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The Genus Ficus in the Samoan Islands

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INTRODUCTION

Otto Warburg provided the first relatively complete account of the Samoan figs in Reinecke's "Die Flora der Samoa-Inseln" (Engler Bot. Jahrb., **25**: 613, 1898). He included altogether eight species, of which seven were described as new, *Ficus tinctoria* Forster f. being the only old species recognized.

In 1905, Dr. Karl Rechinger visited the group and later published an account of the *Ficus* specimens collected by him (Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 270-272, 1910). He added four more species: *F. obliqua* Forster f. and three new species.

Dr. Erling Christophersen visited Samoa twice, in 1929 and 1931 respectively (B. P. Bishop Mus., Bulls. **128, 154,** 1935, 1938), during which time he made a considerable collection of *Ficus* material. Through the kindness of Bernice P. Bishop Museum, I have been able to study this material, together with specimens of figs collected by other visitors to the islands. The following account is based mainly on these collections, but I have seen the type specimens of nearly all the recorded species, and much of the material at Berlin collected by Reinecke and Graeffe, as well as the smaller collections at Kew and the British Museum. Of Rechinger's collections at Vienna, I have seen only a few gatherings apart from the types of his new species.

Since this study has been carried on contemporaneously with monographic studies of the figs of Oceania generally and particularly

of the adjacent island groups, such as Fiji, Tonga, and the Society Islands, I have been able to consider all the species from a broader aspect than would otherwise have been possible. The result is apparent in the numerous reductions to synonymy of described species which have been found necessary following a general study of Pacific figs. There is little doubt that a too narrow view of species has been taken by some previous students of the group, resulting in a multiplicity of species based often on quite inadequate characters.

The Samoan islands are the most easterly group in the Pacific possessing an at all varied *Ficus* flora. Eastward, only the widely spread *F. tinctoria* Forster f. and *F. prolixa* Forster f. are found. The Hawaiian islands have no native species.

Key to the Species

Male and perfect female flowers occurring in the same receptacle; trees (when mature) with more or less development of aerial roots; leaves smooth, glabrous; receptacles sessile or subsessile (§ *Urostigma*):

Basal bracts of receptacle persistent; aerial roots frequently well developed; base of leaf often somewhat rounded, lateral nerves not forming any distinct submarginal vein but joining in a series of bow-shaped loops; perianth of flowers gamophyllous, splitting irregularly; anther-loculi ± parallel, not confluent at apex.....1. **F. prolixa**

Basal bracts of receptacle caducous, leaving a more or less circular cushion around apex of peduncle; base of leaf cuneate, lateral nerves joined by shallow arcs and forming a distinct submarginal vein; perianth 3-4-partite, segments narrow; stamen adnate to one perianth segment, anther-loculi confluent at apex forming a reniform anther.....2. **F. obliqua**

Male and galled-female flowers in one set of receptacles, perfect female flowers in distinct receptacles (perhaps on different plants); no aerial roots developed; leaves often rough or hairy on one or both surfaces; receptacles stalked, sometimes in groups on larger branches or trunk (§ *Sycidium*):

Basal bracts of receptacle always at base of peduncle; male flowers always with well-developed gall-ovary; perianth of all flowers shortly hairy, especially in lower part, not setose-ciliate; receptacle inside pubescent, not setose, between the flowers; reticulation of under surface of leaf often very distinct, the veins paler than the mesophyll; leaves obliquely oblong-ovate, outline somewhat angular....3. **F. tinctoria**

Basal bracts towards apex of peduncle or one or more on the receptacle itself; male flowers usually with minute gall-ovary, latter rarely well developed; perianth glabrous or setose-ciliate in the upper part; receptacle inside more or less setose between the flowers:

Leaves more or less equally cordate or rounded at the base, ovate, not long-acuminate; perianth segments ± densely ciliate at the apex:

Mature leaves not scaberulous, pubescent below, especially on the veins; receptacles shortly hispid hairy; petioles and young stems

adpressed pubescent.....4. **F. Reineckei**
Mature leaves scaberulous on both sides, lower portion of midrib and veins puberulous on lower surface, otherwise glabrous; receptacles very sparsely pubescent when young, glabrescent when mature; petioles and young stems shortly puberulous.....5. **F. ciliata**
Leaves cuneate, cuneate-rounded or unequally cordate at the base, shortly pointed or long-acuminate at the apex (if nearly equally cordate at the base the apex is long-acuminate); perianth segments glabrous or very sparsely ciliate at the apex:
Base of leaf very unequal, one lobe forming a rounded auricle overlapping the petiole, apex of leaf long-acuminate; leaves more or less pubescent beneath, large, up to 35 cm. long and 13 cm. broad; petiole short, about 1 cm. long (sometimes to 2 cm.); receptacles hairy, often densely so.....6. **F. uniauriculata**
Base of leaf with no overlapping auricle; leaves glabrous, rarely more than 20 cm. long; receptacles nearly glabrous:
Main lateral nerves of leaf 6-8, markedly curved or ascending, the lower some distance apart, the lowest pair usually distinctly longer than the others, the base being consequently more or less 3-nerved:
Leaves oblong, elliptical-oblong, oblong-lanceolate or rarely oblong-ovate, with a short blunt point.....7. **F. Godeffroyi**
Leaves lanceolate or ovate with a long narrow acumen.....7a. **F. Godeffroyi** var. **hygrophila**
Main lateral nerves of leaf 8-20, slightly ascending or almost horizontal, the lowest pair not very much longer than the others; apex of leaf always narrow acuminate:
Leaves usually 10-25 cm. long, 2.5-8.5 cm. broad (but sometimes one or two smaller leaves may be present), broadly lanceolate or oblong-lanceolate, sometimes very unequal at the base; receptacles up to 2.5 cm. in diameter.....8. **F. longe-cuspidata**
Leaves 4-12 cm. long, 9-18 mm. broad, narrowly lanceolate, gradually tapering to apex; receptacles up to 1 cm. in diameter.....9. **F. samoensis**

Enumeration of Species

I have seen the specimens cited unless it is stated otherwise.

1. **Ficus prolixa** Forster f., Florulae Insularum Australium Prodromus, 77, 1786.

F. umbilicata Bureau, Drake del Castillo, Flore de la Polynésie Française, 195, 1893.

F. Aoa Warburg, Engler Bot. Jahrb., **25**: 615, taf. 11, 1898; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 271, 1910.

F. prolixioides Warburg, Fedde Repert. **1**: 79, 1905.

Savaii: *Reinecke 374; Christophersen 2622, 2653, 2763, 2879, 2880* (in part), *3015*.

Upolu: *Reinecke 504* (not seen), without no. (as *F. tinctoria*).

Tutuila: *Swezey,* without no.

The Reinecke numbers are reversed in his account, but the Savaii specimen at Berlin is number 374. Reinecke says that the species occurs on all the islands; I have seen material only from those named above. *F. prolixa* forms huge trees of a banyan type with abundant aerial roots.

Distribution: French Polynesia, Cook Islands, Tonga, Fiji, New Hebrides, New Caledonia, Solomon Islands. (I am unable to give accurately the western limits of distribution of this species. I have not found it possible to distinguish with certainty *F. prolixa* from some forms of *F. glabella* Blume and *F. nesophila* F. Mueller ex Miquel.)

2. **Ficus obliqua** Forster f., Florulae Insularum Australium Prodromus, *77,* 1786; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: *272,* 1910.

F. Graeffii Warburg, Engler Bot. Jahrb., **25**: 616, 1898; Rechinger, loc. cit.

F. eugenioides F. Mueller, Miquel Ann. Mus. Lugd.-Bat., 3: 286, 1867.

F. aphanoneura Warburg, Fedde Repert. **1**: 80, 1905.

Savaii: *Christophersen 591, 611, 2880* (in part), *2882, 3224, 3331; Christophersen and Hume 1874, 2035, 2530, 3188, 3388.*

Upolu: *Hopkins 640; Christophersen 300, 971; Eames 5.*

Apolima: *Rechinger 478, 1037* (not seen).

