Contributions to the Flora of Hawai'i II. Begoniaceae—Violaceae and the Monocotyledons

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ABSTRACT

This paper, alphabetically covering the dicot families Begoniaceae to Violaceae, and the monocots, is the second and final of a series providing new records of naturalized species in Hawai'i, new combinations, and descriptions of new taxa before the publication of the *Manual of the Flowering Plants of Hawai'i*. The following 59 new records of naturalized species are reported: *Begonia foliosa* var. *miniata*, *B. hirtella*, *B. reniformis*, *Myosotis discolor*, *Sisymbrium irio*, *Buddleia madagascariensis*, *Lonicera japonica*, *Atriplex eardleyae*, *Chenopodium album*, *C. hircinum*, *Hypericum canariense*, *Ipomoea ochracea*, *Crassula sieberiana*, *Elaeagnus umbellata*, *Chamaesyce hyssopifolia*, *C. maculata*, *Euphorbia graminea*, *Mallotus philippensis*, *Crotalaria brevidens*, *C. lanceolata*, *Glycine wightii*, *Lathyrus latifolius*, *L. tingitanus*, *Macroptilium atropurpureum*, *Prosopis juliflora*, *Geranium homeanum*, *G. molle*, *G. pusillum*, *Gonocarpus chinensis* subsp. *verrucosus*, *Cinnamomum burmannii*, *Utricularia gibba*, *Cuphea hyssopifolia*, *C. ignea*, *Abutilon auritum*, *Herissantia crispa*, *Malvastrum americanum*, *Sida urens*, *Sidastrum micranthum*, *Mollugo cerviana*, *Sauvagesia erecta*, *Polygonum convolvulus*, *Galium divaricatum*, *Mitracarpus hirtus*, *Spermacoce mauritiana*, *Buchnera pusilla*, *Cymbalaria muralis*, *Dopatrium junceum*, *Lindernia antipoda*, *Parentucellia viscosa*, *Solanum aviculare*, *S. nigrescens*, *S. robustum*, *Cyperus virens*, *Fimbristylis aestivalis*, *F. schoenoides*, *Rhynchospora caduca*, *R. globularis*, *Aristea gerrardii*, and *Typha latifolia*. A total of 30 new combinations were required for the new taxonomic treatments of the families Malvaceae, Myrtaceae, Rubiaceae, Thymelaeaceae, Violaceae, and Cyperaceae. They are: *Hibiscus arnottianus* subsp. *immaculatus*, *H. a.* subsp. *punaluuensis*, *H. brackenridgei* subsp. *mokuleianus*, *H. kokio* subsp. *saintjohnianus*, *H. waimeae* subsp. *hannerae*, *Metrosideros waialealae* var. *fauriei*, *Hedyotis* sect. *Gouldia*, *H. fosbergii*, *H. hillebrandii*, *H. terminalis*, *Wikstroemia oahuensis* var. *palustris*, *Viola chamissoniana* subsp. *robusta*, *V. c.* subsp. *tracheliifolia*, *Carex macloviana* subsp. *subfusca*, *C. wahuensis* subsp. *rubiginosa*, *Mariscus fauriei*, *M. hillebrandii*, *M. h.* subsp. *decipiens*, *M. hypochlorus* subsp. *brevior*, *M. pennatiformis*, *M. p.* subsp. *bryanii*, *M. phleoides* subsp. *hawaiiensis*, *M. rockii*, *M. sandwicensis*, *Gahnia*

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vitiensis subsp. *kauaiensis*, *Pycreus polystachyos* subsp. *holosericeus*, *Rhynchospora chinensis* subsp. *spiciformis*, *R. rugosa* subsp. *lavarum*, *Bolboschoenus maritimus* subsp. *paludosus*, and *Schoenoplectus lacustris* subsp. *validus*. During the preparation of the *Manual*, 1 new section, 5 new species, 1 new subspecies, and 1 new variety were discovered in the families Caryophyllaceae, Gesneriaceae, Lamiaceae, Myrsinaceae, Myrtaceae, Rubiaceae, and Cyperaceae. They are: *Silene perlmanii*, *Cyrtandra oxybapha*, *Stenogyne campanulata*, *Myrsine vaccinioides*, *Metrosideros polymorpha* var. *pumila*, *Hedyotis* sect. *Phyllozygia*, *Hedyotis tryblium*, and *Carex wahuensis* subsp. *herbstii*. Previously misidentified species in the genera *Capsella* and *Chenopodium* are discussed. An infrageneric classification of *Hedyotis* is given. Additional commentary is included for the generic distinction between *Alsinidendron* and *Schiedea*, the subdivision of *Scirpus* into *Bolboschoenus* and *Schoenoplectus*, and the subdivision of *Cyperus* into *Cyperus*, *Kyllinga*, *Mariscus*, *Pycreus*, and *Torulinium*.

INTRODUCTION

The last complete flora of Hawai'i was published 100 years ago (Hillebrand 1888). This has left the Hawaiian flora—one of the most interesting in the United States—without any modern floristic inventory of its plants. A project to produce the *Manual of the Flowering Plants of Hawai'i* (Wagner, Herbst & Sohmer, in press) was initiated in 1982 by S.H. Sohmer and funded primarily by the Irwin Charity Foundation of San Francisco and the National Science Foundation. The recently completed *Manual* brings together, with a uniform taxonomic treatment, the existing knowledge of the native and naturalized flowering plants pertinent to their identification, classification, distribution, and status. The project also has sought knowledgeable specialists to contribute treatments of specific groups to the book and has encouraged scientists to initiate more detailed research programs on Hawaiian genera. The completion of the *Manual* is a significant step towards an overall evaluation of the native and naturalized flowering plants of the Hawaiian Archipelago; however, it should be followed by more detailed studies, especially in systematics, evolution, pollination ecology, autecology, genetics, and population biology.

This is the second of two papers in the precursor series for the *Manual* (see Wagner et al. 1986). It is intended to bring out, before the publication of the *Manual*, new records of naturalized species, previously incorrectly identified naturalized species, and notes or comments on native and naturalized species. Two other papers that report newly naturalized and some adventive species were published by K. Nagata (1987, 1988) during the preparation of the *Manual*. For some genera, new combinations or new species are being published in the precursor series, since no new combinations or new species will be published in the *Manual*. Other precursor papers have been published by us and contributing specialists (Austin 1987; Davidse, in press; Fosberg 1987; Hayden 1987; Henrickson & Herbst 1988; Jones 1984; Lammers 1988; Medeiros & St. John 1988; Nagata & Gon 1987; Wagner 1988; Wagner & Herbst 1987) to make more detailed information and taxonomic innovations available before the publication of the *Manual*. In this paper certain taxonomic groups were contributed by other authors; these sources are indicated in footnotes.

Under each new record of a naturalized species reported, a single collection, usually the earliest, is cited for each island on which it occurs. References to original publications of names of naturalized species are not given, since they are available elsewhere and since the discussions here are more informal, focusing on distribution and not nomenclature. However, references to original publications and types are given for all native Hawaiian taxa. Distributions are also given for all native taxa discussed, but specimens examined are cited only for new taxa.

BEGONIACEAE

Begonia L.

A number of *Begonia* species are cultivated in Hawai'i, but only three are naturalized, none of which previously had been reported as such by St. John (1973). We thank K. Burt-Utley and L.B. Smith for verification of the determinations, and L.B. Smith for comments on these species.

Key to the Naturalized Species of *Begonia* in Hawai'i

1. Leaves numerous, closely spaced, blades in line with petioles, 1.2–5 cm long, margins crenate to serrate . . . . . ***B. foliosa***
1. Leaves relatively few, widely spaced, blades oblique to petioles, (2–)3–17 cm long, margins shallowly toothed or lobed 2
2(1). Stipules 0.7–1.1 cm long, conspicuously long-ciliate; leaf blades (2–)3–11 cm long, upper surface sparsely hirtellous; stamens 10–15 . . . . . ***B. hirtella***
2. Stipules 1.5–3 cm long, entire; leaf blades 9–17 cm long, upper surface sparsely scabrous; stamens ca. 18 . . . . . ***B. reniformis***

Begonia foliosa Kunth var. ***miniata*** (Planch.) L.B. Sm. & B.G. Schubert

B. fuchsioides Hook.

This species is native to Colombia and Venezuela. It has been cultivated in Hawai'i and is naturalized at least since 1917 in the Kīlauea Settlement lots, Puna District, Hawai'i, but not previously reported.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Kīlauea Volcano, 1917, *Rock 12996* (BISH).

Begonia hirtella Link

This species is native to Brazil and Peru. It is sometimes cultivated in Hawai'i, primarily as a pot plant, and has become naturalized and sometimes locally common in disturbed, wet, shaded sites, 450–940 m, at least on O'ahu, East Maui, and Hawai'i, but not previously reported.

Representative specimens examined. HAWAIIAN IS: O'AHU: Waialua Dist, Kawai Iki, 1962, *B. Bishop s.n.* (BISH); EAST MAUI: Hāna Dist, Ke'anae Arboretum [spontaneous], 1987, *Hobdy 2487* (BISH); HAWAI'I: Puna Dist, near Pāhoa, 1952, *Degener 21764* (BISH).

Begonia reniformis Dryander

This species is native from southern Mexico to Guatemala. In Hawai'i it apparently was cultivated on the McCandless Ranch, where it is now naturalized and common in pastures and disturbed areas. It was reported as adventive by Nagata (1987).

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Kona Dist, McCandless Ranch, 1976, *Herbst & Spence 5633* (BISH).

BORAGINACEAE

Myosotis L.

Myosotis discolor Pers.

This species is native to Europe and appears recently to have become sparingly naturalized in the South Hilo District, Hawai'i.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Hilo Dist, near Kūlani Project, 1981, *Davis et al. 468* (BISH).

BRASSICACEAE

We thank R. Rollins for annotation of the BISH material of this family from Hawai'i. Here we include one misidentified species and one previously unreported naturalized species in Hawai'i. An analysis of the naturalized *Lepidium* species in Hawai'i, including several previously unreported species, is given by Rollins (1986).

Capsella Medik.

Capsella rubella Reut.

This species, native to Eurasia, has been naturalized in Hawai'i for most of this century. It has consistently been misidentified as *C. bursa-pastoris* (L.) Medik., which differs from *C. rubella* in that its petals are about twice as long as the sepals, the sepals are usually green and often pubescent, and the siliques are straight-sided. By contrast, *C. rubella* has petals that scarcely exceed the sepals, the sepals are usually reddish at the apex and glabrous, and the siliques are slightly concave.

Representative specimens examined. HAWAIIAN IS: O'AHU: Honolulu Dist, Kaimukī, 1919, *Forbes 2531.O* (BISH); LĀNA'I: Kō'ele, 1913, *Munro 305* (BISH); MAUI: Makawao Dist, Kula, 1920, *Forbes 2177.M* (BISH); HAWAI'I: Hāmākua Dist, Ni'eni'e, Parker Ranch, 1909, *Rock 8322* (BISH).

Sisymbrium L.

Sisymbrium irio L.

This species is native to Europe, but widely naturalized. In Hawai'i it apparently is only locally naturalized in the saddle area between Mauna Kea and Mauna Loa, and has not previously been reported.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: probably Hāmākua Dist, Saddle Rd, 1963, *Kawasaki 1* (BISH).

BUDDLEJACEAE

Buddleia L.

Previously only *Buddleia asiatica* Lour. had been reported as naturalized in Hawai'i (St. John 1973). Here we report an additional naturalized species.

Buddleia madagascariensis Lam.

This species has recently become naturalized after cultivation in Hawai'i as an ornamental at least since 1931. It is easily identified by its orange corolla, pubescent ovary, and fleshy, indehiscent fruit. It presently is naturalized in the Volcano area, Hawai'i, and apparently also along the Hāna Highway, East Maui.

Representative specimens examined. HAWAIIAN IS: O'AHU: Honolulu Dist, Woodlawn (cultivated), 1931, *Neal s.n.* (BISH); EAST MAUI: Hāna Dist, 18 mi from Hāna on Hāna Highway, 1972, *Ishikawa 201* (BISH, HLA); HAWAI'I: Puna Dist, Volcano transfer dump, 1975, *Herbst & Ishikawa 5526* (BISH, HLA).

CAPRIFOLIACEAE

Lonicera L.

Lonicera japonica Thunb.

This species is often cultivated as an ornamental and unfortunately has recently become naturalized at least in Kōke'e State Park, Kaua'i, and near Volcano Village and on the slopes of Hualālai, Hawai'i. *Lonicera japonica* usually does not produce fruit in Hawai'i, but fertile strains apparently have developed recently in some populations. However, Fosberg (pers. comm.

1988) notes having observed this species fruiting in Mānoa Valley as early as the 1930s. This honeysuckle probably will become a serious pest, as it has in many other parts of the world.

Representative specimens examined. HAWAIIAN IS: KAUA'I: Waimea Dist, Kōke'e, 1987, *Plews s.n.* (BISH); O'AHU: Honolulu Dist, University of Hawaii Campus (cultivated), 1929, *Octavio s.n.* (BISH) (G. Linney [pers. comm. 1987] reports fertile plants from Mānoa Val); HAWAI'I: Ka'ū Dist, Kīlauea Military Camp, spontaneous, 1951, *Fosberg 33294* (BISH).

CARYOPHYLLACEAE

There has been confusion in the past concerning the validity of separating the genus *Alsinidendron* from *Schiedea* (Stone 1967). Hillebrand (1888, p. 36) recognized 1 species of *Alsinidendron*, *A. trinerve* H. Mann. Based on the features of the "staminodia" (referred to here as enations) and fleshiness of the calyx, he stated that "there might be good reasons for combining *S. viscosa* and *S. lychnoides* with *Alsinidendron*." Later A.A. Heller (1897) studied *S. lychnoides* and concluded that the habit and large flowers of *S. lychnoides* somewhat removed it, along with *S. viscosa*, from the remainder of *Schiedea*. In 1934 Pax and Hoffmann reduced *Alsinidendron* to a section of *Schiedea*. Later, Sherff (1944) reviewed the situation and formally transferred *S. lychnoides* and *S. viscosa* to *Alsinidendron*. He also transferred *S. verticillata* without comment. We reviewed the literature and examined available specimens for the *Manual* treatments and concurred with Hillebrand and Sherff that the two genera should be maintained. However, the floral morphology of *Schiedea verticillata* is clearly that of *Schiedea* and not *Alsinidendron*. The following key, descriptions, and discussion summarize the distinctions between the two genera.

