

Partial Flora of
the Society Islands:
Ericaceae to Apocynaceae

*Martin Lawrence Grant,
F. Raymond Fosberg,
and Howard M. Smith*



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ABSTRACT

Grant, Martin Lawrence, F. Raymond Fosberg, and Howard M. Smith. Partial Flora of the Society Islands: Ericaceae to Apocynaceae. *Smithsonian Contributions to Botany*, number 17, 85 pages, 1974.—Results of a botanical investigation of the Society Islands carried out by Grant in 1930 and 1931, and subsequent work on the material collected and other collections in the U.S. herbaria and other published works are reported herein. This paper is a partial descriptive flora of the Society group with a history of the botanical exploration and investigation of the area.

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Preface

The senior author, after spending almost a year during 1930 and 1931 in the Society Islands, collecting herbarium material and ecological data, worked intensively on a comprehensive flora of this archipelago for the next five years. Most of this work was done at the University of Minnesota, but six months were spent at the B. P. Bishop Museum, Honolulu, and shorter visits were made to other herbaria. A vast card catalog of literature and herbarium records was made, and the families Ericaceae through Apocynaceae were completed and submitted as a thesis in partial fulfillment of the requirements for the Doctor of Philosophy degree at the University of Minnesota, which he was awarded in 1936. This thesis was practically ready for publication at that time, and in 1937 I urged him to submit it to the Bishop Museum for publication. He said he preferred to wait until the entire flora was finished before publication. After that more and more of his time was consumed by teaching and other activities, and, although his card file on Polynesian plants was greatly expanded, no further manuscript had been completed by the time of his death in 1968.

The manuscript came into my hands in 1969. I looked it over and realized that in the time elapsed, because of changes in the International Code of Botanical Nomenclature and because of great advances in knowledge of many of the plant groups concerned, the work could not be published in the condition it was in.

With the help of Mr. Howard Smith I undertook the task of putting it in shape for publication. The entire manuscript was gone over critically, and necessary changes in nomenclature were made and such taxonomic changes as seemed essential. Every effort was made to preserve the author's own taxonomic viewpoint and such opinions as had not been rendered completely obsolete by later work. Even though in many cases my own taxonomic concepts differ from Grant's, his were retained, as was his style of writing and even certain editorial peculiarities.

His section on botanical exploration of the region treated was judged totally inadequate, so Mr. Howard Smith, whose interests are mainly in the history of botany, undertook to redo this. The result is included under his own name, following the body of the taxonomic treatment.

I accept full responsibility for the nomenclatural aspects of the work and for any taxonomic changes as have been introduced that may not be what Grant would have accepted if he had lived to bring the work to publishable form.

It is with some hesitation and apology that Mr. Smith and I place ourselves as junior authors; but the amount of additional work probably justifies it, as does bibliographic honesty, not to mention facilitation of publication in the Smithsonian series.

MARTIN LAWRENCE GRANT
(1907–1968)

Martin Lawrence Grant was born 31 January 1907 in Chelsea, Michigan. After an active scientific career that included botanical and ornithological work on three continents and in the Pacific Islands, as well as almost 40 years of teaching biology, mostly at what is now the University of Northern Iowa, he died in Cedar Falls, Iowa, on 22 June 1968. An excellent plant collector, he made significant herbarium collections in the United States, the Society Islands, Colombia, and Iran. These will stand as a monument, valuable to his colleagues, even though he published very little of the vast amount of information he amassed during his life.

After Martin's too early death, in 1968, I had the privilege of spending a couple of days in his library and study in Cedar Falls, Iowa, selecting certain Pacific Islands materials that he had said he wanted me to have. I had known him well during parts of his life and had a picture of a keen intellect, broadly interested, highly competent at whatever he chose to do. I had been critical of his apparent incapacity to bring any major work to the point of publication, especially the Flora of the Society Islands that he undertook during his explorations there in 1930–1931.

This examination of his library, catalogs, and papers revealed an intellectual breadth previously unsuspected, as well as giving a clue to his lack of productivity of major scientific works. His interests virtually encompassed the world in a material sense, and man especially as a religious being. His library was vast—for a private one—very inclusive, but with certain areas emphasized: botany, ornithology, Pacific Islands, religion, nudism, and popular periodical literature—magazines.

To accumulate this collection and to grasp its content left little time for the concentrated mental work required to finish a scientific book. Add active teaching and active participation in professional and intellectual organizations, and one could no longer be surprised that the Flora of the Society Islands never appeared, even though Martin showed me a finished typescript of the families Ericaceae through Apocynaceae in 1937.

Information from people close to Martin during his life suggests an additional obstacle to his finishing and publishing any major work. He was undoubtedly a perfectionist, hesitating to put anything into print until he had studied all the material, consulted all previous work, and was absolutely sure of his conclusions. It has even been suggested that he did not want anything of his in print for fear others would find omissions or errors in it. This may not have been a conscious attitude, but could very well have been a real block, subconsciously. There is, however, no doubt at all that one lifetime could not possibly have sufficed to complete all the projects that he was engaged in.

His principal accomplishment on the Pacific Islands flora was a massive unpublished bibliographic catalog of the Polynesian flora, centering on that of the Society Islands, cross-indexed, expressing some judgments of his own but generally setting forth the latest taxonomic conclusions of others. Many putative new species are indicated, but quite a few of them he generously permitted others to publish. Others may never see the light of day unless future workers study the same or similar material and happen to agree with his judgments.

As this work stands it comprises the only modern revision of the Society Islands members of the families covered, and as such, will be useful to anyone working on the Polynesian flora or visiting the Society Islands. It also provides

a starting point, as well as a model, for the much needed complete flora of this island group, centrally placed in southeastern Polynesia. Biogeographers and specialists in the families treated will also find the work of substantial help. We hope we have, in the necessary revision, not lost any of either the substance or the flavor of the work.

The following biographical sketch was contributed by his sister, Mrs. Charlotte Kaufman of Reston, Virginia.

Martin Lawrence Grant was the eldest son of four generations of Martin Grants. The first was a Scot who emigrated from Yorkshire County, England, bought property, settled, and prospered in Springfield, Ohio. The fourth Martin Grant embodied such major family traits as independence, alertness, curiosity, and a kind of emotional solidity that is disciplined in relation to accomplishing tasks but somewhat aloof in personal relationships. All the Martin Grants married women of warmth and intellect who produced many children and softened somewhat the rigid, protestant dogmatism that was passed on from generation to generation.

The subject, second in a group of seven, was born on 31 January 1907 in Chelsea, Michigan. His father, Martin Lee Grant, was graduated from Oberlin Divinity School and had gone to Chelsea for his second small parish at the Congregational Church. His next flock was in Detroit, Michigan; and from there the family moved to Marion, Indiana, where Rev. Grant remained the next twenty years.

Young Martin had early shown an interest in birds, and all kinds of plants and animals. One of the many family stories about him that his younger siblings remember is that he was kicked off the junior high school baseball team for watching a bird in flight, rather than catching a fly ball. About that time also he came into church late after one of his regular long walks in the country carrying in each hand a garter snake. He was puzzled that the church emptied so fast as he assumed that everybody would know that they were harmless. Another story that his then five-year-old sister remembers with great glee happened at the Sunday night supper table with at least four family guests present. One large frog from Martin's always specimen-stuffed pockets got out and leaped into the middle of a huge cut glass bowl of floating island—a soft custard—and his Mother's special creation for the family party. As usual Martin didn't understand the adult consternation that he had caused, and demanded his frog as he was being ejected from the dining room. Martin was graduated from Marion High School at the head of his class of one hundred and fifty. It is not known whether the fact that he was the only boy in knee pants bothered him; he did not gain his full height of six feet for three more years.

Oberlin College was also his choice and after many financial struggles he was graduated from there in 1927 with honors in botany. He considered himself fortunate to obtain one of the few teaching fellowships available in his field and went on to the University of Minnesota for his doctorate. He met Dorothy Sweet a nursery school teacher in Minneapolis and they were married in Minneapolis. His first foreign assignment was in Tahiti on a Yale-Bishop Museum fellowship. They had three children, all scholarly, the two living daughters having earned graduate degrees in anthropology. After securing his doctorate he again felt lucky to be hired at what is now the University of Northern Iowa, as it was by then the bottom of the "Great Depression" and academic appointments were scarce.

During World War II he was assigned by the federal government to locate Cinchona trees, the source of quinine, in South America. Characteristically, he proceeded on horseback and on foot across the land, up and down the high mountain ranges, marking trees and collecting plant samples all the way. A Fulbright lectureship in Iran in 1963-1965 resulted in a superb collection of the flora of that country. His assignment in Iran was to establish a science department in the new Pahlavi University in Shiraz. In the meantime he had continued to hold his professorship in the natural sciences at the University of Northern Iowa where he remained until his death.

True to his scientific bent he tabulated his physical reactions to the bite of a gila monster from his hospital bed, as well as the effects of the cancer of the bone that resulted in his death on 22 June 1968.

Information to supplement my own recollections was supplied by Mrs. Charlotte Kaufman, Mrs. Dorothy S. Grant, Mrs. Janet Grant, and Mrs. Barbara Sibley.

22 August 1973

F. R. FOSBERG

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Introduction

MATERIALS.—Grant spent the period from 28 April 1930 to 3 March 1931 collecting plants on eight of the Society Islands (Tahiti, Mehetia, Moorea, Huahine, Raiatea, Tahaa, Borabora, and Tupai). About 2000 numbers were secured, including all groups of plants. About 50 to 60 new species of vascular plants are represented in the collections, six of these being described in the present paper. This collection is the basis of the present flora, although many species described from the Society Islands are not represented in Grant's collection.

In addition, all of the specimens in the Bishop Museum Herbarium have been studied. The following are the principal collections involved:

1909. B. Leland, E.W.B. Chase, and J. E. Tilden. Tahiti. Nos. 1-88.
1910. J. E. Tilden. Tahiti. Nos. 345-382.
1912. J. E. Tilden. Tahiti. No. 393.
1921. F.B.H. Brown. Tahiti and Raiatea. A few numbers.
1921, 1922. Whitney Expedition: E. H. Quayle and C. C. Curtiss. Tahiti, Mehetia. Many numbers.

1922. W. A. Setchell and H. E. Parks. Tahiti. Several hundred numbers.
1926-1927. J. W. Moore. Raiatea. About 800 numbers.
1926-1932. G. P. Wilder. Tahiti, Moorea, Tetiaroa. Several hundred numbers.
1927. L. H. MacDaniels. Tahiti. Many numbers.
1929-1930. A. M. Adamson. Tahiti. Many numbers.
1934. Mangarevan Expedition: H. St. John, F. R. Fosberg, and others. Tahiti, Mehetia, Moorea, Huahine, Raiatea, Tahaa, and Borabora. 628 numbers. Duplicate sets of some of these have been seen in other herbaria (University of Minnesota, University of California, and Field Museum).

All of the specimens studied have been collected fairly recently. All other specimens that have been cited in the literature, however, have been included in an attempt to make the work more complete. Such specimens are always cited here with a reference to the taxonomist responsible for the determination in order to make it clear that the sheet has not been checked by Grant. This applies principally to the collections in European herbaria, particularly at the British Museum, Kew, Paris, Vienna, Berlin, and Geneva, all rich in Polynesian material, none of which has been seen. While Grant hoped to see these collections eventually it was deemed advisable to sum up the known flora of the islands in the light of the material then available.

A report on the ferns of the collection has already been published (Copeland, 1932).

Martin Lawrence Grant, University of Northern Iowa, Cedar Falls, Iowa [deceased, 1968]. F. Raymond Fosberg, Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Howard M. Smith, Department of Biology, University of Richmond, Richmond, Virginia 23173.

SCOPE.—As an attempt at a complete flora, the scope of the present work is restricted to the 14 Society Islands. Particular pains are taken, however, to give the distribution of all the species as carefully as possible, especially with reference to other parts of Polynesia. In addition, there is included in the summaries for each genus and family a list of all the species occurring in Polynesia that are not found in the Society Islands. If the species involved are few, their names are given; if a genus has a large number of endemic species in Polynesia, the number of species in each island group is listed. Thus it is hoped that this Flora can also be used to provide a summary of the distribution of all Polynesian flowering plants.

The term Polynesia is used in this Flora to cover the following islands and island groups: Hawaii, the Marquesas, the Tuamotu Islands, the Gambier Islands, Easter Island, the Austral Islands, Rapa, the Cook Islands, Samoa, Tonga, Fiji, and all the smaller islands lying between these groups and west through the Phoenix and Ellice islands. Thus New Zealand, the Kermadecs, Norfolk Island, New Caledonia, the New Hebrides, and most of Micronesia (from the Gilbert and Marshall islands west) are omitted. This natural region is thus almost exactly the same as was included by Drake del Castillo (1886–1892) in the most recent summary of Polynesian vascular plants.

The lists of cultivated species, other than for the Society Islands, are by no means complete, as generally only those that had been seen by Grant in herbaria or that have appeared in works dealing with the native flora have been included. This particularly applies to the Hawaiian Islands, where occur an enormous number of introduced plants whose names have not appeared in systematic literature.

In the citation of species names an attempt is made to include all references of nomenclatural importance and all citations which record the occurrence of the plant in Polynesia. Most general references and all references to plants of wide range that do not specifically deal with their occurrence in Polynesia are omitted. Similarly, only such synonyms as have been applied to the plant in its Polynesian range are included.

ACKNOWLEDGMENTS.—The field work on which this Flora is based was carried out under the auspices of the Bishop Museum of Honolulu while Grant was

a Bishop Museum Fellow of Yale University, and to the directors and officers of these institutions full acknowledgment is accordingly due. Particularly Dr. Herbert E. Gregory, Director of the Museum, and Mr. Edwin H. Bryan, Curator of Collections, have by their constant advice and material assistance done the most to render the completion of this work possible. An additional grant from the Bishop Museum permitting 6 months of study at the Museum Herbarium at Honolulu greatly facilitated the progress of the work. Other members of the museum staff to whom the writer is deeply obligated for assistance are Dr. Harold St. John, Miss Marie Neal, Mr. E. Y. Hosaka, and Miss Margaret Titcomb. At the University of Minnesota, where the major portion of the rest of the work was done, Dr. Frederic K. Butters has served as advisor and has edited the manuscript; Dr. C. O. Rosendahl has also assisted in an advisory capacity; and Dr. J. W. Moore has generously made available his collections from Raiatea and has in numerous other ways contributed to the present flora: to all of these it is a deep pleasure to express an appreciation for invaluable assistance. While in the Society Islands the work was greatly expedited by aid rendered by Mr. J. Frank Stimson and Mr. Kenneth P. Emory of the museum staff, and several of the native chiefs, in particular Tu Temarii Nadeaud, grandson of the French botanist of that name, Raiarii, and Teriieroo Teriierooiterai. I also wish to thank Prof. W. A. Setchell and Prof. E. B. Copeland, both formerly of the University of California, for encouragement and assistance. [These acknowledgments are as written by Grant in 1936.—F.R.F.]

GEOGRAPHY

The Society Islands lie northwest of the center of the southeastern quarter of the Pacific Ocean. The archipelago consists of 14 islands stretched along in an irregular line running 19° north of west for a distance of 720 km (450 mi). The latitude covered is from 15°46' to 17°53' south, and the longitude from 148°04' to 154°50' west. From southeast to northwest the islands are Mehetia, Tahiti, Moorea, Tetiaroa, Tubuai Manu, Huahine, Raiatea, Tahaa, Borabora, Tupai, Maupiti, Mopelia, Motu One [Bellingshausen], and Manuai [Scilly]. The area (estimated for the smaller islands), maximum alti-

tude, and dimensions of the islands, arranged according to area, are shown in Table 1. Islands are referred to by their current Polynesian names. See Appendix A for synonyms.

Most of the islands are volcanic, with a fringing reef along the shore, a barrier reef a mile or so offshore, and a lagoon in between. In this class fall Tahiti, Moorea, Tubuai Manu, Huahine, Raiatea, Tahaa, Borabora, and Maupiti. Mehetia is a small cone with a poorly developed fringing reef and no barrier reef. The other islands are coral atolls: Tetiaroa, Tupai, Mopelia, Manuai, and Motu One. Seven of the eight volcanic islands (all except the smallest, Tubuai Manu) were visited in the course of the present survey, and also Tupai, the largest and best developed of the atolls.

Several of the islands are composed of pairs of volcanic peaks. Thus Tahiti consists of two distinct cones, Tahiti-nui ("large") and Tahiti-iti ("small") or Tairapu, with a very narrow and low isthmus connecting them. Similarly, Huahine is composed of two peaks, which are separated by water at high tide, and Raiatea and Tahaa are enclosed within one barrier reef.

The largest and highest of the islands is Tahiti, which includes 65 percent of the area of the group; second is Raiatea, with 12 percent, and third is Moorea, with 8 percent. The eight islands visited represent 97.5 percent of the land area of the archipelago.

The volcanic islands all have very rugged topography, as the original cones are considerably dissected by sub-aerial erosion. Darwin (1852:413) said after coming from crossing the Andes, "In the Cordillera I have seen mountains on a far grander scale, but for abruptness nothing at all comparable with this." Steep cliffs are particularly characteristic of Borabora, Tahiti, Moorea, Huahine, Raiatea, and Tahaa, approximately in the order named. In fact, the highest mountain in Tahiti, Mt. Orofena (2237 m; 7340 ft.) in the early 1950s was climbed by Maurice Jäy, a resident of Tahiti. Among those who had attempted and failed may be mentioned James Dwight Dana, Darwin, many other early explorers, and more recently, James Norman Hall, Charles Nordhoff, Harold St. John, F. R. Fosberg, and Martin L. Grant, who failed on two attempts. The second highest mountain, Mt. Aorai (2064 m; 6770 ft), has been climbed about 20 times of which there is record; the ascent is relatively easy. The ultimate summits of Mehetia, Huahine, and Tahaa were reached by Grant. Those of Raiatea and Moorea were not attempted, but the former has been climbed by Dr. J. W. Moore. Mt. Otemanu, the principal peak on Borabora, was given up after two attempts, though every other promontory on the island was scaled. On all the islands where the upper slopes are not too steep they are always rather densely forested with a scrubby type of tree growth, the lower stories thickly matted with lianas (*Freycinetia*) and climb-

TABLE 1.—*Dimensions of the Society Islands archipelago**

<i>Atoll or island</i>	<i>Area</i>		<i>Maximum altitude</i>		<i>(Dimensions km)</i>	
	<i>Sq km</i>	<i>Sq mi</i>	<i>Meters</i>	<i>Feet</i>	<i>E-W</i>	<i>N-S</i>
Tahiti	1042	402	2237	7340	60	33
Raiatea	194	75	1033	3389	14	22
Moorea	132	51	1212	3975	17	12
Tahaa	82	32	590	1936	13	13
Huahine	73	28	710	2331	10	15
Borabora	30	12	725	2379	6	9
Tupai	18	7	ca 10	ca 30	8	11
Maupiti	12	5	244	800	3	3
Mopelia	7	3	ca 6	ca 20	9	13
Manuai	8	3	ca 6	ca 20	12	15
Tetiaroa	6	2	ca 6	ca 20	6	8
Motu One	5	2	ca 6	ca 20	4	6
Mehitia	3	1	435	1427	2	2
Tubuai Manu	2	1	168	550	2	1
Total	1614	624				

* Dimensions for the atolls include the reefs, those for the volcanic islands do not.

ing (*Lygodium*) and sprawling (*Gleichenia*) ferns.

In general the major vegetation regions consist of the strand forest (e.g., *Cocos*, *Hibiscus*, *Pandanus*), the lower valley forests (e.g., *Hibiscus*, *Inocarpus*, *Aleurites*), the lower dry ridge scrub or brake (*Gleichenia* and various shrubs), the upper valley forests, and the upper ridge forests, the last two dominated by a multitude of small trees which are largely endemic.

CLIMATE

The warm moist season is from October to May, and the cooler drier season from May to October.

The average annual temperature (all figures from Papeete) is 28° C (82° F). The maximum temperature rarely exceeds 34° C in January and 28° C in July (Liot, ms). The minimum in the warm season rarely goes below 22° C and in the cool season below 18° C. The absolute maximum and minimum for the period 1901–1905 (Crampton, 1916:19) were 35° and 17° C, respectively (95° and 62° F). On several occasions in the field Grant recorded temperatures as low as 14° C (57° F) at high altitudes. On the summit of Mt. Aorai he found a note left by L. Gautier on 8 October 1917, saying a minimum temperature of 7.5° C (45° F) had been experienced during the night; this is apparently the coldest temperature ever recorded in the Society Islands.

The only official meteorological station is at Papeete, and the only figures available to Grant were for the years 1901–1905 (Crampton, 1916:21), 1923 (Setchell, 1926:247), and 1926–1929 (Liot, ms), during which broken series of ten years the annual precipitation varied from a minimum of 101 cm to a maximum of 327 cm, with an average of 197 cm (78 in). At Papeari, on the south side of Tahiti, the rainfall recorded by H. W. Smith for the years 1923, and 1926–1929 averaged 258 cm (102 in). Crampton (1916:22) has estimated the rainfall in the upper valleys at 2590 mm (1020 in; the estimate is little more than a guess), which is more than double the heaviest rainfall known in the world. The wettest month is February and the driest is June.

In 1929 at Papeete the mean monthly relative humidity was 77 percent at 8 A.M. and 73 percent at 4 P.M. Crampton (1916:22) has published a three year average (1902–1904), also at Papeete, of 84.1

and 78.9 percent for the same times of day. The absolute minimum at Papeete from 1901 through 1905 was 61 percent.

The trade winds blow from a direction varying from east southeast to east northeast. Westerly winds are infrequent and of short duration. During the warm season the trades are weak, and irregular winds may blow from the northeast-northwest.

ETHNOBOTANY

In the more primitive parts of the Society Islands the native inhabitants still depend almost exclusively on the indigenous (or aboriginally introduced) plants for food, shelter, canoes, instruments, etc. In this paper these uses are listed under the respective plants.

A few notes on the Tahitian dialect of the Polynesian language are given here, inasmuch as a special effort was made to secure the native names of the plants collected. The alphabet consists of thirteen letters, i.e., the five vowels and eight consonants: f, h, m, n, p, r, t, v. Every syllable (and thus each word) ends in a vowel and two consonants are never placed together in a word. In other Polynesian dialects the Tahitian *h* may become *s*, *f*, or may be omitted, the *r* may become *l*, the *t* may become *k* (in Hawaiian only), the *v* may become *w* (in Hawaiian and Maori), and the *f* (or *h*) may become *wh* (Maori) or be omitted. The sound of *g* (often spelled *ng*) and of *k* (except for the Hawaiian *k*), which occur in many Polynesian dialects are absent in Tahitian. To illustrate this variation in dialect, and to show the simplicity and constancy of the transliteration, the Polynesian word for "plant" or "tree" is given:

In Fiji the word is *kau*, and in the Gilbert Islands, *kai*. A few names, such as *niu* (coconut), are constant in almost all central Pacific dialects.

FLORISTICS

Compared to the two largest Polynesian archipelagoes the Society Islands flora (about 700 species

of vascular plants) is relatively small, but larger than the relative size of the group (625 sq mi as compared with 6570 sq mi for Hawaii and 7435 sq mi for Fiji) might lead one to expect. The only other Polynesian group with a flora comparable in size is Samoa.

The number of interesting endemic plants in the Society Islands does not compare with that of Hawaii, but it is comparable with that of Samoa and Fiji, each of which offers little that cannot be duplicated either to the east or to the west. Thus of the eight endemic genera of Compositae in Polynesia, seven are confined to Hawaii, and the remaining one, *Fitchia*, has four species in the Society Islands and one each in Rarotonga, Mangareva, and Rapa. Fiji, with its large proportion of endemic species in Indo-Malayan genera has but one endemic in this family, whereas there are 13 in the Society Islands and 129 in Hawaii. Of the Polynesian Compositae (172 species native, all but 8 being endemic, including 50 species in 8 endemic genera) 96 percent of the species are endemic, probably a higher figure than can be demonstrated for any other large flora.

The woody habit of most Polynesian endemics has often been stressed. In the Compositae, for example, 102 (63%) of the species are woody, 33 are suffruticose, and 28 herbaceous. Six of the eight endemic genera in this family are exclusively woody. All of the widely ranging Polynesian Compositae (8 species) are herbaceous.

Only one endemic sympetalous genus occurs in the Society Islands, *Apetahia* (Campanulaceae). Another genus, *Hitoa* (Rubiaceae), supposedly endemic is better regarded as an aberrant form of the wide-spread genus *Ixora*. A number of genera, originally thought to be endemic to the Society Islands, have proved to be of slightly wider range and occur in other parts of Polynesia. Such are *Lepinia* (Apocynaceae), *Sclerotheca* (Campanulaceae), and *Fitchia* (Compositae).

One of the principal interests in the Society Islands flora is that it lies near the easternmost limit of range of a very large number of genera, such as *Alyxia* and *Geniostoma* (Madagascar to Tahiti, the Marquesas, and Henderson), *Palaquium* (India to Tahiti), *Planchonella* (tropical Asia to Tahiti), and *Fagraea* (Ceylon to Tahiti and the Marquesas). A large number of species, e.g., *Plumbago zeylanica*, have a similar range. Genera of this type represent the largest single floristic element in the

Society Islands flora, a group of genera best developed in southeastern Asia, the East Indies, and northern Australia, which gradually fade out as they cross the Pacific, losing more and more species and species-producing vigor as they reach farther and farther east. Thus each of the genera mentioned above has a large number of species in the East Indies and only one or two in the Society Islands. For an exception to this rule, however, see the remarks under *Rapanea*.

A second conspicuous element in the Tahitian flora is the Australian-New Zealand complex, represented by *Styphelia* and *Metrosideros*, which differs from the first group in being non-Asiatic. The eight native nonendemic Compositae in Polynesia are all clearly of Australian or Malasian origin. Only one reaches Hawaii (*Adenostemma*) and that was not found by the earliest collectors; only two reach the Tuamotus and none get to Easter Island.

A third type of distribution is shown by the Antarctic element of groups which occur in southern South America, New Zealand, and Australia, such as *Fuchsia* and *Nertera depressa* J. Gaertner (= *N. granadensis* (L.f.) Druce) in the Society Islands, and *Lagenophora* elsewhere in Polynesia. A fourth element of interest, but small in numbers, is the boreal element, represented by *Vaccinium*, which reaches its southern limit in Polynesia. A fifth group consists of genera such as *Jasminum* which are more or less cosmopolitan in the tropics. A sixth element shows strictly American affinities (cf., 10 genera of Astereae, 8 of which are endemic, and the Campanulaceae). The endemic genera make up a group by themselves.

Arising as it has, by eruption from the sea-bottom, the Society Archipelago has been populated by plant disseminules brought in from without. The paths along which these have come are probably in most cases correlated with the various floristic elements mentioned. Presumably the islands have never been connected to any present continent, nor is there any geological or biological evidence favoring the former existence of a continent in the general eastern Polynesian region. The region of the Pacific to the west provides a great abundance of islands in the form of stepping-stones, by means of which the ancestors of most of the species of the present flora probably entered the Society Islands in the form of wind-blown, bird-carried, and a few water-borne disseminules. The American element, due to the distance

involved, with no stepping-stone islands of any size, is more difficult of explanation.

A number of very conspicuous plants are undoubtedly of aboriginal introduction. Such are the breadfruit, eating banana, taro (*Colocasia*), and sugar cane. A much greater number have been accidentally or purposefully introduced since the advent of the Europeans, and have provided both beautiful ornamentals and troublesome weeds. In Polynesia, for example, there occur 53 species of introduced weeds in the Compositae alone. Two of these were collected as early as 1773, but the average date of the first collection or report is 1887. Of these 53, the original homes are in America (32), Asia (7), Europe (7), Eurasia (3) cosmopolitan (3), and Micronesia (1). Most of the species were accidentally introduced from America, this probably being true of the European and Eurasian species as well. Half of these introductions (24 species) have been reported only from Hawaii. All are herbs except three.

HERBARIUM ABBREVIATIONS

- B Berlin, Germany: Institut für Systematische Botanik und Pflanzengeographie der Freien Universität Berlin
 BISH Honolulu, Hawaii: Bernice P. Bishop Museum
 BM London, England: British Museum (Natural History)
 G Geneva, Switzerland: Conservatoire et Jardin Botaniques
 K Kew, England: The Royal Botanic Gardens
 MIN Minneapolis, Minnesota: Department of Botany, University of Michigan
 NY New York, New York: The New York Botanical Garden
 P Paris, France: Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie
 S Stockholm, Sweden: Botanical Department, Naturhistoriska Riksmuseet
 UC Berkeley, California: Department of Botany, University of California
 WU Vienna, Austria: Botanisches Institut und Botanischer Garten der Universität Wien

ERICACEAE

Other than *Vaccinium*, the only genus in this family in Polynesia is the Indo-Malayan *Agapetes*, represented by *A. vitiensis* (Seemann) Benth & Hooker ex Drake, which is endemic in Fiji.

1. *Vaccinium* L.

Vaccinium L., Gen. Pl. 5th ed. 191. 1754.

Metagonia Nuttall, Trans. Am. Phil. Soc., n.ser., 8:263. 1843.

TYPE-SPECIES.—*V. myrtillus* L.

RANGE.—About 125 species in the northern hemisphere, with a few somewhat below the equator in tropical Africa, Polynesia, and Melanesia. With regard to the Tahitian species Banks and Solander wrote in 1769 (in Seemann, 1866:146), "Quis expectat speciem genuinam huius familiae intra tropicos legere?" Reinecke's (1898:664) statement that his *V. antipodum* (= *V. whitmeei* F. Mueller) is the first species from the southern hemisphere is not correct.

In Polynesia, besides the species below, one species occurs in Rapa (*V. rapae* Skottsberg), one in Samoa (*V. whitmeei* F. Mueller), and five in Hawaii.

1. *Vaccinium cereum* (L.f.) G. Forster

Andromeda cerea L.f., Supp. 238. 1781.

Vaccinium cereum (L.f.) G. Forster, Prod. 28. 1786b.—Endlicher, Ann. Wien Mus. 1:170. 1836.—Guillemin, Ann. Sci. Nat., ser. 2, 7:248. 1837.—W. Hooker, Icon. Pl. 1, sub t. 87. [excl. var. beta, gamma, and delta, and t. 87]. 1837.—Dunal in de Candolle, Prod. 7:575 [excl. var. beta, gamma, and delta]. 1839a.—Steudel, Nom. Bot. 2:739 [excl. var. beta and gamma]. 1841.—Pancher in Cuzent, Iles Soc. Tahiti. 234. 1860.—Gray, Proc. Amer. Acad. 5:323, 1862c.—Seemann, Fl. Vit. 146. 1866.—Nadeaud, Enum. Pl. Tahiti. 62. 1873.—Butteaud, Fl. Tahiti. 55. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:223. 1892; Fl. Polyn. 115. 1892.—Skottsberg, Bish. Mus. Bull. 43:86, t. 6 pro parte. 1927; Acta horti Gothb. 8:83, fig. 1-10, 30-32. 1933.

Metagonia cerea (L.f.) Nuttall, Trans. Am. Phil. Soc., n.ser., 8:263. 1843.

Vaccinium alaternoides Solander ex Seemann, Fl. Vit. 146. 1866 [pro syn.; non Humboldt, Bonpland, and Kunth 1819 (Peru)].

DESCRIPTION (based on the Tahitian specimens seen).—A shrub, often arborescent (*Grant 3754* was 2.5 m high and 7.5 cm in diameter at base; *St. John 17007* was 2 m high). Wood very hard and rather heavy (*Grant 4373* with specific gravity of 0.82). Leaves large (5 × 3.4 cm) and coriaceous on old twigs, thinner and smaller (average 2.3 × 1.6 cm, may be 1.8 × 1.1 cm) on flowering shoots, persisting for 4-5 years, elliptical on old twigs, usually somewhat obovate on flowering branches, shiny above, paler beneath, appressed glandular-serrate with 9 to 19 teeth per side (may vary to the extent of 4 teeth on opposite sides of the same leaf), obtuse, acutish, acuminate, or abruptly apiculate. Flowers produced throughout the year, axillary, solitary, on

5–8 mm pedicels, about 1 cm long. Bractlets 2, rarely 1, at or below the middle of the pedicel, about 4 mm long. Corolla white, or with a reddish tip. Aristae of anthers 0.8–1 mm long. Fruit dark reddish purple to black, about 1.5 cm in diameter, very palatable, though St. John states on the label of his no. 17109, “rather acid, not at all sweet.”

The young twigs and bases of the leaves are puberulent, and occasionally even the mature leaves may be sparingly so on both surfaces (*Grant 3754*). The pubescence of the flower is very variable, and on this character Skottsberg has founded a number of varieties and forms. While these segregates merge to some extent, they are nevertheless usually recognizable and accordingly can be maintained. The receptacle varies from glabrous to densely tomentulose with short curly hairs (*St. John 17007*). Some of the sheets show variation from an essentially glabrous flower to one sparingly puberulent (*Grant 4373*, *St. John 17109*). All the flowering specimens seen in which the stamens were examined have hirsute filaments.

RANGE.—Society Islands, Marquesas, Rarotonga. The records listed here as “Society Islands” are probably all from Tahiti, the only record elsewhere within the group being a single collection from Raiatea (cf., var. *raiateense*).

This species was observed at a total of 40 stations in Tahiti, all in the northwestern quarter of Tahiti-nui (districts of Pare, Arue, Mahina, and Papenoo) except for a single station on the ridge between Papenoo and Mataiea. It was found from an altitude of 500 m (1660 ft) to the very summit of Mt. Aorai,

2064 m (6770 ft), the highest point that Grant reached on the island. At the lower elevations it is a very low shrub (about 0.5 to 1 m tall) scattered in the *Gleichenia* formation. On these dry slopes, its abundance is favored by the small fires set by the native goat-hunters, as it reproduces by root-shoots. At the lower edge of the forest on these slopes, and again in the cloud forests of the upper crests, it may be a dominant species in the vegetation, but in between it usually appears as one of the larger shrubs in the low forests. Its most common dominant associates at these 40 stations were, in order of abundance, *Weinmannia parviflora*, *Metrosideros collina*, *Gleichenia linearis*, *Ilex taitensis*, *Styphelia pomarae*, *Fagraea berteriana*, and *Santalum insulare*.

ETHNOBOTANY.—English: *blueberry*. Tahitian: *opu-opu* (recorded by Guillemain (1837) as *obu-obu*). No native name is given by Cheeseman (1903:286), but Wilder (1931:85) states that it is called *poroporo* in Rarotonga, probably on account of the similarity to species of *Solanum* and *Capsicum*, to which the name *poro* (ball) is applied in various combinations, *poroporo* being the diminutive. I was told in Tahiti that the Rarotongan name is *hopuhopu*; however, that name in Tahitian refers to *Centipeda minima*. In the Marquesas it is called *heua* (Jardin, 1862:24), *toa-toa* (Decaisne, 1864:23), or, according to F. B. H. Brown (1935:216) *hueki* in Nukuhiva and *puatoatoa* in Fatuhiva.

The fruit is edible, but is not used much by the natives. In fact, Grant was told by some that it was poisonous!

Key to the Society Islands Forms of *Vaccinium cereum*

1. Perianth glabrous, or essentially so.
 2. Pedicels glabrous.
 3. Filaments glabrous 1a. var. *cereum*
 3. Filaments hirsute 1a1. var. *cereum* f. *eristemon*
 2. Pedicels puberulent 1c. var. *raiateense*
1. Perianth puberulent.
 4. Filaments glabrous 1b. var. *pubiflorum*
 4. Filaments hirsute 1b1. var. *pubiflorum* f. *skottsbergii*, new name

1a. *Vaccinium cereum* (L.f.) G. Forster var. *cereum*

Vaccinium cereum var. *typicum* Skottsberg, Acta horti Gothob. 8:85, fig. 1–10. 1933.

Vaccinium cereum var. *genuinum* Skottsberg, Acta horti Gothob. 8:87, fig. 1–10. 1933 [in obs.].

DESCRIPTION.—Flowers glabrous. Typical form with filaments glabrous.

TYPE.—Collected by *Forster* in Tahiti, 1773–1774. Previously collected by *Banks* in 1769.

RANGE.—Society Islands: *Bidwill* in 1850, pro

parte, flower and fruit (K, fide Skottsberg). Tahiti: *Forster* in 1773–1774 (S, flower; K, fruit; B, 2 sheets, erroneously labeled "Ins. Amicor.," flower and fruit; fide Skottsberg); *Sparrman* in 1773–1774 (S, 3 sheets, 1 erroneously labeled "Nova Zeylandia," flower); *D'Urville* in 1837–1840 (P, fide Skottsberg); *St. John and Fosberg 17109*, Orofena, 1350 m, 25 September 1934, flower and fruit (BISH).

The following have not been determined as to variety.

Society Islands: *Nelson* in 1777 (BM, fide Seemann); *Wiles and Smith* (BM, fide Seemann). Tahiti: *Banks and Solander* in 1769 (BM, fide Seemann); *Bertero and Moerenhout* in 1831–1834 (P, fide Guillemain); *Hombroun* in 1837–1840, and *Lépine 174* in 1847 (P, fide Drake del Castillo); *Vesco* in 1847 (P, fide Decaisne); *Nadeaud 405* in 1856–1859 (P, fide Drake del Castillo); *Quayle 37*, Aorai trail, alt. 1694 m, 22 September 1921, flower and fruit (BISH, 2 sheets); *Quayle*, Pirae-Aorai trail, 1–3 August 1922, flower and fruit (BISH, 5 sheets).

Skottsberg (1933:91) has called attention to the Forster specimens labeled "Ins. Amicor.," with the remark that "it is not impossible that the labels speak true." These specimens were probably the basis of the report in Steudel (1841, 2:739) and the Index Kewensis (2:1162) of this species being native to Tonga rather than Tahiti. Forster (1786b) records it from Tahiti only, and none of the 18 (at least) collectors who have visited Tonga since Forster's time have found it there. The "Ins. Amicor." specimens, according to Skottsberg, agree in all respects with the typical plant, which is not positively known outside of Tahiti. The same remarks apply to Sparrman's "Nova Zeylandia" specimens.

Hooker (1837) and Skottsberg (1927:86; 1933:91) cite *Cuming 1429* from "Toobouai" (Tubuai, Austral Islands) at Kew, but the plant is sterile and thus undeterminable.

1a1. *Vaccinium cereum* var. *cereum* f. *eriosstemon* Skottsberg

Vaccinium cereum var. *typicum* f. *eriosstemon* Skottsberg, Acta horti Gothob. 8:87, fig. 11–18. 1933.

DESCRIPTION.—Flowers glabrous; filaments hirsute.

TYPE.—Collected by U.S. *Exploring Expedition* in 1839.

RANGE.—Society Islands: *Bidwill* in 1850, pro

parte, flower and fruit (K, fide Skottsberg). Tahiti: *U.S. Exploring Expedition* in 1839, flower (P, fide Skottsberg); *Andersson*, Fautaua Valley, September 1852, flower (S, 2 sheets, fide Skottsberg); *Grant 4373*, Mahina, Ahonu Valley, alt. 823 m (2700 ft), in open forest of *Metrosideros* and *Gleichenia*, 4 November 1930, flower, wood specimen (BISH, MIN).

1b. *Vaccinium cereum* var. *pubiflorum* Skottsberg

Vaccinium cereum var. *pubiflorum* Skottsberg, Acta horti Gothob. 8:89, fig. 19–25. 1933.

DESCRIPTION.—Pedicel, calyx, and corolla velutinous. The typical form with filaments glabrous.

TYPE.—Collected by *Andersson* in 1852.

RANGE.—Tahiti: *Andersson*, Fautaua Valley, 1852, flower and fruit (S, 2 sheets, fide Skottsberg); *Grant 5613*, Mahina, Aorai ridge, alt. 1364 m (4475 ft), in *Metrosideros* forest, 6 June 1930, fruit (BISH).

1b1. *Vaccinium cereum* var. *pubiflorum* f. *skottsbergii* Grant, new name

Vaccinium cereum var. *pubiflorum* f. *eriosstemon* Skottsberg, Acta horti Gothob. 8:89, fig. 26–29. 1933 [non *V. cereum* f. *eriosstemon* Skottsberg, 1933].

DESCRIPTION.—As in var. *pubiflorum*, but filaments hirsute.

TYPE.—Collected by *Moseley* in 1875.

RANGE.—Society Islands: Tahiti: *Moseley*, alt. 1220 m (4000 ft), September 1875, flower (K, fide Skottsberg); *Grant 3754*, Pare, Fautaua Valley, ridge below Diadem, alt. 1021 m (3350 ft), in ridge forest, 13 May 1930, flower and fruit (BISH, MIN); *St. John and Fosberg 17007*, Orofena, s. ridge, 1700 m, 22 September 1934, flower and fruit (BISH).

Skottsberg applied the name *eriosstemon* for the form with hairy filaments both to the typical variety and the var. *pubiflorum*, which latter is here re-named, since the same name cannot be used for different subspecific entities within a given species unless they are based on the same type.

