. kusaiense* is possibly a synonym of *E. carolinense*.

Elaphoglossum carolinense Hosok.	E. Carolines	V	H	--
Elaphoglossum kusaiense H. Ito	Kosrae	V	H	--

GLEICHENIACEAE
1/2(1)

The *Dicranopteris* ferns of Micronesia are associated with open savannas, roadside banks, and other clearings. They form very dense thickets which are routinely burned by people to clear the way. This in turn prevents forest regeneration but also increases plant diversity in the savannas as it is hard for other plants to compete with *Dicranopteris*. Fosberg's *D. weatherbyi* is distinguished from the

common *D. linearis* by its much larger overall size of all parts. It is known only from Pohnpei and Kosrae, and was listed as vulnerable on the 1997 IUCN Red List of Threatened Species.

Dicranopteris weatherbyi (Fosberg) Glassman	Carolines	V	H	R

LINDSAEACEAE
3/12(1)

Lindsaeaceae is a small mostly tropical family with approximately 200 species. Its genera were formerly placed in Dennstaedtiaceae. Molecular data supports it as a monophyletic family and the most basal lineage in the Polypodiales. *Tapeinidium* is comprised of approximately 19 species, one of which, *T. carolinense,* is endemic to the Caroline Islands.

Tapeinidium carolinense Kramer	Carolines	V	H	C

LOMARIOPSIDACEAE
3/9(1)

Lomariopsidaceae is almost entirely restricted to the tropics, with about 70 species. They are characterized by having dimorphic leaves where the fertile parts are on one leaf, the other sterile. *Cyclopeltis* is a small genus with only about seven described species. *C. kingii* is a very poorly known species restricted to the limestone forests of Palau.

Cyclopeltis kingii (Hance) Hosok.	Palau	L	H-E	--

PTERIDACEAE
12/20(3)

Pteridaceae, or the brake fern family, is a large fern family that has gone through much revision which is ongoing today. The family includes a number of genera that have been traditionally grouped into separate families. Relationships between genera remain unclear within the family which itself, as currently recognized, may not even be monophyletic. *Adiantum*, the maiden hair ferns, a genus of about 200 species, are distinctive in appearance and favored in horticulture. They are commonly associated with streambanks and rock faces adjacent to waterfalls. *Ceratopteris* was traditionally placed in the monotypic Parkeriaceae comprised of only four to six aquatic species. They are widespread in the tropics and comprise the only genus of homosporous ferns that is entirely aquatic. The status of *C. gaudichaudii* as an endemic variety or species is currently under investigation (Masuyama & Adjie 2008). The genus *Pteris* has approximately 280 species worldwide with one Micronesian endemic represented by only a few collections. The name *Pteris* is derived from the Greek word for fern.

Adiantum palaoense C. Chr.	Palau	V	H	--
Ceratopteris gaudichaudii Brongniart	Guam	A	H	--
Pteris tapeinidiifolia H. Itô	Palau	L	H-E	--

POLYPODIACEAE
14/20(5)

Polypodiaceae has over 1,500 species, mostly tropical and epiphytic. Several traditional families have been incorporated into this larger circumscription of Polypodiaceae. About 20 species have been recorded from the Micronesian region. All four genera listed below were formerly placed in Grammitidaceae. *Calymmodon* is mostly an Indomalaysian genus of 25-30 species. *Grammitis* formerly contained about 200 species. Most of these have been transferred to other genera including *Ctenopterella, Oreogrammitis,* and *Prosaptia*, leaving *Grammitis* with about 25 species. *Grammitis ponapensis* will very likely be separated into a new genus that has yet to be described. *Prosaptia* contains approximately 50 species with Indomalaysian-Pacific distribution. Its name in Greek refers to its distinctive sori, "immersed or inserted" in the lamina.

Calymmodon ponapensis Copel.	Pohnpei	V	E	--
Oreogrammitis palauensis (Hosok.) Parris	Palau	V	E	--
Grammitis ponapensis Copel.	Pohnpei	V	E	--
Oreogrammitis scleroglossoides (Copel.) Parris	Pohnpei	V	E	--
Prosaptia palauensis Hosok.	Palau	V	H	--

THELYPTERIDACEAE
3/19(8)

Thelypteridaceae is a large, mostly tropical family with approximately 950 species. Most are terrestrial; a few are lithophytic or semi-aquatic. The taxonomy of this family has been problematic with no consensus on the correct circumscription of genera. Traditionally Micronesia's species have either been treated all under *Thelypteris* (Fosberg et al. 1982) or split into several separate genera (Holttum 1977). We follow the circumscription of Thelypteridaceae genera presented by Smith et al. (2006), and treat all of the Micronesian endemics under *Cyclosorus*.

Cyclosorus carolinensis (Hosokawa) Lorence	Palau	L	H	--
Cyclosorus perglanduliferus (Alderw.) Ching	Palau	V	H	--
Cyclosorus gretheri (W. H. Wagner) Lorence	S. Marianas	L	H	C
Cyclosorus guamensis (Holttum) Lorence	Guam	--	H	--

Cyclosorus maemonensis Wagner & Grether	Micronesia	--	H	U
Cyclosorus palauensis (Hosokawa) Lorence	W. Carolines	V	H	--
Cyclosorus ponapeanus (Hosokawa) Lorence	Pohnpei	V	H	--
Cyclosorus rupicola (Hosokawa) Lorence	Palau	L	H	--

WOODSIACEAE
1/6(1)

Woodsiaceae contains approximately 700 species circumscribed into 15 genera. Most species are placed within two genera including *Diplazium*. *Diplazium* contains approximately 400 species, though is likely a paraphyletic genus (Smith 2006). Its name is derived from the Greek diplazios, meaning double, referring to the indusia that lie on both sides of the lamina veins. *Diplazium ponapense* (Copel.) Hosok. may be synonymous with the older name *D. melanocaulon* Brack.

Diplazium ponapense (Copel.) Hosok.	E. Carolines	V	H	--

GYMNOSPERMAE
(1)

CYCADACEAE
1/2(1)

There are two native cycad species in Micronesia. One is considered endemic (Hill 1994; 2004), the other also occurs in Southeast Asia (DeLaubenfels 2007). These two species were formerly treated as one widespread species, *Cycas circinalis,* which is now regarded as endemic to the Western Ghats of India (Hill 2004). A more complete discussion on the history of this taxonomic problem was covered by Costion (2009). The local distribution of the two separate species that occur in Palau is not well known as they were formerly treated as one species. They can occur on all soil types but are more commonly found on sandy beach forest and on limestone islands. In the Marianas and to a lesser extent in the Rock Islands of Palau, *C. micronesica* can be abundant enough to form dense understory stands. Flour made from the seeds was often eaten by the indigenous Chamoro of Guam until it was suspected to be linked with the degenerative neurological disease known as Guam dementia. Henceforth, consuming the seeds has been discouraged. However, the exact causes of the disease are to date, unresolved.

Cycas micronesica K.D. Hill	Micronesia	G	T-S	C-R

BASAL ANGIOSPERMS (15)

ANNONACEAE
3/3(3)

Guamia was previously considered the only angiosperm genus endemic to Micronesia. Schatz (1987) revised this by describing a new species of *Guamia, G. mexicana,* from Mexico. The Guam species, however, is retained as an endemic species. It occurs abundantly on limestone soils in the Marianas, and occasionally on mixed soils. Both Annonaceae species from Palau are very poorly known and likely quite rare. *Polyalthia merrillii* may be only known from the type. *Goniothalamus carolinensis* is only known from the island of Babeldoab from a few collections. Notes from herbarium collections indicate that even the early Japanese collectors regarded it as a rare and uncommon tree.

Goniothalamus carolinensis Kaneh.	Palau	V	T	R
Guamia mariannae (Safford) Merrill	Marianas	G	T	A
Polyalthia merrillii Kaneh.	Palau	L	T	--

LAURACEAE
2/4(2)

Cinnamomum is a pantropical genus with approximately 250 species distributed throughout the Neotropics, Pacific, and Australasia. *Cinnamomum* and other members of this family are regarded as characteristic components of neotropical montane cloud forest canopy. Micronesia is notably home to the lowest elevation cloud forests in the world, occurring on the islands of Pohnpei and Kosrae. Both Micronesian species of *Cinnamomum* occur on Pohnpei. *Cinnamomum carolinense* is also known from Kosrae and Palau, but in Palau it is rare. On the island of Pohnpei, the leaves of native *Cinnamomum* species are boiled to make a delicious tea that has reported medicinal qualities. The only other native Lauraceae in the region belongs to *Cassytha*, a parasitic group of plants mostly of Australian distribution. *Cassytha filiformis* is a cosmopolitan species which commonly occurs in the savannas and coastal areas of Micronesia.

Cinnamomum sessilifolium Kaneh.	Pohnpei	V	T	--
Cinnamomum carolinense Koidz.	Carolines	V	T	--

MYRISTICACEAE
2/3(1)

Myristicaceae is a pantropical family, though only a few species occur in Australia and the Pacific. *Horsfieldia* is represented by approximately 100 species, mostly in SE Asia with one species in Australia and a few species extending east to Micronesia and the Solomon Islands. *H. palauensis* is a common and characteristic

component of Palau's volcanic upland and limestone forests. The widespread *H. irya* reaches its north eastern limit of distribution in Palau and Kosrae where it was formerly treated as the endemics *H. amklaal* and *H. nunu*. It is associated with fresh water and in Palau forms impressive stands of swamp forest in association with two *Calophyllum* species. *Horsfieldia tuberculata* was recorded for Palau under the previous name *H. novo-guineensis;* however it is very poorly known and rarely collected there. Local residents cannot distinguish it from the other two and some doubt it as a valid record. *Myristica insularis* was formerly regarded as endemic to the Carolines but was revised to be a variety *M. hypargraea,* a species also known from Samoa and Tonga, by de Wilde (1994). The author admittedly reported that limited material was studied ex situ and acknowledged morphological differences in the fruit and leaves but that the two were close enough to merit merging the taxa. Molecular studies may indicate otherwise and revive the endemic name.

Horsfieldia palauensis Kaneh.	Palau	G	T	C

PIPERACEAE
2/15(9)

Piperaceae are well represented and rich in endemics in Micronesia. Some species are well known while others are not and require further study (Fosberg & Sachet 1975). Both *Peperomia* and *Piper* are pantropical in distribution. *Peperomia* usually occurs as a terrestrial, epiphytic or lithophytic herb, while *Piper* often occurs as a shrub or hemiepiphytic vine. In *Peperomia, P. breviramula* occurs in the montane forest of Pohnpei and is known only from the type and one other collection. It is potentially the same species as *P. glassmanii* which is also endemic to the Pohnpei mountain flora. *Peperomia kusaiensis* is epiphytic in the cloud forests of Kosrae, and *P. ponapensis* is lithophytic on limestone and basalt at low elevations in the Eastern Carolines from Chuk to the Marshall Islands. *Piper* is an important native plant genus for the people of Micronesia. *Piper betle* and *P. methysticum* are both used in the preparation of local intoxicants. Though the latter is only exploited in Pohnpei, the former is inseparable from daily life throughout Micronesia. *Piper nigrum,* black pepper, though introduced, has historical significance in the region where it was at one time a valuable commercial crop. Two species of *Piper* are endemic to Micronesia.

