Botany of the Marquesas Islands: new taxa, combinations, and revisions

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EDITORIAL

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Introduction to Botany of the Marquesas Islands: new taxa, combinations, and revisions

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The Marquesas Islands (French Polynesia) are an isolated group of volcanic hot spot islands in the SE Pacific Ocean. These 12 islands range from 61.3 to 330 km^2 in size, from 360 to 1250 m in elevation, and from 1.3 to 6.3 Ma in age. Steep and rugged, the Marquesas were, until recently, comparatively unexplored and under-collected botanically. The only existing flora for the region was that of Brown and Brown (1931), Brown (1935) which is incomplete and outdated. Jacques Florence (IRD, Paris) has published two volumes of the Flore de la Polynesie française (Florence 1997, 2004), but this awaits completion. Disturbance by humans, feral animals, and invasive alien plants have severely impacted the lowland and mid-elevation vegetation (Florence and Lorence 1997; Wagner and Lorence 1997).

The currently known native vascular flora comprises about 362 species, of which 45% are endemic. This includes an impressive 118 species of pteridophytes, or 30% of the total. Largest angiosperm lineages are *Psychotria* L., 13 spp., *Bidens* L., 9 spp., *Cyrtandra* J. R. Forst. & G. Forst., 10 spp., *Ixora* L., 7 spp., *Coprosma* J. R. Forst. & G. Forst., 6 spp., *Oparanthus* Sherff, 5 spp., and *Kadua* Cham. & Schltdl., 4 spp. Marquesan floristic affinities are with the Society, Austral, and other islands in SE Polynesia, the paleotropics, and to a lesser degree, the Hawaiian Archipelago and the neotropics.

The Vascular Flora of the Marquesas Islands is a collaborative project between the National Tropical Botanical Garden, the Smithsonian Institution, and the Délégation à la Recherche (French Polynesia). In 1987–1988 both of us were taking new research positions at the National Tropical Botanical Garden and the Smithsonian Institution. Our desire to collaborate and to develop interactions between our institutions led to consideration of possible projects. A logical project was a Marquesas flora project because of the years of previous work by Smithsonian researchers Ray Fosberg and Marie-Hélène Sachet in the Marquesas (summarized in Wagner and Lorence 1997), and the focus on Pacific archipelagoes by the National Tropical Botanical Garden. The project was initiated informally on Kauai in 1988 over drinks during a meeting between Peter Raven, who received the Allerton Medal that year, and us. Peter suggested it would be an excellent collaborative project between the two institutions. So with a toast and handshakes the project was born.

The first collaborative field trip in 1988 included staff from the NTBG, Bernice P. Bishop Museum, the Smithsonian Institution, and Jacques Florence of the French research organization ORSTOM. The private yacht of Honolulu resident Ed Carus provided transportation between the islands and served as a mobile field station. Our small team of botanists and entomologists visited the islands of Eiao, Nuku Hiva, Hiva Oa, and Fatu Hiva and made c. 600 collections consisting of more than 2000 specimens, including 10 new species and island records. Two subsequent field trips were funded by NTBG and the Smithsonian, with collaboration from the French Polynesian Delegation for the Environment and ORSTOM. These early trips targeted poorly explored islands and regions on islands. They yielded large numbers of general collections of native and introduced vascular plant species, included a significant number of species new to science in relation to the flora's relatively small size. The project was continued with new funding by a generous grant from one of the NTBG's trustees in 2002. This grant enabled us to hire a research technician and conduct field trips to explore and document the flora of many additional islands and habitats. The four collecting expeditions in 2003–2005 yielded c. 6100 herbarium specimens comprising some 714 native and non-native vascular plant species, including additional new, undescribed species and island records. Sixty-two new species were discovered during the course of the project (since 1988), including a significant number by Jacques Florence, increasing the known flora by an impressive 20%.

Based on specimens from these trips several precursor papers in the form of regional taxonomic revisions were published describing new species in the genera *Hedyotis* L. (now included in *Kadua* Cham. & Schltdl.) (Florence & Lorence 2000), *Lepinia* Decne. (Lorence & Wagner 1997), *Trimenia* Seem. (Wagner & Lorence 1999), and *Wikstroemia* Spreng. (Wagner & Lorence 1998). Additional papers describing the vegetation and new species were described in a series of papers published in a special issue of Allertonia documenting the results of the 1988 Fatu Hiva expedition (Lorence 1997). Additional precursor papers from trips in 1995 and 1997 described new species of *Psychotria* L. (Lorence & Wagner 2005), *Ixora* (Lorence & Wagner 2007), and

Elaphoglossum Schott ex J. Sm. (Rouhan et al. 2008). Additional papers revising the genera *Bidens* (Asteraceae) and *Cyrtandra* (Gesneriaceae) are in preparation.

This series of nine precursor papers in this special issue of PhytoKeys, presented in phylogenetic order, includes three new combinations and descriptions of an additional 18 new species and one new variety of ferns and flowering plants, bringing the total number of new species described from the Marquesas in conjunction with this project and the Flore de la Polynesie francaise to 62. Field work has revealed the majority of these new species to be extremely rare and localized. Consequently, most have been assigned preliminary IUCN Red List ratings of Endangered or Critically Endangered. As has been clearly demonstrated by this project, biodiversity of many tropical islands is still poorly documented and understood. Field work and biological inventories are essential to enhance our knowledge of insular biodiversity and provide critical information for conservation of these organisms and habitats. Results of this project are available on an Internet-based resource hosted on the Smithsonian Department of Botany website [http://botany.si.edu/pacificislandbiodiversity/marquesasflora/index.htm], which provides access to a database of specimens, images, checklist, species pages, elevational range, geographic distribution, and literature. The final goal of this project is publication of a two volume book, the Vascular Flora of the Marquesas Islands.

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RESEARCH ARTICLE

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New pteridophyte species and combinations from the Marquesas Islands, French Polynesia

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Abstract

Intensive botanical exploration of the Marquesas Islands (French Polynesia) for the Vascular Flora of the Marquesas Islands and Flore de la Polynésie française projects has resulted in numerous additional new collections from these islands. Study of these collections has brought to light 11 new species of pteridophytes (ferns and lycophytes) which are described herein: *Blechnum pacificum* Lorence & A. R. Sm., **sp. nov.**, *Cyclosorus castaneus* A. R. Sm. & Lorence, **sp. nov.**, *Cyclosorus florencei* A. R. Sm. & Lorence, **sp. nov.**, *Dryopteris macropholis* Lorence & W. L. Wagner, **sp. nov.**, *Dryopteris sweetorum* Lorence & W. L. Wagner, **sp. nov.**, *Polystichum kenwoodii* Lorence & W. L. Wagner, **sp. nov.**, *Polystichum uahukaense* Lorence & W. L. Wagner, **sp. nov.**, *Pteris hivaoaensis* Lorence & K. R. Wood, **sp. nov.**, *Pteris marquesensis* Lorence & K. R. Wood, **sp. nov.**, *Pteris tahuataensis* Lorence & K. R. Wood, **sp. nov.**, and *Thelypteris marquesensis* Lorence & K. R. Wood, **sp. nov.** One new combination is made: *Cyclosorus marquesicus* (Holttum) Lorence & A. R. Sm., **comb. nov.** (based on *Plesioneuron marquesicum* Holttum). An analysis of the conservation status of these new Marquesas Islands taxa reveals they are in need of inclusion in the IUCN Red List with conservation status ranging from vulnerable (one species), and endangered (four species), to critically endangered (five species).

Keywords

Blechnum, Cyclosorus, Dryopteris, French Polynesia, Marquesas Islands, *Polystichum,* pteridophytes, *Pteris, Thelypteris*

Introduction

The only recent treatment of the Marquesan pteridophytes (=ferns and lycophytes, used interchangeably herein) is Forrest and Elizabeth Brown's Flora of Southeastern Polynesia (Brown & Brown 1931). This is essentially a report on the plants collected by the Browns on the Bayard Dominick Expedition (1921–1922), by E. H. Quayle, B. W. Jones, and R. Beck on the Whitney Expedition (1921–1922), and by the Pacific Entomological Survey (1929–1932) (Lorence and Wagner 1997). The Browns' flora did not include earlier collections not then represented in the Bishop Museum, except as they may have been recorded in the French Polynesian flora of Drake del Castillo (1892). In his Flore de la Polynésie Française Drake del Castillo recognized 142 fern and lycophyte species from the region, three of which were described as new. Brown and Brown (1931) recorded 103 species from southeastern Polynesia, or more specifically 122 taxa including varieties and forms of which 59 (48%) were described as new. Although the Browns' work suffers from a number of shortcomings such as non-parallel descriptions, atypical typifications, and errors in identification, it has remained the only modern pteridophytes flora available for the Marquesas.

Copeland (1932) subsequently published a floristic treatment of the Society Islands pteridophytes that included 164 species from this archipelago, but did not include the Marquesas Islands. Most recently, Kato et al. (2008) published an illustrated flora of ferns and lycophytes of the South Pacific islands, encompassing Samoa, Fiji, Vanuatu, and New Caledonia. Revisions of only a few taxonomic groups occurring in French Polynesia and the Marquesas have been published to date, e.g. *Elaphoglossum* (Rouhan et al. 2008) and Hymenophyllaceae (Ebihara et al. 2006). Useful identification guides include an online key and pictorial checklist of the pteridophytes of Moorea, available at http://ucjeps.berkeley.edu/moorea/pteridophytes.html. A comprehensive published treatment of Marquesan pteridophytes is clearly needed.

This paper increases our knowledge of the Marquesan pteridophyte flora by describing 11 new species and proposing one new combination. The present contribution forms part of a series of precursor publications with the goal of producing the first complete Vascular Flora of the Marquesas Islands (Lorence and Wagner 1997). Currently available online as a Web-based flora with a searchable database of descriptions, photos, literature and specimens, it may be accessed at http://botany.si.edu/pacificislandbiodiversity/marquesasflora/index.htm. This project will provide a comprehensive treatment of all Marquesan pteridophytes, for which the essentially completed treatment is now available on the website. A primary goal is to publish the Vascular Flora of the Marquesas Islands as a two volume printed work. A second goal involves collaboration on the Flora of French Polynesia project headed by Jacques Florence under the auspices of the French Institute pour la Recherche et Developpement (IRD, formerly ORSTOM). To date only two volumes of the modern *Flore de la Polynésie Française* have been published (Florence 1997, 2004), although Dr. Florence is currently finalizing a field guide to the French Polynesian pteridophytes.

Island Names

Orthographic variation exists for certain of the Marquesas Islands. For the sake of consistency we herein utilize the names accepted by the French Polynesian Government (see website at: www.presidence.pf) for the islands. In the following list accepted names are in boldface and alternative spellings are listed in parentheses: **Fatu Hiva** (Fatuhiva, Fatu Iva), **Hiva Oa** (Hivaoa), **Mohotani** (Motane), **Nuku Hiva** (Nukuhiva), **Tahuata, Ua Huka** (Uahuka), and **Ua Pou** (Uapou).

Conservation Status

As the Marquesan environment is under serious threat from human impacts, feral animals, and weeds (Florence and Lorence 1997) the conservation status was estimated for each new species. When evaluated using the IUCN criteria for endangerment (IUCN 2001, see also www.iucnredlist.org/info/categories_criteria2001), all but one of the new Marquesan pteridophyte species fall into the Endangered (EN) or Critically Endangered (CR) categories, which designates species facing the highest risk of extinction in the wild. One species, *Blechnum pacificum* which occurs on five Marquesan islands, three Society Islands, and Rapa Iti in the Austral Islands, is considered Vulnerable (VU). The IUCN **Endangered** (EN) criteria include: B1having known ranges less than 5000 km^2; B2 an area of occupancy of less than 500 km^2; a, b severely fragmented or known to exist at no more than five locations; c continuing decline in the quality of habitat; or D, a populations size less than 250 mature individuals. The IUCN **Critically Endangered** (CR) criteria include: B1 having known ranges of less than 100 km^2 and/or B2, an area of occupancy of less than 10 km^2; D, population size of less than 50 mature individuals; and estimates including at least two of the following: a, severely fragmented or known to exist at only a single location; b, continuing decline in the extent and/or quality of habitat, extent of occurrence or occupancy, or number of mature individuals.

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from field notes and photos. Measurements are presented in the descriptions as follows: length × width, followed by units of measurement (mm or cm). All specimens cited in this paper have been seen by the authors. Specimens from the following herbaria were studied: AD, BISH, BR, K, MO, NY, P, PAP, PTBG, and US. The area of occupancy (distribution) was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001; www.iucnredlist.org/info/categories_criteria2001).

Systematics

BLECHNACEAE
Blechnum

Blechnum L. is a cosmopolitan genus of about 180 species especially well represented in the southern hemisphere (Mabberley 2008). Brown and Brown (1931) recorded three species from the Marquesas Islands: the endemic *B. nukuhivense* E. D. Br., the rather widespread Pacific species *B. vulcanicum* (Bl.) Kuhn, and *B. capense* (L.) Schltdl. However, it is apparent that the latter name has been misapplied to Polynesian plants, which we describe below as a new species. The three Marquesan *Blechnum* can be separated by the following key.

Key to *Blechnum* in the Marquesas Islands

1a Sterile fronds 1-pinnate, nearly all the pinnules contracted at their bases and free from rachis, the apex with a conform terminal pinna similar to lateral pinnae.....***B. pacificum***

1b Sterile fronds entire, pinnatifid, or pinnatisect with the segments adnate and not contracted at their bases, or rarely the basal segments pinnate and the basiscopic base contracted and not adnate, the apex lacking conform terminal pinna **2**

2a Sterile fronds entire or sometimes irregularly pinnatifid toward middle and base..... ***B. nukuhivense***

2b Sterile fronds pinnatisect or rarely the basal segments pinnate ..***B. vulcanicum***

1. *Blechnum pacificum* Lorence & A. R. Sm., sp. nov.
urn:lsid:ipni.org:names:77112673-1
http://species-id.net/wiki/Blechnum_pacificum
Figs 1, 2, 14A

Species Blechno venoso Copel. affinis, sed stipitis squamis non tan numerosis, deciduis, leviter castaneis usque ad castaneis, sterilibus pinnis cum axialibus glabris et paulatim prominentibus venis, fertilibus pinnis cum viridi expansa textura prope basin differt.

Type. Marquesas Islands: Ua Pou: Poumaka Summit Trail, 690 m elevation, 9°23'33"S, 140°04'59"W, 19 June 2004, L. M. Dunn and D. H. Lorence 481 (Holotype: PTBG-041866!, PTBG-041867! [2 sheets]; Isotypes BISH!, P!, PAP!, US!).

Blechnum capense sensu E. D. Br. & F. B. Br., non Burm. f., non (L.) Schltdl.

Description. *Large terrestrial ferns*; *rhizomes* erect or suberect, rarely decumbent and dorsiventral, short, stout, (10–)15–20 mm in diameter (excluding scales), apex covered with scales; scales of rhizome and bases of stipes linear-subulate to oblong-ovate, 20–30 ×1–3(–5) mm, thin, light brown to brown, concolorous but somewhat

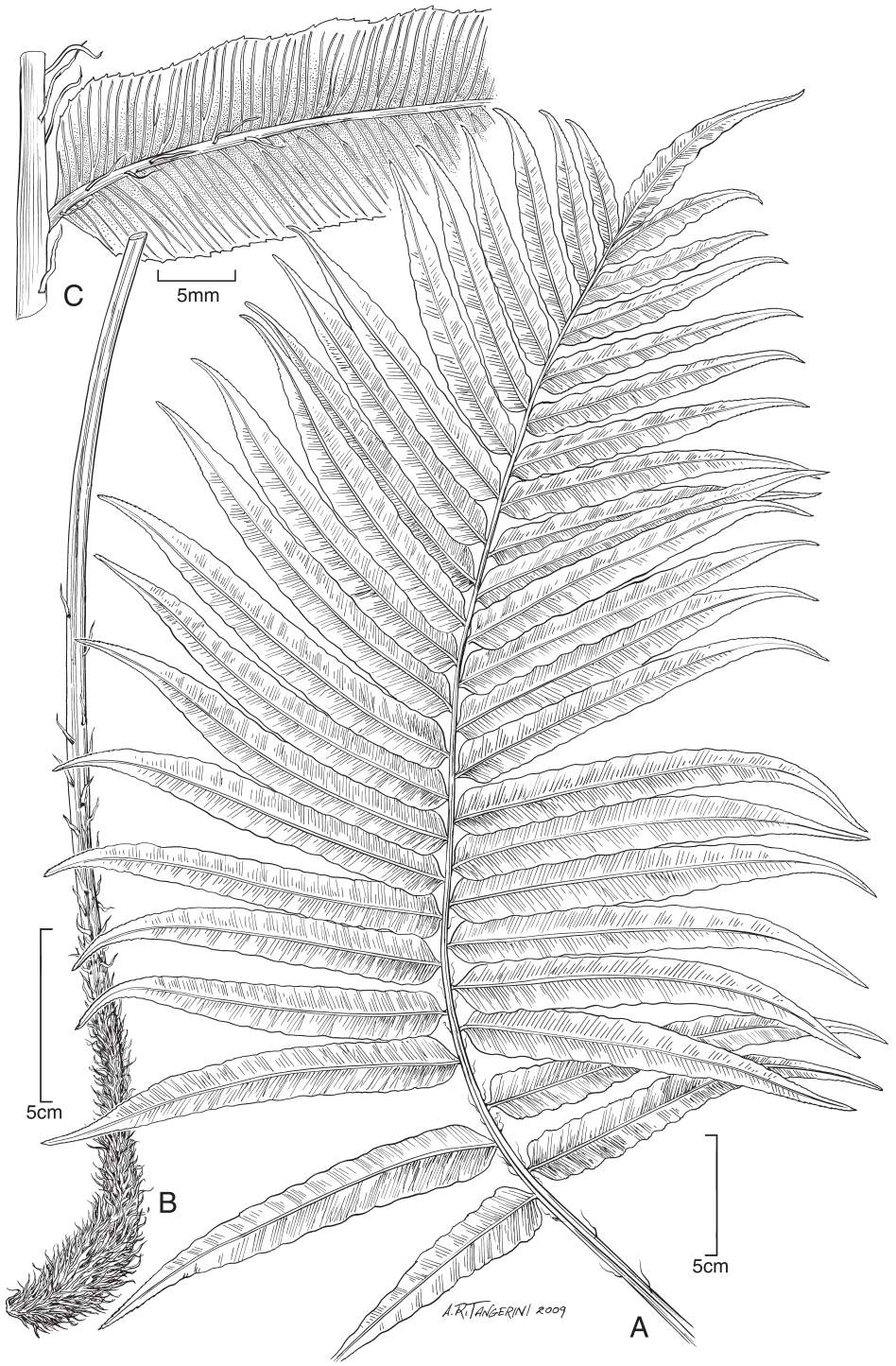

Figure 1. *Blechnum pacificum* Lorence & A. R. Sm. **A** sterile frond, blade **B** sterile frond, stipe **C** sterile frond, pinna base. Drawn from the type collection (Dunn and Lorence 481).

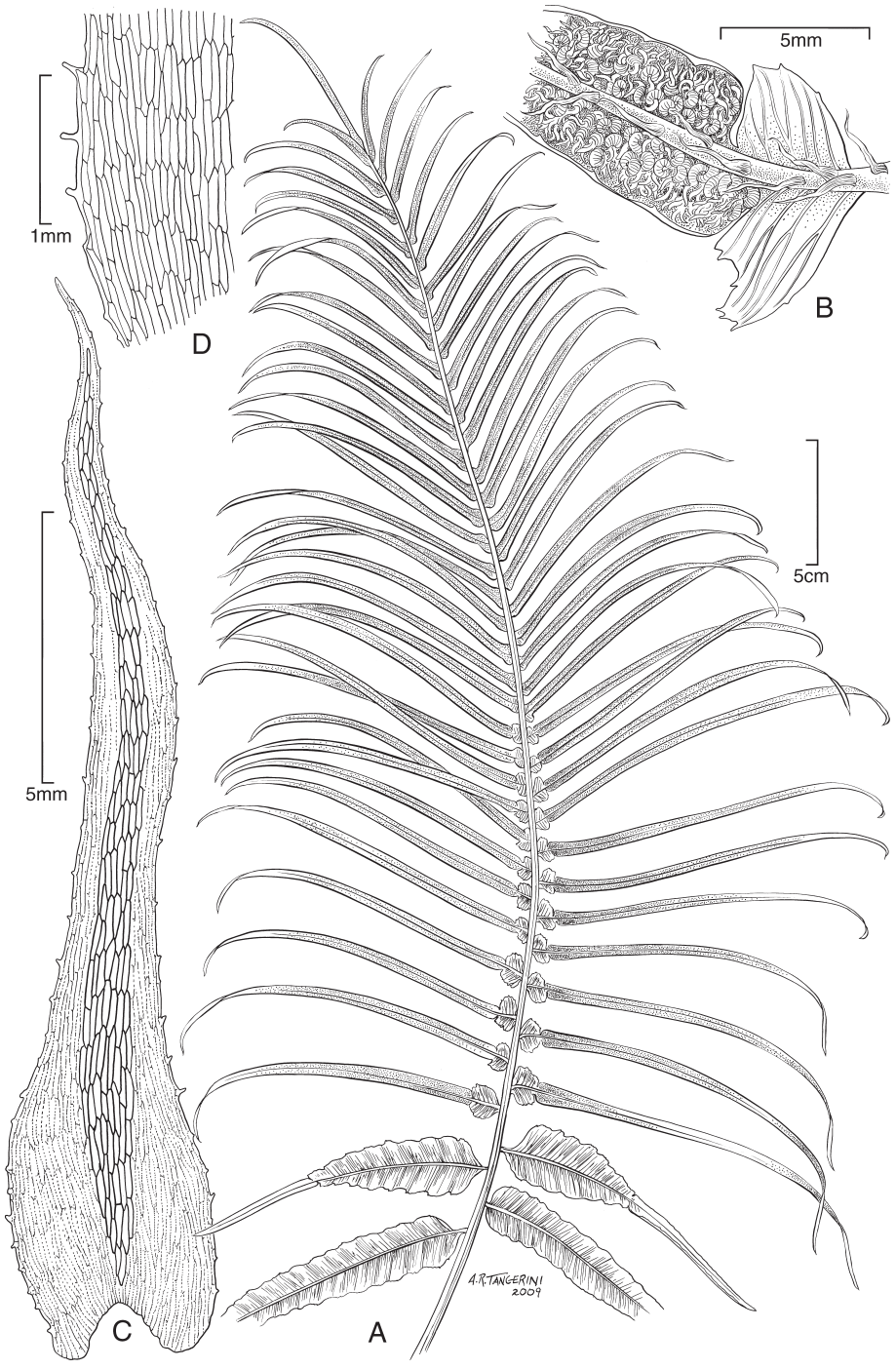

Figure 2. *Blechnum pacificum* Lorence & A. R. Sm. **A** fertile frond, blade **B**, fertile frond, pinna base showing expanded sterile portion **C** scale from base of stipe **D** part of scale from base of stipe, detail of cells. Drawn from the type collection (Dunn & Lorence 481).

thicker and darker basally and in center, basifixed, base rounded or truncate, apex sinuate, margins entire or subentire, cells linear, arranged in vertical rows. *Fronds* clustered near apices of rhizomes, usually dimorphic but both fertile and sterile pinnae occasionally occurring on the same blade; stipes 41–102 cm long, 4–10 mm in diameter, stout, light to dark brown when fresh, drying stramineous, densely scaly toward the bases, sparsely so distally, eventually glabrescent, smooth, grooved adaxially. *Sterile blades* 1-pinnate, oblong-ovate to oblong-elliptic, (35–)50–100 × (20–)30–60 cm, coriaceous to subcoriaceous, stiff, rachises stramineous or sometimes dark brown, proximal pinnae only slightly or not at all reduced, apices acute, each blade with a conform terminal pinna, when young the rachises, costae, costules, and veins scaly with thin, scurfy, brown to pale brown, oblong-ovate to subulate, contorted-sinuate scales to 10 mm long with margins subentire or sometimes lacerate basally; pinnae 19–30 on a side, with a slightly swollen, mammiform aerophore at the base each pinna, basal pinnae opposite and shortly stipitate (to 2 mm), the distal ones becoming subopposite to alternate, sessile with basiscopic base often adnate to rachis, terminal pinna free, conform, medial pinnae 11–30 × 1.5–2.5 cm, linear, margins serrulate, often decidedly undulate, apices acute or acuminate, serrulate, acroscopic bases oblique-cuneate, basiscopic base truncate or rounded, the veins prominulous, simple or 1-forked, free, each ending in a marginal tooth; *fertile fronds* subequal to or slightly smaller than sterile, with up to 40 pinnae pairs (sometimes the proximal pinnae sterile and distal pinnae fertile on the same frond), fertile pinnae approximately the same length as sterile pinnae but narrower, 2.5–5 mm wide, the margins strongly revolute, the sori covering most of the abaxial surface but usually with some expanded green tissue at the base, adaxially glabrate. *Sori* linear, abaxial surface of pinnae bordered or partly covered by the reflexed, scarious, erose blade margins except on expanded green bases. *Spores* subellipsoidal, 67 × 47 μm including a perispore 8–12 μm wide.

Distribution. Known from the Marquesas Islands (Nuku Hiva, Ua Pou, Hiva Oa, Tahuata, and Fatu Hiva), Society Islands (Moorea, Raiatea, and Tahiti), and Austral Islands (Rapa Iti).

Ecology. This new terrestrial species occurs in clearings or shade from 380 to 1500 m elevation in lowland to montane mesic and wet forests, shrubland or fernland, in valleys, on slopes or ridge crests and rocky banks. In the Marquesas associated species include *Crossostylis biflora* J. R. Forst. & G. Forst., *Dicranopteris linearis* (Burm. f.) Underw., *Freycinetia impavida* (Gaudich. ex Hombr.) B. C. Stone, *Metrosideros collina* (J. R. Forst. & G. Forst.) A. Gray, *Pandanus tectorius* Parkinson, *Santalum insulare* Bertero ex A. DC., and other native tree, shrub, and pteridophyte species. Threats include competition from alien plant species and damage from feral ungulates. Although this is the most widely distributed of the new species, it is clearly at risk due to habitat loss and degradation.

Etymology. The epithet refers to the Pacific distribution of this new species.

Conservation status. IUCN Red List Category: **Vulnerable** (VU): B1: total area of occupancy less than 20,000 km^2 (ca. 750 km^2); b (i–iii), habitat continuing decline inferred; B2: total area of occupancy less than 2000 km^2 (ca. 750 km^2); B2b (i–iii), habitat continuing decline inferred. The suitable habitat for *Blechnum pacificum* on

most islands of occurrence is indicated as a declining or endangered environment, threatened by human activity (deforestation, fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimens examined. Austral Islands: Rapa Iti. Perau–Mamuere summit, eastern peaks, 27°S, 144°W, 10–100 ft (3–30 m), Wood & Faraire 9777 (NY, PTBG [4 sheets]), Fosberg 11567 (UC), Fosberg 11601 (UC), Fosberg 11605 (UC); St. John & Fosberg 15293 (UC). **Society Islands: Moorea:** Mt. Rotui, 149°50'18W, 17°30'38S, 916 m, Nitta & Vinette 212 (PAP, UC); Mt. Tohiea,149.819°, 17.553°, 994 m, Nitta & Vinette 320 (PAP, UC). **Tahiti.** Pirae–Maoua Aorai trail, Quayle 105A (BISH, UC); Orofena, east side of south ridge, ravine in rain forest, St. John & Fosberg 17114 (BISH); Mt. Marau road, crest between Tapaerui and Punaruu valley, 1250 m, Fosberg 62647 (PTBG [2 sheets], US); Orofena, south ridge, moist thicket on exposed ridge, 1600 m, St. John & Fosberg 17082 (UC); Mahina, Ahonu-tuauru, 2875 ft (876 m), Grant 4394 (UC); Aorai, in summit shrubs, 6700 ft (2042 m), M. L. Grant 3791 (UC); Faaa, Mt. Marau, 3 km below TV tower, 1300 m, Hodel 1375 (UC); Fautaua, below Diadem, 2830 ft (863 m), Grant 3546 (UC). **Raiatea:** Temehani Plain, Moore 175 (BISH [2 sheets]). **Marquesas Islands: Nuku Hiva:** Toovii, 1000 m, Brown & Brown 528 (BISH); Toovii Plateau, spur of Mt. Ooumu, 790 m, Gagné 1039 (US); Tauamaka, Toovii plateau, 1000 m, Mumford & Adamson 576 (BISH, UC); without precise locality, 1000 m, Quayle 1284 (BISH), Quayle 1298 (BISH). **Ua Pou:** Mt. Tekahoipu, 800 m, Quayle 1138 (BISH [2]); Tekohepo, summit, 2500–3000 ft (762–914 ft), 09°24'31"S, 140°04'21"W, Wood & Perlman 6455 (PTBG [2 sheets], US); Drainage northwest of Teavahaakiti, 700 m, Wood 10458 (P, PAP, PTBG, US). **Hiva Oa:** road from Atuona to Puamau, just below Ootua, 625–700 m, Sachet & Decker 1904 (PTBG, US); Puamau, along Puamau–Atuona trail, 500–650 m, Decker 1190 (PTBG, US); Feani, 800 m, Brown 877 (BISH [3]); Atuona–Feani Trail, ridge crest, 1200–1300 m, 24–26 Sep. 1963, Sachet & Decker 1160 (US [2]); Montagnes NW du Temetiu, entre la haute vallée de Hanamenu et la crête de Temetiu–Feani, 850 m, Schäfer 5932 (US); Vaiata, NW slopes of Mt. Ootua, 800 m, Mumford & Adamson 355 (BISH); Feani ridge to upper slopes of dry side of island, 1150 m, Oliver & Schäfer 3130 (US [2]); Temetiu, 1100 m, Pacific Entomol. Surv. 156 (BISH); above Atuona, 800 m, Pacific Entomol. Surv. Ex 355 (BISH); Hanaiapa, 700 m, Jones 1613 (BISH [2 sheets]); without precise locality, 800 m, Brown 16 (BISH). **Tahuata:** de Hamatea [Amatea] à la crête centrale de l'île, 750–850 m, Thibault 64 (US); Mt. Amatea, 1000 m, Jones 1796 (BISH). **Fatu Hiva:** 'Omo'a–Ouia–Mounanui Trail, 690 m, Gagné & Montgomery 2323 (BISH); trail from 'Omo'a along Punaitai ridge crest to base of Tekou peak, 550–840 m, Lorence et al. 6171 (BISH, PAP, PTBG); Hanavave, 600 m, Jones 1826 (BISH); Sentier d'Ouia, W du col, lieu-dit Tahuna, 620 m, Schäfer 5803 (US).

Discussion. The name *Blechum capense* Burm. f. has been erroneously applied to this new Polynesian species (Brown and Brown 1931; Copeland 1932). The true *Blechnum capense* is confined to southern Africa and some nearby islands (Burrows 1990; Roux 2001). This southern African species has also been treated under the name *B. syl-*

vaticum Schelpe (Schelpe 1979; Jacobson 1983), on the false assumption that the type of *B. capense* Burm. f. was a mixed collection of two species (Jacobson 1983). However, there seem to be good reasons for placing *B. sylvaticum* in synonymy under *B. capense* (Roux 1982; Schelpe and Anthony 1986; Burrows 1990; Roux 2001).

The name *Blechnum procerum* G. Forst. has also been incorrectly applied to the Polynesian plants. Quoting Nicholson and Fosberg (2004: 125–126), who stated that the type of *Blechnum procerum* is from New Zealand: "Tindale (1960b: 254) published a photo (t. 7) of the Goettingen material [Nova Zeelandia, *Forster 295*, GOET] as 'Type specimen' and referred to BM and K specimens as 'Forster material.' Chambers and Farrant (1998a: 4), without discussion, said 'T. Noua Zeelandia, Forster; lecto (here chosen): K; isolecto: BM, GOET (photo seen).'" Nicolson and Fosberg (2004: 126) further stated "There is considerable confusion about the names applied to this taxon and the following quotation from Brownsey and Smith-Dodsworth (2001) summarized it well: 'The name *Blechnum minus* was used incorrectly by Allan (1961) and Crookes (1963) for the plant we call *B. procerum*. The true *B. minus*, or swamp kiokio, is only doubtfully distinct from the common kiokio (previously known as *B. capense*).'" *Blechnum procerum* has lower pinnae only slightly reduced (not less than half the length of the median pinnae), fertile fronds are up to 50% longer than sterile fronds, and the fertile pinnae show no expanded green tissue at the base in the type as in *B. pacificum*. Clearly, the name *B. procerum* does not apply to the Polynesian plants.

In New Zealand, closest relatives appear to be *B. novae-zelandiae* T. C. Chambers & P. A. Farrant and *B. minus* (R. Br.) Ettingsh., neither of which is conspecific with our Polynesian plants. *Blechnum novae-zelandiae* is superficially similar but differs in having reduced proximal pinnae and distinctive "black-spot" rhizome and stipe scales with dark brown or black centers and pale margins (Chambers and Farrant 1998). From evidence presented in a recent paper on the phylogeny of New Zealand Blechnaceae by Shepherd et al. (2007, Fig. 2), it seems likely that if *Blechnum pacificum* were sampled, it would fall somewhere in the clade containing *B. wattsii* Tindale and B. *novae-zelandiae*.

Several species from New Caledonia, all considered endemic, form a confusing array of species somewhat similar to *B. pacificum*. These include *B. confusum* (E. Fourn.) Brownlie, *B. chauliodontum* Copel., and *B. subcordatum* (E. Fourn.) Brownlie. Brownlie's (1969) illustration and characterization of *B. subcordatum* suggests that it differs in having smaller fronds with less scaly stipes and rachises, fewer pinnae pairs (5–15), and sterile pinnae not so undulate at the margins. *Blechnum confusum* differs in its strongly ascending, more sharply serrulate and less scaly pinnae (sterile blades are nearly glabrous). The closest species in Malesia (excluding Papua New Guinea) appears to be *B. vestitum* (Blume) Kuhn, nom. cons., non *B. vestitum* T. Moore (see Chambers and Farrant 2001; Chambers 2004; McNeill et al. 2006: 438). The Papua New Guinea species *B. dilatatum* (Brause) T. C. Chambers & P. A. Farrant is similar to *B. pacificum* in having fertile pinnae with an expanded basal sterile region, but in the latter the margins are never revolute and the rhizome scales are thin, concolorous, and pale to medium brown. No names of taxa with types from Fiji apply to the new species, the

closest species there being *B. milnei* (Carruthers) C. Chr. (historically also called *B. procerum*), which differs in having very large fronds with generally broader, less coriaceous pinnae and a less scaly rachis and costae on the sterile blades, and fertile pinnae lacking expanded green tissue at the base.

Among the Polynesian species of *Blechnum*, *B. pacificum* seems most closely related to *B. venosum* Copel. from Rapa Iti in the Austral Islands. In addition to having copious, shiny, dark brown, almost blackish scales on the stipes as noted in the diagnosis, the veins of *B. venosum* are very prominent and strongly raised above the surface on the abaxial side of blades, whereas the veins in *B. pacificum* are visible abaxially but scarcely, if at all, raised. This gives *B. venosum* a much harsher, more cartilaginous appearance. Also, in *B. venosum*, there are very short hairs on the veins abaxially and some hairs are even present between the veins on laminar tissue, but *B. pacificum* lacks such hairs. In *B. venosum*, some of these hairs on the veins and laminar tissue appear multicellular (septate, but uniseriate), and glandular or gland-tipped. Also, pinna margins in *B. pacificum* are more crenulate (scalloped) than in *B. venosum* which has entire margins.

DRYOPTERIDACEAE

Dryopteris

Dryopteris Adanson is a large, essentially cosmopolitan genus of around 225 species with its greatest diversity in north temperate regions (Fraser-Jenkins 1986a, 1989; Mickel and Smith 2004). Previously only a single species, *Dryopteris fatuhivensis* E. D. Br., was recorded from the Marquesas (Brown and Brown 1931), where it occurs on Nuku Hiva, Fatu Hiva, and Ua Huka. *Dryopteris fatuhivensis* was placed in subg. *Dryopteris,* sect. *Hirtipedes* by Fraser-Jenkins (1986b) along with related species from Asia, including the widespread *D. hirtipes* (Blume) Kuntze which includes two subspecies, subsp. *hirtipes* and subsp. *atrata* (Kunze) Fraser-Jenk., both in southeast Asia. We follow Fraser-Jenkens (1989) in recognizing *D. fatuhivensis* as a Marquesan endemic species distinct from *D. hirtipes*.

Recent collections from the Marquesas have revealed the presence of two additional, distinctive endemic *Dryopteris* species distinguished by their large, 3-pinnate to 3-pinnate-pinnatifid fronds. Both species have normally developed spores and lack any morphological features suggesting hybrid origin. Morphologically they are quite different than *D. fatuhivensis,* from which they may be separated by the characters in the following key.

Key to *Dryopteris* in the Marquesas Islands

1a Blades 1-pinnate to 1-pinnate-pinnatifid ..... ***D. fatuhivensis***
1b Blades 3-pinnate to 3-pinnate-pinnatifid **2**

2a Ultimate pinnule segments spaced 5–10 mm distant with margins serrate, segments acute at apex .....***D. sweetorum***

2b Ultimate pinnule segments spaced 3–5 mm distant, margins crenate or lobed ¼ –2/3 toward costule, segments truncate or obtuse at apex...***D. macropholis***

2. *Dryopteris macropholis* Lorence & W. L. Wagner, sp. nov.
urn:lsid:ipni.org:names:77112674-1
http://species-id.net/wiki/Dryopteris_macropholis
Figs 3, 4, 14B, C, D

A ceteris marchinonicis speciebus integra margine maximis usque ad 80 × 14 mm squamis (vel paleis) vestitis rhizomate atque stipitis base, ampla tripinnati-pinnatifida lamina, ultimis usque ad 12–19 × 4–8 mm inferne glabris pinnulis, truncatis vel crenatis, 1/4–2/3 costa dissectis lobis, sparsis parvis castaneis paleis vestita rhachidi, quaque pinnula 1–4 indusiatorum sororum paribus munita, glabro indusio, praecipue differt.

Type. Marquesas Islands: Ua Huka: Hitikau region, ascended via Matukuoha ridge overlooking Hane, constitutes the summit of the single crater of Ua Huka, 700 m, UTM 0661697–9015668, 5 Dec 2003, K. R. Wood 10489 (Holotype PTBG-041629!, PTBG-041630! [2 sheets]; Isotypes P!, PAP!, US!).

Description. *Terrestrial ferns*; *rhizomes* suberect, 20–25 cm long, 5–7 cm in diameter (to 15 cm including scales), densely clothed with pale brown to reddish brown or dark brown scales; scales of rhizome and base of stipe (10–)20–80 × (1–)2–5–14 mm, thin, narrowly oblong-elliptic to linear-lanceolate, falcate, usually twisted distally, concolorous, lustrous, medium to dark brown or reddish brown, margins entire, cells narrowly rectangular to linear-fusiform. *Fronds* clustered, 5–7 per rhizome, erect-arching; stipes (35)49–75 cm long, 4–6 mm in diameter medially, about as long as the blades, adaxially grooved, reddish brown to stramineous, entire length clothed in dense, persistent, spreading, lustrous, light to dark brown or reddish brown, linear-oblong to linear-lanceolate twisted scales to ca. 20 × 3 mm, margins entire or subentire and fringed with short-stipitate glands, bases darkened at point of attachment, mixed with smaller bristlelike and hairlike scales, surfaces bearing short, gland-tipped hairs, scales progressively smaller and finer distally and on rachis, stipes of older fronds punctate with dark scale bases; *blades* thickly chartaceous, dark above green when fresh, paler beneath, 50–100 × 32–66 cm, ovate-deltate, 3-pinnate to 3-pinnate-pinnatifid at least in lower half, distally mostly 2-pinnate-pinnatifid; rachises stramineous to light brown, densely scaly with persistent medium to dark brown, spreading bristlelike scales to 9 × 1 mm, margins entire or with sparse sessile glands, mixed with short glandular hairs, rachises of older fronds punctuate with dark brown scale bases; pinnae opposite to subopposite, (11–)13–20 on a side, spreading, ovate-oblong to linear-oblong, apex acuminate, lowermost pinnae the largest, 20–33 × 11–19 cm, with 11–16 pairs of pinnules, slightly inequilateral, basiscopic basal pinnules 7–10.5 cm long, acroscopic basal pinnules shorter, 4–8.5 cm long, lowermost pinnules usually the largest, distal pinnae stalked 3–6 mm becoming sessile, apices pin-

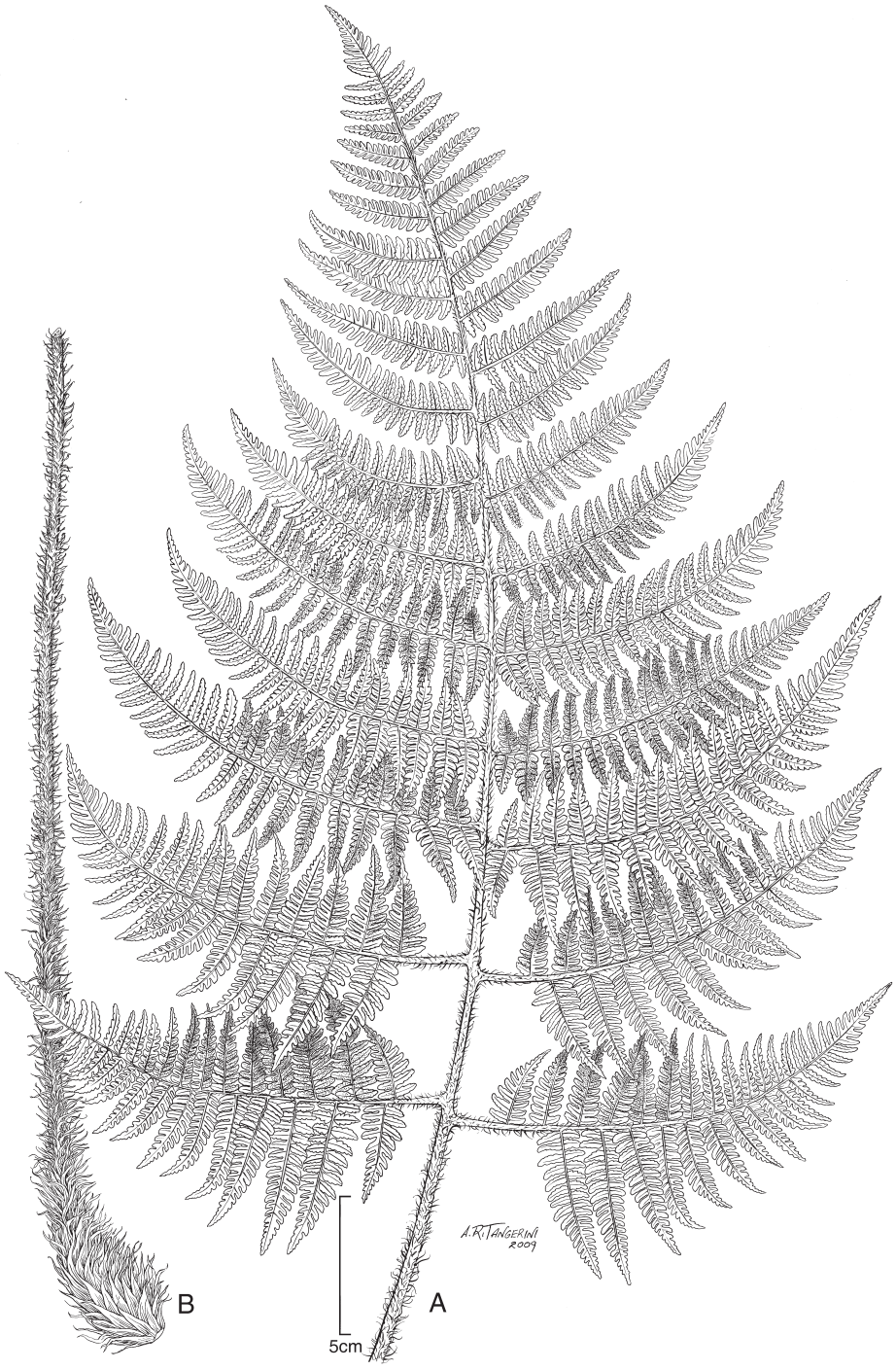

Figure 3. *Dryopteris macropholis* Lorence & W. L. Wagner. Frond with **A** blade and **B** stipe. Drawn from the type collection (Wood 10489) and field images.

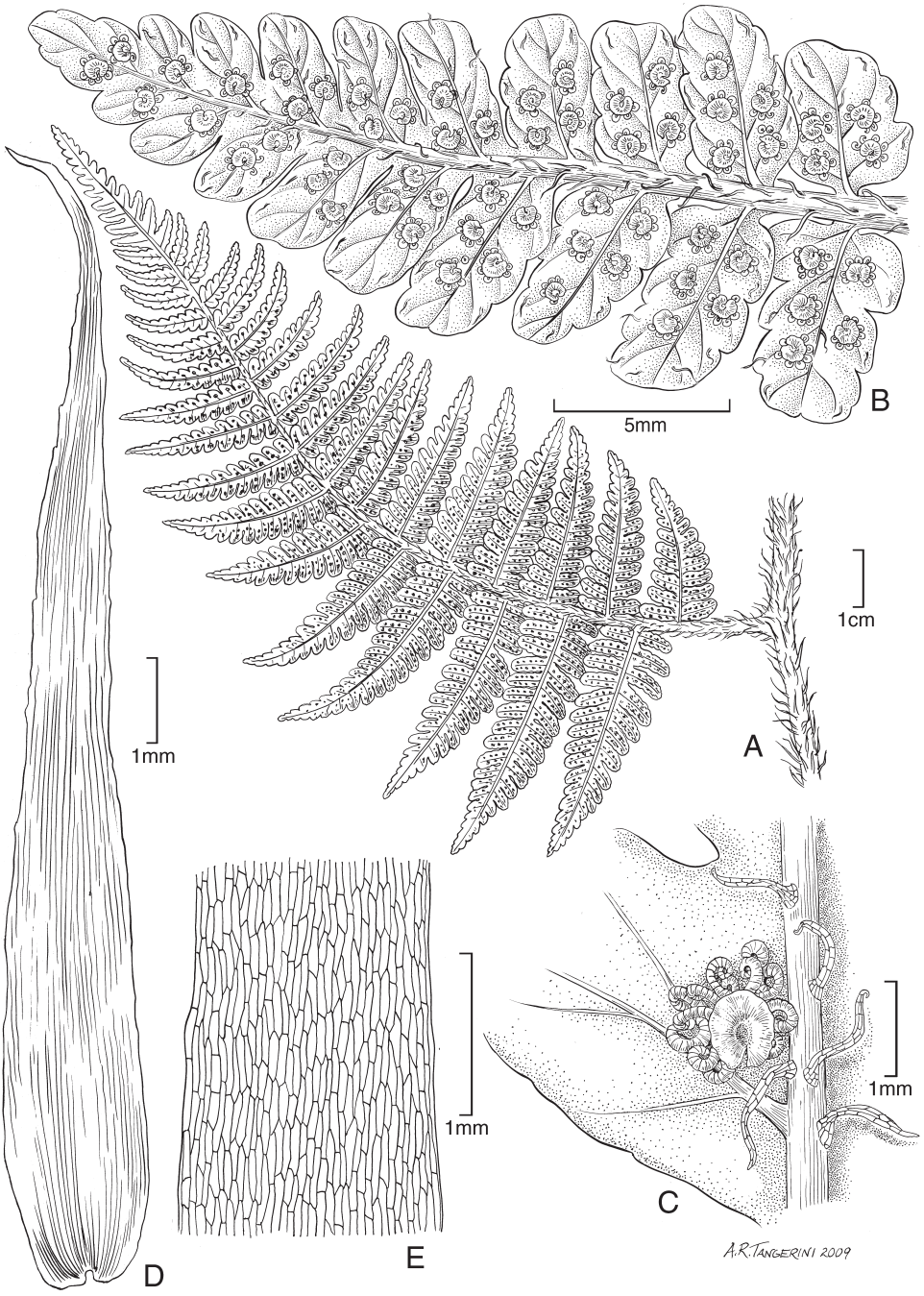

Figure 4. *Dryopteris macropholis* Lorence & W. L. Wagner. **A** pinna from near base of lamina, lower surface **B** lower surface of fertile pinnule showing sori **C** pinnule with sorus, sporangia, and scales **D** scale from stipe **E** part of stipe scale showing detail of cells. Drawn from the type collection (Wood 10489) and field images.

natifid; largest ultimate pinnules 12–19 × 4–8 mm, spaced 5–10 mm distant, obtuse to truncate at apices, margins crenate or cut ca. ¼ –2/3 toward costule, adaxially glabrous, abaxially glabrous except for scattered small, spreading, brown linear scales on rachises; veins forking 1–2 times, scarcely visible to visible on both surfaces, depressed adaxially and prominulous abaxially; each fertile pinnule usually with 1–4 pairs of inframedial sori. *Sori* with indusia 0.4–0.6 mm in diameter, brown, thick, glabrous. *Spores* dark brown.

Distribution. Marquesas Islands, known from Nuku Hiva, Ua Huka, Ua Pou, Hiva Oa, and Tahuata.

Ecology. This new species is rare and localized from ca. 700 to 1150 m elevation. It occurs in transitional mesic to wet forests with *Alsophila tahitensis* Brack., *Hernandia nukuhivensis* F. Br.*,* and *Sphaeropteris* spp.; in wet forests dominated by *Crossostylis biflora, Freycinetia* spp., *Hibiscus tiliaceus* L.*, Metrosideros collina, Pandanus tectorius*, and with associates including *Fagraea berteroana* A. Gray ex Benth.*, Ficus prolixa* G. Forst. var. *prolixa*; *Glochidion (Phyllanthus) marchionicum* F. Br.*, Weinmannia marquesana* F. Br. var. *marquesana,* and *Xylosma suaveolens* (J. R. Forst. & G. Forst.) G. Forst. subsp. *pubigerum* Sleumer; in montane wet forests of *Metrosideros collina* and *Weinmannia marquesana* var. *marquesana*; in montane shrublands; and in and summit cloud forests and shrublands with *Alsophila tahitensis, Cyrtandra* spp.*, Dicranopteris linearis, Freycinetia* spp.*, Metrosideros collina, Psychotria* spp., *Sphaeropteris* spp.*,* and *Vaccinium cereum* (L. f.) G. Forst. var. *adenandrum* (Decne.) F. Br.and diverse pteridophytes. Threats in most areas include human disturbance, feral pigs, and invasive weeds.

