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THE PACIFIC SPECIES OF OPHIORRHIZA L. (RUBIACEAE)[1]

STEVEN P. DARWIN[2]

Ophiorrhiza is an Indo-Malesian genus belonging to the family Rubiaceae and comprising about 150 species (Airy Shaw, 1973). The genus is taxonomically complex in many parts of its range, but a worldwide treatment has never been attempted. This study is limited to a taxonomic consideration of the Pacific species of *Ophiorrhiza*. The Pacific, as here understood, is the area extending from the Caroline and Marianas Islands, the Santa Cruz Islands, and the New Hebrides eastward to the Hawaiian Islands and Easter Island. It is equivalent to Takhtajan's (1969) Polynesian Subkingdom except that the Bonin Islands are excluded. This exclusion is based on evidence presented by van Balgooy (1971) that the Bonins are floristically more Asian than Oceanic. Fifteen species of *Ophiorrhiza* are treated here, four of them being described as new.

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Ophiorrhiza L. Sp. Pl. 150. 1753, Gen. Pl. ed. 5. 74, as *Ophiorhiza*. 1754; Seem. Fl. Vit. 126. 1866; Drake, Fl. Polynés. Franç. 86. 1893.

Prior to 1753, Linnaeus had published the genus *Ophiorrhiza* based

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[2]Department of Botany, University of Massachusetts, Amherst, Mass. 01002.
Present address: Gray Herbarium, 22 Divinity Ave., Cambridge, Mass. 02138.

on the species *O. mungos,* from the East Indies. In *Species Plantarum,* Linnaeus added to *Ophiorrhiza* the species *O. mitreola,* based on Houstoun's genus *Mitra (Mitreola* of *Hortus Cliffortianus),* from the New World. Hitchcock & Green (1929) have proposed *O. mungos* as lectotype of the genus; this seems appropriate, since *O. mitreola* is now usually recognized as a member of the distinct genus *Mitreola* L. ex Schaeffer, of the Spigeliaceae (Airy Shaw, 1973). In 1754 Linnaeus published *Ophiorhiza* with altered spelling, and various authors have taken up that orthographic variant; in the following citations, however, the spelling has uniformly been corrected to *Ophiorrhiza.*

Distribution

Ophiorrhiza exhibits a distributional pattern described as Indo-Malesian by van Balgooy (1971). The genus extends from Ceylon and eastern India northeastward into China, Formosa, Japan, and Micronesia, and southeastward through Malesia and Fiji to the Society Islands. One species is also found in Queensland, Australia. In its distribution, *Ophiorrhiza* is similar to many other Pacific genera, attaining its greatest diversity in New Guinea and southeastern Asia, the former locality probably being its center of origin (van Balgooy, 1971). Therefore, the Pacific species of *Ophiorrhiza* are peripheral populations which cannot be expected to represent a discrete, phylogenetically natural group.

At least two groups of *Ophiorrhiza* species are represented in the Pacific: the single Micronesian species, *O. palauensis,* with its closest relatives probably in eastern Asia, and the fourteen South Pacific species, which may be derived from one or a few Malesian ancestors. The Micronesian species shows a pattern of distribution which is in keeping with floristic analyses of that area. Known only from the Palau Group of the Caroline Islands, it fails to cross "Kanehira's line" between the West and East Carolines (van Balgooy, 1971). The South Pacific taxa also show a common distributional pattern, with the exception of one curious disjunction which should be pointed out.

Three specimens of *Ophiorrhiza* bear "Samoa" as a locality, yet no published account of the Samoan flora has confirmed the presence of the genus in that archipelago. Two of the specimens are U.S. Exploring Expedition collections which represent *O. tahitensis* and *O. subumbellata,* two species otherwise known only from the Society Islands. Considering the lack of corroborative observations of *Ophiorrhiza* in Samoa, as well as the occasional mislabelling of botanical collections of the Exploring Expedition, I am inclined to think that the two "Samoa" collections were made in the Society Islands. Similarly, a Graeffe collection from "Samoa" is assignable to *O. leptantha,* from

Fiji and the Horne Islands. It is known that Graeffe collected on the island of Viti Levu, and in several other instances it is reasonably certain that his specimens labeled "Samoa" actually came from Fiji (A. C. Smith, personal communication). I have therefore considered this Graeffe collection as being of Fijian origin.

The absence of *Ophiorrhiza* from Samoa, Tonga, the Cook Islands, and the Austral Islands is unexpected, in view of its relative abundance and diversity in Fiji and the Society Islands. It is not known whether intermediate archipelagoes once supported populations of *Ophiorrhiza* which have since become extinct, or whether the presence of *Ophiorrhiza* in the Society Islands is the result of chance long-distance dispersal which never involved intermediate land areas. The latter is probably the more likely hypothesis, since there is no obvious reason why *Ophiorrhiza* should not have persisted in such forested archipelagoes as Samoa once it had become successfully established.

Morphology

The basic characters discussed below being more or less generic in nature, they are not repeated in the specific descriptions unless particularly significant.

Habit and habitat. The species of *Ophiorrhiza* in the Pacific vary from procumbent herbs to shrubs about three meters high. Considerable variation is encountered within many species, but most are suffrutescent herbs of about fifty centimeters. Some authors (Drake, 1893) have placed considerable weight on habit as a key character separating Tahitian species, but so much variation in habit is encountered as to preclude the use of such characteristics as defining species. Most species have been described as perennial, but some, specifically *O. palauensis,* have been referred to as annuals. Although the period of duration may prove to be of some taxonomic value, not enough reliable information is available to warrant its use as a key character in this study.

Habitat seems more reliable in characterizing some species of *Ophiorrhiza.* Most are inhabitants of humid. upland forests, but some (e.g. *O. leptantha, O. laxa, O. peploides,* and *O. palauensis)* have a wider altitudinal range. A few species (e.g. *O. orofenensis* and *O. tahitensis)* are known only from comparatively high elevations, while *O. rupestris* is restricted to a strand habitat.

Indument. The Pacific species of *Ophiorrhiza* are all pubescent to some degree, although in some species (e.g. *O. longituba)* the pubescence may be restricted to the inflorescences and the interior of the corolla tubes. Indument varies from small orange-yellow hairs (especially characteristic of *O. leptantha, O. nelsonii,* and *O. setosa)* to

longer, stiffer hairs which may be more scattered, to almost imperceptible, very minute hairs (characteristic of *O. subumbellata, O. scorpioidea, O. solandri, O. platycarpa).* I have examined with the light microscope a sampling of the indument of nearly all plant parts of the species under consideration here (FIGURE 1). In general, the trichomes of the Pacific species are of three types. Hairs of moderate length are commonly found on the vegetative organs, the inflorescences, and the ovary. When present, they are usually multicellular and uniseriate. As far as I am able to determine, the septa between the cells are complete in Verdcourt's (1958) sense. The number of cells making up each trichome may vary greatly, as does the length of the terminal

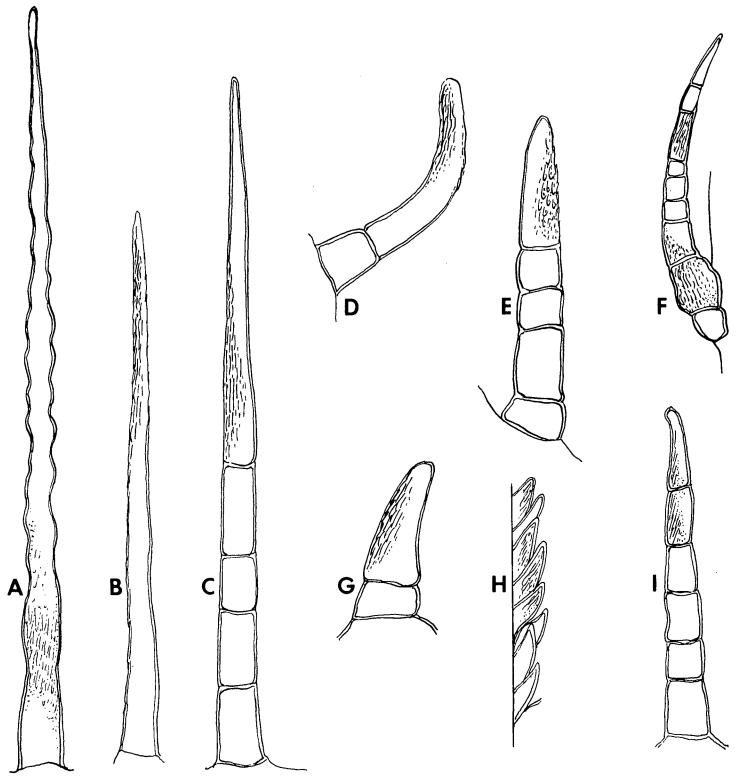

FIGURE 1. Trichomes from representative Pacific species of *Ophiorrhiza.* A, *O. rupestris,* from corolla throat, × 125, from *McKee 19879.* B, *O. palauensis,* from corolla throat, × 125, from *Fosberg 32406.* C, *O. tahitensis,* from exterior of corolla, × 125, from *Vesco.* D, *O. setosa,* from inflorescence bract, × 200, from *Vesco.* E, *O. peploides,* from margin of leaf blade, × 200, from *Setchell & Parks 15131.* F, *O. laxa,* from margin of leaf blade, × 200, from *Degener 14805.* G, *O. palauensis,* from exterior of corolla, × 200, from *Fosberg 32406.* H, *O. subumbellata,* from branchlet, × 200, from *Grant 4424.* I, *O. nelsonii,* from exterior of corolla, × 125, from *MacDaniels 1601.*

cell. A second type of trichome is found in those species which are very minutely puberulent (e.g. *O. subumbellata).* Here the hairs are extremely small and consist of but one curved cell (FIGURE 1, H). In the third trichome type the hairs are elongate and unicellular (FIGURE 1, A&B). Such hairs have been found only on the interior of corolla tubes and at corolla throats; Verdcourt (1958) is of the opinion that multicellular hairs on the interior of corolla tubes in the Rubiaceae are very rare. The walls of these unicellular hairs were found to be subparallel in all species examined except those of *O. rupestris,* in which the walls are distinctly undulate in optical section (FIGURE 1, A). In all the trichomes observed, the walls of the cells are tuberculate to striate. No crystals were found in the cells of the trichomes.

Leaves and stipules. The leaves of Pacific species are, with but one exception, petiolate, chartaceous to membranaceous, and entire. In outline they usually vary from obovate to ovate; they are acute to acuminate at apex, and decurrent on the petiole at base. In *Ophiorrhiza rupestris,* the leaves are often obtuse to rounded at apex and are frequently subfalcate (FIGURE 3, E). In *O. peploides,* the leaves are considerably smaller than in other species and are often spathulate in outline and apparently sessile on the branchlets; the margins may be somewhat crenulate (FIGURE 4, D&E). In all species the upper surfaces of the leaf blades dry dark, while the blades remain paler beneath. In some, e.g. *O. nelsonii,* the lower surfaces of the leaf blades dry with a distinct orange color; in others the leaves have a yellowish cast *(O. leptantha). Ophiorrhiza solandri* is the only Pacific species characterized by having rugose leaves, the secondary nerves being distinctly elevated above when dry (FIGURE 10, B). In *O. orofenensis,* the secondary nerves become pale when dry, while the lamina remains dark (FIGURE 10, G).

Among the species studied, stipule form has been found to be a valuable taxonomic character. In general, the stipules are interpetiolar, but they vary greatly in shape, size, and persistence. Stipules are easily observed in all species except *Ophiorrhiza peploides,* in which they are extremely small and ephemeral; Seemann (1866) was of the opinion that this species was exstipulate. Among the other Pacific species, at least three stipule types are recognizable: (1) stipules which are setaceous to narrowly subulate over most of their length and have only a small membranaceous base, as in *O. brachyantha* (FIGURE 4, A), *O. laxa* (FIGURE 4, H), *O. leptantha* (FIGURE 6, D), *O. palauensis* (FIGURE 6, F & G), and *O. setosa* (FIGURE 7, B); (2) those which are almost entirely made up of a larger membranaceous body and are variable at apex but often fimbriate, as in *O. nelsonii* (FIGURE 7, D) and *O. tahitensis* (FIGURE 8, D); and (3) those which are more minute, coria-

ceous, and deltoid, often being acute at apex, as in *O. platycarpa* (FIGURE 9, B), *O. subumbellata* (FIGURE 10, E), and *O. scorpioidea* (FIGURE 11, D).

The form of the stipular apices has been considered an important taxonomic character by some authors (Seemann, 1866). *Ophiorrhiza tahitensis,* for example, has been indicated as having entire stipules which are setaceous toward the apex, whereas *O. nelsonii* has been thought to possess stipules which are invariably fimbriate. However, as here interpreted, both species possess entire as well as fimbriate stipules and are to be distinguished by other characters. Similarly, stipules of *Ophiorrhiza* which I have examined are often variously divided, sometimes to the base. Since divided and undivided stipules are frequently found on the same specimen, I consider the degree of division to be a character of dubious taxonomic value.

Crystals. Recently proposed systems for the suprageneric classification of the Rubiaceae (Verdcourt, 1958; Bremekamp, 1966) have employed the presence or absence of raphid crystals as an important character defining subfamilies and tribes. Considerable confusion persists regarding the proper placement of *Ophiorrhiza* within the family, a problem which is discussed in more detail below. Bremekamp (1952) reported that the species of *Ophiorrhiza* which he examined do not possess raphides, but Verdcourt (1958) did describe raphid crystals in the genus. I have found various types of crystals, including raphides, in the leaf tissues of some Pacific species. The bundles of raphides are easily discernible in the outer tissues of the branchlets and petioles of some species (e.g. *O. palauensis);* I have found them in abundance in mesophyll cells of *O. peploides* (FIGURE 3, A). However, I have been unable to locate raphid crystals in the leaves of some other Pacific species (e.g. *O. subumbellata, O. leptantha)* although such crystals possibly occur in other parts of the plant. Druses are also frequently present in the leaf tissues of the species examined. It may well be that raphides are not present throughout the genus, although some species definitely do possess them.

Inflorescences. Inflorescences which are terminal helicoid cymes, or cymes with helicoid branches, are characteristic of the genus *Ophiorrhiza* (Schumann, 1891). Certain Pacific species, for example *O. rupestris* (FIGURE 3, C) and *O. scorpioidea* (FIGURE 11, E) show this feature particularly well. The branching may be nearly dichotomous or alternate. Some specimens of *O. peploides* (FIGURE 4, B) and *O. solandri* (FIGURES 9, D; 10, A) have unbranched inflorescences, but in most species the inflorescences are freely branching. In addition to the above mentioned features, I have employed the openness of the branching and the number of flowers per inflorescence as species-

defining characters, since they appear to be reasonably stable.

Inflorescence bracts are frequently encountered in species of *Ophiorrhiza,* and their presence or absence was considered by Schumann (1891) to be of considerable importance in defining species groups within the genus. I have found bracts to be variously present in the inforescences of all Pacific species. In some specimens of *O. peploides, O. leptantha,* and *O. laxa,* bracts may be strongly developed, while they are lacking entirely in other specimens of the same species. Similarly, bracts are known only in the flowering inflorescences of *O. longituba,* and are only occasionally discernible in *O. rupestris.* As the inflorescence bracts are variable in occurrence, so are they variable in shape from broadly subulate to setaceous. However, their overall form and maximum length seem to be species-specific within limits.

Perianth. The calyces of *Ophiorrhiza* species are relatively small and consist of five lobes which are quite free or somewhat fused toward the base. In the Pacific species examined, the calyx lobes are essentially deltoid, but in *O. palauensis* they may be somewhat lanceolate and proportionately long.

The corollas of the species of *Ophiorrhiza* which I have examined are most often white, but sometimes they are pink, purple, yellow, or red. To some extent the corolla color is species-specific, but some species (e.g. *O. leptantha* and *O. laxa)* are quite variable in this respect. Among the Pacific taxa the corolla shape also differs. In most cases the corollas are narrowly infundibular to somewhat hypocrateriform (FIGURES 4, F; 6, A; 7, C; 8, A); they are usually considerably longer than broad. Very short corollas are found in *O. rupestris* (FIGURE 3,D) and *O. brachyantha* (FIGURE 3, G), and in the former species they may be somewhat urceolate. The corollas of *O. peploides* are broadly infundibular and, unlike those of any other species examined, have lobes nearly equal to or exceeding the tube in length (FIGURE 4, C).

The exteriors of the corollas in some species (e.g. *Ophiorrhiza tahitensis* and *O. nelsonii)* may vary from puberulent to glabrous (FIGURE 7, E & F). The corolla tubes of *O. longituba* and *O. solandri* are always glabrous without, those of *O. peploides* only rarely puberulent. The indument on the interior of the corolla tubes is also variable, but it seems more usable as a specific character. In some species (e.g. *O. peploides* and *O. brachyantha),* the corolla tube is glabrous within, while in others the interior of the tube is puberulent throughout (e.g. *O. palauensis).* In many species (all from the Society Islands) the indument is restricted to an area of the tube below the point of attachment of the stamens. The corolla tubes of *O. leptantha, O. laxa,* and

O. rupestris are glabrous within except for long, white hairs which are usually present at the corolla throat.

Androecium. *Ophiorrhiza* species have five stamens which are adnate to the corolla tube. In most of the Pacific species the stamens are attached subequally to the tube well below the corolla throat and the anthers are included. Only the Fijian species *O. laxa, O. leptantha,* and *O. peploides* have stamens which are inserted at or near the corolla throat and anthers which are exserted, although the anthers of *O. leptantha* may be either exserted or included (FIGURE 5, B—H). The filaments of *O. peploides* are well developed and are often longer than the corolla tube (FIGURE 4, C); in *O. laxa* the anthers are subsessile at the corolla throat (FIGURE 5, A). In species with included stamens, the free portion of the filament may vary in length within the same flower and is easily separated from the tube for most of its length.

The anthers are usually oblong-linear in shape and apparently 2-loculed (FIGURES 6, E; 7, G; 10, F). Dehiscence is longitudinal. In many species the anthers are subbasally attached, but in a few (especially *Ophiorrhiza subumbellata)* they are dorsifixed. In the latter case the anther locules are free from the point of attachment of the filament to their base and may be somewhat spreading, the anther, consequently, appearing somewhat sagittate.

Pollen. I have examined the pollen of most of the Pacific species of *Ophiorrhiza* (FIGURE 2), and in all features the pollen of those taxa agrees well with Verdcourt's (1958) description of the pollen of species outside our range. The single grains (monads) were found to be isopolar, radiosymmetric, tricolporate and circulaperturate, subspheroidal to suboblate, subtriangular in polar view (or more circular in *O. nelsonii, O. tahitensis,* and *O. setosa),* and medium sized, the average length of the polar axes being 23—40μ and that of the longest equatorial axes 30—47μ (both axes often equal in *O. setosa,* the grains essentially spherical). Apertures are composed of short colpi (these weakly developed in *O. tahitensis* and *O. setosa)* and ora which are usually circular in outline (more distinctly lolongate in *O. tahitensis)* and 3.6—9.6μ in diameter (the largest ora occurring in *O. tahitensis, O. nelsonii, O. setosa,* and *O. palauensis).* The exine is about 2μ thick (somewhat thinner in *O. peploides,* up to 3μ in *O. scorpioidea* and *O. subumbellata),* the nexine as thick as to half as thick as the

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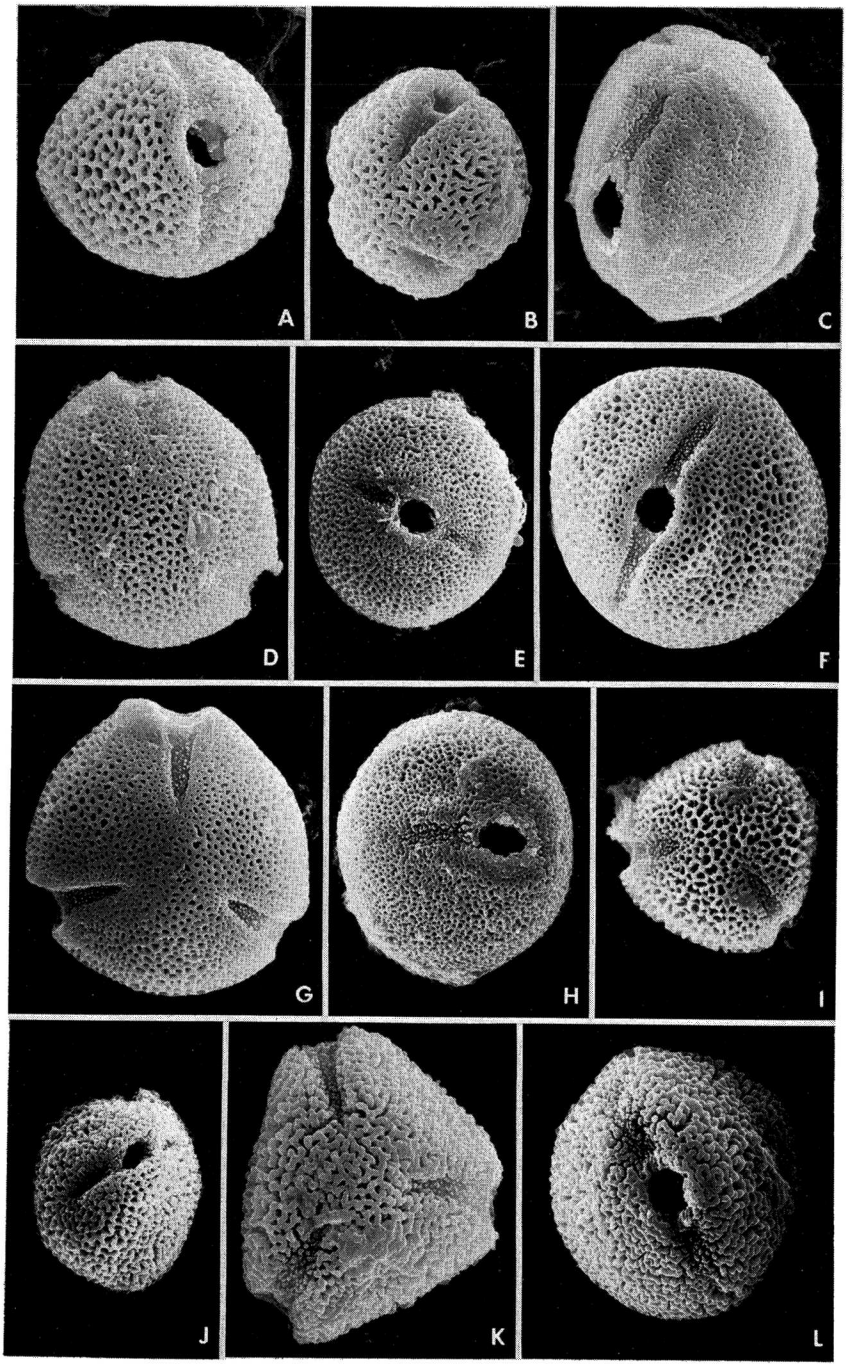
FIGURE 2. Scanning electron micrographs of pollen grains from representative Pacific species of *Ophiorrhiza.* A, *O. peploides,* × 1500, from *Smith 9329.* B, *O. laxa,* × 1500, from *Smith 5889.* C, *O. palauensis,* × 1500, from *Fosberg 32406.* D & E, *O. setosa,* both × 1000, both from *Vesco.* F & G, *O. nelsonii,* both × 1000, both from *MacDaniels 1728.* H, *O. tahitensis,* × 1000, from *Quayle 65.* I & J, *O. subumbellata,* both × 1000, both from *Vesco* in 1847. K & L, *O. scorpioidea,* both × 1500, both from *Grant 5388.*


A
B
C
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sexine, somewhat to conspicuously thicker around the ora. The grains are tectate-perforate to semitectate, with the columellae numerous, randomly spaced beneath the muri, and with the lumina 1—2μ in diameter (often smaller in *O. tahitensis, O. nelsonii,* and *O. palauensis).*

Gynoecium. The ovary in *Ophiorrhiza* is relatively small, subglobose, and often conspicuously ribbed by the decurrent bases of the calyx lobes. The ovules are many in each of the two locules and are attached to a turbinate placenta near the center of the dissepiment, the placenta becoming bacculate to clavate in fruit and often occupying a more basal position on the dissepiment (FIGURES 6, C; 11, C). The ovary is capped by a 2-lobed disk which encircles the base of the style but is free from it.

