

The Rare Plants of Samoa

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BIODIVERSITY
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The Rare Plants of Samoa

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ABOUT THE BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

This document is part of a technical report series on conservation projects funded by the Critical Ecosystem Partnership Fund (CEPF) and the Conservation International Pacific Islands Program (CI-Pacific). The main purpose of this series is to disseminate project findings and successes to a broader audience of conservation professionals in the Pacific, along with interested members of the public and students. The reports are being prepared on an ad-hoc basis as projects are completed and written up.

In most cases the reports are composed of two parts, the first part is a detailed technical report on the project which gives details on the methodology used, the results and any recommendations. The second part is a brief project completion report written for the donor and focused on conservation impacts and lessons learned.

The CEPF fund in the Polynesia-Micronesia region was launched in September 2008 and will be active until 2013. It is being managed as a partnership between CI Pacific and CEPF. The purpose of the fund is to engage and build the capacity of non-governmental organizations to achieve terrestrial conservation. The total grant envelope is approximately US\$6 million, and focuses on three main elements: the prevention, control and eradication of invasive species in key biodiversity areas (KBAs); strengthening the conservation status and management of a prioritized set of 60 KBAs and building the awareness and participation of local leaders and community members in the implementation of threatened species recovery plans.

Since the launch of the fund, a number of calls for proposals have been completed for 14 eligible Pacific Island Countries and Territories (Samoa, Tonga, Kiribati, Fiji, Niue, Cook Islands, Palau, FSM, Marshall Islands, French Polynesia, Wallis and Futuna, Eastern Island, Pitcairn and Tokelau). By late 2010 more than 35 projects in 9 countries and territories were being funded.

The Polynesia-Micronesia Biodiversity Hotspot is one of the most threatened of Earth's 34 biodiversity hotspots, with only 21 percent of the region's original vegetation remaining in pristine condition. The Hotspot faces a large number of severe threats including invasive species, alteration or destruction of native habitat and over exploitation of natural resources. The limited land area exacerbates these threats and to date there have been more recorded bird extinctions in this Hotspot than any other. In the future climate change is likely to become a major threat especially for low lying islands and atolls which could disappear completely.

For more information on the funding criteria and how to apply for a CEPF grant please visit:

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Location of the project in the Polynesia-Micronesia Biodiversity Hotspot



Contents

	About the Biodiversity Conservation Lessons Learned Technical Series	3
	Lessons Learned	7
PART 1	The Rare Plants of Samoa	
	Introduction	9
	1. The Flora of Samoa	11
	2. Botanical Collections from Samoa	11
	3. Reasons for Rarity	12
	Classifications of Rarity	15
	1. Criteria Used Here for Rare	16
	Methodology	19
	Results	21
	1. Rare Polynesian Introductions	22
	1.1. Rare Unintentional Polynesian Introductions	22
	1.2. Rare Intentional Introductions (Polynesian Cultigens)	23
	2. Rare Indigenous Species	26
	2.1 Rare Indigenous Orchids	26
	2.2. Rare Indigenous Non-Orchids	28
	3. Rare Endemic Species	31
	3.1 Rare Endemic Orchids	31
	3.2 Rare Endemic Non-Orchids	32
	Discussion	35
	1. Rare National Endemic Species	37
	2. Rare Archipelago Endemic Species.	38
	3. Rare Indigenous Non-Orchid Species	38
	4. Rare Indigenous Orchids Needing Further Work	43
	5. Rare Alien Species of Ancient Introduction	43

Recommendations	45
Select Bibliography	48
Appendices	51
Appendix 1. Table of Rare Plants of Samoa	51
Appendix 2. IUCN Red List Categories	57
Appendix 3. Species Recommended for the Samoan Plants Red List	65
Appendix 4. Species Doubtful in Samoa	69
Appendix 5. The Rare Species Profiles	71
PART 2 CEPF Small Grant Final Project Completion Report	207

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THE RARE PLANTS OF SAMOA

Lessons Learned

The major lesson learned has probably been to secure transportation. The project was always having to share the truck with other elements in the MNRE. Also, one person should have been put in charge from the beginning, rather than several people, which led to confusion.

Some of the problems that cropped up were handled well by Suemalo Talie Foliga. However he was taken off the project at times, despite the fact that he probably knows the plants better than anyone else at MNRE and was best suited to benefit from the workshop. No one participant did all the field trips, as they were pulled off for various reasons. If more participants had been included, one of them might have taken a real interest in carrying on the work on the flora and rare plants of Samoa.

Project Design Process

Aspects of the project design that contributed to its success/shortcomings.

Transportation should have been a part of the budget, and a local organizer from MNRE should have been appointed earlier. Perhaps there are too many workshops going on in Samoa, and someone in the department (MNRE) should try to space them out.

Project Implementation

Aspects of the project execution that contributed to its success/shortcomings.

Some of the problems that cropped up were handled well by Talie Foliga. But he was taken off the project at times, and he would have been the person best suited to benefit from the workshop (since he probably knows the plants better than anyone else at MNRE, and is very reliable. No one participant did all the field trips, as they were pulled off for various reasons. If more participants had been included, one of them might have taken a real interest in carrying on the work on the flora and rare plants of Samoa.



PLANTS OF SAMOA
SPECIES

Taccaceae

Tacca samoaensis Salm.

Herb with inflorescence on a long scape. Bracts green, growing in area of leproretrieved soil above limestone, elevation 150 m.

Coll. Art Whistler
No. W 1531 Date 7 Feb. 1976



FLORA OF SAMOA
TA'U

RUTACEAE

Melicope heterophylla (A. Gray) T. Hartley

Tree 3 m high, flowers white, 3 mm long, occasional in the scrubby vegetation near the summit of the island on Mt. Lata at 910 m elevation.

Collector: Art Whistler
Number: 11015 Date: 3 May 1996



PLANTS OF SAMOA
SPECIES

Rubiaceae

Psychotria chlorocalyx K. Schum.

Tree 1.5 m high with yellowish-green flowers, growing in the forest SW of Utunapei elevation 300 m.

Coll. Art Whistler



PLANTS OF SAMOA
ATAFU

Myrtaceae

Syzygium chinensis (Chr. Merr. & Perry)

Tall tree with white flowers, growing in the forest inland from Anua on Utunapei land at 450 m elevation 450 m. "Pani val".

Coll.

Introduction

The 'flora' of an area is usually thought of as a list (or book) that includes all the plants occurring in that area. This list can include all flowering plants, all vascular plants (flowering plants, gymnosperms, and ferns), or all plants (including algae, lichens, etc.). Together the flowering plants, gymnosperms, and ferns are often referred to as 'higher plants,' a category known scientifically as Tracheophyta. The higher plants are divided into two main groups (called 'divisions,' which together comprise the 'plant kingdom')—ferns, which are placed in the Pteridophyta (individually called pteridophytes), and seed plants, which are placed in the Spermatophyta (individually called spermatophytes). Between the ferns and seed plants, but typically included in the pteridophytes, is a heterogeneous assemblage of plants called 'fern allies,' which in Samoa comprise the genera *Psilotum* (two species), *Selaginella* (2), *Lycopodium* (8), and *Tmesipteris* (1), all of them small plants. These are usually studied separately from the seed plants by botanists who specialize in ferns, and are beyond the scope of this study. The seed plants are divided into two groups: Gymnospermae (called gymnosperms, or sometimes, conifers), and Angiospermae (flowering plants). There are no native gymnosperms in Samoa, so they are not covered in this report. Consequently this study comprises the flowering plants, the angiosperms.

The angiosperms are divided into two groups: monocots and dicots. These two groups (as well as other plants) are further divided into groups called 'orders,' and orders are divided into 'families,' which range in size from a single species to thousands of species. Orders are not commonly used, but families are. All family names can be identified by the ending '-ceae.' For example, the orchid family, the largest one in Samoa, is called the Orchidaceae, and the largest dicot family, the coffee family, is called *Rubiaceae*. In the past, there were eight exceptions to this ending, but these eight are now given different names with the standard '-ceae' ending: the carrot family *Umbelliferae* (now called *Apiaceae*), the sunflower family *Compositae* (*Asteraceae*), the mustard family *Cruciferae* (*Brassicaceae*), the mangosteen family *Guttiferae* (*Clusiaceae*), the pea family *Leguminosae* (*Fabaceae*), the mint family *Labiatae* (*Lamiaceae*), the palm family *Palmae* (*Arecaceae*), and the grass family *Gramineae* (*Poaceae*).

Plant species can be classified by their distribution: they are either *native*, i.e., they occur naturally in the area (having arrived by non-human transport), or they are *alien* (introduced species that arrived by direct or indirect human transport). Alien species can be further divided into species introduced by the Polynesians (i.e., species brought in prior to ca. 1830, and called *Polynesian introductions*) and those introduced in modern times (i.e., after ca. 1830, and called *modern introductions*) by Europeans or by Polynesians traveling by means of western transport (boats, and nowadays, planes). Alien plants can also be divided another way into *intentional introductions* (plants brought intentionally, usually useful plants) and *unintentional introductions* (plants accidentally arriving in Samoa, typically weeds).

Native plants can be further divided into two categories, *endemic* and *indigenous*. Endemic means restricted to a certain area; plants endemic to Samoa are found only in Samoa. Indigenous in its current usage, refers to native species with a wider distribution (i.e., those naturally found in Samoa as well as elsewhere). These terms are relative, because their meaning depends upon how the 'area' is defined. For example, a plant occurring in Samoa and Tonga can be referred to as endemic to western Polynesia, but then it would be indigenous to these two areas when they are treated individually. However, in practical usage endemism is usually applied to countries, archipelagoes, or islands.

The use of the term 'Samoa' in any biological report can be confusing because the archipelago is divided politically into two parts, independent Samoa (Samoa) and American Samoa. Politically, 'Samoa' refers to the entity formerly known as Western Samoa, but geographically it refers to the whole archipelago. To avoid confusion, the western part of the archipelago is referred to in this report as 'independent Samoa,' and if the whole archipelago is meant, 'Samoa' (or 'the archipelago') is used. Although American Samoa and independent Samoa are separate politically, the plants of the archipelago do not honor this distinction and it is not realistic to divide the archipelago in a botanical context into the political entities. However, because the two governments are independent from each other, their environmental departments (the Department of Marine and Wildlife Resources in American Samoa, and the Ministry of Natural Resources and Environment in independent Samoa) are likewise separate, and arrangements to treat plants of the archipelago as a whole have not been made between the two governments. This is pity, since the most logical way to deal with these plants is on an archipelago level. Because of this political division, a plant can be recognized as endemic to independent Samoa or American Samoa, when the more realistic way would be to use only the term 'Samoa endemic' without any political distinction. It is artificial to separate the archipelago into the two parts, but often necessary since decisions made about plants occurring in both parts of the archipelago are usually made independently by the two political entities. The most realistic concept of endemism in Samoa should include plants endemic to the archipelago, not to the political entities. In this regard, a plant endemic to American Samoa should be considered to be endemic to the archipelago instead of the political entity, and conversely for independent Samoa endemics.

The political division also affects the status of rare plants. For example, the attractive large white ground orchid *Calanthe hololeuca* is common in American Samoa, where it has been collected 16 times, but it is rare in independent Samoa, where it has been collected only twice since 1931. Although included here on the list of rare plants of independent Samoa, it is not rare in the archipelago. For the purposes of this report, however, all plants rare in independent Samoa are included here, even though they may be common in American Samoa. This is treated further in the Discussion section below.

1. The Flora of Samoa

The flora of Samoa (the archipelago) comprises about 550 native species of flowering plants (Whistler, pers. research). These species fall into 95 plant families and about 300 genera. Although Samoa has the second largest native flora in tropical Polynesia (behind Hawai'i), its flora is only about one third as large as that of Fiji located about 1100 km (685 mi) to the west. The largest family of flowering plants in Samoa is the orchid family Orchidaceae, with approximately 100 species. Approximately 30% of the flowering plants of Samoa are endemic to the archipelago. Only two genera, *Sarcopygme* (Rubiaceae) and *Solfia* (Arecaceae), are endemic to the archipelago.

The state of knowledge of the flora of Samoa has lagged behind that of much of the rest of Polynesia. Samoa is the largest archipelago in Polynesia that does not have a published flora. Hawai'i has a recent flora (Wagner et al. 1990), and Fiji has a recent and large, comprehensive one (Smith 1979–1996). Tonga had a flora published by Yuncker in 1959, and Niue has had two (Sykes 1979; Yuncker 1943). A flora of Samoa is long overdue but hopefully this problem will be rectified in the near future.

2. Botanical Collections from Samoa

The collection of the Samoan flora began dramatically when the ship's botanist from the La Pérouse expedition gathered a number of specimens in the vicinity of A'asu Bay on the northern coast of Tutuila in 1787. However, the specimens he carried on his back when he swam to the ship during a battle between Samoans and his French shipmates were lost several months later along with the ship and crew. After that A'asu incident, explorers and scientists avoided Samoa, and the next visit by a botanist was not until 1838, when another French expedition, this one under the command of Dumont d'Urville, visited Samoa. Very little is known about the d'Urville collections, although they are apparently stored in the Paris Herbarium. The following year the United States Exploring Expedition (USEE) visited Samoa, and a large collection was made (Pickering 1876). This collection, although important because of its very early date, is of somewhat dubious value, since it was poorly curated and many specimens are now known to have been mislabeled, some even attributed to the wrong archipelago (there are two Samoan endemic species whose specific names refer to their incorrect collection locality in Tahiti).

This exploratory phase was followed by one consisting of botanical collections made by several amateur and professional European botanists who visited or lived in Samoa during the middle part of the nineteenth century. The most notable of these collectors were E. Graeffe, a Swiss physician (intermittently in Samoa from ca. 1862 to 1872); the Rev. T. Powell, an English missionary (in Samoa ca. 1848 to 1885); and the Rev. J. Whitmee, another English missionary (in Samoa ca. 1875–1885). Graeffe and Whitmee did not publish their botanical information, and Powell (1868) published only a list of Samoan plant names. More comprehensive study of the flora did not begin until the last decade of the century, when the German botanist F. Reinecke worked in the archipelago from 1893 to 1895 and published his *Die Flora der Samoa-Inseln* (1896, 1898). He was followed by Dr. F. Vaupel, a German physician and amateur botanist whose collections date from 1904 to 1906 (and were partially treated in Lauterbach 1908), and K. Rechinger, who visited Samoa in 1905 and published a series of reports (1907–1915) based on his collections. Three other botanists visited Samoa during this phase and published information on the flora of Samoa. The Americans Lloyd and Aiken visited the archipelago in 1905, and published a booklet 29 years later with the somewhat grandiose title *Flora of Samoa* (Lloyd & Aiken 1934). B.P.G. Hochreutiner, a Swiss botanist, collected in Samoa in the

same year as Lloyd & Aiken and Rechinger, and published his results in a series of seldom quoted articles many years later (Hochreutiner 1912, 1925, 1934, 1936).

The modern phase of Samoan botany began in 1920 with the visit of W. Setchell to American Samoa, and is characterized by collections made by amateur and professional American or American-sponsored botanists. Setchell's work on the Samoan flora (published in 1924) was followed by E. Christophersen, who collected in Samoa in 1929 and 1931 and published his two-volume work *Flowering Plants of Samoa* (Christophersen 1935, 1938), which also included records of previous minor collectors (Garber, Eames, Bryan, Wilder, and Diefenderfer) who botanized in the archipelago during the preceding two decades. In 1939, T. Yuncker collected in American Samoa, and based upon his collections, published *Plants of the Manua Islands* (1945). His publication also included collections in Manu'a made by A. & W. Harris (mostly in 1938). At about the same time, C. Christensen (1943) published a fern flora of Samoa, based on the collections of other botanists, but he did not personally visit Samoa.

Since Yuncker's time, several other significant collections have been made, most notably by M. Bristol in 1968, P. Cox in the 1970s and 1980s, and W. A. Whistler (1968–present), but little has been published about these, other than checklist of the flora of American Samoa (Whistler 1998). The most significant Samoan floristic studies are still the work of Reinecke (1896, 1898), Rechinger (1907–1915), and Christophersen (1935, 1938). The best of these publications is undoubtedly that of Christophersen, not only because of its comprehensive coverage (Christophersen collected about 83% of the flora, which is considerably more than Rechinger's 60%, Reinecke's 54%, and Vaupel's 45%), but also because it is the most recent of the three. Actually, these publications are all more correctly classified as partial floras since they lack 'keys' and botanical descriptions that characterize floras, and are consequently of little use to anybody but a taxonomist. There is, therefore, no published 'flora of Samoa,' but species checklists can be compiled from the earlier publications and recent collections, and from up-to-date information in the recent flora of Fiji (Smith 1979–1996). Additional information on Samoan plants is included in a booklet by Parham (1972). Other publications that deal with Samoan plants, some of which contain flora checklists, include the following: for vegetation, Whistler 1978, 1980, 1984, 1992A, 1992B, 1994, and 2002; for medicinal plants, Whistler 1992D and 1996; and for weeds, Whistler 1983 and 1995.

Until the last few years, Christophersen's collection of 2900 specimens was the largest made in Samoa, but between 1968 and the present, A. Whistler has amassed a personal collection of over 8000 specimens. The collection includes over 90% of the known angiosperm flora of the archipelago. The only taxonomic works based on these specimens are revisions of two of the three largest genera in Samoa, *Psychotria* (Whistler 1986) and *Syzygium* (Whistler 1988). Whistler also published *Plants in Samoa Culture* (2001), which includes the local names of Samoan plants, and *Rainforest Trees of Samoa* (2004A), which is a partial flora of native Samoan lowland forest trees.

3. Reasons for Rarity

There are a number of reasons why plants are rare in Samoa, some of them due to the activities of man, some to chance, and some to natural causes. These reasons can be put into several categories: (1) loss of habitat; (2) competition; (3) herbivory; (4) abandonment of cultigens; and (5) natural rarity. By far the two most common and important reasons belong to the first two categories. Plants that have died off over their entire range are referred to as extinct. Species that have died off in only part of their range are referred to as extirpated from those places.

Loss of habitat is probably the most serious cause of plants becoming rare in Samoa after the arrival of the first Polynesian settlers about 3000 years ago. After the original settlement, the population soon expanded and started utilizing the environment, especially the lowlands. Forests were cut down for villages and plantations, and marshes were utilized to grow taro. Species already uncommon in the lowlands, and restricted to there, were soon threatened, and some of them have probably already gone extinct, especially during the European era when much of the remaining lowland forest was planted in commercial coconut plantations.

One example of the loss of habitat threatening a native plant is shown with *Centipeda minima*, a small herb of the sunflower family *Asteraceae*. It is restricted to the edges of coastal and inland wetlands, and was most recently collected along the edges of a pond in Faleālupo, Savai'i. Its habitat, wetlands, has been highly modified by humans, which has reduced places in which it can survive. Also, a devastating cyclone two decades ago destroyed the only known recent collection site (at Faleālupo) and the species was not found during a recent cursory survey there in July 2010. Even more devastating to native plant habitat has been the destruction of Samoan lowland forest, especially on 'Upolu. Species restricted to this forest have been hard hit, and several of them, perhaps naturally rare to begin with, may have already become extinct or extirpated because of this.

Competition is also a serious problem for native species. The native plants developed together in the Samoan environment over thousands and even millions of years, and each of them developed traits that allowed them to survive in the little-changing habitat. However, the first Polynesian settlers arriving in Samoa brought with them alien plant species that changed the vegetation dynamics. These species, some of which were cultigens that do not reproduce themselves naturally, but some were adventive species that naturally spread into the native habitats. Even more serious was the changes wrought by the more numerous and aggressive alien weedy species brought to Samoa after the arrival of Europeans beginning in about 1830. Some native plant species were probably dependent upon natural forest clearings and open sunny conditions for their seedlings to grow and development. But with the arrival of so many new weedy species (hundreds of them), especially the fast-growing mile-a-minute vine (*Mikania micrantha*, ***fue saina***), has caused these clearings to now rapidly be covered with a smothering growth of weeds, blocking out the sunlight needed by the native species. This kind of competition has probably led to the extirpation from Samoa of the native herb *Blumea milnei* in the sunflower family *Asteraceae*. It is also probably the major cause of extirpation of Polynesian weeds that were unable to compete with the more recent arrivals in Samoa.

Herbivory has been a major problem for native Pacific species ever since the introduction of alien mammals by the Polynesians. Prior to the arrival of the first settlers, there were no native terrestrial mammals present in Polynesia other than bats. Samoa has two apparently native fruit bats that are more helpful to native plants than they are harmful, since they are major seed dispersers. The other native bat is small and insectivorous. Polynesians brought three mammals with them, the Polynesian rat (*Rattus exulans*), the dog, and the pig. The Polynesian rat's influence on the native flora of Polynesia is only recently being understood. They are major seed consumers, particularly of palms, and are now thought to have led to the extinction, extirpation, and drastic population reduction of palms in places such as Easter Island, Hawai'i, and Fiji. At the present time, however, there are no known rat seed predation effects on native Samoan palms or other species, a subject that needs further study (especially now that rats have recently been eradicated from Nu'utele Island).

Pigs have had serious effects in many places in Polynesia because of their rooting habits and taste for some native species. Hunting has kept them in check in most of Samoa, and even though they are known to inhabit the highest elevations of Samoa, the damage they cause does not seem to be major. Dogs and cats have no effect on the native flora, since they are carnivores. Elsewhere in

Polynesia, deer, goats, cattle, and sheep have caused extensive damage. In Samoa only cattle have been known to become feral, but this infrequently happens, mostly because stray cattle are prime targets for Samoan hunters and poachers, and the animals are not suited to a life in the rainforest.

The abandonment of cultigens is probably the major reason for the extirpation or near extirpation of some ancient Polynesian cultivated plants from Samoa. The ancient Polynesians carried the plants useful to them throughout Polynesia, and maintained their populations by cultivation. However, in the European era many new and better species were introduced, which led to some of the 'canoe plants' no longer being cultivated. A good example of this is the Polynesian tomato *taulo'u* (*Solanum ferox*), which in ancient times was cultivated for its tomato-like fruits. However, with the introduction of the more prolific and tastier real tomatoes, Samoans apparently lost interest in cultivating *taulo'u*, which has led to its extirpation from Samoa. Although it is not an endemic species and hence is also found elsewhere, it has been extirpated throughout most of its Polynesian range and is in danger of extinction. A second example is tou (*Cordia aspera*), which in ancient times was used to produce a glue for making tapa cloth. Its use for this has been discontinued, and the plant is now rare in forest and probably on its way to extirpation from Samoa. Few if any Samoans know its name anymore.

Some species are probably naturally rare in Samoa, for a variety of reasons. The most common one is probably the chance recent arrival of species that have not had enough time to spread. Good examples of this include the littoral shrubs *Pemphis acidula* and *Suriana maritima*. *Pemphis* is known from only two localities on the southeast coast of Savai'i between Salelologa and Sala'ilua, and *Suriana* is known from a single shrub collected on Nu'ulua beach. These two species will probably always be rare in (or disappear from) Samoa because their preferred habitat is atoll sand or makatea limestone rock, which are absent in Samoa.

Classifications of Rarity

The definitions of the terms 'rare,' 'threatened,' and 'endangered' are conceived of in different ways. The United States Interior Department's U.S. Fish and Wildlife Service (FWS) has primary responsibility for terrestrial and freshwater plants, as provided for in the Endangered Species Act (ESA) of 1973. Under the ESA, plant species may be listed as either endangered or threatened. 'Endangered' means a species is in danger of extinction throughout all or a significant portion of its range. 'Threatened' means a species is likely to become endangered within the foreseeable future. As of March 2008, the FWS had listed 1,925 species worldwide as endangered or threatened, 1,351 of which occur in the U.S. The term 'rare' has no legal meaning, but is used in this report to mean it is difficult to find.

The main international agency in charge of rare plants is the IUCN, which produces a list called the 'Red List' of these species. The IUCN system divides plants based upon their frequency and distribution into nine categories: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Near Threatened (NT); Least Concern (LC); Data Deficient (DD); and Not Evaluated (NE). The definitions of these are somewhat complicated and based upon a lot of data that is almost entirely lacking in Samoa, but these definitions can be seen in Appendix 2.

New Zealand, which has a very active program for protecting their rare plants, uses its own system of classification. Townsend et al. (2008) has developed the New Zealand Threat Classification System so that every native organism that exists in the wild in New Zealand can be assigned a threat status. The species on the list are divided into two main groups: those that are able to be evaluated and those that are not. Those that cannot be evaluated, for whatever reason, are assigned the category 'Data Deficient' (as on the IUCN Red List). The categories with sufficient data are classified as follows.

1. Extinct

Plants that are no doubt no longer found in New Zealand. This actually includes plants that are extinct (no longer exist on the planet) and extirpated (no longer exist in New Zealand). As de Lange et al. (2010) note, it is nearly impossible to prove that a plant is extinct, and there are plant species that have been listed thus and subsequently rediscovered. Species extinct in the wild but remaining in cultivation are not included in this category, nor are species that arrived by chance but did not become established ('vagrants').

2. Threatened

Plants that are on the road to extinction. This category is subdivided into several smaller categories based upon the population size and the current and predicted decline rate for the taxon: (1) Nationally Critical; (2) Nationally Endangered; and (3)

Nationally Vulnerable. A number of additional qualifiers are used in this system, such as 'extinct in the wild,' 'range restricted,' and 'range restricted.'

3. At Risk

Plants that are at some risk of extinction but are not as yet directly threatened.

4. Not Threatened

Species that have been evaluated but have been determined to not be endangered or threatened in the country.

Virtually no work has been done on the rare plants of Samoa. The first listing of rare species was done by Whistler (1992C) in a report on the biodiversity of Western Samoa. It included 81 flowering plants and 55 fern and fern ally species. This, however, was only a preliminary list, and no action has occurred on it. The IUCN included five plants on its Red List (IUCN 2008) in Samoa. These are *Solfia samoensis* (listed there as *Drymophloeus samoensis*), *Clinostigma samoense*, *Aglaia elaeagnoidea*, *Aglaia samoensis*, and *Calophyllum neo-ebudicum*. However, it is not clear why these plants were selected, since none of them were on Whistler's 1992 list. *Drymophloeus* occurs at high elevations and is apparently not uncommon; *Clinostigma samoense* has been collected over 20 times in Samoa, nine times by Whistler alone; *Aglaia elaeagnoidea* does not occur in Samoa; *Aglaia samoensis* is a very common understory tree; and *Calophyllum neo-ebudicum* is a very common timber tree. Consequently, the Red List is entirely unsatisfactory for Samoa, and there is currently no accurate list of plants that should be considered rare, threatened, or endangered.

A survey of the rare plants was recently prepared for American Samoa (Whistler 2004B). A rare plant was defined there as a species that is currently difficult to find. The list included 108 species, including rare Polynesian cultigens and weeds as well as native species. The inclusion of non-native plants (the weeds and cultigens) was done so that the cultural plants that were once a part of Samoan culture could be included. Twenty of the 108 species were recommended for further consideration as 'threatened' or 'endangered' in American Samoa. The report was linked to a GIS data base to show on maps where each of the rare plant records were collected, and the whole thing added to an accessible website (www.cieer.org/efloras/samoa/about.html). Unfortunately, nothing has been done to date to protect these species. The purpose of the present report is the same as for the American Samoa one—to list plants that are rare or currently hard to find in independent Samoa. From the plants selected (108 species) and the resulting recommendations in the Conclusions section here, botanists and conservationists can make educated decisions as to what species should be included on the sorely needed revision of Samoa's Red List of plants.

Criteria Used Here for Rare

Some degree of fixed criteria is desirable in determining if a species should be considered to be rare in Samoa. Most of these criteria are based on the number of times a species has been collected in Samoa. The collections from independent Samoa can be determined by searching the literature, especially Christophersen (1935, 1938), Rechinger (1907–1915), and Reinecke (1898). Also important is the unpublished collection data of the author, whose herbarium specimens represent perhaps a third of those known to exist. Another important way to find specimen records is to look in herbaria housing Samoan collections, particularly for specimens that have not been listed in the literature. This includes the collections of Vaupel, Whitmee, Powell, Graeffe, and the U.S. Exploring

Expedition (USEE), which are widely dispersed in a number of herbaria in Europe, America, and, to a lesser extent, Australia and New Zealand. The following criteria, based on the extant herbarium specimens and experience of the author, were used to compile a list of rare Samoan plants presented here. Inclusion in the list required inclusion in at least one of these categories.

1. Rarity of collections

This category includes species that have been collected less than six times. However, montane species (e.g., those occurring over 900 m elevation) are overly represented in this category merely because the montane areas have been under-collected. In such cases, they are sometimes omitted from consideration because they are not in fact rare, just rarely collected. Some rarely collected plants are common species that may not have been collected because of the difficulty of making them into specimens (e.g., coconut), and these are also usually excluded from consideration.

2. Rarity of modern collections

This category includes species collected three times or less in the modern era (since 1931). Their lack of modern collections is a possible indicator that they are becoming rare and in need of protection.

3. Restriction to threatened habitats

This category includes habitats below 500 m elevation that are under pressure from development and agriculture. This most commonly applies to lowland marshes and lowland rainforest, two of the most damaged habitats in Samoa.

4. Restricted distribution in Samoa

This category includes plants found in only one or at most a few lowland or otherwise threatened localities. Extensive disturbance in these relatively small areas can have serious consequences to the rare plants found there.

5. Over-harvesting

This category includes species that are over-harvested for human use. Probably only one species in Samoa is threatened by over harvesting, *Manilkara samoensis* (Sapotaceae). *Intsia bijuga* (ifilele) may be commercially threatened, but it is not threatened with real extirpation in Samoa, and is thus excluded from the present list.

6. Field experience of the author

The author has been working in Samoa for the last 40 years and has collected about 95% of the native flowering plants known from Samoa. His experience helps qualify him to understand which of the species are rare rather than just under-collected. His experience was sometimes the final arbiter in borderline cases.

Typically threatened or endangered plants are usually native species, most commonly endemic ones. However, two other types of species are included on this list of rare Samoan plants—rare Polynesian cultigens and rare Polynesian adventives. The Polynesian cultigens comprise traditionally cultivated plant species that were brought by the ancient voyagers. These plants often are unable to produce and spread by themselves, and need care by humans (e.g., weeding, planting, etc.) in order to survive in places where they have been introduced. During the modern

period, many new cultigens have been introduced, and many of these are so superior to the older cultigens that cultivation of the latter group has diminished or ceased. Because of the absence of the care needed by these plants, they have gradually disappeared. A good example of this is the Polynesian tomato *Solanum ferox* (*taulo'u*). It was one of the few edible fruits cultivated by Polynesians, but is inferior when compared to the more recently introduced tomatoes, and its cultivation has been abandoned. This change of cultigens also occurs at the varietal level, as when new, more prolific or better tasting varieties of traditional Polynesian cultigens have been introduced, and the less prolific or less tasty ones have been abandoned. These disappearing varieties are not addressed in the present paper since they are only varieties, not species.

Rare Polynesian adventives (weeds) comprise plants unintentionally introduced to Samoa before the European era, but which have become rare or have disappeared because of competition more recently introduced weeds. An example of this is *Sigesbeckia orientalis* (*'a'ami'a*), a weed of ancient introduction to Samoa. Prior to the European era, it was probably a common weed of disturbed places, and was used to scent coconut oil. It has apparently now entirely disappeared from Samoa (last collected there in 1931), probably because of its inability to compete with the legions of weeds introduced in modern times (since 1830). These ancient weeds are often not treated in the literature in the same way as native species. They are ignored because they are widespread, but they may be disappearing over their whole range, and thus slip under the radar. Plants belonging to these two categories of non-native plants are included here because they have been a part of Samoan culture since before the European era.

The conservation status of the 108 plant species included in this report is listed under each species entry in the section below entitled Appendix 5. Rare Species Profiles. The most important category referring to their status is 'rare national endemic,' which signifies species found only in independent Samoa (see the discussion above relating to this). The second most important category is 'rare archipelago endemic,' but this is sometimes misleading because it includes some species that are rare in independent Samoa, but common in American Samoa, as noted above. These first two categories together comprise species that are endemic to Samoa, the archipelago. The third category, rare indigenous, comprises native species that are found in Samoa as well as elsewhere. It comprises the bulk of the rare plants listed here, since nearly two-thirds of Samoan native plants are indigenous rather than endemic. The fourth and fifth categories, rare Polynesian cultigen and rare Polynesian adventive are of lesser importance since they comprise alien (non-native) species.

For the purposes of discussion, the plants selected as 'rare' in Samoa are divided into several categories because they have different characteristics and origins. They are listed because they rare (difficult to find), are restricted geographically, are restricted in habitat, or are becoming rare in recent times. The categories as used in the individual species profiles are summarized as follows:

1. Rare Polynesian adventive.
2. Rare Polynesian cultigen;
3. Rare indigenous; 3. Rare archipelago endemic; and
4. Rare national endemic.

Methodology

The first task in this study was to go through the author's flora data and prepare a preliminary checklist of species that might be included in this report. The flora data is based primarily upon collection data (specimens collected in Samoa) and the author's personal experience with the flora during his 40 years of work in the archipelago. The collection data was divided into old collections (those gathered before 1932) and modern collections (those gathered after that date). The reason these two divisions were considered is because a disparity between the two. I.e., a paucity of modern collections compared to old collections could indicate that the species is disappearing from Samoa.

After considering the available data, the author decided that the best way to proceed was to establish criteria for inclusion on the list of rare plants. In the end, six criteria were used: (1) rarity of collections; (2) rarity of modern collections; (3) restriction to threatened habitats; (4) restricted distribution in Samoa; (5) over-harvesting; and (6) field experience of the author. These are explained in more detail in the 'Criteria Used Here for Rare' section above. One other factor was considered: whether or not the species was primarily an upland species that inhabited the higher elevations of Savai'i. Species predominantly there are likely to be under-collected because of the infrequency of botanical work in this area of difficult access, as noted above. Several species that would otherwise fit into one of the six above categories were eliminated because they were judged to be rarely collected rather than rare.

Once the species were selected for the rare plant list (109 species if the final number: see Appendix 1), a species profile was prepared for each (see Appendix 5). This included the following preliminary information: (1) species name; (2) botanical family to which the species belongs; (3) author(s) of the species name; (4) synonyms of the species name; (5) Samoan name (if any); (6) English name (if any); (7) status (e.g., rare endemic); (8) reason for listing as a rare plant; and (9) suggested action for protecting the species. This was followed by information about the range, habitat, distribution (in and out of Samoa), frequency, and any ethnobotanical uses. Then a botanical description was written for each species, using previous literature, field descriptions made by the author, and descriptions based on botanical collections stored in the Bishop Museum and the University of Hawai'i herbaria. Finally, the sites of collection of all known specimens of the rare plants were recorded. Doubtful species records are shown in Appendix 4.

The sites of collection data for the 108 rare plants are found on hundreds of herbarium specimens and some visual records (the latter lack voucher specimens). The location data for many of the herbarium specimens is found in the publications of Christophersen (1935, 1938), Reinecke (1896, 1898), and Rechinger (1908–1915).

Specimens not cited in those publications can be found in various herbaria, particularly the Bishop Museum herbarium in Honolulu. Second in importance is the herbarium of the Botany Department of the University of Hawai'i, which is the main depository for the specimens of the author (his personal collection). The specimens of Reinecke were originally housed in the Berlin Herbarium, but were destroyed during World War II; however, many duplicates survive in various herbaria. The specimens of Powell and Whitmee are at the Royal Botanic Gardens, Kew, and those of the United States Exploring Expedition (USEE) are mostly at the Smithsonian Institution. The specimens of Graeffe are located at various herbaria, but many are thought to have been destroyed at Berlin. The author has seen nearly all of the above noted specimens at their respective herbaria. The most difficult specimens to deal with are those of Powell, Whitmee, and the USEE, since their specimens rarely note from which island their specimens were collected.

The author then visited Samoa and presented a two-week workshop for the MNRE. This included PowerPoint presentations on the flora of Samoa, the working list of rare species, and field methods. This was followed by eight days of fieldwork with MNRE trainees to teach methodologies for finding rare plant species. Selected sites on Savai'i (three days) and 'Upolu (five days) were visited and searched for rare plants that had been recorded there. Thirteen of the listed rare plants were found during these surveys (see the species marked with asterisks in Appendix 1). The workshop finished with a PowerPoint presentation, open to the public, on the results of the herbarium and literature study and the fieldwork. The report was prepared and submitted to Conservation International and the Ministry of Natural Resources and Environment (MNRE). It included the report, and the species profiles of each of the species, which include color photos of nearly all the species. (A few of the species have probably never been photographed; for these, photos of herbarium specimens were utilized, if they could be found.) Armed with this information, GIS programs can be used to map the distribution of the species, and the whole report, along with the species profiles and photographs, can be put on line on a site dedicated to the flora of Samoa.

Results

The results of this study are arranged into three groups: (1) Rare Polynesian introductions; (2) Rare Indigenous Species (some of which are rare elsewhere in their natural range, some not); and (3) Rare Endemic Species. The first category is divided into Rare Unintentional Polynesian Introductions (mostly weeds) and Rare Intentional Introductions (Polynesian cultigens), which are cultivated plants that have become rare in the European era. The other two categories are subdivided into orchids and non-orchids.

1. Rare Polynesian Introductions

Whether a species is native or alien is sometimes difficult to determine, but several factors have to be considered in ascertaining this: (1) method of dispersal; (2) known range outside of Samoa; (3) whether or not there is a natural habitat for it to occupy; and (4) and if the plant has disappeared in recent times. A plant with no natural means of dispersing across the ocean to Samoa is almost certainly an alien species. A good example of this is the Tahitian chestnut (ifi, *Inocarpus fagifer*), which has large fruits that cannot be carried by wind or animals, and do not survive immersion in seawater for long; hence it is an alien species (Polynesian introduction). If a species is not found on adjacent islands (e.g., Tonga and Fiji), but much farther away (e.g., Australia), is it most likely an alien plant (and usually of modern introduction). Prior to the arrival of Polynesians, most of Samoa was covered in a dense tropical rainforest. Disturbed habitats in pre-Polynesian Samoa were minimal and occurred mostly after drastic climatic events (e.g., cyclones, volcanic eruptions). Hence light-loving inland species had relatively little area to colonize, and most of those found in the plentiful disturbed habitats in Samoa today are alien species. Introduced plants are often not able to compete with native species in undisturbed habitats, but may be common in disturbed habitats because they are planted there by humans. When these plants are no longer desired or cultivated, they may eventually disappear. This is the case for *Parinari insularum* (*sea*), which was frequently collected by the early botanists, but has now apparently disappeared from Samoa. Consequently, useful plants that have become uncommon in recent times are usually alien species (mostly Polynesian cultigens).

The Polynesian introductions considered to be rare in Samoa are divided into two groups for further discussion—weedy species that are mostly of unintentional introduction, and useful species that are mostly of intentional introduction. Because they are alien species, they would not be considered for 'red-listing,' i.e., alien species are rarely considered to be threatened or endangered. However, a case can be made for some of them being considered, since they may be threatened throughout their range.

1.1. Rare Unintentional Polynesian Introductions

This category includes alien species that were accidentally or unintentionally introduced prior to the modern era in Samoa (e.g., prior to about 1830). Such plants are sometimes referred to as Polynesian weeds. Not all weeds are alien species because some are fairly certain to be native (e.g., the common liana *Merremia peltata* [*fue lau tetele*], is currently a major weed but is apparently native). Whether a plant is of ancient or modern introduction is not always clear, and like distinguishing alien from native species, several factors have to be considered: (1) first date of collection; (2) known range outside of Samoa; and (3) whether or not the plant has a local name. Weedy species, especially common ones, not collected by early botanists (i.e., those working in the 19th century) are most likely to be modern rather than Polynesian introductions. Weedy species found among the first collections in Samoa (U.S. Exploring Expedition 1839) are a mixture of modern and Polynesian introductions, but an examination of earlier collections made by the Captain Cook expeditions in Tonga, Tahiti, and Hawai'i can show if the plant was in the area at a much earlier date (before the European era). Virtually all weedy species originally native to tropical America are modern introductions. Weeds that were common in ancient Samoa most likely had names because very few weedy species were present in Samoa in ancient times, and they would have been much more noticeable and a topic of discussion (hence, they would need a name). A list of nine now-rare species that are thought to have been Polynesian introductions are shown in Table 1 below. The species are arranged in alphabetical order by scientific name, and their distribution in the archipelago is noted, including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted.

The antiquity of three of the species on the list is somewhat questionable. The grass *Heteropogon contortus* was not collected in Samoa until 1905 (twice), and not since. It is apparently native to Hawai'i, but in the areas closer to Samoa—Tonga, Tahiti, and Fiji—its first collection dates are comparatively recent. The vine *Ipomoea indica* was first collected in Samoa in 1895, and again in 1905 and 1931, but not since. It is apparently native to Hawai'i and perhaps Tonga (Yuncker 1959 noted it was collected in the 1770s there), but its collection dates in Tahiti and Fiji are comparatively recent. The subshrub *Waltheria indica* was apparently first collected in Samoa in 1839, and is now rare. Like the two preceding species, it appears to be native to Hawai'i, but is of more recent collection in Fiji, Tahiti, and Tonga. It is interesting that all three species are apparently native to Hawai'i, but are rare and probably of modern introduction to Samoa.

TABLE 1. Rare Polynesian Weeds.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Heteropogon contortus</i>	S	–	–	–	–	2	Yes? (1905)
<i>Ipomoea indica</i>	S	–	–	–	–	3	Yes? (1931)
<i>Leucas decemdentata</i>	S	U	T ⁴	O	T	19	No ⁵
<i>Phyllanthus virgatus</i>	S	U	T	O	T	17	No
<i>Portulaca quadrifida</i>	S	U	T	O	T	17	No
<i>Senna sophera</i>	S	–	T	–	–	3	Yes (1920)
<i>Sida samoensis</i>	S	U ⁶	T	O	T	16	No
<i>Sigesbeckia orientalis</i>	S	U	–	–	T	8	Yes (1922)
<i>Waltheria indica</i>	S	U	– ⁷	–	–	6	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Noted by the USEE to occur on Tutuila, but no specimen known. 5 Apparently extirpated from independent Samoa, but still present on in Manu'a American Samoa. 6 Reported only from Manono and Nu'utele Island. 7 Noted by the USEE to occur on Tutuila, but no specimen known.

A weed not included on the list, *Blumea milnei*, appears to be native to Samoa because of its early collection date and because it has a natural habitat (disturbed montane forest) that existed before the arrival of the Polynesians. It is found in Table 4 below. One species included on the Polynesian weed list, the prostrate woody herb *Sida samoensis*, is problematical because it is a littoral species of limited distribution (Fiji and western Polynesia), but occurs only in disturbed sandy habitats. The remaining five species seem to clearly be Polynesian introductions to Samoa that were weeds before the influx of new more aggressive species that probably crowded them out. For information about each species, see the individual species profiles in Appendix 5.

1.2. Rare Intentional Introductions (Polynesian Cultigens)

This category includes 'canoe plants' that were intentionally brought to Samoa by ancient voyagers for the purpose of cultivation, but which in modern times have fallen into disuse and have or nearly have disappeared. The ancient Polynesians had a limited number of useful plants to cultivate, partly because few if any of the native species were very useful. Thus all the species cultivated had to have been carried by them when they started their eastward migrations into Polynesia, or were picked up along the way. The arrival of Europeans (starting in about 1830 in Samoa) opened a whole new avenue for cultivated plants from all over the world. Many of these alien species, such

as mango, proved to be very popular and are now commonly cultivated. Concurrently, many of the ancient useful species quickly lost popularity and their cultivation diminished and eventually ended. If these species were entirely dependent upon people to propagate them, they eventually became rare or disappeared. A good example of this is the wax gourd *Benincasa hispida*. Its only recorded use was as a small gourd for storing scented coconut oil. When Europeans arrived, they brought bottles that were easily obtainable by Samoans (discarded after opening), making the less useful and more attention-requiring gourds obsolete. Nowadays, the gourd is rare but still persists in a few places. Another example is the Polynesian tomato *Solanum ferox* (*taulo'u*). It was formerly cultivated for its mediocre tomato-like fruits, but when other fruits, especially real tomatoes (*Lycopersium esculentum*), were introduced, the aboriginal species soon fell into disuse and has now disappeared from Samoa (and much of Polynesia), as noted earlier.

The twelve species considered to be rare Polynesian cultigens are shown in Table 2. The species are arranged in alphabetical order by scientific name, and their distribution in the archipelago is noted, including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted.

TABLE 2. Rare Polynesian Cultigens.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Acalypha grandis</i>	S	U	T	O	T	15 ⁴	No
<i>Amorphophallus paeoniifolius</i>	S	U	T	O	T	19	No
<i>Atuna racemosa</i>	S	U	T	O ⁵	T ⁵	25	No
<i>Benincasa hispida</i>	–	U	T	–	–	6	No
<i>Cordia aspera</i>	S	U	T	O	T	13	No
<i>Cucumis melo</i>	S	U	T	O	T	13	No ⁶
<i>Dracontomelon vitiense</i>	–	U	–	–	–	9	No
<i>Gardenia taitensis</i>	S	U	T	O	T	4 ⁷	No
<i>Parinari insularum</i>	S	U	T	O ⁵	T ⁵	12	Yes (1955)
<i>Saccharum maximum</i>	S	U	–	–	–	3	No
<i>Solanum ferox</i>	–	U	–	O	–	5	Yes (1905)
<i>Solanum viride</i>	S	U ⁸	T	O	T	25	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'u. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Also found on Apolima, Manono, and 'Aunu'u. 5 Sight records only. 6 Probably extirpated from independent Samoa, but recently found in American Samoa. 7 This excludes the cultivated forms. 8 Also collected on Apolima and Nu'utele.

Four plants on the list are somewhat problematical. The small tree *Acalypha grandis* is found in coastal areas, mostly near trails and villages, and hence seems to be a cultigen. However, it is not clear why it would be introduced (i.e., it has no reported uses) and apparently has no Samoan name. The tree *Dracontomelon vitiense* is a somewhat similar case. It is a cultivated fruit tree in Fiji, where it appears to be native, but is rare in Samoa, where it is known only in cultivated areas and coastal forest, and has no reported Samoan names or uses.

The Tahitian gardenia (*pua Samoa*, *Gardenia taitensis*) is also somewhat problematical. It is native to Vanuatu and Fiji at least, and is definitely a Polynesian introduction into eastern Polynesia. There appears to be a fruit-bearing native form in Samoa that is rare in coastal and littoral habitats, but also a larger-flowered, cultivar that is occasional in cultivation (but less commonly than it was a generation or two ago), but which rarely sets seed or fruit. The cultivated form has been commonly collected, but it is not always clear which specimens are from cultivated, sterile individuals and which are from apparently native, fertile individuals. It is only the seemingly native form of this gardenia that is listed here as rare.

The fourth problematical species, the sugarcane-like reed *Saccharum maximum* (*fiso*), is a very unusual case. It is apparently a natural hybrid between the native reed *Miscanthus floridulus* and the Polynesian-introduced sugar cane *Saccharum officinarum*. Thus it is difficult to classify it as native or introduced, because it is part of both. For information about each of the twelve species, see the individual species profiles in Appendix 5.

2. Rare Indigenous Species

Indigenous species differ from endemic species mainly in their extent of distribution: an endemic species is restricted to a single area (typically an island, archipelago, or country) while indigenous species are found in more than one place. (Some are pantropic, i.e., found throughout the tropics.) The more important of the two, in terms of rare plants, is the endemic category because if they are rare in one place (i.e., the place to which they are native), they are rare globally. Indigenous species can be rare in some places and common in others, but some are rare throughout their range.

An indigenous plant can be rare for a number of reasons. The species may be at its geographical limit, and is rare because it is a recent natural arrival without much time to spread, or because it is at its climatic limit (e.g., it may require a wetter or drier climate than that found in Samoa in order to flourish). It may also be rare because of edaphic factors, e.g., it may thrive only on limestone, which is virtually absent from the volcanic Samoan islands. The indigenous species included here are divided into orchids and non-orchids. Orchids are best treated separately from other rare species in Samoa because they are such a large and unique group of plants.

2.1 Rare Indigenous Orchids

About one hundred orchid species are native to Samoa, which represents about 18% of the native vascular flora of the archipelago. Twenty-three species are included in this category of rare indigenous orchids, which makes up over 21% of the rare plants of Samoa. Ecologically, orchids can be divided into two main groups, epiphytes and terrestrials, and these should also be treated differently from each other. Epiphytes are particularly difficult to monitor, because they can be virtually invisible in closed canopy forest. Because of this, the apparently rare species listed here may not actually be rare, just rarely collected (i.e., they are hard to find, not rare). Terrestrial species, however, are much easier to find when present, but when forests are disturbed but not cut down, the terrestrials are more threatened than the epiphytes. A number of the terrestrials have been collected fairly frequently in the past, but not in the last 25 years, which is a cause of concern. Globally, orchids as a group are also threatened, because many of them are prized by commercial and local collectors, which means they need protection from over-collecting.

TABLE 3. Rare Indigenous Orchids.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Epiphytic							
<i>Bulbophyllum longiflorum</i>	S	U	–	–	–	3	No
<i>Bulbophyllum pachyanthum</i>	S	U	T	–	T	9	No
<i>Bulbophyllum trachyanthum</i>	S	–	–	–	–	2	No (1931)
<i>Dendrobium whistleri</i>	–	U	–	–	–	3	No
<i>Liparis gibbosa</i>	S	–	T	–	–	7	No
<i>Luisia teretifolia</i>	S	–	T ⁴	–	–	3	No
<i>Microtatorchis samoensis</i>	S	U	–	–	–	3	No
<i>Phreatia minima</i>	S	U	–	–	–	4	No
⁵ <i>Pseuderia ramosa</i>	S	–	T	–	T	10	No
<i>Schoenorchis micrantha</i>	S	U	–	–	–	3	No
<i>Thelasis carinata</i>	S	U	–	–	–	3	No
Terrestrial							
⁵ <i>Calanthe hololeuca</i>	S	U	T	–	T	23	No
<i>Chrysoglossum ornatum</i>	S	U	–	–	–	2	No
<i>Cryptostylis arachnites</i>	S	U	–	–	T	5	No
⁵ <i>Erythrodes purpurascens</i>	–	U	T	–	T	11	No
<i>Geodorum densiflorum</i>	S	U	–	–	–	3	No
<i>Hetaeria whitmeei</i>	S	U	–	–	T	8	No
<i>Microstylis taurina</i>	–	U	–	–	T	9	No
⁵ <i>Nervilia aragoana</i>	S	U	T	O	U	14	No
⁵ <i>Peristylus tradescantifolius</i>	S	U	T	O	T	17	No
<i>Spiranthes sinensis</i>	S	–	–	–	–	4	No
<i>Tropidia effusa</i>	S	–	–	–	–	3?	No
<i>Zeuxine vieillardii</i>	S	U	–	O	–	8	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Observed but not collected. 5 Species rare in independent Samoa, but are much more common in American Samoa, and thus, should not be considered rare in Samoa as an archipelago.

All Samoan orchids are on the CITES (Convention on the International Trade in Endangered Species) list, so nothing else much needs to be done to protect them at the moment, other than simply enforcing existing rules and protecting the native forests in which they occur. The epiphytic orchids probably do not need much in the way of additional work, collections, or listings.

The species, first divided into epiphytes and terrestrial species, are arranged in alphabetical order by scientific name in the two categories in Table 3, and their distribution in the archipelago is noted, including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted. For information about each of the twenty-three species, see the individual species profiles in Appendix 5.

2.2 Rare Indigenous Non-Orchids

This category comprises 31 wide-ranging, non-orchid species that are rare in Samoa. The species can be further divided into two groups—littoral species and inland species, which differ mostly in their mode of transport to Samoa and their preferred habitats. The term 'littoral' refers to plants occurring on the seashore (Latin: *litoris* = shore), and whose presence and distribution are affected either directly or indirectly by the sea. Their area of occurrence, often called 'littoral strand,' occupies a very narrow area on the immediate coast, and typically exhibits zonation into several bands that run roughly parallel to the coastline. Littoral vegetation occurs on nearly all undisturbed shores of Samoa, as well as on rocky offshore islets, typically from just above the high-tide mark up to 5 or 10 m elevation, but sometimes to over 100 m on steep, exposed slopes.