Conservation status. Proposed IUCN Red List Category **Endangered** (EN): B2a, B2b (i–iii): B2: total area of occupancy less than 5000 km^2 (ca. 904 km^2). B1a, severely fragmented; B1b (i–iii), habitat continuing decline inferred. The suitable habitat for *Dryopteris macropholis* on Nuku Hiva (ca. 340 km$^{2)}$, Ua Huka (ca. 83 km^2), Ua Pou (ca. 105 km$^{2)}$, Hiva Oa (ca. 315 km^2), and Tahuata (ca. 61 km^2) is restricted to mountain slopes and summits, indicated as an endangered environment that is threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimens examined. Marquesas Islands: Nuku Hiva. Toovii, Ooumu area, top of Tapueahu Valley off new road, 8°51'S, 140°19'W, 3500–3700 ft (1067–1128 m), Wood & Perlman 4606 (P, PTBG [2 sheets], US). Route Taiohae–Toovii, branche droite de la haute Taipivai, 8°53'S, 140°8'W, 750 m, Florence 8423 (P [6 sheets]); Piste Nord de Terre Déserte, haute vallée de Tapueahu, 1150 m, 140°11'W, 8°52'S, Florence et al. 9447 (P [3 sheets]). **Ua Huka:** Hitikau and the Vaikivi summit region, 8°54'S, 139°31'W, 800 m, Wood & Perlman 10761 (PAP, PTBG, US). **Ua Pou:** forested ridges and slopes to the N and W of Pouakei, 9°23'S, 140 °5'W, 2300 ft (701 m), Wood & Perlman 10840 (PAP, PTBG, US); Tekohepu, 2500–3000 ft (762–914 m), 9°24.31'S, 140°4.21'W, Wood 6499 (P [2 sheets], PTBG [2 sheets], US). **Hiva Oa**: Temetiu, 9°49'S, 139°4'W, 3700 ft (1128 m), Wood 4381 (P, PTBG [2 sheets]); Temetiu region, drainages to southeast of Vaimete et Vaiumioi (source), headwaters of Hanamenu, UTM 0710665–8916125, 3500 ft (1067 m), Wood 10045 (PTBG [5 sheets]); piste de Hanamenu, NW du Mt. Temetiu, 1150 m, 9°48'S, 139 °5'W, Flor-

ence & Perlman 9665 (P [4 sheets]). **Tahuata:** summit ridge near Haaiputeomo, NE of Vaitahu, 9°57.19'S, 139 °5.74'W, 2500–2700 ft (762–823 m), Wood 6572 (BISH, P, PAP, PTBG [5 sheets], US).

Discussion. This remarkable new species resembles *Dryopteris macrolepidota* Copel. (type from Tahiti), a species distinguished by it massive suberect rhizome with russet scales to 30 × 3 mm, fronds to 160 cm long, stipes to 50–70 cm long, stipes and rachises paleaceous with long, thin russet scales with dark, thickened bases, 3-pinnate subcoriaceous blades to 80 × 40 cm, the abaxial surfaces with scattered thin, linear scales, and supramedial sori. Society Islands collections in the Bishop Museum herbarium identified as *Dryopteris dicksonioides* (Mett. ex Kuhn) Copel. have massive prostrate to erect rhizomes to 50 cm tall, fronds 80–140 cm long with stipes 60–100 cm long scaly only near the base, stipe scales dark brown and opaque to 20 mm long, rachises with small brown, scattered scales, and 3-pinnate-pinnatifid blades to 80 × 40 cm, the segments thinly chartaceous with linear brown scales on the lower surfaces. Scales of the rhizomes and stipe bases in *D. macropholis* are much larger than in the former two species. Palmer (2003) considered *Dryopteris dicksonioides* synonymous with *D. glabra* (Brack.) Kuntze, an exindusiate species endemic to the Hawaiian Islands. However, the type of *D. dicksonioides* is from Tahiti and clearly does not represent *D. glabra* (Copeland 1932). This new species seems most closely related to *D. sweetorum,* known only from Fatu Hiva, which differs by its rhizome and stipe base scales smaller, lustrous, dark brown, 9–25 × 1–2 mm and its broadly ovate-deltate, 3-pinnate-pinnatifid blades (42–)62–93 × (38–)64–80 cm, the ultimate segments to 15 × 5 mm, spaced 5–10 mm distant, oblique with tips acute, cut about halfway to the costule, with margins acutely serrate, and the abaxial surfaces and rachises glabrous.

3. *Dryopteris sweetorum* Lorence & W. L. Wagner, sp. nov.
urn:lsid:ipni.org:names:77112675-1
http://species-id.net/wiki/Dryopteris_sweetorum
Fig. 5

A D. macropholi minoribus, atro-castaneis, ovato-lanceolatis vel lineari-oblongis squamis 12-25 × 1.5-2 mm supra rhizomates et stipitum bases, largis tripinnato-pinnatifidibus frondibus, ultimis segmentibus usque ad 15 × 5 mm, intervallibus 5-10 mm distantibus, obliquis, acutis culminibus, sectis ca. in medio ad costulam cum marginibus acute serratis, abaxialibus superficiebus et glabris rachidibus differt.

Type. Marquesas Islands: Fatu Hiva: Teavapuhiau, ridge to Touaouoho, 2000 ft (607 m), 8 September 1995, K. R. Wood 4493 (Holotype: PTBG-038471!, PTBG-038472!, PTBG-038473!, PTBG-0384741! [4 sheets]; Isotypes BISH! [2 sheets], P!, PAP! [3 sheets], NY!, US! [3 sheets]).

Description. *Terrestrial ferns*; *rhizomes* short creeping to suberect, 3–15 cm in diameter including stipe bases, densely clothed with scales; scales of rhizomes and bases of stipes lustrous, dark brown, 9–25 × 1–2 mm, ovate-lanceolate to linear-oblong, concolorous, margins entire to subentire distally with short, irregular teeth,

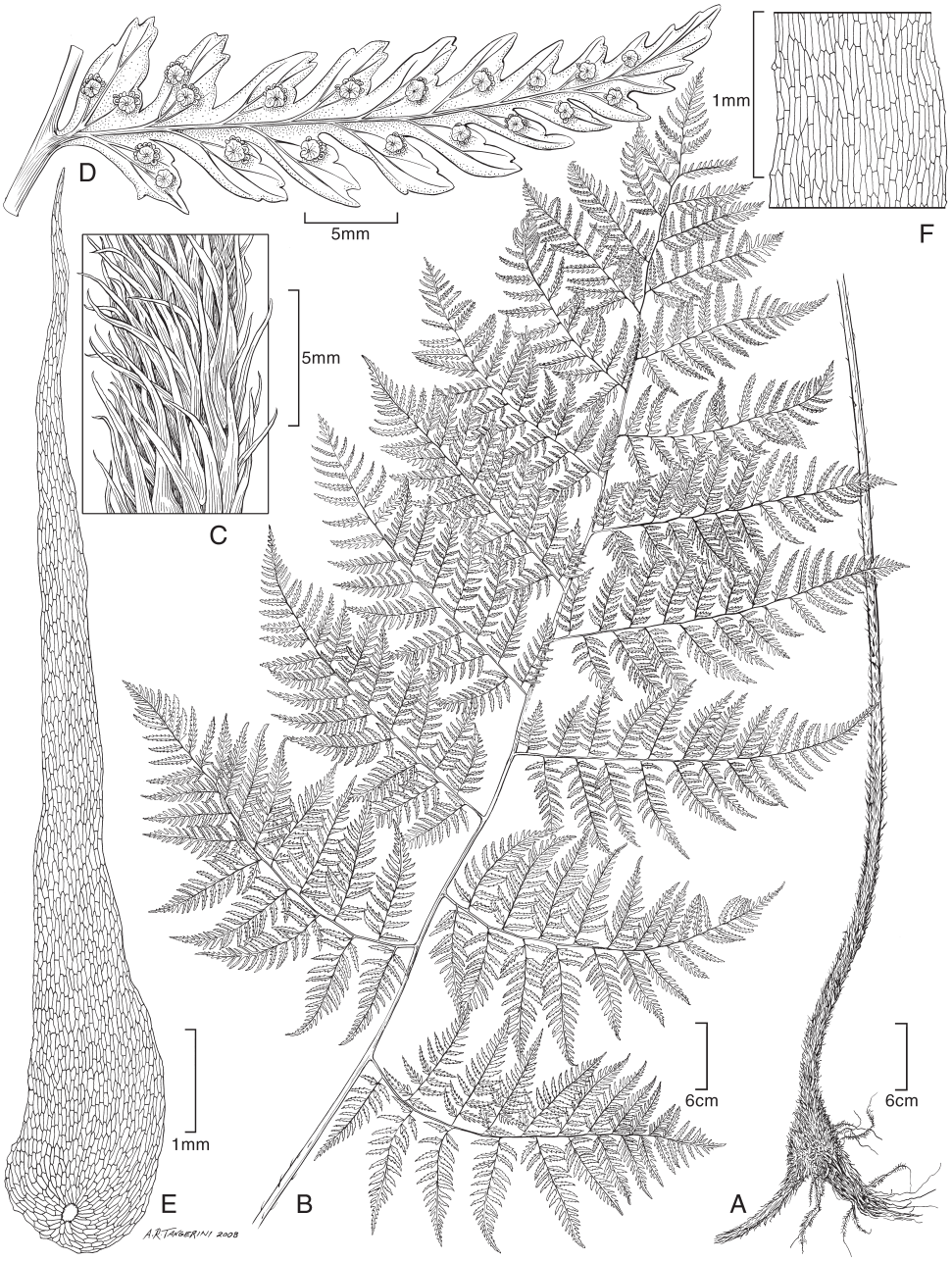

Figure 5. *Dryopteris sweetorum* Lorence & W. L. Wagner. **A** stipe and part of rhizome **B** blade **C** detail of stipe with scales **D** lower surface of fertile pinnule showing sori **E** rhizome scale **F** part of rhizome scale, detail of cells. Drawn from the type collection (Wood 4493*)* and field images.

cells linear. *Fronds* densely clustered, 5–7 per rhizome; stipes (45–)60–100 cm long, 7–10 mm in diameter medially, adaxially grooved, stramineous to medium brown, densely scaly basally, distally with progressively smaller scales and appressed hairlike scales, mostly glabrescent, surfaces brown-punctuate; blades firmly chartaceous, broadly ovate-deltate, (42–)62–93 × (38–)64–80 cm, 3-pinnate-pinnatifid at base, otherwise mostly 2-pinnate-pinnatifid, with pinnae opposite to subopposite, spreading, 8–13 on a side; rachises stramineous, with scattered narrow scales to 2–12 × 0.2–0.6 mm; lowermost pinnae the largest, 25–38 × 19–25 cm, slightly inequilateral, basiscopic basal pinnules 10–15 cm long, acroscopic basal pinnules slightly shorter, 7–12 cm long, distal pinnae stalked to 5 mm or sessile, apex pinnatifid; ultimate pinnules to 15 × 5 mm, spaced 5–10 mm distant, oblique, tips acute, cut ca. ½ toward costule, with margins acutely serrate, adaxially glabrous, abaxially glabrous or rachises with scattered hairlike scales; veins forking, scarcely visible adaxially, prominulous abaxially. *Sori* (1–)3–6 pairs per segment, supramedial; indusia 0.9–1.3 mm in diameter, brown, thick, glabrous except with a few short-stipitate glands in center. *Spores* dark brown.

Distribution. Known only from Fatu Hiva, Marquesas Islands, in montane wet forest at 600–640 m elevation.

Ecology. This new endemic species is apparently rare and localized, known only from the region from Teavapuhiau ridge to Mt. Touaouoho where it grows scattered among other ferns on hillsides in understory of open forest with *Alsophila tahitensis*, *Crossostylis biflora, Cyclophyllum barbatum* (G. Forst.) N. Hallé & J. Florence, *Freycinetia impavida, Hibiscus tiliaceus, Metrosideros collina*, *Pandanus* sp.*, Weinmannia marquesana* var. *marquesana,* and *Vaccinium cereum* var. *adenandrum,* and *Wikstroemia coriacea* Seem.

Etymology. We take great pleasure in naming this magnificent new species in honor of Barbara K. and Cyrus B. Sweet, III, who have generously supported scientific research at the National Tropical Botanical Garden and particularly the Vascular Flora of the Marquesas Islands project.

Discussion. This new species differs from *D. macropholis* by the characters noted in the diagnosis above, notably in the ultimate pinnules segments spaced 5–10 mm distant with serrate margins and acute apices.

Conservation status. Proposed IUCN Red List Category: **Critically Endangered** (CR): B1ab, B2a,b (i–iii). B1, total extent of occurrence less than 100 km^2 (ca. 85 km^2), a,b, known from a single location; B2a, estimated area of occupancy estimated to be less than 10 km^2 [three collections likely representing a single population are known]; B2b (i–iii), habitat continuing decline inferred. The estimated area of occupancy for *D. sweetorum* on Fatu Hiva (less than 10 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plant species, reducing the extent of the forest.

Specimens examined. Marquesas Islands: Fatu Hiva: Teavapuhiau, leeward side of windswept ridge, UTM 758470–8840707, 2100 ft (640 m), Wood 10091 (PTBG [3 sheets], PAP [2 sheets], US [3 sheets]); Teavapuhiau Pass (above Ouia Valley), 700

m, B. Gagné 1233 (US); Epaulement SW de Mt. Touaouoho, 770 m, 138°38'W, 10°29'W, Florence et al. 9536 (P [4 sheets]).

Polystichum

Polystichum Roth is a cosmopolitan genus of about 300 species (Mabberley 2008). Brown and Brown (1931) recognized and described a single species from the Marquesas, *P. marquesense* E. D. Br. Recent collections from Hiva Oa, Tahuata, and Ua Huka have revealed the presence of two new species which are described below. *Polystichum marquesense* differs from both new species in having exindusiate sori and stipes clothed with large, dull brown, ovate, overlapping scales.

Key to *Polystichum* in the Marquesas Islands

1a Blades uniformly bipinnate ..... ***P. uahukaense***
1b Blades tripinnate, at least in lower portion **2**
2a Largest stipe scales linear-oblong, 25–30 × 1–3.5 mm, reddish brown with margins bearing short acicular teeth, concentrated base of stipe, mid to upper part of stipe with smaller, spreading linear-oblong scales and hairlike scales; largest pinnules and lobes of largest pinnae usually with 1 apical and occasionally 1–6 crenate marginal teeth, arista of apical tooth 0.5–0.7 mm long; indusia present ..... ***P. kenwoodii***
2b Largest stipe scales ovate to narrowly ovate, 10–20(–30) × 4–10 mm, dull, pale brown with strongly erose-ciliate margins, overlapping and evenly distributed along stipe, mixed with smaller ovate-ciliate scales and cobwebby scurf; largest pinnules and pinnule lobes of largest pinnae usually with 3–8(–11) teeth, arista of apical tooth 0.5–2 mm long; indusia absent ..... ***P. marquesense***

4. *Polystichum kenwoodii* Lorence & W. L. Wagner, sp. nov.

urn:lsid:ipni.org:names:77112677-1
http://species-id.net/wiki/Polystichum_kenwoodii
Figs 6, 14E

A Polytsicho marquisensi E. D. Br. longioribus et angustis rhizomatibus, stipitis squamis 20-35 mm, squamis prope stipitis basin congregates, soris indusiatis differt.

Type. Marquesas Islands: Ua Huka: Vaikivi summit region and drainage, 8°54'S, 139°31'W, 600 m, 16 June 2004, K. R. Wood 10759 (Holotype PTBG-044161!, PTBG-044162!, PTBG-044163! [3 sheets]; Isotypes BISH!, P!, PAP!, US!).

Description. *Terrestrial ferns*; *rhizomes* erect or suberect, 7–20 cm long, 5–15 cm in diameter including bases of stipes (from collector's notes); rhizome scales 20–35 × 2–2.5 mm, linear-oblong, concolorous, medium brown, margins entire, cells narrow

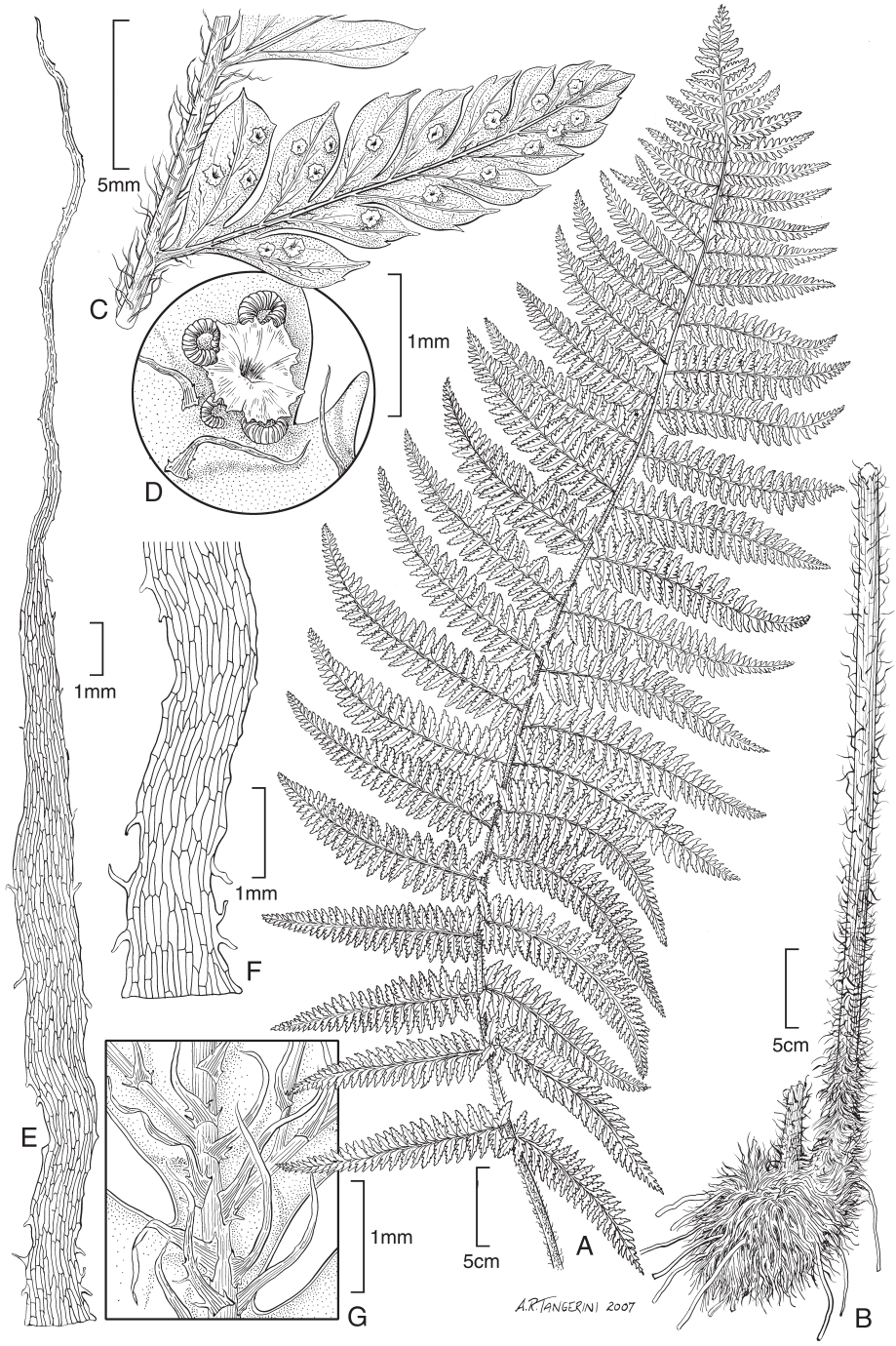

Figure 6. *Polystichum kenwoodii* Lorence & W. L. Wagner. **A** blade **B** stipe and part of rhizome **C** lower surface of fertile pinnule showing sori and scales **D** sorus with indusium and scales **E** rhizome scale **F** part of rhizome scale, detail of cells **G** lower surface of sterile pinnule showing scales. Drawn from type collection (Wood 10759) and field images.

linear, in sinuous files, mixed with slender hairlike scales. *Fronds* clustered; stipes 55–90 cm long, 5–6 mm in diameter medially, 2/5 as long as or equaling length of the blade, adaxially grooved, pale brown, basally densely clothed with reddish brown, linear to linear-oblong scales 10–30 × 1.5–3 mm, similar to rhizome scales, stipes distally with progressively smaller and finer scales mixed with matted hairlike scales or glabrescent; *blades* narrowly ovate to oblong-ovate, 50–83 × 30–32 cm, tripinnate at least in lower pinnae, with 20–28 pinnae on a side; rachises stramineous, moderately to densely scaly with reddish brown hairlike scales to 8 mm long; pinnae linear-oblong, apices long-acuminate, largest pinnae 8–26 × 4.5–7 cm, lowermost 2(–3) pinnae pairs slightly reduced, costules adaxially grooved; largest pinnae with up to 32 pairs of pinnules, pinnules deeply incised acro- and basiscopically forming 1–2 free, obovate lobes or blades tripinnate in large fronds, pinnule apices obtuse, tips abruptly acuminate-aristate, both margins serrate-crenate, blades stiffly chartaceous to subcoriaceous, adaxially glabrous except for a few hairlike scales basally, abaxially with whitish or tan hairlike scales with expanded lacerate-ciliate bases on costules and veins; veins forking, scarcely visible adaxially, slightly prominulous abaxially. *Sori* with a peltate *indusium* 0.5–0.7 mm in diameter, tan, thin and fugacious, with scattered marginal projections, not confluent at maturity. *Spores* dark brown.

Distribution. Marquesas Islands, known from Ua Huka, Hiva Oa, and Tahuata.

Habitat. This new species occurs at 600–884 m elevation in diverse montane wet forest and shrubland dominated by *Freycinetia* sp.*, Hibiscus tiliaceus,* and *Weinmannia marquesana* var. *marquesana* with other associates including *Alstonia marquisensis* M. L.Grant*, Boehmeria virgata* (G. Forst.) Guill.*, Cheirondendron bastardianum* (Decne.) Frodin*, Crossostylis biflora*, *Cyclophyllum barbatum*, *Ficus prolixa* var. *prolixa, Metrosideros collina, Myrsine grantii* Fosberg & Sachet, *Reynoldsia marchionensis* F. Br.*, Xylosma suaveolens* subsp. *pubigera,* and often growing with numerous other pteridophytes. It also occurs in transitional mesic to wet forest with *Alsophila tahitensis, Crossostylis biflora, Freycinetia* sp.*, Metrosideros collina, Pandanus tectorius,* and *Weinmannia marquesana* var. *marquesana*. *Polystichum kenwoodii* grows terrestrially in forest understory or sometimes along boulder-strewn stream beds.

Etymology. We take pleasure in naming this new species for its collector Kenneth R. Wood (1953–), whose excellent collections have contributed greatly to our knowledge of the Marquesas flora.

Conservation status. Proposed IUCN Red List Category: **Endangered** (EN): B2a, B2b (i–iii): B2: total area of occupancy less than 500 km^2 (ca. 460 km^2); B2a, severely fragmented with only three populations known; b (i–iii), habitat continuing decline inferred. The suitable habitat for *Polystichum kenwoodii* on Ua Huka (ca. 83 km^2), Hiva Oa (ca. 315 km^2), and Tahuata (ca. 61 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimens examined. Marquesas Islands: Hiva Oa: Hanamenu region, up Hanamenu valley to the drainages below and west of Temetiu, 9°76'S, 139°0'W, 884 m, K. R. Wood 10232 (BISH, P, PAP, PTBG [3 sheets], US). **Tahuata:** Amatea region,

around Haaoiputeomo satellite dish, 9°92'S, 139°8'W, 884 m, K. R. Wood 10257 (BISH, P, PAP, PTBG [3 sheets], US).

Discussion. *Polystichum rapense* E. D. Br. from Rapa Iti (Austral Islands) resembles this new species but differs in having very dark brown, almost black scales 3–4 mm wide on the rhizome and base of stipe and much smaller, bipinnate fronds (stipes 6–10 cm long, blades 11–14 × 8–10 cm). *Polystichum stokesii*, also from Rapa Iti, has similar dark brown to blackish, lustrous scales on the rhizome and base of stipe and shorter fronds with stipes to 20 cm long and blades to about 50 × 40 cm compared with *P. kenwoodii*.

5. *Polystichum uahukaense* Lorence & W. L. Wagner, sp. nov.
urn:lsid:ipni.org:names:77112678-1
http://species-id.net/wiki/Polystichum_uahukaense
Figs 7, 14F, 15A

A Polytsicho marquisensi E. D. Br. minoribus rhizomatibus 3-4 cm. longis × 1.5-3 cm diametro, frondibus minoribus bipinnatibus cum laminis 26-58 × 12-27 cm, soris indusiatis differt.

Type. Marquesas Islands: Ua Huka: Hane/Hokatu cliff zone, 520 m, 11 December 2003, K. R. Wood & J.-Y. Meyer 10518 (Holotype PTBG-042930!; Isotypes AD!, BISH!, K!, MO!, NY!, P!, PAP!, UC!, US!).

Description. *Terrestrial ferns*; *rhizomes* short, erect or suberect, 3–4 cm long, 1.5–3 cm in diameter; rhizome scales 20–28 × 2–2.5 mm, linear-oblong, concolorous, medium to dark brown, margins entire or with occasional short teeth, cells linear, in sinuous files. *Fronds* 5–7 per rhizome; stipes 16–43 cm long, ½–2/3 length of the blades, adaxially grooved, base with dense, linear to linear-oblong scales 10–20 × 1–2 mm, brown and similar to rhizome scales but with thinner, lacerate-dentate margins, mixed with smaller hairlike scales with lacerate bases, mid- to upper part of stipe with hairlike scales or glabrescent; blades ovate-oblong to narrowly oblong, 26–58 × 12-27 cm, bipinnate; rachises densely scaly with pale brown, hairlike scales 3-6 mm long with expanded lacerate base; pinnae 20–30 on a side, narrowly oblong, apex narrowly acute, largest pinnae 6–15 × 1.5–3 cm, lowermost 1(–2) pairs slightly reduced, costules adaxially grooved, pinnules 8–16 pairs per pinna, each incised acroscopically with a small auricle or basal pinnules of larger pinnae sometimes deeply incised forming a nearly free obovate lobe, pinnule apices acute to obtuse, both margins crenate, apex and lobes spinulose at tip; blades chartaceous to subcoriaceous, adaxially sparsely capitate-glandular when young, glabrate, abaxially with pale tan hairlike scales on costae, veins, and margins, veins forking, scarcely visible adaxially, slightly prominulous abaxially. *Sori* each with a peltate indusium 0.5–0.6 mm in diameter, tan, with numerous marginal projections, thin and often fugacious, not confluent at maturity. *Spores* black.

Distribution. Marquesas Islands, known only from the type locality on Ua Huka in the Hane/Hokatu cliff zone at the head of the valley above Hane village.

Ecology. *Polystichum uahukaense* is extremely localized and known from a single population on moist, mossy cliff faces in shade of wet forest with *Hibiscus tiliaceus* and

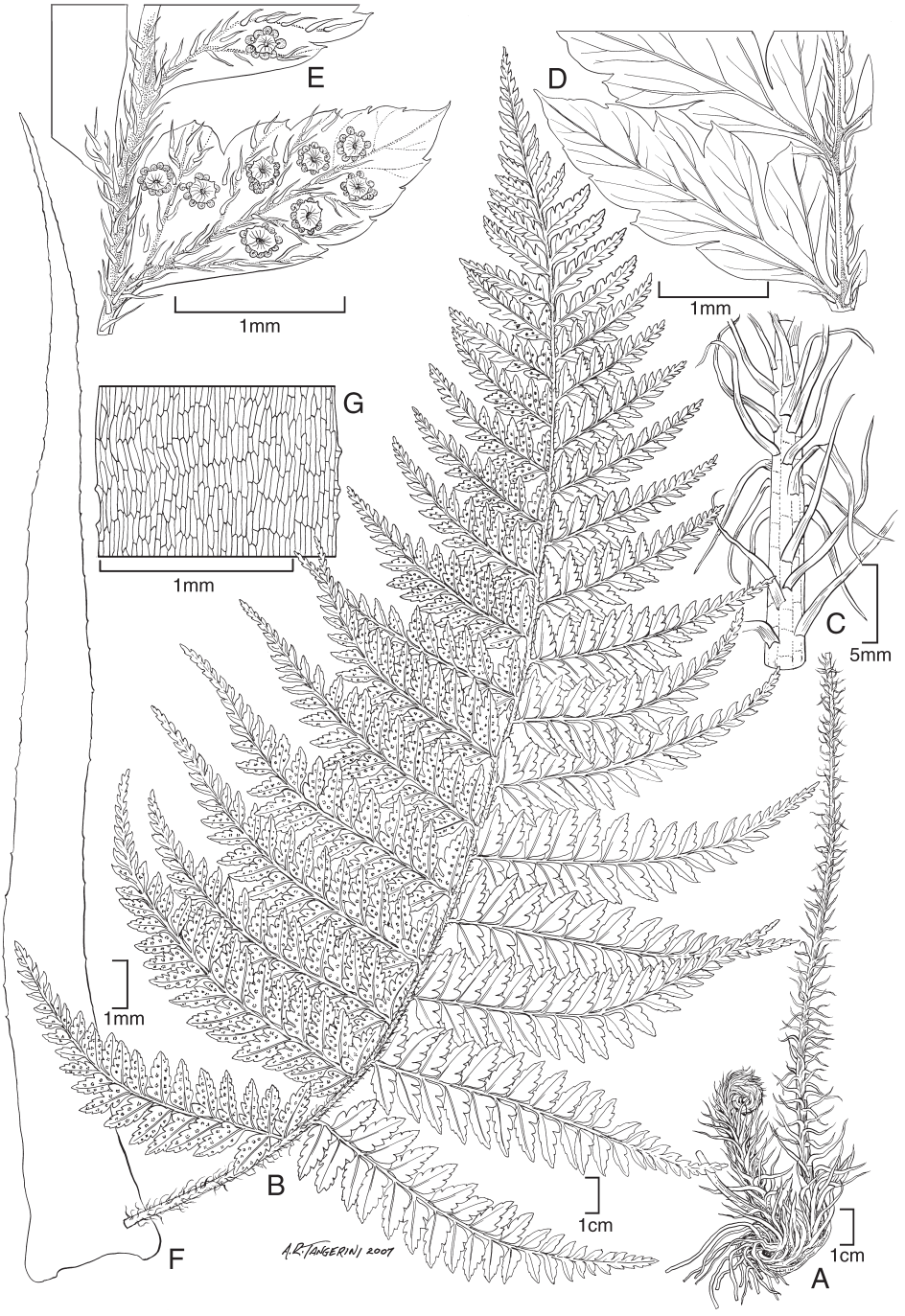

Figure 7. *Polystichum uahukaense* Lorence & W. L. Wagner. **A** rhizome and stipe **B** blade **C** detail of stipe with scales **D** lower surface of sterile pinnule **E** lower surface of fertile pinnule showing sori and scales **F** rhizome scale, outline **G** part of rhizome scale, detail of cells. Drawn from the type collection (Wood 10518) and field images.

Pandanus tectorius dominant, at 520–525 m. Associated vegetation on cliffs includes *Bidens polycephala* Sch. Bip., *Boehmeria virgata, Macropiper latifolium* (L. f.) Miq., *Peperomia pallida* (G. Forst.) A. Dietr., *Phyllanthus pacificus* Müll. Arg., and pteridophyes including *Dryopters macropholis, Microsorum grossum* (Langsd. & Fisch.) Brownlie, *Nephrolepis* sp., *Pteris comans* G. Forst., *Selaginella arbuscula* (Kaulf.) Spring., and *Tectaria jardinii* (Mett. ex Kuhn) E. D. Br. The main threats to this ecosystem include rockslides and competition with naturalized plant species including *Ageratum conyzoides* L., *Coffea arabica* L., *Kyllinga brevifolia* Rottb., *Oplismenus compositus* (L.) P. Beauv., *Paspalum conjugatum* P. J. Bergius, *Psidium guajava* L., and *Zingiber zerumbet* (L.) Sm.

Etymology. This new species is named for its only known island of occurrence.

Conservation status. Proposed IUCN Red List Category **Critically Endangered** (CR): B2a, B2b (i–iii); D): B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred. The suitable habitat for *Polystichum uahukaense* on Ua Huka (ca. 83 km^2) is indicated as an endangered environment, threatened by feral animals and invasive plants, reducing the extent of the forest. Estimated population size is 300 individuals (*Wood 10735*).

Specimens examined. Marquesas Islands: Ua Huka: Hane/Hokatu cliff zone, 520 m, 14 December 2003, K. R. Wood & J.-Y. Meyer 10552 (P, PAP, PTBG, US), 480 m, S 8° 54'37", W 139° 31'32", 12 June 2004, Lorence et al. 9303 (BISH, NY, P, PAP, PTBG, US).

Discussion. *Polystichum uahukaense* differs from its Marquesas Islands congeners in having uniformly bipinnate blades, a feature it shares with *P. rapense* from Rapa Iti which differs in having very dark brown, almost black scales 3–4 mm wide on the rhizome and base of stipe and much smaller, bipinnate fronds (stipes 6–1 cm long, blades 11–14 × 8–10 cm). However, based on overall morphology these two species seem closely allied to each other.

PTERIDACEAE

Pteris

Pteris L. is a large, pantropical genus comprising about 250 species (Mickel and Smith 2004). In their treatment of southeastern Polynesian pteridophytes, Brown and Brown (1931) recognized two indigenous species of *Pteris* L. from the Marquesas: *P. comans* G. Forst. and *P. tripartita* Sw. Recent collections made by Kenneth R. Wood in conjunction with this project have yielded three additional, very distinctive endemic *Pteris* species described below.

Key to *Pteris* in the Marquesas Islands

1a Blade tripartite.....***P. tripartita***
1b Blade 1- to 2-pinnate.....**2**

2a	Blade 2-pinnate	***P. comans***
2b	Blade 1-pinnate to 1-pinnate-pinnatifid	**3**
3a	Stipes thickly clothed in persistent, stiff, spreading, red-brown bristlelike or hairlike scales	***P. marquesensis***
3b	Stipes glabrous or soon glabrate	**4**
4a	Apex pinnatifid, 6–7-lobed	***P. hivaoaensis***
4b	Apex entire, the single terminal pinna free or sometimes adnate basally to the distal pinnae pair	***P. tahuataensis***

6. *Pteris hivaoaensis* Lorence & K. R. Wood, sp. nov.
urn:lsid:ipni.org:names:77112679-1
http://species-id.net/wiki/Pteris_hivaoaensis
Figs 8, 15B

Ab aliis Marquesas speciebus laminis 1-pinnatis usque ad 1-pinnato-pinnatifidis, apice cum 6-7 loborum paribus distalibus falcatis, glabris vel glabrescentibus stipitibus differt.

Type. Marquesas Islands: Hiva Oa: Temetiu, windswept ridges and drainages, 9°49'S, 139°4'W, 930 m (3050 ft), 24 August 1995, K. R. Wood 4374 (Holotype PTBG-038496!; Isotypes BISH!, P!, PAP!, US!).

Description. *Lithophytic ferns*; *rhizomes* erect, clumping together, 3–7 cm long,15–22 mm in diameter, clothed in very narrow, golden-brown acicular hairlike scales 1–2 mm long. *Fronds* erect or arching-pendent, to 30 cm long, clustered at rhizome apex; *stipes* ca. ½ length of frond, up to 1 mm in diameter medially, atrocastaneous, grooved adaxially, sparsely pustulate-tuberculate, glabrous except for a few linear to linear-lanceolate, falcate scales 2–3 × 0.1–0.5 mm at bases, tan-brown, margins subentire; *blades* chartaceous, glabrous, narrowly ovate to lanceolate, 10–16 × 5–9 cm; proximal 2–3 pinnae consisting of subopposite, subequal pairs, 1-pinnate-pinnatifid for most of length, sessile or stalked up to 2 mm, non-articulate, bearing 2–3 pair of falcate lobes of increasing size proximally with maximum size at basiscopic lobe of lowest pinnae, lobes linear-oblong or linear-triangular 0.3–2.5 × 0.3–11 mm, apices rounded to acute, crenate to dentate, basal pinnae slightly reduced, blade distally pinnatifid, lanceolate, the apex pinnatifid, with 6–7 pairs of falcate lobes 5–8 mm wide above their bases, dilated basiscopically, margins mostly entire, tapering gradually to acute apices with crenate-dentate margins, single terminal lobe falcate or tapering to narrowly linear crenate margin; margins of sterile pinnae finely dentate with one tooth per vein ending; costae and costules grooved adaxially, rounded abaxially, similar to stipe in color; veins netted with 1–2 rows of areoles. *Sori* occasionally interrupted at sinuses and absent at apices of segment; indusia tan-brown with entire margins. *Spores* tan-brown.

Distribution. Known only from Hiva Oa, Marquesas Islands.

Ecology. This rare species is known only from the type location at 930 m on wet stream walls adjacent to wet forest dominated by *Cheirodendron bastardianum, Cros-*

Figure 8. *Pteris hivaoaensis* Lorence & K. R. Wood. **A** habit **B** lower surface of fertile pinna **C** sterile pinnule, detail of venation **D** lower surface of fertile pinnule showing sori **E** rhizome scale. Drawn from the type collection (Wood 4374) and field images.

sostylis biflora, Metrosideros collina, Weinmannia marquesana var. *marquesana* and other associates including *Alsophila tahitensis, Cyrtandra* spp., *Freycinetia* sp., *Leptochloa marquisensis* (F. Br.) P. M. Peterson & Judz., *Melicope* spp., and *Psychotria* spp., interspersed with a rich pteridophyte understory. The main threats to this habitat are feral pigs and invasives plants including *Elephantopus mollis* Kunth, *Psidium guajava*, and *Syzygium cumini* (L.) Skeels.

Conservation status. Proposed IUCN Red List Category **Critically Endangered** (CR): B2a, B2b (i–iii), D); B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 mature individuals. The suitable habitat for *Pteris hivaoaensis* on Hiva Oa (ca. 315 km^2) is indicated as an endangered environment, threatened by human activity (deforestation, fire), feral animals, and invasive plants, reducing the extent of the forest. D, the rarity of this species is supported by the lack of collections and the small extant area within a commonly collected island, i.e. with a single collection.

Etymology. This new species is named for its only known island of occurrence.

Discussion. *Pteris hivaoaensis* is quite distinct from the other Marquesan *Pteris* species, differing by its pinnate to pinnate-pinnatifid blades with glabrous or glabrescent stipes and the apex pinnatifid with 6–7 pairs of falcate lobes.

7. *Pteris marquesensis* Lorence & K. R. Wood, sp. nov.

urn:lsid:ipni.org:names:77112680-1
http://species-id.net/wiki/Pteris_marquesensis
Figs 9, 15C, D.

Ab aliis Marquesas speciebus laminis 1-pinnatis usque ad 1-pinnato-pinnatifidis, stipitibus dense vestitis cum squamis persistentibus, rigidibus, setiformibus rubro-castaneis differt.

Type. Marquesas Islands: Tahuata, summit ridge near Haaiputeomo, satellite dish region NE of Vaitahu, 2500–2700 ft, 9°57.19'S, 139°5.74'W, 17–19 July 1997, K. R. Wood 6565 (Holotype PTBG 038520!, 038521!, 038522!, 038523!, 038524! [5 sheets]; Isotypes BISH!, NY!, P!, PAP!, UC!, US!).

Description. *Terrestrial ferns*; *rhizomes* dorsiventral, short creeping to suberect, up to 2 cm in diameter (to 15 × 15 cm including stipe bases), scaly at apex, scales of rhizome and base of stipe concolorous, reddish brown, lustrous, linear, sinuate distally, 15–30 × 0.5–0.7 mm, margins subentire or rarely with scattered short teeth, intermixed with smaller narrower scales. *Fronds* 4–7 per rhizome, clustered at rhizome apex; stipes 60–134 cm long, 4–6 mm in diameter medially, adaxially grooved, stramineous, densely scaly especially in lower ca. 1/3, above with scales spreading and less dense, acicular, bases dark brown, persistent, thickened, distally sinuate, apex filiform, margins subentire; lamina chartaceous, 1-pinnate-pinnatifid or in smaller fronds 1-pinnate, 66–90 × 35–64 cm, ovate-triangular, base obtuse or truncate, apex acute, pinnatifid and not conform; pinnae 6–10 pairs, basal 1–5 pinnae pairs rarely entire or more com-

Figure 9. *Pteris marquesensis* Lorence & K. R. Wood. **A** rhizome and stipe bases **B** fertile blade **C** lower sterile pinna **D** lower surface of fertile pinnule showing marginal sori **E** rhizome scale **F** part of rhizome scale, detail of cells **G** detail of stipe scales. Drawn from the type collection (Wood 6565) and field images.

monly irregularly pinnatifid or lobed at least toward base, or occasionally to apex in sterile fronds, basal pair of pinnae on stalks 2–6 mm long, largest basal pinnae 22–36 × 11–18 cm, basiscopic lobes to 13 × 2.5 cm, linear-oblong, slightly falcate, nearly twice as long as acroscopic lobes, acroscopic base often auriculate, apex acute to acuminate, occasionally obtuse in shorter lobes, middle and upper pinnae sessile, basiscopic base decurrent on rachis, acroscopic base free and nearly parallel to rachis, margins entire or finely serrate towards lobe apices, rachis stramineous, grooved adaxially, with scattered dark brown, acicular scales to 2 mm long, glabrescent or scales sometimes persisting in pinnae axes; *veins* netted with 2–5 rows of areoles in larger pinnules. *Sori* with indusia 1 mm wide, entire, continuous along margins except at serrate apices; sporangia mixed with paraphyses. *Spores* medium brown.

Distribution. Known from Tahuata and Hiva Oa, Marquesas Islands.

Ecology. *Pteris marquesensis* occurs in wet forest and shrubland with *Crossostylis biflora*, *Freycinetia* sp., *Metrosideros collina,* and *Weinmannia marquesana* var. *marquesana,* dominant. Other associates include *Cyrtandra* spp., *Morinda citrifolia, Psychotria* spp.*, Vaccinium cereum* var. *adenandrum,* numerous pteridophytes including *Asplenium* spp.*, Doodia marquesensis* E. D. Br.*,* and *Tmesipteris gracilis* Chinnock, and diverse bryophytes.

Etymology. This new species is named for the Marquesas Islands, where it is known from three islands.

Conservation status. Proposed IUCN Red List Category **Endangered** (EN): B2a, B2b (i–iii), D): B2: total area of occupancy less than 500 km^2 (ca. 10 km^2); b (i–iii), habitat continuing decline inferred; D, population size estimated to number fewer than 250 mature individuals. The suitable habitat for *Pteris marquesensis* on Hiva Oa (ca. 315 km^2) and Tahuata (ca. 61 km^2) is indicatedas an endangered environment, threatened by human activity (deforestation, fire), feral animals, and invasive plants, reducing the extent of the forest.

Discussion. This striking, large new species is distinctive among all other Polynesian and Micronesian members of the genus. It resembles *Pteris warburgii* Christ from Papua New Guinea which also has reticulate veins and pinnatifid blades, but that species differs in having only a single pair of lateral pinnae and a terminal pinna, and very few, inconspicuous rhizome and stipe scales. *Pteris marquesensis* also somewhat resembles *P. umbrosa* R. Br. from Australia, but that species has fronds with free dichotomous veins and narrower pinnae adnate to the winged rachis, with the lowermost pair of pinnae pinnate-pinnatifid.

Specimens examined. Marquesas Islands: Hiva Oa: Temetiu region, drainages to the SE of Vaimete and Vaiumioi, headwaters of Hanamenu, UTM 0710665–8916125, 1067 m, Wood 10046 (P, PAP, PTBG, US); Ootua, W side of summit area above road, 9°46'S, 138°58'W, 777 m, Wood 10871 (PTBG, 3 sheets), Wood 10072 (P, PAP, PTBG, US). **Tahuata:** Haaoiputeomo near satellite dish, NE from Vaitahu to summit ridge, 2000–2500ft (610–762 m), Wood 4461 (BISH, NY, P, PAP, PTBG, UC, US); satellite dish region NE of Vaitahu, 2500–2700 ft (762–823 m), 9°57.19'S, 139°5.74'W, Wood 6556 (BISH, NY, P, PAP, PTBG, US).

8. *Pteris tahuataensis* Lorence & K. R. Wood, sp. nov.
urn:lsid:ipni.org:names:77112681-1
http://species-id.net/wiki/Pteris_tahuataensis
Figs 10, 15E

Ab aliis Marquesas speciebus laminis 1-pinnatis usque ad 1-pinnato-pinnatifidis, distalibus pinnis non alatis, et glabris ver glabrescentibus stipitibus differt.

Type. Marquesas Islands: Tahuata: Hanatetena, main valley, first deep gulch to the north, general UTM 0710938 – 8899189, 518 m, 2 Feb 2003, K. R. Wood 10083 (Holotype: PTBG-04297!; Isotypes P!, PAP!, UC!, US!).

Description. *Terrestrial or lithophytic ferns*; *rhizomes* creeping to suberect, 2–5 cm long, 1–3 cm in diameter, clothed in fine, golden-brown acicular hairs 1–2.5 mm long; *fronds* 15-20 per rhizome, pendent, 35–125 cm long; stipes ca. ½ length of frond, up to 4 mm in diameter, atrocastaneous to stramineous, grooved adaxially, sparsely pustulate, glabrous except for a sparse cover of linear to linear-lanceoate, tan-brown scales 3–5 × 0.3–0.5 mm at base of stipes; blades chartaceous, glabrous, ovate, 18–65 × 12–35 cm, ovate. with 5–7 pairs of pinnae; proximal 1–3 pinnae pairs 1–(2–) pinnate-pinnatifid, up to 34 cm long, sessile or stalked up to 9 mm, base obtuse to truncate, uniauriculate or bearing 2–3 pair of falcate lobes or with proximal pair occasionally dividing into falcate pinnules 5–13 cm × 1.4–1.7 mm, reaching maximum length basiscopically on lowest pinnae, apices acute to cuneate, or attenuate, margins crenate to dentate; distal part of blade composed of 3–5 pinnae pairs, these simple, falcate, subopposite, up to 23 cm long, the bases sessile, obtuse to truncate, sometimes uniauriculate acroscopically, tapering gradually to cuneate or attenuate apices with crenate-dentate margins, the single terminal pinna free or sometimes adnate basally to the distal pinnae pair, 6.5–23 × 1.0–2.5 cm, apex attenuate, crenate; costae and costules grooved adaxially, rounded abaxially, similar to stipe in color; veins netted with 2–3 rows of areoles. *Sori* with indusia 0.5–0.9 mm wide, olivaceous; sori usually absent at apices of pinnae, *Spores* castaneous.

Distribution. Known only from Tahuata, Marquesas Islands.

Ecology. This new terrestrial or lithophytic species occurs in wet forests and shrublands from about 418 to 914 m elevation, usually on windswept vertical cliffs in water seepage. A population of approximately 50–70 plants was observed at 914 m on windswept vertical cliffs around a natural spring on saturated basalt walls with *Leptochloa marquisensis* (F. Br.) P. M. Peterson & Judz. and *Selliguea feeioides* Copel., mosses, and lichens in wet forest of *Crossostylis biflora, Freycinetia* sp., *Metrosideros collina, Reynoldsia marchionensis, Weinmannia marquesana* var. *marquesana, Myrsine grantii,* and *Pandanus tectorius.* A second population occurs at 518 m in mesic forest with *Cerbera manghas* L., *Cyclophyllum barbatum, Hibiscus tiliaceus, Pandanus tectorius, Sapindus saponaria* L. and *Xylosma suaveolens* subsp. *pubigerum.* A third population is from lowland degraded mesic forest at 418 m elevation with *Cerbera manghas, Cyclophyllum barbatum, Ficus prolixa* var. *prolixa, Hibiscus tiliaceus, Pan-*

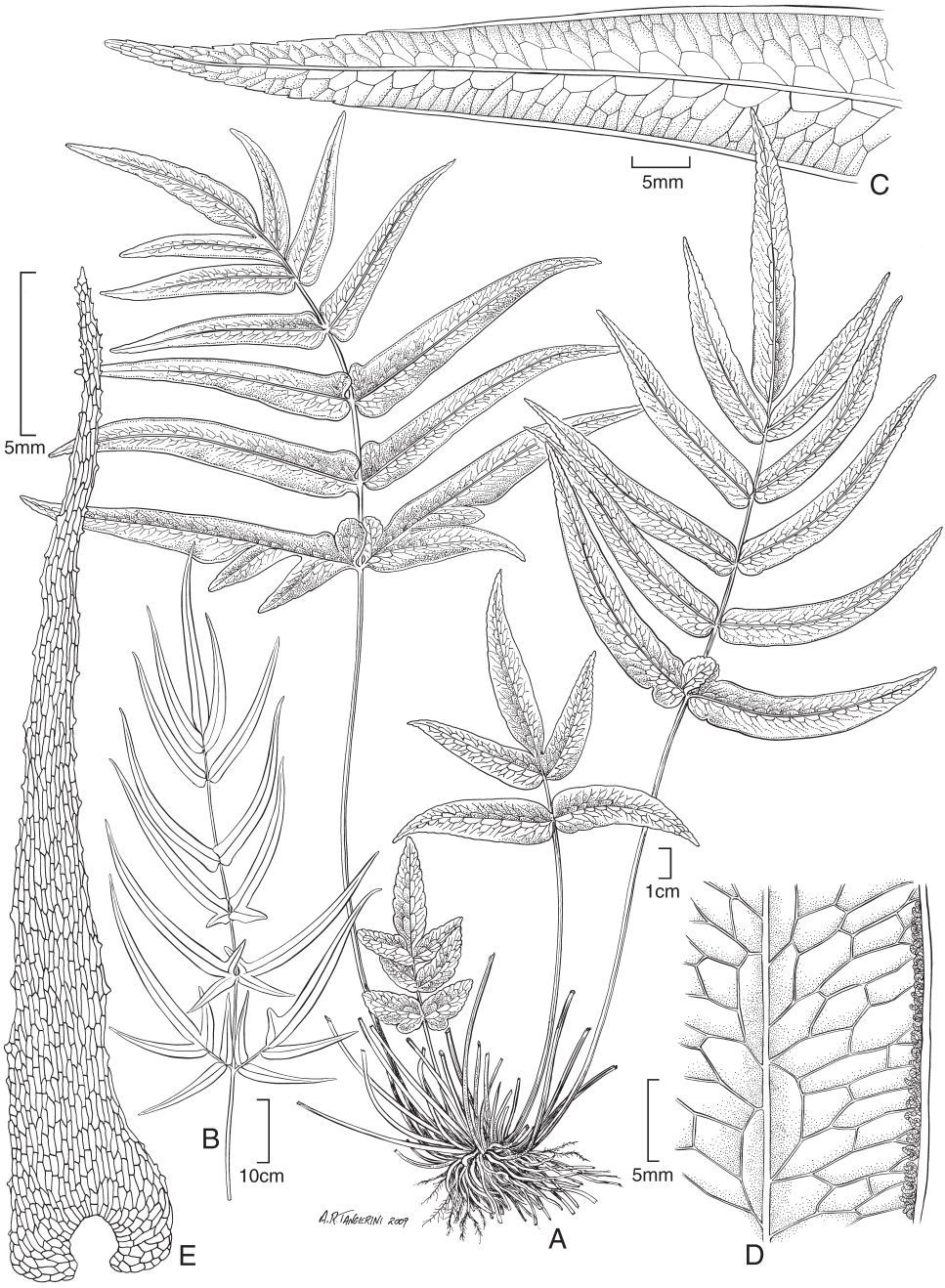

Figure 10. *Pteris tahuataensis* Lorence & K. R. Wood. **A** habit **B** blade **C** fertile pinna distal part **D** lower surface of fertile pinnule showing marginal sori **E** rhizome scale. Drawn from the type collection (Wood 10083) and field images.

danus tectorius, and *Xylosma suaveolens* subsp. *pubigerum, Sapindus saponaria*. The main threats to this species include competition from invasive alien plant species and habitat destruction by feral goats and fire at lower elevations. Known only from three collections, the one population at 418 m having an estimated 50–70 plants (Wood 10085), the others were isolated plants.