1c. *Vaccinium cereum* var. *raiateense* (Moore) Grant, new combination

Vaccinium raiateense Moore, Bish. Mus. Bull. 102:35. 1933.

Vaccinium cereum f. *eriosstemon* Skottsberg, pro parte, Acta horti Gothob. 9:190, fig. 17-23. 1934.

DESCRIPTION.—Differs from var. *cereum* in the pubescent pedicels, from var. *pubiflorum* in the glabrous perianth, and from both in the prevailing smaller leaves.

RANGE.—Society Islands: Raiatea: Moore 741, Temehani, alt. 750 m, 15 April 1927, flower (BISH, 2 sheets; MIN).

Skottsberg had concluded that this is not specifically distinct from *V. cereum*, but some of the features, listed above, seem to warrant recognition as a geographical variety, though Grant suspected they were due to the ecological conditions of the peculiar upland moor habitat in which the plant grows. The slight differences in the measurements given by Moore and Skottsberg result from studying different sheets of the same collection.

**Id. *Vaccinium cereum* var. *adenandrum*
(Decaisne) F.B.H. Brown**

Vaccinium cereum var. *adenandrum* (Decaisne) F.B.H. Brown, Bish. Mus. Bull. 130:215. 1935.

Vaccinium adenandrum Decaisne, Voy. Venus Bot. Atlas. t.17. 1846; Voy. Venus Bot. (Text):23. 1864 [*V. adinandrum* Drake del Castillo, 1892:115, pro syn. (sphalm.)].

Vaccinium cereus Jardin, Ess. Marq. 24, 41. 1862 [sphalm.].

Vaccinium cereum f. *eriosstemon* Skottsberg, pro parte, Acta horti Gothob. 8:92, fig. 33-37. 1933.

DESCRIPTION.—See F.B.H. Brown (1935) for a description and a discussion of the reasons for retaining this as a variety.

TYPE.—Collected by Du Petit-Thouars in 1836-1839.

RANGE.—Marquesas: "S.F.I.M. no. 168," flower (P, fide Skottsberg). Nukuhiva: Du Petit-Thouars in 1836-1839 (P, fide Drake del Castillo); Jardin 101 in 1853-1855 (P, fide Drake del Castillo).

F.B.H. Brown (1935:216) says, "collected from Nukuhiva, Uapou, Uahuka, Hivaoa, and Fatuhiva." He correctly cites specimens, however, only from Nukuhiva, Uahuka, and Hivaoa. The specimen he cites as from Fatuhiva (*Quayle 1153*) was actually collected on Uapou, although there is a sterile specimen from Fatuhiva in the Bishop Museum (*Brown 1082*, alt. 800 m, January 1922). Another unrecorded sterile sheet is *Mumford and Adamson 145*, Hivaoa, alt. 1100 m, 23 March 1929 (BISH).

**Ie. *Vaccinium cereum* subsp. *cheesemannii*
Skottsberg**

Vaccinium cereum subsp. *cheesemannii* Skottsberg, Acta horti Gothob. 8:95, fig. 38-43. 1933.

Vaccinium cereum Cheeseman, Trans. Linn. Soc. 6:286. 1903.
Vaccinium reticulatum sensu Wilder, Bish. Mus. Bull. 86:85. 1931 [non Smith, 1819].

DESCRIPTION.—See Skottsberg (1933) for description.

RANGE.—Cook Islands: Rarotonga: Cheeseman 597, crests of mountain ridges, 240-600 m (800-2000 ft), June 1899, fruit (K, fide Skottsberg); Wilder 546, alt. 460 m (1500 ft), 15 June 1927, flower (BISH); Wilder 804, alt. 560 m (1850 ft), 20 April 1929, flower and fruit (BISH, 2 sheets).

Wilder's designation of his plant as *V. reticulatum* Smith seems to have been wholly unintentional. In the first place, Cheeseman had previously recorded *V. cereum* from Rarotonga, and Wilder followed Cheeseman very closely. Furthermore, Wilder 804 bears the label "*V. reticulatum* Forst.," showing Wilder undoubtedly had Forster's plant in mind and not the Hawaiian endemic *V. reticulatum*.

EPACRIDACEAE

Other than *Styphelia*, the only Polynesian representative in this family is the Australian-Melanesian genus *Leucopogon*, with one species (*L. cymbulae* Labillardière) in Fiji, New Caledonia, and the New Hebrides.

1. *Styphelia* J. E. Smith

Styphelia J. E. Smith, Spec. Bot. New Holl. 45. 1795.

Cyathodes Labillardière, Nov. Holl. Pl. Spec. 1:57, t.81. 1804 [1805].

TYPE-SPECIES.—*Styphelia tubiflora* Smith.

RANGE.—About 170 species in the Australian-New Zealand region with outposts in eastern and northern Polynesia. Besides the following, there are two other Polynesian species, *S. acerosa* (Solander ex R. Brown) in New Zealand, the adjacent subantarctic islands, and Rapa, and *S. douglasii* (Gray) F. Mueller ex Skottsberg in Hawaii.

LOCAL NAMES.—*S. tameiameia* is called *aitomoua* in Tahiti (Nadeaud), *ohupukei* in the Marquesas

(Brown), and *pukeawe* (*pukeawe*), *maieli* (*mai-
ele*), and *kawau* in Hawaii (Hillebrand, Rock).
The only name I heard in Oahu was *pukeawe*.

Styphelia pomaræ is also called *aitomoua* ("moun-
tain *Casuarina*") in Tahiti. The Rapan species is
called *magie*, according to Stokes' field label.

Key to the Species of *Styphelia* in the Society Islands

- Leaves variable in shape, linear, elliptical, or obovate; petiole 1 mm or less long; leaf mucro-
glabrous; corolla 2.4–3 mm long, the tube not much, if any, exceeding the calyx; style about
half again as long as the ovary.....1. *S. tameiameiæ* [including var. *brevisiyla*]
Leaves elongate-elliptical; petiole 1–2 mm long; mucro with a deciduous tuft of hairs at the
apex; corolla 4.3–5.2 mm long, the tube much exceeding the calyx; style about 3 times the
length of the ovary2. *S. pomaræ*

1. *Styphelia tameiameiæ*

(Chamisso & Schlechtendal) F. Mueller

- Cyathodes tameiameiæ* Chamisso & Schlechtendal, *Linnaea*,
1:539. 1826.—Endlicher, *Ann. Wien Mus.* 1:170. 1836.—
A. P. de Candolle, *Prod.* 7:741. 1839b.—Nuttall, *Trans. Am.
Phil. Soc. n.ser.* 8:270. 1843.—Gray, *Proc. Am. Acad.* 5:325.
1862c.—Mann, *Proc. Am. Acad.* 7:188. 1867.—Wawra, *Flora*
56:59. 1873.—Hillebrand, *Fl. Haw. Is.* 272. 1888.—Drake
del Castillo, *Ill. Fl. Ins. Pac.* 7:244. 1892.—Heller, *Minn.
Bot. Stud.* 1:872. 1897.—Rechinger, *Denks. Akad. Wien* 89:
637. 1913.—F.B.H. Brown, *Bish. Mus. Occ. Pap.* 8 (6):332,
f.9. 1922.—Degener, *Pl. Haw. Nat. Park* 247, t.69. 1930.
Cyathodes banksii Gaudichaud, *Voy. Uran. Bot.* 98. 1827
[nomen nudum].—Endlicher, *Ann. Wien Mus.* 1:170. 1836
[nomen nudum].—A. P. de Candolle, *Prod.* 7:742. 1839b.
[cum desc.].—Nuttall, *Trans. Am. Phil. Soc. n.ser.* 8:270.
1843.
Cyathodes macraeana A. P. de Candolle, *Prod.* 7:742. 1839b.
Cyathodes tameiameiæ var. *societatis* Gray, *Proc. Am. Acad.*
5:325. 1862c.—Seemann, *Fl. Vit.* 146. 1866.—Nadeaud,
Enum. Pl. Tahiti 62. 1873.—Drake del Castillo, *Fl. Polyn.*
Fr. 116. 1892.
Styphelia tameiameiæ (Chamisso & Schlechtendal) F. Mueller,
Fragm. 6:55. 1867.—Drude in Engler and Prantl, *Nat. Pfl.*
4 (1):78. 1889 [under *C. tameiameiæ*, sphalm.].—Rock,
Indig. Trees Haw. 365. 1913.—Skottsberg, *Medd. Goteb.
Bot. Trädj.* 2:254. 1926.
Styphelia tameiameiæ f. *marquesensis* F.B.H. Brown, *Bish.
Mus. Bull.* 130:218. 1935.

DESCRIPTION.—Shrub, 2 m high, with spreading
or erect branches. Young twigs pubescent, old ones
glabrate. Leaves erect on young shoots, soon
spreading, and becoming reflexed before they drop
off. Petiole 1 mm or less long. Leaves very variable
in shape, often of 3 distinct types: linear, elliptical,
and obovate, rarely all 3 occurring on the same twig;
5–17 (–30 on young sprouts) mm long by 1–3.2 mm
wide; tip acute when the leaf is linear and obtuse

when the leaf is obovate, but rather regularly mu-
cronulate; usually ciliolate along the distal third (or
more) of the margin; grayish or bluish-green above,
usually paler or glaucous below; with about 7 pri-
mary veins which branch dichotomously from base
to margins of leaf, giving a striolate appearance.
Flowers axillary or pseudoterminal, solitary, 3–4
mm long. Pedicels 1–2 mm long, bearing 5–9
imbricated sepal-like bractlets, which are obtuse,
scarious-margined, and ciliolate. Sepals 1.5 mm
long, obtuse, ciliolate. Corolla 3 mm long, pinkish
white, cut half-way to the base, the tube usually
very slightly exceeding the calyx, although this
character is very variable; lobes spreading at matu-
rity, each with 4 or 5 conspicuous hairs on the inner
surface. Stamens slightly exerted from the tube.
Scales 0.3–0.4 mm long. Pistil 1.7 mm long, the
ovary subglobose, somewhat 5-angled, puberulent,
0.7 mm long, the style 1 mm long, the stigma
praemorse. Drupe 4–6 mm in diameter, oblate-
spherical, 5–8 celled, light to dark rose.

The above description is based on Hawaiian
specimens (*Grant 7004* and *7388*, Waianae Range,
Oahu), and includes all the variations seen in her-
baria and mentioned in the original description and
the subsequent accounts of Gray, Nadeaud, Hille-
brand, Drake del Castillo and Rock, with the fol-
lowing exceptions. At higher elevations the plant
becomes a small tree, to 3.5 m high; the corolla
may be wholly glabrous (var. *brownii* Gray, var.
macraeana (de Candolle) Hillebrand); and the
drupe may be white. Hillebrand says that the leaves
are aciliolate, but I assume that is merely a matter
of relative magnification; leaves several years old
may be essentially smooth-margined. Rock has

copied Hillebrand's description. Degener's plate shows the leaves as clearly ciliate.

Gray described his var. *societatis* as "corollae lobis intus parcissime barbatus; foliis plerisque linearibus," but doubted its validity, due to the variability of each of these characters in this species.

F. B. H. Brown (1935) based his f. *marquesensis* on a single character: ". . . the leaves are on the average longer than those of the Hawaiian forms. The Marquesan form differs little from that of the Society Islands." He gives the leaf length as 10–15 mm. Grant examined the type (*Brown 533*, sheet A), and found the leaves average 11 × 2.5 mm. Hillebrand gives the length of the leaves as 4 to 6 lines (8–12 mm), and as stated above, the variation is even wider in the Hawaiian plant. In Brown's plant the leaves may be aciliate, the corolla tube is 1.7 mm long, slightly exceeding the calyx, the corolla lobes 1.2–1.5 mm, the ovary 0.7 mm, and the style 1–1.2 mm long. The other Marquesan specimens cited below agree in all important particulars. Grant postulates a segregable form in the Marquesas, as there are very few truly indigenous species which have just this distribution (Hawaii, Marquesas, Society Is.), but he could find no characters on which to separate it.

TYPE.—Collected by *Chamisso* in Oahu in 1816.

RANGE.—Society Islands, Marquesas, Hawaii.

Society Islands: Tahiti: *Nadeaud 404*, alt. 900 m, in 1856–1859 (P, fide Drake del Castillo, 1892b). Moorea (Eimeo): *Pickering* in 1839 (fide Gray).

Marquesas: Nukuhiva: *Brown 533*, alt. 900 m, 15 July 1921, flower and fruit (BISH, 3 sheets); *Quayle 1237*, alt. 900 m, 30 December 1922, flower and fruit (BISH); *Mumford and Adamson 560*, alt. 915 m, 22 October 1929 (BISH, sterile; NY, fruit).

Hawaiian Islands: Numerous records.

According to *Nadeaud* the plant is common in Tahiti, but no other collector has secured it since, and he may not have distinguished it in the field from *S. pomarae*. I have not seen the typical plant from the Society Islands.

R. Brown (1810:539) referred to a Tahitian species of *Cyathodes*, which would be either this or *S. pomarae*, and presumably had seen a specimen collected by Banks and Solander in 1769, nothing further is known of this record. Seemann

and others apparently have not found the specimen in the British Museum.

1a. *Styphelia tameiameiae* var. *brevistyla*
(Moore) Grant, new combination

Styphelia brevistyla Moore, Bish. Mus. Bull. 102:36. 1933.

DESCRIPTION.—Differs from the typical form in its low habit of growth (40 cm high or less), smaller leaves (6–7.5 × 1.5 mm) with veins not as freely forking (due to the smaller size of the leaves), calyx slightly longer than the corolla-tube, corolla slightly shorter (2.3–2.5 mm) with the tube 1 mm long, and smaller pistil (1.3 mm long, with ovary 0.5 mm high and style 0.9 mm). Flower red, according to St. John.

All of these differences are reductions, which are apparently correlated with the high moor environment of the plant. The interesting thing about the vegetation of this environment is that almost all the species which grow there exhibit this type of reduction.

Moore in describing his new species pointed out four differences between *S. brevistyla* and *S. pomarae*, all of which hold, and there is certainly no question about these two plants being different species. The affinities of his plant, however, are not with *S. pomarae*, but with *S. tameiameiae*. Two of the ways he gives in which his plant differs from *S. pomarae* are just the ways in which *S. tameiameiae* differs from *S. pomarae*, namely, "leaves without a pronounced tuft of hairs at the apex" and "a relatively shorter corolla." Moore also states, "smaller narrower leaves," which is true. The fourth difference—"a style that is shorter than the ovary"—would separate it from both the other species, but this does not hold (cf., the measurements above). Moore must have examined pistils of greater age in which the ovary had grown following fertilization, as he says "ovarium 1 mm. in diameter," whereas, at anthesis, the ovary is but half that diameter, and the style decidedly longer than the ovary; *brevistyla* is thus a misnomer.

RANGE.—Raiatea: Temehani Plateau. *Moore 106*, alt. 470 m, in wet moss, 21 September 1926, flower and fruit (BISH, type, 2 sheets; MIN); *Grant 5217*,

Faaharato, alt. 600 m (1970 ft), high moor, 29 January 1931, sterile (BISH, MIN); *St. John 17293*, alt. 750 m, high moor, flower and fruit, 5 October 1934 (BISH).

2. *Styphelia pomarae* (Gray) Moore

Cyathodes pomarae Gray, Proc. Am. Acad. 5:324. 1862c.—Seemann, Fl. Vit., 146. 1866.—Drake del Castillo, III. Fl. Ins. Pac. 7:224. 1892; Fl. Poly. Fr. 116. 1892.

Cyathodes tahitensis Nadeaud, Enum. Pl. Tahiti 62. 1873. *Styphelia pomarae* (Gray) Moore, Bish. Mus. Bull. 102:36, footnote. 1933.

In herbaria Grant saw this combination attributed to F. Mueller, who reduced the genus *Cyathodes* to *Styphelia*, but could find no record of its publication. Nadeaud was unaware of Gray's earlier name when he published his species.

DESCRIPTION.—Shrub, 2 m high, with branches usually ascending; lower stems often twisted and rope-like; wood heavy (*Grant 4397* with specific gravity of 0.89). Twigs tan, with light pubescence. Leaves erect, soon spreading, with puberulent petioles 1–2 mm long, elongate elliptical, 10–14 × 2–2.5 mm, usually, but not necessarily, ciliolate, mucronate, with a deciduous terminal tuft of hairs on the mucro, glaucous below, with about 7 principal veins which fork to a variable degree. Flowers axillary, solitary (or rarely in clusters of 2 or more, fide Nadeaud), including pedicel about 6 mm long, with 3–9 ciliolate bractlets. Sepals 2.3 mm long, ovate, ciliolate. Corolla 4.3–5.2 mm long, the tube 2.5–3.2 mm, much exceeding the calyx, and the lobes 1.7–2 mm long, glabrous or sparingly hairy along the adnate filaments within, the lobes usually, but not always, with a few long hairs on the inner surface. Anthers slightly exerted from the tube. Scales 0.3 mm long. Ovary 0.7–0.8 mm long, style 2–2.2 mm. Drupe 8 mm in diameter, subglobose, about 6-celled, dark red becoming purple in drying; mesocarp mealy, with flat taste.

The above key brings out the differences between this species and *S. tameiameiae*. The distinction given by Drake del Castillo (1892:116): "Arbuste dressé—*C. pomarae*, Arbuste à rameaux ascendants—*C. tameiameiae*" is incorrect. Nadeaud says "ramis nigrescentibus," and this is true of *Grant 3739* and *4397*, but the color is due to infection by fungi.

TYPE.—Collected by *Pickering* in Tahiti (U.S. Exploring Expedition) in 1839.

RANGE.—Society Islands: Tahiti: *Pickering*, mountains, in 1839 (fide Gray); *Nadeaud 403*, crests of Mt. Aorai, 1858, fruit, and Ure e Hiro (Orofere Valley, Paea), alt. 1200 m, flower (P fide Drake del Castillo 1892); *Quayle 35*, Aorai trail, alt. 1694 m, 22 September 1921, flower and fruit (BISH); *Quayle*, Aorai trail, 1–3 August 1922, flower and fruit (BISH, 6 sheets); *Grant 3549*, Pare, Fautaua Valley, face of Mt. Diadem, alt. 1085 m (3560 ft), 13 May 1930, flower (BISH, MIN); *Grant 3739*, Mahina, Aorai ridge, alt. 1220 m (4000 ft), in thicket of *Vaccinium* and *Metrosideros* 5 June 1930, flower and fruit (BISH, MIN); *Grant 4397*, Mahina, Ahonu-Tuauru ridge, alt. 915 m (3010 ft), in *Weinmannia*–*Metrosideros* forest, 5 November 1930, flower and fruit, wood specimen (BISH, MIN); *St. John and Fosberg 16982*, Orofena, s. ridge, alt. 1570 m, low woods, 21 September 1934, flower and fruit (BISH).

Grant observed the plant at 15 field stations in Tahiti, all, including the above-listed records, from the northwestern quarter of Tahiti-nui, in the districts of Papenoo, Mahina, Arue, Pare, and Paea. It ranges in altitude from 900 m to the summit of Mt. Aorai (2064 m) the highest point Grant reached on the island. It usually occurs as a dominant or subdominant shrub in the low forests of the upper humid crests, its most common dominant associates being, in order of abundance, *Weinmannia parviflora*, *Metrosideros collina*, and *Vaccinium cereum*.

MYRSINACEAE

Besides the following (*Rapanea* and *Ardisia*), five other genera of this family are represented in Polynesia. There are 12 species of *Maesa*, one in Samoa, one in Tonga, and 10 in Fiji. Fiji has eight species of *Tapeinosperma*. There are three species of *Discocalyx* in Fiji and one in Tonga. *Embelia* is represented by two species in Hawaii, one in Samoa, and one in Fiji. Hawaii has 11 species of *Suttonia*. Each of these species is endemic in a single Polynesian archipelago, except for two doubtful records in the genus *Maesa*. Including *Rapanea* and *Ardisia* there are 60 species in Polynesia in this family, all endemic except the introduced *Ardisia elliptica*.

Key to the Genera of Myrsinaceae in the Society Islands

- Flowers large, 1 cm long, 5-merous, in subterminal peduncled corymbs; cultivated.....1. *Ardisia*
 Flowers small, 2-4 mm long, 4-merous, in sessile cauline umbels; native.....2. *Rapanea*

1. *Ardisia* Swartz

Ardisia Swartz, Prod. Veg. Ind. Occ. 3 and 48. 1788.

TYPE-SPECIES.—*A. tinifolia* Swartz.

RANGE.—Tropics, about 280 species, mostly in Asia, some in America, Africa, and Australia. Two other species occur in Polynesia, both endemic in Fiji.

1. *Ardisia elliptica* Thunberg

Ardisia elliptica Thunberg, Nov. Gen. Pl. 8:119. 1795 [cf. Merrill, Trans. Am. Phil. Soc. n. ser. 24 (2):298. 1935].

Ardisia humilis sensu Mez, in Das Pflanz. 9:127. 1902.—Wilder, Bish. Mus. Bull. 86:86. 1931.—Christophersen, Bish. Mus. Bull. 128:166. 1935 [non Vahl, 1794].

TYPE.—From Ceylon.

RANGE.—Society Islands (cultivated): Tahiti: Seen by Grant, not collected. Raiatea: Moore 190, Uturoa, 9 October 1926, flower (BISH, MIN).

India to the Philippines and Java. In cultivation and as an escape everywhere in the tropics. Reported from Rarotonga (Wilder, 1931) and Samoa (Christophersen, 1935) as an escape. Native to south and southeast Asia.

2. *Rapanea* Aublet

Rapanea Aublet, Hist. Pl. Guiane Franc. 1:121, t. 46. 1775.

TYPE-SPECIES.—*Rapanea guyanensis* Aublet.

DESCRIPTION (based on the Society Islands species).—Small trees, with alternate, glabrous, usually entire, lucid, punctate leaves. Flowers borne in cauline fascicles which are essentially umbels, on short (0.5-1 mm) wart-like branches among or below the leaves, tetramerous with single pistils, minute (2-4 mm long), greenish or whitish. Polygamo-dioecious, some individuals with perfect flowers, others with functionally staminate ones. Perianth valvate, punctate, glandular-ciliolate. Sepals about $\frac{1}{3}$ united, petals less so and revolute at anthesis. Anthers subsessile on the corolla tube, introrse. Pistil 1-celled, with a 2-lobed or an entire but 3 or 4-angled sessile stigma, which is much reduced (0.1-0.3 mm) in the male flowers. Fruit a small superior drupe, 1-seeded, varying from very fleshy to very dry.

RANGE.—Of the 190 species, 68 occur in tropical America, 16 in Africa and the islands of the Indian Ocean, 21 in Asia, and the remainder (85) on the islands of the Pacific Ocean. There are 18

TABLE 2.—Known distribution of the Society Islands species of *Rapanea* by island (X present, - absent)

Species of <i>Rapanea</i>	Tahiti	Moorea	Huahine	Raiatea	Borabora
1. <i>taitensis</i>	x	-	-	-	-
2. <i>longifolia</i>	x	-	-	-	-
3. <i>hartii</i>	x	-	-	-	-
4. <i>ovalis</i>	x	-	x	x	-
5. <i>vescoi</i>	x	-	-	x	-
6. <i>obovata</i>	-	-	-	-	-
7. <i>nadeaudii</i>	x	-	-	x	-
8. <i>st.-johnii</i>	x	-	-	-	-
9. <i>ronuiensis</i>	x	-	-	-	-
10. <i>collina</i>	x	-	x	x	-
10a. <i>collina</i> var. <i>falcata</i>	x	-	-	x	x
11. <i>fusca</i>	-	x	x	x	-
11a. <i>fusca</i> var. <i>fasciculata</i>	-	-	-	x	-
12. <i>viridis</i>	-	-	-	x	-

species in Polynesia, of which 12 occur in the Society Islands (Table 2), and 1 each in the Marquesas, Rapa, Raivavae, Rarotonga, Samoa, and Fiji [There are 21 in Hawaii if the Hawaiian species formerly placed in *Suttonia* and now generally put in *Myrsine* are regarded as congeneric with those discussed here. Hosaka (1940) places the Hawaiian species, which certainly do not differ generically from the rest of the Polynesian species, in *Myrsine*. There seems to be very little difference between *Rapanea* and *Myrsine* except a slender habit and toothed leaves in the latter. Stigma shape has been used, but this is a most variable character in *Rapanea*. If the generic identity of the Hawaiian species with *Rapanea* is accepted, the figure 190 will rise to 211, that of 85 to 106, and that of 18 to 39].

LOCAL NAMES.—The only apparently authentic Tahitian name for this genus was *nuareitea* ("on the branches"), given for *R. taitensis*. For *R. fusca* var. *fasciculata*, the name *tororire* was given in Raiatea by an unreliable native, a name which in the Society Islands is usually applied to *Leucaena forsteri*; however, Wilder (1931:86) cites *taraire* for *R. cheesemanii* in Rarotonga. Two other unreliable names received were *ofeo* (which is *Pittosporum*) and *hitoa* (*Ixora*), the leaves and habit of both plants being similar to *Rapanea*. Setchell (1924:61) lists *saitamu* for *R. samoensis*, and F. B. H. Brown (1935:220) records *tiki* for his *R. myricifolia* in the Marquesas.

DISCUSSION.—It is very peculiar for an Indo-Malayan genus (and the affinities of the Pacific species are here rather than with the American

center) which has 10–15 species each in the East Indies, Philippines, New Guinea, Australia, and New Caledonia to be relatively absent from the other Polynesian groups (e.g., Fiji, Samoa) and to produce a large number of species in the Society Islands. We know of no other group of plants which exhibits this type of distribution. After a study of the majority of the known specimens of *Rapanea* from the other Polynesian groups, we do not feel that this is merely a matter of taxonomic splitting and lumping. For example, the 12 collections of *R. myricifolia* (Gray) Mez, which Grant saw from Fiji, show no greater variation than the eight collections cited here as *R. fusca*. All of the other Polynesian species are known from a much smaller number of specimens.

An historical peculiarity of the genus in Polynesia is that none of the early collectors in Tahiti or elsewhere secured any samples of this group. The first-known collections are those of the U. S. Exploring Expedition in 1839–1840. Here again, we know of no other large genus (i.e., with a relatively large number of species in the Society Islands) that was overlooked completely by Banks, Solander, Forster, Cook, Nelson, Menzies, Bennett, Lay, Collie, Bertero, and Moerenhout, all of whom collected in Tahiti before that date. Even in Mez's (1902) monograph of the family each of the Society Islands species (he records 7) is described from a single collection.

There are described here three new species, two others are reduced to varieties, and another is excluded from the archipelago.

Key to the Species of *Rapanea* in the Society Islands *

1. Blades large, averaging over 10 cm long, various in texture; twigs glabrous.
 2. Blades rounded to subcordate at the base.
 3. Blades obtuse to rounded at apex, 10–18 × 5.5–8.5 cm, coriaceous; umbels 6–10-flowered; pedicels 2–7 mm long; drupe 6 mm long.....1. *R. taitensis*
 3. Blades acutish, 25–50 × 7–12 cm, pergameneous; umbels 1–5-flowered; pedicels 10 mm long; drupe 13 mm long.....2. *R. longifolia*
 2. Blades cuneate to attenuate at the base.
 4. Blades rounded at the tip, heavily coriaceous, 18–23 × 6.5–8.7 cm, obovate.....3. *R. hartii*, new species
 4. Blades acute to obtuse, chartaceous to pergameneous, 9–20 × 3–7.2 cm, elliptical, obovate, or oblanceolate. (These 3 species are too imperfectly known by us for more distinct separation).

* Due to fragmentary knowledge of flowers and fruits of some of the species, this key of necessity is based primarily on the leaves.

5. Blades elliptical to obovate, 9–18 × 4–7.2 cm, i.e., relatively broad, chartaceous to pergameneous, obtuse to acute at apex; calyx lobes 0.7–1 mm long.....4. *R. ovalis*
5. Blades elliptical to oblanceolate, 12–20 × 3–6 cm, i.e., relatively narrow, pergameneous, obtuse (to acute?) at apex; calyx lobes 1–1.2 mm long.
6. Blades elliptical to oblanceolate, not rhombic, 12–17 × 3–5 cm obtuse (or acute?) at apex; umbels 3–8-flowered; pedicels 3–4 mm long; drupe 4–5 mm long.....5. *R. vescoi*
6. Blades obovate to oblanceolate, somewhat rhombic in outline, 16–20 × 5–6 cm, obtuse; umbels 7-flowered; pedicels 5–9 mm long; drupe 6.5–7 mm long.....6. *R. obovata*
1. Blades small, averaging under 10 cm long, coriaceous or subcoriaceous; twigs glabrous or pubescent.
7. Pedicels 5–7 mm long; blades 8–10 × 3.3–5 cm; drupe 7 mm long; umbels 2–4-flowered.....7. *R. nadeaudii*
7. Pedicels 0.5–4 mm long; blades 1.7–9 (–12?) cm long; drupe (unknown in *R. ronuiensis* and *R. st.-johnii*) 2–7 mm long; umbels 3–8-flowered.
8. Blades subrounded to scarcely cuneate at base, broadly obovate, 4.5–11 × 3–5 cm; pedicels puberulent, 1.5–3 mm long; umbels 5–8-flowered.....8. *R. st.-johnii*, new species
8. Blades definitely cuneate at base, elliptic to obovate or oblanceolate, 1.7–12 × 0.6–4.5 cm; pedicels (excepting *R. collina*) glabrous, 0.5–4 mm long; umbels 3–8-flowered.
9. Drupe 7 mm long; blades 1.7–2.8 × 0.6–1.1 cm, often subdentate at apex; petioles 1–2 mm long.....12. *R. viridis*
9. Drupe 2–4 mm long (unknown in *R. ronuiensis*) blades 1.7–9 × 0.5–4 cm (5–9 cm long in *R. ronuiensis*); entire.
10. Anthers 0.8 mm long; pedicels 0.5–1.5 mm long; young growth puberulent; petioles 0–5 mm long; umbels 5–7-flowered; blades 5–9 × 2.3–3.8 cm.....9. *R. ronuiensis*, new species
10. Anthers 1–1.5 mm long; pedicels 1–4 mm long; young growth puberulent or glabrous; petioles 2.5–15 mm long.
11. Blades often falcate and rhombic in outline, relatively broad (1.5–4.5 cm wide); calyx lobes 0.7–0.9 mm long; anthers 1.4–1.5 mm long; pedicels 1–4 mm long; corolla 1.7–2 mm long.
12. Twigs ferruginous puberulent; drupe 2–3 mm long; corolla 2 mm long.....10. *R. collina*
12. Twigs glabrous, or very slightly puberulent with scattered hairs; drupe 3–4 mm long; corolla 1.7 mm long.....10a. *R. collina* var. *falcata*, new combination
11. Blades symmetrical, not rhombic; narrow or small (0.5–1.8 cm wide); calyx lobes 0.5 mm long; anthers 1–1.4 mm long; pedicels 1–2.5 mm long; corolla 2–4 mm long; twigs glabrous or nearly so.
13. Blades 3–6 × 1.3–1.8 cm; petioles 5–10 mm long; drupes 3.5–4 mm long.....11. *R. fusca*
13. Blades smaller, 1.7–3.2 × 0.5–1.4 cm; petioles 2.5–5 mm long; drupes 3 mm long.....11a. *R. fusca* var. *fasciculata*, new combination

1. *Rapanea taitensis* (Gray) Mez

Myrsine taitensis Gray, Proc. Am. Acad. 5:330, 1862c.—See-mann, Fl. Vit. 149, 1866 [*M. tahitensis*].—Drake del Castillo, Ill. Fl. Ins. Pac. 7:227, 1892; Fl. Polyn. Franc. 118, 1892 [excl. var. *longifolia* and syn. *M. coriacea* and *M. ovalis*].
Rapanea tahitensis (Gray) Mez, in Das Pflanz. 9:373, 1902.

DESCRIPTION.—Tree, 3–5 m high, becoming 20 cm in diameter, glabrous. Twigs brown or gray. Petioles 2–5 mm long. Blades elliptical, 12–18 × 6–8.5 cm, subcordate or rounded at the base, ob-

tuse or rounded at the tip, stiffly coriaceous, prominently reticulate, when young punctate with orange-red dots and lines that become obscure as the blades mature. Umbels on short (1 mm) branches on twigs 7 mm in diameter, below the leaves, 6–10 flowered. Pedicels 5–7 mm long. Perfect flowers unknown. Male flowers (not previously described) 3.6 mm long. Perianth prominently red-punctulate. Calyx greenish when fresh; tube 0.4 mm long; lobes deltoid, 0.9 mm long, acutish,

ciliolate. Corolla whitish, tube 0.7 mm long; lobes ovate, 3 mm long, minutely puberulent within. Anthers 1.8 mm long. Ovary ovoid-conical, 1.3 mm long; stigma conical, 0.3 mm long, weakly 2-lobed. Drupe obovoid, 6 × 6.5 mm (4 mm, fide Mez), greenish and red-punctate when young, becoming maroon and black-maculate when ripe, on twigs 1.5 cm in diameter.

The above description is largely from *Grant 3779* and checks fully, except for fruit size, with Gray's and Mez's descriptions. Quayle's specimen collected in 1922 differs from the other specimens in having smaller leaves (10 × 5.5 cm) and shorter pedicels (2–4.5 mm).

Drake del Castillo (1892) combined three other species with this one, but from the specimens he cited it is clear that he had not seen any material of true *R. taitensis*.

TYPE.—Collected by the *U. S. Exploring Expedition* in 1839 in Tahiti.

RANGE.—Society Islands: Tahiti: *U. S. Exploring Expedition*, mountains, 1839, fruit (Gray, fide Mez); *Quayle 40*, Aorai trail, 23 September 1921, fruit (BISH, 1 sheet, another sheet of this number being *R. ovalis*); *Quayle*, Aorai trail, 1–3 August 1922, flower (BISH, 2 sheets); *Grant 3779*, Mahina, Mt. Aorai, alt. 1830 m (6010 ft), in *Metrosideros-Ilex* forest, 6 June 1930, male flowers (BISH, MIN); *St. John and Fosberg 17000*, Orofena, s. ridge, alt. 1600 m, rain forest, 22 September 1934, fruit (BISH). The specimens cited by Drake del Castillo belong to *R. longifolia*, *R. ovalis*, and *R. nadeaudii*.

2. *Rapanea longifolia* (Nadeaud) Mez

Myrsine longifolia Nadeaud, Enum. Pl. Tahiti 61. 1873; Journ. de Bot. 11:109. 1897; Journ. de Bot. 13:3. 1899.
Myrsine tahitensis var. *longifolia* Drake del Castillo, Ill. Fl. Ins. Pac. 7:227. 1892; Fl. Polyn. Franc. 118. 1892.
Rapanea longifolia (Nadeaud) Mez, in Das. Pflanz. 9:366. 1902.

DESCRIPTION (based on *Grant 4266*, the phrases in quotation marks from Nadeaud's and Mez's descriptions).—Unbranched "or few-branched" small tree or shrub, "2–8 m. high, 5–8 cm. in diameter," with 1 terminal tuft of leaves "or several superimposed," glabrous, "dioecious." Wood fine-grained, light brown, specific gravity 0.77. Twigs 1 cm in diameter. Leaves oblanceolate "lanceolate or elliptical," 35–45 × 8–11 cm "25–50 × 7–12

cm.," narrowed to a rounded base, acutish, pergamentaceous, prominently veined, minutely punctulate, subsessile on a 3 mm petiole, "petiole elongated." Umbels borne below the leaves, "sometimes between the whorls, peduncles 2–5-branched, 1–5-flowered, pedicels 1 cm. long." "Female flowers 3–4 mm. long, greenish-white; sepals very short; 4 rudimentary stamens; stigma large, elongated, 5-angled. Male flowers larger, white; stamens 4, short, with large anthers; ovary rudimentary." Drupe globose, 13 mm in diameter "pyriform, 13 × 9 mm," fleshy, "green when young," red at maturity, very sparingly punctulate, "channelled when dry." Pyrene 7–8 × 8 mm, 1–("1–2") seeded.

TYPE.—Collected by *Nadeud* in 1859 in Tahiti.

RANGE.—Society Islands: Tahiti: *Lépine* in 1847 (P, fide Drake del Castillo); *Ribourt 51* and *68* (or *66?*), circa 1850 (P, fide Drake del Castillo); *Nadeud 401*, Paea, Orofere Valley, foot of Mt. Mapuhi, alt. 1000 m, 10 May 1859, and Tearapau above Mamano, August 1896, fruit (G, fide Mez); *Grant 4266*, Papenoo, Mt. Orofena, alt. 710 m (2325 ft), in *Cyathea* forest, 23 September 1930, fruit, wood specimen (BISH).

Nadeud cites two other localities, but we do not know whether specimens were preserved: Pare, Mt. Ereereae, alt. 1100 m, May 1896, fruit; Mahaena, Puaa, alt. 850 m, 14 February 1898, flower.

3. *Rapanea hartii* Grant, new species

Arbor parva, glabra; folia petiolis 5–8 mm longis, laminis obovatis 18–23 cm longis 6.5–8.7 cm latis basi attenuatis anguste cuneatis apice rotundatis rigidusculis coriaceis haud manifeste punctatis; umbellae 6–7-florae; flores ignoti; pedicelli fructiferi 5 mm longi; calyx tubo 0.5 mm longo, lobis 1 mm longis late deltoideis acutis; drupa subglobosa vel obovata 4–5 mm longa 4 mm lata.

Small tree, glabrous, with leaves scattered along the twigs, not fascicled, petioles 5–8 mm long. Blades obovate, 18–23 × 6.5–8.7 cm, rounded at the tip, attenuate to a narrowly cuneate base; very coriaceous for this genus; prominently reticulate-veined, with a well-developed midrib 2.5–3 mm in diameter at the base, and 25–35 lateral veins which are irregularly arranged, usually alternately long and short, the long ones turning upward and fusing toward the margin; punctate with lines and dots, inconspicuously so in direct light (the dots

black), and conspicuously pellucid (orange-red) by transmitted light. Umbels occurring principally below the leaves, sessile on minute branches (0.5 mm long) from stems 6–8 mm thick, 6–7 flowered. Flowers unknown. Fruiting pedicels 5 mm long, 0.6 mm thick. Calyx tube 0.5 mm long, lobes 4, broadly deltoid, 1 mm long, acutish, punctulate, glandular-ciliolate. Drupe subglobose to obovate, 4–5 × 4 mm, greenish, punctate with red and black lines.

The closest relative is *R. taitensis*, from which it differs in the leaves being obovate, cuneate-attenuate at the base (elliptical and subcordate in *R. taitensis*), and more prominently punctulate, the slightly shorter pedicels, shorter calyx lobes, and smaller fruits. The difference in leaf shape is very striking. The plant shows no evident similarity to the thinner-leaved, larger-fruited *R. obovata* of Raiatea.

ETYMOLOGY.—The species is named after Mr. John W. Hart, of Raiatea, a long-time settler in southern Polynesia, who was leader of the party on the occasion of the discovery of the species.

RANGE.—Society Islands: Tahiti: *Grant 4080*, Papenoo Valley, Ana Pua, alt. 365 m (1200 ft), in *Cerbera-Pandanus* forest, 6 September 1930, fruit (BISH, type; MIN).

4. *Rapanea ovalis* (Nadeaud) Mez

Myrsine ovalis Nadeaud, Enum. Pl. Tahiti. 61. 1873.

Myrsine tahitensis sensu Drake del Castillo, Ill. Fl. Ins. Pac. 7:227. 1892; Fl. Polyn. Franc. 118. 1892 [pro parte quoad syn. *M. ovalis*; non *M. taitensis* Gray, 1862].

Rapanea ovalis (Nadeaud) Mez, in Das Pflanz. 9:373. 1902.—Wilder, Bish. Mus. Bull. 120:37. 1934.

DESCRIPTION (after Nadeaud and Mez).—Medium-sized tree, with strong twigs. Petiole 1 cm long. Leaves ovate-lanceolate or elliptical, falcate at base (Nadeaud), symmetrical (Mez), 12–15 × 5–6 cm, base shortly acute, apex obtuse, chartaceous, shining, prominently reticulate-veined, punctate with dots sunken into the parenchyma. Flowering branches short, verruciform, with 2–4 flowers. Pedicel 7 mm (Nadeaud), 5 mm (Mez) long. Sepals fused for over 1/3 of their length, lobes broadly ovate, acutish, heavily ciliate, maculate. Drupe ovate (Nadeaud) ellipsoid (Mez), 6–7 × 4–4.5 mm, acutish, with obscure longitudinal ridges, and marbled with brown lines.