Peperomia breviramula C.DC.	Pohnpei	V	E	R
Peperomia glassmanii Yunck.	Pohnpei	V	E	--
Peperomia kraemeri C.DC.	Palau	G	H	--
Peperomia kusaiensis Hosok.	Kosrae	V	E	--
Peperomia mariannensis C.DC.	Marianas	L	H	--
Peperomia palauensis C.DC.	Palau	G	H	C
Peperomia ponapensis C.DC.	Micronesia	G	H	--
Piper guahamense C.DC	Marianas	L	S	C
Piper hosokawae Fosberg	Palau	G	WL	C

MONOCOTS
(121)

ARACEAE
6/9(2)

The arum or aroid family is mostly tropical and known for the calcium oxalate crystals or raphides present in most species. This explains the necessary preparations required for eating the main staple of most of Micronesia and Polynesia. Taro, a member of this family cultivated for its carbohydrate and nutrient-rich corms, has numerous varieties spanning four genera and several species. Many of these were introduced into the Pacific from Southeast Asia. Micronesia has two endemic aroids that occur as climbing vines.

Epipremnum carolinense Volkens	W. Carolines	V	H-E	C
Scindapsus carolinensis Hosok.	Chuuk	--	H-E	--

ARECACEAE
8/11(7)

Micronesia is home to eleven native palm species, seven of them endemic. Several of these palms have undergone recent name changes. *Ponapea* is a genus of only three known species, all endemic to Micronesia. It was formerly partially included under *Ptychosperma*. All three species of Ponapea are rare with the exception of *P. ledermanniana* which is common on Kosrae, though it is threatened and in decline on Pohnpei (Lewis 2008). *Ponapea hosinoi* has a very small natural range on Pohnpei making it highly vulnerable to habitat loss. *Ponapea palauensis* is considered Critically Endangered under IUCN red listing criteria (Costion et al. 2009) due to its very small extent of occurrence. *Clinostigma* is a genus of 11 species endemic to the south and western Pacific. One species, *C. ponapense*, is endemic to Pohnpei where it is abundant in some localities, while the other, *C. carolinense,* is endemic to Chuuk. The genus *Hydriastele* was recently revised to incorporate three other genera including *Gulubia*. Its range now stretches from New Zealand to Indonesia and the Pacific with most species occurring in New Guinea. The Palau species is found in patches scattered throughout the Rock Islands. *Metroxylon* is the sago palm genus, widely utilized for the starch extracted from the pith. There are seven species total, the Micronesian species being the only species that is not monocarpic (flowers only once then dies).

Clinostigma carolinense (Becc.) Moore & Fosberg	Chuuk	--	--	--
Clinostigma ponapense (Becc.) Moore & Fosberg	Pohnpei	V	T	--
Hydriastele palauensis (Becc.) W.J.Baker & Loo	Palau	L	T	U-R

Metroxylon amicarum (H.Wendl.) Hook.f.	Micronesia	--	T	--
Ponapea hosinoi Kaneh.	Pohnpei	V	T	--
Ponapea ledermanniana Becc.	E. Carolines	V	T	--
Ponapea palauensis Kaneh.	Palau	L	T	R

CYPERACEAE
13/64(4)

There are over 4,000 species of sedges found worldwide. They are most abundant in the tropics and most commonly associated with wetland or riparian areas and poor soils. They are well represented in Micronesia where there is no shortage of poor soils and wet areas. Four species are considered endemic.

Hypolytrum dissitiflorum Steud.	E. Carolines	--	H	--
Hypolytrum flavinux (T. Koyama) D.A. Simpson	Palau	V	H	--
Fimbristylis palauensis Ohwi	Palau	V	H	--
Mapania pacifica (Hosok.) T. Koyama	E. Carolines	V	H	--

HEMEROCALLIDACEAE
1/2(2)

This family has tentatively been placed within the Xanthorrhoeaceae as a subfamily along with Asphlodaceae by some authors. Since morphological support for this view is lacking and molecular data remain inconclusive we retain it as a distinct family following Mabberley (2008). Xanthorrhoeaceae sensu stricto are the characteristic "grass trees" endemic to Australia forming a monotypic family of approximately 28 species. Hemerocallidaceae has approximately 63-85 species distributed on all continents except North America. *Dianella* has about 40 known species, many of which are endemic to Australia. The two Micronesian species commonly occur in open savannas or barren volcanic soils. They have attractive blue to purplish flowers and fruits making them good native ornamental candidates.

Dianella carolinensis Laut.	W. Carolines	V	H	C
Dianella saffordiana Fosberg & Sachet	Guam	V	H	C

ORCHIDACEAE
50/120(85)

The orchids form the largest angiosperm family with over 22,000 species worldwide. It is the most diverse family in Micronesia for both native and endemic species and also one of the most likely Micronesian plant groups to have new species yet to be discovered. There is a long list of potential new orchid species from Micronesia. These tentative names are not included here as most are unverified records or

based on infertile specimens. The three largest orchid genera in Micronesia are *Bulbophyllum* (6), *Phreatia* (7), and *Dendrobium* (12). *Bulbophyllum* is the largest orchid genus and with over 1,800 species is one of the largest plant genera in the world. Its centre of diversity is New Guinea. *Phreatia* is a small genus of about 150 mostly Indomalesian species. Some were formerly placed in *Rhynchophreatia*, which is no longer an accepted genus. *Dendrobium* is also a large genus found from Asia to the Pacific. All are either epiphytes or lithophytes. Most of Micronesia's orchids have small inconspicuous flowers, though a few such as *Dendrobium palawense, Dendrobium mirbelianum,* and *Dipodium freycinetioides* have much horticultural potential and are already being harvested in alarming quantities from the forests for local gardens.

Aglossorrhyncha micronesiaca Schltr.	Palau	V	E	--
Agrostophyllum kusaiense Tuyama	Kosrae	V	E	--
Agrostophyllum palawense Schltr.	Palau	V	E	--
Bulbophyllum desmanthum Tuyama	Palau	V	E	--
Bulbophyllum fukuyamae Tuyama	Kosrae	V	E	--
Bulbophyllum guamense Ames	Guam	--	E	--
Bulbophyllum hatusimanum Tuyama	Palau	V	E	--
Bulbophyllum kusaiense Tuyama	Kosrae	V	E	--
Bulbophyllum micronesiacum Schltr.	Micronesia	V	E	--
Cherostylis raymundii Schltr.	W. Carolines	--	H	R
Chiloschista loheri Schltr.	Palau	G	E	C
Cleisostoma porrigens (Fukuy.) Garay	Palau	V	E	U
Coelogyne guamensis Ames.	Micronesia	V	H-E	--
Corybas ponapensis Hosok. & Fukuy.	Pohnpei	V	E	R
Crepidium calcarea (Schltr.) D. L. Szlachetko	Palau	L	H	--
Crepidium kerstingiana (Schltr.) D.L. Szlachetko	Palau	G	H	U
Crepidium palawensis (Schltr.) D. L. Szlachetko	Palau	V	H	U
Crepidium setipes (Schltr.) D. L. Szlachetko	Palau	V	H	A
Cystorchis ogurae (Tuyama) Ormerod & P. J. Cribb	Palau	V	H	--
Dendrobium adamsii A. D. Hawkes	Pohnpei	V	E	--
Dendrobium brachyanthum Schltr.	Palau	V	E	C
Dendrobium carolinense Schltr.	E. Carolines	V	E	C
Dendrobium guamense Ames.	S. Marianas	--	E	--
Dendrobium implicatum Fukuy.	Palau	V	E	--
Dendrobium kerstingianum Schltr.	Palau	V	E	--
Dendrobium kraemeri Schltr.	Carolines	G	E	--
Dendrobium oblongimentum Hosok. & Fukuy.	S. Marianas	--	E	--

Dendrobium okabeanum Tuyama	Chuuk	--	E	--
Dendrobium palawense Schltr.	Palau	L	E	--
Dendrobium patentifiliforme Hosok.	Palau	V	E	--
Dendrobium ponapense Schltr.	E. Carolines	--	E	--
Didymoplexis trukensis Tuyama	Chuuk	--	H	--
Dienia volkensi M.A. Clem. & D.L. Jones	W. Carolines	V	H	--
Diplocaulobium carolinense A. D. Hawkes	Pohnpei	V	E	--
Diplocaulobium elongaticolle (Schltr.) Hawkes	W. Carolines	G	E	C
Diplocaulobium flavicolle (Schltr.) Hawkes	Pohnpei	V	E	--
Dipodium freycinetioides Fukuy.	Palau	V	E	--
Glomera carolinensis L. O. Williams	Pohnpei	V	E	--
Liparis dolichostachya Fukuy.	Palau	V	H-E	--
Liparis palawensis Tuyama	Palau	V	H-E	--
Liparis yamadae (Tuyama) Fosberg & Sachet	Palau	V	H-E	--
Malaxis alamaganensis S. Kobay.	N. Marianas	V	H	R
Malaxis trukensis (Fukuy.) Fosberg & Sachet	Chuuk	--	H	--
Micropera draco (Tuyama) P.J. Cribb & Ormerod	Palau	V	E	--
Microtatorchis hosokawae Fukuy.	Pohnpei	V	E	--
Moerenhoutia hosokawae (Fukuy.) Tuyama	Carolines	V	H	--
Moerenhoutia laxa Schltr.	Palau	V	H	U
Moerenhoutia leucantha Schltr.	Ponhpei	V	H	--
Nervilia jacksoniae Rinehart & Fosberg	Marianas	--	H	--
Nervilia palawensis Schltr.	W. Carolines	G	H	R
Nervilia trichophylla Fukuy.	Palau	V	H	R
Oberonia hosokawae Fukuy.	Ponhpei	V	E	--
Oberonia palawensis Schltr.	Palau	G	E	--
Oberonia ponapensis Tuyama	Pohnpei	V	E	--
Oberonia rotunda Hosok.	W. Carolines	V	E	--
Peristylus carolinensis (Schltr.) Tuyama	Pohnpei	V	H	--
Peristylus palawensis (Tuyama) Tuyama	Palau	V	H	R
Peristylus setifera Tuyama	W. Carolines	V	H	R
Phreatia carolinensis Schltr.	Pohnpei	V	E	--
Phreatia kanehirae Fukuy.	Palau	V	E	--
Phreatia kusaiensis Tuyama	Kosrae	V	E	--

Phreatia palawensis (Schltr.) Tuayama	Palau	L	E	--
Phreatia ponapensis Schltr.	Pohnpei	V	E	--
Phreatia pseudothompsonii Tuyama	Ponhpei	V	E	--
Phreatia thompsonii Ames	Micronesia	--	E	--
Pseuderia micronesiaca Schltr.	Carolines	V	E	--
Pseudovanilla ponapensis (Kaneh. & Yam.) Garay	Pohnpei	V	E-V	U
Rhynchophreatia pacifica Fukuy.	Kosrae	V	E	--
Robiquetia kusaiensis Fukuy.	Kosrae	V	E	--
Robiquetia lutea (Volk.) Schltr.	Carolines	--	E	--
Robiquetia palawensis Tuyama	Palau	G	E	--
Robiquetia trukensis Tuyama	Chuuk	V	E	--
Spathoglottis carolinensis Schltr.	W. Carolines	V	H	--
Spathoglottis micronesiaca Schltr.	W. Carolines	V	H	--
Taeniophyllum marianense Schltr.	Carolines	--	E	--
Taeniophyllum palawense Schltr.	Palau	V	E	--
Taeniophyllum petrophilum Schltr.	Carolines	--	E	--
Taeniophyllum trukense Fukuy.	Chuuk	--	E	--
Thrixspermum arachnitiforme Schltr.	Ponhpei	V	E	--
Thrixspermum ponapense Tuyama	Pohnpei	V	E	--
Trichoglottis ledermannii Schltr.	Carolines	G	E	--
Vrydagzynea micronesiaca Schltr.	Carolines	V	H	--
Zeuxine fritzii Schltr.	Micronesia	--	H	--
Zeuxine ovata (Gaudich.) Garay. & W. Kittr.	Marianas	--	H	--
Zeuxine palawensis Tuyama	Palau	V	H	C

PANDANACEAE
2/17(12)

Pandanaceae, the screwpine family, is a large Old World family of over 800 species ocurring from tropical Africa and Madagascar to the Pacific. *Freycinetia* is a genus of woody climbers. They are easy to distinguish in a dense forest canopy by their trifarious spiralled leaves. Micronesia has three species, two of which are endemic. The third, *F. reineckei,* also occurrs in Samoa. *Pandanus* is a large genus which has been subject to considerable taxonomic dispute in the Pacific due to some species such as *P. tectorius* having variable forms from island to island. These plants do well along the coast and in poor soils but seem to occur in just about every habitat in Micronesia from the fire adapted *P. tectorius* association in the savannas to the salt tolerant *P. kanehirae* swamp forest association of Palau. They also range considerably in size from the enormous *P. dubius* to small understory trees such as *P. amiriikensis*, and even potentially small scandent shrubs as observed for the elusive *P. peiliuensis*. All parts of the plants are widely utilized by Micronesians for food, basketry, mats, clothing, medicine, fishing tools, and even sails.