Conservation status. Proposed IUCN Red List Category **Critically Endangered** (CR): B2a, B2b i–iii; D): B2: total area of occupancy less than 10 km^2 (ca. 5 km^2); B2a, three populations known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 mature individuals. The suitable habitat for *Pteris tahuataensis* on Tahuata (ca. 61 km^2) is indicated as an endangered environment, threatened by human activity (deforestation, fire), feral animals, and invasive plants, reducing the extent of the forest. D, the rarity of this species is supported by the lack of collections and the small extant area, i.e. with only three known collections and an estimated total population size of fewer than 250 plants.

Etymology. This new species is named for its only known island of occurrence.

Specimens examined. Marquesas Islands: Tahuata: Hapatoni, village to the south of Vaitahu, ridge to summit above Patikoea point, UTM 0706136–8897872, 418 m, Wood 10085 (BISH, K, MO, NY, P, PAP, PTBG, UC, US); Amatea region, locations around Haaoiputeomo satellite dish, 9°92'S, 139°8'W, 914 m, Wood 10250 (PTBG, US).

THELYPTERIDACEAE

With approximately 950 species (Smith et al. 2006) the Thelypteridaceae are one of the largest and most diverse fern families in the Marquesas and the tropics in general. Holttum recognized 15 genera in the Pacific and Australasia (Holttum 1976, 1977). However, delimitation of Holttum's genera is often not clear-cut, and some of the most important characters he used for circumscribing them involve chromosome numbers and spore characters visible only at high magnification (e.g., under the scanning electron microscope). Furthermore, although many of Holttum's genera seem monophyletic, a combination of characters is usually needed to circumscribe them. For these reasons, many authors now recognize only about five genera of Thelypteridaceae (Kramer and Green 1990; Smith and Cranfill 2002; Smith et al. 2006). For the purposes of the Marquesas Vascular Flora project we prefer to adopt this broader generic circumscription of *Thelypteris* Schmidel. and *Cyclosorus* Link, but follow Kramer and Green (1990) in recognizing the subgenera as natural groups. Two new species of *Cyclosorus* (subg. *Plesioneuron*) and one new species of *Thelypteris* (subg. *Coryphopteris*) have come to light among specimens collected in the Marquesas and are described below. One new combination is required, bringing the total number of Thelypteridaceae species in the Marquesas to nine. The genera may be separated using the characters in the following key.

Key to the genera of Thelypteridaceae in the Marquesas Islands

1a Veins to 14 pairs per segment; segments oblique, falcate; indusia absent or very small; sporangia generally setose ..... ***Cyclosorus***

1b. Veins to 7 pairs per segment; segments spreading or slightly oblique, not falcate; indusia relatively large, persistent; sporangia lacking setae ..... ***Thelypteris* (subg. *Coryphopteris*)**

Cyclosorus

Viewed in the broad sense, *Cyclosorus* is the largest genus of Thelypteridaceae, comprising about 600 species in the tropics of both hemispheres. The seven indigenous or endemic and one naturalized species in the Marquesas may be separated by the following key.

Key to the species of *Cyclosorus* in the Marquesas Islands

1a Lower pinnae not reduced, lower 2–3 pairs usually not deflexed; veins all free; sinus with thickened membrane ± obliquely decurrent as a ridge almost to costa on lower surface ..... ***C.* (subg. *Plesioneuron*) *marquesicus***

1b Lower pinnae not or only slightly reduced, lower 2 (–3) pairs deflexed; veins free or uniting, but sinus lacking thickened ridge decurrent toward costa on lower surface **2**

2a Blade with basal pinnae much narrowed on both sides near base, rudimentary pinnae below them 0–2 pairs, inconstant and irregular; blades with sessile spherical yellow glands present abaxially, especially along veins near segment tips; scales absent along costae abaxially, costal hairs ca. 0.1 mm long ..... ***C.* (subg. *Amphineuron*) *opulentus* (Kaulf.) Nakaike**

2b Blade with basal pinnae narrowed or not on both sides, but rudimentary basal pinnae lacking or several pairs regularly present; blades lacking sessile spherical yellow glands abaxially, or these spread ± evenly on laminar tissue; scales present or absent along costae abaxially, costal hairs 0.1–1 mm long, or hairs absent **3**

3a Fronds 1.5–3 m long; narrow, hairlike scales to 2 cm long present throughout stipe and on basal part of rachis, often breaking and leaving spine-like bases; lower surface of pinnae lacking sessile spherical yellow glands; sori exindusiate ..... ***C.* (subg. *Chingia*) *longissimus* (Brack.) Ching**

3b Fronds to 1.2 m long, usually smaller; stipe scales less than 2 cm long, these usually confined to base of stipe, not hairlike or leaving spine-like bases; sessile spherical yellow glands scattered all over lower surface of pinnae (except *C. invisus*); sori indusiate **4**

4a Rhizomes creeping; laminar tissue between veins lacking sessile glands abaxially **5**

4b Rhizomes suberect or erect; laminar tissue between veins bearing numerous sessile, round, yellowish to orange-red glands abaxially **7**

5a Blades glabrous or very sparsely hairy abaxially, hairs if present less than 0.1 mm long on rachises and costae abaxially; costae glabrous adaxially; indusia absent; sporangia lacking hairs (Hiva Oa) .... ***C.* (subg. *Pneumatopteris*) *florencei***

5b Blades abundantly hairy abaxially, on costae, costules, veins, and between veins, hairs to 1 mm long; costae hairy adaxially; indusia present, hairy..... **6**

6a Rhizomes long-creeping; pinnae lobed 1/3–2/5 toward costae; veins and costules glabrous adaxially; sporangia bearing hairs (Fatu Hiva) .... ***C.* (subg. *Sphaerstephanos*) *invisus* (G. Forst.) Copel.**

6b Rhizomes short-creeping; pinnae lobed 1/2–2/3 toward costae; veins and costules, sometimes also laminar tissue between veins, with acicular hairs adaxially; sporangia lacking hairs (Ua Huka)..... ..... ***C.* (subg. *Christella*) *dentatus* (Forssk.) Ching**

7a Abaxial costal hairs red-brown (castaneous), at least in part, curved toward pinna tips, some hairs > 0.5 mm long (Nuku Hiva)..... ..... ***C.* (subg. *Sphaerostephanos*) *castaneus***

7b Abaxial costal hairs hyaline, spreading or ascending, straight or falcate, uniformly very short and < 0.1 mm long, or costae sometimes with scattered to rather dense longer hairs to ca. 1 mm; Society and Marquesas Islands (Fatu Hiva, Hiva Oa, Tahuata, Ua Huka) .... ***C.* (subg. *Sphaerostephanos*) *subpectinatus* (Copel.) Ching**

Discussion. *Cyclosorus subpectinatus* (Copel.) Ching, from the Marquesas and Society Islands, is extremely variable and possibly represents more than a single species, but the material at hand seems to intergrade. Specimens from different islands are all slightly different in various indument, venation, indusial, and size characteristics. Specimens with the largest indusia (to nearly 1 mm in diameter) and longest costal hairs are from Ua Huka (e.g., Dunn 340, BISH; Lorence 9307, PTBG, UC). The type of *C. subpectinatus*, from Tahiti, also has rather long, dense costal hairs, but has smaller indusia only ca. 0.3 mm in diameter The sole collection seen from Tahuata (Wood 10270, P, PAP, PTBG, US) has exceptionally large fronds, with pinnae to 28 × 3.5 cm. Most specimens seen from both the Society Islands (Huahine, Moorea, Raiatea, and Tahiti), and the Marquesas Islands have relatively short, uniform costal hairs ca. 0.1 mm long and small indusia ca. 0.3 mm in diameter. Two specimens from Fatu Hiva (Chapin 789, BISH, cited by Holttum, 1977, as the sole specimen of the species from the Marquesas; and Florence 9509, BISH, P, US) seem to be nearly or quite exindusiate. All specimens seen of *C. subpectinatus* have rather numerous to moderate, tan, adpressed, lanceolate costal scales abaxially, as well as dense, spherical, yellowish to orange-red sessile glands between the veins abaxially, but lack laminar glands adaxially.

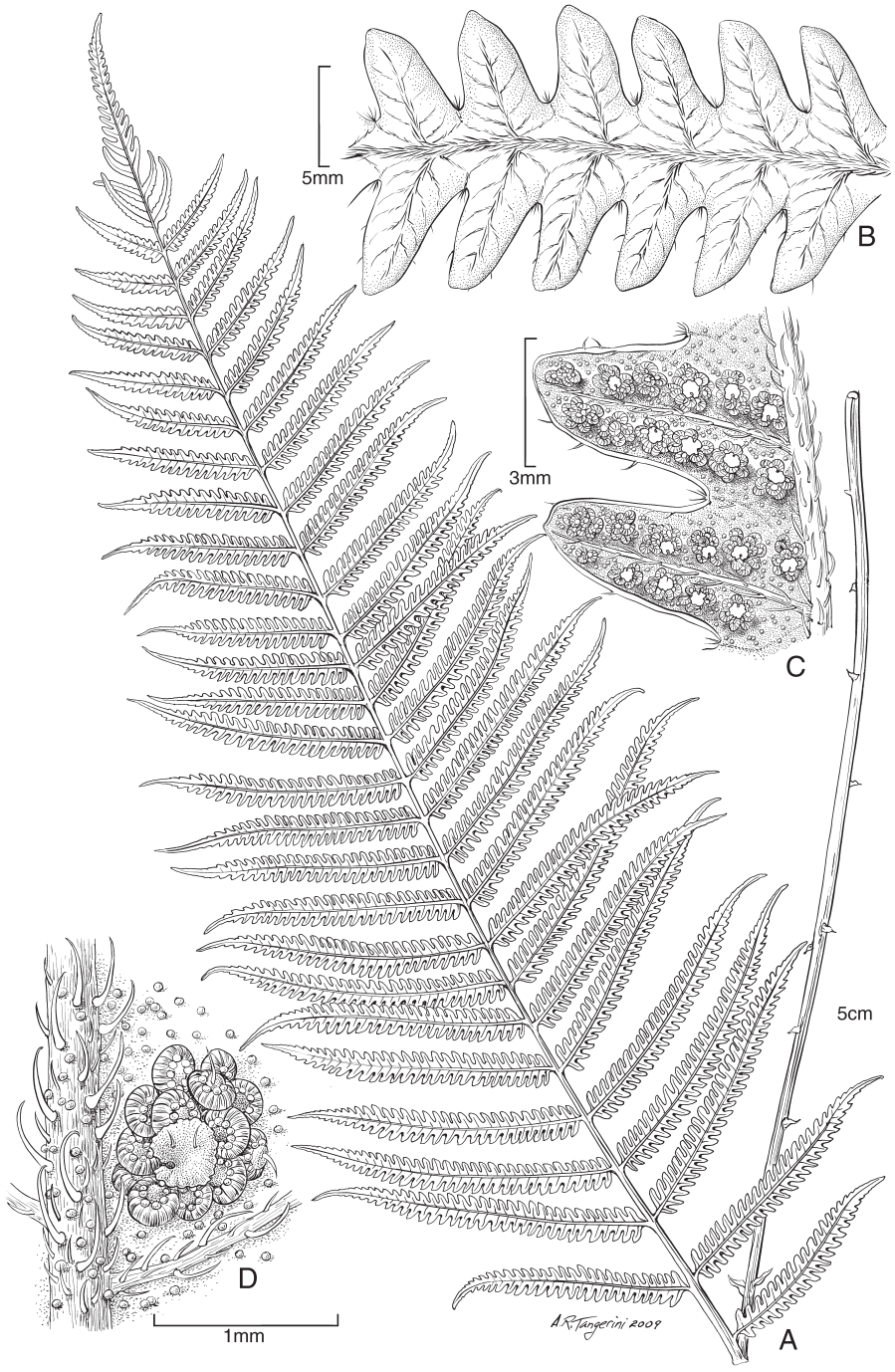

Figure 11. *Cyclosorus castaneus* A. R. Sm. & Lorence. **A** frond **B** upper surface of pinna **C** lower surface of fertile pinnules showing sori, hairs, and glands **D** detail of lower surface of fertile pinnule with sorus, hairs, and glands. Drawn from the type collection (Lorence et al. 6115).

9. *Cyclosorus* (subg. *Sphaerostephanos*) *castaneus* A. R. Sm. & Lorence, sp. nov.
urn:lsid:ipni.org:names:77112682-1
http://species-id.net/wiki/Cyclosorus_(Sphaerostephanos)_castaneus
Fig. 11

A Cyclosoro heterocarpo (Blume) Ching numerosis, nitidis, castaneis, falcatis pilis 0.3–1.5 mm longis super rachides, costis et costulis abaxialibus, parva indusia 0.4–0.6 mm diametro, magis marcatis aerophoribus, fortasseque longioribus, magisque bene-formatis caudicibus differt.

Type. Marquesas Islands: Nuku Hiva: Toovii region, trail along ridge from near l'Economie Rurale complex to Ooumu peak, 860–1080 m, 17 July 1988, D. Lorence (with W.L. Wagner, J. Florence and S. Perlman) 6115 (holotype PTBG!; isotypes BISH!, PAP!, US!).

Description. *Terrestrial ferns*; *rhizomes* erect, caudices 15–60 cm long; *fronds* clustered, 7–10 per rhizome; base of stipes to first large pinnae 40–50 cm, distal part of stipes bearing 7–10 pairs of reduced pinnae 3–5 cm apart, 1–7(–35) mm long, the largest ones sometimes trifid; *rachises* reddish brown, bearing numerous reddish, often curved hairs; proximal large pinnae narrowed at their bases; *blades*, excluding reduced proximal pinnae, 50–70 cm long; largest pinnae 11–16 × 1.5–2 cm, at their bases each with a swollen, tuberculiform aerophore (most developed and scalelike, to 4 mm long in young fronds), pinnae bases not auricled, apices caudate-acuminate, lobed 2/3–3/4 toward the costae (2–3 mm from costae), lobes slightly falcate, rounded at tips; costules ca. 3–5 mm apart; veins to ca. 8–9 pairs per segment, the basal pair from adjacent segments anastomosing and producing an excurrent vein 1–1.5 mm long to the sinus, the next acroscopic vein to sinus-membrane; abaxial surface of costae with very short, hyaline, spreading to distally curved hairs 0.1 mm long and much longer and stouter falcate hairs to 0.3–1.5 mm on costae, scales lacking or costae with a few adpressed, tan, amorphous scales to 2 × 0.1 mm; yellowish sessile glands borne on abaxial laminar surfaces, often dense, absent or very sparse on adaxial laminar surfaces; stout reddish, falcate hairs adaxially on costae and costules to 1 mm long, with short, falcate hairs ca. 0.2–0.3 mm long sometimes on veins and between veins, especially below sinuses. *Sori* medial; indusia reddish brown to tan, ca. 0.4–0.6 mm in diameter, glabrous or with a few short hairs 0.1–0.2 mm long; sporangia with sessile, yellow glands on the capsules.

Distribution. Known only from Nuku Hiva, Marquesas Islands.

Ecology. This new species occurs in montane rain forest with fern understory. All three specimens seen were collected on Nuku Hiva on or near Ooumu Peak in the Toovii area and probably represent a single population.

Conservation status. Proposed IUCN Red List Category **Endangered** (EN): B2a, B2b i–iii): B2: total area of occupancy less than 500 km^2 (ca. 50 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred. The suitable habitat for *Cyclosorus castaneus* on Nuku Huka (ca. 340 km^2) is indicated as an endangered environment, threatened by human activity (deforestation), feral animals, and invasive plants, reducing the extent of the forest.

Etymology. Named for the castaneous, curved hairs that are borne on the costae abaxially.

Specimens examined. Marquesas Islands: Nuku Hiva: Toovii Plateau, trail behind L'Economie Rurale toward Ooumu peak; 3100 ft (945 m), S. Perlman 10125 (BISH, PTBG); Toovii, Ooumu area, top of Tapueahu Valley off new Hwy, 0851 S 14019 W, 3500–3700 ft (1067—1128 m), K. Wood 4578 (BISH, PAP, PTBG, US).

Discussion. The three known specimens were previously determined as *Sphaerostephanos (Cyclosorus)heterocarpus* (Blume) Holttum, a related species known from Southeast Asia, Malesia, Australia (Queensland), Melanesia (Fiji, Vanuatu), and Samoa. From that species *C. castaneus* differs in the numerous shiny, castaneous, falcate hairs 0.3–1.5 mm long, on the rachises, costae, and costules abaxially. These hairs vary in length, but are frequently longer than 0.5 mm on the costae. *Cyclosorus heterocarpus* shows considerable variation in indument (both length and disposition of hairs); however, the hairs in *C. heterocarpus* are always hyaline, not so decidedly curved, and are generally much shorter than those in *C. castaneus*. Holttum (1982) recognized many unnamed forms of *C. heterocarpus* and produced a key to them based primarily on the depth of pinna lobing, presence/absence of sessile glands on the laminae adaxially, width of fertile pinnae, and presence/absence of hairs on the laminae adaxially. *Cyclosorus heterocarpus* also has larger indusia than *C. castaneus*, often 1 mm in diameter or more, and the indusia envelop the sporangia when young. Some variants of *C. heterocarpus* have sessile glands adaxially (rare in *C. castaneous*) and less deeply incised pinnae (Holttum 1982). Aerophores in *C. heterocarpus* appear to be much less developed, only a lunate, slightly raised area, or mammiform hump. In *C. castaneus*, the aerophores are tuberculiform, peglike, or even scalelike, to 4 mm long. A single specimen from Ua Pou (Anakooma river valley just ESE of Oave peak, 470 m, Lorence 9117, PTBG) resembles *C. castaneus* in having reddish hairs on the costae abaxially, but the hairs are less deeply colored and spreading, not falcate. Most sporangia seem empty, and what spores are formed are irregular, so it is possible this is a hybrid involving *C. castaneus* and *C. florencei*. However, neither parental species has been found on Ua Pou. Further study is clearly needed.

10. *Cyclosorus* (subg. *Pneumatopteris*) *florencei* A. R. Sm. & Lorence, sp. nov.

urn:lsid:ipni.org:names:77112683-1
http://species-id.net/wiki/Cyclosorus_(Pneumatopteris)_florencei
Fig. 12

A C. glandulifero (Brack.) Copel. absentibus falcatis, acicularibus pilis adaxialliter supra axiales costas et presentibus reductarum proximalium pinnarum paribus non tan numerosis (ca. 10 pro ca. 20), absentibus pilis supra sporangiales stipites et et receptacula differt.

Type. Marquesas Islands: Hiva Oa: Atuona, trail to Hanamenu, 9°48'S, 139°04'W, wet forest, 29 Jul 1988, J. Florence (with D. Lorence, S. Perlman) 9598 (holotype BISH!; isotypes P, PAP, neither seen).

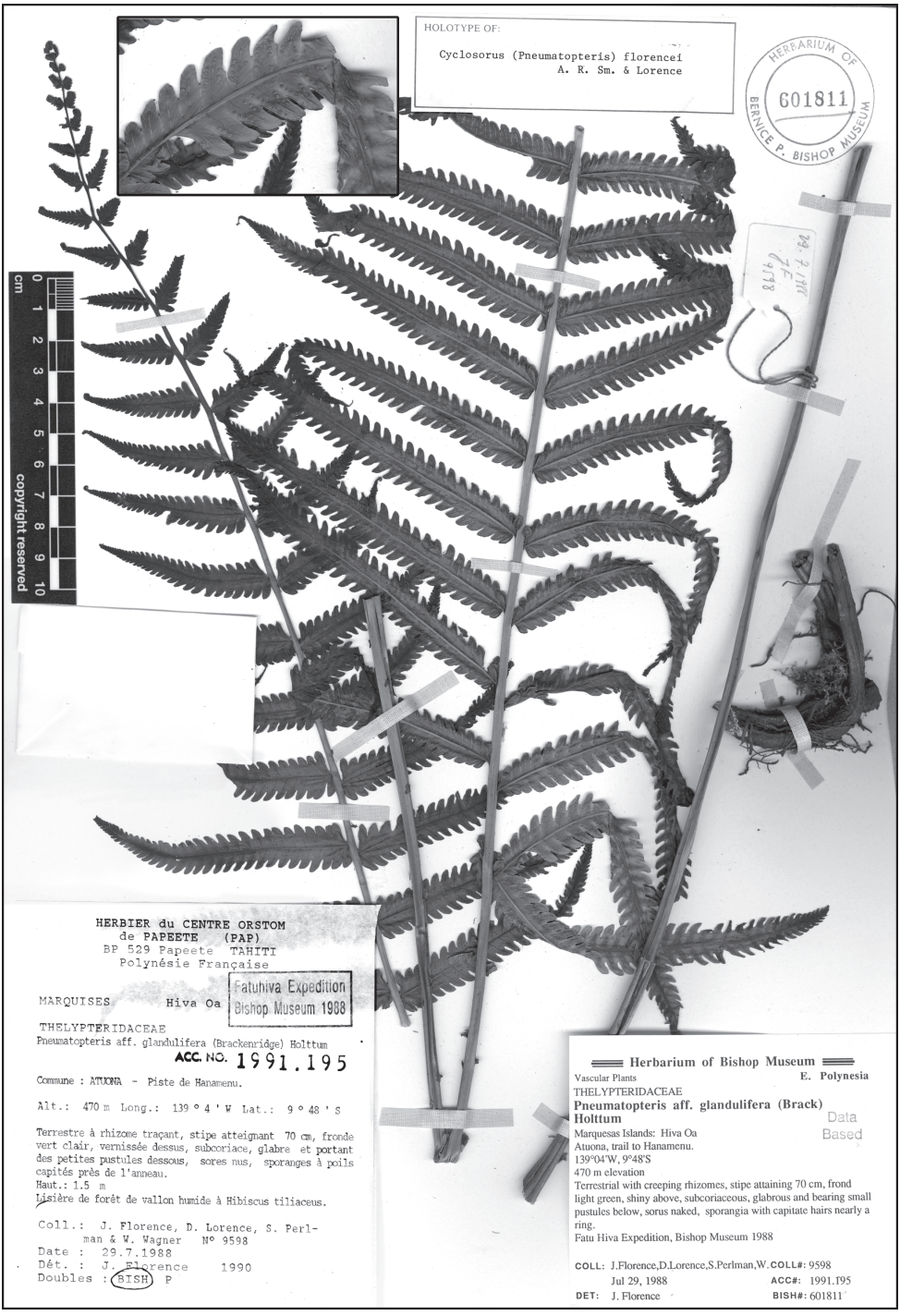

Figure 12. *Cyclosorus florencei* A. R. Sm. & Lorence Holotype collection with frond and part of rhizome, Florence et al. 9598 (BISH). Inset shows detail lower surface of fertile pinna with sori.

Description. *Terrestrial ferns*; *rhizomes* creeping, to 10 mm in diameter; *fronds* spaced, base of stipes sparsely scaly, scales brown, lanceolate; stipes to ca. 70 cm long below first large pinnae, distal part of stipes to 9 mm in diameter at base, bearing ca. 10 pairs of greatly reduced pinnae 2.5–4 cm apart, these 1–10 mm long; proximal large pinnae narrowed at their bases; blades subcoriaceous, excluding reduced, glanduliform proximal pinnae, to ca. 60 cm long, gradually reduced distally to a pinnatifid apex; rachises tan to stramineous, glabrous; large developed pinnae to ca. 30 lateral pairs, to ca. 12 × 1.7 cm, at their bases each with a swollen, conical aerophore to ca. 0.5 mm long, pinnae bases not auricled, apices caudate-acuminate, lobed 2/5–1/2 toward the costae (3–4 mm from costae), lobes oblique and slightly falcate, subacute to rounded at tip; costules ca. 4 mm apart; veins to ca. 8–9 pairs per segment, prominent (especially abaxially) on both sides of laminae, the basal pair from adjacent segments generally obtusely united and producing an excurrent vein 2.5–3 mm long to the sinus, the next 1–1 1/2 pairs merging with this excurrent vein or running to a cartilaginous, raised, sinus membrane; abaxial surface of rachis, costae, costules, and veins nearly lacking hairs or with scattered, minute hairs less than 0.1 mm, costae bearing adpressed to slightly spreading, tan, amorphous (cell walls not readily discernible at 30×) scales to 2 × 0.2 mm; yellowish sessile glands absent on both laminar surfaces, pustules also lacking; hairs absent adaxially on costae, costules, and veins. *Sori* medial to supramedial; indusia absent; sporangia bearing yellowish capsular glands ca. 0.1 mm, lacking acicular hairs on sporangia and from receptacles.

Distribution. Hiva Oa, Marquesas Islands, known only from the type collection made along the trail from Atuona to Hanamenu.

Ecology. Occurs in montane wet forest with *Crossostylis biflora*, *Freycinetia* sp., *Metrosideros collina, Weinmannia marquesana* var. *marquesana* and other species characteristic of this habitat.

Etymology. We take pleasure in naming this new species for Jacques Florence (1951–) who has done so much to advance our knowledge of the flora of the Marquesas Islands and that of French Polynesia in general.

Conservation status. Proposed IUCN Red List Category **Critically Endangered** (CR); B2a, B2b i–iii; D): B1, extent of occurrence estimated to be less than 100 km^2; B2, area of occupancy estimated to be less than 10 km^2 (ca. 9 km^2), and B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 mature individuals. The suitable habitat for *Cyclosorus florencei* on Hiva Oa (ca. 315 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest; and D, the rarity of this species is supported by the lack of collections and the small extant area within a commonly collected island, i.e. with a single collection.

Discussion. This new species is perhaps most closely related to *Cyclosorus glanduliferus* (Brack.) Copel., from Rarotonga (Cook Islands), Samoa, Solomon Islands, and New Hebrides, and to *C. stokesii* (E. D. Br.) Ching, known only from Rapa Iti in the Austral Islands (Holttum 1977). The three species are similar in rhizome habit, blade

dissection, and blade size. However, *C. glanduliferus* differs from *C. stokesii* in having more numerous glanduliform pinnae along the stipes (to about 20 pairs), longer aerophores at bases of costae, presence of small aerophores at costule bases, fewer and shorter costal scales, presence of numerous acicular, falcate hairs on the costae adaxially, and hairs borne on the sporangial stalks and receptacles. From *C. stokesii*, *C. florencei* differs in having less scaly stipe bases (scales numerous and ovate in *C. stokesii*), fewer pairs of glanduliform proximal pinnae (to 20 pairs of glanduliform pinnae in *C. stokesii*), lacking aerophores at bases of costules, more numerous, longer costal scales, 4–5 pairs of veins uniting below sinus or connivent at the sinuses, and lacking hairs from the sporangial stalks. Spore differences mentioned by Holttum (1977) between *C. glanduliferus* and *C. stokesii* cannot be evaluated for *C. florencei* because the sporangia in the type of *C. florencei* are immature. The label with the type indicates the presence of small pustules abaxially, but we fail to see any pustules of the kind often found in species of subg. *Pneumatopteris;* we do see numerous, slightly more reflective stomates (guard cells) at 30 times magnification. Until now no species of subg. *Pneumatopteris* has been recorded from the Marquesas Islands.

The following **new combination** in Thelypteridaceae is also required.

11. *Cyclosorus marquesicum* (Holttum) Lorence & A. R. Sm., comb. nov.
urn:lsid:ipni.org:names:77112686-1
http://species-id.net/wiki/Cyclosorus_marquesicum

Basionym: *Plesioneuron marquesicum* Holttum, Allertonia 1: 192. 1977.

Type. Marquesas Islands: Hivoa: Hana lafa, 700 m, October 1922, *W. B. Jones 1618* (Holotype BISH!).

Distribution. Marquesas Islands (known from Hiva Oa, Tahuata, Ua Huka, and Ua Pou) and the Society Islands (Moorea). A list of exsiccatae is available on the Flora of the Marquesas website (http://botany.si.edu/pacificislandbiodiversity/marquesasflora/index.htm).

***Thelypteris* (subgen. *Coryphopteris*)**

Holttum (1976, 1977) circumscribed *Coryphopteris* Holttum as a genus of about 50 species with its greatest diversity in New Guinea and the Malesian region. However, we prefer to consider *Coryphopteris* as a subgeneric segregate of a more broadly circumscribed *Thelypteris* following the concepts of Kramer and Green (1990), Smith and Cranfill (2002), and Smith et al. (2006). For the purposes of the Marquesas Vascular Flora project we prefer to adopt two genera, *Thelypteris* and *Cyclosorus* in their broader sense, but follow Kramer and Green (1990) in recognizing the subgenera as natural groups.

Species belonging to *Thelypteris* subgenus *Coryphopteris* are small to medium-sized terrestrial ferns (rarely epiphytic) resembling miniature tree ferns with an erect or

sometimes decumbent rhizome topped by a cluster of 1-pinnate fronds with the basal pinnae pairs deflexed in most species. Additional distinguishing characters include relatively large, sessile glands especially dense on the lower surface of the lamina, often abundant scales on the lower surface, and septate acicular hairs on the upper surface of the rachis and costa of some species. Most species belonging to subgenus *Coryphopteris* are restricted to low wet forest or mossy cloud forest habitat on high mountain ridge slopes and crests, often above 1,000 m elevation, where they grow in leached, nutrient poor soils (Holttum 1976).

Two species of *Thelypteris* subgenus *Coryphopteris* are known from the Marquesas, *T. quaylei* (E. D. Br.) Ching [*Coryphopteris quaylei* (E. D. Br.) Holttum], and a diminutive new species described below, *T. marquesensis*. *Thelypteris quaylei* is a larger, more robust species known from Nuku Hiva, Ua Pou, Ua Huka, Hiva Oa, and Fatu Hiva, generally at lower elevations (580–884 m). Certain collections of *T. quaylei* from the summit region of Ua Huka (700–884 m) tend to be relatively small, precociously fertile plants. However, the appearance and habitats of the two species are quite different and they can be separated morphologically by the characters in the following key.

Key to *Thelypteris* subg. *Corphyopteris* in the Marquesas Islands

1a Plants with stipes 1–5(–8.5) cm long, with scattered scales when young, with hairs to 0.5–0.7 mm long; scales near base of stipe 1-2 mm long; blades 2.5–14.5 cm long; pinnae 5–14 pairs; pinnae lobed 1/3–4/5 toward to costa, sessile glands lacking on surface, sori 1(–2) per segment; pinnule veins 1–5 pairs..... ***T. marquesensis***

1b Plants with stipes 15–25(–33) cm long, densely scaly when young, glabrescent, with hairs to 0.2 mm long; scales near base of stipe 5–7 mm long; blades 20–30 cm long; pinnae (12–) 18–25 pairs; pinnae lobed 4/5–7/8 toward to costa, sessile glands present on surface, sori (1–) 3–4 per segment; pinnule veins 5–9 pairs..... ***T. quaylei***

12. *Thelypteris marquesensis* Lorence & K. R. Wood, sp. nov.
urn:lsid:ipni.org:names:77112689-1
http://species-id.net/wiki/Thelypteris_marquesensis
Figs 13, 15F

Species Thelypteri quayleii affinis, sed minori habitu, laminis cum 1-3 paribus inferis deminutisque pinnarum, et pinnarum abaxiali superficie sine sessilibus glandis differt.

Type. Marquesas Islands: Hiva Oa; Temetiu, windswept ridges and drainages, 3280 ft [999 m], 9°48'S, 139 °4'W, 26 August 1995, K. R. Wood 4408 (holotype PTBG-038499!; isotypes, P!, PAP!, US!).

Small ferns, usually lithophytic, forming colonies over wet basalt rock faces (rarely mossy tree trunks); *rhizomes* slender, decumbent to suberect, unbranched, radial, 1.5–7 cm long, 0.4–1.2 cm in diameter, densely clothed by stipe bases, sparsely covered in red-

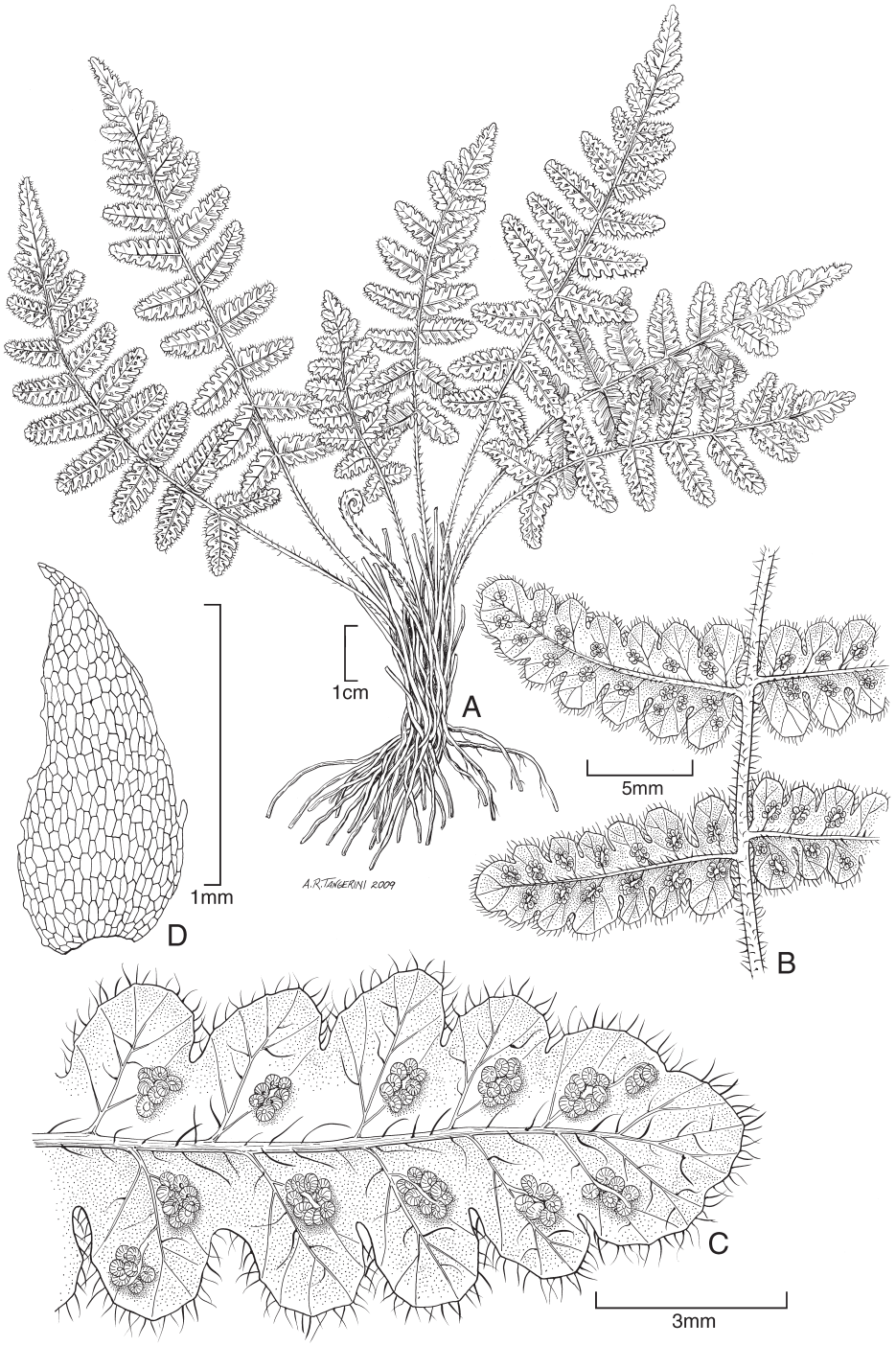

Figure 13. *Thelypteris marquesensis* Lorence & K. R. Wood. **A** habit **B** lower surface fertile pinnae showing sori **C** lower surface of fertile pinna showing sori and hairs **D** rhizome scale. Drawn from the type collection (Wood 4408) and field images.

Figure 14. A *Blechnum pacificum*, habit, habit, fertile and sterile fronds (Fatu Hiva, Lorence 6171) **B–D** *Dryopteris macropholis* **B** frond (Ua Huka, Wood 10489, type) **C** habit, D rhizome and stipe bases (**C, D** Hiva Oa, Wood 10045) **E** *Polystichum kenwoodii*, rhizome and stipe bases (Hiva Oa, Wood 10232) **F** *Polystichum uahukaense*, habit (Ua Huka, Wood 10552).

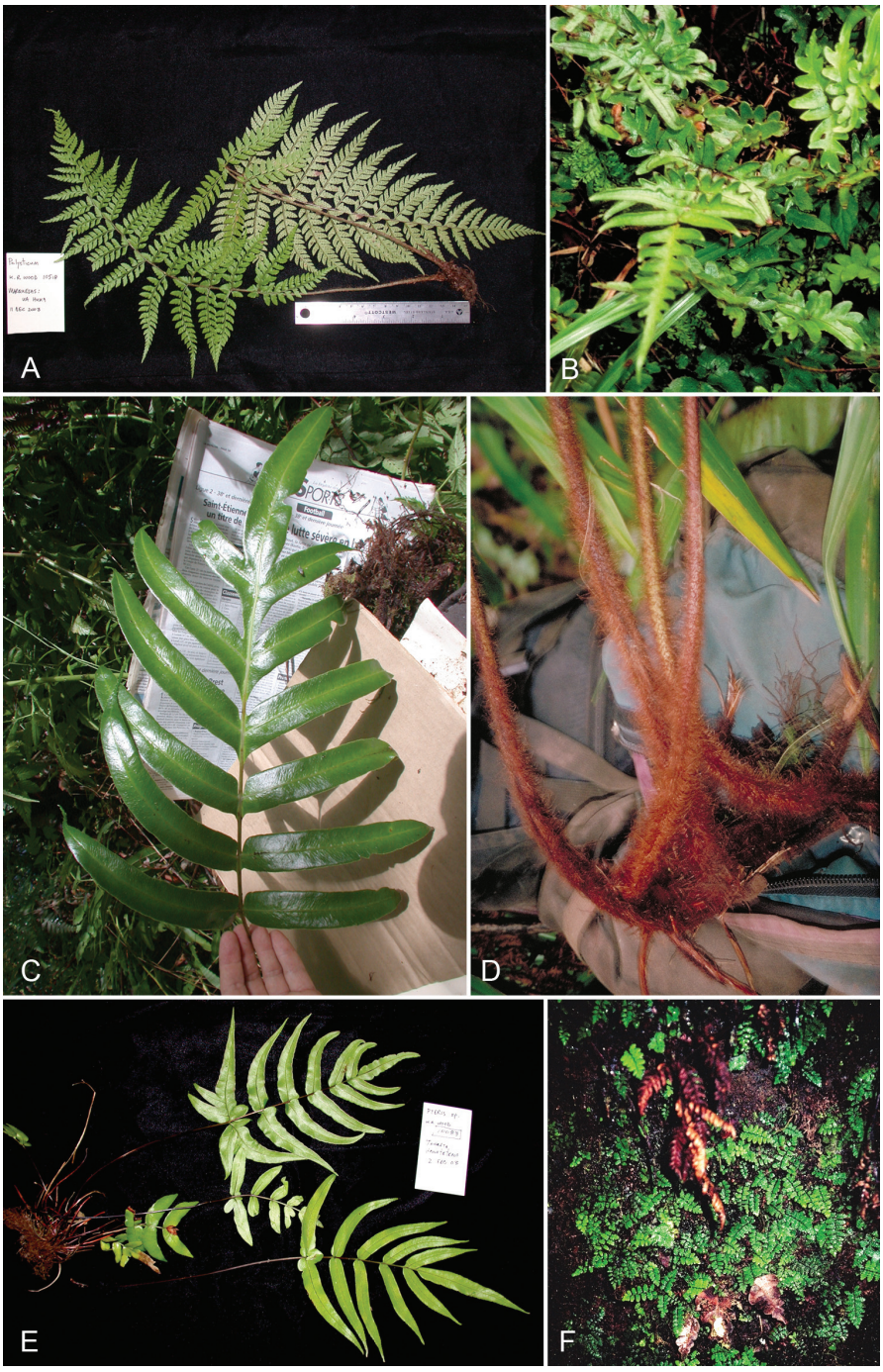

Figure 15. A *Polystichum uahukaense,* frond (Ua Huka, Wood 10518) **B** *Pteris hivaoaensis* (Hiva Oa, Wood 4374) **C, D** *Pteris marquesensis* **C** frond **D** rhizome and stipe bases (both Hiva Oa, Wood 10871) **E** *Pteris tahuataensis* (Tahuata, Wood 10083) **F** *Thelypteris marquesensis*, habit, colony on wet rock face (Hiva Oa, Wood 4408).

brown, unicellular acicular hairs; *fronds* 7–9 per rhizome; stipes 1–5(–8.5) cm long, medium brown, moderately covered in unicellular acicular, red-brown hairs 0.5–0.7 mm long and scales, the scales sparsely scattered, those near base ovate-falcate, red-brown to brownish black, 1–2 × 0.5–0.7 mm, margins entire or with sparse short projections; blades 1-pinnate-pinnatifid, 2.5–8.5 × 1.2–2.8 cm, oblong-elliptic, rachises medium to red-brown, moderately covered with light brown, curved acicular hairs 0.3–0.7 mm long, apex pinnatifid, pinnae 5–12 pairs, largest pinnae 0.6–1.4 × 0.3–0.5 cm, apex obtuse, lobed (1/3–)½ toward costa, lobes crenate, margins with acicular hairs 0.3–0.6 mm long, costules to 2 mm apart, lower pinnae slightly reduced and lower 2(–3) pairs deflexed, basal acroscopic pinnule 1 mm longer than next, veins 2–3 pairs in basal lobe, 1–2 pairs in middle lobes, abaxial surface of rachises and costae hirtellous with brown acicular hairs 0.2–0.7 mm long, adaxial surfaces glabrous or with occasional short acicular hairs 0.2–0.5 mm, sessile glands absent. *Sori* medial, 1(–2) per segment; indusia reniform to subcircular, margins with sessile glands, otherwise glabrous.

Distribution. Known only on Hiva Oa, Marquesas Islands, from a single population in the vicinity of Mt. Temetiu, on the island's central summit crest.

Ecology. *Thelypteris marquesensis* occurs at 1000–1200 m elevation in low, windswept, montane wet forests and shrublands with *Alsophila tahitensis, Cheirodendron bastardianum, Crossostylis biflora*, *Cyrtandra* spp., *Freycinetia* spp., *Leptochloa marquisensis, Melicope* spp., *Metrosideros collina, Psychotria* spp., *Weinmannia marquesana* var. *marquesana,* and abundant pteridophytes in the understory. This new species is rare and localized, although in one area it occurs in dense colonies of hundreds of plants that completely cover wet banks and rock faces in and around shallow depressions or grottos, with fronds often appressed to the rock face (K. Wood, pers. obs.). Threats to this species include rooting by feral pigs and invasion by aggressive alien plant species, notably *Elephantopus mollis*, *Psidium guajava*, and *Syzygium cumini*.

Etymology. This new species is named for the Marquesas Islands, where it is known currently known only from Hiva Oa.

Conservation status. Proposed IUCN Red List Category **Critically Endangered** (CR): B2a, B2b i–iii): B1, extent of occurrence estimated to be less than 100 km^2; B2, area of occupancy estimated to be less than 10 km^2 (ca. 9 km^2), and B2a, a single population known; b (i–iii), habitat continuing decline inferred. The suitable habitat for *Thelypteris marquesensis* on Hiva Oa (ca. 315 km^2), confined to Mt. Temetiu and vicinity, is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals (pigs), and invasive plants, reducing the extent of the forest.

Discussion. This new species differs from *Thelypteris quaylei* in its much smaller habit (although some specimens of *T. quaylei* from the Ua Huka summit are atypically small), fronds with 1–3, gradually reduced basal pairs of pinnae, and lack of sessile glands on the lamina surfaces (but present on indusial margins), a feature it shares with *T. fasciculata* Ching from New Caledonia, New Guinea, and the Celebes (Holttum 1977). Although *T. marquesensis* may occur in the vicinity of *T. quaylei* (Lorence et al. 8942, PTBG), the latter species tends to grow in wet forest understory either terres-

trially or on mossy boulders, although it is sometimes found in shady depressions on steep ridge slopes either as individuals or forming small colonies.

Specimens examined. Marquesas Islands: Hiva Oa: Temetiu, windswept ridges and drainages, 3900 ft, 9°48'S, 139°4'W, Wood 4392 (P, PAP, PTBG, UC, US); chemin d'Atuona a Hanamenu par Feani, pente vers Hanamenui, Schäfer 5195 (US); Atuona–Feani trail, crest of Feani ridge, Sachet & Decker 1127 (US), *1192* (US).

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The extremely useful discussions, field observations, photos, and specimens provided by Jacques Florence of IRD [ex ORSTOM], Paris in conjunction with the ongoing Flore de la Polynésie française project, Jean-Yves Meyer (Delegation à la Recherche, Polynésie française), and Steve Perlman and Ken Wood (National Tropical Botanical Garden) all have contributed significantly to this study. Important observations and new collections resulted from fieldwork carried out during the 1988 Fatu Hiva Expedition and subsequent trips in 1995, 1997, 2003, 2004, and 2005 as part of the *Vascular Flora of the Marquesas Islands* project, which was supported by a generous project donation from private sponsors. We are grateful to the Delegation à la Recherche (Papeete, Tahiti), the Musée de Tahiti et des Iles, and the Service du Développement Rural for logistic support and permission to collect in the Marquesas and to the Delegation and the Haut-Commissariat de la République en Polynésie française for permission to conduct research there. We thank the curators of the following herbaria for loans or permission to study specimens: BISH, K, MO, NY, P, PAP, PTBG, UC, and US. The magnificent illustrations were skillfully drawn by Alice Tangerini (Smithsonian Institution), often from large or otherwise challenging specimens. Val Romano (Smithsonian Institution) kindly assisted with locating, managing, and updating of specimens. We thank Alain Touwaide (Smithsonian Institution) for translating the Latin diagnoses. The contribution by WLW to this study was partially supported by the Smithsonian Research Opportunities Fund and while appointed as McBryde Chair at NTBG. Support for ARS to study specimens at NTBG was provided by the McBryde Senior Research Fellow program. We wish to thank the reviewers (Thomas Ranker and Kunio Iwatsuki) for valuable suggestions and comments that improved the final version of this paper.

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RESEARCH ARTICLE

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Oxalis simplicifolia (Oxalidaceae), an unusual new unifoliolate species from the Marquesas Islands (French Polynesia)

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Abstract

Oxalis simplicifolia Lorence & W. L. Wagner **sp. nov.**, a new species from the Marquesas Islands (Ua Huka) is described and illustrated. It differs from the other Marquesas species, *O. gagneorum*, in having simple, unifoliolate glabrous leaves, minutely glandular-puberulent calyx lobes, shorter corolla lobes, erect capsules, and smaller seeds. As its habitat is under serious threat from human impact, feral animals, and weeds, we conclude this new species should be added to the IUCN Red List as critically endangered (CR).

Keywords

Conservation, French Polynesia, Marquesas Islands, *Oxalis*, Oxalidaceae, unifoliolate

Introduction

Intensive botanical exploration of the Marquesas Islands (French Polynesia) for the Vascular Flora of the Marquesas Islands and Flore de la Polynésie française projects has resulted in numerous additional new collections from these islands. During the collecting expeditions for the current Vascular Flora of the Marquesas Islands project under the direction of David H. Lorence and Warren L. Wagner (Wagner and Lorence, 1997) a unique unifoliolate species of *Oxalis* was collected on the island of Ua Huka by Steve Perlman and Ken Wood of the National Tropical Botanical Garden. An analysis

of the conservation status of this new species reveals it should be included as a critically endangered (CR) species in the IUCN Red List.

Oxalis is a cosmopolitan genus of approximately 500 to 700 species with its greatest diversity in South America and the African Cape region (Mabberley 2008). Previously only a single native species of *Oxalis* was known from the Marquesas: *O. gagneorum* Fosberg & Sachet, a small shrub 30–40 cm tall endemic to the islands of Eiao, Hiva Oa, Tahuata, and Fatu Hiva. The naturalized herbaceous species *O. corniculata* L. also occurs in suitable habitat on most of the main islands.

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from alcohol-preserved flowers and fruits, field notes, and digital photos. Measurements are presented in the descriptions as follows: length × width, followed by units of measurement (mm or cm). All specimens cited in this paper have been seen by the authors. The area of occupancy (distribution) for this species was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001; see also www.iucnredlist.org/info/categories_criteria2001).

Systematics

Oxalis simplicifolia **Lorence & W. L.Wagner, sp. nov.**
urn:lsid:ipni.org:names:77112690-1
http://species-id.net/wiki/Oxalis_simplicifolia
Figs 1, 2

Ad Oxalidem gagneorum Fosberg & Sachet affinis sed in foliis simplicibus unifoliolatis glabris, in laminis ovatis vel late ovatis subpalmate nervatis, in lobis calycis minute glandulo-puberulis, in lobis corollae brevioribus 8-12 mm longis, in staminibus 5-8 mm longis, in capsulis maturis rectis et in seminis minoribus 0.8-0.9 × 0.5 mm differt.

Type. MARQUESAS ISLANDS: Ua Huka: Hanahouua valley, back of valley below cliff walls, 457 m elevation, 8°54.47'S, 139°30.89'W, 26 June 2004, S. Perlman & K. R. Wood 19072 (holotype: PTBG-041184!; Isotypes: P!, PAP!, US!).