Because of the variation shown in the material, a combined description of the eight specimens in the Bishop Museum is here given separately: Tree to 8 m high and 10 cm in diameter, glabrous. Twigs reddish to brown. Petioles 4–12 mm long. Blades prevailingly obovate, in other cases elliptical, 9–18.5 × 4–7.2 cm, cuneate at the base, obtuse to acute (rounded in 1 specimen) at apex, frequently attenuate at either or both ends, chartaceous to pergameneous, bright green with a distinct reddish cast, frequently drying brown, usually paler below, midrib 1–1.5 mm thick at the base, usually about 18–25 somewhat pronounced lateral veins, inconspicuously punctulate. Umbels sessile on short (1 mm) branches, usually below the leaves, on rather thick twigs 4–4.5 mm in diameter, 5–10 flowered. Flowers not seen. Pedicels variable, 1–7 mm long. Calyx tube 0.5–0.7 mm long, lobes ovate or deltoid, 0.7–1 mm long, obtuse, greenish, glandular-ciliolate, sparingly punctulate. Mature drupe globose or elliptical to slightly obovate, 5–5.4 × 4.5–5.2 mm, greenish, punctate with orange-red longitudinal lines. Style 1.1 mm long.

Most of these specimens differ from the original descriptions in having obovate leaves with an attenuate base, not prominently reticulate veins, more flowers in a cluster, shorter pedicels, and smaller fruits, and some in having acute leaves. All are broader leaved than is *R. vescoi*. If it is a single species and no combination of characters indicate otherwise, it is very variable.

TYPE.—Collected by *Nadeaud* in Tahiti in 1856–1859.

RANGE.—Society Islands and Tuamotus. Society Islands: Tahiti: *Nadeaud 400*, Pare, Mt. Marau, alt. 1200 m, in 1856–1859, fruit (P, fide Drake del Castillo; G, fide Mez); *Quayle 40* pro parte, Mt. Aorai, alt. 1848 m, 23 September 1921, fruit (BISH); *MacDaniels 1665*, Tautira, Vaita Valley, alt. 300 m, 12 June 1927, fruit (BISH); *Grant 4617*, Paea, Ruapo, alt. 550 m (1810 ft), in *Aleurites-Tecoma* forest, 4 December 1930, sterile (BISH, MIN). Huahine-nui: *St. John and Anderson 17174*, Mt. Turi, nw. ridge, alt. 400 m, woods, 1 October 1934, fruit (BISH). Raiatea: *Moore 397*, Vairahi-Averarahi ridge, alt. 300 m, 3 December 1926, sterile (BISH, MIN); *Moore 500*, Faarua, alt. 150 m, ridge, 7 January 1927, sterile (BISH, MIN); *St. John 17263*, Mt. Temehani, alt. 450 m, woods along stream, 5 October 1934, fruit

(BISH). Tuamotus: Makatea: *Wilder 1201*, alt. 60 m (200 ft), 27 October 1932, fruit (BISH). One of the most common trees on the island according to Wilder.

5. *Rapanea vescoi* (Drake del Castillo) Mez

Myrsine vescoi Drake del Castillo, Ill. Fl. Ins. Pac. 7:227. 1892; Fl. Polyn. Franc. 119. 1892.

Rapanea vescoi (Drake del Castillo) Mez, in Das Pflanz. 9: 372. 1902.

DESCRIPTION (after Drake del Castillo).—Large glabrous shrub. Leaves oblong, 12–25 × 3–4 cm, attenuate at base, acute at apex. Umbels 5–8-flowered. Pedicels short, thick. Calyx lobes ovate, acute, glandular-ciliolate. Corolla slightly longer than calyx, lobes obovate. Anther tips attenuate.

The species is very close to *R. ovalis*, perhaps too close. It is supposed to have narrower acute leaves. We are placing here a specimen that seems to fit, though the leaves are broader and the umbels fewer-flowered. It is a tree 2.5 m high and 4 cm in diameter, with petioles 5–10 mm long, blades oblanceolate to elliptical, 13–17 × 5 cm, acutish or obtuse, attenuate to rounded at the base, pergameneous, minutely pellucid punctate by transmitted light, umbels 3–4 flowered, pedicels 3–4 mm long, calyx tube 0.5 mm long, lobes 1 mm long, glandular-ciliolate, drupe green, red-punctate (black in drying), globose to obovate, 4–4.5 × 4 mm.

TYPE.—Collected by *Vesco* in Tahiti in 1847.

RANGE.—Society Islands: Tahiti: *Vesco* in 1847 (P, fide Drake del Castillo, but not found there by Mez); *Grant 4054*, Papenoo, Ana Hue, alt. 310 m (1010 ft), in *Psidium-Neonauclea* forest, 5 September 1930, fruit (BISH, MIN).

6. *Rapanea obovata* Moore

Rapanea obovata Moore, Bish, Mus. Bull. 102:37. 1933.

DESCRIPTION.—“Shrub, 2.5 m. high,” glabrous. Leaves clustered at the tips of the branches. Petioles 4–6 (3–9) mm long. Blades obovate to oblanceolate, somewhat rhombic in outline, 16.5–20.5 × 5.1–6.2 cm, obtuse, slightly abruptly attenuate at the tip, tapering to a subcuneate base, pergameneous, rather dark green, conspicuously and densely black-punctate with dots and lines which are yellow and pellucid by transmitted light. Um-

bels regularly 7-flowered (not 3–5 as described), though fewer fruits ripening. Flowers unknown. Pedicels 6–8 (5–9) mm long. Calyx tube 0.5 mm long, lobes deltoid-ovate, 1.2 mm long, acutish, glandular-ciliolate. Drupe ellipsoidal or slightly ovate or obovate, fleshy, 6.5–7 × 5.5 mm when dry, greenish, with prominent longitudinal dark red punctulations.

From the published descriptions Moore is correct in relating this to *R. vescoi*, from which it differs in the oblanceolate leaves and the longer pedicels, though the pedicel length (“short”) of *R. vescoi* is unknown. We have assigned a specimen to *R. vescoi* which has shorter pedicels, but the leaves are oblanceolate to elliptical as in this species. Any further comparison of *R. vescoi* and *R. obovata* is impossible due to the fragmentary description of the former (fruit unknown) and the apparent loss of the type. See the key above for a list of differences which indicate that *R. obovata* may be merely a large edition of *R. vescoi*.

TYPE.—Collected by *Moore* in Raiatea in 1927.

RANGE.—Society Islands: Raiatea: *Moore 521*, Avera Valley, alt. 300 m, on clay ridge, 11 January 1927, fruit (BISH, type; MIN).

7. *Rapanea nadeaudii* Mez

Myrsine coriacea Nadeaud, Enum. Pl. Tahiti 61. 1873 [non *R. Brown*, 1810; nec aliorum].

Myrsine tahitensis sensu Drake del Castillo, Ill. Fl. Ins. Pac. 7:227. 1892, Fl. Polyn. Franc. 118. 1892 [pro parte, quoad syn. *M. coriacea*; non *M. tahitensis* Gray, 1862].

Rapanea nadeaudii Mez, in Das Pflanz. 9:372. 1902 [non *R. coriacea* (Swartz) Mez, 1902].

DESCRIPTION (after Mez and Nadeaud).—Tree, 5–6 m high, glabrous. Twigs thick, with leaves congested at the tip. Petioles thick, 2–3 mm long. Blades ovate, oblong, or oblong-elliptical to obovate, 8 × 3.3 cm (10–15 [–24 on young shoots] × 4–10, fide Nadeaud), acute or attenuate at the base, somewhat obtuse at the tip, coriaceous, reddish, midrib prominent below, lateral veins sometimes conspicuous above, prominently punctulate. Umbels sessile on twigs or on minute branchlets 2–4 flowered. Pedicels slender, 5–7 mm long. Male flowers unknown. Female flowers 2.5–3 mm long. Sepals fused for half their length or more, lobes acute, papillose-ciliolate, punctulate. Petals fused for ¼ their length, lobes elliptic, acutish, punctu-

late. Anthers sessile, shorter than the corolla, sagittiform, acute. Ovary 1/5 inferior. Stigma large, conical, 4-lobed. Drupe globose, 7 mm in diameter.

We have seen nothing that quite matches this. Drake del Castillo combined it with *R. taitensis*, without, however, having seen any material of that species.

TYPE.—Collected by *Nadeaud* in Tahiti in 1857.

RANGE.—Society Islands: Tahiti: *Nadeaud* 399, "Fareraupe" (where?), alt. 800 m, 27 August 1857, flower and fruit (P, fide Drake del Castillo; G, fide Mez). *Nadeaud* cites an additional locality: Faaa, Pinai.

8. *Rapanea st.-johnii* Grant, new species

Arbor usque ad 3–4 m alta, ramulis glabris; folia petiolis 1–4 mm longis, laminis late obovatis 4.5–7 (–11) cm longis 3–4 (–5) cm latis basi subrotundatis vel parum cuneatis haud attenuatis apice subrotundatis vel obtusis coriaceis dense punctatis juvenilibus ciliolatis; umbellae 5–8-florae, pedicellis 1.5–3 mm longis glandulosi-puberulis; flores masculini ignoti, hermaphroditi viridi-albi; calyx glandulosi-puberulus tubo 0.5 mm longo lobis deltoidis 0.7 mm longis obtusis vel rotundatis; corolla tubo 0.3 mm longo lobis 1.7 mm longis ciliolatis intus ad apices puberulis; antherae 1 mm longae ad apices puberulae; ovarium ovatum 1 mm longum, stigma pyramidale 3–4-angulatum 1 mm longum; fructus ignoti.

Tree, 3–4 m high, with divaricate branches. Flowering twigs 3–5 mm thick, glabrous. Pedicels and calyx glandular puberulent; young leaves ciliolate. Petioles 1–4 mm long. Blades broadly obovate, 4.5–7 (–11) × 3–4 (–5) cm long, base subrounded or barely cuneate, not attenuate, apex rounded (or obtuse); coriaceous, lucid; densely glandular-punctate with lines and dots; midrib 1.5 mm thick at base, lateral veins not especially prominent. Umbels 5–8-flowered. Pedicels 1.5–3 mm long. Male flowers unknown. Perfect flowers with perianth greenish white, orange and black punctate. Calyx tube 0.5 mm long, lobes 0.7 mm long, obtuse to rounded, glandular-ciliolate. Corolla tube 0.3 mm long, lobes 1.7 mm long, ciliolate and puberulent within at tips. Anthers 1 mm long, tips puberulent. Ovary ovoid, 1 mm long; stigma conical, 1 mm high, 3–4-angled. Fruit unknown.

Differs from *R. nadeaudii*, the description of which it most closely matches, in having shorter, broader, obovate leaves, rounded to scarcely cuneate at the base, more flowers in a cluster, and shorter glandular-pubescent pedicels. The flowers and fruit cannot be compared as the flowers of *R. nadeaudii* and the fruit of *R. st.-johnii* are unknown.

The leaves of *St. John* 17012 approach those of *R. taitensis* in size and shape (those of the other collections being much smaller), and it is to that species that the present one is possibly most closely related. The flowers of *R. taitensis*, however, are almost twice as large.

TYPE.—Collected by *St. John* and *Fosberg* in Tahiti in 1934.

RANGE.—Society Islands: Tahiti, Mt. Orofena: *St. John* and *Fosberg* 16989, s. ridge, alt. 1600 m, mossy ridge, 22 September 1934, flower (BISH, type); *St. John* and *Fosberg* 17012, same place and date, rain forest, flower (BISH); *St. John* and *Fosberg* 17019, same place and date, mossy brush on ridge, flower (BISH).

9. *Rapanea ronuiensis* Grant, new species

Arbor parva, ramulis novellis ferrugineo-puberulis mox glabrescentibus; folia sessilia vel petiolata, petiolis latis ad 5 (–7) mm longis, laminis obovatis saepe falcatis 5–9 cm longis 2.3–3.8 cm latis basi cuneatis vel parum attenuatis apice obtusis vel rotundatis pergameneis virentibus haud nitentibus punctatis juvenilibus ciliolatis mox glabrescentibus; umbellae 5–7-florae, pedicellis glabris 0.5–1.5 mm longis; flores masculini ignoti, hermaphroditi 1.8 mm longi; perianthium lutei-viride; calyx tubo 0.5 mm longo lobis deltoidei-ovatis 0.5–0.7 mm longis obtusis vel rotundatis glandulosi-ciliolatis vel nudis; corolla calycem bis superans tubo 0.5 mm longo lobis ovatis 1 mm longis obtusis ciliolatis intus ad apices tomentellis; antherae 0.8 mm longae connectivo obscuro; ovarium ovatum 1 mm longum, stigma pyramidale 3–4-angulatum; fructus ignoti.

Small tree. Flowering branches 2.5–3 mm in diameter, brown. Young twigs ferruginous puberulent and young leaves ciliate, both soon glabrous. Leaves clustered at the tips of the branches. Petioles broad, to 5 (–7) mm long, or leaves sessile. Blades obovate, often falcate,

5-9 × 2.3-3.8 cm, cuneate or somewhat attenuate at the base, obtuse to rounded at the tip; pergameneous, dull, dark green with a gray cast, punctate-lined and dotted (orange-pellucid in transmitted light); midrib 1 mm in diameter at base, lateral veins about 25, not prominent. Umbels borne mainly below the leaves, on minute (0.5 mm long) branches, 5-7-flowered. Pedicels glabrous, 0.5-1.5 mm long. Male flowers unknown. Perfect flowers 1.8 mm long. Perianth yellowish green, red and black punctate with lines and dots. Calyx tube 0.5 mm long; lobes deltoid-ovate, 0.5-0.7 mm long, obtuse to rounded, glandular-ciliolate to nude. Corolla twice as long as the calyx, tube 0.5 mm long, lobes ovate, 1 mm long, obtuse, ciliolate, tomentulose within. Anthers 0.8 mm long, acutish, subsessile, rose in color, with dark connective. Ovary ovoid, 1 mm long; stigma sessile, pyramidal, 3-4-angled, usually unlobed but very variable as to shape, 0.8 mm long. Fruit unknown.

Affinities are with *R. collina* from which it differs most conspicuously in the sessile or broadly short-petioled obovate leaves, and the subsessile flowers with smaller anthers. The leaves are of a darker duller gray-green, a color I have seen in no other *Rapanea*, and the flowering twigs are thicker. From *R. nadeaudii* it differs in the many-flowered inflorescence and the subsessile flowers.

TYPE.—Collected by Grant in Tahiti in 1930.

RANGE.—Society Islands: Tahiti-iti: Grant 3905, Teahupoo, Mt. Ronui, alt. 860 m (2815 ft), in *Weinmannia-Ascarina*-etc. forest, 2 July 1930, flower (BISH, type; MIN). Apparently only one other collection of *Rapanea* is known from the lesser peninsula of Tahiti (*R. ovalis*).

10. *Rapanea collina* (Nadeaud) Mez

Myrsine collina Nadeaud, Enum. Pl. Tahiti 61. 1873.—Drake del Castillo, III. Fl. Ins. Pac. 7:227. 1892; and Fl. Polyn. Franc. 119. 1892 [excl. syn. *M. falcata*].

Rapanea collina (Nadeaud) Mez, in Das Pflanz. 9:372. 1902.

DESCRIPTION (after Nadeaud and Mez, with interpolations in parentheses to cover the specimens cited below).—Small tree (2-) 3-5 m high. Twigs thickish (slender, 2-3 mm in diameter). Young branches, petioles and pedicels ferruginous-tomentulose. Petioles 4-7 (3-15) mm long. Leaves ovate, somewhat falcate at base (elliptic to

obovate, somewhat rhombic in outline, and symmetrical or somewhat falcate), 4-7 × 2-3 (3-8 × 1.5-4) cm, base acute (cuneate), tip obtuse or rounded (occasionally emarginate), coriaceous (or pergameneous), opaque, glabrous, punctate only when young (*Grant 4396* is conspicuously punctate with purple (when fresh) lines which converge toward the base of the leaf, and some leaves are pellucid in transmitted light with minute orange dots. *Grant 5302* and *Moore 669* are dotted but not lined, the dots obscure in age in the former. Venation not especially prominent). Umbels borne on short (0.5 mm) branches (mainly below the leaves), 1-5- (3-7-) flowered, appearing in July. Pedicels 1-1.5 (1-2) mm long. (Perianth greenish). (Calyx tube 0.4 mm long), lobes wide-ovate (0.7-0.9 mm long), subrounded (to acutish, lined or dotted with orange punctae), glandular-ciliolate (or nude). (Corolla tube 0.7 mm long, lobes 1.3 mm long, red-maculate, heavily ciliolate and tomentulose within at the very tip). Stamens subsessile (anthers 1.4 mm long. Ovary conical, 0.8 mm long. Stigma minute, 0.1-0.2 mm long, 2-lobed). Drupe globose (slightly obovoid), 2-3 mm in diameter (3 × 2.7 mm), gray (green, turning purple), marbled-punctate (with longitudinal lines).

Grant 4396 agrees with the original description except that the leaves are rather conspicuously punctate and the pubescence is minute. *Grant 3763.2* is similar, but more conspicuously tomentulose, even to the young leaves, and it has smaller blades (3-4 × 1.5-1.8 cm). *Grant 5302* has larger blades (7-8.5 × 2.7-4 cm), with pink-tinged midribs, leaf margins, and young twigs. *Moore 669* has some twigs pubescent, others glabrous; it has rounded leaf tips, while all the other specimens seen are merely obtuse.

TYPE.—Collected by Nadeaud in Tahiti in 1856-1859.

RANGE.—Society Islands: Tahiti: Nadeaud 397, Pare, Haamuta, alt. 800 m, September 1856-1859, fruit (G, fide Mez; P. fide Drake del Castillo); *Grant 4396*, Mahina, Ahonu-Tuauru, alt. 915 m (3010 ft), in *Weinmannia-Metrosideros* forest, 5 November 1930, fruit, wood specimen (BISH, MIN); *Grant 3763.2*, Mahina, Mt. Aorai, alt. 1900 m (6255 ft), in *Metrosideros-Styphelia* forest, 6 June 1930, fruit (BISH, MIN). Huahine: *Grant 5302*, Fare, Matoereere, alt. 400 m (1290 ft), in *Macaranga-Metrosideros* forest, 7 February 1931,

male flowers (BISH, MIN). Raiatea: *Moore 669*, Vahuti, alt. 100 m, ridge, 18 March 1927, sterile (BISH, MIN).

**10a. *Rapanea collina* var. *falcata*
(Nadeaud) Grant, new combination**

Myrsine falcata Nadeaud, Enum. Pl. Tahiti 61. 1873.

Myrsine collina Nadeaud sensu Drake del Castillo, III. Fl. Ins. Pac. 7:227. 1892; Fl. Polyn. Franc. 119. 1892 [pro parte quoad syn. *M. falcata*].

Rapanea falcata (Nadeaud) Mez, in Das Pflanz. 9:372. 1902.

DESCRIPTION.—Differs from the species in having the twigs glabrous (or very slightly puberulent with scattered hairs), the drupes slightly larger (3–4 as against 2–3 mm), and the corolla slightly smaller (1.7 as against 2 mm).

According to Nadeaud's and Mez's descriptions this "species" differs from *R. collina* in being glabrous (even to the nude-margined calyx lobes), with slightly longer (8.5 cm) acutish, chartaceous, subprominently punctate leaves, longer pedicels (3–4 mm), and slightly larger (4 × 3.5 mm) obovoid fruits.

The Borabora specimen checks fully with the original description. It was a tree, 3 m high; twigs glabrous or very minutely and sparingly puberulent; leaves 6–8.5 × 2.3–3.2 cm, punctate-lined (markings dark, converging to the base of the leaf) and dotted (yellow, conspicuous in transmitted light); fruits dropped, borne 3–5 in umbels.

The Raiatean specimen (*Moore 742*) is closer to the type-description than the Tahitian ones seen, and without the intermediates mentioned below would probably be given specific rank, but it varies considerably in conspicuousness of punctation, and the calyx lobes range from very minutely glandular-ciliolate to essentially naked, both of which characters tend to tie the species and the variety together. The only character in which it might not seem to fit this species is the large size of the leaves (9–12 × 3.2–4.5 cm). The plant is glabrous, leaves elliptic to slightly obovate, symmetrical or slightly falcate, cuneate to rounded at base; male flowers (not previously described) 7 or 8 in a cluster, on 3 mm pedicels; calyx tube 0.3 mm long, lobes ovate, 0.7 mm long, obtuse; corolla 1.75 mm long (not quite mature), ciliate, punctate-lined; anthers 1.5 mm long; ovary conical, 0.6 mm high, stigma 0.2 mm long.

Grant 4396 is referred to *collina* on the basis of its other characteristics, but its leaves slightly exceed the maximum given for *R. collina*. They are acute and prominently punctate, symmetrical or somewhat falcate, and the fruit is obovoid, all of which are characters of *R. falcata*. Obviously the two are very closely related. *Grant 4259*, here referred to this variety, is almost identical with *4396*, but is subglabrous, being very sparingly and minutely puberulent on the young twigs and pedicels. Other tendencies shown by it in the direction of *R. falcata*: branches spreading, twigs slightly more slender (2 mm in diameter), blades slightly longer (5–8 × 2.2–3 cm), pedicels becoming longer (1–3 mm), and drupe slightly longer (3–3.5 × 2.5 mm). It was a small tree, 3 m high and 7.5 cm in diameter at the base, with greenish twigs becoming reddish brown in age. On the basis of these two specimens alone, we would not have separated the two, but according to Nadeaud and Mez the differences can become more prominent. Drake del Castillo combined the two species.

TYPE.—Collected by *Nadeaud* in Tahiti in 1856–1859.

RANGE.—Society Islands: Tahiti: *Nadeaud 398*, Mahaena, Mt. Aramaoro, summit, 1856–1859, fruit (G, fide Mez; P, fide Drake del Castillo); *Grant 4259*, Papenoo, Mt. Orofena, alt. 1230 m (4045 ft), side of ridge, with *Psychotria*, *Cyathea*, etc., 22 September 1930, fruit (BISH, MIN). Raiatea: *Moore 742*, Mt. Temehani, 700 m, 15 April 1927, male flowers (BISH, MIN). Borabora: *Grant 4591*, Tevaitapu, Mt. Tarapaia, alt. 490 m (1600 ft), in *Metrosideros-Rapanea* forest, 3 January 1931, fruits fallen (BISH, MIN).

11. *Rapanea fusca* Moore

Myrsine myricaefolia Gray, Proc. Am. Acad. 5:330. 1862c [pro parte quoad spec. ex Eimeo (Moorea)].—Drake del Castillo, III. Fl. Ins. Pac. 7:277. 1892 [pro parte simile]; Fl. Polyn. Franc. 118. 1892 [non *Rapanea myricifolia* Mez, 1902; nec F.B.H. Brown, 1935].

Rapanea fusca Moore, Bish. Mus. Bull. 102:37. 1933.

DESCRIPTION.—Tree, 2–6 m high, up to 5 cm in diameter, much branched. Young growth sparsely ferruginous-pubescent or glabrous. Petioles (3–) 5–10 mm long. Blades elliptic, obovate, or oblanceolate, (2–) 3–6 × (0.7–) 1.3–1.8 cm, cuneate at base, obtuse to rounded at apex, entire,

occasionally retuse, subcoriaceous, grayish green, inconspicuously punctulate, midrib pinkish when fresh, brown in drying, with 8–12 prominent lateral veins. Umbels sessile on the leafy twigs, 4- or 5-flowered. Pedicels 1–2.5 mm long. Perianth 4- (rarely 5-) merous, greenish, punctate, glandular-ciliolate. Calyx tube 0.5 mm long, lobes deltoid-ovate, 0.5 mm long, obtuse to acutish. Corolla tube 0.3 mm long, lobes 1.8–2.4 mm long, tomentulose at tip within. Filaments 0.6 mm, adnate to the corolla tube; anthers 1–1.4 mm long. Ovary in perfect flowers subglobose, 4-angled, 1 mm long, with stigma 4-angled, 1.8 mm long, 2-lobed. Male flowers with ovary 0.6 mm long, conical; stigma 0.2 mm long, capitate, 4-angled, weakly 2-lobed. Drupe globose to obovoid, 3.5–4 × 3–4 mm, red punctate.

This species is very close to *R. myricifolia* (Gray) Mez, which is endemic in Fiji. Endemic species of the same affinity are found in Samoa (*R. samoensis* Lauterbach), the Marquesas (*R. myricifolia* f. *marquesensis* F.B.H. Brown), and Rapa (*R. myricifolia* f. *rapensis* F.B.H. Brown). A comparison with the original descriptions and with 12 collections from Fiji reveals the following minor differences: petioles of *R. fusca* 5–10 mm long (5 mm in the Fiji plant), pedicels 1–2 mm (0.5–1 mm in Fiji plants), umbels about 4-flowered (4–10), and leaves subcoriaceous (chartaceous). Grant had seen fruiting examples of *R. samoensis*, but had not had flowering specimens for comparison.

TYPE.—Collected in Raiatea by Moore in 1927.

RANGE.—Society Islands: Moorea (Eimeo): U.S.

Exploring Expedition in 1839 (fide Gray). Huahine-nui: Grant 5307, Fare, Mt. Matoereere, alt. 435 m (1425 ft), in *Crossostylis-Alstonia-Glochidion* forest, 7 February 1931, male flowers (BISH, MIN); *St. John and Anderson 17162*, Mt. Turi, nw. ridge, alt. 650 m, woods, fruit (BISH). Raiatea: Moore 669A, Vahuti, alt. 100 m, ridge, 18 March 1927, perfect flowers and fruits (BISH, type; MIN).

11a. *Rapanea fusca* var. *fasciculata* (Moore) Grant, new combination

Rapanea fasciculata Moore, Bish. Mus. Bull. 102:36. 1933.

DESCRIPTION.—Differs from the typical plant in having smaller leaves (1.7–3.2 × 0.5–1.4 cm), shorter petioles (2.5–5 mm), and slightly smaller fruits (3 mm in diameter), which reductions are characteristically correlated with the humid high-moor habitat of the plant. For remarks on similar varietal differences see the notes above under *Vaccinium cereum* var. *raiateense* and *Styphelia tameiameia* var. *brevistyla*. In combining the species we have adopted the name *R. fusca* rather than *R. fasciculata* as it applies to the more widely distributed plant of the more typical forest environment.

Comparison of the original descriptions of *R. fasciculata* and *R. fusca* yields 10 differences, all quantitative (Table 3). The added values in parentheses are taken from a series of three sheets of the original collection of each, the type, and two isotypes. The extreme length given for the

TABLE 3.—Quantitative differences between *Rapanea fasciculata* and *R. fusca* (measurements by Grant compared with those of original descriptions of Moore, 1933)

Character	<i>R. fasciculata</i>		<i>R. fusca</i>	
	Moore	Grant	Moore	Grant
Blades (cm)	2.2 × 1.2	1.7–3.2 × 0.7–1.2	2–4.5 × 0.7–1.6	
Lateral veins	6–9	6–12	10–12	8–12
Pedicels (mm)	1–1.5	1–2	1–2	
Corolla (mm)	2¼ × 1¼	2 × 1	1¾ × 1	2.1 × 1
Stamens (mm)	2	1.7	1¼	1.6
Filaments (mm)	1¼	0.6	0.5	0.6
Anthers (mm)	1¼ × ¼	1.1 × 0.7	¾	1
Ovary (mm)	1	0.8	0.5	1
Stigma (mm)	⅓		1.5	1.8 × 0.6
Fruit (mm)	3		4	3.5–3.8 × 3–3.5

filaments of *R. fasciculata* is difficult to understand (typographical error?), as such a length would push the tip of the anther out of the flower. No *Rapanea* is known to have filaments that long in proportion, and those Grant measured on the type-specimen were only half the length given. Of the above differences, then, only three of any significance remain: the size of the leaves (30% smaller in *R. fasciculata*) and fruits (12% smaller), and the size of the ovaries and stigmas. This difference in the pistils, however, is due to the fact, not noted by Moore, that the type of *R. fasciculata* is a male plant, and that of *R. fusca* had perfect flowers. All other species of *Rapanea* examined exhibit within themselves this same difference in sexuality. The male flowers of *R. fusca*, not seen by Moore, have ovaries 0.6 mm long, with a stigma 0.2 mm long, which measurements are identical with those of *Grant 5191*, clearly *R. fasciculata*. Furthermore, a detailed examination of three other collections of *R. fasciculata* from the type-locality, checked by flowering material put up in fixative at the time of collection, even further narrows the limits between the two "species." It was in an attempt to identify *Grant 5221*, which seemed intermediate between the two, that Grant came to make the above detailed comparison. It was noted that 27 identical pairs of Latin descriptive words and phrases are used in the original descriptions of the two entities.

TYPE.—Collected by Moore in Raiatea in 1927.

RANGE.—Society Islands: Raiatea, Mt. Temehani: *Moore 469*, alt. 450 m, wet clay soil, 1 January 1927, male flowers (BISH, type; MIN); *Moore 76*, ne. slope, alt. 350 m, 16 September 1926, fruit (BISH, MIN); *Grant 5191*, Vaitoitoi, alt. 390 m (1285 ft), 29 January 1931, male flowers (BISH, MIN); *Grant 5221*, Teapoo, alt. 580 m (1900 ft), 29 January 1931, male flowers (BISH, MIN); *St. John 17256*, alt. 550 m, high moor, 5 October 1934, fruit (BISH).

12. *Rapanea viridis* Moore

Rapanea viridis Moore, Bish. Mus. Bull. 102:38. 1933.

DESCRIPTION.—Small tree, 2 m high. Twigs glabrous. Blades obovate, 1.7–2.8 × 0.6–1.1 cm, sessile or usually on petioles 1–2 mm long, cuneate at base, rounded to obtuse at tip, usually emar-

ginate, entire or irregularly dentate at apex, coriaceous, dark green, punctate with dots and lines which are conspicuous in transmitted light, lateral veins 5–6, ascending at an angle of 45 degrees. Flowers unknown. Pedicels 2 mm long. Calyx lobes deltoid ovate, 1 mm long, glandular-ciliolate. Drupe globose, 7 mm in diameter (4–5 mm when dry), fleshy, blue. As largely pointed out by Moore, this species, while close to the preceding, differs in the subsessile, darker green, more conspicuously punctate leaves, often subdentate at the apex, with ascending lateral veins, the longer calyx lobes, and the larger fleshy fruits.

RANGE.—Society Islands: Raiatea: *Moore 739*, Mt. Temehani, alt. 750 m, 15 April 1927, fruit (BISH, type; MIN); *Moore 716*, "highest mountain," alt. 950 m, 4 April 1927, sterile (BISH, MIN).

PRIMULACEAE

Not represented in the Society Islands. The genus *Lysimachia* has nine species in the Hawaiian Islands, all endemic but one, *L. mauritiana* Lamarck, of wide range to the west. A close relative of this has been described as endemic in Rapa, *L. rapensis* F.B.H. Brown. The only other indigenous Polynesian species in the family is *Samolus repens* (Forster) Persoon, known in Polynesia only from Easter Island, but also found in New Zealand, Australia, and South America. A European weed, *Anagallis arvensis* L., has spread in Hawaii. The total for the family in Polynesia is thus 12 species, of which 9 are endemic, 2 more indigenous, and 1 established.

PLUMBAGINACEAE

A single genus represented in Polynesia.

1. *Plumbago* L.

Plumbago L. Gen. Pl. 75. 1754.

TYPE-SPECIES.—*P. europaea* L.

RANGE.—About 12 species, in Africa, Asia, and America, with one in the Pacific. Besides the following, *P. caerulea* Humboldt, Bonpland & Kunth has been reported in cultivation in Hawaii.

Key to the Species of *Plumbago* in the Society Islands

1. Flowers red; cultivated..... 1. *P. indica*
 1. Flowers blue or white
 2. Flowers pale blue; cultivated..... 2. *P. auriculata*
 2. Flowers white; native..... 3. *P. zeylanica*

1. *Plumbago indica* L.

Plumbago indica L., Stickman Herb. Amb. 24. 1754a; Amoen. Acad. 4:133. 1759.

Plumbago coccinea Salisbury, Prod. 122. 1796.—Hillebrand, Fl. Haw. Is. 286. 1888.—Butteaud, Fl. Tahiti. 70. 1891.

Plumbago rosea L., Sp. Pl. 2nd ed. 1:215. 1762.—Butteaud, Fl. Tahit. 70. 1891.

DESCRIPTION.—Shrubby, more or less climbing, with scarlet or purplish red flowers.

RANGE.—Society Islands, Marquesas.

Society Islands (cultivated): Tahiti: Introduced in 1882 by Bishop d'Axieri, according to Butteaud.

Marquesas (not previously reported): Nukuhiva: *Mumford and Adamson 406*, 20 May 1929 (BISH); *Mumford and Adamson 644*, 11 December 1929 (BISH).

Native from India to China and the East Indies. Also cultivated in Hawaii.

2. *Plumbago auriculata* Lamarck

Plumbago auriculata Lamarck, Encyc. Method. 2:270. 1786.—Degener, Fl. Haw. 1932.

Plumbago capensis Thunberg, Prod. Fl. Cap. 33. 1794.—Pancher in Cuzent, Iles Soc. Tahiti 236. 1860.—Hillebrand, Fl. Haw. Is. 286. 1888.—Butteaud, Fl. Tahit. 70. 1891.

Plumbago grandiflora Tenore, Cat. Orto Nap. 91. 1845.—Pancher in Cuzent, Iles Soc. Tahiti. 236. 1860.—Butteaud, Fl. Tahiti. 70. 1891.

DESCRIPTION.—A shrub or leaning climber with pale blue flowers.

RANGE.—Society Islands (cultivated). According to Pancher, it was introduced into the Society Islands by the French naval commander Pasquier. Native of South Africa. Also cultivated in Hawaii.

3. *Plumbago zeylanica* L.

Plumbago zeylanica L., Sp. Pl. 151. 1753.—G. Forster, Prod. 14. 1786b.—Hooker and Arnott, Bot. Beech. Voy. 93. 1832.—Endlicher, Ann. Wien Mus. 1:167. 1836.—Guillemin, Ann. Sci. Nat. 7:192. 1837.—Pancher in Cuzent, Iles Soc. Tahiti 236. 1860.—Seemann, Fl. Vit. 194. 1866.—Nadeaud, Pl. Us. Tahiti. 31. 1864; Enum. Pl. Tahiti. 48. 1873.—Mann, Proc. Am. Acad. 7:189. 1867.—Lanessan, Pl. Ut. Col. Franc. 866. 1866.—Hillebrand, Fl. Haw. Is. 286. 1888.—

Drake del Castillo, Ill. Fl. Ins. Pac. 7:225. 1892; Fl. Polyn. Franc. 117. 1892.—Butteaud, Fl. Tahiti. 70. 1891.—C.N. Forbes, Bish. Mus. Occ. Pap. 5 (3):106. 1913.—Setchell, Univ. Cal. Pub. Bot. 12:200. 1926.—Wilder, Bish. Mus. Bull. 86:86. 1931.—F.B.H. Brown, Bish. Mus. Bull. 130:222. 1935.—Christophersen, Bish. Mus. Bull. 128:168. 1935. *Plumbago maximowiczii* Gandoger, Bull. Soc. Bot. France 66:221. 1919 [new synonym].

DESCRIPTION.—Subshrub, or somewhat scandent, with alternate ovate leaves and terminal racemes or panicles of white flowers. Calyx glandular-viscid. In other localities the corolla may be pale blue.

Plumbago maximowiczii Gandoger, which has yet to be synonymized, is merely the erect form which is most common in Polynesia. It was described from Oahu.

TYPE.—From Ceylon.

RANGE.—Society Islands: *Forster* in 1774. Tahiti: *Hombroin* in 1837–1840 (P, fide Drake del Castillo); *Vesco*, lower forests, 1847 (P, fide Drake del Castillo); *Lépine 80*, dry hills, 200–300 m, 1847 (P, fide Drake del Castillo); *Ribourt 33*, ca. 1850 (P, fide Drake del Castillo); *Savatier 888*, 1885 (P, fide Drake del Castillo); *Nadeaud 332*, Faaa, Tipaerui, and Pare, Papeava, dry ravines and seashore, 1856–1859 (P, fide Drake del Castillo); *Tilden 346*, Paea, Papehue, June 1910, flower and fruit (BISH; MIN, 2 sheets); *Setchell and Parks 70*, Punaauia, Punaruu, 23 May 1922, flower and fruit (BISH, UC); *Setchell and Parks 291*, Paea, Papehue, 7 June 1922, flower (UC); *Setchell and Parks 351*, Punaauia, Punaruu, 14 June 1922, flower and fruit (UC).

Borabora: *Grant 4051*, Tevaitapu, Mt. Matahiuaa, alt. 245 m (810 ft), dry rocky cliffs, 9 January 1931, flower and fruit (BISH, MIN). Presumably indigenous, but possibly introduced by the natives. Found only on the drier hills and valleys close to the seashore, where it has a weedy appearance.

Common in Hawaii, Fiji, and the Marquesas, with one record from Samoa, and cultivated in Rarotonga. Ranges west to Australia, India, and Africa.

ETHNOBOTANY.—Tahitian: *avaturatura*. Called *kahauta* in the Marquesas, according to F.B.H. Brown, and *ilieo* in Hawaii (Hillebrand). According to Christophersen it is *lau tafifi* in Samoa, but that is merely a general Polynesian term for "vine."

The root is used in native medicines. Nadeaud states that it is used externally to raise blisters (F.B.H. Brown reports the same in the Marquesas) and for indolent swellings. Mann records that the plant juices were used for tattooing in Hawaii.

SAPOTACEAE

Genera in this family that have indigenous species in Polynesia are: *Payena* (1 in Fiji),

Burckella (1 in Fiji, and 1 in Tonga, which has also been referred to *Madhuca*), *Chelonespermum* (1 in Fiji), *Nesoluma* (1 in Henderson Island and 1 in Hawaii, which has also been reported from Rapa), and *Manilkara* (1 in Tonga). All the above are endemic, except possibly the Tongan *Manilkara*, which has also been reported from the New Hebrides. There is considerable difference of opinion regarding the systematic position of some of the above genera, and a complete, consistent list of the Polynesian species cannot be given here without indicating some new combinations.

In the Society Islands there are five genera (1 species each) with two endemic and three cultivated species. The total number of endemics in Polynesia is 21.

Key to the Genera of Sapotaceae in the Society Islands

1. Fertile stamens 10–12, in 2 whorls; berry 6-celled; sepal 5–6, petals 6; native.....1. *Palaquium*
1. Fertile stamens 5–6, in 1 whorl, opposite the petals.
 2. Staminodes 5–6, petaloid, alternate with the petals.
 3. Flowers 6-merous; sepals 6, in 2 cycles; petals, staminodes and stamens 6; ovary 10–12-celled; seeds usually more than 5, with endosperm; cultivated.....2. *Manilkara*
 3. Flowers 5-merous (sepals, petals, staminodes, and stamens); ovary 5-celled.
 4. Seeds with horny endosperm; fruit obovoid, 3 cm long; native.....3. *Planchonella*
 4. Seeds without endosperm; fruit globose, larger; cultivated.....4. *Lucuma*
 2. Staminodes none; ovary 7–10-celled; seeds with endosperm; sepals, petals, and stamens 5; leaves reddish brown, pubescent below; cultivated.....5. *Chrysophyllum*

1. *Palaquium Blanco*

Palaquium Blanco, Fl. Filip. 403. 1837.

TYPE-SPECIES.—*P. lanceolatum* Blanco.

RANGE.—India east to Tahiti, with 100 species, of which 87 are Malayan, 9 in Ceylon and India, 1 in Australia, and 4 Polynesian. Besides the following, there are endemic species in Fiji (2) and Samoa (1). Other undetermined or doubtful species have been reported from Samoa.

1. *Palaquium nadeaudii* Drake del Castillo

Mimusops dissecta sensu Nadeaud, Enum. Pl. Tahiti. 62. 1873.—Butteaud, Fl. Tahiti. 56. 1891 [non R. Brown, 1810].
Mimusops decussata Nadeaud, in Durand and Jackson, Ind. Kew. Supp. 1:310. 1906 [sphalm].
Palaquium nadeaudii Drake del Castillo, Ill. Fl. Ins. Pac. 7: 229. 1892; Fl. Polyn. Franc. 120. 1892.—Nadeaud, Journ. de Bot. 11:110. 1897.

DESCRIPTION (after Nadeaud, 1897).—Tree, 10–15 m high. Wood reddish, very hard; bark rough. Branches erect, tuberculate with the pedicel scars. Twigs and petioles reddish hairy. Petioles 2.5–4 cm long. Blades elliptical, 8–12 × 3–5 cm, attenuate at base and apex, coriaceous, shining, with 12–14 lateral nerves, finely reticulate. Fascicles 2–4-flowered. Pedicels 6–10 cm long, conical, enlarged at tip, reddish white tomentose. Flowers 12 mm wide at anthesis, greenish white. Sepals 5, ovate, acute, persistent, in 2 series, the exterior pubescent, the inner small and almost glabrous. Petals 5–6, ovate, large, broad, enlarged at tip, rounded, thickened along the middle line, white-veined, glabrous. Staminodes 5–6, fimbriate, 3-toothed, the central tooth larger. Stamens 10–12, in 2 cycles, exserted, glabrous. Filament large, flat, with a membranous appendage. Anthers petaloid in some flowers. Pollen grains smooth, elongated, with an obscure median line. Ovary

smooth, with 10–12 crenulations at the base, each with a tuft of red hairs; 6-celled, 6-seeded. Style conical, pointed, slightly inclined, punctate at the summit, rose-colored, shorter than the stamens. Fruit irregularly pear-shaped, 2.5 cm long, apiculate, smooth, with longitudinal white lines. Seed ovoid, irregular, 1.5 × 1 cm, maroon.