Key to *Alsinidendron* and *Schiedea*

1. Stamens connate at base into a lobed ring, but with thin, oblong, hyaline enations alternate with stamens; sepals white or the outer pair green externally, enlarging, becoming fleshy and dark purple or membranous and not changing color in fruit; styles 4–11; flowers in axillary, compound cymes formed by the development of lateral shoots . . ***Alsinidendron***

1. Stamens distinct, those opposite the sepals with a hollow, cylindrical nectary arising at base; sepals green, sometimes purple-tinged, neither especially enlarging nor becoming fleshy and dark purple or membranous in fruit; styles usually 3, sometimes 4, or rarely 5; flowers in terminal and axillary, compound, open or congested and head-like, paniculate or corymbose cymes . . . . . ***Schiedea***

Alsinidendron H. Mann

Alsinidendron H. Mann, Proc. Boston Soc. Nat. Hist. 10: 311. 1866.

Schiedea Cham. & Schlechtend. sect. *Alsinidendron* (H. Mann) Pax & K. Hoffm., Nat. Pflanzenfam. ed. 2, 16c: 326. 1934. TYPE: *Alsinidendron trinerve* H. Mann.

Schiedea Cham. & Schlechtend. sect. *Nothoschiedea* H. Mann, Proc. Boston Soc. Nat. Hist. 10: 310. 1866. TYPE: *Schiedea viscosa* H. Mann [= *Alsinidendron viscosum* (H. Mann) Sherff].

Erect shrubs or vines. Leaves opposite, conspicuously palmately 3-nerved or sometimes 5-nerved, margins entire, petiolate, stipules absent. Flowers in axillary, compound cymes formed by development of lateral shoots; sepals 4–5(6), completely white or the outer pair green externally, white within, inner ones whitish with a green midrib externally, white within, oblong, oblong-elliptic to elliptic or obovate, persistent, enlarging, becoming fleshy and dark purple or membranous and not changing color in fruit, unequal, the largest 2 subopposite and external, or when 4, decussate; petals absent; stamens 10, occasionally 8, connate at base into a lobed ring, with thin, oblong, hyaline enations alternate with the stamens arising from the outside of the staminal cup, these inconspicuous or conspicuous and 2–3-toothed; anthers

reddish purple, oblong, attached above base; ovary 1-celled, placentation free-central; styles 4–11, filiform, receptive completely around upper clavate ½. Fruit a narrowly ovoid, ovoid, or subglobose capsule, enclosed by the persistent fleshy or membranous calyx, 8–12 mm long, splitting at maturity into 4–11 valves, sometimes variable in number on the same plant. Seeds numerous, black at maturity, orbicular-reniform, flattened, 1–1.5 mm long, the surface papillose, papillae especially large along margins.

Remarks. A Hawaiian endemic genus of 4 species. These can be readily divided into 2 groups, each with 2 species: (1) shrubs with sepals becoming fleshy and purple at maturity, restricted to mesic and wet forest in the Wai'anae Mountains, O'ahu; and (2) sprawling or weakly climbing subshrubs with membranous sepals that do not change color at maturity, restricted to wet forest along the western margin of the Alaka'i Swamp, Kaua'i. The Kaua'i group has previously been placed in *Schiedea* (Mann 1866, 1867; Hillebrand 1888), but their possession of connate stamens, hyaline enations, and lateral inflorescences, and absence of cylindrical nectaries show that they clearly belong in *Alsinidendron*. *Alsinidendron* differs from *Schiedea* primarily in the characters listed above, although they probably share a common ancestor, with *Alsinidendron* being the most highly derived. The nature of the oblong enations arising on the outer side of the staminal cup is presently unknown, but they probably are analogous to nectaries in *Schiedea*. It is also possible that they represent vestigial petals. Since this genus has 10 stamens it seems unlikely that the enations represent staminodes as previously suggested.

Included species are:

1. *Alsinidendron lychnoides* (Hillebr.) Sherff
2. *Alsinidendron obovatum* Sherff
3. *Alsinidendron trinerve* H. Mann
4. *Alsinidendron viscosum* (H. Mann) Sherff

Schiedea Cham. & Schlechtend.

Schiedea Cham. & Schlechtend., Linnaea 1: 46. 1826, non A. Rich. nec Bartl.

Small shrubs, subshrubs, or herbaceous or woody vines. Leaves opposite or sometimes in whorls of 3, 1-nerved or per node, palmately 3–9-nerved, margins entire, petiolate, stipules absent. Flowers perfect or unisexual (and the plants dioecious or gynodioecious), in terminal and axillary, compound, open or congested and head-like, paniculate or corymbose cymes; sepals (4)5(6), green, sometimes purple-tinged, imbricate, persistent; petals absent; nectaries 5, arising at base of and between stamens and sepals, the nectary sheath cylindrical, hollow, thin and translucent, apex entire or bifid, base an enlarged, usually yellowish, horseshoe-shaped, nectar-producing gland; stamens usually 10, rarely fewer, distinct, in 2 series, 5 alternate with the sepals, inserted between the nectaries, the other 5 opposite the sepals, inserted in center of nectary, staminodes often present in pistillate flowers, these often smaller than the stamens, with empty anther sacs; anthers yellow, oblong, attached above base; ovary 1-celled, placentation free-central; styles usually 3, sometimes 4, rarely 5, filiform, receptive completely around upper clavate ½. Fruit an ovoid capsule, enclosed by or exserted from the persistent dried calyx, dehiscing at maturity by as many valves as styles. Seeds relatively few to numerous, usually black or dark reddish brown, sometimes grayish black or brown, orbicular-reniform, reniform, or rarely orbicular, usually laterally compressed, 0.6–1 mm long, the surface rugose, papillose, or sometimes nearly smooth.

Remarks. An endemic genus of 22 species. *Schiedea* and the related genus *Alsinidendron* are presumably derived from a single *Arenaria*-like ancestor. *Schiedea verticillata*, *S. kaalae*, and *S. globosa* are quite distinct in the genus. *Schiedea verticillata* is the most distinctive with its large,

densely glandular pubescent flowers and fleshy, usually whorled leaves with 7–12 nerves. Nearly as distinctive are *S. kaalae*, with its large, open inflorescences, large, thick, chartaceous, 1-nerved leaves, and greatly reduced stems, and the coastal *S. globosa*, with its fleshy leaves and stems and congested, head-like inflorescences. The remaining species fall into 2 distinct groups: (1) plants with flowers distant, in open, paniculate cymes (*S. amplexicaulis*, *S. diffusa*, *S. helleri*, *S. implexa*, *S. lydgatei*, *S. membranacea*, *S. nuttallii*, *S. pubescens*, and *S. stellarioides*); and (2) plants with flowers in contracted and often congested, paniculate cymes (*S. adamantis*, *S. apokremnos*, *S. haleakalensis*, *S. hookeri*, *S. kealiae*, *S. ligustrina*, *S. mannii*, *S. menziesii*, *S. salicaria*, and *S. spergulina*). Smaller groups of closely related species can be discerned within each of these larger, rather polymorphic groups.

Included species are:

1. *Schiedea adamantis* St. John
2. *Schiedea amplexicaulis* H. Mann
3. *Schiedea apokremnos* St. John
4. *Schiedea diffusa* A. Gray
5. *Schiedea globosa* H. Mann
6. *Schiedea haleakalensis* Degener & Sherff
7. *Schiedea helleri* Sherff
8. *Schiedea hookeri* A. Gray
9. *Schiedea implexa* (Hillebr.) Sherff
10. *Schiedea kaalae* Wawra
11. *Schiedea kealiae* Caum & Hosaka
12. *Schiedea ligustrina* Cham. & Schlechtend.
13. *Schiedea lydgatei* Hillebr.
14. *Schiedea mannii* St. John
15. *Schiedea membranacea* St. John
16. *Schiedea menziesii* Hook.
17. *Schiedea nuttallii* Hook.
18. *Schiedea pubescens* Hillebr.
    - var. *pubescens*
    - var. *purpurascens* Sherff
19. *Schiedea salicaria* Hillebr.
20. *Schiedea spergulina* A. Gray
    - var. *leiopoda* Sherff
    - var. *spergulina*
21. *Schiedea stellarioides* H. Mann
22. *Schiedea verticillata* F. Brown

Silene L.

Silene perlmanii W.L. Wagner, Herbst & Sohmer, **sp. nov.** TYPE: HAWAIIAN IS: O'AHU: 'Ewa Dist, Wai'anae Mts, below ridge crest trail between Palikea and Pōhākea Pass, 790 m, 5.III.1987, *S. Perlman & J. Obata 5401* (BISH-509428!, holotype).

Planta suffruticosa est, foliis anguste ellipticis glabris excepta pagina superficia ad basim strigillosa marginibus in parte 5–6 mm longa ciliatis, cymis dense breve hirtellis, pedicellis 7–10 mm longis, calycibus 22–30 mm longis, petalis albis laminis 8–10 mm longis ungue 11–12.5 mm longo, carpophoro ca. 13 mm longo.

Subshrubs, usually many-branched from base, often forming clumps; stems erect to ascending, 3–5 dm long, glabrous. Leaves narrowly elliptic, 50–105 mm long, 7–16 mm wide, glabrous except upper surface strigillose toward base, margins ciliate in the lower 5–6 mm and sometimes also toward apex, sometimes somewhat undulate, apex acute, gradually tapering to base. Flowers few in terminal, corymbose cymes, densely short-hirtellous throughout, pedicels 7–10 mm long; calyx tubular, 5-lobed, 22–30 mm long, 10-nerved, sometimes with conspicuous lateral nerves from the sinus nerves in upper ⅓, densely short-hirtellous, the lobes 3–6 mm long, margins scarious and weakly purple-tinged, also sparsely ciliate; petals white, blades obovate, 8–10 mm long, deeply notched, the appendage ca. 2.5–3 mm long, deeply 2-cleft, each tooth obliquely bifid, the claw 11–12.5 mm long, sparsely ciliate; stamens exserted beyond calyx; styles 3–4; carpophore ca. 13 mm long. Capsules oblong-obovoid, 3–4-celled in the lower ⅔, 9–10 mm long (immature). Seeds unknown.

Distribution. Extremely rare, known from a single population of perhaps 20 individuals on a cliff face in a diverse mesic forest, 790 m, between Palikea and Pōhākea Pass, southern Wai'anae Mountains, O'ahu.

Remarks. *Silene perlmanii* appears to be most closely related to *S. alexandri* Hillebr., an extremely rare plant from Moloka'i, and differs primarily in the densely short-hirtellous calyx and pedicels, the latter being 7–10 mm long. *Silene alexandri* has a glabrous calyx and pedicels, the latter being 10–19 mm long. Both these species are related to a single colonizing ancestor and appear to share it with the other white-flowered species, *S. lanceolata* A. Gray (formerly known from Kaua'i, Lāna'i, and Hawai'i, and presently rare on Moloka'i), *S. cryptopetala* Hillebr. (probably extinct, known only from the type from East Maui), and *S. degeneri* Sherff (probably extinct, known only from the type and one other collection from East Maui).

CHENOPODIACEAE

Here we report a naturalized species of *Atriplex*, two of *Chenopodium*, and a long-standing confusion in Hawai'i between *C. album* and *C. murale*. We thank P. Brennan, H. Wilson, and P. Wilson for determinations, literature, and comments on *Chenopodium* in Hawai'i.

Atriplex L.

Atriplex eardleyae Aellen

This annual species is a native of Australia. It was found in 1984 to be naturalized at Pu'uhonua O Hōnaunau National Historical Park, Hawai'i.

Atriplex eardleyae is easily distinguished from the other three species of *Atriplex* naturalized in Hawai'i by its fan-shaped fruiting bracts. The other species are *A. lentiformis* (Torr.) S. Wats., *A. semibaccata* R. Br., and *A. suberecta* Verd. The latter species was previously confused with *A. muelleri* Benth., and in Hawai'i often mistaken for *A. semibaccata*. It is readily distinguished by its ascending stems and fruit bracts 2–3.5 mm long, which become hardened and yellow at maturity. By contrast, *A. semibaccata* has prostrate stems and fleshy red or red-tinged fruiting bracts 4–6 mm long.

Specimen examined. HAWAIIAN IS: HAWAI'I: South Kona Dist, Pu'uhonua O Hōnaunau National Historical Park, 1984, *Higashino et al. 10266* (BISH).

Chenopodium L.

Chenopodium album L.

This species is a cosmopolitan weed, but only recently has become naturalized in Hawai'i. It is currently known only from the Kula area, East Maui. Many Hawaiian specimens of *Chenopodium murale* L.—which differs from *C. album* by a more keeled calyx that does not enclose the fruit, and acutely keeled seeds—have been misidentified by Hawaiian botanists as *C. album*.

Representative specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Kula area, 1986, *Hobdy 2573* (BISH).

Chenopodium hircinum Schrad.

This previously unreported species is native to South America. In Hawai'i it is known from only two naturalized collections. This species is most readily distinguished from other species in Hawai'i by its alveolate seeds. Both specimens listed below were identified by H. Wilson, the latter only tentatively.

Specimens examined. HAWAIIAN IS: MAUI: district unknown, Haleakalā Crater, 2,500 m, 1909, *Faurie 1059* (BISH); HAWAI'I: South Kohala Dist, Parker Ranch, west of Ke'āmuku Camp, 915 m, 1982, *Wagner et al. 4734* (BISH).

CLUSIACEAE

Hypericum L.

Hypericum canariense L.

This species is native to the Canary Islands and Madeira and is now widely cultivated as an ornamental. In Hawai'i it is cultivated and recently has become sparingly naturalized in disturbed areas at 970–1,100 m, Kula, East Maui.

Representative specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Kula, 1985, *Hobdy 2394* (BISH).

CONVOLVULACEAE

Ipomoea L.

Ipomoea ochracea (Lindl.) G. Don

Although this species has been a naturalized component of the Hawaiian flora since at least 1919, it has not previously been reported in the literature. Earlier collections either were unidentified or confused with *I. obscura* (L.) Ker-Gawler. Native to Africa, in Hawai'i it is naturalized in disturbed mesic sites, 15–600 m, on Kaua'i, O'ahu, Maui, and Hawai'i.

Representative specimens examined. HAWAIIAN IS: KAUA'I: Kawaihau Dist, Wailua Homesteads, 1986, *Flynn 1511* (BISH); O'AHU: Honolulu Dist, Kamehameha School Grounds, 1919, *Forbes 2532.O* (BISH); MAUI: Makawao Dist, Hāmākua Poko, 1985, *Hobdy 2319* (BISH); HAWAI'I: South Kona Dist, Ho'okena, 1976, *Herbst & Spence 5631* (BISH).