Littoral species are usually dispersed by seeds or fruits that float long distances in seawater, or they have barbed fruits that stick to the feathers of seabirds. These dispersal characteristics account for the wide distributions of most littoral species: few Pacific littoral species are endemic, and none in Samoa are. Most of the rare Samoan littoral plant species are common elsewhere in the Pacific, and their rarity in Samoa can often be attributed to absence of their preferred substrate there, or to the simple fact that the species is a recent arrival that has not had time to spread. The shrub *Pemphis acidula*, for example, is one of the most common littoral shrubs on limestone coasts in the tropical Pacific. However, limestone coasts do not occur in the volcanic Samoan archipelago. The same limiting edaphic factors may also be the cause of the rarity of *Suriana maritima*, *Sophora tomentosa*, and *Capparis cordifolia*, which are common elsewhere in the Pacific on limestone or coral sand shores. One species not included in this category of rare indigenous plants is *Sida samoensis*. It is usually a littoral species, but is unusual in that it only seems to be found in villages and disturbed places, and hence was included in this discussion under rare Polynesian weeds.

Inland species are dispersed mostly by seeds being carried internally by forest birds that have consumed the fruits, or by being carried in wind currents. Windborne species are usually very small, or have wings or plumes that allow them to be carried for long distances in the wind. They usually occur inland from the shore because they are not adapted to the bright sunny and saline littoral conditions found on the shore. These inland species occupy a wide variety of habitats. *Ceratophyllum demersum*, is an aquatic herb found in streams. This is a habitat that has rarely been explored, and consequently a search of lowland streams and estuaries may turn up many more populations. Two other species, *Limnophila fragrans* and *Centipeda minima*, are wetland species that occur in both lowland and montane elevations. Most of the rest are lowland forest trees. One species, *Korthalsella hornei*, is a parasitic leafless shrub that may be more common than the collections would indicate because it is difficult to find due to its growing in the canopy where it is not readily visible.

TABLE 4. Rare Indigenous Non-Orchids.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Littoral Species							
<i>Acacia simplex</i>	S	U	–	–	–	13	No
<i>Boerhavia albiflora</i>	–	U ⁴	T	–	–	6	No
<i>Capparis cordifolia</i>	S	–	T ⁵	O	T	11	No
<i>Cenchrus caliculatus</i>	S	U	T	–	–	9	Yes? (1905)
<i>Gossypium hirsutum</i>	–	U ⁶	–	O ⁵	– ⁷	10	No
<i>Millettia pinnata</i>	–	U	T	–	T	6	No
<i>Pemphis acidula</i>	S	–	–	–	–	4	No
<i>Sesuvium portulacastrum</i>	–	U ⁴	T	O	T	9	No
<i>Sophora tomentosa</i>	–	U	T ⁸	O	–	11	No
<i>Suriana maritima</i>	–	U ⁴	–	–	– ⁷	2	No
<i>Vigna adenantha</i>	S	U	T	O	T	19	No
<i>Xylocarpus moluccensis</i>	S	U ⁹	T ⁸	–	–	18	No
Inland Species							
<i>Blumea milnei</i>	S	U	–	O	–	6	Yes (1905?)
<i>Centipeda minima</i>	S	U	–	–	–	5	No
<i>Ceratophyllum demersum</i>	–	U	–	–	–	2	No (1895)
<i>Chionanthus vitiensis</i>	S	–	T	O	–	9	No
<i>Crateva religiosa</i>	S	U	–	O	–	10	No
<i>Dodonaea viscosa</i>	S	U ¹⁰	–	–	–	14	No
<i>Guioa rhoifolia</i>	–	U	T	–	–	5	No
<i>Gyrocarpus americanus</i>	S	–	– ¹¹	O	–	9	No
<i>Ixora elegans</i>	S	–	–	–	–	3	No
<i>Korthalsella horneana</i>	S	U	–	–	T	5	No
<i>Limnophila fragrans</i>	S	U	T	O	T	17	No
<i>Manilkara dissecta</i>	–	U	T	–	–	10	No

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Melodinus vitiense</i>	–	U	–	–	–	2	No
<i>Parasponia andersonii</i>	–	U	–	–	–	1	No
<i>Peperomia pallida</i>	S	–	–	–	–	1	No
<i>Strychnos vitiensis</i>	S	–	–	–	–	1	No
<i>Syzygium effusum</i>	S	–	–	–	–	3	No?
<i>Tacca maculata</i>	–	U	T	–	–	4	No
<i>Zanthoxylum pinnatum</i>	S	–	–	–	–	1	No (ca. 1972)

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Aleipata Islands only, not 'Upolu. 5 Sight record only. 6 Apolima Island only. 7 Rose Island only. 8 'Aunu'u Island too. 9 Manono Island only. 10 Based only on a Graeffe specimen, possibly mislabeled. 11 'Aunu'u Island only.

The 31 species considered to be rare in Samoa are shown in Table 4, divided into 12 littoral species and 19 inland species. The species are arranged in the two categories in alphabetical order by scientific name, and their distribution in the archipelago is noted, including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted. For information about each of the rare indigenous, non-orchid species, see the individual species profiles in Appendix 5.

3. Rare Endemic Species

This category includes species that are endemic to Samoa. As in the previous categories, these are best further divided into two smaller categories, orchids and non-orchids. The rate of endemism of native species in Samoa is about 31%, and there is a correlation between the rate of endemism and elevation: montane and cloud forest species have the highest rates in Samoa, while species on the seashore (i.e., littoral species) have the lowest rate (0% in Samoa). The data for high elevation species may be somewhat skewed because there is a correlation between the number of specimens collected per species and elevation of the species, because plant collecting at higher elevations is more difficult and has consequently been less frequently done. Hence, a species may be rarely collected, but may be occasional in its montane forest habitat, where it is relatively safe from habitat destruction. The main threat to rare endemic species is habitat destruction. As with rare indigenous species, the rare endemic species are divided here into orchids and non-orchids.

3.1 Rare Endemic Orchids

This includes the rarest endemic orchids in Samoa, and consequently species that are globally rare. Four of the eight species are known from only a single collection, and three of these single collections were destroyed in the bombing of the Berlin Herbarium during World War II. Only three of the orchids have been collected in the recent times (since 1972), *Taeniophyllum savaiiense* (4 times by the present author), *Zeuxine plantaginea* (six times, three since 1972), and *Microstylis samoensis* (18 times). The latter species is rare in independent Samoa, but is much more common in American Samoa, and hence is not as threatened with extinction as are the other seven.

As noted in a previous section, all Samoan orchids are on the CITES (Convention on the International Trade in Endangered Species) list, so nothing else much needs to be done to protect them at the moment, other than simply enforcing existing rules and protecting the native forests in which they occur. Particular attention should be paid to collecting the four species known only from single collections—both herbarium specimens (for further research) and live specimens (for propagating for their protection).

The eight species considered to be rare in Samoa are shown in Table 5, divided into two epiphytic orchids and six terrestrial orchids. Within these subcategories the species are arranged in alphabetical order by scientific name, and their distribution in the archipelago is noted,

including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted. For information about each of the rare endemic orchid species, see the individual species profiles in Appendix 5.

TABLE 5. Rare Endemic Orchids.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Epiphytic							
<i>Dendrobium scirpoides</i>	–	U	–	–	–	1 (lost)	Yes? (1880?)
<i>Taeniophyllum savaiiense</i>	S	–	–	–	–	4	No
Terrestrial							
<i>Corybas betchei</i>	–	U	–	–	–	1 (lost)	Yes (1880?)
<i>Goodyera sp. nova?</i>	S	–	–	–	–	1	No? (1905)
<i>Habenaria monogyne</i>	S	U	T	–	–	5	No (1920)
⁴ <i>Microstylis samoensis</i>	–	U	T	O	T	18	No
<i>Nervilia grandiflora</i>	S	–	–	–	–	1 (lost)	No? (1905?)
<i>Zeuxine plantaginea</i>	S	U	–	–	–	6	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Most of these collections are from American Samoa, where the orchid is not uncommon.

3.2. Rare Endemic Non-Orchids

This category includes the rare endemic species other than the orchids. It mostly comprises montane tree and shrub species, many of them partly or entirely occurring above 800 m elevation. Some of these may be more common than collection data would indicate, because their lack of collections may reflect the lack of collectors and collection time spent in the highest elevations of Savai'i rather than actual rarity. A botanical survey of upland Savai'i may show that some of these are not actually rare. Because this area is unlikely to be disturbed in the future, those reaching these elevations are relatively safe from human disturbance. Those found only at the lower elevations are not so lucky, and are much more threatened.

The 25 endemic non-orchid species considered to be rare in independent Samoa are shown in Table 6, divided into archipelago endemics (i.e., species that also occur in American Samoa) and national endemics (species endemic to independent Samoa). Within these subcategories the species are arranged in alphabetical order by scientific name, and their distribution in the archipelago is noted, including the number of times they have been collected in Samoa. Their status (extirpated or extinct, or not) is also noted. Four of the species in this rare endemic, not-orchid category are considered to be archipelago endemics. These are less of a concern as threatened or endangered plants, especially because all four of them are much more common in American Samoa and are not threatened there. (They are not included in the list of rare plants of American Samoa, Whistler 2005.) The other 21 species are national endemics, i.e., they are endemic only to independent Samoa (Savai'i and 'Upolu only). For information about each of the rare endemic non-orchid species, see the individual species profiles in Appendix 5.

TABLE 6. Rare Endemic Non-Orchids.

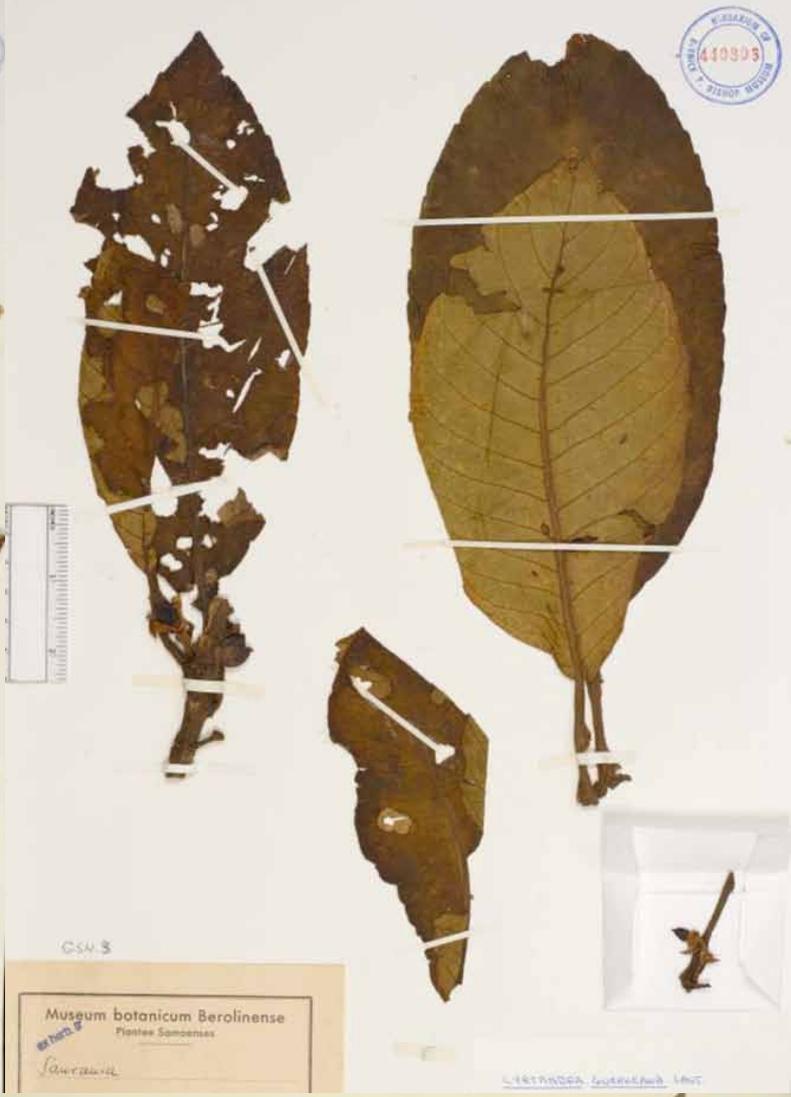
	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Rare Archipelago Endemics							
<i>Casearia samoensis</i>	–	U	T	–	–	11	No
<i>Hoya whistleri</i>	S	–	T	O	T	10	No
<i>Melicope vatiana</i>	–	U	T	–	T	16	No
<i>Pandanus reineckeii</i>	S	U	T	–	T?	12	No
Rare National Endemics							
<i>Abutilon whistleri</i>	S	–	–	–	–	3	No
<i>Acalypha sp. nova</i>	–	U	–	–	–	1	No
<i>Balaka samoensis</i>	S	–	–	–	–	5	No
<i>Boehmeria sp. nova</i>	–	U	–	–	–	2	No
<i>Cyrtandra campanulata</i>	S	U	–	–	–	5	Yes? (1905)
<i>Cyrtandra funkii</i>	S	–	–	–	–	4	Yes? (ca. 1895)
<i>Cyrtandra guerkeana</i>	S	–	–	–	–	6	Yes? (1906)
<i>Cyrtandra mamolea</i>	–	U	–	–	–	2	Yes? (ca. 1895)
<i>Manilkara samoensis</i>	S	–	–	–	–	8	No
<i>Mariscus whitmeei</i>	– ⁴	–	–	–	–	1	Yes? (ca. 1870)
<i>Melicope sulcata</i>	S	–	–	–	–	1	No (1931)
<i>Metrosideros gregoryi</i>	S	–	–	–	–	2	No (1931)
<i>Polyalthia sp. nova</i>	S	–	–	–	–	2	No
<i>Psychotria bristolii</i>	S	–	–	–	–	3	No
<i>Psychotria chlorocalyx</i>	–	U	–	–	–	6	No
<i>Psychotria juddii</i>	S	–	–	–	–	2	No (1929)
<i>Syzygium christophersenii</i>	S	–	–	–	–	3	No
<i>Syzygium graeffei</i>	S	–	–	–	–	2	No (1905)
<i>Syzygium vaupelii</i>	S	–	–	–	–	2	No (1929)
<i>Trichosanthes reineckeana</i>	S	U	–	–	–	5	No
<i>Vavaea cf. amicorum</i>	–	U	–	–	–	3	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'u. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 No locality given, but Savai'i or Upolu.



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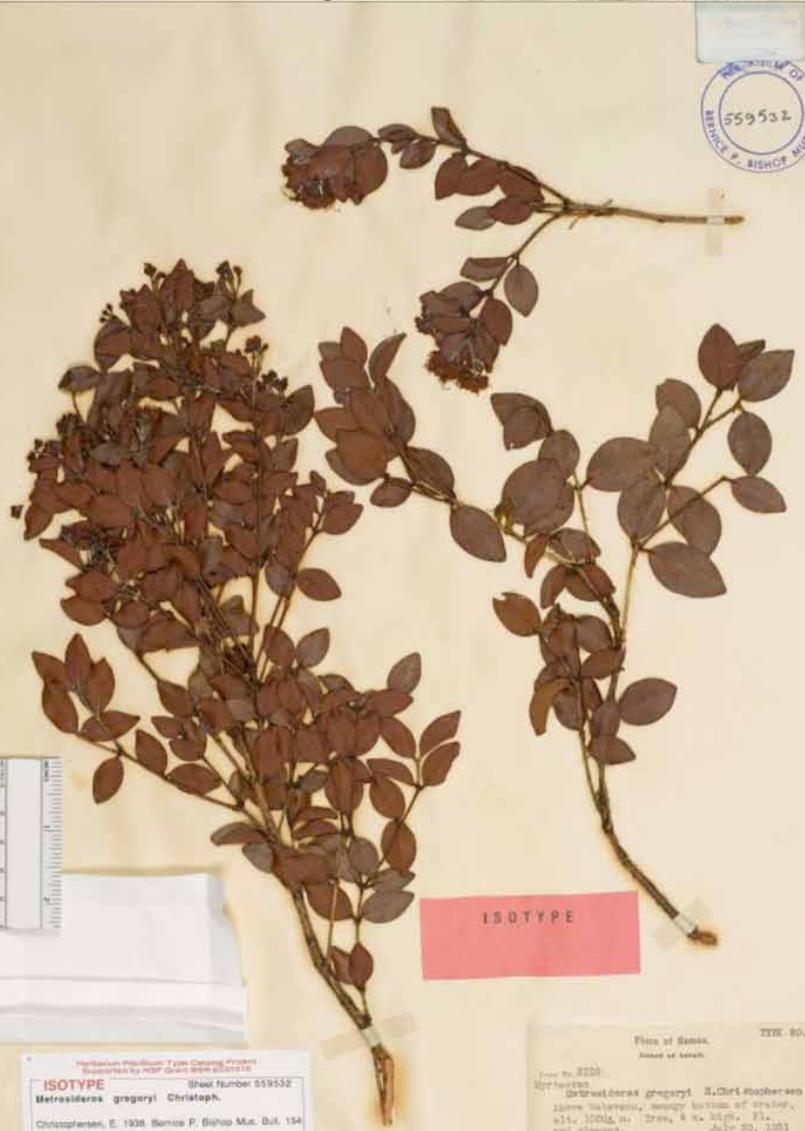
PLANTS OF FIJI
A. C. Smith, no. 6120
25720000 - *Clitoria* A. C. Smith
"Mouthlathiba," high-climbing liana, in
open of no. 6120; corolla pale yellow.
Dense forest.
VITI LEVU: Mac (University of the South Pacific), Hill between Pambala and Naka
vaka (Davao, along trail from Naka, Macaulay). Hill between Pambala and Naka



449993
BISHOP MUSEUM

CSU 3
Museum botanicum Berlinense
Plantae Samoenses
Samoensis

Clitoria *Clitoria* *Clitoria*



559532
BISHOP MUSEUM

ISOTYPE

Herbarium Preloium: Type Catalog Project
Sponsored by NSF Grant BNS 810414
ISOTYPE Sheet Number 559532
Metrosideros *gregoryi* Christoph.
Christophersen, E. 1938. *Boraceae* P. Bishop Mus. Bot. 154
28, 29, fig. 8.

Flora of Samoa. 278. 80.
Metrosideros *gregoryi* H. Christophersen
Island of Samoa, steep bottom of crater,
alt. 1000 m. Tree, 8 m high. Fl.
red-stained. July 20, 1933



REISE NACH DEN SAMOA-INSELN 1905.
Metrosideros *gregoryi*
H. Christophersen
Island of Samoa
Kororua über Uluvaupua

Discussion

From the list of 108 rare flowering plant species recognized here for independent Samoa, 37 native species have been selected here for recommendation for consideration on the Red List produced by the IUCN. These are discussed in more detail below, arranged in the following categories: (1) national endemics, represented by 28 species, and divided in the table into orchids and non-orchids; (2) archipelago endemics, represented by a single species; and (3) indigenous non-orchid species possibly threatened throughout their range, represented by eight species; Another 19 indigenous orchids are discussed separately. These orchids are rare (or rarely collected) in Samoa, but most of them have very wide ranges, some of them extending all the way to tropical Asia. Several alien species are also discussed separately. These species should also be considered for some kind of status, since these are either ancient Polynesian weeds possibly threatened over their entire range (two species), or traditional cultigens possibly threatened over their entire range (five species). For details on these species, see their complete write-ups in Appendix 5.

Nine species on the list of 108 rare plants in Samoa have not been included with the species recommended for the Red List of Samoan plants because, while they are rare in independent Samoa, they are not uncommon in American Samoa. Hence, they are rare on the national level, but not on the archipelago level. This includes the indigenous orchids (*Orchidaceae*) *Calanthe hololeuca*, *Erythrodes purpurascens*, *Microstylis samoensis*, *Peristylus tradescantifolius*, and *Pseuderia ramosa*; and four indigenous non-orchids *Casearia samoensis* (*Flacourtiaceae*), *Hoya whistleri* (*Asclepiadaceae*), *Melicope vatiana* (*Rutaceae*), and *Pandanus reineckei* (*Pandanaceae*). They are shown in Table 7.

TABLE 7. Endemic Species Rare in Independent Samoa but not in the Archipelago.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Orchids							
<i>Calanthe hololeuca</i>	S	U	T	–	T	23	No
<i>Erythrodes purpurascens</i>	–	U	T	–	T	11	No
<i>Microstylis samoensis</i>	–	U	T	O	T	18	No
<i>Peristylus tradescantifolius</i>	S	U	T	O	T	17	No
<i>Pseuderia ramosa</i>	S	–	T	–	T	10	No
Non-Orchids							
<i>Casearia samoensis</i>	–	U	T	–	–	11	No
<i>Hoya whistleri</i>	S	–	T	O	T	10	No
<i>Melicope vatiana</i>	–	U	T	–	T	16	No
<i>Pandanus reineckeii</i>	S	U	T	–	T?	12	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years).

Calanthe hololeuca has been collected in independent Samoa only seven times, but 16 times in American Samoa. *Erythrodes purpurascens* has been collected in independent Samoa only twice, but nine times in American Samoa. *Microstylis samoensis* has been collected in independent Samoa only three times, but is common in American Samoa with 15 collections. *Peristylus tradescantifolius* has been collected in independent Samoa seven or eight times, but another nine or ten times in American Samoa (most of them recent). *Pseuderia ramosa* has been collected in independent Samoa only once, but it has been collected in American Samoa nine times. *Casearia samoensis* is nearly endemic to the island of Tutuila, where it has been collected ten times. It has been collected on 'Upolu twice, both on the same hill near Afulilo. *Hoya whistleri* has been collected in independent Samoa three times, but seven times (on four islands) in American Samoa. *Melicope vatiana* has been collected in independent Samoa only four times, but twelve times in American Samoa. And finally, *Pandanus reineckeii* has been collected in independent Samoa four times, but eight times in American Samoa, all but one of them in trachyte soil on Tutuila.

1. Rare National Endemic Species

This list shown as part of Table 8 includes 28 rare species that are endemic to independent Samoa. Sixteen of them are endemic to Savai'i, eight of them are endemic to 'Upolu, three of them are found on both islands, and the locality of one is unknown (no location data included on the one specimen collected). These are the most important of the rare plants, since they are endemic, which means they are also threatened or endangered globally, and are the species that should take priority in red-listing. The list is divided into non-orchids (22) and orchids (6), since it is useful to discuss these two groups separately.

The genus *Cyrtandra*, which, with 18 species, is the second largest of the flowering plant genera in Samoa, includes four species on the list. These four are represented by 17 specimens, not one of them collected in the last century. This genus is perhaps the largest one in Polynesia, where it readily disperses and speciates. (Fifty-three species are currently recognized in Hawai'i.) Many of the specimens are represented by incomplete location and elevational data, which adds to the problem. It is not clear why these four species have not been collected recently, except, perhaps, they are mostly undisturbed lowland forest species that occur in areas now severely disturbed. With 20 species, *Psychotria* is the largest genus in Samoa, and it includes three species on the list. These are represented by eleven specimens, five of which were collected more than a century ago. With 16 species, *Syzygium* is the third largest genus of flowering plants in Samoa, and includes three species on the list represented by seven specimens, all but one of which is over a century old. All three may be typically montane or cloud forest species, which may indicate that they are only rarely collected and rather than rare.

Balaka samoensis is a species of palm (*Arecaceae*) known from five specimens, four of them recent (since 1931), and all collected in lowland forest of Savai'i at 300 to 450 m elevation. Its relatively low elevation makes it susceptible extinction since so much of the lowland forest of Samoa has been or is disappearing. *Metrosideros gregoryi* of the Myrtle Family *Myrtaceae* is known from only two specimens, both of them collected in the same area of montane forest on Savai'i in 1931, at 1500 m elevation. *Melicope sulcata* is a member of the Citrus Family *Rutaceae*, and is known only from a single specimen collected in the montane forest of Savai'i at 1300 m elevation in 1931. *Abutilon whistleri* of the Mallow Family *Malvaceae* is known from only three collections from Savai'i, two of them recent. It is recorded only above 800 m elevation. Species of this genus are native to only three places in Polynesia, two of them far from Samoa in eastern Polynesia.

Trichosanthes reineckeana in the Pumpkin Family *Cucurbitaceae* is known from independent Samoa from five collections. The three on Savai'i are all recent, but the two from 'Upolu are over a century old. The species has probably been extirpated from 'Upolu. *Mariscus whitmeeanus* of the Sedge Family *Cyperaceae* is known from a single old specimen (ca. 1870) with no data other than 'Samoa.' It is similar to species found on Rarotonga and Tahiti.

Four of the species are unnamed or unidentified, which can probably and should be soon rectified when a flora of Samoa is done. A new species of *Boehmeria*, a small shrub of the Nettle Family *Urticaceae*, has been record from the montane region of 'Upolu between 1020 and 1060 m elevation. It is represented by only two specimens, both of them recent. A new species of *Polyalthia*, a tree in the Sour Sop Family *Annonaceae*, has recently been discovered on Savai'i. It is represented by two specimens collected in lowland forest from 270 to 600 m elevation. The third unidentified or unnamed species appears to the genus *Acalypha* belonging to the Spurge Family *Euphorbiaceae*. It is known from a single, nearly sterile specimen collected in lowland forest on

'Upolu at 300 m elevation. The last species appears to belong to *Vavaea* in the Mahogany Family Meliaceae. It is known from four sterile specimens collected in montane forest on 'Upolu at 860 to 960 m elevation.

Ixora elegans in the Coffee Family *Rubiaceae* is a shrub that is restricted to a small patch of forest on the north-central part of Savai'i. It was found to be common in this patch during the fieldwork of July 2010. It is also found in Fiji, where its frequency is unknown. *Manilkara samoensis* of the Sapodilla Family Sapotaceae is the only species that is threatened by over-harvesting. Its hard wood is used for axe handles and other tools. The tree is now restricted to the Faleālufo Peninsula of Savai'i, which is now highly disturbed and threatened. Its nearest relative is found in Pohnpei thousands of miles away.

Six orchids are on the list of National endemics. Four of them are known from single collections: *Corybas betchei* ('Upolu in ca. 1880); *Dendrobium scirpoides* ('Upolu in ca. 1880); *Goodyera* sp. nova (Savai'i in 1905); and *Nervilia grandiflora* (Savai'i in 1905). None of these four have been collected in the last century, and two of the only known specimens were destroyed. The other two are more common. *Taeniophyllum savaiiense* is known from four collections from Savai'i, all of them made since 1972. It is not clear why there are no earlier collections of this species. *Zeuxine plantaginea* is known from six specimens from Savai'i and 'Upolu, three of them since 1972.

2. Rare Archipelago Endemic Species

This category includes only a single species. Most archipelago endemics are found on all the main islands, and consequently are not rare in Samoa (or globally). One orchid species, however, *Habenaria monogyne*, is known from only four specimens occurring in both parts of the archipelago—on Savai'i, 'Upolu, and Tutuila. It is represented by five specimens, only one of which has been collected in the last century (1920).

3. Rare Indigenous Non-Orchid Species

This category includes eight indigenous species that are rare in Samoa, and may also be rare over much or most of the rest of their range, at least in Polynesia and Melanesia. *Blumea milnei* in the Aster Family *Asteraceae* was collected on Savai'i, 'Upolu, and Ofu a total of six times, all of them over a century ago. The plant's distribution ranges from Ofu to New Guinea, but based on the author's experience, it is now rare or extirpated from Samoa, Tonga, and Fiji. It is likely this species was a native weed that could not compete with all the more recently introduced weeds. *Cenchrus caliculatus* in the Grass Family *Poaceae* is a littoral grass probably distributed by spiny burs that cling to seabird feathers. It has been collected in Samoa nine times, but not in the last century. It also appears to be disappearing from elsewhere in its Polynesian range, including Niue, Tonga, Rarotonga, and Norfolk Island. It is likely disappearing because of the loss of seabird colonies due to human disturbance. *Centipeda minima* in the Aster Family *Asteraceae* has been collected only five times in Samoa (Savai'i and 'Upolu), three of them over a century ago. It is also rare in Tonga (known from only two islands) and is threatened in New Zealand (de Lang et al. 2010). It may be threatened by loss of wetlands and the introduction of wetland weeds.

TABLE 8. Species Recommended for Inclusion on Samoa’s Red-List of Plants.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
National Endemic Species (Non-Orchids)							
<i>Abutilon whistleri</i>	S	–	–	–	–	–	3 No
<i>Acalypha sp. nova</i>	–	U	–	1	No	10	No
<i>Balaka samoensis</i>	S	–	–	–	–	5	No
<i>Boehmeria sp. nova</i>	–	U	–	–	–	2	No
<i>Cyrtandra campanulata</i>	S	U	–	–	–	5	Yes? (1905)
<i>Cyrtandra funkii</i>	S	–	–	–	–	4	Yes? (ca. 1895)
<i>Cyrtandra guerkeana</i>	S	–	–	–	–	6	Yes? (1906)
<i>Cyrtandra mamolea</i>	–	U	–	–	–	2	Yes? (ca. 1895)
<i>Ixora elegans</i>	S	–	–	–	–	3	No
<i>Manilkara samoensis</i>	S	–	–	–	–	8	No
<i>Mariscus whitmeei</i>	– ⁴	–	–	–	–	1	Yes? (ca. 1870)
<i>Melicope sulcata</i>	S	–	–	–	–	1	No (1931)
<i>Metrosideros gregoryi</i>	S	–	–	–	–	2	No (1931)
<i>Polyalthia sp. nova</i>	S	–	–	–	–	2	No
<i>Psychotria bristolii</i>	S	–	–	–	–	3	No
<i>Psychotria chlorocalyx</i>	–	U	–	–	–	6	No
<i>Psychotria juddii</i>	S	–	–	–	–	2	No (1929)
<i>Syzygium christophersenii</i>	S	–	–	–	–	3	No
<i>Syzygium graeffei</i>	S	–	–	–	–	2	No (1905)
<i>Syzygium vaupelii</i>	S	–	–	–	–	2	No (1929)
<i>Trichosanthes reineckeaana</i>	S	U	–	–	–	5	No
<i>Vavaea cf. amicum</i>	–	U	–	–	–	3	No

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
National Endemic Species (Orchids)							
<i>Corybas betchei</i>	–	U	–	–	–	1	Yes (1880?)
<i>Dendrobium scirpoides</i>	–	U	–	–	–	1 (lost)	Yes? (1880?)
<i>Goodyera sp. nova?</i>	S	–	–	–	–	1	No? (1905)
<i>Nervilia grandiflora</i>	S	–	–	–	–	1 (lost)	No? (1905?)
<i>Taeniophyllum savaiiense</i>	S	–	–	–	–	4	No
<i>Zeuxine plantaginea</i>	S	U	–	–	–	6	No
Archipelago Endemic Species							
<i>Habenaria monogyne</i>	S	U	T	–	–	5	No
Indigenous Non-Orchid Species							
<i>Blumea milnei</i>	S	U	–	O	–	6	Yes (1905?)
<i>Cenchrus caliculatus</i>	S	U	T	–	–	9	Yes? (1905)
<i>Centipeda minima</i>	S	U	–	–	–	5	No
<i>Crateva religiosa</i>	S	U	–	O	–	10	No
<i>Gossypium hirsutum</i>	–	U	–	O	– ⁵	10	No
<i>Gyrocarpus americanus</i>	S	U	– ⁶	O	–	9	No
<i>Limnophila fragrans</i>	S	U	T	O	T	16	No
<i>Manilkara dissecta</i>	–	U	T	–	–	10	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2 This category includes all specimens collected in the archipelago. 3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years). 4 Island not recorded. 5 Rose Atoll only. 6 'Aunu'u only.

Crateva religiosa (**pulu elo**) is a tree in the Caper Family Capparidaceae known in independent Samoa from only three collections; a recent one from Fagalele Bay in western Savai'i (but not found there during a cursory look in July 2010) and Lauli'i on 'Upolu, where it was collected twice in 1905. In American Samoa it is restricted to small areas on Ofu and Olosega, and in Tonga, to the island of Tafahi (and one collection from Tongatapu 57 years ago). In Fiji it is known from a single collection from Ba and a recent one from the Lau Islands (Whistler, pers. research). *Gossypium hirsutum* (Polynesian cotton, **vavae**) in the Mallow Family Malvaceae has been collected in independent Samoa only four times, three of them on Apolima. (The other record, a Graeffe specimen from the 1860s, notes 'Upolu but this could also be 'Apolima.) Thus it would qualify as rare because of its limited distribution as well as scant collections. It is a little more common in American Samoa, where it has collected six times and observed once (on coastal cliffs, by using a telescope). It also appears to be rare throughout the Pacific (Whistler, pers. research). *Gyrocarpus americanus* (**vili, moa**) in the Gyrocarpaceae has been collected seven times in independent Samoa (five of them in the last 35 years), but only between Āsau and Faleālupo. It was collected twice in American Samoa, but not since 1925. It appears to be limited to cultivation in Tonga (Whistler, pers. research). Elsewhere in Polynesia, it is known only from Tahiti, where it has apparently not been collected in over a century. The tree has a strange distribution, ranging from eastern Africa to tropical America.

Limnophila fragrans in the Snap-Dragon Family Scrophulariaceae has been collected seven times in independent Samoa, four of them recently. It is rare because its habitat (marsh) in Samoa has been severely disturbed, and the plant may suffer from competition with more recently introduced wetland weeds. It is more common in American Samoa, but is threatened there for the same reasons—loss of native habitat. It is also rare in Tonga, and possibly the Society Islands. *Manilkara dissecta* in the Sapodilla Family Sapotaceae is known from independent Samoa only from Nu'utele Island, where it is not uncommon, and from one or two places on the adjacent 'Upolu mainland. A grove of nine large trees was found on the latter during the fieldwork of July 2010. It is also rare in American Samoa, where it is limited to the north-central coast of Tutuila. It is apparently known from Tonga only in cultivation (Whistler, pers. research).

TABLE 9. Rare Indigenous Orchids Needing Further Research.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Bulbophyllum longiflorum</i>	S	U	–	–	–	3	No
<i>Bulbophyllum pachyanthum</i>	S	U	T	–	T	9	No
<i>Bulbophyllum trachyanthum</i>	S	–	–	–	–	2	No (1931)
<i>Chrysoglossum ornatum</i>	S	U	–	–	–	2	No
<i>Cryptostylis arachnites</i>	S	U	–	–	T	5	No
<i>Dendrobium whistleri</i>	–	U	–	–	–	3	No
<i>Geodorum densiflorum</i>	S	U	–	–	–	3	No
<i>Hetaeria whitmeei</i>	S	U	–	–	T	8	No
<i>Liparis gibbosa</i>	S	–	T	–	–	7	No
<i>Luisia teretifolia</i>	S	–	T	–	–	3	No
<i>Microstylis taurina</i>	–	U	–	–	T	9	No
<i>Microtatorchis samoensis</i>	S	U	–	–	–	3	No
<i>Nervilia aragoana</i>	S	U	T	O	U	14	No
<i>Phreatia minima</i>	S	U	–	–	–	4	No
<i>Schoenorchis micrantha</i>	S	U	–	–	–	3	No
<i>Spiranthes sinensis</i>	S	–	–	–	–	4	No
<i>Thelasis carinata</i>	S	U	–	–	–	3	No
<i>Tropidia effusa</i>	S	–	–	–	–	3?	No
<i>Zeuxine vieillardii</i>	S	U	–	O	–	8	No
<i>Syzygium vaupelii</i>	S	–	–	–	–	2	No (1929)
<i>Trichosanthes reineckeana</i>	S	U	–	–	–	5	No
<i>Vavaea cf. amicorum</i>	–	U	–	–	–	3	No

1S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2This category includes all specimens collected in the archipelago. 3A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years).

4. Rare Indigenous Orchids Needing Further Work

Nineteen species of indigenous orchids are rare in independent Samoa, in addition to the other five species noted above that are rare in independent Samoa, but common in American Samoa. They are shown in Table 9. Orchids are hard to study for several reasons. They are often in small populations, and collectors are sometimes loath to collect them for legal and conservation reasons (especially since the whole plant must be taken). Epiphytic orchids are hard to locate in tree canopies and are often missed during botanical surveys. Also, many orchids have wide distributions, so it is hard to study the species over its whole range. In fact, two thirds of these 19 orchid species are found beyond Melanesia, some as far west as tropical Africa. Consequently, these orchids were separated from the other rare indigenous species because more research is needed to determine if they are rare globally or just in Samoa (or rarely collected in Samoa). Their treatment here would correspond to the IUCN 'DD' category (data deficient).

5. Rare Alien Species of Ancient Introduction

As noted earlier, this category is divided into intentional Polynesian introductions (cultigens) and unintentional introductions (mostly weeds). Because of the change of lifestyles wrought by the arrival of Europeans and their culture, many cultivated plants upon which Samoan culture depended fell into disuse. Since most of them are not able to reproduce or spread by themselves, many have become rare or have disappeared entirely. A good example of this is the small melon *Cucumis melo* ('*atiu*'; the same species as cantaloupe, but a different variety) in the Pumpkin Family Cucurbitaceae. Many of these species were represented by numerous endemic varieties, and the loss of the species, and their varieties, is a loss of biodiversity, even though the plants are alien species. The weeds do not usually have varieties, but some of them are becoming rare throughout much of their range because of competition with more aggressive species, many of them from the New World Tropics. The species that should be looked out for here are shown in Table 10. It comprises five cultigens and two weedy species.

As noted earlier, *Benincasa hispida* of the Pumpkin Family has been recorded in independent Samoa based on four specimens from 'Upolu (three of them modern), and in American Samoa from two modern collections from Tutuila. It was formerly used as a bottle for scented coconut oil, but discarded bottles brought in by Europeans probably soon made the plant obsolete. The Polynesian variety *puriens* is a gourd, but cultivated varieties in Asia are edible. *Cucumis melo* noted above is known from independent Samoa based on five specimens, all over a century old. It, however, has been recently collected on Ofu and Ta'ū in American Samoa, both times near to where recent grading (for airports) had been done. The seeds can apparently lie buried for long periods of time, and germinate when exposed to sunlight. *Saccharum maximum* of the Grass Family *Poaceae* is noted from independent Samoa based on three collections, two of them since 1968. It is an unusual case since it is apparently a natural hybrid swarm formed by a cross between sugar cane and the native reed *Miscanthus floridulus*. It is not clear how it could be preserved, since it is a hybrid. *Solanum ferox* (Polynesian tomato, *taulo'u*) of the Nightshade Family Solanaceae was once cultivated for its tomato-like fruit, but with the introduction of the more prolific and better tasting tomatoes, it fell into disuse, and was last collected in Samoa in 1905. It is also rare in Fiji, the Cook Islands, and Niue, and may have been extirpated from the Society Islands, Marquesas, and Tonga. *Solanum viride* (cannibal cherry, polo iti) of the Nightshade Family Solanaceae was once cultivated for its tomato-like fruit used for making leis and possibly as a minor food source. Like *Solanum ferox*, it fell into disuse, but unlike it, still persists in some sunny coastal areas, e.g., on the forest edges of Nu'utele. It is also rare or has been extirpated over most of its Polynesian range (and is reported from Hawai'i based on only three collections), except in Tonga and the Cook Islands, where it is still cultivated.

The two weedy species shown in Table 10 were never cultivated, so disuse has not been the cause of their becoming rare. *Senna sophera* of the Pea Family Fabaceae was probably once a common weed in Samoa, but competition from other more aggressive, more recently introduced weeds, especially ones in the same genus, has probably led to its becoming extirpated in Samoa. It is also rare in Tonga, where it has been seen only once by the author. *Sida samoensis* of the Mallow Family Malvaceae is an unusual case since it appears superficially to be a littoral species, but is found only in disturbed sandy coastal areas. It is known from independent Samoa only from eleven collections, most of them dating back to before 1932. If it is native, then it should be included on the list of species recommended for inclusion on Samoa's Red List, since it has a limited distribution (western Polynesia and Fiji).

Appendix 3 includes a list of all plants recommended for inclusion on Samoa's Red List of plants.

TABLE 10. Rare Alien Species of Ancient Introduction.

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
Alien Polynesian Cultigens							
<i>Benincasa hispida</i>	–	U	T	–	–	6	No
<i>Cucumis melo</i>	S	U	T	O	T	13	No
<i>Saccharum maximum</i>	S	U	–	–	–	3	No
<i>Solanum ferox</i>	–	U	–	O	–	5	Yes (1905)
<i>Solanum viride</i>	S	U	T	O	T	25	No
Alien Polynesian Weeds							
<i>Senna sophera</i>	S	–	T	–	–	3	Yes (1920)
<i>Sida samoensis</i>	S	U	T	O	T	16	No

1S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū. 2This category includes all specimens collected in the archipelago. 3A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years).

Recommendations

The author would like to make several recommendations for future work in Samoa.

1. Botanical surveys of 'Upolu and Savai'i.

Relatively little collecting of plant specimens has been done at the higher elevations of the two main islands. Even though 'Upolu is the smaller and lower of the two main islands, very few collections are known from the high elevation region between Mt. Fito and Lemafa Pass, and in the mountain to the north known as Malata near Uafato. But by far the most important region needing further collection is the montane area of Savai'i (over about 800 m elevation). The highest elevation on Savai'i is over 1800 m in elevation, and only a few botanists have spent any time up there. Even the author, whose collections are more numerous than those made by the next two most prolific collectors, has been in this area less than a total of two weeks, and most of that was in the same locality near Mataoleafi. There are plans afoot for such a major collecting effort on Savai'i, and this is to be encouraged in order to determine the frequency of many upland species. Detailed vegetation surveys will be able to show which montane species are actually rare and which are only rarely collected.

2. Surveys of Samoan Orchids

Despite the recent publication of an orchid flora of Samoa (Cribb and Whistler 1996), much work needs to be done on orchids. Because of the small size of many terrestrial species and the inaccessibility of epiphytic species that grow high in the forest canopy, orchids are often poorly treated in botanical surveys. Consequently, there is little frequency information other than checklists and collected specimens, which do not really elucidate the frequency of the species. This can be improved in several ways. One is to do a survey of the orchids of the lava flows, especially the recent lava flows of A'opo, Matavanu, and Mataoleafi. At least thirty species of orchids have been recorded from the upper portion of the Matavanu flow, that that was just in unpublished checklists (Whistler, pers. research). The other is to spend more time observing orchids in forest surveys, such as the one being considered for upland Savai'i.

3. Completion of a flora of Samoa.

The flora of Samoa has never been completely done. The relevant available material comprises several partial floras, and numerous monographs of various taxa that occur in Samoa. Particularly helpful are publications on a number of genera and families in the region by A.C. Smith, and especially his flora of Fiji (1979–1996). Even the partial floras are woefully out of date, the most recent of them being 1935 (Christophersen). (The exception is the lowland tree flora of Samoa, Whistler 2004A.) The author has amassed a wealth of data and information, but what is needed is a regular published

flora, complete with descriptions and keys. There are plans afoot to have this done, and completing the work should be most strongly encouraged.

4. Red-Listing of Samoan Plant Species.

The work in this report is only preliminary. The report provides the frequency data of 108 species that are 'rare' in Samoa. The next step is to get a panel of experts together and determine which of the 109 species should be included on IUCN's Red List. Some of them would not qualify, since they are only rare in Samoa, but common elsewhere. (Particularly rare littoral species are sometimes put in the category of 'vagrant' because they exist only in few and small populations, since their favored habitat is not found in Samoa.) Currently only five species are on Samoa's Red Lists of plants, and all five of these, selected for unknown reasons (one is not even found in Samoa), should be removed because they are not considered to be rare the present report. The recommendations for Red List plants is only the first step, since some countries have a plethora of data to go along with each species, while this report is only a preliminary work on the rare plants of Samoa. With more research, additional species may be determined to be rare, and the Red List may be augmented with these. It is also advisable that independent Samoa and American Samoa get together to list their species jointly, since it is one archipelago whose political division does not reflect a botanical division.

5. Put the collection locations of all species on maps using GIS programs.

This was done for American Samoa, where a map of sites of collection for each species was produced, as well as one map (or one map for each island) for all the rare plant collections from American Samoa. When brought up on the GIS program, the distribution of each species (i.e., their sites of collection) can be easily viewed. (Unfortunately, this part of the website, found at www.cieer.org/efloras/samoa/about.html, is not working at the moment.) This information should be put onto a website on the flora of Samoa. The author already has a website, www.floraofsamoa.com, but it is rudimentary at the present time.

6. Protection for the Aleipata Islands.

The terrestrial part of the Aleipata Islands should be strengthened. Sometimes parks are created in name only. They are sometimes recognized by the government, but not by the local villagers, who may not understand the importance of the biodiversity of Samoa. These islands include several of the rare plants of Samoa.

7. Protection for the upland area of Savai'i.

The montane region of Savai'i is home to most of Samoa's endemic species. Some are found only in this region. It is very important that this area is preserved. It is far away from the villages on the coast of Savai'i, but without adequate protection, damage could be done by unscrupulous loggers, who have already devastated the lowlands of independent Samoa.

8. Establish a national herbarium for Samoa.

Samoa currently has no herbarium in which locally collected specimens can be stored. For their safety, voucher specimens currently have to be taken out of the country and deposited in foreign herbaria. It would be very useful to have a national herbarium where specimens can be viewed by local and visiting botanists. JICA made a small collection of specimens of native species, but these are currently stored in a drawer rather than an airtight cabinet in an air-conditioned room. The National University of Samoa has a collection of specimens made during a Japanese-led project,

but these are stored in cabinets and rarely if ever used. A special room with air-conditioning and closed cabinets is needed. Some one or some people also need to be trained to maintain the collection. Then specimens collected during future botanical surveys can be deposited locally.

9. Establishment of a working botanical garden.

A working botanical garden should be set up and used to grow rare native plants and cultigens. There is currently a botanical garden at Vailima, but it should be upgraded and a program instituted to collect the rare plants of Samoa. The cultigens can be planted in one area that could be dedicated as an ethnobotanical garden. This serves the dual purposes of saving rare plants and educating visitors about the native flora and traditional plants.

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Appendix 1

TABLE OF RARE PLANTS OF SAMOA

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
DICOTS							
AIZOACEAE							
<i>*Sesuvium portulacastrum</i>	–	U	T	O	T	10	No
ANACARDIACEAE							
<i>Dracontomelon vitiense</i>	–	U	–	–	–	9	No
ANNONACEAE							
<i>Polyalthia sp. nova</i>	S	–	–	–	–	2	No
APOCYNACEAE							
<i>Melodinus vitiense</i>	–	U	–	–	–	2	No
ASCLEPIADACEAE							
<i>Hoya whistleri</i>	S	–	T	O	T	10	No
ASTERACEAE							
<i>Blumea milnei</i>	S	U	–	O	–	6	Yes (1905?)
<i>Centipeda minima</i>	S	U	–	–	–	5	No
<i>Sigesbeckia orientalis</i>	S	U	–	–	T	8	Yes (1922)
BORAGINACEAE							
<i>Cordia aspera</i>	S	U	T	O	T	13	No
CAPPARIDACEAE							
<i>*Capparis cordifolia</i>	S	–	T	O	T	12	No
<i>Crateva religiosa</i>	S	U	–	O	–	10	No

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
CERATOPHYLLACEAE							
<i>Ceratophyllum demersum</i>	–	U	–	–	–	2	No (1895)
CHRYSOBALANACEAE							
<i>Atuna racemosa</i>	S	U	T	O	T	25	No
<i>Parinari insularum</i>	S	U	T	O	T	12	Yes (1955)
CONVOVLULACEAE							
<i>Ipomoea indica</i>	S	–	–	–	–	3	Yes? (1931)
CUCURBITACEAE							
<i>Benincasa hispida</i>	–	U	T	–	–	6	No
<i>Cucumis melo</i>	S	U	T	O	T	13	No ⁶
<i>Trichosanthes reineckeana</i>	S	U	–	–	–	5	No
EUPHORBIACEAE							
<i>Acalypha grandis</i>	S	U	T	O	T	15	No
<i>Acalypha sp. nova</i>	–	U	–	–	–	1	No
<i>Phyllanthus virgatus</i>	S	U	T	O	T	17	No
FABACEAE							
* <i>Acacia simplex</i>	S	U	–	–	–	13	No
<i>Millettia pinnata</i>	–	U	T	–	T	6	No
<i>Senna sophera</i>	S	–	T	–	–	3	Yes? (1920)
<i>Sophora tomentosa</i>	–	U	T	O	–	11	No
<i>Vigna adenantha</i>	S	U	T	O	T	19	No
FLACOURTIACEAE							
* <i>Casearia samoensis</i>	–	U	T	–	–	12	No
GESNERIACEAE							
<i>Cyrtandra campanulata</i>	S	U	–	–	–	5	No? (1905)
<i>Cyrtandra funkii</i>	S	–	–	–	–	4	No? (ca.1895)
<i>Cyrtandra guerkeana</i>	S	–	–	–	–	4	No? (1906)

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Cyrtandra mamolea</i>	–	U	–	–	–	2	No? (ca.1895)
GYROCARPACEAE							
* <i>Gyrocarpus americanus</i>	S	–	–	O	–	9	No
LAMIACEAE							
<i>Leucas decemdentata</i>	S	U	T	O	T	19	No ⁵
LOGANIACEAE							
<i>Strychnos vitiensis</i>	S	–	–	–	–	1	No
LYTHRACEAE							
<i>Pemphis acidula</i>	S	–	–	–	–	4	No
MALVACEAE							
<i>Abutilon whistleri</i>	S	–	–	–	–	3	No
<i>Gossypium hirsutum</i>	–	U	–	O	–	10	No
<i>Sida samoensis</i>	S	U	T	O	T	16	No
MELIACEAE							
<i>Vavaea cf. amicorum</i>	–	U	–	–	–	3	No
* <i>Xylocarpus moluccensis</i>	S	U	T	–	–	18	No
MYRTACEAE							
<i>Metrosideros gregoryi</i>	S	–	–	–	–	2	No (1931)
<i>Syzygium christophersenii</i>	S	–	–	–	–	3	No
<i>Syzygium effusum</i>	S	–	–	–	–	3	No?
<i>Syzygium graeffei</i>	S	–	–	–	–	2	No (1905)
<i>Syzygium vaupelii</i>	S	–	–	–	–	2	No (1929)
NYCTAGINACEAE							
* <i>Boerhavia albiflora</i>	–	U	T	–	–	6	No
OLEACEAE							
* <i>Chionanthus vitiensis</i>	S	–	T	O	–	10	No
PIPERACEAE							
<i>Peperomia pallida</i>	S	–	–	–	–	1	No
PORTULACACEAE							

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Portulaca quadrifida</i>	S	U	T	O	T	17	No
RUBIACEAE							
* <i>Gardenia taitensis</i>	S	U	T	O	T	4 ⁴	No
* <i>Ixora elegans</i>	S	-	-	-	-	4	No
<i>Psychotria bristolii</i>	S	-	-	-	-	3	No
<i>Psychotria chlorocalyx</i>	-	U	-	-	-	6	No
<i>Psychotria juddii</i>	S	-	-	-	-	2	No (1929)
RUTACEAE							
<i>Melicope sulcata</i>	S	-	-	-	-	1	No? (1931)
<i>Melicope vatiana</i>	-	U	T	-	T	10	No
<i>Zanthoxylum pinnatum</i>	S	-	-	-	-	1	Yes (ca. 1972)
SAPINDACEAE							
<i>Dodonaea viscosa</i>	S	U	-	-	-	14	No
<i>Guioa rhoifolia</i>	-	U	T	-	-	5	No
SAPOTACEAE							
* <i>Manilkara dissecta</i>	-	U	T	-	-	10	No
* <i>Manilkara samoensis</i>	S	-	-	-	-	8	No
* <i>Limnophila fragrans</i>	S	U	T	O	T	16	No
SOLANACEAE							
<i>Solanum ferox</i>	-	U	-	O	-	5	Yes (1905)
<i>Solanum viride</i>	S	U	T	O	T	25	No
STERCULIACEAE							
<i>Waltheria indica</i>	S	U	-	-	-	6	No
SURIANIACEAE							
<i>Suriana maritima</i>	-	U	-	-	-	2	No
ULMACEAE							
<i>Parasponia andersonii</i>	-	U	-	-	-	1	No?
URTICACEAE							

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Boehmeria sp. nova</i>	–	U	–	–	–	2	No
VISACEAE							
<i>Korthalsella horneana</i>	S	U	–	–	T	5	No
MONOCOTS							
ARACEAE							
<i>Amorphophallus paeoniifolius</i>	S	U	T	O	T	17	No
ARECACEAE							
<i>Balaka samoensis</i>	S	–	–	–	–	5	No
CYPERACEAE							
<i>Mariscus whitmeei</i>	–	U	–	–	–	1	Probable (1870)
ORCHIDACEAE							
<i>Bulbophyllum longiflorum</i>	S	U	–	–	–	3	No
<i>Bulbophyllum pachyanthum</i>	S	U	T	–	T	9	No
<i>Bulbophyllum trachyanthum</i>	S	–	–	–	–	2	No (1931)
<i>Calanthe hololeuca</i>	S	U	T	–	T	23	No
<i>Chrysoglossum ornatum</i>	S	U	–	–	–	2	No
<i>Corybas betchei</i>	–	U	–	–	–	1	Probable (1880?)
<i>Cryptostylis arachnites</i>	S	U	–	–	T	5	No
<i>Dendrobium scirpoides</i>	–	U	–	–	–	1 (lost)	Probable (1880?)
<i>Dendrobium whistleri</i>	–	U	–	–	–	3	No
<i>Erythrodes purpurascens</i>	–	U	T	–	T	11	No
<i>Geodorum densiflorum</i>	S	U	–	–	–	3	No
<i>Goodyera sp. nova?</i>	S	–	–	–	–	1	Probable (1905)
<i>Habenaria monogyne</i>	S	U	T	–	–	4	No
<i>Hetaeria whitmeei</i>	S	U	–	–	T	8	No
<i>Liparis gibbosa</i>	S	–	T	–	–	7	No
<i>Luisia teretifolia</i>	S	–	T	–	–	3	No
<i>Microstylis samoensis</i>	–	U	T	O	T	18	No

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
<i>Microstylis taurina</i>	–	U	–	–	T	9	No
<i>Microtatorchis samoensis</i>	S	U	–	–	–	3	No
<i>Nervilia aragoana</i>	S	U	T	O	T	14	No
<i>Nervilia grandiflora</i>	S	–	–	–	–	1 (lost)	Probable (ca.1905)
<i>Phreatia minima</i>	S	U	–	–	–	4	No
<i>Pseuderia ramosa</i>	S	–	T	–	T	10	No
<i>Schoenorchis micrantha</i>	S	U	–	–	–	3	No
<i>Thelasis carinata</i>	S	U	–	–	–	3	No
<i>Peristylus tradescantifolius</i>	S	U	T	O	T	17	No
<i>Spiranthes sinensis</i>	S	–	–	–	–	4	No
<i>Taeniophyllum savaiiense</i>	S	–	–	–	–	4	No
<i>Tropidia effusa</i>	S	–	–	–	–	3?	No
<i>Zeuxine vieillardii</i>	S	U	–	O	–	8	No
<i>Zeuxine plantaginea</i>	S	U	–	–	–	6	No
PANDANACEAE							
<i>Pandanus reineckeii</i>	S	U	T	–	T?	12	No
POACEAE							
<i>Cenchrus caliculatus</i>	S	U	T	–	–	9	Yes (1905)
<i>Heteropogon contortus</i>	S	–	–	–	–	2	Yes? (1905)
<i>Saccharum maximum</i>	S	U	–	–	–	3	No
TACCACEAE							
<i>Tacca maculata</i>	–	U	T	–	–	4	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū.