From the description this is unquestionably a true *Palaquium*, but it was omitted by Lam (1925, 1927) in his monographs of the group, and it is, as far as can be determined, the only species of the genus so omitted.

RANGE.—Society Islands: Tahiti: *Nadeaud* 402, Faaa, Tipaerui, alt. 800 m, cliffs, 1856–1859, in bud, "flowers in June, August" (P, fide Drake del Castillo), *Nadeaud* also collected plants on 24 April and 12 June 1896, with flowers and fruits. We have not seen this. *Nadeaud* found two trees only, one of which was sterile.

2. *Manilkara* Adanson

Manilkara Adanson, Fam. 2:166. 1763.

TYPE-SPECIES.—*Manilkara kauki* (L.) Dubard.

RANGE.—About 75 species in all tropical countries. There are about 30 in America, 35 in the African region, and some 15 in Australia and the Pacific.

1. *Manilkara zapota* (L.) van Royen

Achras zapota L., Sp. Pl. Append. 1190. 1753 [spelling changed by Linnaeus in 1762].

Achras sapota L., Sp. Pl. 2nd ed. 1:470. 1762 [sensu later authors and L. pro parte excluding type].—Cuzent, Étud. Vég. Tahiti 129. 1857; Iles Soc. Tahiti 214. 1860. Hillebrand, Fl. Haw. Is. 275. 1888.—Wilder, Bish. Mus. Bull. 86: 86. 1931; Bish. Mus. Bull. 120:37. 1934.—F.B.H. Brown, Bish. Mus. Bull. 130:223. 1935.

Sapota achras Miller, Gard. Dict. 8th ed. [unnumbered] 1768.—Pancher in Cuzent, Iles Soc. Tahiti 234, 1860.—Lanessan, Pl. Ut. Col. Franc. 865. 1886.—Butteaud, Fl. Tahiti. 56. 1891.

Manilkara zapota (L.) van Royen, Blumea 7:410. 1953.

DESCRIPTION (after van Royen).—Lactiferous tree. Leaves alternate, 5–12 × 1.8–5.5 cm, petioles slender, 1.5–3 cm; with 18–21 secondary nerves. Petals 0.3–0.6 cm, with 2 appendages.

Stamens 6; anthers 0.15–3 mm. Ovary (6–)10–12-celled. Seeds compressed to terete with an almost basal scar; scar varying from large to small, wide to narrow, oblong to linear at base of the ventral side of seed.

RANGE.—Society Islands (cultivated): Tahiti: Pare, Mamao, not collected. Raiatea: *Moore* 722, Faarua, alt. 20 m, 11 April 1927, sterile (BISH, 2 sheets; MIN).

Native to tropical America. Introduced into Tahiti in 1846 by Admiral Hamelin, according to Cuzent. Also cultivated in Hawaii, Rarotonga, Makatea, the Marquesas, and generally throughout the tropics.

ETHNOBOTANY.—English: *sapodilla*, or *sapodilla plum*; French: *sapotille*; both from the West Indian aboriginal name, *sapota*. Tahitian: *tapoti*, an obvious borrowing.

Used in America, but not in Tahiti, as a source of chicle, from which chewing-gum is made.

3. *Planchonella* Pierre

Planchonella Pierre, Not. Bot. Sapot. 35. 1891.

This genus is a segregate from *Sideroxylon*, and was distributed among five sections of that genus by Engler. While it has not been fully adopted (rejected by Engler, Burkill, Drake, Rock, Merrill, Guillaumin, and F. B. H. Brown), many recent workers on Pacific floras have used it (Dubard, Lam, Skottsberg, Gillespie, St. John, and Christophersen). We were not in a position to study the genus as a whole, but feel inclined to accept Dubard's and Lam's careful treatments.

TYPE-SPECIES.—*Planchonella obovata* R. Brown.

RANGE.—As a separate genus, it ranges from tropical Asia and Australia east to Tahiti, with about 82 species. Included with *Sideroxylon* (along with other segregates) it is found in the tropics and subtropics of both worlds with about 125 species. In either case, besides the following, there are endemic species in Hawaii (5), Samoa (1), and Fiji (2), and one which has been recorded from Fiji, Tonga, Rarotonga, and Makatea (*P. grayana* St. John, q.v. sub. *P. tahitensis*). Two of these have not been named in *Sideroxylon* and three have not been named in *Planchonella*, though all appear to be congeneric.

1. *Planchonella tahitensis* (Nadeaud)
Pierre ex Dubard

Sideroxylon tahitense Nadeaud, Journ. de Bot. 11:111. 1897;
Journ. de Bot. 13:3. 1899.

Planchonella tahitensis (Nadeaud) Pierre ex Dubard, Ann.
Mus. Colon. Marseille 20:50. 1912 [name not in Kew Index].

DESCRIPTION (after Nadeaud).—Tree, 25–40 m high. Wood yellowish. Branches erect, whitish. Twigs and leaves whitish tomentose and buds reddish tomentose. Petioles 0.5–2.5 cm long. Blades ovate or obovate, 10–11 × 3–4 cm, irregularly decurrent, rounded or obtuse; coriaceous, often undulate, deep green with whitish border; lateral veins 10–12, prominent above. Flowers 4–7 in axillary fascicles. Pedicels 1–1.5 cm, arcuate, white-tomentose. Sepals 5, ovate, rounded, silky without, ciliate, persistent. Petals 5, exceeding the calyx, greenish white. Stamines 5, small, narrow. Stamens 5, opposite the petals; anthers yellow. Ovary enlarged at base, 5-ribbed, tomentose, 5-celled, each 1-ovuled. Style short, stigma capitate, punctiform. Fruit pyriform, obovoid, 3-furrowed, 30 × 17–20 mm, apiculate. Seeds usually 3 (1–4), oboval, flattened, 21 × 10 × 6 mm, pointed and hooked at the base, thick and rounded on the back, with a raised ventral furrow, gray, red-spotted.

RANGE.—Society Islands, 500–1000 m. Flower 8 May 1896, and 25 April 1898. Nadeaud cites the following localities: Tahiti: Arue, Pirae; Papeenoo, Haaripo; Faaa, Tipaerui; Punaauia, Punaruu. Moorea: Mt. Raairi.

We have not seen this. From Nadeaud's description, it differs from *P. grayana* St. John (St. John, in Wilder, 1934) only in being a larger tree with petioles averaging shorter, longer white-hairy pedicels, and seeds averaging larger. Grant saw eight collections of *P. grayana* (cited by St. John, in Wilder, 1934) from Makatea, Rarotonga, and Fiji (it has also been reported from Tonga). We suspect these two are conspecific but, of course, cannot consider combining them without having studied material of *P. tahitensis*. If such a union should eventually occur, however, Nadeaud's epithet would take precedence, so the nomenclature given here would not be affected. To the list of synonyms cited by St. John (in Wilder, 1934) may be added *Bassia* sp. (Cheeseman, 1903:286) and *Sideroxylon vitiense* Bonpland & Humboldt

ex Drake (Drake del Castillo, 1892a:229). This combination thus appeared nine years before it was published by Burkill (1901); it is one of many of Drake del Castillo's names which have been overlooked by later workers on account of being buried in the addenda to the first supplement of the Kew Index.

4. *Lucuma* Molina

Lucuma Molina, Sagg. Chil. 196. 1781 (1782) [now usually combined with *Pouteria* Aublet].

TYPE-SPECIES.—*Lucuma bifera* Molina.

RANGE.—About 35 species, mostly tropical American, several in Australia, New Caledonia, the East Indies, and the Malay Peninsula.

1. *Lucuma obovata*
Humboldt, Bonpland & Kunth

Lucuma obovata Humboldt, Bonpland & Kunth, Nov. Gen. et Sp. 3:241. 1819.—Pancher in Cuzent, Iles Soc. Tahiti 234. 1860.—Lanessan, Pl. Ut. Col. Franc. 865. 1866.—Butteaud, Fl. Tahiti. 56. 1891 [now usually called *Pouteria lucuma* (Ruiz & Pavon) O. Kuntze].

DESCRIPTION (based on South American material).—Tree to 10 m tall, young growth brownish sericeous; leaves obovate, generally 10–25 × 4–9 cm, thick-chartaceous, apex obtuse to rounded, base contracted to a petiole 2–4 cm long, nerves 12–15 on a side, opposite to alternate, lightly pubescent to glabrous beneath; flowers 10–15 mm long, on stout, straight to somewhat recurved pedicels, 1–2 in an axil, 5–15 mm long, sepals 5, imbricate, somewhat unequal, rounded to oval, brownish sericeous tomentose, to 1 cm long, corolla cylindrical, strongly exerted at anthesis, to 12–15 mm long, lobed $\frac{1}{4}$ – $\frac{1}{3}$ the way, lobes rounded, imbricate, very finely sericeous or subglabrous, stamens 5, included, inserted on the corolla tube opposite lobes, filament short, swollen, anthers ovate, obtuse, basifixed, staminodia 5, subulate, opposite the sinuses, pistil with ovary 5-loculed, ovoid, hirsute in basal part, glabrous above, tapering to a stout, cylindrical style, stigma minute, terminal; fruit fleshy, depressed, globose with a slight umbo, with 1 or 2 seeds developed, these globose with an oblong ovate scar on the inner side, with 2 thick cotyledons.

RANGE.—Society Islands (cultivated): Tahiti: Introduced in 1850 by Bishop d'Axieri, according to Pancher. Not seen by us. [Native from Colombia to Peru; cultivated in tropical countries].

LOCAL NAMES.—English: *lucuma*. French: *jaune d'oeuf*.

5. *Chrysophyllum* L.

Chrysophyllum L., Gen. Pl. 5th ed. 88. 1754.

TYPE-SPECIES.—*Chrysophyllum cainito* L.

RANGE.—About 70 species in the tropics, mostly American, a few in Africa, one Asian, one Australian, and four in New Caledonia.

1. *Chrysophyllum cainito* L.

Chrysophyllum cainito L., Sp. Pl. 192. 1753.—Pancher in Cuzent, Iles Soc. Tahiti. 234. 1860.—Lanessan, Pl. Ut. Col. Franc. 865. 1886.—Butteaud, Fl. Tahiti. 56. 1891.—Wilder, Bish. Mus. Bull. 86:86. 1931.—Christophersen, Bish. Mus. Bull. 128:171. 1935.

DESCRIPTION.—Striking tree with twigs and leaves (below) shining reddish brown pubescent. Blades elliptical, 7–10 × 4–4.5 cm, coriaceous, lucid above. Flowers small, in sessile, axillary fascicles. Fruit globose, 5–10 cm, in diameter, 7–10-celled, purple.

RANGE.—Society Islands (cultivated): Tahiti: *Brown 1196*, alt. 60 m (200 ft), 17 October 1922, sterile (BISH); *Grant 4310*, Papeete, alt. 6 m, 22 October 1930, flower (BISH, MIN). Raiatea: *Moore 697*, Huaru, alt. 1 m, 31 March 1927 (BISH, 2 sheets; MIN).

Native to the West Indies. Introduced into Tahiti in 1852 by Admiral Bruat, according to Pancher. Previously reported from Rarotonga (!) and Samoa. Also cultivated in Hawaii and in Fiji (*Gillespie 4637*, Taviuni, BISH).

LOCAL NAMES.—English: *star-apple*, from the shape of the "core." French: *cainitier*. Grant heard no Tahitian name for this. Christophersen states that it is called *pipi o eva* in Savaii.

EBENACEAE

One of the few families which has produced several endemic species (in 2 genera) in Fiji, Tonga, Samoa, and Hawaii, but which does not

extend east to the Society Islands. *Diospyros* is represented by two species in Fiji and one in Samoa with additional species cultivated in Polynesia. *Maba* has endemic species in Fiji (2), Samoa (1), and Hawaii (1); with one occurring in Samoa, Tonga, Fiji and New Caledonia; one in Tonga and Fiji; one in Hawaii, Fiji, and Uvea; one from Tonga west to Africa. This makes a total in Polynesia of nine endemic species, with two more of wider range. [Most modern authors include *Maba* in *Diospyros*.—Fosberg.]

STYRACACEAE

1. *Styrax* L.

Styrax L., Gen. Pl. 5th ed. 203. 1754.

TYPE-SPECIES.—*Styrax officinalis* L.

RANGE.—About 60 species, in tropical Americas and Asia, with one in the Mediterranean region.

1. *Styrax benzoin* Dryander

Styrax benzoin Dryander, Phil. Trans. 77:308, t.12. 1787.—Perkins, in Das Pflanz., 30:60. 1907.

DESCRIPTION (based on *Wilder 1238*).—Tree, 10 m high. Young growth, inflorescence, perianth and fruit greenish gray, stellate-tomentose. Leaves alternate, to 12 × 4 cm, entire or somewhat irregularly toothed, glabrous above, white stellate-tomentose below. Panicles axillary, loose, to 6 cm long, about 12-flowered. Calyx cup-shaped, 3 mm long, barely 4-toothed. Petals 4, valvate, linear-oblong, 5 mm long, obtuse. Fruit globose, 13 mm in diameter, 1-celled, thick-walled. Seeds basal, globose, 6 mm long.

The specimen checks with Perkins' description except that the perianth, in part at least, is 4-merous instead of 5-merous, and the petals are very short.

RANGE.—Society Islands (cultivated): Tahiti: *Wilder 1238*, Papeete, 5 January 1929, flower and fruit (BISH). Native to Java, Sumatra, and Malacca.

SYMPLOCACEAE

A single species in Polynesia, *Symplocos leptophylla* (Brand) Turrill, endemic in Fiji.

OLEACEAE

Besides the following two genera, two other species occur in Polynesia, *Osmanthus sandwicensis* (Gray) Knoblauch, which is endemic in Hawaii, and

Linociera pauciflora C. B. Clarke, occurring in Tonga and Fiji, and ranging west to Burma. There are in Polynesia four endemic species, four other indigenous species, and at least eight introduced ornamentals.

Key to the Genera of Oleaceae in the Society Islands

- Small tree; leaves silvery-scaly beneath with stellate hairs; corolla lobes valvate; fruit a drupe..... 1. *Olea*
- Shrubs or vines; leaves glabrous or pubescent with simple hairs; corolla lobes imbricated; fruit a berry, deeply divided and appearing as 2, each 2-seeded, often only 1 of the halves of the berry maturing..... 2. *Jasminum*

1. *Olea* L.

Olea L., Gen. Pl. 5th ed. 8. 1754.

TYPE-SPECIES.—*Olea europaea* L.

RANGE.—About 40 species, centering in South Africa and the Austro-Malasian region. *Olea vi-tiensis* Seemann is endemic in Fiji, and *O. paniculata* R. Brown has been reported in cultivation in Hawaii.

1. *Olea europaea* L.

Olea europaea L., Sp. Pl. 8. 1753.—Pancher in Cuzent, Iles Soc. Tahiti 234. 1860.—Hillebrand, Fl. Haw. Is. 301. 1888.—Butteaud, Fl. Tahit. 57. 1891.—Rechinger, Denks. Akad. Wien 85:328. 1910.

Olea sativa Hoffmannsegg and Link, Fl. Port. 1:388. 1809?—Wilder, Bish. Mus. Bull. 86:84. 1931.

DESCRIPTION.—Small tree. Leaves elliptic to oblanceolate, averaging about 5 × 1.2 cm, silvery-

scaly beneath with stellate hairs. Perianth 4-merous, fragrant, the lobes valvate. Fruit a drupe, ellipsoidal, 1.2-4 cm long.

RANGE.—Society Islands (cultivated): Tahiti: Grant 4357, Jardin de Mamao, 29 October 1930, sterile (BISH, MIN). Introduced into Tahiti in 1848 by Robin, according to Pancher.

Also in cultivation in Hawaii, Rarotonga, and Samoa. The Tahitian and Rarotongan trees have apparently not fruited. Native to the Mediterranean region.

LOCAL NAMES.—English: *olive*. Tahitian: *orive*, a simple borrowing.

2. *Jasminum* L.

Jasminum L., Gen. Pl. 5th ed. 6. 1754.

TYPE-SPECIES.—*Jasminum officinale* L.

DESCRIPTION.—Shrubs or vines with opposite (or subopposite) leaves. Inflorescence cymose-

Key to the Species of *Jasminum* in the Society Islands

- 1. Leaves simple, entire; cultivated.
 - 2. Blades predominately chartaceous, rather prominently reticulate on both surfaces; calyx teeth 4-8 mm long, pubescent to glabrous; corolla lobes obtuse to rounded, about equaling tube..... 1. *J. sambac*
 - 2. Blades thicker, predominately pergameneous, not prominently reticulate above; calyx teeth 12-18 mm long, densely pubescent with spreading hairs; corolla lobes acute, often longer than the tube..... 2. *J. multiflorum*
- 1. Leaves compound or deeply pinnatifid.
 - 3. Leaves 5-7-foliolate (or deeply pinnatifid); cultivated..... 3. *J. officinale* f. *grandiflorum*
 - 3. Leaves 3-foliolate.
 - 4. Young twigs and cymes heavily tomentose; leaflets acute; calyx teeth 0.7 mm long; corolla lobes 8-10 mm long; cultivated..... 4. *J. azoricum*
 - 4. Young twigs and cymes pubescent but not tomentose; leaflets predominately obtuse, though on shade-leaves often acute; calyx teeth minute (0.3 mm) or obsolete; corolla lobes 3-5 (-8) mm long; native..... 5. *J. didymum*

paniculate. Corolla salverform with imbricated lobes. Fruit a berry, deeply lobed and appearing as 2, each of the 2 cells ripening but each with 1 seed, and frequently but one of the cells maturing.

RANGE.—Over 200 species, mostly in south-western Asia and the East Indies, many in Africa and Australia, one in Peru, and one in the Mediterranean region. In Polynesia, beside the following, are found endemic species in Samoa (1) and Fiji (2), another occurring from Samoa through Tonga and Fiji to Australia, and others in cultivation in Hawaii. One indigenous and four cultivated species in the Society Islands.

1. *Jasminum sambac* (L.) Aiton

Nyctanthes sambac L., Sp. Pl. 1:6. 1753.

Jasminum sambac (L.) Solander ex Aiton, Hort. Kew. 1:8. 1789.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Hillebrand, Fl. Haw. Is. 301. 1888.—Butteaud, Fl. Tahiti. 57. 1891.—Rechinger, Denks. Akad. Wien 85:328. 1910.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:59. 1924.—Wilder, Bish. Mus. Bull. 86:84. 1931.—F.B.H. Brown, Bish. Mus. Bull. 130:225. 1935.—Christophersen, Bish. Mus. Bull. 128:175. 1935.

DESCRIPTION.—Sprawling or climbing shrub, pubescent. Petioles 2–5 mm long. Terminal blades ovate, 5.5–8 × 3.7–6 cm, cuneate to cordate at base, obtuse or acute at tip, apiculate, chartaceous, usually pubescent on the veins and with tufts of hairs in the axils of the lateral veins below, rather prominently reticulate on both surfaces. Cymes terminal, 3-many-flowered. Pedicels 5–10 mm long. Flowers double, 2.5–3.3 cm long, white, fragrant. Calyx tube about 2 mm long, lobes subulate, 4–8 mm long, usually pilose, especially within. Corolla tube 1.3–1.6 cm long; lobes many, elliptical, 1.2–1.6 cm long, rounded or obtuse.

RANGE.—Society Islands (cultivated): Tahiti: *Grant 4510*, Hitiaa, alt. 2 m, 16 November 1930, flower (BISH, MIN). Raiatea: *Moore 290*, Faaroa, 11 November 1926, flower (BISH, MIN).

Native to tropical Asia. Both the single and the double-flowered forms were introduced in 1850 by Admiral Bonard, according to Pancher. Also cultivated in Hawaii, the Marquesas, Rarotonga, and Samoa. Established in Samoa.

LOCAL NAMES.—English: *Arabian jasmine*. French: *Jasmin d'Arabie*. Tahitian, Marquesan, and Raro-

tongan: *pitate*. In Samoa it is called *pua sosola* ("gardenia vine") and *pua Samoa* ("native gardenia"), according to Setchell. *Pikake* is the Hawaiian name.

2. *Jasminum multiflorum* (Burman f.) Andrews

Nyctanthes multiflora Burman f., Fl. Ind. 5, t.3, f.1. 1768.

Nyctanthes pubescens Retzius, Obs. 5:9. 1789.

Jasminum pubescens Willdenow, Sp. Pl. 1:37. 1797.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Butteaud, Fl. Tahiti. 57. 1891.

Jasminum multiflorum (Burman f.) Andrews, Bot. Rep. 8: t. 496. 1807.—Christophersen, Bish. Mus. Bull. 128:175. 1935.

DESCRIPTION.—Similar to *J. sambac*. See the key above for differences.

RANGE.—Introduced into Tahiti in 1845 by Dr. Johnstone (both the single and the double-flowered forms, according to Pancher). Not seen by us, and we suspect confusion with *J. sambac*. Also cultivated and as an escape in Samoa according to Christophersen [and commonly cultivated in Hawaii]. Native to China.

3. *Jasminum officinale* L.

Jasminum officinale L., Sp. Pl. 1:7. 1753 [f. *officinale* not known from the Society Islands].

3a. *Jasminum officinale* L. forma *grandiflorum* (L.) Kobuski

Jasminum officinale sensu Butteaud, Fl. Tahiti. 57. 1891. [non L., 1753].

Jasminum grandiflorum L., Sp. Pl. 2nd ed. 1:9. 1762.—Wilder, Bish. Mus. Bull. 86:87. 1931.—F.B.H. Brown, Bish. Mus. Bull. 130:225. 1935.

Jasminum officinale f. *grandiflorum* (L.) Kobuski, Journ. Arn. Arb. 13:161. 1932.

DESCRIPTION.—Erect, trailing, or leaning shrub; pubescent at the nodes, in the axils of the lateral veins below, and on the inner side of the calyx lobes. Leaves divided nearly or quite to the midrib into 5–7 pinnae; lobes prevaillingly ovate, rounded to cuneate at base, rounded to acute at apex, acuminate to retuse. Cymes terminal, about 7-flowered. Flowers 4–5.5 cm long, white or red-tinged, fragrant. Calyx tube 2 mm long, lobes subulate, 4–8 mm long. Corolla tube 2–3 cm long; lobes 5, elliptical, 2.5 × 1.5 cm or somewhat smaller.

RANGE.—Society Islands (cultivated): Tahiti: *Grant 4511*, Hitiaa, alt. 2 m, 16 November 1930, flower (BISH, MIN). Raiatea: *Moore 267*, coast, 29 October 1926, escape?, flower (BISH, MIN).

Native to China and India. First reported from Tahiti by Butteaud in 1891. Also cultivated in Rarotonga (*Wilder 908*, 1929), the Marquesas (*Mumford and Adamson 215*, Hiva Oa, 1929; *Brown 710*, Nukuhiva, 1921), and Pitcairn (Whitney Expedition, no date), the specimens in the Bishop Museum. Also cultivated in Hawaii.

LOCAL NAMES.—English: *jessamine* (the species), and *Spanish jasmine* (the variety). French: *jasmin ordinaire*. Tahitian, Rarotongan, and Marquesan: *pitate*. In Raiatea (according to Moore) and in Borabora it is called *pitate farani* ("French jasmine").

4. *Jasminum azoricum* L.

Jasminum azoricum L., Sp. Pl. 1:7. 1753.—Hillebrand, Fl. Haw. Is. 301. 1888.—Lauterbach, Bot. Jahrb. 41:232. 1908 [non Hooker and Arnott, 66. 1832 (= *J. didymum*)].

DESCRIPTION (based on *Moore 204*).—"Climbing vine to 3 m." Young twigs tomentose. Petioles 1.5 cm long, pubescent. Leaves trifoliolate. Blades ovate, 4.5 × 2.5 cm and smaller, base truncate or rounded, tip acute, sometimes attenuate, with prominent tufts of hairs in the axils of the lateral veins below. Cyme terminal, tomentose. Flowers 2.8 cm long, 1.8–2 cm broad, white. Calyx teeth 0.7 mm long. Corolla tube 1.5–1.7 cm long, lobes 9–10 mm long, acute. Halves of the berry globose, 1 cm in diameter.

RANGE.—Society Islands (cultivated): Raiatea: *Moore 204*, Uturoa, alt. 1 m, 13 October 1926, flower and fruit (BISH, 2 sheets; MIN).

Native to the Azores. Widely cultivated in the tropics. A collection (*Vaupel 255*, Savaii, 1906, BISH) with slightly smaller flowers (Corolla tube 13 mm, lobes 6 mm) that may be *J. didymum* has been reported from Samoa (Lauterbach, 1908). Also cultivated in Hawaii. [This plant is now usually placed in *J. fluminense* Vellozo.—F.R.F.]

5. *Jasminum didymum* G. Forster

Jasminum didymum Parkinson, Journ. Voy. 37. 1773 [nomen nudum].—G. Forster, Prod. 3. 1786b.—Endlicher, Ann. Wien Mus. 1:177. 1836.—Guillemin, Ann. Sci. Nat. ser. 2.

7:192. 1837.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Gray, Proc. Am. Acad. 5:332. 1862c.—Seemann, Fl. Vit. 154. 1866.—Nadeaud, Enum. Pl. Tahiti 55. 1873.—Butteaud, Fl. Tahiti, 57. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:231. 1892; Fl. Polyn. Franc. 121. 1892.—Hemsley, Journ. Linn. Soc. Bot. 30:184. 1894.—Burkill, Jour. Linn. Soc. Bot. 35:45. 1901.—Cheeseman, Trans. Linn. Soc. 6:286. 1903.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:60. 1924; Univ. Cal. Pub. Bot. 12:200. 1926.—Henry, Bish. Mus. Bull. 48:61. 1928.—Wilder, Bish. Mus. Bull. 86:87. 1931; Bish. Mus. Bull. 120:39. 1934.—Christophersen, Bish. Mus. Bull. 128:174. 1935.—F.B.H. Brown, Bish. Mus. Bull. 130: 225. 1935.

Jasminum divaricatum R. Brown, Prod. 521. 1810; Labillardière, Sert. Austro-Cal. 1:t.27. 1824.

Jasminum azoricum sensu Hooker and Arnott, Bot. Beech. Voy. 66. 1832 [non L., 1753].

Jasminum parviflorum Decaisne, Nouv. Ann. Mus. Par. 3:405. 1834.—Rechinger, Denks. Akad. Wien 85:327. 1910.

Jasminum didymum var. *stenophyllum* Daeniker, Viert. Nat. Ges. Zür. 78:366. 1933.

DESCRIPTION.—Twining vine to 6 m long. Twigs puberulent or glabrescent. Petioles 1–4 cm long. Leaves trifoliolate. Terminal leaflet of sun-leaves ovate, 4–9 × 2.5–5.5 cm, rounded at base, obtuse, occasionally retuse, or acute and aciculate, subcoriaceous, lucid, light yellowish green, prominently reticulate below; lateral leaflets smaller, often asymmetrical; shade leaves chartaceous, usually acute, not prominently veined. Cymes axillary, puberulent or glabrescent, many-flowered. Flowers 1–1.2 cm long, white, fragrant. Calyx tube 1–3 mm long, entire or short (0.3 mm) 4–6-toothed. Corolla tube 8–10 (4–15) mm long, lobes 3–5 (2–8) mm long, obtuse or rounded. Half-berries globose, 1–1.5 cm in diameter, greenish becoming purple-black.

Labillardière (1824, under *J. divaricatum*) described a narrow-leafleted form from New Caledonia, which was redescribed by Daeniker (1933) as var. *stenophyllum*. According to Seemann (1866) the two forms occur on the same plant. This form has not been recorded east of Fiji.

TYPE.—Described by Forster from the Society Islands, but the only Forster specimen in the British Museum cited by Seemann is from New Caledonia.

RANGE.—Society Islands: *U.S. Exploring Expedition* in 1839, fide Gray. Tahiti: *Anon.* (BM, fide Seemann); *Lay and Collie* in 1826 (BM, fide Seemann); *Bertero and Moerenhout* in 1831–1832 (P, fide Drake del Castillo); *Ribourt*, ca. 1850

(P, fide Drake del Castillo); *Bidwill*, ca. 1850 (BM, fide Seemann; P, fide Drake del Castillo); *Nadeaud 362* in 1856–1859 (P, fide Drake del Castillo); *Jelinek* in 1857–1859 (WU, fide Rechinger); *Tilden 345*, Paea, Papehue, June 1910, fruit (BISH, MIN, 2 sheets); *Quayle 106*, Mt. Aorai, alt. 800 m, 5 October 1921, flower (BISH); *Setchell 80*, Punaauia, Punaruu, 23 May 1922, fruit (UC); *Setchell 297*, Paea, Papehue, 7 June 1922, sterile (UC); *Grant 4204*, Papenoo, Orofena, alt. 640 m (2095 ft), *Tecoma* forest, 21 September 1930, sterile (BISH, MIN); *Grant 4379*, Mahina, Ahonu-Tuauru, alt. 585 m (1925 ft), *Fagraea-Metrosideros* forest, 4 November 1930, flower (BISH); *Grant 4615*, Paea, Ruapo, alt. 500 m (1660 ft), *Aleurites* forest, 4 December 1930, sterile (BISH, MIN).

Moorea: *Grant 5396*, Afareaitu, Putoa, alt. 380 m (1240 ft), *Hibiscus-Pandanus-Cyathea* forest, 18 February 1931, sterile (BISH, MIN).

Huahine: *Grant 5334*, Fare, Motu Aratupau-pau, alt. 2 m, beach, 18 February 1931, flower (BISH, MIN).

Raiatea: *Moore 144*, alt. 300 m, 26 September 1926, flower, fruit (BISH, 2 sheets; MIN); *Moore 285*, Faaroa, alt. 60 m, 8 November 1926, fruit (BISH, 2 sheets; MIN).

Tahaa: *Grant 5183*, Ruutia, Mt. Ohiri, alt. 1110 ft (340 m), *Xylosma-Morinda-Crossostylis* forest, Jan. 25, 1931, sterile (BISH).

In Polynesia, known also from Makatea (!), Raivavae (!), Cook Islands (!), Samoa (!), Tonga, and Fiji (!). Ranges west to Australia and Java.

LOCAL NAMES.—The most common Tahitian name is *tiatia-maua* (variously misspelled in the literature as *teatea-maowa* (Parkinson) and *tia tia mana* (Solander in Seemann; Drake del Castillo), which is also regularly applied to *Davallia epiphylla*. F.B.H. Brown gives the shorter form *tia tia* as being used in Tahiti, but we can find no authority for this. A second common name is *tafifi*, which is a general Polynesian word for "vine" and is applied to other climbers. Nadeud (1873: 83) lists a variation of this, *afifi*.

F.B.H. Brown reports the Marquesan name *pitate*, which in the Society Islands is apparently restricted to the cultivated jasmines. Wilder cites two Makatean names which also seem to be taken from the cultivated jasmines by extension, namely, *pitate ofai* ("rock jasmine," i.e., climbing over rocks), and *pitate ovile* ("fruiting jasmine," as distinct from the cultivated species, which here, except the infrequent *J. azoricum*, rarely, if ever, set fruit). Cheeseman gives the Rarotongan name *aketa*, and Setchell the Samoan names *fuefue* and *fuemalo*.

LOGANIACEAE

Two genera in the Society Islands, *Geniostoma* and *Fagraea*. Four other genera are represented in Polynesia: *Labordia* is endemic in the Hawaiian Islands with 19 described species; *Strychnos vitiensis* Hill and two species of *Couthovia* are endemic in Fiji; and *Buddleia asiatica* Loureiro is a common adventive in Hawaii.

Key to the Genera of Loganiaceae in the Society Islands

- Fruit a small capsule; corolla small, to 4 mm long; stipules connate, sheathing the stem.....1. *Geniostoma*
 Fruit a large berry; corolla large, 6–10 cm long; stipules not sheathing2. *Fagraea*

1. *Geniostoma* J. R. & G. Forster

Geniostoma J. R. & G. Forster, Char. Gen. 23, t.12. 1776.

TYPE-SPECIES.—*Geniostoma rupestre* J. R. & G. Forster

DESCRIPTION.—Trees or shrubs, Society Islands' species glabrous. Leaves opposite, coriaceous. Stipules connate, sheathing the stem. Cymes axillary, short. Calyx lobes 5, acute. Corolla rotate-

campanulate, lobes imbricate or contorted. Stamens 5, adnate to the corolla tube, filaments short. Ovary superior, 2-celled; style length variable; stigma usually capitate. Ovules many, amphitropous, becoming anatropous. Capsule septicidally dehiscent, the valves reflexing; seeds enclosed by the pulpy placentae. Embryo cylindrical, nearly as long as the fleshy endosperm.

RANGE.—About 50 species, ranging from Mad-

agascar through the East Indies, Australia, and New Zealand east to the Marquesas and Tahiti, with 16 species in New Caledonia and 10 in Poly-

nesia. Three species in the Society Islands (2 endemic), with others endemic in Rapa (1), Samoa (4), and Fiji (2).

Key to the Species of *Geniostoma* in the Society Islands

1. Style short, but definite; stipules entire.
 2. Tree; leaves 5–8 cm or more long; style 0.5 mm long; corolla 3 mm long.....1. *G. rupestre*
 2. Small shrub to 50 cm high; leaves 2 cm long; style 1–1.3 mm long; corolla 4 mm long.....
-2. *G. clavatum*
1. Style none, stigma sessile; stipules bifid.....3. *G. astylum*

1. *Geniostoma rupestre* J. R. & G. Forster

Geniostoma rupestris [sic] J. R. & G. Forster, Char. Gen. 24, t.12. 1776.—G. Forster, Prod. 17. 1786b.—Sprengel, Syst. Veg. 1:588. 1825.—de Candolle and de Candolle, Prod. 9:26. 1845.—Bentham, Journ. Linn. Soc. Bot. 1:69, 97. 1857.—Gray, Proc. Am. Acad. 4:321. 1860b.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Seemann, Fl. Vit. 163. 1866.—Nadeaud, Pl. Us. Tahiti, 36. 1864; Enum. Pl. Tahiti. 55. 1873; Journ. de Bot. 11:112. 1897.—Lanessan, Pl. Ut. Col. Franc. 863. 1886.—Butteaud, Fl. Tahiti. 60. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:236. 1892; Fl. Polyn. Franc. 126. 1892.—Hemsley, Journ. Linn. Soc. Bot. 30:185. 1894.—Burkill, Journ. Linn. Soc. Bot. 35:47. 1901.—Cheeseman, Trans. Linn. Soc. 6:288. 1903.—Gibbs, Journ. Linn. Soc. Bot. 39:157. 1909.—Rechinger, Denks. Akad. Wien 85:328. 1910.—Gilg and Benedict, Bot. Jahrb. 56:542. 1921.—Guillaumin, Bull. Soc. Bot. France 75:292. 1928.—F.B.H. Brown, Bish. Mus. Bull. 130:227. 1935 [non Reinecke, 1898; nec Valetton, 1902 (= *G. gracilis* Rechinger)].

Geniostoma crassifolium var. *glaberrimum* Bentham, Journ. Linn. Soc. Bot. 1:96. 1857.—Hemsley, Journ. Linn. Soc. Bot. 30:185. 1894.

Geniostoma aff. *rupestris* Christophersen, Bish. Mus. Bull. 128:176. 1935.

DESCRIPTION.—The following description of Forster's type in the Berlin Herbarium is compiled from Forster, Sprengel, de Candolle, and Gilg and Benedict. Glabrous. Branches subangled. Stipules broadly ovate, truncate above. Petioles of mature leaves 6 mm long. Blades lanceolate or ovate-lanceolate, asymmetrical, 4.5–6 × 2 cm, cuneate at base, blunt acuminate. Cymes axillary, subverticillate, 7–8 mm long, rather many-flowered. Pedicels bibracteolate at the middle. Calyx turbinate; lobes ovate, short, acute, ciliolate, persistent. Corolla tube 1.5 mm long, longer than the calyx, pilose at the throat; lobes ovate, 1.5 mm long, acute (Forster), blunt (Gilg and Benedict), spreading, heavily papillate within. Filaments short, hairy, anthers oblong, glabrous, with a conspicuous

appendage. Ovary ovate, thick, almost glabrous; style filiform, 0.5 mm long, hairy; stigma capitate, obtuse, sulcate, hairy. Capsule oblong; seeds subangled.

Measurements made on Forster's plate indicate that the flowers are about 7 mm long and the capsule 8 × 3.5 mm. Gray however, has pointed out some of the discrepancies in the plate and the flowers are undoubtedly smaller, Gilg and Benedict giving the measurements above. Guillaumin, who is probably most familiar with the flora of the New Hebrides, from whence Forster's type comes, described the pedicels and flowers as each under 4 mm long. Grant saw a single collection of the species from this island group (*Kajewski* 728, Aneityum, det. Guillaumin). He had also seen 31 collections of *Geniostoma* from Fiji, all of which had been referred to *G. rupestre* by Gillespie (1932), the late expert on the Fiji flora, though Gilg and Benedict (1921:542) describe the Fiji plant as a new species, *G. vitiense*. The flowers are about 3 mm long, and in this large amount of material the capsules range from 5.5 to 13 mm long. It is unnecessary to state that the whole group needs further study.

Geniostoma gracile Rechinger (1909:325, Gilg and Benedict, 1921:544, Christophersen, 1935:175) of Samoa, appears to differ in rounded leaf base, longer corolla (4 mm), fewer (3–5) flowered cymes, longer (10–14 mm) pedicels and broader (5–6 mm) capsules. As to one of these differences, Reinecke (1898:666) states in regard to his collections (1 of which is referred to *G. gracile* by Gilg and Benedict) that the leaves are exceptionally narrowed at the base. Christophersen says the leaves vary from rounded to cuneate at base, and that the species is characterized by few-flowered cymes and slender pedicels. The type (*Rechinger*

1475, of which Grant saw a photograph) has the cymes mostly 5-flowered.

We have seen no material of the Tahitian plant, and no recent collector seems to have found it. Pancher apparently was the first to report this species from Tahiti, with the single remark "indigène." As far as the native flora is concerned Pancher's paper was merely a compilation of previous lists, his only real additions being of cultivated plants. Possibly this citation is an error: he similarly records other Forsterian species (i.e., *Melicytus ramiflorus*) that are otherwise unknown from Tahiti. The first definite citation is that of Seemann (1866) "Tahiti (Cook)," and it was subsequently recorded by Nadeaud (1873:55) and Drake del Castillo (1892:126), the latter citing three specimens from Tahiti, including Nadeaud's, all collected before 1860. Drake del Castillo, having seen three of these four specimens, states that the leaves are 10 × 5 cm, the cymes 3–4 cm long, few-flowered, the style short, and the capsule 1 cm long. He also says "fleurs 1–2 mm," which, if true, certainly cannot apply to this species. Nadeaud describes it as an "arbrisseau," while all other reports from Tahiti and elsewhere call it a small or medium-sized tree.

The only Marquesan specimen known (*Brown 1096*, cited by Brown as no. 1996) has elliptical leaves, 6–7.5 × 2.8–4 cm, which are bluntly acute or barely acuminate. The flowers are immature.

The Rapan specimen (*Stokes 384*, also cited by F.B.H. Brown) has elliptical leaves, 6–8.5 × 3–4 cm, acute or slightly acuminate, with cymes 2 cm long and broad, flowers 3.5 mm long, "greenish-white, odor sickening" (Stokes' field label), the calyx lobes ovate, 1 × 1 mm, the corolla villous within, the ovary globose, 1 × 1 mm, style 0.5 mm long, and the stigma capitate, globose, 0.5 mm long, papillose. It appears to agree with Forster's type. Another very distinct species, *G. rapense* Brown, of which Grant saw the type, occurs on this island.

TYPE.—Collected by *Forster* in Tanna, New Hebrides in 1774.

RANGE.—Society Islands: Tahiti: *Cook* (BM, fide Seemann); *Vesco* in 1847 (P, fide Drake del Castillo); *Lépine 208*, Tautira, 1847 (P, fide Drake del Castillo); *Nadeaud 363*, mountain sides, 1856–1859, flowers in Oct., Dec. (fide Nadeaud) (P, fide Drake del Castillo).

There are many collections from New Caledonia, and the species has often been treated to include *G. arboreum* (Reinwardt ex Blume) O. Kuntze of Java. See the remarks above on some of the material from Fiji, Samoa, the Marquesas, and Rapa. The species has also been recorded from Tonga (5 collections), Uvea, and, with a question mark, from Rarotonga (Cheeseman).

ETHNOBOTANY.—Tahitian: *faipuu* (*faipun*, Lanesan (1886:863), typographic error) and *atoro* according to Nadeaud. Rapan: *angae*, fide F.B.H. Brown. Samoan: *tai tai ipu*, listed by Christophersen. Names in other dialects are recorded for the closely related species listed above.