Description. *Perennial woody herbs or subshrubs* 20–50 cm tall, stems prostrate or sprawling to erect, branching from near base, with sparse lateral branches, glabrous or new growth sparsely pilose, mature twigs 2–3 mm diam, bark smooth, reddish brown to dark brown, with tufts of pilose hairs at thickened, persistent leaf bases. *Leaves* simple, spirally arranged; blade dark green above, yellow-green below, firm and moderately coriaceous when fresh, chartaceous when dry, glabrous, (15–) 20–47 × (12–)18–37 mm

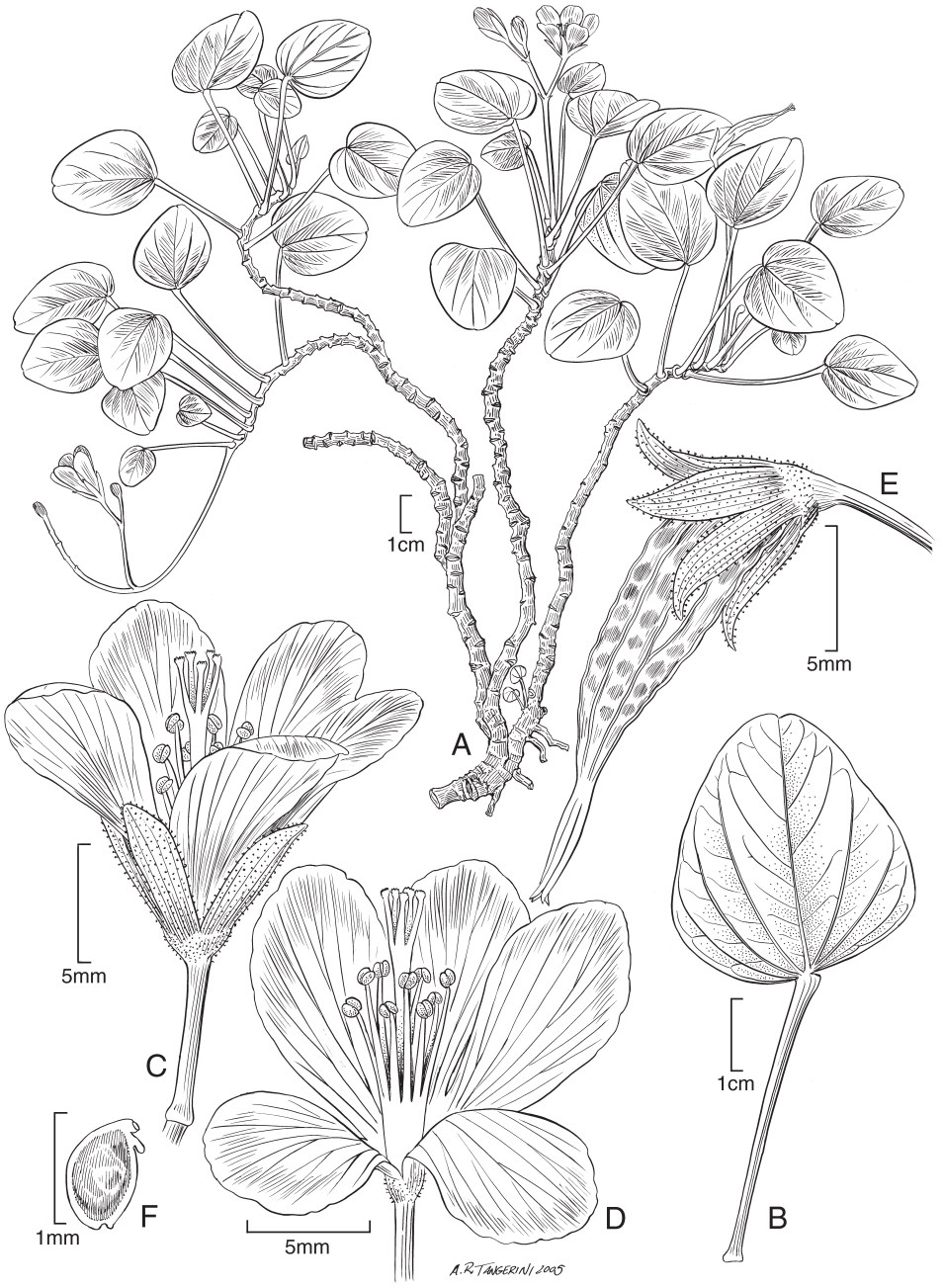

Figure 1. *Oxalis simplicifolia* Lorence & WL Wagner **A** habit **B** leaf **C, D** flowers **E** fruit **F** seed. Drawn from the type collection (Perlman & Wood 10972) and field images.

Figure 2. Field images of *Oxalis simplicifolia* **A** habit **B** stems with flowers and fruits (Perlman & Wood 10972).

ovate to broadly ovate, base obtuse to rounded or truncate, apex obtuse, tip usually emarginate, venation subpalmate with 1–2(–3) pairs of secondary veins from base and 2–3 pairs along midrib above, venation raised and visible to 3° above and to 4° beneath; margin thin, plane; petiole (20–) 25–45 × 0.6–0.8 mm, sparsely scattered pilose or gla-

brescent, flattened, adaxially sulcate, distally with slight pulvinus. *Inflorescences* axillary near ends of branches, cymose, 5–13–flowered, 5–8 cm long, peduncles 4–5 cm long, terminating in apical flower and two monochasial lateral branches 18–40 mm long each with 2–6 flowers, bracts linear-subulate, 1–2 × 0.3–0.4 mm, sparsely puberulent with acicular and scattered glandular-tipped trichomes. *Flowers* (long-styled morph seen) with 5 calyx lobes 5–7 × 1.7–2 mm, narrowly ovate-oblong, 6–8-veined, apex acute, both surfaces minutely glandular-puberulent with capitate trichomes; petals yellow, 10–12 × 5 mm, narrowly obovate to oblong-elliptic, 7–9-veined, apex obtuse to rounded; stamens 10, in two series, the longer 7–8 mm long, the shorter 5.5–6 mm long, filaments connate basally, anthers broadly ellipsoid, 0.4–0.5 mm long, reniform to subcircular; gynoecium 10-14 mm long, with ovary 6–7 mm long, narrowly ovoid-cylindrical, externally glabrous, beak 4–5 mm long, styles 5, 1–2.5 mm long, stigmas slightly thickened, papillose, not bifid. *Fruits* ovoid-cylindrical, 10–11 × 2–2.5 mm, at maturity apparently straight and not twisting, externally glabrous, carpels 5, villous within, seeds ca. 40. *Seeds* ellipsoid, compressed, 0.8–0.9 × 0.5 mm, surface shiny, brown, rugose.

Distribution. Known only from Ua Huka, Marquesas Islands.

Ecology. Known only from two localities on Ua Huka, this new species occurs in shrubby and herbaceous vegetation on vertical basalts cliff above a mesic to wet lowland forest zone with *Freycinetia impavida* (Gaudich. ex Hombr.) B.C. Stone, *Hibiscus tiliaceus* L.*, Pandanus tectorius* Parkinson*,* and *Pisonia grandis* R. Br. Plants grow scattered on cliffs rooting in rock crevices (Figure 2A, B). *Oxalis gagneorum* occurs sympatrically or nearly so with *O. simplicifolia* at both Hanahouua (Perlman and Meyer 19748) and Hane/Hokatu (Wood & Meyer 10530, 10551).

Etymology. The specific epithet refers to the simple, unifoliolate leaves.

Conservation status. Following the criteria and categories of IUCN (2001) *Oxalis simplicifolia* is assigned a preliminary status of Critically Endangered (**CR**): B2a, B2b (i–iii); D): B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, two populations known; b (i–iii), habitat continuing decline inferred. D, population estimated to number fewer than 250 individuals. The suitable habitat for *Oxalis simplicifolia* on Ua Huka (ca. 83 km^2) is indicated as an endangered environment, threatened by feral animals and invasive plants, reducing the extent of the forest. Estimated population size is ca 100+ plants at the Hanahouua locality (Perlman & Meyer 19748), and "scattered" individuals were noted by the collectors at the Hane/Hokatu locality (Wood & Meyer 10530, 10551).

Specimens examined. Marquesas Islands: Ua Huka: Hanahouua valley, back of valley on ridge between Hanahouua and Hanalei, 8°54.47'S, 139°30.87'W, 488 m, 28 July 2005, S. P. Perlman, J.-Y. Meyer 19748 (PTBG); Hane/Hokatu cliff, zone, 520 m, 11 Dec 2003, K. R. Wood, J.-Y. Meyer 10512 (PAP, PTBG, US).

Discussion. Although the majority of *Oxalis* species have palmately compound leaves with three (rarely to nine) leaflets, several taxa with unifoliolate leaves occur in South America in subgenus *Thamnoxys* (Lourteig 1994). At least three South African taxa are also unifoliolate: *Oxalis monophylla* L., *Oxalis salteri* L.Bolus, and *Oxalis flava* L. var. *unifoliolata* Dreyer & Oberl. (Dreyer et al. 2010). These are small, bulbous,

acaulescent plants with white or yellow flowers apparently unrelated to *O. simplicifolia*. Certain species, e.g. *O. renifolia* Kunth and a few other South American taxa can have one and three leaflets on the same branch (E. Emshwiller, pers. comm. 2009). Following Lourteig's (1994, 2000) monograph *O. simplicifolia* keys to subgenus *Monoxalis* (leaves simple, 1-foliolate, stigmas linguiform) which consists of two herbaceous species from the southwestern United States and Mexico (*O. dichondrifolia* A. Gray and *O. robusta* Kunth), neither of which bears any morphological similarity to *O. simplicifolia*.

This new species may be related to the Marquesas endemic *O. gagneorum*, from which it differs by its glabrous simple, unifoliolate leaves with ovate to broadly ovate blades having subpalmate venation of one to three basal vein pairs, minutely glandular puberulent calyx lobes, shorter corolla lobes 8–12 mm long, shorter stamens 5–8 mm long, capsules not twisting at maturity (they often twist in *O. gagneorum*), and smaller seeds 0.8–0.9 × 0.5 mm (Table 1). Fosberg and Sachet (1981: 3–5, Fig. 1) stated that the relationships of *O. gagneorum* were obscure and suggested that it may be related to *O. novaecalidoniae*

Table 1. Distinguishing morphological features of *Oxalis gagneorum* and *O. simplex*.

Character	***O. gagneorum***	***O. simplicifolia***
Height (m)	0.3–1.2	0.2–0.5
Stem pubescence	young growth pilose	glabrous or sparsely pilose
Leaflet pubescence	pilose-strigose below	glabrous
Leaflet number	3	1
Leaflet shape	broadly obovate or oblong-elliptic	ovate to broadly ovate
Leaflet blade length (mm)	35	(20–) 25–47
Leaf blade width (mm)	26	(12–) 18–37
Venation	pinnate	subpalmate
Secondary vein pairs	5–7	1–2 (–3) basal, 2–3 above
Flowers per inflorescence	3–5	5–13
Calyx lobe shape	ovate	ovate-oblong
Calyx lobe length (mm)	4–6	5–7
Calyx lobe width (mm)	2–3	1.7–2
Calyx pubescence	sparsely pilose	minutely glandular puberulent
Corolla lobe length (mm)	12–35	8–12
Corolla lobe width (mm)	3–5	5
Corolla lobe shape	narrowly obovate to spathulate, clawed	narrowly obovate to oblong-elliptic
Shorter stamen length (mm)	11–14	5–5.6
Longer stamen length (mm)	14–16	7–8
Fruit shape	Broadly cylindrical, twisting at maturity	Ovoid-cylindrical, not twisting at maturity
Fruit length (mm)	9–15	10–11
Fruit width (mm)	3–4	2–2.5
Seed length (mm)	1.3–1.4	0.8–0.9
Seed width (mm)	0.8–1.2	0.5
Seed surface	shiny, brown, rugose	shiny, brown, rugose

Kunth & Schlechter, a species belonging to section *Caledonicae* (= section *Neocalidonicae*), but that mature seeds were needed for more accurate placement. Lourteig (2000) placed *O. gagneorum* in section *Rhombifoliae* along with several neotropical species characterized by "lianoid" transversely striate stems [a character not apparent in material of either Marquesan species studied by us] and trifoliolate leaves with oblong to rhomboidal leaflets and lacking stipules, but expressed doubt as to its relationships due to the poor material available for study (i.e., lacking stigmas and seeds). Unfortunately, it has not been possible to obtain DNA sequences from samples of either Marquesan species thus far (E. Emshwiller, pers. comm. 2009), and consequently their phylogenetic relationships remain unclear.

Oxalis species often have different floral morphs, frequently tristylous or sometimes distylous (Weller et al. 2007). Examination of material of *O. gagneorum* revealed most flowers appear to be homostylous with styles about equaling the stamens. Due to a paucity of flowering collections of *O. simplicifolia*, only the long-styled floral morph with both whorls of stamens shorter than the style is known (illustrated in Fig. 1). There may be several possible explanations for this: either *O. simplicifolia* might be a clonally reproducing species with a single morph (as are several *Oxalis* species in Mexico), or it could be an autogamous species that reproduces sexually but has only a single morph (S. Weller, pers. comm. 2009). Further collections and field studied are clearly necessary to resolve this question.

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Weinmannia marquesana var. *angustifolia* (Cunoniaceae), a new variety from the Marquesas Islands

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Abstract

Weinmannia marquesana F. Br. var. *angustifolia* Lorence & W. L. Wagner, **var. nov.**, a new variety with narrow, simple leaves endemic to Tahuata, Marquesas Islands (French Polynesia) is described and its affinities and conservation status are discussed. It is similar to the other two varieties of this species by having simple leaves, but this new variety has much narrower leaf blades, and it resembles *W. tremuloides* in having narrow leaf blades but differs by having simple, not trifoliolate leaves.

Keywords

Conservation, Cunoniaceae, French Polynesia, Marquesas Islands, *Weinmannia*

Introduction

Brown (1935) described the simple-leaved Marquesan endemic species *Weinmannia marquesana* F. Br. (Cunoniaceae) based on collections from Nuku Hiva, Ua Huka, and Ua Pou. He recognized the nominate variety as var. *typica* F. Br. and simultaneously described var. *glabrata* F. Br. to accommodate glabrous or nearly glabrous collections from Hiva Oa and Fatu Hiva. In his revision Bernardi (1964) recognized *W. marquesana* in a broad sense without infraspecies. Fosberg and Sachet (1972) subsequently subsumed *W. marquesana* under *W. parviflora* G. Forst., a species from the Society Islands, and

recognized Brown's two taxa as *W. parviflora* vars. *marquesana* and *glabrata*. They also described the new variety *W. parviflora* var. *myrsinites* Fosberg & Sachet from Hiva Oa.

In their revision of *Weinmannia* in the Society, Marquesas, and Austral Islands (French Polynesia) Hopkins and Florence (1998) described a distinctive new trifoliolate species, *W. tremuloides* H. C. Hopkins & J. Florence, endemic to Fatu Hiva. They recognized two varieties of *W. marquesana* F. Br. (vars. *marquesana* and *myrsinites*) and synonymized both of Brown's varieties under *W. marquesana* var. *marquesana*. Following their circumscription, the widespread var. *marquesana* is characterized by its larger elliptic or ovate leaves with blades (2.5–)3.3–7.5 × (1–)1.3–4.4 cm and occurs on the major islands Nuku Hiva, Ua Huka, Ua Pou, Hiva Oa, and Fatu Hiva, whereas the second variety, var. *myrsinites* (Fosberg & Sachet) H. C. Hopkins & J. Florence, has smaller leaves with blades 1.6–2.7(–3.3) × 0.7–1.7 cm and is endemic to Hiva Oa.

Hopkins and Florence (1998) cited three specimens of a narrow-leaved variant occurring on Tahuata under var. *marquesana* without further discussion, although noting that *W. marquesana* is a variable species "with some intermediates between the two named varieties." Further collections of this distinctive variant from Tahuata show that it differs from typical var. *marquesana* by its narrowly elliptic to oblong elliptic leaves 2.5–5.8 × 0.4–1.2 cm which taper at both ends. The floral and fruit morphology of this variant fit within the dimensions known for *W. marquesana*. As it is the only *Weinmannia* taxon to occur on Tahuata and does not intergrade with either of the two previously recognized varieties in leaf morphology, we recognize and describe it as a new variety.

Systematics

***Weinmannia marquesana* F. Br. var. *angustifolia* Lorence & W. L. Wagner, var. nov.**
urn:lsid:ipni.org:names:77112691-1
http://species-id.net/wiki/Weinmannia_marquesana_angustifolia
Figs 1, 2

Ab Weinmannia marquesana *var.* marquesana *atque* W. marquesana *var.* myrisnites *foliis unifoliatis anguste ellipticis vel oblongo-ellipticis 2.5–5.8 × 0.4–1.2 cm differt.*

Type. Marquesas Islands: Tahuata: Ridge between Amatea & Haaoiputeomo, summit crest of island, 914 m elevation, 12 July 1997 [fl, fruit], S. P. Perlman, K. R. Wood, and J.-P. Luce 15992 (holotype: US!; isotypes: BISH!, MO!, P!, PAP!, PTBG!).

Description. *Shrub or small tree* 2–3 m tall, leafy twigs 0.8–1 mm in diam., terete, sparsely strigose with pale brown hairs when young, glabrate, reddish brown and lenticellate when fresh. *Leaves* opposite, unifoliate, blade narrowly elliptic to oblong elliptic, 2.5–5.8 × 0.4–1.2 cm, costa strigulose on both surfaces, glabrescent above; secondary veins 8–10 pairs, red or yellow when fresh, visible above, higher order venation reticulate, prominulous and visible to tertiary beneath, margins finely serrate, thickened, with 8–14 teeth on each side; petioles 1.5–8 × 0.7–0.8 mm, narrowly winged, strigulose, red when

Figure 1. *Weinmannia marquesana* var. *angustifolia* Lorence & W. L. Wagner. **A** habit (Perlman 14911, S. Perlman photo), **B** branchlets with male flowers (Perlman 14911, K. Wood photo).

Figure 2. *Weinmannia marquesana* var. *angustifolia* Lorence & W. L. Wagner (Perlman et al. 15992, holotype US).

fresh; stipules rounded, 0.3–0.7 mm long, apex obtuse, strigulose, thick, persistent. *Inflorescences* 3.5–5.5 × 2–5 cm, usually trichotomous and consisting of 3(5) racemes, sessile or on slender peduncle 10–15 mm, the axes strigulose, red when fresh, each raceme with 25–40 flowers; bracteoles reduced or absent; *flowers* on pedicels 0.8–1.7 mm long, calyx lobes 0.6–0.9 × 0.5–0.6 mm, broadly ovate, obtuse, sparsely strigulose or glabrous without, deciduous in fruit; petals broadly ovate, 1–1.4 × 0.7–0.9 mm, apex obtuse; *male*

flowers with stamens twice as long as pistil, filaments 2–2.5 mm, anthers ovoid, 0.4 mm, ovary 0.6–0.7 mm, style 0.2 mm, stigma bilobed and slightly thickened; *female flowers* with stamens subequal to pistil, filaments 1–1.2 mm, anthers ovoid, 0.2 mm, abortive, ovary 1 mm, strigulose, styles 2, 0.6–0.8 mm, stigma bilobed, papillose, and slightly thickened. *Infructescence* 5–7 × 5.5–6.5 cm; *capsules* narrowly obovoid, 4–5 × 1.5–2 mm (excluding the styles), strigulose, the persistent styles 1 mm. *Seeds* narrowly oblong- ellipsoid, c. 0.8–1 mm, comose with tuft of hairs 0.3–0.4 mm at each end.

Distribution. Known only from the summit ridge of Tahuata, Marquesas Islands.

Ecology. This new variety occurs in windswept native wet evergreen shrubland or low wet forest on ridge crests from 620 to 850 m elevation, with *Crossostylis biflora* J. R. Forst. & G. Forst.*, Freycinetia arborea* Gaudich.*, Metrosideros collina* (J. R. Forst. & G. Forst.) A. Gray, *Polyscias marchionensis* (F. Br.) Lowry & G. M. Plunkett, tree ferns including *Alsophila tahitensis* Brack., and numerous pteridophytes and bryophytes in the understory. Collected in flower in July and September and in fruit in July.

Conservation status: Exact size of the population unknown, although this variety is said by collectors to be "locally common" or "abundant" (four collections made at 750 to 850 m elevation) or "somewhat rare" (one collection made at 620 m elevation). However, *Weinmannia marquesana* var. *angustifolia* is known only from a single locality on a single island with a total area of occupancy of less than ca. 5km^2. The suitable habitat on Tahuata (ca. 61 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest. We recommend placing this variety in the IUCN **Endangered** (EN) category B2a, B2b (i–iii): B2 total area of occupancy less than 500 km^2; B2a, a single population known; B2b (i–iii), continuing habitat decline inferred.

Specimens examined. Marquesas Islands: Tahuata: Ha'aoiputeomo: near the summit of Amatea on north facing ridge 850 m elevation, 9°56'36" S, 139°5'5" W, 3 Jul 2003, L. M. Dunn 198 (P, PAP, PTBG, US); Haaoiputeomo, summit ridge and highest peak on the island , 927 m, 12 July 1997, S. P. Perlman, K. R. Wood 15964 (BISH, MO, P, PAP, PTBG, US). Amatea, W of antenna, S facing slope over Hanatetena, 793 m, 13 July 1997, S. P. Perlman, K. R. Wood, J.-P. Luce 15982 (MO, PAP, PTBG, US). Ridge between Amatea & Haaoiputeomo, summit crest of island , 823 m, 12 July 1997, S. P. Perlman, K. R. Wood, J.-P. Luce 15983 (MO, NY, PAP, PTBG, US). Trail from Amatea to Moteve, above Haaoipu Bay, to NE of Hanatetena, top of ridge crest, W facing slope, 808 m, 17 July 1997, S. P. Perlman, K. R. Wood, J.-P. Luce 15995 (AD, MO, NY, P, PAP, PTBG, US). Summit of ridge above Vaitahu, near Haaoiputeomo, on ridge near antenna, along ridge crest between Vaitahu & Hanatetena, 835 m elevation, 1 September 1995, S. P. Perlman, K. R. Wood, J. P. Luce 14911 (BISH, MO, P, PAP, PTBG, US). Summit of ridge above Vaitahu, near Haaoiputeomo, on ridge near antenna, along ridge crest between Vaitahu & Hanatetena, 823 m, 1 September 1995, S. P. Perlman, K. R. Wood, J.-P. Luce 14918 (BISH, MO, P, PAP, PTBG, US). Tahuata: Vaitahu, crête d'Amatea, début de la montée raide vers la partie haute, 620 m, 10 April 1975, P. A. Schäfer 5499 (BISH, K, PTBG, US). De Hamatea (750 m) à la crête centrale de l'île, 750–850 m, 26 May 1975, J.-C. Thibault

60 (BISH, PAP, PTBG, US). Haaoiputeoma, near satelite dish, NE from Vaitahu to summit ridge; wind swept ridge, 610–762 m, 1–2 September 1995, K. R. Wood 4431 (BISH, MO, P, PAP, PTBG, US). Haaoiputeoma, near satelite dish, NE from Vaitahu to summit ridge; along wind swept rim, 610–762 m, 1–2 September 1995, K. R. Wood 4438 (AD, BISH, MO, P, PAP, PTBG, US).

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A nomenclator of Pacific oceanic island *Phyllanthus* (Phyllanthaceae), including *Glochidion*

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Abstract

Recent molecular phylogenetic studies and reevaluation of morphological characters have led to the inclusion of *Glochidion* within a broader delimitation of *Phyllanthus*. It is necessary for preparation of the *Vascular Flora of the Marquesas Islands* to make new combinations for the Marquesan species. We also provide the relevant combinations and listing of all of the currently accepted species of *Phyllanthus* on Pacific oceanic islands for a total of 69 native species in oceanic Pacific islands. *Glochidion tooviianum* J. Florence is here placed into synonymy of *P. marchionicus* (F. Br.) W. L. Wagner & Lorence based on new assessment of recently collected specimens from Nuku Hiva. *Glochidion excorticans* Fosberg var. *calvum* Fosberg is placed into synonomy of *P. ponapense* (Hosokawa) W. L. Wagner & Lorence and *Glochidion puberulum* Hosokawa and *Glochidion excorticans* Fosberg are placed in synonymy of *P. senyavinianus* (Glassman) W. L. Wagner & Lorence based on new study of all Micronesian specimens available to us. No infraspecific taxa are recognized within *P. pacificus* of the Marquesas Islands. Species already with valid names in *Phyllanthus* are also listed for completeness and convenience. Brief distributional comments are given for each species. We propose new names for species for which a new combination is not possible: *P. florencei* W. L. Wagner & Lorence, **nom. nov.**, *P. mariannensis* W.L. Wagner & Lorence, **nom. nov.**, *P. otobedii* W. L. Wagner & Lorence, *P. raiateaensis* W. L. Wagner & Lorence, *P. st-johnii* W. L. Wagner & Lorence, **nom. nov.,** and *P. vitilevuensis* W.L. Wagner & Lorence, **nom. nov.** We provide information for four additional naturalized species within the region (*P. amarus, P. debilis, tenellus,* and *P. urinaria*). The name *Glochidion ramiflorum* widely applied to Pacific island populations is here considered to be a species further west in the Pacific with all of the oceanic species here referred to several regional species.

Keywords

Caroline Islands, Fiji, *Glochidion,* Marquesas Islands, Micronesia, Pacific, Phyllanthaceae, *Phyllanthus*

Introduction

Recent molecular phylogenetic studies have greatly advanced the understanding of relationships in the family Phyllanthaceae (a segregate from Euphorbiaceae *s. l.*) based on chloroplast and nuclear DNA sequence data (Wurdack et al. 2004; Samuel et al. 2005; Kathriarachchi et al. 2005, 2006). Among the tribes in Phyllanthaceae (Hoffmann et al., 2006), tribe Phyllantheae is the largest natural group and accounts for more than half of the 2000 species in the family (Kathriarachchi et al. 2006; Hoffmann et al. 2006). One of the most taxonomically difficult groups in the family is *Phyllanthus* L. and related genera, species of which have small unisexual flowers and an often confusingly similar habit in unrelated groups. Historically generic circumscriptions in Phyllantheae have undergone substantial fluctuation, and the definition of natural groups is still unclear in many parts of the tribe (Hoffmann et al. 2006). The recent molecular studies of relationships within the family, with special emphasis on the large genus *Phyllanthus*, confirm paraphyly of *Phyllanthus* in its traditional circumscription with *Breynia* J. R. Forst. & G. Forst., *Glochidion* J. R. Forst. & G. Forst., *Reverchonia* A. Gray, and *Sauropus* Blume embedded within *Phyllanthus*. These results led the research groups working on Phyllanthaceae (Hoffmann et al. 2006; Kathriarachchi et al. 2006) to conclude that the embedded genera should be submerged into a broadened *Phyllanthus* rather than further generic segregation, which would create a series of highly technical genera distinguishable only by specialists. Distinguishing morphological characters among these five taxa are not clear-cut or comparable, and thus recognition of equivalent clades at generic level would exacerbate the problem of understanding the evolution of this large and widespread lineage (Hoffmann et al. 2006). The enlarged *Phyllanthus* comprises nearly 1300 species with the inclusion of *Breynia*, *Glochidion*, *Reverchonia*, *Phyllanthodendron* Hemsl., and *Sauropus*. It is not surprising that the vast morphological diversity of *Phyllanthus* prior to adding the embedded taxa would readily accommodate them (Hoffmann et al. 2006). Unfortunately, the broadening of *Phyllanthus* necessitates a considerable number of new combinations, but nevertheless this seems to be the best approach over the long term in the interest of developing a classification that facilitates understanding of the evolution and relationships in the overall group.

Our work has focused on the oceanic Pacific and specifically we are currently completing investigation of the flora of the Marquesas Islands as part of a collaboration between National Tropical Botanical Garden (NTBG), Smithsonian Institution (SI), and the Délégation à la Recherche, Papeete, Tahiti (French Polynesia). We do not believe it is wise to make only the necessary combinations for just the Marquesan species previously placed in *Glochidion* so we here provide a synopsis of all of the Pacific oceanic island species (Fiji and Caroline Islands eastward across the Pacific). We also include all of the species currently recognized within *Phyllanthus* for completeness. We have not made an exhaustive study of the taxonomy of these species, but accept for the most part previous taxonomic conclusions. The Pacific group of species is in serious need of comprehensive analysis as previous work has focused on localized areas with few excep-

tions. Smith (1981) and Florence (1997) have made good regional taxonomic studies, but both point out problems that need a broader geographical perspective to solve. The Micronesian species are in particular need of comprehensive study and have received only partial treatments, either of part of the region (Hosokawa 1935) or more superficial descriptive work (Fosberg and Oliver 1991) without consideration of all species previously described. We have made some changes to the taxonomy of these species, but an in depth study is required to gain a more solid understanding of the diversity within Micronesia. Webster (1986) also made a partial study in the region, primarily of southwestern Pacific species, and Croizat (1943) contributed a useful analysis of several species. We have made extensive use of the Euphorbiaceae world checklist (Govaerts et al. 2000) in compiling the list presented here.

Systematics

1. *Phyllanthus amentuliger* Müll. Arg., Flora 48: 390. 1865. **TYPE. FIJI ISLANDS: Vanua Levu:** Mbua Bay, 1840, U.S. Expl. Exped. s.n. (holotype: probably G; Isotype: US!).

Diasperus amentuliger (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 598. 1891. *Glochidion amentuligerum* Müll. Arg.) Croizat, Sargentia 1: 46. 1942.

Distribution. Endemic to Fiji and known from Vanua Levu and eastern Viti Levu at elevations of 100–400 m in dense or open forest, edges, and thickets (Smith 1981).

2. *Phyllanthus amicorum* G. Webster, Pacific Sci. 40: 100. 1986 [1988]. **TYPE. TONGA:** Eua, E. Soakai 341 (Holotype: K).

Distribution. Endemic to the island of Eua, Tonga (Webster 1986) where it is only known from forest margins and exposed rocks, 300m, on the Liku Plateau.

3. *Phyllanthus anfractuosus* (Gibbs) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112692-1

Basionym: *Glochidion anfractuosum* Gibbs, J. Linn. Soc. Bot. 39: 168. 1909. TYPE. FIJI ISLANDS: Viti Levu: Nandarivatu, Sep 1907, *J. G. Gibbs 730* (holotype: BM).

Distribution. Endemic to Fiji and known only from Viti Levu and Ovalau at elevations from 100 to 1075 m, in dense or dry forest, thickets or ridge forest (Smith 1981).

4. *Phyllanthus aoraiensis* Nadeaud, Énum. Pl. Tahiti 73. 1873. **TYPE. SOCIETY ISLANDS: Tahiti:** 1000 m, Nov 1857, J. Nadeaud 459 (holotype: P; isotypes: G [2], P[2]).

Distribution. Endemic to the Society Islands and known only from Tahiti at about 1000 m elevation on a ridge crest. Not collected since 1857 and presumed extinct (Florence 1997).

5. *Phyllanthus atalotrichus* (A.C. Sm.) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112693-1

Basionym: *Glochidion atalotrichum* A.C. Sm., Contr. U.S. Natl. Herb. 37: 74. 1967. **TYPE. FIJI ISLANDS: Viti Levu:** Namosi, northern Korombasambasanga Range, drainage of Wainavindrau Creek, 450 to 600 m, 28 Sep 1953, A.C. Smith 8747 (holotype: US-02191397!; isotypes: GH, BISH!, L, NY!, S).

Distribution. Endemic to Fiji and known only from Namosi Prov., Viti Levu from 250–800 m in dense forest (Smith 1981).

6. *Phyllanthus atrovirens* (A.C. Sm.) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112694-1

Basionym: *Glochidion atrovirens* A.C. Sm., Fl. Vitiensis Nova 2: 481,491. 1981. **TYPE. FIJI ISLANDS: Viti Levu:** Serua, hills between Wainiggere and Waisese Creeks, between Ngaloa and Wainiyambia, 50 to 100 m, 10 Dec 1953, A.C. Smith 9550 (holotype: BISH-508142!; isotype: US!).

Distribution. Endemic to Fiji and know only from coastal and slightly inland areas of southern Viti Levu from 50–100 m in dry or dense forest (Smith 1981).

7. *Phyllanthus bracteatus* (Gillespie) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112695-1

Basionym: *Glochidion bracteatum* Gillespie, Bernice P. Bishop Mus. Bull. 91: 15. 1932. **TYPE. FIJI ISLANDS: Viti Levu:** Rewa, SE slopes of Mt. Korombamba, 7 Aug 1927, J. W. Gillespie 2169 (holotype: BISH-508144!; isotypes: BISH [2]!).

Distribution. Endemic to Fiji from southern and eastern Vitu Levu, from 100 to 430 m in dense or open forest (Smith 1981).

8. *Phyllanthus brothersonii* (J. Florence) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112696-1

Basionym: *Glochidion brothersonii* J. Florence, Fl. Polynésie Française 1: 68. 1997. **TYPE. SOCIETY ISLANDS: Raiatea:** Opoa, Mont Oropiro, épaulement nord. 200 m, 151°24' W, 16°51' S, 2 Jun 1990, J. Florence 10373 (holotype: P; isotypes: BISH!, CHR, DAV, K, L, P, PAP, PTBG!, US!).

Distribution. Endemic to the Society Islands and know only from Raiatea at apparently only low elevations from 200 to 250 m, collected in riparian forest with *Hibiscus tiliaceus* L. and in mesic ridge forest with *Metrosideros collina* (J. R. Forst. & G. Forst.) A. Gray and *Commersonia bartramia* (L.) Merr. (Florence 1997). The area has been converted to pine plantation (D. Hembry, pers. comm. 2011).

9. *Phyllanthus brunnescens* (A.C. Sm.) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112697-1

Basionym: *Glochidion brunnescens* A.C. Sm., Fl. Vitiensis Nova 2: 482, 491. 1981. **TYPE. FIJI ISLANDS: Viti Levu:** Namosi, Mt., Nambui, third peak of Korombasambasanga Range, 12 Nov 1965, DA 14548 pro parte (coll. D. Koroiveibau & I. Qoro) (holotype: BISH-508147!; isotype: SUVA).

Distribution. Endemic to Fiji and know only from inland areas of Viti Levu and Vanua Levu, from 300 to 960 m in dense forest, ridge forest and scrubby forest (Smith 1981).

10. *Phyllanthus calciphilus* (Croizat) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112698-1

Basionym: *Glochidion calciphilum* Croizat, Sargentia 1: 46. 1942. **TYPE. FIJI ISLANDS: Fulanga:** limestone cliff of lagoon, 0 to 80 m, 26 Feb 1934, A.C. Smith 1217 (holotype: GH; isotypes: BISH!, K, S, US!).

Distribution. Endemic to Fiji and know only from the two islands of southern Lau (Fulaga and Kabara) near sea level on limestone and lagoon cliffs (Smith 1981).

11. *Phyllanthus christophersenii* (Croizat) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112699-1

Basionym: *Glochidion christophersenii* Croizat, Occas. Pap. Bernice P. Bishop Mus. 17(16): 213. 1943. **TYPE. SAMOAN ISLANDS: Savai`i:** above Matavanu, 1300 m, 24 Jul 1931, E. Christophersen & E. P. Hume 2134 (holotype: A; isotype: BISH).

Distribution. Endemic to montane Savai`i and known from cloud forest at 1000–1550 m (Whistler 1978; Christopherson 1935).

12. *Phyllanthus cleistanthoides* (Fosberg) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112700-1

Basionym: *Glochidion cleistanthoides* Fosberg, Willdenowia 20: 263. 1991. **TYPE. CAROLINE ISLANDS: Pohnpei:** 1913, C. L. Ledermann 13599a (holotype: B-bc100249519!)

Distribution. Endemic to Pohnpei where it occurs from ca. 12 to 770 m elevation, most commonly in lowland wet forest and agroforest, but occasionally in summit cloud forest.

Note. This species is distinctive in having oblong-ovate to narrowly oblong-elliptic leaves and comparatively small flowers in umbel-like fascicles often borne on short, sometimes branched stalks or peduncles to 5 mm long, a densely puberulent pistil with a puberulent columnar style exserted for 1–1.5 mm beyond the calyx lobes, and relatively small, densely puberulent fruits. Pohnpei collections of this species have been identified as *Glochidion ramiflorum* or less commonly *G. puberulum*.

13. *Phyllanthus comitus* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112701-1

Basionym: *Glochidion comitum* J. Florence, Novon 7:29. 1997. **TYPE. PITCAIRN ISLANDS: Pitcairn:** Sommet Crete Sud-Est, 25°4' S, 130°7' W, 300 m, 19 Apr 1991, J. Florence 10740 (holotype: K; isotypes: BISH, BM, DAV, E, L, MO, P, PAP, TER, US!).

Distribution. Endemic to Pitcairn where it is known from fewer than 10 collections.

14. *Phyllanthus concolor* (Müll. Arg.) Müll. Arg., Flora 48: 374. 1865.

Basionym: *Glochidion concolor* Müll. Arg., Linnaea 32: 62. 1863. *Phyllanthus concolor* var. *ellipticus* (Müll. Arg.), Prodromus Systematis Naturalis Regni Vegetabilis 15(2): 290. 1866, nom. illeg. *Diasperus concolor* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 599. 1891. **TYPE. FIJI ISLANDS:** *s.l.*, Nov 1855, W. H. Harvey s.n. (holotype: P; isotypes: BM, K).

Glochidion ramiflorum J.R. Forst. & G. Forst. var. *lanceolatum* Müll. Arg. Linnaea 32: 63. 1863. *Phyllanthus ramifloris* (J.R. Forst. & G. Forst.) Müll. Arg. var. *lanceolatus* (Müll. Arg.) Müll. Arg., Flora 48: 374. 1865, nom. illeg. **TYPE. FIJI ISLANDS: Ovalau:** Port Kinnaird, June 1860 and Somosomo, Taveuni, May 1860, B.C. Seemann 415 (lectotype: presumably G, designated by Smith (1981, p. 476); isolectotypes: BM, K).\\

Distribution. Widespread in Fiji, Tonga, and possibly Raratonga (Smith 1981), and also from Niue (Sykes 1970) from 0 to 1000 m elevation in dense or open forest, edges and forest-grassland transition, and on open slopes. These collections were previously referred to *Glochidion ramiflorum*, but were considered by Smith (1981) to be a separate species. He considered *G. ramiflorum* to be a species from New Guinea to New Hebrides.

15. *Phyllanthus cordatus* (Seem. ex Müll. Arg.) Müll. Arg., Flora 48: 376. 1865.

Basionym: *Glochidion cordatum* Seem. ex Müll. Arg., Linnaea 32: 64. 1863. *Diasperus cordatus* (Seem. ex Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 599. 1891. **TYPE. FIJI**

ISLANDS: Viti Levu: July 1860 and **Ovalau**: Port Kinnaird, June 1860 [the K isotype bears 2 field labels], B.C. Seemann 416 (holotype: presumably G; isotypes: BM, K).

Distribution. Endemic to Fiji and know from Viti Levu, Ovalau, and Vanua Levu at 50–900 m, in dry forest, ridge forest, and in pastures and along roadsides (Smith 1981).

16. *Phyllanthus cuspidatus* Müll. Arg., Flora 48: 377. 1865.

Basionym: *Glochidion cuspidatum* (Müll. Arg.) Pax, Bot. Jahrb. Syst. 25: 645. 1898. *Diasperus cuspidatus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 599. 1891. **TYPE. SAMOAN ISLANDS:** *s.l.*, U.S. Expl. Exped. s.n. (holotype: G-DC).

Distribution. Endemic to the Samoan Islands (Savai`i, `Upolu), and Tutuila at up to 400–450 m in ridge forest (Whistler 1980).

17. *Phyllanthus distichus* Hook. & Arn., Bot. Beechey Voy.: 95. 1832.

Basionym: *Diasperus distichus* (Hook. & Arn.) Kuntze, Revis. Gen. Pl. 2: 599. 1891. **TYPE. HAWAIIAN ISLANDS: O`ahu:** 1827–1827, G.T. Lay & A. Collie s.n. (probable holotype: K; probable isotype: E).

Distribution. *Phyllanthus distichus* is endemic to the Hawaiian islands where it is occasional to locally common in mesic forest, often on steep slopes or ridge tops, sometimes in dry shrubland at 60–950 m on the islands of Kaua`i, O`ahu, Moloka`i, Lana`i, West Maui, and rare on East Maui. A number of additional names have been applied to populations of *P. distichus,* but they were placed into synonymy by Wagner et al. (1990, 1999) and are not repeated here.

18. *Phyllanthus emarginatus* (J. W. Moore) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112702-1

Basionym: *Glochidion emarginatum* J. W. Moore, Bernice P. Bishop Mus. Bull. 102: 30. 1933. **TYPE. SOCIETY ISLANDS: Raiatea:** Mount Temehani, 470 m, 1 Jan 1927, J.W. Moore 476A (holotype: BISH-508150!; isotype: P [2]).

Glochidion raiateense J. W. Moore, Bernice P. Bishop Mus. Bull. 102: 30. 1933. **TYPE: SOCIETY ISLANDS: Raiatea:** Mount Temehani, 470 m, 1 Jan 1927, J.W. Moore 476B (Holotype: BISH-508230!).

Distribution. Endemic to the Society Islands and known only from Raiatea at 580–750 m where it occurs in marshy shrubland with *Metrosideros collina* and species of Cyperaceae. Also collected at ca. 930 m in mesic ridge shrubland with *Ilex* and *Weinmannia* (Florence 1997).

19. *Phyllanthus euryoides* (A. C. Sm.) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112703-1

Basionym: *Glochidion euryoides* A.C. Sm., J. Arnold Arbor. 33: 373. 1952. **TYPE. FIJI ISLANDS: Viti Levu:** Mba, upper slopes of Mt. Koromba (Pickering Peak), 3 Jun 1947, A. C. Smith 4659 (holotype: A; isotypes: BISH!, K, S, US!).

Distribution. Endemic to Fiji and known only from the type collection.

20. *Phyllanthus florencei* W. L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112704-1

Replaced name: *Glochidion societatis* J. Florence, Fl. Polynésie Française 1: 90. 1997. **TYPE. SOCIETY ISLANDS: Tahaa:** Patio, Mt. Purauti, crête sud-est, 151°30' W, 16°37' S, 225 m, 18 Jun 1990, J. Florence 10,627 (holotype: P; isotypes: BISH!, CHR, DAV, K, L, NY!, P [2], PAP, PTBG!, US!).

Distribution. Known from the Society Islands (Huahine, Mauapiti, Raiatea, and Tahaa) and Austral Islands (Rimatara) at 0–225 m elevation where it is locally common to abundant in coastal vegetation with *Scaevola* and *Euphorbia* on coral sand, in lowland mesic forest with *Neolauclea* and *Hibiscus tiliaceus*, in mesic ridge forest with *Metrosideros collina* and *Dicranopteris linearis* (Burm. f.) Underw., and in secondary forest (Florence 1997).

21. *Phyllanthus gillespiei* (Croizat) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112705-1

Basionym: *Glochidion gillespiei* Croizat, Sargentia 1: 46. 1942. **TYPE. FIJI ISLANDS: Viti Levu:** Namosi, near summit of Mt. Naitarandamu, 28 Sep 1927, J.W. Gillespie 3161 (holotype: GH; isotypes: BISH).

Distribution. Endemic to Fiji and known only from mountainous areas of Viti Levu from 750–1155 m in dense or ridge forest (Smith 1981).

22. *Phyllanthus grantii* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112706-1

Basionym: *Glochidion grantii* J. Florence, Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 250. 1996. **TYPE. SOCIETY ISLANDS: Tahaa:** Tapuamu, crête entre les Monts Tete et Ohiri. 530 m, 151°31' W, 16°37' S, 5 Nov 1992, J. Florence & R. Tahuaitu 11816 (holotype: P; isotype: BISH!, DAV, K, L, PAP, US!).

Distribution. Endemic to the Society Islands (Raiatea and Tahaa) where it occurs at 435–730 m elevation in marshy shrubland with *Metrosideros* and Cyperaceae and in wet summit forest with *Metrosideros* and *Macaranga* (Florence 1997).

23. *Phyllanthus grayanus* Müll. Arg., Flora 48(24): 380. 1863.

Diasperus grayanus (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 599 .1891. *Glochidion grayanum* (Müll. Arg.) J. Florence, Bull. Mus. Natl. Hist., B, Adansonia 18: 250. 1996. **TYPE. SOCIETY ISLANDS: Tahiti:** *s. l.*, Sep 1839 or Jan1841, U. S. Expl. Exped. s.n. (Holotype: G-DC).

Distribution. Endemic to the Society Islands and known only from Tahiti at 60–1040 m. It occurs in lowland riparian forest with *Neonauclea* and *Hibiscus tiliaceus* and extends up to mesic ridge and summit forest dominated by *Metrosideros collina* (Florence 1997).

24. *Phyllanthus heterodoxus* Müll. Arg., in DC., Prodr. 15(2):321. 1866.

Diasperus heterodoxus (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 599. 1891. *Glochidion heterodoxum* (Müll. Arg.) Pax & K.Hoffm. in H.G.A. Engler, Nat. Pflanzenfam. ed. 2, 19c: 58. 1931. **TYPE. FIJI ISLANDS:** *s. l.*, 1840, U.S. Expl. Exped. s.n. (Holotype: Probably G).

Distribution. Endemic to Fiji and known only from Vanua Levu and Lau Group, Fulaga from 0 to 870 m (Smith 1981).

25. *Phyllanthus hivaoaense* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112707-1

Basionym: *Glochidion hivaoaense* J. Florence, Fl. Polynésie Française 1: 74. 1997. **TYPE. MARQUESAS ISLANDS: Hiva Oa:** Atuona, piste de Hanamenu, NW du Mt. Temetiu, 139°5' W, 9°48' S, 1100 m, 30 Jul 1988, J. Florence & S. Perlman 9673 (holotype: P; isotypes: BISH!, DAV, K, L, P, PAP, PTBG!, US!). Fig. 1.

Distribution. Endemic to the Marquesas Islands of Hiva Oa and Tahuata, from about 700 to 1200 m, collected in wet shrubland and forest with *Freycinetia, Weinmannia,* and the tree ferns *Alsophila* and *Sphaeropteris* (Florence 1997).

26. *Phyllanthus hosokawae* (Fosberg) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112708-1

Basionym: *Glochidion hosokawae* Fosberg, Willdenowia 20: 261. 1991. **TYPE: CAROLINE ISLANDS: Pohnpei:** Awak, 25.8.1980, F.R. Fosberg 60467 (holotype: US [not located]: isotypes: BISH, L).

Distribution. To date know only from the type collection from Pohnpei; the holotype could not be located at US.

Note. This entity should be carefully evaluated in the context of an overall review of *Phyllanthus* in Micronesia. It may be conspecific with *G. cleistanthoides*, in which

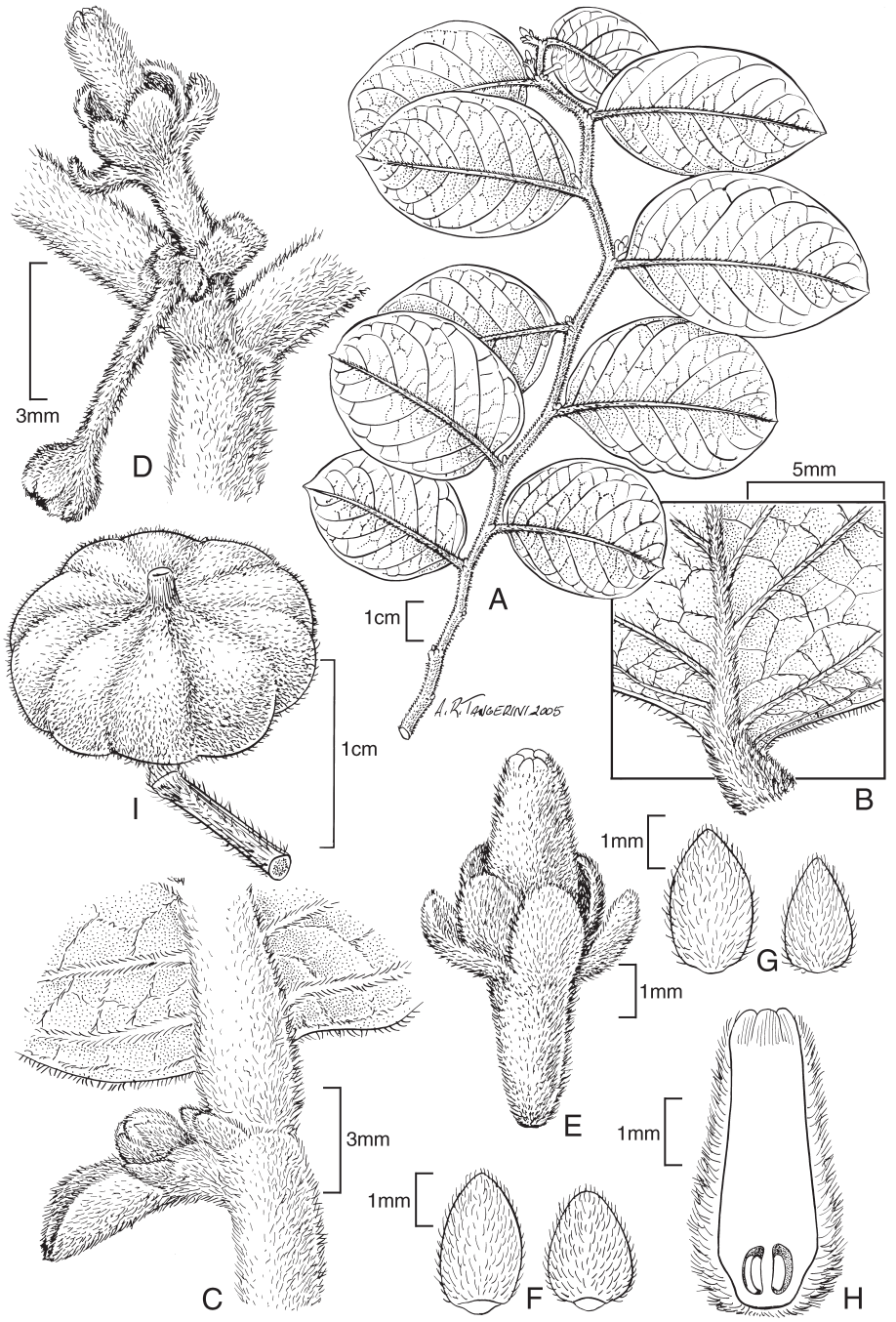

Figure 1. *Phyllanthus hivaoaense* (J. Florence) W. L. Wagner & Lorence. **A** branch **B** abaxial leaf surface **C** leaf axil showing stipules **D** female flowers **E** female flower close-up **F–G** calyx lobes **H** longitudinal view of female flower **I** capsule. **A–I** drawn from: Marquesas Islands. Tahuata: Haaoiputeomo, summit ridge, 823-951 m, Wood et al. 6522 (BISH, DAV, K, MO, P, PAP, PTBG, US).

case we would adopt the latter name because the description applies most closely to this species and the holotype is available at B.