Freycinetia ponapensis Martelli	E. Carolines	V	WL	--
Freycinetia villalobosii Martelli	Palau	V	WL	C-A
Pandanus aimiriikensis Martelli	Palau	V	T(u)	C-A
Pandanus amissus Huynh	Kosrae	V	T	U
Pandanus japensis Martelli	Yap	--	T	--
Pandanus kanehirae Martelli	Palau	V	T	U
Pandanus kusaicolus Kaneh.	Kosrae	V	T	U
Pandanus lorencei Huynh	Palau	L	T	--
Pandanus macrojeanneretia Martelli	Palau	V	T	U
Pandanus palawensis Martelli	Palau	V	T	--
Pandanus patina Martelli	Pohnpei	V	T-S	--
Pandanus peliliuensis Kaneh.	Palau	L	T-S	R

POACEAE
46/90(7)

The grass family is one of the few angiosperm families that is literally global in distribution. Over 10,000 species of grasses are found from the arctic to sub-Saharan Africa and into the Pacific, and the family is subdivided into 13 subfamilies and over 650 genera. The adaptability and evolutionary capacity of grasses is evident even in Micronesia's Gilbert Islands. *Lepturus pilgerianus* is the only endemic plant species that occurs on these small atolls dominant with the characteristic Pacific atoll vegetation. Despite the reputation of many grass species as weeds, including species in the genera *Digitaria, Isachne, Ischaemum, Panicum,* and *Sporobolus*, there are also both native and endemic species in Micronesia. The grasses are one of the most important plant families to human society, having given rise to most major cereal crops. They were not exploited for food by the islanders of Micronesia in the pre-European contact era, though today rice is a common staple and in many islands has almost entirely replaced traditional staples.

Digitaria gaudichaudii (Kunth) Henrard	Marianas	--	H	--
Digitaria mezii Kaneh.	Marianas	--	H	--
Isachne carolinensis Ohwi	Pohnpei	V	H	--
Ischaemum longisetum Merrill	Marianas	L	H	--
Lepturus pilgerianus Hans. & Potzt.	Gilbert Is.	L	H	--
Panicum palauense Ohwi	Palau	V	H	--
Sporobolus farinosus Hosok.	Micronesia	L?	H	--

POTAMOGETONACEAE
2/3(1)

The pondweed family is comprised of about 120 species worldwide. They are all aquatic perennial herbs with tetramerous flowers lacking petals. Many species are regarded as having vitally important roles in their ecosystems by providing habitat

and food for other organisms, notably ducks. The Marianas endemic *Potamogeton* species may have been a food plant for the Marianas mallard (Stone 1970), *Anas oustaleti,* which was declared extinct in 1981 after several decades of decline from loss of wetland habitat.

Potamogeton marianensis Cham. & Schltdl.	Guam	A	H	--

ZINGIBERACEAE
4/6(1)

Alpinia is the largest and most widespread genus in the ginger family. It has approximately 230 species distributed in the Asia-Pacific region, though recent studies indicate that it is a polyphyletic genus (Kress et al. 2005). *Alpinia carolinensis* belongs to subgenus *Dieramalpinia* (Smith 1990), which is comprised of taxa occurring mostly east of Wallace's Line. Many species of *Alpinia* are popular as ornamentals. Micronesia's endemic, "giant ginger" has for the most part, not been exploited in this regard though many plant enthusiasts express utter amazement at its size. It is one of the largest species in the entire ginger family, reaching up to 8 meters (26 feet) tall. It is a common component of the forest understory on the volcanic islands.

Alpinia carolinensis Koidz.	Carolines	V	H/T	C

EUDICOTS
(195)

ACANTHACEAE
5/8(3)

Acanthaceae is a mostly tropical family of about 4,000 species. They are often easily identified by their opposite leaves with swollen nodes and showy petalaoid bracts, but not all species display these characters. There are three native and one endemic *Hemigraphis* species in Micronesia, occurring as small herbs. The endemic *H. pacifica* is poorly known, though has been observed and collected along the stream banks of Babeldaob. It has been confused with *H. palauana* which Fosberg et al. (1979) treat as a synonym for *H. angustifolia*, native to Palau. *Pseuderanthemum* has several ornamental species that are widely cultivated and popular in Micronesia. Fosberg and Sachet (1980) described an additional endemic *Pseuderanthemum* distinct from *P. inclusum* by its leaf and inflorescence shape, longer floral parts, and warty seeds.

Hemigraphis pacifica Hosok.	Palau	V	H	--
Pseuderanthemum inclusum Hosok.	Palau	V	H	--
Pseuderanthemum palauense Fosberg & Sachet	Palau	G	H	--

ANACARDIACEAE
5/7(4)

The Anacardiaceae family has about 600 species with its center of diversity in Malesia. The family contains the well known cash crops mango, cashew, and the poison ivy of North America. Members of this family contain highly poisonous sap that often turns black and is caustic, causing minor to severe skin irritations. A liberal dose of *Semecarpus* sap in particular can lead to hospitalization. Micronesians take care when entering the forest, especially after rain, and avoid this plant entirely. The fruits are subtended by a fleshy receptacle which is allegedly edible. The genus has about 60 species, mostly in Southeast Asia. *Buchanania* is a small genus of roughly 25 tree species from Asia to the Pacific. The two endemics from the Western Carolines are difficult to distinguish and have been confused in Palau.

Buchanania engleriana Volk.	W. Carolines	--	T	C
Buchanania palawensis Lauterb.	Palau	--	T	U
Semecarpus kraemeri Lauterb.	Chuuk	--	T	--
Semecarpus venenosus Volk.	W. Carolines	G	T	C

APOCYNACEAE
14/21(7)

The Apocynaceae family now incorporates the former family Asclepiadaceae as a subfamily. Asclepiadaceae was split from Apocynaceae in the 1800's primarily on the basis of the presence of pollinia. A pollinium is a sac of pollen grains that is dispersed by sticking to an insect as it visits the flower for nectar. Orchids have also independently evolved this unique pollination strategy. Molecular data now show that Asclepiadaceae is not monophyletic and is nested within Apocynaceae. The family is easy to identify by its milky white latex, opposite or whorled leaves, and often two-parted fruits. The latex is often highly toxic and for some species it is known to cause temporary to permanent blindness. Thus care should be taken when handling the plants. *Rauvolfia*, a genus of about 110 mostly tropical trees and shrubs, is of interest for research in medicinal plants. Several members of this genus are rich in biochemical compounds that have been used in medicine, notably *R. serpentina*, which has been used to treat snake bites and wounds for millennia and more recently as the source of reserpine, an antihypertensive drug and tranquilizer.

Hoya schneei Schltr.	Pohnpei	V	HV	--
Hoya trukensis Hosok.	Chuuk	--	HV	--
Lepinia ponapensis Hosok.	Pohnpei	V	T	RR
Lepiniopsis trilocularis Mgf.	Carolines	L	T-S	--
Melodinus insularis (Markgr.) Fosberg	Palau	V	WL	--
Ochrosia mariannensis A.DC.	Marianas	G	T	C
Rauvolfia insularis Markgr.	Palau	V	T	U,RR

APTANDRACEAE
1/1(1)

Aptandraceae is a very small family of parasitic plants. There are only 34 species but these are subdivided into eight different genera. *Anacalosa* was formerly placed in the Olacaceae family. *Anacalosa* is a pantropical genus with about 18 species. The plants are dioecious with leaves two-ranked on zig-zag shaped branches. *Anacalosa glochidiiformis* is a small tree with small white flowers and orange fruits. The members of this family are suspected to be root parasites; however, direct evidence of functional haustoria, the roots that penetrate the host's tissue to extract nutrients, has yet to be recorded.

Anacalosa glochidiiformis Kaneh. & Hatus.	Palau	G	T	U

AQUIFOLIACEAE
1/1(1)

The genus *Ilex*, comprises the entire montypic Aquifoliaceae family, commonly known as the hollies. There are over 400 species found worldwide. The genus is most diverse in the tropics but also extends into temperate regions. Many are endemic to mountain ranges in the temperate tropical montane flora, but species also occur in the humid lowlands and on oceanic islands. *Ilex volkensiana* is found only in the cloud forests of Pohnpei.

Ilex volkensiana (Loes.) Kaneh. & Hatus.	Pohnpei	V	T	--

ARALIACEAE
3/9(8)

The Araliaceae or ginseng family is a mostly tropical family occurring worldwide. *Osmoxylon* has approximately 60 species, mostly concentrated in east Malesia, the Philippines, and Melanesia. Its Pacific distribution is limited to the Solomon Islands, Vanuatu, and Micronesia. *Osmoxylon oliveri* is a common understory component throughout Palau, whereas *O. pachyphyllum* is less common but widespread, and *O. truncatum* is only known from a few collections. It is considered endemic to southern Babeldaob. *Osmoxylon mariannense* is endemic to Rota. *Polyscias* is a genus of small to medium sized understory trees in the tropics with roughly 130 species. Molecular work (Plunkett et al. 2001) suggests the genus is paraphyletic with at least four to five distinct clades represented in the Pacific. *Schefflera* is a polyphyletic genus of over 600 species, also with 5 separate geographically distinct clades (Plunkett 2005). Micronesia's native *S. elliptica* belongs to the Asian clade. However the Chuuk endemic *S. kraemeri* has not been included in any molecular phylogenies to date. This is worth noting considering a separate

Pacifc clade of *Schefflera* is recognized with its center of diversity in Melanesia. Thus, Micronesia's *Schefflera* and *Polyscias* species could potentially be derived from more than one dispersal event within each genus. The Melanesian-centered clade of *Schefflera* is sister to *Meryta*. *Meryta* is a genus of approximately 30 species endemic to the South Pacific, all restricted to islands or island groups from New Caledonia to the Marquesas (Tronchet 2005).

Osmoxylon mariannense Fosberg & Sachet	S. Marianas	--	T	--
Osmoxylon oliveri Fosberg & Sachet	Palau	G	T(u)	A
Osmoxylon pachyphyllum Fosberg & Sachet	Palau	G	T(u)	U
Osmoxylon truncatum (Kaneh.) Fosberg & Sachet	Palau	V	T(u)	--
Meryta senfftiana Volkens	Micronesia	--	T	C
Polyscias grandifolia Volkens	Micronesia	L	T(u)	C
Polyscias subcapitata Kaneh.	Kosrae	V	T	--
Schefflera kraemeri Harms	Chuuk	--	--	--

BORAGINACEAE
4/8(1)

Cordia is a pantropical genus with over 200 species worldwide. Its center of diversity is in the West Indies. The borage family is famous in botany for the *Echium* species of the Canary Islands that show an insular shift to woodiness from an herbaceous lineage. The borage family has adapted well to insular life and is represented in Pacific atoll vegetation with widespread *Heliotropium, Cordia,* and *Tournefortia* species. *Cordia micronesica* is likely derived from the widespread palaeotropic species *C. subcordata,* characteristic of strand vegetation. Both its flowers and fruits are substantially smaller than the latter, however, and its leaves are more distinctly serrated. *Cordia subcordata* is revered by islanders for its lightweight durable wood but also has many other uses including dye and medicine.