According to Nadeaud, the leaves furnish a coumarin-like principle which the natives used in cosmetics. Brown states a medicinal extract is made from the bark in Rapa.

2. *Geniostoma clavatum* Moore

Geniostoma clavatum Moore, Bish. Mus. Bull. 102:38. 1933.

DESCRIPTION.—Shrub to 50 cm high, glabrous. Leaves sessile, or on petioles 1–2 mm long. Stipular sheath an entire collar 0.4 mm high. Blades ovate or elliptical, rarely orbicular, 1.5–2.8 × (0.8–) 1.1–2 cm, cuneate to rounded at base, acute to rounded at tip, stiff and coriaceous, olive in color, well-developed ones with 7 lateral veins. Cymes axillary, 1–5-flowered. Pedicels 1–4 mm long, bibracteolate at the middle. Flowers 5.2 mm long. Calyx 2 mm wide (not 4 as described); tube 0.8 mm long; lobes deltoid, 1.2 mm long, acute, minutely glandular-ciliolate. Corolla campanulate; tube 2 mm long; lobes ovate, 2 mm long, pilose at base. Filaments 0.6 mm long, pilose within; anthers 0.6 mm long. Ovary depressed-globose (not ovoid), 0.6 mm high, 1 mm broad, glabrous; style 1–1.3 mm long, glabrous; stigma oblong, 1 mm long, 0.5–0.8 mm broad, papillate, slightly notched by a terminal suture. Capsule ovate, 6–8 mm long, 3 mm wide, black. Seeds ovate, 1 mm long, light brown, finely reticulate, embedded in the ferruginous placentae.

The description of the flowers is largely from *Grant 5219*, put up in fixative at the time of collection. The pistil is slightly larger and the ovary somewhat differently shaped than described by Moore, otherwise the material checks fully with the type.

Possibly this is a local derivative of *G. rupestre* sensu lato, but on morphological grounds it is clearly a distinct species. It exhibits the reduction in size (stature, leaves, and fruits) characteristic of the other Temehani endemics, but has larger flowers and longer styles.

TYPE.—Collected by Moore in Raiatea.

RANGE.—Society Islands: Raiatea, Mt. Temehani: Moore 473, Te Apoo, alt. 470 m, wet clay soil, 1 January 1927, flower and fruit (BISH, type; MIN); Grant 5219, Te Apoo, alt. 600 m (1970 ft), 29 January 1931, flower (BISH, MIN); St. John 17258 pro parte, alt. 600 m, high moor, 5 October 1934, fruit (BISH).

3. *Geniostoma astylum* Gray

Geniostoma astylum Gray, Proc. Am. Acad. 4:321. 1860b.—Seemann, Fl. Vit. 164. 1866.—Drake del Castillo, Ill. Fl. Ins.

Pac. 7:236. 1892; Fl. Polyn. Franc. 126. 1892.

DESCRIPTION (after Gray).—Leaves ovate. Stipules truncate, bifid. Sepals ovate. Aestivation quincuncial. Corolla glabrous within. Stigma subglobose, sessile, entire. Immature fruit narrowly oblong.

RANGE.—Society Islands: Tahiti: *U. S. Exploring Expedition* in 1839 (fide Gray). Not seen.

2. *Fagraea Thunberg*

Fagraea Thunberg, Vet. Acad. Handl. Stockh. 125. 1782.

TYPE-SPECIES.—*Fagraea ceylanica* Thunberg.

RANGE.—About 40 species, ranging from Ceylon to China, the Philippines, Australia, and Polynesia. Two species in the Society Islands, with others described as endemic in Samoa (1) and Fiji (2). See the remarks below.

Key to the Species of *Fagraea* in the Society Islands

- Leaves subsucculent, venation not prominent in dried material, abruptly acuminate; corolla 6.5–8 cm long, lobes 1.4–2 cm long 1. *F. berteriana*
 Leaves pergameneous, lateral veins prominent, apices rounded and channelled; corolla 10 cm long, lobes 2.5–3 cm long 2. *F. longituba*, new species

1. *Fagraea berteriana* Gray ex Bentham

Besleria laurifolia Parkinson, Journ. Voy. Endeav. 41. 1773 [nomen nudum].—Solander in Seemann, Fl. Vit. 164. 1866 [pro syn. (name not in Kew Index)].
Carissa grandis Bertero ex Guillemin, Ann. Sci. Nat., ser. 2, 7:248. 1837 [nomen nudum].—A. de Candolle, Prod. 8:336. 1844 [nomen nudum].—Cuzent, Et. Veg. Tahiti 128. 1857; Iles Soc. Tahiti. 28, 214. 1860.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Jardin, Ess. Marq. 25, 42. 1862.—Lanessan, Pl. Ut. Col. Franc. 863. 1886.—Butteaud, Fl. Tahiti. 60. 1891.
Fagraea berteriana Gray ex Bentham, Journ. Linn. Soc. Bot. 1:98. 1837.—Gray, Proc. Am. Acad. 4:323. 1860b.—Seemann, Fl. Vit. 164. 1866 [pro parte].—Nadeaud, Enum. Pl. Tahiti. 55. 1873.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:238. 1892; Fl. Polyn. Franc. 139. 1892.—Cheeseman, Trans. Linn. Soc. 6:288. 1903.—Gilg and Benedict, Bot. Jahrb. 56:550. 1921.—Setchell, Univ. Cal. Pub. Bot. 12:200. 1926.—F.B.H. Brown, Bish. Mus. Bull. 130:228. 1935.
 An *Fagraea berteriana* Gray ex Bentham sensu Seemann, Fl. Vit. 164. 1866 [pro parte].—Hemsley, Journ. Linn. Soc. Bot. 30:185. 1894.—Reinecke, Bot. Jahrb. 25:665. 1898.—Burkill, Journ. Linn. Soc. Bot. 35:47. 1901.—Rechinger, Denks. Akad. Wien 85:328. 1910.—Turrill, Journ. Linn. Soc. Bot. 43:34. 1915.—Setchell, Carn. Ins. Dep. Mar. Biol. Bull. 20: 59. 1924.—Christophersen, Bish. Mus. Bull. 128:176. 1935.

Fagraea pua Nadeaud, Pl. Us. Tahiti. 36. 1864 [nomen nudum, new synonym (name not in Kew Index)].

Fagraea tahitensis Butteaud, Fl. Tahiti. 60. 1891 [new synonym (name not in Kew Index)].

DESCRIPTION.—Tree to 15 m high and 1 m in diameter, glabrous. Stipules 5–7 mm long, connate in the axils of the petioles but separate (occasionally barely touching) between the opposite leaves. Petioles 1–3 cm long. Blades obovate, (6–) 10–15 × (3–) 6–8 cm, cuneate or attenuate at the base, rounded at the tip with an abrupt acumen 3–5 mm long, crass-coriaceous, subsucculent, yellowish green, with about 8 major lateral veins. Cymules 3–7-flowered, racemosely arranged in a subcorymbose terminal inflorescence. Peduncles 3 cm long; pedicels 1 cm or less. Calyx turbinate, the tube 6 mm long; lobes 5, ovate, 5 mm long, rounded, scarious-margined. Corolla salverform-funnel-shaped, expanded above the middle, 6.5–8 cm long, somewhat bilabiate, cream-colored without and white within, turning yellow, very fragrant; lobes elliptical or obovate, 1.4–2 cm long, rounded, contorted to the right (clockwise). Stamens 5, inserted above the

middle of the tube. Ovary ovoid, 7 mm long, 2-celled, placentae inrolled; style 5–6 cm long. Berry ellipsoidal, rarely globose, 3.5 × 2 cm, orange to red, many-seeded. Seeds 1.5 mm long.

TYPE.—Collected by *Bertero* in Tahiti in 1831–1832.

RANGE.—Society Islands: *Banks and Solander* in 1769 (BM, fide Seemann); *Hinds and Barclay* in 1836–1842 (fide Gray); *U.S. Exploring Expedition* in 1839 (fide Gray).

Tahiti: *Bertero* in 1831–1832 (fide Guillemain, Gray); *Bidwill* ca. 1850 (BM, fide Seemann); *Lépine 84* in 1847 (P, fide Drake del Castillo); *Savatier 900* in 1855 (P, fide Drake del Castillo); *Nadeaud 364* alt. 800 m, 1856–1859, flrs. in Sept. and Oct. (fide Nadeaud) (P, fide Drake del Castillo); *Quayle 105*, Mt. Aorai, 5 October 1921, flower and fruit (BISH); *Quayle* (BISH); *Setchell and Parks 486*, Maara, alt. 250 m, 28 June 1922, fruit (BISH, UC); *Grant 3592*, Pare, below Diadem, alt. 920 m (3020 ft), dominant, common, 13 May 1930, sterile (BISH); *Grant 3884*, Teahupoo, Mt. Ronui, alt. 315 m (1040 ft), *Fagraea-Weinmannia* forest, 1 July 1930, fruit (BISH, MIN); *Grant 4500*, Hitiaa, Puunui, alt. 370 m (1220 ft), *Metrosideros* forest, 15 November 1930, flower and fruit (BISH, MIN).

Raiatea: *Moore 332*, south of Uturoa, alt. 5 m, rocky clay soil, 17 November 1926, flower (BISH, 2 sheets; MIN); *Moore 673*, south end, alt. 200 m, ridge, 18 March 1927, fruit (BISH, 2 sheets; MIN); *St. John 71314*, Paoio, alt. 250 m, wooded ridge, 8 October 1934, fruit (BISH).

Tahaa: *St. John 17381*, Hamene Bay, alt. 30 m, open ridge, 11 October 1934, flower and fruit (BISH).

A fairly common and very conspicuous tree (with large white flowers and red fruits) throughout the Society Islands, extending from the lower forest (which in the wetter districts reaches the sea) up to about 1200 m.

In the Bishop Museum there are six collections from the Marquesas (Nukuhiva and Hivaoa) where it was first collected by Barclay in 1836–1842, and has since been reported by Jardin and Brown. There are also three collections from Rapa and one from Rurutu. Cheeseman reported it from Rarotonga, and Grant saw a sterile specimen from there (*Wilder 927*, BISH).

Fagraea is common in Samoa and Fiji, but Gilg and Benedict (1921:551, 553) have distinguished

these forms as *F. samoensis* and *F. vitiensis*, respectively. The Tongan form, reported by Hemsley and Burkill, presumably would be one of these two "species" or possibly distinct. Grant saw five collections from Fiji, three from Tonga, and 10 from Samoa, but a comparison with the Tahitian material lies outside the field of this paper. Gillespie and Christophersen have determined the Fijian and Samoan material as *F. berteriana*, apparently ignoring Gilg and Benedict's treatment. In addition, there has been described from Fiji a very different species, *F. gracilipes* Gray, which has no distinct stipules. *Fagraea berteriana* has been incorrectly recorded from New Caledonia and the Solomon Islands. Barclay's collection from the Louisiade Islands has been referred to this species, but probably incorrectly, since many other species have since been described from that general region, and *F. berteriana* is not recognized in any recent Melanesian Flora.

ETHNOBOTANY.—Tahitian: *pua*. Parkinson calls it *pooamattapeepee*, which, put into better phonetic Tahitian, becomes *pua-matapipi* ("flower-eye-bean," whatever that may refer to). Cheeseman records it as *fua* in Rarotonga, presumably a typographical error, as there is no letter "f" in that dialect, and Wilder later listed it as *pua*. Christian (1910:211) and F.B.H. Brown call it *pua* in the Marquesas, while Jardin, referring principally to the fruits, reports *kaupe*. It is also called *pua* in Raivavae and Rapa, according to Brown. *Pua* in Samoan generally refers to *Gardenia*, while *Fagraea* is called *pua ula*, "ula" meaning necklace. In Fijian it is *bua*, or *pua dina*. Nadeaud reports another Tahitian name, *hauou*, which Grant did not hear used.

The flowers are highly prized for necklaces, and at one time were used to perfume coconut oil for hair-dressing. According to Nadeaud the berries were used for bronchitis, though toxic in heavy doses. Jardin says they were also employed in an embalming process to keep the hair on the head. An extract of the bark was used to heal fractures (Butteaud), and the wood was used for drums and canoe thwarts (Parkinson) and for ax handles (Cheeseman).

2. *Fagraea longituba* Grant, new species

Arbor ad 4 m alta, glabra; folia opposita stipulis intrapetiolaris connatis, petiolis 3–3.5 cm longis, laminis obovatis 14–18 cm longis 8–9 cm

latis basi cuneatis apice rotundatis canaliculatis pergameneis lutei-viridibus conspicue venosis; inflorescentia terminalis paniculata subcorymbosa circa 7 cymulis 3-5-floriferis, pedunculis 3-4 cm longis, pedicellis 1-2 cm longis supra medium bibracteatis; calyx turbinatus tubo 8-10 mm longo, lobis ovatis 6 mm longis apice rotundatis scariosis, corolla infundibuli-hypocrateriforma supra medium ampliata parum bilabiata 10 cm longa flavescens odorata, lobis 5-6 ellipticis vel obovatis 2.5-3 cm longis apice rotundatis; stamina 5-6, supra medium tubi inserta, filamentis 1.8 cm longis, antheris linearibus 13 mm longis 1.3 mm latis; pistillum ovario conico, stylo gracili 6.5 cm longo bilobato lobis planis ovatis 5 mm longis 4 mm latis apice rotundatis. Fructus ignotus.

Tree to 4 m high, glabrous; leaves opposite, stipules connate to the inside of the petioles, petioles 3-3.5 cm long, blades obovate, 14-18 cm long, 8-9 cm wide, cuneate at the base, apex rounded, channelled, pergameneous, greenish yellow with conspicuous veins; inflorescence terminal, paniculate, somewhat corymbose, about 7 cymules, 3-5-flowered, peduncles 3-4 cm long, pedicels 1-2 cm long, bibractate above the middle; calyx turbinate, tube 8-10 mm long, lobes ovate, 6 mm long, rounded at apex, scariosus; corolla salverform-funnel-shaped, expanded above the middle, somewhat bilabiate, 10 cm long, pale yellow, fragrant, lobes 5-6, elliptic or obovate, 2.5-3 cm long, with rounded tips; stamens 5-6, inserted above the middle of the tube, filaments 1.8 cm long, anthers linear, 13 mm long, 1.3 mm wide; pistil with ovary conical, style slender, 6.5 cm long, bilobate, each lobe flat, ovate, 5 mm long, 4 mm wide, rounded at the tip. Fruit unknown.

The species differs from *F. berteriana* in the longer petioles, thinner leaves with more prominent venation and rounded, channelled, nonacuminate tips, blunter calyx lobes and longer corolla with a much larger limb. *Fagraea berteriana* has conspicuously subsucculent, abruptly acuminate leaves and corollas 7-8 cm long, with lobes 1.4-2 cm long. Both species belong in Bentham's section *Corymbosae* subsection *Longiflorae* (Bentham,

1857:97). The distinction between this section and section *Racemosae* is merely one of degree of separation of the separate cymes which make up the paniculate inflorescence.

This cultivated plant may turn out to be an exotic, but nothing seems to fit it, and the native in whose yard the plant was growing stated that it was the native *pua* which he had transplanted from the mountain forest.

RANGE.—Society Islands: Tahiti: *Grant 3940*, Pare, Papeete, alt. 3 m, cultivated, 7 July 1930, flower (BISH, type; MIN). *Wilder 1236*, Papeete, cultivated, alt. 8 m, 6 January 1929, flower (BISH) may also belong here, but no notes on the specimen are available.

GENTIANACEAE

Not represented in the Society Islands. There are two Polynesian genera with a total of four species. *Centaurium sebaeoides* (Grisebach) Druce is endemic in Hawaii, and *C. australe* (R. Brown) Druce occurs in Easter Island, Fiji, and the Australian region. *Centaurium umbellatum* Gilibert is introduced in Hawaii. *Limnanthemum indicum* (L.) Grisebach occurs from Fiji west to tropical Africa.

APOCYNACEAE

Other Polynesian genera in this family are *Melodinus* (2 species in Fiji, of which 1 extends to Tonga), *Tabernaemontana* (3 in Fiji, of which 1 is introduced), *Pteralyxia* (3 in Hawaii), *Rauwolfia sandwicensis* A. de Candolle (Hawaii), *Carothersia* (2 in Fiji), and *Lyonsia laevis* Gray (Fiji). All are endemic except for the single introduction. Four additional genera are represented in cultivation in Hawaii by one species each: *Carissa grandiflora* (E. Meyer) A. de Candolle, *Trachelospermum divaricatum* (Thunberg) K. Schumann, *Beaumontia grandiflora* (Roxburgh) Wallich, and *Strophanthus caudatus* (Burman f.) Kurz. The above list totals 11 endemic species and five in cultivation. Only one of the genera (*Pteralyxia*) is endemic in Polynesia.

Key to the Genera of Apocynaceae in the Society Islands

1. Stamens free, not tailed (except in *Ervatamia*), and filled with pollen to the base; seeds glabrous (except *Alstonia*); corolla lobes sinistrorse (except *Alstonia*, *Thevetia*).
 2. Ovary compound, 1-celled; capsule globose, 2-valved, echinate; corolla bright yellow, 7–13 cm long; leaves whorled; cultivated shrub.....1. *Allamanda*
 2. Ovaries 2, separate; style single.
 3. Carpels 3–4; corolla 1–2 cm long, lobes sinistrorse; leaves alternate; native tree.....2. *Lepinia*
 3. Carpels 2.
 4. Seeds many in each cell.
 5. Calyx glandless.
 6. Trees or shrubs; seeds in several rows.
 7. Corolla 7–10 cm long, yellowish white, tube short, lobes sinistrorse, with stamens attached near the base; seeds glabrous; leaves alternate; cultivated tree.....3. *Plumeria*
 7. Corolla 1–1.5 cm long, white, tube long, lobes dextrorse, with stamens attached near the middle; seeds ciliate-fringed; leaves opposite; native tree or shrub.....4. *Alstonia*
 6. Cultivated herb; seeds in 2 rows; corolla white or rose, lobes sinistrorse; leaves opposite.....5. *Catharanthus*
 5. Calyx glandular at base within; leaves opposite.....6. *Ervatamia*
 4. Seeds 1 or 2 in each cell or ripe drupe-like fruit.
8. Placenta very thin; seeds dorsally attached, pendant; corolla under 2 cm long, greenish or cream-colored; drupe dry; leaves opposite or whorled; native shrubs.....7. *Alyxia*
8. Placenta thick, extending far into the fruit; seeds peltate; corolla 2–7 cm long.
 9. Leaves whorled; corolla salverform, white or greenish white, 2.5 cm long, lobes sinistrorse; drupe spongy-fibrous; native shrub or small tree.....8. *Ochrosia*
 9. Leaves alternate; corolla funnel-shaped.
 10. Corolla white, 5 cm long, lobes sinistrorse; calyx glandless; drupe spongy-fibrous; leaves 3–6 cm wide; native tree.....9. *Cerbera*
 10. Corolla yellow, 6–7 cm long, lobes dextrorse; calyx glandular; drupe fleshy; leaves under 1 cm wide; small cultivated tree.....10. *Thevetia*
1. Stamens firmly united to the stigma; anthers tailed, outer sporangia not full of pollen to the base; corolla with scales at the base of the throat, the lobes dextrorse; follicles dry; seeds with simple tufts of hairs; leaves opposite or whorled; flowers double, white or pink; cultivated shrub.....11. *Nerium*

Artificial Key to the Genera of Apocynaceae in the Society Islands

1. Leaves alternate.
 2. Flowers small, 1–2 cm long; carpels 3–4.....2. *Lepinia*
 2. Flowers large, 5–10 cm long; carpels 2.
 3. Leaves under 1 cm wide; corolla yellow.....10. *Thevetia*
 3. Leaves 3–13 cm wide; corolla lobes white.
 4. Leaves 3–6 cm wide; corolla white.....9. *Cerbera*
 4. Leaves 10–13 cm wide; corolla white with yellow center.....3. *Plumeria*
1. Leaves opposite or whorled.
 5. Cultivated herb.....5. *Catharanthus*
 5. Trees, shrubs [or vines].
 6. Flowers large, 3–13 cm long; mainly cultivated.
 7. Flowers yellow, single, 7–13 cm long.....1. *Allamanda*
 7. Flowers white or rose, often double, 3–6 cm long.
 8. Leaves whorled (except at base of shoot); flower white or rose.....11. *Nerium*
 8. Leaves opposite; flower white.....6. *Ervatamia*
 6. Flowers small, 1–2.5 cm long; native.
 9. Follicles long and slender, 10–30 × 0.3–0.4 cm.....4. *Alstonia*
 9. Drupes subellipsoidal.
 10. Leaves large, 10–30 cm long.....8. *Ochrosia*
 10. Leaves smaller, 3–9 cm long.....7. *Alyxia*

1. *Allamanda* L.

Allamanda L., Mant. 2:146. 1771.

TYPE-SPECIES.—*Allamanda cathartica* L.

RANGE.—About 12 species, mostly in Brazil,

north to Central America. Four species cultivated in Polynesia. *Allamanda violacea* Gardner is grown in Hawaii and Samoa. *Allamanda neriiifolia* Hooker has been reported from Rarotonga by Wilder (1931), but no specimens were collected.

Key to the Species of *Allamanda* in the Society Islands

- Twigs and leaves subglabrous; leaves 9–11 × 3–4 cm; flowers 13 × 13 cm; sepals 15 mm long; corolla funnel-salverform, tube with a narrow basal portion about 4 cm long, broadly expanded above, lobes spreading-horizontal, 5 cm long.....1. *A. cathartica* var. *hendersonii*
- Twigs and leaves puberulent; leaves about 7 × 2 cm; flowers 7 × 4.5–5 cm; sepals 8 mm long; corolla funnel-campanulate, tube 1–1.5 cm long, lobes ascending, 1.5 cm long.....2. *A. schottii*

1. *Allamanda cathartica* L.

Allamanda cathartica L., Mant. 2:214. 1771.—Hillebrand, Fl. Haw. Is. 284. 1888.—Rechinger, Denks. Akad. Wien 85:330. 1910; Denks. Akad. Wien 89:637. 1913.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:57. 1924; Univ. Cal. Pub. Bot. 12:200. 1926.—Christophersen, Bish. Mus. Bull. 128:177. 1935.—F.B.H. Brown, Bish. Mus. Bull. 130:229. 1935.

Allamanda hendersonii Bull, Cat. Autumn. 1. 1865.—Wilder, Bish. Mus. Bull. 86:88. 1931.

Allamanda neriiifolia sensu Butteaud, Fl. Tahiti. 58. 1891 [non Hooker, 1851].

Allamanda cathartica var. *hendersonii* (Bull) Rafill in Bailey, Stand. Cyc. Hort. 1:247. 1914.

DESCRIPTION (based on var. *hendersonii*).—Low shrub or vine to 10 m. Twigs glabrous. Petioles 2–4 mm long. Blades prevailingly oblanceolate, 9–11 × 3–4 cm, cuneate at base, prominently acuminate, coriaceous, shining green, with a few hairs on the veins below. Racemes subterminal, 5–8-flowered. Peduncles (and pedicels at times) puberulent. Sepals ovate, about 15 mm long. Corolla to 13 cm long and wide, bright yellow, with a narrowed basal portion about 4 cm long, tube broadly expanded in upper part, lobes spreading, 5 cm long. Capsule echinate.

RANGE.—Society Islands (cultivated, possibly escaping): Tahiti: *Grant 4112*, Mataiea, Lake Vaihiria, alt. 450 m (1475 ft), climbing on rocks, probably planted, 7 September 1930, flower (BISH, MIN). Raiatea: *Moore 273*, Faaroa, alt. 20 m, 2 November 1926, flower (BISH, 2 sheets; MIN).

Both of the above are var. *hendersonii*, which is the most common form in cultivation the world over. It may be a good species, having larger flowers and thicker leaves than the typical form, in which the flowers are but 5–7.5 cm broad. But-

teaud reported *A. neriiifolia* from Tahiti, but did not mention any other species, and the present one is very common there. Setchell (1926:200) reported *A. cathartica*, but the two specimens listed above are apparently the only collections.

Common in cultivation in the Marquesas, Rarotonga, Samoa, and Hawaii, the collections from the first three localities and most of the Hawaiian plants being var. *hendersonii*. An escape in Samoa, and possibly here in the Society Islands. A sterile plant from Hivaoa (*Mumford and Adamson 407*, in 1929, BISH) may be the typical form.

LOCAL NAMES.—Moore records *piti*, which is the name of the similar but smaller-flowered *Tecoma stans*, from which the name was presumably taken.

2. *Allamanda schottii* Pohl

Allamanda schottii Pohl, Pl. Bras. 1:73, t. 58. 1827.

Allamanda cathartica var. *schottii* (Pohl) Rafill in Bailey, Stand. Cyc. Hort. 1:247. 1914.

DESCRIPTION.—See the key above for the differences from *A. cathartica*.

RANGE.—Society Islands (cultivated): Raiatea: *Moore 320*, alt. 1 m, 17 November 1926, flower and fruit (BISH, MIN). Native to Brazil.

2. *Lepinia* Decaisne

Lepinia Decaisne, Ann. Sci. Nat. ser. 3, 12:194, t.9. 1849.

TYPE-SPECIES.—*L. taitensis* Decaisne.

RANGE.—The only other species are *L. solomonensis* Hemsley from the Solomon Islands [and *L. ponapensis* Kanehira from Ponape, Caroline Islands].

1. *Lepinia taitensis* Decaisne

Lepinia taitensis Decaisne, Ann. Sci. Nat. ser. 3, 12:194, t.9. 1849; Fl. Serr. Jard. 7:225, f.1. 1852.—Nadeaud, Enum. Pl. Tahiti 56. 1873.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:233. 1892; Fl. Polyn. Franc. 123. 1892 [*"L. tahitensis"*].
 Non *Lepinia taitensis* sensu Hemsley, Kew Bull. 1895:159; Ann. Bot. 5:502. 1891; Journ. Linn. Soc. Bot. 30:165. 1894.—Lauterbach and K. Schumann, Fl. Deutsch. Südsee. 501. 1901.—Markgraf, Bot. Jahrb. 63:281. 1930 [= *L. solomonensis*].

DESCRIPTION.—Tree to 8–10 m. Leaves alternate. Petioles 2–4 cm long. Blades oblanceolate, 15–20 × 5–7 cm, attenuate at the base, abruptly acuminate, glabrous, coriaceous, shining, with prominent veins. Cymes terminal. Calyx lobes 5, ovate, 2–3 mm long, ciliate, glandless. Corolla salverform, 1–2 cm long, tube long, widened at insertion of the filaments, scaleless, lobes 5, sinistrorse. Stamens included in upper part of tube, anthers subsessile, narrow, apiculate. Disk absent. Carpels 3–4, free at base; style single, filiform; stigma oblong, acute. Fruit dry, fibrous, 15 cm long, the segments remaining attached at the tip and becoming long-stipitate at the base at maturity, which carries up the ovaries into the form of a cross ("un veritable perchoir pour petits oiseaux," Butteaud, 1891:59). Seeds solitary, pendulous, deeply wrinkled. Endosperm cartilaginous-horny.

TYPE.—Collected by *Lépine* in 1847.

RANGE.—Society Islands (endemic) Tahiti: *Lépine* in 1847 (P, fide Drake del Castillo); *Vesco* in 1847 (P, fide Drake del Castillo); *Nadeaud* 369, Papenoo and Hitiaa, Papeiha, July 1856–1859, flower and fruit (P, fide Drake del Castillo). Moorea: *Nadeaud*, Maatea, Tevaiahia, 1856–1859 (P, fide Drake del Castillo).

We have not seen this very interesting plant. Hemsley's original identification of the Solomon Island specimen, collected by Comins, with the Tahitian plant was made without seeing specimens of the latter. Markgraf was apparently unaware that Hemsley had finally published the plant as a distinct species, nor had he seen the specimen.

3. *Plumeria* L.

Plumeria L., Gen. Pl. 5th ed. 99. 1754. [*Plumiera* and *Plumieria* Auct.].

TYPE-SPECIES.—*Plumeria rubra* L.

RANGE.—About 40 species, mostly in tropical America, with a few in Africa, though some are adventive all over the tropics. *Plumeria rubra* L. is cultivated in Hawaii.

1. *Plumeria rubra* L.

Plumeria rubra L. Sp. Pl. 209. 1753.

Plumeria acuminata Aiton, Hort. Kew, 2nd ed. 2:70. 1811.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:58. 1924; Univ. Cal. Pub. Bot. 12:200. 1926.—Christophersen, Bish. Mus. Bull. 128:186. 1935.—F.B.H. Brown, Bish. Mus. Bull. 130:234. 1935.

Plumeria acutifolia Poiret, Ency. Method. Supp. 2:667. 1811 [Aiton's name appeared earlier in the same year].—Hillebrand, Fl. Haw. Is. 294. 1888.—Rechinger, Denks. Akad. Wien 85:330. 1910; Denks. Akad. Wien 89:637. 1913.—Christophersen, Bish. Mus. Bull. 44:56. 1927.—Wilder, Bish. Mus. Bull. 120:40. 1934.

Plumeria alba sensu Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Butteaud, Fl. Tahiti. 58. 1891.—Cheeseman, Trans. Linn. Soc. 6:287. 1903.—Wilder, Bish. Mus. Bull. 86:89. 1931 [non L., 1753].

DESCRIPTION.—Small rounded tree, 3–6 m high. Leaves alternate, in clusters at the tips of the thick succulent twigs. Petioles 2–4 cm long. Blades oblong-oblanceolate, commonly 30–40 × 10–13 cm, subcuneate at the base, acuminate, puberulent along the veins below, coriaceous. Cymes terminal, puberulent to tomentose, 2- or 3-branched, about 6-flowered. Pedicels 1–1.5 cm long. Calyx 1.5 mm long, subentire or 5-lobed. Corolla salverform, white or cream-colored with yellow center; tube cylindrical, narrow, 1.5 cm long; lobes elliptical to obovate, 3.5–4.5 × 2.3–3 cm, apex rounded to acute, subglabrous. Follicles 2, 15–20 cm long, only rarely maturing.

Plumeria alba L., frequently but erroneously reported from Polynesia, has narrow (0.5–1.5 cm wide) oblong-linear leaves that are tomentose below. *Plumeria jamesonii* Hooker, with which this species has been confused in herbaria, is a much smaller plant with a red-throated corolla. The first two specimens cited below are of the *P. acutifolia* type, i.e., with broader corolla lobes, while the third, with narrower lobes, is *P. acuminata*. The two forms intergrade, however, and are usually combined with *P. rubra* (Woodson, 1938).

RANGE.—Society Islands (cultivated and seemingly spontaneous): Tahiti: very common, not

collected. Raiatea: *Moore 199*, Uturoa, alt. 1 m, 13 October 1926 (BISH, 2 sheets; MIN); *Moore 489*, south of Uturoa, 3 January 1927, flower (MIN); *Moore 490*, south of Uturoa, 3 January 1927, flower (BISH, MIN). Borabora: *Grant 5058*, Nune, Raititi, alt. 20 m, on rocks in *Hibiscus* forest, apparently established, Jan. 12, 1931, wood specimen only (BISH, MIN).

Introduced into Tahiti in 1852 by Abadie, according to Pancher. Native of Mexico. Also cultivated in the Marquesas (!), Tuamotus (!), Hawaii (!), Samoa, and Washington Island.

ETHNOBOTANY.—English: *frangipani*, *plumeria*, *graveyard-flower*. French: *franchipanier*. Tahitian and Marquesan: *tipanie*, presumably from the French. Reported as *tipani* by Wilder in Rarotonga and Makatea. Samoan: *pua fiti* or *fiti* ("flower of Fiji"), according to Setchell (1924:58). Used frequently for leis.

4. *Alstonia* R. Brown

Alstonia R. Brown, Mem. Wern. Soc. 1:75. 1809 [1810].

TYPE-SPECIES.—*Alstonia scholaris* (L.) R. Brown.

RANGE.—About 45 species, extending from southeastern Asia through the East Indies and Australia to Polynesia. Four species have recently been described from Africa.

Two species in the Society Islands (1 extending to Rarotonga), with others endemic in the Marquesas (1), Samoa (2), Fiji (2), and one which occurs in both Samoa and Fiji (*A. reineckiana* Lauterbach). Another is found in Samoa, Fiji, and New Caledonia (*A. plumosa* Labillardière). *Alstonia scholaris* (L.) R. Brown has been reported in cultivation in Hawaii. This totals 10 species in Polynesia, of which eight are endemic, one extends slightly outside (New Caledonia), and one is cultivated.

Key to the Species of *Alstonia* in the Society Islands

1. Tree to 10 m; corolla lobes 2 mm wide.
 2. Leaves with petioles 2–5 cm long, blades averaging 14 × 6 cm; calyx lobes ovate..... 1. *A. costata*
 2. Leaves with petioles 1.5–3 cm, blades 9–12 × 2.5–5 cm; calyx lobes rounded..... 1a. *A. costata* var. *fragrans*, new combination
1. Shrub to 1 m; petioles 1–2 cm long, blades 5–9 × 2–3.5 cm; corolla lobes 2.5–2.7 mm wide.... 2. *A. elliptica*

1. *Alstonia costata* (G. Forster) R. Brown

Echites costata G. Forster, Prod. 20. 1786b [excl. syn. Rheede].—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Butteaud, Fl. Tahiti. 59. 1891.

Echites corymbosa sensu G. Forster, Herb. Aus. 1797 [non Jacquin, 13. 1760].

Alstonia costata (G. Forster) R. Brown, Mem. Wern. Soc. 1:75. 1809 [1810].—Endlicher, Ann. Wien Mus. 1:175. 1836.—Guillemin, Ann. Sci. Nat., ser. 2, 7:246. 1837 [cum desc. Forster].—A. de Candolle, Prod. 8:409. 1844.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Gray, Proc. Am. Acad. 5:334. 1862c.—Seemann, Fl. Vit. 161. 1866.—Nadeaud, Pl. Us. Tahiti. 38. 1864; Enum. Pl. Tahiti 56. 1873.—Lanesan, Pl. Ut. Col. Franc. 865. 1886.—Drake del Castillo, Ill. Fl. Ins. Pac. 1:31, t. 10, 1886; Ill. Fl. Ins. Pac. 7:234. 1892; Fl. Polyn. Franc. 125. 1892.—Butteaud, Fl. Tahiti. 59. 1891.—Cheeseman, Trans. Linn. Soc. 6:287. 1903.—Setchell, Univ. Cal. Pub. Bot. 12:201. 1926.—Wilder, Bish. Mus. Bull. 86:88. 1931 [non Wallich Cat. no. 1649. 1828 (= *A. macrophylla* G. Don)].

DESCRIPTION.—Tree, 3–10 m high, glabrous. Wood white, specific gravity 0.75. Leaves opposite.

Petioles 2–5 cm long, narrowly margined, enlarged at the base. Blades elliptical, varying to lanceolate, ovate, or obovate, well-developed ones averaging 13.8 × 6 (8–16.5 × 3–8) cm, cuneate or attenuate at the base, acuminate at the apex, coriaceous, shining, glabrous or with a few scattered hairs at the base of the midrib below, entire or somewhat sinuate, with 13–19 prominent lateral veins united near the margin. Inflorescence subterminal, cymose-paniculate, subcorymbose, spreading, small or becoming 12 cm high and 16 cm broad. Bracts minute. Pedicels 3–6 mm long. Bractlets ovate, obtuse to subacute, 0.75 mm long. Calyx cut almost to the base; lobes 5, ovate, 1.8–2.2 mm long, sharply acute to obtuse, imbricate. Corolla salverform, rather constantly 11 mm long, rarely 13 mm, glabrous except for the hairy throat, white, fragrant; tube 4.5 mm long (not "scarcely longer than the calyx"), slightly expanded at the middle due to the swelling of the anthers; lobes 5, linear-

lanceolate, 6.5–7 (–8) mm long, 2 mm wide, dextrorsely contorted. Anthers lanceolate, 1.3 mm long, acute, subsessile on the corolla tube. Nectary a minute annulus surrounding the ovary. Ovaries 2, collectively ovoid-conical, either free or coherent, 0.9 mm long, glabrous; style 0.8 mm long; stigma ovoid-conical, 0.5–0.6 mm long; ovules many, compressed, amphitropous. Follicles geminate, linear, averaging 21 (11–35) cm long, 3–4 mm wide, usually arcuate or spirally curved, occasionally straight. Seeds elliptical, thin, compressed, peltately attached, averaging 5.2 (3.5–7) mm long including appendages (the body about 3.6 mm), ciliate-fringed, the lower end with an entire blunt acumen, the upper usually notched or bifid into 2 unequal appendages, the appendages averaging 1 (0.3–2) mm long (the perfectly symmetrical seed shown in Drake del Castillo's plate with single equal appendages on each end is very rare); albumen thin; radicle superior; cotyledons oblong, flat, longer than the radicle.

Grant 4265 was collected to show the large-sized leaves (38 × 21 cm) that can be produced on young nonflowering plants in shaded habitats. *Grant 4123* has leaves 16.5 × 8–9 cm, inflorescence 16 × 20 cm, pedicels 5–7 mm, and corollas 15 cm long, with lobes 9 mm long, all of these dimensions being much greater than those of any other specimen seen. It shows no qualitative differences, but could easily be distinguished as a variety. These extreme dimensions are not included in the general description above.

Grant 3921 has narrowly lanceolate leaves 10–13 × 2.8–3.5 cm, suggesting a distinct species, but it is connected to *A. costata* by *MacDaniels 1666*, these two being the only collections from Tahiti-iti. The flowers of both are typical of the species. In some respects *Grant 3921* is transitional to var. *fragrans* (q.v.), which grows in a similar environment.

St. John 17042 has short (11 cm), divaricate, horizontal, almost straight fruits identical with those of *A. elliptica* (q.v.), and more abruptly acuminate leaves than in typical *A. costata*, but the blades are large (15 × 7.5 cm).

TYPE.—Collected by *Forster* in Tahiti in 1773–74.

RANGE.—Society Islands and Rarotonga. Society Islands: *Banks and Solander* in Tahiti and Raiatea in 1769 (BM, fide Seemann); *Wiles and*

Smith (BM, fide Seemann); *Barclay* in 1836–42 (BM, fide Seemann); *U. S. Exploring Expedition* in 1839 (fide Gray); *Bidwill* ca. 1850 (BM, fide Seemann).

Tahiti: *Forster* in 1773–1774 (BM, fide Seemann); *Bertero and Moerenhout* in 1831–1832 (P, fide Drake del Castillo); *Hombroon* in 1837–1840 (P, fide Drake del Castillo); *Vesco* in 1847 (P, fide Drake del Castillo); *Lépine 198* and *199* in 1847 (P, fide Drake del Castillo); *Ribourt 46*, ca. 1850 (P, fide Drake del Castillo); *Nadeaud 371*, alt. 800 m and above, 1856–1859 (P, fide Drake del Castillo); *Quayle 57*, Mt. Aorai, alt. 1100 m, 27 September 1921, flower and fruit (BISH); *Quayle*, Mt. Aorai, 1–3 August 1922, flower (BISH); *Whitney Exp. 598*, Fautaua, 7 July 1922, flower and fruit (BISH); *Setchell and Parks 485*, Papeari, Maara, 250 m, 25 June 1922, flower and fruit (BISH, UC); *Setchell and Parks 525*, Fautaua, 8 July 1922, fruit (UC); *MacDaniels 1542*, 15 May 1927, flower and fruit (BISH); *MacDaniels 1666*, Tautira, Vaita, alt. 350 m, 12 June 1927, flower and fruit (BISH, 2 sheets); *Grant 3555*, Pare, Mt. Diadem, alt. 1085 m (3550 ft), ridge forest, occasional, 13 May 1930, flower and fruit (BISH, MIN); *Grant 3921*, Teahupoo, Mt. Ronui, *Parasponia-Cyathea* forest, alt. 900 m (2955 ft), 2 July 1930, flower and fruit (BISH, MIN); *Grant 4123*, Mataiea, Lake Vaihiria, alt. 440 m (1450 ft), *Alstonia-Neonauclea* forest, 7 September 1930, flower and fruit, wood specimen (BISH, MIN); *Grant 4265*, Papenoo, Pufau, alt. 150 m (480 ft), *Hibiscus-Neonauclea* forest, 23 September 1930, sterile (BISH); *St. John and Fosberg 17042*, Orofena, s. ridge, alt. 1250 m, 20 September 1934, flower and fruit (BISH); *St. John and D. Anderson 17427*, Mt. Aorai, 1100 m, 16 September 1934, flower (BISH).

Moorea: *Vesco* in 1847 (P, fide Drake del Castillo); *Lépine* in 1847 (P, fide Drake del Castillo).

Raiatea: *Moore 395*, Vairahi-Avera ridge, alt. 300 m, 3 December 1926, flower and fruit (BISH, MIN).

Borabora: *Grant 4955*, Tevaitapu, Tahuhuura, alt. 505 m (1660 ft), ridge scrub, 3 January 1931, fruit (BISH, MIN).