27. *Phyllanthus huahineense* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112709-1

Basionym: *Glochidion huahineense* J. Florence, Fl. Polynésie Française 1: 75. 1997. **TYPE. SOCIETY ISLANDS: Huahine:** Maeva, motu Oavarei, secteur Haaparu, 151°W, 16°41' S, 2 m, 1 Nov 1992, J. Florence & R. Tahuaitu 11745 (holotype: P ; isotypes: BISH, DAV, K, L, NY, P, PAP, PTBG !, US !).

Distribution. Endemic to the Society Islands and known only from Huahine on the islet Motu de Maeva at 1–4 m elevation, restricted to coral sand substrate in coastal vegetation with *Casuarina, Guettarda,* and *Tournefortia* (Florence 1997).

28. *Phyllanthus inusitatus* (A.C. Sm.) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112710-1

Basionym: *Glochidion inusitatum* A.C. Sm., Fl. Vitiensis Nova 2: 486, 493. 1981. **TYPE. FIJI ISLANDS: Vanua Levu:** divide between Wainunu and Ndreketi Rivers, between Nanduna (old village site) and Mt. Ndelanathau, 17 May 1934, A.C. Smith 1851 (holotype: BISH-142932; isotypes: many indicated, but not specific as to where deposited).

Distribution. Endemic to Fiji and known only from the type.

29. *Phyllanthus jardinii* Müll. Arg., Linnaea 32: 21. 1863. **TYPE. *s. l.***, D.E.S.A. Jardin s.n. (holotype: G-DC-FP3347; isotypes: P [2]). Type presumed to be from Nuku Hiva in the Marquesas Islands.

Note. Precise locality uncertain, known only from a single collection possibly made in the Marquesas Islands (Nuku Hiva) by Jardin in the 19th century (Florence 1997).

30. *Phyllanthus kanehirae* (Hosokawa) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112711-1

Basionym: *Glochidion kanehirae* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 22. 1935. **TYPE. CAROLINE ISLANDS: Palau:** Jul–Aug 1929, R. Kanehira 241 (holotype: TAI).

Distribution. Caroline Islands: Palau (Peleliu, Koror including the Rock Islands of Mecherchar, Ngeruktabel, Ulebsechel and Urukthapel, and also known from Babeldaob [Fosberg et al. 1979; Wagner et al. unpubl.]), Yap (Yap Island), and Chuuk (Moen Island, also Tol, Udot, Uman, Dublon, Fano, Fanurmot [Fosberg et al. 1979; Wagner et al. unpubl.]). On Palau it is restricted to limestone substrate from near sea level to about 200 m elevation in coastal forest with speices of *Bruguiera, Heretiera,*

Semecarpus, Osmoxylon, and *Phyllanthus,* and in lowland evergreen forest with *Horsfieldia* and *Phyllanthus* and agroforest. On Chuuk it occurs near sea level (3 m) in coastal forest interspersed with mangroves and on slopes of unknown elevation in agroforest and secondary vegetation. On Yap it occurs from near sea level at the edge of mangrove vegetation and on slopes up to 40 m with secondary vegetation.

Note. This glabrous species is characterized by female flowers with a small, depressed-globose pistil 1–1.5 mm long with a very short 10–11-fid stylar column 0.5 mm long. Certain collections from Yap have been identified as *Glochidion* cf. *ramiflorum*, and certain collections from Palau have been identified as *Glochidion palauense.*

31. *Phyllanthus longfieldiae* L. Riley, Bull. Misc. Inform. Kew [2]:55. 1926.

Glochidion longfieldiae (L. Riley) F. Br., Bernice P. Bishop Mus. Bull. 130: 141. 1935. **TYPE. AUSTRAL ISLANDS: Rapa:** L.A.M. Riley 776 (holotype: K; isotype: BM).

Distribution. Endemic to the Austral Islands (Rapa) where it occurs from 140 to 575 m, in mesic *Metrosideros* forest on slopes and in valleys and ravines with species of *Corokia* and *Fitchia* (Florence 1997).

32. *Phyllanthus macrosepalus* (Hosokawa) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112712-1

Basionym: *Glochidion macrosepalum* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 21. 1935. **TYPE. CAROLINE ISLANDS: Palau:** Babeldaob, valley near Mt. Agade, "Arukoron-sogan", 20 Sep 1933, T. Hosokawa 7053 (holotype: TAI-118940; isotypes: BISH, GH, TAI). Holotype presumed to be the TAI sheet with the typewritten label as is typical of Hosokawa collections.

Distribution. Endemic to Palau (Babeldaob, Anguar, Peliliu, and Malakal Islands), where it occurs at 3–150 m, in lowland evergreen moist and wet forest on limestone and limestone-derived soils.

Note. This glabrous species is characterized by female flowers with relatively large calyx lobes enclosing the short, depressed-ovoid pistil 1.5 mm long with a very short style column and flat 5-6-sulcate or -lobed stigmatic region. In male flowers the staminal column is composed of 5 connate stamens (versus 3-4 in other Micronesian species).

33. *Phyllanthus manono* (Baill. ex Müll. Arg.) Müll. Arg., Flora 48: 377. 1865.

Basionym: *Glochidion manono* Baill. ex Müll. Arg., Linnaea 32: 65. 1863. *Diasperus manono* (Baill. ex Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. **TYPE. SOCIETY ISLANDS: Tahiti:** *s. l.*, J. Lepine 210 (lectotype: G-DC, designated by Florence, Fl. Polynésie Française 1: 79. 1997; isolectotypes: P [2]).

Distribution. Endemic to the Society Islands of Moorea and Tahiti where it occurs at 30–1000 m, in valleys in wet forest with *Neonauclea, Hibiscus*, and *Inocarpus* and also on slopes and summits, sometimes in disturbed or secondary forest with *Metrosideros*, *Dicranopteris*, and *Psidium* (Florence 1997).

34. *Phyllanthus marchionicus* (F. Br.) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112713-1

Basionym: *Glochidion marchionicum* F. Br., Bernice P. Bishop Mus. 130: 142. 1935. **TYPE. MARQUESAS ISLANDS: Ua Huka:** 9 Nov 1922, *E. H. Quayle 1689* (Lectotype: BISH-508228! & 508229!, designated by St. John, Phytologia 33: 420. 1976). Fig. 2.

Glochidion tooviianum J. Florence, Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 260. 1996, syn. nov. **TYPE. MARQUESAS ISLANDS: Nuku Hiva:** Toovii, 800 m, 140°9' W, 8°51' S, 3 Mar 1986, J. Florence 7445 (holotype: P; isotypes: BISH!, P, PAP, US).

Distribution. Endemic to the Marquesas Islands (Nuku Hiva, Ua Huka, Ua Pou, Hiva Oa, Tahuata, and Fatu Hiva) from 50 to 1130 m, where it is widespread in moist valleys with *Hibiscus tiliaceus,* disturbed mesic ridge forest with *Casuarina*, *Sapinus,*and *Xylosma*, and secondary vegetation with *Dicranopteris*, *Leucaena*, *Miscanthus,*and *Psidium* or in primary wet forest with *Cheirodendron, Crossostylis, Ilex,* and tree ferns (Florence 1997).

35. *Phyllanthus mariannensis* W.L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112714-1

Replaced name: *Glochidion marianum* Müll. Arg., Linnaea 32: 65. 1863. *Phyllanthus gaudichaudii* Muell.-Arg. var *marianus* (Müll. Arg.) Müll. Arg., in DC. Prodr. 15(2): 300. 1866. **TYPE. MARIANA ISLANDS: Guam:** C. Gaudichaud-Beaupré 139 (holotype: G-DC).

Distribution. Endemic to the Mariana Islands (Guam) where it occurs on limestone and basaltic soils in old fields and grasslands and disturbed native and secondary vegetation at ca. 60–150 m elevation.

Note. The ovate leaves with short acuminate to rounded apices and glabrous columnar style 1.5–2 mm long exserted beyond the calyx lobes are characteristic of this species. Collections from Caroline Islands (Pohnpei) previously identified as this species are here considered to represent *P. senyavinianus*.

36. *Phyllanthus marianus* Müll. Arg., Linnaea 32:17. 1863.

Diasperus marianus (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. **TYPE. MARIANA ISLANDS: Guam:** *s.l.,* 17 March to 3 April 1819, C. Gaudichaud-Beaupré s. n. (holotype: G-DC).

Figure 2. *Phyllanthus marchionicus* (F. Br.) W. L. Wagner & Lorence**.** Branch with dehisced fruit showing red arillate seeds, with trunk in background. Field image by K. R. Wood: Marquesas Islands. Ua Huka, Haahue, northwestern coastal valley, Wood 10765 (PTBG, US).

Distribution. Endemic to the Mariana Islands (Guam, Aguijan, Agrihan, Alamagan, Anathan, Asuncion, Guguan, Maug, Pagan, Rota, Saipan, Sarigan, Tinian)

and the Caroline Islands (only on Ulithi Atoll). On Guam it is common on limestone cliffs and terraces.

37. *Phyllanthus melvilliorum* (Airy Shaw) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112715-1

Basionym: *Glochidion melvilliorum* Airy Shaw., Kew Bull. 25: 487. 1971. **TYPE. FUJI ISLANDS: Viti Levu:** Nausori Highlands, Nandronga and Navosa Province, 2 May 1962, R. & E.F. Melville & J.W. Parham 7048 (holotype: K; isotypes: BISH, SUVA).

Distribution. Endemic to Fiji and known only from the vicinity of the type locality at 600–670 m in dense or mixed forest (Smith 1981).

38. *Phyllanthus multilobus* (A.C. Sm.) W.L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112716-1

Basionym: *Glochidion multilobum* A.C. Sm., Fl. Vitiensis Nova 2: 484, 493. 1981. **TYPE. FIJI ISLANDS: Vanua Levu:** Thakaundrove Prov., SW slope of Mt. Mbatini, 28 Nov 1933, A.C. Smith 606 (holotype: BISH-142931; isotypes: many indicated, but not specific as to where deposited).

Distribution. Endemic to Fiji and know only from Mt. Batini and Mt. Seatura on Vanua Levu from 300 to 800 m in dense or crest forest (Smith 1981).

39. *Phyllanthus nadeaudii* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112717-1

Basionym: *Glochidion nadeaudii* J. Florence, Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 253. 1996. **TYPE. SOCIETY ISLANDS: Moorea:** Pao Pao, crête N du Mt. Fairurani. 670 m, 149°47' W, 17°30' S, 14 May 1987, J. Florence 8287 (holotype: P; isotypes: BISH!, PAP, US!).

Distribution. Endemic to the Society Island of Moorea at 420–800 m, where it typically occurs on high ridge slopes and crests with *Weinmannia, Metrosideros, Dicranopteris*, and *Nephrolepis* (Florence 1997).

40. *Phyllanthus orohenense* (J. W. Moore) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112718-1

Basionym: *Glochidion orohenense* J. W. Moore, Bernice P. Bishop Mus. 16: 6. 1940. **TYPE: SOCIETY ISLANDS: Tahiti:** south side of Mt. Orohena, 1300 m, 14 May 1927, ***L. H. McDaniels 1312*** (holotype: BH; isotype: BISH!).

Distribution. Endemic to the Society Island of Tahiti where it is rare and localized at 900–1750 m, in cloud forest with *Metrosideros*, *Weinmannia,* and *Alsophila* (Florence 1997).

41. *Phyllanthus otobedii* W. L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112719-1

Replaced name: *Glochidion palauense* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 22. 1935. **TYPE. CAROLINE ISLANDS: Palau:** Aurapushekaru I. (Oropusyakaru-to), S. of Koror I., 8 Oct 1933, T. Hosokawa 7453 (holotype: TAI; isotype: BISH!, MICH, US!, Z).

Distribution. Endemic to Palau on Babeldaob, Anguar, Ngerechong, Ulebsechel, Ulong, and the Rock Islands (Koror, Ngerukeuid, Ngeruktabel). On Babeldaob this species occurs on basaltic soils in evergreen wet forest and savannas at about 100 m elevation. On the Rock Islands it occurs on limestone substrate near sea level (2–5 m elevation) in evergreen coastal forest and cliff vegetation. This glabrous species is distinguished by its female flowers with a conical-columnar pistil 3 mm long with a cylindrical style and shortly 6–7-lobed stigma.

Etymology. We are pleased to name this species for Mr. Demei O. Otobed, president of the board of directors of the Belau National Museum, who has done so much to advance the study and conservation of Palau's biodiversity.

Note. Some Palau collections of this species were identified as *Glochidion macrosepalum*.

42. *Phyllanthus pacificus* Muell. Arg, Linnaea 32 : 31. 1863.

Diasperus pacificus (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. **TYPE. MARQUESAS ISLANDS: Nuku Hiva:** D.E.S.A. Jardin 122 (lectotype: P, designated by Florence, Fl. Polynésie Française 1: 123. 1997; isolectotype: G-DC [2], P).

Phyllanthus pacificus Müll. Arg. var. *uapensis* F. Br., Bernice P. Bishop Mus. Bull. 130 : 138. 1935, syn. nov. **TYPE. MARQUESAS ISLANDS: Ua Pou:** 9 Sep 1922, E. H. Quayle s.n. (holotype: BISH-143921! & 508277!; isotype: BISH).

Phyllanthus pacificus Müll. Arg. var. *quaylei* F. Br., Bernice P. Bishop Mus. Bull. 130: 139. 1935, syn. nov. **TYPE. MARQUESAS ISLANDS: Nuku Hiva:** s.*l.*, 15? Oct 1922, E. H. Quayle 1341 (holotype: BISH-508703!).

Phyllanthus pacificus Müll. Arg. var. *uahukensis* F. Br., Bernice P. Bishop Mus. Bull. 130: 139. 1935, syn. nov. **TYPE: MARQUESAS ISLANDS: Hiva Oa:** Kopaafaa, 2770 ft, 2 Aug 1929, E.P. Mumford & A.M. Adamson 488 (lectotype: BISH-508705!; designated by St. John, Phytologia 33: 420. 1976). **Additional syntypes: MARQUESAS ISLANDS: Ua Huka:** *s.l.*, 9 Nov 1922, E. H. Quayle 1781 (BISH-508704! & -143920!).

Distribution. Endemic to the Marquesas Islands (Nuku Hiva, Hiva Oa, Tahuata, Ua Pou, Ua Huka, and Fatu Hiva) where it is widespread and occurs from about 25 to 1085 m, growing in open areas or on rocky slopes and cliffs in secondary vegetation with *Dicranopteris* and grasses. At higher elevations it grows among fern cover in *Metrosideros-Weinmannia* wet shrubland and forest (Florence 1997).

43. *Phyllanthus palauensis* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 19. 1935. **TYPE. CAROLINE ISLANDS: Palau:** Babeldaob Island, near Almatin at low altitudes, 17 Sep 1933, T. Hosokawa 6921 (holotype: TAI; isotype: GH).

Distribution. Endemic to Palau (Babeldaob, Ngemelachel, Ulong) and Rock Islands (Koror, Mecherchar, Ngerukeuid, Ngerekebesang, Ngeruktabel) where it occurs to at least 30 m elevation on volcanic soils in wet forests along streams and in savannah vegetation.

44. *Phyllanthus papenooense* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112720-1

Basionym. *Glochidion papenooense* J. Florence, Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 254. 1996. **TYPE: SOCIETY ISLANDS: Tahiti:** Papenoo, Ofetanu, 160 m, 149°26' W, 17°38' S, 9 Sep 1989, J. Florence 9901 (holotype: P; isotypes: BISH!, PAP).

Distribution. Endemic to the Society Island of Tahiti where it is apparently rare and known only from Papenoo Valley up to about 650 m in riparian forest with *Hibiscus* and *Neonauclea* invaded by *Miconia calvescens* DC. (Florence 1997).

45. *Phyllanthus pergracilis* Gillespie, Bernice P. Bishop Mus. Bull. 91: 18. 1932. **TYPE. FIJI ISLANDS: Viti Levu:** Naitasiri Province, Tamavua woods, 11 km from Suva, 150 m, 9 Aug 1927, J.W. Gillespie 2122 (holotype: BISH-508710!; isotypes: GH, UC).

Distribution. Endemic to Fiji and known only from Viti Levu at 30–1200 m (Smith 1981; Webster 1986).

46. *Phyllanthus pinaiensis* S.L.Welsh, Flora Societensis 112. 1998.

Basionym: *Phyllanthus urceolatus* Baill., Adansonia 2: 239. 1862. *Diasperus urceolatus* (Baill.) Kuntze, Revis. Gen. Pl. 2: 601. 1891, non *Phyllanthus urceolatus* Noronha (1790). **TYPE. SOC IETY ISLANDS: Tahiti: "**Nouvelle-Caledonie, Port de France", E. Vieillard 336 (holotype: P; isotype: P).

Distribution. Endemic to the Society Islands of Moorea, Raiatea, and Tahiti from 150–830 m, usually in understory of valley forest with *Hernandia*, *Hibiscus,* and *Neonauclea* or sometimes on ridge crests. Not collected on Tahiti since the end of the 19th century but apparently still frequent on Moorea (Florence 1997).

Note. According to Florence (1997) the type of *Phyllanthus urceolatus* Baill. is from Tahiti, not New Caledonia. This is likely due to a labeling error.

47. *Phyllanthus pitcairnense* (H. St. John) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112721-1

Basionym. *Glochidion pitcairnense* (F.Br.) H.St.John, Trans. Roy. Soc. New Zealand, Bot. 1: 187. 1962. *Glochidion tahitense* var. *pitcairnense* F. Br., Bernice P. Bish-

op Mus. Bull. 130: 142. 1935. **TYPE: PITCAIRN ISLANDS:** *s.l.*, 1922, E. H. Quayle s.n. (holotype: BISH-508246! & -508247!).

Distribution. Endemic to the Pitcairn Islands (Henderson and Pitcairn), from about 30 to 270 m elevation. On Henderson it occurs at 30 m on eroded calcarenite in beach forest and scrub with *Nesoluma*, *Pisonia,* and *Xylosma*. On Pitcairn it has been collected at 270 m in secondary upland vegetation with grasses and ferns.

48. *Phyllanthus podocarpus* Müll. Arg., Flora 48: 388. 1865.*Diasperus podocarpus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. *Glochidion podocarpum* (Müll. Arg.) C.B. Robinson, Philippine J. Sci. Bot. 6: 300. 1911. **TYPE. FIJI ISLANDS:** *s. l.,* 1840, U.S. Expl. Exped. s.n. (holotype: probably G; isotype: US!).

Distribution. Endemic to Fiji and know only from the type collection.

49. *Phyllanthus ponapense* (Hosokawa) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112722-1

Basionym. *Glochidion ponapense* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 24. 1935. **TYPE: CAROLINE ISLANDS: Pohnpei:** summit of Mt. Troton, 13 Aug 1933, T. Hosokawa 5770 (holotype: TAI).

Glochidion excorticans Fosberg var. *calvum* Fosberg, Willdenowia 20: 261. 1991, syn. nov. **TYPE: CAROLINE ISLANDS: Pohnpei:** 1913-1914, C. L. Ledermann 13333 (holotype: B-bc100249513!).

Distribution. Endemic to Pohnpei, this species occurs from lowland wet forest up into montane cloud forest on summits from 20 to 732 m elevation.

Note. This species is characterized by its female flowers with a short, glabrous, depressed-globose ovary 0.5 mm long and glabrous columnar style 1-1.5 mm long with a 6-7-dentate stigma. Some collections of *Phyllanthus ponapense* were previously identified as *Glochidion marianum* or *G. ramiflorum.*

50. *Phyllanthus raiateaensis* W. L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112723-1

Replaced name: *Glochidion moorei* P. T. Li, Acta Phytotax. Sin. 20: 117. 1982, non *P. moorei* M. Schmid (1991). *Glochidion salicifolium* J. W. Moore, Bernice P. Bishop Mus. Bull. 226: 13. 1963, non *G. salicifolium* (Baill.) Müll. Arg. (1863) nec *P. salicifolius* Baill (1862). **TYPE. SOCIETY ISLANDS: Raiatea:** Temihani Plateau, 5 Oct 1934, H. St. John 17250 (holotype: BISH-508232!; isotype: BISH).

Note. The sheet (BISH-142814) was considered by Florence (1997) to not be part of the type because it was pubescent vs. glabrous as in the holotype. The full variation of *P. raiateaensis* is not well understood, but Florence accepted both specimens as this species. Without further supporting information that this really represents a mixed collection it seems best to accept the second sheet as an isotype. However, even if the

second sheet is not accepted as an isotype, the first sheet is clearly the holotype as it was explicitly stated as such and shown in a figure in the original publication.

Distribution. Endemic to the Society Island of Raiatea where it is known from the Temehani plateau region at 435–750 m, occurring in wet forest with *Metrosideros, Weinmannia*, and *Myrsine* and in open marshland with *Metrosideros* and species of Cyperaceae (Florence 1997).

51. *Phyllanthus raivavense* (F. Br.) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112724-1

Basionym. *Glochidion raivavense* F. Br., Bernice P. Bishop Mus. Bull. 130: 142. 1935. **TYPE. AUSTRAL ISLANDS: Raivavae:** 23 Mar 1922, A. M. Stokes 43 (holotype: BISH-508248!).

Distribution. Endemic to the Austral Islands (Raivavae, Rurutu, and Tubuai). It occurs at 10–340 m in primary and secondary vegetation including riparian forest with *Aleurites*, *Hernandia*, *Hibiscus tiliaceus,* and *Metrosideros*, and on dry slopes or crests with *Celtis, Dicranopteris*, *Xylosma,* and grasses (Florence 1997).

52. *Phyllanthus rapaense* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112725-1

Basionym. *Glochidion rapaense* J. Florence, Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 258. 1996. **TYPE. AUSTRAL ISLANDS: Rapa:** flanc SE du Mt. Pukumia, 150 m, 144°19' W, 27°36' S, 5 Feb 1984, J. Florence 6465 (holotype: P; isotypes: BISH!, K, PAP, US!).

Distribution. Endemic to the Austral Island of Rapa, at 50–330 m in mesic forest with *Metrosideros, Meryta*, and *Freycinetia,* and sometimes on wet rocks or cliffs (Florence 1997).

53. *Phyllanthus rupiinsularis* Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25: 19. 1935. **TYPE. CAROLINE ISLANDS: Palau:** upon a coral islet near the island of Urktable [Ngeruktabel], 15 Oct 1933, T. Hosokawa 7534 (holotype: TAI; isotype: GH, US [2]!).

Distribution. Endemic to Palau where it occurs on the Rock Islands (Ngerukeuid, Ngeruktabel, Ulong), on limestone substrate in coastal cliff vegetation near sea level to about 5 m elevation.

54. *Phyllanthus saffordii* Merr., Philipp. J. Sci., C 9: 104. 1914. **TYPE. MARIANA ISLANDS:** Guam: hills back of Piti, 100 m, Oct 1911, R. C. McGregor 476 (lectotype: US- 01860446!, here designated). The type in PNH was destroyed during World War II.

Distribution. Endemic to the Maraiana Islands (Guam, Alamagan, Anatahan, Pagan, Saipan, and Tinian). This species occurs in savannah vegetation.

55. *Phyllanthus st-johnii* W. L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112726-1

Replaced name: *Glochidion myrtifolium* J. W. Moore, Bernice P. Bishop Mus. Bull. 226: 10. 1963. **TYPE. SOCIETY ISLANDS: Raiatea**: S ridge of Ereeo Valley, 9 Oct 1934, H. St. John 17328 (holotype: BISH-508233!; isotype: BISH).

Glochidion longipedicellatum J.W.Moore, Bernice P. Bishop Mus. Bull. 226: 9. 1963, nom. illeg., non Yamamoto (1933). *Glochidion longipes* P.T.Li, Acta Phytotax. Sin. 20:117. 1982. **TYPE. SOCIETY ISLANDS: Raiatea**: south side of Toahiva Valley, 200 m, 7 Oct 1934, H. St. John 17305 (holotype: BISH-508155!; isotype: BISH).

Distribution. Endemic to the Society Islands (Bora Bora, Moorea, Raiatea, and Tahaa) where it occurs at 30–680 m in primary or secondary mesic or wet forest with *Hibiscus tiliaceus* and *Nauclea* in valleys, or with *Dicranopteris, Metrosideros,* and *Psidium* on slopes and ridges (Florence 1997).

56. *Phyllanthus samoanus* (Müll. Arg.) W. L. Wagner & Lorence, comb. et stat. nov.
urn:lsid:ipni.org:names:77112727-1

Basionym: *Phyllanthus ramiflorus* (J.R. Forst. & G. Forst.) Müll. Arg. var. *samoanus* Müll. Arg. in A.P.de Candolle, Prodr. 15(2): 289. 1866. *Glochidion ramiflorum* J.R. Forst. & G. Forst. var. *samoanum* (Müll. Arg.) Pax, Bot. Jahrb. Syst. 25: 645. 1898. **TYPE. SAMOAN ISLANDS:** *s.l.*, U.S. Expl. Exped. s.n. (holotype: probably G-DC).

Phyllanthus gaudichaudii var. *samoanus* Müll. Arg. in A.P.de Candolle, Prodr. 15(2):300. 1866. *Glochidion cuspidatum* var. *samoanum* .(Müll. Arg.) Pax, Bot. Jahrb. Syst. 25:645. 1898. **TYPE. SAMOAN ISLANDS:** *s.l.*, U.S. Expl. Exped. s.n. (holotype: probably G-DC).

Distribution. Endemic to the Samoan Islands (Savai`i, Upolu, Tutuila, Aunu`u, Ofu, Olosega, and Ta`u) at 60–1000 m disturbed forest, secondary forest, and pastures (Whistler 1980).

Note. Even though the varietal name was published under an illegitimate species it is legitimate under Art. 55.2 of the ICBN and is available for use at the specific level. These Samoan collections were previously referred to *Glochidion ramiflorum*, but were considered by Smith (1981) to be a separate species. He considered *G. ramiflorum* to be a species from New Guinea to New Hebrides [see Excluded Names].

57. *Phyllanthus seemannii* (Müll. Arg.) Müll. Arg., Flora 48: 374. 1865 (as *seammanianus*).

Basionym. *Glochidion seemannii* Müll. Arg., Linnaea 32: 63. 1863 (as *seemanni*). *Diasperus seemannii* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. **TYPE. FIJI**

ISLANDS: Kandavu: *s.l.*, 1860, B.C. Seemann 413 (holotype: probably G; isotypes: BM, K).

Phyllanthus venulosus Müll. Arg., J., Flora 48:374. 1865. *Diasperus venulosus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 601. 1891. *Glochidion venulosum* (Müll. Arg.) P.T.Li, Guihaia 14: 131. 1994. **TYPE. FIJI ISLANDS:** *s.l.*, 1840, *U.S. Expl. Exped. s.n.* (Holotype: probably G; Isotypes: GH, US).

Distribution. Endemic to Fiji where it is known from Viti Levu, Ovalau, Vanua Levu, Taveuni, and Moala, but Smith (1981) thought it is most likely more widespread, at 0–1150 m, in dense dry or secondary forest or on more open hillsides.

58. *Phyllanthus senyavinianus* (Glassman) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112728-1

Basionym. *Glochidion senyavinianum* Glassman, Bernice P. Bishop Mus. Bull. 209: 71. 1952. **TYPE. CAROLINE ISLANDS: Pohnpei:** Mt. Ninani, 731 m, 17 Aug 1949, S. Glassman 2884 (holotype: US-02158415!; isotypes: BISH, OKL).

Glochidion puberulum Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25:23. 1935, non *Phyllanthus puberulus* Miq. ex Baill., syn. nov. (1858). **TYPE. CAROLINE ISLANDS: Pohnpei:** 8 Aug 1933, T. Hosokawa 5523 (holotype: TAI; isotype: US!).

Glochidion excorticans Fosberg, Willdenowia 20: 260. 1991, syn. nov. **TYPE. CAROLINE ISLANDS: Pohnpei:** 1913-1914, C. L. Ledermann 13643x (holotype: B!).

Distribution. Caroline Islands, known from Pohnpei and Chuuk (Fano, Dublon, Nomwin, Melot Moen, Romonum, Tol, Udot, and Uman). On Pohnpei it occurs from near sea level (2 m) to 770 m in primary and secondary lowland and montane wet forest and summit cloud forest. On Moen it occurs in lowland areas among mangrove swamps near sea level and on slopes and ridges where said to be common in agroforest and secondary forest. Habitat is unknown on the other islands of Chuuk.

Note. This species is characterized by its variably pubescent stems and densely hirtellous pistil and capsules. Collections from Chuuk resemble *P. senyavinianus* in having a densely hirtellous ovary and style, but the pistil is comparatively shorter and only as long as the calyx lobes, and the leaves are narrowly ovate-oblong. These collections from Chuuk were previously identified as *Glochidion puberulum* and are here tentatively included under *P. senyavinianus*, but may represent an undescribed species. Chuuk collections of *P. kanehirae* differ in having female flowers with a glabrous pistil nearly twice as long as the calyx lobes. Some of these collections were previously identified as *G. puberulum.* Certain Pohnpei collections of *P. senyavinianus* were previously identified as *G. ramiflorum* or *G. marianum*.

59. *Phyllanthus smithianus* G. L. Webster, Pacific Sci. 40: 99. 1986 (1987). **TYPE. FIJI ISLANDS: Viti Levu:** Rewa, woods at summit of Mt. Korombamba, 381 to 427 m, 09 Jul 1968, G.L. Webster, R. Hildreth & I. Kuruvoli 14078 (holotype: DAV; isotypes: BI, SH, GH, NY, US!).

Distribution. Endemic to Fiji on the southern part of Viti Levu at 50–430 m (Smith 1981; Webster 1986).

Note. This distinctive species was treated as *Phyllanthus sp.* by Smith (1981, p.464).

60. *Phyllanthus societatis* Müll. Arg., in DC. Prodr. 15(2): 364. 1866. *Diasperus societatis* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 601. 1891. **TYPE. SOCIETY ISLANDS:** *s. l.*,1838–1842, U.S. Expl. Exped. s.n. (holotype: G-DC; isotype: US!).

Distribution. Known from the central southern Pacific region, ranging from Nauru to the Tuamotu Islands (Makatea) and Cook Islands (Aitutaki, Atiu, Mauke, and Mitiaro). Restricted to lowland calcareous substrates, usually in clearings or sunny sites in forest with *Guettarda, Hibiscus, Homalium*, and *Pandanus* (Florence 1997).

61. *Phyllanthus taitensis* (Baill. ex Müll. Arg.) Müll. Arg., Flora 48: 380. 1865.

Basionym. *Glochidion taitense* Baill. ex Müll. Arg., Linnaea 32: 66. 1863. *Diasperus taitensis* (Baill. ex Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 601 (1891). **TYPE. SOCIETY ISLANDS: Tahiti:** 1847, J. Lépine 209 (holotype: G-DC; isotypes: P [3]).

Phyllanthus taitensis (Baill. ex Müll. Arg.) Müll. Arg. var. *glabrescens* Müll. Arg. in A.P.de Candolle, Prodr. 15(2): 301. 1866. **TYPE. SOCIETY ISLANDS: Tahiti:** 1838–1842, U.S. Expl. Exped. s.n. (holotype: G-DC; isotype: US!).

Glochidion ramiflorum J.R. Forst. & G. Forst. var. *macrophyllum* Müll. Arg., Linnaea 32: 63. 1863. *Phyllanthus ramiflorus* (J.R. Forst. & G. Forst.) Müll. Arg. var. *macrophyllus* (Müll. Arg.) Müll. Arg., Flora 48: 374. 1865. **TYPE. SOCIETY ISLANDS: Tahiti:** J.A. Moerenhout s.n. (lectotype: G, designated by Florence, Fl. Polynésie Française 1: 123. 1997; isolectotype: P).

Distribution. Endemic to the Society Islands of Moorea and Tahiti where widespread and common from 50 to 1500 m, occurring from lowland wet forest with *Hibiscus tiliaceus* and *Neonauclea* in valleys to mid and high elevation wet forest with *Alstonia*, *Metrosideros, Streblus,* and *Weinmannia* (Florence 1997).

62. *Phyllanthus temehaniensis* (J. W. Moore) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112729-1

Basionym. *Glochidion temehaniense* J. W. Moore, Bernice P. Bishop Mus. Bull. 226: 15. 1935. **TYPE. SOCIETY ISLANDS: Raiatea:** Temehani Plateau, 600 m, 5 Oct 1934, H. St. John 17279 (holotype: BISH-508231!; isotype: P).

Distribution. Endemic to the Society Islands (Huahine, Raiatea, and Tahaa) where it occurs from 0 to 600 m in lowland vegetation such as coconut plantations and wet valleys with *Hibiscus* and *Neonauclea* to higher slopes and ridge crests with wet forest or shrubland of *Metrosideros, Weinmannia*, and Cyperaceae (Florence 1997).

63. *Phyllanthus tuamotuensis* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112730-1

Basionym. *Glochidion tuamotuense* J. Florence, J., Fl. Polynésie Française 1: 98. 1997.
TYPE. TUAMOTU ISLANDS: Niau: Maiahu, secteur oust, 146°20' W, 16°11' S, 2 m, 26 Mar 1990, J. Florence 10070 (Holotype: P; Isotypes: BISH!, CHR, DAV, K, L, P, PAP, PTBG!, US!).

Distribution. Endemic to the Gambier Islands (Taravai, Mangareva) and Tuamotu Islands (Niau), where it occurs from near sea level to 7–8 m on calcareous substrate. On Niau it grows in lowland forest with *Allophylus, Planchonella*, and *Xylosma,* whereas on Taravai it was collected in secondary vegetation with *Dicranopteris* and *Psidium* (Florence 1997).

64. *Phyllanthus virgatus* G. Forst., Fl. Ins. Austral. Prodr. 65. 1786. *Phyllanthus simplex* var. *virgatus* (G.Forst.) Müll. Arg., Linnaea 32: 32. 1863, nom. illeg. *Diasperus virgatus* (G.Forst.) Kuntze, Revis. Gen. Pl. 2: 597. 1891. **TYPE. SOCIETY ISLANDS: Tahiti:** Not designated.

Distribution. Widespread, but increasingly rare on Pacific Islands from Vanuatu, Fiji, Samoa, Tonga, Austral, Society and Cook islands (Webster 1986), and Caroline Islands (Yap) and Mariana Islands (Guam) in Micronesia, from 15 to 500 m elevation.

Note. Smith (1981) treated *P. virgatus* as native in Asia, but likely naturalized in the Pacific as did Florence (1997). Webster (1986) found a number of morphological features (smaller seeds, short fruiting pedicels, smooth to slightly roughened ovaries, and an irregularly dissected disk) that distinguish the Pacific island populations from the mainland Asian ones, and thus the Asia plants are most likely a different species, *P. simplex* Retz. Considering these differences the Pacific island *P. virgatus* is likely a native and not found outside of Pacific islands. A complex set of considerations would be involved to make a proper lectotypification for this species. A. C. Smith (1981, p. 464) suggested that one of two collections at BM (Banks & Solander s.n.) be selected by a specialist as the lectotype. Webster (1986) incorrectly considered Smith's comments to be a lectotypification, and Nicolson and Fosberg (2004) summarized the Cook voyage materials available, including Foster collections. They thought it inappropriate to select the Banks and Solander collection as the lectotype while also pointing out that a specialist needs to make the selection because the original material could represent a mixture of this species or *P. simplex* Retz. or *P. maderaspatensis* L.

65. *Phyllanthus vitiensis* Müll. Arg., Flora 48: 374. 1865. *Diasperus vitiensis* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 601. 1891. *Glochidion vitiense* (Müll. Arg.) Gillespie, Bernice P. Bishop Mus. Bull. 91: 17. 1932. **TYPE. FIJI ISLANDS:** *s. l.*, 1840, U.S. Expl. Exped. s.n. (holotype: probably G; isotype: US!).

Glochidion concolor var. *obovatum* Müll. Arg., Linnaea 32: 62. 1863. *Phyllanthus concolor* var. *obovatus* (Müll. Arg.) Müll. Arg. in A.P.de Candolle, Prodr. 15(2): 290. 1866. **TYPE. FIJI ISLANDS: Viti Levu:** 1860, B. C. Seemann 412 (holotype: probably G; isotypes: BM, K).

Distribution. Endemic to Fiji and known from Viti Levu, Kadavu, Nairrai, Moala, Kanacea, and Vanua Balavu, at 0–590 m in dense dry forests, open rolling hills, and grassy slopes.

66. *Phyllanthus vitilevuensis* W.L. Wagner & Lorence, nom. nov.
urn:lsid:ipni.org:names:77112731-1

Replaced name. *Glochidion collinum* A.C. Sm., Fl. Vitiensis Nova 2: 486, 494. 1981, non *P. collinus* Domin (1928). **TYPE. FIJI ISLANDS: Viti Levu**: Naitasiri, N portion of Rairaimatuku Plateau, between Mt. Tomanivi (Mt. Victoria) and Nasonggo, 870 to 970 m, 18 Sep 1947, A.C. Smith 6148 (holotype: BISH-142913; isotype: US!).

Distribution. Endemic to Fiji and known only from the interior of Viti Levu at 850–1150 m in dense forest (Smith 1981).

67. *Phyllanthus websteri* (Fosberg) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112732-1

Basionym. *Glochidion websteri* Fosberg, Willdenowia 20: 262. 1991. **TYPE. CAROLINE ISLANDS: Palau:** 1914, C. L. Ledermann 14507 (holotype: B-bc100241068!).

Distribution. Caroline Islands, Pohnpei, known only from the type without specific locality.

Note. A glabrous species to date know only from the type collection which has only pistillate flowers. The glabrous pistil is cylindrical with a columnar style 2-2.5 mm long exserted well beyond the calyx lobes. It most closely resembles and may be conspecific with *P. ponapense*. This entity should be carefully evaluated in the context of an overall review of *Phyllanthus* in Micronesia.

68. *Phyllanthus wilderi* (J. Florence) W. L. Wagner & Lorence, comb. nov.
urn:lsid:ipni.org:names:77112733-1

Basionym. *Glochidion wilderi* J. Florence, Fl. Polynésie Française 1: 99. 1997. **TYPE. TUAMOTU ISLANDS: Makatea:** Vaitepaua Ouest, piste de Temao, 45 m, 148°16' W, 15°49' S, 31 Jan 1988, J. Florence 9073 (holotype: P; isotypes: BISH!, CHR, DAV, K, P, PAP, US!).

Distribution. Endemic to the Gambier Islands (Mangareva) and Tuamotu Islands (Makatea). On Makatea it occurs from 45–75 m on calcareous substrate in primary

forest with *Guettarda* and *Pandanus* or in degraded *Homalium* forest. On Mangareva it was collected in relict primary or secondary forest and cliffs up to 350 m elevation (Florence 1997).

69. *Phyllanthus wilkesianus* Müll. Arg., in DC., Prodr. 15(2): 396. 1866. *Diasperus wilkesianus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 601. 1891. **TYPE. FIJI ISLANDS:** *s. l.*, 610 m, 1840, U.S. Expl. Exped. s.n. (holotype: G, isotype: GH).

Distribution. Endemic to Fiji and known only from two localities: Nadarivatu, Viti Levu and Macuata Range, Vanua Levu at 100–800 m (Smith 1981).

Naturalized species

70. *Phyllanthus amarus* Schumach. & Thonn., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd. 4: 195. 1829.

Distribution. Presumably native to the Neotropics, but now naturalized across tropical regions of the world; in the Pacific on Fiji, Austral, Cook, Gambier, Marquesas, Samoa, Society, Tuamotu Islands, and widespread in Micronesia (Carolines, Gilberts, Marshalls, Marianas, Nauru, and Wake) at 0–600 m elevation.

71. *Phyllanthus debilis* Klein ex Willd., Sp. Pl. 4: 582. 1805. *Phyllanthus niruri* var. *debilis* (Klein ex Willd.) Müll. Arg. in A.P.de Candolle, Prodr. 15(2): 407. 1866. *Diasperus debilis* (Klein ex Willd.) Kuntze, Revis. Gen. Pl. 2: 601. 1891.

Distribution. Native to India and Sri Lanka, but now widely naturalized; in the Pacific naturalized on Fiji, Society Islands (only Tahiti), Hawaiian Islands, and Micronesia (Caroline Islands, Mariana Islands, and Marshall Islands) at 0–450 m. Specimens from Palau referred to *P. boninsimae* Nakai are *P. debilis*.

72. *Phyllanthus tenellus* Roxb., Fl. Ind., ed. 1832, 3: 668. 1832. *Diasperus tenellus* (Roxb.) Kuntze, Revis. Gen. Pl. 2: 601. 1891.

Distribution. Origin uncertain, but now naturalized across the Indo-Pacific region and currently known from the Hawaiian Islands (Kaua`i, O`ahu, Lana`i, Maui, Hawai`i), Austral Islands (Raivavae, Rurutu, and Tubaui), Gambier (Mangareva, and Taravai), Marquesas Islands (Nuku Hiva), Society Islands (Huahine, Moorea, Raiatea, Tahiti, and Tetiaroa), and in Micronesia the Caroline Islands (Pohnpei).

73. *Phyllanthus urinaria* L., Sp. Pl.: 982. 1753. *Diasperus urinaria* (L.) Kuntze, Revis. Gen. Pl. 2: 601. 1891.

Distribution. Native to southern Asia and now naturalized pantropically; it is naturalized across the Pacific and currently known from Fiji, Austral Islands (Rurutu), Marquesas Islands (Fatu Hiva), Society Islands (Huahine, Moorea, Raiatea, Tahaa, and Tahiti), Caroline Islands and Maraiana (Guam) Islands in Micronesia, at 0–1200 m.

Excluded names

Glochidion ramiflorum J.R. Forst. & G. Forst., Char. Gen. Pl.: 57. 1775. *Bradleia glochidion* Gaertn., Fruct. Sem. Pl. 2: 128. 1791, nom. illeg. *Phyllanthus ramiflorus* (J.R. Forst. & G. Forst.) Müll. Arg., Flora 48: 374. 1865, nom. illeg., non *Phyllanthus ramiflorus* (Aiton) Pers., Syn. Pl. 2: 591. 1807 [= *Flueggea suffruticosa* (Pall.) Baill., Étude Euphorb.: 502. 1858]. *Diasperus ramiflorus* (J.R.Forst. & G.Forst.) Kuntze, Revis. Gen. Pl. 2: 600. 1891. **TYPE. TANNA AND AMSTERDAM ISLANDS:** *s. l.*, J.R. & G. Forster s.n. (lectotype: BM, designated by Smith, Fl. Vitiensis Nova 2: 473. 1981).

We follow Smith (1981) in considering the material previously assigned to this name from Fiji and Samoa to represent other species (*P. concolor* and *P. samoanus*). We also exclude the use of the name for collections from Micronesia, and include them instead under *P. cleistanthoides* (the majority), *P. ponapense,* and *P. senyavinianus*. There is currently no available name within *Phyllanthus* for the *G. ramiflorum* because it would need a new name as there are two different names *Phyllanthus ramiflorus*, both illegitimate. We provide the nomenclature for *Flueggea suffruticosa* below to bring together the complex set of names involving the epithet *ramiflorus*. Given the uncertainty surrounding the delimitation of this species we refrain from providing a new name here.

Flueggea suffruticosa (Pall.) Baill., Étude Euphorb. 502. 1858.

Xylophylla ramiflora Aiton, Hort. Kew. 1: 376, nom. illeg. 1789 [based on *Pharnaceum suffruticosum* Pall.]. *Phyllanthus ramiflorus* (Aiton) Persoon, Syn. Pl. 2: 591. 1807, nom. illeg. *Securinega ramiflora* (Aiton) Müll. Arg. in A.P.de Candolle, Prodr. 15(2): 449. 1866, nom. illeg. *Acidoton ramiflorus* (Aiton) Kuntze, Revis. Gen. Pl. 2: 592. 1891, nom. illeg.

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A reassessment of Marquesan *Ochrosia* and *Rauvolfia* (Apocynaceae) with two new combinations

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Abstract

A reassessment of collections of Marquesan Apocynaceae assigned to the genera *Neisosperma* Raf.*, Ochrosia* Juss.*,* and *Rauvolfia* L. revealed that two nomenclatural changes are necessary: 1) transfer of *Neisosperma brownii* Fosberg & Sachet to the genus *Ochrosia,* as *Ochrosia brownii* (Fosberg & Sachet) Lorence & Butaud, **comb. nov.**, and 2) transfer of *Ochrosia nukuhivensis* Fosberg & Sachet to *Rauvolfia* as *Rauvolfia nukuhivensis* (Fosberg & Sachet) Lorence & Butaud, **comb. nov**. As a result, two species each of *Ochrosia* and *Rauvolfia* are recognized from the Marquesas Islands, all endemic. Recent field work has yielded important new data on their distribution, habitat, and conservation status. It is recommended that all four species should be added the IUCN Red List at the Critically Endangered (CR) category.

Keywords

Apocynaceae*,* French Polynesia, Marquesas Islands, *Neisosperma, Ochrosia, Rauvolfia*

Introduction

In his Flora of Southeastern Polynesia, Forrest Brown (1935) incorrectly interpreted three Apocynaceae collections he made at 800 to 900 meters on Nuku Hiva and Fatu Hiva in the Marquesas Islands as belonging to the widespread coastal Indo-Pacific species, *Ochrosia parviflora* (G. Forst.) Henslow. The latter is now considered a synonym of *Ochrosia oppositifolia* (Lam.) K. Schum., or alternatively of *Neisosperma oppositifoli-*

um (Lam.) Fosberg & Sachet (Nicolson and Fosberg 2004; Smith 1988), a species not known from the Marquesas but occurring in the Austral archipelago. Based on these three rather poor, incompletely flowering and fruiting collections, Fosberg and Sachet (1972) described two species in *Ochrosia* Juss., one each from Nuku Hiva and Fatu Hiva, and one in *Neisosperma* Raf. from Nuku Hiva. Fosberg (1981) later described a species of *Rauvolfia* L. based on a Sachet collection from Hiva Oa.

During the preparation of an account of Apocynaceae for the Vascular Flora of the Marquesas Islands and Flore de la Polynésie française, additional field work by J-FB and study of additional herbarium specimens have greatly increased our knowledge of the Marquesan taxa and their correct identity. For example, collections from field work associated with the project resulted in the discovery of a new species of *Lepinia*, a genus previously not even known from the Marquesas (Lorence and Wagner 1997). Critical study of the type collections of the four previously described species of Marquesan Apocynaceae, all apparently endemic, coupled with new collections and field observations has resulted in a reassessment of their generic status.

Ochrosia or *Neisosperma* ?

Traditionally *Neisosperma* [incorrectly spelled *Neiosperma* by Fosberg & Sachet (1972)] was separated from *Ochrosia* based on two morphological features: the gynoecium possesses a nectary comprised of two thin lobes or scales present in the former but lacking in the latter; secondly, the fruit endocarp is fibrous and muricate with no air cavity in the former and fibrous but relatively smooth-surfaced with two air cavities in the latter (Smith 1988: 44). Disintegration of the surrounding pericarp and mesocarp by weathering, however, reveals the endocarp of *Ochrosia* to be fibrous as well (Lorence and Butaud, pers. obs. 2010). In both cases the fruit consists of usually two mericarps.

Based on morphological and molecular evidence, recent classifications of Apocynaceae tend to recognize only a single genus *Ochrosia* (Endress et al. 2007; Simões et al. 2007; Mabberley 2008). Molecular studies of 19 species of *Ochrosia* using cpDNA (the rps 16 intron) and ITS sequences revealed that *Ochrosia* species formed a strongly supported clade sister to and nested within a paraphyletic *Neisosperma* clade (Hendrian and Kondo 2007a, b). However, additional data from combined rps16 intron plus ITS sequences showed a more robust clade of *Ochrosia* sensu lato, supported by 100% bootstrap value, supporting the inclusion of *Neisosperma* into *Ochrosia* and recognition of only one genus (Hendrian and Kondo 2007c), a conclusion we adopt here. Nevertheless, it is possible that additional studies may show that the genus *Neisosperma* could be resurrected in a narrower concept potentially including two species from Marquesas and one species from the Austral Islands.

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from field notes, alcohol-preserved specimens, and digital photos. Measurements are presented in the descriptions as follows: length × width (or length × width × thickness in the case of fruits and seeds), followed by units of measurement (mm or cm). All specimens cited in this paper have been seen by the authors. Specimens from the following herbaria were studied: AD, BISH, K, MO, MU, PAP, PTBG, and US. The area of occupancy (distribution) for these species was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001; www.iucnredlist.org/info/categories_criteria2001).

The Marquesan species of *Ochrosia*

Key to species of *Ochrosia* in the Marquesas Islands

1a Calyx lobes c. 2 mm long; corolla lobes 6–7 mm long; mericarps ellipsoid 37–53 × 27–37 mm; Nuku Hiva ..... ***O. brownii***

1b Calyx lobes c. 2.5 mm long; corolla lobes 9–10 mm long; mericarps ovoid-ellipsoid 61–78 × 32–44 mm; Fatu Hiva ..... ***O. fatuhivensis***

Ochrosia brownii **(Fosberg & Sachet) Lorence & Butaud, comb. nov.**
urn:lsid:ipni.org:names:77112734-1
http://species-id.net/wiki/Ochrosia_brownii
Figs 1A, B

Basionym. *Neisosperma brownii* Fosberg & Sachet, Micronesica 8: 49, 1972 [as *Neiosperma*]).

Type. Marquesas Islands: Nuku Hiva: without precise locality, 15 July 1921, F. B. H. Brown 541 (Holotype BISH-500905!).