The style (FIGURES 6, E; 7, G; 10, F) is filiform and glabrous over most of its length; it is about the same length as the corolla tube and terminates in a capitate to clavate, 2-lobed stigma. The stigma (FIGURES 4, G; 10, F) is variable in indument as well as form and may be conspicuously puberulent or essentially glabrous. In most species the stigma is variably included within the corolla tube or exserted a few millimeters beyond it. In no species have I found the mature stigma positioned below the anthers, although it is frequently subequal to them in distal extent.

Fruits and seeds. The characteristic fruit of *Ophiorrhiza* is a dry, papery, loculicidally dehiscent capsule which is laterally flattened (FIGURES 3, C; 4, B; 6, C; 7, A; 8, C; 9, A, C, & D). The fruits are compressed in such a way that the longest axis is perpendicular to the dissepiment. Such capsules have been found to be consistently more than twice as broad as long and in many species they may be described as mitriform, i.e. resembling a mitre. This description is particularly apt in those cases (e.g. *O. setosa)* in which the inflated locules are somewhat fusiform and the apex of the fruit is depressed (FIGURE 7, A). In a few instances (e.g. *O. longituba)* the fruits are somewhat cordate to subtriangular in outline (FIGURE 9, A, C, & D). A few species of *Ophiorrhiza* in the Society Islands are characterized by fruits which are subglobose. In these species, *O. subumbellata, O. orofenensis* (FIGURE 11, B & C), and *O. scorpioidea* (FIGURE 11, E), the mature fruits are only slightly broader than long and they are not especially compressed. In all species examined, the fruits are coronate with the persistent disk and calyx lobes.

The seeds (FIGURE 6, B) are numerous (50—200) in each locule and attached to the placenta, which expands with the maturing fruit. They are dry and rhomboid, the longest axis being about 0.5 mm. The surface is smooth.

Reproductive biology

Schumann (1891) listed *Ophiorrhiza* as one of a number of rubiaceous genera in which heterostyly is well developed. Later authors, however, have not considered *Ophiorrhiza* as having true heterostyly, and the genus was not listed by Vuilleumier (1967) in her review. Verdcourt (1958) specifically stated that species of his tribe Ophiorrhizeae (comprising *Ophiorrhiza* and *Spiradiclis*) are not heterostylous. In a casual examination of specimens from localities throughout the range of the genus, I have not found evidence of heterostyly; it is certainly not present in any of the Pacific species. The variable location of the stamens in the corolla tubes of *O. leptantha* (Figure 5, B—H) may have some significance in the regulation of pollen flow, but no evidence of this has been accumulated. In the proper sense, this species is not heterostylous, since the positions of the stigma and anthers are not reciprocal from flower to flower. A similar situation has been reported by Verdcourt (1958) for *Sipanea* Aubl., a genus usually placed in or near the tribe Rondeletieae.

The shape of the elongate corolla tubes in most of the Pacific species of *Ophiorrhiza* suggests that the flowers are pollinated by lepidopterans, an hypothesis also supported by the well-developed floral disk which is present at the base of the corolla. Species with shorter or more open tubes (e.g. *O. rupestris* and *O. peploides)* may be pollinated by other insects. In the Fijian species the anthers are frequently exserted beyond the corollas; in those cases the flowers may be wind pollinated. I have found no evidence to suggest that the flowers of the Pacific species are functionally unisexual.

Phylogeny

Tribal relationships. In having opposite, stipulate leaves, sympetalous corollas, and inferior ovaries, *Ophiorrhiza* is a typical member of the Rubiaceae. In the past, *Ophiorrhiza* was associated with other genera having numerous seeds in each ovary locule, and it has consequently been placed by concerned authors in the subfamily Cinchonoideae or its equivalent (Hooker, 1873; Schumann, 1891). Because the seeds of *Ophiorrhiza* are unwinged and the aestivation of the corolla lobes valvate, the genus has, by the same authors, been assigned to the tribe Hedyotideae. Systems for the classification of the Rubiaceae recently proposed by Verdcourt (1958) and Bremekamp (1966) have largely ignored the number of ovules per locule as a character defining subfamilies. Instead, both authors have employed other features, especially the presence or absence of raphid crystals, as indicating intergeneric relationships.

Bremekamp (1952) removed *Ophiorrhiza* from the Hedyotideae because, unlike other genera of that tribe, it was found not to possess

raphides. Bremekamp united *Ophiorrhiza, Spiradiclis* Blume, and *Virectaria* Bremekamp into a new tribe which he called the Ophiorrhizeae. He later (1954) made *Ophiorrhiza* the type genus of a subfamily, the Ophiorrhizoideae (a subfamilial name which was never validly published). In his most recent classification, Bremekamp (1966) placed the Ophiorrhizeae in the subfamily Urophylloideae, a taxon "imperfectly characterizable," but devoid of raphides.

Verdcourt (1958), in reviewing Bremekamp's placement of *Ophiorrhiza,* reported the presence of raphid crystals in that genus and *Spiradiclis;* he therefore removed both genera to the subfamily Rubioideae. Verdcourt placed *Virectaria* in the subfamily Cinchonoideae. Although Verdcourt did not specifically exclude *Spiradiclis* from the tribe Ophiorrhizeae, his description of the tribe as having capsules "very characteristic, broadly obcordate" suggests that his concept of the Ophiorrhizeae is limited to *Ophiorrhiza* alone, since the fruits of *Spiradiclis* are globose or cylindrical.

As stated in the above description of crystals in the Pacific species of *Ophiorrhiza,* I agree with Verdcourt that raphid crystals are present in at least a few of the species belonging to the genus. For this reason, as well as for its albuminous seeds and the valvate aestivation of its corolla lobes, I would place *Ophiorrhiza* in the subfamily Rubioideae.

As to tribal relationships, arguments may be presented in favor of the placement of *Ophiorrhiza* in the Coccocypseleae, Schradereae, Cruckshanksieae, Hedyotideae, or a tribe of its own, the Ophiorrhizeae. Maintenance of a separate tribe Ophiorrhizeae is based primarily on the peculiar, laterally flattened fruits of *Ophiorrhiza* and the absence of heterostyly in the genus. However, in examining the Pacific species I have found fruits which are subglobose. In some respects *Ophiorrhiza* is similar to the genera placed in the tribes Coccocypseleae and Schradereae. Although raphid crystals are present in those two tribes, their component genera differ from *Ophiorrhiza* in their capitular or subcapitular inflorescences and baccate fruits, among other characters. Members of the Cruckshanksieae and Hedyotideae are similar to *Ophiorrhiza* in the presence of raphides, valvate aestivation of the corolla lobes, noncapitular inflorescences, and dry, capsular fruits. The Cruckshanksieae and Hedyotideae were united by Schumann (1891), but Verdcourt and Bremekamp follow Hooker (1873) in maintaining them as separate although closely related tribes. Whether united with the Hedyotideae or treated as a distinct tribe, the genus *Cruckshanksia* Hook. & Arn. and its close relatives differ from *Ophiorrhiza* in having ovules which are usually only two in each ovary locule and attached near the base of the dissepiment. In addition, the Cruckshanksieae are strongly heterostylous and do

not have flattened fruits; in those same two features the Hedyotideae also differ from *Ophiorrhiza,* but in that tribe the ovules are usually many in each ovary locule.

Familiar only with the Pacific taxa, I am inclined to place *Ophiorrhiza* in the tribe Hedyotideae, although it would be a very distinct member of that taxon. Many characters of the genus, e.g. its usually herbaceous to suffrutescent habit, septate hairs, tricolporate pollen, and narrow corolla tubes, are not out of place in the Hedyotideae. *Ophiorrhiza* may indeed be closely related to *Spiradiclis,* although the latter genus possesses flowers which are sometimes four-parted, fruits which open by four valves, and thyrsoid inflorescences.

Infrageneric classification. Schumann (1891) seems to have been the only author to have proposed an infrageneric classification of *Ophiorrhiza.* He divided the genus into two groups ("Reihe"), the first *(Ebracteolatae)* comprising species without inflorescence bracts, or with such bracts small and caducous; Schumann cited *O. mungos* and its close relatives as members of the group. The second "Reihe" *(Bracteolatae)* includes species in which the inflorescence bracts are well developed and the vegetative parts dry with a purple color; the group is characterized by *O. grandiflora* and *O. succiruba.* Although hypotheses about the infrageneric relationships of *Ophiorrhiza* cannot be safely constructed when only the Pacific species have been examined, I am inclined to consider Schumann's two infrageneric taxa unlikely to be natural. Such taxa based on a single character are notoriously unsound; within what appear to be otherwise homogeneous species I have found specimens with well developed inflorescence bracts and others in which the bracts are absent.

The Pacific species of *Ophiorrhiza,* because they represent geographical fringe elements of the genus, cannot be expected to show strong relationships among themselves. In other genera this has been found to be the case, the Pacific species probably being most closely related to eastern Asian or Malesian taxa. However, as a result of apparent secondary speciation in the Society Islands, a few species of *Ophiorrhiza* endemic to that archipelago seem to be closely interrelated; these species are *O. platycarpa, O. subumbellata, O. orofenensis,* and *O. scorpioidea.* The last three species are distinct in having subglobose fruits, a feature which I have not found reported elsewhere in the genus and one which, in conjunction with other characters, may warrant the recognition of those species as a separate infrageneric taxon of some rank. Clarification of the relationships of the species of *Ophiorrhiza* must await a worldwide revision of the genus; at least the New Guinean and southeastern Asian taxa must be reviewed before any firm conclusions can be reached.

KEY TO SPECIES

Corolla tubes less than 3 mm. long.

Stipules subcoriaceous, up to 1 mm. long, rounded to acute to acuminate at apex; peduncles more than 2 cm. long; bracts of inflorescence infrequent, less than 1 mm. long; corolla lobes puberulent without; plants of the strand.

1. *O. rupestris.*

Stipules membranaceous, more than 4 mm. long, setaceous at apex; peduncles less than 1.5 cm. long; bracts of inflorescence frequent, setaceous, more than 1 mm. long; corolla lobes glabrous without; plants of inland forests.

2. *O. brachyantha.*

Corolla tubes more than 3 mm. long.

Stipules caducous or not easily discernible; corolla broadly infundibular, the tube up to 7 mm. long, the lobes almost as long as the tube or longer; stamens with filaments commonly more than 3 mm. long; branchlets up to 0.5 mm. in diameter toward apex; leaf blades commonly less than 3 cm. long, often sessile and spathulate; Fiji only ..... 3. *O. peploides.*

Stipules usually discernible; corolla narrowly infundibular to hypocrateriform, the tube more than 8 mm. long, the lobes much shorter than the tube; stamens with filaments less than 3 mm. long; branchlets more than 0.5 mm. in diameter toward apex; leaf blades usually more than 3 cm. long, always petiolate.

Fruits laterally flattened, triangular to mitriform, more than twice as broad as long.

Interior of corolla tube glabrous except usually puberulent at throat with white hairs up to 1 mm. long.

Branchlets slender, up to 1 mm. in diameter toward apex; inflorescences rarely more than 4-branched, the peduncles usually less than 2 cm. long; corolla tubes up to 1.4 cm. long; hypanthium and calyx usually glabrous or finely puberulent with minute, white, rarely yellow hairs; anthers subsessile, attached at corolla throat amid long, white hairs; style less than 15 mm. long; Fiji only ..... 4. *O. laxa.*

Branchlets commonly more than 1 mm. in diameter toward apex; inflorescences 4- to 15-branched, the peduncles usually more than 2.5 cm. long; corolla tubes more than 1.4 cm. long; hypanthium and calyx puberulent with minute, yellow to orange hairs, rarely glabrous; stamens attached well below corolla throat or attached at throat with filaments 1—3 mm. long, or the anthers subsessile at the glabrous throat; style more than 15 mm. long; Fiji and Horne Islands. ..... 5. *O. leptantha.*

Interior of corolla tube puberulent below stamens with hairs up to 0.8 mm. long, the throat variously puberulent.

Mature stipules narrowly subulate to setaceous over most of their length, short-deltoid and membranaceous at base, more than 4 mm. long, often divided to base.

Fruiting inflorescences often more than 2 cm. broad, the peduncles more than 25 mm. long; corolla throat densely puberulent with lax, white hairs up to 0.7 mm. long; corolla lobes often more than 4 mm. long; filaments of stamens up to 1 mm. long; Palau Islands.. 6. *O. palauensis.*

Fruiting inflorescences less than 2 cm. broad, the peduncles rarely more than 20 mm. long; corolla throat finely puberulent with minute, white hairs; corolla lobes less than 4 mm. long; filaments of stamens more than 1 mm. long; Society Islands ..... 7. *O. setosa.*

Mature stipules variable in shape but never setaceous over most of their length, if setaceous at apex, then not more than 3 mm. long; Society Islands.

Inflorescences relatively compact, often more than 2 cm. broad, freely branching, commonly with more than 7 flowers; leaf blades not noticeably rugose when dry, the secondary nerves immersed to prominulous above.

Branchlets often more than 1 mm. in diameter toward apex; stipules commonly more than 2 mm. long and divided at apex.
Inflorescences usually with more than 15 flowers, more than 5 cm. long in fruit, densely puberulent with minute orange to yellow hairs, especially so on the peduncle; leaf blades often more than 10 cm. long and drying bright orange to orange-brown beneath; anthers 2.5—3 mm. long ..... 8. *O. nelsonii.*
Inflorescences with fewer than 15 flowers, less than 4.5 cm. long in fruit, glabrous to puberulent with curved, red-brown to stramineous hairs; leaf blades rarely more than 10 cm. long, drying pale green beneath; anthers 2—2.5 mm. long.
Leaf blades puberulent beneath with minute hairs often restricted to costa and secondary nerves; stipules rarely more than 10 mm. long; inflorescence bracts usually subulate, 0.3—1 (—1.5) mm. broad at middle, common in fruiting inflorescences; stigma 2—2.5 mm. long; fruits up to 3 mm. long at middle, rarely more than 7 mm. broad; branchlets usually puberulent with stramineous to reddish, curved hairs, rarely glabrous. 9. *O. tahitensis.*
Leaf blades glabrous beneath; stipules more than 10 mm. long; inflorescence bracts narrowly subulate to setaceous, about 0.3 mm. broad at middle, not common in fruiting inflorescences; stigma about 1 mm. long; fruits more than 3 mm. long at middle, more than 8 mm. broad; branchlets usually glabrous. 10. *O. longituba.*
Branchlets up to 1 mm. in diameter toward apex; stipules rarely more than 2 mm. long, not divided at apex ..... 11. *O. platycarpa.*
Inflorescences slender and lax, up to 2 cm. broad, unbranched or occasionally branched once, rarely with more than 7 flowers; leaf blades conspicuously rugose when dry, the secondary nerves sharply raised above. 12. *O. solandri.*
Fruits subglobose, not especially laterally flattened, only slightly broader than long.
Inflorescences with fewer than 25 flowers, the peduncles less than 3.5 cm. long.
Branchlets usually less than 1 mm. in diameter toward apex; secondary nerves of leaf blade not especially yellowish above when dry; stipules less than 1 mm. long; inflorescences usually with fewer than 15 flowers, about 1.5 cm. broad at anthesis ..... 13. *O. subumbellata.*
Branchlets more than 1.5 mm. in diameter toward apex; secondary nerves of leaf blade conspicuously yellowish above when dry; stipules commonly more than 1 mm. long; inflorescences usually with more than 15 flowers, more than 3 cm. broad at anthesis ..... 14. *O. orofenensis.*
Inflorescences with more than 25 flowers, the peduncles commonly more than 3.5 cm. long ..... 15. *O. scorpioidea.*

1. **Ophiorrhiza rupestris** Hemsl. in Kew Bull. **1894:** 212. 1894; St. John & A. C. Sm. in Pacific Sci. **25:** 340. 1971.

FIGURES 1, A; 3, B—E.

Ophiorrhiza cf. *harrisiana* sensu Guillaumin in J. Linn. Soc. Bot. **51:** 555. 1938; non Heyne.

Subligneous herb to 35 cm. high, the indument composed of minute, curved, ferrugineous to yellow hairs up to 0.1 mm. long, the branchlets slender, subterete, dark brown, 1—1.5 mm. in diameter toward apex; stipules caducous, subcoriaceous, deltoid, 0.5—1 mm. long, 1—1.5 mm.

broad at base, acute to acuminate at apex, finely puberulent over both surfaces; petioles slender, semiterete to canaliculate at base, 5—20 mm. long, 0.5—1 mm. broad at middle; leaf blades chartaceous, drying dark green above, paler beneath, ovate to elliptic, often subfalcate, (3.5—) 5—10 cm. long, 1.5—4 cm. broad, acute to obtuse or rarely rounded or acuminate at apex, decurrent on petiole and often oblique at base, entire at margin, finely puberulent with scattered minute hairs above and on costa and secondary nerves beneath, the costa prominent, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 6—9 per side, plane to prominulous above, prominulous beneath, the tertiary nerves and veinlets plane to somewhat impressed above, prominulous beneath; inflorescences open, with 2—5 branches and 10—45 flowers, 2.5—6.5 cm. long, 1.5—4 cm. broad, the peduncle slender, 2—3 cm. long, up to 1 mm. in diameter, the rachis more or less straight, elongate, the pedicels up to 1 mm. long, the bracts infrequent, subulate, up to 0.4 mm. long; calyx lobes coriaceous to chartaceous, deltoid, 0.2—0.8 mm. long, 0.3—0.5 mm. broad, acute at apex, entire at margin, finely puberulent over both surfaces; corolla broadly hypocrateriform to suburceolate, the tube 1.5—2.5 mm. long, 0.7—1.5 mm. in diameter at middle, puberulent without with minute, yellow to brown hairs or glabrous, glabrous within except puberulent at throat with thin, white, spreading hairs up to 0.5 mm. long, the lobes ovate, 0.7—1.5 mm. long, 0.7—1 mm. broad, acute to obtuse at apex, entire at margin, puberulent on both surfaces with minute, yellow to white hairs; stamens inserted immediately below corolla throat, the filaments filiform, 0.5—0.7 mm. long, the anthers exserted, subdorsifixed about 0.2 mm. above base, oblong-linear, about 1 × 0.1 mm.; ovary subglobose, about 0.7 × 1.2 mm., capped by a 2-lobed disk up to 0.3 mm. high, finely puberulent; style filiform, about 3.2 mm. long, 0.1—0.2 mm. in diameter, glabrous except for a few scattered hairs below stigma; stigma exserted up to 1 mm., short-clavate to capitate, about 0.5 × 0.2—0.5 mm., minutely puberulent with whitish hairs; fruits mitriform, 1.5—2 mm. long at middle, 4.5—6.5 mm. broad, the locules widely spreading, finely puberulent with scattered hairs, brown when dry, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: Hemsley's description of *Ophiorrhiza rupestris* is contained in a paper dealing with Solomon Island collections "made by the officers of H. M. S. 'Penguin,' and communicated by Captain W.G.L. Wharton, F.R.S., Hydrographer to the Admiralty." For this reason, the "Penguin" expedition specimen (K) labeled *O. rupestris* seems the obvious lectotype, even though Hemsley also mentioned material collected by Rev. R.B. Comins (K). The lectotype bears the date 1894 and was obtained in the Solomon Islands without further locality.