Rarotonga: *Cheeseman* in 1899 (BM?); *Wilder 544*, alt. 550 m (1800 ft), 15 June 1927, flower

and fruit (BISH); *Wilder 729*, Avarua, alt. 75 m (250 ft), 15 March 1926, flower and fruit (BISH, 2 sheets).

Throughout the Society Islands, *Alstonia* is a rather common small tree in the middle forest zone, extending up the ridges from a minimum altitude of 750 m (250 m in the wetter districts) to a maximum of 1540 m. In the larger interior valleys it can be found at much lower elevations (150 m). The fragrance of the flowers and the long, twisted follicles make it rather conspicuous and it seems more abundant than it really is. It is one of the dominant trees in the elfin ridge forest, where it averages about 3 m in height. Its most frequent dominant associates are, in order of abundance, *Weinmannia parviflora*, *Metrosideros collina*, *Freycinetia*, *Vaccinium cereum*, *Ilex taitensis*, and *Styphelia pomarar*.

The two Rarotongan specimens seen seem to agree in all particulars with the Tahitian plant. *Wilder 729*, at low altitude has leaves 13–16 × 7.5–8.7 cm, corollas 11 mm long with lobes 6 mm, fruits 29 cm, seeds 6 mm overall, with appendages to 1 mm. His other collection, at high (for Rarotonga) altitude (550 m) has identical flowers but exhibits the reduced leaves (10 × 5.5 cm) and shorter (15 cm) straight follicles of the Tahitian plants of higher elevations (cf. *A. elliptica* below).

Christophersen (1935:180) has suggested that one of his collections (3540) may be *A. costata*. Grant saw this Samoan specimen, and the suggestion is possibly correct, but the flowers are immature, no fruits are present, and it is accordingly indeterminable. There are 4 other species in this genus known from Samoa, and *Christophersen 3540* might well be one of them. (We are not acquainted with *A. godeffroyi* Reinecke).

Gillespie has determined four of his collections from Fiji in the Bishop Museum as *A. costata* (*Gillespie 3165, 4836, 4569, and 4549*). The first three appear to be *A. reineckiana* Lauterbach, and the last *A. plumosa* Labillardière; see the remarks on these two species under *A. elliptica* below.

ETHNOBOTANY.—Tahitian: *atache*, variously misspelled as *attache* (Banks ex Endlicher) and *atae* (Pancher), the latter being the name of *Erythrina orientalis*. G. Forster (in Guillemain, 1837:246) also reports *ahimara* (*ahi* is *Santalum*, and *mara* is *Neonauclea*: there is also a variety of *Santalum*

called *ahimarea*). Nadeaud (1873:84) adds *napau* (miscopied by Butteaud as *napao*). *Grant 3921* was termed *papaihone* by Nadeaud's grandson, Tu T. Nadeaud. Pancher reports *manono*, but this is due to confusion by him with certain Euphorbiaceae such as *Glochidion*. Similarly, Drake del Castillo (1892:125) lists *utureva* (which is *hutureva*, i.e., *Cerbera manghas*) and *afairetou*, which last is presumably a misspelling of a place name in Moorea (Afareaitu) from whence were secured some of Vesco's and Lépine's specimens cited by Drake del Castillo (1892:126). He apparently mistook the locality label for a native name.

The only native use of this species we have heard of is for stomach complications associated with elephantiasis (Nadeaud, 1864).

**1a. *Alstonia costata* var. *fragrans* (Moore)
Grant, new combination**

Alstonia fragrans Moore, Bish. Mus. Bull. 102:39. 1933.

DESCRIPTION.—Differs from the typical form in the somewhat shorter and narrower blades (9–12 × 2.5–5 cm), shorter petioles (1.5–3 cm), and the more rounded calyx lobes.

Moore lists a number of other differences between his species and *A. costata* but they are not constant enough to be serviceable. The relative acumination of the blades, the length of the style (0.8 mm), the width of the corolla lobes (2 mm), and the shape of the ovary (ovoid, 0.8–1 mm long) are just as in *A. costata*. The sepals, however, are not only "obtuse" but may actually be rounded at the apex, while they are acute to obtuse in the species proper. They are the same length in each (1.8–2.1 mm).

The plant is a tree, 3 m high. The leaves may be elliptic to oblanceolate or obovate, and are abruptly acuminate. There are 18 lateral veins both on the type-specimen and in my own collection, but part of the type-material shows 12–13 veins. Mature corollas are 11–12 mm long. The follicles are 21–25 × 0.3–0.4 cm, with seeds elliptical, about 4 × 1.5 cm, appendaged just as in *A. costata*.

This variety is of interest principally as representing a transition between *A. costata* and *A. elliptica* (with reference to the shape of the leaf), being known only from near the habitat of the

latter. We do not suspect hybridization, inasmuch as we interpret *A. elliptica* (q.v.) as an ecological species rather than a genetically determined one.

RANGE.—Society Islands: Raiatea: Moore 84, east of Mt. Temehani, alt. 350 m, 16 September 1929, flower and fruit (BISH, type; MIN); Grant 5198, Mt. Temehani, alt 435 m (1430 ft), ridge scrub, 29 January 1931, flower and fruit (BISH, MIN).

2. *Alstonia elliptica* Moore

Alstonia elliptica Moore, Bish. Mus. Bull. 102:39. 1933.

DESCRIPTION.—Low shrub, to 1 m high. Petioles 1–2 cm long. Blades elliptical, rarely slightly obovate, 5–9 × 2–3.5 cm, rounded to acute at the tip, occasionally short acuminate. Inflorescence usually 4–5 cm high and 8 cm wide, though becoming 12 cm high on the type sheet. Calyx lobes obtuse to rounded. Corolla tube 4.7 mm long, lobes 7–8 mm long and 2.5–2.7 mm wide. Follicles 10–12 cm long, 3 mm thick, straight, usually divaricate and approximately horizontal. Otherwise as in *A. costata*.

The other differences given by Moore to distinguish this species from *A. costata* do not hold in the light of the fuller material available. The leaves do not always have “fewer (12–14) secondary nerves” as even in the type-material they may go up to 20, and in the other collections cited below they average 14–15, while the average in *A. costata* is 13–16. The corollas are not definitely larger, being 12–13 mm long, while 11–13 (–15) mm in *A. costata*. The calyx is evenly imbricated and the seeds are elliptical in each. A detailed comparison of Moore’s description of *A. elliptica* with the description given above of *A. costata*, will, however, bring out other apparent differences between the two, and accordingly the following points, determined from the type-material of *A. elliptica* (including two isotype sheets as well as the type), and confirmed from examination of three other collections, including flowers put up in fixative at the time of collection, are here listed: pedicels averaging 5 cm long; calyx lobes 1.8 mm long; ovary ovoid (not ellipsoidal), 0.9 mm long; style 0.8 mm long; stigma 0.5 mm long; seeds averaging 3.5 × 1.5 mm and appendaged at each end, the “emarginate” condition being due to the bifurcation of the upper appendage.

This species is presumed to be a typical Mt. Temehani reduction (cf. *Vaccinium*, *Styphelia*, *Rapanea*, etc.) of *A. costata*, all of the important differences being ones of size, except for the blunter leaf tips, which, however, are far from constantly so, and the broader corolla lobes, and all of them, without exception, comparable to the phenomena associated with alpine dwarfing in boreal regions. The highest altitude collection of *A. costata* from Tahiti shows fruits identical with this form (*St. John 17042*, q.v.), and very similar types are cited above from the Marquesas and Rarotonga. We doubt if the species has any validity from a genetic standpoint, but morphologically it is very distinct, instantly recognizable both in the field and in the herbarium, and is accordingly maintained.

From a purely morphological standpoint, however, its closest relationship is not to *A. costata*, but to *A. plumosa* Labillardière, described from New Caledonia, of which we have seen no authentic material. Drake del Castillo (1886–1892: 31–32) who had seen the type of *A. plumosa*, says that it differs from *A. costata* in having nonacuminate leaves, obtuse corolla lobes which are hairy within, and narrower seeds with longer appendages. Of these differences only the seed character would separate *A. plumosa* from *A. elliptica*. Grant saw 15 collections of “*A. plumosa*” from Fiji, but did not know if it is really conspecific with Labillardière’s plant, especially since Turrill (1915) has described *A. montana* from Fiji which appears to differ little from *A. plumosa*. In the Fiji material these long appendages (1–2 mm) seem to differentiate the two species, though we cannot separate them on the leaves alone. Kew has distributed material from Fiji which Grant took to be *A. plumosa* since *A. reineckiana* Lauterbach has even longer appendages on the seeds (*Tothill 396*, 427, and 475). *Alstonia plumosa* apparently does not occur in Samoa, though Christophersen’s “*A. aff. plumosa*” (1935:177) is a closely related species which was also collected by Vaupel in 1905 and distributed as “*A. aff. costata*.”

RANGE.—Society Islands: Raiatea, Mt. Temehani: Moore 746, alt. 600 m, red clay soil, 16 April 1927, flower and fruit (BISH, type; MIN); Grant 5205, Vaiumete, alt. 500 m (1650 ft), ridge scrub, 29 January 1931, flower and fruit (BISH, MIN); Grant 5225, Te Apoo, alt. 585 m

(1920 ft), ridge scrub, 29 January 1931, flower and fruit, flowers fixed (BISH, MIN); *St. John 17252*, alt. 600 m, high moor, 5 October 1934, flower (BISH).

5. *Catharanthus Don*

Catharanthus Don, Gen. Hist. 4:95. 1838.
Lochnera Reichenbach, Consp. 134. 1828 [non *Lochneria* Scopoli, 271. 1777].

TYPE-SPECIES.—*Catharanthus roseus* (L.) Don.

RANGE.—Two other species, one in India and one in Madagascar.

1. *Catharanthus roseus* (L.) Don

Vinca rosea L., Syst. 10th ed. 2:944. 1759.—Hillebrand, Fl. Haw. Is. 294. 1888.—Butteaud, Fl. Tahiti, 58. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:234. 1892.—Hemsley, Journ. Linn. Soc. Bot. 30:185. 1894.—Burkill, Journ. Linn. Soc. Bot. 35:46. 1901.—Cheeseman, Trans. Linn. Soc. 6:287. 1903.—Rock, Indig. Trees Haw. 407. 1913.—Wilder, Bish. Mus. Bull. 86:89. 1931.—F.B.H. Brown, Bish. Mus. Bull. 130:234. 1935.

Lochnera rosea Reichenbach, Consp. 134. 1828.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Reinecke, Bot. Jahrb. 25:667. 1898.—Rechinger, Denks. Akad. Wien 85:330. 1910.—Setchell, Univ. Cal. Pub. Bot. 12:201. 1926.—Wilder, Bish. Mus. Bull. 120:40. 1934.—Christophersen, Bish. Mus. Bull. 128:180. 1935.

Catharanthus roseus (L.) Don, Gen. Hist. 4:95. 1838.—Degener, Fl. Haw. 1933.

Vinca alba Butteaud, Fl. Tahiti, 58. 1891 [nomen nudum; non Noronha, 1790 (= *Ervatamia divaricata*)].

DESCRIPTION.—Herb, 3–8 dm high, puberulent. Leaves opposite. Petioles 3–5 mm long. Blades oblong to obovate, 3.5–5 × 1.5–2.5 cm, cuneate at base, rounded and apiculate at tip, chartaceous. Flowers axillary, paired. Calyx lobes subulate, 2–3 mm long. Corolla salverform, white or rose, often with a white, red, or yellow center; tube 2.5 cm long; lobes obovate, 1.5 × 1.2 cm, rounded, sinistrorse. Follicles 2, 2.5 × 0.5 cm. Seeds oblong, 2 × 1 mm, finely wrinkled.

RANGE.—Society Islands (cultivated): Raiatea: *Moore 207*, Uturoa, alt. 1 m, 13 October 1926, flower (white) and fruit (BISH, 2 sheets; MIN). Borabora: *Grant 5084*, Nunue, Vaitape, alt. 1 m, 18 January 1931, flower (white) (BISH, MIN).

First reported by Pancher (in Cuzent) in 1860. According to Butteaud it was introduced by Bishop d'Axieri. Native of Madagascar. Also cultivated in the Marquesas (!). Naturalized in Makatea, Hawaii, Samoa, and Rarotonga.

LOCAL NAMES.—English: *Periwinkle*, *Madagascar periwinkle*. French: *pervenche*. Samoan: *pua ula*, according to Reinecke (cf. *Fagraea berteriana*).

6. *Ervatamia Stapf*

Ervatamia Stapf in Thistleton-Dyer, Fl. Trop. Afr. 4(1):126. 1902.

TYPE-SPECIES.—*Ervatamia divaricata* (L.) Burkill.

RANGE.—About 30 species, from tropical Africa through Asia to Australia and Polynesia.

Key to the Species of *Ervatamia* in the Society Islands

- Stamens in middle of corolla tube, flowers usually double, cultivated.....1. *E. divaricata*
Stamens near base of corolla tube, flowers single, native.....2. *E. orientalis*

1. *Ervatamia divaricata* (L.) Burkill

Nerium divaricatum L., Sp. Pl. 1:209. 1753.
Nerium coronarium Jacquin, Icon. Pl. Rar. t.52. 1781.
Tabernaemontana coronaria Willdenow, Enum. Hort. Berol. 275. 1809.—Hillebrand, Fl. Haw. Is. 294. 1888.
Tabernaemontana divaricata (L.) R. Brown ex Roemer and Schultes, Syst. Veg. 4:427. 1819.—Setchell, Univ. Cal. Pub. Bot. 12:210. 1926.—Wilder, Bish. Mus. Bull. 86:89. 1931; Bish. Mus. Bull. 120:40. 1934.—F.B.H. Brown, Bish. Mus. Bull. 130:234. 1935.

Ervatamia coronaria Stapf in Thistleton-Dyer, Fl. Trop. Afr. 4(1):127. 1902.

Ervatamia divaricata (L.) Burkill, Rec. Bot. Surv. India 10:320. 1925.

DESCRIPTION.—Shrub to 2 m, glabrous. Leaves opposite, with intrapetiolar stipules. Petioles 1–1.5 cm long. Blades oblong or elliptical, 10–16 × 4–7 cm, cuneate at base, abruptly long acuminate at apex, green above, pale below, chartaceous, with about 9 lateral veins. Cymes axillary, about 5-flowered. Pedicels 1–2.5 cm long. Calyx tube 1 mm long, lobes ovate, 2–2.5 mm long, acute, scarious margined. Corolla salverform, white, usually

double, fragrant; tube 2–2.5 cm long; lobes broadly ovate, 2–3.5 cm long, often with crisped edges. Follicles 2 (apparently not maturing here), 2.5–7.5 × 0.6 cm, pilose.

RANGE.—Society Islands (cultivated): Tahiti: *Setchell 554*, Papeete, 13 July 1922, flower (UC); *Grant 4126*, Papeete, 12 September 1930, flower (BISH, MIN). Raiatea: *Moore, 306*, south of Faaroa, 15 November 1926, flower (BISH, 2 sheets; MIN).

Native of tropical Asia. First introduced into the Society Islands at Moorea, by "Makatavishia" (a Mr. MacTavish ?), according to native informants. Also cultivated in the Marquesas (!), Makatea (!), Rarotonga (!), and Hawaii.

LOCAL NAMES.—Tahitian: *tiare moorea* (also in Rarotonga and Makatea, according to Wilder) or *potii moorea*, both meaning "flower of Moorea." English: *crape-jasmine*, *rosebay*.

2. *Ervatamia orientalis* (R. Brown) Turrill

Tabernaemontana citrifolia sensu G. Forster, Prod. 20. 1786b.—Endlicher, Ann. Wien Mus. 1:175. 1836 [non L., Sp. Pl. 1:210. 1753].

Tabernaemontana orientalis R. Brown, Prod. 468, 1810.—Seemann, Fl. Vit. 159. 1866.—Nadeaud, Enum. Pl. Tahiti 56. 1873.—Butteaud, Fl. Tahiti. 58. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:235. 1892; Fl. Polyn. Franc. 125. 1892.—Hemsley, Journ. Linn. Soc. Bot. 30:185. 1894.—Reinecke, Bot. Jahrb. 25:668. 1898.—Burkill, Journ. Linn. Soc. Bot. 35:46. 1901.—Rechinger, Denks. Akad. Wien 85: 332. 1910.—Wilder, Bish. Mus. Bull. 120:40. 1934.—Christophersen, Bish. Mus. Bull. 128:180. 1935.

Tabernaemontana vitiensis Seemann, Bonpl. 9:257. 1861.

Ervatamia orientalis (R. Brown) Turrill, Journ. Linn. Soc. Bot. 43:32. 1915.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:59. 1924.

DESCRIPTION.—Shrub, glabrous. Leaves opposite. Petioles 1–2 cm long. Blades ovate to obovate, 10–15 × 5–6 cm, attenuate at base, acuminate, glaucous below. Cymes trichotomous, few-flowered. Peduncles 8–10 cm long, slender. Pedicels short. Flowers about 2 cm long. Calyx lobes acute, glandular at base. Corolla salverform, lobes ovate oblong. Follicles geminate, divaricate, obovate, falcate, keeled, to 4 cm long and 1.3 cm wide, beaked.

Rechinger has described a var. *dilatata* from Samoa, with wider elliptical-rotund leaves, having 9–10 secondary nerves.

RANGE.—Society Islands: Tahiti: *Banks* (BM,

fide Seemann); *Vesco* in 1847 (P, fide Drake del Castillo); *Ribourt* ca. 1850 (P, fide Drake del Castillo); *Nadeaud 370*, Papara, Papaihonu, alt. 500 m, cliffs, in 1856–1859 (P, fide Drake del Castillo).

We have not seen this from the Society Islands. Wilder has reported it from Makatea (*Wilder 1203*, alt. 60 m (200 ft), 27 October 1932, fruit, (BISH). Ranges through Samoa (!), Tonga (!) and Fiji (!) west to Australia, Malaya, and Madagascar (Schumann).

LOCAL NAMES.—Tahitian: *faiata* (Nadeaud). Wilder records the same name in Makatea.

7. *Alyxia Banks* ex R. Brown

Alyxia Banks ex R. Brown, Prod. 469. 1810 [nom. cons.]. *Gynopogon* J. R. & G. Forster, Char. Gen. 35, t.18. 1776 [nom. rejic.].

TYPE-SPECIES.—*Alyxia spicata* R. Brown. *Gynopogon stellatum* J. R. & G. Forster is the type of Forster's genus.

DESCRIPTION.—Shrubs, usually scandent. Wood, bark, foliage, and flowers fragrant. Leaves opposite or in whorls of 3, prevailingly elliptical, broad or narrow, entire, glabrous, shining, obtuse, with prominent midrib and inconspicuous secondary veins. Cymes axillary with 3 or 4 flowers borne umbellately on the peduncle. Bracts at the base of the pedicels, minute, ovate, subacute. Calyx deeply 5-lobed; lobes ovate-lanceolate, obtuse, ciliate at tip. Corolla salverform, greenish or yellowish white; tube slightly expanded at the position of the anthers, villous within in the upper half, constricted at the throat; lobes 5, sinistrorsely contorted, usually asymmetrical, rounded, ciliate at the tip. Stamens 5, included in the upper part of the corolla tube; filaments 0.3–0.5 mm long; anthers lanceolate, 1 mm long. Ovaries 2 usually villous at the base, few-ovuled; style single, glabrous; stigma ovate, erect-bearded at the tip. Drupes geminate, frequently only 1 maturing, ellipsoidal, ventrally flattened, short-beaked, usually 1-seeded, occasionally 2 seeds maturing to form a moniliform fruit. Placenta intrusive; endosperm ruminate.

RANGE.—About 65 species, from Madagascar east to China, Australia, and Polynesia. Three species in the Society Islands, of which two extend

west to Fiji, and one is endemic. One endemic species each in Hawaii, Rarotonga, Samoa, and Fiji, one that occurs in Samoa and Fiji (*A. erythrosperma* Gillespie), and one that is found in Samoa, Tonga, and Fiji (*A. bracteolosa* Rich ex Gray).

ETHNOBOTANY.—Tahitian: *maire*. Variants of this are *monoi maire* (Wilder), and *maire makatea* or *maire maatea*, the plant being common on Makatea (Maatea in Tahitian). Grant was given the name *pitoa* both in Tahiti and Borabora. It

has been called *torotea* by confusion with *Canthium*. Samoan: *lau maile* (Reinecke, Christophersen), *gau* and *gau lili* (Setchell), *ngau* and *lava* (Christophersen). Hawaiian: *maile* (*A. oliviformis* Gaudichaud). Frequently employed in garlands both for the bright green leaves and the fragrant flowers, whose odor is variously described as like sweet clover, bitter almonds, or gardenias. The leaves were used in making coconut oil perfume (*monoi*). Lanessan states that the bark furnishes a remedy for rheumatism.

Key to the Species of *Alyxia* in the Society Islands

1. Leaves narrow, prevailing under 1.5 cm wide, and over 3.5 times as long as wide; flowers 6–9 mm long; corolla lobes approximately 1.5 times as long as broad; petioles 1–2 mm long.....1. *A. stellata*
1. Leaves prevailing broad, over 1.5 cm wide, and less than 3.5 times as long as wide; petioles 1.5 mm long.
 2. Flower 10–15 mm long, corolla lobes approximately twice as long as broad; blades 2.2–3 times as long as wide.....2. *A. scandens*
 2. Flowers 8.5–9 mm long; corolla lobes approximately as long as broad; blades 1.8–2 times as long as wide.....3. *A. latilimba*, new species

1. *Alyxia stellata* (J. R. & G. Forster) Roemer & Schultes

Gynopogon stellatum J. R. & G. Forster, Char. Gen. 36, t. 18. 1776.—G. Forster, Prod. 19. 1786b.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:233. 1892; Fl. Polyn. Franc. 122. 1892.—Schumann in Engler & Prantl, Nat. Pflanzenf. 4 (2):151. 1895.—Rechinger, Denks. Akad. Wien 85:331. 1910.

Alyxia stellata (J. R. & G. Forster) Roemer and Schultes, Syst. Veg. 4:439. 1819.—Richard, Sert. Astrolab. 2:8. 1834.—Endlicher, Ann. Wien Mus. 1:175. 1836.—Guillemin, Ann. Sci. Nat., ser. 2, 7:247. 1837.—A. de Candolle, Prod. 8:346. 1844.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Gray, Proc. Am. Acad. 5:333. 1862c.—Seemann, Fl. Vit. 157. 1866.—Nadeaud, Pl. Us. Tahiti. 37. 1864; Enum. Pl. Tahiti 56. 1873.—Lanessan, Pl. Ut. Col. Franc. 865. 1886.—Butteaud, Fl. Tahiti. 59. 1891.—Hemsley, Journ. Linn. Soc. Bot. 30:184. 1894.—Burkill, Journ. Linn. Soc. Bot. 35:45. 1901.—Gibbs, Journ. Linn. Soc. Bot. 39:156. 1909.—Setchell, Carn. Inst. Dep. Mar. Biol. 20:58. 1924.—Christophersen, Bish. Mus. Bull. 128:184. 1935 [non F.B.H. Brown, 1935 = *A. scandens*].

Gynopogon oliviformis sensu Reinecke, Bot. Jahrb. 25:667. 1898.—Rechinger, Denks. Akad. Wien 85:331. 1910 [non Schumann, 1895; nec. *A. oliviformis* Gaudichaud, 1829].

Gynopogon oliviformis subsp. *apolimae* Rechinger, Denks. Akad. Wien 85:331, t. 6, f. 1. 1910 [erroneously cited both by Rechinger, except sub. t. 6, and the Kew Index as *G. apolimae*, syn. nov.].

DESCRIPTION (based on the specimens cited).—

Shrub, 1–2 m high, glabrous. Twigs terete or somewhat angled, 1.5–2 mm in diameter, usually rich brown in color, varying to gray. Lenticels frequently prominent. Leaves opposite (most commonly) or in threes, both types frequently on the same shoot, though on any ultimate branch the arrangement is constant. Petioles 1–2 mm long. Blades narrowly elliptical to oblanceolate, 3.3–8 × 0.6–1.5 cm, commonly 5–6 (3.3–7.5) times as long as wide, cuneate at base, margin slightly revolute, frequently drying rather dull green. Peduncles 5–15 mm long. Pedicels 4–8 mm long. Calyx tube 0.4–0.5 mm long, lobes 0.7–1 mm long. Corolla 6–9 mm long; tube 4–5.5 mm long, enlarged slightly above the middle, cream-yellow; lobes 2.3–3 × 1.8–2.3 mm, i.e., approximately 1.5 times as long as broad. Drupes 1-seeded, 12–16 × 9–12 mm long, dull gray-green, turning bluish black, beak to 2 mm long. Ovaries 0.5 mm long, villose at base; style 2 mm (or somewhat more) long; stigma 0.5 mm long.

The Forsters originally described this and the following as the only two species in their genus *Gynopogon*. From the Forster manuscript description, published by Guillemin (1837:247) it is clear that the genus was based primarily on this

species, and that Forster's figure is of this species rather than of *G. scandens*, for he gives a very long description of the flowers of *G. stellatum*, and for *G. scandens* merely says "Flores albi, contorti, simillimi floribus *G. stellati*. Fructificatio tota eadem."

J. R. & G. Forster distinguished the two species in 1776 as "Stellatum. *G. foliis verticillatis*" and "Scandens. *G. foliis oppositis*," and in all the keys that Grant saw, which pretend to separate the two, this is the only character that has been used. However, it appears to be of no value as a distinction. The seven collections cited below include three which have leaves constantly opposite, one having them constantly verticillate (*Grant 5216*), and three showing both arrangements. Nowhere in the literature until Rechinger (1910:331) mentioned "plerumque ternis", followed by Christophersen (1935:184), "usually ternate," did this irregularity, which in itself is nothing remarkable, appear to be noticed, and both of these references deal with the Samoan plant (see below). Similarly, of the 10 collections cited below as *A. scandens*, three have leaves opposite, three verticillate, and four both.

In his *Prodromus*, G. Forster (1786b) amplified his description of *G. stellatum* with the word "lancoelatis," and of *G. scandens* with "ovatis costatis," and it is this difference in leaf shape which primarily is being used to differentiate the two species. The rest of G. Forster's later-published description seems to offer little or nothing that will serve to differentiate the two, except possibly "subtus pallide viridia" (*G. scandens*), which is more characteristic of that species as Grant interpreted it than of *A. stellata*. We are very doubtful of the value of the size of the flowers, which has been used in the key above (in which connection see also the remarks under *A. scandens*), but G. Forster's plate, presumably of *A. stellata*, represents the flowers as of about the minimum length given here for that species, while the available flowering material (which on the basis of leaf-shape is referred to *A. scandens*) has much larger corollas. It is a temptation to combine the two and treat the genus in the Society Islands as one very variable species, as is generally done in Hawaii (*A. oliviformis* Gaudichaud). Even though the Hawaiian material is just as variable, the two extremes are remarkably distinct, and, in addition, there appears

to be another entity (*A. latilimba*, new species) in Borabora and Tahaa.

TYPE.—Collected by Forster in 1773–1774 in the Society Islands or in Tonga, there being a specimen of Forster's in the British Museum from the latter locality, according to Seemann.

RANGE.—Society Islands: Forster in 1773–1774 (P, fide Drake del Castillo, WU, fide Rechinger). Tahiti: Bertero and Moerenhout in 1831–1832 (P, fide Drake del Castillo); *U. S. Exploring Expedition* in 1839 (fide Gray); *Lépine 191*, Taravao, Vairoa, 800–1000 m, in 1847 (P, fide Drake del Castillo); *Savatier* in 1855 (P, fide Drake del Castillo); *Nadeaud 367*, Mahaena, Tuumatairiri and Mt. Aorai, alt. 1000 m and over, July 1857, flower (P, fide Drake del Castillo); *Quayle 56*, "South Pacific" (from the field numeral it is presumed this was from Mt. Aorai), sterile (BISH); *Grant 3701.1*, Mahina, Mt. Aorai, alt. 1225 m (4028 ft), *Vaccinium-Weinmannia* scrub, 4 June 1930, fruit (BISH, MIN). Moorea: *U. S. Exploring Expedition* in 1839 (fide Gray). Raiatea: *Moore 69*, Uturoa, alt. 190 m, 16 September 1926, flower and fruit (BISH, MIN); *Moore 538*, south of Uturoa, alt. 250 m, dry ridge, 15 January 1927, fruit (BISH, MIN); *Grant 5200*, Avera, Mt. Temehani, alt. 435 m (1430 ft), ridge scrub, 29 January 1931, flower and fruit (BISH, MIN); *Grant 5216*, Avera, Faaharato, alt. 580 m (1910 ft), ridge scrub, 29 January 1931, fruit (BISH, MIN); *St. John 17299*, Mt. Temehani, alt. 600 m, high moor, 5 October 1934, flower and fruit (BISH).

Also occurring in Samoa, Tonga, and Fiji. The Samoan material, of which Grant saw 22 collections, includes much that, on the basis of leaf shape at least, is *A. scandens*. Another reason for thinking so is that both Rechinger and Christophersen record the plant as a climber in Samoa, and this habit has not been recorded in the Society Islands for this species. Most of the Samoan species have the leaves constantly in threes, as described by the Forsters. The four collections from Fiji in the Bishop Museum appear to belong here. We have seen no material from Tonga, although it has been reported from there many times.

The report from the Marquesas and the Austral Islands (F.B.H. Brown, 1935) is based on what we would name *A. scandens*. Hemsley records it from the Tuamotus, but the only specimens we

have seen from there [Makatea] also appear to be *A. scandens*. Labillardière's New Caledonia record is generally recognized as a distinct species; at least it has been renamed several times. Reports from Java, the Malay Peninsula, India, etc., also are referable to other species.

2. *Alyxia scandens* (J.R. & G. Forster) Roemer & Schultes

Galaxa oppositifolia Park nson, Journ. Voy. Endeav. 38. 1773 [nomen subnudum, new synonym (genus and species not in Kew Index)].

Gynopogon scandens J. R. & G. Forster, Char. Gen. 36. 1776.—G, Forster, Prod. 19. 1786b.—Reinecke, Bot. Jahrb. 25:668. 1898.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:232. 1892; Fl. Polyn. Franc. 122. 1892.

Alyxia scandens (J. R. & G. Forster) Roemer and Schultes, Syst. Veg. 4:440. 1819.—Sprengel, Syst. Veg. 1:835. 1825.—Hooker and Arnott, Bot. Beech. Voy. 66. 1832.—Endlicher, Ann. Wien Mus. 1:175. 1836.—Guillemin, Ann. Sci. Nat., ser. 2, 7:247. 1837.—Gray, Proc. Am. Acad. 5:333. 1862c.—Seemann, Fl. Vit. 157. 1886.—Nadeaud, Pl. Us. Tahiti. 37. 1864; Enum. Pl. Tahiti 56. 1873.—Lanessan, Pl. Ut. Col. Franc. 865. 1886.—Hemsley, Journ. Linn. Soc. Bot. 30:184. 1894.—Gibbs, Journ. Linn. Soc. Bot. 39:156. 1909.—Setchell, Univ. Cal. Pub. Bot. 12:201. 1926.—Wilder, Bish. Mus. Bull. 120:40. 1934.—F.B.H. Brown, Bish. Mus. Bull. 130:232. 1935.

Alyxia stellata Roemer & Schultes sensu F.B.H. Brown, Bish. Mus. Bull. 130:232. 1935 [non Roemer & Schultes, 1819].

DESCRIPTION.—Shrub, 1.5–3 m, usually erect, occasionally climbing. Twigs terete or somewhat angled, 1.5–2 mm in diameter, pale brown, gray, or somewhat purplish in color. Lenticels usually not prominent. Leaves opposite or in threes, the two arrangements equally common and often on the same plant. Petioles 1–5 mm long. Leaves broadly elliptical or ovate-lanceolate, 5.5–9 × 1.5–3 cm, commonly 2.5–3 (2.2–3.6) times as long as wide, cuneate to rounded at base, usually somewhat attenuate at the tip, margin slightly revolute, frequently drying a bright yellow-green, and paler beneath. Peduncles 4–18 mm long. Pedicels 3–12 mm long. Flowers fragrant. Calyx tube 0.5–0.8 mm long, lobes 1.2–1.3 mm. Corolla 10–15 mm long; tube 5–9 mm long, widest 2–3 mm below the throat, orange to peach in color; lobes 5.5 × 2.3–3 mm, approximately twice as long as broad, entire or slightly sinuate, cream-colored or greenish white. Ovaries 0.5–1 mm long, villous at base; style 4.5–6 mm long, glabrous; stigma ellipsoid to

obovate, 0.6–0.7 mm long, bearded. Drupes 1- (rarely 2-) seeded, 14–19 × 12–15 mm.

As indicated by the remarks above (under *A. stellata*), these species are questionably distinct. The three Orofena specimens collected by St. John are intermediate between the two.

Guillemin records a "*Meliola*" on the leaves of Forster's type, and *Grant 4389* is parasitized, but the fungus has not been determined.

TYPE.—Collected by *Forster* in Tahiti in 1773–1774.

RANGE.—Society Islands: *Nelson* (BM, fide Seemann); *Wiles and Smith* (BM, fide Seemann); *Lay and Collie* in 1826 (fide Guillemin). Tahiti: *Forster* in 1773–1774 (BM, fide Seemann); *U. S. Exploring Expedition* in 1839 (fide Gray); *Vesco* 1847 (P, fide Drake del Castillo); *Lépine 192* in 1847 (P, fide Drake del Castillo); *Ribourt 43* ca. 1850 (P, fide Drake del Castillo); *Pancher* in 1855 (P, fide Drake del Castillo); *Nadeaud 368*, rocky cliffs, in 1856–1859 (P, fide Drake del Castillo); *Setchell and Parks 345*, pro parte, Paea, Orofere, Tarevareva, 13 June 1922, fruit (BISH); *Setchell and Parks 493*, Papeari, Maara, 29 June 1922, fruit (UC, not seen); *Grant 3907*, Teahupoo, Mt. Ronui, alt. 590 m (1935 ft), *Weinmannia-Pandanus-Cyathea* forest, 2 July 1930, flower and fruit (BISH, MIN); *Grant 4389*, Mahina, Ahonu-Tuauru, alt. 1050 m (3460 ft), *Weinmannia-Ilex* forest, 5 November 1930, immature flowers and fruit, wood specimen (BISH, MIN); *Grant 4483*, Hitiaa, Tevaipoe, alt. 310 m (1010 ft), *Hibiscus-Neonauclea* forest, 15 November 1930, flower (BISH, MIN); *St. John and Fosberg 16990*, Mt. Orofena, south ridge, alt. 1600 m, mossy ridge, 22 September 1934, flower (BISH); *St. John and Fosberg 16995*, Mt. Orofena, south ridge, alt. 1500 m, rain forest, flower and fruit (BISH); *St. John and Fosberg 17044*, Mt. Orofena, south ridge, alt. 1250 m, wooded ridge, 20 September 1934, immature flowers (BISH); *St. John and Fosberg 17030*, Mt. Orofena, south ridge, alt. 1250 m, 20 September 1934, *Cyathea* forest, flower (BISH). Moorea: *U. S. Exploring Expedition* in 1839 (fide Gray). Raiatea: *Moore 506*, south of Faaroa, alt. 200 m, wet clay, 10 January 1927, fruit (MIN); *St. John 17257*, Mt. Temehani, alt. 600 m, high moor, 5 October 1934, fruit (BISH).

Reported from Samoa by Reinecke, and apparently much of the material reported by Christo-

phersen (1935) as *A. stellata* belongs here. Recorded from Fiji by Seemann and Gibbs. A collection from Uvea (*Burrows* 25, 9 November 1932, sterile, BISH) matches the Samoan specimens. Also reported from the Tuamotus (*Savatier* in 1855, fide Drake del Castillo; *Wilder* 1143 and *Jones* 905, both from Makatea, BISH). There are 7 collections from the Marquesas in the Bishop Museum, 4 of which are cited by F.B.H. Brown as *A. stellata*. Collected in Rapa, Rurutu, and Rai-vaivai (cited by Brown as *A. stellata*).

3. *Alyxia latilimba* Grant, new species

Frutex, 1.5–2 m altus, glaber, ramulis triangulatis vel subalatis, 2–3 mm crassis; folia verticillata terna sessilia vel petiolata, petiolis ad 4 mm longis, laminis late obovatis ellipticis vel vix ovatis 3.5–5.6 cm longis 2–3 cm latis basi cuneatis vel subrotundatis apice obtusis interdum parum attenuatis coriaceis nitentibus lutei-viridibus subtus pallidi-oribus margine revolutis; cymae axillares 4-floriferae, pedunculis 10–15 mm longis, pedicellis 5 mm longis; calyx viridis tubo 0.4 mm longo, lobis ovati-lanceolatis 1.2–1.5 mm longis obtusis apice ciliolatis; corolla infundibulariforma lutea, tubo 5.5–6.5 mm longo 1–1.5 mm infra faucem parum dilatato parte supera intus villosa, lobis ovatis vel suborbiculatis parum asymmetricis 2.8–3 mm longis 2.5–3 mm latis, apice rotundatis ciliolatis; stamina filamentis 0.3–0.5 mm longis, antheris ovati-lanceolatis 1 mm longis includentibus; ovaria bina 0.6 mm longa basi longe villosa; stylus singulus 4–4.5 mm longus glaber; stigma ovatum 0.6 mm longum barbatum; drupae geminatae ellipticae vel subgloboseae (vel saepe dispermae moniliformae) 13 mm longae 12 mm latae 9 mm crassae parum apiculatae.

Shrub, 1.5–2 m high, glabrous. Twigs prominently 3-angled or subwinged, 2–3 mm thick, brown or gray, lenticels not prominent. Leaves verticillate, in 3's, sessile or on petioles to 4 mm long, broad, obovate, elliptical or scarcely ovate, 3.5–5.6 × 2–3 cm, cuneate or rounded at base, obtuse and occasionally somewhat attenuate at the tip, coriaceous, shining, yellowish green, somewhat paler below, revolute, with 14–18 inconspicuous lateral veins. Cymes 4-flowered, peduncles 10–15 mm long, pedicels 5 mm long. Calyx tube 0.4 mm long; lobes

ovate-lanceolate, 1.2–1.5 mm long, obtuse, ciliolate at the tip. Corolla salverform, yellow; tube 5.5–6.5 mm long, slightly expanded 1–1.5 mm below the throat; lobes ovate to suborbicular, somewhat asymmetrical, 2.8–3 × 2.5–3 mm, rounded at the tip, which is faintly ciliolate. Filaments 0.3–0.5 mm long; anthers ovate-lanceolate, 1 mm long, acute. Ovaries 2, 0.6 mm long, long-villous at the base; style 4–4.5 mm long; stigma ovoid, 0.6 mm long, bearded at the tip. Drupes (submature?) geminate, elliptical or subglobose (when 1-seeded), flattened ventrally, 13 × 12 × 9 mm, frequently moniliform (2-seeded) and then longer, minutely or not at all beaked, greenish. Embryo 7 mm long; cotyledons curved.

In leaf shape the species is rather close to *A. scandens*, but the leaves are much broader in proportion, more coriaceous, and somewhat more conspicuously revolute. The flowers are about $\frac{2}{3}$ as large and the corolla lobes about half as long as in *A. scandens*. The species is named with reference to the broad blades and broad corolla lobes.

The St. John specimens cited below probably belong here, though we have no record of the shape of the corolla lobes. If these specimens do belong here the plant may reach 3 m tall and the ripe fruit is black, becoming 17 mm long.

RANGE.—Society Islands: Borabora: *Grant* 4964, Tevaitapu, Mt. Tarapaia, alt. 560 m (1840 ft), ridge scrub, 3 January 1931, flower and fruit (BISH, type; MIN). Tahaa: *Grant* 5162, Ruutia, Mt. Ohiri, alt. 465 m (1525 ft), *Morinda-Crossostylis* forest, 25 January 1931, flower and fruit (BISH, MIN); *St. John* 17397 and 17402, Mt. Purauti, alt. 420–500 m, ridge thicket, 11 October 1934, flower and fruit (17397), fruit (17402) (BISH).

LOCAL NAME.—Borabora and Tahaa: *pitoa*.

8. *Ochrosia* Jussieu

Ochrosia Jussieu, Gen. Pl. 144. 1789.

TYPE-SPECIES.—*Ochrosia borbonica* (Sprengel) Gmelin.

RANGE.—Numerous species from the islands of the Indian Ocean east to Polynesia. There are several Polynesian species in Fiji, Hawaii and the Marquesas.

1. *Ochrosia oppositifolia* (Lamarck) Schumann

Cerbera oppositifolia Lamarck in Lamarck & Poiret, Encyc. Method. 1:62. 1783.

Cerbera parviflora G. Forster, Prod. 19. 1786b.—Endlicher, Ann. Wien Mus. 1:174. 1836 [excl. spec. Lay and Collie from Sandwich Islands; non Hooker and Arnott, 1832 (= *Rauwolfia sandwicensis*)].