Cordia micronesica Kaneh. & Hatus.	Palau	V	T	U-R

CAPPARACEAE
2/3(1)

The relatively small caper family is closely related to Brassicaceae, the mustard family. *Capparis* has about 250 species worldwide of mostly shrubs or lianas and is famous for the pickled condiments capers. *Capparis carolinensis* occurs on the limestone islands of Palau. It was treated as a synonym by Jacobs (1960) but was confused with its relative and putative ancestor, *C. cordifolia*. *Capparis carolinensis* has larger, more elliptic leaves compared to *C. cordifolia*'s distinct orbicular leaves and has smaller, more numerous, clustered flower buds. *Capparis cordifolia* has

a more widespread distribution in the Pacific but in Micronesia occurs only on Palau's limestone islands.

Capparis carolinensis Kaneh.	Palau	L	S	--

CELASTRACEAE
3/5(2)

The Celastraceae family has approximately 1,350 species worldwide and now incorporates the former Hippocrateaceae. They most commonly occur as small trees, shrubs, or lianas, but there are two herbaceous genera. They are often characterized by the distinctive nectar disk present in the flowers. In most species, the flowers are yellow to greenish and inconspicuous. The family as a whole is not very economically important, though a few species are used as ornamentals in the genera *Celastrus* and *Euonymus*, and a narcotic is derived from *Catha edulis,* a native of East Africa and Arabia. *Maytenus* is a pantropical genus with 200-270 species. Both of Micronesia's endemics are relatively common where they occur.

Maytenus palauica (Loes.) Fosberg	Palau	G	S	C
Maytenus thompsonii (Merr.) Fosberg	S. Marianas	L	S	C

CLUSIACEAE
4/10(7)

The Clusiaceae (or Guttiferae) is a small family of about 600 species mostly restricted to the moist tropics. Members of this family have opposite leaves and usually have latex that can be creamy to off white or bright yellow to orange in color. *Garcinia* is the mangosteen genus, named after the esteemed fruit from Southeast Asia, *G. mangostana*. Several other species are also cultivated for their fruits, and others have medicinal compounds that are utilized in traditional and modern medicine. *Garcinia* now includes the genus *Pentaphalangium*, which was formerly applied to *G. carolinensis* and *G. volkensii*. The genus *Calophyllum* is well known in the Pacific from the widespread strand tree *Calophyllum inophyllum*. This has evolved into a separate variety, *C. inophyllum* var. *wakamatsui*, found inland from the coasts on the volcanic island of Babeldaob where it can reach impressive sizes along ridgelines. Palau's other endemic, *C. pelewense*, is probably derived from *C. soulattri,* which is very similar in morphology. *Calophyllum soulattri* is also widespread in distribution from Vietnam to Australia. *Kayea* is a smaller genus of about 65 species from India to Australia. The Palau endemic is an uncommon riparian tree with foliage resembling *Cynometra ramiflora*, and thus the same vernacular name is somtimes applied to both.

Calophyllum pelewense P.F. Stevens	Palau	V	T(c)	U
Garcinia carolinensis (Ltb.) Kosterm.	Chuuk	--	T	--
Garcinia matsudai Kaneh.	Palau	V	T	C-A

Garcinia ponapensis Laut.	E. Carolines	V	T	--
Garcinia rumiyo Kaneh.	W. Carolines	--	T	--
Garcinia volkensii (Ltb.) Kosterm.	Yap	--	T	--
Kayea pacifica Hosok.	Palau	V	T	U

COMBRETACEAE
3/7(3)

The Combretaceae family consists of about 500 species of trees or lianas mostly in the tropics. Species of *Terminalia* are generally large trees with a characteristic "pagoda- like" branching pattern and leaves clustered at the twig tips in rosettes. Its name is derived from the Latin *terminus*, referring to the terminal foliage and branching pattern. *Terminalia carolinensis* is a large buttressed tree found in the swamp forests of Kosrae and Pohnpei. *Terminalia crassipes* is a large riparian tree only known from two river systems in Palau. *Terminalia rostrata*, also a large tree, is only known from the tiny, 7.3 km^2, uninhabited Asuncion Island.

Terminalia carolinensis Kaneh.	E. Carolines	V	T(c)	--
Terminalia crassipes Kaneh. & Hatus.	Palau	V	T(c)	R, RR
Terminalia rostrata Fosberg & Falanruw	N. Marianas	V	T(c)	R

CUCURBITACEAE
2/3(1)

The Cucurbitaceae family has about 845 mostly vine or liana species worldwide and can easily be recognized by the hairy palmate leaves and branched tendrils occurring at a 90º angle with the leaf petiole at the nodes. There are numerous economically important crops in this family, many of which are cultivated in Micronesia including melons, squashes, and cucumbers. There are only a few native species. *Trichosanthes* is one of the largest genera with about 100 species, mostly occuring in Australasia. The only record of *T. hosokawae* we are aware of is Fosberg's type collection from the limestone Rock Island of Aulupse'el. It likely occurs throughout the Rock Islands, though Fosberg noted that it was rare.

Trichosanthes hosokawae Fosberg	Palau	L	WL	--

ELAEOCARPACEAE
1/6(6)

Elaeocarpaceae is a tropical family of trees and shrubs with a classic Gondwanan distribution of extant taxa. There are over 600 species, over half of which are within the largest genus, *Elaeocarpus*. They are easily recognized by the foliage. The leaves are often serrated with a swollen petiole, sometimes have domatia, and nearly always turn yellow to red before falling to the ground. The flowers are also

very distinctive, usually with fringed petals. This genus has many endemic species with narrow ranges. The center of diversity is in Southeast Asia, 60 species are endemic to Papuasia (New Guinea to Solomon Islands), and new species are still being described in Australia where the flora is well known. All Micronesian *Elaeocarpus* species are considered endemic. It is worth noting that although the Palau population of *E. joga* occurs abundantly on the volcanic island of Babeldaob, the Marianas populations are only known from limestone based soils and have been shown to be in decline (Ritter & Naugle 1999).

Elaeocarpus carolinensis Koidz.	E. Carolines	V	T	--
Elaeocarpus joga Merr.	Micronesia	G	T	--
Elaeocarpus kerstingianus Schltr.	Pohnpei	V	T	--
Elaeocarpus kusaiensis Kaneh.	E. Carolines	V	T	--
Elaeocarpus kusanoi Kaneh.	E. Carolines	V	T	--
Elaeocarpus rubidus Kaneh.	Palau	L	T	--

ERICACEAE
1/1(1)

The following species was formerly placed in Epacridaceae and was transferred from the genus *Styphelia* or *Cyathodes* to *Leptecophylla* along with six other species from New Guinea and the Pacific (Weiller 1999). Epacridaceae were formerly understood as closely related to Ericaceae but as a seperate Gondwanan family. They now form the subfamily Styphelioideae within Ericaceae. Most species occur in Australia and New Zealand, but they also occur from Southeast Asia into the Pacific (Hawaii and the Marquesas) and the southern tip of South America. Ericaceae species prefer poor, acidic soils and temperate climates. Tropical members of the family rarely occur in the lowlands. *Leptecophylla mariannensis* is only known from Alamagan, an eleven square kilometer island located north of Saipan. The island is volcanic with a large caldera at the summit and reaches to 744 meters in elevation. *Leptecophylla mariannensis* occurs near the caldera up to about 700 meters (Sleumer 1963).

Leptecophylla mariannensis (Kaneh.) C.M.Weiller	N. Marianas	V	S	RR

EUPHORBIACEAE
12/21(8)

Euphorbiaceae, the spurge family, used to include what are now Phyllanthaceae and Putranjavaceae. It is a large family of nearly 6,000 species with its center of diversity in the Indomalayan tropics. There are few universal vegetative characters for this family but the plants often have leaves of irregular size with glands near or at the base or petiole and/or with stipules present. The flowers are unisexual and the fruits are nearly always three-parted. *Claoxylon* has about 80 species distrib-

uted from Madagascar to the Pacific. The flowers are very small and inconspicuous born on spikes in the axils of the leaves. *Croton* is a large pantropical genus with about 1300 species. A number of species are used for traditional medicine, food, and even research for potential biofuels. *Croton saipanensis* is only known from Saipan. *Euphorbia* is one of the largest genera of flowering plants. Most species are succulent or xerophytic and have toxic white latex. There are a number of weedy *Euphorbia* species in Micronesia. The native ones, including the endemic *E. gaudichaudii,* tend to be small herbs or shrubby strand plants. *Macaranga* is a palaeotropic genus of about 240 species. They are often colonizers found in disturbed sites or primary vegetation, and many species have been documented to have symbiotic relationships with ants that live in the hollow stems.

Claoxylon carolinianum Pax & Hoffm.	Pohnpei	V	T	--
Claoxylon longiracemosum Hosok.	Palau	V	T	U
Claoxylon marianum Mueller-Argoviensis	S. Marianas	L	T-S	C
Cleidion sessile Kaneh. & Hatus.	Palau	L	T	--
Croton ripensis Kaneh. & Hatus.	Pohnpei	V	T-S	R
Croton saipanensis (Hosok.) Hosok.	S. Marianas	--	--	--
Euphorbia gaudichaudii Boissier	Micronesia	G	S	--
Macaranga thompsonii Merr.	Marianas	L	T-S	C

FABACEAE
27/46(12)

The legume family is the third largest family of flowering plants with approximately 19,400 species worldwide. They are easy to distinguish, having alternate, usually compound leaves with stipules and fruits usually as legumes. Fabaceae is a very economically important family with many crops and nitrogen fixing plants. Although there are numerous introduced and weedy Fabaceae species present in Micronesia, there are also a number of endemics with very narrow ranges. Both species of *Parkia* have very small population sizes and are single island endemics. *Serianthes nelsonii* is endemic to the islands of Guam and Rota. There is only one known mature tree left on Guam (Stone 1970; Wiles 1998). The population on Rota is more intact with about 120 trees, though it is expected to decline from lack of regeneration (Wiles 1998). *Parkia parvifoliola* qualifies for Endangered status under the IUCN red listing criteria (Costion et al 2009) and *Serianthes nelsonnii* is listed as Critically Endangered (Wiles 1998). *Mucuna pacifica* and *Rhynchosia calosperma* are only known from Saipan, Tinian, and Rota, and *Derris mariannensis* is only known from the island of Rota. *Tephrosia mariana* is endemic to the Micronesia bioregion but only known from Guam and Chuuk.