Tutuila: *Swezey,* without no.; *Setchell 198, 315, 422.*

Ofu: *Garber 992.*

Island not recorded: *Whitmee 171, 188.*

Varies from a small shrub to a large tree, but aerial root development is not very great. Distinctness or lack of distinctness of the primary nerves cannot be used as a specific character since it depends upon age and preservation.

The material in the British Museum collected by Forster and named by him *F. obliqua* is a mixture of the species here dealt with and of *F. prolixa* Forster f. From the description of the basal bracts as "calycibus caducis" it is evident which species Forster had in mind, as in *F. prolixa* the bracts are persistent. Material of *F. eugenioides* F. Mueller, Miquel from the type locality (Albany Island, Cape York,

Queensland), agrees exactly with the Pacific islands specimens of *F. obliqua.*

Distribution: Fiji, Tonga, New Hebrides, New Caledonia, Australia.

3. **Ficus tinctoria** Forster f., Florulae Insularum Australium Prodromus 76, 1786; Warburg, Engler, Bot. Jahrb. **25**: 613, 1898; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 96, 1910.

F. chlorosykon Rechinger, loc. cit.

Savaii: *Rechinger 1070; Vaupel 254; Christophersen 579, 583, 584, 701, 2858; Christophersen and Hume 1872.*

Upolu: *Reinecke 44; Reinecke,* without no.; *Rechinger 516, 1783, 1792; Christophersen 967; Eames 160; Swezey,* without no.; *Buxton 640.I.*

Tutuila: *Diefenderfer 13, 18; Swezey,* without no. (2 gatherings).

Tau: *Garber 544.*

Ofu: *Garber 996.*

Island not recorded: *Powell 38, 108, 108a; Swezey 9.*

I cannot distinguish *F. chlorosykon* Rechinger. The differences given by Rechinger are of no importance or are due to faulty observation; for example, the perianth segments are shortly hairy in the type material of *F. chlorosykon,* not glabrous, as stated by Rechinger.

Distribution: French Polynesia, Cook Islands, Fiji, Tonga.

All the material referred to *F. tinctoria* which I have seen from regions to the west (for example, New Guinea) belongs, in my opinion, to other species.

4. **Ficus Reineckei** Warburg, Engler Bot. Jahrb. **25**: 617, 1898; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 98, 1910.

Upolu: Rechinger, various gatherings (not seen).

Olosenga (Manua Islands): *Reinecke 472.*

Island not recorded: *Powell 310.*

My dissections show that this species is better referred to § *Sycidium* than to § *Urostigma.* The receptacles examined by me were all either male-gall or female exclusively; in addition, the vegetative characters are not those of § *Urostigma.*

Distribution: Endemic.

5. Ficus ciliata Warburg, Engler Bot. Jahrb. **25**: 615, 1898.

Savaii: *Christophersen 3286, 3299.*

Upolu: *Reinecke 37* (in part), *73, 126; Christophersen 313; Eames 159; Graeffe 1323, 1462.*

Tutuila: *Meebold 8250, 16732; Swezey,* without no.; Setchell *148, 314, 421, 427.*

Tau: *Swezey 13.*

Island not recorded: *Powell 110; Swezey 8, 12; Graeffe,* without no.

Distribution: Endemic.

6. Ficus uniauriculata Warburg, Engler Bot. Jahrb. **25**: 616, 1898; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 97, 1910.

Savaii: *Christophersen and Hume 1998, 2584; Bryan 123.*

Upolu: *Reinecke 138; Christophersen 48; Reichinger 1477.*

Tutuila: *Setchell 69.*

Island not recorded: *Whitmee 170, 294; Powell 112; Swezey 10.*

This species varies considerably in leaf-shape which may be ovate or lanceolate, while the large auricle at the base varies from rounded to distinctly toothed; the amount of overlapping also varies. Some forms of *F. longe-cuspidata* Warburg with rather unequal leaf-base approach *F. uniauriculata* but the latter can be distinguished by the hairy fruits.

Distribution: Endemic.

7. Ficus Godeffroyi Warburg, Engler Bot. Jahrb. **25**: 613, 1898; Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 97, 1910.