2 This category includes all specimens collected in the archipelago.

3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years).

4 Does not include collections of the cultivated variety. An asterisk (*) indicates that the species was found during the fieldwork of July 2010.

Appendix 2

IUCN RED LIST CATEGORIES

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Extinct in the Wild (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E below, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of $\geq 90\%$ over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of $\geq 80\%$ over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of 1a–1e above.

3. A population size reduction of $\geq 80\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of 1b to 1e above.

4. An observed, estimated, inferred, projected or suspected population size reduction of $\geq 80\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of 1a–1e above.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both.

1. Extent of occurrence estimated to be less than 100 km², and estimates indicating at least two of a–c:

(a) Severely fragmented or known to exist at only a single location.

(b) Continuing decline, observed, inferred or projected, in any of the following:

(i) Extent of occurrence

(ii) Area of occupancy

(iii) Area, extent and/or quality of habitat

(iv) Number of locations or subpopulations

(v) Number of mature individuals

(c) Extreme fluctuations in any of the following:

(i) Extent of occurrence

(ii) Area of occupancy

(iii) Number of locations or subpopulations

(iv) Number of mature individuals.

2. Area of occupancy estimated to be less than 10 km², and estimates indicating at least two of a–c:

(a) Severely fragmented or known to exist at only a single location.

(b) Continuing decline, observed, inferred or projected, in any of the following:

(i) Extent of occurrence

(ii) Area of occupancy

(iii) Area, extent and/or quality of habitat

(iv) Number of locations or subpopulations

(v) Number of mature individuals.

(c) Extreme fluctuations in any of the following:

(i) Extent of occurrence

(ii) Area of occupancy

(iii) Number of locations or subpopulations

(iv) Number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

- 1.** An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR
- 2.** A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):
 - (a) Population structure in the form of one of the following:
 - (i) No subpopulation estimated to contain more than 50 mature individuals, OR
 - (ii) At least 90% of mature individuals in one subpopulation.
 - (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

Endangered (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

A. Reduction in population size based on any of the following:

- 1.** An observed, estimated, inferred or suspected population size reduction of $\geq 70\%$ over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
 - (a) Direct observation
 - (b) An index of abundance appropriate to the taxon
 - (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
 - (d) Actual or potential levels of exploitation
 - (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
- 2.** An observed, estimated, inferred or suspected population size reduction of $\geq 50\%$ over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of the following:
 - (a) Direct observation
 - (b) An index of abundance appropriate to the taxon
 - (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
 - (d) Actual or potential levels of exploitation
 - (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

3. A population size reduction of $\geq 50\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of the following:

- (a) Direct observation
- (b) an index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

4. An observed, estimated, inferred, projected or suspected population size reduction of $\geq 50\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5,000 km², and estimates indicating at least two of a-c:

- (a) Severely fragmented or known to exist at no more than five locations.
- (b) Continuing decline, observed, inferred or projected, in any of the following:
 - (i) Extent of occurrence
 - (ii) Area of occupancy
 - (iii) Area, extent and/or quality of habitat
 - (iv) Number of locations or subpopulations
 - (v) Number of mature individuals.
- (c) Extreme fluctuations in any of the following:
 - (i) Extent of occurrence
 - (ii) Area of occupancy
 - (iii) Number of locations or subpopulations
 - (iv) Number of mature individuals.

2. Area of occupancy estimated to be less than 500 km², and estimates indicating at least two of a-c:

- (a) Severely fragmented or known to exist at no more than five locations.
- (b) Continuing decline, observed, inferred or projected, in any of the following:
 - (i) Extent of occurrence
 - (ii) Area of occupancy

- (iii) Area, extent and/or quality of habitat
- (iv) Number of locations or subpopulations
- (v) Number of mature individuals.

(c) Extreme fluctuations in any of the following:

- (i) Extent of occurrence
- (ii) Area of occupancy
- (iii) Number of locations or subpopulations
- (iv) Number of mature individuals.

C. Population size estimated to number fewer than 2,500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

(a) Population structure in the form of one of the following:

- (i) No subpopulation estimated to contain more than 250 mature individuals, OR
- (ii) At least 95% of mature individuals in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of $\geq 50\%$ over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of $\geq 30\%$ over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

3. A population size reduction of $\geq 30\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

4. An observed, estimated, inferred, projected or suspected population size reduction of $\geq 30\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of the following:

- (a) Direct observation
- (b) An index of abundance appropriate to the taxon
- (c) A decline in area of occupancy, extent of occurrence and/or quality of habitat
- (d) Actual or potential levels of exploitation
- (e) The effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 km², and estimates indicating at least two of a–c:

- (a) Severely fragmented or known to exist at no more than 10 locations.
- (b) Continuing decline, observed, inferred or projected, in any of the following:
 - (i) Extent of occurrence
 - (ii) Area of occupancy
 - (iii) Area, extent and/or quality of habitat
 - (iv) Number of locations or subpopulations
 - (v) Number of mature individuals.

(c) Extreme fluctuations in any of the following:

- (i) Extent of occurrence
- (ii) Area of occupancy
- (iii) Number of locations or subpopulations
- (iv) Number of mature individuals.

2. Area of occupancy estimated to be less than 2,000 km², and estimates indicating at least two of a–c:

(a) Severely fragmented or known to exist at no more than 10 locations.

(b) Continuing decline, observed, inferred or projected, in any of the following:

- (i) Extent of occurrence
- (ii) Area of occupancy
- (iii) Area, extent and/or quality of habitat
- (iv) Number of locations or subpopulations
- (v) Number of mature individuals.

(c) Extreme fluctuations in any of the following:

- (i) Extent of occurrence
- (ii) Area of occupancy
- (iii) Number of locations or subpopulations
- (iv) Number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer (up to a maximum of 100 years in the future), OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

(a) Population structure in the form of one of the following:

- (i) No subpopulation estimated to contain more than 1,000 mature individuals, OR
- (ii) All mature individuals are in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

1. Population size estimated to number fewer than 1,000 mature individuals.

2. Population with a very restricted area of occupancy (typically less than 20 km²) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Near Threatened (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Not Evaluated (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Appendix 3

SPECIES RECOMMENDED FOR THE SAMOAN PLANTS RED LIST

	S ¹	U	T	O	T	Collections ²	Extirpated? ³
National Endemic Species							
<i>Abutilon whistleri</i>	S	–	–	–	–	3	No
<i>Acalypha sp. nova</i>	–	U	–	1	No		
<i>Balaka samoensis</i>	S	–	–	–	–	5	No
<i>Boehmeria sp. nova</i>	–	U	–	–	–	2	No
<i>Corybas betchei</i>	–	U	–	–	–	1 (lost)	Yes (1880?)
<i>Cyrtandra campanulata</i>	S	U	–	–	–	5	Yes? (1905)
<i>Cyrtandra funkii</i>	S	–	–	–	–	4	Yes? (ca. 1895)
<i>Cyrtandra guerkeana</i>	S	–	–	–	–	4	Yes? (1906)
<i>Cyrtandra mamolea</i>	–	U	–	–	–	2	Yes? (ca. 1895)
<i>Dendrobium scirpoides</i>	–	U	–	–	–	1 (lost)	Yes? (1880?)
<i>Goodyera sp. nova?</i>	S	–	–	–	–	1	No? (1905)
<i>Manilkara samoensis</i>	S	–	–	–	–	8	No
<i>Mariscus whitmeei</i>	– ⁴	–	–	–	–	1	Yes?
<i>Melicope sulcata</i>	S	–	–	–	–	1	No (1931)
<i>Metrosideros gregoryi</i>	S	–	–	–	–	2	No (1931)
<i>Nervilia grandiflora</i>	S	–	–	–	–	1 (lost)	No? (1905?)
<i>Polyalthia sp. nova</i>	S	–	–	–	–	2	No

<i>Psychotria bristolii</i>	S	–	–	–	–	3	No
<i>Psychotria chlorocalyx</i>	–	U	–	–	–	6	No
<i>Psychotria juddii</i>	S	–	–	–	–	2	No (1929)
<i>Syzygium christophersenii</i>	S	–	–	–	–	3	No
<i>Syzygium graeffei</i>	S	–	–	–	–	2	No (1905)
<i>Syzygium vaupelii</i>	S	–	–	–	–	2	No (1929)
<i>Taeniophyllum savaiiense</i>	S	–	–	–	–	4	No
<i>Trichosanthes reineckeana</i>	S	U	–	–	–	5	No
<i>Vavaea cf. amicorum</i>	–	U	–	–	–	3	No
<i>Zeuxine plantaginea</i>	S	U	–	–	–	6	No
Archipelago Endemic Species							
<i>Habenaria monogyne</i>	S	U	T	–	–	4	No
Indigenous Non-Orchid Species							
<i>Blumea milnei</i>	S	U	–	O	–	6	Yes (1905?)
<i>Cenchrus caliculatus</i>	S	U	T	–	–	9	Yes? (1905)
<i>Centipeda minima</i>	S	U	–	–	–	5	No
<i>Crateva religiosa</i>	S	U	–	O	–	10	No
<i>Gossypium hirsutum</i>	–	U	–	O	– ⁵	10	No
<i>Gyrocarpus americanus</i>	S	U	– ⁶	O	–	9	No
<i>Limnophila fragrans</i>	S	U	T	O	T	16	No
<i>Manilkara dissecta</i>	–	U	T	–	–	10	No
Indigenous Non-Orchid Species							
<i>Bulbophyllum longiflorum</i>	S	U	–	–	–	3	No
<i>Bulbophyllum pachyanthum</i>	S	U	T	–	T	9	No
<i>Bulbophyllum trachyanthum</i>	S	–	–	–	–	2	No (1931)
<i>Chrysoglossum ornatum</i>	S	U	–	–	–	2	No
<i>Cryptostylis arachnites</i>	S	U	–	–	T	5	No

<i>Dendrobium whistleri</i>	–	U	–	–	–	3	No
<i>Geodorum densiflorum</i>	S	U	–	–	–	3	No
<i>Hetaeria whitmeei</i>	S	U	–	–	T	8	No
<i>Liparis gibbosa</i>	S	–	T	–	–	7	No
<i>Luisia teretifolia</i>	S	–	T	–	–	3	No
<i>Microstylis taurina</i>	–	U	–	–	T	9	No
<i>Microtatorchis samoensis</i>	S	U	–	–	–	3	No
<i>Phreatia minima</i>	S	U	–	–	–	4	No
<i>Schoenorchis micrantha</i>	S	U	–	–	–	3	No
<i>Spiranthes sinensis</i>	S	–	–	–	–	4	No
<i>Thelasis carinata</i>	S	U	–	–	–	3	No
<i>Tropidia effusa</i>	S	–	–	–	–	3?	No
<i>Zeuxine vieillardii</i>	S	U	–	O	–	8	No
Indigenous Species Restricted to One Locality							
<i>Ixora elegans</i>	S	–	–	–	–	3	No
Alien Polynesian Weeds							
<i>Senna sophora</i>	S	–	T	–	–	3	Yes (1920)
<i>Sida samoensis</i>	S	U	T	O	T	16	No
Alien Polynesian Cultigens							
<i>Benincasa hispida</i>	–	U	T	–	–	5	No
<i>Saccharum maximum</i>	S	U	–	–	–	3	No
<i>Solanum ferox</i>	–	U	–	O	–	5	Yes (1905)
<i>Solanum viride</i>	S	U	T	O	T	25	No

1 S = Savai'i; U = Upolu; T = Tutuila; O = Ofu/Olosega; T = Ta'ū.

2 This category includes all specimens collected in the archipelago.

3 A yes indicates the species is most likely no longer found in Samoa, and it is followed by the year of the last known collection in the archipelago (for those species not collected in the last 40 years).

4 Island not recorded.

5 Rose Atoll only.

6 'Aunu'u only.

Appendix 4

SPECIES DOUBTFUL IN SAMOA

The following nine species, if they exist in Samoa, would be included in the list of rare plants in Samoa. However, there are problems with the specimens (one for each of the species), either because they may have incorrect location data that erroneously lists the plant from Samoa, or because the specimen has been misidentified.

Anoectochilus imitans Schltr. (Orchidaceae)

This orchid was attributed to Samoa by Cribb and Whistler (1996), based upon a single specimen at Melbourne. The specimen has only one identifying word on it, "Samoa." It could conceivably be a specimen collected by Graeffe in Fiji, but incorrectly labeled as Samoa. There are other instances of species being attributed to Tonga and Samoa based on erroneously labeled specimens, as noted earlier and below. This will be listed as a doubtful record unless the species turns up in future collections.

Bulbophyllum cf. *pallidum* Schltr. (Orchidaceae)

A sterile specimen (Whistler 10105) of what appears to be similar to this species was collected, at Mauga Mū in the highlands of Savai'i in scrub forest at 1600 m elevation. The specimen could not be located during a recent search of the author's collections (2010) at the University of Hawai'i herbarium. For the time being, this will be listed as a doubtful record.

Dendrobium macrophyllum A. Rich. (Orchidaceae)

This species was reported from Samoa based upon a single specimen, Graeffe 1242 stored at HBG (Cribb and Whistler 1996). However, this appears to be in error because the same Hamburg specimen is included under *Dendrobium whistleri*. This is probably based upon two separate viewings of the specimen, one before and one after the new species, *Dendrobium whistleri* Cribb, was named. This will be listed as a doubtful record unless the species turns up in future collections.

Eleocharis ochrostachys Steudel in Zoll. (Cyperaceae)

This species was reported from Samoa based on Graeffe 1239, recorded as being collected on 'Upolu without further data. The specimen at Kew was annotated as *E. variegata*, at least one variety of which (now called *E. ochrostachys*) is the one that occurs in Fiji. This species is difficult to distinguish from *E. dulcis* that is abundant in Samoan marshes. The former is distinguished from the latter by the absence of internal septa in the leafless culms. This Kew specimen could be a misidentification, but it is just as likely that the Samoan location of collection is incorrect. The collections of Graeffe apparently sometimes have incorrect location data. For the time being, this species will be recorded as a doubtful record.

Hoya betchei Schltr. (Asclepiadaceae)

There is much confusion about this genus in Samoa, and some experts think the type specimen of this species is the only collection of it. More work needs to be done on *Hoya* in Samoa, but for the time being it will be listed as a doubtful record and belonging to one of the other recognized species of *Hoya* in Samoa.

Oberonia bifida Schltr. (Orchidaceae)

This species is based on a single specimen, Christophersen 2296b, an epiphyte in montane forest east of Olo Crater at 700 to 800 m elevation, identified by Cribb (Cribb and Whistler 1996). This Melanesian species occurs in New Guinea, Solomon Islands, and Vanuatu, but not otherwise any farther to the east. Most likely this specimen is just a narrow-leafed example of *Oberonia equitans*, a species common in Samoa. For the time being, this species will be recorded as a doubtful record.

Ruppia maritima L. (Ruppiaceae)

This species is recorded from Samoa based upon a single specimen, Graeffe 1184 (the location of this specimen is unclear), labeled as from Samoa, without further locality. The collections of Graeffe apparently sometimes have incorrect location data. Future surveys of Samoan streams may one day yield this species, but for the time being this species will be recorded as a doubtful record.

Serianthes melanesica Fosb. (Fabaceae)

This species was reportedly collected in Samoa in 1877, by Whitmee without further locality or data. Fosberg (1960) recognized the sole Samoan specimens (one at Kew, a duplicate at Melbourne) as the endemic var. *samoensis* Fosb. There is a distinct possibility that this specimen was collected from somewhere other than Samoa (the species occurs in Tonga and Fiji), and Whitmee may have collected in one of these other island groups instead of Samoa. If the species is extirpated from Samoa, or the variety now extinct in Samoa, it is a moot point. For the time being, this species will be recorded as a doubtful record.

Solanum amicum Benth. (Solanaceae)

This species was reportedly collected in Samoa in 1878, by Whitmee without further locality or data. There is a distinct possibility that this specimen was collected from somewhere other than Samoa (it occurs in Tonga and Niue), and Whitmee may have collected it in one of these other island groups instead of Samoa. If the species is extirpated from Samoa, it is a moot point. For the time being, this species will be recorded as a doubtful record.

Appendix 5

RARE SPECIES PROFILES

The following list contains 109 plant species deemed to be rare in independent Samoa. The first division of the species is into dicots (Dicotyledonae) and monocots (Monocotyledonae). Within the two groups the species are listed in alphabetical order by Family, and within the families in alphabetical order by scientific name. Included for each species is the scientific name in bold italics, followed by the “author” who first described the species, or who reassigned it to a new genus. (The author name in the parentheses of some species is the botanist who first named the plant; the author outside the parentheses reassigned it to a different genus.) Below that is a list of synonyms, if any. These are names that were once used, but are now considered to be incorrect. Following this is the Samoan name (if any), the English name (if any), reason for listing the species, its classification status (e.g., rare indigenous, rare endemic, etc.), the reason for its listing or inclusion on the list, and suggested action to protect the plant.

Following this introductory material is a brief discussion of the status (endemic, etc.) of the species, its range outside Samoa, its distribution in Samoa (i.e., on which Samoan islands it occurs), its habitat, its elevation range, its frequency (mostly rare), its ethnobotanical uses (if any), and any other relevant information. This is followed by a full botanical description, and a short diagnostic description. The last portion of each species is a list of collections, with collection data. These are arranged by island, and generally oldest to newest under each island. Some specimens lack even island data, i.e., on which Samoan island they were collected. These are listed under “**SINE LOC:**” which is an abbreviation in Latin of “without island.” In the future this Samoan distribution information can be used to put collection locations on a map that can be downloaded into a GIS program that will produce maps of the distribution maps of the species in Samoa. The 109 species are as follows. A list of doubtful species is found in Appendix 4.

DICOTYLEDONAE

AIZOACEAE

Sesuvium portulacastrum (L.) L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: preservation of the vegetation of the Aleipata Islands

Indigenous to Samoa, widespread in the Pacific. It occurs on the four main islands of American Samoa, but in independent Samoa it has been collected only twice—both times on Fanuatapu Islet off the east coast of 'Upolu. It is rare in the archipelago on coastal rocks, reported only near sea level. It is, however, much more common elsewhere in the tropical Pacific, where it is one of the most salt-tolerant of littoral species, and can often be found dominating wave-splashed or saline habitats where few other species can survive. No Samoan names or uses have been recorded. This species was found on Fanuatapu during this project's fieldwork in July 2010.

Prostrate succulent herb with glabrous red stems up to 80 cm long, often forming dense mats. **Leaves** simple, opposite; blade succulent, linear to spatulate, 1–3.5 cm long, attenuate at the base, rounded at the tip; surfaces glabrous; margins entire; subsessile. **Inflorescence** of solitary, axillary flowers on a short pedicel up to 1.2 cm long. **Calyx** campanulate, petaloid, 6–9 mm long, white to pink inside, deeply divided into 5 ovate, acute-tipped lobes. **Corolla** absent. **Ovary** superior, styles 3–5. **Stamens** free, many, the same color as the calyx. **Fruit** an ovoid to subglobose capsule 5–7 mm long, containing numerous small black seeds. **Flowering** and fruiting occur continuously.

Distinguishable by its prostrate herbaceous habit and littoral habitat; alternate, linear to spoon-shaped, succulent leaves; and solitary, axillary, 5-lobed white to pink flowers with many stamens.

UPOLU:

Whistler 3935—Exposed rocks on the southeast tip of Fanuatapu.

Whistler 12156—Forming dense mat on the windswept southeast tip of Fanuatapu.

OTHER SAMOAN COLLECTIONS: Tutuila (1), Ofu (3), Olosega (1), Ta'ū (3).



ANACARDIACEAE

Dracontomelon vitiense Engl.

Dracontomelon villosum Seem. of Rechinger (a non-existent name, probably a mistake for *Dracontomelon sylvestre* sensu auct. non Bl.)

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Publicity to see if anyone knows the plant and knows where it occurs, and if found, collection of propagation material for growing in a botanical garden. It is not clear if this is an ancient or modern introduction, or even is native to Samoa.

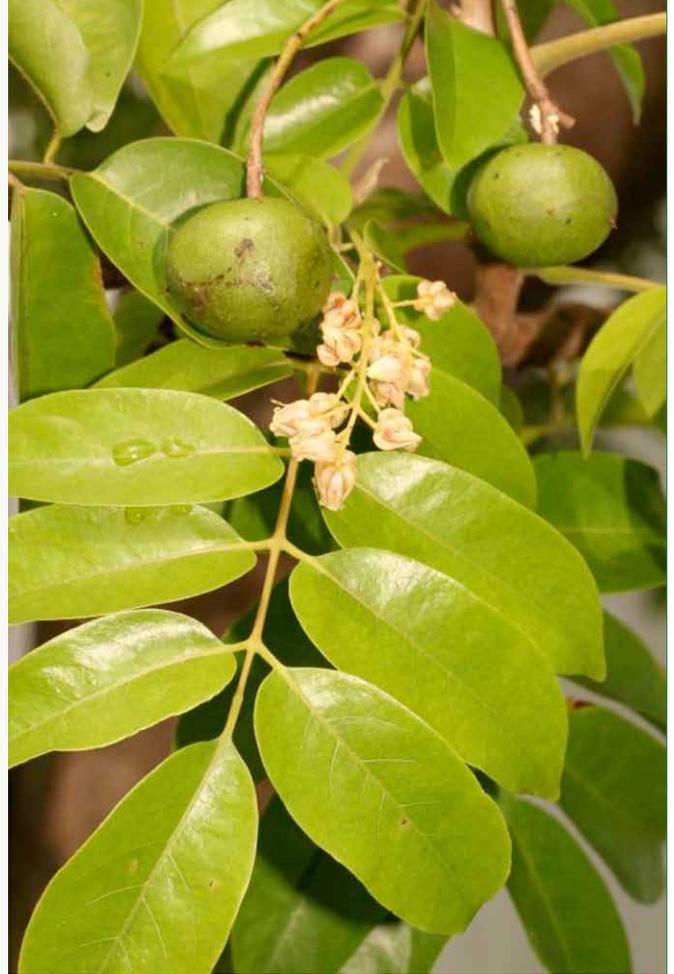
Indigenous or possibly a Polynesian introduction to Samoa, also found in Fiji. The species is a native fruit tree in the latter archipelago, and because it is so rare in Samoa and lacks a common name, it may have been a Polynesian or even a European introduction to Samoa. It is rare in lowland forest in Samoa, where it has been collected only on 'Upolu and the adjacent Aleipata Islands, reported from about 50 to 300 m elevation. The earliest collection dates to the 1860s. (Two Whitmee collections could have been collected on a different island, since no localities are given for them.) No Samoan names or uses are reported. This species was found on Namu'a during this project's fieldwork in July 2010.

Large tree up to 20 m in height, with puberulent young stems. **Leaves** even-pinnately compound (sometimes odd-pinnately), alternate; rachis pubescent, swollen at the base, 10–30 cm long; leaflets in 4–10 subopposite or alternate pairs; leaflet blades mostly elliptic, 7–17 cm long, oblique at the base, shortly acuminate at the tip; surfaces glabrous, veins of lower side aqueous, with domatia in the axils of the secondary veins; margins entire; petiolules 4–8 mm long. **Inflorescence** a widely branching, many-flowered, axillary or terminal panicle 8–20 cm long. **Calyx** of 5 pale green, oblong to ovate sepals 3.5–5 mm long, on a pedicel 3–7 mm long. **Corolla** divided to near the base into 5 white, elliptic petals 6–9 mm long, recurved at anthesis. **Ovary** of 5 fused carpels, red at the base, often some aborting; with styles fused at their tips to form a 5-angled stigma. **Stamens** 10, free, attached to the outside of the disk. **Fruit** a yellow, compressed-globose berry 3–4 cm in diameter, with 5 tiny bract-like appendages up to 2 mm long near the equator, and containing a yellow pulp and up to 5 seeds. **Flowering** reported from January to May, fruiting from March to August, but both possibly of longer duration.

Distinguishable by its even-pinnately compound leaves; widely branching panicles of numerous small white flowers; five stigmas fused at their tips; 10 stamens; and purple, flattened-globose berry with small appendages around the middle.

UPOLU:

Graeffe 1362—Without further locality (not in Reinecke).



Rechinger 893—"Large tree on Mt. Vaea without flowers or fruit."

Eames 62—Rocky slopes near Apia at 50 m elevation [possibly Mt. Vaea].

Eames 182a—Stream bank near Moamoa at 200 m elevation, "perhaps escaped."

Watanabe 181—Near Falefā.

Whistler 4567—Forest near the top of Namu'a Islet at ca. 50 m elevation.

Whistler 8329—Forest on west slope of Nu'utele at ca. 30 m elevation.

Whistler 12162—Forest just above the beach fales on the west-facing slope of Namu'a.

SINE LOC:

Whitmee 110—Without further locality.

Whitmee s.n.—Without further locality.

ANNONACEAE

Polyalthia sp. nova

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare independent Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical surveys, especially on the north mid-elevation slopes of Savai'i, to determine how rare the tree is.

Endemic to Samoa, where it has been collected only twice (once in flower), both times on Savai'i. It is rare in lowland to foothill forest, reported from 270–600 m elevation. A.C. Smith (1981: 14) noted it is somewhat related to *P. amoena* of Fiji. No Samoan names or uses have been reported.

Small to medium-sized tree up to 8 m or more in height, with sparsely pubescent young stems. **Leaves** simple, alternate, distichous; blade elliptic, 10–18 cm long, rounded to acute at the base, acuminate at the tip; surfaces glabrous; margins entire; petiole 0.4–1 cm long. **Inflorescence** of solitary flowers borne in axils on the leafless stem. **Calyx** of 3 valvate sepals 1.5–2 mm long, borne on a pedicle 1.2–2.5 cm long, pedicel thickened and elongating in fruit. **Corolla** of 6 narrowly oblanceolate to spatulate yellow petals 1.2–2 cm long, subequal, in 2 series. Ovaries many, 1-celled, short-stalked, with a capitate or irregular style. **Stamens** numerous, on a thick filament longer than the anther. **Fruit** of numerous subglobose 1–5 seeded berries borne on stipes up to 1.8 cm long. (Mature fruit not seen; description based on the only flowering specimen known.) **Flowering** reported in March, fruiting specimens not known, but both processes probably occur throughout the year, as it does in the genus in Fiji.

Distinguishable by its small to medium-sized tree habit; alternate, distichous leaves; solitary, yellow, 6-merous flowers; numerous stamens and carpels; and stalked fruits numerous per flower.

SAVAII:

Whistler 576—Le Aisa Plantation in open forest at 500 to 600 m elevation.

Whistler 9481a—Above Sāsina in lowland forest at 270 m elevation.



APOCYNACEAE

Melodinus vitiense Rolfe

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Preserve of central 'Upolu forests.

Indigenous to Samoa, ranging westward to New Caledonia. It is apparently restricted in Samoa to montane forest of 'Upolu, where it has been collected only between Mt. Fiamoe and Mt. Sina'ele, reported from 650–700 m elevation. It is known from Samoa based on two sterile specimens. The paired branches and subundulate leaf margins favor this identification rather than the very similar *Alyxia bracteolosa*. No Samoan names or uses have been reported.



Liana, high-climbing, with glabrous stems often forming paired perpendicular branches at the node; sap milky. **Leaves** simple, opposite; blade coriaceous, lanceolate to elliptic, 4–13 cm long, rounded to acuminate at the base, mostly acuminate at the tip; surfaces glabrous, distinctly veined; margins subundulate to subentire; petiole 4–10 mm long. **Inflorescence** an axillary, many-flowered cyme 2–6 cm long. **Calyx** 1.5–2.5 mm long, deeply lobed into 5 ovate lobes, on a pedicle 1–4 mm long. **Corolla** sympetalous, salverform, cream-colored, tube 2–3 mm long, with 5 ovate, imbricate lobes about as long as the tube. **Ovary** superior, 2-celled, with a short style. **Stamens** 5, epipetalous, included. **Fruit** a green to brown, globose berry mostly 4–8 cm in diameter. (Description based on fertile specimens from Tonga and Fiji.) **Flowering** and fruiting probably occur continuously if not infrequently.

Distinguishable by its liana habit; milky sap; paired branches borne perpendicular to the stem; opposite leaves usually with subundulate margins; axillary many-flowered cymes; small white flowers; and large globose fruit.

UPOLU:

Whistler 8361—Montane forest on the north, outer slope of Mt. Sina'ele at ca. 650 m.

Whistler 11533—Montane forest on a ridge just east of Lake Lanoto'o at ca. 700 m.

ASCLEPIADACEAE

Hoya whistleri Kloppenburg

Hoya no. 3 of Powell?

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare archipelago endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Accumulate botanical surveys to determine if the plant is just rarely collected or actually rare, and if rare, whether it is threatened or endangered.

Endemic to Samoa, where it is uncommon as an epiphytic vine in lowland forest on Savai'i, Tutuila, Ofu, Olosega, and Ta'u, reported from 10 to 600 m elevation. No common names or local uses have been reported for this newly described species. This genus needs revising, as a recent published study (Kloppenburg, pers. comm.) recognizes many more species than the present author does.

Climbing herbaceous vine with glabrous stems and milky sap. **Leaves** simple, opposite; blade coriaceous to subsucculent, ovate to lanceolate, the longest ones 5.5–10.5 cm long, rounded at the base, acute to shortly acuminate at the tip; surfaces glabrous; margins entire; petiole 1.1–2 mm long. **Inflorescence** of many-flowered (up to 28 or more flowers), axillary umbels on a peduncle 2–6 cm long. **Calyx** 1.5–2 mm long, deeply divided into 5 reflexed, ovate to triangular lobes, on a pedicel 2–3 cm long. **Corolla** sympetalous, broadly bell-shaped to rotate, waxy white to pale green, stellate-pubescent inside, 1.2–1.8 cm across, divided more than halfway into 5 broadly ovate lobes with the base red but inconspicuous behind the spreading hoods. **Ovary** superior, 2-carpellate (but only one maturing), each 1-celled and sharing a thickened stigma with the longitudinal stigmatic surfaces alternating with the anthers. **Stamens** 5, fused into a tube bearing a corona of spreading hoods. **Fruit** a fusiform follicle up to 12 cm long, filled with numerous comose seeds. **Flowering** and fruiting occur continuously.

Distinguishable by its epiphytic, herbaceous vine habit; milky sap; subsucculent, opposite, ovate leaves acute to shortly acuminate at the tip; broadly campanulate, white corolla stellate pubescent inside; and a pod up to 12 cm long containing many silky seeds. It is similar to the much more common *Hoya australis*, but differs in having less succulent leaves more ovate in shape; white, more bell-shaped corolla with the maroon base obscured by the spreading hoods; and inner corolla surface covered with star-shaped hairs.

SAVAII:

Whistler 9456—Lowland forest north of A'opo at 50 m elevation.

SINE LOC:

Powell 30?—Without further locality (but check with Kew).

Powell 211? (sterile)—Without further locality (but check with Kew).

OTHER SAMOAN COLLECTIONS: Tutuila (1), Ofu (3), Olosega (0, visual record), Ta'u (3).



ASTERACEAE

Blumea milnei Seem.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Nothing at this time because the plant has probably been extirpated from Samoa. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, ranging westward from there and Tonga to New Guinea. This large herb has probably been extirpated from Samoa. The only record of it from Samoa is a single collection from Ofu over a century ago, and three from Savai'i (without further locality) that are also over a century old. It is rare in Tonga and Fiji, but has been collected in recent times (Whistler, pers. record). Although no elevation data is reported for it in Samoa, it was probably collected in montane forest (it is reported from near sea level to 1100 m in elevation in Fiji). It may have originally been a weed of all elevations, but was subsequently extirpated from the lowlands by competition with more aggressive weeds introduced to Samoa in modern times (since 1830), and eventually from the higher elevations. See Randeria (1960) in *Blumea* 10: 231 for further information. No Samoan names or uses have been reported. The Powell specimen appears to be the same as Whitmee's.

Coarse erect herb up to 3 m in height, with pubescent stems. **Leaves** simple, alternate; blade elliptic, 4–27 cm long, attenuate at the base, acute to acuminate at the tip; surfaces appressed pubescent; margins toothed; petiole 0.5–3 cm long. **Inflorescence** of discoid heads in clusters borne in axillary and terminal panicles 10–30 cm long; heads 5–8 mm long, with linear to oblong phyllaries 5–8 mm long, the receptacle naked. Disc florets numerous, yellow, tubular, shallowly 5-lobed, ca. 6–8 mm long. Ray florets absent. **Ovary** inferior, 2-celled, with a long, 2-lobed style. **Stamens** 5, epipetalous, included. **Fruit** an oblong, 5–10-ribbed achene ca. 0.5 mm long, with a pappus comprising numerous fine white setae 4–5 mm long, in a single series borne on a basal ring. **Flowering** and fruiting have been reported throughout the year.

Distinguishable by its tall herbaceous habit; alternate leaves; panicles of heads bearing white disc florets; and tiny achenes bearing numerous terminal bristles in a basal ring.

SAVAII:

Graeffe 1427—Without further locality (not recorded in Reinecke).

Vaupel 288—(Specimen not at Bishop Museum).

UPOLU:

Powell 104—Without further locality (Kew).

Whitmee 21—Without further locality (Kew).

Whitmee s.n.?—Without further locality (source of this record is unclear).

OTHER SAMOAN COLLECTIONS: Olosega (1, in ca. 1894)



Centipeda minima (L.) A. Braun & Ascherson
Myriogyne minuta Less.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of the marshes at Aleipata and Lanoanea to see if the plant is still found there. If so, then determine its frequency and distribution. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, also found in Tonga, Fiji, and westward, and apparently a modern introduction to the Society Islands. It is known in Samoa only from 'Upolu and Savai'i in two distinct wetland habitats—in the crater marsh at Lanoanea on 'Upolu at ca. 700

m elevation, and in tidal areas at the westernmost

tip of Savai'i. The plant is extremely rare, and has been collected only once in Samoa in the last 78 years.

The locality of the most recent collection (Savai'i) was hit by cyclones in the early 1990s, and the species was not found when the area was later searched by the author. The author has also searched the marsh at Lano'anea with similar results, so this species may now have been extirpated from Samoa. No Samoan names or uses have been reported for this tiny inconspicuous species.

Prostrate herb with glabrous, much-branched stems up to 20 cm long. **Leaves** simple, alternate; blade oblanceolate, 0.5–2 cm long, cuneate at the base, acute to subround at the tip; surfaces glabrescent, arachnoid-pilose on both sides when young; margins mostly 3–5 pinnately lobed; sessile.

Inflorescence a sessile, axillary, subglobose head 2–5 mm in diameter, surrounded by 1 or 2 series of tiny, subequal phyllaries. **Calyx** of 4 short lobes. **Corolla** dimorphic, sympetalous, shortly tubular, 4-merous; those of the ray florets 0.2–0.7 mm long, white or green; those of the disc florets yellow or violet tinged, 0.5–0.7 mm long. **Ovary** inferior, 2-celled; style 2-branched. **Stamens** 4, epipetalous, included. **Fruit** a 4-angled (3–5), narrowly ovoid achene ca. 1 mm long, the ribs appressed pubescent, the surfaces between them darker, with a minute, pale, spongy pappus on top. **Flowering** and fruiting probably occur continuously.

Distinguishable by its prostrate herb habit; small, alternate, 3–5 pinnately lobed leaves; small, sessile, axillary bearing tiny white to yellow or violet flowers; and tiny, ribbed achene ca. 1 mm long, with a spongy mass on top.

SAVAII:

USEE s.n.—Without further locality.

Christophersen 3314—Edge of tidal swamp at Tufutāfoe at the west end of Savai'i.

Whistler 6812—Edge of a wetland at the north end of Faleālupo Tai village near sea level.

UPOLU:

Reinecke 308—Crater marsh of Lanoanea (in 1894).

Rechinger 751—Crater marsh of Lanoanea.



Sigesbeckia orientalis L.

SAMOAN NAME: 'a'ami'a

ENGLISH NAME: none

STATUS: rare Polynesian adventive or cultigen

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Nothing at this time because the plant has probably been extirpated from Samoa.

A Polynesian introduction to Samoa, indigenous to the Old World tropics. It is rare and probably now extirpated from the archipelago, since it has not been collected there since 1929. It occurred as an adventive in sunny places (but may have been intentionally introduced as a fragrance plant) of the lowlands, and may have not been able to survive the competition from more recently introduced weeds. The plant, probably originally called 'a'ami'a, was used to scent coconut oil. It is a modern introduction to Hawai'i, where it is an occasional weed.

Erect herb up to 90 cm in height, with pubescent stems. **Leaves** simple, opposite; blade broadly ovate to deltoid or lanceolate, 2.5–15 cm long, truncate to attenuate at the base, acute at the tip; surfaces densely pubescent, 3-lobed from the base; margins irregularly toothed or lobed; petiole 0–1 cm. **Inflorescence** of few-flowered composite heads arranged several together in leafy, paniculate clusters; phyllaries in 2 series, the outer ones usually 5, clavate, 5–6 mm long, covered with stalked glands, the inner ones partly enveloping the ray achenes. Ray florets ligulate, ca. 2 mm long, fertile, yellow. Disk florets tubular, shallowly 5-lobed, ca. 1 mm long, yellow. **Ovary** inferior, 1-celled, with a long, bifid style. **Stamens** 5, epipetalous, exserted. **Fruit** an obovoid to oblong, 4-angled achene 2.5–4 mm long, covered with glandular hairs, often curved, lacking a pappus. **Flowering** and fruiting occur continuously.

Distinguishable by its erect herb habit; opposite, deltoid leaves with toothed margins; yellow disc and ray florets in heads arranged in paniculate clusters; and sticky achenes.

SAVAII:

Reinecke 327a—Tafua without further data.

Vaupel 251—Sale'aula (Bishop Museum: 30 April 1905); Sale'aula (AK: 5 May 1905).

Rechinger 1642—Dry places near Sāsina.

Christophersen 684—Open “fern country” near Manase at 100 m elevation.

UPOLU:

Reinecke 327—Above Vailele without further data.

SINE LOC:

Powell 103—Samoa without further locality.

Whitmee 209—Samoa without further locality.

Other Samoa Collections: Ta'ū (1, in ca. 1922)



BORAGINACEAE

Cordia aspera Forst. f.

SAMOAN NAME: *tou*

ENGLISH NAME: none

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Nothing at this time since the tree appears to be dispersed, and is not native. However, if and when individuals are found, propagation material should be collected and planted in a botanical garden to preserve this cultural plant.

A Polynesian introduction to Samoa, indigenous from the Philippines and Indonesia eastward, but probably an ancient introduction in much of its eastern range, which extends to Samoa and Tonga. This tree occurs in secondary and lowland forest on all the main islands (except perhaps Olosega), reported from near sea level to 250 m elevation. Its rarity today when it was formerly cultivated as a useful plant is indicative of an introduced species, and after its introduction it escaped into native forest, where it persists in small numbers in scattered localities. The small white fruits of *tou* were formerly used as glue for pasting together layers of tapa cloth (*siapo*). The light wood was also once used for making fishing net floats. It, along with its name, have now virtually been forgotten in Samoa.

Medium-sized tree up to 7 m in height, with the young parts densely covered with red-brown pubescence. **Leaves** simple, alternate; blade ovate, 6–20 cm long, acute to rounded at the base, acuminate to attenuate at the tip; surfaces sparsely appressed-pubescent on both sides; margins serrate with apiculate teeth; petiole 1–5 cm long. **Inflorescence** an axillary, many-flowered cyme up to 7 cm long, with its axis and branches densely covered with red-brown pubescence. **Calyx** campanulate, 5–6 mm long, with 5 small teeth ca. 1 mm long, densely pubescent and with 10 longitudinal grooves on the outside, subsessile. **Corolla** campanulate, white, tube 4–6 mm long, limb divided into 5 lobes 2–4 mm long. **Ovary** superior, with a filamentous style twice dichotomously branched into 4 stigmas. **Stamens** 5, epipetalous, slightly exserted. **Fruit** a white, ovoid drupe 1–1.2 cm long, strongly ribbed when dry, with the spreading, persistent calyx below it. **Flowering** reported in May and August to December, fruiting in August and October, but both probably occur throughout the year.

SAVAII:

Rechinger 143—Sunny dry areas near Vaipōuli.

Whistler 989—Along main forestry road below the nursery at ca. 250 m elevation, Āsau.

Whistler 9273—Two trees along forestry road at 275 m elevation, Āsau.

UPOLU:

Graeffe 1575—Samoa without further locality.

Reinecke 129—Native forest at Mulifanua.

Whistler 8350—Along the stream in Vaoto Bay (not on Samoan maps) east of Uafato, 30 m elevation.

SINE LOC:

Powell 302—Samoa without further locality.

Whitmee 193—Samoa without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (3), Ofu (1), Ta'ū (1).



CAPPARIDACEAE

Capparis cordifolia Lam.

Capparis sandwichiana sensu auct. non DC.

Capparis spinosa sensu auct. non L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of the coast between Āsau and Sasina, its only known site of collection in independent Samoa, in order to estimate the population size and distribution. The area is probably not under threat since it is an uninhabited, cliff-bound lava coast.

Indigenous to Samoa, ranging from Palau to southeastern Polynesia. In Samoa, it is reported only on Savai'i from Faleālupo to Āsau, and on the four main islands of American Samoa, where it is restricted to rocky coastal areas, reported only near sea level. A closely related species is present in Hawai'i, *Capparis sandwichiana*, but both of these are considered by some authors to be part of a wider ranging species, *C. spinosa* var. *mariana*. No Samoan names or uses have been reported.

Prostrate or low woody shrub up to 1 m in height, with glabrous stems. **Leaves** simple, alternate; blade somewhat fleshy, elliptic to ovate, 2–7 cm long, mostly rounded at both ends; surfaces glabrous; margins entire; petiole 1–4 cm long. **Inflorescence** of solitary, axillary flowers on a pedicel 5–8 cm long. **Calyx** of 4 unequal, sepals 1.4–3 cm long, the outer pair strongly concave (bent into a U-shape) and enclosing the bud, on a pedicel up to 8 cm or more in length. **Corolla** of 4 unequal, asymmetrical showy white petals 2.5–5 cm long. **Ovary** superior, 1-celled, with a small sessile stigma; borne on a long gynophore. **Stamens** numerous, free, anthers often pink. **Fruit** a clavate capsule 3–6 cm long borne on a gynophore up to 8 cm or more in length; seed numerous, round 3–4 mm in diameter. **Flowering** and fruiting probably occur continuously.

Distinguishable by its prostrate woody habit; alternate, elliptic to ovate, somewhat fleshy leaves; large, showy, solitary white flowers bearing numerous stamens; and club-shaped fruit borne on a long stalk.

SAVAII:

Vaupel 630—Without further locality (Bishop Museum: 1906).

Christophersen 2662—Without further locality.

Christophersen 2782—Faleālupo coast.

Christophersen 3342—Rocky coast at Faleālupo to Fagalele Bay.

Whistler 995—Lava-bound coast east of Āsau, near sea level.

Whistler 12147—Lava-bound coast east of Āsau, near sea level.

OTHER SAMOAN COLLECTIONS: Tutuila (recent sight record), Ofu (1), Olosega (1), and Ta'ū (4).



Crateva religiosa Forst. f.

Crateva speciosa Volk.

SAMOAN NAME: *pulu elo?*

ENGLISH NAME: sacred garlic pear

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of the coastal forest on the Falealupo peninsula, especially near Fagalele Bay, to determine the distribution and frequency of the species in its only known area of collection in independent Samoa. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, ranging from northern India eastward to eastern Polynesia and Micronesia, but rare in most of the Pacific Islands, except in some parts of Micronesia (e.g., Yap, where it is cultivated for its edible fruits). In Samoa it occurs in only a few locations on Savai'i, 'Upolu, Ofu, and Olosega in coastal to lowland forest, reported from near sea level to 40 m elevation. No uses have been reported, but the last part of its name means bad-smelling, presumably referring to the flowers. In Samoan, *pulu* means coconut husk and *elo* means offensive smelling.

Medium-sized tree up to 15 m or more (up to 40 m in New Guinea) in height, with glabrous stems marked by conspicuous lenticels. **Leaves** trifoliate, alternate, rachis 4–13 cm long (larger in juvenile leaves); blades obovate to elliptic, 6–18 (–27) cm long, acute to oblique at the base, acuminate and apiculate at the tip; surfaces glabrous, upper side darker; margins entire to undulate; petiolules 2–10 mm long. **Inflorescence** a terminal, several-flowered (up to 18 or more) raceme 3–14 cm long, with tiny caducous bracts at the bases of the pedicels, flowers malodorous. **Calyx** of 4 elliptic to oblong, subequal sepals 4–7 mm long (or sometimes larger and petaloid) borne on a broad receptacle, atop a long pedicel up to 9 cm long. **Corolla** of 2 pairs of free, ovate to elliptic petals 1.5–4 cm long, clawed at the base, white aging to pale yellow. **Ovary** superior, 1-celled, borne on an often reddish gynophore (ovary stalk) 4–9 cm long at anthesis, the ovary swollen at the tip and topped by a discoid stigma. **Stamens** many (10–30), free, exserted, with long filaments purplish towards their tips, protandrous. **Fruit** a somewhat garlicky smelling, mottled yellowish gray or pale green, ellipsoid berry 6–15 cm long. **Flowering** reported in April and May



(January and February in cultivation in Hawai'i, but throughout the year in New Guinea (at least), fruiting from April to June.

Distinguishable by its medium-sized tree habit; alternate, trifoliate leaves; large white, bad-smelling flowers; ovary borne on a long stalk; stamens long and numerous; and a large, mottled gray or pale green, somewhat garlicky smelling, sausage-shaped fruit.

SAVAIL:

Whistler 11132—Two trees along the east side of the trail near Fagalele Bay, Faleālupo.

Whistler 11468—One tree along the east side of the trail near Fagalele Bay, Faleālupo.

UPOLU:

Rechinger 262—Primary forest near Lauli'i with no indication of elevation.

Rechinger 853—Primary forest near Lauli'i with no indication of elevation.

Other Samoan Specimens: Ofu (5), Olosega (1).

CERATOPHYLLACEAE

Ceratophyllum demersum L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical survey of streams, especially in the Vailele Stream east of Āpia, to see if the plant is still found in Samoa. If found, then its range and frequency should be recorded to see if it is threatened or endangered in Samoa.

Indigenous to Samoa, cosmopolitan in distribution. This herb is known in Samoa from two old collections from 'Upolu, one at the Letogo estuary, the other without further locality. No Samoan names or uses have been reported.

Aquatic herb, submerged, rootless, with leafy floating branches up to 3 m in length and forming large masses. **Leaves** simple, whorled, with 3–12 per node; blade dichotomously dissected, 1–2 cm or more long, ultimate divisions linear; surfaces glabrous; margins entire or remotely toothed; sessile. **Inflorescence** of tiny, greenish, solitary, axillary flowers borne one to a node, surrounded by a thin herbaceous involucre of 8–15 segments dentate or lacerate at the tips; flowers unisexual, plants monoecious. **Calyx** absent. **Corolla** absent. **Ovary** superior, ovoid, unicarpellate, with a filiform style 4–6 mm long. **Stamens** 10–20, free, subsessile. **Fruit** a wingless, green, compressed-ellipsoid achene 4–6 mm long bearing 2 basal spines 2–5 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its floating aquatic herb habit; finely dissected leaves arranged 6–10 at a node; and tiny green, axillary flowers lacking a perianth.

UPOLU:

Kubary 36—Without further locality.

Reinecke 616—Letogo estuary.



CHRYSOBALANACEAE

Atuna racemosa Raf.

Cyclandrophora laurina (A. Gray) Kost.

Parinari glaberrimum sensu auct. non Hassk.

Parinari laurinum A. Gray

SAMOAN NAME: *ififi*

ENGLISH NAME: none

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of modern collections (actually, its infrequency of recent collections)

Recommended Action: Propagating material should be obtained, probably the fruits, and planted in a botanical garden to preserve this ancient cultivar before it disappears from Samoa.

A Polynesian introduction to Samoa, ranging from tropical Asia to Fiji and introduced to western Polynesia. It is uncommon in lowland to montane forest on the three largest islands, and is reported but not collected from Manu'a, sometimes forming small groves where it does occur, reported from near sea level to 450 m elevation. The pulp of the large seed was used for scenting coconut oil; it was used like *pani* or *togo* (*Bruguiera gymnorrhiza*) as a cosmetic for the hair—chewed and mixed with candlenut and coconut oil. Setchell (1924) also noted the use of the oil for hair washing. The tree is now rare, and its uses and even its name have nearly been forgotten in Samoa. It has been collected a number of times recently, but since it is no longer being actively cultivated, it appears to be less frequent than it was thirty years ago or so.