CRASSULACEAE

Crassula L.

Crassula sieberiana (Schult.) Druce

This inconspicuous, fleshy, annual herb has minute flowers, stamens as many as the distinct petals, opposite leaves, and 3–5 ovaries. It is native to Australia, Tasmania, and New Zealand. It recently was discovered to be naturalized in subalpine vegetation at ca. 1,585 m in the Pōhakuloa Training Area, Hawai'i.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Hāmākua Dist, Pōhakuloa Training Area, 1978, *Warshauer & McEldowney 1882* (BISH).

ELAEAGNACEAE

Elaeagnus L.

Elaeagnus umbellata Thunb.

This species, which is native to Asia, is cultivated as an ornamental in Hawai'i. It is now sparingly naturalized at Volcano Village and Kīlauea, Hawai'i Volcanoes National Park, Hawai'i. It was first collected at an old dwelling site at Hawai'i Volcanoes National Park Headquarters in 1963, at which time it was not spreading. By 1984 it had become sparingly naturalized from plants cultivated in Volcano Village along the roadside of Haunani Rd. (*Stemmermann 6872*, BISH).

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Ka'ū Dist, Hawai'i Volcanoes National Park Headquarters, 1963, *Fosberg 44457* (BISH).

EUPHORBIACEAE

We thank M. Huft for identification of Hawaiian Euphorbiaceae.

Chamaesyce S.F. Gray

Chamaesyce hyssopifolia (L.) Small

This species is an annual herb not previously reported for Hawai'i. It is native from the southern United States to Argentina and the West Indies. The species superficially resembles *C. hypericifolia* (L.) Millsp., which has been naturalized in Hawai'i for at least 75 years, differing in its leafy cymes and larger capsules (1.5–2 mm long vs. 1–1.5 mm long in *C. hypericifolia*). In Hawai'i it is naturalized in low elevation, dry, disturbed sites on Kaua'i, O'ahu, Maui, and Hawai'i.

Representative specimens examined. HAWAIIAN IS: KAUA'I: Koloa Dist, grounds of Pacific Tropical Botanical Garden, 1983, *Wagner et al. 5140* (BISH); O'AHU: Honolulu Dist, lower campus, University of Hawaii at Manoa, 1975, *Nagata 1262* (BISH); MAUI: Makawao Dist, Kahului airport toward Kanahā Beach Park, 1988, *Wagner et al. 5786* (BISH); HAWAI'I: Ka'ū Dist, roadside near Punalu'u, 1959, *Stone 3014* (BISH).

Chamaesyce maculata (L.) Small

This prostrate or decumbent annual herb is native to the eastern United States. It has long been naturalized in the western United States and Europe, and is now naturalized in Hawai'i on Kure and Midway atolls. As only military aircraft are allowed to land on these islands, the aircraft or, more likely, the personnel or supplies brought from the mainland United States undoubtedly were the dispersal agents.

Representative specimens examined. HAWAIIAN IS: KURE ATOLL: Green Island, around LORAN buildings, 1979, *Herbst et al. 6286* (BISH); MIDWAY ATOLL: Sand Island, 1980, *Herbst & Takeuchi 6392* (BISH).

Euphorbia L.

Euphorbia graminea Jacq.

This species is native from northern Mexico to Colombia and Venezuela. In Hawai'i it apparently is recently naturalized and is currently known only from the raised coralline plain near sea level, Barbers Point, O'ahu.

Representative specimen examined. HAWAIIAN IS: O'AHU: 'Ewa Dist, 'Ewa Plains (Barber's Point), 1978, *Char et al. 78.094* (BISH).

Mallotus Lour.

Mallotus philippensis (Lam.) Müll. Arg.

This tree, which is native to southeast Asia, is now naturalized and fairly common in the Lualualei Naval Ammunition Depot, Wai'anae, O'ahu. It is easily recognized when in fruit by the conspicuous carmine red powdery covering of the capsules.

Representative specimen examined. HAWAIIAN IS: O'AHU: Wai'anae Dist, Lualualei Naval Magazine, 1984, *Funk 240* (BISH).

FABACEAE

Crotalaria L.

We thank D. Windler and S.G. Skinner for identifications of *Crotalaria* specimens from Hawai'i.

Crotalaria brevidens Benth.

This species is native to Africa. It is distinguished from other *Crotalaria* species in Hawai'i

by its short calyx teeth (1.3–2 mm long). In Hawai'i, it was recently found naturalized along roadsides, at least at Ulumalu and in Makawao Forest Reserve, at 250–670 m, Maui.

Representative specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Makawao Forest Reserve access road in Haleakalā Homesteads, 1984, *Hobdy 2012* (BISH).

Crotalaria lanceolata E. Mey.

Native to Africa, in Hawai'i this species is recently naturalized at least on the Kona Coast and Kapoho, Puna District, Hawai'i. This species and *Crotalaria brevidens* can be easily distinguished from the other species in Hawai'i by their calyx lobes, which are much shorter than the tubes, and from *C. brevidens* by flowers 7–8.5 mm long and keel petals with a short beak. *Crotalaria brevidens* has flowers 11–18.5 mm long with a prolonged beak on the keel petals.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Kea'au transfer dump, 1975, *Herbst & Ishikawa 5548* (BISH).

Glycine Willd.

Glycine wightii (Wight & Arnott) Verdc.

Native to Central and South America and the West Indies, and now widely naturalized, in Hawai'i this species is cultivated as a fodder plant and at least since 1975 has become naturalized in pastures, along roadsides, and in other low elevation, disturbed areas at least on O'ahu, Maui, Kaho'olawe, and Hawai'i.

Alternatively, this species has been placed in the genus *Neonotonia* Lackey as *N. wightii* (Wight & Arnott) Lackey (Lackey 1977). *Neonotonia* is distinguished from *Glycine* by its pseudoracemose inflorescences and calyx with the upper 2 lobes completely connate.

Representative specimens examined. HAWAIIAN IS: O'AHU: Waialua Dist, Wai'anae Mts, Keālia Trail above Dillingham Airfield, 1984, *Wagner et al. 5322* (BISH); MAUI: Makawao Dist, along the road to 'Ulupalakua, Palauea, 1979, *Hobdy s.n.* (BISH); KAHO'OLAWE: southwest of Luamakika, 1980, *Clarke et al. ESP215* (BISH); HAWAI'I: Ka'ū Dist, along the highway south of Pāhala, 1975, *Herbst & Ishikawa 5515* (BISH).

Lathyrus L.

Lathyrus latifolius L.

Native to Europe, where it is widely cultivated and naturalized, in Hawai'i this species is cultivated and now naturalized at least at 1,130 m, Olinda area, East Maui, but not previously reported.

Specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Olinda, in pasture by roadside, 1985, *Hobdy 2412* (BISH).

Lathyrus tingitanus L.

Native to Spain, Portugal, Sardinia, and the Azores, sometimes cultivated, in Hawai'i this species is apparently cultivated as a forage plant and recently sparingly naturalized along roadsides and in pastures, 915–1,220 m, Olinda, Maui.

Specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Olinda, a roadside weed, 1985, *Hobdy 2409* (BISH).

Macroptilium (Benth.) Urb.

Macroptilium atropurpureum (DC) Urb.

Native to the Neotropics, now widely cultivated and naturalized throughout the tropics and

subtropics, in Hawai'i this species is naturalized along roadsides and in other disturbed areas on O'ahu, Maui, and Hawai'i, but not previously reported.

Representative specimens examined. HAWAIIAN IS: O'AHU: Ko'olau Poko Dist, Waimānalo Agr. Exp. Sta., 30–40 m, 1975, *Herbst & Shearard 5348* (BISH); MAUI: Wailuku Dist, a disturbed area near Paukūkalo Hawaiian Home settlement, 1982, *Hobdy 1674* (BISH); HAWAI'I: Ka'ū Dist, Nīnole Bay, along dirt roadside, 1986, *Stemmermann & Warshauer 7064* (BISH).

Prosopis L.

Prosopis juliflora (Sw.) DC

Native to the Neotropics, introduced and naturalized in many tropical countries, in Hawai'i this species is naturalized on O'ahu at Sand Island and vicinity.

Representative specimen examined. HAWAIIAN IS: O'AHU: Honolulu Dist, mitigation islands, Ke'ehi Lagoon, 1978, *Herbst & Walker 6048* (BISH).

Remarks. *Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth also grows in the same area and appears to hybridize with *P. juliflora* (e.g., *Herbst & Walker 6049*, BISH).

Prosopis pallida differs from *P. juliflora* in being spineless or having slender spines 0.3–1(–1.7) cm long and leaves with (1–)3–4 pairs of pinnae, each with 6–15 pairs of leaflets, while *P. juliflora* has stout spines 1–3(–5) cm long and leaves with 1–2(–4) pairs of pinnae with (6–)12–25(–29) pairs of leaflets on each.

Prosopis pallida in Hawai'i was originally identified by Hillebrand (1888) as "*Prosopis juliflora* DC or *P. dulcis* Kunth." Heller (1897) pointed out that *P. dulcis* had torulose pods and could not possibly be the species growing in Hawai'i; he also believed the local tree to be distinct from the *P. juliflora* he knew from the southwestern part of the United States. However, the name *juliflora* has persisted in the local botanical literature until recent times. In a 1966 publication, Fosberg identified the common Hawaiian plant as *P. pallida*, and most local botanical literature has used that name since. In 1978 the true *P. juliflora* was found growing naturalized on Sand Island and six of the other small islets in Ke'ehi Lagoon during a botanical survey of the area. A tree believed to be a hybrid between the two species was discovered by D. Herbst and J. Porter (*Herbst & Porter 1960*, BISH) on another of the Ke'ehi Lagoon islets in 1971.

GERANIACEAE

Geranium L.

In addition to the six endemic woody species of *Geranium* sect. *Neurophyllodes* A. Gray, there are five herbaceous naturalized *Geranium* species in Hawai'i. Fosberg (1937a) indicated that two introduced species of *Geranium* occurred in Hawai'i. One of them, *G. dissectum* L., was at that time known from a single collection (*Forbes 218.M*, BISH) collected on Maui in 1910. This species is now known to occur on Kaua'i, Maui, and Hawai'i. Fosberg identified the remainder of the Hawaiian specimens of naturalized *Geranium* as *G. carolinianum* L. var. *australe* (Benth.) Fosb. According to Carolin (1964), this name actually represents *G. solanderi* Carolin, which is not naturalized in Hawai'i. The Hawaiian collections studied by Fosberg actually represent three different species: *G. homeanum*, *G. pusillum*, and *G. retrorsum*. Carolin (1964) mentioned that the last species was naturalized in Hawai'i and in fact was the first recorded from the islands before 1871 (*Hillebrand s.n.*, BISH). It is not especially common, but has been collected on Lāna'i, Maui, and Hawai'i. One additional species, *G. molle*, was recorded in 1938 after Fosberg's paper. The naturalized *Geranium* species are distinguished by the following key. Notes on the newly recorded species follow the key. We thank R. O. Gardner for determinations on these plants and R. Carolin for comments on our key and notes.

Key to the Naturalized Species of *Geranium* in Hawai'i

1. Sepals awnless, at most bluntly mucronate; seeds smooth 2
1. Sepals prominently awned, the awn 0.4–1.5 mm long; seeds reticulate 3
2(1). Carpel bodies glabrous, conspicuously transversely wrinkled; stylar column with a narrower apical portion 1–2 mm long . . . . . ***G. molle***
2. Carpel bodies finely and densely puberulent, smooth; stylar column without a narrower apical portion . . . . . ***G. pusillum***
3(1). Annual herbs; hairs of pedicels spreading, usually glandular . . . . . ***G. dissectum***
3. Perennial herbs; hairs of pedicels retrorsely appressed, never glandular 4
4(3). Sepals with 3 prominent veins, hairs usually confined to veins and toward base; seeds reddish brown; central lobe of leaves nearly as wide as long; root cylindrical, branched . . . . . ***G. homeanum***
4. Sepals with 3 inconspicuous veins, hairs more evenly distributed, but somewhat denser along veins; seeds dark brown to nearly black; central lobe of leaves usually longer than wide; root enlarged, fleshy, unbranched . . . . . ***G. retrorsum***

Geranium homeanum Turcz.

Native to Australia and New Zealand, this species is now naturalized in other areas, including Hawai'i, where it occurs in disturbed areas, primarily pastures, 1,130–2,150 m, on Kaua'i, Maui, and Hawai'i. It is the most common of the naturalized species.

Representative specimens examined. HAWAIIAN IS: KAUA'I: Waimea Dist, Halemanu Val, Kōke'e, 1984, *Flynn 861* (BISH); MAUI: Makawao Dist, 'Ulupalakua Ranch south of Pu'u'io, 1986, *Wagner et al. 5665* (BISH); HAWAI'I: Ka'ū Dist, near Kīlauea, 1926, *Degener 30233* (BISH).

Geranium molle L.

This species, native to Europe and North Africa, is now widely naturalized. In Hawai'i it is known from a single collection at 1,525 m on Hawai'i Island, and perhaps no longer persists.

Specimen examined. HAWAIIAN IS: HAWAI'I: Hāmākua Dist, upper Pā'auhau, 1938, *Hosaka 2203* (BISH).

Geranium pusillum N. L. Burm.

This species is native to temperate Eurasia. In Hawai'i it is known from a single collection made at 2,000 m on Hawai'i Island, and probably no longer persists.

Specimen examined. HAWAIIAN IS: HAWAI'I: district unknown, Mauna Kea, 1909, *Faurie 856* (BISH).

Gesneriaceae

Cyrtandra J.R. Forster & G. Forster

A distinctive new species of *Cyrtandra* sect. *Crotonocalyces* Hillebr. was recently discovered by R. Hobdy on West Maui. This brings the total number of species in this section to 13. In addition to the new species, the only other species in sect. *Crotonocalyces* to occur on Maui are *C. platyphylla* A. Gray and *C. munroi* C. Forbes.

Cyrtandra oxybapha W.L. Wagner & Herbst, **sp. nov.** TYPE: HAWAIIAN IS: MAUI: Wailuku Dist, West Maui, forests of Hana'ula, upper Pōhākea Gulch, 1,130 m, 23.V.1986, *R. Hobdy 2107* (BISH-459848!, holotype).