DISTRIBUTION: In our area *Ophiorrhiza rupestris* is known from the island of Espiritu Santo in the New Hebrides and from Futuna, one of the Horne Islands. *Ophiorrhiza rupestris* is otherwise distributed

throughout the Solomon Islands and is probably identical with *O. insularis* Val. in New Guinea (Merrill & Perry, 1945). It is a suffrutescent, littoral herb with white flowers. Flowering and fruiting material have been gathered between September and December.

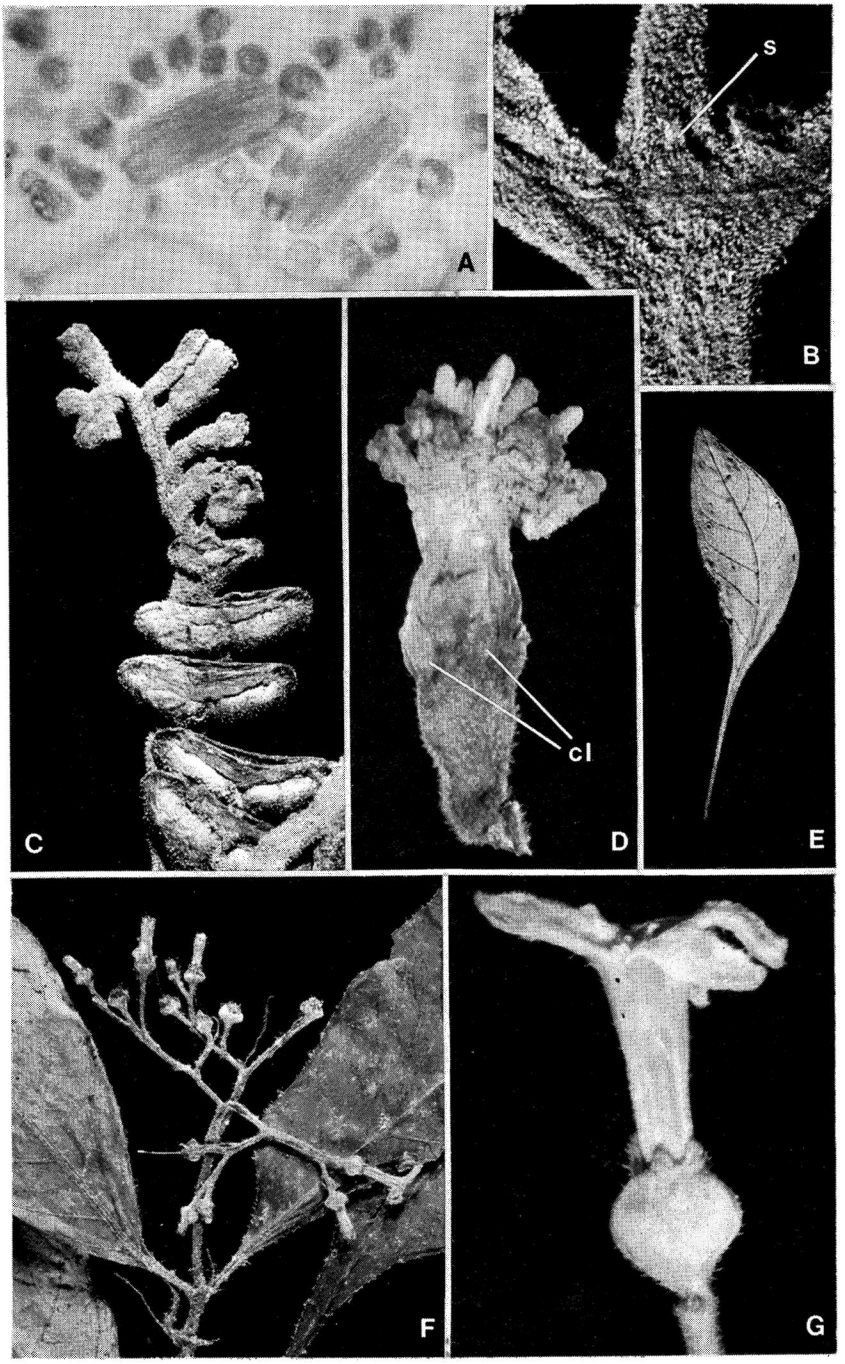
New Hebrides. ESPIRITU SANTO: Big Bay, Tolomako, Malotchiritchiri Rocks, *Raynal (R. S. N. H.) 16400* (BISH); Hog Harbour. *I. & Z. Baker 88* (BM); Tangoa, south of Santo, *Morrison* (K).
Horne Islands. FUTUNA: Singave, *McKee 19879* (BISH, P.).

The listed collections assigned to *Ophiorrhiza rupestris* agree well with material from the Solomon Islands. The species is readily recognized by the often subfalcate leaf blades and the long, spreading inflorescence branches which exhibit particularly well the helicoid cyme which is characteristic of the genus. Unlike those of most other Pacific *Ophiorrhizae,* the leaf blades of this species are often obtuse to rounded at apex and the inflorescence bracts are small and infrequent. In the size and shape of the stipules, as well as in the very fine indument, *O. rupestris* resembles certain Tahitian species, e. g. *O. subumbellata, O. solandri,* and *O. platycarpa.* However, from these *O. rupestris* differs in its much shorter and differently shaped corolla tubes, its elongate and often spreading inflorescence branches, and the shape of its leaf blades, among other characters. If the assignment by Merrill & Perry (1945: 13) of *O. insularis* to this species is correct, the range of *O. rupestris* extends northwestward into New Guinea, where its closest relatives are probably to be found.

From the one other New Hebridean species, *Ophiorrhiza brachyantha,* the present species is readily distinguished by the shape and size of the stipules, the length of the pedicels, the type of indument, and the infrequency of inflorescence bracts.

2. **Ophiorrhiza brachyantha** S. Darwin, sp. nov. FIGURES 3, F&G; 4, A.

Herba suffrutescens ad 70 cm. alta, indumento pilis curvatis multicellularibus ferrugineo-ochraceis ad 0.2 mm. longis plerumque ornata, ramulis gracilibus subteretibus apicem versus ad 1 mm. diametro fuscis; stipulis plus minusve persistentibus basi deltoideis membranaceis apice setaceis non divisis 4—7 mm. longis, basi circiter 1 mm. latis, utrinque pilis dispersis puberulis; petiolis gracilibus semiteretibus 7—25 mm. longis, ad medium plus minusve 0.5 mm. latis; foliorum laminis chartaceis, in sicco supra atroviridibus subtus pallidis, lanceolatis vel oblanceolatis, 6—11 cm. longis, 1.5—2.5 cm. latis, apice acuminatis, basi acutis vel in petiolum longidecurrentibus, integris, supra pilis dispersis puberulis subtus pilis ad costam et nervos secundarios et marginem restrictis, costa conspicua supra prominula vel canaliculata subtus elevata et rotundata, nervis secundariis utrinsecus 8—12 patentibus supra prominulis subtus elevatis et rotundatis, ner-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vis tertiariis et rete venularum utrinque aliquantum prominulis; inflorescentiis laxe 3- vel 4-ramosis 6—15-floris, sub anthesi circiter 2.5 cm. longis, 1—3.5 cm. latis, pedunculo puberulo 6—12 mm. longo, pedicellis puberulis ad 3 mm. longis, bracteis frequentibus plus minusve setaceis utrinque puberulis, 1.5—6 mm. longis, ad 0.1 mm. latis; calycis lobis coriaceis vel chartaceis deltoideis, 0.3—0.5 mm. longis, basi 0.3—0.5 mm. latis, apice acutis, integris glabris vel subtiliter puberulis; corollae tubo hypocrateriformi circiter 2.5 mm. longo, ad medium 0.5—1 mm. diametro, extus glabro intus subtiliter pilis aurantiacis minutis puberulo; corollae limbo circiter 3.5 mm. lato, lobis ellipticis circiter 1.5 mm. longis, 0.5—0.7 mm. latis, integris, apice acutis, extus glabris intus pilis aurantiacis minutis puberulis; staminibus circiter 1.5 mm. sub corollae fauce insertis, filamentis filiformibus ad 0.5 mm. longis, antheris dorsifixis oblongo-linearibus, circiter 1 mm. longis et 0.2 mm. latis, loculis e basi circiter 0.3 mm. liberis; ovario subgloboso circiter 1 × 1.5 mm., pilis aurantiacis minutis dense puberulo; stylo filiformi glabro, circiter 3.5 mm. longo et 0.1 mm. diametro; stigmate clavato supra medium bifido quasi glabro, circiter 3.5 × 0.1 mm.; fructibus ignotis.

TYPE LOCALITY: As the type of this species I designate *Bernardi 13298* from Eromanga, cited below. This collection, because of its more numerous flowers, is preferred to the Morrison number. Bernardi's label indicates that the first set of his material was deposited at Geneva, and an isotype may well be located there.

DISTRIBUTION: Restricted to the New Hebrides and thus far known only from the islands of Efaté and Eromanga. *Ophiorrhiza brachyantha* has been observed as an herb growing along watercourses at an altitude of 400—450 m. The corollas are white and the leaf blades are conspicuously pale beneath. Flowering material has been collected in June and August, but fruits are unknown.

New Hebrides. EFATE: Undine Bay, Mt. Macdonald, *Morrison,* Aug. 27, 1896 (K). EROMANGA: Happy Land, east of Mt. Nompoun-Oumpan, *Bernardi 13298* (P holotype).

Ophiorrhiza brachyantha, proposed here as new, seems most closely related to *O. laxa,* a Fijian endemic. It is hardly separable from that species by means of vegetative characters and especially resembles it in the shape of the leaf blades, the overall form of the stipules, and the type of indument. In floral morphology, however, the Fijian spe-

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FIGURE 3. A, *Ophiorrhiza peploides,* portion of cleared leaf mesophyll showing two bundles of raphid crystals, × 350, from *Smith 9329.* B—E, *O. rupestris,* all from *McKee 19879;* B, distal node showing stipule, × 10; C, portion of inflorescence with flowers and fruits, × 4; D, flower, × 10; E, leaf, × 1. F & G, *O. brachyantha,* both from *Bernardi 13298;* F, inflorescence, × 2; G, flower, × 10. s = stipule. cl = calyx lobe.

cies differs in its longer corolla tubes, which are glabrous within except at the throat, the longer corolla lobes, the insertion of the stamens at the throat, the basifixed anthers, and the much longer style. *Ophiorrhiza brachyantha,* although partly sympatric with *O. rupestris,* is easily distinguished from that species by the characters mentioned in the above key. Like *O. rupestris,* this new species differs from other Pacific species of *Ophiorrhiza* in its much shorter corolla tubes.

The collections included by me in *Ophiorrhiza brachyantha* had been determined previously as *O. harrisiana* Heyne. I have inspected other collections of *O. harrisiana* from New Guinea and the Philippines and have found them to be quite distinct from the New Hebridean species considered here. As in *O. brachyantha,* the corollas of *O. harrisiana* are short (up to about 5 mm.), but the inflorescences are much more robust and bear more numerous flowers. Similarly, the branchlets are stouter and the leaves are larger. The stipules of the two species are similar in shape and size.

3. **Ophiorrhiza peploides** A. Gray in Proc. Amer. Acad. Arts **4:** 311. 1859; Seem. in Bonplandia **9:** 256. 1861, Viti, 438. 1862, Fl. Vit. 127. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 189. 1890; Gibbs in J. Linn. Soc. Bot. **39:** 151. 1909; Turrill in op. cit. **43:** 24. 1915; Gillespie in Bishop Mus. Bull. **74:** 26. *fig. 35, a—c.* 1930; J.W. Parham, Pl. Fiji Isl. 200. 1964, ed. 2. 281. 1972.

FIGURES 1, E; 2, A; 3, A; 4, B—E.

Suffrutescent herb or low shrub 10—50 cm. high, the indument composed of curved, ferrugineous hairs up to 0.4 mm. long, the branchlets slender, semiterete to somewhat flattened, 0.3—0.5 mm. in diameter toward apex, drying light to dark red-brown; stipules ephemeral, usually not discernible, membranaceous, deltoid, up to 0.4 mm. long, acute at apex, finely puberulent on both surfaces; leaf blades usually without a discernible petiole, chartaceous to subcoriaceous, drying dark green above, paler beneath, ovate to oblanceolate and spathulate, (0.5—) 0.7—3(—4.3) cm. long, 0.3—1 (—1.2)cm. broad, acute to obtuse at apex, gradually tapering at base, entire to somewhat crenulate at margin, glabrous or finely puberulent above with scattered hairs or these restricted to costa, puberulent beneath with scattered hairs up to 0.2 mm. long or these restricted to costa and secondary nerves or base of blade, the costa plane to somewhat canalicu-

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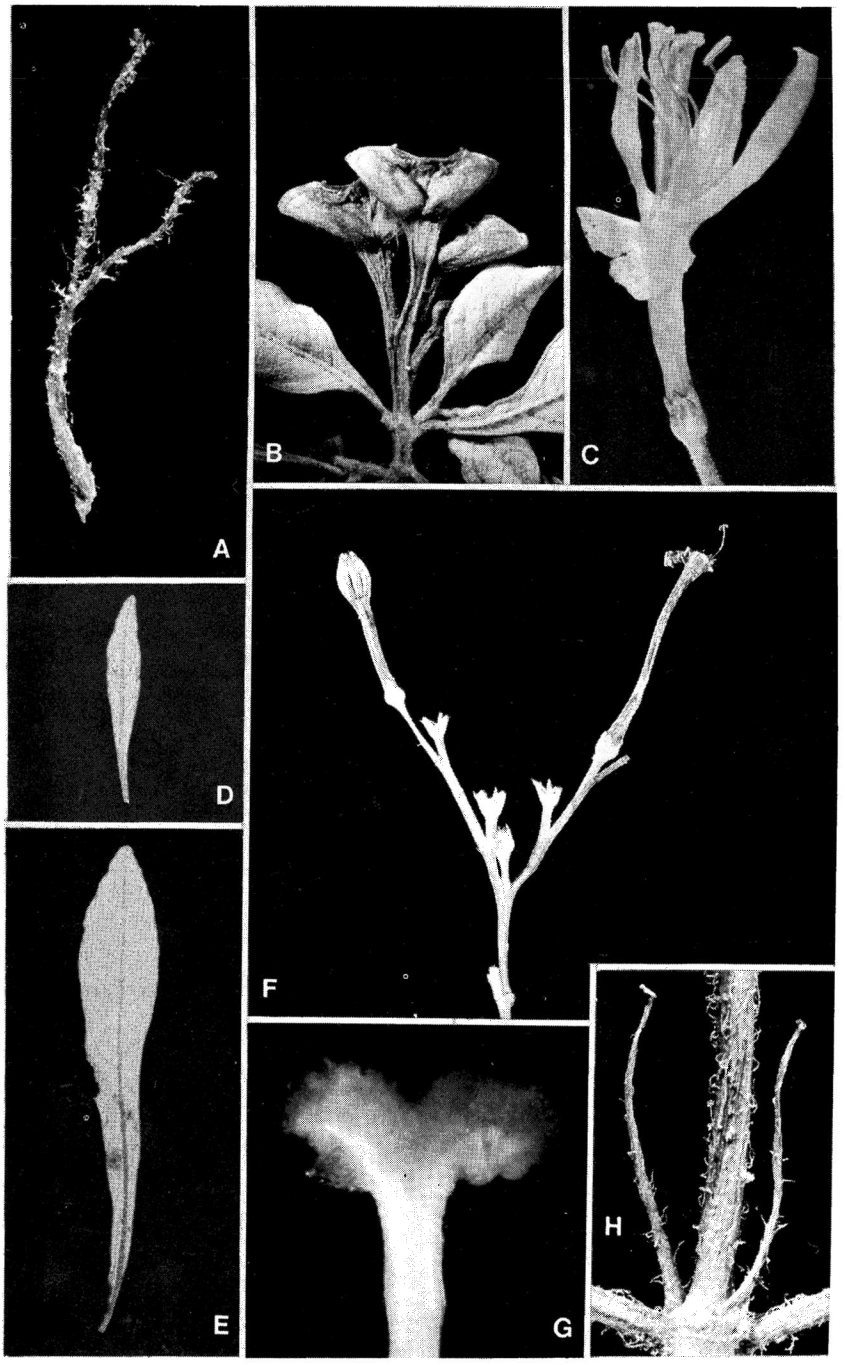
FIGURE 4. A, *Ophiorrhiza brachyantha,* excised stipule, × 10, from *Bernardi 13298.* B—E, *O. peploides;* B, fruiting inflorescence, × 4, from *Smith 9329;* C, flower, × 4, from *MacGillivray* in 1854; D, leaf, × 2, from *Smith 8333;* E, leaf, × 2, from *Harvey* in 1855. F—H, *O. laxa;* F, inflorescence, × 2, from *Smith 4418;* G, stigma, × 30, from *Smith 5889;* H, node with two stipules, × 6, from *Smith 8017.*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late above, raised and rounded beneath, the secondary nerves spreading, 3—5 per side, plane above, prominulous beneath, the tertiary nerves and veinlets barely discernible beneath; inflorescences with 3—7 flowers, the peduncle slender, 1—3 mm. long, puberulent with minute, white, curved hairs, the pedicels 1—2 mm. long at anthesis, up to 6 mm. long in fruit, rarely longer, puberulent with hairs up to 0.1 mm. long, the bracts occasional, deltoid, 0.3—2.5 mm. long, about 2 mm. broad, acute at apex, densely puberulent on both surfaces; calyx lobes broadly subulate, 0.3—0.5 mm. long, about 0.3 mm. broad at base, acute at apex, entire at margin, glabrous to finely puberulent without; corolla broadly infundibular, the tube 3.6—6.5 mm. long, 0.3—0.8 mm. broad at middle, glabrous to finely puberulent without with whitish hairs, glabrous within, the lobes elliptic, 2.8—9 mm. long, 1—3.3 mm. broad, acute at apex, entire at margin, glabrous to very finely puberulent without and within; stamens inserted at corolla throat, the filaments filiform, 2.6—7 mm. long, the anthers exserted, more or less basifixed, oblong-linear to somewhat sagittate, 0.8—1.3 (—1.6) mm. long, 0.2—0.3 mm. broad; ovary subglobose, 0.8—1.4 × 1.2—1.9 mm., capped by a 2-lobed disk up to 0.2 mm. high; style filiform, 7.2—12 mm. long, 0.1—0.2 mm. in diameter, glabrous; stigma exserted, clavate and strongly bifid to more or less capitate and 2-lobed, about 0.5 mm. long, 0.7—1 (—1.5) mm. broad when the lobes are spread apart, finely puberulent with minute glandular hairs on upper surface; fruits mitriform, 1.3—2.5 mm. long at middle, 4.2—7.2 mm. broad, finely puberulent, drying brown to purple, capped by persistent calyx lobes and disk.

TYPE LOCALITY: Gray's description of *Ophiorrhiza peploides* was based on collections made by Milne, Harvey, and the U.S. Exploring Expedition. Since his 1859 paper deals with the botany of the Exploring Expedition, it seems logical to give preference to those collections when typifying his Pacific taxa. Therefore, a U.S. Exploring Expedition specimen (US 47493) is here taken as the lectotype of the species. Gray ascribed *O. peploides* to the Fiji Islands without giving further locality data, but the lectotype bears the notation "Ovolau, Feejee Islands." Other Exploring Expedition specimens of this species are evidently part of the same collection and may be considered isolectotypes (GH, K); they bear the locality "Feejee Islands" only. Another specimen of *O. peploides* (NY) was part of the herbarium of John J. Cooke until 1899 and was collected on "Ovolau, Fiji." Although the sheet is without an Exploring Expedition label, it is essentially identical with the US collection and is here considered an isolectotype.

DISTRIBUTION: Endemic to Fiji, but widespread in that archipelago. *Ophiorrhiza peploides* is found as a suffrutescent herb at altitudes from sea level to about 1,100 m. in a variety of habitats including tidal marshes, edges of mangrove swamps, roadsides, stream banks, and

most often, in dark, humid forests. The flowers are fragrant and usually white, rarely pink or purplish. The fruits are usually green, occasionally purple-tinged. Flowering and fruiting specimens have been gathered throughout the year.

LOCAL NAMES AND USES: A number of local names have been recorded for this species: *asiasi-ni-vatu (Degener 15094), lera, lerandamu* (Parham, 1972, cited above), *ndi-ndi-ndi (Gillespie 4061), ndre-ndre-wai, thandrai (H. B. R. Parham 224), todaolo (Yeoward 3), u-thu-ni-rau-rau (H. B. R. Parham 224).* H. B. R. Parham reported that parts of this plant are used by Fijians as a hair-wash and perhaps are also eaten.