Ochrosia parviflora sensu F. Br., non (G. Forst.) Henslow

Description. *Tree* to 13 m tall, trunk to 24 cm diam., branchlets glabrous, leafy twigs 4–4.5 mm in diam, terete, drying wrinkled, older leafless twigs 6–7 mm in diam., latex white. *Leaves* opposite on smaller branchlets, ternate on larger branchlets, petiolate, leaf axils with dark brown, linear-digitate colleters 1–1.5 mm long secreting pale yellow resin; blades obovate-elliptic, 9.4–16.5 × 3.2–6.4 cm, base narrowly cuneate, attenuate, apex shortly acuminate, glabrous, discolorous, drying brown above, yellowish-brown below, when fresh green to yellow green above, pale green below, both surfaces glossy, secondary veins 15–20 on each side, secondary and tertiary veins visible above, prominulous beneath, margins conspicuously and tightly revolute; petioles

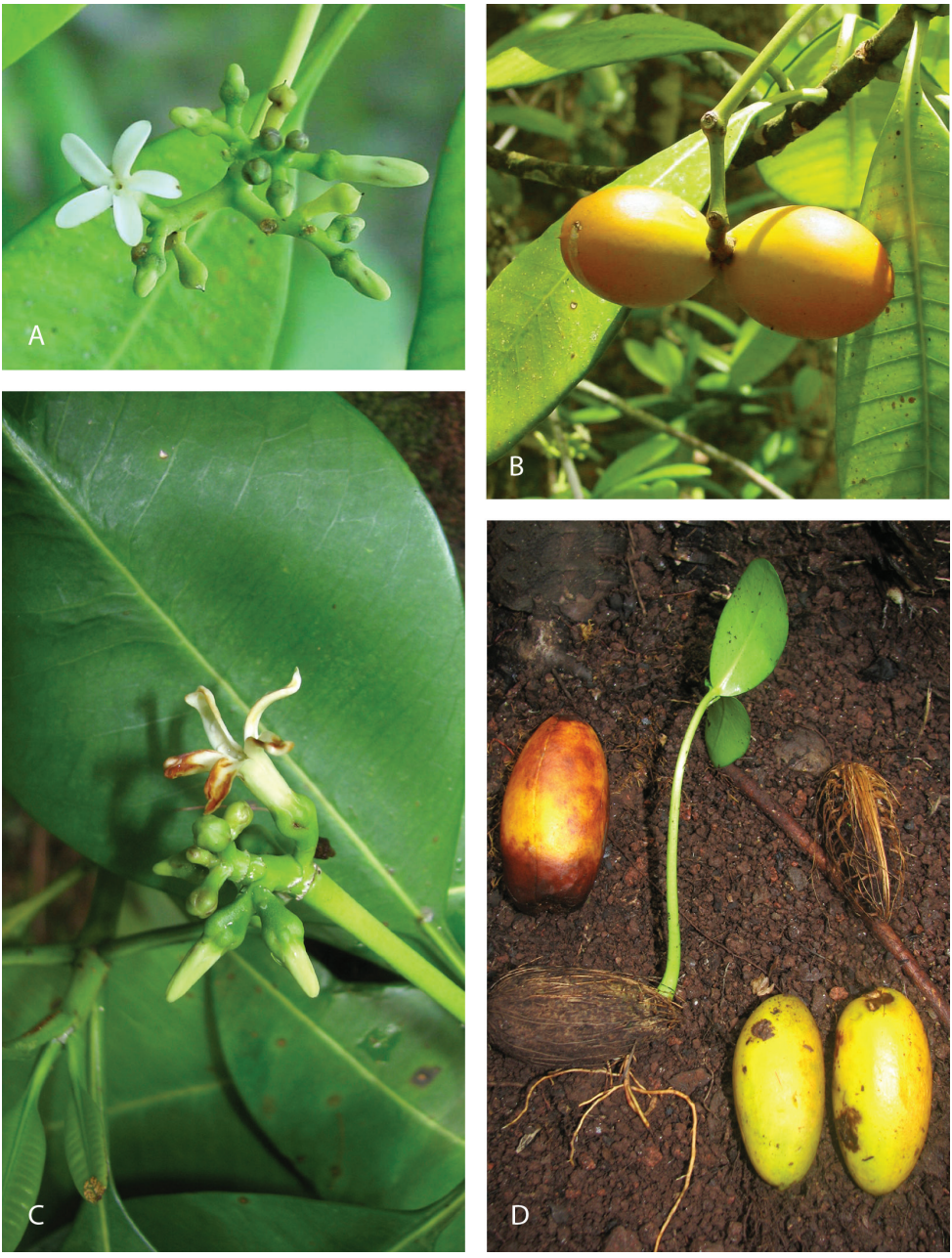

Figure 1. A, B *Ochrosia brownii.* **A** inflorescence and open flower and buds showing right-contorted corolla lobes (Vaipupui, Nuku Hiva, Feb. 2003, Butaud unvouchered) **B** branchlet with apocarpous fruit composed of paired mericarps (Vaipupui, Nuku Hiva, Butaud 8); **C, D** *Ochrosia fatuhivensis*. **C** inflorescence with open flower and buds, Hanativa (Fatu Hiva, Nov. 2009, Butaud 2458) **D** ripe mericarps, seed showing fibers and germinating seed (Hanativa, Fatu Hiva, Nov. 2009, Butaud 2458).

17–33 mm long, 1.7–2 mm in diam. *Inflorescence* terminal, 7–12 cm long, trichotomous, branching to the third degree, with 2 primary branches at apex of peduncle, each with 12–18 flowers, glabrous, axes with small, scale-like bracts; flowers on pedicels 1.5–4 mm long, 5-merous; calyx lobes obtuse to rounded, 2 × 2.5 mm; corolla in bud to 10 mm long; corolla at anthesis white, fragrant, corolla tube 6–7 × 3 mm, corolla lobes 5, contorted to the right, 6–7 × 2–25 mm, rounded at apex; ovary conical, 0.7–0.8 mm long, bicarpellate, style 0.8 mm long, stigmatic head ovoid, 0.7-0.8 mm long with tuft of hairs at apex and green ring (but no collar) at base, nectary 0.3 mm, 2-lobed, the lobes alternating with and partly covering the carpels. *Infructescence* with peduncle c. 17 cm long; fruits composed of two fleshy mericarps, when fresh orange at maturity, ellipsoid, 37–53 × 27–37 × 25–36 mm, mesocarp orange, 5 mm thick; endocarp externally fibrous, internally woody, 31–48 × 23–33 × 19–27 mm, the fibers to 1.5 mm in diam. *Seed* 2 per fruit, ellipsoid, 25 × 23–26 × c. 4 mm.

Distribution. Nuku Hiva, Marquesas Islands, originally known only from the type collected in the vicinity of the Toovii plateau at about 900 m (Brown 1935). The species was rediscovered by Jean-François Butaud in 2003 on Nuku Hiva where a single tree and some juveniles were located on the Vaioa plateau (at Matahamo, also called Vaipupui) SE of Toovii.

Ecology. This species occurs in evergreen wet forest between 730 and 900 m elevation, with species of *Hibiscus, Ixora*, *Metrosideros, Pandanus, Phyllanthus, Premna, Wikstroemia, Xylosma,* and ferns including *Asplenium australasicum* (J. Sm.) Hook., *Histiopteris incisa* (Thunb.) J. Sm., and *Microsorum grossum* (Langsd. & Fisch.) Brownlie.

Conservation status. When evaluated using the IUCN criteria for endangerment (IUCN 2001) *Ochrosia brownii* falls into the Critically Endangered (CR) category, which designates species facing the highest risk of extinction in the wild. IUCN Red List Category: **Critically Endangered** (CR) B1a, b; B2a, B2b (i–iii): B1, extent of occurrence estimated to be less than 100 km^2, and B1a, known to exist at only a single location; B1b (i-iii), continuing projected decline in (i) extent of occurrence, (ii) area of occupancy, and (iii) area, extent and quality of habitat; B2, area of occupancy estimated to be less than 10 km^2, and B2a, a single population known. B2b (i–iii), habitat continuing decline inferred. The suitable habitat for *Ochrosia brownii* on Nuku Hiva (*c.* 340 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimens examined. Marquesas Islands: Nuku Hiva: Matahamo, Vaioa, fin de la piste forestière, 758 m, 2 Jan. 2003, Butaud 8 (PAP); Matahamo, Vaioa, 758 m, 9 Feb. 2003, Butaud 10 (PAP); Vaipupui, amont de la piste forestière menant à la dernière parcelle de pins, 737 m, 27 Jan. 2010, Butaud & Benne 2586 (PAP).

Discusison. Since 2006, a conservation plan proposed by the Environment Direction of French Polynesia has been implemented, with conservation *ex situ* (seed collection and conservatory plantings) and *in situ* (fencing enclosure of the population and enrichment planting of seedlings inside).

Ochrosia fatuhivensis **Fosberg & Sachet, Micronesica 8: 48 (1972).**
http://species-id.net/wiki/Ochrosia_fatuhivensis
Figs 1C, D

Type. Marquesas Islands: Fatu Hiva: Oia [Ouia], c. 800 m, 19 Jan. 1922, F. B. H. Brown 886 (Holotype BISH-500706!).

Description. *Tree* 10–14 m tall, trunk 15–20 cm in diam., branchlets glabrous, leafy twigs 2.5–7 mm in diam., bark wrinkled when dry, latex white. *Leaves* opposite on smaller branchlets, apparently ternate on larger branchlets; blades elliptic, 5.8–20.2 × 2.4–10.1 cm, base narrowly cuneate, apex shortly acuminate, glabrous, discolorous, when fresh dark green above, pale green below, drying brown, margins slightly revolute; secondary veins 9–20 on each side, prominulous on both surfaces, intersecondaries and tertiaries prominulous on both surfaces; petioles 14–36 mm long. *Inflorescence* terminal, tri- or quadrichotomous, branching twice, cymose-corymbiform, 52–88 mm long, axes and flowers glabrous, sessile, with 3 primary branches (6–)20–64 × c. 2 mm, subquadrangular, bracts ovate-triangular, 1–1.2 × 1–1.2 mm, ultimate axes with flowers crowded in cymules; flowers with pedicels 2–5 mm long, each with a single bract, calyx cup 2.5 mm long, calyx lobes 5, triangular-ovate, 2.5 × 3 mm, apex obtuse; corollas in bud to 10 mm long; corolla at anthesis white, fragrant, corolla tube 7–8 × 3 mm, corolla lobes 5, contorted to the right, 9–10 × 2–2.5 mm; ovary and nectary not seen. *Infructescence* with peduncle c. 11.5 cm long. *Fruits* apocarpous, composed of 2 fleshy mericarps, when fresh orange at maturity, ovoid-ellipsoid, 61–78 × 32–44 × 30–40 mm, mesocarp c. 7 mm thick; endocarp 54–72 × 27–40 × 23–34 mm, fibrous without, woody within, single-seeded. *Seed* 2 per fruit, ellipsoid, 29–37 × 18–19 × 3–4 mm.

Distribution. Marquesas Islands, Fatu Hiva where originally known only from the type collected in Ouia Valley at 800 m.

Ecology. This species was recently rediscovered in 2009 by Jean-François Butaud and Ravahere Taputuarai following the directions of Joseph Mititai. This population in Hanativa valley, a remote hanging valley north of Ouia, consists of 13 adult plants and numerous juveniles and seedlings at 480 m elevation. It occurs in mesic to wet forest with species of *Aleurites, Allophylus, Artocarpus, Boehmeria, Cerbera, Inocarpus, Macropiper, Metrosideros, Musa troglodytarum* L.*, Pandanus, Phyllanthus, Pipturus argenteus* (G. Forst.) Wedd., *Wikstroemia,* the introduced *Coffea arabica* L. and *Dioscorea* spp., and the ferns *Nephrolepis biserrata* (Sw.) Schott*, Pteris comans* G. Forst., and *Tectaria jardinii* (Mett. ex Kuhn) E. D. Br.

Conservation status. *Ochrosia fatuhivensis* is currently known only from a single population. When evaluated using the IUCN criteria for endangerment it falls into the Critically Endangered (CR) category, which designates species facing the highest risk of extinction in the wild. IUCN Red List Category: **Critically Endangered** (CR) B1a, b; B2a, B2b (i–iii): B1, extent of occurrence estimated to be less than 100 km^2, and B1a, known to exist at only a single location; B1b (i-iii), continuing projected decline in (i) extent of occurrence, (ii) area of occupancy and (iii), area, extent and

quality of habitat; B2, area of occupancy estimated to be less than 10 km^2, and B2a, a single population known. B2b (i–iii), habitat continuing decline inferred. The suitable habitat for *Ochrosia fatuhivensis* on Fatu Hiva (*c.* 85 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimen examined. Marquesas Islands: Fatu Hiva: Hanativa, Affluent Sud de la vallée, vallon perché, 481 m, 7 Novembre 2009, Butaud, Taputuarai & Mititai 2458 (PAP).

Discussion. Fosberg & Sachet (1972) suggested *Ochrosia fatuhivensis* may be related to *O. compta* K. Schum. of Hawaii, but no molecular-phylogenetic studies have been carried out involving these two species. The local name is ho'ei in Fatu Hiva, similar to the name holei used for species of *Ochrosia* in Hawaii (Wagner et al. 1990). On Fatu Hiva the seeds were eaten in time of famine according to Brown (1935) and several present day inhabitants.

The Marquesan species of *Rauvolfia*

A single species of *Rauvolfia*, *R. sachetiae* Fosberg was described from Hiva Oa, Marquesas based on a single collection (Fosberg 1981). Recent collections and field observations of *Rauvolfia* from Nuku Hiva were thought to represent this species. However, a re-examination of the holotype of *Ochrosia nukuhivensis* Fosberg & Sachet (*Brown 432,* BISH) reveals that it possesses distinctive whorled leaves and dark, linear or digitate, resiniferous colleters in the leaf axils and adjacent petiole characteristic of most Pacific *Rauvolfia* species, although the type lacks fruits. In *Ochrosia* the colleters are generally shortly conical or scale-like and usually obscured by a copious resinous exudate. Additional morphological differences separating these two genera include in *Rauvolfia* the corolla lobes are left-contorted (sinistrorse), presence of a well-developed annular nectary disc, and the presence of a conspicuous membranous basal collar on the style-head, whereas in *Ochrosia* corolla lobes are right-contorted (dextrorse), the nectary is absent or consists of 2 small, poorly developed thin lobes alternating with the carpels, and the style head sometimes has a ring of longer hairs near its base but no collar (M. Endress, pers. comm. 2010).

A recent Nuku Hiva collection, *Perlman 10014* distributed under the name *Rauvolfia sachetiae*, compares very well with *Brown 432,* the type of *Ochrosia nukuhivensis*, and clearly represents the same species. Furthermore, *Perlman 10014* has subglobose or globose, syncarpous fruits characteristic of many Pacific species of *Rauvolfia* in which normally each of the two carpels contains two ovules, but frequently one aborts so that at maturity the fruit is usually 2-seeded, but sometimes one carpel does not fully develop, resulting in a 1-seeded syncarpous drupe. In *Ochrosia* the fruits consist of a pair of well separated, distinct or bally basally connate oblong mericarps (Wagner et al. 1990). This Nuku Hiva species differs in leaf and calyx morphology from *R. sachetiae* on Hivaoa, and the two species may be separated by the following key.

Key to species of *Rauvolfia* in the Marquesas Islands

1a Leaves narrowly ovate to narrowly elliptic or oblong, L:W ratio 2.9:1 to 3:1, secondary veins 21–25 on each side; calyx total width distally 3.2–4 mm; calyx lobes 1.5–2 × 1.5–2 mm ..... ***R. nukuhivensis***

1b Leaves ovate to elliptic, L:W ratio 1.7:1 to 2:1, secondary veins 18–19(–21) on each side; calyx total width distally, 2–2.5 mm; calyx lobes 1–1.2 × 1–1.2 mm..... ***R. sachetiae***

***Rauvolfia nukuhivensis* (Fosberg & Sachet) Lorence & Butaud, comb. nov.**
urn:lsid:ipni.org:names:77112735-1
http://species-id.net/wiki/Rauvolfia_nukuhivensis
Figs 2A, B, C

Basionym: *Ochrosia nukuhivensis* Fosberg & Sachet, Micronesica 8: 48, 1972.

Type. Marquesas Islands: Nuku Hiva: without precise locality, ca. 1000 m, 20 June 1921, F. B. H. Brown 432 (Holotype BISH-500695!).

Description. *Tree* 8–15 m tall, trunk 40–50 cm in diam., bark furrowed, pale orange to beige in color, leafy branchlets 3–3.5 mm in diam., glabrous, bark wrinkled, brown, leafless branchlets 6 mm in diam., gray-brown, latex white. *Leaves* ternate, leaf axils and adjacent petiole bases with brown, glandular digitate colleters 1–2 mm long; blades narrowly ovate to narrowly elliptic or oblong-elliptic, 6–17.6 × 1.5–6.2 cm, base narrowly cuneate to cuneate, apex acute, chartaceous, glabrous, when fresh pale green, discolorous, margin slightly revolute, secondary veins 21–25 on each side, intersecondary and tertiary veins prominulous on both surfaces, petioles 12–36 × 1.2–1.5 mm, adaxially flattened. *Inflorescences* terminal, displaced by terminal shoot growth, 5–7 × 7–10 cm, including the verticellate peduncles 1.7–5.4 × 2 mm, branchlets slightly zigzag, glabrous, branching three to four times, ultimate branches trichotomous, bracteoles 1.5 mm long, triangular, acute; calyx total width distally 3.2–4 mm, calyx lobes 5, broadly triangular-ovate, 1.5-2 ×1.5-2 mm, obtuse at apex; corolla cream color when fresh, tube 8–13 mm long, lobes 2–3.5 × 2–2.5 mm, slightly contorted to the left, anthers 1.2-1.3 mm long, narrowly triangular-subulate, sagittate at base, ovary conical, 1.5 mm long, nectary disc annular, 0.4-0.5 mm long, style 5 mm long, stigma head cylindric, 0.4 mm long, with membranous collar at base. *Fruit* subglobose when mature, 12–15 mm in diam., fleshy, turning black at maturity, drupaceous with 1–3 seeds. *Seeds* compressed, obliquely oblong-ovoid, with one straight and one curved edge, base sub-truncate, apex diagonal from straight edge upward to a blunt point, sides coarsely and shallowly rugose.

Distribution. Marquesas Islands, known only from Nuku Hiva between 198 and 627 m elevation.

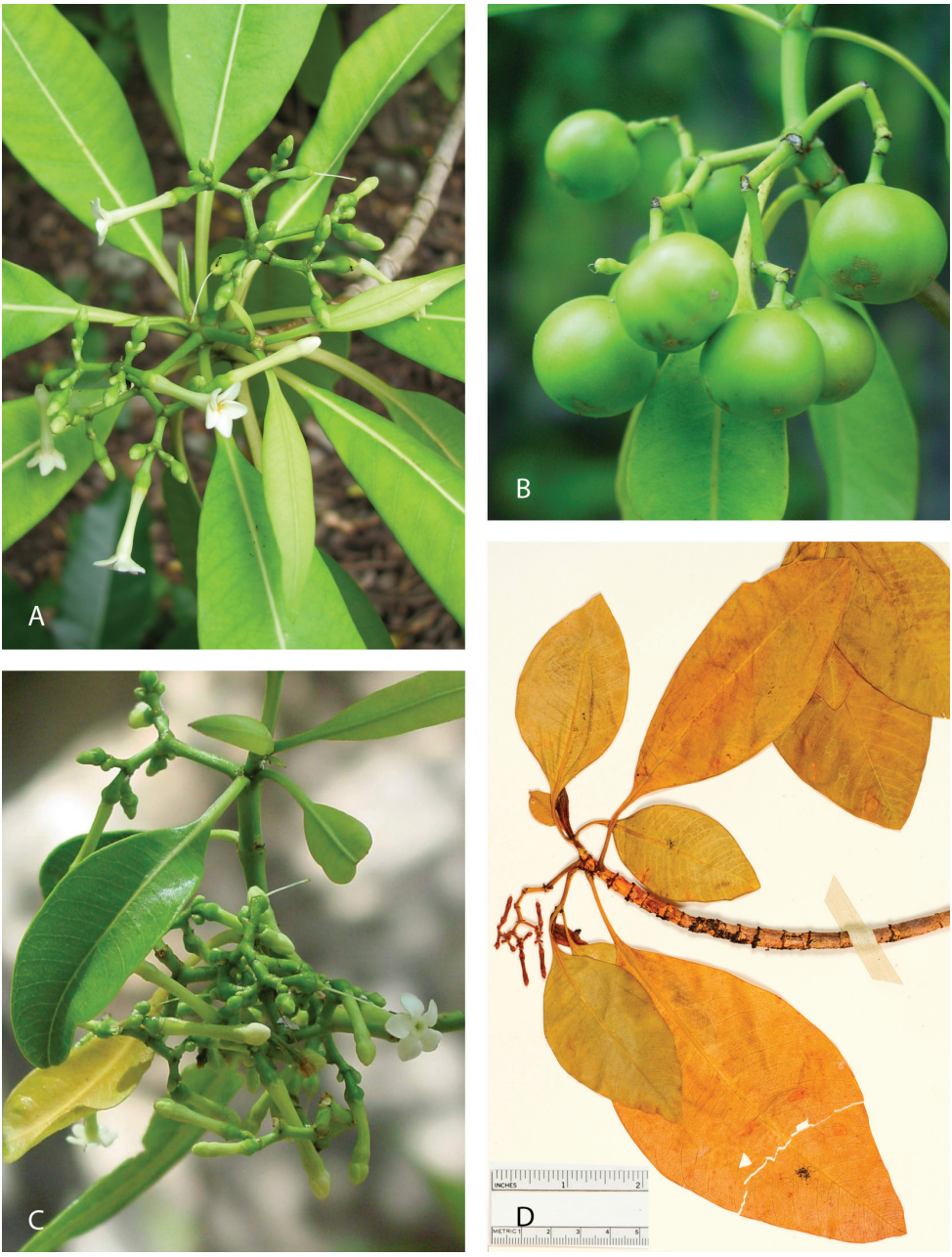

Figure 2. A, B, C, *Rauvolfia nukuhivensis* **A** branchlet with leaves and inflorescence with open flowers, and buds with left-contort corolla lobes (Terre-Deserte, Nuku Hiva, May 2007, Butaud (unvouchered) **B** infructescence with syncarpous green fruits (Maauu, Nuku Hiva, April 2004, Butaud 418) **C** inflorescence with buds and open flower (Keiaki, Nuku Hiva, 27 Dec. 2002, J.-F. Butaud unvouchered); **D** *Rauvolfia sachetiae,* portion of isotype specimen showing leaves and inflorescence (Hiva Oa, above Taaoa, 15 Jan. 1975, Sachet 2115, Isotype BISH-578658).

Ecology. *Rauvolfia nukuhivensis* is very rare and localized with fewer than 50 living trees currently known in valley or plateau dry forest with species of *Cerbera, Ficus, Maytenus, Phyllanthus*, *Sapindus,* and *Xylosma*. Currently known in the Terre-Deserte region in the valleys of Motuee, Hakaavao, Haahopu, Haatuatua, Hakaoa, Tapueahu and Uea, and on the plateaus of Tohuahee, Vaiteheii, Maauu, and Putata. As many dead trees as living trees are known. Formerly known from the north coast of Nuku Hiva, between the Haataivea peninsula and behind Aakapa village.

Conservation status. The suitable habitat for *Rauvolfia nukuhivensis* on Nuku Hiva (*c.* 340 km^2) is indicated as an endangered environment, threatened by human activity (deforestation, exploitation for leaves and bark), feral animals, and invasive plants, reducing the extent of the forest. Following the criteria and categories of IUCN (2001) IUCN Red List Category: **Critically Endangered** (CR) B1a, B1b (i-iii), D; B1, extent of occurrence estimated to be less than 100 km^2, and B1a, severely fragmented (several small subpopulations); B1b (i-iii), continuing projected decline in (i) extent of occurrence, (ii) area of occupancy, and (iii) area, extent, and quality of habitat; D population size estimated to number fewer than 50 mature individuals (fewer than 50 total individuals).

Specimens examined. Marquesas Islands: Nuku Hiva: Tapueahu (labels erroneously says Matatekouaehi) Valley, 650 ft. (198 m), 1 July 1988, Perlman 10014 (AD, BISH, K, MO, MU, P, PAP, PTBG, US); Terre Déserte, branche gauche de la moyenne vallée de la Baie Marquisienne, face au Keiaki, 340 m, 30 July 1987, Florence 8434 (BISH, PAP, US); broad interfluve above Uea Valley, near Baie Marquisienne, 20 Apr. 1964, Decker 2046 (US); Ivipuovoteahi, NO de Keiaki, 400 m, 8°55’ S, 140°12’ W, February 1987, Jourdan 128 (PAP); Terre Deserte, Pipiheihe, 400 m, 8 April 1989, Toutain 4275 (PAP); Plateau de Maauu, au Sud du deuxième vallon de la forêt naturelle, 456 m, 9 April 2004, Butaud 418 (PAP).

Discussion. Collectors’ notes indicate the leaves and bark are used for traditional medicine, another factor likely contributing to the decline of this species. Since 2006, a conservation plan lead by the Environment Direction of French Polynesia was implemented, with conservation *ex situ* (seed collection and conservation plantings) and *in situ* (enclosure of several populations). Local name: tueiao

Rauvolfia sachetiae **Fosberg, Smithsonian Contr. Bot. 47: 21, 1981.**
http://species-id.net/wiki/Rauvolfia_sachetiae
Fig. 2D

Type: Marquesas Islands: Hiva Oa: dry crest above Taaoa, SW of village, 350 m, M.-H. Sachet 2115 (Holotype US!; Isotype BISH-598409!).

Description. *Tree* 6–10 m tall, trunk 20–25 cm in diam., bark furrowed, branches more or less horizontal, twigs and leaves in whorls of 3–4, entire plant glabrous, latex abundant; branchlets 4–6 mm in diam., proximal internodes to 9 cm long, distal ones 0.5–1 cm long toward end of season’s growth, terminal buds with abundant

clear, brown resin. *Leaves* elliptic to broadly elliptic, 5.5–22 × 2.5–6.8 cm apex acute to obtuse, base acute to occasionally obtuse, slightly decurrent on petiole, glabrous, chartaceous, light to bright yellowish green when dried, secondary veins 12–15 on a side, brochidodromous, forming a wide angle with costa, secondary and tertiary veins prominulous on both surfaces; petioles 15–35 × 1–2 mm in diam. with 20–30 brown digitate, glandular colleters 0.5–1.2 mm long in each leaf axil. *Inflorescences* terminal, pseudoaxillary by displacement, compound cymes 3–6 × 8–12.5 cm including the corollas, peduncles verticellate, 1.5–3 cm long, 3–6 times ramified, branches open, widely divergent, ultimate branches trichotomous with central branch usually represented by a single pedicellate flower, most flowers early caducous from all but the most distal branches, each lateral branch subtended by a scale-like, ovate-triangular bract 1–1.5 × 1–1.5 mm, a bract pair subtending each lateral bud, axils of bracts glandular as those of leaves, pedicel of central flower 2–2.5 mm long, lateral buds of a triad subsessile, globose, tending to develop into a new triad with only the central flower of a triad developing to anthesis; calyx turbinate-campanulate, lobed almost to base, lobes 1.5–2 × 1.5–1.7 mm, imbricate, obtuse, margins thin; corolla yellow in bud, at anthesis cream colored, 12–14 mm long including limb, tube 9.5–14 × 1–1.5 mm in diam. medially, slightly dilated at apex and base, lobes slightly left-contorted, ovate, 2.5–3.5 × 2 mm, obtuse or rounded at apex, anthers narrowly ovate, somewhat bluntly acuminate, sagittate at base, subsessile, 1.5 mm long, inserted 1.5 mm below throat, a very few hairs around and below insertion on inside surface of corolla tube; ovary surrounded by cup-like nectary disk with minutely crenulate margin, carpels oblong, free distally, united in lower half, style glabrous, 7–9 mm long, style head thickened, cylindrical (not seen: floral description from Fosberg 1981). *Fruit* subglobose to globose, 12–15 mm long, fleshy, turning black at maturity (at least when dry), apex rounded or emarginate, subtended by persistent spreading calyx. *Seed* 1 by abortion (only one mature fruit examined) 12 × 8 × 5 mm, obliquely oblong-ovoid, with one straight and one curved edge, base sub-truncate, apex diagonal from straight edge upward to a blunt point, sides coarsely and shallowly rugose.

Distribution. Marquesas Islands, Hiva Oa, previously known only from a single tree at the type locality above Taaoa. In 2011 one dead trunk probably representing this species was found in a small gulch above Tanaeka valley, at around 430 m elevation (Butaud, pers. obs.).

Ecology. Dry secondary forest or shrubland with *Casuarina*.

Conservation status. Despite careful searches this species has not been found since the last collection was made at the type locality in 1977. In 2010 the area was observed to be overgrazed by goats and invaded by *Syzygium cumini*.(L.) Skeels (Butaud, pers. obs.). *Rauvolfia sachetiae* falls into the **Critically Endangered (CR)** category, which designates species facing the highest risk of extinction in the wild. IUCN Red List Category: **Critically Endangered** (CR) B1a, b; B2a, B2b (i–iii): B1, extent of occurrence estimated to be less than 100 km^2, and B1a, known to exist at only a single location; B1b (i-iii), continuing projected decline in (i) extent of occurrence, (ii) area of occupancy, and (iii) area, extent and quality of habitat; B2, area of occupancy estimated

to be less than 10 km^2, and B2a, a single population known. B2b (i–iii), continuing habitat decline inferred. The suitable habitat for *Rauvolfia sachetiae* on Hiva Oa (*c.* 315 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Specimens examined. Marquesas Islands: Hiva Oa: Ridge above Taaoa, SW of village, 350 m, 20 Nov 1974, Sachet & Decker 1885 (BISH, CBG, CHR, L, MO, NSW, P, PTBG, US), Taaoa, sur la presqu'île, versant SW, 350 m, 8 March 1977, Schäfer & Oliver 5293 (BISH, CBG, CHR, MO, NSW, PTBG, US).

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Revision of *Coprosma* (Rubiaceae, tribe Anthospermeae) in the Marquesas Islands

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Abstract

During the preparation of the Vascular Flora of the Marquesas Islands three new species of *Coprosma* (Rubiaceae, tribe Anthospermeae) have come to light and are described herein: *C. fatuhivaensis* W. L. Wagner & Lorence, *C. meyeri* W. L. Wagner & Lorence, and *C. temetiuensis* W. L. Wagner & Lorence. Descriptions, illustrations, conservation status, and specimen citations are provided. Amended descriptions of three previously described Marquesan *Coprosma* species are also provided as well as a key to the species, four of which fall into the Critically Endangered (CR) and two into the Endangered (EN) category. With the description of these the new species, *Coprosma* becomes the sixth largest lineage in the Marquesas Islands with six species after *Psychotria* (one lineage which has 9 spp.), *Cyrtandra* (8 spp.), *Bidens* (8 spp.), *Melicope* (7 spp.), and *Ixora* (7 spp.).

Keywords

Conservation, *Coprosma*, French Polynesia, Marquesas Islands, Rubiaceae

Introduction

Coprosma J.R. Forst. & G. Forst. is a genus of about 110 species, unusual in most species being dioecious and wind-pollinated. The genus is widely distributed on Pacific islands with a primary center of diversity in New Zealand (ca. 50 spp.), but with secondary centers of diversity the Hawaiian Islands (13 spp.), New Guinea (11 spp.), and

Australia (8 spp.). The remainder are scattered over a wide area of the Pacific Basin, extending to southeastern Polynesia and the Juan Fernández Islands. There are 16 species of *Coprosma* in Polynesia, with six species endemic to the Marquesas Islands, four in the Society Islands, three in the Australs, two in Samoa, and one each in the Tuamotu Islands, Pitcairn Island, and Cook Islands.

Oliver (1935) divided the genus into seven groups, most of which were subdivided into smaller groups of presumably closely related species. He placed all southeastern Polynesia species then known into his *Coprosma pyrifolia* group characterized by relatively large leaves that are usually obovate to ovate and finely reticulate, triangular stipules, which are entire to denticulate, male flowers in small clusters with a calyx present, and female flowers 3 per cluster, the calyx lobes as long as or shorter than the tube. He hypothesized that this group was related to similar species in New Zealand. Florence (1986) in a paper describing two new Marquesan species (*C. nephelephila* Florence and *C. reticulata* Florence) allied them and the one other Marquesan species then known [*C. esulcata* (F. Br.) Fosberg] with the orange-fruited Hawaiian species. Heads (1996) supported Florence's hypothesis by placing the Marquesan species in a group with the Hawaiian species, rather than the *C. pyrifolia* group where all of the other southeastern Polynesian species were placed. No comprehensive study of relationships has been made, but a recent molecular study of Tribe Anthospermeae (Anderson et al. 2001), in which 6 of 16 of the taxonomic groups recognized by Heads (1996) were sampled, indicates an apparent Australian origin of *Coprosma* and possible independent colonization of Fiji and Hawaiian Islands from New Zealand. The two subgenera of *Coprosma* recognized by Heads (1996) were not supported. No Polynesian species were included in the sparse sampling of the genus leaving the relationships and biogeography of the genus in the Pacific completely open. The species in the following taxonomic section of this paper are arranged alphabetically.

Brown (1935) described the first species of *Coprosma* discovered in the Marquesas Islands in his Rubiaceae treatment for the *Flora of Southeastern Polynesia*, but mistakenly placed it in the genus *Psychotria* as *P. esulcata* F. Br. Fosberg (1939) in his revision of Marquesan *Psychotria* maintained it as a species of *Psychotria*; however, he later (Fosberg 1956) realized it was actually a poorly understood species of *Coprosma* and transferred to its proper place as *C. esulcata* (F. Br.) Fosberg. It remained the sole Marquesan member of the genus until the Flore de la Polynésie française project under the auspices of Jacques Florence at IRD (formerly ORSTOM) was initiated. Collecting in the Marquesas Islands intensified greatly with the initiation of this project and Florence (1986) discovered two additional species of *Coprosma* (*C. nephelephila* and *C. reticulata*). During the collecting expeditions for the current Vascular Flora of the Marquesas Islands project under the direction of David H. Lorence and Warren L. Wagner (Wagner & Lorence 1997) three additional species were discovered, bringing the total to six species. This paper, a generic revision for the Marquesas Islands with descriptions of new taxa, represents a precursor to the latter project.

Conservation status

The Marquesan species of *Coprosma* are distributed with a typical higher diversity on the older and larger islands. Three species occur on Nuku Hiva (*C. esulcata, C. nephelephila* and *C. reticulata*), one on Ua Pou (*C. esulcata*), two on Hiva Oa (*C. feaniana* and *C. temetiuensis*), and one on Fatu Hiva (*C. fatuhivaensis*). To date only 36 total collections of *Coprosma* have been made of the Marquesan species, which gives an indication of how uncommon these species are. Two of the species, *C. esulcata* and *C. reticulata*, constitute the bulk (26) of the collections. Both of these species occur as scattered individuals in appropriate habitats or are occasionally locally common. The other four species are known from only a few collections. When evaluated using the IUCN criteria for endangerment (IUCN 2001), four of the Marquesan *Coprosma* species of (*C. fatuhivaensis*, *C. meyeri C. nephelephila,* and *C. temetiuensis*) fall into the **Critically Endangered** (CR) category, which designates species facing the highest risk of extinction in the wild. Marquesan species of *Coprosma* meet the IUCN criteria by having known ranges less than 100 km^2, an area of occupancy of less than 10 km^2, continuing decline in the quality of habitat, and a populations size less than 50 mature individuals. *Coprosma esulcata* and *C. reticulata* are considered **Endangered** (EN): B1, B2b (i–iii): B1 extent of occurrence <5,000 km^2; B2: total area of occupancy less than 500 km^2 (c. 75 km^2); B2b (i–iii), habitat continuing decline inferred in (i) extent of occurrence, (ii) areas of occupancy, and area, (iii) extent and/or quality of habitat. Further details are given under each species.

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from alcohol-preserved flowers and fruits, field notes, and color slides or digital photos. Measurements are presented in the descriptions as follows: length × width, followed by units of measurement (mm or cm). Specimens from the following herbaria were studied: BISH, K, MO, MPU, NY, P, PAP, PTBG, US, and WU). The area of occupancy (distribution) for each species was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001; www.iucnredlist.org/info/categories_criteria2001).

Systematics

***Coprosma* J. R. Forster & G. Forster**
http://species-id.net/wiki/Coprosma

Description. *Shrubs*, multi-branched, erect, occasionally creeping and sometimes rooting at the nodes or *occasionally trees*, often foetid when bruised. *Leaves* simple, opposite

or rarely ternate, margins entire, petiolate or sessile; stipules interpetiolar, distinct or partly connate, entire or dentate with tooth-like marginal colleters. *Flowers* unisexual (and the plants dioecious or rarely monoecious), rarely polygamous or in one species perfect, axillary, solitary or in cymes; calyx 4–5(–10)-toothed, often reduced or absent in male flowers; corolla funnelform or campanulate, 4–5(–10)-lobed, lobes valvate in bud; stamens 4–5(–10), inserted at base of corolla tube; filaments long-exserted, erect or pendulous; ovary 2(–4)-celled, ovule 1 per cell, basal, anatropous; style 2(–4)-lobed, divided nearly to base; stigmas long-exserted, papillose-hirsute. *Fruits* drupaceous, juicy, ovoid to globose, with 2(–4), 1-seeded, plano-convex pyrenes.

Key to species of *Coprosma* in the Marquesas Islands

1a	Leaves ternate, chartaceous	**4. *C. nephelephila***
1b	Leaves opposite, thin- to thick-coriaceous	**2**
2a	Petioles 0–0.1 cm long; Leaf blades with secondary and higher venation obscure, only the midvein conspicuous	***3. C. meyeri***
2b	Petioles 0.3–1.7 cm long; leaf blades with secondary and higher venation conspicuous, reticulate	**3**
3a	Leaves 0.9–1.8 cm wide, narrowly elliptic	**2. *C. fatuhivaensis***
3b	Leaves 2.0–6.0 (–13.0) cm wide, oblanceolate, oblong, or elliptic-oblanceolate	**4**
4a	Lower surface of leaves strigose along the veins; leaves thick-coriaceous	**1. *C. esulcata***
4b	Lower surface of leaves glabrous; leaves thin-coriaceous	**5**
5a	Leaves 5.1–9.1 × 2.1–3.6 cm; stipules 1.5–3 mm long	**6. *C. temetiuensis***
5b	Leaves 8.5–19.7 × 3–13 cm; stipules 3–5 mm long	**5. *C. reticulata***

***Coprosma esulcata* (F. Br.) Fosberg, Brittonia 8: 178. 1956.**
http://species-id.net/wiki/Coprosma_esulcata

Basionym. *Psychotria esulcata* F. Br. (Bernice P. Bishop Museum Bulletin 130: 315. 1935).

Type. Marquesas Islands: Ua Pou: Without further locality, 1000 m, 1921, E. Qualye 1136 (holotype: BISH-578803!).

Description. *Shrub or small tree* 1.5–4 m tall; young stems glabrous. *Leaves* decussate, thick-coriaceous, blades 6.5–13 × 2.7–6 cm, elliptic-oblanceolate, pinnately veined with 8–18 pairs of secondary veins, higher level venation conspicuously reticulate, upper surface glabrous, lower surface strigose along the veins, midrib broad, with a narrow wing, domatia small or sometimes apparently absent, located along midrib near juncture of secondary veins, apex acuminate, base cuneate; petioles 0.4–1.3 cm

long, stout, narrowly winged; stipules ca. 3–8 mm long, connate 1/2–4/5 of length, both surfaces glabrous, margins ciliate with reddish brown hairs and dentate with conspicuous colleters, apex obtuse to a conspicuous appendage. *Inflorescences* axillary with 6(–15) flowers, trichotomously branched, with 1–3 nodes, the uppermost with a 3-flowered cymule, the others with usually only 1–2 flowers developing on each, these 5–6-merous, peduncles finely, sparsely strigulose. *Flowers:* male flowers with calyx campanulate, ca. 2 mm long, the tube 1 mm long, the lobes 1 mm long, corolla 6–7 mm long, the tube 5 mm long, the lobes ca. 2 mm long, staminal filaments 7 mm long; female flowers with peduncles 2–3 mm long, calyx tubular, 0.4–0.8 mm long, corolla narrowly funnelform, the tube 1.8–2 mm long, the lobes 1.4–1.8 mm long, the styles 9–11 mm long. *Fruits* ca. 6–7 mm long × 3 mm wide, obovoid-elliptic, ripening bright red or reddish orange, apex with persistent calyx teeth. *Pyrenes* obovoid-ellipsoid, ca 4 mm long × 2.5-3 mm wide hemispherical in cross-section, smooth, heavily slerified on the edges and on the flat inner face, thin on convex side.

Distribution: Marquesas Islands, scattered to locally common on Ua Pou and a single collection known from Nuku Hiva.

Ecology. This species is known from 770 to 920 m elevations on steep slopes or ridges in cloud-shrouded shrubland and wet forest dominated by *Freycinetia impavida* (Gaudich. ex Hombr.) B. C. Stone*, Pandanus tectorius* Parkinson*,* and *Metrosideros collina* (J. R. Forst. & G. Forst.) A. Gray.

Specimens Examined. Marquesas Islands: Nuku Hiva. between Taiohae Bay and Hooumi Bay, 900 m, *Gagné 1159* (BISH, US). **Ua Pou:** Teavaituhai, 3000 ft, Mumford & Adamson 642 (BISH), Meyer 2835 (PTBG, US); Teavahaakiti, steep slopes of main ridge to S of Oave, N & E facing cliffs between Teavahaakiti & Tekohepu, 2700 ft, Perlman & Wood 15905 (PTBG), 2550 ft, Perlman & Wood 15922 (PTBG, WU); Matahenua, between Oave and Poutetainui, high mountain peaks along main backbone ridge, 899 m, Perlman & Wood 19079 (P, PAP, PTBG, US); forested ridge and slopes up to Teavahaakiti, northwest side, 914 m, Wood 10440 (PAP, PTBG, US), Wood 10446 (PTBG, US); central Ua Pou including the summit crest regions around Oave and the near-by peak of Matahenua., 2950-3030 ft, [09°23’454”S, 140°04’433”W], Wood & Perlman 10802 (PAP, PTBG, US); Tekohepo, summit, 2500-3000 ft, [09°24’31”S, 140°04’21”W], Wood & Perlman 6487 (PAP, PTBG), Wood & Perlman 6492 (PTBG).

Conservation status. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Endangered** (EN): B1, B2b (i–iii): B1 extent of occurrence <5,000 km²; B2: total area of occupancy less than 500 km² (c. 50 km²); B2b (i–iii), habitat continuing decline inferred in (i) extent of occurrence, (ii) areas of occupancy, and area, (iii) extent and/or quality of habitat. The suitable habitat for *C. esulcata* on Nuku Hiva (c. 340 km²) and Ua Pou (c. 105 km²) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

***Coprosma fatuhivaensis* W. L. Wagner & Lorence, sp. nov.**
urn:lsid:ipni.org:names:77112736-1
http://species-id.net/wiki/Coprosma_fatuhivaensis
Figs 1, 4A, B

Foliis tenuiter coriaceis, 5.3–6.7 cm longis × 0.9–1.8 cm latis, anguste ellipticis, petiolis 0.7–1.1 cm longis, stipulis circa 2–2.5 mm longis.

Type. Marquesas Islands: Fatu Hiva: Tevaiua, southern summit region, 870 m, 15 February 2003, K. R. Wood 10137 (Holotype: PTBG!; Isotypes: AD!, BISH!, K!, MO!, MPU!, NY!, P!, PAP!, US!).

Description. *Tree* ca. 7 m tall; young stems short-pilose. *Leaves* opposite, thinly coriaceous, blades 5.3–6.7 × 0.9–1.8 cm, narrowly elliptic, pinnately veined with 8–9 pairs of secondary veins, higher level venation conspicuously reticulate, both surfaces glabrous, domatia minute, usually subcircular, located along midrib near juncture of secondary veins, apex acute, base attenuate; petioles 0.7–1.1 cm long; stipules ca. 2–2.5 mm long, connate 4/5 of length, both surfaces glabrate, margins weakly ciliate and dentate with a larger and sometimes also a few small colleters, the colleters often with a small tufts of a few hairs. *Inflorescences* axillary, subsessile, with 3 flowers, these 5–6-merous. *Flowers:* male flowers unknown; female flowers with peduncles to 4.2 mm long, calyx short-tubular, ca. 0.5–0.6 mm long, the tube ca. 0.1–0.2 mm long, the lobes triangular, 0.3–0.4 mm long, corolla narrowly funnelform, the tube 2 mm long, the lobes 1.2–1.3 mm long. *Fruit and pyrenes* unknown.

Etymology. The specific epithet refers to the only known island of occurrence for this species.

Distribution. This new species is known only from a single collection at the type locality in the southern summit region at 870 m on Fatu Hiva, Marquesas Islands.

Ecology. *Coprosma fatuhivaensis* occurs in *Metrosideros collina* windswept wet ridge forest with secondary dominants of *Crossostylis biflora* J. R. Forst. & G. Forst. and *Freycinetia impavida*.

Conservation status. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Critically endangered** (CR): B2a, B2b (i–iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2); B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals (a single individual observed). The suitable habitat for *Coprosma fatuhivaensis* on Fatu Hiva (ca. 85 km^2) is indicated as an endangered environment, threatened by feral animals and invasive plants, reducing the extent of the forest. Estimated population size (collector's note) is a single female individual.

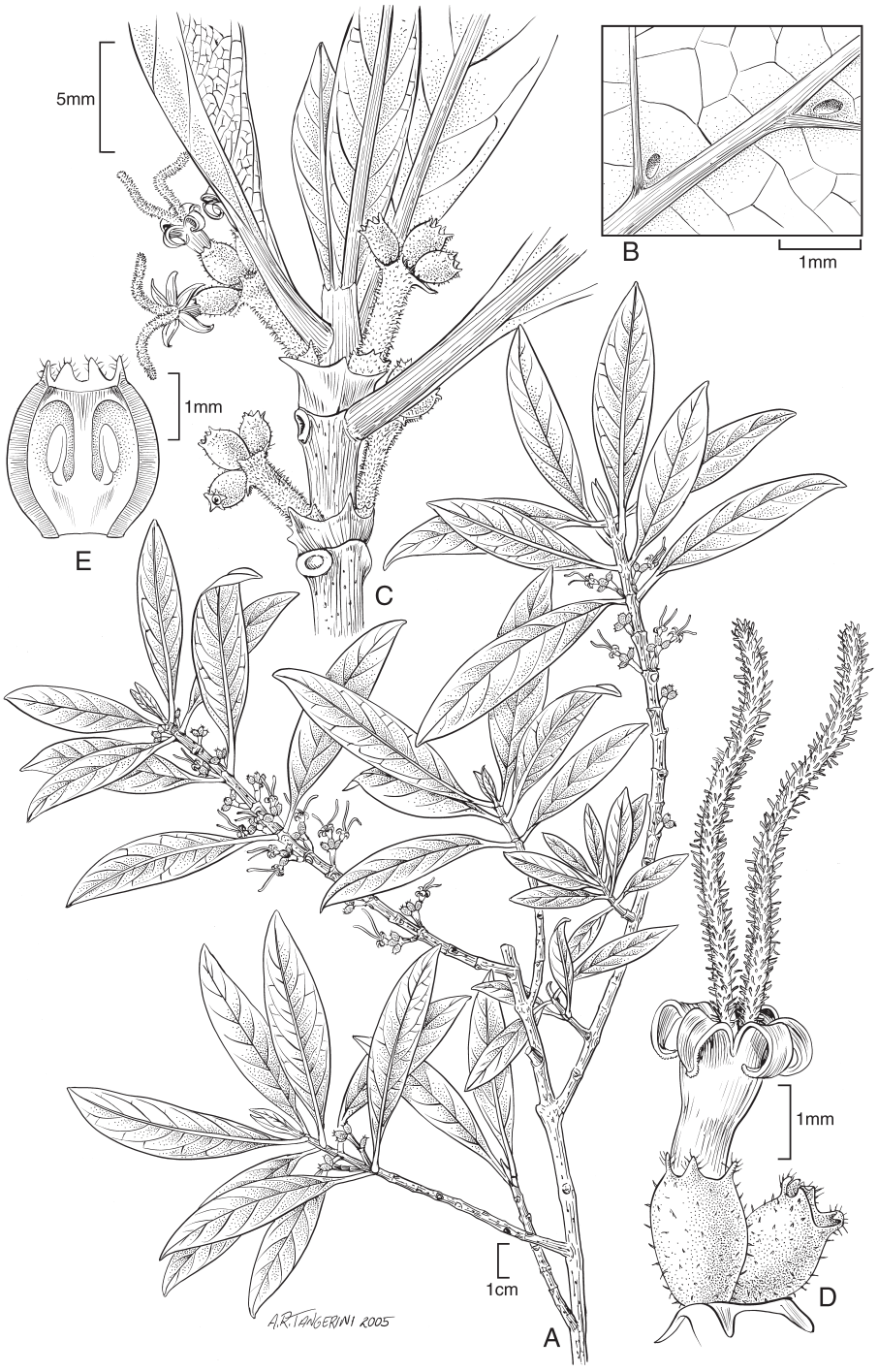

Figure 1. *Coprosma fatuhivaensis* W. L. Wagner & Lorence **A** Flowering branch **B** Lower surface of leaf portion showing domatia **C** Upper stem with female inflorescences **D** Female flowers **E** Longitudinal section of ovary showing basal ovules. Drawn from the type collection (Wood 10137) and field images.

***Coprosma meyeri* W. L. Wagner & Lorence, sp. nov.**
urn:lsid:ipni.org:names:77112737-1
http://species-id.net/wiki/Coprosma_meyeri
Figs 2, 4C, D

Foliis coriaceis 4–7.2 longis × 1.2–2 cm latis, oblanceolatis, laminis cum secondaria et altiori obscura venatione, centrali costa solum conspicua, petiolis 0–0.1 cm, stipulis ca. 3–8 mm longis.

Type. Marquesas Islands: Hiva Oa: Feani area, on Hanamenu trail at summit crest above Vaiumete et Vaiumioi, 1090 m, [9°47.93”S, 139°4.75”W], 30 January 2003, S. Perlman 18337 (Holotype: PTBG!; Isotypes: BISH!, P!, PAP!, US!).

Description. *Shrubs* 2–3 m tall; young stems sparsely villous. *Leaves* opposite, thick-coriaceous, blades 4–7.2 cm × 1.2–2 cm, oblanceolate, only midvein evident, both surfaces glabrous, domatia absent, apex acuminate to acute, base cuneate; petioles ca. 0.1 cm long; stipules 2.5–3 mm long, connate 4/5 of length, both surfaces glabrous, margin dentate with a few conspicuous colleters and ciliate, the colleters usually with a tuft of hairs. *Inflorescences* axillary, apparently trichotomously branched, with very short internodes, with 6(–12) flowers, these 5–6-merous, subsessile. *Flowers*: male flowers with campanulate calyx ca. 2 mm long, the tube 1.5 mm long, the lobes triangular, 0.5 mm long; corolla narrowly funnelform, 5.4–5.7 mm, the tube 3.3 mm long, the lobes 2.1–2.4 mm long, the anthers 2.5–3.1 mm long, filaments to 11 mm long; female flowers unknown. *Fruits and pyrenes* unknown.

Distribution. *Coprosma meyeri* is known only from the type locality at ca. 1090–1113 m elevation in the Feani area along the trail to Hanamenu on the summit crest of Hiva Oa, Marquesas Islands.