Calycibus ca. actinomorphicis late campanulatis 20–21 mm longis ca. ½ partitis ambitu dense villosis, tubo corollae subcylindrico 19–20 mm longo et 10–11 mm diametro, ovario glabro.

Shrubs 2–3 m tall; stems many-branched. Leaves opposite, borne on upper 3–4 nodes, those of a pair unequal, slightly asymmetrical, chartaceous, suborbicular to very broadly elliptic, ca. 12–18 cm long, ca. 8–9 cm wide, upper surface moderately hirtellous, lower surface densely velvety villous, margins coarsely and irregularly serrate-dentate, apex acuminate, base truncate to broadly cuneate, petioles ca. 4–6.5 cm long, densely brown villous. Flowers 1–2 in cymes arising in the leaf axils, densely villous throughout, peduncles stout, ca. 20–25 mm long, pedicels stout, ca. 18–25 mm long, elongating to ca. 32–35 mm long in fruit, bracts foliaceous, very broadly elliptic, 17–19 mm long; calyx nearly actinomorphic, apparently pale green, chartaceous, broadly campanulate, ca. 20–21 mm long, cleft ca. ½ its length, the lobes broadly elliptic, erect at anthesis, spreading at nearly right angles to fruit, both surfaces densely villous, apex acute; corolla white(?), tube subcylindrical, flaring slightly below mouth, 19–20 mm long, ca. 10–11 mm in diameter medially, moderately villous, upper lobes rhombic-orbicular, ca. 5 mm long, ca. 8 mm wide, lower lobes rhombic-orbicular, ca. 6.5–7.5 mm long, ca. 9–10 mm wide; ovary glabrous; style ca. 2 mm long, glabrous. Berries white, ovoid, ca. 1.8 cm long, surrounded by the persistent, spreading calyx.

Distribution. This species is very rare and is known from only one site in the wet forest of the type locality.

Specimen examined. HAWAIIAN IS: MAUI: Wailuku Dist, West Maui, Hana'ula, gulch below reservoir, 1,220 m, 1988, *Wagner et al. 5862* (BISH).

Remarks. *Cyrtandra oxybapha* is related to *C. platyphylla* and probably represents a specialized derivative of it. It is distinguished by its campanulate calyx, fewer-flowered cymes, and corolla tubes greater in diameter. The specific epithet is from the Greek for saucer, in reference to the configuration of its calyx.

HALORAGACEAE

We thank A.E. Orchard for determination of the following record.

Gonocarpus Thunb.

Gonocarpus chinensis (Lour.) Orch. subsp. ***verrucosus*** (Maiden & E. Betcke) Orch.

This taxon is native to the coastal regions of New South Wales and Queensland, Australia. In Hawai'i it is sparingly naturalized in Hawai'i Volcanoes National Park, but was previously reported by Orchard (1975) as *Gonocarpus chinensis* subsp. *chinensis*.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Volcano area near the 27-mile marker from Hilo, 1966, *Degener & Degener 30591* (BISH).

LAMIACEAE

Stenogyne Benth.[4]

Stenogyne campanulata Weller & Sakai, **sp. nov.** TYPE: HAWAIIAN IS: KAUA'I: Hanalei Dist, from a cliff above Kalalau Val, ca. 1,130 m, 16.VIII.1986, *S.L. Montgomery s.n.* (BISH-504033!, holotype).

Calycibus latiore campanulatis 13–14 mm longis dense pubercentibus dentibus superis et inferis aequaliter connatis, tubo corollae albo recto 12–13 mm longo, labiis purpureis extra dense tomentosis.

Apparently vines; stems 4-angled, densely tomentose. Leaves membranous, broadly ovate, 5–6.3 cm long, 2.6–3.6 cm wide, both surfaces densely tomentose, margins serrate, apex acute,

4. Contributed by Stephen G. Weller and Ann Sakai, Department of Ecology and Evolutionary Biology, University of California, Irvine, CA 92717, USA.

base cordate, petioles 14–17 mm long, densely pubescent. Flowers ca. 6 per verticillaster, raised on peduncles ca. 2 mm long, pedicels ca. 4 mm long, densely pubescent; calyx radially symmetrical, very broadly campanulate, 13–14 mm long, densely pubescent, the teeth obtuse, 2–3 mm long, 5–6 mm wide at base; corolla tube white, lips purple, densely tomentose externally, scattered glandular pubescent within, tube straight, 12–13 mm long, upper lip 3.5–5 mm long, lower lip ca. 3 mm long. Nutlets unknown.

Distribution. Rare and known only from the type locality.

Remarks. This is a distinctive species characterized by the large, broadly campanulate calyces that nearly enclose the relatively small corollas.

LAURACEAE

Cinnamomum Schaeff.

Cinnamomum burmannii (Nees) Blume

Native to Indonesia, in Hawai'i this species is cultivated on O'ahu, where it has recently become naturalized at least in Mānoa Valley and on Pauoa Flats. Although it has been cultivated in Hawai'i during most of this century, the first naturalized collection was made in 1975.

Representative specimen examined. HAWAIIAN IS: O'AHU: Honolulu Dist, H.L. Lyon Arboretum, 1975, *Baker 99* (BISH).

LENTIBULARIACEAE

Utricularia L.

Utricularia gibba L.

This species is a pantropical aquatic or subaquatic herb now naturalized in Europe, New Zealand, and Hawai'i. In Hawai'i it is presumably sparingly naturalized and is known from a single collection made in 1982 in a wet forest along the Stainback Highway, Hawai'i. This is the first report of the family in Hawai'i. We thank P. Taylor for the determination of our specimen.

Specimen examined. HAWAIIAN IS: HAWAI'I: South Hilo Dist, in a stagnant pond at 960 m in the 'ōhi'a rain forest along the Stainback Highway, 1982, *Stemmermann et al. 6815* (BISH).

LOGANIACEAE

Labordia Gaud.

The low-growing *Labordia* shrub, known only from cloud-swept summits of the Ko'olau Mountains and described as *L. hedyosmifolia* var. *hosakana* by Sherff in 1938, is the only member of the *L. hedyosmifolia* complex occurring on O'ahu. Further, it is the only member currently recognized that is treated at the varietal level. The other members of the complex are: *Labordia hedyosmifolia* Baill. (Moloka'i, Lāna'i, Maui, and Hawai'i); *L. pumila* (Hillebr.) Skottsb. (Kaua'i); and *L. venosa* Sherff (East Maui). Because the Ko'olau populations are equally distinctive, if not more so than the other members of the complex, in their low-growth habit, rugose leaves, and bracts 8–13 mm long, they merit recognition at the same taxonomic level. Thus the following new combination is necessary.

Labordia hosakana (Sherff) W.L. Wagner, Herbst & Sohmer, **comb. et stat. nov.** *Labordia hedyosmifolia* Baill. var. *hosakana* Sherff, Amer. J. Bot. 25: 584. 1938. TYPE: HAWAIIAN IS: O'AHU: 'Ewa Dist, Waipi'o, Kīpapa Gulch, south ridge, denuded ridge, 750 m, 4.VII.1932, *E.Y. Hosaka 679* (BISH-510928!, holotype).

Distribution. Occurring on cloudswept summits in wet forest, 790–860 m, Ko'olau Mountains from Kīpapa to Wa'ahila, O'ahu.

LYTHRACEAE

Cuphea P. Br.

Cuphea hyssopifolia Kunth

This subshrub, which is native from Mexico to Guatemala and Honduras, is commonly grown as an ornamental. It has been cultivated in Hawai'i at least since 1909 and now is naturalized, usually in open, disturbed sites and streambeds, on Hawai'i, although not previously reported. The name was incorrectly applied by Hillebrand (1888) to the common, naturalized *C. carthagenensis* (Jacq.) Macbr.

Representative specimens examined. HAWAIIAN IS: O'AHU: Honolulu Dist, University of Hawaii at Manoa (cultivated), 1985, *Lau 1157* (BISH); HAWAI'I: Puna Dist, in an intermittent streambed near Mountain View, 1976, *Herbst 5818* (BISH).

Cuphea ignea A. DC

This species is native to Mexico but is now widely cultivated. In Hawai'i it was introduced before 1871 for its flowers, which are used for *lei*, and has become sparingly naturalized in Honokāne Nui Valley and Honoka'a, Hawai'i, although not previously reported.

Representative specimens examined. HAWAIIAN IS: O'AHU: Honolulu Dist, Kamilo Nui Val (cultivated), 1986, *Lau 1849* (BISH); HAWAI'I: North Kohala Dist, Honokāne Nui Val, 1952, *Degener & Greenwell 21914* (BISH).

MALVACEAE[5]

Abutilon Mill.

Abutilon auritum (Wall. ex Link) Sweet

Native to New Guinea, Indonesia, the Philippines, New Caledonia, and Queensland, Australia, this *Abutilon* has been collected once in Hawai'i, in 1910, although not previously reported. It is not known if it has persisted.

Representative specimen examined. HAWAIIAN IS: MAUI: Hāna Dist, Kahikinui, 1910, *Rock s.n.* (BISH).

Herissantia Medik.

Herissantia crispa (L.) Briz.

This species is native to and widespread in the New World tropics. It is now naturalized, primarily at low elevations, in nearly all tropical parts of the world. In Hawai'i, a small population was recently discovered on an arid ridge in West Maui.

Representative specimen examined. HAWAIIAN IS: MAUI: Lahaina Dist, on an arid ridge west of Olowalu Val, 1986, *Herbst et al. 8715* (BISH).

Hibiscus L.

Hibiscus arnottianus A. Gray, U.S. Expl. Exped., Phan. 176. 1854. TYPE: SANDWICH [HAWAIIAN] IS: on the Ka'ala Mts behind Honolulu, O'ahu, *U.S. Expl. Exped. s.n.* (US, lectotype; lectotype designated by H. St. John in Rhodora 87: 568. 1985.).

The native, white-flowered populations of *Hibiscus* are here treated as two modally distinct species: *H. arnottianus* and *H. waimeae*. Collectively, they comprise a complex of morphological forms in which character intergradation is extensive, although differences between individual populations or plants may be pronounced. Three subspecies of *H. arnottianus* are recognized, based largely on modal differences between populations.

5. Contributed by David M. Bates, L.H. Bailey Hortorium, Cornell University, Ithaca, NY 14873, USA.

Hibiscus arnottianus A. Gray subsp. ***arnottianus***

Hibiscus arnottianus A. Gray f. *parviflorus* Skottsb., Acta Horti Gothob. 15: 396. 1944. TYPE: HAWAIIAN IS: O'AHU: Wai'anae Mts, 1 mi S of Kolekole Pass, 1938, *O. Selling 3364* (BISH-57481!, syntype).

Hibiscus waimeae A. Heller var. *hookeri* Hochr., Annuaire Conserv. Jard. Bot. Genève 4: 132. 1900. TYPE: HAWAIIAN IS: O'AHU: Mts behind Honolulu, 1864–65, *H. Mann & W.T. Brigham 530* (BISH-57492!, isotype).

Subspecies ***arnottianus*** has young stems, leaves, pedicels, and calyces glabrate, leaves 4–10 cm long, involucral bracts reflexed, 5–8(–10) mm long, calyx 1.5–2.8 cm long, and petals (5–)6–8(–10) cm long from the point of insertion.

Distribution. Occurring throughout the Wai'anae Mountains and the eastern end of the Ko'olau Mountains from Wahiawā to Niu Valley, 120–790 m, O'ahu.

Hibiscus arnottianus A. Gray subsp. ***immaculatus*** (M. Roe) D. Bates, **comb. et stat. nov.** *Hibiscus immaculatus* M. Roe, Pacific Sci. 15: 22. 1961. TYPE: HAWAIIAN IS: MOLOKA'I: Wailau Val, pali of Oloku'i above Waiehu, 1912, *C.N. Forbes 551.Mo* (BISH-511115!, holotype).

Subspecies ***immaculatus*** differs from subsp. *arnottianus* in usually having deeply crenate leaves, caudate calyx teeth, a white staminal column, and capsules enclosed by the calyx.

Distribution. A rare plant recorded only from Wailau, Waihānau, and Pāpalaua valleys, Moloka'i.

Hibiscus arnottianus A. Gray subsp. ***punaluuensis*** (Skottsb.) D. Bates, **comb. et stat. nov.** *Hibiscus arnottianus* A. Gray var. *punaluuensis* Skottsb., Acta Horti Gothob. 15: 396. 1944. *Hibiscus punaluuensis* (Skottsb.) Degener & I. Degener, Fl. Hawaiiensis, fam. 221. *Hibiscus punaluuensis*. Publ. priv., 2 pp. 1957. TYPE: HAWAIIAN IS: O'AHU: Ko'olau Loa Dist, Ko'olau Mts, Punalu'u, 1938, *O. Selling 3638* (BISH-57473!, S, syntypes).

Subspecies ***punaluuensis*** is a robust variant with young stems, leaves, pedicels, and calyces moderately coarsely pubescent, leaves 10–20(–30) cm long, involucral bracts apparently appressed to the calyx, 10–25 mm long, calyx 2–3.4 cm long, and the petals (7–)8–11(–13) cm long from their point of insertion.

Distribution. Occurring in the Ko'olau Mountains from Kaipapa'u to Waiāhole valleys, 200–700 m, O'ahu.

Hibiscus brackenridgei A. Gray, U.S. Expl. Exped., Phan. 175. 1854. TYPE: SANDWICH [HAWAIIAN] IS: on a mountain in the W division of Maui, *U.S. Expl. Exped. s.n.* (US, holotype).

Hibiscus brackenridgei is closely related to the widespread *H. divaricatus* Jacq. and may not be specifically distinct from it. It varies morphologically from island to island, but the population series seem to fall into two principal morphological types.

Hibiscus brackenridgei A. Gray subsp. ***brackenridgei***

Hibiscus brackenridgei A. Gray var. *molokaiana* Rock in Caum, Occas. Pap. Bernice P. Bishop Mus. 9(5): 4. 1930. TYPE: HAWAIIAN IS: MOLOKA'I: W end, 1920, *J.F. Rock s.n.* (BISH-512430!, holotype; BISH! 5 sheets, isotypes).

Subspecies ***brackenridgei*** is an erect to sprawling shrub or small tree with calyx 1.5–2.5 cm long, involucral bracts from ½ as long to equally long as the calyx, and petals 3.5–5(–6) cm long.

Distribution. Occurring in dry forest and shrubland from near sea level to 370 m, on Moloka'i, Lāna'i, Maui, and Hawai'i.