Fiji. VITI LEVU: MBA: Mountains between Lautoka and Loloti, *Greenwood 73* (K); escarpment north of Nandarivatu, *Smith 6276* (A, BISH, K, NY, US); vicinity of Nandarivatu, *Gibbs 607* (BM), *Gillespie 4061* (BISH, K, UC), *im Thurn 76* (K), *Vaughan 3376* (BM, K); Navai, *im Thurn 202* (BM, K). NANDRONGA & NAVOSA: Korolevu, *Krauss,* Jan. 1958 (BISH); Nokonoko District, *H. B. R. Parham 224* (BM); vicinity of Vatukarasa, *O. & I. Degener 32119* (BISH, NY). SERUA: Trail to Mt. Gordon, *Fiji Dept. Agr. 14494* (BISH, SUVA); vicinity of Ngaloa, *Smith 9329* (BISH, GH, K, NY, P, SUVA, UC, US), *Degener 15094* (A, K, NY, US). NAMOSI: Vicinity of Namosi, *Gillespie 2618* (BISH), *2706* (BISH). RA: Mountains near Penang, *Greenwood 73-A* (K). NAITASIRI: Wainimala River above Mataniwailevu, *Fiji Dept. Agr. 18029* (MASS, SUVA); vicinity of Korovou Village, *Fiji Dept. Agr. 14018* (BISH, K, SUVA); waterfall on Savura River, *Vaughan 3265* (BM, K); vicinity of Nasinu, *Gillespie 3589* (BISH, UC). TAILEVU: Nukurua Creek, *Fiji Dept. Agr. 1025* (A, SUVA). REWA: Mt. Korombamba, *Meebold 16482* (BISH, K); vicinity of Lami, *Gillespie 4577* (BISH, UC), *Tothill 240* (K), *241* (K); Vatuwangga, near Suva, *Yeoward 3* (K); vicinity of Suva Bay, *Setchell & Parks 15131* (UC). VITI LEVU, without further locality, *Graeffe 34* (BM), *1619* (GH). KANDAVU: Namalata isthmus region, *Smith 43* (BISH, NY). OVALAU: Hills southeast of Mbureta River, *Smith 7423* (BISH, GH, K, US); vicinity of Levuka, *Gillespie 4462* (BISH, NY, UC), *Prince,* in 1898 (GH); Ovalau, without further locality, *Graeffe 1539* (K), *1590* (K), *Graeffe* (NY), *Le Guillou,* Oct. 1838 (P), *MacGillivray,* Oct. 1854 (BM), *Milne 50* (K), *U.S. Expl. Exped.* (US 47493 lectotype; isolectotypes at GH, K, NY). KORO: Western slope, *Smith 1069* (BISH, GH, K, NY, UC, US). NGAU: Mt. Vonda, toward Waikama, *Smith 7980* (BISH, GH, K, NY, SUVA, UC, US). VANUA LEVU: MBUA: Vicinity of Rukuruku Bay, *H. B. R. Parham 2* (K); Nandi, *Milne 263* (K). MATHUATA: Mathuata Range, north of Natua, *Smith 6754* (A, K, US); Mt. Numbuiloa, east of Lambasa, *Smith 6354* (A, BISH, K, P, US), *6355* (A, BISH, K, NY, P, US). THAKAUNDROVE: Mt. Mbatini, *Smith 671* (BISH, GH, K, NY, P, US); vicinity of Savusavu, *Degener & Ordonez 14021* (A, US); Savusavu, Nawena Plantation, *Fiji Dept. Agr. 11529* (BISH, SUVA); Maravu, near Salt Lake, *Degener & Ordonez 14132* (A, BISH, K, NY, UC, US), *14216* (A, BISH, K, NY, UC, US); trail from Mbiangunu to Drayton Peak, *Bierhorst F136* (MASS); Natewa Peninsula, hills west of Mbutha Bay, *Smith 823* (BISH, GH, K, NY, P, US). TAVEUNI: Vicinity of Somosomo, *Seemann 228* (BM, GH, K); vicinity of Wairiki, *Gillespie 4400.1* (BISH, SUVA, UC, US), *4680* (BISH); Mt. Manuka, east of Wairiki, *Smith 8333* (BISH, GH, K, NY, SUVA, UC, US). MATUKU: Without further locality, *Milne 106* (K), *Moseley,* July, 1874 (K). FIJI, without further locality, *Harvey,* Nov. 1855 (BM, GH, K), *Home* (BM), *Horne 130* (GH, K).

This species of *Ophiorrhiza* is one of the most distinct in the genus, differing from other Pacific taxa in its usually glabrous, broadly infundibular corollas with proportionately long lobes, its exserted

stamens with long filaments, its slender branchlets, its small, often spathulate leaves, and its minute, ephemeral stipules. No close relative is readily discernible among the other Pacific species, although occasional specimens of *O. laxa* may be mistaken for *O. peploides* upon casual examination. However, *O. peploides* usually differs from *O. laxa* in all of the above mentioned characters, but especially in the morphology of the stipules and the shape of the corolla tubes. It seems reasonable to hypothesize a common ancestor shared among *O. peploides, O. laxa, O. leptantha,* and *O. brachyantha,* although the first of these, judging from several strikingly unique characters, probably diverged quite early from the related South Pacific taxa.

4. **Ophiorrhiza laxa** A. Gray in Proc. Amer. Acad. Arts **4:** 312. 1859; Seem. Fl. Vit. 127. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 188. 1890; Gibbs in J. Linn. Soc. Bot. **39:** 151. 1909; Turrill in op. cit. **43:** 24, p. p. 1915; J.W. Parham, Pl. Fiji Isl. ed. 2. 279. 1972.
FIGURES 1, F; 2, B; 4, F—H; 5, A.

Ophiorrhiza leptantha var. *yasawana* Fosberg in Bull. Torrey Bot. Club **67:** 420. 1940; J.W. Parham, Pl. Fiji Isl. 200. 1964, ed. 2. 281. 1972.

Suffrutescent herb or shrub to 3 m. high, the indument composed of curved, stramineous to ferrugineous hairs or these rarely lacking, the branchlets slender, lax, subterete, up to 1 mm. in diameter toward apex, drying dark brown; stipules membranaceous, narrowly deltoid, 3.5—9.1 mm. long, 0.3—1.3 mm. broad at base, narrowly subulate to setaceous toward apex, often divided once or twice to base, puberulent with minute, scattered, ferrugineous hairs or glabrous; petioles slender, semiterete to distally canaliculate, 2—26 mm. long, 0.4—0.8 mm. broad at middle; leaf blades chartaceous to membranaceous, drying dark green to brown above, paler beneath, lanceolate to ovate, rarely oblanceolate, 2.5—9(—15) cm. long, 0.8—2.5 (—4.6) cm. broad, acute to long-acuminate at apex, obtuse to decurrent on petiole at base, entire to somewhat erosulous at margin, glabrous to puberulent above with scattered, ferrugineous hairs up to 0.7 mm. long, glabrous to puberulent beneath with white to ferrugineous hairs, these scattered or restricted to costa, secondary nerves, and margin, the costa conspicuous, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, (5—) 7—16 per side, plane to prominulous above, raised and prominent beneath, the tertiary nerves and veinlets plane above, somewhat prominulous beneath; inflorescences 1—3(5-)-branched, with 3—35 flowers, 1.1—9.2 cm. long, up to 5.8 cm. broad at anthesis or in fruit, the peduncle up to 2 cm. long, the rachis slender and lax, the pedicels 0.8—4.5 mm. long, up to 7.2 mm. long in fruit, the bracts occasionally present, narrowly subulate to setaceous, 0.6—8.4 mm. long, essentially glabrous; calyx lobes coriaceous, deltoid, 0.4—0.8 mm. long, 0.3—0.6 mm. broad at base, acute at apex, entire at margin, glabrous to finely puberulent with minute white,

appressed hairs; corolla narrowly infundibular, the tube (4.6—) 8.2—11.8 (—14.2) mm. long, 0.5—0.8 mm. in diameter at middle, glabrous without or rarely puberulent toward base with scattered, short, white hairs, glabrous within except villose at corolla throat with weak, white hairs up to 1.2 mm. long, the lobes ovate to elliptic, 2—3.6 mm. long, 1—2 mm. broad, acute at apex, entire at margin, glabrous without, puberulent within with short, white, glandular hairs; stamens inserted at corolla throat, the filaments filiform, up to 0.3 mm. long, the anthers exserted, more or less basifixed, oblong-linear, 1.3—1.5 mm. long, 0.3—0.4 mm. broad; ovary subglobose, 1—1.2 mm. long, 0.8—1.7 mm. broad, glabrous to densely puberulent with minute, white to stramineous hairs, capped by a 2-lobed disk up to 0.8 mm. high; style filiform, (6.2—) 7.8—14.8 mm. long, about 1mm. in diameter, glabrous; stigma barely exserted, capitate, 2-lobed, about 0.3 mm. long, 0.5—1.2 mm. broad, minutely glandular on upper surface; fruits mitriform, 1.9—3.2 mm. long at middle, 5.1—8.2 mm. broad, glabrous to finely puberulent, red-brown when dry, capped by persistent calyx lobes and disk.

TYPE LOCALITY: Gray's description of *Ophiorrhiza laxa* was based on a collection made by Milne and specimens obtained during the course of the U.S. Exploring Expedition. As noted under the preceding species, an Exploring Expedition collection should be taken as the lectotype, since those collections form the subject of Gray's paper. In the case of *O. laxa,* a number of Exploring Expedition sheets have been annotated *O. laxa* by Gray, but not all fit his description. As lectotype I designate one specimen at the U.S. National Herbarium (US 47491), the place of deposit of the first set of Exploring Expedition collections. Another *"laxa"* specimen found there (US 47490) falls within my concept of *O. leptantha.* One other Exploring Expedition specimen (NY) fits Gray's description of *O. laxa* but is evidently not part of the same collection as the lectotype and therefore cannot be considered an isolectotype. Gray ascribed this species to the Fiji Islands without further locality; all of the above mentioned Exploring Expedition specimens bear the locality "Ovolau, Feejee Islands," and therefore Ovalau is probably the correct place of collection.

The holotype of *Ophiorrhiza leptantha* var. *yasawana* is *St. John 18126* (BISH), collected on Waya Island in the Yasawa group of the Fijian archipelago. St. John gives the locality as Olo Creek, north of Yalombi, at an altitude of 800 ft.

DISTRIBUTION: Endemic to Fiji and found throughout that archipelago, although relatively rare on the island of Vanua Levu. *Ophiorrhiza laxa* varies in habit from a small herb to a slender shrub or even a liana. It is found at elevations from sea level to about 1,200 m. in open areas, or more usually in dense, humid forests. The corol-

las are variable in color, ranging from white to pinkish to purple, or even yellow; the corolla tube is sometimes green, while the lobes are white. The branches of the inflorescence and the calyx are often purple. Flowers and fruits have been collected throughout the year.

LOCAL NAMES AND USE: Collectors in Fiji have recorded the following names for this species: *karaua (St. John 18126), kethe (Smith 4797), mothe-mothe (Gillespie 3690), na-sendua (St. John 18328),* and *ndrau-ni-kau-ni-mbata (Gillespie 2481).* In addition, Parham (1972, cited above) includes the local names *ndrau-ni-kau-ni-mbati* and *ndrau-rau-ni-ulu.* St. John reports that the leaves of *Ophiorrhiza laxa* are chewed in order to stop blood in urine.

Fiji. YASAWAS: WAYA ISLAND: Olo Creek, north of Yalombi, *St. John 18126* (BISH holotype of *O. leptantha* var. *yasawana).* VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 42* (K); Mt. Evans Range, *Fiji Dept. Agr. 14179* (BISH, SUVA), *Greenwood 110* (K), *111* (K); Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4202* (A, BISH, K, NY, P, US); Mt. Nairosa, eastern flank of Mt. Evans Range, *Smith 4418* (A, BISH, K, NY, P, US); Mt. Koromba, *Smith 4706* (A, BISH, K, NY, P, US); vicinity of Nandarivatu, *O. & I. Degener 32055* (BISH), *Degener & Ordonez 13587* (A, BISH, F, K, MASS, MO, NY, P, SUVA, UC, US), *Gibbs 606* (BM, K), *im Thurn 259, p. p.* (BM, K), *Parks 20535* (UC), *20583* (BISH, P, SUVA, UC, US), *Tothill 238* (K), *239 (coll. W. Teulon)* (K), *Vaughan 3223* (BM, K); Mt. Nanggaranambuluta, *Fiji Dept. Agr. 10388* (MASS, SUVA), *Gillespie 3690* (BISH, K, NY, UC), *Smith 4797* (A, BISH, K, NY, US), *Webster & Hildreth 14212* (BISH, MASS); Mt. Matomba, Nandala, *Degener 14507* (A, BISH, K, NY, US); Nauwanga, *Degener 14805* (A, NY, US); hills between Nggaliwana and Tumbeindreketi Creeks, east of Navai, *Smith 5889* (A, BISH, K, NY, P, US); Mt. Tomanivi, *Fiji Dept. Agr. 12714 (Melville et al. 7103)* (A, K, SUVA), *12744 (Melville et al. 7136)* (K, SUVA), *13057* (BISH, K, SUVA), *Gillespie 4090* (BISH, P), *Webster & Hildreth 14173* (BISH, GH, MASS). NANDRONGA & NAVOSA: Nausori Highlands, *O. & I. Degener 32186* (BISH, NY); Nandrau, *Degener 14903* (A, US); Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5418* (A, BISH, K, NY, P, US). SERUA: Mbuyombuyo, near Namboutini, *Tabualewa 15589* (A, BISH, K, US); vicinity of Ngaloa, *Degener 15133* (A, BISH, K, MO, NY, UC, US), *Fiji Dept. Agr. 12451* (K, SUVA). NAMOSI: Mt. Naitarandamu, *Gillespie 3122* (BISH, NY, UC), *3294* (BISH, P); ridges southeast of Namosi, *Gillespie 2684* (BISH, K, NY, US); vicinity of Mt. Voma, *Gillespie 2481* (BISH); vicinity of Namuamua, *Gillespie 2987* (BISH). NAITASIRI: Taunaisali, central plateau, between Wainimala and Singatoka Rivers, *St. John 18328* (BISH, NY); 9 miles above Suva, *Meebold 16685* (BISH, K); Tholo-i-suva, *Parks 20926* (BISH, SUVA, UC, US); Central Road, *MacDaniels 1157* (A, BISH), *Tothill 242* (K), *305* (K), *407* (K); Prince's Road, *Setchell & Parks 15104* (BM, UC), *Vaughan 3283* (BM, K); vicinity of Tamavua, *Gillespie 2014* (BISH, P), *2046* (BISH), *2159* (BISH, P), *2439* (BISH, K, P), *2440* (BISH, NY, UC, US). REWA: Mt. Korombamba, *Gillespie 2229* (BISH, K, P), *Meebold 16684* (BISH, K), *16686* (BISH). VITI LEVU, without further locality, *Milne 12* (K), *Milne* or *MacGillivray* (K). OVALAU: Mt. Korotolutolu, west of Thawathi, *Smith 8017* (BISH, GH, K, NY, P, UC, US); mountains west of Levuka, *Gillespie 4430* (BISH, P); Ovalau, without further locality, *Hombron,* Oct. 1838 (P), *Milne 52* (K), *U.S. Expl. Exped.* (NY), *U.S. Expl. Exped.* (US 47491 lectotype). NGAU: Without further locality, *Milne 215* (K). VANUA LEVU: MATHUATA: Vicinity of Lambasa, *Greenwood 530* (K); Mt. Numbuiloa, *Smith 6578* (A, BISH, K, P, US). THAKAUNDROVE: Nakorothau, *Krauss 1018* (BISH). TAVEUNI: Hills east of Somosomo, *Smith 8365* (BISH, GH, K, US); Mt. Manuka, *Smith 785* (BISH, GH, K, NY, P, UC, US).

Ophiorrhiza laxa has been variously treated since its description by Gray, who discussed its relationship to *O. leptantha.* Since then

O. laxa has been recognized as distinct by some authors but combined with *O. leptantha* by others. In reviewing essentially all the available collections of this complex in Fiji, I have been able to place nearly all the specimens in one or the other taxon with reasonable certainty. Intermediate collections do exist, but they are few in number and after critical examination they can usually be confidently referred to one or the other species. The concept of *O. laxa* here adopted is to a large extent based on such generalized features as the comparatively slender and lax branchlets and inflorescences, the fine, white indument of the calyx and hypanthium, the relatively short corolla tubes and styles, and the insertion of the stamens at the corolla throat, which is always puberulent with a ring of white hairs. Correlation of the somewhat generalized vegetative characters with more specific features of floral morphology (e. g. the position of the stamens) would suggest a reasonable degree of genetic isolation from *O. leptantha.*

Examination of the holotype of *Ophiorrhiza leptantha* var. *yasawana* shows this collection to be quite unlike typical *O. leptantha* but in no way separable from *O. laxa* as here understood.

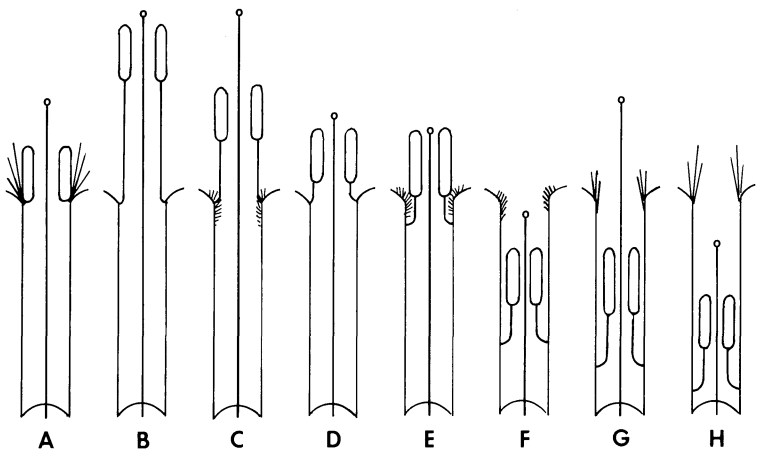

FIGURE 5. A—H, Diagrams of corollas from representative collections of *Ophiorrhiza laxa* and *O. leptantha* showing relative position of anthers and stigmas. A, *O. laxa,* from *Degener & Ordonez 13587.* B—H, *O. leptantha;* B, from *Degener & Ordonez 13819;* C, from *Smith 814;* D, from *Smith 6453;* E, from *Degener & Ordonez 14008;* F, from *Fiji Dept. Agr. 1020;* G, from *im Thurn 359 p. p.;* H, from *U.S. Expl. Exped.*

5. **Ophiorrhiza leptantha** A. Gray in Proc. Amer. Acad. Arts **4:** 312. 1859; Seem. in Bonplandia **9:** 256. 1861, Viti, 438. 1862, Fl. Vit. 127. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 188. 1890; Turrill in J. Linn. Soc. Bot. **43:** 24. 1915; Gillespie in Bishop Mus. Bull. **74:** 26. *fig. 35, d—f.* 1930; Fosberg in Bull. Torrey Bot. Club **67:** 420. 1940; St. John & A. C. Sm. in Pacific Sci. **25:** 340. 1971.

FIGURES 5, B—H; 6, A—D.

Ophiorrhiza laxa sensu Seem. in Bonplandia **9:** 256. 1861, Viti, 438. 1862; non A. Gray.

Ophiorrhiza leptantha var. *leptantha;* J. W. Parham, Pl. Fiji Isl. 200. 1964, ed. 2. 280. 1972.

Suffrutescent herb or shrub to 3 m. high, the indument composed of stramineous to ferrugineous, curved hairs, the branchlets relatively stout, subterete, 0.8—1.8 (—2.6) mm. in diameter toward apex, drying dark red-brown; stipules membranaceous, narrowly deltoid, 3.2—10.2 mm. long, 1.2—2.6 mm. broad at base, narrowly subulate to setaceous at apex, often 1- to 4-times divided partly or completely to base, glabrous to finely puberulent with minute, ferrugineous, curved hairs; petioles slender, semiterete to distally canaliculate, 8—45 (—65) mm. long, 0.4—1.5 mm. broad at middle; leaf blades chartaceous to somewhat membranaceous, drying dark green above and often with a yellow cast, paler beneath, elliptic to lanceolate to ovate, 6—21 cm. long, (1.6—) 2—5.6 (—7) cm. broad, acuminate at apex, acute to decurrent on petiole at base, entire at margin, glabrous or rarely puberulent above with minute, scattered hairs, glabrous to puberulent beneath with ferrugineous to white, scattered hairs, or these restricted to the costa and secondary nerves, the costa prominent, plane to somewhat canaliculate above, raised and rounded beneath, the secondary nerves spreading, often subparallel, (6—) 11—23 per side, plane above, raised beneath, the tertiary nerves and veinlets plane above, prominulous beneath; inflorescences 4—15-branched, with 9—80 flowers, (5—) 6—11 cm. long and (2—) 2.5—10 cm. broad at anthesis, 3—9 cm. long and (1.5—) 4.2—11.2 cm. broad in fruit, the peduncle (1.8—) 2.5—4.8 cm. long, the pedicels 4—7.8 mm. long at anthesis, up to 11.5 mm. long in fruit, the bracts frequent, narrowly subulate to setaceous, up to 8.5 mm. long, rarely longer, finely puberulent to glabrous; calyx lobes coriaceous, deltoid, 0.6—1.1 mm. long, 0.5—0.8 mm. broad at base, acute at apex, entire at margin, densely puberulent with minute, yellow hairs to glabrous; corolla narrowly infundibular to somewhat hypocrateriform, the tube (14—) 17.6—30.8 mm. long, 0.6—1.4 mm. in diameter at middle, finely to densely puberulent without with scattered, white to stramineous hairs, glabrous within or occasionally puberulent at corolla throat with lax, white hairs up to 0.5 mm. long, the lobes ovate to somewhat deltoid, 2.6—9.5 mm. long, 1—4 mm. broad, acute at apex, entire at margin, glabrous to finely puberulent without, finely puberulent within with stramineous, glandular hairs; stamens inserted at corolla throat or up to 4 mm. below, the filaments filiform, 0.6—8 mm. long, the anthers exserted or included, subbasifixed, oblong-linear, 1.3—1.8 mm. long, 0.3—0.5 mm. broad; ovary subglobose, 1.2—1.5 mm.

long, 1.4—1.8 mm. broad, densely puberulent with white to orange hairs, capped by a 2-lobed disk up to 0.8 mm. high; style filiform, (15—) 18—20.4 mm. long, about 1 mm. in diameter, glabrous; stigma short-clavate to capitate to somewhat peltate, usually included or barely exserted, 0.5—1.4 mm. long, 0.5—1 mm. broad, finely puberulent with glandular hairs on upper surface; fruits mitriform, 2.4—3.6 mm. long at middle, 6.2—10.6 mm. broad, puberulent with scattered, stramineous to white hairs, drying dark red-brown, capped by persistent calyx lobes and disk.