Medium-sized tree up to 20 m in height, but usually much less, with glabrous stems and linear caducous stipules up to 2.4 cm long. **Leaves** simple, alternate, blade chartaceous, lanceolate to elliptic, 12–30 cm long, acute to rounded at the base, subacute or acuminate or attenuate at the tip; surfaces glabrous; margins entire; petiole thick, 3–8 mm long. **Inflorescence** a many-flowered axillary raceme or panicle of 2 or 3 racemes 3–18 cm long, with tomentose branches and axis. **Calyx** hypanthium obconic, tube 8–11 mm long, tomentose on the outside, limb divided to the base into 5 ovate to elliptic lobes 5–8 mm long, on a pedicel 0–2 mm long, subtended by a tomentose bract up to 1 cm or more long. **Corolla** of 5 elliptic petals 8–10 mm long, white or tinged with purple, spreading or reflexed at anthesis. **Ovary** superior, adnate to the hypanthium, style filamentous, red, as long as the stamen filaments, with a small terminal stigma. **Stamens** many (ca. 20), free, exserted, filaments red, up to 1.5 cm long. **Fruit** a dry, subglobose to laterally-compressed ovoid drupe up to 8 cm long, with a thick (ca. 8 mm), hard, brown wall enclosing the single large seed. **Flowering** reported from July to March, possibly year round, fruiting throughout much of the year.

Distinguishable by its medium-sized tree habit; large, papery leaves; racemes or panicles of white flowers bearing many long red stamens; and large, brown, woody drupe.



SAVAII:

Vaupel 237—Safai (specimens at Auckland and Bishop Museum).

Rechinger 4500—Near the active volcanic cone at Vaipouli.

Christophersen 2442—Coconut plantation at Safune.

Christophersen 3242—Open ground above Sili at 100 m elevation.

Christophersen 3272 (not listed in Chr.)—In medium wet forest above Sili at 300 m elevation.

Bristol 2196—“Lata Block” above Lataitai at 75 m elevation.

Whistler 991—In yard in Āsau village.

Whistler 6836—Along trail to Faga on the coast west of Taga.

UPOLU:

Rechinger 37—In forest above Moamoa.

Rechinger 718—At Lake Lanoto’o.

Rechinger 735—In forest above Malifa.

Rechinger 4489—In forest on Mt. Vaea.

Wilder 402—Cultivated at Āpia.

Christophersen 344—Near Āpia.

McKee 2928—Lotofaga on the south coast of the island.

Whistler 689—In native forest above Utumapu at ca. 450 m elevation.

Whistler 3924—In ridge forest inland from Sa’agafou at ca. 200 m elevation.

Whistler 6780—In secondary forest at Sātuilufilufi.

Whistler 10183—In forest around “Lanoto’o” (Aleipata) marsh at 360 m elevation.

SINE LOC:

USEE s.n.—Without locality.

Powell 218—Without locality.

Whitmee 136—Without locality.

OTHER SAMOAN COLLECTIONS: Tutuila (4), Ofu (sight record), Ta’ū: (sight record).

Parinari insularum A. Gray

SAMOAN NAME: *sea*

ENGLISH NAME: none

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: A publicity campaign in Samoa to determine if anyone still has a surviving individual of this species. If so, then propagating material should be collected and planted in a botanical garden.

A Polynesian introduction to Samoa, native to Fiji where it occurs in native forest from near sea level to 800 m elevation. It is restricted in Samoa to cultivation, and is probably a relict of former cultivation if found in native forest. It has probably been extirpated from Samoa, where it was cultivated in the lowlands of all the main islands, last collected in 1955 (but was reported up until the late 1990s to still be growing near Salelologa in Savai'i). The tree is also rare in Tonga, where it was likewise a Polynesian introduction. Although the species is known as a timber tree in Fiji, only the fruits are reported to have been used in Samoa; these or slices of them were formerly strung into fragrant leis, as well as being used to scent coconut oil.

Medium-sized tree up to at least 12 m in height (30 m in Fiji), with densely brown-pubescent young stems and caducous linear stipules up to 1.6 cm long. **Leaves** simple, alternate; blade ovate, mostly 4–15 cm long, rounded to subcordate or truncate at the base, acute at the tip; upper surface glabrous or glabrescent, the lower side with arachnoid pubescence between the finely reticulate tertiary veins; margins entire; petiole 1–7 cm long, brown-pubescent or glabrous. **Inflorescence** an axillary or terminal, several- to many-flowered panicle up to 12 cm long, with tomentose axes and branches. **Calyx** hypanthium campanulate, 2–3 mm long, limb deeply divided into 5 ovate lobes brown-pubescent on the outside, on a pedicel up to 2 mm long. **Corolla** zygomorphic, with 5 white, spatulate petals ca. 2 mm long. **Ovary** superior, adnate to the hypanthium, style shorter than the calyx lobes, with a small capitate stigma. **Stamens** 7 or 8, free, shorter than the calyx lobes, with several staminodes. **Fruit** a brown to orange, ellipsoid drupe 3–4 cm long, covered with conspicuous lenticels. **Flowering** reported in Fiji from February to October, and fruits there persisting most of the year, both incompletely known in Polynesia.

Distinguishable by its medium-sized tree habit; simple, alternate leaves; spiderweb-like pubescence on the lower leaf surfaces; panicles of small white flowers; and relatively large, fragrant, orange to brown, ellipsoid drupe.

SAVAII:

Reinecke 339—Sātaua without further data.

UPOLU:

Graeffe 13b—Without further locality.

Graeffe 287—Without further locality.

Graeffe 1353—Without further locality.

Graeffe 1557—Without further locality.



Wilder 404—Cultivated in Āpia, without further data.

Christoffersen 351—Vailele, without further data.

Parham 9375—Papauta on “open slope at 500 ft.”

SINE LOC:

Powell 168—Without further locality.

Powell 218—Without further locality.

Whitmee 19—Without further locality.

OTHER SAMOAN SPECIMENS:

Tutuila (1, in 1920),

Ofu (1, in 1894),

Ofu (Guest, oral record)



CONVOLVULACEAE

Ipomoea indica (Burm.) Merr.

Ipomoea acuminata (Vahl) Roem. & Schult.

Ipomoea congesta R. Br.

Ipomoea hederacea sensu Rechinger; non (L.) Jacq.

Pharbitis insularis Choisy

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous?

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: Since the species has not been found in Samoa in nearly eighty years, it has possibly been extirpated from Samoa. Because it is not clear if this is native, a Polynesian introduction, or a modern introduction, no action beyond being aware of its status is recommended at this time.

Possibly indigenous to Samoa, pantropic in distribution. Because of its wide world distribution, the absence of early collections, and its occasional use in Polynesian medicines in Tonga and Hawai'i, it is not clear if this vine is a modern or Polynesian introduction, or even native (since it appears to be native to Hawai'i). It is rare in Samoa in open places in the lowlands, reported only from Savai'i and perhaps is now extirpated from Samoa. No Samoan names or uses have been reported.

Herbaceous to subwoody vine with pubescent stems up to 10 m in length twining at the tips. **Leaves** simple, alternate; blade broadly ovate, 5–12 cm long, cordate at the base, acuminate to obtuse at the tip; surfaces densely pubescent, especially on the lower side; margins entire; petiole 1.5–12 cm long, pubescent. **Inflorescence** a congested, few-flowered axillary cyme on a peduncle 1.5–15 cm long, bearing narrow bracts similar to the calyx lobes. **Calyx** deeply cut into 5 lanceolate sepals 1.8–3.3 cm long, acuminate to long-attenuate at the tip. **Corolla** sympetalous, funnel-shaped, 6–9 cm long, 6–8 cm in diameter, blue, purple, or pink (rarely white). **Ovary** superior, 4-celled, with a filamentous style. **Stamens** 5, epipetalous, included. **Fruit** a subglobose, 4-seeded, usually angled, brown capsule up to 1 cm in diameter. **Flowering** and fruiting occur continuously.

Distinguishable by its vine habit; alternate, heart-shaped, pubescent leaves; long-stalked congested cymes; narrow bracts below the calyx; sepals with attenuate tips; and showy, pink to blue, rotate corolla.

SAVAII:

Reinecke 382—Coastal area of Agalava (not on Samoan maps).

Rechinger 1986—Near Patamea without further locality.

Christophersen 2809 (n.s.)—Plantation near Faleālupo.



CUCURBITACEAE

Benincasa hispida (Thunb.) Cogn.

Benincasa cerifera Savi

Cucurbita hispida Thunb.

Cucurbita pruriens Sol.

Lagenaria siceraria sensu auct. non
(Molina) Standley

Lagenaria vulgaris sensu auct., non. L.

SAMOAN NAME: *fagu*

ENGLISH NAME: wax gourd

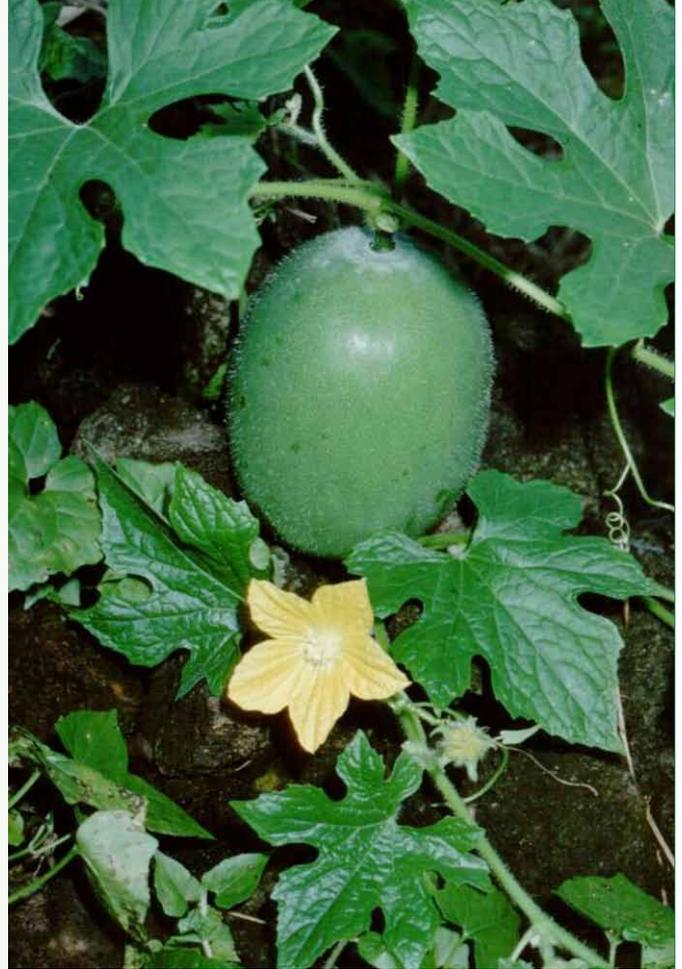
STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: The last known locations of collection of this plant should be visited to see if it is still present there, since it appears to last for long periods of time as seeds in the soil or in the gourd-like fruits. If found, seeds should be planted in a botanical garden to preserve this once useful species.

A Polynesian introduction to Samoa, probably native to Southeast Asia or Malaya, but an ancient introduction eastward all the way to the Marquesas. The Pacific island form, sometimes called var. *pruriens*, was cultivated for its gourd-like fruit used as a container for scented coconut oil, but since the introduction of the more useful bottles and cans, this use abruptly ceased and the plant is nowadays all but forgotten in Samoa and the rest of Polynesia. Interestingly enough, the current Samoan name for bottle is the same as the name for this plant. The vine persists as a rare occasional weed of disturbed places and plantations in the lowlands, climbing into trees and sometimes forming large patches. It appears to die back during part of the year and the only signs of its existence are numerous round, waxy white fruits on the ground. In recent times, an Asian variety with an edible fruit was reintroduced into Polynesia, but most people do not realize that the two varieties belong to the same species. (In Samoa, this introduced edible variety is called *melo*).

Herbaceous vine, annual, with longitudinally ribbed, strigose stems with banded hairs,



climbing by means of axillary bifid tendrils. **Leaves** simple, alternate; blade reniform to broadly ovate, mostly 7–15 cm long and as wide, cordate at the base, acute at the tip; surfaces pubescent; margins with 5–11 lobes or angles acute at the tips; petiole 3–12 cm long, strigose. **Inflorescence** of solitary axillary, unisexual flowers; plants monoecious. **Calyx** broadly campanulate, ca. 1–1.5 cm long, deeply divided into 5 recurved, narrowly lanceolate lobes, on a pedicel 1–4 cm long. **Corolla** sympetalous, rotate, yellow, divided to near the base into 5 obovate lobes ca. 2–3 cm long. **Ovary** of female flowers inferior, with a thick style bearing 3 stigmas; ovary rudimentary in male flowers. **Stamens** of male flowers 3, free, reduced to staminodes in female flowers. **Fruit** a globose, many-seeded, hard-shelled berry up to ca. 10 cm in diameter and length, covered with a white, powdery wax. **Flowering** and fruiting probably occur throughout the year, although the plant may die during the dry season.

Distinguishable by its viney habit; axillary, 2-parted tendrils; hairy stems; solitary, axillary, unisexual flowers; recurved calyx lobes; yellow, 5-lobed corolla; and round, waxy white, gourd-like fruit about the size of a tennis ball.

UPOLU:

Bristol 2413—Āpia refuse dump near sea level.

Whistler 184—Roadside between Fagali'i airport and the golf course, ca. 100 m elevation.

Whistler (visual record)—Near Tapatapaō, in disturbed area near the road.

SINE LOC:

Powell 207—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (2).

Cucumis melo L.

Cucumis acidus Jacq.

Cucumis pubescens Willd.

SAMOAN NAME: 'atiu

ENGLISH NAME: Polynesian melon

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Since there are no collections of this species in independent Samoa in over a century, it is possible that it has been extirpated from the country, and there are no likely places to search for it. Consequently, no action is recommended at this time other than to keep a lookout for this cultural species. The author has seeds for this species, which should perhaps be obtained and planted in a botanical garden.



A Polynesian introduction to Samoa, native from tropical eastern Africa to India, but an ancient introduction eastward across the Pacific all the way to the Marquesas. This plant is probably the original variety ("wild type") from which the larger, edible cantaloupe and honeydew melon were derived. Although it was probably once commonly cultivated in Samoa, it came into disuse and is now virtually unknown throughout its Polynesian range after other plant species with better edible fruits were introduced in modern times. It is now rare in Samoa, where it has recently been found in American Samoa along the margins of newly constructed or modified airports in Manu'a (Whistler 2001), and its status in the rest of Polynesia is poorly known. The plant was used in ancient times primarily for food. The fruits, about the size of walnuts and looking like small cantaloupes (which is a cultivar of the same species), were formerly eaten (mostly by children). The fragrant fruits were also used for decoration. The Polynesian subspecies is *agrestis* (Naudin) Panalo.

Herbaceous vine, prostrate and weakly climbing by means of simple axillary tendrils, stems hispid.

Leaves simple, alternate; blade ovate to subround, 4–11 cm long, cordate at the base, blunt and apiculate at the tip; surfaces hispid; margins palmately 3–7-lobed or angular, finely toothed between the lobes; petiole mostly 2–7 cm long, densely hispid. **Inflorescence** solitary, axillary, with unisexual flowers; plants monoecious. **Calyx** sympetalous, campanulate, 4–6 mm long, with 5 shorter filiform lobes, densely pubescent, on a pedicel 5–20 mm long at anthesis. **Corolla** sympetalous, rotate, yellow, 8–12 mm long, divided about halfway into 5 rounded lobes. **Ovary** of female flowers inferior, with 3–5 stigmas on a short style; ovary rudimentary in male flowers. **Stamens** of male flowers 3, free, reduced to 3 staminodes in female flowers. **Fruit** a fragrant, pale yellow to brown, subglobose, many-seeded berry 3–5 cm long. **Flowering** and fruiting occur continuously.

Distinguishable by its herbaceous vine habit; bristly stems and foliage; alternate leaves with lobed and finely toothed margins; simple axillary tendrils; yellow, separate male and female flowers on the same plant; and a small, fragrant, cantaloupe-like fruit.

SAVAII:

Vaupel 400—(Specimen not at Bishop Museum).

Rechinger 14—On a rocky shore near Satāua, near sea level.

UPOLU:

Reinecke 491—Vailele in hedges in plantations.

SINE LOC:

Powell 184—Samoa without further locality.

Whitmee 224—Samoa without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (2), Ofu (1), Ta'ū (5).

Trichosanthes reineckeana Cogn.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare independent Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: This species is still likely to be found in disturbed vegetation above A'opo. This area should be searched, especially along old forestry roads. If found, seeds should be collected and grown in a botanical garden. It is unlikely that the species is still found on 'Upolu. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is found only on Savai'i and 'Upolu. It occurs in lowland to montane forest in sunny disturbed places, such as rock walls, clearings, and trails, reported from the lowlands up to 975 m elevation. No Samoan names or uses have been reported. It is similar to *Trichosanthes quinquangulata* A. Gray named from the Sulu Islands and also present in the Philippines (three specimens present at Bishop Museum). There are no other native species of *Trichosanthes* in Polynesia or Fiji, so it is possible that this plant is an alien species introduced to Samoa sometime before 1895.

Herbaceous vine, creeping or low-climbing with thin, 2- or 3-branched, axillary tendrils. **Leaves** simple, alternate; blade cordate, 13–21 cm long and wide, cordate with a broad sinus at the base, acute to acuminate at the tip; upper surface covered with scattered, flat, silvery scales imbricate on the surface; margins mostly 3-lobed, serrate; petiole 4–10 cm long. **Inflorescence** a several-flowered, axillary male raceme up to 24 cm long, the female flowers solitary (but not known); the male flowers bearing fimbriate, bract-like leaves in the lower portion; flowers unisexual, plants monoecious. **Calyx** forming a calyx tube from the gradually expanding pedicel, divided at the top into 5 linear-lanceolate lobes 0.5–1.2 cm long, outer surface puberulent. **Corolla** sympetalous, salverform, white, with 5 obovate lobes up to 4 cm long fimbriate at the tip. **Ovary** inferior, with a slender style bearing 3 stigmas. **Stamens** of male flowers 3, free. **Fruit** a fleshy berry (pepo), not known. **Flowering** reported from May to September, fruiting time not known.

Distinguishable by its vine habit; axillary 2- or 3-branched tendrils; 3-lobed, heart-shaped alternate leaves; white axillary flowers solitary (female) or in racemes (male); distinctly fringed corolla lobes; and berry fruit.

SAVAII:

Whistler 73—Forestry Block 11 ca. 8 km along a forestry road from Āsau, no elevation given.

Whistler 6826—Open area on roadside along the road between Elietoga and Āsau at ca. 850 m elevation.

Whistler 10120—Montane forest above Sala'ilua at 975 m elevation.

UPOLU:

Graeffe 32A—Without further locality.

Reinecke 84—Native forest at Mulifanua, in clearings, trails, and rock walls.



EUPHORBIACEAE

Acalypha grandis Benth.

Acalypha insulana sensu auct. non Muell. Arg.

SAMOAN NAME: *si'usi'u pusi*

ENGLISH NAME: none

STATUS: rare indigenous or Polynesian cultigen

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: The areas of modern collection should be surveyed to see if the plant is still present and how frequently it is found there. It is likely that this plant is still found in relatively undisturbed coastal areas of most of the main islands, including Manono and Apolima.

Apparently a Polynesian introduction to Samoa, ranging from the Philippines eastward to Samoa. This occurs in coastal areas of Apolima, Manono, and 'Upolu, and all the main islands of American Samoa except, perhaps, Ofu. Since it is usually found in disturbed areas, such as along coastal trails, it appears to be a Polynesian introduction, but for what purpose is not known. No Samoan names, other than *si'usi'u pusi* ("cat's tail," but cats are a modern introduction into Samoa), or uses have been reported.

Shrub up to 2 (–5) m in height, with sericeous stems. **Leaves** simple, alternate; blade ovate, 10–21 cm long, subcordate at the base, acuminate at the tip; upper surface sparsely pubescent, lower surface glabrescent, 5-veined from the base; margins serrate; petiole 5–9 cm long, sericeous. **Inflorescence** of axillary spikes (female) or narrow axillary panicles (male) up to 21 cm long; flowers unisexual in separate inflorescences, trees monoecious; male flowers subsessile in dense, pubescent clusters, female flowers surrounded by a sheathing green bract up to 8 mm long with deeply toothed margins; rachis densely pubescent. **Calyx** of 4 small ovate sepals ca. 1 mm long, bearing stiff bristles. **Corolla** absent. **Ovary** of female flower superior, 3-celled, each cell with a single ovule; style divided into reddish filiform segments. **Stamens** of male flower 3, free. **Fruit** a tiny, green, 3-seeded, pubescent schizocarp 2–3 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its shrub habit; pubescent stems; large ovate leaves subcordate at the base; narrow axillary panicles (male) or spikes (female) flowers on separate plants; female flowers enclosed within a sessile, sheathing bract with toothed margins; and tiny green 3-celled schizocarp.

APOLIMA:

Rechinger 177—Coastal forest on the rim of the crater.

MANONO:

Reinecke 146—Without further locality.

Whistler 2409—Along trail near Faleū.



UPOLU:

Graeffe 59—Without further locality.

Graeffe 1568—Without further locality.

Whistler 3511—Near the coast between Lepā and Tāpaga.

SINE LOC:

Whitmee 20 (Kew, as *A. insulana*)—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (1), 'Aunu'u (2), Olosega (3), Ta'ū (2).

Acalypha sp. nova

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: The one area of collection of this species should be surveyed to see if more individuals can be found. Since it is not certain what the species is, even to genus, material from the one collected specimen should be sent to a lab to see if it can be identified by its DNA. Recommended for the Red List of Samoan plants.

Apparently endemic to Samoa, where it is rare in lowland forest of 'Upolu. It has been collected only once, reported from 300 m elevation. A.C. Smith noted a record of *Acalypha repanda* Muell. Arg. from Samoa, but without source or citation of specimens, so it is unclear why he noted this. It differs from that Fijian species by having glabrous foliage and a narrow rather than a cordate leaf base. It is possible that this species is not even an *Acalypha*,

so more material needs to be collected. No Samoan names or uses have been reported. Mueller-Arg.'s publication needs to be checked to see if he cites any specimens for his *Acalypha repanda* record.

Shrub 3 m in height, with glabrous or glabrescent stems. **Leaves** simple, alternate; blade elliptic to obovate, up to 30 cm long, attenuate to cuneate at the base, acuminate at the tip; surfaces glabrous, upper side darker than the lower; margins serrulate with minute teeth spaced 3–5 mm apart; petiole 5–25 mm long, glabrous. **Inflorescence** of axillary spikes; flowers probably unisexual in separate inflorescences, trees monoecious; male flowers (?) subsessile and densely packed on the rachis, subtended by a hirsute, ovate bract; female flowers unknown; **Calyx** unknown, probably of 4 small ovate sepals. **Corolla** absent. **Ovary** of female flower unknown, probably superior, 3-celled, each cell with a single ovule. **Stamens** of male flower unknown, probably 3, free. **Fruit** unknown, probably a tiny, green, 3-seeded, appressed-pubescent schizocarp 2–3 mm long. **Flowering** time probably at least in June, fruiting time unknown.

Distinguishable by its shrub habit; mostly glabrous stems; elliptic to obovate leaves attenuate to cuneate at the base; serrulate leaf margins; and narrow axillary spikes of male and female flowers on separate inflorescences and plants.

UPOLU:

Whistler 10142—Lowland near or on the Tavalagi Pass trail above Sauniatu at ca. 300 m elevation.



Phyllanthus virgatus Forst. f.

Phyllanthus simplex Retz.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous, or Polynesian adventive

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much that can be done for this species except to be on the lookout for its occurrence, and if it is found, then seeds should be collected for planting in a botanical garden. It is not clear if this wide-ranging is native to Samoa or of Polynesian introduction.

Indigenous or a Polynesian introduction to Samoa, ranging from Asia to Polynesia. This herb is uncommon in sunny or disturbed places in forests, reported from 40 to 260 m elevation. It originated in Malaysia or Southeast Asia, and is native or was possibly aboriginally introduced across the Pacific as far east as Tahiti. It was probably a common weed prior to the European era in Polynesia, but is now fairly uncommon due, most likely, to an inability to compete with more recently introduced weeds. It occurs along trails and in disturbed places, and in natural habitats such as dry streambeds and rock outcroppings where competition from other weeds is less. No Samoan names or uses have been reported.

Erect herb up to 50 cm in height, somewhat woody and branching near the base, with glabrous stems. **Leaves** simple (but superficially appearing to be pinnately compound), alternate, distichous; blade narrowly elliptic to oblong, 0.8–3 cm long, rounded to acute at the base, acute at the tip; surfaces glabrous; margins entire; petiole 0.5–1 mm long. **Inflorescence** of solitary, axillary, unisexual flowers borne on the lower side of the branchlets on pedicels 1–2 mm long on male flowers, 2–10 mm on female flowers (including fruiting pedicel); flowers unisexual, plants monoecious. **Calyx** synsepalous, ca. 0.5–1 mm long, deeply divided into 5 obovate lobes. **Corolla** absent. **Ovary** of female flowers superior, 3-celled, with a bifid stigma; ovary absent in male flowers. **Stamens** usually 5 (?), free, absent in female flowers. **Fruit** a green, globose capsule 2–3 mm in diameter, splitting into three 2-seeded segments. **Flowering** and fruiting occur continuously.

Distinguishable by its erect herb habit; small, narrow, simple alternate leaves on branchlets superficially appearing to be compound leaves; tiny green, unisexual, axillary flowers arranged on the lower side of the branchlets; and a tiny green, globose capsule.

SAVAII:

Vaupel 381—Without further locality (Bishop Museum: 27 February 1906).

Rechinger 1135—Dry rocky stream beds at the Patamea River.

Rechinger 1167—Dry rocky stream beds at the Patamea River.

Whistler 109—Plantation roadside between Tufu and Neiafu, only one seen, near sea level.

Whistler 1794—Dry streambed near Patamea at ca. 150 m elevation.



MANONO:

Reinecke 145—Without further locality.

UPOLU:

Graeffe 40—Without further locality.

Reinecke 46—On the coast, without further locality.

SINE LOC:

Powell 86—Without further locality.

Whitmee 175—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (3), Olosega (1), Ta'ū (3).

FABACEAE

Acacia simplex (Sparr.) L. Pedley

Acacia laurifolia Willd.

Acacia simplicifolia (L. f.) Druce

SAMOAN NAME: *tātānia* (or incorrectly, *tītānia*)

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: This is a wide-ranging species common in littoral habitats on other nearby archipelagoes. But because it is rare, its distribution in Samoa should be mapped and population size estimated. The small population reported on 'Upolu should also be checked to see if it is viable there. Its known habitat, beaches at the west end of Savai'i, should be preserved as much as possible.



Indigenous to Samoa, also found in Tonga, Futuna, and Melanesia. This tree is restricted to two places in Samoa—beaches and shores on the west end of Savai'i, and the southwest coast of 'Upolu at Matāutu where a single collection was once made, reported only near sea level. The wood was used for war clubs and boat keels, and seeds were strung into seed leis. For some reason, it is often called *tītānia* nowadays, which is the biblical word for "tares" (seeds).

Small tree up to 8 m or more in height (but usually much less), with glabrous, longitudinally striate stems; bark gray-brown, green beneath, inner bark reddish, wood light tan. **Leaves** simple, alternate; blade an elliptic to suborbicular phyllode mostly 7–16 cm long, attenuate at the base, acute to rounded or subretuse at the tip; surfaces glabrous, with 5–14 similar, parallel, longitudinal veins prominent on the lower surface and having irregular reticulations between them; petiole 3–6 mm long. **Inflorescence** of 30–50 flowers in an axillary head about 6 mm in diameter, on a peduncle 5–18 mm long borne on a short axillary branch, several usually forming on the branch but only a few maturing. **Calyx** campanulate, of 4 or 5 narrow subspathulate lobes less than 1 mm long. **Corolla** of 4–5 free, tiny yellow, oblancheolate petals ca. 1.5 mm long. **Ovary** superior, 1-celled, style filamentous with a small terminal stigma. **Stamens** numerous, yellow, showy, exerted, filaments 1–2 mm long. **Fruits** in clusters of several (up to 12 or more), narrow, oblong, flattened legumes 6–15 cm long, somewhat constricted between the 3–10 dark, oval seeds that are 5–7 mm long. **Flowering** reported from July and October to December, but probably occurring periodically throughout the year, the fruits long-persisting.

Distinguishable by its small tree habit, parallel-veined leaves (phyllodes), small yellow flowers in pedicellate axillary heads, and flattened pods (legumes) somewhat constricted between the seeds.

SAVAII:

Reinecke 503—Matāutu coast.

Vaupel 365—Manase (Bishop Museum: 16 August 1905).

Christophersen 939—Beach near Falelima.

Christophersen 1931—Beach at Āvao.

Christophersen 2460—Beach at Sāfotu-Manase.

Christophersen 2774—Sandy shore near Faleālupo.

Whistler 100—One sapling on a sandy beach between Faleālupo and Tufutafoe.

Whistler 994—Shore east of Āsau Bay.

Whistler 3891—Shore east of Āsau Bay.

Whistler 8238—Shore at the south end of Faleālupo.

Whistler 11563—Littoral forest on the northeast side of Āsau Bay.

UPOLU:

Whistler 8373—Rocky coastal peninsula just west of a little bay between Matāutu and Sa’anapu.

SINE LOC:

Whitmee 202—Without further locality.

Millettia pinnata (L.) Panigrani

Cytisus pinnatus L.

Pongamia glabra Vent.

Pongamia pinnata (L.) Pierre

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the Lefaga Bay area to see if the species is still present, and if so, in what numbers. This is a common species on beaches in Melanesia, and Samoa is its farthest penetration into Polynesia.

Indigenous to the Samoa, ranging from the Seychelles Islands to Samoa. It is rare in littoral forest on three of the islands: 'Upolu on the edge of Lefaga Bay, Tutuila around Tafuna Bay; and Ta'ū in lowland forest on the northwest quarter of the island, reported near sea level to ca. 100 m elevation. It is considered to be a useful timber tree in Fiji, where it is more common, but has no Samoan name or reported uses.

Large tree up to 20 m in height, with glabrous stems; bark light gray, rough with large lenticels, sometimes flaky, inner bark thick, light orange streaked with darker orange, wood white. **Leaves** odd-pinnately compound, alternate; rachis 12–30 cm long, swollen at the base; leaflets 5 or 7, opposite; blades ovate to oblong or elliptic, mostly 5–16 cm long, broadly acute to cordate at the base, acute to acuminate at the tip; surfaces glabrous, upper side darker, with veins prominent on the lower surface; margins entire; petiolules dark green, thick, 4–7 mm long. **Inflorescence** an axillary raceme or panicle of many-flowered racemes 4–25 cm long, with the flowers typically paired or in few-flowered clusters. **Calyx** cup-shaped, purple, 3–4 mm long, rim unlobed, on a pedicel 5–9 mm long. **Corolla** papilionaceous; standard suborbicular to obovate, notched at the tip, 7–10 mm long, mauve with green in the middle; wings and keel oblong and similar in size and color to the standard. **Ovary** superior with a short style and small stigma. **Stamens** 10, diadelphous, fused into a tube with 1 free at the base but connate to the others above the middle, enclosed within the keel. **Fruit** a brown, 1-seeded, oblong to ellipsoid legume 3.5–6 cm long. **Flowering** reported in July, and fruiting in July and October, but both probably occurring anytime during the year.

Distinguishable by its large tree habit; pinnately compound leaves with 5 or 7 leaflets; racemes or panicles of purple, butterfly-like flowers; and elliptic, 1-seeded pod (legume).

UPOLU:

Bristol 2372—*Inocarpus* grove between Matāutu and Salamumu at Lefaga Bay, near sea level.

OTHER SAMOAN COLLECTIONS: Tutuila (2), Ta'ū (3).



Senna sophera (L.) Roxb.

Cassia sophera L.

SAMOAN NAME: *lau matui*

ENGLISH NAME: none

STATUS: rare Polynesian adventive

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much that can be done for this species, since it appears to be a Polynesian weed that has lost out in competition with more recently introduced weeds. Perhaps a botanical survey of disturbed areas of the Falealupo peninsula, and asking people if they know the name *lau matui*. However, this name may now apply to the more recently introduced *Senna occidentalis*.

A Polynesian introduction to the archipelago, native to and widespread in the Old World Tropics. This subshrub is known in Samoa only from three collections—Savai'i (in 1905), Tutuila (in 1920); and without further locality (the late 19th century). It occurs in disturbed places, reported only from the lowlands. It has apparently been unable to successfully compete with more recently introduced, more aggressive alien weed species, including a closely related species, *Senna occidentalis*. *Lau matui* may have possibly been used medicinally (for treating ringworm), but the plant, its name, and its possible use have now been virtually forgotten in Samoa.

Erect subshrub up to 2 m in height, with reddish, glabrate stems. **Leaves** even-pinnately compound, alternate; rachis 7–18 cm long, with a pair of clavate to cylindrical glands at the base; leaflets 6–12 pairs; leaflet blades lanceolate to ovate, mostly 1.5–3.6 cm long, unequally acute at the base, acuminate at the tip; surfaces glabrous; margins entire; petiolules 1–2 mm long. **Inflorescence** an axillary, 4–10-flowered raceme 3–5 cm long, bearing subacute to obtuse bracts. **Calyx** of 5 free, ovate sepals ca. 3.5–5 mm long, pedicel ca. 5–7 mm long (longer in fruit). **Corolla** of 5 free, yellow, obovate petals ca. 8–12 (?) mm long. **Ovary** superior, 1-celled, with a simple style. **Stamens** 10, free, some reduced to staminodes. **Fruit** a linear legume 6–9.5 cm long, bearing seeds in two rows. **Flowering** and fruiting occur continuously.

Distinguishable by its subshrub habit; alternate, pinnately compound leaves, often with a pair of club-shaped glands at the base of the rachis; 6 to 12 pairs of ovate leaflets; yellow, 5-parted flowers; and a narrow, flattened pod (legume) 6–9.5 cm long, with seeds in two rows.

SAVAII:

Rechinger 5313—Common in dry sunny lava flows near the sea at Sātaua.

SINE LOC:

Powell 105 (author's Kew list, n.s.?)—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (1, 1920).



Sophora tomentosa L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: A botanical survey of the coast from Poutasi to Salani to see if the Tafatafa population is the only one present in Samoa, and to count and map the individuals present. This is often a common atoll species in the region, and perhaps does not do well on volcanic islands.

Indigenous to Samoa, pantropical in distribution. It is rare but locally common in several places on the seaward side of littoral vegetation on 'Upolu (Tafatafa), Tutuila (Nu'uuli), 'Aunu'u, and Ofu (near the airport), reported only near sea level. This shrub is much more common in adjacent archipelagoes, but for some reason is restricted in Samoa to the places noted above. The shrub is virtually unknown to Samoans except those living near to where it is found, and no uses or native names have been recorded.

Shrub up to 6 m in height with appressed-pubescent young stems. **Leaves** odd-pinnately compound, alternate; rachis mostly 14–30 cm long; leaflets opposite, mostly 13–23; leaflet blades unequally sided, oblong to nearly round, 2–6 cm long, rounded at the tip and base; upper and lower surfaces pubescent, gray-green; margins entire; petiolules 1–3 mm long. **Inflorescence** of many-flowered axillary or terminal racemes 10–30 cm long. **Corolla** papilionaceous, yellow, 1.3–2.1 cm long, banner obovate to rounded, wings oblong. **Ovary** superior, with a simple style. **Stamens** 10, diadelphous, enclosed within the keel. **Fruit** a legume 7–15 cm long, greatly constricted between the 2–8 subglobose seeds.

Distinguishable by its shrubby habit; silvery, pinnately compound leaves; racemes of yellow, butterfly-like flowers; and legume 7–15 cm long constricted between the seeds.

UPOLU:

Christophersen 974—Sandy beach between Poutasi and Salani on the southeast coast.

Whistler 7049—Tafatafa beach.

Whistler 8121—Beach west of Vāovai.

SINE LOC:

Powell 273—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (2), 'Aunu'u (1), Ofu (4).



Vigna adenantha (G. F. W. Meyer) Maréchal,
Mascherpa, & Stainier

Phaseolus adenanthus G. F. W. Meyer

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much that can be done for this species, since it is widely distributed but rare. Perhaps a survey of relatively undisturbed marshes, which seems to be one of its preferred habitats.

Probably indigenous to Samoa, pantropic in distribution. This vine is found in scattered localities in Samoa, where it has been reported from all the main islands except perhaps Olosega. It occurs mostly in coastal areas, marshes, and plantations, reported only from the lowlands. No uses or Samoan names have been reported.

Herbaceous vine, climbing or sprawling, perennial, with strigulose stems up to 4 m in length, and oblong to ovate stipules 3–5 mm long. **Leaves** trifoliate, alternate; rachis 4–14 cm long; leaflet blades ovate to rhomboid, mostly 5–7 cm long, broadly acute to rounded at the base, obtuse to acute and often mucronulate at the tip; surfaces sparsely appressed pubescent, often with conspicuously reticulate venation; petiolules 2–5 mm long, densely pubescent. **Inflorescence** a 6–12-flowered raceme 9–20 cm long. **Calyx** bilabiate, 4–10 mm long, unevenly 4-lobed about halfway into acuminate lobes. **Corolla** papilionaceous, white in color and tinged with pink or purplish blue; banner 1.5–2.5 cm in diameter; wings slightly shorter than the standard; keel about 5 cm long, curved into 2 or 3 spirals. **Ovary** superior, 1-celled, style linear. **Stamens** 10, enclosed within the keel, diadelphous with 9 of the filaments fused together. **Fruit** a narrowly oblong legume 8–14 cm long, containing 9–15 dark reddish brown seeds. **Flowering** reported from April to October, fruiting from May to August, but both probably occur throughout the year.

Distinguishable by its prostrate to weakly climbing vine habit; alternate trifoliate leaves; lavender and white, contorted papilionaceous flowers; and narrowly oblong pod.

SAVAII:

Rechinger 1652—Lava flow near Sāsina.

Christophersen 1890—Abandoned plantation behind Vaipōuli at 100 m elevation.

Christophersen 2461—Lava flow near Sale’aula.

Whistler 8185—Disturbed area above the village of Tafuatai.

Whistler 8289—Roadside disturbed place just west of Sāsina, near sea level.

UPOLU:

Rechinger 352—Dry sunny places near Moto’otua.

Rechinger 432—Dry sunny places near Moto’otua.

Whistler 238—Roadside near Faleula, near sea level.



SINE LOC:

USEE s.n. (Samoa and Tahiti)—Without further locality (not listed in Pickering 1876).

Powell 355—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (6), Ofu (2), Ta'ū (1).

FLACOURTIACEAE

Casearia samoensis Whistler

Myroxylon suaveolens sensu Setchell non Forst.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare archipelago endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the eastern 'Upolu mountains to see if the tree is found in places other than just the rim of Fogālepolo Crater. Leaf material can be sent to some lab to determine by DNA analysis if this sterile specimen really belongs to species that is otherwise endemic to Tutuila.

Endemic to Samoa, where it is occasional in lowland forest on Tutuila, and was collected twice in foothill forest on eastern 'Upolu, reported from near sea level to 400 m elevation.

No names or uses have been reported, probably because it is too small and too uncommon to be recognized or used by Samoans. The 'Upolu specimens could conceivably belong to a new species, but without fruit or flowers, this is impossible to determine. No Samoan names or uses are reported. A survey of the area during the fieldwork for this project in July 2010 turned up the second sterile specimen.

Small tree up to 6 m in height, with glabrous, longitudinally striate, somewhat zigzag stems marked with small, light-colored lenticels, and caducous ovate stipules up to 3 mm long. **Leaves** simple, alternate, distichous; blade coriaceous, elliptic to obovate, 10–24 cm long, rounded to acute and shortly decurrent at the base, acuminate to broadly acute at the tip (rarely rounded or emarginate); surfaces glabrous, mostly with 4–8 pairs of looping secondary veins; margins entire; petiole 8–21 mm long. **Inflorescence** of axillary, many-flowered (ca. 18–25 flowers) clusters. **Calyx** of 4 petaloid, white, ovate to suborbicular, concave sepals ca. 5–7 mm long, subtended by 2 ovate sepal-like bracts 2–3 mm long, on a pedicel up to 1.3 cm long at anthesis bearing tiny bracts at the base. **Corolla** absent. **Ovary** superior, with a short style and capitate stigma. **Stamens** 10, free, alternating with 10 staminodes hairy at the tip. **Fruit** an ovoid capsule up to 2 cm long, usually 1 or 2 forming per axil, seeds many, surrounded by a red aril. **Flowering** reported in June, July, and October, fruiting in August, October, and December, but both may occur throughout the year since the related *Casearia richii* of Fiji has flowers and fruits “to be expected in any month.”

Distinguishable by its small tree habit; zigzag stems; elliptic to ovate leaves borne on the stem in one plane; axillary clusters of bisexual, white, 4-parted flowers; and ovoid capsule containing red seeds.

UPOLU:

Whistler 7073—Sapling on the rim of Fogālepolo Crater east of Lemafa Pass, ca. 400 m elevation.

Whistler 12152—Sterile small tree on the north rim of Fogālepolo Crater.

OTHER SAMOAN COLLECTIONS: Tutuila (10).



GESNERIACEAE

Cyrtandra campanulata Reinecke

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much that can be done for this species since it has been collected in several places, but not since about 1893, and all specimens are lacking in elevation data. On the other hand, its collection from the central mountain region of Savai'i may indicate it is a montane forest species. If so, it may turn up in proposed botanical surveys of that area. Recommended for the Red List of Samoan plants.

Cyrtandra denhamii Seem. var. *glaberimma* Reinecke

Endemic to Samoa, where it is restricted to 'Upolu and Savai'i. It occurs in lowland to montane forest, without specified elevations. It has not been collected in over a century and may be extinct. No Samoan names or uses have been reported.

Shrub up to 2 m in height, with pubescent young foliage. **Leaves** simple, opposite; blade lanceolate, 9–27 cm long, attenuate at the base, acute to acuminate at the tip; upper surface glabrous at maturity, lower surface glabrous to puberulent; margins entire; petiole 1–3.5 cm long. **Inflorescence** 3–5-flowered axillary cymes on a tomentose peduncle 2–8.5 cm long terminated by a pair of linear bracts ca. 2 mm long. **Calyx** 1.2–1.4 cm long, split $\frac{1}{2}$ to $\frac{3}{4}$ of its length in 5 equal, lanceolate, acuminate lobes puberulent on the outside, on a pedicel 1–2.5 cm long. **Corolla** sympetalous, bilabiate, ca. 5.5 cm long, split 1–1.5 cm into rounded, unequal lobes, glabrous on the outside. **Ovary** superior, 1-celled, glabrous, surrounded by a cupulate annular disc with an entire margin; style ca. 1.2 cm long, bearing glandular-capitate hairs, with a bilobed stigma. **Stamens** 2, epipetalous, included; staminodes 3. **Fruit** a cylindrical, orange (?) berry 2–2.5 cm long with a rounded apex topped by the persistent 1 mm long style base. **Flowering** and fruiting times not known, but probably occurring throughout the year.

Distinguishable by its shrub habit; pubescent young foliage; opposite lanceolate leaves with entire margins; 3–5-flowered cymes with a pair of short linear bracts at the top of the peduncle; puberulent calyx; white, bilabiate flowers; and a fleshy cylindrical berry less than 3 cm long.

SAVAII:

Reinecke 361—Central montane region. (Specimen stored at Edinburgh, Smithsonian, Geneva, and Warsaw.)

UPOLU:

Reinecke 411—"Letogo-Fall." (Specimen stored at Warsaw.)

Reinecke 571—Central montane region in shady native forest. (Specimen stored at Geneva.)

Rechinger 982—Shady forest in deeply dissected, shady river valleys above Utumapu. (Specimen stored at Vienna.)

SINE LOC:

Powell 352—Without further locality. (Specimen stored at Kew.)



Cyrtandra funkii Reinecke

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, no modern collections, probably extinct

SUGGESTED ACTION: There is not much that can be done for this species since it has been collected in several places on 'Upolu, but not since about 1893, and all specimens are lacking in elevation data. On the other hand, its collection from the central mountain region of 'Upolu may indicate it is a montane forest species. If so, it may turn up in future botanical surveys of that area. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to 'Upolu. Its habitat and elevational range are not known, since the species is known only from four specimens collected in the late 1800s, with no locality other than 'Upolu noted. No Samoan names or uses have been recorded.

Shrub (no size recorded) with brown-pubescent young parts. **Leaves** simple, opposite; blade elliptic-ovate, 11–25 cm long, acuminate at the base and tip; surfaces pubescent; margins serrate; petiole 1.5–6 cm long. **Inflorescence** an axillary, 8–10-flowered, axillary, 2-branched cyme on a puberulent peduncle 7.5–15 cm long, terminated by a pair of bracts (not seen), each branch subtended by a pair of bracteoles ca. 1 cm long. **Calyx** ca. 8 mm long, split $\frac{3}{4}$ of its length into 5 equal, lanceolate, acuminate lobes, glabrous. **Corolla** sympetalous, salverform, white, ca. 4.2 cm long, split about $\frac{1}{4}$ of its length into 5 unequal rounded lobes. **Ovary** superior, 1-celled, glabrous, surrounded by an annular disc with an entire margin; style ca. 2.4 cm long (with ovary). **Stamens** 2, epipetalous, included; with 3 staminodes. **Fruit** not known, but a fleshy berry. **Flowering** and fruiting times not known, but probably occurring throughout the year.

Distinguishable by its shrub habit; pubescent foliage; opposite leaves with serrate margins; axillary cymes of several white, deeply split, glabrous calyx; white salverform flowers over 4 cm long; 2 stamens; and fleshy berry.

NOTE: Despite an email agreement from Hamburg herbarium to photograph one of their three species belonging to this species, and a follow up enquiry from the author, the task was never completed.

UPOLU:

Reinecke 592—Central mountain region. (Specimen apparently lost.)

Graeffe 55a—Without further locality. (Specimen stored at Hamburg.)

Graeffe 93—Without further locality. (Specimen stored at Hamburg.)

Graeffe 498—Without further locality. (Specimen stored at Hamburg.)

NOTE: Photo of herbarium specimen not obtained.

Cyrtandra guerkeana Lauterb.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, no modern collections, probably extinct

SUGGESTED ACTION: There is not much that can be done for this species since it has not been collected in Samoa since about 1906. On the other hand, its collection from the central mountain region of Savai'i may indicate it is a montane forest species. If so, it may turn up in proposed botanical surveys of that area. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. It occurs in montane to cloud forest, reported from 1200 to 1600 m elevation. It may now be extinct since it has not been collected since ca. 1906, but since it is a montane species, it may be found during more searching in the mountainous interior. No Samoan names or uses have been reported.

Shrub (no height recorded) with pubescent stems. **Leaves** simple, opposite; blade elliptic to ovate, 13–27 cm long, acute to rounded at the base, acute to acuminate at the tip; surfaces pubescent, upper surface villose, lower surface with shorter hairs; margins serrate; petiole 4–6 cm long. **Inflorescence** an axillary, 3–8-flowered cyme on a peduncle 1–1.5 cm long terminated by a pair of ovate bracts 4.5–5 cm long, the branches with bracteoles 2–2.5 cm long. **Calyx** campanulate, 1.3–2 cm long, split into 5 unequal acute lobes 3–5 mm long, on a pedicel 1–2 cm long. **Corolla** sympetalous, bilabiate, pale (?) yellow, ca. 2.7 cm long, unequally cleft into 5 lobes 0.4–1 cm long, villose on the outside, glandular-pubescent within. **Ovary** superior, 1-celled; style ca. 1 cm long, bilobed at the tip. **Stamens** 2, epipetalous, included; with 3 staminodes. **Fruit** a subglobose (?), orange (?) berry ca. 2 cm long, with a persistent 1–2 mm long style base and persistent calyx. The fruit is insufficiently known, at least at Bishop Museum. **Flowering** and fruiting times not known, but probably occurring throughout the year.

Distinguishable by its shrub habit; pubescent foliage; opposite leaves with serrate margins; axillary cymes of yellowish, bilabiate flowers; 2 fertile stamens; and fruit a berry enclosed within the persistent calyx.

SAVAII:

Powell 227—Without further locality. (Specimen stored at Kew.)

Vaupel 489—(Bishop Museum: behind Maugaloa, 16 May 1906. Bishop Museum: near Maugaloa at 1200 m elevation, 30 June 1906. Bishop Museum photo: montane forest at Mata'ana, elevation not recorded, 11? October 1905. Cited by Lauterbach, possibly at Berlin: Mata'ana, at 1600 m elevation, 20 September 1906). (Other specimens stored at Hamburg, Munich, and Warsaw.)

Vaupel 664—A questionable record listed from Berlin, but not in the literature.

Vaupel 677—(Bishop Museum: without further locality, labeled as "*Saurauria*," a genus not found in Samoa, 1905 without further date).



Cyrtandra mamolea Reinecke

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, no modern collections, possibly extinct

SUGGESTED ACTION: There is not much that can be done for this species since it has been collected only twice on 'Upolu, but not since about 1893. The sole elevation record is 600 m, so it may not be a high elevation species and hence greatly endangered, if not already extinct. It may turn up in future botanical surveys of that area. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it occurs only from 'Upolu. It is known from only two collections in montane forest, reported from ca. 600 m elevation. It is possibly now extinct since it has not been collected for 115 years. No Samoan names or uses have been reported.

Shrub up to 3 m in height, with glabrous stems. **Leaves** simple, opposite; blade elliptic-lanceolate, 12–20 cm long, acuminate at the base, acuminate at the tip; surfaces glabrous; margins entire; petiole 2.5–4 cm long. **Inflorescence** an axillary, several-flowered cyme bearing bracts and bracteoles. **Calyx** 5–9 cm long, split 2/3 or more of its length into a 5 equal lobes, borne on a pedicel. **Corolla** sympetalous, bilabiate, white (?), ca. 1 cm long. **Ovary** superior, 1-celled, glabrous; style bilobed at the tip. **Stamens** 2, epipetalous, included, with 3 staminodes. **Fruit** a berry with a persistent style base ca. 1 mm long. (Extant specimens are lacking in flowers, and no specimens are stored at Bishop Museum.) **Flowering** and fruiting times not known, but probably occurring throughout the year.

Distinguishable by its shrub habit; glabrous foliage; elliptic-lanceolate, opposite leaves; several-flowered axillary cymes; bilabiate white corolla; 2 stamens; and berry with a persistent style base.

UPOLU:

Graeffe 16—Near Lake Lanoto'o at 600 m elevation. (Specimen stored at Vienna.)

Reinecke 233—Falevao Mountain (near Lemafa

Pass). (Specimens stored at Edinburgh and Geneva.)



GYROCARPACEAE

Gyrocarpus americanus Jacq.

SAMOAN NAME: *vili, vilivili; moa*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of the coastal forest from the Falealupo peninsula to Āsau Bay, especially near Fagalele Bay, to determine the distribution and frequency of the species in its only known area of collection in independent Samoa since 1905. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, ranging throughout the tropics. This tree is very rare in Samoa, where it has been reported only from Ofu (Nu'utele Islet, 1922), 'Aunu'u (in the 1850s or 1860s?), and the western tip of Savai'i (recently) in coastal and lowland forest. It is rare throughout its Polynesian range (as far east as the Society Islands) at least and is possibly extirpated from some of the islands where it formerly occurred. Its Samoan name is *vili* or *vilivili* (which mean to spin) or *moa* (which means chicken), all of which refer to the fluttering or spinning motion of the winged fruit thrown in the air by playful children, a use reported throughout the tree's Polynesian range. No other uses are reported. The species was seen but not collected during project field work in July 2010.