Ochrosia parviflora (G. Forster) Henslow, Ann. Nat. Hist. 1:345. 1838.—Don, Gen. Syst. 4:99. 1838 [excl. syn. Hooker and Arnott].—Gray, Proc. Am. Acad. 5:333. 1862c.—Seemann, Fl. Vit. 158. 1866.—Nadeaud, Enum. Pl. Tahiti 55. 1873; Trans. Proc. N.Z. Inst. 6 (App.):lxvi. 1874.—Butteaud, Fl. Tahiti. 59. 1891.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:233. 1892; Fl. Polyn. Franc. 124. 1892.—Hemsley, Journ. Linn. Soc. Bot. 30:184. 1894.—Burkill, Journ. Linn. Soc. Bot. 35:46. 1901.—Christophersen, Bish. Mus. Bull. 128:185. 1935.—F.B.H. Brown, Bish. Mus. Bull. 130:232, t. 83. 1935.

Ochrosia oppositifolia (Lamarck) Schumann in Engler & Prantl, Nat. Pflanzenf. 4 (2):156. 1895.—Rock, Coll. Haw. Bull. 4:52. 1916.

Ochrosia borbonica sensu Maiden, Proc. Linn. Soc. N.S. Wales 29:547. 1904 [non Gmelin, 1791].

DESCRIPTION.—Shrub or small tree to 10 m high, glabrous. Leaves in whorls of 3–4. Petiole 1 cm long. Blades oblong or obovate, 10–30 × 3–12.5 cm, attenuate at the base rounded or acuminate, coriaceous. Cymes subdichotomous, 3–5-flowered. Bracts opposite, ovate, short, acute. Calyx cup-shaped, 3 mm long, angled; lobes 5, ovate, obtuse. Corolla salverform; tube enlarged above the middle, 12 mm long, glabrous within, greenish white; lobes oblong-linear, oblique, 12 mm long, obtuse, white. Stamens inserted slightly above the middle of the tube, included. Ovaries 2, flat anteriorly, convex exteriorly, 8-ovuled. Styles shorter than the tube. Stigma single, ovate-oblong, subulate at tip. Drupes geminate, horizontally spreading, ovate-oblong, somewhat compressed, 5–7 × 2–3 cm, yellow, with dry spongy-fibrous mesocarp, 2-celled with a membranaceous septum, 1 cell usually enlarged. Seeds solitary, oblate, compressed.

According to Rock, if his plant is this species, it becomes a tree with trunks 2 feet in diameter and 50 feet high.

RANGE.—Society Islands: *Banks and Solander* in 1769 (BM, fide Seemann); *Nelson* (BM, fide Seemann). Tahiti: *Vesco* in 1847 (P, fide Drake del Castillo); *Lépine 187*, Pare, Fautaua, alt. 700–800 m (P, fide Drake del Castillo); *Ribourt 45* ca. 1850 (P, fide Drake del Castillo); *Nadeaud 366*,

Arue, or Mahina, Ahonu, alt. 800 m, 1857–1858, flower (P, fide Drake del Castillo).

Drake del Castillo implies a specimen of Dupetit-Thouars came from Tahiti, but it is actually from the Marquesas where Dupetit-Thouars collected extensively. We have seen no material of this from the Society Islands, though there is an abundance of collections in the Bishop Museum from the Marquesas, Rurutu, Tonga, Samoa, Fiji, Uvea, Palmyra. It occurs in Funafuti and west to New Guinea.

ETHNOBOTANY.—Tahitian: *tamore-moua* (Nadeaud, 1873). Marquesan: *hoe*, *hoei*, *eva*, and *kaepu*, according to F.B.H. Brown. (*Eva* is applied to *Cerbera* and *kaepu* to *Fagraea* according to Jardin, 1862). Rurutu: *ao* (Stokes ex F.B.H. Brown). Samoa and Funafuti: *fao* (Christophersen, Maiden). Marianne Islands; *fago* (Markgraf, 1930).

Nadeaud (1874) reports that the plant is good for stomach trouble associated with elephantiasis. Brown says the fruit is considered poisonous in Nukuhiva, but is eaten in Fatuhiva.

9. *Cerbera* L.

Cerbera L. Gen. Pl. 5th ed. 98. 1754.

TYPE-SPECIES.—*Cerbera manghas* L.

RANGE.—About eight species, from Madagascar through Malasia, with one species in Polynesia.

1. *Cerbera manghas* L.

Cerbera manghas L., Sp. Pl. 1:208. 1753.—G. Forster, Prod. 19. 1786b.—Richard, Sert. Astrolab. 2:8. 1834.—Endlicher, Ann. Wien Mus., 1:174. 1836.—Guillemin, Ann. Sci. Nat., ser. 2, 7:245. 1837.—Jardin, Ess. Marq. 25, 42. 1862.—Nadeaud, Pl. Us. Tahiti. 37. 1864.—Lanessan, Pl. Ut. Col. Fr. 865. 1886.—Reinecke, Bot. Jahrb. 25:668. 1898.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:59. 1924; Univ. Cal. Pub. Bot. 12:201. 1926.—Wilder, Bish. Mus. Bull. 86:89. 1931.—Christophersen, Bish. Mus. Bull. 128:185. 1935.—F.B.H. Brown, Bish. Mus. Bull. 130:236. 1935.

Galaxa sparsa Parkinson, Journ. Voy. Endeav. 38. 1773 [nomen subnudum, new synonym (genus and species not in Kew Index)].

Tanghinia manghas (L.) Don, Gen. Hist. 4:98. 1838.—Cuzent, Etud. Vég. Tahiti 129. 1857; Iles Soc. Tahiti 214. 1860.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Butteaud, Fl. Tahiti, 59. 1891 [“*Tanghinia naughas*”].

Cerbera odollam sensu Gray, Proc. Am. Acad. 5:333. 1862c.—Hemsley, Bot. Chall. 1 (1):19. 1885.—Hillebrand, Fl. Haw. Is. 294. 1888.—Drake del Castillo, Ill. Fl. Ins. Pac. 7:233.

1892; Fl. Polyn. Franc. 123. 1892 [*"C. odolla"*].—Hemsley, Journ. Linn. Soc. Bot. 30:184. 1894.—Burkill, Journ. Linn. Soc. Bot. 35:46. 1901.—Cheeseman, Trans. Linn. Soc. 6:287. 1903.—Gibbs, Journ. Linn. Soc. Bot. 39:157. 1909 [non J. Gaertner, 1791].
Cerbera forsteri Seemann, Fl. Vit. 157. 1866.—Nadeaud, Enum. Pl. Tahiti 55. 1873.—Butteaud, Fl. Tahiti. 59. 1891.

DESCRIPTION.—Tree, 15–20 m high and 60 cm in diameter, glabrous. Sap milky, poisonous. Twigs thick, succulent, with the alternate leaves clustered at the tips. Petioles 2–4 (–7?) cm long. Blades elliptical to oblanceolate, 12–30 × 3–5.5 cm, cuneate at the base, obtuse and slightly attenuate at the tip, chartaceous, green, drying black. Cymes terminal, 5- or more-flowered. Peduncles 4–12 cm long; pedicels 1.5–2.5 cm long. Sepals 5, elliptical, the outer pair 1.8–2.5 cm long, the inner smaller, rounded at the tip, deciduous before anthesis. Flowers fragrant. Corolla salverform, somewhat irregular, 7 cm broad, white, waxy; tube 1.5–2 cm long, enlarged above; lobes elliptical or obovate, 3 cm long, rounded at the tip. Carpels 2, 1-ovuled. Drupes geminate, elliptical, flattened anteriorly, 10 × 7 × 6 cm (*Grant 4016*) or smaller, green, turning dark red or purple, with spongy-fibrous mesocarp, floating, 1–2-seeded.

The above description is of the Tahitian specimens. F.B.H. Brown's description of the Marquesan material indicates shorter pedicels, broader leaves, longer calyx lobes, pink-centered flowers, and longer corolla-lobes. Christophersen's Samoan specimens have even longer calyx-lobes and corolla-tubes.

RANGE.—Society Islands: *Forster* in 1773–1774. Mehetia: *St. John 14225*, Fatia-po, alt. 200 m, 12 May 1934, flower and fruit (BISH).

Tahiti: *Bertero and Moerenhout* in 1831–1832 (P, fide Drake del Castillo); *Wiles and Smith* (BM, fide Seemann); *Vesco* in 1847 (P, fide Drake del Castillo) *Lépine 204* in 1847 (P, fide Drake del Castillo); *Setchell and Parks 324*, Papenoo, 9 June 1922, fruit (UC); *Setchell and Parks 353*, Puna-uaia, Punaruu, 9 June 1932, flower (UC); *Adams-son 28*, Papenoo, alt. 500 m, 30 October 1928, sterile (BISH); *Grant 4016*, Teahupoo, Taaha, alt. 75 m (250 ft), *Hibiscus-Cerbera* forest, 8 August 1930, flower, fruit (BISH, MIN); *Grant 4077*, Papenoo, Ana Pua, alt. 370 m (1220 ft), *Cerbera-Pandanus* forest, 6 September 1930 (BISH, MIN).

Raiatea: *Moore 420*, south of Faaroo, alt. 150 m, 11 December 1926, flower and fruit (BISH, MIN).

Borabora: *Lesson* (P, fide Drake del Castillo). A common tree of the lower forests, extending far into the interior at low elevations. It is certainly indigenous, in spite of Gray's statement to the contrary.

Also in the Marquesas (!) Pitcairn, Gambiers, Samoa (!), Tonga (!), Fiji (!), Uvea (!), and west to Malesia. Cultivated in Hawaii. In Rarotonga it was considered indigenous by Cheeseman, but Wilder says, ". . . introduced . . . seen about dwellings."

ETHNOBOTANY.—Tahitian and Rarotongan: *reva*, which is the name throughout all of Polynesia, becoming by regular consonant shift *eva* in the Marquesas, *leva* in Samoa, and *rewa* in Fiji. Alternative Tahitian names are given by Parkinson (*deva*, an obvious error), Nadeaud (*hutureva*, the *hutu* being *Barringtonia*), and Setchell (*metua-reva* and *reva-reva*). Also *ava* in Rarotongan (Cheeseman) and *vasa* in Fijian (Seemann). It becomes *ereva* in Rurutu (Stokes ex F.B.H. Brown), and *ria* in Yap (Volkens). The latex contains a violent poison, and eating the fruits used to be a favorite method of committing suicide. Jardin records the same custom in the Marquesas. The plant, either bark (Nadeaud) or root (Seemann), was used as a purgative, and the latex for various medications, such as a liniment for rheumatism (Cheeseman). The wood was used for drums (Parkinson).

10. *Thevetia* Adanson

Thevetia Adanson, Fam. 1:171. 1763 [nom. cons.].

TYPE-SPECIES.—*Thevetia ahouai* (L.) A. de Candolle.

RANGE.—About eight species in tropical America.

1. *Thevetia peruviana* (Persoon) Schumann

Cerbera thevetia L., Sp. Pl. 1:209. 1753.

Cerbera peruviana Persoon, Syn. Pl. 1:267. 1805.

Thevetia nereifolia [*neriifolia*] Jussieu ex Steudel, Nom. Bot. 2nd ed. 2:680. 1841.—Hillebrand, Fl. Haw. Is. 294. 1888.—Rechinger, Denks. Akad. Wien 85:332. 1910; Denks. Akad. Wien 89:637. 1913.—F.B.H. Brown, Bish. Mus. Bull. 130: 235. 1935.

Thevetia peruviana (Persoon) Schumann in Engler & Prantl, Nat. Pflanz. 4(2):159. 1895.—Setchell, Univ. Cal. Pub. 12:

201. 1926.—Wilder, Bish. Mus. Bull. 86:89. 1931.—Christophersen, Bish. Mus. Bull. 128:186. 1935. [This combination, omitted from the Kew Index until the 8th Supplement (1933), was independently published by Merrill in 1914 and is usually attributed to him.]

DESCRIPTION.—Tree, 3–4 m high and 5 cm in diameter, glabrous. Leaves alternate, sessile, linear, 10–15 × 0.6–1 cm, cuneate at base, obtuse at tip, apparently 1-nerved, but microscopically reticulate. Cymes terminal, few-flowered. Pedicels 2–4 cm long. Calyx lobes triangular, 5 mm long, dark glandular within at base. Corolla tubular-campanulate, 6–7 cm long, bright yellow, tube broadly expanded above; lobes 3–4 cm long, dextrorsely contorted. Drupe triangular-obovate, black, poisonous, 2-celled, the stone falcate, broader than long, 2 × 3 cm.

RANGE.—Society Islands (cultivated): Tahiti: *Setchell and Parks 179*, Faavaia, churchyard, 29 May 1922, flower and fruit (BISH, UC); *Grant 4429*, Arue, alt. 5 m, 3 November 1930, flower and fruit (BISH, MIN). Raiatea: *Moore 348*, south of Faaroa, alt. 1 m, 24 November 1926, flower and fruit (BISH, 2 sheets; MIN); *Moore 749*, 20 March 1926, flower (BISH).

Also cultivated in the Marquesas (!), Rarotonga, Samoa (!), and Hawaii (!). Reported as an escape in Samoa [and in Kauai, Hawaiian Islands].

LOCAL NAMES.—English: *trumpet-flower*, *yellow oleander*. Tahitian: Grant reported the name *poupou* ("land-shell," i.e., *Partula*) in Huahine, apparently applied on account of the shape of the stone. Moore reports *piti* in Raiatea (as for *Allamanda*), the name applied by extension from *Tecoma* which has somewhat similar flowers. [Hawaii: "bestill tree."]

II. *Nerium* L.

Nerium L., Gen. Pl. 5th ed. 99. 1754.

TYPE-SPECIES.—*Nerium oleander* L.

RANGE.—The Mediterranean region to Japan. The one or two following well-known species are cultivated in Polynesia. There are possibly three other species, native to southern Asia.

I. *Nerium oleander* L.

Nerium oleander L., Sp. Pl. 1:209. 1753.—Pancher in Cuzent, Iles Soc. Tahiti 235. 1860.—Hillebrand, Fl. Haw. Is. 294.

1888.—Butteaud, Fl. Tahiti. 58. 1891.—Cheeseman, Trans. Linn. Soc. 6:287. 1903.—Setchell, Carn. Inst. Dep. Mar. Biol. Bull. 20:59. 1924.—Christophersen, Bish. Mus. Bull. 128:186. 1935.—St. John, Bish. Mus. Occ. Pap. 11(14):4. 1935.

Nerium indicum Miller, Gard. Dict. 8th ed. 1768.—Setchell, Univ. Cal. Pub. Bot. 12:202. 1926.—Wilder, Bish. Mus. Bull. 86:89. 1931; Bish. Mus. Bull. 120:40. 1934.

Nerium odorum (Solander) ex Aiton, Hort. Kew. 1:297. 1789.—F.B.H. Brown, Bish. Mus. Bull. 130:235. 1935.

Nerium haqueville Pancher in Cuzent, Iles Soc. Tahiti 235. 1860 [nomen nudum, apparently intended as a designation of a horticultural variety (name not in Kew Index)].

DESCRIPTION.—Shrub, puberulent. Leaves usually in threes, linear-oblong to -oblanceolate, 10–15 × 1–2 cm, cuneate, acute. Cymes paniculate, terminal. Calyx lobes lanceolate, 6 mm long. Corolla usually filled, white or rose; lobes dextrorsely contorted, generally obovate, often irregular, 2.5–3 cm long. Follicles 2, not (or rarely) maturing.

Nerium indicum and *N. oleander* are commonly treated as separate species, and Schumann (in Engler and Prantl, 1895:180) distinguishes them as "B. lineal-lanzettlich, Bl. wohlreichend -*N. odorum*; B. lanzettlich, Bl. geruchlos -*N. oleander*," but the most obvious of these characters does not show up at all in herbarium specimens. Linnaeus himself originally described *N. oleander* as "foliis lineari-lanceolatis," indicating that even the shape of the leaf is subject to interpretation. Other distinctions have been made on the basis of the length of protrusion of the anther segments and the number of teeth on the segments of the crown.

Others have expressed doubt as to the separability of the species (cf., Merrill, 1935:315). In any case, the Polynesian material seems to be uniform in having odorous flowers, but has been variously interpreted. No taxonomist has yet reported both species from any one locality. Setchell reported *N. indicum* from Tahiti and *N. oleander* from Samoa, but preserved specimens in neither case. Cheeseman reported *N. oleander* from Rarotonga, while Wilder (1931) lists *N. indicum* from that island. Most earlier authors were not aware of Miller's name, *N. indicum*, and called it *N. odorum*.

RANGE.—Society Islands (cultivated): Tahiti: Common, not collected. Raiatea: *Moore 321*, south of Uturoa, 17 November 1926, flower (red) (BISH, MIN); *Moore 388*, south of Uturoa, 1 December 1926, white flowers (BISH, MIN).

Native to southern Asia. The red-flowered form was introduced into Tahiti by the English missionaries and the other forms in 1848 and 1850, according to Pancher. Also cultivated in the Marquesas (!), Rarotonga (!), Samoa, Hawaii (!), and Midway Island. Naturalized in Rarotonga. Reported for the first time from the Tuamotus: *Jones 841*, Niau, 16 August 1922, sterile (BISH, 2 sheets).

LOCAL NAMES.—English: *oleander*. French: *laurier rose* and *laurier blanc*. Tahitian: *tarona*, and the white form *tarona uouo*. Samoan: *oliana* (Christophersen).

History of the Botanical Exploration of the Society Islands¹

HOWARD M. SMITH

The Society Islands lie halfway around the world from Europe and were only discovered in 1767; but by the end of the eighteenth century their flora was relatively well known to European botanists. At first glance, this seems not at all surprising. The century was, after all, one which saw the great voyages of exploration in the Pacific, and the very hallmark of the age was the pursuit of science. Even though long sea voyages were numerous, scurvy and the inability to determine accurate positions at sea combined to make them both difficult and dangerous. Moreover, they were expensive, and usually only possible if subsidized by governments or large trading companies. Neither of these institutions was primarily concerned with promoting the sort of botanical studies necessary to produce a flora, for little return on their investment could be promised. On the other hand, they were most interested in spice-producing plants since trade in these was a very profitable business indeed. (The interest of France in spices in the eighteenth century is well documented by Ly-Tio-Fane [1958, 1970].) A by-product of this interest was the fact that areas of the world which were brought to the attention of Europe because

¹ The author wishes to thank Dr. F. R. Fosberg, Dr. M.-H. Sachet, and Dr. Bryce Decker for their patience, help, and encouragement in preparing this essay. Always in my mind as I wrote it were Jim, Bess, and Joe Murray, who really began it all in Moorea in 1967.

of their commercial value were also areas whose natural history became increasingly well known. (For comments on the relationship of botany to British imperialism in the Far East, see Archer [1959] and Woodcock [1969].)

The Society Islands could not claim this advantage because they had few spices to speak of; certainly none in the quantity necessary to make a long sea voyage profitable. Therefore, the knowledge of their flora available in the eighteenth century, particularly in England, cannot be explained either by their commercial advantages or their accessibility. Other reasons must be sought, and for them it is first necessary to understand the circumstances under which the Societies were discovered and explored.

The year was 1763 and the Seven Years War had just been overwhelmingly won by the British. The Treaty of Paris left the balance of power in Europe undisturbed, and the young king of England, George III, pronounced it "a time of profound peace." Finding that his nation had emerged from the war in undisputed command of the seas, His Majesty now felt himself free to devote his attention to what historians would later call *The Founding of the Second British Empire* (Harlow, 1952). In pursuance of this goal, the Admiralty brought it to his attention (Robertson, 1948:xxii) that

Land or Islands of Great extent, hitherto unvisited by any European power may be found in the Southern Hemisphere between Cape Horn and New Zealand [sic], in Latitudes convenient for Navigation, and in climates adapted to the produce of commodities useful in Commerce

The land supposed to lie in this area of the Pacific was the fabled *Terra Australis Incognita*, the legend of which probably began after the voyage of Marco Polo.² Even though the report of the continent had never been verified, the tradition of its existence was still alive in the eighteenth century, particularly in contemporary geographical thought. For example, Charles de Brosses argued in 1756

² *Terra Australis Incognita* ("Unknown Southern Land") is not to be confused with Australia, which was discovered in the 17th century by the Dutch, or with Antarctica. The land that the 18th-century navigator sought was purely mythical, and throughout this essay I shall allude to it as the "Southern Continent." This discussion is concerned only with those who searched for it and played some part in the exploration of the Society Islands.

that a land mass was necessary somewhere in the Southern Hemisphere in order to act as a counterweight for the land already known in the Northern Hemisphere; otherwise, the globe would be top-heavy and could not maintain an even keel (Dunmore, 1965, I:45-50). The "Southern Continent" fulfilled this need for a balance very adequately. De Brosse found an enthusiastic English advocate in Alexander Dalrymple (1737-1808) who made similar arguments in *An Account of the Discoveries Made in the South Pacific Ocean, Previous to 1764* (Laughton, 1963-1964, V:402-403). Thus both men assured their respective countries that the "Southern Continent" had to be there; all that was necessary now was to send a ship to the South Seas and claim it.

The governments of England and France, however, were interested in the "Southern Continent" for reasons other than its capacity as a counterweight. It was reputed to be enormously rich in spices and gold, and, therefore, the addition of it to the colonial empire of either nation would upset the delicate balance of power resulting from the Treaty of Paris. The "Southern Continent," it was reasoned, could make its possessor the greatest nation in Europe. It had first, however, to be found. Accordingly, an English expedition was fitted out, consisting of two ships: the *Dolphin* under command of Samuel Wallis and its consort, the *Swallow*, captained by Philip Carteret. The Admiralty advised Wallis that he was "to proceed with the *Dolphin* and the *Swallow* round Cape Horn or through the Strait of Magellan, as you find most convenient; and stretch to the westward about One Hundred or One Hundred and Twenty degrees of Longitude from Cape Horn, losing as little Southing as possible" (Robertson, 1948: xxiii). It was expected that the "Southern Continent" would be found long before one hundred degrees was passed, and Wallis was given detailed instructions on how he was to deal with its inhabitants and take possession of it for England.

The ships left Plymouth Harbour together on 21 August 1766, and the following January both were at the southern tip of South America. Wallis, to his cost, found it "most convenient" to enter the Pacific through the Straits of Magellan. The *Dolphin* and the *Swallow*, particularly the latter, had a great deal of trouble with storms and heavy seas in this treacherous channel, and when the *Dolphin*

finally cleared the Straits, the *Swallow* was nowhere to be seen. Carteret was not able to get through until four days later, and the two ships were never in sight of each other again in the course of the voyage.

Prevailing winds prevented Wallis from keeping as far to the south as he had been instructed and instead drove him northwest. He turned due west only when he was in about twenty degrees of latitude, and a journey of some five months on this course enabled him to discover Mehitia, the easternmost of the Societies on 17 June 1767 (Appendix 1). He did not land there because he could find no anchorage for his ship.

At two o'clock, the same day, we bore away, and in about half an hour, discovered very high land in the W.S.W. At seven in the evening, Osnaburgh Island [Wallis' name for Mehitia] bore E.N.E. and the new discovered land, from W.N.W. to W. by S. . . . [A]t day-break we saw the land, at about five leagues distance and steered directly for it . . . (Hawkesworth, 1773, I:433).

On 24 June 1767, the *Dolphin* lay at anchor in a superb harbor on this new island; Tahiti and all its allurements had been discovered.

In order to recoup his own ill health and that of his crew, Wallis remained in Tahiti until 20 July, a sojourn the delights of which are surely unparalleled in the history of Pacific navigation, but which did not advance the cause of botany overmuch. Very little exploration of the island of any kind was undertaken, much to the disgust of George Robertson (1948:231), Master of the *Dolphin*, who complained in his journal:

. . . Capt. Wallis, would not allow any of his Ships company to go to Examen any part of the Kings Island [Tahiti], but a small part of the Bay where the Ship Lay, Except the day that Mr. Gore went four or five mile up the River side, where he found cotton, Ginger, Indigo and many oother things growing that we knowed nothing of before.

Gore was master's mate of the *Dolphin* and the "River side" that he went up was that of the Vaipopoo, which then emptied into Matavai Bay where the ship was anchored. The "cotton" that he saw was probably *Gossypium taitense* Parkinson, and the "ginger," *Zingiber zerumbet* (L.) Smith. When he reported "indigo," he most likely saw the very similar *Tephrosia purpurea* Persoon since *Indigofera*, the true indigo, was of later introduction into the Societies.

After Wallis left Tahiti, he did not actually land

on any other islands of the Society group although he sighted and named several (see Appendix 1). He was back in England again on 20 May 1768 and the "Southern Continent" was still not part of the British Empire.

It would be a mistake to assume that France, even though defeated in 1763, was sitting idly by while the British were exploring the Pacific. Most Frenchmen regarded the Seven Years War as a clear indication that England was outstripping France and they were by no means adverse to a little empire building of their own. In the winter of 1766, the Chevalier Louis-Antoine de Bougainville left Brest in the frigate *La Boudeuse* to be followed a month later by her storeship *L'Etoile*. One of the purposes of the voyage was a search for the "Southern Continent" for, like Wallis, Bougainville had been instructed to

examine in the Pacific Ocean as much of and in the best manner he can the land lying between the Indies and the western seaboard of America, various parts of which have been sighted by navigators. . . . Since knowledge of the islands or continents is very slight, it will be interesting to perfect it; furthermore, since no European nation has any settlement on, or claim over, these islands it can be to France's advantage to survey them, and to take possession of them if they offer articles of value to her trade and her navigation.

In this sea, the area to which M. de Bougainville must pay particular attention is that between 40° of southern latitude towards the north, and what lies between the two tropics. It is in these latitudes that are found precious metals and spices. M. de Bougainville will study the land, the trees and the principal products; he will bring back samples and drawings of every-thing he considers merits attention . . . (Dunmore, 1965, I:67).

Here in capsule form are the interests of the French in the Pacific and no doubt because of the emphasis on natural products in the last paragraph of these instructions, the Duke of Praslin, who was Minister of the Marine at the time, decided that a naturalist should accompany this expedition. This was somewhat unusual, for most of the "scientific" personnel who took part in voyages of exploration in the eighteenth century were astronomers whose main function was determining the ship's position at sea. (Vernon served in that capacity with Bougainville.) Since most of the ships' surgeons knew a little natural history, it was only rarely that a professional naturalist accompanied such voyages.

Nevertheless, the Duke of Praslin wanted a naturalist and two of his advisors recommended

Philibert Commerson to his attention. Commerson was a young botanist who had come to Paris at the urging of Bernard de Jussieu, and was appointed naturalist at the Jardin du Roi (now the Jardin des Plantes) in 1764. He had already amassed a large collection of plants from the provinces of central France and Switzerland, and at his death his herbarium was said to contain three thousand new species and genera (Lasègue, 1845: 56; Montessus, 1888-1890:200). Antoine-Laurent de Jussieu published a number of Commerson's genera in his *Genera Plantarum* of 1789, but Commerson is probably best remembered to history for the romantic nonsense he wrote about the Tahitians in a letter to the French astronomer, Joseph Lalande, which was published in the *Mercur de France* (November 1769). In it he described Tahiti as a Utopia, an ideal republic whose happy inhabitants wandered about "*sans vices, sans préjugés, sans besoins, sans dissensions*"—all of this on the strength of an eight-day visit. The more-or-less constant native thievery was pictured as a sort of primitive socialism, and one can only conjecture what he would have made of it had he seen a human sacrifice or the practice of infanticide.

Unrealistic as this letter was, it added considerably to the growing cult of the "noble savage," and Tahiti was thrust upon the European conscience in an unparalleled way. The Rousseauists seized upon this description of a primitive society as proof of their contention that "civilization" was the source of much of the evil suffered by mankind,³ and Diderot, the editor of the *Encyclopédie*, used it as a basis for his plea for a more liberal relationship between the sexes in Europe. Without doubt Tahiti might have seemed like an earthly paradise in contrast to the artificiality of Versailles, but Commerson's rosy perspective fell far short of an accurate description of pre-European Tahitian life. However, we may forgive him that. It was a sentimental age and Tahiti was bound to appeal to a sentimental nature. What is harder to forgive is that he never published a single scientific work during his lifetime and therefore there is no record of what the first trained European botanist saw as he wandered through his "*Utopie*."

³ Jean Jacques Rousseau advocated such notions in his *Social Contract* of 1762.

Bougainville anchored on the eastern side of Tahiti at Hitiaa on 6 April 1768, a little more than eight months after Wallis' departure and remained there for about eight days. He went home by sailing north of New Guinea, on to Batavia, through the Indian Ocean to the French island of Mauritius (where he left Commerson) and entered the harbor of St. Malo on 16 March 1769; he had to report that the "Southern Continent" had also eluded him (see Appendix 2).

Still the idea persisted. After all, the geographers argued, the previous voyages had been in the vicinity of the Tropic of Capricorn. There was an enormous expanse of ocean to the south in the latitudes of New Zealand and surely there the continent was to be found. Let someone search below Capricorn and the geographers would be proved right. James Cook did just that—on two separate occasions—and he proved them wrong (Cook, 1955–1967).

Cook was first sent into the Pacific under the auspices of two institutions with very different motives: the Royal Society of London and the British government. In the spring of 1769 an event of great importance to astronomy was to occur. The planet Venus would cross the disc of the sun and proper observation of it would provide the foundation for the calculations of the distance of the earth from the sun. The transit had been observed in 1761, but only poorly, and it would not happen again until 1874. It was therefore necessary to insure the success of this observation and as early as June of 1766 the Royal Society began to prepare for it (Cook, 1955–1967, I, App. 2; see also Woolf, 1959). The "Committee for the Transit" decided to send observers to three parts of the world: Hudson's Bay, the North Cape of Lapland, and to some suitable island in the South Seas. The Royal Society thought that the Hudson Bay Company would provide passage for the astronomers to North America and they might reach Lapland on the annual Navy ship which went there to protect Britain's fishing interests. To send observers to the South Seas was another matter. The Royal Society itself had no money to equip and launch such an expedition and it turned to the government for the necessary financial support. The King was agreeable and granted the sum of four thousand pounds; the Admiralty provided a

ship—the Whitby-built collier, now famous in Pacific history as the *Endeavour*.

The Council of the Royal Society proposed as observers of the transit Alexander Dalrymple, the geographer who argued so cogently for the existence of the "Southern Continent," and Charles Green, an assistant to the Astronomer Royal at the Greenwich Observatory. Mr. Dalrymple made it abundantly clear, however, that he had not the slightest intention of making the voyage unless he had "the total management of the ship to be sent . . ." The Admiralty, on its part, made it just as clear that, since Mr. Dalrymple was not a professional seaman, such an arrangement would be "totally repugnant to the rules of the navy . . ." (Cook, 1955–1967, I:513). Thereupon James Cook was selected as the commander of the ship and also as one of the observers of the transit since he had had some practical experience as an astronomer during a marine survey on the northeastern coast of North America.

All these arrangements had taken place by mid-May of 1768 though the Royal Society had no very clear idea of just which island in the South Seas would be suitable as a site for astronomical observation. A few days later on 20 May, however, the *Dolphin* arrived in England and Wallis reported the discovery of an island which would serve the Society's purpose quite nicely. The natives called it "Otaheite" and, fortunately, he had been able to determine its position rather accurately. Moreover, the natives showed no tendencies toward cannibalism, the climate was excellent, and food was available in trade for nothing more than iron nails and a few hatchets. Wallis also thought that he had actually seen the "Southern Continent" some "20 leagues to the South of George's Island" (Cook, 1955–1957, I:cix), and Britain, still mindful of the economic and political advantages of an expanded empire, instructed Cook to pursue this report. After observing the transit from Tahiti, he was to sail south, down to forty degrees latitude; if he found no land, he was to turn west and search for it between thirty-five and forty degrees, all the way to the coast of New Zealand if necessary.

At this juncture, the Secretary of the Royal Society communicated one last request to the Admiralty (Banks, 1963; I:22):

Joseph Banks Esqr Fellow of this Society, a Gentleman of large fortune, who is well versed in natural history, being Desirous of undertaking the same voyage the Council very earnestly request their Lordships, that in regard to Mr. Bank's great personal merit, and for the Advancement of useful knowledge, He also, together with his Suite, being seven persons more, that is eight persons in all, together with their baggage be received on board of the Ship, under the command of Captain Cook.

Included in Banks' entourage, besides servants, artists, and a couple of dogs, was Daniel Solander (Rauschenberg, 1968), a young Swede and favorite pupil of Linnaeus who had been sent to England to promulgate the Linnean system of classification. Solander was elected a fellow of the Royal Society in 1764 and he probably met Banks shortly thereafter. Not only was he an agreeable man personally, but also one of the ablest botanists of his day; probably no better choice could have been made by Banks as a traveling companion in the Pacific. (For biographical information about Banks, see Banks, 1963, and Cameron, 1952.)

The extraordinary thing about this request of the Royal Society was that the Admiralty did not object to it in the slightest. Of Banks' "great personal merit" at this time—he was only twenty-five—there is little enough evidence. But of his charm and abundant measure of the self-assurance of an eighteenth-century "gentleman of large fortune," the very fact that no difficulties were raised is eloquent testimony. After all, this was a preposterous notion of Banks'. He proposed to inflict himself and his companions on an already over-crowded vessel for purposes not at all envisaged by either the government or the Royal Society and furthermore those purposes might uncharitably be construed as frivolous and totally removed from the serious nature of the enterprise (Banks, 1963, I:23). However, to his lasting credit, he brought it off; so well in fact that Joseph Banks was to become the single most important man of the eighteenth century in promoting the development of knowledge of the Society Islands' flora.

The *Endeavour* arrived at Tahiti on 13 April 1769 and remained there for three months. Venus was duly observed and Banks and his party collected about the island with complete freedom. While there, Cook learned of several other islands that were not far away and he decided to put this

knowledge to some use. He badly needed more supplies than he could get at Tahiti and he felt his men would be the better for a rest before experiencing "the cold weather we might expect to meet with to the Southward at this Season of the year . . ." (Cook, 1955-1967, I:139).

Although the crew had been working very hard to prepare for the observation of Venus, they had also encountered Venus in the more substantial form of the native women. They delighted in the latter to such an extent that Cook confessed to his journal that the men "were in a worse state of hilt [sic] than they were on our first arrival, for by this time full half of them had got the Veneral Disease . . ." (Cook, 1955-1967, I:138). And so he sailed westward when he left Matavai Bay and in the course of the next month leisurely visited the islands of Huahine, Raiatea, and Tahaa on all of which Banks and Solander collected plants (Banks also had collected on Moorea during this voyage; Banks, 1963, I:283-285). He sailed along, but did not land on, the eastern coast of Borabora and sighted Tetiaroa, Maupiti and Tupai [Motu-iti] (Appendix 1). In describing these islands in his journal, Cook (1955-1967, I:151) said, ". . . as they lay contiguous to one another [sic] I have named [them] Society Isles." Thus the Societies were not named for the Royal Society and at first included only these six islands mentioned above. Now the name embraces all of the islands and atolls from Mehetia in the east to Motu One in the west. It is in this modern sense that the name is used in this essay. In August 1769 the *Endeavor* turned due south and Cook began the second phase of his instructions.

When he arrived back in England, to general acclaim, on 13 July 1771, he had illuminated much of the Pacific area but had found no new continent, although its possible northern limits had been pushed back to a considerable extent. Cook was promoted to commander but enjoyed only a brief respite at home for there was a great deal of clamor for a second voyage. Both Cook and Banks wanted to return to the Pacific and those theorists who clung tenaciously to the last vestiges of the "Southern Continent" pointed to the Pacific below forty-five degrees latitude which hitherto had not been searched. Clearly, what was wanted was a passage in these higher latitudes all the way across the Pacific. In a postscript to his journal of

the voyage of the *Endeavour*, Cook had briefly outlined a scheme for further Pacific exploration and, thus spurred, the Admiralty decided upon another voyage (Cook, 1955-1967, I:478-479). Cook, of course, was given the command and it was understood that Mr. Banks would accompany him.

Banks was determined that this time natural history would not scramble aboard and make do. He had been lionized to such an extent ever since his return that this amiable young gentleman was suffering exceedingly from a swelled head. Two ships had been chosen for the second voyage—the *Resolution* and the *Adventure*—and when Banks saw the *Resolution* he decided emphatically that she would not do. He had accumulated a "Suite" this time of fifteen besides himself and had been spending money at a furious pace for all manner of equipment. The *Resolution*, he objected, was just not large enough for his purposes and would have to be refitted or else he would not go; this latter being his constant threat if his plans were thwarted in any way. Wishing to indulge such a wealthy youth, everyone tried hard to please him. Eventually, the ship, built for the coal trade with a wide, flat bottom and hold, was so altered that she became topheavy and threatened to capsize when any useful amount of sail was raised. At last, exasperated beyond endurance with Banks and his demands, the Admiralty and the Navy Board came down hard and ordered the *Resolution* restored to her original condition at once. This decision reduced Banks to swearing, stamping incoherence. John Elliot, a midshipman on the *Resolution* who later wrote his memoirs, recalled, "Mr. Banks came to Sheerness and when he saw the ship, and the alterations that were made, He swore and stamp'd upon the Warfe, like a Mad Man; and instantly order'd his servants, and all his things out of the Ship" (Cook, 1955-1967, II:xxx). Again he threatened that he would not go but this time the Admiralty took him at his word and his tantrum resulted in the appointment of John Reinhold Forster and his son George as naturalists of the expedition. This is one instance where Banks was not responsible for the appointment of the naturalists on an English voyage to the Pacific. Parliament had voted four thousand pounds for a "scientific man," and it was Daines Barrington, a prominent lawyer and naturalist,

who got the job for the Forsters (Cook, 1955-1967, II; Hoare, 1967,1971). It is indicative of the interest Cook's first trip created in England that so large a sum was granted for a single person on the proposed second voyage. It will be recalled that it was an identical sum of money which the King had granted for the *entirety* of Cook's first voyage.

Cook's instructions were merely an expanded version of his own outline and once more the object of the voyage was the "Southern Continent." The Royal Society had no particular interests in this voyage, but, together with the Board of Longitude, asked that four chronometers be tested for the purpose of determining longitude at sea. This was one of the great unsolved navigational problems of the day and Parliament had offered a prize of 20,000 pounds for its successful solution. One chronometer, based on John Harrison's model (E. Forbes, 1966), was successful and it earned high praise from Cook before the journey's end.

Cook and the Forsters were to call at the Society Islands on two different occasions on this voyage (Appendix 2). They entered the Pacific by way of the Cape of Good Hope, where the elder Forster engaged Anders Sparrman (Forster and Forster, 1776:iii) as an assistant naturalist, and continued on to New Zealand. On 26 August 1773 they were anchored in Matavai Bay, having spent some nine days on the eastern side of Tahiti-iti where the *Resolution* had been driven onto the reef. They spent six days in the familiar port and Cook then sailed to Huahine. Desirous of adding to his supplies, he visited Raiatea where the natives were so friendly that he was able to stock provisions beyond his expectations.

Then for eight months Cook searched the Pacific for the "Southern Continent" in a gigantic swing in the high latitudes, reaching between seventy and seventy-five degrees before turning north. Subsequently he visited Easter Island, continued north to the Marquesas and then turned south through the Tuamotus; he was back at Tahiti on 22 April 1774. Huahine and Raiatea were visited as usual and on 4 June he left for another sweep of the Pacific. On 29 July 1775 he was safely back in England and Dalrymple's and de Brosses' dreams were shattered forever; the ghost of the "Southern Continent" was well laid to rest.

With the completion of this voyage, Cook accepted an appointment at Greenwich Hospital for

a well-deserved rest. It was not to be for long. At a dinner party given by First Lord of the Admiralty Lord Sandwich in early February 1776, Cook volunteered for yet another voyage, once more in search of an equally elusive bit of eighteenth-century geography—the Northwest Passage between the Atlantic and Pacific.

Considerable energy had been expended on this effort ever since John Cabot's voyage in 1497 but to no avail. All previous attempts, however, had been made from east to west, i.e., they began the search in Hudson's Bay. What was now proposed was a western approach to the problem, an approach which led via the South Pacific and up the coast of California to see if the presumed western outlet of the passage could be found. Not only would the discovery be of immense strategic value to the British government but the Royal Society espoused the voyage as one which "would contribute to the promotion of Science in general, and more particularly that of geography . . ." (Beaglehole, 1960:289). Cook was again to have two ships for the purpose, the familiar *Resolution* and another Whitby-built vessel, the *Discovery*.

Joseph Banks reentered the history of the Pacific with this voyage and under much more edifying circumstances than he departed from the last one. To be sure, he was not among the voyagers; he was, in fact, never to see the Pacific again. On the *Discovery*, however, was David Nelson, a Kew gardener whom Banks had engaged as a botanical collector (Dawson, 1958:256; Bladen, 1893:406), and natural history was competently represented on the *Resolution* by William Anderson, the surgeon's mate of Cook's last voyage.