Canavalia megalantha Merr.	Marianas	--	WL	--
Crudia cynometroides Hosok.	Palau	V	T	U
Cynometra yokotai Kaneh.	Chuuk	--	T	--

Dalbergia hosokawae Costion & Lorence	Palau	V	WL	--
Dalbergia palauensis Hosok.	Palau	V	WL	--
Derris mariannensis Hosok.	S. Marianas	--	WL	--
Mucuna pacifica Hosok.	S. Marianas	--	--	--
Parkia korom Kaneh.	Pohnpei	V	T	R
Parkia parvifoliola Hosok.	Palau	V	T(c)	RR
Rhynchosia calosperma Warb.	S. Marianas	--	--	--
Serianthes nelsonii Merr.	S. Marianas	--	T	R
Tephrosia mariana DC. & Hosok.	Micronesia	--	S	--

GENTIANACEAE
1/2(1)

Gentianaceae is a cosmopolitan family with over 1,600 species occurring worldwide, mainly in temperate regions. Their foliage is distinctive in having opposite leaves with the two petioles joining at the base. *Fagraea* is a genus of about 75 species, one of which is now a popular ornamental in the Pacific, particularly in Hawaii. *Fagraea berteroana* is native to Australia, New Guinea, Micronesia, and east to the Marquesas. The Palau endemic *F. ksid* is very close to *F. berteroana* in its morphology and may be derived from it. It is easily distinguished from the latter by its elongated ovoid fruit and larger flowers with stamens and style that are not exserted. *Fagraea berteroana* in Palau also tends to occur as an epiphyte in the forest while *F. ksid* occurs as a tree in the savannas or savanna edges and along ridgelines.

Fagraea ksid Gilg & Gilg-Ben.	Palau	V	T	C

GESNERIACEAE
1/4(4)

Gesneriaceae is almost entirely tropical and is close to Lamiaceae, the mint family. All species are either herbaceous or soft stemmed trees or shrubs. They have opposite serrated leaves often with soft hairs or pubescence and flowers with bilateral symmetry. The genus *Cyrtandra* has radiated substantially throughout the Pacific with a high percentage of single island endemics. It has nearly 600 known species and is most diverse in Southeast Asia. Recent molecular work strongly suggests that the species in the Pacific are Southeast Asian derived and have radiated from a single dispersion event followed by stepping stone migration across the Pacific (Cronk et al. 2005). Micronesia has four species, and all are endemic with limited distributions.

Cyrtandra kusaimontana Hosok.	Kosrae	V	--	U-R
Cyrtandra palawensis Schltr.	Palau	V	WL	U-C
Cyrtandra todaiensis Kaneh.	Palau	L	S	--
Cyrtandra urvillei C.B. Cl.	E. Carolines	V	--	U

LAMIACEAE
8/16(1)

The mint family was recently expanded to include many, but not all, previous members of Verbenaceae. It has worldwide distribution with many important economic plants, particularly herbs and spices. Plants in this family often have aromatic leaves, square shaped stems, bisymmetric flowers with an upper and lower lip, and branches of woody species often have distinct lenticels. *Callicarpa*, a genus of up to 140 recognized species, was formerly placed in Verbenaceae. It has global distribution, but most species occur in East and Southeast Asia. There is very little information available on *C. lamii*. It even escaped Stone's (1970) attention in the Flora of Guam, and thus it is probably very similar to the widespread *C. candicans*. Fosberg & Sachet (1980) also noted that it was only weakly distinct from *C. candicans*, and that the varieties of the latter species they recognized and its relationships with other Indopacific species are also unclear requiring further study. Kawakubo (1986) also noted a high degree of morphological variation in endemic *Callicarpa* of the Bonin Islands. Molecular studies may revise species concepts in this genus. *Callicarpa* remains unplaced within the Lamiaceae.

Callicarpa lamii Hosok.	Marianas	--	S	--

MALVACEAE
18/23(6)

The Malvaceae family now includes Tiliaceae, Sterculiaceae, and Bombacaceae as subfamilies in a larger family concept, Malvaceae sensu lato, which includes over 4,000 species. The family can often be recognized without fertile material by its alternate stipulate leaves, palmate venation or palmately compound leaflets, and stellate hairs on the leaves. The branches often have "strong" or very fibrous bark that peels down the branch instead of breaking clean, often with mucilage. *Hibiscus tiliaceus,* a common Pacific strand and wetland plant, is exploited for just these characters. Long strips of bark are used to extract the juice of sakau in Pohnpei, giving it the characteristic slimy texture. Other important economic plants in this family include cotton and chocolate. Micronesia's endemics range from canopy trees to pioneer shrubs. *Heritiera longipetiolata* occurs rooted in crevices in dissected limestone slopes and plateaus in the Marianas. It is listed as Vulnerable on IUCN redlist and known outside the Marianas only from Pohnpei. *Sterculia* is a pantropical genus of 150 species. *Sterculia palauensis* is a large buttressed tree only found on Palau's limestone islands, and *S. ponapensis* is known only from Pohnpei and Yap. *Trichospermum* is predominantly a Malesian genus with its diversity centered in New Guinea. Two species occur in Micronesia, and are both are endemic. They are common shrubs occurring in primary vegetation or at edges of savannas.

Heritiera longipetiolata Kaneh.	Micronesia	L	T	R
Melochia villosissima Merr.	Micronesia	V	S	U

Sterculia palauensis Kaneh.	Palau	L	T(c)	--
Sterculia ponapensis Kaneh.	Carolines	V	T	--
Trichospermum ikutai Kaneh.	Yap	--	S	--
Trichospermum ledermannii Burret	Palau	V	S	A

MELESTOMATACEAE
3/8(6)

The Melestomataceae family is a large pantropical to substropical family with over 5,000 species. The center of diversity is in the neotropics. Members of this family are easy to distinguish by their opposite leaves with three or more conspicuous veins ascending from the base with tertiary veins occurring perpendicular to the midrib. The flowers are also distinct in having porose anthers with conspicuous connectives or appendages. *Astronidium* has 70 species from Indomalesia to the Pacific. Three are now recognized as endemic in Micronesia with the former *Astronidium kusaianum* reduced to synonomy under *A. carolinense*. *Medinilla* is a palaeotropic genus of shrubs and lianas. In Micronesia the three endemics species occur as lianas or climbing shrubs.

Astronidium carolinense (Kaneh.) Markgr.	Chuuk	--	T	--
Astronidium palauense (Kaneh.) Markgr.	Palau	V	T(u)	C
Astronidium ponapense (Kaneh.) Markgr.	Pohnpei	V	T	--
Medinilla blumeana Mansf.	Palau	V	WL	--
Medinella diversifolia Kaneh.	Kosrae	V	WL	RR
Medinilla medinilliana (Gaud.) Fosberg & Sachet	Marianas	--	S-WL	C

MELIACEAE
4/5(1)

Meliaceae, the mahogany family, is a pantropical family with over 600 species. Mahogany is native to Central and South America, but it is widely cultivated in the Pacific for its esteemed timber. It grows well in the Pacific where it is free of natural pests and is considered a low risk of becoming an invasive naturalized weed. Not many native Meliaceae species occur in Micronesia, though recent molecular studies (Muellner et al. 2005) have indicated that some complex and variable species, following Pannell's wide species concept (1992), contain more than one taxon each. Both *Aglaia palauensis* and *A. ponapensis* were reduced to synonymy under *A. mariannensis* in Pannell's revision (1992). These taxa may be revived pending the results of future molecular work on the Micronesia populations. *Aglaia* is an Indomalayan genus of over 100 arborescent species mostly found in the moist tropics. In Micronesia they occur as small understory trees with new growth that has a conspicuous reddish brown pubescence. The Mariannas population is restricted to

limestone forest communities, while the Palau and Eastern Caroline populations are found on both volcanic and limestone forests.

Aglaia mariannensis Merr.	Micronesia	G	T(u)	C

MORACEAE
4/11(2)

The fig family has about 1125 species mostly in the tropics and particularly abundant in the lowland rainforests of Africa and the Americas. All species have conspicuous milky white latex, and many species have alternate leaves with a prominent terminal sheathing stipule. *Ficus* is by far the largest genus in the family with 800 species. Micronesia has several native *Ficus* species but only one endemic. *Ficus saffordii,* known from Marianas and Palau, is a large banyan fig that starts out as an epiphyte. It was treated as a variety of *F. microcarpa* by Stone (1970) but is currently recognized as a distinct species (Berg & Corner 2005). *Artocarpus* is a Malesian and Pacific genus with 45 species. Several species are cultivated for food and timber including A. *heterophyllus*, commonly known as jackfruit, and several species of breadfruit including *A. mariannensis*, which was not recognized by Berg et al. (2006) in their Flora Malesiana treatment. They treat it as a synonym of *A. altilis*, which is regarded as an introduction to Micronesia. However, *A. mariannensis* (dugdug or chebiei) is a seeded breadfruit that grows wild in Palau and the Mariana Islands and has long been cultivated throughout Micronesia, especially on the atoll islands. It hybridizes naturally with the introduced breadfruit *A. altilis,* and the numerous hybrids are only found in Micronesia (Ragone 2010, www.ntbg.org/breadfruit/breadfruit/). Breadfruit is an important staple on Pohnpei particularly and to a lesser extent on other islands in Micronesia. It is also the favored timber for constructing outrigger canoes because of its durability and light weight.

Artocarpus mariannensis Trecul	Micronesia	L	T	--
Ficus saffordii Merr.	Micronesia	--	E-T	--

MYRTACEAE
3/12(7)

Myrtaceae is a large tropical to warm-temperate family of over 4,600 species. They generally have opposite leaves with gland dots and ethereal oils that make the leaves aromatic when crushed. The bark is often flakey and the stamens are often colored and numerous. *Syzygium*, a palaeotropical genus of over 1,000 species, has often been confused with *Eugenia*. Its center of diversity is in Southeast Asia, where there are many undescribed species. *Eugenia* is now recognized as a neotropical-centered genus, though a few such as *E. reinwardtiana*, native to Australia, Southeast Asia, Micronesia, and other Pacific Islands, do occur outside this range. Fosberg et al. (1979) treated all of the Micronesia plants in this complex under *Eugenia*. Most of these have been transferred back to their previous

names under *Syzygium* while others are retained as *Eugenia*. For two, *Syzygium thompsonii* and *Syzygium trukensis*, new combinations were required. We follow Schmid's (1972) treatment for distinguishing *Eugenia* and *Syzygium* in Micronesia and found the material fits this classification scheme. Micronesia's *Eugenia* species were formerly treated as *Jossinia* and many of the *Syzygium* species were formerly treated as *Jambosa*. The two Marrianas endemics in *Eugenia* are very closely allied and were even suspected by Stone (1970) to be potentially different growth forms of the same species. Both names are retained here until molecular or others studies provide evidence to support their synonymy.

Eugenia bryanii Kaneh.	Guam	--	S	--
Eugenia palumbis Merr.	Marianas	L	S	C
Syzygium thompsonii (Merr.) N. Snow	S. Marianas	L	T(c)	--
Syzygium trukensis (Hosok.) Costion & E. Lucas	Chuuk	--	--	--
Myrtella bennigseniana (Volk.) Diels	Micronesia	V	S	--
Syzygium palauensis (Kaneh.) Hosok.	Palau	G	T	--
Syzygium stelechanthum (Diels) Glassman	E. Carolines	V	T-S	--

OLEACEAE
2/2(1)

The olive family contains over 600 species worldwide, all woody. The leaves are opposite, lacking stipules, and may be simple or compound. The flowers are four to five-merous, often aromatic, and are especially distinctive by nearly always having only two stamens. Aside from olives, other economically important members this family include many ornamentals such as lilacs, jasmines, and forsythia. Micronesia's endemic, *Jasminum marianum*, is common and widespread on open limestone forests in the Marianas.