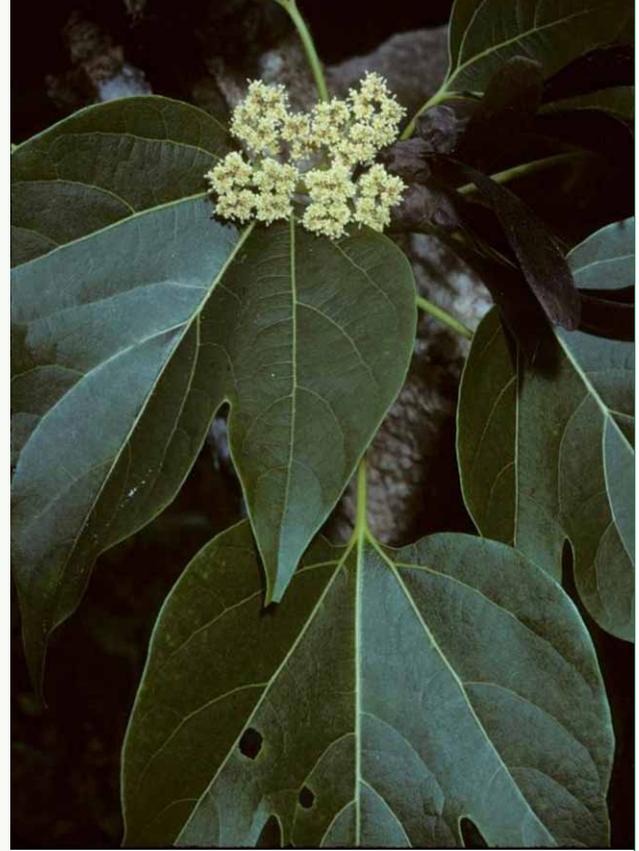
Medium-sized tree up to 18 m in height, but usually much less, with subglabrous stems, and when old, with a thick gnarled trunk; bark tan, smooth except for scattered horizontal ridges, vertical shallow grooves, and vertical rows of conspicuous, corky lenticels. **Leaves** simple, alternate, often crowded at the branch tips and nearly deciduous during flowering; blade ovate to subround and often 3-lobed, 10–26 cm long, rounded to subcordate at the base, narrowly acute to attenuate at the tip; upper surface glabrous, lower side pubescent; margins entire to lobed; petiole 7–25 cm long.

Inflorescence of upper-axillary, many-flowered cymes up to 15 cm long in fruit (much shorter at anthesis); flowers unisexual, plants monoecious, male flowers many and borne

towards the upper portion of the cyme, female or bisexual flowers fewer and borne towards the base.

Calyx usually of 7 elliptic, white sepals ca. 1 mm long, puberulent on the outside, 2 of which enlarge after anthesis to form wings, on a pedicel 2–12 mm long.

Corolla absent. **Ovary** of female flowers superior, with a sessile capitate stigma; ovary vestigial in male



flowers. **Stamens** of male flowers 3–5, free, with or without staminodes, stamens present or absent in female flowers. **Fruit** a brown, pendulous, ovoid to ellipsoid drupe 1.2–1.6 cm long, with 2 prominent ob lanceolate wings up to 9 cm long, surfaces puberulent. **Flowering** seasonal, reported from April to September, fruiting from July to January.

Distinguishable by its medium-sized tree habit; often thick trunk; alternate, long-stalked, often palmately lobed leaves; small white flowers in axillary cymes; and dry, ovoid fruit bearing two long, prominent wings.

SAVAII:

Rechinger 1034—Strand near Sāfata.

Rechinger 1967—Strand near Sāfata.

Whistler 4250—Just west of the Public Works house at Āsau, at ca. 20 m elevation.

Whistler 6845—Several spaced trees in the forest just east of Fagalele Bay, Faleālupo, at ca. 20 m elevation.

Whistler 11466—Forest just east of Fagalele Bay, Faleālupo, at ca. 20 m elevation.

Whistler 11734—Just west of the Public Works house at Āsau, at ca. 20 m elevation.

Whistler 11793—Open roadside area along the road from Papauta and Papatai, ca. 30 m elevation.

OTHER SAMOAN COLLECTIONS: ‘Aunu’u (1, ca. 1860), Ofu (1, in 1925).

LAMIACEAE

Leucas decemdentata (Forst. f.) Sm.

Leucas flaccida R. Br.

SAMOAN NAME: *ogoogo sina?*

ENGLISH NAME: none

STATUS: rare Polynesian adventive or indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much that be done for this Polynesian weed, because it has not been collected in independent Samoa since 1931. However, the coastal bluffs near Papa, Savai'i, should be checked to see if any individuals have survived there.

Indigenous or a Polynesian introduction to Samoa, ranging from tropical Asia to the Society Islands. This small herb was probably weedy in pre-European times but is now rare apparently because of its inability

to compete with more-recently introduced weeds. It occurs in sunny rocky coastal areas, such as streambeds, reported from near sea level to 150 m elevation. The herb has been recorded from Savai'i and 'Upolu in independent Samoa, and Ofu, and Ta'ū in American Samoa, but has possibly now been extirpated from the independent Samoa, where it hasn't been collected in over 60 years. It is perhaps more common in eastern part of it range, i.e., Asia. Possibly once called *ogoogo sina* in Samoan, and formerly used in native remedies. It is doubtful if anybody in Samoa still knows this plant.

Herb up to 40 cm or more in height, with weak, pubescent, 4-angled stems. **Leaves** simple, alternate; blade ovate, 2.5–3.5 cm long, acute to rounded and slightly oblique at the base, broadly acute at the tip; surfaces light green, finely pubescent; margins crenate; petiole 9–11 mm long. **Inflorescence** of 5–8-flowered axillary verticils borne at the axils. **Calyx** campanulate, 4.5–6 mm long, pubescent, 10-ribbed, ribs extending into 10 linear teeth on top, on a pedicel 1–2 mm long. **Corolla** sympetalous, bilabiate, white, tube ca. 7 mm long, lower lip reflexed, pubescent, 3–4 mm long, lower lip 6–7 mm long, 3-lobed at the tip with an additional pair of lateral lobes. **Ovary** superior, deeply 4-lobed, style 2-lobed at the tip. **Stamens** 4, epipetalous, enclosed within the lower lip. **Fruit** comprising 4 dark, oblong nutlets ca. 1.5 mm long, enclosed within and falling free of the membranous calyx. **Flowering** and fruiting occur continuously.

Distinguishable by its herbaceous habit; square (in cross-section) stems; opposite, toothed, ovate leaves; axillary whorls of flowers; white, 2-lipped corolla; and fruit of 4-nutlets enclosed within the membranous, 10-toothed calyx.

SAVAII:

Vaupel 252—Manase (Bishop Museum: 12 August 1905).

Rechinger 663—Dry places between Ā'opo and Āsau.

Christophersen 3417—Rock bluff near Papa.



UPOLU:

Graeffe 1484—Without further locality.

Reinecke 52—Āpia.

Reinecke 67—Mulifanua.

Rechinger 1858—Stream banks at Papase'ea waterfall.

SINE LOC:

USEE?—"Manu'a, Tutuila, 'Upolu, and Savai'i."

Powell 39—Without further locality.

Whitmee 58—Without further locality.

OTHER SAMOAN COLLECTIONS: Ofu (2), Ta'ū (7).

LOGANIACEAE

Strychnos vitiensis A. W. Hill

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey along the sides of the Mali'oli'o Stream on Savai'i, its only known area of location. If found, propagation material should be collected and grown in a botanical garden. Since the plant is sterile, it is possible that it is a new species.

Indigenous, also found in Fiji. It is only recorded from lowland forest on Savai'i, where it has been collected only once, reported from 300 m elevation. No Samoan names or uses have been reported.

Liana, high climbing, with glabrous stems and paired terminal, unbranched tendrils. **Leaves** simple, opposite; blade coriaceous, ovate to elliptic, 5–12 cm long, rounded to cuneate at the base, acute to obtusely cuspidate at the tip; surfaces glabrous, 5- or 7-nerved from near the base; margins entire; petiole 5–15 mm long. **Inflorescence** of axillary, many-flowered, widely branching panicles 5–9 cm long, the flowers ultimately in dense cymes of 3–7 flowers. **Calyx**

subrotate, broadly and shallowly 5-lobed, ca. 1 mm long; on a pedicel up to 1 mm long. **Corolla** sympetalous, pale yellow, subrotate at anthesis, 2–2.7 mm long, divided more than halfway into 5 ovate lobes. **Ovary** superior, with a thick style and minutely capitate stigma. **Stamens** 5, epipetalous, included. **Fruit** a yellowish to brownish green, subglobose berry 2.5–3.5 cm in diameter. **Flowering** has been reported in August and September, fruiting in November and December and April to June, but both probably occur throughout the year. (Description is from Fijian specimens, since the sole Samoan specimen is sterile.)

Distinguishable by its liana habit; paired terminal, unbranched tendrils; opposite leaves palmately veined from near the base; axillary panicles of tiny pale yellow flowers; and a subglobose yellowish berry 2.5–3.5 cm in diameter.

SAVAII:

Whistler 1775—Climbing on tree in "Ā'opo West" Forestry block near Ā'opo at ca. 300 m elevation.

(This specimen, stored at the University of Hawai'i, could not be located during the present study; one duplicate has been noted, but it is not known where this specimen is now.)



LYTHRACEAE

Pemphis acidula Forst.

SAMOAN NAME: *gigie?*

ENGLISH NAME: pemphis

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoan distribution, rarity of collections

SUGGESTED ACTION: Botanical survey of the coast between Taga and Sala'ilua to find and the population or populations reported from there. Determine the GPS coordinates of all extant populations. This shrub is characteristic of and common on regional atolls rather than volcanic islands.

Indigenous to Samoa, native from tropical East Africa eastward to eastern Polynesia (Pitcairn, but not the Marquesas), and found on most of the limestone islands and atolls in this range. It has been recorded from only two places in Samoa—on the southeast Savai'i coast between Salelologa and Tafua and on the rock-bound coast at Aveave (not on Samoan maps) between Taga and Sala'ilua; reported only near sea level. It often forms a mono-dominant association as a low shrub comprising the outermost fringe of vegetation on limestone coasts elsewhere in Oceania, and is also common on sandy shores or raised reefs of atolls, where it often is a small tree instead. The only record of its Samoa name is the *gigie* recorded by Powell (1868), and no uses have been reported.

Small tree or shrub up to 4 m or more in height, often prostrate on rocks, stems somewhat 4-angled, dark brown, pubescent when young. **Leaves** simple, opposite, decussate, clustered at the ends of the branches; blade somewhat fleshy, oblanceolate, 1–3 cm long, attenuate at the base, acute at the tip; both surfaces appressed-pubescent; margins entire; subsessile. **Inflorescence** of solitary, axillary flowers. **Calyx** campanulate, 7–8 mm long, ca. 18-ribbed, and with 6 short deltoid lobes and a smaller lobe between each, on a pedicel 5–15 mm long. **Corolla** of 6 free, white, wrinkled, elliptic to ovate, caducous petals 6–8 mm long. **Ovary** superior, style short, filiform, with a capitate stigma. **Stamens** 12, free, borne on the inside of the calyx. **Fruit** a reddish, obovoid to ellipsoid or globose capsule 3–5 mm in diameter, enclosed within the calyx tube, opening by means of a cap to release the many angular seeds. **Flowering** and fruiting occur throughout the year.

Distinguishable by its small tree or shrub habit; opposite, oblanceolate leaves; small solitary, axillary flowers; distinctly ribbed calyx; corolla of 6 free white petals; and small capsule that opens by means of a terminal cap.

SAVAII:

Christophersen 931—On rocky shore at Aveave (not on Samoan maps) between Sala'ilua and Taga.

Hellqvist 3030—Without further locality.

Whistler 2202—Locally abundant in one place only on the coast south of Sālelologa.

Whistler 11331—Locally abundant in one place only on the coast south of Sālelologa.



MALVACEAE

Abutilon whistleri Fosb.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical survey of the montane region of Savai'i, especially the north-central slope of the island, to determine its frequency.

Endemic to Samoa, where it is restricted to montane and cloud forest on Savai'i, reported from ca. 800 to 1400 m elevation. No Samoan names or uses have been reported, since this plant is inconspicuous and found only at high elevations. It is most closely related to three species in eastern Polynesia. Recommended for the Red List of Samoan plants.

Medium-size to large tree up to 18 m in height, with stellate-pubescent stems. **Leaves** simple, alternate; blade ovate to cordate, 8–18 cm long, cordate at the base, acuminate at the tip; surfaces stellate-pubescent, particularly the lower side; margins irregularly denticulate; petiole 5–6 cm long, stellate-pubescent. **Inflorescence** an axillary, few-flowered raceme up to 10 cm long, with a stellate-pubescent rachis. **Calyx** campanulate, up to 1 cm long, divided about halfway into 5 oblong-ovate, blunt-tipped lobes, velvety-pubescent on the outside, on a pedicel 1–2 cm long. **Corolla** of 5 obovate, white petals ca. 2 cm long. **Ovary** superior, 5-celled, with a 5-lobed stigma. **Stamens** many, monadelphous. **Fruit** a green, depressed-globose capsule 1.2–1.4 cm across, truncate at the top, divided into 19 or 20 segments, stellate-pubescent. **Flowering** reported in June, fruiting in September, but both probably of longer duration.

Distinguishable by its tree habit; alternate, heart-shaped leaves; stellate-pubescence covering most of the surfaces; white flowers with monadelphous stamens; and a many-segmented capsule.

SAVAII:

Christophersen 2677—Montane forest behind Sala'ilua at 1300–1400 m elevation.

Whistler 2476—Montane forest above Ā'opo at ca. 1140 m elevation.

Whistler 10243—Montane forest above Ā'opo at ca. 1120 to 1320 m elevation.



Gossypium hirsutum L.

Gossypium religiosum sensu auct. non L. (?)

SAMOAN NAME: *vavae*

ENGLISH NAME: Polynesian cotton

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of Apolima island to map the distribution and determine the frequency of this shrub on the island. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, widespread from Fiji eastward to South America and perhaps north to Micronesia. The indigenous variety in Samoa, var. *taitense* Roberty, is reported to be found “sparingly” in Fiji, and appears to be uncommon over most of its Pacific range. It is rare in exposed coastal areas of Tutuila, Ofu, ‘Aunu’u, and Apolima, and a single seedling was once found on Rose Atoll, reported from near sea level to about 100 m elevation. No uses have been reported for this species. The name *vavae* is generally given to introduced cotton species (and the introduced kapok tree), but it may have originally only referred to the native cotton.

Shrub mostly less than 1 m in height, with foliage and other parts covered with tiny black glands. **Leaves** simple, alternate; blade usually broadly palmately 3-lobed, 3–12 cm long and nearly as wide, cordate at the base, acuminate at the tip; surfaces mostly glabrous, but gland-dotted on both sides; margins entire other than the lobes; petiole 2–6 cm long. **Inflorescence** of solitary axillary flowers borne on a pedicel 2–4 cm long. **Calyx** shallowly cup-shaped, indistinctly 5-lobed, 6–10 mm long, subtended by an epicalyx of 3 deeply toothed bracts. **Corolla** of 5 obovate petals 3–5 cm long, yellow to cream-colored with red at the base. **Ovary** superior, with a style surrounded by the androecium, and bearing a 5-lobed stigma. **Stamens** many, monoecious, the same color as the corolla. **Fruit** a beaked, 3–5 valved globose to ovoid capsule 1.5–2.5 cm long, with the 5–11 seeds densely covered with lint. **Flowering** has been reported in May and August, and fruiting in August and January to April, but both are probably of longer duration.

Distinguishable by its low shrubby habit; stellate pubescence; palmately lobed, alternate leaves; large showy white flowers; stamens fused into a column; 5-lobed stigma; and capsule

fruit filled with woolly seeds.

APOLIMA:

Rechinger 179—Crater rim under littoral plants.

Parham 9724—(Specimen not seen for this study, possibly at Christchurch).

Whistler 5336—Southwest rim of the crater above the village.

UPOLU:

Graeffe 443—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (1), ‘Aunu’u (4), Ofu (sight record), Rose (1).



Sida samoensis Rechinger

Sida parvifolia sensu auct. non DC.

Sida retusa sensu auct. non L.

Sida (No. 4) sensu Pickering

SAMOAN NAME: *mautofu*?

ENGLISH NAME: none

STATUS: rare Polynesian adventive

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Botanical survey of the west side of Nu'utele Island and Manono to see if this species is still found in this disturbed habitat.

Possibly an unintentional Polynesian introduction to Samoa, native to Fiji and western Polynesia (despite the fact that it was named from Samoa). It would seem to be native since it has restricted regional distribution, but collections indicate that it does not occur in native habits. Instead, it is a minor weed in coastal villages and sunny disturbed places, reported only near the coast. It was probably much more common prior the European era, but has declined in frequency probably because of the competition with more aggressive weeds introduced during the last two centuries. No uses or Samoan names have been reported, unless people called it *mautofu* (or some variation of this), which is applied to the larger, more common, and more conspicuous *Sida rhombifolia*.

Prostrate subshrub, much-branched, with finely stellate-pubescent stems up to 35 cm long, and equal, filiform, stipules 1–3 mm long. **Leaves** simple, alternate; blade orbicular to broadly ovate, 0.5–2.5 cm long, cuneate to rounded at the base, acute to obtuse at the tip; lower surface densely stellate-pubescent; margins serrate; petiole 3–5 mm long. **Inflorescence** of solitary, axillary and subterminal flowers. **Calyx** cup-shaped, 3.5–5 mm long, deeply divided into 5 broadly ovate, apiculate, strongly ribbed lobes, on thin pedicel 1–2 cm long. **Corolla** rotate, with 5 free, pale orange, obovate, unequally bilobed petals ca. 7–9 mm long. **Ovary** superior, usually 1-celled; stigma 5-lobed. **Stamens** many, monadelphous. **Fruit** a flattened-globose schizocarp 3–4.5 mm in diameter, breaking up at maturity into 5 mericarps, each with a pair of terminal awns ca. 1.5 mm long. **Flowering** and fruiting occur continuously.

Distinguishable by its prostrate, somewhat woody herb habit; small, alternate leaves with toothed margins; pale orange, 5-parted, monadelphous flowers lacking bracts below the calyx; and a rotate schizocarp that splits into 5 segments (mericarps), each bearing a pair of awns.

SAVAII:

USEE s.n.—“Growing near the coast,” without further locality.

Vaupel 249—Matāutu (Bishop Museum, 26 October 1906).

Rechinger 1444—sandy beach area at Sāsina, near sea level.

Rechinger 1640—Dry soil at Āsau.

Rechinger 1719—Matāutu.



Christophersen 577—Lawn at Fagamālo at near sea level.

Christophersen 2490—Sandy places near the beach at Manase.

Christophersen 3323—Sandy places near the beach at Faleālupo.

MANONO:

Rechinger 219—Beach without further locality.

Whistler 2400—Sandy area without further locality.

UPOLU:

Whistler 4010—Sandy place near some graves on the west side of Nu'utele, near sea level.

Other Samoan Records: Tutuila (1, ca. 1860), 'Aunu'u (2), Ofu (1), Ta'ū (1).

MELIACEAE

Vavaea cf. amicorum Benth.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic (?)

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: Botanical survey of the area around Lepu'e to determine the distribution and population size of this species. Some vegetative material should be sent to a lab to determine by DNA analysis just what the species is, since it has never been collected with fruits or flowers. Recommended for the Red List of Samoan plants.

Indigenous to Samoa (if the plant in Samoa belongs to *Vavaea amicorum*; if not, then it is endemic), also found in Tonga and Fiji, and

perhaps farther eastward into Melanesia. It is rare in montane to cloud forest of 'Upolu at 860 to 960 m elevation. Fertile material is needed to correctly define this species or population, but the description below applies to *Vavaea amicorum*. No Samoan names or uses have been reported.

Small tree up to 6 m or more (up to 20 m in Fiji) in height, with terminaloid branching and brown, finely pubescent young stems later marked by elliptic, 2-lipped lenticels; bark rough, finely ridged with horizontal cuts, inner bark pale orange streaked with green, oxidizing to gray, wood pale yellow. **Leaves** simple, alternate; blade coriaceous, oblanceolate to obovate, 8–24 cm long, acute to cuneate at the base, broadly acute and slightly notched or rounded at the tip; surfaces glabrous or with sparse pubescence on the midrib of both surfaces, upper side darker, lower side with prominent secondary veins; margins entire; petiole 1.5–5 cm long, enlarged basally, pubescent, caniculate. **Inflorescence** a long-stalked, axillary, many-flowered (25 or more flowers) cyme 3–12 cm long, bearing small, leaf-like bracts. **Calyx** campanulate, 2–3 mm long (4–5 mm in fruit), divided about halfway into 5 ovate lobes pubescent on the outside, on a pedicel 4–10 mm long. **Corolla** of 5 (4) elliptic to oblong petals 6–7 mm long, white aging to pale yellow, puberulent on the outside. **Ovary** superior, densely pubescent, with a short filiform style bearing a capitate stigma. **Stamens** 10 (8), with the filaments fused into a broad staminal tube having a bearded rim. **Fruit** a red to purple, globose drupe 1–1.5 cm in diameter, often with green and colored fruits in the infructescence, pericarp thin, enclosing the single globose seed. **Flowering** reported from January to August, fruiting from April to August, but both perhaps occurring throughout the year. (Description is taken from Tongan specimens.)

Distinguishable by its small tree habit; oblanceolate to obovate leaves; long-stalked axillary cymes of small white flowers that age to yellow; and a fleshy, globose, red to purple fruit.

UPOLU:

Whistler 4181—Montane forest on rim of Mt. Le Pu'e crater at 930 m elevation.

Whistler 4189—Montane forest on rim of Mt. Le Pu'e crater at 930 m elevation.

Whistler 9575—Disturbed montane forest near Mt. Lepu'e at 960 m elevation.

Whistler 11797—Heavily disturbed montane forest east of Mt. Lepu'e at 860 m elevation.



Xylocarpus moluccensis (Lam.) Roemer

Xylocarpus granatum sensu auct. non Koen.

SAMOAN NAME: *le'ile'i*

ENGLISH NAME: puzzle nut

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: The areas of intact littoral forest on Manono should be surveyed to see if the species is still found there. The Vanega area should be given some kind of protection since it is botanically such a unique area of vegetation.

Indigenous to Samoa, ranging from Madagascar to western Polynesia. It is rare in independent Samoa, where it is reported only from the south and southeast coasts of Savai'i. At Vanega between Si'utu and Taga, the tree is dominant in a sandy area on top of the cliffs where waves sometimes wash in. It was also once noted from Manono (in 1980), but was not found again during a later search of the area in 2005. It is also found on Tutuila (Nu'uuli) and on 'Aunu'u in American Samoa. The tree is usually associated with the edges of mangrove swamps or littoral forest in sandy places. The rather soft, red, termite-resistant wood has been used for small canoes, carved artifacts such as war clubs, and house ribs, according to Guest (1939). The tree also had some minor use for medicine. The Vanega site was visited during fieldwork for the present project in July 2010. The flora of the site was recorded, and the vegetation of a 1000 m² plot was sampled.

Medium-sized tree up to 12 m or more in height, with glabrous stems. **Leaves** even-pinnately compound, alternate; rachis 2–14 cm long; leaflets usually 4 (2–6), opposite; leaflet blades coriaceous, unequally-sided, mostly elliptic to oblong, 5–17 cm long, oblique at the base, broadly acute to rounded and retuse the tip; surfaces glossy, glabrous; margins entire; petiolules 3–10 mm long. **Inflorescence** a several-flowered axillary panicle up to 6 cm long; flowers functionally unisexual, trees monoecious. **Calyx** ca. 2 mm long, divided about halfway into 4 rounded lobes spreading at maturity. **Corolla** of 4 white, elliptic petals 4–6 mm long, spreading at maturity. **Ovary** superior, with a short style topped by the discoid stigma; ovary vestigial in male flowers. **Stamens** 8, their filaments fused into a staminal tube 4–5 mm long, sterile in female flowers. **Fruit** a large, hanging, globose capsule 12–25 cm in diameter and brown at maturity, eventually splitting open



by 4 valves to release the 8–20 large, corky, irregularly angled seeds. **Flowering** reported from March to June and October to December, fruiting in June and October, but both probably occurring throughout the year

Distinguishable by its medium-sized tree habit; even-pinnately compound leaves; mostly 4 obovate to oblong leaflets; panicles of small white flowers with the stamens fused into a staminal tube; and large brown, globose fruit filled with large corky seeds.

SAVAII:

Vaupel 520—Lava coast near Lata (Bishop Museum, 16 October 1906).

Christophersen 927—At Vanega between Si'utu and Taga.

Christophersen 2640—At Vanega between Si'utu and Taga.

Whistler 6865—At Vanega between Si'utu and Taga, in sandy area on lava rock near sea level.

Whistler 8225—At Vanega between Si'utu and Taga, in sandy area on lava rock near sea level.

Whistler 11720—One sterile specimen on the rocky coast just south of Sālelologa.

MANONO:

Whistler 4524—Three sterile trees on the beach at Falemoa (not on Samoan maps).

OTHER SAMOAN COLLECTIONS: Tutuila (8), 'Aunu'u (3).

MYRTACEAE

Metrosideros gregoryi Christoph.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical survey of the montane region of Savai'i to determine the distribution and frequency of this species. It has only been collected twice, apparently at the same crater far above Matavanu Crater. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to the montane to cloud forest of Savai'i. It is known from only two collections, both of them from the bottom of a crater in cloud forest above Matavanu Crater at 1500 m elevation. No Samoan names or uses have been reported. It is related to a similar montane species from Fiji.

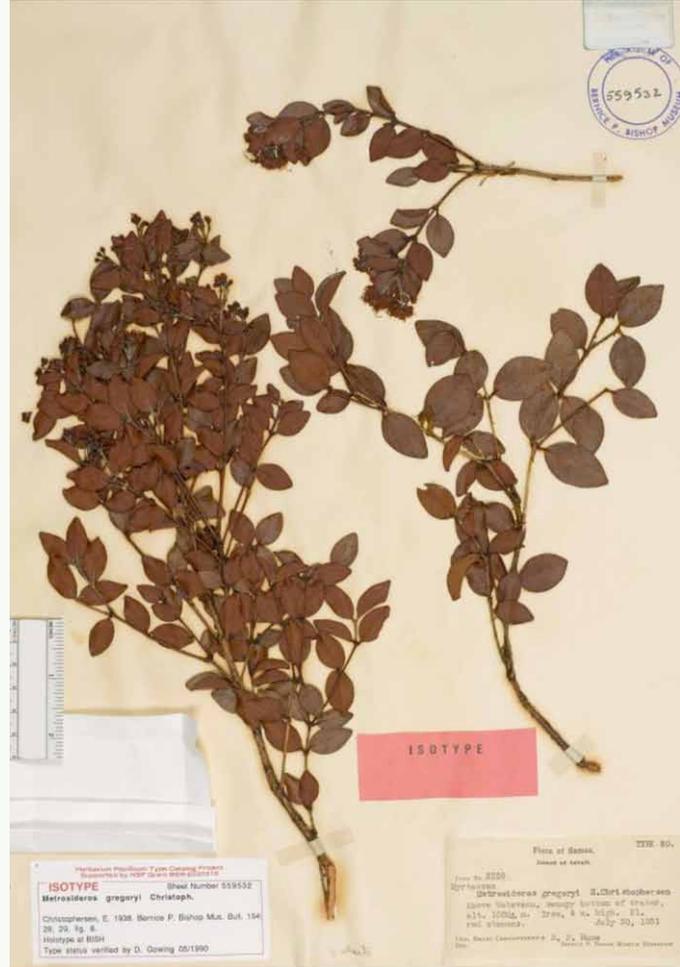
Tree up to 4 m or more in height, with square, pubescent young stems. **Leaves** simple, opposite; blade coriaceous, ovate to elliptic, 1–3.2 cm long, broadly acute at the base and tip; surfaces glabrescent, grayish silky-pubescent when young, with an intramarginal vein close to the margin, with one basal pair (the 2nd or 3rd pair) of secondary veins making the venation appearing 3–5-veined, lower side glandular-punctate; margins entire, revolute; petiole narrowly winged, ca. 4 mm long. **Inflorescence** of axillary and terminal, 10–15-flowered cyme up to 2.5 cm long, with ovate to lanceolate bracteoles ca. 1 mm long at the nodes. **Calyx** turbinate, 2–3 mm long, with the margin cut into four broadly ovate lobes, on a pedicel 1–2 mm long. **Corolla** of 5 subround, clawed, red petals 1.5–2.5 mm long. **Ovary** inferior, 3-celled, with a linear style up to 1.5 cm long. **Stamens** many, free, exserted, red. **Fruit** a 3-valved capsule ca. 4 mm long, containing many tiny seeds. **Flowering** reported from July to September, fruiting in September, but both probably of longer duration.

Distinguishable by its tree habit; opposite coriaceous leaves with distinct intramarginal vein; surface appearing 3–5-veined from the base; cymes of red flowers bearing many exserted stamens; and 3-lobed capsule.

SAVAII:

Christophersen 796—In a crater in cloud forest above Matāvanu Crater at 1500 m elevation.

Christophersen 2226—In a crater in cloud forest above Matāvanu Crater at 1500 m elevation.



Syzygium christophersenii Whistler

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoan endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: The only collections of this species have been in the zone between lowland and montane forest, so a botanical survey of the montane region of Savai'i is recommended to see if this species gets up to that elevation, where it would be safer from forest clearing. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. It occurs in foothill to montane forest, reported from 450 to 600 m elevation. No Samoan names or uses have been reported.

Large tree (no height recorded) with glabrous stems.

Leaves simple, opposite; blade elliptic to ovate,

5.5–9 cm long, acute to subcuneate at the base, acuminate and twisted at the tip; surfaces glabrous, coriaceous, finely pinnately nerved, dull above, lighter, dull and not appearing glandular-punctate below, intramarginal veins straight; margins entire; petiole 0.5–1.8 cm long. **Inflorescence** a terminal, many-flowered panicle 4–8 cm long, with terete branches. **Calyx** campanulate, 0.7–1.1 cm long, shallowly notched into broadly rounded lobes 1–2 mm long, on a pedicel 0.8–1.2 mm long. **Corolla** of 4 white, ovate petals ca. 5 mm long, confluent and calyptrate, falling together at anthesis. **Ovary** inferior, 2-celled; style linear, up to 10 mm long. **Stamens** ca. 275, free, white; filament up to 1.2 cm long. **Fruit** a drupe (but not known). **Flowering** reported in March and November, fruiting time not known, but both probably occurring for much or all of the year.

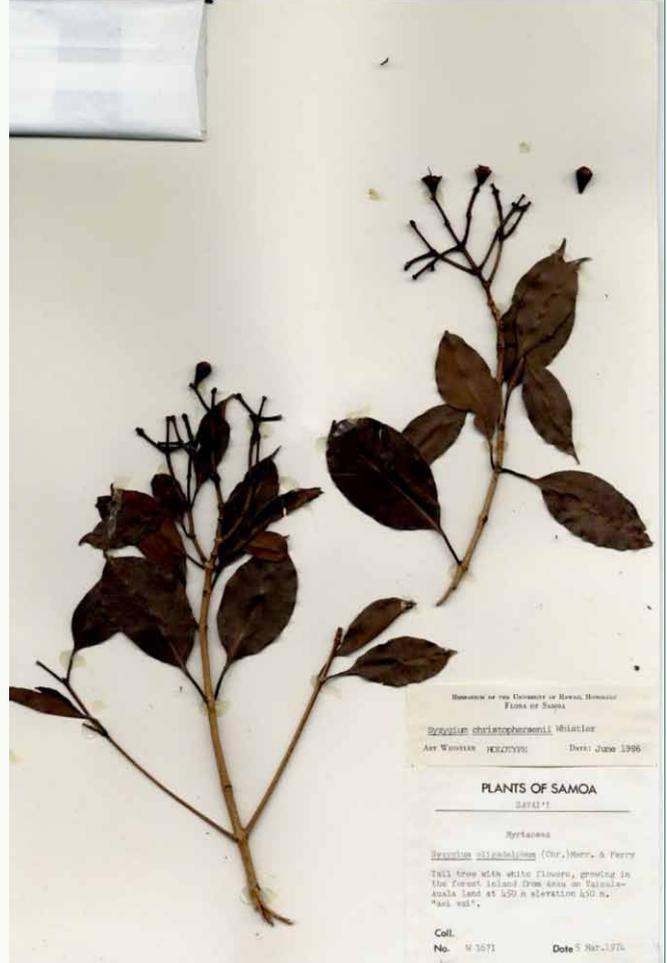
Distinguishable by its large tree habit; round stems; straight intramarginal collecting veins; opposite, simple, elliptic to ovate leaves not noticeably glandular-punctate, 5.5–9 cm long; acute to subcuneate leaf base; short terminal panicles; calyx up to 1.1 cm long; and white flowers bearing hundreds of stamens.

SAVAII:

Christophersen 3386—Montane forest above Si'uvao and Auala at 600 m elevation.

Whistler 574a?—Montane forest above Ologogo at 700 m elevation.

Whistler 1671—Lowland forest above Āsau at 450 m.



MYRTACEAE

Syzygium effusum (A. Gray) Walp.

Eugenia effusa A. Gray

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoan endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species.

Indigenous to Samoa, also found in Fiji. It is known in Samoa only from three collections made by the same botanist in ca. 1894. It is presumably a montane forest species (100–1323 m in elevation in Fiji), and differs from the Fijian population by having pedicels 3–5 mm long instead of 1 mm. No Samoan names or uses have been reported for this tree.

Large tree (no height recorded) with glabrous, quadrangular, winged young stems. **Leaves** simple, opposite; blade elliptic, 2.5–4 (6) cm long, acute at the base, broadly acute at the tip; surfaces glabrous, coriaceous, finely pinnately veined, dark green above, lighter and obscurely glandular-punctate below, intramarginal veins straight; margins entire; petiole 3–7 mm long. **Inflorescence** terminal and upper-axillary, many-flowered panicles 2–7 cm long, with 4-angled branches bearing deciduous bracts ca. 0.5 mm long. **Calyx** campanulate (?), 2–3 mm long, shallowly notched into broadly rounded lobes less than 0.5 mm long, on a pedicel 3–5 mm long. **Corolla** of 4 white, ovate petals ca. 2 mm long, confluent and calyptrate, falling together at anthesis. **Ovary** inferior, 2-celled; style 1–2 mm long. **Stamens** ca. 35, free, white; filament ca. 2 mm long. **Fruit** a drupe (but not known). **Flowering** reported in September, fruiting time not known, but both probably of longer duration.

Distinguishable by its tree habit; quadrangular stems; opposite, simple, elliptic leaves up to 6 cm long; acute leaf bases; short terminal and axillary panicles; calyx 2–3 mm long; petals fused together to form a cap; and many white stamens.

NOTE: photos of the specimens could not be obtained.

SAVAII:

Reinecke 485—Mountain region [presumably in montane forest] without further locality. (Specimen stored at Geneva.)

Reinecke 487—Mountain region [presumably in montane forest] without further locality. (Specimen stored at Geneva and Kew.)

SINE LOC:

Reinecke s.n.—Mountain region [presumably in montane forest] without further locality. (Specimen stored at Kew and Wroclaw.)

NOTE: Photo of herbarium specimen not obtained.

Syzygium graeffei Whistler

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. No data has been recorded (except on the Rechinger specimen, which was not seen by the author during this study), but the tree is probably restricted to montane or cloud forest on Savai'i. No Samoan names or uses are reported.

Tree (height not recorded) with young quadrangular or winged stems, or sometime s terete. **Leaves** simple, opposite; blade lanceolate, 8–13 cm long, rounded at the base, acuminate to subacuminate at the tip; surfaces glabrous, upper side darker, lower side glandular-punctate; margins entire, not revolute; petiole 1–3 mm long. **Inflorescence** of loose, terminal or upper axillary, many-flowered (up to 27 flowers) panicles up to 11 cm long, with the ultimate branches bearing 3 flowers. **Calyx** turbinate, 5–6 mm long, divided into 4 broadly rounded lobes 2–3 mm long. **Corolla** of 4 white, ovate petals ca. 5 mm long, confluent and calyptrate, falling together at anthesis. **Ovary** inferior, 2-celled; style 4–6 mm long. **Stamens** ca. 80, free, white; filament ca. 1.2 cm long. **Fruit** a drupe (but not known). **Flowering** reported in August, fruiting time not known, but both probably at least of several months in duration.

Distinguishable by its tree habit; usually 4-angled young stems; opposite lanceolate leaves glandular-punctate on the lower surface; petioles 1–3 mm long; panicles of white flowers bearing many (ca. 80) free white stamens; and drupe fruit.

SAVAII:

Graeffe 213a—Without further locality.

Rechinger 3736—Central volcanic region, no elevation given. (Specimen is stored at Vienna.)



Syzygium vaupelii Whistler

Syzygium aff. effusum sensu Christoph., non (A. Gray) Walp.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to montane forest on Savai'i, reported from 900 to 1300 m elevation. It has been collected only twice in Samoa, both in high-elevation montane forest. Because this kind of forest has not been explored nearly as completely as lowland forests, it is not clear if this paucity of collections is because of few collecting trips into this region or actually rarity of the species. No Samoan names or uses have been reported.

Tree (height not recorded) with glabrous terete stems. **Leaves** simple, opposite; blade obovate, 20–35 cm long, cuneate at the base, shortly acuminate at the tip; surfaces coriaceous, glossy above, lighter and conspicuously glandular-punctate beneath, finely pinnate-nerved; margins entire, slightly revolute; petiole 2–6 mm long. **Inflorescence** a terminal, many-flowered panicle 2–4 cm long. **Calyx** cup-shaped, 4–6 cm long, irregularly and shallowly notched, on a pedicle 1–4 mm long. **Corolla** of five white, ovate petals ca. 4 mm long, confluent and calyptrate, falling together at anthesis. **Ovary** inferior, 2-celled; style, thick, linear 2.5–4.5 mm long. **Stamens** up to ca. 100, free, white; filament up to 1.2 cm long. **Fruit** a drupe (but not known). **Flowering** reported in July and August, fruiting not known, but both perhaps occur most of the year.

Distinguishable by its tree habit; terete stems; opposite, simple obovate leaves less than 4 cm long; short terminal panicles; inferior ovary with the petals fused together to form a cap; and many white stamens.

SAVAII:

Vaupel 408—Montane forest south of Mt. Maugaloa at 1200 m elevation (Bishop Museum: 30 August 1906, four copies; UHAW: same data). (Other specimens are stored at Berlin, Kew, and Smithsonian, not seen for this study).

Christophersen 1997—Montane forest above Matāvanu at 900 m.



NYCTAGINACEAE

Boerhavia albiflora Fosb.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: This species is recorded in independent Samoa only on the Aleipata Islands. A botanical survey of all of four of the islands is recommended to determine on which islands the herb is found, and the GPS coordinates of all sites should be recorded.

Indigenous to Samoa, widespread in the Pacific, where it occurs only on rocky littoral strand, reported only near sea level. This herb is known in independent Samoa from only four collections from two of the Aleipata Islands—Fanuatapu and Nu’ulua. It is also known from three collections in American Samoa (Tutuila only), but may be more common since it is inconspicuous and often found in inaccessible areas. No Samoan names or uses have been reported. During the fieldwork for the present project in Samoa in July 2010, this species was found on Fanuatapu.

Prostrate herb with puberulent stems arising from a thick taproot. **Leaves** simple, opposite; blade oblong to ovate, 1–3 cm long, rounded to truncate at the base, rounded to acute and apiculate at the tip; surfaces glabrous; margins subentire; petiole 3–12 mm long. **Inflorescence** an axillary, several-flowered cyme on a thin peduncle up to 3.5 mm long. **Calyx** funnellform, petaloid, white, shallowly 5-lobed, ca. 3 mm long, on an articulated pedicel 1–3 mm long. **Corolla** absent. **Ovary** superior, 1-celled, with a filiform style bearing a capitate stigma. **Stamens**, ca. 5, free, exserted. **Fruit** a sticky, narrowly ellipsoid, 5-ribbed anthocarp 3–4 mm long. **Flowering** and fruiting occurring continuously.

Distinguishable by its prostrate herbaceous habit; opposite leaves; tiny white flowers in stalked clusters; and tiny sticky, green, cylindrical fruit.

UPOLU:

Whistler 1933—Tuff rock on the rocky peninsula on the south side of Nu’ulua Islet.

Whistler 3934—Windswept areas of Fanuatapu Islet.

Whistler 4416a—Exposed rocks on the south side of Fanuatapu Islet.

Whistler 12150—On rock faces on the west side of Fanuatapu Islet.

OTHER SAMOAN COLLECTIONS: Tutuila (3).



OLEACEAE

Chionanthus vitiensis (Seem.) A.C. Smith

Fagraea vitiensis Seem. sensu auct., non Gilg & Benedict

Linociera gillespiei A.C. Smith

Linociera paucifolia sensu auct., non C. B. Clarke

Linociera vitiensis (Seem.) A.C. Smith

Olea vitiensis Seem

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections (all collections sterile)

SUGGESTED ACTION: There is not much that can be done to help this species since it is found in scattered localities. A botanical survey of the forest around the old Āsau timber mill should be conducted to determine its extent in that area of Savai'i. The species was found at Asau and along the trail to Fagalele Bay during the June 2010 fieldwork in Samoa.

Indigenous to Samoa, also occurring in Tonga, Niue, and Fiji. It is rare in Samoa in lowland forest on Savai'i, 'Upolu, Tutuila, and Ofu, reported from near sea level to 450 m elevation (up to 1130 m in Fiji). It has been collected only four times in independent Samoa (all of them lacking fruits and flowers), and five times in American Samoa, but is more common on other islands and archipelagoes. No uses or common names have been reported.

Medium-sized tree up to 15 m (up to 20 m in Fiji) in height, with glabrous, light-colored, somewhat flattened young stems; bark gray, thin, powdery, inner bark green on the outside and orange inside, wood cream-colored. **Leaves** simple, opposite; blades coriaceous, mostly elliptic, 7–16 (–27) cm long, acute to cuneate at the base and decurrent on the petiole, mostly acuminate at the tip; surfaces glabrous, upper side darker, lower side yellow-green with a prominent midrib and aqueous secondary veins; margins entire, slightly revolute; petiole 1–2.5 cm long, shallowly canaliculate on the upper side. **Inflorescence** an axillary or terminal, many-flowered cyme 2.5–13 cm long, with the 4-angled rachis bearing distichous branches and tiny caducous bracts. **Calyx** cup-shaped, 1.5–2.5 mm long at anthesis, lobed about one third of its length into 4 broadly triangular lobes, on a pedicel 0–4 mm long. **Corolla** of 4 lanceolate to ligulate, white to yellowish petals 2.5–5 (–7) mm long, free or loosely united at the base. **Ovary** superior, with a short, thick style and entire to shallowly lobed stigma. **Stamens** 4, epipetalous, slightly exerted, sessile. **Fruit** a yellow to orange, ellipsoid to obovoid drupe 3–4.5 cm long, containing a single seed with a prominent longitudinal ridge on both sides. **Flowering** reported in March, May, and October to January (reported from July to March in Fiji), fruiting from July to January (December to May in Fiji), and perhaps both occur anytime during the year.

Distinguishable by its medium-sized tree habit; light gray bark; opposite leaves; axillary and terminal cymes of small white to yellowish; 4-parted flowers; superior ovary; two stamens; relatively large yellow to orange drupe; and large seed with a prominent longitudinal ridge.



SAVAII:

Whistler 8272—In a kipuka on the lava flow near Ā'opo.

Whistler 10274—Foothill forest near Ologogo at 450 m elevation.

Whistler 11616—Roadside forest adjacent to the old Āsau timber mill at ca. 20 m elevation.

Whistler 12146—Roadside forest adjacent to the old Āsau timber mill at ca. 20 m elevation.

UPOLU:

Whistler 4495—Coastal forest near the summit of Nu'utele Islet at ca. 200 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (3), Ofu (2).

PIPERACEAE

Peperomia pallida (Forst. f.) Dietr.

Piper pallidum Forst. f.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species.

Indigenous to Samoa, ranging from the Marquesas to Fiji (the Lau Islands at least), and on most of the makatea and high islands in between. In Samoa, the local small-leaved form is restricted to montane forest of Savai'i, reported from 720 to 1080 m elevation. A similar species typically with longer spikes, *Peperomia rechingeriae*, is also found at high elevations in Samoa. Elsewhere in Polynesia, *Peperomia pallida* is a widespread species of littoral to cloud forest, from 2–600 m or more in elevation, sometimes epiphytic, but more commonly on rocks and cliff faces. The fact that it occupies an entirely different habitat than the rest of the Polynesian and Fijian populations suggest this may actually be a new species. No Samoan names or uses have been reported. This species and its genus in the Pacific need further study.

Erect to ascending herb up to 40 cm or more in height, rooting at the lower nodes, with mostly glabrous, somewhat succulent stems. **Leaves** simple, opposite, sometimes appearing alternate (or even whorled) at some nodes; blade variable in shape, but mostly obovate or suborbicular to elliptic, 0.6–5.5 cm long, rounded to cuneate at the base, rounded to broadly acute at the tip; surfaces mostly glabrous, palmately 3–5–veined from the base; margins entire; petiole 2–6 mm long. **Inflorescence** of terminal or subterminal spikes in the upper 1–2 axils, 1–2 (–4) per axil, 2–6 (–8) cm long, 1–4 mm wide. **Calyx** absent. **Corolla** absent. **Ovary** superior, one-celled, with a simple stigma. **Stamens** 2, free. **Fruit** a tiny green drupe less than 1 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small herb habit; stems rooting at the nodes; mostly opposite, glabrous leaves; upper axillary and terminal spikes mostly 2–6 cm long; tiny green flowers lacking a calyx and corolla; 2 stamens; and a tiny green drupe.

SAVAII:

Whistler 502—Epiphyte in montane forest above Sāfune at ca. 720 m elevation.

Whistler 10215—Epiphyte in montane forest above Sala'ilua at 1080 m elevation.



PORTULACACEAE

Portulaca quadrifida L.

Portulaca (No. 3) sensu Pickering

SAMOAN NAME: *tamole*?

ENGLISH NAME: none

STATUS: rare Polynesian adventive

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: There is not much that can be done for this aboriginal weed other than look for it in disturbed areas of coastal villages of all the main islands.

Probably an unintentional Polynesian introduction to Samoa, pantropic in distribution. This species could be native, since some other members of the genus (e.g., *Portulaca lutea*) have seawater-dispersed seeds. Although it occurs in sunny littoral habitats, it is more commonly found as a rare weed in villages and along gravelly trails, reported only from coastal areas. It has no reported Samoan name (although *tamole* may refer to the whole genus) or uses.

Prostrate succulent herb with stems up to 10 cm or more in length, rooting at the nodes, with conspicuous axillary hairs ca. 5 mm long around the node. **Leaves** simple, opposite; blade succulent, often somewhat reddish, ovate to oblong, 3–10 mm long, rounded at the base, acute at the tip; surfaces glabrous; margins entire; subsessile. **Inflorescence** of solitary terminal flowers, surrounded by an involucre of 4 leaf-like bracts. **Calyx** of 2 ovate sepals ca. 3 mm long, united at the base. **Corolla** of 4 obovate, yellow petals 4–5 mm long mostly rounded at the tip. **Ovary** superior, with free-central placentation; style 4-branched (3–5-). **Stamens** usually 8 (12), free. **Fruit** an obovate, circumscissile capsule 2–3.5 mm long, containing many tiny black seeds. **Flowering** and fruiting occur continuously.

Distinguishable by its tiny prostrate herb habit; conspicuously hairy leaf axils; tiny, opposite, succulent leaves; small yellow, 4-merous flowers; and many-seeded capsule opening by the top splitting off. It can be distinguished from the similar and more common, native *Portulaca samoensis*, which has 5-merous flowers, many of its leaves spirally arranged rather than opposite, and hairs only in the axils.

SAVAIL:

USEE s.n.—Without further locality.

Reinecke 428—Matāutu.

Rechinger 9—Gravelly volcanic soil in disturbed places in the Sātāua.

Christophersen 704—Gravelly road at Sāmalae'ulu.

MANONO:

Rechinger 524—Without further locality.



UPOLU:

Rechinger 580—Near the beach at Lauli'i.

Rechinger 842—Near the beach at Lauli'i.

Eames 104—Waste place near Āpia.

Whistler 835—Gravelly driveway at Maluafofou in Āpia.

Whistler 11523—Gravelly driveway at the east end of Uafato.

OTHER SAMOAN COLLECTIONS: Tutuila (3), 'Aunu'u (1), Ta'u (3).

RUBIACEAE

Gardenia taitensis DC.

SAMOAN NAME: *pua Samoa*

ENGLISH NAME: Tahitian gardenia

STATUS: rare indigenous?

REASON FOR LISTING: rarity of modern collections (of the wild "type")

SUGGESTED ACTION: A botanical survey of the Aleipata Islands to determine on which islands in addition to Fanuatapu it occurs. The coast between Aleipata and Tiave'a should also be surveyed since this area has some habitat suitable to this coastal species. This species was found growing on Fanuatapu Islet during the fieldwork in July 2010.

Indigenous to Vanuatu and possibly eastward to Niue, where it occurs in native habitats, but probably an ancient introduction to eastern Polynesia, where it is known only in cultivation. In its native state, it is rare in Samoa, where it has been noted only from coastal rocks. It is also commonly cultivated, especially in the Cook and Society Islands, and is the national flower in the latter archipelago. The bark is often used in herbal medicines in Samoa, and the flowers are used in decorations and for scenting coconut oil throughout its range. The cultivated one is often called *tiare* by younger people who did not know the plant is also native or of aboriginal introduction to Samoa. This species is problematical since it is still occasional in cultivation, but the native form, which produces fruits and viable seeds, is rare and restricted to rocky coasts.

Small tree or shrub to 6 m in height, but usually much less, with glabrous stems and conspicuous, triangular, caducous stipules up to 1.2 cm long united at their bases to form a cup-like sheath around the young stem; bark gray, smooth, with obvious lenticels, thin, green beneath. **Leaves** simple, opposite, congested near the branch tips, blade obovate to broadly elliptic, mostly 5–18 (–24) cm long, acute to cuneate and decurrent at the base, round to broadly acuminate at the tip; surfaces glabrous, upper side dark glossy green, lower side lighter and with prominent yellowish veins; margins entire; petiole 1–5 mm long, swollen at the base. **Inflorescence** of upper axillary or subterminal, solitary flowers. **Calyx** conical, 2–4 cm long, about half of that comprising 4 or 5 lanceolate lobes borne at right angles to the hypanthium and extending as ridges down its sides, on a pedicel 8–30 mm long. **Corolla** salverform, white, fragrant, tube 2.5–4 cm long, limb divided to the base into 5–8 spreading, unevenly sided, elliptic lobes 2.5–4 cm long. **Ovary** inferior; style as long as the tube, with a slightly exerted stigma with 3 appressed lobes. **Stamens** as many as corolla lobes, epipetalous, exerted, sessile. **Fruit** an ellipsoid to ovoid capsule 2.2–5 cm long (but infrequently forming in cultivation), with persistent calyx lobes contiguous with the longitudinal ridges. **Flowering** and fruiting occur throughout the year, but fruiting rarely occurring in cultivation.

Distinguishable by its small tree or shrub habit, opposite, glossy leaves with interpetiolar stipules, large, showy white, axillary flowers with 5–8 lobes, and infrequently forming, longitudinally ridged capsule with persistent calyx lobes.



SAVAII:

Whistler 9484—On lava rocks at Aveāvai just to the west of Sāsina.

UPOLU:

Whistler 3938—In scrub forest on the north side of Fanuatapu.

Whistler 4224—On coastal rock face just past “Vai o le Tama” at Amaile.

Whistler 12154—One seen on coast just south of the landing spot on Fanuatapu.

OTHER SAMOAN COLLECTIONS: Tutuila (10), Aunu’u (1).

Specimens of the cultivar: Powell 56 (sine loc.); Whitmee 132, 233? (n.s.); Reinecke 381 (Savai’i), 575 (‘Upolu, not seen); Vaupel 384 (Savai’i); Rechinger 90; Christophersen 667 (Savai’i), 2361 (Savai’i), 2570 (Savai’i); Cox 939 (Savai’i), 1008 (Savai’i); Whistler 452 (Nu’utele), 4450 (Manono).