TYPE LOCALITY: Gray based his description of *Ophiorrhiza leptantha* on a collection made by Harvey and others obtained during the course of the U.S. Exploring Expedition. Since Gray's paper deals with the plants collected during that Expedition, one of the latter collections should be considered the lectotype. An Exploring Expedition specimen (US 47492) identified by Gray as *O. leptantha* agrees well with his description and is accepted here as the lectotype. Gray cited *O. leptantha* as found in the Fiji Islands without further locality; the lectotype bears the notation "Ovolau, Feejee Islands," which is probably the correct type locality. Other Exploring Expedition sheets (K, P) fall within my concept of *O. leptantha,* but they differ somewhat from the lectotype; they are probably not part of the same collection and therefore should not be considered isolectotypes. Those sheets bear the locality "Feejee Islands" only.

DISTRIBUTION: Common throughout the Fijian archipelago and also occurring on the island of Futuna, one of the Horne Islands. A perusal of specimens determined as *Ophiorrhiza leptantha* from the Solomon Islands indicates that those collections are referable to a different taxon. Similarly, *O. leptantha* is unknown in the New Hebrides, to which it has been ascribed. One Graeffe collection labeled "Samoa" seems referable to *O. leptantha,* although the genus is not reliably recorded in the Samoan flora. Since Graeffe is known to have collected in Fiji, and since others of his collections are suspected to have been mislabeled, I am inclined to consider the one Samoan collection of *O. leptantha* as being of probable Fijian origin.

In elevation, this species ranges from near sea level to about 1,000 m. It has variously been reported as an herb or sizable shrub common in dense, humid forests or rarely in more open environments. The flowers are fragrant and white varying to pink; the fruits are green before becoming brown upon drying. The calyx and branches of the inflorescences are sometimes purple-tinged. Flowers and fruits have been collected throughout the year.

LOCAL NAMES AND USE: In Fiji the local names *mbulu (Smith 370), ndomale (St. John 18928),* and *ndranikau-ni-ula (Gillespie 2685)* have

been reported for *Ophiorrhiza leptantha*. St. John has noted that a decoction of the mashed leaves of this species is used by Fijians as a cure for stomach aches.

Fiji. VITI LEVU: MBA: Vicinity of Nandarivatu, *im Thurn 259, p. p.* (BM); Mt. Nanggaranambuluta, *Gillespie 4361* (BISH, P); western and southern slopes of Mt. Tomanivi, *Smith 5104* (A, BISH, K, NY, US). SERUA: Track north of Korovou, *St. John 18928* (BISH, US). NAMOSI: Mt. Naitarandamu, *Gillespie 3295* (BISH, P); hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8451* (BISH, GH, K, NY, P, SUVA, UC, US); ridges east of Namosi, *Gillespie 2685* (BISH). NAMOSI or REWA: Queen's Road, between Wainamboro Creek and Wainandoi River, *Vaughan 3365* (BM, K). NAITASIRI: Waimanu River, southeast of Nasele, *Fiji Dept. Agr. 15432* (MASS, SUVA), *15434* (MASS, SUVA); Wairoro, Navolau, *Fiji Dept. Agr. 2460* (A); Prince's Road, *Meebold 26626* (BISH), *Vaughan 3280* (BM, K); Tholo-i-suva, *Bryan 223* (BISH), *Fiji Dept. Agr. 12482 (Fiji Dept. For. 131, Bola 33)* (K, SUVA), *im Thurn 359, p. p.* (BM, K); Tamavua-Sawani Road, *Setchell & Parks 15046* (BM, MO, UC, US); Tamavua, *Yeoward 94* (K). TAILEVU: Nukurua Creek, *Fiji Dept. Agr. 1020* (A, SUVA). REWA: Mt. Korombamba, *Gillespie 2247* (BISH, K, UC, US), *Webster & Hildreth 14062* (MASS), vicinity of Lami, *Meebold 16882* (BISH, K). VITI LEVU, without further locality, *Seemann 229, p. p.* (BM, GH, K). KANDAVU: Mt. Mbuke Levu, *Smith 265* (BISH, GH, K, NY, P, UC, US). OVALAU: Wainisavulevu, Lovoni, *Fiji Dept. Agr. 14508* (BISH, K, SUVA); Mt. Tana Lailai, *Graeffe,* Dec. 1864 (K); Levuka River, *Milne 264* (K); Port Kinnaird, *Seemann 229, p. p.* (BM, GH, K); Ovalau, without further locality, *Milne 262* (K), *U.S. Expl. Exped.* (US 47492 lectotype), *U.S. Expl. Exped.* (US 47490). NGAU: Without further locality, *Milne 234* (K). VANUA LEVU: MATHUATA: Vicinity of Savusomo, *Fiji Dept. Agr. 12912* (K, SUVA); Mathuata Range, north of Natua, *Smith 6762* (A, BISH, K, NY, P, US); Mt. Numbuiloa, east of Lambasa, *Smith 6453* (A, K, US). THAKAUNDROVE: Yanawai River region, Mt. Kasi, *Smith 1804* (BISH, NY); southeastern slope of Mt. Mbatini, *Smith 602* (BISH, GH, K, NY, UC, US); trail from Mbiangunu to Drayton Peak, *Bierhorst F147* (MASS, UC); southern slope of Mt. Mariko, *Smith 410* (BISH, K, NY, US); southern slope of Valanga Range, *Smith 370* (BISH, GH, K, NY, UC, US); vicinity of Savusavu Bay, *Degener & Ordonez 13819* (A, BISH, K, NY, UC, US), *13914* (A, BISH, K, NY, UC, US), *14008* (A, BISH, K, MO, NY, UC, US), *Bierhorst F32* (MASS); Natewa Peninsula, hills west of Mbutha Bay, *Smith 814* (BISH, GH, K, NY, P, UC, US); Namoliwawa, *Fiji Dept. Agr. 13153* (SUVA, US). VANUA MBALAVU: Nambavatu, *Tothill 291* (K). TUVUTHA: Central forest, *Bryan 550* (A, BISH, K, UC, US). FIJI, without further locality, *Graeffe* (BM "Samoa," GH), *Harvey,* Nov. 1855 (BM, GH, K), *Horne 214* (K), *314* (GH, K), *466* (GH), *Seemann 277* (BM, GH, K), *U.S. Expl. Exped.* (K, P).

Horne Islands. FUTUNA: Southern slopes of Mt. Puke, *McKee 19849* (BISH, P).

Separation of *Ophiorrhiza leptantha* and *O. laxa* has long been recognized as a problem, because specimens intermediate between the extremes of the two species can be found. Diverse opinions have been expressed by some of the authorities cited above; Turrill considered the two species quite distinct, whereas Gillespie and Fosberg com-

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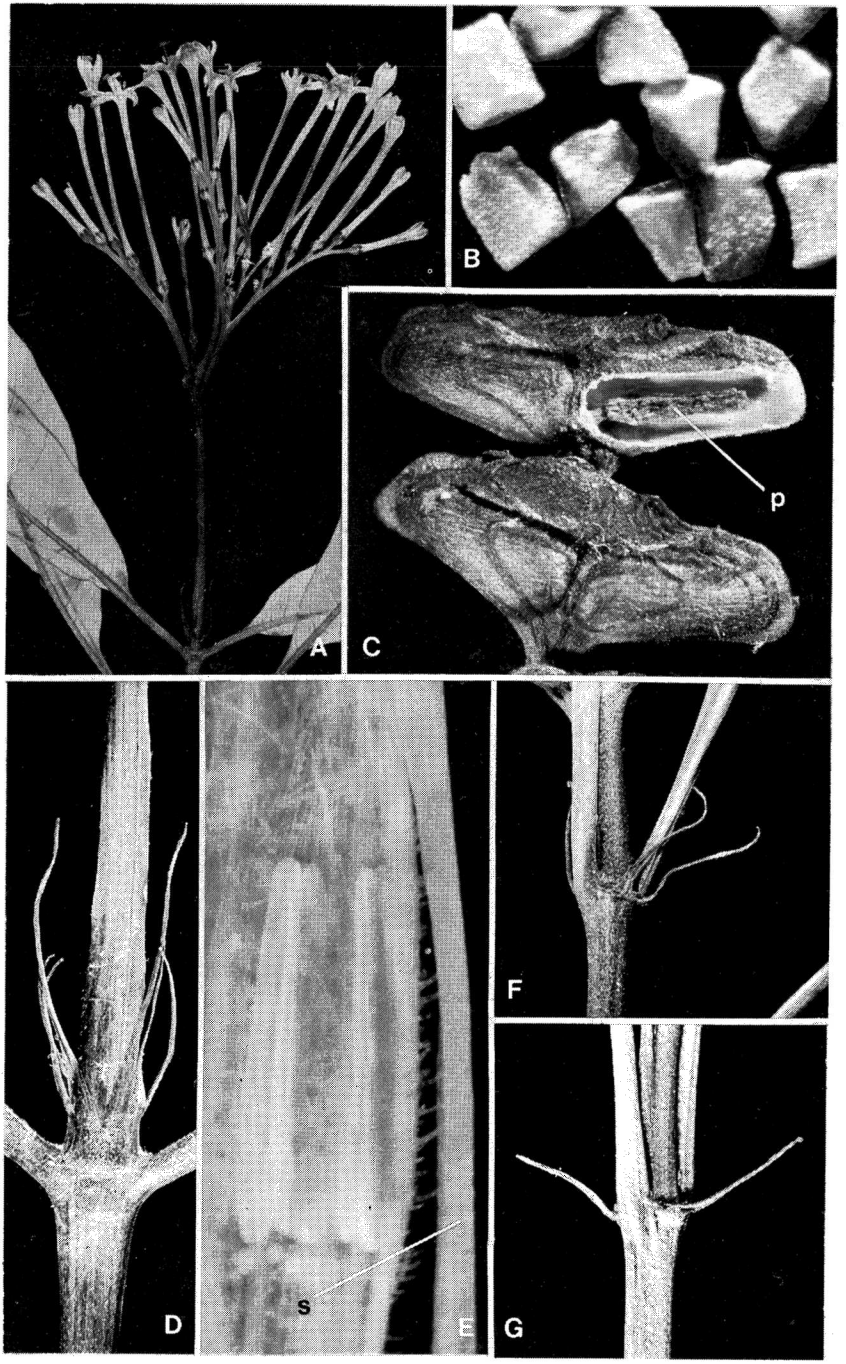
FIGURE 6. A—D, *Ophiorrhiza leptantha*; A, inflorescence, × 1, from *Smith 814;* B, seeds, × 30, from *Smith 602;* C, intact (lower) and partially dissected (upper) fruits showing persistent disk and elongate placenta, × 6, from *Smith 602;* D, node with stipules, × 4, from *Smith 814.* E—G, *O. palauensis,* all from *Fosberg 32406;* E, portion of corolla interior showing two stamens, indument, and style, × 20; F, node with bifid stipule, × 4; G, node with entire stipules, × 4. p = placenta. s = style.


A
B
C
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bined them, using the epithet *leptantha.* In reviewing a relatively large number of *Ophiorrhiza* collections from Fiji I have been able to separate *O. leptantha* and *O. laxa* with reasonable certainty; such recognition can usually be based on general impressions and the characters mentioned in my key. The most reliable technical characters, however, deal with the position of the stamens on the corolla tube and the indument of the corolla throat. In *O. laxa* the anthers are always subsessile at the corolla throat, which is invested with a ring of long, white hairs. In *O. leptantha* the stamens are often inserted well below the throat and the anthers are included. Sometimes in *O. leptantha,* however, the stamens may be inserted at the corolla throat, which may either be glabrous or densely puberulent with long white hairs as in *O. laxa;* but in either case the anthers have a distinct filament and are not subsessile. Because these characters are well correlated with the more generalized features of the branchlets, leaves, and inflorescences, it seems likely that *O. leptantha* and *O. laxa* are genetically isolated and merit recognition as distinct species.

6. **Ophiorrhiza palauensis** Val. in Bot. Jahrb. **63:** 298. 1930; Kanehira, Fl. Micrones. 465. 1933, in J. Dept. Agr. Kyushu Imp. Univ. **4:** 423. 1935; Fosberg in Occas. Pap. Bishop Mus. **15:** 214. 1940. FIGURES 1, B & G; 2, C; 6, E—G.

Ophiorrhiza palauensis var. *biseta* Fosberg in Occas. Pap. Bishop Mus. **15:** 214. 1940.

Herb or small shrub to 1 m. high, glabrous or with indument composed of curved, yellow hairs 0.2—0.8 mm. long, the branchlets subterete, 1—2.5 mm. in diameter toward apex, drying yellow-brown to nearly black; stipules relatively persistent, membranaceous at base, deltoid, (3.5—) 4.8—12.5 (—17) mm. long, up to 2 mm. broad, narrowly subulate to setaceous at apex, often divided to base, glabrous or more rarely puberulent on both surfaces with occasional, scattered hairs; petioles slender, semiterete to somewhat strap-shaped distally, 8—54 mm. long, 0.7—1.3 mm. broad at middle; leaf blades chartaceous to somewhat membranaceous, drying dark above, paler beneath, ovate to lanceolate to obovate, 6.5—15 cm. long, 1.2—6.7 cm. broad, acute to acuminate at apex, acute to decurrent on petiole at base, entire at margin, glabrous to puberulent above with scattered hairs up to 1 mm. long, these sometimes restricted to margins, glabrous to puberulent beneath with shorter, yellow, curved hairs, these scattered or restricted to costa and secondary nerves, the costa conspicuous, often paler than lamina, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 8—18 per side, plane to prominulous above, more sharply raised beneath, the tertiary nerves and veinlets plane above, somewhat prominulous beneath; inflorescences freely branched, with 8—45 flowers, 6.5—14 cm. long and 2.2—7 cm. broad at anthesis, 7.5—13 cm. long and 2.5—6 cm. broad in

fruit, the peduncle stout, 25—85 mm. long, glabrous to puberulent with minute, yellow hairs, the pedicels up to 1.5 mm. long, puberulent with minute yellow hairs, the bracts frequent, subulate to setaceous, up to 13 mm. long, up to 0.7 mm. broad at base, glabrous or finely puberulent; calyx lobes coriaceous, deltoid to broadly subulate, 1—2.8 (—3.2) mm. long, 0.3—0.8 mm. broad and somewhat united at base, acute at apex, entire at margin, glabrous to finely puberulent with scattered hairs; corolla hypocrateriform to narrowly infundibular, the tube (15—) 20—38 mm. long, 0.6—1.4 mm. in diameter at middle, puberulent without with scattered, spreading, stramineous to white hairs up to 0.4 mm. long, villose within with lax, white hairs about 0.7 mm. long, these somewhat longer at corolla throat, the lobes more or less ovate, 4—8 mm. long, 0.8—2.8 mm. broad, acute at apex, entire at margin, puberulent within with minute, white, curved hairs up to 0.2 mm. long, these sometimes restricted to margin, puberulent like tube without; stamens inserted well within corolla tube, the filaments filiform, 0.5—0.8 mm. long, the anthers included, more or less basifixed, oblong-linear, about 2—2.5 × 0.5 mm.; ovary subglobose, 1—1.2 mm. long, 1.2—2 mm. broad, capped by a 2-lobed disk about 0.5 mm. high, puberulent with minute, scattered hairs; style filiform, about as long as corolla tube or slightly longer, about 0.2 mm. in diameter, glabrous to finely puberulent with scattered, minute, white hairs below stigma; stigma exserted, short-clavate to capitate or subpeltate, 2-lobed, up to 1 mm. long, 1—2 mm. broad, essentially glabrous; fruits mitriform, 2.5—4.5 mm. long at middle, 4—11.2 mm. broad, puberulent with scattered, minute hairs, drying brown to black, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: In his original description of *Ophiorrhiza palauensis,* Valeton cited but one collection, *Raymundus 124* from Koror, without further locality. I have not seen an example of this collection, and Valeton did not indicate its place of deposit. However, with Valeton's detailed description and a number of topotypes at hand, there is no confusion concerning the application of this name.

The type of *Ophiorrhiza palauensis* var. *biseta* Fosberg is *Takamatsu 1272* from Ngatpang, Babelthuap Island, cited below. The holotype (BISH) is a fruiting specimen collected in April, 1936.

DISTRIBUTION: Endemic to the Palau Islands of Micronesia and commonly found as an herb or small shrub in coral-reef forests, on limestone cliffs, or on volcanic rock. Its altitudinal range is from near sea level to about 100 m. The flowers are white and have been gathered throughout the year, as have fruiting specimens.

Caroline Islands. PALAU GROUP: BABELTHUAP ISLAND: Mt. Megilon, *Hosokawa 7118* (A, BISH, US); Ngatpang, *Takamatsu 1272* (BISH holotype of *O. palauensis* var. *biseta*); Aimelik, *Hosokawa 7274* (A, BISH); Itau, south of Me'ebe'ubul, *Fosberg 32406* (US); Tôdal-san, *Hosokawa 7528* (A); Babelthuap Island, without further locality, *Kanehira 1883* (K). KORAK ISLAND: Without further locality, *Takamatsu 1154* (BISH). MADMOSUK ISLET: Without further locality, *Stone 1300* (BISH). KOROR ISLAND:

Ngarmid, *Cheatham 61* (UC); Arumidu-sango, *Hosokawa 7405* (US); Koror, without further locality, *Kanehira 223* (NY), *247* (NY). AULUPSE'EL ISLAND: Ngarmalk, *Fosberg 31948* (UC). AURAPUSHEKARU ISLAND: Without further locality, *Stone 4550* (US). AULUPTAGEL ISLAND: Without further locality, *Hosokawa 7451* (A). URUKTHAPEL ISLAND: Magaild, Malakal Harbor, *Fosberg 25864* (US); Ngaremediu Peak, *Kanehira 1873* (NY); southwest peninsula, *Fosberg 32187* (US).

I have carried out a cursory review of some mainland Asian and Philippine species of *Ophiorrhiza,* none of which seems to resemble *O. palauensis* very closely. No collections were seen in which the corolla tube length equaled that of the Micronesian species; in the Asian and Philippine species reviewed, the length of the tube rarely exceeded 15 mm. *Ophiorrhiza japonica* has a longer tube, but its corollas are more broadly infundibular, its inflorescences more delicate, and its fruits much narrower. Conclusions concerning the relationships of *O. palauensis* must wait until the entire genus is reviewed.

Fosberg distinguished *Ophiorrhiza palauensis* var. *biseta* from more typical material by its narrower leaf blades and by stipules which are divided to base. In reviewing the collections from Micronesia, I have found that some collections, including the type of Fosberg's variety, do have somewhat narrower than typical leaf blades which become dark brown in color upon drying, although a number of collections are somewhat intermediate. In addition, both divided and entire stipules are frequently found on the same specimen. The taxonomic value of this stipule character has, in my opinion, been overestimated. The degree of division of the stipules may well depend upon their age or the rate at which the diameter of the branchlet increases. For those reasons, the maintenance of var. *biseta* does not seem justified.

7. **Ophiorrhiza setosa** S. Darwin, sp. nov.

FIGURES 1, D; 2, D & E; 7, A—C.

Herba suffrutescens ad 30 cm. alta, indumento pilis minutis straminеis vel aurantiacis subtiliter ornata, ramulis juvenilibus gracilibus subteretibus apicem versus 1—1.5 mm. diametro fuscis; stipulis persistentibus basi membranaceis sed pro parte maxima anguste subulatis vel setaceis, integris vel divisis, 6—13 mm. longis raro brevioribus, basi quam ramulis latis, utrinque glabris vel puberulis; petiolis gracilibus semiteretibus vel distaliter applanatis, (7—) 15—45 mm. longis, ad medium circiter 1 mm. latis; foliorum laminis chartaceis vel membranaceis in sicco supra atroviridibus subtus pallidis, ovatis vel lanceolatis, (6—) 9—15 cm. longis, 2—4.5 cm. latis, apice acuminatis, basi in petiolum decurrentibus, integris, supra glabris, subtus ad costam et nervos secundarios puberulis, costa conspicua supra plana vel canaliculata subtus elevata et rotundata, nervis secundariis utrinsecus 12—16 patentibus supra planis vel prominulis subtus prominulis,

nervis tertiariis et rete venularum supra immersis subtus prominulis; inflorescentiis multiramosis 8—20-floris sub fructu circiter 1.5 × 2 cm., pedunculo 5—15 (—50) mm. longo puberulo, pedicellis sub fructu ad 3 mm. longis puberulis, bracteis multis anguste subulatis vel setaceis 3—15 mm. longis, ad medium circiter 0.3 mm. latis, utrinque puberulis; calycis lobis coriaceis deltoideis circiter 1 × 1—1.2 mm. apice acutis, integris, puberulis vel glabris; corollae tubo 10—27 mm. longo, ad medium 0.5—1 mm. diametro, extus pilis aurantiacis minutis puberulo, intus pilis albis effusis ad 0.3 mm. longis puberulo; corollae lobis ovatis vel lanceolatis, 2.5—3.5 mm. longis, 1—1.5 mm. latis, apice acutis, integris, extus et intus pilis minutis aurantiacis vel stramineis puberulis; staminibus 5—6 mm. sub corollae fauce insertis, filamentis filiformibus 1—1.5 mm. longis, antheris plus minusve basifixis oblongo-linearibus, circiter 2 × 0.3 mm.; ovario subgloboso circiter 1.5 × 2 mm., dense puberulo; stylo filiformi 10—28 mm. longo, circiter 0.2 mm. diametro quasi glabro; stigmate ultra corollae tubum ad 3 mm. exserto, 0.5—0.7 mm. longo, 0.7—1 mm. lato, plus minusve capitato vel breviclavato et supra medium bifido, pilis aurantiacis minutis puberulo; fructibus mitriformibus ad medium circiter 2.5 mm. longis, ad 7 mm. latis, fuscis, puberulis, calycis lobis persistentibus coronatis.