Hibiscus brackenridgei A. Gray subsp. ***mokuleianus*** (M. Roe) D. Bates, **comb. et stat. nov.** *Hibiscus brackenridgei* A. Gray var. *mokuleiana* M. Roe, Pacific Sci. 15: 12. 1961. TYPE: HAWAIIAN IS: O'AHU: Waialua Dist, Mokulē'ia, second gulch E of Pu'ukaupakuhale, NE slope of Mount Ka'ala, 1957, *M. Roe 210* (BISH-511162!, holotype; BISH, isotype).

Subspecies ***mokuleianus*** is a tree with calyx 2.5–4 cm long, involucral bracts 18–25 mm long, and petals 6–8 cm long.

Distribution. Occurring in a habitat similar to subsp. *brackenridgei* in the Wai'anae Mountains between Kawaihāpai and Pu'upane, 120–240 m, O'ahu, and reportedly from Līhu'e and Olokele Canyon, Kaua'i.

Hibiscus kokio Hillebr., Fl. Hawaiian Isl. 48. 1888. *Hibiscus arnottianus* A. Gray var. *kokio* (Hillebr.) Hochr., Annuaire Conserv. Jard. Bot. Genève 4: 133. 1900. TYPE: HAWAIIAN IS: MOLOKA'I: Hālawa Val, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed; lectotype designated by O. Degener and I. Degener in Phytologia 35: 465. 1977; BISH, isolectotype, not located).

Hibiscus kokio is variable in vegetative and floral characters throughout its range. Variations are largely recurrent among the populations of each island except in the coastal valleys of northwestern Kaua'i; these populations are here recognized as a subspecies. The two subspecies of *H. kokio* are:

Hibiscus kokio Hillebr. subsp. ***kokio***

Hibiscus kahilii C. Forbes, Occas. Pap. Bernice P. Bishop Mus. 5(1): 4. 1912. TYPE: HAWAIIAN IS: KAUA'I: Kōloa Dist, on the slopes of Kāhili above Wahiawa Bog, 1909, *C.N. Forbes 259.K* (BISH-511116!, holotype; BISH 2 sheets, isotypes).

Hibiscus kokio Hillebr. var. *pekeloi* Degener & I. Degener, Phytologia 35: 465. 1977. TYPE: HAWAIIAN IS: MOLOKA'I: rainy, shrubby, coastal ledges, Wailau Val, 1928, *O. Degener 18222* (NY, holotype; BISH-57574!, isotype).

Hibiscus kokio Hillebr. var. *pukoonis* Caum, Occas. Pap. Bernice P. Bishop Mus. 9(5): 7. 1930. TYPE: HAWAIIAN IS: MOLOKA'I: bottom of Pūko'o Val, just inside the native forest (neither flower nor fruit), 1921, *E.L. Caum 155* (not located). There are two sheets in BISH labeled *Caum 155* in pencil, which were collected in 1930. They are from plants cultivated in Caum's garden from cuttings from *Caum 155*.

Hibiscus oahuensis Degener & I. Degener, Phytologia 35: 468. 1977. TYPE: HAWAIIAN IS: O'AHU: Waialua Dist, Kawai Iki Ditch Trail, Kawailoa, Ko'olau Range, 1956, *M. Roe 204* (presumably NY, holotype).

Hibiscus ula Degener & I. Degener, Phytologia 35: 467. 1977. TYPE: HAWAIIAN IS: MAUI: Wailuku Dist, on a narrow ridge about an hour's walk from the 'Īao Valley State Park, West Maui, date unknown, *R. Sylva s.n. (O. Degener & I. Degener number 34145)* (NY, holotype; AC, B, CU, E, G, K, L, LE, MO, W, isotypes).

Subspecies ***kokio*** is characterized by stellate pubescence on the calyx and a red corolla.

Distribution. This subspecies occurs in dry to wet forests, 70–800 m, on Kaua'i, O'ahu, Moloka'i, Maui, and probably Hawai'i.

Hibiscus kokio Hillebr. subsp. ***saintjohnianus*** (M. Roe) D. Bates, **comb. et stat. nov.** *Hibiscus saintjohnianus* M. Roe, Pacific Sci. 15: 18. 1961. TYPE: HAWAIIAN IS: KAUA'I: Hanalei Dist, headland W of Hanakāpī'ai, Nāpali Coast, on sharply precipitous slopes, 1956, *H. St. John 25989* (BISH-511392! and BISH-511132!, holotype, mounted on 2 sheets).

Hibiscus roetae St. John, Pacific Sci. 26: 286. 1972. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, bottom of short Nu'alolo Trail, 1969, *R. Hobdy 158* (BISH-511131!, holotype).

Subspecies ***saintjohnianus*** is characterized by glandular pubescence on the calyx and flower color ranging from yellow to red orange.

Distribution. This subspecies occurs in dry to mesic forests, 150–890(–1,100) m, in northwestern Kaua'i.

Hibiscus waimeae A. Heller, Minnesota Bot. Stud. 1: 851. 1897. *Hibiscus waimeae* A. Heller var. *helleri* Hochr., Annuaire Conserv. Jard. Bot. Genève 4: 132. 1900, nom. illeg. TYPE: HAWAIIAN IS: KAUA'I: Waimea, 1,000 m, 2–9.IX.1895, *A.A. Heller 2785* (MINN, holotype; BISH, isotype).

Hibiscus waimeae can be divided into two subspecies based upon leaf and flower size:

Hibiscus waimeae A. Heller subsp. ***hannerae*** (Degener & I. Degener) D. Bates, **comb. et stat. nov.** *Hibiscus waimeae* A. Heller var. *hannerae* Degener & I. Degener, Fl. Hawaiiensis, fam. 221. *Hibiscus waimeae*. Publ. priv., 2 pp. 1962. TYPE: HAWAIIAN IS: KAUA'I: Hanalei Dist, Kalihi Wai, 1913, *J. Lydgate s.n.* (BISH-511394!, holotype).

Subspecies ***hannerae*** has flowers with the calyx 2–2.5 cm long, petals 4–6 cm long, and combined staminal and petal tube length ca. 1.5 cm.

Distribution. The range of this subspecies includes Hanakāpī'ai, Limahuli, and Kalihi Wai valleys on northwestern Kaua'i; it is apparently rare.

Hibiscus waimeae A. Heller subsp. ***waimeae***

Subspecies ***waimeae*** has smaller leaves but larger flowers than subsp. *hannerae*, with the calyx 3–4.5 cm long, petals 6–13 cm long, and the combined staminal and petal tube length ca. 3–6 cm.

Distribution. Occurring in diverse mesic forests, 250–1,200 m, from upper Waimea Canyon to the valleys of the western and northern coasts of Kaua'i.

Malvastrum A. Gray

Malvastrum americanum (L.) Torr.

This species is a pantropical weed occurring from near sea level to above 2,000 m; in Hawai'i it is apparently recently naturalized in the boulder-strewn grass and shrubland, ca. 5 m, at Kaloko (Queen's Beach), where it is locally common. It differs from the common, long-established *M. coromandelianum* (L.) Garcke in its dense, terminal spikes, stellate hairs with usually 6–12 arms, and more or less unarmed mericarps. *Malvastrum coromandelianum* has solitary or few axillary flowers, 4-armed stellate hairs, and mericarps armed with a ventro-apical awn.

Representative specimen examined. HAWAIIAN IS: O'AHU: Honolulu Dist, Kaloko, 1985, *Nagata 3245* (BH, HLA).

Sida L.

Sida urens L.

Native from Mexico to the Caribbean, South America, and Africa, in Hawai'i this species apparently is recently naturalized and known from a single collection on Hawai'i Island.

Specimen examined. HAWAIIAN IS: HAWAI'I: North Kona Dist, North Kona, 1980, *Nagata & Park 2114* (BISH, HLA).

Sidastrum E.G. Baker

Sidastrum micranthum (St. Hil.) Fryx.

This species is widespread throughout its native range of South America, the Caribbean, and Central America. In Hawai'i it is naturalized in the pastures of Makaleha Valley, O'ahu, and Ka'awaloa, Hawai'i. It has been observed on Hawai'i Island since about 1900, but the first specimen was not collected until 1948. It has not been previously reported.

Representative specimens examined. HAWAIIAN IS: O'AHU: Waialua Dist, Makaleha pastureland, common weed along road to Mount Ka'ala, 1986, *Takeuchi & Ziegler 2978* (BISH); HAWAI'I: South Kona Dist, Ka'awaloa, 1948, *Greenwell & Greenwell 19369* (BISH).

MOLLUGINACEAE

Mollugo L.

Mollugo cerviana (L.) Ser.

A weed of warm temperate and tropical regions, which may be native to the Old World. In Hawai'i, it has been found only on Hawai'i Island, where it apparently is recently naturalized in dry sites at low elevation. This is the first report of the family in Hawai'i.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Kohala Dist, along Ka'ahumanu Highway E of Waikoloa junction, 1975, *Herbst & Ishikawa 5386* (BISH).

MYRSINACEAE

Myrsine L.

A distinctive new species of *Myrsine* from West Maui came to our attention as we prepared the treatment of this genus for the *Manual*. The single early collection of this species had been determined as *Myrsine rockii* (Degener & Hosaka) Hosaka [= *M. punctata* (H. Lév.) Wilbur], from Kaua'i, which differs from the new species, *M. vaccinioides*, in that the leaves lack conspicuous secretory lines, the flowers are 2–6 per fascicle, and drupes ca. 7–8 mm in diameter.

Myrsine vaccinioides is probably most closely related to the widespread wet forest species *M. sandwicensis* A. DC, and differs primarily in its prominent secretory lines on the lower surface of the leaves, serrulate leaf margin, and fewer flowers per fascicle.

Myrsine vaccinioides W.L. Wagner, Herbst & Sohmer, **sp. nov.** TYPE: HAWAIIAN IS: MAUI: Pu'ukukui Trail, in open bogs around Violet Lake, 1,500 m, 11.XII.1980, *R. Hobdy 958* (BISH-447238!, holotype).

Foliis anguste obovatis varie oblongo-obovatis 1–2 cm longis 0.6–1 cm latis infra plerumque cum lineis secretoriis longis elevatis conspicuis plerumque rubrubri-purpureis marginibus serrulatis et in parte ⅓–¼ supra revolutis, drupis 8–9.5 mm diametro.

Small branched shrubs 0.3–1 m tall; branches brown to reddish brown, glabrous. Leaves coriaceous, narrowly obovate to oblong-obovate, 1–2 cm long, 0.6–1 cm wide, midrib prominent, lower surface usually with conspicuous long, raised, usually reddish purple secretory lines, glabrous, both surfaces black punctate, margins entire, becoming serrulate in upper ⅓–¼, revolute, apex rounded, base cuneate, petioles 1–2 mm long. Flowers apparently perfect, 1–2 in bracteolate fascicles among or just below the leaves, pedicels 2.5–6 mm long, glabrous; calyx lobes 1–1.3 mm long, margins sparsely ciliate; petals linear-oblanceolate, ca. 3.5 mm long, the inner surface with conspicuously raised, reddish secretory lines, margins ciliate; anthers ca. 1.5–1.6 mm long, apex nearly glabrous; ovary glabrous; stigma capitate-angled. Drupes purplish black, subglobose, 8–9.5 mm in diameter.

Distribution. Restricted but not uncommon in shrubby bogs, 1,520–1,525 m, near Violet Lake, Pu'ukukui, W Maui.

Specimens examined. HAWAIIAN IS: MAUI: W Maui, Pu'ukukui, open bog, 1,500 m, *Wilbur & Webster 901* (BISH); *Hobdy 2128* (BISH).

This distinctive species is unique in having raised reddish purple secretory lines on the lower leaf surface.

MYRTACEAE[6]

Metrosideros Banks ex Gaertn.

Metrosideros polymorpha Gaud. var. ***dieteri*** J. Wyndham Dawson & Stemmermann, **var. nov.** TYPE: HAWAIIAN IS: KAUA'I: Hanalei Dist, Kalalau Lookout, Kōke'e National Park, 4.VI.1983, *Dawson s.n.* (BISH, holotype).

Arbores parvae sunt, cortie asperi, gemmis 2–3 cm longis et 2 cm latis, foliis glabris 4–6 cm longis et 3–4 cm latis obovatis cum nervis jugatis compluribus elevatis ex basi radiatis apice late rotundatis basi cuneata varie rotundata marginibus non revolutis, floribus rubris, staminibus 20–25 mm longis, fructibus 6.5–7 mm latis 5.5–6 mm altis, capsulis paulum exsertis.

Small trees to 7 m tall, bark fissured, flaky; branchlets obscurely 4-angled, vegetative buds unusually large, obovoid, 2–3 cm long, 2 cm wide, scales red, broadly ovate to almost orbicular, sometimes emarginate, fimbriate, 1.5–2.5 cm long, 1–1.5 cm wide. Leaves broadly obovate to oblong, 4–6 cm long, 3–4 cm wide, glabrous, apex broadly rounded, base cuneate to rounded, lowermost 2–3 pairs of secondary veins raised and prominent, radiating from the base of the lamina, petiole 6–10 mm long, 2–3 mm wide. Flowers red; inflorescences of 3–4 pairs of cymules with a dense, woolly, white to pale gray pubescence on all external parts, peduncles 5–18 mm long, 2–3 mm wide, pedicels 2–3 mm long, 2 mm wide, bracts ovate to almost orbicular, 6–10 mm long, 4–6 mm wide; hypanthium 6–7 mm high, 7–8 mm wide; sepals triangular, acute, 3.5–4 mm high, 2.5–3 mm wide; petals ± orbicular, 3.5–5 mm long, 3–4.5 mm wide; stamens 20–25 mm long; style 25–30 mm long. Fruiting hypanthium pubescent, 5.5–6 mm long, 6.5–7 mm wide, capsules only slightly exserted.

Distribution. Occasional on slopes, 800–1,200 m, at Kōke'e State Park to the Alaka'i Swamp and near Wahiawa Bog, Kaua'i.

The broadly obovate leaves with raised basal secondary veins and large vegetative buds and flowers make this a handsome as well as distinctive variety.

Metrosideros polymorpha Gaud. var. ***pumila*** (A. Heller) J. Wyndham Dawson & Stemmermann, **comb. et stat. nov.** *Nania pumila* A. Heller, Minnesota Bot. Stud. 1: 864. 1897. TYPE: HAWAIIAN IS: KAUA'I: in the bog at the head of the Wahiawa Riv, 914 m, 1896, *A.A. Heller 2738* (MINN, holotype; fragment of this collection BISH!, but it is not known from which duplicate Rock took it, perhaps the B sheet).