Ixora elegans Gillespie

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoa distribution

SUGGESTED ACTION: A botanical survey of the forests near Patamea inland from the only known location of this species, to determine if its distribution is larger than currently known. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, also found in Fiji. This small tree is rare in littoral to coastal forest, known only from one coastal locality on the north coast of Savai'i just east of Patamea, reported at ca. 30 m elevation. No Samoan names or uses have been reported. During the fieldwork sampling of the only forest from which it is known carried out in July 2010, this shrub

or small tree was found to be a common understory species, but it is not known inland from the road that currently defines its known distribution

Small tree up to 10 m in height, with glabrous stems and broadly ovate, mucronate, interpetiolar stipules 4–6 mm long. **Leaves** simple, opposite; blade elliptic to oblanceolate, 20–35 cm long, acute to cuneate at the base, acuminate at the tip; surfaces glabrous; margins entire; petiole 1.5–2.5 cm long. **Inflorescence** a terminal, widely branching, many-flowered panicle 6–12 cm long and often as wide, bearing perpendicular branches, and small lanceolate bracts at the nodes, rachis and branches puberulent. **Calyx** campanulate, 1.5–2 mm long, with 4 tiny teeth on the rim, on a pedicel 1–4 mm long. **Corolla** sympetalous, salverform, white, tube 5–7 mm long, with 4 reflexed to spreading, narrowly oblong lobes 5–7 mm long. **Ovary** inferior, 2-celled; stigma lobes 2, 3–4 mm long. **Stamens** 4, epipetalous, exerted at reflexed at maturity. **Fruit** a dark red, globose drupe 5–7 mm long including the persistent calyx, containing 2 pyrenes. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small tree habit; interpetiolar stipules; large opposite leaves; widely branching terminal panicles; white, 4-merous, salverform flowers; and small dark red, 2-seeded drupe.

SAVAII:

Flynn 3692—East of Patamea in littoral forest on a small area the coast.

Whistler 7102—East of Patamea in littoral forest on a small area the coast.

Whistler 8301—East of Patamea in littoral forest on a small area the coast.

Whistler 12145—East of Patamea in littoral forest on a small area the coast.



Psychotria bristolii Whistler

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic **REASON FOR LISTING:** rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to montane forest on Savai'i, reported from ca. 700 to 950 m elevation, based upon the three known specimens. No Samoan names or uses have been reported.

Small to medium-sized tree 6–12 m in height, with glabrous stems; stipules connate to form a cup-shaped to cylindrical sheath 3.5–4 cm long with a truncate to rounded tip. **Leaves** simple, opposite; blade elliptic, 14–26 cm long, acute at the base, acute to mucronate at the tip; surfaces glabrous; margins entire; petiole 4–8.5 cm long. **Inflorescence** a many-flowered, widely branching, upper-axillary panicle 15–25 cm long, on a stout rachis up to 15 cm long. **Calyx** cup-shaped, 3–5 mm long, margin entire to finely serrate, on a pedicle 1–2 cm long. **Corolla** salverform, white, tube 3–4 cm long, with 5 spreading, linear-lanceolate lobes 1.2–1.8 cm long, glabrous. **Ovary** inferior, 2-celled; stigma lobes 2, 2–3 mm long, slightly exerted. **Stamens** 5, epipetalous in the upper throat, partially exerted. **Fruit** a red (?), ellipsoid drupe 2–3.3 cm long, laterally compressed with a prominent transverse rib on the face of the 2 pyrenes, crowned by a persistent calyx. **Flowering** reported in March, fruiting from June to August, but both probably occurring year round.

Distinguishable by its tree habit; interpetiolar stipules fused to form a cylindrical sheath up to 5 cm long; simple opposite leaves 14–26 cm long; terminal, many-flowered panicles; white, 5-lobed, salverform corolla with a tube 3–4 cm long; and a red (?) ellipsoid drupe containing two pyrenes with a prominent rib on each when dry.

SAVAII:

Christophersen 2038—Montane forest above Matavanu at ca. 900 m elevation.

Bristol 2162—Montane forest above Ā'opo at ca. 950 m elevation.

Whistler 1745—Montane forest southeast of Āsau at ca. 700 m elevation.



Psychotria chlorocalyx K. Schum.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: There is not much that can be done for this species at the present time other than look for it in botanical surveys carried out in mid-elevation and montane rainforest on 'Upolu. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to lowland and foothill forest of 'Upolu, reported from 350 to 500 m elevation, based on the six known specimens, only one of which is recent. Because of its relative low elevation records, this species may be more endangered than the other rare *Psychotria* species, which are often found at higher, less disturbed, elevations. No Samoan names or uses have been reported.

Small tree 1.5–3 m in height, with glabrous stems; stipules interpetiolar, linear-lanceolate, connate at the base, 0.6–1.3 cm long. **Leaves** simple, opposite; blade elliptic, 8–15 cm long,

acute at the base, acute to acuminate at the tip; surfaces glabrous, pale green with yellow veins; margins entire; petiole 0.5–1.5 cm long. **Inflorescence** a terminal, widely branching, terminal, 15–50-flowered panicle 7–15 cm long. **Calyx** rotate, split to near the base into 4 reflexed, ovate lobes 1.5–3 mm long.

Corolla salverform, white, tube 0.8–1.2 cm long with 4 spreading, elliptic lobes 4–6 mm long, 4-ribbed before anthesis. **Ovary** inferior, 2-celled; stigma lobes 2, 1–1.5 mm long. **Stamens** 4, subsessile and epipetalous at the top of the tube, included. **Fruit** a red, oblong to pyriform drupe 1–1.6 cm long including the persistent calyx, containing 2 pyrenes, and longitudinally lobed when dry. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small tree habit; simple opposite leaves 8–15 cm long; interpetiolar stipules fused to form a cylindrical sheath; terminal, many-flowered panicles; white, 5-lobed, salverform corolla with a tube 0.8–1.2 cm long; and a red ellipsoid drupe containing two pyrenes with a prominent rib on each when dry.

UPOLU:

Reinecke 152 p.p.—Mt. Vaea. (Specimen at Smithsonian.)

Reinecke 242—Mt. Vaea. (Specimen at Geneva and Smithsonian.)

Reinecke 635—"Le Pua" [Lepu'e?]. (Specimen at Geneva and Warsaw.)

Rechinger 1570—Above Utumapu. (Specimen at British Museum.)

Rechinger 1686—Above Utumapu. (Specimen at Vienna.)

Whistler 1991—Above Utumapu, between 250 and 500 m elevation.



Psychotria juddii Christoph.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. It occurs in montane forest, reported from 900 to 1100 m elevation. No Samoan names or uses have been reported.

Small tree up to 6 m in height, with glabrous stems and lanceolate interpetiolar stipules 1.5–3 cm long that are split at the tip into two short lobes. **Leaves** simple, opposite, concentrated at the ends of the branches; blade oblong to elliptic or slightly obovate, 14–22 cm long, acute to short-attenuate at the base, acute to acuminate at the tip; surfaces glabrous; margins entire; petiole 2–6 cm long. **Inflorescence** a solitary, erect, globose head

2.5–3 cm across, bearing up to 45 flowers, on a thick peduncle 2–4.5 cm long. **Calyx** cup-shaped ca. 5 mm long, shallowly divided into 5 obtuse lobes, glabrous. **Corolla** sympetalous, funnelform, white, tube 2.8–3.6 cm long, with 5 fleshy, recurved linear lobes up to 1.6 cm long, scurfy-pubescent on the outside, densely pubescent within, sessile. **Ovary** inferior, 2-celled; style as long as the tube, bifid. **Stamens** 5, epipetalous, included. **Fruit** not known, but probably a fleshy red drupe containing two pyrenes. **Flowering** reported in December, fruiting not known.

Distinguishable by its small tree habit; interpetiolar stipules; opposite leaves up to 22 cm long; flowers in many-flowered solitary heads on a thick peduncle; funnel-shaped white corolla with the tube up to 3.6 cm long; and probably a fleshy red drupe.

SAVAII:

Christophersen 2706—Montane forest above Sala'ilua at 900 to 1000 m elevation.

Christophersen 3424—Montane forest above Gāga'emalae at 1000 to 1100 m elevation.



RUTACEAE

Melicope sulcata T. G. Hartley

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the montane region of Savai'i to determine the range and frequency of this species, which is known from only a single collection in montane forest there. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is uncommon in cloud forest on Savai'i, reported at 1300 m elevation. No Samoan names or uses have been recorded, since it is too uncommon, too small, and too far away from habitations. This species seems little different from *Melicope vatiana*, and should be examined again.

Shrub or small tree (height not recorded) with glabrous stems. **Leaves** trifoliolate, opposite; blade mostly elliptic, 7–14 cm long, acute to acuminate at the tip, subattenuate to attenuate at the base (and unequally sided in lateral leaflets of trifoliolate leaves); surfaces glabrous, with the midrib of the upper side impressed; margins entire; petiole 3.5–6 cm long, canaliculate. **Inflorescence** an axillary, several- to many-flowered thyrse 2–5 cm long, bearing tiny bracts less than 1 mm long; flowers unisexual, trees probably dioecious. **Calyx** less than 1 mm long, divided over halfway into 4 ovate-triangular lobes persistent in the fruit, on a pedicel 4–4.5 mm long. **Corolla** of 4 white ovate to elliptic petals ca. 3 mm long. **Ovary** superior, divided to near the base into 4 parts, puberulent or sparsely so; style short with capitate, 4-lobed stigma; ovary infertile in male flowers. **Stamens** 8, free, sterile in female flowers. **Fruit** a 4-celled capsule, but not known. **Flowering** reported in July, fruits not known, but both probably occur throughout the year.

Distinguishable by its small tree or shrubby habit; opposite trifoliolate leaves; midvein of upper surface impressed; axillary panicles of small white, 4-merous flowers; carpels nearly free to the base; and a 4-lobed capsule containing 4–8 small shiny black seeds. It differs from two other closely related trifoliolate species, *Melicope vatiana* (found on 'Upolu, Tutuila, and Ta'ū) and *Melicope lauterbachii* (found on Savai'i and 'Upolu) by its carpels being separate to near the base rather than entirely fused.

SAVAII:

Christophersen 2147—Montane forest above Matavanu at 1300 m elevation.



Melicope vatiana (Setchell) T.G. Hartley

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is little that can be done for this species at the moment since it occurs in scattered localities. It is much more common in American Samoa.

Acronychia diversifolia A. Gray

Acronychia heterophylla A. Gray

Evodia vatiana Setchell

Jambolifera heterophylla (A. Gray) Kuntze

Endemic to Samoa, where it is occasional to uncommon in lowland to montane forest on 'Upolu, Tutuila, and Ta'ū, reported from 40 to 900 m elevation. No Samoan names or uses have been recorded, since it is small and uncommon.

Shrub or small tree up to 9 m in height, with minutely puberulent young stems. **Leaves** trifoliate or appearing simple (actually unifoliate, with two leaflets lost), opposite; blade elliptic to obovate, terminal leaflet 7–19 cm long, attenuate to subattenuate at the base (and unequally sided in lateral leaflets of trifoliate leaves), obtuse to acuminate at the tip; surfaces glabrous; margins entire; petiole 2.5–9 cm long. **Inflorescence** an axillary, several- to many-flowered thyrse 2–5 cm long, bearing tiny bracts up to 1.5 mm long; flowers unisexual, trees probably dioecious. **Calyx** 1–1.3 mm long, divided over halfway into 4 ovate-triangular lobes persistent in the fruit, on a pedicel 1.5–2.5 mm long. **Corolla** of 4 white ovate to narrowly elliptic petals 3–3.5 mm long. **Ovary** superior, 4-celled, puberulent or sparsely so; style short with 4-lobed capitate stigma; ovary infertile in male flowers. **Stamens** 8, free, sterile in female flowers. **Fruit** a subglobose, shallowly lobed capsule 4–6 mm long, containing 8 shiny black seeds. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small tree habit, simple-appearing opposite leaves; minutely puberulent young stems; midvein of upper leaf surface not impressed; small white, 4-merous flowers bearing 8 stamens; ovary with the carpels fused their entire length; pedicel ca. 1 mm long at anthesis and 2–2.5 mm in fruit; and a 4-lobed capsule containing 8 shiny black seeds. It differs from the related trifoliate species *Melicope lauterbachii* (found on Savai'i and 'Upolu), which has longer pedicels and glabrous young branches. It differs from another related *Melicope sulcata* (found only on Savai'i), which has the carpels separate to near the base.

UPOLU:

Betche 307—Above Fagaloa Bay.

Whistler 4170—Along the roadside in forest on the road to Ole Pupū coast, ca. 50 m elevation.

SINE LOC:

Powell 234—Without further locality (not cited in Hartley 2001).

Whitmee 286—Without further locality (not cited in Hartley 2001).

OTHER SAMOAN COLLECTIONS: Tutuila (7), Ta'ū (5).



Zanthoxylum pinnatum (Forst.) Oliver

Fagara pinnata (Forst.) Engl.

SAMOAN NAME: *au manogi*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: A botanical survey of the area around the old Āsau timber mill on Savai'i to determine if it occurs in this area of forest from where its only collection is known.

Indigenous to Samoa, also found on Norfolk Island, Fiji, and Tonga, and possibly Australia. It is rare in lowland or coastal forest on Savai'i, reported only near sea level. This tree is a mystery, since it was only collected once, in a fruiting state, near Āsau in 1972. The area should be thoroughly searched to see its current status, i.e., whether it has disappeared or not. No uses have been reported.

Medium-sized tree up to 10 m or more in height, with glabrous young stems maturing to brown with lighter longitudinal streaks. **Leaves** even-pinnately compound, alternate, rachis 4–22 cm long, grooved on the axial surface, leaflets 3–6 opposite pairs; blades coriaceous, elliptic, unequally sided, 5–10 cm long, oblique at the base, acuminate at the tip; surfaces glabrous, upper side darker, lower side with aqueous veins, glandular-punctate; margins entire; petiolules 2–5 mm long.

Inflorescence an axillary, many-flowered panicle up to 7 cm long. **Calyx** rotate, ca. 2 mm across, shallowly divided into 4 broad lobes. **Corolla** divided to the base into 4 (3) elliptic, concave petals 4–5 mm long, white.

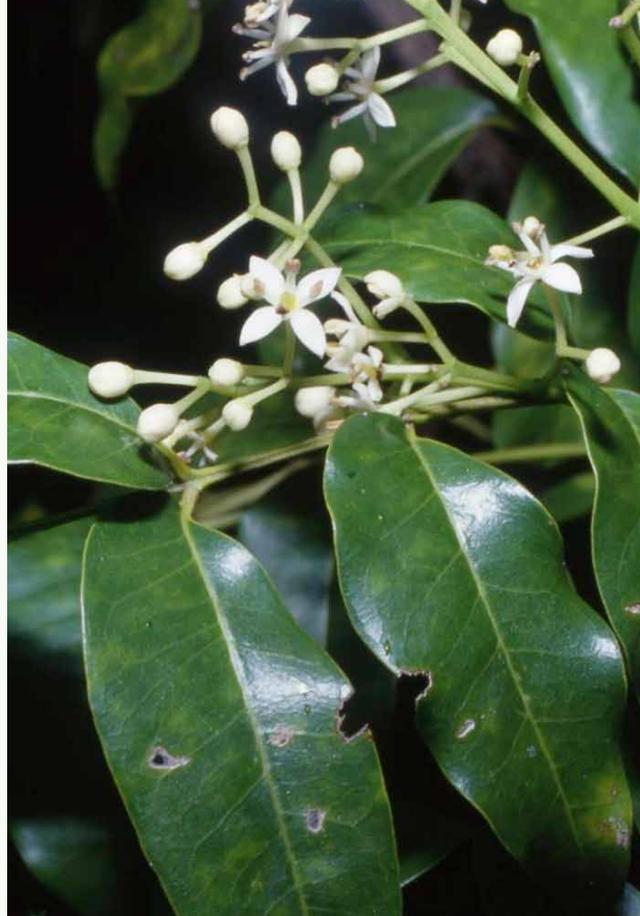
Ovary superior, with a short simple style. **Stamens** 4 (3), exserted, filaments thick, white; anthers dark. **Fruit** a purple, glandular-punctate, subglobose drupe 1.2–1.6 cm long, containing a single large, shiny black seed.

Flowering and fruiting occur throughout the year. (Description mostly taken from Tongan specimens.)

Distinguishable by its medium-sized tree habit; alternate, pinnately compound leaves with 3–6 pairs of leaflets; white corolla usually with 4 petals; 4 exserted stamens; and purple, glandular-punctate drupe containing a large, shiny black seed.

SAVAII:

Fasavalu 17—Lowland forest behind the village of Auala at 210 m elevation.



SAPINDACEAE

Dodonaea viscosa Jacq.

SAMOAN NAME: *lala vao?*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections, restricted Samoa distribution

SUGGESTED ACTION: A botanical reconnaissance of the lava flows at A'opo and "fernlands near Manase to determine the present distribution of this species.

Indigenous to Samoa, pantropic in distribution. It is uncommon in lava flow scrub forest on Savai'i, reported from 25 to 180 m elevation. There is also a single old record of it from 'Upolu, but the specimens of Graeffe have sometimes proven to be mislabeled. The shrub is now virtually unknown to Samoans, but the stems were reportedly used for walking sticks.

Shrub up to 4 m or more in height, with glabrous stems. **Leaves** simple, alternate; blade oblanceolate to elliptic, 7–15 cm long, attenuate at the base, shortly attenuate at the tip; surfaces viscid; margins subentire; petiole 1–5 mm long. **Inflorescence** of several-flowered axillary panicles 1–5 cm long bearing unisexual or bisexual flowers; plants monoecious. **Calyx** usually of 4 tiny green sepals 1.5–2.5 mm long, on a pedicel 7–15 mm long (longest in fruit). **Corolla** absent. **Ovary** of female flower superior, 2- or 3-celled, with 2–4 styles; ovary vestigial in male flowers. **Stamens** of male flowers usually 8, free, often absent in female flowers. **Fruit** a yellow to red, somewhat inflated, papery, 2–4-winged capsule 1.4–1.8 cm long, notched at the tip. **Flowering** and fruiting occur continuously.

Distinguishable by its shrubby habit; alternate simple leaves having a varnish-like surface; small inconspicuous flowers, and papery, 2–4-winged capsule.

SAVAII:

Graeffe 218a—Without further locality.

Reinecke 356—Tuafa (not on Samoan maps) above Sāfotu.

Vaupel 293—Manase (Bishop Museum, 11 December 1906).

Rechinger 1722—Lava flow between Ā'opo and Āsau.

Rechinger 1972—Above Matāutu.

Christophersen 680—Open "fern country" in a Manase plantation at 100 m elevation.

Christophersen 2364—Open "fern country" in a Manase plantation at 100 m elevation.

Whistler 1732—Lava flow east of Ā'opo ("Ā'opo East Block 8") at 120 m elevation.

Whistler 3899—Ā'opo lava flow.

Whistler 4249—Roadside on the lava flow near Ā'opo at 180 m elevation.



UPOLU:

Graeffe s.n.—Without further locality.

SINE LOC:

Powell 107 (Kew list, n.s.)—Without further locality.

Powell s.n. (Kew list, n.s.)—Without further locality.

Whitmee s.n.—Without further locality.

Guioa rhoifolia (A. Gray) Radlk.

Guioa subfalcata Radlk.

SAMOAN NAME: *taputo'i?*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: There is not much can be done for this species, since it is known from only one location on 'Upolu (the other specimen is without further locality on 'Upolu). It is more common in American Samoa.

Indigenous to Samoa, also found in Fiji. It is rare in lowland to montane forest on Tutuila and 'Upolu, reported from 240 to 750 m elevation. No uses or Samoan names are reported, probably because it is so uncommon, but Samoans might call it *taputo'i*, a name applied to other similar members of the same family.

Small tree up to 3 m or more in height (9 m or more in Fiji), with dark brown, subglabrous young stems. **Leaves** even-pinnately compound, alternate, rachis 3–9 cm long, glabrous to sparsely pubescent, swollen at the base, leaflets 4 or 6 (10 in Fiji); blades coriaceous, usually somewhat unequally sided, lanceolate, 3–9 cm long, acute to shortly winged at the base, broadly attenuate at the tip; surfaces glabrous, darker above, midvein of upper side yellow-green, lower side usually with 1 or 2 conspicuous domatia in the axils of the basal veins; margins entire; petiolules 2–6 mm long, swollen at the base. **Inflorescence** a terminal or upper-axillary panicle up to 10 cm long; flowers unisexual, trees dioecious. **Calyx** of 5 unequal, concave, suborbicular to reniform sepals 1.5–3 mm long, on a pedicel 1–4 mm long. **Corolla** of 5 white, obovate, shortly clawed petals 2–3 mm long, each with an axial appendage bearing two yellow glands. **Ovary** of female flowers superior, with a short, unlobed style. **Stamens** of female flowers 8, free, with red anthers. **Fruit** a 2-lobed (1–3) capsule 2–3 cm in diameter, wider than long, each containing a single black seed whose base is surrounded by an aril. **Flowering** and fruiting reported throughout the year (in Fiji at least).

Distinguishable by its medium-sized tree habit; alternate, pinnately compound leaves with domatia at the base of the lower surface of the 8–12 subfalcate leaflets; panicles of small white, unisexual flowers; 8 stamens with red anthers; and a 2- or 3-valved capsule.

UPOLU:

USEE s.n.—Without further locality.

Christophersen 560—Lowland forest on Mt. Fao at 300 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (5).



SAPOTACEAE

Manilkara dissecta (L. f.) Dubard

SAMOAN NAME: *pani*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: restricted Samoa distribution

SUGGESTED ACTION: A botanical survey of the coastal forest on Nu'utele Island to determine the frequency of this species there. The Aleipata Islands should be preserved as a nature reserve, for botanical reasons as well as for the marine and terrestrial fauna. A grove of several large trees was found in an Aleipata village during the present fieldwork in Samoa in July 2010. Recommended for the Red List of Samoan plants.

Indigenous to Samoa, ranging westward to New Caledonia. Its only occurrence in Polynesia other than Samoa is in Tonga, but it is known there only in cultivation and is perhaps an ancient introduction to that archipelago. In Samoa it is rare in coastal and lowland forest on Nu'utele Islet (Aleipata), with a single record from the mangroves on the adjacent mainland of 'Upolu, reported only from sea level to 200 m elevation. It is also reported on the north-central coast of Tutuila in American Samoa. The wood is sometimes fashioned into walking sticks and a brown dye was once obtained from the scraped bark. During the fieldwork for this project in July 2010, the species was seen to be fairly abundant along the Fagalele trail near Falealupo.

Small tree up to 15 m in height (but usually much smaller), with a gnarled trunk, and glabrous stems thickened apically; outer bark dark, inner bark tan, exuding a copious white latex. **Leaves** simple, alternate, crowded at the branch tips; blade coriaceous, obovate, 3–9 cm long, acute to cuneate at the base, rounded to retuse at the tip; surfaces concolorous, finely parallel veined from the midrib, mostly glabrous or lower side glabrescent, midrib of lower side prominent; margins narrowly revolute to entire; petiole 8–20 mm long. **Inflorescence** of axillary clusters of 1–5 flowers congested towards the stem tips. **Calyx** 4–7 mm long, deeply divided into 6 ovate to lanceolate lobes in 2 whorls of 3, the inner series white, conspicuously sericeous on the outer surface, inner surface less so, on a down-curved pedicel up to 3.5 cm long. **Corolla** white, deeply divided into 6 narrowly elliptic lobes 5–7 mm



long, concave and appearing linear at anthesis, each with a shorter pair of dorsal, recurved appendages, falling as a ring with the stamens attached. **Ovary** superior, 6-angled and 6-celled, with a glabrous, unlobed style 6–8 mm long. **Stamens** 6, epipetalous, with an equal number of staminodes. **Fruit** a red to orange, ovoid to subglobose, 1-seeded berry 6–10 mm long. **Flowering** reported in February and from July to December, and fruiting in February, April, and July, but both probably periodically occurring throughout the year.

Distinguishable by its small tree habit; milky sap; small, mostly obovate leaves notched at the tip; axillary clusters of 1–5 flowers; calyx of 6 lobes in 2 whorls; small white, 6-lobed corolla; and small globose, red to orange berry.

UPOLU:

Whistler 457—Coastal forest on the rim of Nu’utele.

Whistler 3889—A single tree on the mangrove margin at Malaelā at near sea level.

SINE LOC:

Powell 187—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (7).

Manilkara samoensis H. J. Lam & B. Meeuse (63)

Manilkara hoshinoi sensu auct. non (Kane.) H. J. Lam

Northia hoshinoi sensu auct., non Kane.

Northiopsis hoshinoi sensu auct. non (Kane.) Kane.

SAMOAN NAME: *pau*

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: A botanical survey of the Falealupo peninsula to determine its current distribution and abundance. A moratorium on the harvesting of this species should be enacted until its current abundance and maximum sustainable rate of harvesting can be determined. This valuable timber tree is found nowhere else in the world. Recommended for the Red List of Samoan plants.



Endemic to Samoa, where it is restricted to lowland forest in the remaining patches of native forest on the Falealupo peninsula at the western end of Savai'i, reported from near sea level to 150 m elevation. Its wood, one of the finest in Samoa, is used for making ax handles and handicrafts. Earlier authors (including Lam 1942) have considered this to be the same species as *Manilkara hoshinoi* of Pohnpei, which would be an unusual disjunct distribution between these two distant islands, but this conclusion was made without the knowledge that the fruits of the Pohnpei population are significantly larger (4–5 cm long) than those of the Samoan population. Further information on this species is found in Atherton (1999).

Large tree up to 18 m in height, with milky sap and subglabrous stems. **Leaves** simple, alternate, crowded at the tips of the branches; blade coriaceous, elliptic to ovate or oblong, 7–22 cm long, broadly acute at the base, shortly acuminate to emarginate at the tip; surfaces glabrous, midvein prominent on the lower side, with closely spaced parallel secondary veins; margins entire; petiole stout, 2.5–4.5 cm long, grooved on the upper side. **Inflorescence** of solitary or paired flowers in the leaf axils. **Calyx** 1.3–1.6 cm long at anthesis, divided to near the base into 6 lanceolate sepals in 2 whorls of 3, tomentose on the outside, on a tomentose pedicel up to 2 cm long at anthesis. **Corolla** white, ca. 1.5 cm long, divided to near the base into 6 ovate, acute-tipped lobes bearing appendages up to 8 mm long. **Ovary** superior, 6-angled and 6-celled, with a glabrous, unlobed style up to 2 cm long. **Stamens** 6, epipetalous, exserted, with 6 staminodes. **Fruit** a globose, 1-seeded, yellowish brown (?) berry 1.5–2 cm in diameter. **Flowering** reported from November and December, with the fruits believed to mature from April to June (Atherton 1999), but both periods are perhaps a little longer.

Distinguishable by its large tree habit; mostly oblong leaves; milky sap; axillary, solitary or paired flowers; calyx of 6 acute-tipped sepals in 2 whorls; relatively large, white, 6-lobed corolla; and globose fruit.

SAVAII:

Christophersen 2660—Without further locality (collected by E. Stehlin in 1931; sterile).

Christophersen 3319—Lowland forest near Faleālupo at 5 m elevation.

Atherton s.n.—Lowland forest near Faleālupo (in ca. 1998).

Whistler 6806—Lowland forest at Faleālupo.

Whistler 8236—Lowland forest at Faleālupo.

Whistler 11278—Lowland forest at the north end of the road on the way to the coastal village.

Whistler 11471—Lava flow west of Ā'opo at 200 m elevation.

SINE LOC:

Whitmee 226—Without further locality.

SCROPHULARIACEAE

Limnophila fragrans (Forst. f.) Seem.

Ambulia serrata Wett.

Curanga (No. 1) sensu Pickering

Ruellia fragrans Forst. f.

SAMOAN NAME: *tamole vai?*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: A botanical survey of the marshes of Savai'i and 'Upolu, including those in montane craters, to determine the distribution and frequency of this species. Recommended for the Red List of Samoan plants.



Native to Samoa, ranging from Australia and Melanesia to the Society Islands (it was originally named from Tahiti). It is rare in Samoa in wet places, such as in taro patches, streambeds, and crater lake margins, on all the main islands (except Olosega in American Samoa), reported from near sea level to 650 m elevation. In American Samoa it prefers old taro patches, and perhaps is uncommon in undisturbed marshes due to its short stature and competition with taller native marsh species. Most of the independent Samoa collections have been from native wetlands rather than taro patches. Before the present survey in July 2010, the only recent collections of this plant from independent Samoa were a new record from Savai'i in ca. 1992 and a 2005 record from **'UPOLU:** prior to the latter date, the plant had not been collected on 'Upolu since 1905. During the present survey, a new locality was found at Lake Lanoataata, where it was abundant in a narrow zone around the lake. This herb is particularly threatened because of the degraded condition of wetlands in Samoa. The name *tamole vai* was recorded for it by Powell (1868), and was also noted by Pratt, Kramer, and Funk. Both Funk and Powell noted its medicinal use, but the name and the plant have virtually been forgotten today.

Herb with weak, greenish, glabrous stems up to 15 cm or more in height, sometimes held upright between other vegetation. **Leaves** simple, opposite, decussate; blade elliptic to obovate, 1–2.5 cm long, broadly acute and winged at the base, broadly acute at the tip; surfaces glabrous, gland-dotted, fragrant; margins finely serrate; sessile. **Inflorescence** of solitary, axillary flowers, one per leaf pair, subtended by several subulate bracts 1.5–2.5 mm long. **Calyx** 3.5–5.0 mm long, cut halfway to the base into 5 lobes. **Corolla** bilabiate, white, 7–9 mm long, the limb shallowly divided into 5 rounded lobes, with dark longitudinal lines in the throat and faintly showing on the outside. **Ovary** superior, with a 2-lobed style. **Stamens** 4, epipetalous, included. **Fruit** an obovoid capsule about as long as the calyx, 4-valved, many-seeded. **Flowering** and fruiting probably occur continuously.

Distinguishable by its weak-stemmed herbaceous habit; small, fragrant, opposite, sessile leaves with finely toothed margins; and small, solitary, white, 5-lobed flowers borne one to an axil.

SAVAII:

Whistler 8241—Basalt rock on the margin of a marsh at the west end of Tufutafoe, near sea level.

UPOLU:

Reinecke 598—Basin of the crater lake at Lanoanea at 600 m elevation.

Rechinger 753—Dry margins of Lanoanea crater lake margins at ca. 700 m elevation.

Hochreutiner 3382—Lanoanea.

Whistler 11796—Marsh at Apolimauta.

Whistler 12164—Common around the edge of Lake Lanoataata at ca. 700 m elevation.

SINE LOC:

Powell s.n.—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (6), Ofu (1), Ta'ū (3).

SOLANACEAE

Solanum ferox L.

Solanum lasiocarpum Dunal

Solanum repandum Forst. f.

Solanum seedi Horne

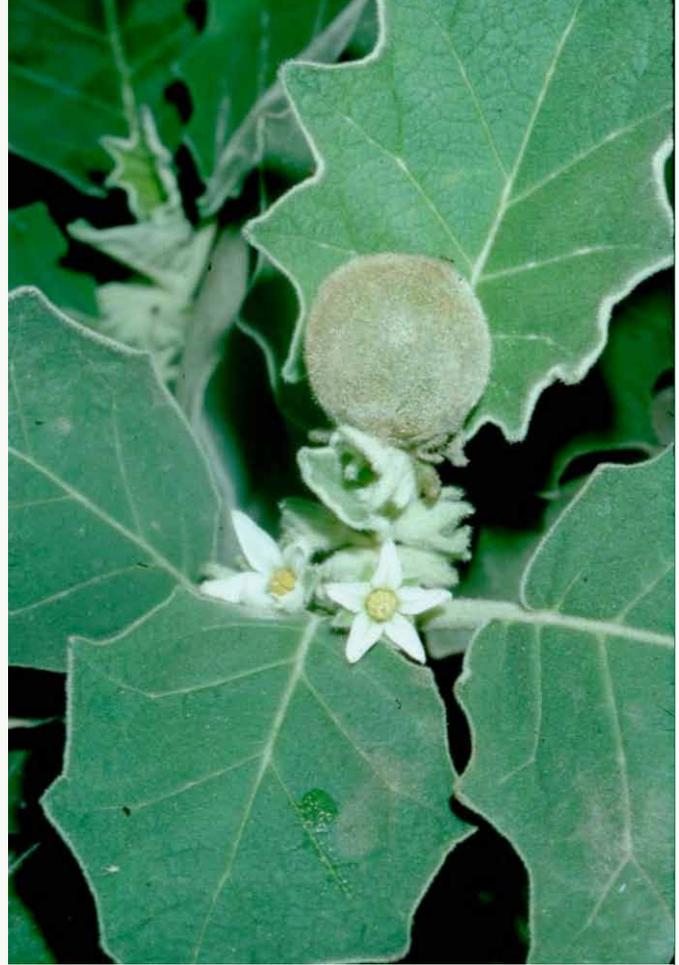
SAMOAN NAME: *taulo'u*

ENGLISH NAME: Polynesian tomato

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of collections, probably extirpated from Samoa

SUGGESTED ACTION: This plant almost certainly has been extirpated from Samoa. However, a photo and description of the species should be put in local newspapers to see by chance anybody recognizes and/or has this species that was last collected in Samoa in 1905.



A Polynesian introduction to Samoa, native to somewhere in Melanesia, recorded from New Britain to the Marquesas. Originally the Polynesian and Melanesian form were thought to belong to a separate species, *Solanum repandum*, but they now appear to be a cultivars of an Asian species, *Solanum ferox*, and, according to Heiser (1996), are correctly called *Solanum ferox* var. *repandum* (Forst. f.) Bitter. Whalen et al. (1981) considered it to be nearly identical to an American species, *Solanum sessiliflorum* Dunal, found in the same kind of habitats, and speculated on its mode of dispersal from there out into the Pacific, but Heiser discounted this relationship. It may have been derived from Melanesian and Indo-Malayan *Solanum lasiocarpum* by selection of spineless individuals. Its natural habitat comprises places associated with human activities, and it apparently never becomes naturalized in undisturbed habitats. It was apparently last collected in Samoa in 1905. The useful part of the plant is its small, fuzzy, tomato-like fruits. They were eaten, according to Parham, "in soup and with *ufi* [yams]."

Shrub up to 1.5 m in height, unarmed, but stems covered with simple or stellate pubescence, at least when young. **Leaves** simple, alternate; blade broadly ovate, 13–35 cm long, obtuse to truncate and often unequally-sided at the base, rounded to acute at the tip; upper surface sparsely pubescent, lower side densely stellate-pubescent; margins with 3–5 lobes at the lateral vein terminations; petiole 3–11 cm long. **Inflorescence** a 5–12-flowered axillary cyme up to 1.5 cm long. **Calyx** *synsepalous, campanulate*, deeply divided into 5 ovate, acute-tipped lobes 5–9 mm long, pubescent on the outside, on a pedicel 5–15 mm long in flower (elongating in the fruit). **Corolla** white, sympetalous, star-shaped, deeply divided into 5 ovate to nearly lanceolate lobes 5–9 mm long. **Ovary** superior, 4–6-celled, with numerous ovules; style simple with a capitate stigma; ovary sterile in the upper flowers on the cyme. **Stamens** 5, epipetalous, yellow. **Fruit** a subglobose, many-seeded, red to yellow berry 4–5 cm long, pubescent, 1 (2–4) forming per inflorescence. **Flowering** and fruiting occur throughout the year.

Distinguishable by its shrubby habit; pubescence often of star-shaped hairs; large, alternate leaves; lobed leaf margins; white, 5-lobed flowers in short axillary cymes; and fuzzy, red to yellow, tomato-like berries usually borne singly or in pairs.

UPOLU:

Reinecke 522—"Āpia-Berg" [presumably Mt. Vaea].

Lloyd s.n.—Without further locality ("It is a rare plant in 'Upolu").

SINE LOC:

Whitmee 4—Without further locality.

Whitmee s.n.—Without further locality.

OTHER SAMOAN COLLECTIONS: Olosega (1, in 1894).

Solanum viride Forst. f. ex Spreng.

Solanum inamoenum Benth.

Solanum aff. *inamoenum* sensu Christoph.

Solanum ornans Wit.

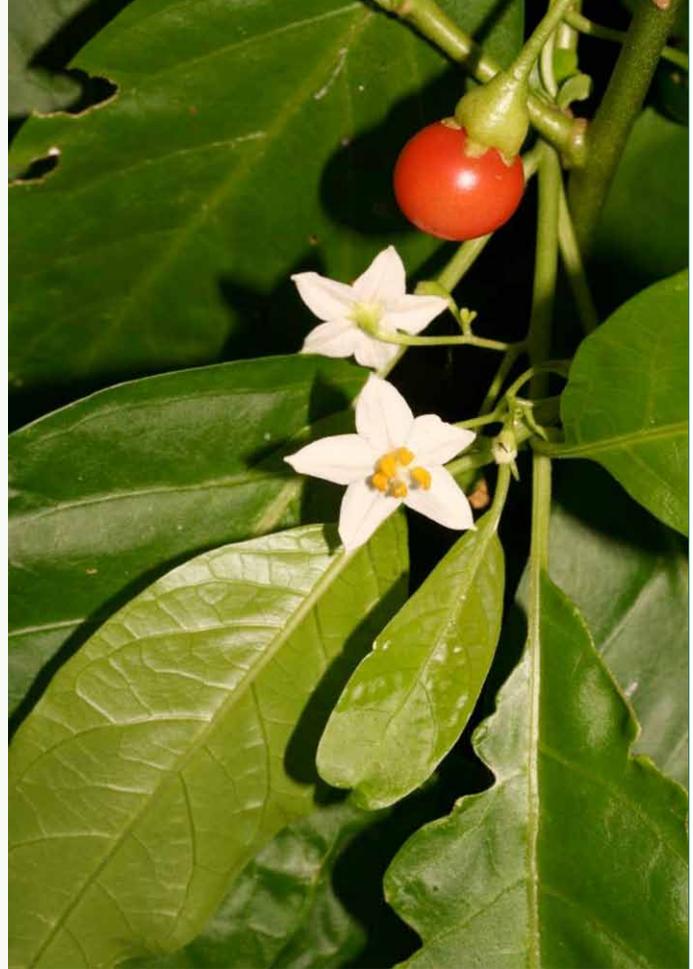
Solanum patameense Wits.

vars. *grandifolium* Wit. & *parvifolium* Wit.

Solanum savaiense Wit.

Solanum upoluense Wit.

Solanum uporo Dunal



SAMOAN NAME: *polo iti*

ENGLISH NAME: cannibal cherry

STATUS: rare cultigen or indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: A photo and description of the species should be put in local newspapers to see anybody recognizes and/or is growing this species that was last collected in Samoa in 1905. Also, a botanical survey of Nu'utele should be conducted, especially on the cliffs on the edge of forest.

Probably an ancient introduction to Samoa, originally native to somewhere in eastern Melanesia, but spread naturally or was introduced by ancient Polynesians eastward across the Pacific to Hawai'i. The exact native range is difficult to determine: it still occurs in native habitats and has a fruit that appears attractive to birds, but it was apparently cultivated on many islands where it has disappeared after cultivation was terminated. It is currently rare in Samoa in coastal habitats. In Fiji, Smith (1991) recognized a cultivar called CV. *Anthropophagorum*, which apparently was derived from the wild type. A large-fruited variety is cultivated in the Cook Islands.

The plant had three minor uses in Samoa—food, decoration, and medicine. The leaves and/or fruits may have been cooked and eaten as greens. The fruits were reportedly eaten and used to flavor kava, and in Fiji as a condiment when human flesh was consumed, according to Seemann (1865–1873). The fruits were strung into festive leis for decoration. In these festive uses it is sometimes now replaced by a spiny relative, *Solanum capsicoides*, an herb of modern introduction to Polynesia. Unspecified medicinal uses are also reported from Samoa, probably for treating boils or other skin ailments.

Shrub up to 2 m in height with nearly glabrous to pubescent stems. **Leaves** simple, alternate; blade ovate, mostly 8–18 cm long, unequal and usually decurrent at the base, acute at the tip; surfaces glabrous to pubescent with simple and branched hairs; margins subentire to shallowly lobed; petiole 1–3 cm long. **Inflorescence** of axillary and terminal, several-flowered cymes. **Calyx** synsepalous, 2–7 mm long, 5-lobed, on a pedicel 4–20 mm long (1–5 cm long in fruit). **Corolla** sympetalous, rotate, white or yellowish white, often pubescent on the outside, divided to near the base into 5 lobes 5–12 mm long. **Ovary** superior, with a short style and capitate stigma. **Stamens** 5, epipetalous, yellow. **Fruit** a subglobose or ellipsoid berry mostly 1–2 cm in diameter, glossy red. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its subshrub habit; alternate, mostly glabrous, ovate leaves; several-flowered clusters of white, wheel-shaped flowers with yellow stamens; and red fruit much like a cherry tomato.

SAVAII:

Vaupel 534—(Specimen not at Bishop Museum).

Rechinger 76—Lealatele.

Rechinger 92—Patamea.

Rechinger 129—Patamea.

Rechinger 1117—Malo.

Rechinger 1183—Lealatele.

Christophersen 3053—Cultivated at the village of Gāga'emalae.

APOLIMA:

Rechinger 474—Without further locality.

UPOLU:

Graeffe 1477—Without further locality (not listed in Reinecke).

Rechinger 482—Lauli'i.

Rechinger 518—Littoral vegetation at Vaitele.

Rechinger 1775—Moamoa.

Hochreutiner 3457—Falefā.

Eames 168—Thicket at Vailele at 100 m elevation.

Bristol 2240—Houseyard at Lefaga near sea level.

Whistler 4120—Coastal forest at the northwest tip of Nu'utele.

Whistler 8332—Coastal forest at the northwest tip of Nu'utele.

SINE LOC:

Powell s.n.—Without further locality.

Whitmee 186—Without further locality.

Whitmee 333—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (3), Ofu (1) Ta'ū (1).

NOTE: Reinecke lists several other unidentified specimens from 'Upolu, 181, 206, 386, 443, and 552, which may belong here.

STERCULIACEAE

Waltheria indica L.

Waltheria americana L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Polynesian adventive or indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: There is not much that can be done for this species, since it is probably a Polynesian or modern weed that has lost out in competition with more recently introduced weeds. It, however, may be indigenous instead. It is most likely found on the A'opo lava flow, but the most recent collection is near the Āsau airport.

An unintentional introduction or possibly indigenous to Samoa, native to the New World tropics, but it is not clear how it reached Polynesia before the Cook expeditions. It is recorded in Samoa only from the dry northwestern coastal area of Savai'i, probably at less than 200 m elevation. The 'Upolu record of the USEE is likely to be in error. No Samoan names or uses have been reported.

Erect to ascending shrub, branched, up to 1.5 m in height, stems and other parts tomentose with stellate hairs. **Leaves** alternate, simple; blade ovate to elliptic, 2–10 cm long, rounded to subacute at the base, rounded at the tip; surfaces tomentose, rugose; margins serrate; petiole 0.5–4 cm long. **Inflorescence** of short, dense, subglobose to irregularly ovoid, many-flowered axillary clusters 0.6–3 cm long, borne on a peduncle 2–12 mm long. **Calyx** campanulate, 3–5 mm long, divided about halfway into 5 lanceolate lobes. **Corolla** of 5 spatulate petals 3.5–5 mm long, yellow drying to orange. **Ovary** superior, 1-celled, with a bearded style. **Stamens** 5, free, exserted. **Fruit** an obovoid, 2-valved capsule 2.5–3 mm long, enclosed within the persistent calyx, containing 1 black, turbinate seed. **Flowering** and fruiting occur continuously.

Distinguishable by its small woody habit; stems covered with star-shaped hairs; alternate, simple, pubescent leaves with rugose margins; small yellow flowers in short dense clusters; and capsule fruit enclosed within the persistent calyx.

SAVAII:

Vaupel 296—(Specimen not at Bishop Museum).

Rechinger 1714—Lava flow at Ā'opo.

Whistler 9462—Track across the lava flow north of Ā'opo.

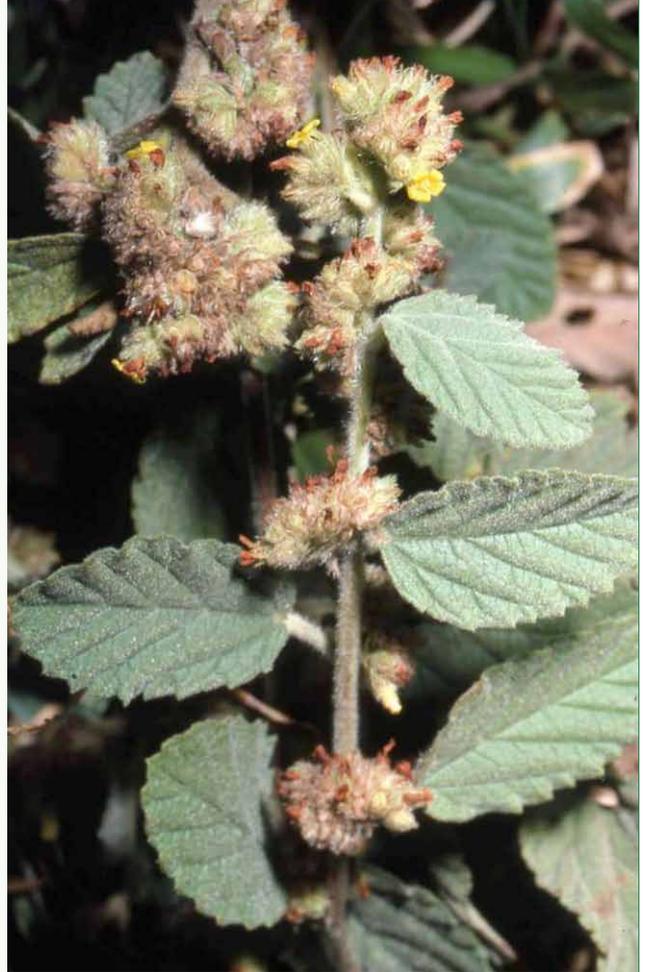
Whistler 11743—Disturbed places around the airport at Āsau, ca. 10 m elevation.

UPOLU:

USEE s.n.—Without further locality [possibly incorrect data].

SINE LOC:

Whitmee 32 (Kew list, not seen)—Without further locality.



SURIANACEAE

Suriana maritima L.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections, restricted Samoa distribution

SUGGESTED ACTION: The beach of Nu'ulua should be checked (this might be done without landing) to see if the plant still occurs there. The same can be done for the beach of the cove of Nu'utele. This plant is common on Polynesian atolls, but not very common on high islands.

Indigenous to Samoa, pantropic in distribution. It is known only from two collections on sandy beaches in Samoa—on Nu'ulua Islet in independent Samoa, and on Rose atoll—but it is much more common in Micronesia and the rest of Polynesia. No Samoan names or uses have been reported.

Shrub up to 4 m in height with sericeous young stems. **Leaves** simple, alternate, crowded at the branch tips; blade narrowly oblanceolate, 1.5–4 cm long, attenuate at the base, rounded to acute at the tip; surfaces finely appressed-pubescent; margins entire; petiole 0–4 mm long. **Inflorescence** of several-flowered axillary cymes 1–3 cm long. **Calyx** deeply divided into 5 lanceolate, attenuate tipped sepals 7–9 mm long, finely pubescent, on a pedicel **Corolla** rotate, of 5 free, obovate to suborbicular, yellow petals 6–9 mm long. **Ovary** superior, 5-celled; style filiform. **Stamens** 10, in 2 series, free. **Fruit** composed of 3–5 ovoid drupes each 2–4 mm in diameter, pubescent, dry, splitting apart at maturity. **Flowering** and fruiting occur continuously.

Distinguishable by its shrub habit; alternate oblanceolate leaves finely covered with appressed hairs; yellow, 5-merous flowers; 10 stamens; and fruit composed of 3–5 drupes.

UPOLU:

Whistler 4238—One shrub growing on the beach of Nu'ulua.

OTHER SAMOAN COLLECTIONS: Rose (1).



ULMACEAE

Parasponia andersonii (Planch.) Planch.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous?

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: The site of the only known location of collection of this species in Samoa—in the Āfulilo Dam site—should be checked to see if this species is still found there.

Possibly indigenous to Samoa, ranging from Fiji to Tahiti. This tree is known to occur in Samoa based on a single modern collection in a disturbed area near Āfulilo dam, and could, perhaps have been introduced during construction of the dam. No Samoan names or uses have been reported.



Medium-sized tree up to 8 m or more in height, with interpetiolar connate stipules leaving a semicircular scar halfway around the stem; young stems sericeous. **Leaves** simple, alternate; blade ovate to lanceolate, 4–10 cm long, subcordate to oblique at the base, attenuate at the tip; upper surface finely scabrous, dark green, lower surface finely pubescent, lighter, 3–5-veined from the base; margins serrate; petiole 7–12 mm long. **Inflorescence** of axillary, many-flowered, freely branched cymes or thyrse 3–20 mm long; flowers unisexual, subglobose to ovoid-conical; trees usually dioecious. **Calyx** of 5 free ovate-oblong (female) to ovate (male) sepals 1.1–1.4 mm long, on a pedicel 0–1.5 mm long. **Petals** absent. **Ovary** of female flowers superior, with two stigmatic arms; staminodes absent. **Stamens** of male flowers 5, free, exserted; ovary vestigial. **Fruit** an ovoid, yellow to orange drupe ca. 3–3.5 mm long. **Flowering** and fruiting occur throughout the year.

Distinguishable by its tree habit; connate stipules leaving a circular scar at the nodes; alternate, alternate, mostly ovate leaves 3–5-veined from the base; small green flowers lacking petals; 2-lobed stigma; and small yellow to orange drupes. It is very similar to *Trema cannabina*, and the leaf scar is the best way to distinguish the two (*Trema* does not have the scar).

UPOLU:

Whistler 10044—Locally common along an access road at Āfulilo dam.

URTICACEAE

Boehmeria sp. nova

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, restricted Samoan distribution

SUGGESTED ACTION: The sites of the only known location of collection in Samoa—between Lepu'e and Fito, should be checked to determine its range and abundance, and coordinates made of known locations. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is rare in montane forest on 'Upolu, known from only two modern collections, reported from 1020 to 1060 m elevation. No Samoan names or uses are reported.

Spreading shrub up to 4 m in height, with densely pubescent stems. **Leaves** simple, opposite in unequally sized pairs; blade lanceolate-falcate, 5–22 cm long, oblique at the base, attenuate at the tip; surfaces densely pubescent, rugulose, 3–5-veined from the base; margins serrate, the tips mucronate; petiole 0.5–5 cm long, unequal in pairs. **Inflorescence** of axillary spikes up to 21 cm long, usually one in both of the upper axils of the stems, flowers ultimately in globose, many-flowered clusters subtended by an ovate, densely pubescent bract 2–3 mm long; flowers unisexual, plants apparently dioecious. **Calyx** of male flowers of 4 ovate, densely pubescent sepals 1–1.5 mm long, on a pedicel that elongates to ca. 2 mm long at anthesis; that of the female unknown. **Corolla** absent. **Ovary** of the female flower unknown. **Stamens** 4, free, exerted. **Fruit** unknown. **Flowering** reported in May and August, probably year round, fruiting not known, but also probably year round.

Distinguishable by its shrubby habit, opposite, densely pubescent leaves in unequal pairs; blade 3–5-veined from the base; rugulose upper leaf surfaces; margins serrate with the teeth tipped with a mucro; and tiny flowers borne in clusters on solitary, upper-axillary spikes up to 21 cm long.

UPOLU:

Whistler 3951—Edge of the meadow at Mt. Vaivai west of Mt. Fito at 1060 m elevation.

Whistler 9956—Edge of the meadow at Mt. Vaivai west of Mt. Fito at 1060 m elevation.



VISCACEAE

Korthalsella horneana V. Tieg.

Korthalsella platycaula sensu Whistler, non (V. Tieg.) Engl.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this shrubby parasitic species since the only time it is usually found is when broken branches are found on the forest floor.