Jasminum marianum DC.	Marianas	G	S	C

PHYLLANTHACEAE
8/25(13)

Phyllanthaceae, a family of 1,745 species worldwide, was split from Euphorbiaceae as a result of molecular studies and various morphological features. Phyllanthaceae species lack latex, the leaves often have petioles with a pulvinus at the base and lack glands, and the fruits have two seeds in each carpel. Many species also have an explosively dehiscent fruit that leaves a persistent central column behind. Both *Cleistanthus* and *Glochidion* are paleaotropic genera with about 140 and 300 species respectively. Wagner & Lorence (2011) recently transferred the Pacific oceanic island *Glochidion* species into *Phyllanthus* and we cite their new names in parentheses below each basioym. This group is very speciose in the Pacific and Micronesia specifically. The expanded genus *Phyllanthus* comprises over

1300 species. Species in the *Glochidion* group can be difficult to differentiate and require further in-depth revision. The Micronesian *Phyllanthus* taxa are distinctive with small and numerous, two-ranked leaves making them very easy to identify in the field. They occur either in the savannas *(P. palauensis* and *P. saffordii),* or on limestone bluffs *(P. marianus* and *P. rupiinsularis).*

Cleistanthus carolinianus Jabl.	Palau	G	T	U
Cleistanthus insularis Kaneh.	Palau	V	T	U
Cleistanthus morii Kaneh.	Chuuk	--	T	--
Glochidion kanehirae Hosok.	Carolines	--	--	--
(=*Phyllanthus kanehirae* (Hosokawa) W.L. Wagner & Lorence)				
Glochidion macrosepalum Hosok.	Palau	G	S	--
(=*Phyllanthus macrosepalus* (Hosokawa) W.L. Wagner & Lorence)				
Glochidion marianum Muell.-Arg.	Guam	G	T-S	C
(=*Phyllanthus mariannensis* W.L. Wagner & Lorence)				
Glochidion palauense Hosok.	Palau	G	T	C
(=*Phyllanthus otobedii* W.L. Wagner & Lorence)				
Glochidion ponapense Hosok.	Pohnpei	V	T-S	--
(=*Phyllanthus ponapense* (Hosokawa) W.L. Wagner & Lorence)				
Glochidion senyavinianum Glassman	Pohnpei	V	T-S	--
(=*Phyllanthus senyavinianus* (Glassman) W. L. Wagner & Lorence)				
Glochidion websteri Fosberg	Palau	--	--	--
(Phyllanthus websteri (Fosberg) W. L. Wagner & Lorence)				
Phyllanthus marianus Muell.-Arg	Micronesia	L	S	A
Phyllanthus palauensis Hosok.	Palau	V	S	C-A
Phyllanthus rupiinsularis Hosok.	Palau	L	S	--
Phyllanthus saffordii Merr.	Marianas	V	S	--

PUTRANJIVACEAE
1/5(5)

This family was formerly included in Euphorbiaceae, but molecular work has placed it as a separate lineage in its own family. It is a small pantropical family with only three to four genera and 210 species, 200 of which are in *Drypetes*. They have two ranked leaves that are often asymmetrical at the base. The fruits are one-seeded and have persistent flap-like stigmas at the apex. The leaves of many species contain mustard oils and are reported to have a peppery taste. The endemics are found in the Western Carolines and Northern Marianas. *Drypetes dolichocarpa* is only known from Saipan, and *D. rotensis* is only known from Rota.

Drypetes carolinensis Kaneh.	Yap	--	T	--
Drypetes dolichocarpa Kaneh.	Marianas	--	T	--
Drypetes nitida Kaneh.	Palau	G	T	C
Drypetes rotensis Kaneh.	S. Marianas	--	T	--
Drypetes yapensis Tuyama	Yap	--	T	--

PRIMULACEAE
5/14(13)

Recent molecular studies suggest that Myrsinaceae is not a monophyletic family. Myrsinaceae was traditionally separated from Primulaceae on the basis of it members being woody verses herbaceous taxa in the latter. Molecular evidence has shown that many herbaceous taxa from Primulaceae are included within Myrsinaceae. Field characters for distinguishing the woody Primulaceae however are still good. They have characteristic "dash" or line shaped punctations visible when held to light. Some have dot and dash shaped punctations. Only one herbaceous Primulaceae species is present in Micronesia, *Lysimachia mauritiana*, and it has a widespread distribution across the Pacific. All woody species of Primulaceae in Micronesia are endemic. Some, such as *Maesa palauensis* are widespread commonly occurring species, though not locally abundant. Others such as *Maesa canfieldiae* are rare and poorly known. *Discocalyx ladronica* is so poorly known that its island locality within the Marianas is totally unknown. It is only known from the type collection and allegedly very distinct from the more common *D. megacarpa*. Stone (1970) suggested a potential locality mix up; however, it is also certainly feasible that it may have become rare or even possibly extinct after or during WW II. Species of *Myrsine* can often be distinguished by their leaves, rather densely clustered leaves near ends of branches and reddish-purple petioles.

Discocalyx ladronica Mez	Marianas	--	--	--
Discocalyx megacarpa Merr.	Marianas	L	S	C
Discocalyx mezii Hosok.	Palau	G	T(u)	U
Discocalyx palauensis Hosok.	Palau	L	T	--
Discocalyx ponapensis Mez	Pohnpei	V	T-S	--
Embelia palauensis Mez	Carolines	V	WL	--
Maesa canfieldiae Fosberg & Sachet	Palau	L	T-S	RR
Maesa carolinensis Mez	E. Carolines	V	T-S	--
Maesa palauensis Mez	Palau	L	S	--
Maesa walkeri Fosberg & Sachet	S. Marianas	--	T-S	--
Myrsine carolinensis (Mez) Fosberg & Sachet	Pohnpei	V	T-S	--
Myrsine ledermannii (Mez) Fosberg & Sachet	Pohnpei	V	T-S	--
Myrsine palauensis (Mez) Fosberg & Sachet	Palau	V	T(u)	C

RHAMNACEAE
4/4(2)

Rhamnaceae, the buckthorn family, has over 900 species worldwide, mostly trees and shrubs, or sometimes climbers. They are most easily recognized by their

flowers having stamens opposite the petals, which are often hood or cup shaped surrounding the stamens. The petals are often smaller than the sepals and can fall off, making it easy to confuse the sepals for petals. Many species are thorny and some are nitrogen fixing. *Alphitonia* is a small genus distributed from Southeast Asia into the Pacific. *Alphitonia carolinensis* is common in the Western Carolines and is most abundant in canopy gaps and edges of savannas. *Ventilago* is also a small genus, palaeotropic in distribution with most species occurring in Australasia. Although *V. nisidai* is not very well known, it has been recorded as a liana collected from the edge of swamp forest on Babeldaob.

Alphitonia carolinensis Hosok.	W. Carolines	V	T	C
Ventilago nisidai Kaneh.	Palau	V	WL-S	--

RUBIACEAE
22/66(45)

Rubiaceae, the coffee family, is the third largest native vascular plant family in Micronesia and the second largest in terms of number of endemic species, exceeded only by the orchids. Members of this family can easily be recognized vegetatively. They have opposite leaves with an inter- or intrapetiolar scar or stipule. The stipule or stipule scar extends across the stem at the node between the two petiole bases. The flowers have an inferior ovary and there is often a scar at the fruit apex left by the calyx and fallen corolla. Micronesia has a number of narrow endemics in this family including *Hedyotis kanehirae,* known only from Alamagan and *Timonius salsedoi,* known only from the island of Malakal. *Hedyotis, Psychotria,* and *Timonius* are by far the most speciose genera in Micronesia. *Hedyotis* is a paleotropical genus most diverse in SE Asia. Many species in this genus have been transferred back and forth from *Oldenlandia*, which is represented in Micronesia by one native and several weedy species. In Micronesia, *Hedyotis* species range from very small herbs to large shrubs and occur in open savannas, clearings, and under the forest canopy. *Psychotria* is one of the largest of Angiosperm genera with perhaps 1,650 species (Nepokreoff et al. 1999). Most of the Micronesian endemics are shrubs or small understory trees. One of particular interest, *P. diospyrifolia,* occurs as a climber or scandent shrub which is rare for the genus. *Timonius* is a palaeotropic genus of 150-180 species. These plants are dioecious trees or shrubs with axillary inflorescences. All of Micronesia's endemics in *Timonius* are restricted to the Western Carolines with the exception of *T. ledermannii* which is endemic to Chuuk and Pohnpei.

Atractocarpus carolinensis (Valeton) Puttock	Carolines	--	T	--
Badusa palauensis Valeton	Palau	G	T	C
Bikkia palauensis Valeton	Palau	L	S	C
Hedyotis aimiriikensis Kaneh.	Palau	V	S	--
Hedyotis cornifolia Kaneh.	Palau	V	H	--

Hedyotis cushingiae Fosberg	Yap	V	D	--
Hedyotis divaricata (Valeton) Hosok	W. Carolines	V	S	--
Hedyotis fruticulosa (Volk.) Merr.	Micronesia	V	S	--
Hedyotis kanehirae (Hatusima) Fosberg	N. Marianas	V	S	RR
Hedyotis korrorensis (Valeton) Hosok	Palau	V	S	C-A
Hedyotis laciniata Kanehira	Marianas	V	H	--
Hedyotis megalantha Merr.	Guam	V	H	--
Hedyotis ponapensis (Valeton) Kaneh.	E. Carolines	V	H	--
Hedyotis sachetiana Fosberg	Palau	V	S	--
Hedyotis scabridifolia Kaneh.	Marianas	V	H-S	--
Hedyotis suborthogona Hosok.	Palau	V	H	--
Hedyotis tomentosa (Valeton) Hosok.	Palau	G	H	C
Hedyotis tuyamae Hosok.	Palau	V	S	--
Hedyotis uncinelloides (Valeton) Hosok.	Pohnpei	V	H	--
Ixora casei Hance	Micronesia	G	S	C
Ixora triantha Volk.	Micronesia	--	S	C
Morinda latibractea Valeton	Palau	L	T(u)	U
Morinda pedunculata Valeton	Palau	V	S-T	C
Ophiorrhiza palauensis Valeton	Palau	G	H	U
Psychotria andersonii Fosberg	Guam	--	--	--
Psychotria arbuscula Volk.	Yap	--	S	--
Psychotria cheathamiana Kaneh.	Palau	L	T(u)	--
Psychotria diospyrifolia Kaneh.	Palau	V	WL-S	U
Psychotria hombroniana (Baill.) Fosberg	Micronesia	G	S	--
Psychotria hosokawae Fosberg	Kosrae	V	T-S	--
Psychotria lasianthoides Valeton	Pohnpei	V	S	--
Psychotria malaspinae Merr.	Guam	--	S-T	--
Psychotria mariana Bartl. ex DC.	Micronesia	L	T	C
Psychotria merrillii Kaneh.	Pohnpei	V	T-S	--
Psychotria mycetoides Valeton	Palau	V	S	--
Psychotria rhombocarpa Kanehira	Kosrae	V	T-S	C
Psychotria rhombocarpoides Hosok.	Pohnpei	V	S	--
Psychotria rotensis Kaneh.	Micronesia	G	T-S	--
Timonius albus Volk.	Yap	--	T-S	--
Timonius corymbosus Valeton	Palau	G	T-S	--
Timonius ledermannii Valeton	E. Carolines	V	T	--
Timonius korrensis Kaneh.	Palau	L	T	--
Timonius mollis Valeton	Palau	V	T(u)	--
Timonius subauritus Valeton	Palau	V	S	C
Timonius salsedoi Fosberg & Sachet	Palau	V	T(u)	RR

RUTACEAE
2/5(3)

Rutaceae is the citrus family with over 1800 species worldwide. The leaves are usually opposite and often compound with distinct gland dots. The foliage of species with simple leaves could potentially be confused with Myrtaceae, which also have opposite leaves with gland dots. The aroma of the oils present in the citrus family however, is noticeably different from Myrtaceae when the leaves are crushed. *Melicope* has 150-233 species distributed from Madagascar and the Indo-Himalaya region east to Hawaii and the Marquesas. There are different viewpoints on the generic limits of this genus, though these do not affect the status of the Micronesian taxa. In Micronesia *Melicope* occurs as a shrub or small understory tree and is more or less inconspicuous. *Melicope ponapensis* has unifoliate leaves that are opposite or in whorls. Both Palau species have trifoliate leaves and are very similar. *Melicope trichantha* occurs on volcanic islands, while *M. palawensis* occurs on limestone islands. *Melicope trichantha* also has stouter branchlets and petioles, and the petals and sepals are larger with a velvety pubescence (Hartley 2001).