F. upoluensis Rechinger, loc. cit., 1910.

Savaii: *Reinecke 73a, 76a, 467; Vaupel 486. Christopersen 635, 2704, 2859, 3067, 3452; Christophersen and Hume 2149, 2196, 2287, 2303, 3287.*

Upolu: *Reinecke 37* (in part); *Rechinger 345; Christophersen 337, 944.*

Tutuila: *Reinecke 76b; Setchell 68; Christophersen 982, 1143; Garber 936.*

Olosenga (Manua Islands): *Garber 1055, 1058, 1064.*

Island not recorded: *Powell 109, 309; Whitmee 169; Swezey 4, 5, 6.*

7a. Ficus Godeffroyi var. **hygrophila** (Rechinger) Summerhayes, var. nov.

F. hygrophila Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wiss. Wien, **85**: 98, 1910.

Savaii: *Vaupel 462; Christophersen 904, 2558; 3121; Christophersen and Hume 2141.*

Upolu: *Rechinger 966, 983.*

Island not recorded: *Swezey 11.*

The variety is almost identical with type *F. Godeffroyi* in floral and receptacular structure. There are, however, surprisingly few intermediates in leaf-shape, so I have thought it best to consider the forms with caudate-acuminate leaves as forming a distinct variety.

Type and variety vary considerably in the shape of the leaf-base which is practically always more or less oblique but rarely is unequally subcordate. With sterile material it is often difficult to distinguish between such cordate-based specimens and certain glabrescent forms of *F. ciliata* Warburg.

Distribution: Endemic.

8. Ficus longe-cuspidata Warburg, Engler Bot. Jahrb. **25**: 614, 1898.

Savaii: *Vaupel 415; Christophersen and Hume 2669.*

Upolu: *Reinecke 154; Christophersen 250; Eames 62.*

Tutuila: *Christophersen 998.*

Island not recorded: *Swezey 7.*

Very similar in appearance to *F. Godeffroyi* var. *hygrophila* but with more and distinctly closer main lateral nerves to the leaf. It is possible, however, that it would be better treated as another variety of *F. Godeffroyi.* There are no floral differences.

Distribution: Endemic.

9. Ficus samoensis, sp. nov. (fig. 1).

Frutex vel arbor parva usque ad 8 m. alta; ramuli graciles, juventute breviter adpresse pubescentes, demum cortice pallide brunneo leviter longitudinaliter ruguloso obtecti. *Folia* breviter petiolata, anguste lanceolata, apice fere caudato-acuminata, basi fere aequaliter subrotundata, 4-12 cm. longa, 9-18 mm. lata, costa utrinque prominente, nervis primariis utrinsecus 10-20 e costa angulo fere recto abeuntibus prope marginem leviter arcuatim conjunctis, nervis secundariis et venis indistinctis, utrinque glabra, laevia, vel subtus interdum ruguloso-punctulata; petiolus gracilis, 7-11 mm. longus, superne leviter canaliculatus, glaber, demum cortice ei ramulorum simili obtectus; stipulae lanceolatae, acuminatae, glabrae, usque ad 7 mm. longae. *Receptacula* axillaria, solitaria

FIGURE 1.—*Ficus samoensis*, sp. nov., subsidiary type, male.

vel caulina e ramulis aphyllis multo ramosis e ramis exeuntibus orta, alia flores ♂ et ♀ cecidiophoros, alia flores ♀ includentia, pedunculata, fere globosa, 6-10 mm. diametro, extra pilis brevissimis nigris sparsis praedita, laevia, maturitate rubra, ostiolo vix vel distincte elevato bracteis leviter adscendentibus, intus setis paucis inter flores instructa; pedunculus gracilis, 4-7 mm. longus, apice vel prope apicem bracteis tribus deltoideis instructus, ut receptaculum similiter sed densius indutus. *Flores* ♂ prope ostiolum siti, sessiles, perianthii segmentis 5-6 spathulato-oblongis rotundatis vel obtusissimis circiter 1.5-2 mm. longis glabris hyalinis vel pallide fulvis; stamina 1-2, perianthio breviora vel fere aequalia; ovarium abortivum saepius minutum, rarissime stamen fere aequans. *Flores* ♀ cecidiophori sessiles vel breviter pedicellati, perianthii segmentis 4-6 oblanceolatis lineari-lanceolatis vel lineari-oblongis obtusis ceterum eis florum ♂ similibus; ovarium breviter stipitatum, obvoideum vel fere globosum, stylo laterali vel subapicali brevi, stigmate brevissimo. *Flores* ♀ saepius sessiles, perianthii segmentis ut videtur eis florum ♂ similibus; ovarium sessile, stylo laterali perianthium superante, stigmate brevi dilatato vel bilobo; achaenia pallide aurantiaca, fere laevia.