Indigenous to Samoa, ranging from Fiji to Tahiti. It occurs on 'Upolu and Savai'i, and in American Samoa on Ta'ū, reported from 300 to 900 m elevation. This species may be more common than the number of collections would indicate, since it is usually found high in forest trees. No Samoan names or uses have been reported.

Hemiparasitic shrub with glabrous, with leafless, jointed, striate stems terete when young, but flattened when older, gradually shorter towards the tip of the plant. **Leaves** absent. **Inflorescence** of tiny white, axillary flowers and fruits in clusters of up to 4; surrounded by moniliform hairs; flowers unisexual, plants monoecious with male and female flowers mixed together. **Calyx** ca. 1–1.5 mm long, deeply split into 3 deltoid sepals; sessile. **Corolla** absent. **Ovary** of female flower superior, 1-celled, with 1 ovule. **Stamens** of male flowers 6, fused into a globose structure. **Fruit** an inconspicuous, red, clavate or subglobose berry containing a single seed that is explosively ejected from it. **Flowering** and fruiting reported in Fiji in May and August, probably occurring throughout the year.

Distinguishable by its parasitic shrub habit; leafless jointed stems round in cross section; tiny white flowers in clusters at the axes; and small red berry.

SAVAII:

Whistler 6896—Montane forest northwest of Mauga Loa at 900 m elevation.

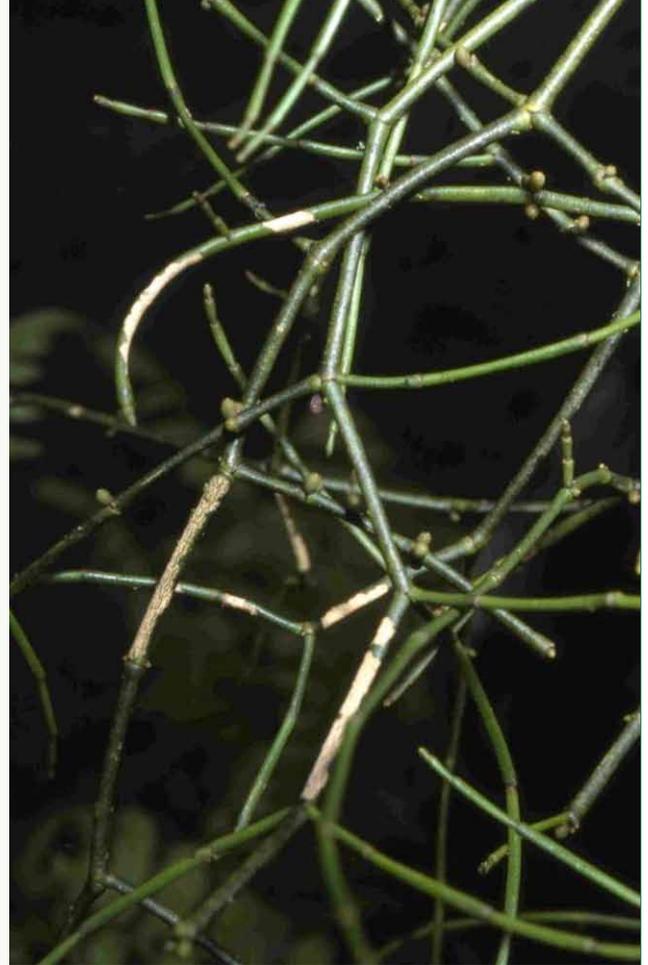
UPOLU:

Cox 909—Specimen not located at Bishop Museum, perhaps it is at the Gray Herbarium.

Whistler 7012—Montane forest at Mt. Sina'ele at ca. 800 m elevation.

Whistler 8370—Montane forest on a crater west of Mt. Sina'ele at ca. 650 m elevation.

OTHER SAMOAN COLLECTIONS: Ta'ū (2).



MONOCOTYLEDONAE

ARACEAE

Amorphophallus paeoniifolius (Dennst.) Nicholson

SAMOAN NAME: *teve*

ENGLISH NAME: island stink lily

STATUS: rare Polynesian cultigen

REASON FOR LISTING: rarity of modern collections (actually, infrequency of recent collections)

SUGGESTED ACTION: Perhaps the best way to protect this plant is to put a photo and description of the species in local newspapers or TV, and ask people to report any place they know it occurs. These sites should then be visited and the corm dug up and taken to a botanical garden for cultivation.

Indigenous to somewhere in the Old World tropics between Madagascar and Indo-Malaya, perhaps closer to the latter (since it doesn't set seed in the western part of its range), but was an ancient introduction into the Pacific as far east as the Marquesas. Although once cultivated and often common, it is now uncommon throughout Polynesia, but is sometimes found naturalized in open native and secondary forest and plantations (although it is often difficult to find, especially since it is leafless during part of the year), reported from all the main islands of Samoa, near sea level to 350 m elevation.

Stink lily was originally introduced as a supplemental food plant, but is no longer cultivated in Samoa. Like other members of the aroid family, the corm and other parts of the plant contain calcium oxalate crystals called raphides that have a caustic substance on the surface. Ingestion of the stems, leaves, or corms releases the crystals, which cause one's throat and mouth to become inflamed and swollen. Few people know the plant nowadays, or how it was prepared as food. In Samoa, adulterers or criminals were sometimes sentenced to bite the stem, which caused the gums to become so extraordinarily inflamed that death often resulted, although this may be somewhat overstated. According to Powell (1868), "The chiefs in Samoa sometimes sentenced a culprit to bite the stem of this plant, but the culprits sometimes succeeded in deceiving them by putting inside its hollow stem a young banana leaf in its rolled or twisted state, and biting that instead of the *teve*, and then making such grimaces as would indicate that they were severely stung." This is impossible, however, since unlike the similar-looking Polynesian arrowroot (*Tacca leontopetaloides*), its stems are solid.

Large herb, stemless, arising from an acrid tuber up to 30 cm in diameter. **Leaves** compound, solitary and arising from the corm after flowering, blade palmately divided into three lobes that are further divided, 30–40 cm or more long, oblique at the lobe base, acute at the lobe tips; surfaces glabrous; margins of lobes entire; petiole smooth or rough, mottled in color, solid (rather than hollow), up to 65 cm or more in length. **Inflorescence** of unisexual flowers on a spadix surrounded by a spathe, borne on a stalk up to 10 cm long; spadix cylindrical, ca. 15–20 cm long, comprised of three parts—an upper expanded, purple "appendix," a medial part bearing the closely packed male flowers, and a basal part bearing the densely packed female flowers; spathe ca. 20 cm long, green on the outside, purple within, spreading and campanulate at anthesis and drooping with age. Female flowers sessile, lacking a perianth, ovary 1–4-celled with a single ovule, style purple, 3–4 times as long as the ovary, with a deeply



lobed, yellow stigma; ovary absent in male flowers. Male flowers sessile, lacking a perianth, with several united stamens having purple filaments and yellow anthers; stamens absent in female flowers. **Fruit** an red, ovoid, 1-seeded berry ca. 8–12 mm long. **Flowering** and fruiting occur in the winter to early spring (i.e., perhaps June to November in the southern hemisphere).

Distinguishable by its stemless herb habit; large, palmately lobed leaves; mottled, solid leaf stalks; and large, seasonal, bad-smelling, purple spathe and spadix. The single large leaf, which is palmately 3-lobed from the base and further divided, is very similar to that of the Polynesian arrowroot, but its stalk differs in having a warty, mottled surface rather than one that is green and longitudinally grooved. The plant dies back during the end of the rainy season. The huge inflorescence, something like a spreading, dark-colored calla lily and appearing once a year (usually in October and November) after the leaves begin to die off, is the color of rotting meat and emits an unpleasant odor that attracts the flies needed for pollination.

SAVAIL:

Reinecke 577—Sataua.

Christophersen 671 (listed as 676 in Chr.)—Fagamalo.

Christophersen 767—Wasteland above Letui at 200 m elevation.

Christophersen 2593—Coconut plantation at Sala'ilua at 10 m elevation.

Cox 928—Plantation at Faleālupo at 30 m elevation.

Hagner 4005—(Specimen not found.)

APOLIMA:

Rechinger 176—Without further locality.

MANONO:

Whistler (not collected)—Observation in 2005.

UPOLU:

Funk 216—At Lanoto'o.

Rechinger 577—Coastal area near Leulumoega.

Bristol 2382—Lefaga, Matafa'a, at 50 m elevation.

Whistler 4725—Plantation weed at Vini on Nu'utele Islet.

OTHER SAMOAN COLLECTIONS: Tutuila (3), Ofu (1), Ta'ū (3). Vaupel 481 has recorded by the author, but it is not clear where this record was obtained.

ARECACEAE

Balaka samoensis Becc.

Balaka siliensis Christoph.

SAMOAN NAME: *māniuniu* (a generic name)

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this palm, which is vulnerable because it has been reported only from the lowlands. It should be looked for in any mid-elevation forests on Savai'i in any surveys done there. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it occurs in foothill forest on Savai'i, reported from 300 to 450 m elevation. It is called *māniuniu*, which is a generic name for species of *Balaka*. No local uses have been reported. It is very similar to *Balaka brachyclamys*, which apparently occurs on 'Upolu and Savai'i, and the two may be conspecific. Further collecting and study is needed.

Small palm up to 5 m in height, with glabrous stems. Fronds pinnately compound, alternate, rachis red-brown pubescent (when young), longitudinally striate, up to 1.5 (?) m long, leaflets in up to ca. 13 or more alternate pairs, 20–50 cm long, attenuate at the base and up to 1 cm wide there, angled-truncate and coarsely serrate at the tip; surfaces glabrous, upper side darker, veins parallel, prominent; margins entire; leaflets sessile. **Inflorescence** a widely branching, many-flowered axillary panicle up to 72 cm or more in length when in fruit, with spaced clusters of flowers in 3s (2 in uppermost ones), 2 males and 1 female proximally, only male flowers distally. **Calyx** of 3 broadly ovate, rounded sepals up to 2 mm long at anthesis, expanded and up to 5 mm long in fruit, imbricate, sessile. **Corolla** of male flowers comprising 3 valvate, greenish, acute-tipped, narrowly oblong petals 1–1.4 mm long, reflexed at maturity; corolla of female flowers comprising 3 imbricate, broadly ovate petals 1–1.3 cm long, blunt at the tip but with a small mucro, persistent, chartaceous at maturity. **Ovary** simple, 1-celled, stigma clavate, on a wavy style; reduced to a pistillodes in male flowers. **Stamens** many, white, with versatile anthers ca. 3 mm long; reduced to 6 staminodes in female flowers. **Fruit** a red ovoid drupe 2.8–4.2 cm long, irregularly several-ridged when dry. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small palm habit; pinnately compound leaves; leaflets serrate and truncate at the tip; sepals of fruit less than 7 mm long and wide; and fruits 3–4.2 cm long with several irregular ridges when dry. It differs from the similar *Balaka brachyclamys*, which has shorter fruits. It differs from *Balaka taitensis* and *Balaka tuasivica*, which have much smaller fruits, petals, and sepals.



SAVAII:

Christophersen 3260—Foothill forest
above Sili at 300 m elevation.

Christophersen 3266—Foothill forest
above Sili at 300 m elevation.

Bristol 2291—Foothill forest above
Gātaivae at 350–450 m elevation.

Bristol 2293—Foothill forest above Gātaivae
at 350–450 m elevation.

SINE LOC:

Whitmee 4 (7?)—Without further locality.

CYPERACEAE

Mariscus whitmeei C. B. Clarke

Cyperus whitmeei (C.B. Clarke) Kükén.

SAMOAN NAME: none

ENGLISH NAME: none

REASON FOR LISTING: rarity of collections

STATUS: rare Samoa endemic

Endemic to Samoa, where it has not been attributed to an island. The only record of its existence is an 1870 Whitmee specimen from Samoa, without further locality. It is similar to *Mariscus sieberianus* of Rarotonga and *Mariscus umbellatus* of Tahiti. It was annotated at Kew as *Mariscus cf. whitmeei* in 1972. No Samoan names or uses have been reported. It is remotely possible that the specimen was somehow collected outside of Samoa and sent to Kew with the incorrect annotation citing Samoa.

Sedge, robust (height not given) with glabrous, gray-colored, 3-angled stems up to 3 mm wide at the tip, arising from a short oblique rhizome. **Leaves** simple, alternate, up to nearly 5 cm long. **Inflorescence** mostly of simple, somewhat compact umbels bearing elongated oblong bracteoles, and subtended by 7 suberect bracts similar to the leaves and up to 6 x 1 cm; umbel rays 9, up to 10 cm long, bearing cylindrical spikes up to 22 x 8 mm, turned in various ways. Spikelets lanceolate, ca. 6 mm long, acute-tipped, 2-flowered; the lower (?) ones ca. 2.5 mm wide, erect. Glumes greenish red-brown, "rolled," in several series; the fertile glumes ovate-oblong, obtuse, scarcely keeled, closely imbricate, the uppermost glumes sterile, crowded, long-exserted; the second glumes by no means small. **Ovary** superior, bearing a 3-parted style. **Stamens** 3, free. **Fruit** an achene. **Flowering** and fruiting times not recorded. (The description is taken from the original Latin description.)

Distinguishable by its medium-sized habit; leaves up to 5 cm long; the flowers arranged in compound umbels subtended by about 7 leaf-like bracts up to 6 cm long; ovary with a 3-lobed style; and fruit an achene.

SINE LOC:

Whitmee 24 (1870)—Without further locality.

NOTE: Photo of herbarium specimen not obtained.

ORCHIDACEAE

Bulbophyllum longiflorum Thouars

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity.

Indigenous to Samoa, ranging from the Cook Islands to tropical Africa. In Samoa, it occurs on 'Upolu and Savai'i in foothill to montane forest, reported at ca. 500 m elevation. No Samoan names or uses have been reported.



Epiphytic orchid creeping by means of a stout elongate rhizome bearing pseudobulbs at 5–6 cm intervals, these conical, 1.5–3.5 × 0.8–1.2 cm, one-leaved at the tip. Leaf simple, alternate; blade erect, oblong, 9–16 × 2–3.5 cm, cuneate at the base, obtuse at the tip; surfaces glabrous; margins entire; petiole 1.5–3 cm long. **Inflorescence** a suberect to spreading, 4–9-flowered umbel-like raceme up to 24 cm long, rachis 12–30 cm long; flowers elongate, creamy to yellow, blotched with red to purple, lip yolk-yellow to purple, ovary ca. 3 mm long. Sepals unequal, dorsal sepal concave, ovate, with long cilia apically, ca. 8 × 4–5 mm; lateral sepals ligulate, fused in upper two-thirds, 2.5–3 × 0.4–0.6 cm. **Petals** ovate, ciliate, 0.6–0.9 × 0.3–0.4 cm. Lip fleshy, ligulate, 4–5 × 2.5–3 mm, recurved; column ca. 3 mm long with apical down-curved stelidia; foot ca. 4 mm long. **Fruit** a capsule oblanceolate in outline, up to 5 cm long. **Flowering** reported in Samoa in March, fruiting in April, both in Fiji from April to December, but both probably occurring throughout the year.

Distinguishable by its epiphytic orchid habit; creeping rhizomes bearing pseudobulbs 1.5–3.5 cm high, these bearing leaves singly; 4–9-flowered false umbel on a peduncle 12–30 cm long; and showy cream to yellow flowers blotched with red to purple, with a yellow to purple lip.

SAVAII:

Whistler 1769—Epiphyte in lowland forest at "Ā'opo west" forestry plot at 300 m elevation.

UPOLU:

Flynn 3600—Riparian forest east of Vaipū at 320 m elevation.

Whistler 1987—Epiphyte in foothill forest above Utumapu at ca. 375 m elevation.

Bulbophyllum pachyanthum Schltr.

Bulbophyllum longiscapum sensu Parham; non Rolfe

Bulbophyllum sp. of Yuncker

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity. Since it occurs at up to 1600 m elevation, it is probably in no immediate danger.

Indigenous to Samoa, ranging from westward to New Caledonia. In Samoa it occurs in foothill to cloud forest of 'Upolu and Savai'i, reported from 300 to 1600 m elevation. No Samoan names or uses have been reported.

Large epiphytic orchid with a clustered or weakly spreading habit, a somewhat elongated rhizome 4–6 mm in diameter, and closely spaced, obliquely ovoid pseudobulbs 1.8–3.5 × 1–1.7 cm. **Leaves** simple, alternate; blade coriaceous, oblong-elliptic, 8–25 × 3–5.5 cm, narrowly cuneate at the base, broadly acute at the tip; surfaces glabrous; margins entire; petiole 1.5–4 cm long. **Inflorescence** an erect, laxly 2–4-flowered raceme 22–40 cm long, on a peduncle bearing 3 or 4 widely spaced sheaths along its length, as well as broadly ovate, acuminate-tipped bracts 10–12 mm long; flowers developing sequentially, green or greenish yellow spotted with purple, glabrous, pedicel and ovary 1.5–2.5 cm long. Sepals unequal; dorsal sepal narrowly ovate, acuminate at the tip, 2.2–2.8 × 1.2–1.4 cm, slightly thickened and carinate dorsally; lateral sepals obliquely lanceolate, acute at the tip, 3.3–3.8 × 0.8–1.2 cm, dorsally carinate. **Petals** obliquely ovate, acute at the tip, 1.2–1.6 × 0.8–0.9 cm. Lip arcuate, fleshy, oblong-lanceolate, subacute at the tip, 1.2–1.4 × ca. 0.5 cm, auriculate at base; calli 2, longitudinal, somewhat papillate; column ca. 1 cm long, with setose steldia as long as the column; foot ca. 8 mm long. **Fruit** a ribbed fusiform capsule up to 8.5 cm long (including the stalk). **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its epiphytic orchid habit; creeping rhizome with large leaves borne singly from pseudobulbs; leaf blade up to 25 cm long; 2–4-flowered raceme up to 40 cm long; relatively large, showy green or yellowish flowers spotted with purple; petals over 1 cm long; and spindle-shaped fruit up to 8 cm long.

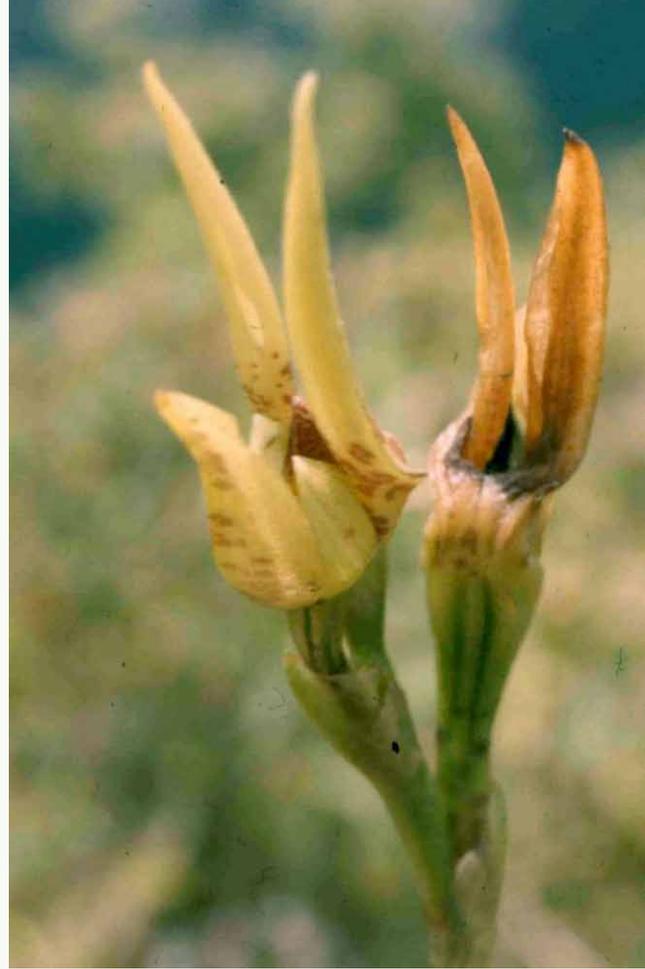
SAVAII:

Whistler 9614—Epiphyte near Mataoleafi at 1600 m elevation.

UPOLU:

Christophersen 558—Epiphyte on tree in foothill forest on Mt. Fao at 300 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (6), Ta'ū (1).



Bulbophyllum trachyanthum Kraenzl.

SAMOAN NAME: none

ENGLISH NAME: none

REASON FOR LISTING: rarity of collections

STATUS: rare indigenous

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity.

Indigenous to Samoa, ranging westward to New Guinea. In Samoa it occurs in foothill to montane forest of Savai'i, reported from 400 to 1030 m elevation. No Samoan names or uses are reported.

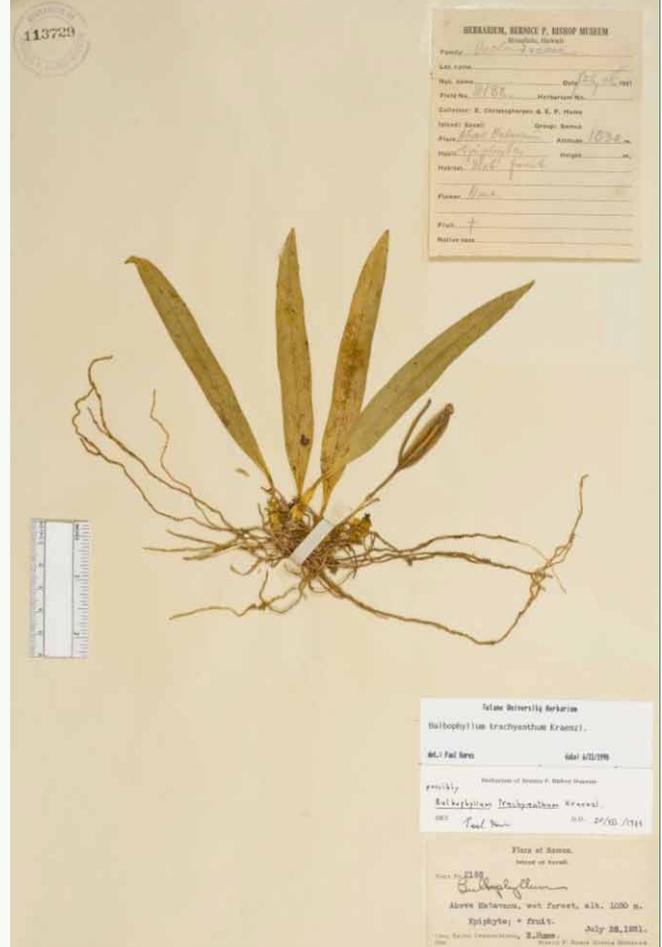
Medium-sized epiphytic orchid with clustered pseudobulbs on a short rhizome ca. 3 mm in diameter, these 3–10 mm apart, narrowly conical to conical-ovoid, weakly 4-angled, 1.8–3 x 0.7–1.3 cm. **Leaves** simple, alternate, blade oblong-lanceolate to oblong-elliptic, 7.5–13 x 1.2–2.2 cm, slenderly petiolate at the base, acute or subacute at the tip; surfaces glabrous; margins entire; petiole 0.5–1.5 cm long. **Inflorescence** of a solitary flower on a peduncle up to 20 cm long; bearing 4 or 5 clasping, ovate, acuminate-tipped bracts much shorter than the ovary; flower large, the sepals green to greenish brown with numerous purple blotches, the petals yellow-green with purple tips, the lip greenish yellow; pedicel and ovary up to 4 cm long. Sepals unequal, dorsal sepal lanceolate, linear-acuminate at the tip, 28–35 x ca. 5 mm; lateral sepals falcate, lanceolate, acuminate at the tip, 25–30 x 4–4.5 mm. **Petals** ovate at the base, linear-clavate at the tip, 12–14 x 3 x ca. 4 mm. Lip fleshy, arcuate, oblong-ligulate, obtuse, ca. 5 x 3 mm, weakly sulcate at the base; column 3–4 mm long, with weakly quadrate stelidia; foot ca. 3 mm long. **Fruit** a ribbed, fusiform capsule ca. 3.3 cm long. **Flowering** and fruiting probably anytime of the year.

Distinguishable by its medium-sized epiphytic orchid habit; creeping rhizome with pseudobulbs bearing leaves singly; leaf blade up to 13 cm long; and showy purple and yellow flowers over 2.5 cm long.

SAVAII:

Christophersen 2188—"Wet forest" above Matāvanu Crater at 1030 m elevation.

Christophersen 3177—Foothill forest above Sili at 400 m elevation.



Calanthe hololeuca Rchb. f.

Calanthe clavata auct. non Lindl.

Calanthe neocaledonica Rendle

Calanthe vaupeliana Schltr.

Calanthe sp. of Yuncker

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this orchid, since it is widely dispersed in the archipelago (and is more common in American Samoa). Because it occurs from 300 to 1000 m or more elevation, it is probably in no immediate danger.

Indigenous to Samoa, ranging westward to New Caledonia. In Samoa it occurs in foothill to montane forest on Savai'i and 'Upolu, and in American Samoa on Tutuila and Ta'u, reported from 300 to 1200 m elevation. No Samoan names or uses are reported.

Large terrestrial orchid 50–90 cm in height, bearing 6–8 leaves. **Leaves** simple, alternate; blade lanceolate, 30–50 × 3–6.8 cm, long-attenuate at the base, acute or acuminate at the tip; surfaces glabrous; margins entire; petiole 11–20 cm long. **Inflorescence** a subdensely many-flowered raceme 27–65 cm long, bearing several sheathing, deciduous, sterile, ovate-lanceolate, acute-tipped bracts, 15–28 mm long, on a rachis 6–15 cm long; flowers white; pedicel and ovary 10–22 mm long. Sepals similar, elliptic to oblong-ovate, acuminate or shortly apiculate at the tip, 11–14 × 4–6 mm. **Petals** elliptic to elliptic-obovate, acuminate at the tip, 10–13 × 4.5–8 mm. Lip 3-lobed, 6–7 × 4–5 mm, lacking a basal callus; side lobes up-curving, oblong, small; midlobe oblong-cuneate or oblong, truncate; spur cylindrical to slightly clavate, 12–14 mm long, slightly sigmoid at tip; column ca. 3 mm long. **Fruit** a fusiform capsule 1.3–1.8 cm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by large terrestrial orchid habit; large plicate leaves 3–6.8 cm across; many flowered raceme 27–65 cm long; all white flowers; petals, sepals, and spur less than 1.5 cm long.

SAVAII:

Reinecke 455 (“lost”)—“Central mountain region.”

Vaupel 358—(Specimen not at Bishop Museum).

Rechinger 1979—Montane forest on Mauga Afi at 1000 m elevation.

Christoffersen 2086—Montane forest above Matāvanu Crater at 900 m elevation.

UPOLU:

Rechinger 1695—Foothill forest above Utumapu at 400 to 500 m elevation.

Whistler 1898—Montane forest in Mt. Taito'elau at 650 m elevation.

Whistler 12104—Montane forest southwest of Mt. Fito at 865 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (10), Ta'u (6).



Chrysoglossum ornatum Bl.

Chrysoglossum gibbsiae Rolfe

Chrysophyllum gibbsiae sensu Whistler
(1979)

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it is widely dispersed in elevation (600 to 1600 m) on two of the islands, and is probably in no immediate danger.

Indigenous to Samoa, ranging westward to India. In Samoa it occurs in montane to cloud forest on Savai'i and 'Upolu, reported from 600 to 1600 m elevation. No Samoan names or uses are reported.

Medium-sized terrestrial orchid 30–65 cm in height, with a rhizome bearing erect, narrowly conical, laxly spaced pseudobulbs 2.5–4 x 0.5–0.9 cm. **Leaves** simple, alternate, erect; blade elliptic to oblong-elliptic, 20–30 x 5.5–9.5 cm, long-attenuate at the base, acute or acuminate at the tip; surfaces glabrous; margins entire; petiole 5–11 cm long. **Inflorescence** an erect, laxly several-flowered raceme 30–65 cm long, bearing bracts 5–6 mm long; flowers yellow or greenish yellow with red markings on the lip; ovary 10–15 mm long. Sepals unequal; dorsal sepal oblong-lanceolate, acute-tipped, 12–17 x 3–4 mm; lateral sepals falcate, lanceolate-oblong, acute at the tip, 10–15 x 2.5–3.5 mm; mentum obtuse, 1.5–2 mm long. **Petals** falcate, lanceolate, acute at the tip, 13–18 x 2.5–3 mm. Lip 3-lobed in the middle, 9–11 x 5–6, acute at the base, with the basal margins undulate; side lobes erect, falcate-rounded; midlobe ovate, with upturned sides, obtuse; callus 3-ridged, the outer ridges reaching the middle of the midlobe, the central one much shorter; column slender, 7–8 mm long, with an auricle halfway along the lower margin on each side. **Fruit** a narrow, ribbed capsule ca. 3 cm long. **Flowering** has been reported in Samoa in May and November, and in Fiji from October to February, so both probably occur throughout the year.

Distinguishable by its medium-sized terrestrial herb habit; narrowly conical pseudobulbs; strongly veined leaves 20–30 cm long; several-flowered raceme 30–65 cm long; and yellow flowers marked with red on the lip.

SAVAII:

Whistler 10088a—Terrestrial on a crater rim near Mataoleafi at 1600 m elevation.

UPOLU:

Whistler 1107—Epiphyte in montane forest on Mt. Taito'elau at ca. 600 m elevation.



Corybas betchei (F. Muell.) Schltr.

Corysanthes betchei F. Muell.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, possibly now extinct

SUGGESTED ACTION: This species is possibly extinct, since it is known only a single collection made over 120 years ago. It should be looked for, however, in any montane surveys on 'Upolu and even Savai'i, but it is hard to spot because of its small size. Recommended for the Red List of Samoan plants.

Endemic to Samoa, probably restricted to foothill or montane forest of 'Upolu, but no data was recorded on the specimen. The genus is absent from Fiji and the rest of Polynesia, but three species are found in Vanuatu. The discussion by F. Muell in Wing's Southern Science Record 1: 171 (1881) should be checked.

Small terrestrial orchid up 5 cm in height growing from an ovoid tuber. Leaf solitary; blade cordate, 1.8–3 x 1.5–2.6 cm, cordate at the base, acute at the tip; surfaces glabrous, possibly with white veins (this detail was not recorded in the original description); margins entire. **Inflorescence** of a solitary flower subtended by a linear bract 4–5 mm long, the flower helmet shaped, probably white and maroon, the ovary 3–4 mm long. Sepals unequal, dorsal sepal curved forwards, obovate, rounded at the tip, 1.4–1.5 x ca. 8 mm; lateral sepals linear-tapering, 1–1.2 x ca. 0.5 cm. **Petals** linear-tapering, 8–9 x ca. 0.5 cm; lip strongly recurved, ca. 1.2 x 1.2 cm, apical margins erose; spurs short, conical, ca. 1.5 mm long. Column 3–4 m long. **Fruit** not described. **Flowering** and fruiting times unknown.

Distinguishable by its small terrestrial orchid habit; single heart-shaped leaf arising from a tuber; and inflorescence of a single white and maroon flower.

UPOLU:

Betche s.n.—Without further locality. (Specimen at Melbourne.)



Cryptostylis arachnites (Bl.) Hassk.

Cryptostylis alismifolia F. Muell.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it is widely dispersed in elevation (500 to 1200 m) on two of the islands, and is probably in no immediate danger.

Indigenous to Samoa, ranging westward to India. In Samoa it occurs in foothill to montane forest of Savai'i and 'Upolu, and in American Samoa from Ta'ū (two collections in 1976), reported from 500 to 1200 m elevation. No uses or names have been reported.



Medium-sized terrestrial orchid up to 40 cm in height, 1- or 2-leaved, with glabrous stems and short erect rhizomes. **Leaves** simple, alternate; blade elliptic to elliptic-ovate, 10–19 cm long, acute to subround at the base, acuminate at the tip; surfaces glabrous, upper side often marked with darker green longitudinal and transverse venation; margins entire; petiole 6–16 cm long, attached to the top of the sheath. **Inflorescence** a laxly 7–15-flowered raceme up to 35 cm long, ovary ca. 2 cm long. Sepals similar, green, free, spreading, linear-lanceolate, 14–18 x 2.5–2.8 mm. **Petals** similar to sepals, but 10–13 x 1.5–1.7 mm. Lip erect, much larger than the sepals and petals, broadly lanceolate, acuminate at the tip, 15–20 x 5.5–7 mm, reddish and marked with darker red spots, the disk densely puberulent; column ca. 2 mm long. **Fruit** a narrowly ovoid capsule ca. 1.5–2.5 cm long. **Flowering** reported in Samoa from July to October, but both flowering and fruiting probably occur throughout the year.

Distinguishable by its medium-sized ground orchid habit; elliptic leaves often marked with darker venation; 7–15-flowered racemes; and greenish, linear-lanceolate petals and sepals 1–1.8 cm long with the lip marked with red spots.

SAVAIL:

Christophersen 2185—Swampy ground above Matāvanu Crater at 1200 m elevation.

UPOLU:

Horne 44—Without further locality.

Betche s.n.—Without further locality.

OTHER SAMOAN COLLECTIONS: Ta'ū (2).

Dendrobium scirpoides Schltr.

Aporum scirpoides (Schltr.) S. Rauschert

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections, possibly extinct

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. It was collected only once without locality on 'Upolu, and could be extinct now because of the loss of lowland forest on the island since its date of collection in ca. 1880. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to 'Upolu. No elevational or ecological is included on the one known specimen collected in ca. 1880, which has now been lost (destroyed in the bombing of Berlin in WW II). No Samoan names or uses have been reported.

Small epiphytic orchid 15–20 cm in height, with an abbreviated, many-rooted rhizome, the stem with the second node above the base swollen, fusiform and sulcate, slender above, laxly 5–8-leafed. **Leaves** simple, alternate; blade erect-spreading, somewhat subfalcate, 3.5–8 x 0.1 x 0.15 cm; surfaces glabrous margins subundulate; petiole articulated to the sheathing bases and somewhat shorter than the nodes. **Inflorescence** a solitary scapose flower produced in the manner of *D. crumentatum* Sw.; flowers similar in size to those of *D. clavipes* Hook. f. (two species that are not native to the region), with the glabrous pedicel and ovary ca. 7 mm long. Sepals unequal, dorsal sepal ovate-lanceolate, acuminate at the tip, ca. 5 mm long; lateral sepals oblique, forming a conical obtuse mentum ca. 5 mm long. **Petals** oblique, linear, acute at the tip, lightly dilated towards the base, ca. 5 mm long. Lip cuneate at the base, entire, elliptic, shortly acuminate at the tip, glabrous, ca. 9 x 4 mm, front margins undulate; callus of 2 parallel lamellae from the base to above the middle; column short, tridentate at the tip; foot ca. 5 mm long. **Fruit** unknown. (Description somewhat abbreviated due to lack of a specimen.) **Flowering** and flowering times unknown.

Distinguishable by small epiphytic orchid habit; stems bearing 5 to 8 leaves 3.5–8 cm long; solitary scapose, dendrobium-like flowers ca. 5 mm long.

UPOLU: Betche s.n. ("lost")—Without further locality.

NOTE: The only specimen of *Dendrobium scirpoides* has been lost, probably destroyed in the Berlin Museum during World War II, so no photo is available.



Dendrobium crumentatum, a related species.

Dendrobium whistleri Cribb

Dendrobium gordonii sensu L.O. Williams,
pro parte; non S. Moore

Dendrobium macrophyllum sensu Whistler
non A. Rich.

Dendrobium waterhousei sensu Whistler
non Carr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity.



Indigenous to Samoa, also found in the Solomon Islands. It is restricted in Samoa to 'Upolu, where it occurs in montane forest, reported from 600 to 700 m elevation. No Samoan names or uses are reported.

Medium-sized epiphytic orchid with spreading to pendent, subclavate pseudobulbs 15–22 cm long, 0.5–0.6 cm in diameter above, turning yellow with age, 5–7-noded, 1- or 2-leafed. **Leaves** simple, alternate, coriaceous; blade lanceolate, 12–18 x 2–2.5 cm, attenuate at the base, acuminate at the tip; surfaces glabrous; margins entire; petiole ca. 5 mm long. **Inflorescence** a lateral or subterminal, laxly 3–5-flowered raceme shorter than the leaves, with a peduncle up to 5 cm long bearing conduplicate, lanceolate, acuminate-tipped bracts 4–7 mm long; flowers probably self-pollinating, not opening widely, white with purple on the lip, pedicel and ovary 9–15 mm long. Sepals unequal; dorsal sepal lanceolate, acuminate at the tip, 9–11 x 3–4 mm; lateral sepals obliquely lanceolate, acuminate at the tip, 10–11 x 3.5–4 mm; mentum obliquely conical, ca. 3 mm long. **Petals** lanceolate, acute at the tip, 9–10 mm x ca. 2 mm. Lip long-clawed, 3-lobed, ca. 9 x 6 mm when flattened; side lobes erect, obliquely oblong, somewhat rounded in front; midlobe subquadrate-transversely elliptic, shortly aciculate, ca. 3.5 x 4 mm; callus 3-ridged from the base to the base of the midlobe; column ca. 3 m long with an erose apical margin; foot ca. 3 mm long. **Fruit** a fusiform capsule ca. 2.5 cm long. **Flowering** reported in July, but both flowering and fruiting probably of longer duration.

Distinguishable by its medium-sized epiphytic herb habit; 1 or 2 terminal leaves; laxly 3–5-flowered raceme; white flowers with the petals and sepals less than 9–11 mm long; and the lip marked with purple.

UPOLU:

Graeffe 1242—Without further locality.

Whistler 1183—Montane forest near Mt. Le Pu'e at 700 m elevation.

Whistler 3867—Montane forest just north of Tiävi lookout at ca. 700 m elevation.

Erythrodes purpurascens Schltr.

Cheirostylis sp. of Yuncker

Erythrodes parvula sensu Kores (1991), pro parte

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it appears to have a wide distribution and wide elevation range. It is much more common in American Samoa, so is relatively not too vulnerable in the archipelago.

Indigenous to Samoa, ranging westward to New Guinea. In Samoa it occurs in lowland to foothill forests of 'Upolu, and in American Samoa on Tutuila and Ta'ū, reported from 300–450 m. No Samoan names or uses have been reported.

Small terrestrial herb up to 32 cm in height. **Leaves** simple, alternate; blade obliquely ovate, 3–5.5 × 1.5–2.2 cm, rounded to acute at the base, acute at the tip; surfaces glabrous; margins entire; petiole 1.2–2.5 cm long including the sheathing base. **Inflorescence** a several-flowered raceme up to 28 cm long, bearing lanceolate, acuminate-tipped bracts 5–8 mm long; flowers white within, brown on outside and with brown marks on lip, pedicel and ovary 6–8 mm long, pubescent. Sepals similar, elliptic-lanceolate, 2.5–4 × ca. 1 mm, glabrous or very sparsely pubescent on outer surface. **Petals** obliquely oblanceolate, acute at the tip, 2.5–3.5 × 0.7–0.8 mm. Lip subpandurate, 2.5–4.5 mm long, the apical lamina ovate, obtuse; spur 1.5–2.5 mm long, bilobed, usually with 2 small calli within; column 2.5–3.5 mm long. **Fruit** a sparsely pubescent, fusiform capsule 8–11 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by small terrestrial habit; ovate leaves less than 6 cm long; several-flowered raceme up to 28 cm long; flowers brown on the outside and white within; a short spur up to 2.5 mm long; and pubescent ovary.

UPOLU:

Whistler 4388—Montane forest on the rim of Mt. Fiamoe at 910 m elevation.

Whistler 10139—Lowland forest behind Sauniatu at 300 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (4), Ta'ū (5).



Geodorum densiflorum (Lam.) Schltr.

Cymbidium pictum R.Br.

Dendrobium furcatum sensu Kraenzl. non Lindl.

Dendrobium pictum Lindl. (not in the Samoan literature)

Dendrobium tricarinatum Schltr.

Geodorum furcatum sensu Kraenzl.; non Lindl.

Geodorum neocaledonicum Kraenzl.

Geodorum pictum (R. Br.) Lindl.

Geodorum tricarinatum sensu Schltr.; non Lindl.

Limodorum densiflorum Lam.



SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical survey of the fernlands at Luatuanu'u and Tiave'a. It is most frequently found in lowlands in sunny places, such as the fernland areas noted above.

Indigenous to Samoa, ranging from India to Niue. In Samoa it occurs in open areas on Savai'i and 'Upolu, such as fernlands, reported from near sea level to ca. 100 m or more in elevation. It has been collected only once in Samoa in the last century. No Samoan names or uses have been reported.

Small terrestrial herb 20–50 cm in height, with clustered, subglobose pseudobulbs 1.3–2.6 cm in diameter covered by scarios sheaths when young. **Leaves** 2–5, simple, alternate; blade ovate to elliptic-ovate, 18–40 × 4.5–7 cm, long-attenuate at the base, acute or acuminate at the tip; surfaces glabrous; margins entire; petiole sheath-like, 6–18 cm long. **Inflorescence** a several-flowered, erect raceme more or less as long as the leaves, rachis recurved when young, bearing linear lanceolate bracts 1–1.3 cm long; flowers borne mostly on the top of the rachis, pale pinkish white to pale purple with reddish marks and yellow blotches on the lip, ovary 5–9 mm long. Sepals similar, oblong-obovate, abruptly acuminate at the tip, 10–12 × 3–3.5 mm. **Petals** oblong to oblong-elliptic, obtuse to subacute at the tip, 9.5–11 × 3.5–4.5 mm. Lip cymbiform, slightly constricted in middle, weakly bilobed at the tip, saccate at the base, 11–13 × 10–12 mm; callus with a small transverse ridge at the base and warts or keels in front; column ca. 3 mm long; foot ca. 3 mm long. **Fruit** an ovoid to fusiform capsule 2.8–3.5 cm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its medium-sized terrestrial orchid habit; large leaves 18–40 cm long; pink flowers clustered on the upper portion of a raceme as long as the leaves and recurved when young; and large capsule 2.8–2.5 cm long.

SAVAII:

Vaupel 285—(Specimen not at Bishop Museum—lost?).

Whistler 11742—Roadside near the old timber mill at Āsau.

UPOLU:

Reinecke 187 ("lost")—"Stubelberg," fernlands above Vailele.

Goodyera sp. nova?

Eucosia carnea sensu Rechinger, non Bl.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic?

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid since it is known only from a single collection over a hundred years ago at 1200 m elevation in upland Savai'i. However, it should be looked for during any botanical surveys of the upland region of Savai'i. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. It occurs in cloud forest, reported from 1200 m elevation, based on the only known collection of this species. No Samoan names or uses are reported.

No description is available. Cribb and Whistler (1996) noted that it has "peloric flowers with a petaloid, ecallose, lanceolate lip. In column structure it appears to be referable to *Goodyera*, close to *G. viridiflora* Blume, but it has more oblong-ovate leaves with short petioles and obtuse sterile bracts on the peduncle. From the single specimen available it is impossible to place it in any of the known Pacific Island species of the genus."

No Samoan names or uses have been reported.

SAVAII:

Rechinger 1588—Shady forest near Mauga Afi at 1200 m elevation.



Habenaria monogyne Schltr.

Habenaria supervacanea Fleischm. & Reehinger, non Rchb. f.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare archipelago endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this terrestrial orchid, since it is scattered over three islands and at reported elevations from 300 to 900 m elevation, but is should be looked for lowland and montane botanical surveys.

Endemic to Samoa, where it is restricted to Savai'i and 'Upolu, and in American Samoa to Tutuila (one 1920 collection), reported from 300 to 900 m elevation. No Samoan names or uses have been reported.

Medium-sized terrestrial orchid up to 60 cm in height, with glabrous stems. **Leaves** simple, alternate; blade lanceolate, up to 14–17 x ca. 2.7 cm, acuminate at the tip; surfaces glabrous; margins entire. **Inflorescence** a terminal, several-flowered raceme; flowers greenish?. Sepals similar, ovate, ca. 9 mm long, acuminate at the tip. **Petals** bipartite, posterior lobe linear-lanceolate, ca. 9 mm long, anterior lobe half as long. Lip 3-lobed, midlobe linear, ca. 1 cm long, side lobes up to 2 cm long; spur ca. 1.4 cm long. **Fruit** a fusiform capsule mm long. (The description needs to be completed; no specimens could be located for this description, and the one in Cribb and Whistler [1996] is abbreviated.) **Flowering** reported in June, fruiting times not recorded, but both probably occur much of the year.

Distinguishable by its medium-sized terrestrial orchid habit; lanceolate leaves up to 17 cm long; greenish flowers in loose, many-flowered racemes; and spur at least 1.4 cm long.

SAVAII:

Vaupel 69—(Specimen not at Bishop Museum—lost?)

UPOLU:

Betche s.n.—Without further locality ("lost").

Reehinger 952—Native forest above Utumapu.

Reehinger 1392—Lowland forest on Mt. Vaea at 300 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (1, in 1920). Cribb and Whistler (1996) list Christophersen 2073 from Savai'i as belonging to this species, but this is a mistake as the specimen with this number is something entirely different.



Hetaeria whitmeei Rchb. f.

Adenostylis stricta Rolfe

Hetaeria francisii Schltr.

Hetaeria polyphylla Rchb. f.

Zeuxine betchei Schltr.

Zeuxine sphaerocheila H. Fleischm. & Rechinger

Zeuxine triandra Hotta

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has not been collected in nearly 80 years, and the known collections are scattered in lowland forest on the two largest islands. Like the other rare orchids, it should be looked for in future lowland and montane forest surveys.

Indigenous to Samoa, ranging westward to New Caledonia. In Samoa it occurs in lowland to montane forest of Savai'i and 'Upolu, and on Ta'ū in American Samoa, reported from 200 to 650 m. No Samoan names or uses have been reported.

Medium-sized terrestrial orchid up to 60 cm in height. **Leaves** simple, alternate; blade elliptic to lanceolate, 10–22 × 1.5–3 cm, acute at the base, acuminate at the tip; surfaces glabrous; margins entire; petiole 2–3.5 cm long sheathing at the base. **Inflorescence** a glabrous, laxly many-flowered raceme 20–40 cm long; flowers brownish white without, creamy within, ovary 7–9 mm long. Sepals unequal; dorsal sepal ovate, subacute at the tip, 4–5 mm × ca. 3 mm; lateral sepals obliquely oblong-ovate, subacute at the tip, 4–5.5 × 2–2.5 mm. **Petals** oblong, rounded at tip, 4–4.5 × 0.7–1 mm. Lip 4.5–5.5 × 3–4 mm, saccate at the base with two lamellate, papillate calli within and longitudinally divided by a shallow groove externally; apical part transversely oblong, 1–1.5 × 1.5–2 mm; column ca. 1.5 mm long. **Fruit** a fusiform capsule 8–10 mm long excluding the persistent perianth. **Flowering** reported from September and October, but it and fruiting probably occur throughout the year.

Distinguishable by medium-sized terrestrial orchid habit; elliptic to lanceolate leaves over 2 cm wide; raceme 20–40 cm long; brownish white to cream-colored flowers less than 5 mm long, with the perianth borne at an angle to the ovary.

SAVAII:

Graeffe 1268—Without further locality (not in Reinecke).

Rechinger 3710—Montane forest above Vaipōuli near the “new craters” (Matavanu).

Christophersen 653—Forest edge next to a plantation above Manase at 200 m elevation.

UPOLU:

Betche 57—Without further locality (not in Reinecke).

Rechinger 1663—Montane forest above Utumapu.

Christophersen 542—Maugatele Ridge above Sāluafata at 550 m elevation.

SINE LOC:

Whitmee s.n.—Samoa without further locality.

OTHER SAMOAN COLLECTIONS: Ta'ū (1). This species should have been on American Samoa list of rare plants, but was inadvertently omitted.



Liparis gibbosa Finet

Liparis disticha auct. non Lindl.

Liparis sp. of Christoph. (in part)

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity. It might turn up in an orchid survey of the upper part of the Matavanu lava flow, which might give an indication of its frequency (on the lava flow at least).

Indigenous to Samoa, ranging westward to Southeast Asia. It occurs in Samoa as an epiphyte in lava flow scrub on Savai'i, and in American Samoa in montane scrub on Tutuila, reported from 500 to 620 m elevation. No Samoan names or uses have been reported.

Small epiphytic orchid with well-spaced, ovoid, pseudobulbs 1–2 x 1–1.5 cm, each bearing a single leaf. Leaf simple, erect; blade linear, 9–23 x 0.8–1.2 cm, broadly tapering at the base, acute at the tip; surfaces glabrous; margins entire; petiole sheathing at the base. **Inflorescence** an erect, several-flowered raceme 5–16 cm long, borne on a slender, somewhat flattened (winged above) peduncle, bearing distichous, imbricate, conduplicate, ovate, acuminate-tipped bracts; flowers successive, yellow-green to pale orange with a darker orange-brown lip, ovary ca. 6 mm long. Sepals similar, reflexed, oblong-elliptic to ovate, 5–6 x 2.2–2.4 mm, abruptly acuminate at the tip. **Petals** erect, oblanceolate, 4.5–6 x 1–1.5 mm, subacute at the tip. Lip strongly recurved, more or less orbicular-ovate, 4–4.5 x 3.5–4 mm, acute at the tip; callus basal, obscure, bilobed; column dilated at base, winged at the tip, 2–2.5 mm long. **Fruit** a weakly 6-ribbed, obovoid capsule 0.6–1.2 mm long. **Flowering** reported from October to December, fruiting at the same time, but both probably occur throughout the year.

Distinguishable by its small epiphytic orchid habit; spaced pseudobulbs each bearing a linear leaf 9–23 cm long; and a long-stalked raceme of small orange and green flowers clustered at the tip among small bracts.

SAVAII:

Whistler 9365—Lava flow scrub on the rim of Matavanu Crater at 600 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (6).



Luisia teretifolia Gaud.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. The most likely place to find this is the A'opo and Āsau area, especially on the lava flow at A'opo.

Indigenous to Samoa, ranging westward to the Himalayan foothills. In Samoa it occurs in lowland and lavaflow scrub forest on Savai'i, as well as a single recent record from Tutuila in American Samoa in ridge forest, reported from about 50 to 300 m elevation. No Samoan names or uses have been reported.

Medium-sized epiphytic herb 15–35 cm in height, with rigid stems rigid up to 4 mm in diameter. **Leaves** simple, alternate; blade suberect, cylindrical, longitudinally striate, 4–20 x ca. 0.3 cm, scarcely narrowing at the base, gradually tapering at the tip; surfaces glabrous; margins entire; sessile, attached to a conspicuous sheath.

Inflorescence a few-flowered raceme 0.5–1 cm long, bearing 1–2 mm long bracts; flowers with green or yellowish green sepals and petals and a reddish brown to dark maroon lip, ovary and pedicel length not recorded. Sepals unequal, dorsal sepal elliptic, 5–5.5 x ca. 3 mm, subacute to obtuse at the tip; lateral sepals lanceolate, 7–8 x ca. 2.5 mm, fleshy at the tip, slightly keeled dorsally. **Petals** linear-oblong, 3–7 x 3.5–4 mm, obtuse at the tip. Lip 2-lobed, 6.5–7.5 cm long, basal part subquadrate, with small elliptic-falcate side lobes; apical part broadly cordate, obtuse; column ca. 2 mm long. **Fruit** a ribbed, fusiform capsule 3.3–5 cm long. **Flowering** times not known, fruits reported in September and October in Fiji and Samoa, but both processes probably of longer duration.

Distinguishable by its medium-sized epiphytic orchid habit; cylindrical, stems lacking leaves; and short racemes of green or yellowish green flowers marked with reddish brown to maroon.

SAVAII:

Vaupel 650—Specimen lost, no data recorded.

Whistler 948—Lowland forest east of the old Potlatch timber mill at ca. 50 m elevation.

Whistler 8271—Lava flow scrub northeast of Ā'opo, north of the main road.

OTHER SAMOAN COLLECTIONS: Tutuila (1, observed, not collected).



Microstylis samoensis Schltr.

Liparis sp. of Yuncker

Malaxis samoensis (Schltr.) Whistler

Malaxis schlechteri (Rolfe) L.O. Williams

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare archipelago endemic (in independent Samoa)

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, which in independent Samoa appears to be restricted to the eastern end of 'Upolu. It is much more common in American Samoa, so is relatively not too vulnerable in the archipelago as a whole.