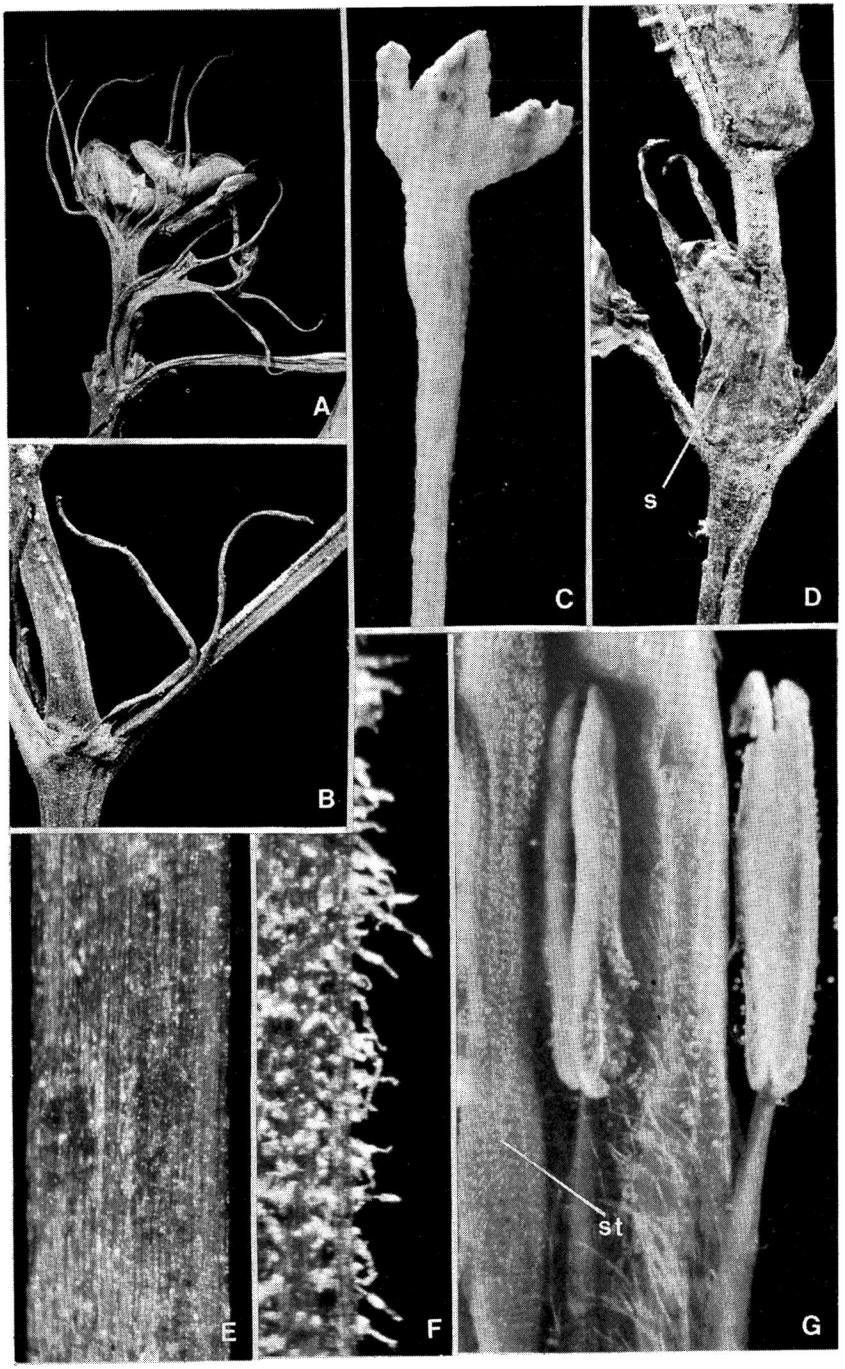
TYPE LOCALITY: Two examples of *Lépine 75* are known (both at P). The specimen giving the detailed locality "mountains of Moorea" is designated the holotype. The other specimen is labeled "Tahiti" without further locality, although both specimens definitely appear to be part of the same collection.

DISTRIBUTION: Occurring on the islands of Moorea and Tahiti at elevations of 400—500 m. The species has been recorded as a suffrutescent herb growing in humid valleys along the banks of streams.

LOCAL NAME. Lépine has recorded the name *haepe* for this plant.

Society Islands. MOOREA or TAHITI: Without further locality, *Lépine 75* (P holotype; isotype at P). TAHITI: Without further locality, *Vesco* in 1847 (P), *Vesco* (P).

This new species belongs to the group of Society Island species with mitriform fruits but differs from all other species in that archipelago in its stipules, which are very narrowly subulate to setaceous for most of their length. In this respect, *Ophiorrhiza setosa* is similar to *O. palauensis,* but it differs from that taxon in the characters indicated in my key. The minute orange-yellow indument on the inflorescences of *O. setosa* is similar to that found in *O. nelsonii,* although in the latter species the longer inflorescences have more numerous flowers, and the corolla tubes are longer. The stipules of *O. tahitensis* are occasionally somewhat setaceous toward apex; in *O. setosa,* however, the membranaceous basal portion of each stipule is much smaller. In addition, the indument of *O. tahitensis* consists of hairs which are considerably longer and more scattered.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8. **Ophiorrhiza nelsonii** Seem. Fl. Vit. 126, as *O. nelsoni.* 1866; Drake, Ill. Fl. Ins. Mar. Pac. 189, as *O. nelsoni.* 1890, Fl. Polynés. Franç. 86, as *O. nelsoni.* 1893. FIGURES 1, I; 2, F & G; 7, D—G.

Ophiorrhiza subumbellata var. *glabra* Nadeaud, Enum. Pl. Indig. Tahiti, 53. 1873.

Suffrutescent herb to 0.5 m. high, the indument composed of minute, usually bright yellow to orange hairs up to 0.1 mm. long, the branchlets stout, subterete, 1.4—3 mm. in diameter toward apex, drying dark red-brown; stipules more or less persistent, membranaceous, ovate, 5.5—15 mm. long, 2—5 mm. broad at base, long-acuminate to subulate at apex, often fimbriate or divided to base, glabrous to puberulent with scattered hairs; petioles slender, semiterete to strap-shaped distally, up to 35 mm. long, 0.5—1.5 mm. broad at middle; leaf blades chartaceous to membranaceous, drying dark green above, bright yellow to orange beneath, ovate to elliptic to obovate, 9—19.5 cm. long, 2.8—6 cm. broad, acuminate at apex, decurrent on petiole at base, entire at margin, glabrous above, glabrous to puberulent beneath with minute stramineous to orange hairs, these often restricted to costa and secondary nerves, the costa prominent, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, subparallel, 12—20 per side, plane above, raised and rounded beneath, the tertiary nerves and veinlets plane above, prominulous beneath; inflorescences congested, freely branched, with (9—) 16—60 flowers, 7—12 cm. long and 3—10.5 cm. broad at anthesis, about 6.5 cm. long and 3.5 cm. broad in fruit, the peduncle stout, 12—55 mm. long, the pedicels up to 4 mm. long, the bracts frequent, setaceous to narrowly subulate, 5—20 mm. long, 0.2—0.6 mm. broad, acute at apex, glabrous to finely puberulent; calyx lobes coriaceous, deltoid, 0.7—1.5 mm. long, 0.5—0.7 mm. broad at base and somewhat united, entire at margin, glabrous to finely puberulent; corolla narrowly infundibular to somewhat hypocrateriform, the tube 27—48 mm. long, 0.5—1.8 mm. in diameter at middle, glabrous or puberulent without with stramineous to orange hairs up to 0.2 mm. long, glabrous within except puberulent below stamens with white, lax hairs up to 0.8 mm. long, the lobes ovate to elliptic, 2.7—5.5 mm. long, 1.5—3 mm. broad, acute at apex, entire at margin, glabrous or puberulent without, densely puberulent within with minute, yellow to white, glandular hairs; stamens inserted about 5 mm. below corolla throat, the filaments filiform, up to 2 mm. long, the anthers included, subbasifixed, oblong-linear, 2.5—3 × 0.2—0.5 mm.; ovary subglobose, about 1 mm. long,

FIGURE 7. A—C, *Ophiorrhiza setosa;* A, fruiting inflorescence showing setaceous bracts, × 2, from *Lépine 75;* B, node with bifid stipule, × 4, from *Lepine 75;* C, distal portion of corolla, × 4, from *Vesco* in 1847. D—G, *O. nelsonii;* D, node with fimbriate stipule, × 4, from *Lépine 77 p. p.;* E, glabrous corolla tube, × 40, from *MacDaniels 1674;* F, puberulent corolla tube, × 40, from *MacDaniels 1601;* G, portion of corolla interior showing two stamens, indument, and style, × 20, from *MacDaniels 1728.* s = stipule. st = style.

1—1.5 mm. broad, densely puberulent with minute, yellow to orange hairs, capped by a 2-lobed disk about 0.5 mm. high; style filiform, 2—5 mm. longer than corolla tube, 0.2—0.3 mm. in diameter, glabrous except puberulent beneath stigma with minute yellow hairs; stigma exserted, capitate to short-clavate and bifid above middle, 0.5—1 mm. long, 0.2—0.7 mm. broad, essentially glabrous; fruits mitriform, 3—3.5 mm. long at middle, 5.5—6 mm. broad, finely puberulent with scattered hairs, drying pale brown, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: Seemann's description of *Ophiorrhiza nelsonii* was based solely on a Nelson collection made on Tahiti during Cook's third Pacific voyage. The holotype (BM) bears the locality "Otaheiti," without other details.

The type of *Ophiorrhiza subumbellata* var. *glabra* is *Nadeaud 353-A*. This collection is represented by four specimens (all at P). In his description of the variety, Nadeaud cited material collected in the Punaaruu Valley and on the Anaorii Plateau during July, 1857, and September, 1858. One specimen of *Nadeaud 353-A* bears the locality "Tahiti ex Anaorii ad finem vallis Papenoo," and this specimen is here designated the lectotype. The other three specimens are indicated only as being from Tahiti, although they appear to be from the same collection and therefore may be considered isolectotypes. It is probable that Nadeaud observed the taxon on Tahiti at different places and at different times but made only a single collection of four specimens; the Papenoo locality would appear to be correct for the lectotype.

DISTRIBUTION: *Ophiorrhiza nelsonii* is endemic to the island of Tahiti, where it is frequently encountered as a perennial herb in moist, shaded forests, especially fern forests. Specimens have been gathered at altitudes of 350—800 m. The flowers range in color from yellow to pink and have been collected throughout the year. Fruiting specimens have been collected in May.

Society Islands. TAHITI: MAHINA: Aorai, *Lépine 77, p. p.* (P). PAPENOO: Orofena, *Grant 4220* (BISH); Anaorii Plateau at end of Papenoo Valley, *Nadeaud 353-A* (P lectotype of *O. subumbellata* var. *glabra;* isolectotypes at P). PAPARA: 30 km. from Papeete, *MacDaniels 1728* (BISH); Papara Valley, *Grant 3675* (A, BISH, K). MATAIEA: North side of Lake Vaheria, *MacDaniels 1601* (BISH); Vaheria River Valley beyond lake, *MacDaniels 1295* (BISH). VAIRO: High valley, *MacDaniels 1674* (BISH). TAHITI, without further locality, *Nelson* (BM holotype), *U.S. Expl. Exped.* (NY).

Ophiorrhiza nelsonii is a reasonably well characterized species which seems most closely related to *O. tahitensis*. Seemann distinguished *O. nelsonii* from other Pacific species by its large, membranaceous stipules, which are fimbriate at apex. However, from the

material which I have examined the stipules may also be entire and setaceous at apex as well as fimbriate. The species is more definitely characterized by its comparatively robust habit, stout branchlets, many-flowered inflorescences, minute, yellow-orange indument, and the lower surfaces of the leaf blades, which often dry with a distinct orange cast. In these features *O. nelsonii* differs from *O. tahitensis* and the other species of *Ophiorrhiza* in the Pacific.

The type specimen of *Ophiorrhiza nelsonii* has puberulent corolla tubes, but many collections differ in having tubes which are glabrous, among which is the type of *O. subumbellata* var. *glabra*. Such collections do not otherwise differ significantly from the holotype of *O. nelsonii* and are here considered referable to the same species. Since it has been necessary to recognize considerable variation in indument within other species (e.g. *O. leptantha*), variation in the same character in *O. nelsonii* hardly seems to justify formal taxonomic recognition of infraspecific taxa.

9. **Ophiorrhiza tahitensis** Seem. Fl. Vit. 127. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 189. 1890, Fl. Polynés. Franç. 87. 1893.

FIGURES 1, C; 2, H; 8, A—D.

Ophiorrhiza subumbellata var. *ciliata* Nadeaud, Enum. Pl. Indig. Tahiti, 53. 1873.

Suffrutescent herb to 0.5 m. high, the indument composed of white to stramineous to ferrugineous, curved hairs up to 0.5 mm. long, rarely lacking, the branchlets subterete, 1—2 (—2.5) mm. in diameter toward apex, drying pale to dark red-brown; stipules caducous or persistent, membranaceous, ovate to somewhat deltoid, (1.5—) 2.5—10 (—12) mm. long, 1.5—4 mm. broad, long-acuminate to setaceous at apex or often fimbriate or sometimes divided to base, glabrous to puberulent with scattered hairs; petioles slender, semiterete to strap-shaped distally, 2—18 mm. long, 0.5—1 mm. broad at middle; leaf blades chartaceous to submembranaceous, drying dark green above, paler beneath, ovate to elliptic to obovate, 4.5—11.5 cm. long, 1.8—4.5 cm. broad, acute to acuminate at apex, decurrent on petiole at base, entire at margin, glabrous to puberulent above with scattered hairs, or these restricted to base and margin, puberulent beneath with scattered hairs, or these more often restricted to costa and secondary nerves, the costa conspicuous, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 9—18 per side, plane to prominulous above, raised and prominent to prominulous beneath, the tertiary nerves and veinlets plane above, prominulous beneath; inflorescences compact, freely branched, with 3—12 (—15) flowers, 3—12 (—15) cm. long and 2—8 cm. broad at anthesis, 2—4.5 cm. long and 1—3 cm. broad in fruit, the peduncle 10—35 (—40) mm. long, puberulent to glabrous, the pedicels up to 3 mm. long, the bracts frequent, setaceous to broadly subulate, often divided, up to 16 mm. long, 0.3—1 (—1.5) mm. broad at middle, glabrous to puberulent with a few scattered

hairs; calyx lobes coriaceous, deltoid to somewhat ovate, 0.5—1.5 mm. long, up to 1 mm. broad at base, acute at apex, entire at margin, essentially glabrous; corolla narrowly infundibular, the tube 11—40 mm. long, 0.5—1.5 mm. in diameter at middle, glabrous or puberulent without with white, lax, spreading hairs 0.1—0.3 mm. long, glabrous within except puberulent below stamens with lax, white hairs up to 0.5 mm. long, the lobes somewhat deltoid to ovate, 2.2—5 mm. long, 0.5—1.5 mm. broad, acute at apex, entire at margin, glabrous or puberulent without, densely puberulent within with minute white hairs about 0.1 mm. long; stamens inserted 3.5—6 mm. below corolla throat, the filaments filiform, up to 0.5 mm. long, the anthers included, subbasifixed, about 2 mm. long, up to 0.5 mm. broad; ovary subglobose, 1—1.5 mm. in diameter, glabrous to densely puberulent, capped by a 2-lobed disk about 0.6 mm. high; style about as long as corolla tube, up to 0.3 mm. in diameter, glabrous except finely puberulent with scattered minute hairs below stigma; stigma included, rarely exserted beyond corolla tube, short-clavate, bifid above middle, 2—2.5 mm. long, up to 0.3 mm. broad, glabrous to finely puberulent with minute, glandular hairs; fruits mitriform, 2.5—3 mm. long at middle, 5.5—7.5 mm. broad, glabrous to puberulent with scattered hairs, drying brown, capped by persistent calyx lobes and disk.

TYPE LOCALITY: The type, as cited by Seemann, was collected by Nelson on the island of Tahiti during the course of Cook's third Pacific voyage. The holotype (BM) bears the locality "Otaheiti," without further information.

Nadeaud based his description of *Ophiorrhiza subumbellata* var. *ciliata* on one of his own collections (no. *353-B*), cited below. The locality given by Nadeaud is the vicinity of Marau, Pua Valley. However, the holotype (P) bears the locality "Tahiti" only.

DISTRIBUTION: Probably endemic to the island of Tahiti, where it has been collected at elevations of about 1,000 m. Although a U.S. Exploring Expedition specimen bears "Samoa" as a locality, it is essentially identical with Tahitian material examined. In view of the fact that the genus *Ophiorrhiza* cannot otherwise be ascribed with certainty to the Samoan archipelago, it seems likely that this collection was actually made in the Society Islands; unfortunately the sorting of some of the Exploring Expedition collections was not critically handled by the botanist, William Rich. *Ophiorrhiza tahitensis* has been observed as a small shrub growing in humid, shaded environments. The flowers are fragrant and have been collected at various times of the year.

Society Islands. TAHITI: PIRAE: Mt. Aorai, Noha Ravine, *Quayle 65* (A, BISH, K, UC); Fare Rau Ape—Aorai trail, *Krauss 751* (BISH). MAHINA: Vicinity of Marau, Pua Valley, *Nadeaud 353-B* (P holotype of *O. subumbellata* var. *ciliata*). MATAIAE: Vaihiria, *Grant 4098* (BISH). TAHITI, without further locality, *Lay & Collie*, March—April, 1826 (BM), *Lépine 77, p. p.* (P), *Nelson* (BM holotype), *U.S. Expl. Exped., p. p.* (US 77669 "Samoa"), *Vesco* (P), in 1847 (P).

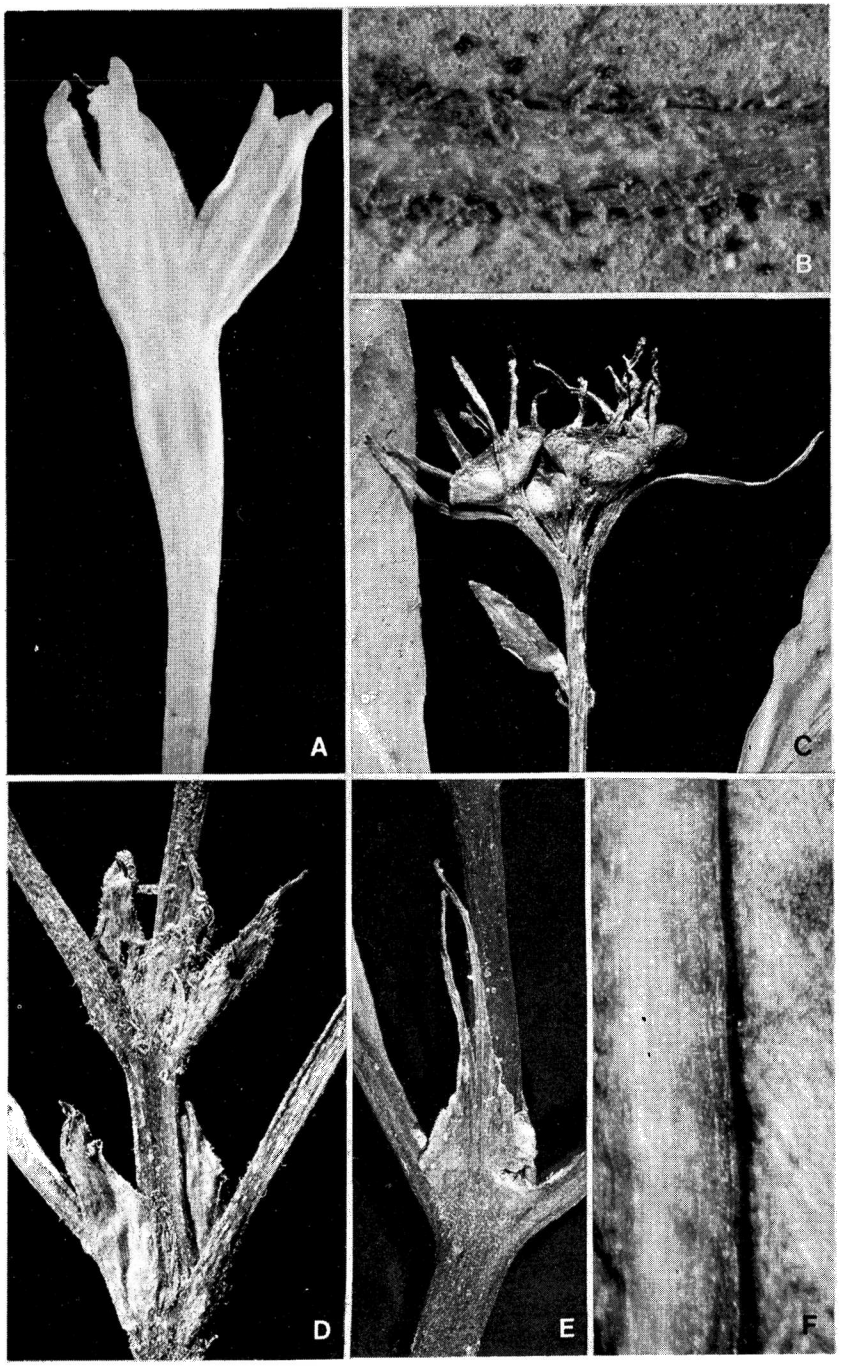
In many respects *Ophiorrhiza tahitensis* is similar to *O. nelsonii,* with which it seems closely related. Seemann distinguished *O. tahitensis* from *O. nelsonii* by the entire stipules of the former taxon versus the fimbriate stipules of the latter. Such distinctions hold when only the type collections are compared, but here the definition of *O. tahitensis* is expanded to include collections with both fimbriate and entire stipules; both stipule types have been found to occur on the same specimen with some frequency. This broader interpretation of *O. tahitensis* also encompasses the type collection of *O. subumbellata* var. *ciliata* Nadeaud, which, except for its relatively broad inflorescence bracts, is hardly separable from *O. tahitensis. Ophiorrhiza nelsonii* is readily distinguished from *O. tahitensis* by the characters mentioned in my key, but especially by the more minute, orange-yellow indument of the former species, its more robust inflorescences with more numerous flowers, and its usually larger leaf blades which often dry with an orange cast beneath.