This variety, known as *lehua maka noe*, *lehua ne'ene'e*, or *lehua nene'e*, comprises shrubs growing in bogs, prostrate and rooting or with few to numerous ascending branches up to 1 m long, bark separating in thin flakes, leaves glabrous on lower surface with a woolly or appressed tomentum, broadly ovate to orbicular, apex rounded to obtuse, base obtuse to cordate, and margins slightly revolute.

Distribution. Variety *pumila* grows in the bogs of Kaua'i, Moloka'i, and Maui.

6. Contributed by John W. Dawson, Botany Department, Victoria University of Wellington, Private Bag, Wellington, New Zealand, and Lani Stemmermann, P.O. Box 308, Volcano, Hawai'i 96785, USA.

Metrosideros waialealae (Rock) Rock var. ***fauriei*** (H. Lév) J. Wyndham Dawson & Stemmermann, **comb. nov.** *Nania* × *fauriei* H. Lév., Repert Spec. Nov. Regni Veg. 10:150. 1911. *Metrosideros collina* (J.R. Forster & G. Forster) A. Gray subsp. *polymorpha* (Gaud.) Rock var. *fauriei* (H. Lév.) Rock, Hawaii, Board Agric. Forest. Bot. Bull. 4: 67. 1917. TYPE: HAWAIIAN IS: MOLOKA'I: Kamalō, 1910, *U. Faurie s.n.* (P, holotype; BM, isotype).

This variety is distinguished from var. *waialealae* by its usually longer and more slender petioles 1–1.5(–2) mm wide and narrower bracts ca. 3 mm long and 1 mm wide. By contrast, var. *waialealae* has petioles 2–3 mm wide and bracts ca. 4 mm long and 3 mm wide; it occurs on Kaua'i. Variety *fauriei* occurs on ridges at higher elevations on Moloka'i and Lāna'i.

OCHNACEAE

Sauvagesia L.

Sauvagesia erecta L.

This small herb may possibly be native to Africa, but it is now naturalized throughout the tropics. In Hawai'i, it apparently has only recently become naturalized and presently is found in pastures and along roadsides, 425 m, near Keōpuka Loa, Moloka'i.

Representative specimen examined. HAWAIIAN IS: MOLOKA'I: Keōpuka Loa, Kalepa Rd, a weed along the rough dirt pasture road, 1985, *Hobdy 2424* (BISH).

POLYGONACEAE

Polygonum L.

Polygonum convolvulus L.

Native to Europe and western Asia, this plant is now widely naturalized throughout tropical and temperate regions of the Northern Hemisphere. In Hawai'i it is known from a single previously unreported collection made in a horse pasture, Haleakalā National Park. We are not certain of the present status of this species.

Specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Haleakalā National Park , on barren, disturbed ground in a horse pasture, 2,070 m, 1981, *Nagata s.n.* (BISH).

RUBIACEAE

Galium L.

Galium divaricatum Pourr. ex Lam.

This species, which is native to southern Europe, apparently is recently naturalized at least in the Waihou Springs area of East Maui.

Specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Waihou Spring, growing on a damp cliff face, 970 m, 1981, *Hobdy 1087* (BISH).

Hedyotis L.

Hedyotis is a heterogeneous genus of more than 250 species, primarily of tropical and subtropical regions of the world, but best developed in the Old World. Generic delimitation is problematic on a worldwide basis, and several segregate genera are sometimes recognized. The Pacific taxa can be subdivided into several subgenera and sections. The treatment followed by us for the Hawaiian species is adapted from Fosberg (1943), except for the addition of sect. *Phyllozygia*, which is described here, and the reduction of the genus *Gouldia* to a section within *Hedyotis*. The Hawaiian species appear to be the result of 1 or perhaps 2 independent introductions.

The reduction of *Gouldia* is made because of the common ancestry with *Hedyotis* sect. *Gouldiopsis*, which was discussed by Fosberg (1943), and because these species differ from *Hedyotis* only in having indehiscent capsules, a fleshy hypanthium, and a trend toward a more arborescent habit. All of these features, except arborescence, were already known to occur in *Hedyotis*.

Furthermore, the most important consideration in the classification proposed here is its overall consistency. Previous classifications (Fosberg 1937b, 1943) have recognized the readily distinguishable group of *Gouldia* species at the generic level, while the equally distinguishable groups of *Hedyotis* species have been treated at infrageneric ranks. Our principal argument with this is that all of these groups of related species are readily distinguishable even at a distance in the field and should be recognized at a similar taxonomic level. It is not consistent to treat one of them at a higher level. This is especially inconsistent when the group segregated, in this case *Gouldia*, is clearly related to one of the taxa within the other heterogeneous group (*Hedyotis*). The classification proposed here is confirmed as more appropriate cladistically in that if *Gouldia* is recognized at the generic level while at the same time retaining related taxa at infrageneric ranking in *Hedyotis*, then the thus constituted genus *Hedyotis* is a paraphyletic group.

The question of the appropriate hierarchical level for the taxa treated here at infrageneric rank remains open and must be addressed by more detailed study of *Hedyotis sensu lato* and related taxa on a worldwide basis. With current information, an equally acceptable treatment of the taxa in Hawai'i would be to divide them among at least four genera. We find this idea less desirable because it would require more extensive nomenclatural innovation without a firm basis on detailed analysis. We have selected the less disruptive , but consistent, classification by reducing *Gouldia* to sectional status adjacent to its sister group in *Hedyotis* and by describing the new species as a related section of *Hedyotis*.

The key to the sections and subgenera presented below indicates the diagnostic features differentiating them. Following the synoptical key is a summary of the 4 fleshy-fruited species here added to *Hedyotis*.

Synoptical Key to the Subgenera and Sections of *Hedyotis* in Hawai'i

1. Slender annual or perennial herbs; peduncles filiform; corolla thin, broadly tubular; capsules thinly cartilaginous; naturalized species [subg. *Oldenlandia* (L.) Fosb.]
   H. callitrichoides (Griseb.) W. Lewis — *H. corymbosa* (L.) Lam.

1. Erect to scandent subshrubs, shrubs, or lianas, sometimes trees or succulent perennial herbs; pedicels not filiform; corolla fleshy or (in *H. acuminata*) not or only slightly fleshy, salverform to salverform-funnelform or urceolate; capsules sclerified or surrounded by fleshy hypanthium; native species 2

2(1). Peduncles adnate to stem at base or nearly throughout its length; flowers 1(–7), in axillary inflorescences; capsules woody [subg. *Kadua* (Cham. & Schlechtend.) Fosb.]
   H. acuminata (Cham. & Schlechtend.) Steud. — *H. fluviatilis* (C. Forbes) Fosb.

2. Peduncles distinct; flowers often more than 5, in terminal or terminal and axillary inflorescences; capsules dry or fleshy (subg. *Polynesiotis* Fosb.) 3

3(2). Fruit a drupaceous indehiscent capsule, surrounded by fleshy hypanthium, dark blue to purplish black 4

3. Fruit a dry or thinly fleshy capsule, dehiscent at least at apex, partially surrounded by very thinly fleshy or dry hypanthium, greenish brown to purple 5

4(3). Leaves with spreading, strongly to moderately arcuate lateral veins; stipules adnate to petioles only at base; flowers in terminal inflorescences or, if lateral, on short branches terminated by an inflorescence; corolla basically fusiform in bud, the limb gradually expanded,

weakly quadrangular, the lobes linear to oblong, each with a terminal fleshy appendage—sect. *Gouldia* (A. Gray) W.L. Wagner & Herbst

H. fosbergii *H. terminalis*
H. hillebrandii

4. Leaves with strongly ascending, weakly arcuate lateral veins; stipules completely adnate to petioles; flowers in axillary congested thyrses; corolla limb abruptly expanded from tube in bud, strongly quadrangular, the lobes broadly ovate, with a minute terminal appendage—sect. *Phyllozygia* W.L. Wagner & Herbst

H. tryblium

5(3). Corolla lobes conspicuously inflexed in bud, apex of bud depressed 6

5. Corolla lobes not conspicuously inflexed in bud, apex of bud not depressed 7

6(5). Calyx lobes usually foliaceous, conspicuous in fruit; corolla limb not quadrangular in bud; upper part of plant and inflorescence sometimes strongly glaucous; capsules nearly as wide or wider than long—sect. *Wiegmannia* (Meyen) Fosb.

H. cookiana (Cham. & Schlechtend.) Steud.
H. degeneri Fosb.
H. elatior (H. Mann) Fosb.
H. foliosa (Hillebr.) Fosb.
H. littoralis (Hillebr.) Fosb.
H. mannii Fosb.
H. parvula (A. Gray) Fosb.
H. st.-johnii Stone & Lane
H. schlechtendahliana Steud.

6. Calyx lobes small, deltate, not enlarging in fruit; corolla limb quadrangular in bud; upper part of plant and inflorescence not noticeably glaucous; capsules longer than wide—sect. *Protokadua* Fosb.

H. coriacea Sm.

7(5). Corolla limb not strongly quadrangular in bud; capsules much longer than wide—sect. *Bikkiocarpa* Fosb.

H. formosa (Hillebr.) Fosb.

7. Corolla limb strongly quadrangular in bud; capsules wider than long—sect. *Gouldiopsis* Fosb.

H. centranthoides (Hook. & Arnott) Steud.
H. foggiana Fosb.
H. knudsenii (Hillebr.) Fosb.

Sect. ***Gouldia*** (A. Gray) W.L. Wagner & Herbst, **comb. et stat. nov.** *Gouldia* A. Gray, Proc. Amer. Acad. Arts 4: 310. 1860. TYPE: *Gouldia sandwicensis* A. Gray, nom. illeg. [= *Hedyotis terminalis* (Hook. & Arnott) W.L. Wagner & Herbst]

Sect. *Gouldia* is endemic to the Hawaiian Islands and consists of 3 species:

Hedyotis fosbergii W.L. Wagner & Herbst, **nom. nov.** *Gouldia st.-johnii* Fosb., Bernice P. Bishop Mus. Bull. 147: 62. 1937, non *Hedyotis st. johnii* B. Stone & Lane (1958). TYPE: HAWAIIAN IS: O'AHU: 'Ewa Dist, Ko'olau Mts, Waipi'o, ridge S of Kīpapa Gulch, rain forest, 750 m, 18.IX.1932, *F.R. Fosberg 8691* (BISH-510593!, holotype).

Distribution. Occurring on windswept ridges and upper slopes in wet forest, 610–900 m, Ko'olau Mountains from Castle Trail to Pālolo, O'ahu, and 795–1,000 m, Lāna'ihale, Lāna'i.

Remarks. This species differs from *Hedyotis terminalis* primarily in its more compact habit and concave leaves with strongly impressed veins. These habit and leaf features are paralleled in species of several genera, such as *Labordia*, *Metrosideros*, and *Psychotria*, that also occur in cloudswept areas; they may represent ecotypes. In spite of its somewhat anomalous distribution on O'ahu and Lāna'i, *Hedyotis fosbergii* is maintained because it is unique in having spreading calyx lobes in addition to the features already mentioned. Plants from Lāna'i differ from O'ahu populations in having leaves usually broadest above the middle, moderately impressed veins, and inflorescences that are more open and usually more than 2 cm long, while those from O'ahu have leaves broadest at or below the middle, strongly impressed veins, and congested inflorescences usually less than 2 cm long. Apparent intergradations between *Hedyotis fosbergii* and *H. terminalis* were reported by Fosberg (1937b). These specimens are rather intermediate

and may represent hybrids or more likely elements along an ecological continuum from exposed windy sites to more protected, wet forest habitats.

Hedyotis hillebrandii (Fosb.) W.L. Wagner & Herbst, **comb. nov.** *Gouldia hillebrandii* Fosb., Bernice P. Bishop Mus. Bull. 147: 59. 1937. TYPE: HAWAIIAN IS: MAUI: Makawao Dist, Haleakalā, Ha'ikū Uka Trail, 950 m, 18.VIII.1933, *F.R. Fosberg 9874* (BISH-510590!, holotype).

Gouldia axillaris Wawra, Flora 57: 297. 1874, non *Hedyotis axillaris* Thwaites (1859). TYPE: HAWAIIAN IS: MAUI: "Mailukuthal" [according to Fosberg (1937b, p. 77) probably Wailuku Val], *H. Wawra 1849* (W).

Distribution. Occurring in mesic to wet forest, 400–1,830 m, on Moloka'i, Maui, and Hawai'i.

Remarks. Fosberg (1937b) treated plants with terminal and axillary inflorescences as hybrids between *Hedyotis hillebrandii* and *H. terminalis* (as *Gouldia*). It is more likely, however, that these plants, which occur widely on Hawai'i and Maui, merely represent the expression of terminal and axillary inflorescences, a feature not at all uncommon in Rubiaceae and many other flowering plants. In other features these plants are not atypical. In fact, *H. hillebrandii* is so closely related to *H. terminalis* that detailed population studies using chemical, morphological, and possibly cytological markers should be made to determine whether the hybridization hypothesis is valid.

Hedyotis terminalis (Hook. & Arnott) W.L. Wagner & Herbst, **comb. nov.** *Petesia? terminalis* Hook. & Arnott, Bot. Beechey Voy. 85. 1832. TYPE: HAWAIIAN IS: O'AHU: Ko'olau Range, 1826–27, *G.T. Lay & A. Collie s.n.* (K, holotype, BISH photo). *Gouldia terminalis* (Hook. & Arnott) Hillebr., Fl. Hawaiian Isl. 169. 1888.

Kadua? affinis DC, Prodr. 4: 431. 1830. TYPE: HAWAIIAN IS: O'AHU: Without further locality, 1816–17, *L.C.A. von Chamisso s.n.* (G-DC, holotype). *Gouldia affinis* (DC) Wilbur, Pacific Sci. 17: 423. 1963, non *Hedyotis affinis* Roem. & Schult. (1818) nec Wight & Arnott (1834).

Distribution. Occurring in mesic to wet forest, sometimes bogs or mesic shrubland, 260–2,040 m, on all of the main islands except Ni'ihau and Kaho'olawe.