Endemic to Samoa, restricted to 'Upolu (based on one old record), where it is rare, and in American Samoa on Tutuila, Olosega, and Ta'ū, where it is more common. It occurs in lowland to cloud forest, reported from 300 to 800 m elevation. No Samoan names or uses have been reported.

Small terrestrial orchid with short cylindrical stems up to 3.5 cm long. **Leaves** simple, alternate, 3–4; blade suberect, lanceolate or narrowly lanceolate, 5–11.5 x 0.8–1.6 cm, attenuate at the base, acuminate-tipped; surfaces glabrous; margins entire; slenderly petiolate at the base. **Inflorescence** an erect, laxly few-flowered raceme 12–15 cm long, bearing reflexed, lanceolate, acuminate-tipped bracts 4–9 mm long; flowers white or pale greenish; pedicle and ovary 4–5 mm but elongating to ca. 1.5 cm long after fertilization. Sepals unequal; dorsal sepal oblong, obtuse,

ca. 3 x 1.5 mm; lateral sepals obliquely oblong, obtuse, ca. 3 x 1.3 mm. **Petals** linear, obtuse, 2.5–3 x ca. 0.5 mm. Lip erect, broadly subcircular, obscurely 3-lobed, ca. 4 x 4 mm; side lobes rounded, 3- or 4-toothed in front; midlobe oblong, deeply emarginated, each lobule acuminate at the tip; callus obscurely horseshoe-shaped; column short. **Fruit** a broadly fusiform capsule 8–11 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small terrestrial orchid habit; subfalcate leaves less than 12 x 1.6 cm; racemes up to 15 cm long bearing white to pale green flowers subtended by small, reflexed, acuminate-tipped bracts; and a shield shaped labellum with toothed margins.

UPOLU:

Betche s.n.? ("lost")—Without further locality.

Whistler 3250—Montane forest on ridge southeast of Mt. Fao.

Whistler 4701—Ridge north of Olomaga on the old Richardson Track at ca. 350 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (7), Olosega (3), Ta'ū (5).



Microstylis taurina Rchb. f.

Malaxis taurina (Rchb. f.) Kuntze

Microstylis sp. of Yuncker

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, which in independent Samoa appears to be restricted to the eastern end of 'Upolu. It is much more common on Ta'ū in American Samoa, so relatively it is not too vulnerable in the archipelago as a whole.

Indigenous to Samoa, ranging westward to New Caledonia. In Samoa it occurs in montane forest on 'Upolu, and on Ta'ū in American Samoa, reported from 430 to 800 m elevation. Strangely, it was not collected in independent Samoa before 1996, and now three times since then. No Samoan names or uses have been reported.

Small terrestrial orchid with short erect stems 3–15 cm in height. **Leaves** simple, alternate, 5–10; blade ovate, 6–9 x 1.8–3.5 cm, acute to attenuate at the base, acute at the tip; surfaces glabrous; margins entire; petiole slender, up to 5 cm long, sheathing at the base. **Inflorescence** a subdensely many-flowered raceme 12–20 cm long, bearing reflexed, linear, acuminate-tipped bracts 4–6 mm long; flowers small, purple or rarely dull yellowish; pedicel and ovary 3–4 cm long. Sepals unequal; dorsal sepal ovate, obtuse, ca. 3 mm x 2 mm; lateral sepals oblong, obtuse, ca. 3 x 1.5 mm. **Petals** linear-oblong, obtuse, ca. 3 x 1 mm. Lip 3-lobed, ca. 4 x 3.5–4 mm; side lobes hatchet-shaped, acute in front; midlobe oblong-elliptic or tapering, emarginated; column short. **Fruit** a broadly fusiform capsule 7–9 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its small terrestrial orchid habit; leaves 5–10 cm long; racemes 12–20 cm long pink flowers subtended by small, reflexed, acute-tipped bracts; and toothed corolla lip.

UPOLU:

Whistler 10138—Epiphytic in foothill forest behind Sāuniatu at 430 m elevation.

Whistler 10148—Epiphytic in foothill forest near Olomaga Crater at the eastern end of the island at 430 m elevation.

Whistler 11317—Lowland forest behind Uafato.

OTHER SAMOAN COLLECTIONS: Ta'ū (6).



Microtatorchis samoensis Schltr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this, or small size, rather than actual rarity. It should be looked for in any future upland botanical surveys.

Indigenous to Samoa, also found in Fiji, and possibly Tahiti. In Samoa it occurs in montane forest on Savai'i and 'Upolu, reported from 800 to 900 m elevation. No Samoan names or uses have been reported.



Tiny epiphytic orchid 2–4 cm in height, with filiform roots up to 1 mm in diameter. **Leaves** simple, alternate; blade oblanceolate, 1.5–6 x 0.2–0.4 cm, acute at the base, acute at the tip; surfaces glabrous; margins entire; petiole sheathing at the base. **Inflorescence** an erect, laxly few-flowered raceme 2–3 cm long; the rachis bearing flowers and small, scale-like, ovate, acute-tipped bracts 2–3 mm long on the upper half; flowers greenish yellow. Sepals similar, lanceolate, acuminate at the tip, fused in the lower 1/3, 1.5–2 x ca. 1 mm. **Petals** similar to sepals. Lip narrowly elliptic-ovate, 1.5–2 x 0.4–0.6 mm, the tip with a small appendage 0.2–0.3 mm long; side lobes somewhat incurved; spur globose, ca. 0.5 mm long; column short, lacking a foot. **Fruit** an ellipsoid capsule 3.5–8 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its tiny epiphytic orchid habit; tiny leaves less than 7 mm long; raceme up to 3 cm bearing tiny yellowish green flowers subtended by tiny leaf-like bracts up to 3 mm long.

SAVAII:

Vaupel 470—(Specimen not at Bishop Museum—lost?).

Christophersen 2268—Montane forest near Olo at 800 m elevation.

UPOLU:

Whistler 7083—Montane forest on the rim of Mt. Fiamoe at 900 m elevation.

Nervilia aragoana Gaudich.

Gastrodia sp. of Reinecke

Pongonia flabelliformis Lindl.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been so widely collected in the lowlands, but infrequently in recent times. It is not easy to find since it usually somewhat solitary and during part of the year it loses its only leaf. It should be looked for in future lowland surveys on the two main islands.

Indigenous to Samoa, ranging from India to eastern Polynesia. In Samoa it occurs in lowland to montane forest on Savai'i and 'Upolu, as well as on Tutuila, Ofu, and Ta'u in American Samoa, reported from 10 to 500 m elevation. It is sometimes difficult to recognize since it loses its leaves during flowering. No Samoan names or uses have been reported.

Small terrestrial orchid arising from a jointed subterranean tuber, bearing a single leaf. Leaf simple, erect; blade plicate, cordate, 12–15 x 14–18 cm, cordate at the base, acute at the tip; surfaces glabrous, upper side often marked with dark maroon; margins entire; petiole 15–30 cm long. **Inflorescence** a laxly 5–15-flowered raceme up to 45 cm in height, bearing linear to linear-lanceolate bracts 1.5–2.5 cm long; flowers pendent or nodding, probably self-pollinating, greenish yellow with a white lip marked with rose or violet veins, ovary ca. 8–10 mm long. Sepals similar, linear-lanceolate, 2–2.5 cm long, acute at the tip. **Petals** similar to sepals. Lip 3-lobed near the tip, 2–2.4 x ca. 0.7 cm; side lobes small, erect, triangular; midlobe subovate, acute to obtuse at the tip, with undulate margins; callus puberulent in middle; column clavate, ca. 7 mm long. **Fruit** an ovoid capsule 0.9–1.2 cm long, with the persistent perianth on top. **Flowering** reported from August to November, fruiting in October and November, but both probably occur for a longer duration.

Distinguishable by its small terrestrial orchid habit; mostly single, basal, heart-shaped leaf; flowering appearing after the leaf dies back; and raceme with 5 or more greenish yellow flowers marked with white and red.

SAVAII:

Reinecke s.n. (lost?)—Common in coastal forest (“coastal bush”).

Vaupel 508—(Specimen not at Bishop Museum—lost?).

Rechinger 1948—Secondary forest near Āsau.

Rechinger 5271—Foothill forest near Ā'opo at 500 m elevation.

Christophersen 2878—Coastal or littoral forest between Sala'ilua and Lata'itai at 5 m elevation.

Christophersen 3406—Coastal forest between Papa and Fagalele at 10 m elevation.



UPOLU:

Reinecke 140 ("lost")—Native forest at Mulifanua.

Reinecke 601 ("lost")—Le Pua [Le Pu'e?].

Whistler 7008—Lowland forest near Sa'agatuai east of Si'umu at ca. 3 m elevation.

Whistler 8084—Lowland forest on inner slope of Lalomanu Crater at 220 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (1), Ofu (2), Ta'ū (1).

Nervilia grandiflora Schltr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare Samoa endemic

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been collected only once without further locality on Savai'i. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is restricted to Savai'i. No ecological or elevational information were recorded on the one known specimen, which is now lost. No Samoan names or uses have been reported.

Small terrestrial orchid up to 35 cm in height, bearing a single leaf. **Leaves** simple, alternate; blade subreniform-cordate, 7–8 x 10–11 cm, shortly apiculate at the tip; surfaces, glabrous; margins entire; petiole ca. 12 cm long. **Inflorescence** a 2-flowered raceme; flowers greenish-yellow (?), erect-spreading; pedicel and ovary ca. 13 mm long. Sepals similar, the dorsal sepal lanceolate, acuminate at the tip, ca. 30 x 4.5 mm; the laterals slightly oblique. **Petals** obtuse at the tip, 18 x 8 mm, slightly thickened longitudinally in the center; column ca. 10 mm long, glabrous. **Flowering** and fruiting times not recorded. (Description is abbreviated because the only specimen has been lost.)

Distinguishable by its small terrestrial orchid habit; mostly single, basal, heart-shaped leaf; flowering appearing after the leaf dies back; and raceme bearing 2, probably greenish-white flowers.

SAVAII:

Vaupel 590—(Apparently lost).

NOTE: No photograph is available, since the only known collection of it, in ca. 1906, has disappeared, probably destroyed in Berlin during World War II.

Peristylus tradescantifolius (Rchb. f.) Kores
Habenaria cyrtostigma Schltr.
Habenaria tradescantifolia Rchb. f.
Habenaria tradescantifolia var. *pinquior*
Fleischm. & Rechinger

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous (but not rare in American Samoa)

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been collected over a wide geographic and elevation range. It should be looked for in future botanical surveys, particularly in intact forest. It is more common in American Samoa.

Indigenous to Samoa, also found in Fiji and Tonga. In Samoa it occurs in lowland to montane forest on all the main islands, reported from 200 to 1000 m elevation, and is much more common in American Samoa than in independent Samoa. No Samoan names or uses have been reported.

Terrestrial herb 30–65 cm in height. **Leaves** 7 or 8, scattered in upper half of stem; blade lanceolate, 8–20 × 1–2.8 cm, subtended by 5 or 6 sheathing cataphylls, acute to acuminate at the base, long-acuminate at the tip; surfaces glabrous; margins entire; petiole indistinct, sheathing at the base. **Inflorescence** a laxly many-flowered raceme 19–55 cm long, bearing lanceolate bracts 5–14 mm long; flowers pale green or greenish white, pedicel and ovary 10–13 mm long. Sepals unequal, dorsal sepal ovate, obtuse, 2.3–3.2 × 1.2–2 mm; lateral sepals obliquely oblong-elliptic, obtuse, 2.5–3 × 1–1.5 mm. **Petals** obliquely ovate, obtuse, 2.5–3.3 × 1.5–2 mm. Lip 3-lobed, obscurely 3-ridged at base; side lobes linear-tapering, recurving towards tip, 4.2–5.5 mm long; midlobe triangular-ligulate, fleshy, 1.5–2 mm long; spur cylindrical-fusiform, slightly incurved, 5–7.5 mm long; column ca. 1 mm long. **Fruit** a fusiform capsule 1–1.3 cm long. **Flowering** and fruiting recorded from May to September, but both probably occur throughout the year.

Distinguishable by its medium-sized terrestrial fern habit; lanceolate leaves 1–2.5 cm wide; raceme up to 55 cm long bearing white flowers less than 6 mm long; and a narrow spur up to 7.5 mm long.

SAVAII:

Vaupel 584—(Apparently lost).

Rechinger 1146—Lowland forest near Patamea at 200 m elevation.

Christophersen 2093—Montane forest above Matāvanu Crater at 900 m elevation.

UPOLU:

Graeffe 1286—In lowland forest on Mt. Vaea, no elevation recorded.

Rechinger 732—Montane forest at Lake Lanoto'o at 700 m elevation.

Rechinger 1802—Montane forest at Lake Lanoto'o at 700 m elevation.

Whistler 3989—Montane forest south of Mt. Fito at ca. 700 m elevation.



SINE LOC:

USEE s.n.—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (2), Ofu (1), Olosega (2), and Ta'ū (4).

NOTE: Cribb and Whistler (1996) included four other specimens in this species, as shown below. These appear to be instead *Habenaria samoensis*, since they have larger flowers, longer leaves, and a thicker fruit. In any case, the orchid has not been collected in independent Samoa since 1931.

Christophersen 649—Montane forest above Matāvanu Crater, Savai'i, at 800 m elevation.

Christophersen 838—Montane forest above Matāvanu Crater Savai'i, at 1000 m elevation.

Christophersen 2284—Montane forest above Matāvanu Crater Savai'i, at 850 m elevation.

Christophersen 368—Montane forest near Lake Lanoto'o, 'Upolu, at 700 m elevation.

Phreatia minima Schltr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this and its small size rather than actual rarity.

Indigenous to Samoa, also found in New Guinea and the Solomon Islands. In Samoa it occurs in montane and volcanic scrub forest on Savai'i and 'Upolu, reported from 575 to 670 m elevation. All four known collections have been made since 1972. This is unusual, but perhaps it is because these orchids are so small and inconspicuous. No Samoan names or uses have been reported.



Tiny epiphytic orchid 1.5–3 cm in height. **Leaves** simple, alternate, 3–5; blade fleshy, linear-oblong, 1–3.5 x 0.2–0.3 cm, attenuate at the base, obtuse at the tip; surfaces glabrous; margins entire; petiole sheathing at the base. **Inflorescence** a lateral, laxly several-flowered raceme up to 3 cm long, bearing minute bracts; flowers not opening widely, translucent white or pale green, probably self-pollinating; ovary 1–2 mm long. Sepals unequal; dorsal sepal ovate, subacute at the tip, ca. 1 x 0.6–0.7 mm; lateral sepals obliquely ovate, subacute at the tip, ca. 1 x 0.7–0.8 mm; mentum shortly conical. **Petals** narrowly oblong-elliptic, obtuse, ca. 0.7 x 0.3 mm. Lip obovate-spathulate, rounded at the tip, 0.6–0.7 x 0.5 mm; claw oblong; column very short; foot ca. 0.5 mm long. **Fruit** a tiny ellipsoid capsule 1.5–2 mm long. **Flowering** and fruiting occur throughout the year.

Distinguishable by its tiny epiphytic orchid habit; linear-oblong leaves up to 3 mm wide; short several-flowered racemes up to 3 cm long; and tiny flowers less than 1.5 mm long.

SAVAII:

Whistler 8292—Volcanic scrub forest below Matāvanu Crater at 575 m elevation.

Whistler 9364—Volcanic scrub forest near Matāvanu Crater at 600 m elevation.

UPOLU:

Whistler 165—Montane forest about 1 mile north of Tiāvi waterfall at ca. 600 m elevation.

Whistler 2047a—Montane forest on the rim of Mt. Sina'ele at 670 m elevation.

Pseuderia ramosa L. O. Williams

Pseuderia sp. of Christoph.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous (but not rare in American Samoa)

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. It should be looked for during any orchid surveys on the upper part of the Matavanu lava flow. It is much more common in American Samoa, so is not endangered in the archipelago as a whole.

Indigenous to Samoa, also found in Futuna. In Samoa it is found in montane scrub and montane forest of Savai'i, and in American Samoa on Tutuila and Ta'u, reported from (100–) 270 to 700 m elevation. It is much more common in American Samoa than in independent Samoa. No Samoan names or uses are reported.

Medium-sized epiphytic orchid, scrambling or climbing, with leafy stems up to 40 cm or more in length, forming adventitious roots from its lower nodes. **Leaves** simple, alternate; blade lanceolate, 10–15 x 1.4–2.5 cm, articulate to sheathing at the base, acuminate at the tip; surfaces glabrous; margins entire; sessile on the sheath. **Inflorescence** of many, laxly to subdensely 3–4-flowered racemes 3–4 cm long, emerging opposite to the subtending leaves, bearing subimbricate, ovate bracts up to 10 mm long; flowers cream white to greenish, fleshy; pedicel and ovary 6–10 mm long. Sepals unequal; dorsal sepal incurved, linear-oblongate, obtuse, 11–12 x 1.5–2 mm; lateral sepals falcate, lanceolate, obtuse, 12–14 x 3–4 mm. **Petals** falcate, lanceolate, obtuse, 10–11 x ca. 1.5 mm. Lip entire, elliptic-rhombic, subacute at the tip, 8–9 x 4–5 mm, glandular-farinose in its apical half; callus basal, triangular, sulcate; column 5–6 mm long. **Fruit** a linear capsule 2.8–3.4 cm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its scrambling, epiphytic orchid habit; narrowly lanceolate leaves 10–15 cm long; short racemes emerging from the sheath opposite the subtending leaf; green flowers up to 1.2 cm long; and linear capsule up to 3.5 cm long.

SAVAII:

Whistler 5151—Lava flow forest on the rim of Matavanu at 580 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (5), Ta'u (4).



Schoenorchis micrantha Reinw. ex Bl.

Schoenorchis densiflora Schltr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity.

Indigenous to Samoa, ranging from Southeast Asia to Samoa. In Samoa it occurs as an epiphyte in lowland to cloud forest on Savai'i and 'Upolu, reported from 50 to 1600 m elevation. No Samoan names or uses have been reported.

Small epiphytic orchid with clustered branching stems up to 15 cm long. **Leaves** simple, alternate; blade fleshy, recurved-cylindrical, 3–6 x ca. 0.2 cm, articulated to 0.3–0.5 cm long sheath, acute at the tip; surfaces glabrous, dorsal surface slightly channeled; margins entire; sessile. **Inflorescence** a densely many-flowered raceme 2–5 cm long, peduncle short, bearing bracts ca. 1 mm long; flowers tiny, white flushed with pink, turning yellow with age; ovary 2–3 mm long. Sepals similar, oblong to oblong-ovate, subacute at the tip, 1.5–2 x 0.6–0.8 mm. **Petals** oblique, oblong-obovate, subacute or retuse at the tip, 1.3–1.8 x 0.3–0.5 mm. Lip closely appressed to the column, 1.3–1.5 mm long, with a low callus in the mouth of the spur; side lobes erect, fleshy, broader than long; midlobe porrect, fleshy, laterally compressed; spur saccate, 0.8–1 mm long; column ca. 0.6 mm long. **Fruit** a fusiform capsule 0.8–1.2 cm long. **Flowering** in Fiji has been noted in July and August, fruiting between February and August in Fiji and in October in Samoa, but both probably occurring throughout the year.

Distinguishable by its small epiphytic orchid habit; cylindrical leaves up to 6 cm long curved back; short racemes of tiny white flowers up to 2 mm long, and turning yellow after anthesis.

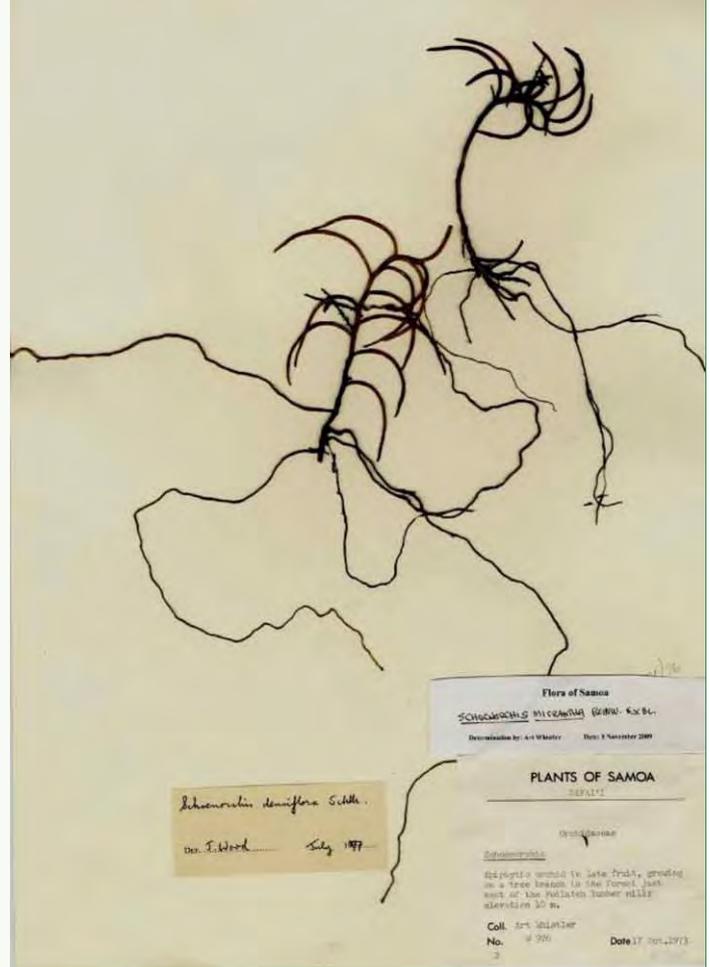
SAVAII:

Cox 286—Specimen not seen during the present study; it is not at Bishop, but may be at the Gray Herbarium).

Whistler 926—Epiphyte in lowland forest east of the old Potlatch timber mill at Āsau at ca. 50 m elevation.

UPOLU:

Betche s.n. ("lost")—Without further locality.



Spiranthes sinensis (Pers.) Ames

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: This wide-ranging species likes volcanic substrates, and it should be looked for during any surveys of the upper half of the Matavanu lava flow, and on the Mataoleafi volcanic area. A survey of the ash plain there could produce a frequency at that site.

Indigenous to Samoa, ranging from India to Niue. In Samoa it occurs only on lava flows of Savai'i, reported from 370 to 1600 m elevation. It is unusual that all four collections from Samoa have occurred since 1975, but this perhaps is because of its tiny inconspicuous appearance. No Samoan names or uses have been reported.

Terrestrial herb 8–20 cm or more in height. **Leaves** simple, alternate, mostly basal, grass-like; blade linear-lanceolate, 2–10 × 1–3 cm, sheathing at the base, acute at the tip; surfaces glabrous; margins entire; petiole indistinct. **Inflorescence** an erect, slender, laxly many-flowered raceme bearing ovate-lanceolate bracts 5–8 mm long; flowers spirally arranged on the rachis, white or pink with a white lip, apparently self-pollinating; pedicel and ovary up to 6 mm long. **Sepals** unequal; dorsal sepal ovate, acute at the tip, 2.5–3.5 × 1–1.4 mm; lateral sepals oblong-lanceolate, acute at the tip, 2.3–4.5 × ca. 1 mm. **Petals** oblong-lanceolate, rounded and erose at the tip, 2.8–4 × 0.7–1 mm. **Lip** oblong-obovate, rounded at the tip, slightly constricted and papillose in apical third, 4–5 × 2–2.5 mm, the apical margins undulate-crispate; calli basal, subglobose, fleshy; column ca. 2 mm long. **Fruit** an ovoid to fusiform capsule 4–6 mm long. **Flowering** has been reported in June, October, and November, and it and fruiting probably occur throughout the year.

Distinguishable by its small, narrow, terrestrial herb habit; linear leaves up to 10 cm long; and tiny pink flowers spiraling conspicuously around the stem.

SAVAII:

Whistler 2584—Cinder plain at Matāvanu at 1550 m elevation.

Whistler 9387—Lava flow scrub below Matāvanu.

Whistler 9618—Ash plain at Mataoleafi at ca. 1550 m elevation.

Whistler 11721—Middle of the unpaved road leading to Matāvanu at 370 m elevation.



Taeniophyllum savaiense Cribb and Whistler

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this rather than actual rarity. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it is found in lowland to foothill and lava flow scrub forest on Savai'i, reported from 10 to 580 m elevation. All four known collections have been made since 1972. This is unusual, but perhaps it is because these orchids are so small and inconspicuous. No Samoan names or uses have been reported.



Small epiphytic herb with long, flattened, spreading, photosynthetic up to 20 cm × 1–3 mm. **Leaves** absent. **Inflorescence** of several densely many-flowered racemes 4–8 cm long, peduncle; rachis filiform, bearing ovate, distichous bracts 1–2 mm long; flowers cream-colored; pedicel and less than 1 mm long. Sepals unequal, dorsal sepal oblong, acute at the tip, 1.5–2 × ca. 0.7 mm; lateral sepals obliquely oblong-lanceolate, acute at the tip, 1.2–2 × ca. 1 mm. **Petals** oblong, obtuse at the tip, ca. 2 × 0.5 mm. Lip obscurely 3-lobed, ovate, acute but fleshy at the tip, ca. 1.5 × 0.7 mm; spur scrotiform, ca. 1 mm across; column short. **Fruit** a narrowly oblong capsule 5–7 mm long. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its tiny epiphytic, stemless and leafless habit; long flattened roots appressed to the substrate; tiny white flowers in racemes 4–8 cm long; and oblong capsule less than 8 mm long.

SAVAII:

Whistler 26—Lowland forest near the forestry road above Āsau, no elevation given.

Whistler 927—Lowland forest just east of the old timber mill at Āsau at 50 m elevation.

Whistler 970—Foothill forest above Āsau at 440 m elevation.

Whistler 5146—Rim of Matavanu crater at 580 m elevation.

Thelasis carinata Bl.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since epiphytic orchids are hard to locate because they are often high up in the forest canopy. Its infrequency of collection may be a result of this and its relatively small size rather than actual rarity.

Indigenous to Samoa, ranging westward to Southeast Asia. In Samoa it is found in foothill to montane forest of 'Upolu and Savai'i, reported from 450 to 500 m elevation. Strangely, all three specimens of this orchid were collected within a two-year span. No Samoan names or uses have been reported.

Small epiphytic orchid, appearing stemless, the leaves arising from obscure, ovoid, bilaterally flattened pseudobulbs up to 4.5 x 1.5 cm, unifoliate at the tip but subtended by several leaves arranged in a fan. **Leaves** simple, alternate, twisted at the base to lie in one plane; blade erect or suberect, linear, 12–45 x 1.2–2.5 cm, articulate to channeled at the base, unequally bilobed at the obtuse tip; surfaces glabrous; margins entire; petiole indistinct. **Inflorescence** an erect raceme 15–35 cm long, peduncle 12–30 cm long, slender; rachis up to 16 cm long, bearing very closely spaced, reflexed, triangular or lanceolate bracts 1.5–3 mm long; flowers small, white or pale yellow, rarely suffused with purple, probably autogamous and perhaps cleistogamous, ovary pendent, ca. 4 mm long. Sepals unequal; dorsal sepal oblong-ovate, acute at the tip, ca. 3.5 x 1.5 mm; lateral sepals oblong-lanceolate, acute at the tip, 3–3.5 x 1.5–2 mm, keeled on the outer surface. **Petals** oblong-lanceolate, acute at the tip, 2–3 x ca. 0.8 mm. Lip ovate, obscurely 3-lobed in the basal part, acute at the tip, 3–3.5 x 1.5–2 mm; column lacking a foot. **Fruit** an obovoid capsule 3.5–5 mm long. **Flowering** reported from September, February, and March, probably both flowering and fruiting occurring throughout the year.

Distinguishable by its small epiphytic herb habit; leaves appearing equitant arranged somewhat fan-like; many-flowered raceme 15–35 cm long; tiny white flowers less than 3 mm long; and small obovoid capsule bearing the dried erect perianth about half as long.

SAVAII:

Whistler 1681—Epiphyte in foothill forest in "Forestry Block 6" behind Vaisala and 'Auala at 450 m elevation.

UPOLU:

Whistler 672—Epiphyte on trees in foothill forest behind Utumapu at 360 to 500 m elevation.

Whistler 1522—Foothill to montane forest near Lanoataata at 500 to 600 m elevation.



Tropidia effusa Rchb. f.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been collected only once with any location data (and twice without). Botanical surveys in foothill to montane forest on northeast Savai'i might come up with species, which is much more common in Fiji.

Indigenous to Samoa, also found in Fiji, where it is more common. In Samoa it occurs in foothill forest of Savai'i, reported from ca. 400 m elevation. No local uses or names have been reported.

Medium-sized terrestrial orchid 20–75 cm in height.

Leaves simple, alternate; blade lanceolate, 12–35 x 1.4–5.4 cm, very shortly petiolate above the tubular sheathing base, acuminate at the tip; surfaces glabrous; margins entire.

Inflorescence a many-flowered raceme up to 12 cm long, simple or with a few branches, the flowers produced one at a time on each branch, bearing distichous, conduplicate, broadly ovate to lanceolate, acute-tipped bracts 7–12 mm long; flowers glabrous, white or pale yellow, not opening widely; pedicel and ovary 7–8 mm long. Sepals similar, ovate or lanceolate, acuminate at the tip, 7–10 x 2–2.5 mm.

Petals oblong-lanceolate, acuminate at the tip, 6–8 x 1.5–2.5 mm. Lip oblong-ovate, acute and reflexed at the tip, 5–7 x 2.5–3.5 mm, saccate at the base; callus of two ridges on the lateral veins in the basal part near the tip; column 2.5–3 mm long. **Fruit** a cylindrical-fusiform capsule ca. 2.2 cm long. **Flowering** and fruiting occur throughout the year.

Distinguishable by its terrestrial orchid habit; lanceolate leaves up to 35 cm long; simple or branched racemes with conspicuous distichous bracts; and white to pale flowers developing one at a time.

SAVAII:

Vaupel 531—Specimen probably lost, no data published.

Whistler 39—Plantation forest at Vai'a'ata near Vailoa, south of Tuasivi at ca. 400 m elevation.

SINE LOC.

USEE s.n. (Fiji or Samoa)—Without further locality. (Probably Fiji, where it is more common.)



Zeuxine plantaginea Schltr.

Zeuxine androcardium Schltr.

Monochilus plantagineus Rchb. f.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare archipelago endemic

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been collected over a wide geographic range. It should be looked for in future botanical surveys in the foothill and montane forest of the two main islands. Recommended for the Red List of Samoan plants.

Endemic to Samoa, where it occurs in foothill to montane forest on Savai'i and 'Upolu, as well as on Olosega in American Samoa, reported from 300 to 800 m elevation. No Samoan names or uses have been reported. This orchid should have been put on the American Samoan list of rare plants, but wasn't.

Small terrestrial orchid 25–35 cm in height. **Leaves** simple, alternate; blade elliptic-ovate or obliquely elliptic-ovate, 5.5–8.5 x 2.5–3.5 cm, articulated at the base to the indistinct sheath, acute at the tip; surfaces glabrous; margins entire; petiole indistinct. **Inflorescence** a 10–15-flowered raceme 15–20 cm long, peduncle and rachis pubescent, bearing lanceolate, acuminate-tipped bracts 6–12 mm long; flowers small, white, stalk and ovary 5–8 mm long, glandular-pubescent, the perianth more or less at right angles to the ovary. Sepals unequal, dorsal sepal deeply cucullate, ovate, obtuse, 5–5.5 x 3–3.5 mm, forming a hood over the column;

lateral sepals obliquely ovate, obtuse, 5–6 x ca. 3 mm. **Petals** obliquely ovate, subacute at the tip, 5–5.5 x 3–3.5 mm. Lip ca. 5 x 3 mm, saccate at the base, transversely oblong at the tip; callus comprises 2 digitate flanges in the saccate part of the lip. Column short, 3–3.5 mm long. **Fruit** a narrowly fusiform capsule ca. 1.2–1.4 cm long. **Flowering** reported from May to September, fruiting in August and November, but both probably occur throughout the year.

Distinguishable by its small terrestrial orchid habit; pubescent, erect, 10–15-flowered racemes; small white flowers with the perianth almost parallel to the ovary; and the dorsal sepal forming a hood over the column.

SAVAII:

Vaupel 287—Specimen lost, no data recorded.

Christophersen 875—Montane forest near Lake Mata'ulanu above Patamea.

Christophersen 2295—Montane forest east of Olo at 700 to 800 m elevation.

Christophersen 2740—Foothill forest above Sala'ilua at 500 m elevation.

Whistler 593—Forest above Safune at Le Aisa plantation at 500 to 600 m elevation.

UPOLU:

Christophersen 38—Montane forest west of Lake Lanoto'o at 700 m elevation.

Whistler 4006—Lowland forest near Āfulilo waterfall at 300 m elevation.

OTHER SAMOAN COLLECTIONS: Olosega (1).



Zeuxine vieillardii (Rchb. f.) Schltr.

Zeuxine samoensis Schltr.

SAMOAN NAME: none

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this orchid, since it has been collected over a wide geographic range. It should be looked for in future botanical surveys in the foothill and montane forest of the two main islands.

Indigenous to Samoa, ranging westward to New Caledonia. In Samoa it occurs in foothill to montane forest on Savai'i and 'Upolu, reported from 500 to ca. 600 m elevation. No Samoan names or uses have been reported for it.

Small terrestrial orchid 30–40 cm in height. **Leaves** simple, alternate; blade ovate, 2.2–4.5 cm long, oblique at the base, acute at the tip; surfaces glabrous; margins entire; petiole 0.5–1 cm long. **Inflorescence** a many flowered raceme 15–21 cm long, peduncle and rachis sparsely pilose on dorsal sepal; stalk and ovary 3–6 mm long, sparsely villose, the perianth more or less at right angles to the ovary, white with a yellow throat. Sepals unequal, dorsal sepal ovate, blunt, 3–4 x 2 mm, forming a hood over the column; lateral sepals obliquely ovate, obtuse, 3–4 x 2 mm, spreading at anthesis. **Petals** linear-lanceolate, obtuse, 3–3.5 x 1–1.5 mm. Lip 3–3.5 mm long and wide; base saccate, bearing two sessile glands within; tip transversely oblong, 1.5–2 x 3.5 mm, the lobules more or less erect; column 1.5 mm long. **Fruit** a fusiform capsule ca. 8–10 mm long. **Flowering** reported in August and September, fruiting in July, but both probably occur throughout the year.

Distinguishable by small terrestrial orchid habit; ovate leaves less than 5 cm long; long narrow raceme with a hairy rachis; small white perianth with a yellow throat borne somewhat at right angles to the hairy ovary; the lateral sepals spreading at anthesis and the dorsal sepal forming a hood over the column; and a fusiform capsule up to 1 cm long.

SAVAII:

Vaupel 656—Specimen lost, no data recorded.

Rechinger 1884 p.p.—Lowland forest between Ā'opo and Āsau.

Whistler 592—Montane forest near Le Aisa plantation at 500 to 600 m elevation.

UPOLU:

Betche 48—Without further locality.

Whistler 349—Montane forest on Mt. Sina'ele at ca. 650 m elevation.

Whistler 738—Montane forest between Le Pu'e and Tiāvi at 700 m elevation.



PANDANACEAE

Pandanus reineckei Warb.

SAMOAN NAME: *fasa*

ENGLISH NAME: none

STATUS: rare archipelago endemic

REASON FOR LISTING: restricted Samoan distribution

SUGGESTED ACTION: This tree should be searched for in swamp and marsh forests in the upland region of Savai'i. It is strange that this species is found in American Samoa in an entirely different substrate (dry trachyte soil).

Endemic to Samoa, where it is recorded from Savai'i, 'Upolu, and Tutuila. On Tutuila it is restricted to areas of montane scrub vegetation at 450–650 m elevation, but in independent Samoa it is probably found mostly in swampy ground in montane forest, reported there from 720 to 1000 m elevation. No uses have been reported for this plant, although if it occurred nearer to habitations the leaves might be used for plaiting.

Palm-like monocot up to 8 m or more in height, with prop roots and prickly stems. **Leaves** spirally arranged, clustered at the branch tips, linear, up to 1.5 m in length 9–10 cm wide, M-shaped in cross section, margins and midrib of lower surface prickly. **Inflorescences** of unisexual flowers borne on separate male and female trees. Male flowers tightly packed, consisting only of numerous stamens (18–30 or more per flower) in clusters on spikes arranged in large paniculate inflorescences bearing large, showy white, lanceolate bracts. Female flowers in a terminal head subtended by several leafy bracts; ovary 1–3-carpelate, the stigma solitary and sessile. **Fruit** a globose subglobose, woody syncarp 14–17 cm in diameter, subtended by short, leaf-like bracts; the phalanges many, mostly unicarpelate (sometimes 2- or 3-carpellate), 1-seeded (per carpel), obovoid when unicarpelate, 4–6 cm long, with a fibrous husk orange (?) at the base when ripe, rounded (not lobed) at the tip. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its palm-like habit; prickly stems; long leaves with thorny margins; prop roots; male inflorescences with large, showy white bracts; female plants producing woody, pineapple-like fruits; and phalanges 4–6 cm long rounded and unlobed at the tip.

SAVAII:

Christophersen 625—Montane forest above Matavanu at 900 m elevation.

Christophersen 861—Mataulano lake at 900 m elevation.

Christophersen 2059—Swampy ground in montane forest at Mata'ana at 1000 m elevation.

UPOLU:

Christophersen 169—Montane swamp near Tiavi at 720 m elevation.

OTHER SAMOAN COLLECTIONS: Tutuila (7), Ta'u (1).



POACEAE

Cenchrus caliculatus Cav.

Cenchrus anomoplexis Labill.

Cenchrus calyculatus Cav. (a misspelling)

SAMOAN NAME: *sefa*?

ENGLISH NAME: Polynesian burr grass

STATUS: rare indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this grass, which has not been collected in Samoa for over a century and has probably been extirpated from the archipelago.

Indigenous to Samoa, ranging from New Caledonia to the Society Islands. In Samoa it has been reported from littoral areas of Savai'i, 'Upolu, and Tutuila, but has not been collected in the islands since 1905 and is probably now extirpated from the archipelago. Possibly called *sefa*. It was probably dispersed by sea birds, but cannot compete with more aggressive, recently introduced weeds, and it is now rare over most of its native range. No names (other than possibly *sefa*) or uses have been reported.

Robust grass, annual or perennial, with trailing to erect culms up to 2 m in length, rooting at lower nodes; leaf sheath glabrous, rounded on back; ligule 0.5–1 mm long, membranous with a fringe of hairs. **Leaves** simple, alternate; blade coarse, 20–50 cm long, 0.8–2.5 cm wide; upper surface scabrous, lower smooth; margins scabrous. **Inflorescence** a dense cylindrical spike-like raceme bearing many spiny burrs on a somewhat zigzag rachis. Spikelet 5–8 mm long, 2-flowered, lower flower male or sterile, upper bisexual, both surrounded by hard spines fused into a burr 2–4 mm long with a short-hairy base, outer bristles stiffer, longer inner bristles scabrid or somewhat featherlike. Glumes unequal, 5–7-nerved, enclosed within the burr. **Flowering** and fruiting probably occur throughout the year.

Distinguishable by its tall grass habit; dense, cylindrical, unbranched, spike-like racemes; and burr-like spikelets with soft spines, borne on a zigzag rachis. It differs from sand bur *Cenchrus echinatus*, a common and troublesome weed, by its much longer inflorescence and soft rather than hard, sharp-tipped burrs.

SAVAIL:

Vaupel 645 (lost?)—Specimen lost, probably destroyed at Berlin.

Vaupel 654—(Bishop Museum: on the lava flow between Ā'opo and Letui, no elevation given).

Rechinger 618—Dry, hot, sparsely vegetated places near Ā'opo at 400 m elevation.

UPOLU:

Graeffe 71—Without further locality.

Graeffe 1189—Without further locality.

Reinecke 65—Mulifanua coast.

SINE LOC:

USEE s.n.—Without further location.

Whitmee 30—Without further location.

OTHER SAMOAN COLLECTIONS: Tutuila (1, ca. 1860).



Heteropogon contortus (L.)
Beauv. ex Roemer & Schultes

Andropogon contortus L.

SAMOAN NAME: none

ENGLISH NAME: pili grass (Hawai'i)

STATUS: rare adventive or indigenous

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Not much can be done for this grass, which has not been collected in Samoa for over a century and has probably been extirpated from the archipelago. It is not clear if this is native, a Polynesian introduction, or a modern introduction. The best place to find it would probably on the A'opo lava flow.

Possibly a Polynesian introduction to Samoa, or perhaps modern, pantropic in distribution and present in Hawai'i before the first botanical collections there. In Samoa it occurs or occurred only in dry lowland areas of the northwest quarter of Savai'i, where it is rare on lava flows, possibly now extirpated from Samoa. No Samoan names or uses were reported, but in Hawai'i, the whole plant was formerly used for roof thatch.

Tufted perennial grass with erect, glabrous culms 30–100 cm long; leaf sheath compressed, keeled, glabrous or sparsely hispid in the throat; ligule a fringed membrane 0.5–1 mm long. **Leaves** simple, alternate; blade 10–25 x 0.3–0.7 cm; surfaces glabrous; margins finely scabrous. **Inflorescence** a solitary raceme 3–7 cm long. Spikelets narrowly lanceolate, 6–10 mm long, paired, one sessile and one stalked; the lower 2–6 pairs male, the upper 8–13 pairs with

a sessile female or bisexual spikelet with a bearded sharp barb below it, and a stalked male or sterile one. Glumes lanceolate, as long as spikelet, often with tubercle-based hairs, lower glume keeled, upper one rounded on back; fertile lemma of upper sessile flowers with a bent, flexuous awn 5–12 cm long intertwined with others. **Fruit** a caryopsis enclosed within the glumes. **Flowering** and fruiting occur throughout the year.

Distinguishable by grass habit; long raceme of paired spikelets; and long (5–12 cm) awns borne on the lemmas, with their tips intertwined.

SAVAII:

Rechinger 1042—On the "asau" (presumably in the thicket forming fern asaua, *Dicranopteris linearis*) at Sāfune.

Rechinger 1712—Lava flow at Ā'opo.



Saccharum maximum (Brongn.) Trin.

Erianthus maximus Brongn.

Erianthus pedicellaris Haeckel

SAMOAN NAME: *fiso*

ENGLISH NAME: sugarcane reed

STATUS: rare indigenous?

REASON FOR LISTING: rarity of modern collections

SUGGESTED ACTION: Botanical survey of the marsh at Mt. Sina'ele, where it was last collected in Samoa. If it is found there, propagating material should be collected and planted in a botanical garden. This natural hybrid was once a cultural plant (used for thatch), so it is probably disappearing because it is no longer cultivated.



Native or an ancient introduction to Samoa, or a natural hybrid, where it was first collected in 1905, reportedly ranging from Malaysia to the Marquesas. It has a spotty distribution in Polynesia, missing from places like Tonga, and is often reported from only one or several islands in archipelagos where it does occur. It has been reported in open places from dry slopes to wetlands, up to an elevation of 740 m, but the author has seen it only in wetlands (Mt. Sina'ele crater on 'Upolu). According to Ellstrand et al. (1999), chromosomal evidence supports the suggestion that *Saccharum maximum* is derived from a natural cross between the cultivated sugarcane (*Saccharum officinarum*) with *Miscanthus floridulus*, but recent publications treat this plant as belonging to the genus *Saccharum* instead of *Erianthus*, the latter now considered to be included in the former. If this hybridization concept is correct, the hybrid could have been created in Polynesia after the Polynesian introduction of sugarcane, or it could have taken place outside of the area and was subsequently carried eastward all the way to the Marquesas. The plant and its name are virtually unknown today, and most people would confuse it with one or both of the parental species. The leaves were apparently also used for thatch, and the stems, which contain some sugar, were chewed by children. Pratt (1911) and Milner (1966) both noted that the name is also applied to the inflorescence of sugarcane.

Large perennial grass up to 5 m in height (but usually much shorter), with stout, solid culms marked with conspicuous nodes; ligule membranous, ca. 2 mm long, with a ciliate margin. **Leaves** simple, alternate; blade linear, up to 90 cm long; sheathing at the base, attenuate at the tip; surfaces glabrous, finely parallel-veined with a thickened midvein; margins serrulate. **Inflorescence** of flowers borne in large feathery panicles up to 50 cm or more long, with numerous ascending to drooping, silvery branches that disarticulate at maturity, with the internode falling attached to the sessile spikelet. Spikelets narrowly lanceolate, paired, one sessile and the other on a pedicel about half as long as the spikelet, 2-flowered, ca. 4–5 mm long, with a cluster of silvery hairs up to twice as long as the spikelet and arising from the callus at the base. Glumes lanceolate, as long as the spikelet, the sterile lemma bearing an awn 2–9 mm long. **Fruit** an ovoid caryopsis. **Flowering** and fruiting reported from June and July, but of uncertain duration.

Distinguishable by its large, cane-like habit; conspicuous nodes; large feathery panicles whose branches break apart at maturity; awned spikelets in pairs with one sessile and the other stalked; and clusters of hairs twice as long as the spikelets forming below their base.

SAVAII: Rechinger 1156—River banks at Lauli'i.

UPOLU:

Whistler 359—Forming a dense thicket beside the marsh in Mt. Sina'ele crater at 720 m elevation.

Whistler 2128—Locality uncertain, perhaps Tapatapaō, collected in 1969.

TACCACEAE

Tacca maculata Seem.

Tacca samoensis Reinecke

SAMOAN NAME: *māsoā*

ENGLISH NAME: none

STATUS: rare indigenous

REASON FOR LISTING: rarity of collections

SUGGESTED ACTION: Botanical survey of the fernlands of Luatuanu'u, its only known site of collection in independent Samoa. The same habitat occurs near Tiave'a, so these areas should also be checked.

Indigenous, also found in Fiji. In Samoa it is found on 'Upolu in fernlands, and there is a recent collection from Tutuila in the same kind of habitat, reported from about 150 m elevation. There is a possibility that this is

just a depauperate form of *Tacca leontopetaloides*, which is stunted by the poor fernland soil in which it occurs. No Samoan names or uses have been reported, but it would probably be called *māsoā*, which is the name for the larger, similar looking *Tacca leontopetaloides*. At Kew this is not recognized as a separate species, as concluded in a monograph by Drenth (1972), but Smith (1979) believes the two to be separate species. During the present survey in July 2010, one fernland at Luatuanu'u was visited but the herb was not found.

Perennial herb, coarse, stemless, up to 1.3 m or more in height, arising from a starchy, potato-like tuber. **Leaves** large, 1–3, up to 1 m long, solitary from the tuber, erect; blade up to 30 cm long, palmately 3-parted and further irregularly pinnatifid, the divisions sessile (lacking a stalk), the segments acuminate, 1–2.5 cm wide, these often filiform apically; surfaces glabrous; petiole transversely striate, often mottled purple and green, up to 75 cm long. **Inflorescence** of many-flowered umbels surrounded by several leafy bracts 2.5–4 x 0.6–1.5 cm and numerous filamentous bracts 5 cm or more in length, all borne atop an erect, hollow, transversely striated scape up to 1.3 m in length. Perianth campanulate, greenish, ca. 1 cm long, deeply divided into 6 tepals. **Ovary** inferior, with a short style and star-shaped stigma. **Stamens** 6, borne on the perianth tube. **Fruit** a globose, several-ribbed, berry ca. 1–1.5 cm in diameter, yellow at maturity. **Flowering** occurs from November to February in the Southern Hemisphere, and fruits a couple of months later.

Distinguishable by its large herbaceous habit; large erect, compound leaves arising from a tuber; ultimate leaf segments 1–2.5 cm wide and attenuate at the tip; a tall scapose umbel bearing hanging flowers and filiform and ovate bracts; and globose fruit up to 1.5 cm in diameter.

UPOLU:

Reinecke 188—"Vailele Mountain" [probably on fernland].

Whistler 1538—Fernland at Luatuanu'u, ca. 150 m elevation.

SINE LOC:

Whitmee s.n.—Without further locality.

OTHER SAMOAN COLLECTIONS: Tutuila (1).



BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

CEPF Small Grant Final Project Completion Report The Rare Plants of Samoa

Organization Legal Name

Isle Botanica

Project Title

The Rare Plants of Samoa

Date of Report

September 2010

Report Author and Contact Information

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CEPF Region

Pacific

Strategic Direction

Threatened and endangered plant species.

Grant Amount

\$19,550

Project Dates

1 September 2009 – 31 July 2010

Implementation Partners for this Project

Please explain the level of involvement for each partner

Ministry of Natural Resources and Environment, Samoa. They organized the two-week workshop and supplied the participants.

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile

The project identified and profiled 108 plant species that are rare in Samoa. From these, 37 were recommended for inclusion on the Red List of Samoan plants. Previous to that there were only five plant species on the Red List prior to the study.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal

The report provides a profile on each of the 108 rare or hard to find species. These can be identified from photographs (for most species) as well as botanical descriptions. Prior to this, there was virtually no information on which plants are rare, threatened, or endangered in Samoa. This report is suitable for inclusion on a website where it can easily be accessed by anyone. All known location of collections are included, so that scientists know where to look for the species. From the location data, areas with high concentrations of rare species can be identified, and possibly protected..

Please provide the following information where relevant

- *Hectares Protected: 0*
- *Species Conserved: 0*
- *Corridors Created: 0*

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives

The short term goal was achieved. The plants were identified. The long term goal is to protect the species, which is the next step.

Were there any unexpected impacts (positive or negative)?

There were no negative impacts from the work, but the implementation of the workshop shows the difficulties of organizing events in the country. Part of the problem is that other workshops were apparently taking place at the same time. There needs to be more organization for projects like this in the future.

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

The major lesson learned has probably been to secure transportation. The project was always having to share the truck with other elements in the MNRE. Also, one person should have been put in charge from the beginning, rather than several people, which led to confusion.

Some of the problems that cropped up were handled well by Suemalo Talie Foliga. However he was taken off the project at times, despite the fact that he probably knows the plants better than anyone else at MNRE and was best suited to benefit from the workshop. No one participant did all the field trips, as they were pulled off for various reasons. If more participants had been included, one of them might have taken a real interest in carrying on the work on the flora and rare plants of Samoa.

Project Design Process: (aspects of the project design that contributed to its success/shortcomings)

Transportation should have been a part of the budget, and a local organizer from MNRE should have been appointed earlier. Perhaps there are too many workshops going on in Samoa, and someone in the department (MNRE) should try to space them out.

Project Implementation: (aspects of the project execution that contributed to its success/shortcomings)

Some of the problems that cropped up were handled well by Talie Foliga. But he was taken off the project at times, and he would have been the person best suited to benefit from the workshop (since he probably knows the plants better than anyone else at MNRE, and is very reliable. No one participant did all the field trips, as they were pulled off for various reasons. If more participants had been included, one of them might have taken a real interest in carrying on the work on the flora and rare plants of Samoa.

Additional Funding

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of funding*	Amount	Notes
MNRE	Transportation, salaries and lunch	?	

*Additional funding should be reported using the following categories:

- A Project co-financing (Other donors contribute to the direct costs of this CEPF project)
- B Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)
- C Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

It is difficult to find suitable personnel to run conservation projects like this. There is limited natural interest in this kind of science in Samoa, and some of the best personnel in the MNRE are hired by NGOs in Samoa, leaving the government department understaffed.

Summarize any unplanned sustainability or replicability achieved.

N/A

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

N/A

Performance Tracking Report Addendum

CEPF Global Targets (01 February 2009 – 31 January 2010)

Provide a numerical amount and brief description of the results achieved by your grant. Please respond to only those questions that are relevant to your project.

PROJECT RESULTS	Is this question relevant?	Numerical response for results achieved during the annual period.	Numerical response for project from inception of CEPF support to date.	Principal results achieved from 1 February 2009–31 January 2010.
1. Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.	N/A			
2. How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?	N/A			
3. Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.	N/A			
4. Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.	Whole country			
5. If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits?	N/A			

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our website, www.cepf.net, and publicized in our newsletter and other communications.

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2