Ecology. This new species occurs in cloud-shrouded low wet forest and shrubland dominated by *Metrosideros* and *Weimannia,* with species of *Alsophila, Alstonia, Ascarina, Blechnum, Cheirodendron, Crossostylis, Cyrtandra, Dicranopteris, Freycinetia, Myrsine, Oparanthus, Psychotria, Reynoldsia,* and *Trimenia*.

Etymology. The specific epithet honors Dr. Jean-Yves Meyer, conservation biologist at the Délégation à la Recherche, Polynésie française, in recognition of his untiring efforts to explore and conserve the biodiversity of French Polynesia.

Conservation status. *Coprosma meyeri* is extremely rare, with less than five plants known from a single locality. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Critically Endangered** (CR): B2a, B2b (i-iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2); B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals. The suitable habitat for on Hiva Oa (*c.* 315 km^2) is indicated as an endangered environment threatened by human activities (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest. Its narrow distribution, disturbance from feral pigs and trail clearing, and invasion by alien plant species such as *Syzygium cumini* (L.) Skeels and *Psidium cattleianum* Sabine put it at risk of extinction.

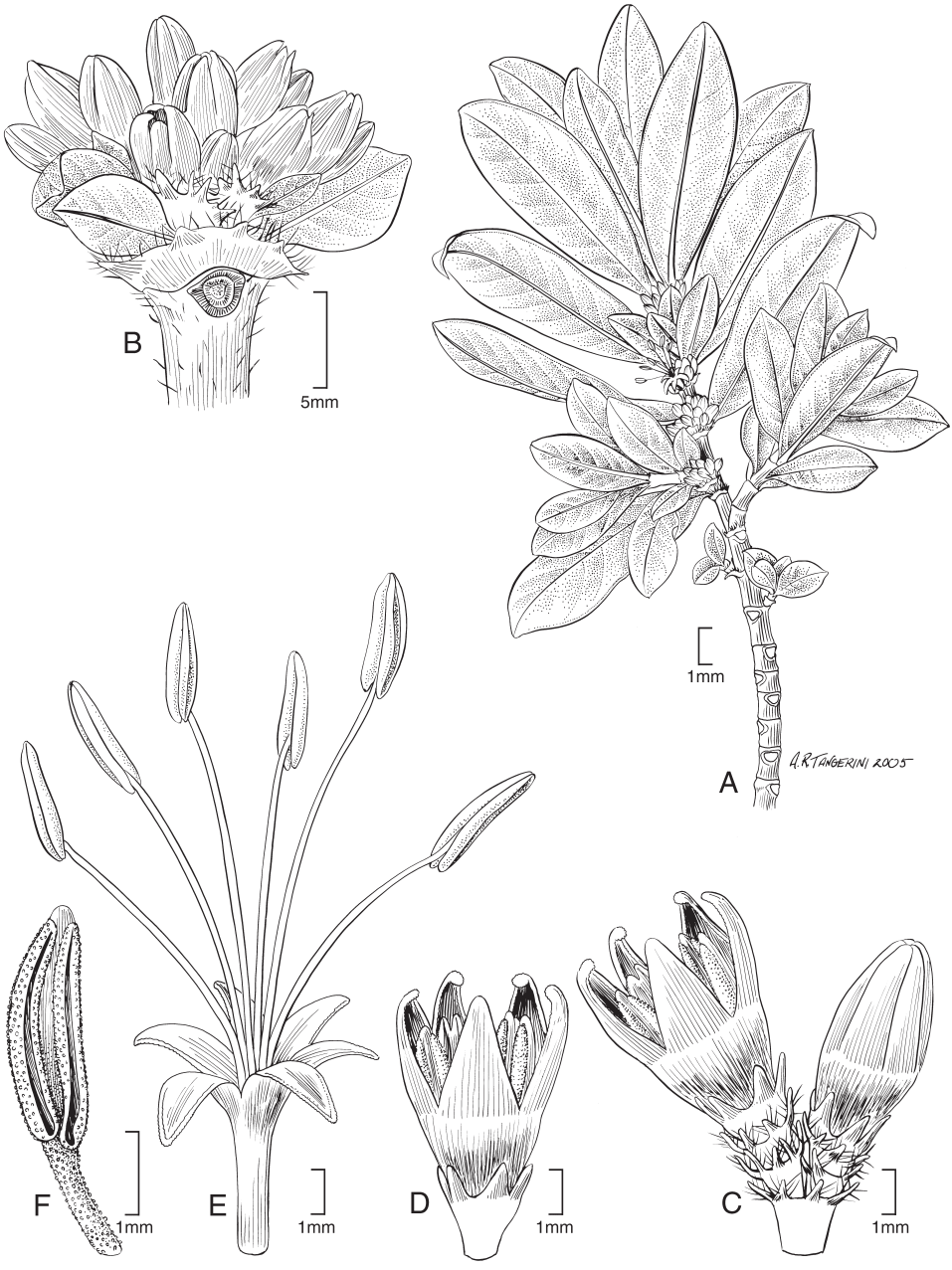

Figure 2. *Coprosma meyeri* W. L. Wagner & Lorence **A** Flowering branch **B** Upper stem with young male inflorescences **C** Male flowers and inflorescence nodes showing the stipules with dentate margin with a few conspicuous colleters and ciliate **D** Young male flower **E** Male flower (corolla and stamens only) **F** Upper part of stamen. Drawn from the type collection (Perlman 18337) and field images.

Specimen examined. Marquesas Islands: Hiva Oa: Feani area, trail to Hanamenu, along summit crest, 1113 m, [9°48' 3" S, 139°4'682" W], 1 Aug 2005, S. Perlman 19763 (BISH, P, PAP, PTBG, US).

Coprosma nephelephila **Florence (Bulletin du Muséum national d'Histoire naturelle, B, Adansonia, Ser. 4, 8: 3, 1986).**
http://species-id.net/wiki/Coprosma_nephelephila

Type. Marquesas Islands: Nuku Hiva. Route Toovii–Terre Deserte, 6 km apres le col, 5 Juin 1984, 1050 m, J. Florence 6913 (holotype P!; isotypes: BISH!, K!, NY!, PAP!, US!).

Description. *Shrubs or small trees* 2.5–6 m tall; stems glabrous. *Leaves* ternate, chartaceous, blades 5–16.5 × 2–5.5 cm, oblanceolate, oblong or elliptic-oblanceolate, midrib narrow, pinnately veined with 8–13 pairs of secondary veins, both surfaces glabrous, higher level venation conspicuously reticulate, raphides conspicuously visible on lower surface along the major veins, domatia minute, located along secondary veins and sometimes also along midrib near juncture, apex acuminate, base attenuate; petioles 0.3–1.2 cm long, narrowly winged; stipules 4–6 mm long, connate ½–4/5 of length, both surfaces glabrous, margins ciliate and dentate with conspicuous colleters, apex obtuse to a conspicuous appendage. *Inflorescences* axillary, trichotomously branched with 6(–15) flowers, each branch with 1–3 nodes, the uppermost with a 3-flowered cymule, and the others when present with usually only 1–2 flowers developing on each, these 5–7-merous, peduncles 1–2 cm long. *Flowers*: male flowers with calyx campanulate, 2.3–3.7mm long, the tube 0.3–1.2 mm long, the lobes 2–2.5 mm long, corolla 6–7 mm long, the tube and lobes ca. 3–3.5 mm long, stamens 5–8(–12), filaments 7–10 mm long; female flowers with peduncles 0.1–0.7 mm long, calyx tubular, 0.4–0.8 mm long, corolla narrowly funnelform, the tube 0.25–0.4 mm long, the lobes 1.5–2.1 mm long, the styles 7–9 mm long. *Fruit* 10-11 × 5-6 mm, ellipsoid, apex with persistent calyx teeth. *Pyrenes* narrowly ovoid-ellipsoid, compressed, 10 × 4-4.5 mm, weakly ribbed dorsally.

Distribution. Known only from the Toovii area of Nuku Hiva, Marquesas Islands.

Ecology. *Coprosma nephelephila* is known from 970 to 1100 m elevation, scattered in montane cloud forests dominated by *Metrosideros* and *Weinmannia* associated with with species of *Alsophila*, *Crossostylis,* and *Ilex*.

Etymology. The specific name alludes to its cloud forest habitat preference.

Conservation status. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Endangered** (EN): B1, B2b (i–iii): B1 extent of occurrence <5,000 km²; B2: total area of occupancy less than 500 km² (c. 50 km²); B2b (i–iii), habitat continuing decline inferred in (i) extent of occurrence, (ii) areas of occupancy, and area, (iii) extent and/or quality of habitat. The suitable habitat for *C. nephelephila* on Nuku Hiva (c. 340 km²) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive

plants, reducing the extent of the forest. The estimated population size for this species is unknown but apparently small.

Specimens examined. Marquesas Islands: Nuku Hiva. Toovii, épaulement S du Mt. Ooumu, 970 m, [08°51'S, 140°08'W], Florence 4342 (BISH, K, NY, P, US); route Toovii-Terre Deserte, km 6.5 après le col, 1010 m, [08°52'S, 140°10'W], Florence 4369 (BISH, P); Haute vallée de Tapueahu, 1070 m, [08°52'S, 140°11'W], Florence 8522 (BISH, CHR, P, PAP, US); summit area of Toovii, near summit of ridge of airport road, S side of new airport road, W side of mountain, 3500 ft [1067 m], Perlman & Wood 15046 (BISH, MO, NY, P, PAP, PTBG, US).

Coprosma reticulata **Florence (Bulletin du Muséum national d'Histoire naturelle, B, Adansonia, Ser. 4, 8: 6. 1986).**
http://species-id.net/wiki/Coprosma_reticulata

Type. Marquesas Islands: Nuku Hiva. Toovii, épaulement au-dessus du réservoir [08°52'S, 140°09'W], 970 m, 12 Avril 1982, Florence 4306 (holotype: P!; isotypes: BISH! [2], K!, NY!, PAP!, US!).

Description. *Shrubs or small trees* 3–10 m tall, up to 12 cm diam., stems glabrous. *Leaves* thinly coriaceous, decussate, the blades 8.5–19.7 × 3–13 cm, oblanceolate, oblong or elliptic-oblanceolate, glabrous, pinnately veined with 8–13 pairs of secondary veins, higher level venation conspicuously reticulate, raphides conspicuously visible on lower surface along the major veins, which are dark-colored, domatia small, slightly elongated, located along midrib near juncture with secondary veins, apex acuminate, base attenuate; petioles 0.3–1.3 cm long, narrowly winged; stipules ca. 3–5 mm long, connate ½–4/5 of length, glabrous externally, strigose internally, margins ciliate and dentate with conspicuous colleters, apex obtuse to a conspicuous appendage. *Inflorescences* axillary, simple or occasionally trichotomously branched with 7 flowers, rarely more, each branch with 1–3 nodes the uppermost with a 3-flowered cymule, the others usually with only 1–2 flowers developing on each, these 4–6-merous, peduncles finely, sparsely strigulose. *Flowers:* male flowers with calyx tube 0.5–1.5 mm long, the lobes 0.3–0.9 mm long, the corolla 6.9–8 mm long, the tube 3.5–4.2 mm long, the lobes 3.4–4 mm long, the stamens with filaments 10–13 mm long, the anthers ca. 5 mm long; female flowers with calyx tube 0.4–0.8 mm long, the lobes 0.3–0.6 mm long, corolla narrowly funnelform, the tube 1.5–2 mm long, the lobes 2.2–2.5 mm long, the styles 8–10 mm long. *Fruit* 7–8 × 3.5–4 mm, obovoid to ellipsoid, ripening orange, apex with persistent calyx teeth. *Pyrenes* ovoid-ellipsoid, compressed, 6 × 3 mm, rugulose, dorsally weakly 1-ribbed.

Distribution. Known only from the Toovii area of Nuku Hiva, Marquesas Islands, at elevations from 800 to 1100 m.

Ecology. *Coprosma reticulata* occurs in wet forest and cloud forest habitat with species of *Alsophila, Crossostylis, Fagraea, Freycinetia, Metrosideros, Weinmannia*, and an understory of ferns including the genera *Dicranopteris, Histiopteris,* and *Nephrolepis*.

Etymology. The specific epithet refers to the distinctive reticulate network of tertiary veins.

Conservation status. Based on the IUCN criteria and categories this species is assigned a preliminary Red List status of **Endangered** (EN): B1, B2b (i–iii): B1 extent of occurrence <5,000 km²; B2: total area of occupancy less than 500 km² (c. 50 km²); B2b (i–iii), habitat continuing decline inferred in (i) extent of occurrence, (ii) areas of occupancy, and area, (iii) extent and/or quality of habitat. The suitable habitat for *C. reticulata* on Nuku Hiva (c. 340 km²) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest. The population size for this species is unknown, but based on available herbarium specimens (14) it is apparently not as rare as its Marquesan congeners.

Specimens examined. Marquesas Islands: Nuku Hiva. Toovii, vallon au-dessus du réservoir, 805 m, [08°52'S, 140°09'W], Florence 4316 (BISH, K, NY, P, PAP, US); Toovii, épaulement au-dessus du réservoir, 910 m, [08°52'S, 140°09'W], Florence 4325 (BISH, P); Toovii, épaulement S du Mt. Ooumu, 980 m, [08°51'S, 140°08'W], Florence 4346 (BISH, K, NY, P, US); Toovii, flanc W de la vallée de la Tapuaooa, 925 m, [08°51'S, 140°09'W], Florence 7452 (BISH, P, PAP); Toovii region, trail along ridge from near l'Economie Rurale complex to Ooumu peak, 860–1080 m, Lorence et. al. 6116 (BISH, PAP, PTBG, US); Mt. Ooumu, 1066 m, Mumford & Adamson 582 (BISH); Toovii Plateau, trail behind l'Economie Rurale, toward Ooumu peak, 3100 ft, Perlman 10124 (BISH, MO, PAP, PTBG, US); off new airport road, W of summit crest, W of Peak #1227 M., drainages of Matatekouaehi, 3580 ft, Perlman & Wood 15041 (BISH, PAP, PTBG, US); along old airport road on W side of summit ridge, W of Toovii, 1.5 miles S of new airport road, 3360 ft, Perlman & Wood 15067 (AD, BISH, MO, NY, P, PAP, PTBG, US); Toovii, 850 m, Thibault 127 (BISH, P, US); Ooumu area, top of Tapueahu Valley off new hwy, 3500–3700 ft [1067–1178 m], [08°51'53"S, 140°10'63"W], Wood et. al. 6344 (PTBG), [08°51'S, 140°19'W], Wood & Perlman 4587 (PTBG, US), Wood & Perlman 4627 (BISH, MO, PAP, PTBG, US).

***Coprosma temetiuensis* W. L. Wagner & Lorence, sp. nov.**
urn:lsid:ipni.org:names:77112738-1
http://species-id.net/wiki/Coprosma_temetiuensis
Figs 3, 4E, F

Type. Marquesas Islands: Hiva Oa. Along trail from Atuona to Mt. Temetiu, moist forest, 700 m, 29 January 2003, D. H. Lorence, L. Dunn, & J. Price 8931 (Holotype: PTBG!; Isotypes: BISH!, P!, PAP!, US!).

Foliis tenuiter coriaceis, 5.1–9.1 × 2.1–3.6 cm, petiolis 0.3–0.8 cm longis, stipulis 1.5–3 mm longis.

Description. *Shrubs* 4–6 m tall; young stems short-pilose. *Leaves* opposite, thinly coriaceous, blades 5.1–9.1 × 2.1–3.6 cm, elliptic, pinnately veined with 8–9 pairs of

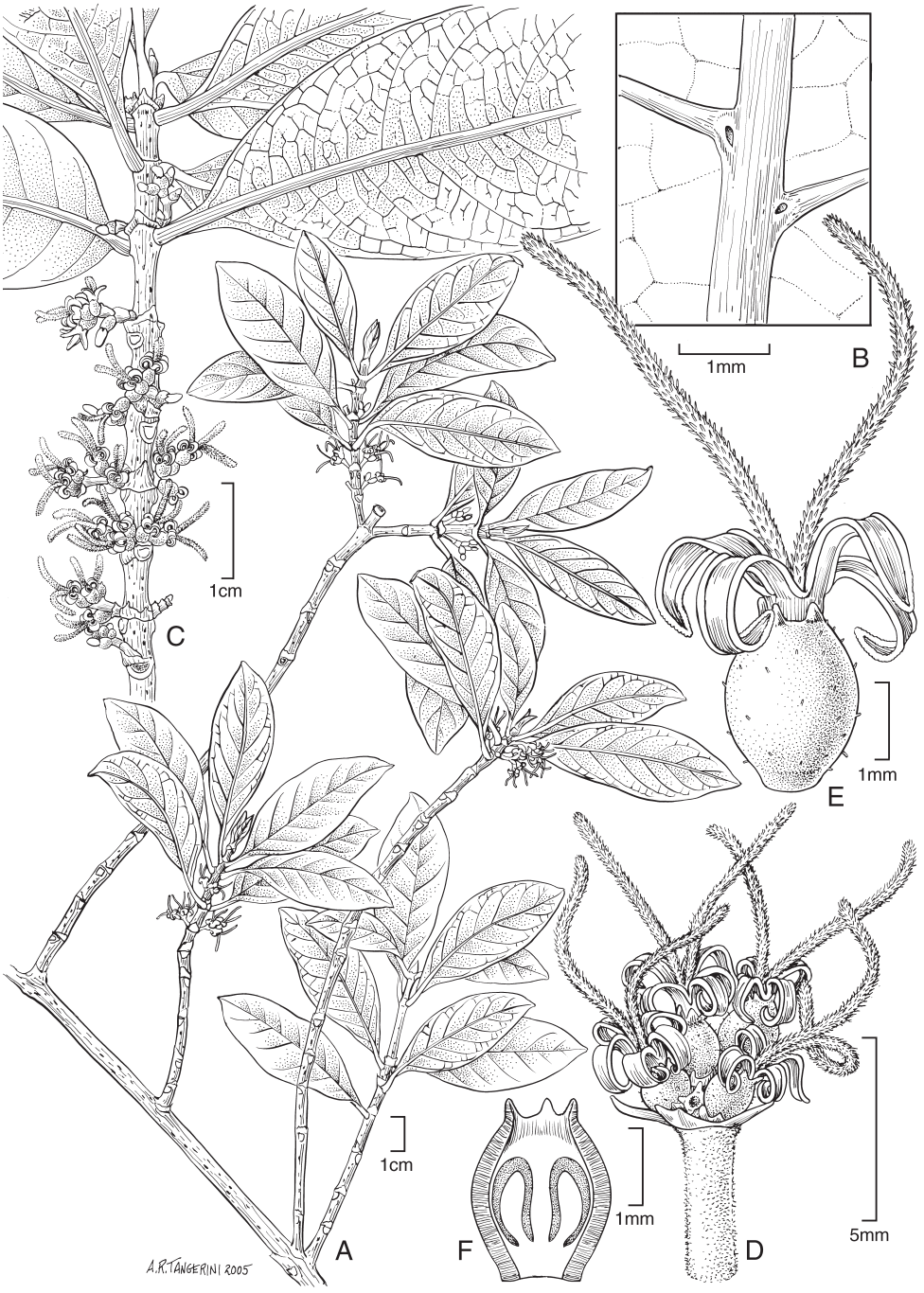

Figure 3. *Coprosma temetiuensis* W. L. Wagner & Lorence **A** Flowering branch **B** Lower surface of leaf portion showing domatia **C** Upper stem with female inflorescences **D** Female inflorence **E** Female flower **F** Longitudinal section of developing fruit showing young basal seeds. Drawn from the type collection (Lorence et al. 8931) and field images.

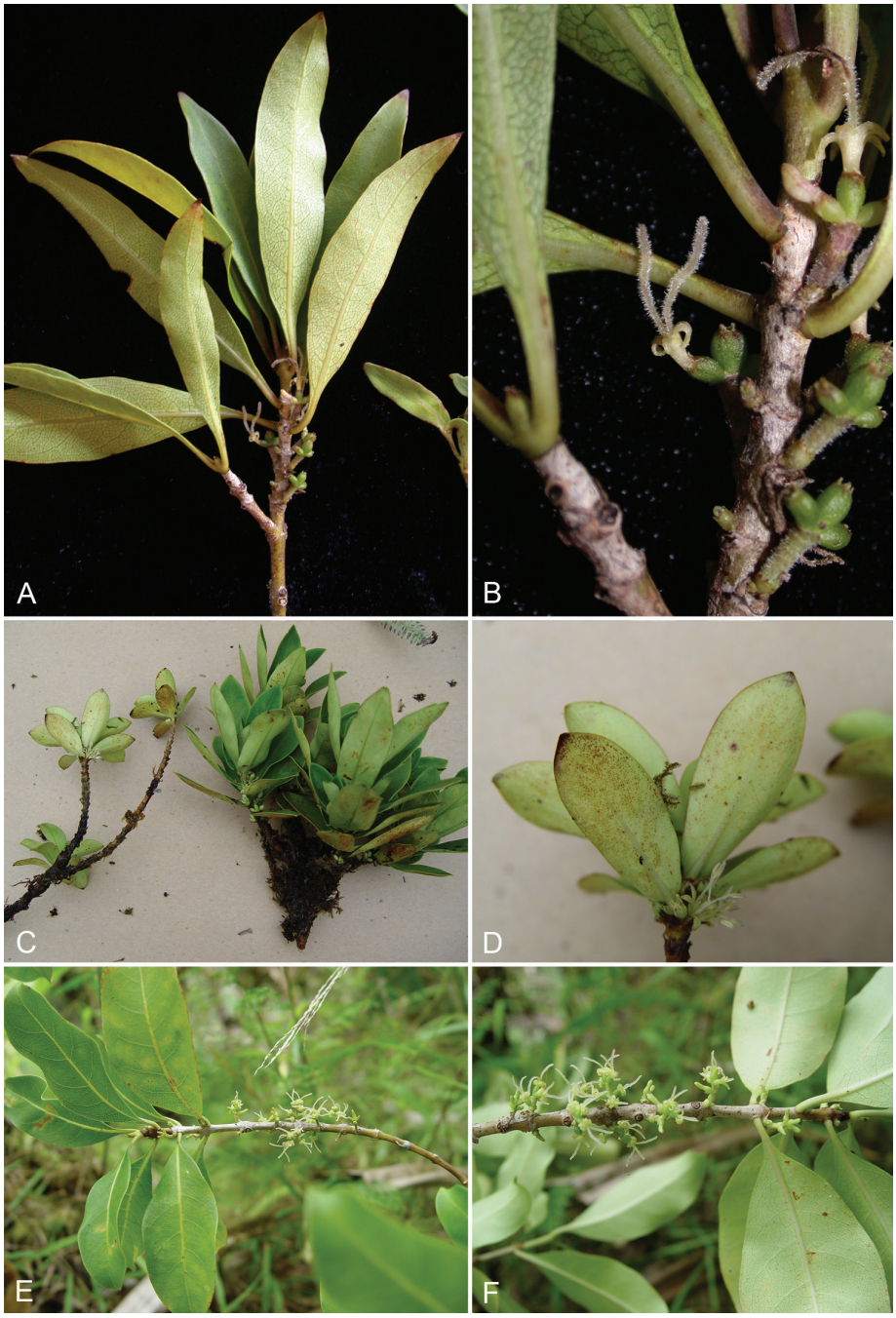

Figure 4. Three new Marquesan *Coprosma* species. *Coprosma fatuhivaensis* W. L. Wagner & Lorence **A, B** branchlets with female flowers (Fatu Hiva, Wood 10137, photos K.R. Wood); *Coprosma meyeri* W. L. Wagner & Lorence **C, D** branchlets with male flowers (Hiva Oa, Perlman 18337, photos D. Lorence); *Coprosma temetiuensis* W. L. Wagner & Lorence **E, F** branchlets with female flowers (Hiva Oa, Lorence & Dunn 8931, photos D. Lorence).

veins, higher level venation conspicuously reticulate, both surfaces glabrous, domatia small, usually somewhat elongate, located along midrib near juncture of secondary veins, apex acuminate, base cuneate; petioles 0.3–0.8 cm long; stipules ca. 1.5–3 mm long, connate 4/ 5 of length, both surfaces glabrous, margins glabrous and dentate with a few small colleters, apex obtuse to a conspicuous appendage. *Inflorescences* axillary with 3(–7) flowers, with 1–3 nodes, the uppermost with a 3-flowered cymule, the others with usually only 1–2 flowers developing on each, these 5-merous, the peduncles 0–4 mm long, finely short-pilose. *Flowers: male flowers* unknown; *female flowers* with calyx short-tubular, 0.25–0.3 mm long, the teeth ca. 0.2 mm long, glabrous, corolla narrowly funnelform, the tube 0.3 mm long, the lobes 2.2–2.5 mm long, glabrous, the styles 5.5–7 mm long. *Young fruits* sparsely pilose, fruits and pyrenes otherwise unknown.

Distribution. Known only from areas the vicinity of Mt. Temetiu, the highest peak on Hiva Oa, Marquesas Islands.

Ecology. *Coprosma temetiuensis* occurs at 700–880 m elevation in mesic forest and cloud forest with *Metrosideros* and *Weimannia,* associated with species of *Alsophila*, *Crossostylis, Freycinetia, Hibiscus, Pandanus,* and *Phyllanthus.*

Etymology. The specific epithet refers to the only known locality for this species.

Specimen examined. Marquesas Islands: Hiva Oa. Hanamenu region, up Hanamenu valley to the drainages below and west of Temetiu, 884 m, [9°76'S, 139°0'W], Wood 10239 (PTBG).

Conservation status. This species is extremely rare, with only two plants known from this locality. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Critically Endangered** (CR): B2a, B2b (i–iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals. The suitable habitat for *Coprosma temetiuensis* on Hiva Oa (*c.* 315 km^2) is indicated as an endangered environment, threatened by human activities (deforestation and fire), feral animals, and invasive plants, reducing the extent of the forest.

Acknowledgments

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Revision of *Kadua* (Rubiaceae) in the Marquesas Islands, French Polynesia, with description of the new species *K. lichtlei*

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Abstract

Kadua lichtlei Lorence & W. L. Wagner, **sp. nov.**, a new species from Ua Huka, Marquesas Islands, is described and illustrated. This new species differs from the three other Marquesan *Kadua* species by its broadly elliptic to broadly ovate or subcircular leaf blades as well as much smaller and more numerous (80-300) flowers and smaller capsules. Known from a single population of about 30 individuals, we conclude this new species should be added to the IUCN Red List as critically endangered (CR). A key, amended descriptions, conservation status, and specimen citations for the three previously described Marquesan species, *Kadua lucei, K. nukuhivensis,* and *K. tahuatensis* are also provided.

Keywords

Conservation, French Polynesia, *Kadua*, Marquesas Islands, Rubiaceae

Introduction

Until recently the Marquesas Islands were relatively poorly explored botanically. Prior to initiation of the Flore de la Polynésie française project under the auspices of Jacques Florence at IRD (formerly ORSTOM) no species of Rubiaceae belonging to tribe Spermacoceae were known from these islands (Brown 1935). Collecting there intensi-

fied greatly with the onset of this project, and Florence and collaborators discovered two distinctive woody species of *Kadua* Cham. & Schltdl. One additional related species was discovered during the collecting phase of the current Vascular Flora of the Marquesas Islands project under the direction of David H. Lorence and Warren L. Wagner (Wagner and Lorence 1997; see website at http://botany.si.edu/pacificislandbiodiversity/marquesasflora/index.htm). These new taxa were published as *Hedyotis lucei, H. nukuhivensis,* and *H. tahuatensis* by Florence and Lorence (2000). Additional field work in 2003–2004 revealed the presence of yet another species on Ua Huka apparently not closely related to the other three which is described below.

Generic delimitations in *Hedyotis* L. and related genera in Hedyotidinae have not been fully resolved, although recent morphological and molecular studies suggest that *Hedyotis* s. str. is an Old World genus ranging from southeastern Asia to the Caroline Islands of Micronesia and with two widespread species ranging into western Polynesia (Church 2003; Terrell and Robinson 2003; Kårehed et al. 2008; Groeninckx et al. 2009). Virtually all the Polynesian species, the majority Hawaiian, were formerly placed in *Hedyotis* (Fosberg 1943; Wagner et al. 1990). However, results from a recent study of Hawaiian species of *Kadua*, focusing on capsule and seed morphology, revealed that these characters of Hawaiian and certain South Pacific species are distinct from other Asian and western Pacific species of *Hedyotis,* and consequently they have been transferred to the genus *Kadua* (Terrell et al. 2005). *Kadua* now comprises some 30 species including this new species and *K. haupuensis* Lorence & W. L. Wagner, a new species recently described from Kaua`i (Lorence et al. 2010).

Based on their salverform, fleshy corollas with appendaged lobes and non-diplophragmous capsules (i.e., that do not separate into paired cocci after dehiscing), the three Marquesan species formerly placed in the genus *Hedyotis* (Florence & Lorence 2000) have been transferred to the genus *Kadua* by Terrell et al. (2005). These include *Kadua lucei* (Lorence & J. Florence) Lorence & W. L. Wagner, *K. nukuhivensis* (J. Florence & Lorence) Lorence & W. L. Wagner, and *K. tahuatensis* (Lorence & J. Florence) Lorence & W. L. Wagner.

Results of an unpublished molecular analysis (Motley 2003) place species of the Hawaiian *Kadua* sect. *Kadua* in the same clade as sect. *Protokadua* with a single Hawaiian species, sect. *Gouldiopsis* with four Hawaiian species, and sect. *Austrogouldia* with six species including two Marquesan species (only *K. nukuhivensis* and *K. tahuatensis* were examined), two from the Society Islands, and *K. rapensis* F. Br. from Rapa, as well as the unispecific sect. *Oceanica* with a single species, *K. romanzoffiansis* Cham. & Schltdl. from southeastern Polynesia. Together these taxa constitute the large Hawaiian and French Polynesian clade (Motley 2003).

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from alcohol-pre-

served flowers and fruits, field notes, and digital photos. Measurements are presented in the descriptions as follows: length × width, followed by units of measurement (mm or cm). All specimens cited in this paper have been seen by the authors. Specimens from the following herbaria were studied: AD, BISH, BR, K, MO, NY, P, PAP, PTBG, and US. The area of occupancy (distribution) for this species was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001; www.iucnredlist.org/info/categories_criteria2001).

Systematics

Key to species of *Kadua* in the Marquesas Islands

1a Inflorescences with 80–300 flowers; corolla tube 1.8–2.2 mm long; capsules 4–5 mm long, 3.5–4 mm wide; seeds 0.5–0.6 mm long, 0.35–0.4 mm wide, irregularly ovoid to ellipsoid..... ***K. lichtlei***

1b Inflorescences with 12–30 flowers; corolla tube 13–28 mm long; capsules 7–22 mm long, 6–12 mm wide; seeds 0.9-1.3 mm long, irregularly trigonous or angulate (unknown in *K. lucei*) **2**

2a Inflorescences 3–6 cm long; corolla tube 13–16 mm long; Tahuata .... ***K. tahuatensis***

2b Inflorescences 8–13 cm long; corolla tube 22–28 mm long; Nuku Hiva; Fatu Hiva..... **3**

3a Corolla lobes 8–10 mm long; capsules 7–8 mm long, 6 mm wide; Fatu Hiva..... ***K. lucei***

3b Corolla lobes 10–15 mm long; capsules 15–22 mm long, 7–12 mm wide; Nuku Hiva ..... ***K. nukuhivensis***

Kadua lichtlei **Lorence & W.L.Wagner, sp. nov.**
urn:lsid:ipni.org:names:77112739-1
http://species-id.net/wiki/Kadua_lichtlei
Figs. 1, 2A,B, 3

Differt a congeneribus Marquesanis laminis late ovatis vel late ellipticis vel rotundis (3–) 5–17.5 × (1.8–) 3.5–11.5 cm, inflorescentia 6.5–14 × 9–12 cm, floribus in inflorescentibus 80–300, parvis, hypanthio 1–1.8 mm longo, corollae tubo 1.8–2.2 mm longo, corollae lobis 1.5–2 mm longis, et capsulis minoribus 4–5 × 3.5–4 mm.

Type. Marquesas Islands: Ua Huka: Hane/Hokatu cliff zone, 520m elevation, 14 December 2003, K.R Wood and J.-Y. Meyer 10554 (holotype PTBG-44091!; Isotypes AD!, BISH!, BR!, K!, MO!, NY!, P!, PAP!, US!).

Figure 1. *Kadua lichtlei* Lorence & WL Wagner **A** habit, fruiting branch **B** inflorescence **C** node showing stipule and petiole bases **D, E** flowers in bud and at anthesis **F** mature capsule, dehisced **G** seeds, lateral and dorsal (center) views. **A, F, G**. based on the type collection Wood & Meyer 10554; **B, C, D, E** based on Lorence 9476.

Description. *Shrub or small tree* reaching 4 m tall, glabrous except for inflorescence, moderately branched, branches diffuse or often decumbent, twigs 3–3.5 mm in diam., internodes compressed, bark smooth to striate, dark brown. *Leaves* opposite, those of a pair at a node equal or sometimes unequal, blade (3–) 5–17.5 × (1.8–) 3.5–11.5 cm, broadly ovate, broadly elliptic, broadly obovate-elliptic or subcircular, chartaceous, glabrous, when fresh glossy dark green above, light green beneath, costa greenish white, margins entire, base acute to obtuse or rounded, shortly decurrent, apex obtuse or rounded, tip abruptly short acuminate, 0.5–1.5 cm , secondary veins 6–9(–11) per side, festooned brochidodromous, venation prominulous and conspicuous to 3º adaxially and to 4º abaxially; petioles (0.5–)1–2 cm long, winged distally; stipules interpetiolar (occasionally also intrapetiolar), fused with adaxial petiole bases, the body forming a short, broadly triangular sheath 1.5–3 × 3–7 mm, apiculate or with a short lateral ridge, glabrous, persistent. *Inflorescences* terminal, 6.5–14 × 9–12 cm (including the corollas), cymose-paniculate or -corymbiform, trichotomous, 80–300-flowered, sessile or sometimes with peduncle 3–4 cm long, the basal primary branches subtended by a pair of short petiolate, ovate foliaceous bracts 2–3.5 cm long, branching to the 4º (–5º), axes and pedicels minutely papillose-puberulent, subtended by brown triangular acuminate bracts 0.5–2 × 0.5–1 mm. *Flowers* hermaphroditic, apparently monomorphic and protandrous, borne in dichasial cymules on ultimate branches, central flower often sessile, lateral ones on pedicels to 4 mm long, hypanthium green when fresh, 1–1.8 × 1.2–1.6 mm, broadly obovoid or obconical, tuberculate, calyx tube 0.2–0.4 mm long, glabrous externally and internally, calyx lobes 4 (–5), 0.2–0.5 mm long, triangular, glabrous; corolla in bud 4-angular, apex obtuse, slightly or not depressed, at anthesis shortly hypocrateriform, when fresh with white lobes and green tube, tube 1.8–2.2 × 1–1.3 mm medially, externally and internally glabrous, lobes 4, triangular-ovate, 1.5–2 × 1.3–1.6 mm, apex with a small incurved appendage, externally papillose, internally rugulose; anthers 4, 0.7–1.4 mm long, ellipsoid, apiculate, bilobed basally, sessile, attached below top of tube, tips exserted; style 1.5 mm long, stigma lobes 0.5 mm long, included in tube. *Capsules* 2/3 inferior, broadly obovoid to subglobose, 4–5 × 3.5–4 mm in diam., apex (beak portion above the calyx) rounded to conical, glabrous, dark brown when fresh, vascular bundles becoming visible with age, loculicidal, apex splitting into 4 segments. *Seeds* c. 200, dull brown, 0.5–0.6 × 0.35–0.4 mm, irregularly ovoid to ellipsoid, laterally compressed, laterally cuneate with a marginal punctiform hilum, the testa irregularly reticulate with areoles enclosing granulate-verrucose mounds.

Distribution. This new species is known only from Ua Huka, Marquesas Islands, where it is apparently restricted to the Hokatu cliff zone above Hane village.

Ecology. Rare and localized, this new species occurs in mixed wet shrubland and herbland growing on basalt cliffs and rock outcrops above wet forest of *Hibiscus tiliaceus* L., *Pandanus tectorius* Parkinson, and *Freycinetia impavida* (Gaudich. ex Hombr.) B.C. Stone. Other associates include species of *Bidens, Boehmeria, Maytenus, Peperomia, Alyxia, Morinda, Phyllanthus, Miscanthus, Macropiper, Xylosma*, and diverse pteridophytes. It was collected in flower in December and June (in bud), and in fruit in June and December (old fruit with a few seeds).

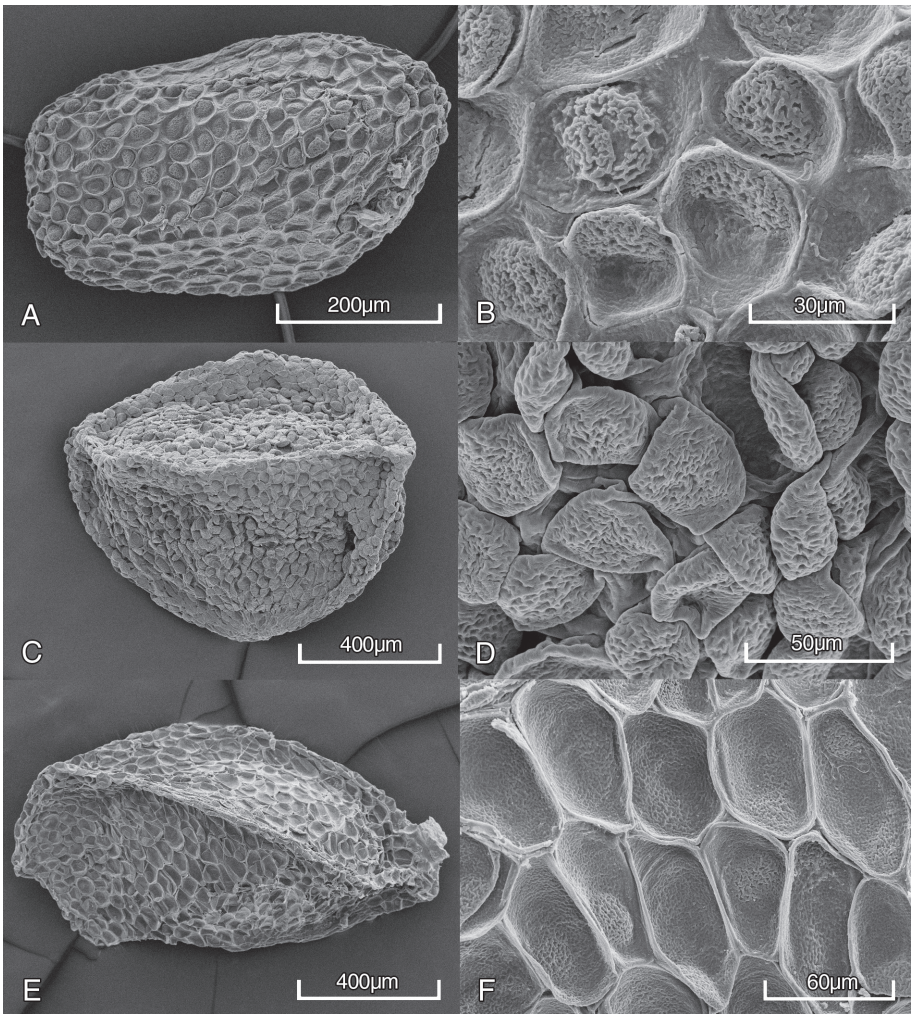

Figure 2. Seeds of three Marquesan *Kadua* species, whole seed and surface detail **A, B** *Kadua lichtlei*, Wood 10514 (PTBG) **C, D** *Kadua nukuhivensis* **C** Perlman 15029 (PTBG) **D** Perlman 15054 (PTBG) **E, F** *Kadua tahuatensis* Perlman 16020 (PTBG).

Etymology. We are pleased to name this new species in honor of Mr. Léon Lichtle, Mayor of Ua Huka, for his generous help and logistic support when we conducted field work on the island and also in recognition of his strong support for conserving the island's native flora and fauna.

Conservation status. The area of occupancy (distribution) for the species was calculated using herbarium collection data and field observations, and the conservation status is proposed following the IUCN Red List Category criteria (IUCN 2001). IUCN Red List Category: **Critically Endangered** (CR): B2a, B2b i-iii; D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred. The suitable habitat for *Kadua lichtlei* on

Ua Huka (ca. 83 km^2) is indicated as an endangered environment, threatened feral animals and invasive plants, reducing the extent of the forest. Estimated population size is about 30 individuals known only from the type locality (*Wood & Meyer 10514*). Threats include invasion by weeds including *Psidium guajava* L. and *Ageratum conyzoides* L., browsing by goats, and landslides. Several plants are in cultivation at the National Tropical Botanical Garden grown from seed (NTBG accession no. 040036, ex *Wood 10514*).

Specimens examined. Marquesas Islands: Ua Huka: Hane valley, ridge and cliffs above tiki marae, back of valley on west side, 8º54.48'S, 138 º3.54'W, 518 m, 12 Jun 2004, Perlman et al. 19007 (BISH, P, PAP, PTBG, US); Hane/Hokatu cliff zone, 520m, 11 December 2003, Wood & Meyer 10514 (BISH, P, PAP, PTBG, US), 550m, 14 December 2003, Wood & Meyer 10544 (PTBG, US), 10547 (PTBG, US), 12 June 2004, 8º54.72'S, 139 º31.60'W, 520 m, Wood et al. 10737 (PTBG), 19738 (PTBG, US).

Cultivated. Hawaiian Islands: Kaua`i: Koloa District, National Tropical Botanical Garden, horticulture center nursery, 5 October 2005, *Lorence 9476* (PTBG, US).

Discussion. Within the Marquesan clade *Kadua lichtlei* differs markedly from the other three species by a number of characters, notably its broadly elliptic to broadly ovate or subcircular leaf blades, much smaller and more numerous flowers (80-300 per inflorescence), and smaller capsules. In addition, seeds of *K. nukuhivensis* and *K. tahuatensis* (those of *K. lucei* were not available) are more sharply angulate with well defined marginal ridges. Seed morphology has proven useful in the infrageneric classification of *Kadua* (Terrell et al. 2005). Seeds of *K. lichtlei* are laterally compressed and laterally cuneate with a marginal punctiform hilum, ovoid to ellipsoid, and irregularly angulate with an irregularly reticulate testa with areoles enclosing reticulate-verrucose mounds (Fig. 1G, 2A,B). Its seed morphology suggests an affinity to species of the Hawaiian *Kadua* sect. *Kadua* (Terrell et al. 2005). However, we here place *K. lichtlei* in section *Austrogouldia*, partly based on the fact that the intra-areolar seed surface has reticulate verrucose sculpturing and is somewhat different from that in sect. *Kadua*. Seeds of species examined so far in this section (*K. nukuhivensis* and *K. tahuatensis*) link section *Austrogouldia* to the Hawaiian sect. *Kadua*.

***Kadua lucei* (Lorence & J.Florence) W.L.Wagner & Lorence, Syst. Bot. 30:832 2005.**

http://species-id.net/wiki/Kadua_lucei

Basionym. *Hedyotis lucei* Lorence & J. Florence (Adansonia, sér. 3, 22: 225, 2000).

Type. Marquesas Islands: Fatu Hiva: au pied de la crête à Touaouoho, env. 1000 m, 3 Aôut1999, J.-P. Luce s.n. (Holotype P!)

Description. *Glabrous shrubs* 1.5–2 m tall, leafy twigs 4–6 mm in diam., internodes compressed, bark brown, smooth to striate or rugulose. *Leaves* of a pair equal to subequal, blade elliptic to obovate-elliptic, (5.3–)10–14.5 × (3.3–)7–10 cm, dis-

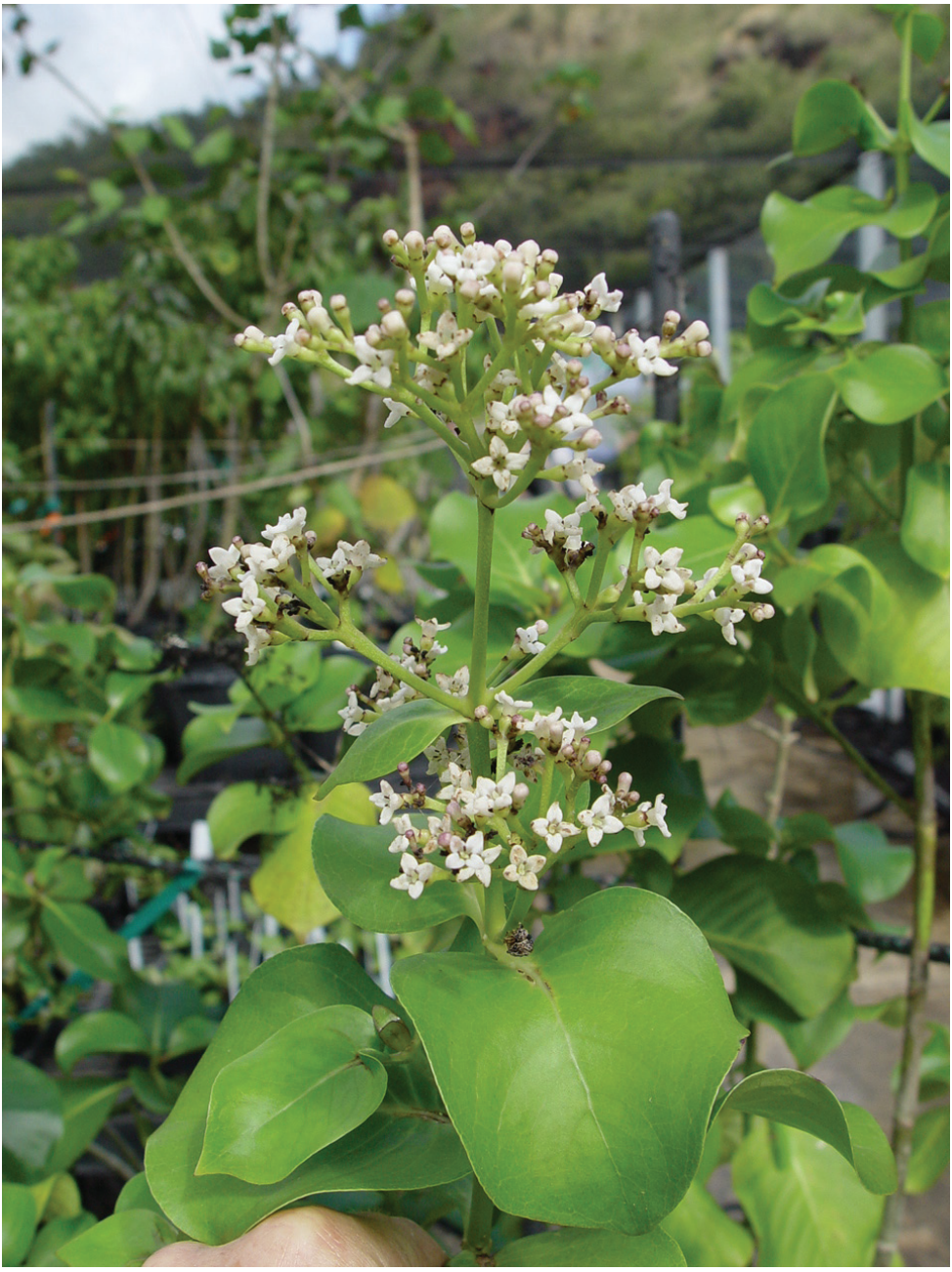

Figure 3. *Kadua lichtlei,* flowering plant growing the National Tropical Botanical Garden nursery, 5 Oct. 2005, Lorence 9476 (PTBG).

colorous, chartaceous to subcoriaceous, base acute to obtuse or rounded, apex acute to obtuse or rounded, often abruptly short acuminate, margin entire, weakly revolute; secondary veins 8–10 pairs, loosely brochidodromous, secondary veins prominulous

on both surfaces, tertiary veins slightly prominulous below; petioles purple when fresh, 2–4 × 2–5 mm, stout, adaxially flattened and slightly winged; stipules inter- and intrapetiolar, apex shortly cuspidate, sheath semicircular, 3 × 4–7 mm, fused with the adaxial petiole bases. *Inflorescences* (only seen with old flowers and young fruits) terminal, corymbiform cymose, 8–9 × 6 cm, peduncle 35 mm long, 2.5–3 mm in diameter, compressed, primary axis 2.5–3 cm × 2–2.5 mm with two pair of secondary branches, the lower pair often branching once again, the upper pair unbranched, the ultimate branches each bearing 2–3 flowers, lower bracts foliaceous, suborbicular, 15 mm in diam. *Flowers* glabrous, about 30 per inflorescence, bracts broadly triangular, scarious, 1 × 1.5 mm, pedicels stout, 2–3 × 0.5–1 mm; hypanthium obconical, 2–3 mm long, calyx limb cupuliform, 2–3 mm long, calyx lobes 4, broadly triangular, 0.5–0.7 × 1.5 mm; corolla fleshy, white when fresh, buds not seen, at anthesis salverform, tube purple tinged when fresh, 22–26 mm long, 1.7–2 mm wide medially, lobes 4, linear to oblong, recurved, 8–10 × 1.5–2 mm, apex with a hook-like appendage 0.5–1 mm long; flowers possibly dimorphic; stamens included, anthers linear, 3–3.5 × 0.3–0.4 mm, connective attached 2 mm from apex of tube; style included, 20 mm long, two stigmatic lobes linear, 2.5 mm long. *Fruits* on stout pedicels 5–7 mm long, capsules turbinate to obovoid-turbinate, old capsules 7–8 × 6 mm, consisting of network of persistent vascular bundles enclosing endocarp, apex (beak portion above the calyx) 1–1.5 mm long. Seeds not seen.

Distribution. Marquesas Islands, Fatu Hiva where known only from a single small population on the summit ridge between Tekou and Touaouoho peaks.

Ecology. This new species was collected at 915–1000 m elevation on a steep, precipitous ridge crest in wet shrubland with species of *Alsophila*, *Freycinetia,* and *Histiopteris*.

Etymology. The specific epithet honors its discoverer and first collector, Mr. Jean-Pierre Luce, an amateur naturalist, in recognition of his efforts to explore the most rugged mountainous zones of the Marquesas and thus increase our knowledge of their flora and vegetation.

Conservation status. The suitable habitat for *Kadua lucei* on Fatu Hiva (ca. 85 km^2) is indicated as an endangered environment, threatened by feral animals and invasive plants, reducing the extent of the forest. Estimated population size is about 3–4 individuals. Following the criteria and categories of IUCN (2001) *Kadua lucei* is assigned a preliminary Red List status of **Critically Endangered** (CR): B2a, B2b (i–iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred. D, population estimated to number fewer than 250 individuals.