Ophiorrhiza tahitensis is suggestive of *O. longituba,* but in the latter species the lower surfaces of the leaf blades are glabrous, the stipules longer, the inflorescence bracts narrower, the stigma shorter, the fruits longer, and the branchlets glabrous. *Ophiorrhiza subumbellata, O. orofenensis,* and *O. scorpioidea* differ from *O. tahitensis* in their subglobose fruits, *O. solandri* differs in its more lax, fewer-flowered inflorescences, *O. platycarpa* in its much smaller stipules and more slender branchlets, and *O. setosa* in its finer indument and narrower stipules.

Like that of *Ophiorrhiza nelsonii,* the indument of the corolla tubes of *O. tahitensis* is quite variable. In some collections, including the type, the corolla tubes are glabrous, but in a few others they are distinctly puberulent. Considering the variation in indument encountered in other species, it seems best not to regard collections with glabrous or puberulent corolla tubes as constituting separate formal taxonomic groups, although it may prove, when more material is available for study, that the recognition of two forms is justifiable.

10. **Ophiorrhiza longituba** J. W. Moore in Bishop Mus. Bull. **102:** 44. 1933. FIGURES 8, E & F; 9, A.

Subligneous herb to 1 m. high, the indument composed of occasional scattered hairs or lacking, the branchlets stout, subterete, 1.5—2 mm. in diameter toward apex, drying dark brown; stipules caducous, membranaceous, ovate to deltoid, 10—20 mm. long, 3—4 mm. broad, long-acuminate to subulate at apex, often divided about halfway to base, glabrous; petioles stout, semiterete, 5—12 mm. long, about 1 mm. broad at middle; leaf blades chartaceous, drying dark green


A
B
C
D
E
F

above, paler beneath, ovate to elliptic, 5—8 cm. long, 1.5—3 cm. broad, acute to acuminate at apex, decurrent on petiole at base, entire at margin, glabrous on both surfaces, the costa prominent, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 14—16 per side, prominulous on both surfaces, the tertiary nerves and veinlets plane to impressed above, somewhat prominulous beneath; inflorescences freely branching, with 5—10 flowers, about 6.5 cm. long and up to 2 cm. broad at anthesis, about 4 × 2.5 cm. in fruit, the peduncle 5—22 mm. long, the pedicels 1—5 mm. long, glabrous or finely puberulent with minute orange hairs, the bracts narrowly subulate, 10—12 mm. long, about 0.3 mm. broad at middle, acute at apex, glabrous; calyx lobes coriaceous, sublanceolate, about 1.5 mm. long and 0.7 mm. broad, acute at apex, somewhat fused at base, entire at margin, glabrous; corolla hypocrateriform to narrowly infundibular, often somewhat constricted at throat, the tube 35—42 mm. long, about 1 mm. in diameter at middle, glabrous without, glabrous within except puberulent for about 5 mm. below stamens with occasional white hairs up to 0.3 mm. long, the lobes long-elliptic, 4—5 mm. long, about 1.5 mm. broad, acute to obtuse at apex, entire at margin, densely puberulent within with minute white hairs, glabrous without; stamens inserted about 4 mm. below corolla throat, the filaments filiform, about 1 mm. long, the anthers included, dorsifixed about 0.5 mm. above base, oblong-linear, 2—2.5 mm. long, about 0.3 mm. broad; ovary subglobose, about 1.5 x 1—1.5 mm., capped by a 2-lobed disk about 0.2 mm. high; style filiform, about as long as corolla tube, about 0.3 mm. in diameter; stigma barely exserted, clavate, bifid above middle, about 1 × 0.5 mm., essentially glabrous; fruits mitriform to triangular, 3—3.5 mm. long at middle, 8—9 mm. broad, glabrous, pale brown when dry, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: The type collection is *Moore 484,* from Mt. Temehani, Raiatea, cited below. It was collected at an elevation of about 450 m., Jan. 1, 1927, and includes both flowers and fruits.

DISTRIBUTION: Endemic to the island of Raiatea and thus far known only from the type collection. Like other Pacific taxa of the genus, *Ophiorrhiza longituba* is found in wet, shaded areas along the banks of streams; Moore reported that the flowers of this species are pink.

Society Islands. RAIATEA: Mt. Temehani, *Moore 484* (BISH 406401 holotype; isotypes at BISH).

FIGURE 8. A—D, *Ophiorrhiza tahitensis;* A, distal portion of corolla, × 4, from *Quayle 65;* B, portion of lower surface of leaf blade showing midrib and indument, × 30, from *Lay & Collie* in 1826; C, fruiting inflorescence with bracts, × 2, from *Nadeaud 353-B;* D, two nodes with stipules, × 4, from *Nadeaud 353-B.* E & F, *O. longituba,* both from *Moore 484;* E, node with stipule, × 4; F, portion of glabrous lower surface of leaf blade, × 30.

Forty years after its first description, *Ophiorrhiza longituba* is still known only from the type collection, a situation which testifies to the need for additional botanical exploration in the Society Islands. This species seems most closely related to *O. tahitensis,* although the latter taxon differs in the puberulent lower surfaces of its leaf blades, its shorter stipules, broader inflorescence bracts, longer stigma, and smaller fruits. *Ophiorrhiza longituba* is not at all suggestive of *O. nelsonii,* which is in nearly all respects more robust and possesses a finer, orange-yellow indument. The present species is quite distinct in that it is almost everywhere glabrous, but its relationship to *O. tahitensis* is fairly close and will require more careful scrutiny when ample material of this general relationship becomes available.

11. **Ophiorrhiza platycarpa** S. Darwin, sp. nov. FIGURE 9, B & C.

Herba ad 60 cm. alta, glabra vel indumento pilis curvatis stramineis vel ferrugineis ad 0.1 mm. longis ornata, ramulis gracilibus subteretibus apicem versus ad 1 mm. diametro fuscis; stipulis membranaceis vel chartaceis deltoideis (0.5—) 1—1.5 (—3) mm. longis, basi circiter 1 mm. latis apice acuminatis vel anguste subulatis non divisis, utrinque glabris vel subtiliter puberulis; petiolis gracilibus semiteretibus, 5—25 mm. longis, ad medium circiter 0.5 mm. latis; foliorum laminis membranaceis, in sicco supra atroviridibus subtus pallidis, anguste lanceolatis vel ellipticis vel oblanceolatis, 2—12 cm. longis, 1—2.5 cm. latis, apice acutis vel acuminatis, basi in petiolum decurrentibus, integris, supra glabris vel pilis dispersis puberulis, subtus pilis dispersis ad costam et nervos secundarios restrictis puberulis, costa conspicua, supra plana vel prominula vel canaliculata, subtus elevata et rotundata, nervis secundariis utrinsecus 12—16 patentibus supra planis subtus prominulis, nervis tertiariis et rete venularum supra immersis subtus prominulis; inflorescentiis libere et laxe ramosis (3—) 6—20-floris, sub anthesi circiter 3.5 cm. longis, sub fructu 4—6 × 2—5 cm., pedunculo (10—) 16—35 mm. longo puberulo vel glabro, bracteis frequentibus subulatis, 5—11 mm. longis, basi ad 0.4 mm. latis, apice acutis utrinque subtiliter puberulis vel glabris; calycis lobis coriaceis deltoideis, ad 1 mm. longis, circiter 0.5 mm. latis, apice acutis, integris, utrinque glabrescentibus; corollae tubo infundibulari circiter 20 mm. longo, ad medium circiter 1 mm. diametro, extus glabro vel puberulo intus ad 10 mm. sub stamina pilis dispersis albis effusis ad 0.5 mm. longis puberulo basi glabro, lobis ovatis, 3—3.5 mm. longis, 1.5—2 mm. latis, integris, apice acutis, extus glabris intus pilis albis minutis puberulis; staminibus circiter 3 mm. sub corollae fauce insertis, filamentis filiformibus ad 0.5 mm. longis, antheris subbasifixis oblongo-linearibus, circiter 2 mm. longis, 0.2—0.4 mm. latis; ovario subgloboso, 1—2 × 1—1.5 mm., puberulo vel glabro; stylo filiformi, 21—25 mm. longo, circiter 0.2 mm. diametro, glabro vel sub stigmate aliquantum glandulifero puberulo; stigmate exserto capitato vel breviclavato, circiter 0.5 mm. longo, ad 1 mm. lato, pilis glandulosis minutis

puberulo; fructibus mitriformibus, ad medium 2.5—3 mm. longis, 6—7.5 mm. latis, fuscis, pilis dispersis puberulis, calycis lobis persistentibus coronatis.

TYPE LOCALITY: As type I designate a Whitney Expedition specimen, *Quayle 123,* which bears mature fruits. The locality given is "Tahiti, Vairao, R. Nohu, rock wall at bottom of canyon opposite open cave."

DISTRIBUTION: Endemic to Tahiti, although from a number of uncertain localities on that island. *Ophiorrhiza platycarpa* has been found as an herb growing along watercourses at an altitude of about 200 m., as far as indicated. The corollas are white. Fruiting material has been gathered in October.

Society Islands. TAHITI: VAIRAO: Nohu River, *Quayle 123 (Whitney Exped. 270)* (BISH holotype; isotype at BISH). TAHITI, without further locality, *Lay & Collie,* March—April, 1826 (BM), *Pancher* (?) *15* (P), *Vesco* in 1847 (P).

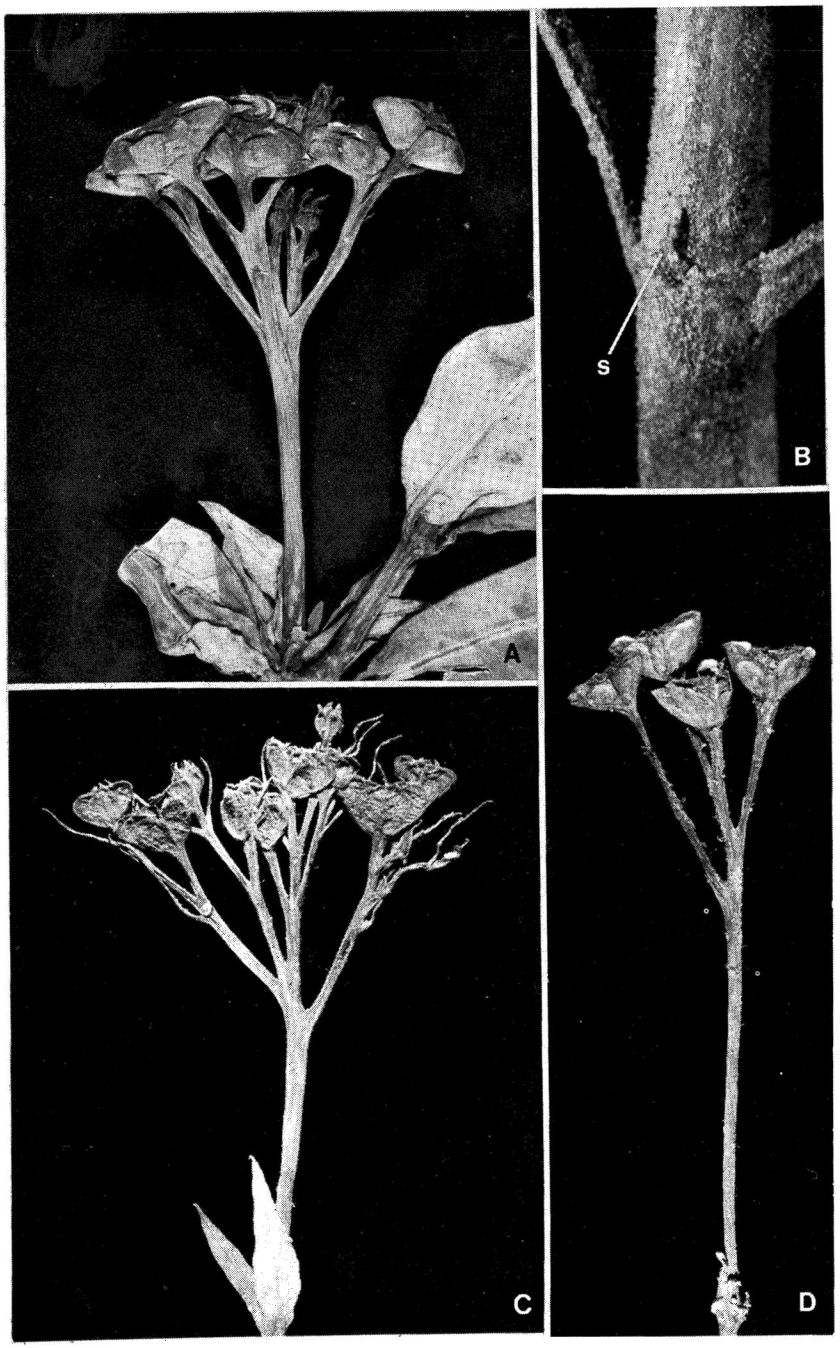
In the size and shape of its stipules and leaf blades, its obscurely puberulent indument, and the size of its inflorescences, this new species is very similar to *Ophiorrhiza subumbellata,* to which it seems very closely related. However, the fruits of the latter species are subglobose, the corolla tubes may be somewhat shorter, and the anthers are more decidedly dorsifixed. The two species are difficult to separate in flowering condition. *Ophiorrhiza platycarpa* is distinct from *O. tahitensis, O. nelsonii,* and *O. longituba* in that those species all have stouter branchlets and much larger stipules, among other characters.

12. **Ophiorrhiza solandri** Seem. Fl. Vit. 127. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 189. 1890, Fl. Polynés. Franç. 88. 1893.

FIGURES 9, D; 10, A & B.

Ophiorrhiza rugosa Solander ex Seem. Fl. Vit. 127, pro syn. 1866; Solander ex Drake, Ill. Fl. Ins. Mar. Pac. 189, pro syn. 1890.
Ophiorrhiza torrentium Nadeaud, Enum. Pl. Indig. Tahiti, 54. 1873.
Ophiorrhiza scorpioidea sensu Setchell in Univ. Calif. Publ. Bot. **12:** 210. 1926; non Nadeaud.

Subligneous herb to 40 cm. high, the indument composed of stramineous to ferrugineous, curved hairs up to 0.1 mm. long, the branchlets slender, subterete, up to 1.5 mm. in diameter toward apex, drying red-brown; stipules caducous, coriaceous to somewhat membranaceous, deltoid to more or less ovate, up to 3 mm. long, rarely longer, obtuse to acute to acuminate at apex, rarely divided, glabrous to finely puberulent with scattered hairs; petioles slender, semiterete, 1—12 mm. long, up to 0.5 mm. broad at middle; leaf blades chartaceous to membranaceous, distinctly rugose when dry, dark green above, paler


A
S
B
C
D

beneath, lanceolate to elliptic to oblanceolate, 3—11.8 cm. long, 1—3 cm. broad, acute to acuminate at apex, decurrent on petiole at base, entire at margin, glabrous to puberulent above with minute, scattered hairs or these restricted to costa and base, glabrous to puberulent beneath with hairs restricted to costa and secondary nerves, the costa conspicuous, prominulous to plane or canaliculate above, prominently raised and rounded beneath, the secondary nerves spreading, 8—20 per side, sharply raised above, prominulous beneath, the tertiary nerves and veinlets raised above, faintly prominulous beneath; inflorescences narrow, lax, unbranched or branched only once, with 2—7 flowers, 2—8 cm. long, up to 1.5 cm. broad at anthesis, 4—12 cm. long, up to 3.5 cm. broad in fruit, the peduncle slender, lax, 2.5—9.5 cm. long, the pedicels up to 10 mm. long, the bracts frequent but caducous, narrowly subulate to setaceous, 2—7 mm. long, about 0.2 mm. broad toward base, glabrous; calyx lobes coriaceous to chartaceous, deltoid to somewhat ovate, 0.3—1 mm. long, 0.3—0.5 mm. broad at base and somewhat united, acute at apex, entire at margin, essentially glabrous; corolla narrowly infundibular, the tube up to 20 mm. long, up to 1 mm. in diameter at middle, glabrous without, glabrous within except puberulent below the stamens with scattered, white hairs up to 0.3 mm. long, the lobes elliptic to ovate, 2.5—3.5 mm. long, 1—1.5 mm. broad, obtuse to acute at apex, entire at margin, glabrous without, puberulent within with minute, white, glandular hairs; stamens inserted 3—5 mm. below corolla throat, the filaments filiform, 0.5—2 mm. long, the anthers included, more or less dorsifixed about 0.5 mm. above base, oblong-linear, up to 2 mm. long, about 0.2 mm. broad, the locules free below point of attachment; ovary subglobose, about 1 × 1.5 mm., capped by a 2-lobed disk up to 0.3 mm. high, glabrous to finely puberulent; style filiform, up to 21 mm. long, about 0.1 mm. in diameter, glabrous except finely puberulent below stigma; stigma clavate, bifid above middle, about 1 × 0.3 mm., finely puberulent with minute, stramineous to orange glandular hairs; fruits mitriform, 1.8—3 mm. long at middle, 5—6.5 mm. broad, glabrous, drying red-brown, capped by persistent calyx lobes and disk.

TYPE LOCALITY: Seemann based his description of *Ophiorrhiza solandri* on a single Tahitian specimen collected by Banks and Solander during the first Pacific voyage of Captain Cook. A notation on the holotype (BM) ascribes the collection to Tahiti without further locality.

The type of Nadeaud's species *Ophiorrhiza torrentium* was collected by him (no. *356*) in May, 1859, on rocks in streams at "Tearapau," Tahiti, at an elevation of about 1,100 m. The single known specimen (P) is in flower.

FIGURE 9. A, *Ophiorrhiza longituba,* fruiting inflorescence, × 2, from *Moore 484.* B & C, *O. platycarpa,* both from *Quayle 123;* B, node with stipule, × 10; C, fruiting inflorescence with bracts, × 2. D, *O. solandri,* fruiting inflorescence, × 2, from *MacDaniels 1585.* s = stipule.

DISTRIBUTION: A Tahitian endemic found as an occasional perennial herb at elevations from 350 to 1,100 m., *Ophiorrhiza solandri* occurs most often on wet cliffs and in the deep shade of rain forests. It is also found along the banks of fast-flowing watercourses. Flowering and fruiting specimens have been collected in May and June respectively.

LOCAL NAME: According to Seemann, *evayanu no the mona* was noted by Solander as a Tahitian name for *Ophiorrhiza solandri.*

Society Islands. TAHITI: FAAA: Tipaerui, *Grant 3501* (BISH). VAIRAO: Maara Valley, *Setchell & Parks 424* (UC). PUEU: Without further locality, *MacDaniels 1585* (BISH). TEARUPOO: Without further locality, *Nadeaud 356* (P holotype of *O. torrentium*). TAHITI, without further locality, *Banks & Solander* (BM holotype), *Vesco* in 1847 (P).

Ophiorrhiza solandri is one of the most distinct species of *Ophiorrhiza* in the Society Islands and can be distinguished from all other Pacific species of the genus by its few-flowered, lax, and often unbranched inflorescences. The leaf blades are usually decidedly rugose when dry, the secondary nerves being sharply elevated above the lamina on the upper surface. In those features the type collection of *O. torrentium* Nadeaud agrees very well; it is probably a young specimen of *O. solandri,* from which it differs only in size and habit, both of which are features likely to be strongly influenced by environment. *Ophiorrhiza solandri* is probably most closely related to *O. subumbellata* and *O. platycarpa.* It differs from those two species in the above mentioned characters, but it is very similar to them in its fine indument and small, often subcoriaceous stipules. In such characters of indument and stipule form, *O. scorpioidea* is similar to *O. solandri,* but the fruits of the former are subglobose.

13. **Ophiorrhiza subumbellata** Forst. f. Fl. Ins. Austr. Prodr. 12. 1786; Endl. in Ann. Wiener Mus. Naturgesch. **1:** 175. 1836; Guillemin in Ann. Sci. Nat. II. Bot. **7:** 251. 1837 (repr. Zephyr. Tait. 51. 1838); Seem. Fl. Vit. 126. 1866; Drake, III. Fl. Ins. Mar. Pac. 189. 1890, Fl. Polynés. Franç. 87. 1893.

FIGURES 1, H; 2, I & J; 10, C—F.