Melicope palawensis (Lauterb.) T.G.Hartley	Palau	L	S	C
Melicope ponapensis Lauterb.	Pohnpei	V	T-S	--
Melicope trichantha (Lauterb.) T.G.Hartley	Palau	V	S-T	--

SAPINDACEAE
7/9(3)

Sapindaceae is a large family distributed worldwide. It was recently expanded to include Aceraceae, the maples, and other small groups. They are an important family in tropical Australia and Southeast Asia. Tropical members can usually be distinguished by their pinnately compound leaves with a small terminal rachis tip protruding at the leaf apex, ridged rachis, and swollen petioles. Most Sapindaceae flowers have an extrastaminal disc, a nectary disc that occurs outside the whorl of stamens, or the whorl of stamens sits on top of the disc. This a unique character among the flowering plants, most nectary discs being intrastaminal, occurring inside the whorl of stamens. *Allophylus holophyllus* was noted by Stone (1970) to be rare on Guam and potentially synonymous with *A. timorensis,* though he did distinguish it from the latter by having an entire leave margin and densely pubescent inflorescence axis. We retain the name until molecular data or other studies prove otherwise. *Cupaniopsis guillauminii* has been placed under several different names spanning three genera over the years. Van der Ham (1977) made the correct combination under *Cupaniopsis* but incorrectly included the Fijian endemic *C. concolor.* This species concept was subsequently rejected by both Smith (1985) and Adema (1991), thus both the Chuuk and Fiji endemics are retained. *Elattostachys palauensis* is only known to us from the type specimen which was collected from the limestone Rock Islands in Koror State.

Allophylus holophyllus Radlk.	S. Marianas	L	S	R
Cupaniopsis guillauminii (Kaneh.) Adema	Chuuk	--	T	--
Elattostachys palauensis Hosok.	Palau	L	T	--

SAPOTACEAE
3/5(3)

Sapotaceae is a tropical family with roughly 1,100 known species. They have alternate leaves often clustered toward branch tips with white latex. The terminal buds are often covered with brownish appressed hairs and the petioles are often described as bottle shaped. The genus *Manilkara* is currently under revision. Preliminary molecular results suggest that the genus is not monophyletic and the Palau species along with others may be transferred to a different genus. *Manilkara udoido* is a distinctive tree with a curious distribution, only occurring in southern Babeldaob, where it can form dominant stands. The two Micronesian species of *Planchonella, P. obovata* and *P. calcarea,* were placed in *Pouteria* by Fosberg et al. (1979), but they have both been transferred back to *Planchonella*. *Planchonella calcarea* is poorly known. It probably occurs throughout the limestone islands of Palau but has only been recorded from one locality aside from the type and was noted to be rare (Fosberg and Sachet 1980). *Palaquium* is a genus of about 120 species from Southeast Asia to Australia and the Pacific. The latex of some species has been intensively studied and exploited for its excellent electrical insulating properties. *Palaquium karrak* is a tall canopy tree occurring in the lowland forests of Pohnpei.

Manilkara udoido Kaneh.	Palau	V	T	A,RR
Palaquium karrak Kaneh.	Pohnpei	V	T	--
Planchonella calcarea (Hosok.) P. Royen	Palau	L	T	--
Planchonella micronesica (Kaneh.) Kaneh. ex H.J. Lam	Kosrae	V	--	--

SALICACEAE
4/6(3)

Many of the tropical members of this family were traditionally placed in a separate family, Flacourtiaceae. This family was never regarded as a solid natural group but has only recently been dissolved and divided into several separate, unrelated families. All of the Micronesian taxa were transferred to Salicaceae except for *Pangium edule,* the football fruit, which was transferred to Achariaceae. Salicaceae have distinct "salicoid" teeth or serrations on the leaf blade which are unique by having a vein extending to the apex of the tooth which is tipped by a circular gland or hair. *Casearia* is a tropical genus of roughly 180 species. They are notoriously difficult to distinguish, and a good hand lens or a dissecting microscope is required for the Micronesian taxa. *Xylosma* is a pantropical genus containing

about 85 species. They are often small shrubby plants with thorns and many are used for ornamental hedges. The Micronesian endemic, *X. nelsonii*, is an unarmed shrub occurring in open areas along the coast or in savannas. It is only known from the Marianas and Chuuk.

Casearia cauliflora Volk.	Yap	--	T	--
Casearia hirtella Hosok.	Palau	G	T	C
Xylosma nelsonii Merr.	Micronesia	V	S	--

SOLANACEAE
2/4(2)

Solanaceae is the nightshade family, which is famous for both its many poisonous and nutritious plants. There are some 2,460 species found worldwide. A great number have been exploited by humans, some for the sustenance they provide such as tomato, potato, chili, eggplant, and goji berries, and others for their alkaloids such as tobacco, *Datura*, and *Brugmansia*. *Solanum* is the largest genus with 1,200-1,700 species. The genus occurs worldwide but is most diverse in South America. *Solanum guamense* is endemic to the Marianas and only occurs on limestone cliffs along the coast. *Solanum mariannense* is very poorly known and has only been recorded from the island of Rota (Fosberg et al 1979).

Solanum guamense Merr.	Marianas	L	S	--
Solanum mariannense Hosok.	S. Marianas	--	S	--

URTICACEAE
11/24(7)

The Urticaceae is the stinging nettle family. To "urticate" means to produce a stinging or itching sensation. Many members of this family have glandular hairs that contain mild to severe neurotoxins in them. The sting can vary from a mild itch, as in many temperate herbaceous *Urtica* species, to severe pain requiring medical attention as in some arborous *Dendrocnide* species. *Dendrocnide latifolia,* native to Micronesia can produce a mild but harmless sting. The flowers of this family are small and mostly wind pollinated and thus distinctively non-showy. *Elatostema* is a large genus of some 300 palaeotropic species. The species generally occur as herbs to small shrubs without stinging hairs. Many of the Micronesia endemics occur as herbs along river banks where it is moist year round. *Pipturus* is an Australasian genus of approximately 50 species stretching from Madagascar to the Pacific. It has radiated substantially in the Pacific, especially Hawaii. The Palau endemic *Pipturus micronesicus* may be derived either from the widespread strand plant *P. argenteus,* or from *P. subinteger,* both native to Palau. It is very poorly known.

Elatostema calcareum Merr.	Micronesia	L	H	--
Elatostema fenkolense Hosok.	Kosrae	V	H	--
Elatostema flumineorupestre Hosok.	Pohnpei	V	H	--

Elatostema kusaiense Kaneh.	E. Carolines	V	H	--
Elatostema stenophyllum Merr.	Guam	V	H	--
Elatostema stoloniforme Kaneh.	Palau	V	H	--
Pipturus micronesicus Kaneh.	Palau	L	S	--

VITACEAE
2/5(1)

The grape family contains about 850 species and is found worldwide, though it is more abundant in the tropics. The leaves are palmately compound, veined, or lobed. Vitaceae vines and lianas can be distinguished from other vines by the tendrils that occur directly opposite the leaves at a 180º angle. The family is represented by two native genera in Micronesia. *Leea* was formerly placed in its own family, Leeaceae. It is now placed as subfamily Leeoidea within the Vitaceae. *Leea guineensis* and *L. indica* are both widespread species that occur as understory trees or shrubs in the Indomalesian region. *Cayratia* is represented by over 60 species in the palaeotropics and Pacific. Preliminary molecular work indicates it is a paraphyletic genus (Soejima 2006). Of the three native *Cayratia* species in Micronesia, one is allegedly endemic to Palau. It is so poorly known that the only information about the species is from the protologue and type specimen.

Cayratia palauana (Hosok.) Suesseng.	Palau	L	WL	--

NEW COMBINATIONS AND NAMES

THELYPTERIDACEAE

We follow Smith et al. (2006) in their circumscription of Thelypteridaceae genera. The five species listed below are now referable to *Cyclosorus* Link, and therefore require the following new combinations in that genus.

Cyclosorus carolinensis (Hosokawa) Lorence, **comb. nov.**
Basionym: *Dryopteris carolinensis* Hosokawa, Trans. Nat. Hist. Formosa 26: 74. 1936. Type: Palau Is. Todai-san, 15 Oct. 1933, *Hosokawa* 7518 (Holotype TAI; Isotype BISH 498211!). *Christella carolinensis* (Hosokawa) Holttum, Kew Bull. 31: 307. *Thelypteris carolinensis* (Hosok.) Fosberg, Smithsonian Contr. Bot. 45: 4. 1980.
Note: The club-shaped yellow-orange glands on lower surface of the pinnae are distinctive.

Cyclosorus gretheri (W. H. Wagner) Lorence, **comb. nov.**
Basionym: *Lastrea gretheri* W. H. Wagner, Pacific Sci. 2: 214, fig. 1. 1948. Type: Mariana Islands. Rota, growing on bare coral-limestone rock in crevice in rather exposed situation on a bank along road at 800 ft. altitude on the north slope of the plateau of Rota, 27 July 1947, *D. F. Grether 4468* (Holotype UC; Isotype BISH

498913!). *Thelypteris gretheri* (W. H. Wagner) B. C. Stone, Micronesica 2: 135. 1967. N. Marianas

Cyclosorus guamensis (Holttum) Lorence, **comb. nov.**
Basionym: *Christella guamensis* Holttum, Allertonia 1: 222. 1977. Type: Mariana Islands. Guam, by small stream, *Grether 4384* (Holotype: BISH! Isotype UC). *Thelypteris guamensis* (Holttum) Fosberg & Sachet, Amer. Fern J. 71(3): 82 (1981). 1981.

Cyclosorus palauensis (Hosokawa) Lorence, **comb. nov.**
Basionym: *Meniscium palauense* Hosokawa, Trans. Nat. Hist. Soc. Formosa 28: 148. 1938. Type: Palau, Babeldaob, in a primary forest on Mt. Grittel near Ngakurao, *Hosokawa 9265*. (Holotype: TAI, digital image seen!). *Thelypteris palauensis* (Hosok.) C. F. Reed, Phytologia 17: 300. 1968.

Cyclosorus rupiinsularis (Fosberg) Lorence, **comb. nov.**
Basionym: *Dryopteris rupicola* Hosokawa, Trans Nat. Hist. Soc. Formosa 26: 73. 1936, non C. Chr. 1917. Type: Caroline Islands. Palau, on elevated coral rock, *Hosokawa 7440* (Holotype TAI; digital image seen!; Isotype BISH). *Glaphyropteris rupicola* (Hosokawa) Hosokawa, Trans. Nat. Hist. Soc. Formosa 32: 285. 1942. *Christella rupicola* (Hosokawa) Holttum, Allertonia 1: 217. 1977. *Thelypteris rupi-insularis* Fosberg, Smithsonian Contr. Bot. 45: 5 (1980).
Note: There is already a *Cyclosorus rupicola* Ching & K.H. Shing, Fl. Fugianica 1: 598. 1982, based on a different type, thus precluding the use of this epithet. This necessitates using the next available epithet, namely that of *Thelypteris rupi-insularis* Fosberg.