Remarks. *Hedyotis terminalis* is probably the most polymorphic species among Hawaiian flowering plants. The variations involve virtually every part of the plant. Fosberg (1937b) described many new varieties and forms (in *Gouldia*), recognizing a total of 85 infraspecific taxa. While many of the variants within *H. terminalis* are distinctive and probably merit formal recognition, sorting out these entities within this polymorphic complex is beyond the scope of this treatment. Fosberg also recognized, without additional detailed study, intermediates between a great number of his described entities, suggesting that rampant hybridization was the cause of the extensive, nearly continuous intergradation between the taxa. A considerable number of his entities appear to represent artificial partitionings of a rather continuous variation pattern, particularly those based on leaf size and shape, pubescence, and size of inflorescence. The process of formally describing each end point in the overall variation pattern forces the recognition of the connecting phenotypes as hybrids.

The biological basis of variation in *Hedyotis terminalis* would be intriguing to study. The study of population variation and sympatric occurrences of different morphological entities should be emphasized. Morphological studies should be correlated with cytological and perhaps chemical data as well as detailed study of the breeding system. Such a study appears to be the only reasonable way to achieve an improved taxonomy of this complex. For this reason, *H. terminalis* is treated here without further subdivision.

Skottsberg (1953) reports an apparent aneuploid series of high chromosome numbers, predominantly from Maui collections of this complex. These reports may be unreliable—especially since many of the reports for other groups in Skottsberg's paper have proved to be incorrect, possibly as a result of difficulties with cytoplasmic staining due to secondary compounds present in many Rubiaceae. It is possible, however, that *Hedyotis* sect. *Gouldia* is an aneuploid complex; therefore, Skottsberg's reports should be confirmed and greatly elaborated. Cytological variation such as this could help to explain the tremendous variation in *Hedyotis terminalis*. Skottsberg (1944) also suggested that *Hedyotis* sect. *Gouldia* species are apomictic, based on his observation of a great number of stigmas in fully mature expanded flowers that never had pollen on them and yet produced fruit with numerous ripe seeds. He also commented on Wawra's observation (1874) that short-styled flowers, which Skottsberg regarded as staminate, also produced fruit. This observation would help to explain the sympatric occurrence of different forms of *H. terminalis*, but should be verified by a detailed examination of each step in the fertilization process.

In summary, due to the lack of biological information on this complex and the as-yet-unconfirmed possibility of chromosomal variation and apomixis, we are treating *Hedyotis terminalis* in the broad sense without further subdividing it at this time.

Sect. ***Phyllozygia*** W.L. Wagner & Herbst, **sect. nov.** TYPE: *Hedyotis tryblium* Herbst & W.L. Wagner.

Frutices scandenti sunt, nervis lateralibus valde adscendentibus illis minoribus obscuris, stipulis membranaceis omnino cum petiolis connatis cupulatis 25–40 mm altis, fructibus drupaceis.

The distinctive specialized monotypic sect. *Phyllozygia* forms a connecting phylogenetic link between the species of *Hedyotis* sect. *Gouldiopsis* and *Hedyotis* sect. *Gouldia*. The distinctive venation pattern, corolla morphology in bud, breeding system, and adnate stipules are shared with *Hedyotis* sect. *Gouldiopsis*, whereas the fleshy hypanthium is shared with sect. *Gouldia*. The section is additionally characterized by its unique habit of long, arcuate, sparingly branched stems that sometimes root along their length.

Hedyotis tryblium Herbst & W.L. Wagner, **sp. nov.** TYPE: HAWAIIAN IS: KAUA'I: Mt Kāhili, 860 m, 18.X.1972, *D.R. Herbst 2834* (BISH-500000!, holotype; isotypes to be distributed).

Frutices scandenti sunt, foliis supra viridibus infra pallide viridibus et cum areis purpureis vel badio-purpureis nervis lateralibus valde adscendentibus illis minoribus obscuris, petiolis supra sulcatis, stipulis membranaceis omnino cum petiolis connatis cupulatis 25–40 mm altis, floribus in thyrsis axillaribus densis, limbo corollae in gemma subito expanso valde quadrangulari lobis cum appendice terminali minuto, fructibus drupaceis.

Glabrous, scandent shrubs; stems sometimes rooting where in contact with ground, up to 5 m long, few-branched, arcuate. Leaves green on upper surface, lower surface pale green and irregularly marked with purple or brownish purple areas, coriaceous, oblong-elliptic to elliptic or narrowly elliptic, slightly asymmetrical, 13–22 cm long, 3–7.5 cm wide, lateral veins strongly ascending, only slightly arcuate, higher order venation obscure, evident veins few, glabrous, apex long-acuminate or sometimes attenuate, base cuneate or sometimes attenuate, petioles 1.8–5.5 cm long, upper surface ragged, appearing grooved as a result of the stipular scars, stipules membranous, completely adnate to petioles to form a cup 25–40 mm high that collects water and debris, quickly becoming ripped along petiole margins as stem and leaves elongate, caducous by second or third node, apex abruptly acuminate, prolonged into a thinly fleshy mucro 7–9 mm long. Flowers heterostylous, apparently perfect or functionally pistillate,

in dense, axillary thyrses, peduncles 1–12 mm long, pedicels 1–2 mm long, bracts connate, ovate, 6–10 mm long; hypanthium turbinate, 1.5–2 mm long; calyx lobes ovate, 2–3 mm long, margins fimbriolate; corolla yellowish green, the tube tinged reddish purple, fleshy, funnelform, slightly dimorphic, those of short-styled flowers bulging at the throat due to underlying anthers, those of long-styled flowers scarcely bulging, the tube 6.5–9 mm long, the limb abruptly expanded from tube in bud, strongly quadrangular, the lobes broadly ovate, 2.5–3 mm long, apex with a minute appendage; anthers fertile in short-styled flowers, sterile in long-styled flowers; style glabrous, 2-lobed, the lobes firmly appressed together in short-styled flowers, exserted and spreading in long-styled flowers. Fruit drupaceous, subglobose, 4–5 mm in diameter when dry, indehiscent. Seeds dark brown, irregularly shaped, minutely papillose.

Distribution. Rare on steep slopes of the windward (eastern) and less commonly leeward side of Mount Kāhili, in Wahiawa drainage, and 1 population just below upper rim of Kalalau Valley, Kaua'i.

Specimens examined. HAWAIIAN IS: KAUA'I: Hanalei Dist, Kōke'e State Park, along Hwy 550 near mile marker 18.3 in Kalalau Val, ca. 10 m below road, *Flynn 1234* (BISH, PTBG), *Wagner et al. 5700* (BISH); Waimea Dist, Mt Kāhili, 860 m, *Herbst 2483* (BISH), *Wagner et al. 5387* (BISH); Wahiawa drainage, *Perlman 491* (BISH), *Wagner et al. 6014* (BISH).

Remarks. The description of the breeding system of *Hedyotis tryblium* is based on examination of 2 collections and a field observation. The type (*Herbst 2834*) has long-styled flowers represented by small anthers that contain abortive pollen (stainability 0%). The population represented by *Flynn 1234* and *Wagner et al. 5700* has short-styled flowers with plump anthers and fertile pollen (stainability 80%) that is shed before corollas open, much of it falling on the short style, as well as some long-styled flowers. The latter observation was confirmed in a field study of this population by Wagner and Flynn. *Flynn 1234* has one apparently mature fruit; however, it is not known from which type of flower it developed.

Mitracarpus Zucc.

Mitracarpus hirtus (L.) DC

This species is native to the Neotropics. In Hawai'i it was recently discovered naturalized in disturbed mesic sites near Hilo.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Hilo Dist, Kaūmana Substation, 320 m, 1982, *Wagner & Stemmermann 4631* (BISH).

Spermacoce L.

Spermacoce mauritiana Gideon

This species, native to Africa and Malesia, is now widely naturalized in the Pacific Basin and Central and South America. Fosberg (pers. comm. 1988), however, indicates that the native range is Africa and the Neotropics. In Hawai'i it is naturalized in relatively dry areas on Hawai'i Island, although previously unreported.

Spermacoce mauritiana differs from the common *S. assurgens* Ruiz & Pav. [*Borreria laevis* sensu auct., non (Lam.) Griseb.] in its shorter hypanthium (ca. 0.5 mm long) and corolla (0.6–0.7 mm long), and its compressed, oblong fruit. *Spermacoce assurgens* has a hypanthium 2–2.5 mm long, corolla 2.4–2.6 mm long, and fruit ellipsoid or obovoid-fusiform.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Kea'au, weed of a macadamia orchard, 1973, *Oaka s.n.* (BISH).

SCROPHULARIACEAE

Buchnera L.

Buchnera pusilla Kunth

This species, which is native from Mexico to South America, appears recently to have become naturalized in Puna, Hawai'i.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Halekamahina, on a grassy roadside S of Lava Tree State Park at 180 m elevation, 1987, *Imada & Takeuchi 1001* (BISH).

Cymbalaria J. Hill

Cymbalaria muralis Gaertn.

This species is native from the southern Alps to Italy. In Hawai'i, it was first collected in 1986 and presently is known from a single gulch on Maui. Apparently it is very recently naturalized.

Specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Olinda, in gulch E of Pi'iholo Rd, 790–950 m, 1986, *Hobdy 2549* (BISH).

Dopatrium F. Ham. ex Benth.

Dopatrium junceum (Roxb.) F. Ham. ex Benth.

Native to Asia and Australia, in Hawai'i this species is naturalized near sea level in and around the taro paddies of Hanalei and Hanapēpē valleys, Kaua'i, although not previously reported.

Specimen examined. HAWAIIAN IS: KAUA'I: Hanalei Dist, U.S. Fish and Wildlife Reservation, Hanalei Val, in and around taro patches, 1977, *Herbst 5950* (BISH).

Lindernia All.

Lindernia antipoda (L.) Alston

This species is native from India to Asia and Malesia. In Hawai'i, it was recently found naturalized in Waipi'o Valley, Hawai'i.

Specimen examined. HAWAIIAN IS: HAWAI'I: Hāmākua Dist, in a muddy ditch on the floor of Waipi'o Val, 1987, *Stemmermann & Luce 7172* (BISH).

Parentucellia Viv.

Parentucellia viscosa (L.) Caruel

Native to the Mediterranean area, in Hawai'i this species appears recently to have become sparingly naturalized in the pastures of Kahuku and Kūka'iau ranches on Hawai'i Island.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Ka'ū Dist, Kahuku Ranch, in pastures along the road to the Nēnē Cabin, ca. 1,520 m, 1971, *St. John 26828* (BISH).

SOLANACEAE

We thank David E. Symon for the identification or verification of the three species of *Solanum* treated below.

Solanum L.

Solanum aviculare G. Forster

Although unreported in the local literature, this species was first collected on Lāna'i in 1955, where it is naturalized. It is native to New Guinea, eastern Australia, and New Zealand, and

is occasionally cultivated as an ornamental or novelty elsewhere; it has become naturalized in a number of localities, such as on the mainland United States and in New Caledonia. More recently, it has been cultivated as a source of solasodine, from which cortico-steroid drugs are manufactured.

Representative specimen examined. HAWAIIAN IS: LĀNA'I: Kalulu, at the edge of the forest at the junction of Kaiholena and the main ridge, 1955, *Sakimura s.n.* (BISH).

Solanum nigrescens Mart. & Galeotti

This plant is native to North, Central, and South America, where it is a widespread and extremely variable species. In Hawai'i it is known only from the saddle between Mauna Loa and Mauna Kea, Hawai'i Island, where it was first collected in 1982. The determination of this species is tentative, as sure identification is difficult. It can be distinguished from *S. americanum* Mill., with which it is often confused, by its drab rather than glossy berries, forked and shortly racemose rather than subumbelliform inflorescences, and greater amount of pubescence. The only known collection of *S. nigrescens* was that made in 1982 (*Symon s.n.*, AD); we have not seen the specimen.

Solanum robustum Wendl.

This South American native is widely grown in botanical gardens, and occasionally as an ornamental for its attractive foliage and winged petioles and stems. In Hawai'i, it is found naturalized only in the guava-infested cattle pastures of Kailua Gulch, Maui, but has not previously been reported.

Representative specimen examined. HAWAIIAN IS: MAUI: Makawao Dist, Kailua Gulch, 230 m elevation, growing under guava trees in a heavily grazed pasture, 1977, *Hobdy 288* (BISH).

THYMELAEACEAE

Wikstroemia Endl.[7]

Wikstroemia oahuensis (A. Gray) Rock, Indig. trees Haw. Isl. 316. 1913. *Wikstroemia foetida* (L. fil.) A. Gray var.? *oahuensis* A. Gray, J. Bot. 3: 303. 1865. TYPE: HAWAIIAN IS: O'AHU: 1851–55, *J. Rémy 223* (GH!, lectotype, designated by Heller, Minnesota Bot. Stud. 1: 860. 1897; NY, P, isolectotype).

Wikstroemia oahuensis is a polymorphic species. The morphological extremes look quite different, and several have been recognized as distinct species. However, as they are interconnected by a series of intermediate forms, it is impossible to keep any of them as segregate species or even as infraspecific taxa, except for the Kaua'i population. That population is here recognized at the varietal level. *Wikstroemia oahuensis* can be divided into two varieties:

Wikstroemia oahuensis (A. Gray) Rock var. ***oahuensis***

Variety ***oahuensis*** is a low shrub or a slender or robust tree up to 4 m tall.

Distribution. This variety is found at higher elevations on Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui.

Wikstroemia oahuensis (A. Gray) Rock var. ***palustris*** (Hochr.) Peterson, **comb. et stat. nov.** *Wikstroemia palustris* Hochr., Candollea 2: 442. 1925. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, clairière toubière de Lihuemakanoi, au-dessus de Weimea, non loin du cottage Gay, alt. 400 m, 1905, *B.P.G. Hochreutiner 3582* (G, holotype; Z, isotype).

7. Contributed by Bo Peterson, Botanical Museum, University of Göteborg, S–413 19 Göteborg, Sweden.

Wikstroemia palustris Hochr. var. *palustris* f. *hirtella* Skottsb., Acta Regiae Soc. Litt. Gothob., Bot. 1: 85. 1972. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, Alaka'i Bog near Kilohana, alt. 1,220 m, 1938, *L.M. Cranwell et al. 2876a* (GB!, holotype; BISH!, S!, isotypes).

Wikstroemia palustris Hochr. var. *major* Skottsb. f. *oblonga* Skottsb., Acta Regiae Soc. Litt. Gothob., Bot. 1: 91. 1972. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, W rim of Kalalau Val, in open woods, 1960, *O. Degener et al. 27131* (S!, holotype; BISH!, S!, isotypes).

Variety ***palustris*** is a densely foliaceous shrub or dwarf tree up to 1 m tall; the common bog form.

Distribution. This variety is restricted to Kaua'i.