This time Cook personally visited Moorea and Borabora, two islands which he had previously only seen from the ship (Appendix 2). Otherwise he made the customary circuit of Tahiti, Huahine, and Raiatea; he then sailed north to discover Hawaii and search the western coast of North America in vain for the outlet of the Northwest Passage. He returned a second time to Hawaii, where he was killed in a skirmish with the natives on 14 February 1779.

It is somewhat ironical that Cook, the greatest of the European explorers of the Pacific, was on each occasion asked to perform impossible tasks there. He could find neither the "Southern Con-

continent" nor the Northwest Passage for the elementary reason that they did not exist as such. Of course, there is a "Northwest Passage" from the Atlantic to the Pacific around the polar region, but it is continuously blocked with ice. Therefore, in a sense, it did not exist for the eighteenth-century sailing ship because there would have been no possible way for such a vessel to penetrate the ice cap. However, this is not to say that Cook made no positive contributions in the Pacific but to emphasize his abilities to dispel illusions. Because of his superb qualities as an explorer, his legacy was a largely completed map of the Pacific, and men would no longer build dream empires on the "Southern Continent." It would be for more narrowly conceived reasons that future expeditions would be dispatched to the Pacific; the great work had been done.

Such was the case for the first voyage of the *Bounty* under William Bligh, who had been Master of the *Resolution* on Cook's third voyage (Mackaness, 1936). When Cook and Banks had visited Tahiti in 1769, they naturally observed and reported the usefulness of breadfruit in the native diet and great interest was taken in this staple in the British West Indies. Almost all of England's sugar came from these islands and it was all produced by slave labor. Since food was often scarce there, particularly on St. Vincent and Jamaica, it was thought that the introduction of the breadfruit would provide a cheap source of food for the slaves and at the same time reduce the dependency of the islands on North America for foodstuffs.

One of the Jamaican plantation owners, Hinton East, who had formed the first botanical garden there in the 1740s (Fawcett, 1897:346), had long been a correspondent of Banks; and when in London in 1786, he personally impressed upon Banks the value of introducing the breadfruit into the West Indies (Mackaness, 1936:49). Banks was intensely interested in such schemes and he in turn proposed the idea to George III. Banks was very much in the confidence of his sovereign at this time so it is not surprising that the King thought well of the plan. Furthermore, Banks had maintained an active interest in the Pacific and became much involved in this voyage. Not only was Bligh appointed commander and David Nelson as botanist at his recommendation, but Banks himself

drew up a careful list of instructions concerning the care of the breadfruit plants (Mackness, 1936:51).

Bligh's party sailed from Spithead on 28 November 1787 and spent five months at Tahiti. When he left there, he had over one thousand breadfruit seedlings on board, and the mutiny which prevented their ever reaching the West Indies is a well-known story. When the mutiny occurred, David Nelson cast his lot with his captain but unfortunately never reached England with him. He died at Timor and, of course, whatever botanical work he had done on Tahiti was totally lost.

Bligh did not get back to England until March of 1790 and in the meantime England and Spain were approaching a serious confrontation concerning the Pacific. Even in the waning years of the eighteenth century the Spanish Crown regarded the majority of the Pacific as part of her empire, and ever since Wallis, French and British voyages into that area of the world were viewed with increasing asperity. Spain was particularly interested in watching British activities in the Societies and in 1772 she sent a voyage to Tahiti from South America to investigate "whether any foreign colony has been planted there, as is suspected may have been done by the British nation" (Corney, 1913, I:265). When this was found not to be the case, a second voyage was dispatched in 1774 to land two friars on Tahiti with an eye to establishing a permanent Spanish settlement there and thus preventing Britain from claiming Tahiti by right of discovery. The missionaries shortly became frightened of the natives and when a third ship reached the island in 1775 to bring them supplies, the friars refused to remain and returned to South America (Appendix 3).

But it was not colonization in this part of the Pacific that was the immediate cause of strained relations between Spain and England in the 1780s. After Cook's last voyage many adventurous minds were attracted to the possibilities of the sea otter fur trade between the Pacific Northwest and China. John Meares, a former lieutenant in the British navy, had gone so far as to purchase land from the local Indians in Nookta Sound in 1788 and arranged exclusive rights to the fur trade with them. (Nookta Sound is an inlet of the Pacific situated on the west coast of Vancouver Island,

British Columbia.) When this became known to Spain later in the year, Captain José Marinez was sent from Mexico to investigate the amount of trade actually taking place around the Sound. So alarming was his report that he was commissioned to establish a permanent Spanish settlement in Nookta Sound in 1789. In doing so he insisted that all of the land there belonged to Spain, including that which Meares had bought from the Indians. The British would not tolerate this position and a full-blown war between Spain and England was only averted by the Spanish realization that, because of Britain's powerful navy and the strength of her allies, war with England at that time would be a very risky business indeed (B. Anderson, 1960:29-43).

The entire affair was finally settled by diplomatic maneuverings and Britain won back Meares' land in the settlement. It was decided to send a ship to Nookta Sound for the formal restitution of the land and George Vancouver was selected to command H.M.S. *Discovery* and her consort, the *Chatham*, for the purpose. In addition, he was to survey the coast of North America from thirty degrees latitude to Cook Inlet in Alaska just in case the outlet of the Northwest Passage had escaped Cook (B. Anderson, 1960:42-43). Vancouver was a logical choice for this assignment since he had been in the Pacific with Cook on his second and third voyages.

The fine hand of Banks is once again seen in this instance for with Vancouver was Archibald Menzies, a naval surgeon and trained botanist, who had collected for Banks along the northeast coast of North America in 1785. Banks had interceded with the King to get Menzies appointed to this voyage and it was from Banks himself that Menzies took his instructions—a most unusual circumstance for a member of the Royal Navy (Dawson, 1958:606).

When Vancouver and Menzies sailed in 1791, Banks had been a scientific advisor to the Royal Gardens at Kew for eighteen years and had carefully encouraged its development. He had the interests of the garden clearly in mind when he instructed Menzies (in Balfour, 1944-1945:81):

When you meet with curious or valuable plants which you do not think likely to be propagated from seeds in His Majesty's Garden, you are to dig up proper specimens of them, plant them in the glass Frame provided for that

purpose, and use your utmost endeavours to preserve them alive 'till your return. . . .

Menzies carried out his instructions very faithfully but many of the live plants intended for Kew did not survive due to the neglect of the servant delegated to care for them (Dawson, 1958:607).

The *Discovery* spent a month at Tahiti to restore the health of the crew and replenish the ship's provisions. Then, late in January of 1792 she sailed northwest to begin the continental survey for which Vancouver is justly famous.

At the same time that Banks was busily involved with Menzies and his part in the Vancouver voyage, he had by no means abandoned his earlier protégé, William Bligh, and his plan for the transfer of breadfruit to the West Indies. As early as October 1790 Bligh was officially exonerated of any responsibility for the *Bounty* mutiny and Banks renewed his appeals to the Admiralty for another breadfruit voyage to Tahiti. The Admiralty was persuaded in March of 1791 and Bligh was instructed to look for a suitable ship (Lee, 1920:vii et passim). He found one in a new West Indiaman, the *Providence*, and the small brig *Assistant* was chosen to accompany her; apparently Bligh was taking no chances of another mutiny and the necessity of getting back to England in the launch.

Banks, as usual, chose the botanists (Dawson, 1958:869-870). James Wiles and Christopher Smith were to sail on the *Providence*, and once more the interests of Kew were urged by Banks (in Britten, 1922:23):

Whenever you shall meet with plants in your opinion particularly beautifull [sic] or curious, you are to . . . take on board one or two of each sort for the use of his Majesty's Botanic Garden at Kew. . . .

In addition, Banks requested them to make a complete set of all the specimens they collected for his personal herbarium, for which they would receive extra pay from him (Dawson, 1958:870).

The two ships sailed on 3 August 1791 and arrived at Tahiti in early April of 1792. Bligh spent only about two months there but collected more breadfruit seedlings than in his previous stay of five months and this time they successfully arrived at the West Indies.

Capped by this note of achievement the eighteenth century closed without any other major

botanical collections from the Society Islands. They had been stumbled upon thirty-three years earlier in the search for a commercial empire hopefully to be founded on spices, and if they had had these in commercially exploitable quantities, their history would quite probably have been vastly different. Apart from a little ginger, however, they had none, so the European governments lost interest in their flora as such. Nevertheless, an amazing amount of botanical collecting had been done and it was due to several fortunate circumstances. Not the least of these was the fact that Sir Joseph Banks was a powerful man in eighteenth-century science, and that he was deeply interested in Pacific botany. Elected President of the Royal Society of London in 1778, he remained in that office for over forty years. During that long tenure he achieved international influence as a promoter of all the sciences.

Indeed, it would be difficult to underestimate Banks' role in bringing Society Islands plants to the attention of Europe. English ships were going to that part of the world for every purpose except botany, and yet he somehow managed to get botanists on board. Not only was his among the first collections of the Societies' flora, he also developed the finest natural history library of the region to be found in Europe. Most of the people interested in the plants of the "South Sea Islands" sooner or later were welcomed at Banks' London house at 32 Soho Square, and all of its botanical treasures put at their disposal. His herbarium had specimens from all over the Pacific and Kew Garden was enriched with several introductions from the Societies obtained at Banks' instigation.

In addition, events had so transpired that England had a number of reasons, both political and commercial, for being in the Pacific in the latter part of the eighteenth century, and the only routes were by way of the Cape of Good Hope or around the Horn. In either case, the Societies, ideally situated in the middle of the South Pacific, were a natural refuge and refitting station. They had good harbors, food was usually easily obtained at one or another of the islands of the group, and the natives—if not conforming to the letter of the *Social Contract*—at least seemed to hold no serious prejudices against Europeans.

Lastly, it must always be kept in mind that the only way of reaching the Societies in the eight-

eenth century was by sea and on that element Britain was supreme. These facts, in connection with Banks' interest and influence, worked together to make this inconspicuous scattering of volcanic and coral outcroppings much visited and much explored by the English.

In the face of all this activity, it is strange that so very little was published about the Societies in the eighteenth century or even the early nineteenth century. Banks' librarian, Jonas Dryander, cataloged his library and published a five-volume account of it from 1796 to 1800. In the volume dealing with botany (1797) under the heading *Insularum Oceani Pacifici* there are only six books and articles listed. These are William Anderson's manuscript, "Descriptiones Plantarum" (1776-1777), Sydney Parkinson's *Journal* (1773), and an article attributed to Parkinson in *Die Naturforscher* (Z., 1774). George Forster is represented by three short entries: *De Plantis Esculentis* (1786a), the *Prodromus* (1786b), and a paper entitled "Decas Plantarum Novarum ex Insulis Maris Australis" (1780). Strangely enough, the *Characteres Generum Plantarum* of J. R. and G. Forster (1776) is not listed.

Philibert Commerson apparently never felt himself to be intellectually prepared enough to commit anything to paper, for in a letter written to one of his friends in 1757 (in Oliver, 1909:37), he observed:

As for your reproach that I am communicating nothing to the public, it is easy to give a satisfactory reply. How could I expect the public to be pleased with me when I have not even satisfied myself?

Whether this was conviction or merely conceit we cannot judge but it remains that Commerson never published the results of any of his botanical studies and his collections from Tahiti have apparently been lost. Indeed, some have doubted that Commerson did any botanical collecting on Tahiti (e.g., Grant, unpublished notes). This would be very surprising if it were true and there is at least indirect evidence that it is not. Bougainville (1772: 304) made the direct statement in his journal that "M. de Commercon [sic] went on shore to botanize there [Tahiti] . . ." and there is a manuscript notebook in the Muséum National d'Histoire Naturelle, annotated in Commerson's hand, containing observations made at Patagonia, Tahiti, and the New Hebrides. The notebook is

dated from 7 September to 25 October 1768 and thus brackets the Bougainville expedition's stay on Tahiti (see Taillemite, 1968:35-58). In a paragraph entitled, "Fertilité de l'isle [Tahiti] et ses productions," he noted at least the important economic plants such as coconuts, bananas, yams, sweet potatoes (*patates*) and sugar cane (Taillemite, 1968:45).

Commerson later alluded to the flora of Tahiti in a manner which leads one to believe that he had a first-hand knowledge of it. In a letter to Lalande, Commerson argued against the generalization that similar plants grow in similar latitudes and in the course of the argument emphatically stated, "Tahiti has its own characteristic botany . . ." (Cap, 1861:118). All of this indicates that Commerson had at least studied, and probably collected, Tahitian plants.

Nevertheless, after his death in 1773, an inventory of his effects included plants from the Mascarenes, Madagascar, the Seychelles, Brazil, the Straits of Magellan, Buenos Aires, Batavia, the island of Buru (or Boero), Paraguay, New Ireland, and Montevideo (Oliver, 1909:221). His will of 1766 made the Jardin du Roi the heir of all his botanical material, and in 1776 they were put into the hands of Antoine-Laurent de Jussieu for study (Bidal, 1934:214; Stafleu, in Jussieu, 1964). Jussieu did not find any Tahitian material among the collection (Montessus, 1889-1890:200), nor is there mention of it in the published records of herbaria to which Commerson is known to have sent duplicates. Some of Commerson's plants, probably duplicates, were sent to Louis-Guillaume Lemonnier who held the Chair of Botany at the Jardin du Roi from 1758 to 1785. Lemonnier's herbarium was purchased by Benjamin Delessert and a description of the Delessert collections contains no Commerson material from Tahiti. "The plants coming from several voyages of Commerson and which were entered in the herbarium of M. Lemonnier, were more than 3000. Several cases of plants, among others those collected at Tahiti, were unfortunately lost during the voyage" (Lasègue, 1845:56). Equally unfortunately, Lasègue is not at all clear about the exact voyage (*traversée*) on which they were lost. Cap (1861:33-34) lists the herbaria to which Commerson is supposed to have sent duplicates.

Aside from a trip to Madagascar, Commerson never left the Mascarenes and he died on Mauritius (Ly-Tio-Fane, 1958). Therefore, if his Tahitian plants survived the Bougainville voyage, they must have been either lost in the Mascarenes or in the transport from Mauritius to the Jardin du Roi.

Accompanying Commerson on his voyage with Bougainville was a young artist, Jossigny. He made a large number of drawings from living specimens and these were also willed to the Jardin du Roi by Commerson. Some five portfolios of drawings arrived there in 1774, three of botany and two of zoology, all bearing the signature of either Commerson or Jossigny (Lalande, 1775: 113, n. 1; Cap, 1861:23-24, 39). Perhaps among these is to be found the only extant record of plants observed by Commerson at Tahiti.

Banks, also, did not publish the results of his botanical discoveries in the Societies. That he had every intention of doing so, and in the grand manner, is evident from the fact that the manuscripts of the floras of Madeira, Brazil, Tierra del Fuego, New Zealand, Java, and the Society Islands were prepared by Solander (1782), which Stearn discussed in two excellent articles (1968, 1969). Sydney Parkinson, one of the artists Banks had engaged for the voyage, had made 995 drawings of natural history objects, and Banks planned to have copper engravings of these made to be included with the text (Britten, 1905:282). Solander was to do the technical descriptions of all the collections resulting from the voyage, and Banks took it upon himself to superintend the engraving of the plates. The latter was a time-consuming task as evidenced by Banks' letter to the younger Linnaeus in 1778 (Smith, 1821, II:575):

Uninterruptedly, however, as I have applied to the work of engraving for near five years, I have not yet advanced above half of my intended progress. About 550 plates are engraved, and I think, if circumstances as yet unexpected do not oblige me to cut it short, it will extend to double that number.

The work was so near completion that he was able to write in November 1784 (Rauschenberg, 1964:67):

The botanical work with which I am presently involved is nearing its conclusion. . . . Since all the descriptions were made when the plants were fresh, nothing remains to be done, except to fully work out the drawings still not finished, and

to record the synonyms from books which we did not have with us or which have come out since. All that is left is so little that it can be completed in two months, if only the engravers can come to put the finishing touches on it.

Unfortunately, these "finishing touches" were never completed. After 1778, when he was elected president of the Royal Society, Banks became increasingly occupied with its affairs and with the Royal Gardens at Kew. In addition, he had lost his co-worker, Solander, who had died in 1782. Sir James Edward Smith (1821, II:579) gave it as his opinion that the reason the volumes were never published was because they were "sacrificed to the duties incumbent, for almost half a century, on the active and truly efficient President of the Royal Society."

Many of Banks' and Solander's observations on plants appear in the journal which Banks kept on the voyage of the *Endeavour* and also in Hawkesworth's (1773) account of it. After Banks died in 1820, all of his collections were willed to the British Museum and in the nineteenth century, Berthold Seemann (1865-1873) published parts of Solander's manuscript of the Societies in his *Flora Vitiensis*. Later still, the plates and descriptions of Banks and Solander's (1900) Australian plants were published by the British Museum. However, the majority of what would surely have been one of the most impressive works in natural history of the eighteenth century still lies unpublished in the British Museum of Natural History.

The only description of the voyage that was published by a member of it was Sydney Parkinson's (1773) journal. It was posthumously published by his brother, Stanfield Parkinson and an extract was published in German in 1774 by "Z." This is an important work in the history of the botany of the Society Islands because it contains a number of binomial names of useful plants found on Tahiti (Merrill, 1954b:326-363). It is highly doubtful that Parkinson originated any of these names; instead, when a new plant was found and Parkinson sketched it, he probably wrote the name Solander gave him on his drawing for future identification. Therefore, it would only be natural for him to refer to these plants by the Solander names in his journal. This account of the Society Islands is the first to include proper scientific names for the plants found there. However, there is a question whether or not the names

are validly published under the present rules of the International Code of Botanical Nomenclature and acceptable to modern taxonomy. F. R. Fosberg (1941:93–96, 1960:101–113, pers. comm.) has accepted at least four of Parkinson's specific epithets as valid, since they are accompanied by enough descriptive information so that there should be no question about their identity. These are *Sitodium altilis* (= *Artocarpus altilis* (Parkinson) Fosberg), *Aniotum fagifera* (= *Inocarpus fagiferus* (Parkinson) Fosberg), *Spondias dulcis* and *Pandanus tectorius*. The Forster names of the genera *Sitodium* and *Aniotum* are *Artocarpus* and *Inocarpus*, respectively. These have been conserved over the prior Parkinson names (Fosberg, 1939:231). Most of the names, however, are to be regarded as *nomina nuda* and thus are not validly published.

The Forsters foreswore colored plates and other pretensions to Banksian magnificence and got down to the business of publishing their results as soon as they returned to England. Both G. Forster (1777) and J. R. Forster (1778) wrote narratives of their voyage, as did Anders Sparrman (1789). Although all three mention the vegetation of the Society Islands, none of them are technical botanical treatises. The first scientific work that appeared from Cook's second voyage was a collaboration between the elder and younger Forster (1776). It was entitled, *Characteres Generum Plantarum* and was first published in a folio edition of only six copies in 1775. In March of the following year, a much larger edition, in quarto, came out, apparently with no textual changes from the first edition (St. John, 1971). Four years later, George Forster (1780) delivered a paper to the Royal Society of Science at Upsala entitled "Decas Plantarum Novarum ex Insulis Maris Australis," which mentioned ten genera of plants all taken from the *Characteres*. Only one genus, *Mallocoeca*, is recorded from the Societies (Huahine).

The 1776 publication contained a description of 75 new genera, classified according to the Linnean system, and for each genus there was a small plate showing the characteristics of typical fruits and flowers. However, the work is somewhat unsatisfactory because there are no collecting localities indicated for the genera, and the plates are extremely small in relation to the size of the page (Holmes, 1952:31).

Exactly why the elder Forster's name appears

first on the title page, and Sparrmann's not at all, is a mystery. In the preface, J. R. Foster (Foster and Forster, 1776:iii) described the allocation of duties of the three naturalists as follows:

Sparrman was to describe the plants [and name them?] my son was to draw them. . . . However while Sparrmann was examining the plants in detail my son and I often were consulted [by Sparrman] and we had common discussions. Then my son arranged the plants he [Sparrman] had described in another volume. I revised them all before the descriptions were again transcribed into yet another volume in accordance with the Linnean System. . . .

In spite of the confusing syntax and surfeit of volumes, it seems clear that Sparrman and George Forster did the majority of the work, and it is somewhat disingenuous of J. R. Forster to assume credit as the senior author.

In 1786[a], George Forster alone produced *De Plantis Esculentis Insularum Oceani Australis*. There were two editions of this book; one was his dissertation for the M.D. degree and published at Halle, and the other was a reprint done in Berlin a few months later (see Merrill, 1954a:35–40). Fifty-four species of plants are listed under the headings of their edible parts such as fruit, root, etc., twenty-six of which were in use in the Society Islands (G. Forster, 1786a:19). In the index to the work, the proper Linnean class follows the name of the plant and each is very adequately described in the text.

Not such a laudable production, perhaps, is George Forster's *Florulae Insularum Australium Prodromus*, also published in 1786[b]. It is indeed a "preliminary" flora because it appears very unfinished. The descriptions of each plant are so short that they are almost worthless except when augmented by the *De Plantis Esculentis*. There are 119 species of flowering plants listed from the Society Islands and Forster in this case did indicate where they were collected. However, he followed Cook's definition of the Societies in that he considered "Tahiti" as being separate from the "Society Islands" (Britten, 1916:251). Therefore, if a specimen was not collected on Tahiti, it is simply labeled "Society Islands," with no further indication of precisely where it was found.

Cook's third voyage produced no botanical publications whatever. David Nelson, appointed by Banks to collect plants for him, apparently did a commendable job, for Banks (in Britten, 1916:

251) later wrote as a recommendation of him that he had "sailed with Captain Cook on his third voyage round the world in my service for the purpose of collecting plants and seeds, and was eminently successful in the object of his mission. . . ."

Nelson sent his collections to Banks when he landed in England in 1781 and Solander, who was still working on the floras from the *Endeavour* voyage, cited a number of Nelson's specimens. No doubt because Nelson was a hired collector and because his collection was incorporated into a flora already in progress, he did no publishing on his own.

William Anderson was under no such obligation to Banks, but, since he died at sea on 3 July 1778, it is impossible to say if he would have published any of his notes. He recorded his observations of the plants he collected in two manuscripts: "Descriptiones seu characteres specificos plantarum in itinere nostro visa annis 1776-77," which is only 6 pages long, and the "Genera nova plantarum seu descriptiones characterum naturalium plantarum adhuc incognitarum in itinere nostro visa 1776-77 in linguis Latinis et Anglice scriptes," of 32 pages. The former of these came into the possession of Banks and is mentioned in the catalog of his library (Dryander, 1796-1800, III:184); both of them are now in the British Museum of Natural History. Although subsequent botanists, including Robert Brown and J. D. Hooker made use of them, the manuscripts themselves were never published (Britten, 1916:348-351).

Archibald Menzies (Boulger, 1963-1964) collected plants on Tahiti and kept a detailed journal of his long voyage with Vancouver, but the only part of it that he published was an account of his mountain-climbing experiences in Hawaii (Menzies, 1829, I:201-208, II:435-442). In 1920 another portion dealing with Hawaii was edited and published under the title of *Hawaii Nei 128 Years Ago* (Menzies, 1920), but no other section dealing with the Pacific Islands has been issued. There are copies of the complete journal, which runs to five volumes, in the British Museum and at the Linnean Society of London (Balfour, 1944-1945).

Some of his new species of plants were described and published by Sir James Edward Smith (1821) and Robert Brown (1810) but by far the majority of them by W. J. Hooker in his *Botanical Miscel-*

lany (1830) and the *Flora Boreali-Americana* (1829-1840).

Menzies' own particular interests were in cryptogams and when he died, he bequeathed his large herbarium of them to the Edinburgh Botanic Garden. Naturally Banks had received many specimens, and some of Menzies' plants from the Pacific Islands are reported to be in the Martius collection at Munich. Other Menzies specimens are also at Brussels and the British Museum (Balfour, 1943-1944:181).

Due to the very nature of the breadfruit voyages, it is not surprising that no publications resulted from them. They were strictly commercial ventures and the botanists who sailed on them were hired primarily to care for the breadfruit seedlings. Little time was available for anything else and even before the ships sailed from England Banks had arranged to buy the collections for himself.

Since there were facilities for maintaining live plants on board, Bligh was able to bring back some "curiosities" on the *Providence*. In a table summarizing the results of the voyage, he included "An Account for his Majesty's Garden at Kew." There were 24 vessels containing 32 plants from Tahiti and among these were "Breadfruit, Rattah or Chestnut, Ayyah or Jambo, Avee or Apple, Peeah Sago Flour, Oraiah Plantain, Coconut, Nono singular and Hoohee or Yams" (Lee, 1920:222).⁴

When the *Providence* arrived at Jamaica, Wiles was engaged to remain there as a gardener at Bath and his collections are in the Delessert Herbarium at Geneva, at Kew, and in the Banks' collection at the British Museum. Smith's dried specimens from Tahiti are also in the British Museum (British Museum, 1904:83). Aiton and Aiton (1810-1813) list some of the plants introduced into Kew from this voyage.

⁴The plants, their Tahitian names, and taxa are as follows: (1) breadfruit: "uru," *Artocarpus altii* (Parkinson) Fosberg; (2) chestnut: "rata" (or "mape"), *Inocarpus fagiferus* (Parkinson) Fosberg; (3) jambo: "ahia," *Eugenia malaccensis* L.; (4) apple: "vi," *Spondias dulcis* Parkinson; (5) sago flour: "pia," *Tacca leontopetaloides* (L.) Kuntze; (6) coconut: "niu," *Cocos nucifera* L.; (7) yams: "uhi" or "ufi," *Dioscorea alata* L. Plantain is *Musa paradisiaca* L., but "oraiah" cannot be rendered into any Tahitian equivalent. Similarly, "nono" is the Tahitian for *Morinda citrifolia* L., but it is not clear to what the "singular" refers.

Thus the eighteenth century provided only a meager list of books about the plants to be found in the Society Islands. Even in the nineteenth century, which saw a tremendous increase in the amount of collecting and number of publications concerning their botany (see below), there was still no flora of the islands written. Several lists of species with varying amounts of description and comment were available, mostly done by French naval officers interested in botany or by Frenchmen living on Tahiti. None of these, however, were critical taxonomic works. The closest thing to a flora of the Societies was Emmanuel Drake del

Castillo's *Flore de la Polynésie Française* of 1892, which includes the Marquesas, Tuamotus, and the Gambier and Wallis groups (Jouan, 1896, has critically reviewed this flora). When Drake del Castillo prepared it, he had not seen many of the plants in the British or American collections, nor had he ever seen any of the plants in the field. It is now, of course, much out of date. And so, this flora prepared by Dr. Martin Grant in 1936, partial though it is, must be considered as much more than just an addition to the field of Society Islands' botany; it constitutes a real beginning.

A CHRONOLOGICAL SUMMARY OF THE MAJOR VOYAGES, COLLECTIONS, AND PUBLICATIONS CONCERNING THE FLORA OF THE SOCIETY ISLANDS IN THE NINETEENTH AND TWENTIETH CENTURIES⁵

- 1817-1856. J. M. Orsmond, missionary, left a record of the native names and uses of a large number of plants which was published by Henry (1928).
- 1822-1825. Lesson, with Duperrey in the *Coquille*, collected a few plants. [The phanerogams of this voyage were reported by Brongniart (1829) and the cryptogams by Bory de Saint Vincent (1827-1829). Lesson (1838) included chapters on the plants of Tahiti and Borabora in his narrative of the voyage. Duperrey (1825-1830) wrote the general account of the voyage.]
1826. Captain Beechey in the *Blossom*. A fair-sized plant collection was made by Lay and Collie, and a report published by Hooker and Arnott (1832-1840).
- 1827-1828. [Hugh Cuming made a small collection in Tahiti which is discussed by St. John (1940). These plants are now at Kew.]
1830. [Captain Waldgrave (1833) discussed some plants of the Society Islands before the Royal Geographical Society.]
- 1831-1834. Bertero and Morenhout made an extensive plant collection which was written up by Guillemin (1836-1837).
1834. Nightingale collected a few plants, largely in Huahine, [and a list of the ferns by W. J. Hooker was included as a botanical index in Nightingale (1835).]
1835. Captain Fitzroy and Charles Darwin in the *Beagle*. Darwin made a few observations on plants in the Society Islands in his journal (1852).
1836. Endlicher (1836) published a list of all the plants known from Polynesia, Micronesia and New Zealand.
- 1836-1839. Du Petit-Thouars in the *Venus*. A very few of his plants were reported on by Decaisne (1849, 1864).
- 1836-1842. Captain Belcher in the *Sulphur*. Hinds and Barclay collected a few plants. [Hinds published a superficial description of the vegetation in Belcher's (1843) narrative of the voyage].
- 1837-1840. Dumont d'Urville in the *Astrolabe* and the *Zélée*. Collections were made by Hombron, Jacquinot, and Le Guillou. [Hombron and Jacquinot (1845-1853) edited the botanical volumes of the voyage and Dumont d'Urville (1841-1846) wrote the narrative.]
1839. The United States Exploring Expedition under Captain Wilkes. [Wilkes (1844) wrote the general account of the voyage.] Plants were collected by Pickering, Rich, and Brackenridge. [Several reports on the flowering plants were issued by Asa Gray (1854-1856) and Brackenridge (1854-1855) wrote up the ferns.]

⁵ This list is adapted from Grant's original manuscript of this publication and all material in brackets is added by Smith. It is concerned only with the ferns and flowering plants and is by no means exhaustive. For more complete information, see Sachet and Fosberg (1955, 1971) and Merrill (1947).

1843. [Virey discussed the economic flora of the Societies.]
- 1845-1847. *Galathea* expedition, with Didricksen collecting a few plants.
- 1845-1847. Dr. Johnston wrote a short paper on the botany of Tahiti. [This paper was found among the papers of William Swainson and the author is unknown. Rehder (1911, I:510) credits it to Nadeaud and Merrill (1947) agrees that it is probably a translation of Nadeaud (1874).]
1847. Vesco, the surgeon of the *Uranie* sent a number of plants to Paris. [This was the frigate *Uranie* under Captain A. J. Bruat.]
1848. [E. Delessert (1848) wrote a narrative of his travels in the Atlantic and Pacific Oceans and included notes on the vegetation of the Society Islands.]
- ca. 1850. Bidwill, Sibbald, and Ribourt collected a few plants.
- 1851-1853. Andersson and Ponten, botanists on the *Eugenie*, made a small collection. [This was a Swedish expedition and the narrative of it was written in Swedish by Skogman in 1855. His account mentions some plants from the Societies. For the German translation, see Skogman (1856).]
- 1852-1857. Jardin (1862) collected a considerable number of plants in the Marquesas, and secured a few plants in Tahiti. [He also published (1860) a supplement to Guillemain 1836-1837.]
1855. Pancher and Vieillard made a small collection and Pancher published a short paper on the flora [in Cuzent (1860).]
- 1856-1859. Nadeaud made very extensive plant collections and published an account of the useful plants (1864), a check-list of the flora (1873), an essay on the botany of Tahiti (1874) and a number of taxonomic notes (1897, 1899).
- 1856-1863. Cuzent, residing in Tahiti, wrote two important papers on the medical and useful plants (1857, 1860) and a number of shorter ones (1861a, 1861b).
1857. Lépine, a pharmacist stationed in Tahiti collected a number of plants and published at least one paper (1857).
- 1857-1859. Commodore Wüllerstorff-Urbair in the *Novara*. Jelinek made a small collection, now in the Vienna herbarium. [The botanical part of the voyage was edited and published by Fenzl (1867-70).]
- 1865-1873. Seemann's *Flora Vitiensis* (1865-1873) contains a record of all the Society Islands' plants then in the British Museum.
- 1865-1884. Jouan published several papers on the useful plants (1865, 1874, 1875, 1876, 1882, 1884).
- ca. 1870. Whitmee made a small collection. [This was the Rev. S. J. Whitmee who also collected in Samoa.]
1875. Captain Spry in the *Challenger*. Moseley (1879) made a small collection of plants. [Baker (1876) wrote a description of the ferns.]
1878. Vernier and Savatier, botanists with the *Magicienne*, brought a number of plants back to Paris. [Savatier's herbarium is now at Kew; see Stapf (1909). A brief account of the voyage was published by Savatier (1880).]
1886. Lanessan's (1886) paper on the useful plants is merely a compilation based on Nadeaud (1864) and Cuzent (1857).
- 1886-1898. Emmanuel Drake del Castillo wrote the first flora which included the Society Islands (1892), a check-list of all Polynesian plants (1886-1892) and a number of short papers (1887, 1888, 1890, 1898).
1891. Butteaud's (1891) *Flore tahitienne* is an inaccurately compiled check-list of the native flora with original notes on the introductions.
- 1905-1906. Seurat published several papers on the useful plants (1905, 1906a, 1906b).
- 1909-1912. Leland, Chase, and Tilden made a small collection (see page 1).
1910. Christian (1910) published a few notes, largely on the useful plants.
1918. [Bonaparte (1918) published a list of Tahitian ferns with notes.]
1921. F. Brown secured a small number of specimens (see page 1). [In their *Flora of Southeastern Polynesia*, F. Brown (1931, 1935) and Brown and Brown (1931) discuss a number of Society Islands plants although the flora is mainly concerned with all of Southeastern Polynesia but the Societies].
- 1921-1923. Whitney expedition. Quayle and Curtiss made a large collection. (See page 1).
1922. Setchell and Parks made a large collection, and a report on the flowering plants

- was published by Setchell (1926). [Maxon (1924) reported on the ferns, and Viguier (1930) wrote some general notes on the vegetation compiled from Setchell.]
- 1926-1927. Moore made an exhaustive collection in Raiatea, the nearest thing to a complete herbarium that I have ever seen from Polynesia. A description of his novelties has been published (1933, 1934).
- 1926-1932. [Wilder collected in the Societies, and published a paper on the breadfruit of Tahiti (1928).]
1927. [Macdaniels made a large collection from Tahiti. (See page 1). From the collection, Moore (1940) described 14 new species.]
- 1929-1930. [Adamson collected several plants in Tahiti. (See page 1).]
- 1930-1931. [Grant's collection on which this flora is based.]
1932. [Copeland published a report on the ferns from Grant's collection.]
- 1932-1933. [Martelli wrote two papers (1932, 1933) on the Pandanaceae.]
1934. [The Mangarevan expedition with St. John and Fosberg. Several papers have been published on the plants collected by them. See Copeland (1938), Fosberg (1937), Heimerl (1937), Sherff (1937), and Sussenguth (1936).]
1961. [A very small collection was made in Moorea by Elizabeth Murray and is now in the Bishop Museum.]
1963. [M.-H. Sachet collected in Tahiti and sets will be deposited in the Bishop Museum and in the U.S. National Herbarium.]
1963. [J.-N. Maclet began collecting in Tahiti and has continued. Many of his specimens are at the U.S. National Herbarium.]
1967. [Howard Smith collected 186 numbers in Moorea. A complete set of the flowering plants is in the Bishop Museum and the ferns are in the University of Michigan Herbarium.]

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Appendix 1

SYNONYMY OF NAMES OF SOCIETY ISLANDS

<i>Island</i> ¹	<i>European name</i>	<i>Discoverer</i> ²	<i>Date</i>
<i>Mehitia</i>	Osnaburgh	Wallis	1767
Mahetia			
Meetia			
Maitea			
<i>Tahiti</i>	King George III Island	Wallis	1767
Otaheite			
Otaiti			
Taiti			
<i>Moorea</i>	Duke of York's Island	Wallis	1767
Eimeo			
<i>Tetiaroa</i>	—	Cook	1769
Tethuroa			
<i>Tubuai Manu</i>	Sir Charles Saunders Island	Wallis	1767
Maiao Iti			
Tapoamano			
Tapuaemanu			
<i>Huahine</i>	—	Cook	1769
Huaheine			
Hooheine			
<i>Raiatea</i>	—	Cook	1769
Uliatea			
Ulietea			
Iriru			
Yoolee e Tea			
<i>Tahaa</i>	—	Cook	1769
Otaha			
Mahea			
Whennuaia			
Whernuaia			
<i>Borabora</i>	—	Roggeveen	1722
Bola Bola			
Vavau			
<i>Tupai</i>	—	Cook	1769
Tubai			
Motu Iti			
<i>Maupiti</i>	—	Roggeveen	1722
Maura			
Maurua			
Mobidie			
<i>Mopelia</i>	Lord Howe Island	Wallis	1767
Mopihaa			
<i>Motu One</i>	Bellingshausen	Kotzebue	1824
<i>Manuai</i>	Scilly	Wallis	1767
Manuae			
Fenua Ura			
Fenua Ora			

¹ The islands are listed from southeast to northwest and common variants of their names listed under them. (For further details consult Jourdain, 1970, and Sharp, 1960).

² Those who first reported the existence of the island, not necessarily those who first landed on it.

Appendix 2

LANDING LOCALITIES IN THE SOCIETY ISLANDS

<i>Captain and island</i>	<i>Landing site</i>	<i>Length of stay</i>
<i>Wallis</i>		
Tahiti	Matavai Bay	21 Jun - 20 Jul 1767
<i>Bougainville</i>		
Tahiti	Hitiaa Lagoon	6 Apr - 14 Apr 1768
<i>Cook—1st Voyage</i>		
Tahiti	Matavai Bay	13 Apr - 13 Jul 1769
Moorea (Banks)	Islet of Irioa	1 Jun - 4 Jun 1769
Huahine	Fare Harbor	17 Jul - 20 Jul 1769
Raiatea	Opoa Harbor	20 Jul - 29 Jul 1769
	Rautoanui Bay	2 Aug - 9 Aug 1769
Tahaa (Banks and Solander)	Haamene Bay	28 Jul - 29 Jul 1769
<i>Cook—2nd Voyage</i>		
Tahiti	Vaitepiha Bay	17 Aug - 24 Aug 1773
	Matavai Bay	26 Aug - 1 Sep 1773
	Matavai Bay	22 Apr - 14 May 1774
Huahine	Fare Harbor	3 Sep - 7 Sep 1773
	Fare Harbor	15 May - 23 May 1774
Raiatea	Haamanino	8 Sep - 17 Sep 1773
	Haamanino	23 May - 4 Jun 1774
<i>Cook—3rd Voyage</i>		
Tahiti	Vaitepiha Bay	13 Aug - 23 Aug 1777
	Matavai Bay	23 Aug - 29 Sep 1777
Moorea	Papetoai Bay	29 Sep - 11 Oct 1777
Huahine	Fare Harbor	12 Oct - 2 Nov 1777
Raiatea	Haaminino	4 Nov - 7 Dec 1777
Borabora	Teavanui Harbor	8 Dec - 8 Dec 1777
<i>Bligh—1st Voyage</i>		
Tahiti	Matavai Bay	25 Oct - 24 Dec 1788
	Toahroah Harbor	25 Dec - 4 Apr 1789
<i>Vancouver</i>		
Tahiti	Matavai Bay	30 Dec 1791 - 24 Jan 1792
	(Menzies went to District of Oparee in that time)	
<i>Bligh—2nd Voyage</i>		
Tahiti	Matavai Bay	10 Apr - 19 Jul 1792

Appendix 3

VOYAGES TO THE SOCIETY ISLANDS IN THE EIGHTEENTH CENTURY

<i>Captain</i>	<i>Ship</i> ¹	<i>Nation</i>	<i>Date</i>	<i>Purpose of visit</i>
Wallis	<i>Dolphin</i>	England	1767	Look for southern continent
Bougainville (Giraudais)	<i>La Boudeuse</i> <i>L'Etoile</i>	France	1768	Look for southern continent
Cook	<i>Endeavour</i>	England	1769	Transit of Venus and look for southern continent
Boenechea	<i>Aguila</i>	Spain	1772	To see if the British had made a permanent settlement on Tahiti
Cook (Furneaux)	<i>Resolution</i> <i>Adventure</i>	England	1773, 1774	Resupply on way to look for southern continent
Boenechea	<i>Aguila</i>	Spain	1774-1775	Take missionaries to Tahiti
Langara	<i>Aguila</i>	Spain	1775	Take supplies for missionaries on Tahiti
Cook (Gore)	<i>Resolution</i> <i>Discovery</i>	England	1777	Resupply on the search for the Northwest Passage
Watts	<i>Lady Penrhyn</i>	England	1778	Resupply on way to New South Wales
Bligh	<i>Bounty</i>	England	1788	Breadfruit from Tahiti
Edwards	<i>Pandora</i>	England	1791	Looking for the mutineers from the <i>Bounty</i>
Vancouver (Broughton)	<i>Discovery</i> <i>Chatham</i>	England	1791-1792	Resupply on way to survey northwest coast of North America
Weatherhead	<i>Matilda</i>	England	1792	Resupply on a whaling voyage
?	<i>Prince William</i> <i>Henry</i>	?	1792	?
Bligh (Portlock)	<i>Providence</i> <i>Assistant</i>	England	1792	Breadfruit from Tahiti
New	<i>Daedalus</i>	England	1793	Resupply on the way to take supplies to Captain Vancouver
Wilson	<i>Duff</i>	England	1797	Deliver members of the London Missionary Society to Tahiti

¹ From Henry, 1928:6-30.

Index of Botanical Names

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