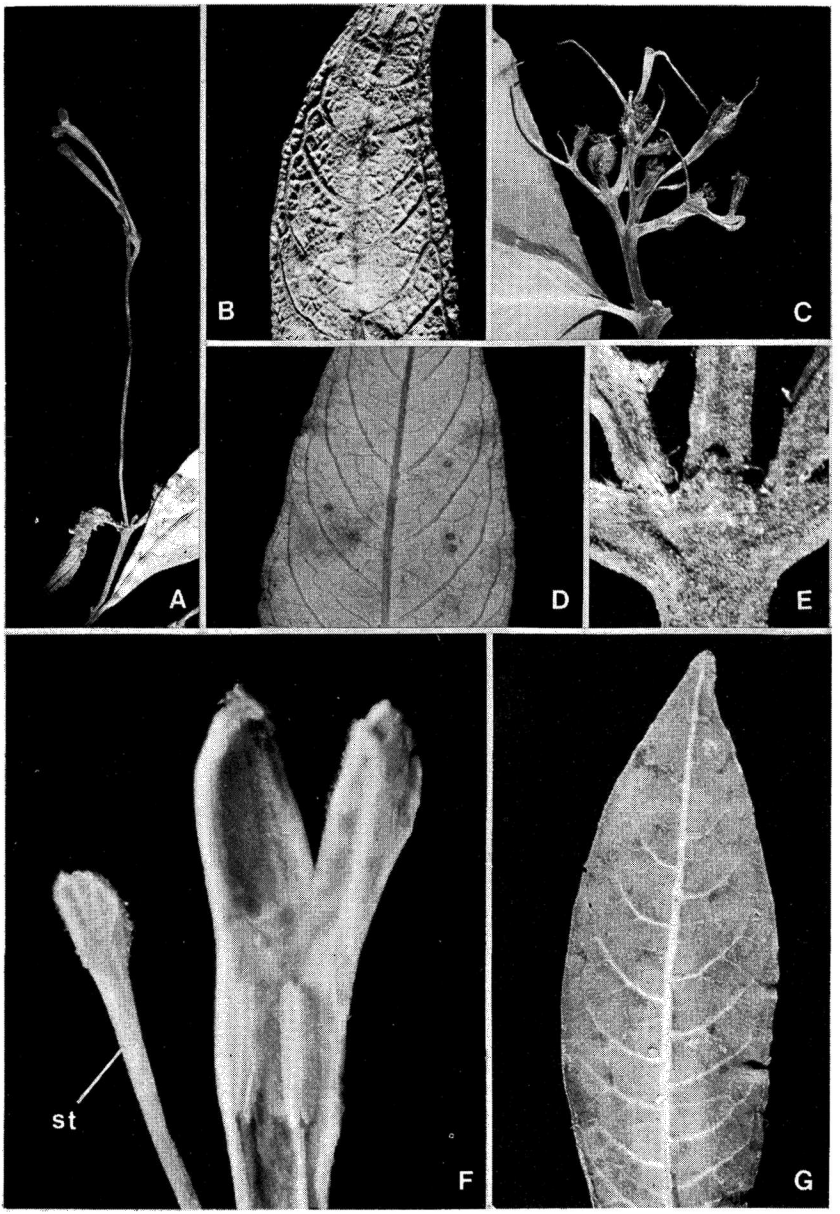
Ophiorrhiza fruticulosa Nadeaud, Enum. Pl. Indig. Tahiti, 53. 1873.

Suffrutescent herb to 1 m. high, the indument almost imperceptible and composed of minute, stramineous to ferrugineous hairs up to 0.02 mm. long or these lacking, the branchlets slender, semiterete, about 1 mm. in diameter toward apex, drying dark brown; stipules caducous, subcoriaceous, deltoid, appressed to the branchlets, 0.5—0.7 (—1) mm. long, up to 1.2 mm. broad at base, obtuse to acute at apex, glabrous to finely puberulent at base on abaxial surface; petioles slender, semiterete to somewhat strap-shaped distally, winged by the attenuate

base of the leaf blade, 1.6—12 (—20) mm. long, 0.5—1 mm. broad at middle; leaf blades chartaceous, drying dark green above, paler beneath, ovate to lanceolate to elliptic to obovate, 3—11 cm. long, 1.2—2.8 cm. broad, acute to acuminate at apex, decurrent on petiole at base, entire at margin, glabrous above, glabrous to finely puberulent beneath with hairs restricted to costa or margin, the costa prominent, plane to somewhat raised to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 9—16 per side, plane to prominulous above, prominulous to raised and rounded beneath, the tertiary nerves and veinlets plane above, discernible beneath; inflorescences at most 3-branched, with 5—18 flowers, 3—5 cm. long and about 1.5 cm. broad at anthesis, 1—2.5 cm. long and 1.5—3.5 cm. broad in fruit, the peduncle 3—10 mm. long, the pedicels not more than 1.5 mm. long at anthesis, up to 5 mm. long in fruit, the bracts conspicuous, narrowly subulate to setaceous, 5—13.5 mm. long, up to 0.5 mm. broad at base, acuminate at apex, glabrous to finely puberulent; calyx lobes coriaceous, deltoid, up to 1 mm. long, about 0.5 mm. broad at base, acute at apex, entire at margin, glabrous to finely puberulent; corolla narrowly infundibular, the tube up to 16 mm. long, up to 0.7 mm. in diameter at middle, glabrous to finely puberulent without with minute hairs near base, glabrous within except puberulent below stamens with a few scattered hairs up to 0.2 mm. long, the lobes more or less ovate, 1.5—3 mm. long, 1—2 mm. broad, acute at apex, entire at margin, essentially glabrous without, finely puberulent within with minute, white hairs; stamens inserted 1—4 mm. below corolla throat, the filaments filiform, 0.5—1 mm. long, the anthers included, dorsifixed 0.5—1 mm. above base, oblong-linear, 1.5—2.5 × 0.2—0.3 mm., the locules free below point of attachment; ovary subglobose, 1—1.7 mm. long, 0.7—1.6 mm. broad, capped by a 2-lobed disk up to 0.3 mm. high, essentially glabrous to finely puberulent with a few scattered, minute hairs; style filiform, about as long as corolla tube, up to 0.1 mm. in diameter, glabrous except for a few scattered hairs below stigma; stigma barely exserted, clavate, about 1 mm. long and 0.3 mm. broad, puberulent with minute, glandular hairs; fruits subglobose, rarely somewhat laterally compressed, 2—4 mm. long, 2.5—4.5 mm. broad, glabrous, drying brown, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: Forster based his brief description of *Ophiorrhiza subumbellata* on a single Tahitian collection made during the second Cook Pacific voyage. He gave the locality only as Tahiti, and this is indicated on the two available Forster collections at BM and K. The former specimen I designate the lectotype; this bears the additional notation "Capt. Cook, 1794," but this date is too late for any of the Cook voyages and may be the date of accession by the herbarium.

Nadeaud based his description of *Ophiorrhiza fruticulosa* on his own collection (no. *354*) from the high valleys of Pirae and Haamuta at an altitude of about 800 m. *Nadeaud 354* is represented by two specimens (P), which may be considered together as constituting the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G

holotype. One of the sheets bears the locality cited by Nadeaud, although it is barely legible.

DISTRIBUTION: Probably endemic to the island of Tahiti and occurring at elevations above 800 m. This species has been observed as an herb or a small shrub in shaded fern forests or more open habitats. Flowering and fruiting specimens have been collected in June and November. One U.S. Exploring Expedition collection (US) bears "Samoa" as a locality, but since this material is essentially identical with the collections of *Ophiorrhiza subumbellata* from Tahiti, it may well be of Tahitian origin also. As previously stated, it is known that the localities cited on the labels of the Exploring Expedition are not overly reliable. Moreover, the flora of Samoa is reasonably well understood, and *Ophiorrhiza* is not known with certainty in that archipelago.

Society Islands. TAHITI: PIRAE: High valleys of Pirae and Haamuta, *Nadeaud 354* (P holotype of *O. fruticulosa*). MOHINA: Aorai, *Grant 3727* (BISH); Ahonu Valley, *Grant 4424* (BISH). TAHITI, without further locality, *J. R. & G. Forster* (BM lectotype; isolectotype at K), *Grant 3527* (BISH), *Lay & Collie*, March—April, 1826 (BM), *U.S. Expl. Exped., p. p.* (US 77669 "Samoa"), *Vesco* in 1847 (P).

Ophiorrhiza subumbellata was the first Pacific species of this genus to be described, and it is one of the most easily recognized by the combined characters of subglobose fruits, small stipules, and compact, relatively few-flowered inflorescences. *Ophiorrhiza orofenensis* and *O. scorpioidea* share with *O. subumbellata* the character of subglobose fruits, a feature which is, as far as known, not found elsewhere in the genus. Since all of the species which share this character are found in the Society Islands, they probably represent a group of closely related taxa. From *O. subumbellata, O. orofenensis* differs in its stouter branchlets, its secondary nerves which dry with a yellowish color, its longer stipules, and its larger inflorescences with more numerous flowers. In *O. scorpioidea* the inflorescences are also longer, bear more numerous flowers, and are more openly branched.

Ophiorrhiza subumbellata also seems to be related to *O. platycarpa;* in the size of the inflorescences, leaf blades, and stipules the two are essentially identical. However, the fruits of *O. platycarpa* are

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FIGURE 10. A & B, *Ophiorrhiza solandri,* both from *Vesco* in 1847; A, inflorescence, × 1; B, rugose upper surface of leaf blade, × 2. C—F, *O. subumbellata;* C, inflorescence with bracts, × 2, from *Grant 3727;* D, upper surface of leaf blade, × 2, from *Grant 3727;* E, node with stipule, × 10, from *Vesco* in 1847; F, interior of distal portion of corolla showing two stamens, style, and stigma, × 15, from *Grant 4424.* G, *O. orofenensis,* upper surface of leaf blade showing pale secondary nerves, × 2, from *St. John & Fosberg 17011.* st = style.

distinctly flattened and mitriform and the anthers are more nearly basifixed. *Ophiorrhiza solandri* is similar to *O. subumbellata* in its minute puberulence and small stipules, but the former species differs in its more lax inflorescences with fewer flowers, distinctly rugose leaf blades, and mitriform fruits.

The type collection of *Ophiorrhiza fruticulosa* Nadeaud closely resembles *O. subumbellata* and *O. platycarpa,* but because the fruits are subglobose it is readily assignable to the former species.

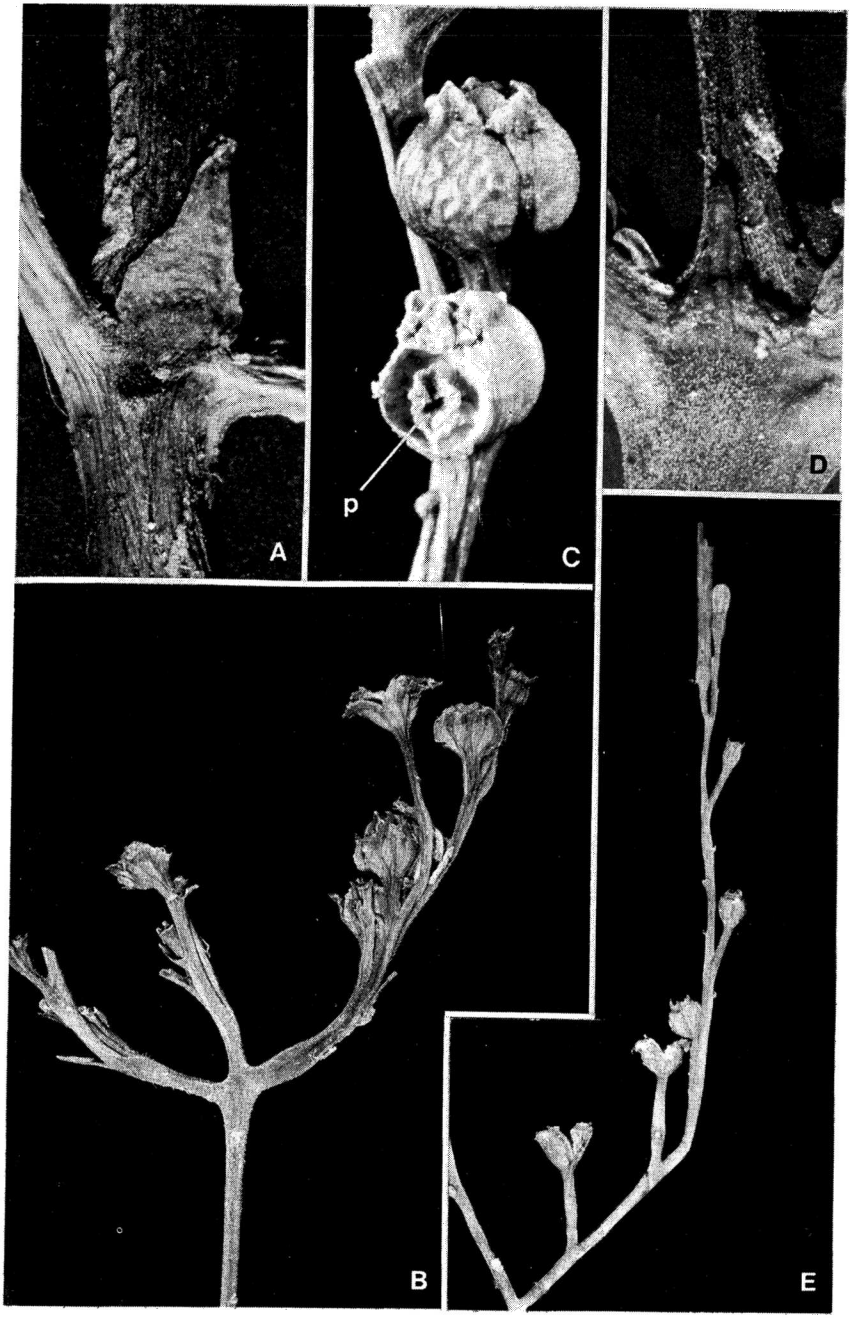
14. **Ophiorrhiza orofenensis** S. Darwin, sp. nov.
FIGURES 10, G; 11, A & B.

Ophiorrhiza sp. Fosberg in Occas. Pap. Bishop Mus. **13:** 251. 1937.

Herba perennis ad 40 cm. alta, glabra vel indumento pilis minutis curvatis aurantiacis ad 0.1 mm. longis subtiliter ornata, ramulis subteretibus apicem versus 1.5—2.5 mm. diametro fuscis; stipulis persistentibus membranaceis, deltoideis vel ovatis, 1—5.5 mm. longis, basi ad 2 mm. latis, integris vel divisis, apice acutis vel acuminatis, glabris vel pilis dispersis puberulis; petiolis crassis semiteretibus, 2—5 mm. longis, ad medium circiter 1 mm. latis; foliorum laminis chartaceis, in sicco supra atroviridibus sed nervis secundariis multo pallidioribus subtus pallidis, lanceolatis vel anguste ellipticis, 5.5—9.5 cm. longis, 1.5—3.5 cm. latis, apice acutis vel subacuminatis, basi in petiolum decurrentibus, integris, supra glabris, subtus glabris vel pilis minutis aurantiacis ad costam et nervos secundarios restrictis subtiliter puberulis, costa conspicua supra plana vel prominula vel aliquantum canaliculata, subtus elevata et rotundata, nervis secundariis utrinsecus 12—16 patentibus supra prominulis et pallidis subtus prominulis, nervis tertiariis et rete venularum utrinque planis vel prominulis; inflorescentiis libere ramosis 15—25-floris, sub anthesi 2—5 cm. longis, 3.5—7 cm. latis, pedunculo 3—32 mm. longo glabro vel puberulo, pedicellis ad 5 mm. longis glabris vel puberulis, bracteis frequentibus subulatis, ad 6 mm. longis, basi circiter 0.5 mm. latis, apice acutis, glabris vel subtiliter puberulis; calycis lobis coriaceis glabris deltoideis, 0.5—1 mm. longis basi 0.5—0.8 mm. latis, apice acutis, integris; corolla tantum in alabastro cognita; ovario subgloboso 1—2 × 1 mm. glabro vel puberulo; fructibus subglobosis, 3.5—4 mm. longis, 4—5 mm. latis, fuscis, aliquot pilis dispersis puberulis mox glabratis, calycis lobis persistentibus coronatis.

TYPE LOCALITY: As holotype I designate *St. John & Fosberg 17011,*

FIGURE 11. A & B, *Ophiorrhiza orofenensis;* A, node with stipule, × 8, from *St. John & Fosberg 17011;* B, portion of fruiting inflorescence showing undehisced and dehisced fruits, × 2, from *MacDaniels 1485.* C—E, *O. scorpioidea;* C, intact (upper) and dissected (lower) fruits showing short-clavate placenta, × 10, from *MacDaniels 1614;* D, node with stipule, × 10, from *MacDaniels 1614;* E, portion of inflorescence showing flower buds and undehisced and dehisced fruits, × 2, from *Lépine 76.* p = placenta.


A
p
C
D
B
E

from ridges south of Mt. Orofena, Tahiti, cited below. It was gathered in a wet forest at an altitude of 1,700 m. in September, 1934, and bears only young flower buds.

DISTRIBUTION: Endemic to Tahiti and known only from high elevations south of Mt. Orofena, this species has been reported as a locally frequent, perennial herb in moist, shaded areas. The leaves are dark green above and conspicuously paler beneath. Fruiting material has been gathered in May, and collections with flower buds have been made in May and September.

Society Islands. TAHITI: PUNAAUIA: Ridge south of Orofena, *St. John & Fosberg 17011* (BISH holotype), *MacDaniels 1485* (BISH). PAPENOO: South of Orofena, *MacDaniels 1502* (BISH).

Ophiorrhiza orofenensis has a remarkably restricted geographical range; the three collections thus far known are all from a relatively high altitude south of Mt. Orofena, Tahiti. Nevertheless, it is a distinctive species and is easily recognizable in the vegetative state by the secondary nerves of the leaf blades, which dry a pale yellow color on the upper surface. In addition, the leaf blades are comparatively small, the petioles stout, and the fruits subglobose. In this last feature, *O. orofenensis* is similar to *O. subumbellata* and *O. scorpioidea,* to which it is probably related. However, those two species differ in their smaller stipules, finer indument, and more slender branchlets, among other characters. Some specimens of *O. orofenensis* have an indument similar to that of *O. nelsonii,* but that species differs strongly in its mitriform fruits, usually longer leaf blades, larger inflorescences, and larger stipules. In these same characters the more widespread *O. tahitensis* also differs from the present species. Unfortunately, flowers are known only in immature bud for *O. orofenensis,* but vegetative and fruit characters seem sufficiently distinct to warrant the recognition of the three available collections as a new species.

15. **Ophiorrhiza scorpioidea** Nadeaud, Enum. Pl. Indig. Tahiti, 53. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 189. 1890, Fl. Polynés. Franç. 87. 1893. FIGURES 2, K & L; 11, C—E.

Suffrutescent herb to 40 cm. high, the indument almost imperceptible, composed of minute, yellow to ferrugineous hairs up to 0.05 mm. long, the branchlets subterete, 1.2—1.8 mm. in diameter toward apex, drying dark red-brown; stipules coriaceous, deltoid to somewhat ovate, 0.6—2.3 mm. long, up to 1.3 mm. broad, long-acuminate at apex, entire, glabrous or minutely puberulent; petioles slender, semiterete to somewhat strap-shaped distally, 4—15 mm. long, about 1 mm. broad at middle; leaf blades chartaceous, drying dark above, paler

beneath, ovate to elliptic to obovate, 7—13 cm. long, (1.5—) 2—4.5 cm. broad, acuminate at apex, obtuse to acute and shortly decurrent on petiole at base, entire at margin, glabrous to puberulent above with minute, scattered hairs, glabrous to puberulent beneath with hairs restricted to the costa, the costa conspicuous, plane to canaliculate above, raised and rounded beneath, the secondary nerves spreading, 10—14 per side, more or less prominulous above, more sharply raised beneath, the tertiary nerves and veinlets plane above, discernible beneath; inflorescences open, lax, freely branched, with 25—50 flowers (or these rarely as few as 10), 3—10 cm. long and 6—9 cm. broad at anthesis or in fruit, the peduncle (10—) 40—75 (—90) mm. long, the rachis elongate and delicate, the pedicels up to 3.5 mm. long, the bracts infrequent, narrowly setaceous, up to 5 mm. long, about 0.5 mm. broad at base, acute at apex, essentially glabrous; calyx lobes coriaceous, deltoid to more or less elliptic, 0.4—0.7 mm. long, up to 0.5 mm. broad, acute at apex, entire at margin, essentially glabrous; corolla narrowly infundibular, the tube 13—18.5 mm. long, 0.5—0.7 mm. in diameter at middle, glabrous without, glabrous to finely puberulent within with a few scattered hairs, the lobes more or less ovate, 1.6—2.8 mm. long, 1—1.5 mm. broad, acute at apex, entire at margin, glabrous without, densely puberulent within with small, yellow, glandular hairs; stamens inserted about 3 mm. below corolla throat, the filaments filiform, up to 0.5 mm. long, the anthers included, dorsifixed about 0.3 mm. above base, oblong-linear, up to 2 mm. long, 0.2—0.3 mm. broad, the locules free below point of attachment; ovary subglobose, 1—1.5 × 1 mm., essentially glabrous, capped by a 2-lobed disk about 0.4 mm. long; style filiform, about the same length as corolla tube, about 0.1 mm. in diameter, glabrous; stigma clavate to capitate, about 1 × 1 mm., puberulent with minute glandular hairs; fruits subglobose, 2—3 mm. long, 2.5—3.5 mm. broad, glabrous, drying brown, capped by the persistent calyx lobes and disk.

TYPE LOCALITY: Nadeaud based his description of this species on one of his own collections (no. *355*) from the island of Tahiti, at the edge of the Anaorii Plateau, at the base of Papenoo Valley, cited below. This collection is represented by two sheets (P), which may be considered as together constituting the holotype. The type collection was made in July, 1857, at an altitude of 600—1,000 m.

DISTRIBUTION: Endemic to the Society Islands; specimens have been collected on Moorea and at various locations on Tahiti. *Ophiorrhiza scorpioidea* is found as an occasional perennial herb or low shrub in moist forests at elevations from 400 to 1,000 m. Flowering material has been collected at various times of the year; the corollas are red. Fruiting specimens have been gathered in June.

Society Islands. MOOREA: AFAREAITU: Putoa, *Grant 5388* (BISH). TAHITI: MAHINA: Aorai, *Lépine 76* (P). PAPENOO: Edge of Anaorii Plateau, bottom of Papenoo Valley, *Nadeaud 355* (P holotype). MATAIEA: Lake Vahiria, *MacDaniels 1614* (BISH). TEARUPOO: Mt. Roniu, *Grant 3924* (BISH).

Ophiorrhiza scorpioidea is similar to *O. subumbellata* in its obscurely puberulent indument, its small, subcoriaceous stipules, and its subglobose fruits. However, the inflorescences of *O. subumbellata* are fewer-flowered and more compact; neither are the inflorescences of *O. orofenensis* as open as they are in *O. scorpioidea*. In its lax inflorescences, *O. scorpioidea* is somewhat reminiscent of *O. rupestris*, but in the latter species the indument is coarser, the corolla tubes much shorter, and the leaves often subfalcate.

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