FABACEAE

The basionym *Dalbergia oligophylla* Hosokawa is invalid. It was described by Hosokawa (1934) after *Dalbergia oligophylla* Baker ex. Hutch & Dalziel was validly published in the Flora of West Tropical Africa (Hutchinson & Dalziel 1928). *Dalbergia oligophylla* is endemic to Cameroon and classified as Endangered (Cheek 2004). We therefore propose the following new name for this species.

Dalbergia hosokawae Costion **nom. nov.**
Basionym: *Dalbergia oligophylla* Hosokawa, Trans. Nat. Hist. Soc. Formosa 24: 415. 1934. Type: Palau, Ailai & Aimiliiki-son Islands *Hosokawa 7298* (Holotype TAI; Isotype MICH, digital image seen!).

MYRTACEAE

Two species formerly treated under *Eugenia* by Fosberg et al. (1979) are transferred to *Syzygium*.Type material was studied in collaboration with Myrtaceae expert Eve Lucas and the morphology was found to be consistent with Schmid's (1972) clas-

sification of *Eugenia* and *Syzygium*. *Eugenia* is mostly restricted to the New World with a few species extending into the Old World and Pacific while *Syzygium* is restricted to the Old World and Pacific. We reject the recent account of Snow and Veldkamp (2010) that merges *Eugenia thompsonii* and *Eugenia trukensis* under one name, *Syzygium thompsonii* (Merr.) N. Snow. The authors did not manually inspect type material of either species and based the merging of the two endemics on digital photos. Further more, the authors ignored obvious discrepencies in substrate types between the two populations. The Marianas population is well known to be restricted to limestone forests. These habitats occur on raised limestone in the Southern Marianas while the type collections of *S. trukensis* are clearly from volcanic soils on Mt. Witipon, Weno (Moen) Island, Chuuk. If the two populations were synonymous then an explanation for its absence on the volcanic soils of Guam is necessary. In addition the authors do not discuss the unlikely probability of such a strange disjunction in Micronesia; restricted to the Southern Marianas and Chuuk. We thoroughly reviewed the literature for the Micronesian flora and are unaware of any plants with such a disjunction. Until sufficient evidence for Snow and Veldkamp's concept of *S. thompsonii* (2010) is provided, we retain the original species concepts of both taxa.

Syzygium thompsonii (Merrill) N. Snow, Austrobaileya 8(2): 182. 2010.
Basionym: *Eugenia thompsonii* Merrill, Phillipp. J. Sci., C 9: 121. 1914, Type: Mariana Islands, Guam. *Jambosa thompsonii* (Merr.) Diels, Engl. Bot. Jahrb. 56: 533. 1921. Type: Mariana Islands, Guam, *Guam Experiment Station/Thompson 469* (Holotype K!).

Syzygium trukensis (Hosokawa) Costion & E. Lucas **comb. nov.**
Basionym: *Eugenia trukensis* Hosokawa, J. Jap. Bot. xiii. 281. 1937. Type: Chuuk islet Wara, *Hosokawa 8434* (Holotype TAI, digital image seen!; Isotype MICH, digital image seen!) *Jambosa trukensis* (Hosok.) Hosok. J. Jap. Bot. 1940, xvi. 545.

UNVERIFIED NAMES

MENISPERMACEAE

Pachygone ledermannii Diels **Allegedly Endemic to: Carolines**
The author of this species maintained four distinct species for Malesia which were all lumped into one by Forman (1957). *Pachygone ledermannii* is allegedly closely allied with *P. vieillardii* Diels, which itself was found by Forman (1997) to be complicated by having its type specimen comprised of two separate species from different genera. For these reasons and since the Micronesian material has been excluded in the more recent revisions by Forman, we refrain from assigning endemic status to this species until further studies can be done.

Tinospora homosepala Diels **Allegedly Endemic to: Marianas**
Potentially the same as or a variety of *Tinospora glabra* (Burm. f.) Merrill, which

is widespread from Malaysia to Philippines, New Guinea, and New Brittain (Forman 1981). The Micronesian plants differ from latter only in having equal sepals, and Forman (1981) notes a variation in sepal length for a specimen *Tinospora glabra* from the Philippines. Fruits of *T. homosepala* are unknown and are required to resolve its taxonomic placement.

Discussion

Table 3 summarizes the results of this paper with the number of endemic plants per island group. The total land area per island group is provided to give additional perspective on the importance of Micronesia's biodiversity. The Caroline Islands comprise less than half the total land area of the region yet contain 77% of all endemic plants found there. Palau alone makes up only 17% of Micronesia's total land area but contains 37% of all endemic plants in Micronesia. The Caroline Islands and Palau in particular, clearly stand out with an exceptionally high endemism and diversity of plant species. Determining the causes and explanations for the unevenness of biodiversity on oceanic islands has generated much interest since MacArthur and Wilson's (1967) theory of island biogeography, but until now addressing the flora of Micronesia as a whole was problematic. It is hoped that in addition to the practical and local benefits for local knowledge and conservation,

Table 3: Number of endemic vascular plant species and total land area per island group

Island Group	Land Area (km^2)	Endemic Species	% Endemism (Spp./km^2)	Sub-Region
Palau	459	135	29%	Western Carolines
Yap	118	9	8%	
W. Carolines	577	16	- - -	
Subtotal	**577**	**160**	28%	
Chuuk	127	16	13%	Eastern Carolines
Pohnpei	345	47	14%	
Kosrae	110	18	16%	
E. Carolines	582	20	- - -	
Subtotal	582	101	17%	
Carolines	1159	19	- - -	All Caroline Islands
Subtotal	**1159**	**280**	24%	
Guam	541	11	2%	Marianas
S. Marianas	843	16	3%	
N. Marianas	164	5	3%	
Marianas	1007	22	- - -	
Subtotal	**1007**	**54**	5%	
Gilbert Islands	281	1	0.4%	Far Eastern Micronesia
Marshall Islands	181	0	0%	
Micronesia	2628	29	- - -	All Micronesian Islands
Total	**2628**	**364**	14%	

this checklist will be utilized as a baseline resource for tackling larger questions on island biogeography in the Pacifc region and beyond. Addressing such questions exceedes the aims of the present study however to emphasize the biodiversity value of Micronesia on a global scale we compare our diversity results from Micronesia to that of other insular floras and recognized global biodiversity hotspots.

In Table 4 we compare the endemism and diversity of plants found within the major archipelagos of the Micronesia-Polynesia biodiversity hotspot (Conservation International 2007). Up to date and reliable information on the number of indigenous and endemic vascular plants was compiled for the Marquesas (Wagner and Lorence 2002), Fiji (Watling 2005), Samoa (Whistler 1992; Whistler 2011a), the Societies (Florence 1987), Tonga (Whistler 2011b) and Hawaii (Wagner et al. 1990; Palmer 2003). The most commonly utilized approach in botanical and conservation literature to calculate plant endemism is to divide the total number of endemic species by the total number of native or indigenous species. This however only gives a measure of the relative speciation rates of lineages once established and the relative isolation of the respective islands. Species richness or richness of endemic species is more accurately calibrated to space; thus in this case the richness of native and endemic plant species per archipelago is also calculated by dividing the total number of species by the total land area (km^2). When this approach is utilized the Micronesia bioregion clearly has the highest richness of

Table 4: Comparison of plant diversity and endemism within and across island biodiversity hotspots.

Archipelago	Size **(km^2)**	Native **species (N)**	Richness **(N/km^2)**	Endemic **species (E)**	Endemism **(E/N)**	(E) Richness **(E ssp./km^2)**
			Micronesia-Polynesia Biodiversity Hotspot			
Micronesia	2,628	1,227	47%	364	30%	14%
Marquesas	1,050	362	34%	162	46%	6%
Society Islands	1,598	896	56%	273	43%	6%
Fiji	18,274	1,594	9%	861	54%	5%
Samoa	3,030	550	18%	165	30%	5%
Hawaii	28,311	1,255	4%	1109	88%	4%
Tonga	748	340	45%	15	4%	2%
			Island Biodiversity Hotspots of the World			
Micronesia	2,628	- - -	- - -	363	- - -	14%
New Caledonia	18,972	- - -	- - -	2,478	- - -	13%
Polynesia-Micronesia	47,239	- - -	- - -	3,074	- - -	7%
East Melanesia	99,384	- - -	- - -	3,000	- - -	3%
Caribbean Is.	230,000	- - -	- - -	6,550	- - -	3%
Philippines	297,179	- - -	- - -	6,091	- - -	2%
Madagascar	600,461	- - -	- - -	11,600	- - -	2%
New Zealand	270,197	- - -	- - -	1,865	- - -	0.7%
Japan	373,490	- - -	- - -	1,950	- - -	0.5%
Wallacea	338,494	- - -	- - -	1,500	- - -	0.4%

both native and endemic plants in the entire Micronesia-Polynesia biodiversity hotspot. Although biodiversity data for island groups such as the Cook Islands and the Phoenix Islands were not available for comparison, their floras, mostly comprised of atoll vegetation (Mueller-Dombois and Fosberg 1998) except for the high islands of the Cook archipelago, are unlikely to surpass those listed in Table 4. Hawaii is often touted as having one of the highest rates of endemism in the world, but clearly Micronesia has a richness of plant endemism per square kilometer ten times higher than Hawaii.

Micronesia's exceptionally high richness of endemic plant species is not only a regional pattern. When it is compared to the recognized island biodiversity hotspots of the world (Conservation International 2007) it surpases them all per unit area (Table 4). Only New Caledonia comes close at 13%. New Caledonia is a continental island with ancient Gondwanan links and is thus expected to have an exceptionally unique biota in comparison to oceanic islands. These data suggest that Micronesia is worthy of being recognized as a distinct biodiversity hotspot. Its richness of plant endemism is distinguishable at both the regional and global scales. The consequence of this fact means that establishment of reserve lands in Micronesia has a substantially high efficiency of maximizing species conserved per square kilometer. It also means that here, possibly more than anywhere else, the vulnerability of extinction is extremely high. The tiny islands of Micronesia may be small geographically; however, their importance to the world in maintaing reserves of unique biodiversity is not small by any means. Efforts to increase funding for collaborative projects and oppurtunities with developed countries to aid in the establishment of protected areas in Micronesia should be given high priority.

The importance of funding alpha taxonomy in the Pacific and other poorly known tropical regions cannot be emphasized enough. While it is common knowledge that we cannot conserve that which we don't know or understand, taxonomy remains a discipline in decline. Many archipelagos in other parts of the Pacific are in need of revised checklists and biodiversity inventories. A potential solution to the decline in taxonomic expertise and funding is to link up with other large funding schemes which are now available for projects relvant to issues such as climate change, the carbon credit scheme, DNA barcoding, and the Tree of Life project. Opportunities such as these can be seized to simultaneously advance alpha taxonomy where it is needed. As the world continues to specialize, taxonomic specialists must broaden their collaborative capacities to achieve outcomes for multiple concurrent platforms.

Lastly, we would like to reiterate Stone's wish that publishing this list will stimulate further floristic studies of all kinds in Micronesia. We have alluded throughout the text to ideas of potential ancestors of some of Micronesia's endemic plants well aware of the fact that focused studies must be done for each taxa and respective lineage to reconstruct their evolutionary history. The era of bioinformatics and DNA research is well underway, which has made the tools for answering questions such as these widely available even for small undergraduate student projects. We hope this list may inspire more small projects such as these in Micronesia. Though the islands may be small, the biota they contain is diverse and complex.

Recent molecular work has already demonstrated that several genera represented in Micronesia are polyphyletic or paraphyeltic, and that some genera dispersed to islands once and speciated while other genera may have dispersed more than once. We expect that the dispersal patterns and historical biogeography here will be complex, and that the process of unraveling these evolutionary stories will provide much pleasure and interest to both the professional and casual naturalists interested in the tropical Pacific flora.

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