Specimen examined. Marquesas Islands: Fatu Hiva: sous la crête entre Tekou et Touaouoho, 915 m, 15 février 2000 (st), J.-Y. Meyer & J.-P. Luce 835 (PAP**,** PTBG).

Discussion. This species is apparently related to *Kadua tahuatensis* from which it differs by its larger inflorescence reaching 8–9 cm long and 6 cm wide, more numerous flowers, about 30 per inflorescence, and larger white corollas with a longer purple-

tinged tube 22–26 mm long. Although mature fruits of *K. lucei* are not known, old fruits are smaller than those of *K. nukuhivensis* and *K. tahuatensis.*

***Kadua nukuhivensis* (Lorence & J.Florence) W.L.Wagner & Lorence, Syst. Bot. 30 : 832, 2005.**

Fig. 2C, D.

http://species-id.net/wiki/Kadua_nukuhivensis

Basionym. *Hedyotis nukuhivensis* J.Florence & Lorence (Adansonia sér. 3, 22: 224, 2000).

Type. Marquesas Islands: Nuku Hiva: route Toovii–Terre Déserte, 5 km après le col, 8°52'S–140°10'W, 1020 m, 5 juin 1984, J. Florence 6914 (Holotype P!; Isotypes BISH!, P!, PAP!, PTBG!, US!).

Description. *Glabrous shrubs or small trees* 2.5–6 m tall, trunk to 20 cm in diam., leafy twigs cylindrical, 7–9 mm in diam., internodes compressed, bark grayish- to blackish-brown. *Leaves* of a pair equal to sometimes unequal, blade obovate to obovate elliptic or oblong, 8–18 × 6–10.5 cm, chartaceous to subcoriaceous, drying brown or blackish-brown, base cuneate, decurrent, apex obtuse to rounded, secondary veins 7–9 pairs, loosely brochidodromous, prominulous above, tertiary veins slightly prominulous, higher order venation obscure, midrib sulcate above, rounded below, margin entire, plane to slightly revolute; petioles 8–13 × 2–3 mm in diam., sulcate; stipules inter- and intrapetiolar, sheath truncate, cupuliform, 2.5–3 × 5–6 mm, caducous but becoming thickened and horseshoe-like on adaxial surface of petioles. *Inflorescences* terminal and rarely also axillary in upper leaf axils, cymose, corymbiform, 7–13 cm long including corollas, on a stout, compressed peduncle 3–6 cm long or sessile with a pair of basal branches, often subtended by a pair of reduced subsessile leaves, bracts foliaceous, 1.5–3 cm long, caducous. *Flowers* 12–30, possibly dimorphic, fragrant when fresh, subtended by caducous triangular bracts c. 1 mm long, hypanthium obconical, 3 mm long, calyx limb cupuliform, 2 mm long, calyx lobes broadly triangular, 0.3–0.5 mm long; corolla fleshy, white or pinkish white when fresh, apex flat to slightly depressed in bud, at anthesis salverform, tube 26–28 × 2 mm in diam. distally, lobes 4, linear-oblong, recurved, 10–15 × 3–5 mm, apex with a recurved hook-like appendage; stamens with anther tips exserted for 1.5 mm, mucronulate, linear, 3–4 × 1 mm, attached 1.5–2 mm below apex of tube; style 17–19 mm long, included, stigmatic lobes 2, adnate, 3 mm long. *Capsules* on stout pedicels to 6 mm long, turbinate to obpyriform, 15–25 × 7–14 mm, strongly compressed, bisulcate, strongly 8-ribbed, 2/3 inferior, apex (beak portion above the calyx) obtuse, 5–6 mm long, smooth, dehiscence loculicidal then septicidal, old capsules disintegrating leaving network of vascular bundles enclosing the persistent endocarp. *Seeds* 1–1.3 × 0.5–0.9 mm, irregularly angulate to broadly ellipsoid, trigonous, margins thin, testa dull, dark brown, surface finely papillose.

Distribution. Marquesas Islands, Nuku Hiva, where known only from the island's central mountain crest, on the leeward side of the Terre Déserte in the upper Tapuaehu Valley, between 1000 and 1065 m elevation.

Ecology. This species occurs in wet forest with species of *Hernandia, Ilex, Metrosideros,* and *Weinmannia* in the canopy and the understory with species of *Cyrtandra, Melicope,* and *Psychotria.* Numerous pteridophytes occur terrestrially and as epiphytes. *Kadua nukuhivensis* also occurs in shrubland on ridge crests with species of *Alsophila*, *Bidens*, *Dicranopteris*, *Elaphoglossum, Freycinetia*, *Pennisetum,* and *Styphelia.*

Etymology. The specific epithet refers to the only known island of occurrence for this species.

Conservation status. The suitable habitat for *Kadua nukuhivensis* on Nuku Hiva (*c.* 340 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, thus reducing the extent of the forest. Based on the IUCN criteria and categories this species is assigned a preliminary Red List status of **Endangered** (EN): B1, B2b (i-iii): B1 extent of occurrence <5,000 km^2; B2: total area of occupancy less than 500 km^2 (c. 75 km^2); B2b (i-iii), habitat continuing decline inferred in (i) extent of occurrence, (ii) areas of occupancy, and area, (iii) extent and/or quality of habitat. This status is a revision from VU originally suggested by Florence and Lorence (2000).

Specimens examined. Marquesas Islands: Nuku Hiva: Route Toovii—Terre Déserte, haute Tapuaehu, 8°52'S–140°11'W, 1020 m, 14 fév 1986, Florence 7545 (BISH, P, PAP, US); off the old Airport road west of the summit crest of Peak #1227 m, drainages of Tapueahu Valley, 0.75 miles south of Airport Road, bottom of valley, 3340 ft., 24 sep 1995, Perlman 15054 (AD, BISH, MO, P, PAP, PTBG (2), US); Ooumu area (sic), top of Tapueahu off new Hwy, 8°51'53"S–140°10'63"W, 3500 ft, 23 jun 1997, Wood, Meyer & Luce 6337 (BISH, P, PAP, PTBG, US).

Discussion. *Kadua nukuhivensis* resembles *K. tahuatensis*, and molecular evidence places these two as sister species in the same clade within the larger clade of Hawaiian and French Polynesian species (Motley 2003)

***Kadua tahuatensis* (Lorence & J.Florence) W. L.Wagner & Lorence (Syst. Bot. 30 : 832, 2005).**

http://species-id.net/wiki/Kadua_tahuatensis

Fig. 2E, F.

Basionym. *Hedyotis tahuatensis* Lorence & J. Florence (Adansonia sér. 3, 22: 227. 2000).

Type. Marquesas Islands: Tahuata: ridge between Amatea and Haaoiputeomo, south-facing slope, 2580 ft. [780 m] elevation, 19 july 1997, S. P. Perlman 16020 (Holotype: PTBG-30160!; Isotypes: BISH!, MO!, P!, PAP!, US!).

Glabrous shrubs to 2 m tall, leafy twigs 4–6 mm in diam., internodes strongly compressed, bark pale brown, smooth to striate. *Leaves* of a pair equal to subequal, blade

elliptic to obovate-elliptic, 4.2–15 × 2–8 cm, discolorus, chartaceous to subcoriaceous, base acute to cuneate or narrowly cuneate, apex obtuse to rounded, tip sometimes abruptly short acuminate, secondary veins (5-) 6–9 pairs, weakly brochidodromous, secondary and tertiary veins prominulous on both surfaces, higher order venation obscure, margin thickened, plane; petiole stout, 2–5 × 2–3 mm, adaxially sulcate; stipules inter- and intrapetiolar, sheath cupuliform, truncate, 3 × 5–6 mm, persistent, fused with adaxial petiole surfaces and becoming thickened and horseshoe-like. *Inflorescences* terminal, thyrsiform cymose, 23–25-flowered, 5–6 × 4.5–6 cm (including corollas), on peduncle to 2 cm long, 1.5–2 mm in diam., flattened, primary axis 15 × 1.5–2 mm with 2 pairs of lateral branches, the basal one often branching once, lower bracts foliaceous, ovate, 1.2–2 × 1–1.5 cm, upper branch pair unbranched, ultimate branches ending in 2–3 flowers. *Flowers* glabrous, on stout pedicels 2–3 × 0.8–1.4, compressed, bracts scarious, ovate-trangular, 1 × 1 mm, hypanthium obconical, 3–4 × 1.5–2 mm, calyx limb campanulate, 2–3 × 4–5 mm, lobes ovate-triangular, 1.5-2 × 2-2.5 mm; corolla fleshy, pale green when fresh, lobes with dark purple margins, in bud fusiform with non-depressed apex, at anthesis salverform, tube 13–16 × 1.5–2 mm in diam. medially, lobes 4, linear-oblong, recurved, 8–10 × 1.5–2 mm, apex with a hooked appendage 1 mm long; flowers possibly dimorphic, stamens exserted for 1.5–2 mm, linear, 3-3.5 × 0.5–0.6 mm, attached 1–1.5 mm below apex of tube, apex slightly mucronulate; style included, 11–12 mm long including 2 coalescent stigmatic lobes 2.5 mm long. *Fruits* on stout pedicels 3–8 mm long; capsule tubinate to obovoid-turbinate, 12–20 × 6–8 mm, sub-quadrangular, 2/3 inferior, apex with short beak portion 5–6 mm long above the calyx, dehiscence at first loculicidal then septicidal, old capsules disintegrating into network of vascular bundles enclosing persistent, bisulcate endocarp. *Seeds* irregularly trigonous or angulate, 0.9–1.2 mm long and wide, margins with narrow wing 0.1-0.3 mm wide, testa finely reticulate.

Etymology. The specific epithet refers to the only known island of occurrence for this species.

Distribution. Marquesas Islands, Tahuata, known only from the island's summit crest and high southeastern slopes between 780 and 835 m elevation.

Ecology. Occurs in wet montane forest and shrubland with species of *Alsophila, Cheirodendron, Crossostylis*, *Hibiscus, Metrosideros, Reynoldsia, Weinmannia*, and pteridophytes including *Asplenium*, *Blechnum*, *Elaphoglossum*, *Lycopodiella* and *Nephrolepis*,

Conservation status. The suitable habitat for *Kadua tahuatensis* on Tahuata (*c.* 61 km^2) is indicated as an endangered environment, threatened by feral animals and invasive plants, reducing the extent of the forest. This species is extremely rare, with only five plants known from two localities. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Critically Endangered** (CR): B2a, B2b (i-iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals.

Specimen examined. Marquesas Islands: Tahuata: ridge between Amatea and Haaoiputeomo, southeast-facing slopes over Hanatetena village, 2740 ft. (835 m) elevation, 11 July 1997, Perlman 15954 (P, PAP, PTBG, US).

Discussion. Morphologically *Kadua tahuatensis* closely resembles *K. nukuhivensis*, and molecular evidence places these two as sister species in the same clade as *K. rapensis* F. Br. and *K. romanzoffiensis* Cham. & Schltdl. within the larger clade of Hawaiian and French Polynesian species (Motley 2003).

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RESEARCH ARTICLE

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Two new Marquesan species of the southeastern Polynesian genus *Oparanthus* (Asteraceae, Coreopsidinae)

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Abstract

Two new species of the recently revised genus *Oparanthus* (Asteraceae, Subtribe Coreopsidinae) were discovered during the National Tropical Botanical Garden/Smithsonian Institution 1997 expedition to the Marquesas Islands. *Oparanthus woodii* W. L. Wagner & Lorence, **sp. nov.** is known from a single population on the island of Nuku Hiva, and *O. tiva* W. L. Wagner & Lorence, **sp. nov.** is known only from Tahuata. Small domatia with a tuft of hairs occur in *O. tiva* (and the previously known *O. hivoanus*), and similar but naked domatia are found occasionally in *O. woodii*. Domatia are of exceedingly rare occurrence in Asteraceae. Both new species are extremely rare and are considered critically endangered (CR) as are the other four species of the genus.

Keywords

Asteraceae, conservation, French Polynesia, Marquesas Islands, *Oparanthus*

Introduction

Ongoing investigation of the vascular flora of the Marquesas Islands has been facilitated through a collaboration between National Tropical Botanical Garden (NTBG), Smithsonian Institution (SI), and the Délégation à la Recherche Papeete, Tahiti, French Polynesia. One of the expeditions in 1997 resulted in the discovery of two additional species of the genus *Oparanthus* Sherff, of which there are two previously

known Marquesan species and two from Rapa Island (Shannon and Wagner 1997). They are described and illustrated and their conservation status is assessed in this paper.

Since the most recent revision of the genus (Shannon and Wagner 1997) new studies of the phylogeny and biogeography of *Oparanthus* have been completed. *Fitchia* Hook. f., *Oparanthus,* and *Petrobium* R. Br. have been considered to be insular derivatives from the genus *Bidens* L. (Carlquist 1974; Shannon and Wagner 1997). These relationships were not supported by ITS study of the Coreopsideae by Kimball and Crawford (2004). According to their phylogenetic results *Fitchia* and *Oparanthus* are sister genera and share a common ancestor with two Caribbean genera, *Narvalina* Cass. and *Selleophytum* Urb. Another study was initiated (H. Dempewolf, T. Motley, D. Lorence and W. Wagner unpubl.) to further examine the biogeographic patterns in this lineage of two genera with no affinities to other Pacific Asteraceae but which represent an interesting biogeographic disjunction with two genera of the Caribbean. This unpublished phylogenetic analysis of *Oparanthus* and *Fitchia* utilized nuclear ribosomal gene regions (ITS, ETS, and *5S*-NTS). The results of the analyses of four species of *Fitchia* (of eight) and five species of *Oparanthus* (of six) indicate a strongly supported relationship between the two genera and, at least among the extant species, it appears that a *Fitchia*/*Oparanthus* ancestor first colonized Rapa. This makes sense because Rapa is at the young end of a series of hot-spot traces in southern Polynesia (McNutt et al. 1997). Rapa is about 4.1–4.8 Ma, but the volcanic chains in this region date back to 34-35 Ma (McNutt et al. 1997; Bonneville et al 2002) allowing for the possibility of colonization much earlier than the age of any islands that either genus occurs on presently (i.e., the Societies, Marquesas, Rapa, and Rarotonga).

To date only 47 total collections of *Oparanthus* have been made of the four Marquesan species, which gives an indication of how uncommon they are. Collections of two of the species, *O. hivoanus* and *O. teikiteetinii*, consititute the bulk (36). Both of these species occur as scattered individuals in appropriate habitat or are occasionally relatively common in localized areas. The two new species described here are known from only a few collections. When evaluated using the IUCN criteria for endangerment (IUCN 2001) all four of the Marquesan species of *Oparanthus* fall into the Critically Endangered (CR) category, which designates species facing the highest risk of extinction in the wild. Marquesan species of *Oparanthus* meet the IUCN criteria by having known ranges less than 100 km^2, an area of occupancy of less than 10 km^2, continuing decline in the quality of habitat.

Methodology

All measurements given herein are taken from dried herbarium specimens, although certain features such as shapes were supplemented with information from alcohol-preserved flowers, field notes, and color slides or digital photos. Measurements are presented in the descriptions as follows: length × width, followed by units of measurement (mm or cm). Specimens from the following herbaria were studied: BISH, K, MO, NY, P, PAP, PTBG, and US.

The new species described here fit well in the sectional classification developed prior to their discovery (Shannon and Wagner 1997). Plants of *Oparanthus* sect. *Albiflori*, which includes all four Marquesan species, are characterized by leaves relatively thin to slightly thickened and subcoriaceous, marginal veins obscure or inconspicuous, the involucral bracts in 2-3 well defined series, corollas white, and achene wings and awns glabrous.

Key to species of *Oparanthus* in the Marquesas Islands

1a Plants hirsute, especially on inflorescences and young shoots and leaves; domatia never present in abaxial primary leaf axils ..... ***O. teikiteetinii***

1b Plants glabrous or nearly so; domatia nearly always present in abaxial primary leaf axils **2**

2a Heads solitary; ray floret corolla tube and throat 7.5–8 mm long; leaf bases connate around stem; domatia present or absent in abaxial leaf axils, without associated hairs ..... ***O. woodii***

2b Heads in clusters of 3; ray floret corolla tube and throat 3–4 mm long; leaf bases not connate around stem; domatia present in abaxial leaf axils, covered with hairs **3**

3a Trees 3–7 m tall; leaves thinly coriaceous, 10–19.3 × 6–15.8 cm; heads 9–14 mm in diameter, 10–20 mm high; receptacular bracts of ray florets 10–11 mm long, those of disk florets 12–13 mm long; sterile disk achenes 12–13... ..... ***O. tiva***

3b Shrubs; leaves subcoriaceous, 2.3-8 × 1.3-4.5 cm, on young shoots up to 13 cm long and 11 cm wide; heads 7–12 mm in diameter, 9–13 mm high; receptacular bracts of ray florets 7.5–8 mm long, those of disk florets 9–11 mm long; sterile disk achenes ca. 20 ..... ***O. hivoanus***

***Oparanthus tiva* W. L. Wagner & Lorence, sp. nov.**
urn:lsid:ipni.org:names:77112740-1
http://species-id.net/wiki/Oparanthus_tiva
Fig. 1, 3C

Ab O. hivoano foliis tenue coriaceis, 10-19.3 × 6-15.8 cm, testibus 9-14 mm diametro, 10-20 mm altis, paleis flosculorum radiorum 10-11 mm longis, paleis flosculorum discorum 12-13 mm longis, 12-13 achenis sterili disci differt.

Type. Marquesas Islands: Tahuata, ridge E of trail ridge up to Amatea from Kuaee, E facing slope, 2560 ft (780 m), 18 July 1997, S. P. Perlman, K. R. Wood, and J. P. Luce 16008 (Holotype: PTBG-025572!; isotypes: BISH!, P!, PAP!, US!).

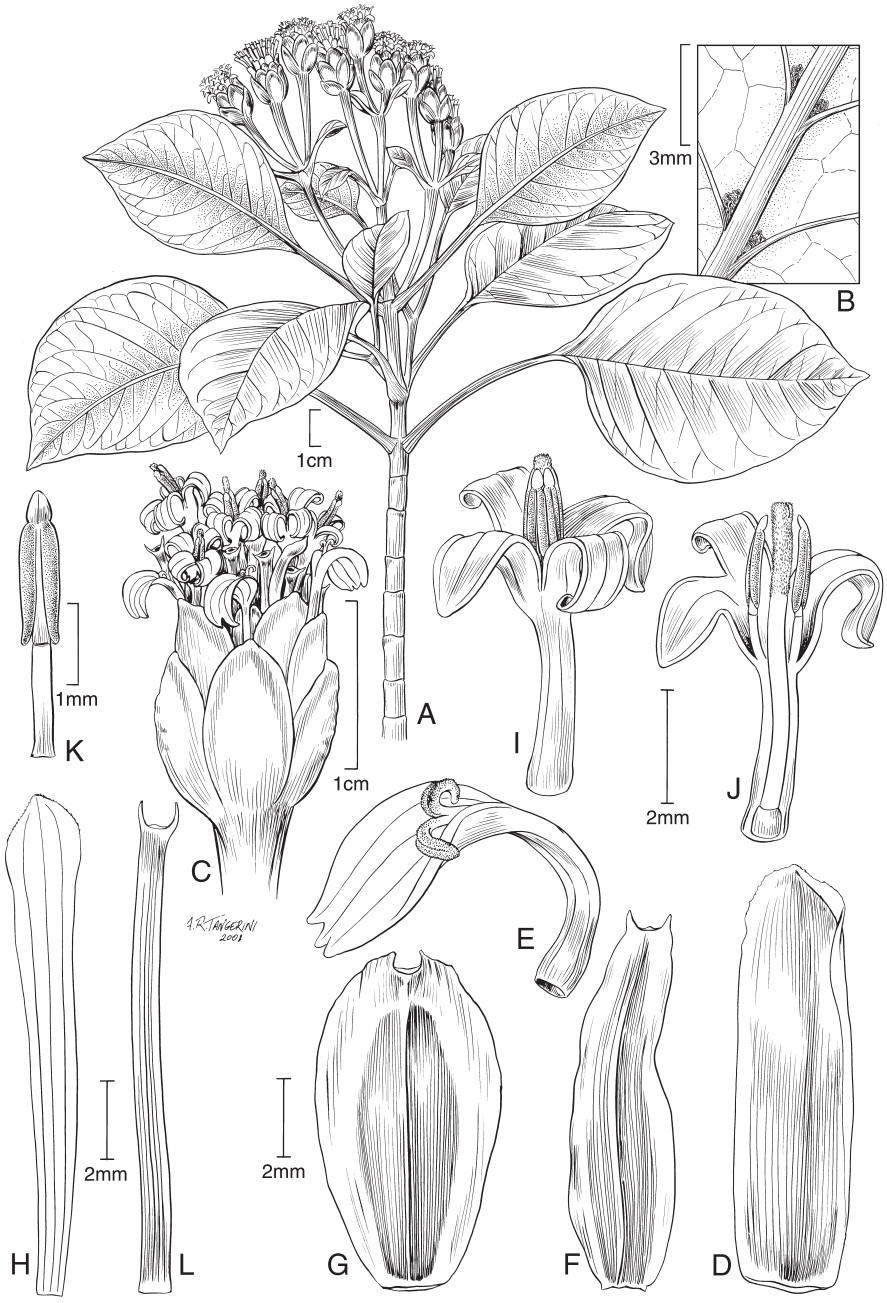

Figure 1. *Oparanthus tiva* W. L. Wagner & Lorence. **A–C** drawn from Perlman et. al 15997, US **A** flowering branch **B** abaxial leaf surface showing domatia with associated tuft of hairs in axils of primary veins **C** head; **D–L** drawn from spirit-preserved material of type collection, Perlman et. al. 16008, PTBG; **D** receptacular bract of ray floret **E** ray corolla and functional style **F–G** ray achene **H** receptacular bract of disk floret **I** disk corolla with non-functional style and fertile stamens **J** longitudinal view of disk corolla with non-functional style and fertile stamens **K** fertile stamen from disk floret **L** sterile disk achene.

Description. *Trees* 3–7 m tall, subglabrous, functionally monoecious, the main trunk to 30 cm in diameter, often with multiple prop roots, bark brown, wood cream colored, the young stems with short internodes. *Leaves* thinly coriaceous, the blade ovate to very broadly ovate, 10–19.3 × 6–15.8 cm, the young ones often viscous and with a turpentine-like scent, secondary veins 6–18 mm apart, abaxial axils with domatia with small tufts of hairs, margins weakly dentate to subentire, apex bluntly acuminate to obtuse, base obtuse to occasionally truncate, often oblique; petioles 3–9 cm long. *Inflorescences* terminal, heads in clusters of 3, 9–14 mm in diameter, 10–20 mm high; peduncles 15–76 mm long; involucre campanulate, the bracts 7–9, in 2 series, 7–11 mm long, the external ones wider and thicker; receptacular bracts of ray florets 10–11 mm long, those of disk florets 12–13 mm long; *ray florets* 8–10 in 1–3 series, white, corolla tube and throat 3–4 mm long, limb 3–3.8 mm long, shallowly toothed; *disk florets* 18–20, white, corolla tube and throat 3.5–4 mm long, the lobes 3 mm long. *Ray achenes* 8–9 mm long, narrowly elliptic to lanceolate, winged on both margins, the wings up to 1 mm wide, the wing margin smooth, extending beyond the achene apex; the disk achenes sterile, linear, 12–13 mm long.

Etymology. We are pleased to name this new species in recognition of its first collector, Steven P. Perlman, known in the Marquesas by his nickname "Tiva", in recognition of his contributions to our knowledge of the flora of the Pacific region.

Distribution. Endemic to the Marquesas Islands and restricted to the vicinity of the type locality on Tahuata.

Ecology. Scattered to locally common in the low wet forest, dominated by species of *Alsophila*, *Crossostylis*, *Freycinetia*, *Hibiscus*, *Metrosideros*, *Reynoldsia*, and *Weinmannia*, with an understory rich in plants such as *Cyrtandra, Dicranopteris*, *Gahnia, Macropiper, Marattia, Morinda,* and *Psychotria,* from 790 to 900 m elevation, usually on windswept slopes and gulches of summit areas. Known to flower and fruit in July.

Conservation status. Following the criteria and categories of IUCN (2001) it is assigned a preliminary status of **Critically Endangered** (CR): B2a, B2b (i-iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals. The suitable habitat for *Oparanthus tiva* on Tahuata (*c.* 61 km^2) is indicated as an endangered environment, threatened feral animals and invasive plants, reducing the extent of the forest. The known habitat is not pristine and nonnative plants such as *Ageratum conyzoides* L.*, Elephantopus mollis* Kunth*, Melinis repens* (Willd.) Zizka, *Paspalum conjugatum* P. J. Bergius*, Paspalum paniculatum* L.*, Psidium guajava* L.*, Spathoglottis plicata* Blume*,* and *Zingiber zerumbet* (L.) Sm. were observed in the area.

Specimen examined. Marquesas Islands: Tahuata: ridge from Amatea to Moteve passing Meikaea, view down is on village of Hanatetena, on E facing slope, Perlman et al. 15977 (BISH, P, PAP, PTBG, US); off trail from Amatea to Moteve, above Haaoipu Bay, to NE of Hanatetena, top of ridge crest, W facing slope, Perlman et al. 15998 (PTBG); Haaoiputeomo summit region, upper drainage to N of satellite dish, [09 56'S, 139 04'W], Wood 6523 (BISH, MO, NY, P, PAP, PTBG [2], US); Amatea

region, locations around Haaoiputeomo satelite dish (parabowl), Wood 10263 (PAP, PTBG, US), Wood 10265 (PAP, PTBG, US).

Discussion. *Oparanthus tiva* has domatia (with an associated tuft of hairs) on the abaxial surface of the leaves. Domatia are essentially absent in the family, so domatia in *O. tiva* should be investigated further to understand the ecological significance. When domatia were discovered in *O. tiva*, we reexamined the other species of the genus and those of the closely related genus *Fitchia*. We found them only in the closest relative, *O. hivoanus* and in the Nuku Hiva species, *O. woodii*, but in these without the associated tuft of hairs covering the pit. *Oparanthus tiva* is a relatively rare species with an estimated 100 individuals known. It is distinguished from *O. hivoanus* by the tree habit, leaves thinly coriaceous, 10–19.3 × 6–15.8 cm, larger heads 9–14 mm in diameter, 10–20 mm high, receptacular bracts of ray florets 10–11 mm long, those of disk florets 12–13 mm long, and the sterile disk achenes 12–13.

***Oparanthus woodii* W. L. Wagner & Lorence, sp. nov.**
urn:lsid:ipni.org:names:77112741-1
http://species-id.net/wiki/Oparanthus_woodii
Fig. 2, 3D

Ab O. teikiteetinii fere glabra arbore, domatiis apilosis in foliis abaxialibus in axilibus nervis secundariis presentibus, foliis basi connatis, flosculis radiorum tubis corollarum 7.5-8 mm differt.

Type. Marquesas Islands: Nuku Hiva: Ooumu region, top of Tapueahu Valley off new Hwy, [08 51’53S, 140 10’63W], 1067–1128 m, 23 June 1997, K. R. Wood 6375 (Holotype: PTBG-025565!; isotypes: BISH!, P!, PAP!, US!).

Description. *Trees* 2–5 m tall, glabrous, functionally monoecious, moderately to diffusely branched, the trunk often with multiple prop roots, bark brown, wood cream-colored. *Leaves* thinly coriaceous, the blade broadly elliptic to broadly elliptic-obovate, 11–23.1 × 3.5–12.7 cm, secondary veins 4–12 mm apart, conspicuously arching upward from midrib, then spreading to margin, abaxial axils often with domatia, these without associated hairs, margins entire, apex rounded to truncate, base cuneate, often oblique; petioles 3.5–6 cm long, the base conspicuously connate around stem with paired leaf petiole. *Inflorescences* terminal, heads solitary, 12–16 mm in diameter, 22–35 mm high, peduncles 3–15 mm long, stout; involucre campanulate; involucral bracts 8, in 2 series, the external ones 8–13 mm long, connate at the base, thick and broadly triangular, becoming lignified in fruit, the internal ones usually longer (up to 15 mm) and narrower, triangular to elliptic; receptacular bracts of the ray florets 13–14 mm long, those of the disk florets 12–13 mm long; *ray florets* ca. 18–22, in 2 series, corolla tube and throat 7.5–8 mm long, limb 4.2–4.5 mm long, 2–3-lobed, the lobes usually divided to near corolla throat, occasionally only shallowly so; *disk florets* ca. 40–50 or perhaps more, corolla tube and throat 6.3–6.6 mm long, the lobes 4.4–5.4

Figure 2. *Oparanthus woodii* W. L. Wagner & Lorence. **A–N** drawn from holotype Wood 6375, PTBG, except **B** from US isotype. **A** flowering branch **B** abaxial leaf surface showing naked domatia in axils of primary veins **C** lower leaf **D** head **E** receptacular bract of ray floret **F** receptacular bract of disk floret **G–H** ray corolla and functional style **I** disk corolla with non-functional style and fertile stamens **J** longitudinal view of disk corolla with non-functional style and fertile stamens **K** sterile disk achene **L–M** ray achenes **N** fertile stamen from disk floret.

Figure 3. Field images of *Oparanthus.* **A** *O. hivaoanus*, (Hiva Oa, Price et al 201, photo D. Lorence) **B** *O. teikiteetinii* (Nuku Hiva, Lorence 6078, photo D. Lorence) **C** *O. tiva* (Tahuata, Wood 6523, photo K. Wood) **D** *O. woodii* (Nuku Hiva, Wood 6338, photo K. Wood).

mm long. *Ray achenes* elliptic, 5–6 mm long, distinctly winged, the wings ca.1 mm wide, extending slightly beyond the achene apex; disk achenes sterile, linear, 10–11 mm long, with 2 awns.

Etymology. This new species is named for Kenneth R. Wood, who first collected it and who has contributed greatly to our knowledge of the flora of the Marquesas and Hawaii through his collections and field observations.

Distribution. Endemic to Nuku Hiva, Marquesas Islands, and apparently restricted to the Ooumu region, in gulches near the top of Tapueahu Valley, from 1060 to 1130 m elevation.

Ecology. Occurring in montane mesic to wet forest, ravines and steep slopes, with *Metrosideros* and *Weinmannia* dominant and a diverse understory of *Asplenium, Blechmum, Cyrtandra, Hypolepis, Ilex,* and *Melicope,* with stands of *Freycinetia* nearby. Known to flower in June, but probably for some months after that.

Conservation status. Based on the IUCN criteria and categories this species is assigned a preliminary Red List status of **Critically Endangered** (CR) B2a, B2b (i-iii); D: B2: total area of occupancy less than 10 km^2 (ca. 5 km^2). B2a, a single population known; b (i–iii), habitat continuing decline inferred; D, population estimated to number fewer than 250 individuals. The suitable habitat for *Oparanthus woodii* on Nuku Hiva (*c.* 340 km^2) is indicated as an endangered environment, threatened by human activity (deforestation and fire), feral animals, and invasive plants, thus reducing the extent of the forest.

Discussion. *Oparanthus woodii* appears to be closely related to *O. teikiteetinii*, which grows at lower elevations, but approaches the known range of *O. woodii* within a few hundred meters. While *O. teikiteetinii* is generally distinctive in the genus for its large size, attaining heights of up to 12 m, and for its large, often solitary capitula, *O. woodii* is a smaller tree up to 5 m tall and has large solitary heads on much shorter and stouter peduncles up to 15 mm long. The corollas are similar in these two species, but the ray corollas of *O. woodii* are also distinctive in that they are deeply divided to near the corolla throat. Likewise the leaves of *O. woodii* are distinctive in that they are conspicuously connate at the petiole bases, have secondary veins that arch upwards, and have naked domatia in the abaxial vein axils. These are not always present and they lack the tufts of hairs in the always present domatia of *O. hivoanus* and *O. tiva*.

Specimens examined. Marquesas Islands: MARQUESAS ISLANDS: Nuku Hiva, Ooumu region, top of Tapueahu Valley off new Hwy, [08 51’53S, 140 10’63W], Wood et. al. 6338 (P, PTBG, US); Wood 6376 (PTBG, US); Wood 6377 (BISH, K, P, PAP, PTBG, US).

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A new species of *Meryta* (Araliaceae) from the Marquesas Archipelago, French Polynesia

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Abstract

Meryta pastoralis F. Tronchet & Lowry, a new species from the island of Hiva Oa in the Marquesas archipelago, is described and illustrated. It differs from other Polynesian members of the genus by its fully free ovaries, a feature shared with one other species found in the region, *M. choristantha* (native to the Austral Islands), from which it can be distinguished by its ovate to spatulate (vs. elliptic to obovate) leaf shape. A preliminary risk of extinction assessment indicates that *M. pastoralis* is Critically Endangered.

Résumé

Une nouvelle espèce, *Meryta pastoralis* F. Tronchet & Lowry, de l'île d'Hiva Oa dans l'archipel des Marquises, est ici décrite et illustrée. Elle diffère des autres espèces du genre en Polynésie par ses ovaires totalement libres. Ce caractère est partagé uniquement par une autre espèce de la région – *M. choristantha* (endémique de l'archipel des Australes) – dont elle se distingue par lses feuilles à limbe ovale à spatulé (vs. elliptique à obovale). Une première estimation du statut de de risque d'extinction indique que l'espèce *M. pastoralis* est en danger critique.

Keywords
Meryta, Araliaceae, French Polynesia, Marquesas, Hiva Oa, conservation

Introduction

The genus *Meryta* J.R. Forst. & G. Forst. comprises a total of 37 species, 10 of which remain to be described (Frodin and Govaerts 2003, Tronchet and al. 2005a, Tronchet and Lowry unpubl. data), including the one proposed here. This distinctive group of monocaulous to well branched trees and shrubs is unique within Araliaceae in exhibiting a combination of simple leaves and a dioecious sexual system (Lowry 1988, Tronchet and al. 2005a). *Meryta* occurs primarily in the South Pacific, extending from New Zealand and New Caledonia in the west across to Henderson Island in the east, with a single member present north of the equator in the Caroline and Mariana Islands (Lowry 1993, Tronchet and al. 2005a). Without exception, each species is endemic to a single island or archipelago, and most are known from just one or a few populations. While they rarely comprise a significant component of the vegetation, the distinctive morphology of *Meryta* species makes them easy to recognize. A few taxa are cultivated, most notably *M. pauciflora* Hemsl. ex Cheesman, which is often listed in horticulture catalogues, and *M. sinclairii* (Hook. f.) Seem., widely grown in New Zealand and occasionally elsewhere.

A recent phylogenetic study based on molecular sequence data (Tronchet et al. 2005a) showed that *Meryta* is monophyletic, a finding that is consistent both with morphology and wood anatomy (Oskolski et al. 2007). Within Araliaceae, *Meryta* belongs to the *Polyscias-Pseudopanax* clade, as defined by Plunkett et al. (2004, 2005; see also Lowry et al. 2004), and within this clade it is most closely related to the SW Pacific genus *Plerandra*, which was recently expanded to include species from Melanesia long included in *Schefflera* (Lowry et al. in press). The molecular phylogeny of Tronchet et al. (2005a) also revealed two principal subclades within the genus, one comprising a majority of the species (including the type) and the other with two species, one each from New Zealand and Fiji.

As part of our taxonomic revision of *Meryta*, we describe here a new species endemic to the island of Hiva Oa in the Marquesas archipelago so that it can be included in the forthcoming *Vascular Flora of the Marquesas Islands* being prepared by D. H. Lorence and W. L. Wagner. This distinctive new entity, first collected by P.A. Schäfer in 1975, represents a significant range extension for the genus and a noteworthy addition to the flora of the Marquesas.

Systematics

***Meryta pastoralis* F. Tronchet & Lowry, sp. nov.**
urn:lsid:ipni.org:names:77112742-1
http://species-id.net/wiki/Meryta_pastoralis
Figs 1-2

Haec species quoad inflorescentiae structuram ac ovaria omnino libera Merytae choristanthae Harms (ex Insulis Australibus) simillima, sed ab ea foliis anguste obovatis usque spathulatis (vs. late ellipticis usque subobovatis), carpellis 5 ad 11 (vs. 5 vel 6 tantum) atque fructu maturitate 7–9 × 7–10 (vs. 8–12 × 10–15) mm distinguitur; etiam quoad foliorum aspectum M. raiateensi J.W. Moore et aliquantum M. lanceolatae J.R. Forst. & G. Forst. similis, sed ab eis (atque adeo ab omnibus congeneris Societatis Insularum ac Tuamotu) ovariis omnino liberis distinguitur.

Type. French Polynesia. Marquesas Islands, Hiva-Oa, Hanamenu valley off Hanamenu trail, in *Metrosideros-Weinmannia-Dicranopteris linearis* wet forest, 09°47'50"S, 139°05'35"W, 908 m, 2 August 2005 (fr), S. Perlman 19767 (holotype: P [P00398408]!; isotypes, PAP!, PTBG!, US!).

Description. Monocaulous to sparsely branched tree, dioecious, Chamberlain architecture (tending toward Leeuwenberg architecture (Hallé 2004) when very old, fide P.A. Schäfer, 1975), 3–6(–10) m tall, without milky sap. Leaves simple, alternate, grouped at branch ends; petiole 1.5–2.5(–4) cm long, 2–3 mm in diam., base enlarged, slightly clasping, lenticels rarely present abaxially, without dark green transverse striations adaxially when fresh; ligule present adaxially at the base of the petiole, persistent, free portion triangular to widely triangular, 5–11(–17) mm long, margins entire, membranous, apex obtuse to acute; blade green, shiny adaxially when fresh, slightly lighter green abaxially, narrowly obovate to spatulate, 20.4–40 × 5.2–9.8 cm (l/w ratio 2.76–5.52), base symmetric to asymmetric, offset 2–5(–10) mm, mostly positively centered in adaxial view, attenuate, margin entire, undulate distally, minutely revolute, apex acute to obtuse, the extreme tip obtuse to mucronate, chartaceous to coriaceous, glabrous on both surfaces; venation brochidodromous, light green-yellow when fresh, with prominent arches lacking intramarginal veins; midvein strong and massive, straight, without evident abaxial thickenings; secondary veins (12–)17–22 pairs, diverging from the midvein by (53–)57–69° (in the widest part of the blade), the distal ones less divergent, weakly recurved near the midvein then strongly recurved toward the margin, joining with the next arch at an obtuse angle without forming a clear intra-marginal vein, intersecondary veins present; tertiary veins evident, not reaching the margin, straight to anastomosing at various angles, sometimes forming convex arcs in the intercostals zone; higher order veins visible in dry material, forming a fine, dense reticulum; veinlets forming quadri- to multi-angular areoles 0.5–1.5 mm in size. Juvenile foliage similar to adult, blade with an obtuse apex. Male material unknown (only old inflorescences seen). Female inflorescence terminal, erect, a raceme of spikes, with 1 degree of branching, axes and peduncle light green, bracts brown-red,

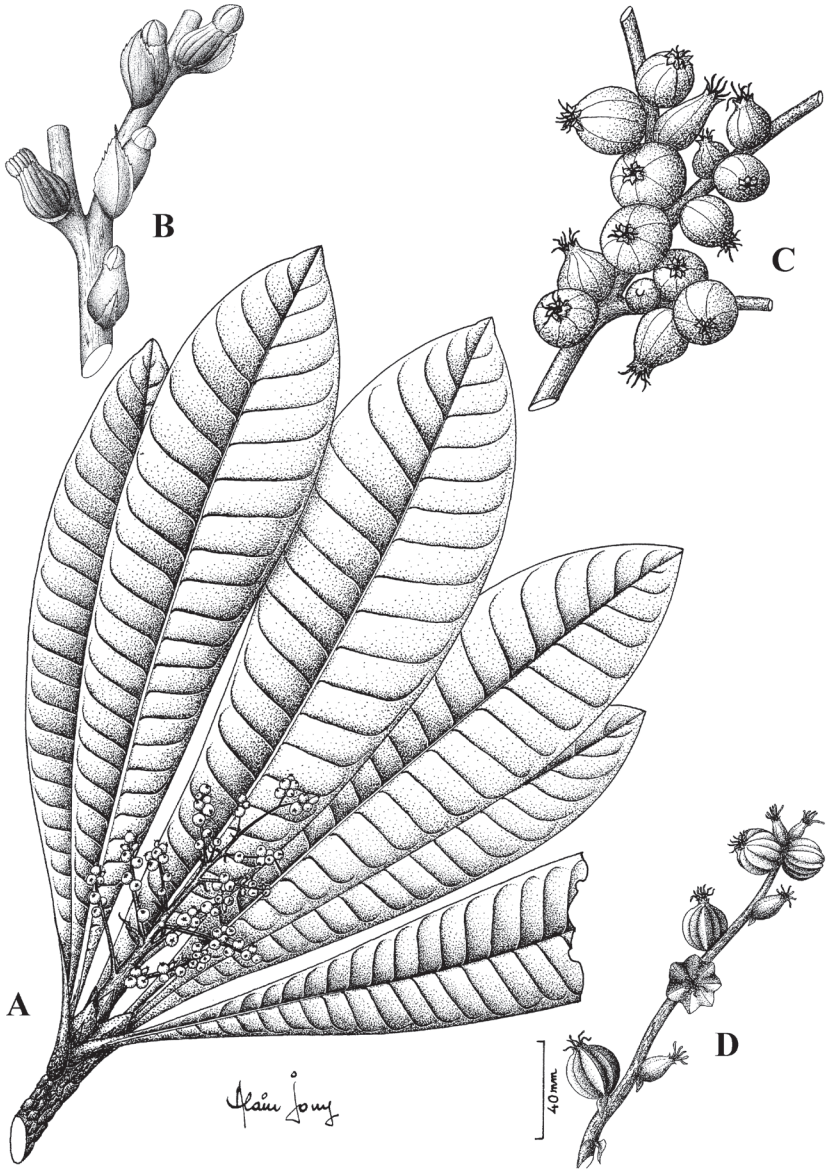

Figure 1. *Meryta pastoralis* F. Tronchet & Lowry. **A** branch with leaves and young infructescence **B** female flowers in bud subtended by bracts **C** female flowers at receptivity **D** young fruits. Line drawing by Alain Jouy from herbarium specimens; voucher Perlman 19767 (**A, D**), Schäfer 5922 (**B**), Perlman 10206 (**C**).

primary axis 15–20 cm long, 5–8 mm in diam. at the base when fresh, subtended by persistent or sometimes caducous triangular cataphylls 13–24 mm long, without lenticels, margins entire, mostly to almost entirely membranous, apex obtuse, bear-

Figure 2. *Meryta pastoralis* F. Tronchet & Lowry. Photo of female plant in fruit (Photo by Steve Perlman of Perlman 19767).

ing a dorsal, ± foliaceous apicule; secondary axes 8–13(–17), 6–12 cm long (shorter distally), straight or sometimes slightly curved upward in the distal portion, diverging 35–60° from the primary axis, each subtended by a caducous, triangular to narrowly triangular bract 7–20 mm long, without lenticels, margin denticulate, mostly membranous, apex acute to acuminate, sometimes apiculate; spikelets with 7–15(–27) flowers, the proximal one inserted 3–15 mm from the base of the secondary axis. Female flowers white when fresh, sessile; bractlets caducous or sometimes persistent, broadly triangular, 3–5 mm long, margin weakly dentate, membranous, brown-red, partially covered by the flower and later the fruit, apex acute to obtuse; petals 5–11, caducous in fruit, ovate, 1–2.5 mm long, weakly cucullate, recurved when flowers receptive, with a pronounced adaxial groove, apex acute; androeciuum present, isostemonous, filaments and anthers developed but pollen sacs empty, stamens with filaments 0.5–1 mm long, anthers 0.5 mm long; ovary inferior, (5–)7 or 8(–11)-carpellate, nectar disc epigynous, 2 mm diam., styles weakly differentiated, to 1 mm long, stigmas 1.5–3 mm long at receptivity, often strongly recurved to twisted. Fruit yellow-green when young, light purple at maturity, remains of petals and stamens brown, ovaries entirely free and distinct from one another; drupes globose to sub-globose, 7–9 × 7–10 mm, smooth and fleshy when fresh, ribbed when dry, the ribs corresponding to the 5–11 pyrenes.

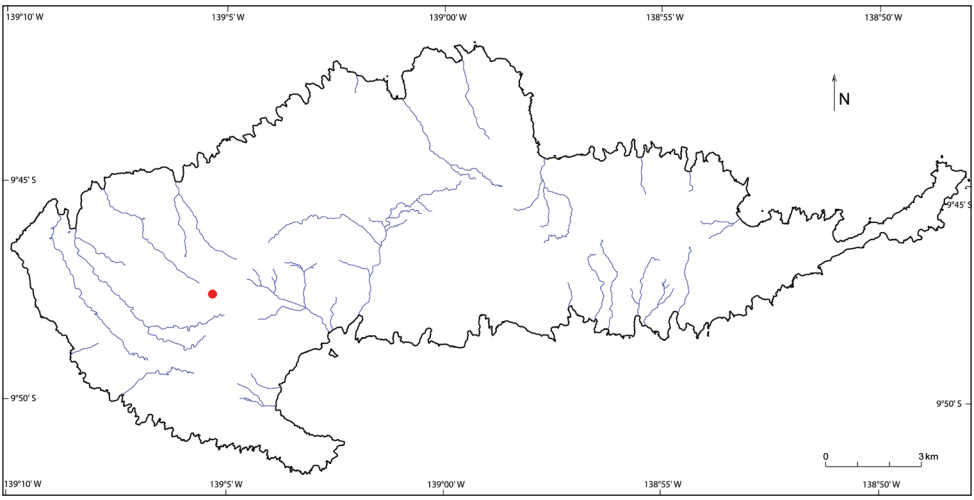

Figure 3. Distribution map of *Meryta pastoralis* F. Tronchet & Lowry on Hiva Oa Island in the Marquesas archipelago (blue lines indicate primary water courses).

Distribution. Known only from the type locality in the Mt. Temetiu/Feani area at ca. 900 m elevation along the Hanamenu trail on the island of Hiva Oa (Fig. 3), the largest and highest in the Marquesas archipelago.

Ecology. *Meryta pastoralis* occurs on slopes and along streams in low stature, humid montane *Metrosideros-Weinmannia* forest at and above 900 m elevation.

Etymology. This species is named in honor of P.A. Schäfer, who was the first to collect it in 1975 while conducting botanical inventory work in the Marquesas, and who has contributed much to our knowledge of the flora of the archipelago. The name Schäfer means shepherd in Alsatian, which when translated into Latin provides the basis for our choice of the epithet *pastoralis*.

Conservation status. *Meryta pastoralis* is known from a single population along a wind-swept ridge below the highest point on Hiva Oa. With an Area of Occupancy of <10 km^2 and an Extent of Occurrence that is probably no larger, it meets the area requirements for Critically Endangered status under criteria B1 and B2 of the IUCN Red List Criteria (IUCN 2001). While the vegetation in the immediate area is still largely intact, increasing impacts from feral pigs, human disturbance and fire during the dry season (D. Lorence, pers. comm.) represent growing threats to *M. pastoralis*, prompting us to assign it a provisional threat status of Critically Endangered (CR B1ab(i,ii,iii,v) + 2ab(i,ii,iii,v)).

Other specimens examined. French Polynesia. Marquesas Islands, Hiva Oa, trail toward Hanamenu; in gulch off trail, low forest, 3 August 1988 (fr). S. Perlman 10206 (AD!, BISH! [2 sheets], F!, K!, MO!, NY!, P [P00372510]!, PAP!, PTBG!, US!); Teakatu, valley on north side of Hanamenu trail heading down to Hanamenu past summit crest, between Teakatau and Tepuna, along stream bottom in *Metrosideros-Weinmannia-Crossostylis* montane wet forest, [09°47'29"S, 139°05'41"W], 933 m, 26

August 1995 (st), S. Perlman & J.-Y. Meyer 14894 (BISH!, MO!, PAP!, PTBG!, US!); Feani area, Tepuna, in gulch to north of Hanamenu trail, down west side of summit crest to 1075 meters elev. and drop into gulch, in *Metrosideros-Weinmannia* forest, 09°47'49"S, 139°05'12"W, 900 m, 29 January 2003 (old ♂fl), S. Perlman 18335 (BISH, P [P00398011]!, PAP, PTBG, US); Feani area, Tepuna, off Hanamenu trail on west side of summit crest, at 1075 meters elev. into gulch north side of trail, scattered plants in *Metrosideros-Weinmannia* forest, 09°47'49"S, 139°05'12"W, 29 January 2003 (♀fl), S. Perlman 18336 (PAP, PTBG, US); Montagnes NW du Temetiu, entre la haute vallée de Hanamenu et la crête du Temetiu Feani, haute vallée, forêt humide, [09°48'00"S, 139°05'30"W], 925 m, 23 October 1975 (♀fl), P.A. Schäfer 5922 (BISH!, K!, MO! [2 sheets], NTBG!, P [P00372508 & P00372509]!, US!).

Discussion. Material of our new species most closely resembles specimens of *Meryta choristantha* Harms from the Austral Islands, with which it shares a similarly structured inflorescence and totally free ovaries, but differs in leaf shape (narrowly obovate to spatulate in *M. pastoralis* vs. widely elliptic to slightly obovate in *M. choristantha*), number of carpels (5–11 vs. 5 or 6), and fruit size at maturity (7–9 × 7–10 vs. 8–12 × 10–15 mm). The leaves of *Meryta pastoralis* are similar in appearance to those of *M. raiateensis* J.W. Moore, and to a lesser degree *M. lanceolata* J.R. Forst. & G. Forst., both from the Society Islands, but our new taxon differs from these entities, and indeed all other species in the Society Islands and on Tuamotu, by its totally free ovaries.

Results from ongoing molecular phylogenetic work (Tronchet et al. 2005a, 2005b, unpubl. data) suggest that *Meryta pastoralis* is part of a small clade now understood to comprise four species, also including *M. sinclairii* from New Zealand, *M. tenuifolia* A.C. Sm. from Fiji, and *M. choristantha*, which together correspond to *Meryta* sect. *Choristomeryta* Harms (Harms 1938). Material here assigned to *M. pastoralis* was referred to informally as 'M. schaeferi' in Tronchet et al. (2005b).

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We are grateful to David Lorence and Warren Wagner for suggesting that we publish this new species as part of the present series of novelties from the Marquesas Islands. We thank Alain Jouy for the fine line drawing, Steve Perlman for allowing is to use his color photo, Roy Gereau for translating the diagnosis into Latin, and David Lorence, Greg Plunkett and Warren Wagner for helpful comments on an earlier draft of the manuscript. This work was supported in part by grants from the U.S. National Science Foundation (DEB 0613728 to PPL) and the National Geographic Society (5793-96, to G.M. Plunkett).

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