A shrub or small tree up to 8 m. high; twigs slender, when young shortly adpressed pubescent, later covered with a pale brown slightly rough bark. *Leaves* shortly stalked, narrowly lanceolate, the apex caudate-acuminate, almost equally rounded at the base, 4-12 cm. long, 9-18 mm. broad, glabrous on both surfaces, smooth or sometimes with small rough points on the lower surface, the midrib prominent on both surfaces, the main lateral veins 10-20 on each side of the midrib, making almost a right angle with the latter and joining near the margin in shallow arcs, secondary and minor veins not distinct; petiole slender, 7-11 mm. long, shallowly channelled, glabrous, later developing cork similar to that of the twigs; stipules lanceolate, acuminate, glabrous, up to 7 mm. long. *Receptacles* axillary and solitary, or borne on leafless much branched twigs arising from the main branches, some containing only male and galled-female flowers, others only fertile female flowers, stalked, almost spherical, 6-10 mm. in diameter, covered sparsely with very short black hairs, smooth, red when ripe, the ostiole scarcely or distinctly raised with slightly protruding bracts, inside with a few stiff hairs between the flowers; stalk slender, 4-7 mm. long, with three triangular bracts at or near the apex, indumentum similar to that of the receptacle but denser. *Male flowers* near the ostiole, sessile; perianth segments 5 or 6, spathulate-oblong, rounded or very obtuse, 1.5-2 mm. long, glabrous, hyaline or pale red-brown; stamens 1 or 2, almost equalling or shorter than the perianth; galled-ovary usually minute but very rarely almost as large as the stamen. *Galled-female flowers* occupying the remainder of the receptacle, sessile or shortly stalked; perianth segments 4 to 6, oblanceolate, linear-lanceolate or linear-oblong, obtuse, otherwise similiar to those of the male flowers; ovary shortly stipitate, obovoid or almost spherical, style lateral or subapical, short, stigma very short. *Female flowers* usually sessile, the perianth segments apparently similar to those of the male flowers; ovary sessile, style lateral, longer than the perianth, stigma short, thickened or bilobed at the apex; achene pale orange, almost smooth.

Savaii: above Letui, 500 m., in forest, September 1929, *Christophersen and Hume 769*; Matavanu, 600-700 m., in open woodland near the crater, July 1931, *Christophersen and Hume 1948* (♂ -gall plant, type in Bishop Museum); Le To, above Salailua, 750 m., in wet

forest, Oct. 1931, *Christophersen 2943* (♀ plant, subsidiary type); Siuvao-Auala, 600 m., in wet forest, November 1931, *Christophersen 3384*.

Upolu: above Malololelei, 700 m., in forest on ridge, Aug. 1929, *Christophersen and Hume 181*.

The species is evidently closely allied to the two preceding species but can be distinguished by the smaller and narrower leaves with numerous primary nerves nearly at right angles to the midrib.

Distribution: Endemic.

Doubtful Species

Ficus Moorei Seemann, Flora Vitiensis 249, 1868.

I have not been able to find the type specimen of this species at the British Museum where it was stated to be by Seemann. The description does not agree with any plant so far known with certainty as native in Samoa but seems to be more closely related to *F. granatum* Forster f., *F. edulis* Bureau, and other similar species from New Caledonia. In view of Seemann's statement that his other two new species received from the Sydney Botanic Gardens are natives of the New Hebrides, is seems probable that *F. Moorei* had a more westerly origin than that ascribed to it. Until material agreeing with Seemann's description has been collected wild in Samoa it does not seem advisable to include this species in the Samoan flora.