VIOLACEAE

Viola L.

Viola chamissoniana Ging., Linnaea 1: 408. 1826. TYPE: HAWAIIAN IS: O'AHU: 1817, *L.C.A. von Chamisso s.n.* (LE, holotype, photo BISH!; B, K, isotypes).

The segregation of populations into *V. chamissoniana*, *V. tracheliifolia*, and *V. robusta*, here treated as one species, appears to have been based on minor morphological and ecological trends rather than discontinuities between population series. Careful comparison is needed of populations on each island along the ecological gradient from mesic to wet habitats. Three modally distinct subspecies are here recognized.

Viola chamissoniana Ging. subsp. ***chamissoniana***

Viola helioscopia Hillebr., Fl. Hawaiian Isl. 17. 1888. TYPE: HAWAIIAN IS: O'AHU: Wai'anae Dist, Mākaha, on dry open ridges, 1851–71, *W. Hillebrand (& J. Lydgate?) s.n.* (B, holotype, presumably destroyed, fragment BISH!; K, isotype).

Subspecies ***chamissoniana*** is a small, branched plant with leaves ca. 2–4 cm long, with a rounded to broadly rounded-cuneate base, and with petioles usually less than 1 cm long. It has 1–2 flowers per peduncle.

Distribution. This rare plant grows on dry cliff sites in the Wai'anae Mountains, O'ahu.

Viola chamissoniana Ging. subsp. ***robusta*** (Hillebr.) W.L. Wagner, Herbst & Sohmer, **comb. et stat. nov.** *Viola robusta* Hillebr., Fl. Hawaiian Isl. 16. 1888. TYPE: HAWAIIAN IS: MOLOKA'I: Kala'e, Kamalō, in boggy clearings on heights, 760 m, 1851–71, *W. Hillebrand s.n.* (B, holotype, presumably destroyed, photo BISH!; K, isotype).

Subspecies ***robusta*** has few lateral branches and has leaves 6–12 cm long with a truncate to broadly cuneate base, and with petioles 2–5 cm long. It usually has more than 1 flower per peduncle.

Distribution. This subspecies grows in wet forests on Moloka'i.

Viola chamissoniana Ging. subsp. ***tracheliifolia*** (Ging.) W.L. Wagner, Herbst & Sohmer, **comb. et stat. nov.** *Viola tracheliifolia* Ging., Linnaea 1: 409. 1826. *Viola chamissoniana* Ging. var. *tracheliifolia* (Ging.) Wawra, Flora 56: 174. 1873. TYPE: HAWAIIAN IS: O'AHU: 1817, *L.C.A. von Chamisso s.n.* (LE, holotype, photo BISH!).

Viola chamissoniana Ging. var. *olokelensis* Skottsb., Acta Horti Gothob. 2: 250. 1926. *Viola tracheliifolia* Ging. var. *olokelensis* (Skottsb.) Skottsb., Acta Horti Gothob. 13: 496. 1940. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, Olokele Canyon, on steep rock wall among shrubs, 1922, *C. Skottsberg 1047* (GB, holotype; BISH!, S, isotypes).

Viola robusta Hillebr. var. *mauiensis* Rock, Coll. Hawaii Publ. Bull. 1: 6. 1911. TYPE: HAWAIIAN IS:

MAUI: Makawao Dist, Haleakalā, gulches above Makawao, 1,065 m, 1910, *J.F. Rock 8563* (BISH-522374!, lectotype, designated by Skottsberg, Acta Horti Gothob. 13: 493. 1940).

Viola tracheliifolia Ging. var. *populifolia* Skottsb., Acta Horti Gothob. 13: 494. 1940. TYPE: HAWAIIAN IS: O'AHU: Ko'olau Mts, date unknown, *C. Skottsberg 87* (GB, holotype).

Viola tracheliifolia Ging. var. *tomentosa* W. Becker, Beih. Bot. Centralbl. 34: 216. 1916. *Viola tracheliifolia* Ging. f. *tomentosa* (W. Becker) Skottsb., Acta Horti Gothob. 13: 490. 1940. TYPE: HAWAIIAN IS: KAUA'I: 1853–71, *V. Knudsen s.n.* (B, holotype, presumably destroyed).

Subspecies ***tracheliifolia*** is usually somewhat branched with short lateral branches, leaves 5–29 cm long with a truncate to cordate base, and with petioles 1.5–8 cm long. It has 1 or rarely 2 flowers per peduncle.

Distribution. This subspecies is found in mesic forests on Kaua'i, O'ahu, Moloka'i, and Maui.

CYPERACEAE[8]

Carex L.

Eight species of *Carex* are native to Hawai'i; 4 of them (*C. alligata* Boott, *C. kauaiensis* R. Krauss, *C. montis-eeka* Hillebr., and *C. wahuensis* C.A. Mey.) are endemic, and the other 4 (*C. echinata* J.A. Murray [including *C. hawaiiensis* St. John and *C. svenonis* Skottsb.], *C. macloviana* Dum. d'Urv., *C. meyenii* Nees, and *C. thunbergii* Steud. [including *C. nealae* R. Krauss]) also occur outside Hawai'i. Nomenclatural changes and one new taxon are given below.

The occurrence of each of these species in Hawai'i is the result of an independent colonization event, except that *C. alligata* and *C. kauaiensis* share a single colonizing ancestor.

Carex macloviana Dum. d'Urv. subsp. ***subfusca*** (W. Boott) T. Koyama, **comb. et stat. nov.** *Carex subfusca* W. Boott in S. Wats., Bot. Calif. 2: 234. 1880. *Carex macloviana* Dum. d'Urv. var. *subfusca* (W. Boott) Kükenth., Pflanzenr. IV. 20 (Heft 38): 197. 1909. TYPE: U.S.A.: CALIFORNIA: Lake Tahoe, Bear Camp, *Kellogg s.n.* (GH, holotype).

Carex wahuensis C.A. Mey., Zap. Imp. Akad. Nauk Fiz.-Mat. Otd. 1: 218, *pl. 10.* 1831. TYPE: Habitat in montibus insulae Wahu [O'ahu], 1816–17, *L.C.A. van Chamisso s.n.* (LE, holotype).

Carex wahuensis is subdivided into 3 subspecies. These basically correspond to the 3 varieties recognized by Krauss (1950). The most distinctive is subsp. *herbstii*, which is characterized by leaves 1.5–2 mm wide, spikes 0.8–1.5 cm long and up to 5 mm wide, perigynium 1–1.5 mm wide, teeth of the beak 0.5 mm long, and achenes without a constriction on the angles. The other 2 subspecies are similar to one another in having leaves over 3 mm wide, spikes 5–10 cm long, and achenes conspicuously constricted at the angles. The unique features of subsp. *rubiginosa* are its broadly obovoid reddish brown to dark red perigynia with teeth 0.2–0.9 mm long. By contrast, the unique features of subsp. *wahuensis* are its ellipsoid to obovoid green to yellow or yellowish brown perigynia, with teeth 1–3 mm long.

Carex wahuensis C.A. Mey. subsp. ***herbstii*** T. Koyama, **subsp. nov.** TYPE: HAWAIIAN IS: O'AHU: Honolulu Dist, N side of Moanalua Val, 365 m, 11.I.1970, *D. Herbst & L.E. Bishop 1495* (BISH–76091!, holotype).

Differt a subsp. *wahuensis* omnibus partibus multo minoribus, utriculis ovoideis tantum 3.5 mm longis et 1.5 mm latis, spicis 8–15 mm longis, 5 mm latis, achaenio ad angulos non constricto.

This new subspecies is distinct from the other 2 subspecies of *C. wahuensis*, subsp. *wahuensis*

8. Contributed by Tetsuo Koyama, The New York Botanical Garden, Bronx, NY 10458, USA.

and subsp. *rubiginosa*, in its much smaller habit with slender culms up to 10 cm tall, narrow leaves 6–9 cm long, 1.5–2 mm wide, unisexual spikes with the terminal spike linear and staminate, and the 2 lateral ones broader, 8–15 mm long, 5 mm wide and pistillate, ellipsoid perigynium 3.5 mm long, 1–1.5 mm wide with a 1.5 mm long beak, achenes trigonous, obovoid, 2–2.2 mm long, 1.2 mm wide, not constricted on the angles, and pistillate glumes ovate, the body 2.5 mm long and the awn 1.2 mm long.

Distribution. Known only from the type.

Carex wahuensis C.A. Mey. subsp. ***rubiginosa*** (R. Krauss) T. Koyama, **comb. et stat. nov.** *Carex wahuensis* C.A. Mey. var. *rubiginosa* R. Krauss, Pacific Sci. 4: 257. 1950. TYPE: HAWAIIAN IS: HAWAI'I: Ka'ū Dist, Kīlauea Iki, 1,200 m, 21.XII.1931, *H. St. John, R.S. Bean & E.Y. Hosaka 11228* (BISH-501912!, holotype).

Distribution. Occurring primarily in subalpine shrubland and dry forest or shrubland, 510–2,500 m, on Maui and Hawai'i; also a few specimens from scattered mesic sites, ca. 240–600 m, on Kaua'i, O'ahu, and Lāna'i.

Remarks. The few collections referred to subsp. *rubiginosa* from Kaua'i, O'ahu, and Lāna'i are atypical in occurring in more mesic sites and having smaller, pale reddish brown or brown perigynia, and thus are somewhat intermediate between subsp. *rubiginosa* and subsp. *wahuensis*. The teeth of the perigynia of these specimens, however, fit the normal range of subsp. *rubiginosa*.

Carex wahuensis C.A. Mey. subsp. ***wahuensis***.

Carex wahuensis C.A. Mey. var. *meyeri* Franch. & Sav., Enum. pl. Jap. 563. 1879.

Carex nupitalis Boott, Illustrations of the Genus *Carex* 4: 175, *pl. 591.* 1867. TYPE: SANDWICH [HAWAIIAN] IS: O'AHU: *T. Nuttall* (K, syntype); 'Voyage de Remy', *J. Rémy 142* (P, GH, syntypes).

Distribution. Occurring primarily in mesic forest, sometimes dry forest and mesic shrubland or mesic coastal forest, (10–)450–1,000 m, on all of the main islands except Ni'ihau and Kaho'olawe.

Subdivision of *Cyperus*

Cyperus L., when treated in the broad sense, is a genus of about 650 species readily recognized by its distichous arrangement of spikelet scales, and spikelets with perfect, usually numerous flowers lacking bristles. Tucker (1987) follows this broad circumscription, as do many other recent workers. When delimited in this fashion, a number of subgenera are recognized. Here a more homogeneous and narrow generic concept is employed, with the elevation of these subgenera to generic status. They are delimited mostly by features of the spikelet. Using this approach, the Hawaiian species fall into 5 genera: *Cyperus*, *Kyllinga* Rottb., *Mariscus* Vahl, *Pycreus* P. Beauv., and *Torulinium* Desv. The following key distinguishes them. A synopsis of the Hawaiian species is given after the key.

Key to *Cyperus* and Segregate Genera

1. Rachilla not articulate, persistent on the axis of spikes 2
1. Rachilla articulate, deciduous 3
2(1). Achenes trigonous or rarely flattened, with 1 side facing the rachilla . . . . . ***Cyperus***
2. Achenes laterally flattened with 1 angle facing the rachilla . . . . . ***Pycreus***
3(1). Rachilla articulate at base and between flowers, breaking into segments, with winged marginal extensions that become corky and clasp the achene . . . . . ***Torulinium***
3. Rachilla articulate only at base, not breaking into segments, without winged marginal extensions 4

4(3). Stigmas 2; achenes lenticular . . . . . ***Kyllinga***
4. Stigmas 3; achenes trigonous . . . . . ***Mariscus***

Cyperus L.

Cyperus alternifolius L. subsp. ***flabelliformis*** (Rottb.) Kükenth.

Distribution. Native to tropical Africa, Madagascar, Mauritius, and the Mascarene Islands, often cultivated as an ornamental in greenhouses; in Hawai'i cultivated and naturalized in marshy areas and along streams, 0–460 m, at least on Midway Atoll, Kaua'i, O'ahu, and Maui.

Cyperus compressus L.

Distribution. Pantropical; in Hawai'i naturalized in disturbed, moist sites and coastal areas, 0–300 m, on Hawai'i Island.

Cyperus difformis L.

Distribution. Native to warm temperate and tropical regions worldwide in wet places, presumably originally distributed only in the Old World; in Hawai'i naturalized in wet sites, beach parks, urban sites, cultivated fields, and along roadsides, 0–50 m, on Kaua'i and O'ahu.

Cyperus esculentus L.

Distribution. Native to southern Europe, Mediterranean region, South Africa, North America, and the Andean region of South America; in Hawai'i known from a single collection from Onomea, Hawai'i, made in 1956 (*Collector unknown s.n.*, BISH), and perhaps no longer persisting.

Cyperus gracilis R. Br.

Distribution. Native to Australia and New Caledonia in wet, partially shaded areas; in Hawai'i cultivated as a ground cover in shaded sites and sparingly naturalized, 0–170 m, at least on Kaua'i, O'ahu, and Maui.

Cyperus halpan L.

Distribution. Native to subtropical and tropical regions worldwide, common in wet places; in Hawai'i naturalized in wet, disturbed sites, especially in bogs, wet forest, and open, muddy areas, 3–1,700 m, on Kaua'i, Maui, and Hawai'i.

Remarks. The epithet of this species has long been spelled "haspan"; however, Linnaeus misread the vernacular name "halpan" as "haspan." According to ICBN Art. 73.1, this orthographic error is to be corrected.

Cyperus laevigatus L.

Distribution. Widespread in warm temperate and subtropical regions; in Hawai'i indigenous, occurring on mud flats, sandy coastal sites, and on edges of and in fresh, brackish, and saltwater ponds, 0–10 m, on Laysan, Ni'ihau, O'ahu, Moloka'i, Maui, and Hawai'i.

Cyperus papyrus L.

Distribution. Native to eastern tropical Africa and Madagascar, now widely cultivated elsewhere as an ornamental in water gardens and greenhouses; in Hawai'i cultivated in water gardens and sparingly naturalized at least by offshoots, at least on Kaua'i.

Cyperus pilosus Vahl

Distribution. Native to India, southern China, Malesia, and western Japan in wet places,

often by rivers and in rice fields; in Hawai'i perhaps introduced in connection with rice cultivation, but known only from a single collection from Līhu'e, Kaua'i, made in 1916 (*Forbes 481.K*, BISH).

Cyperus rotundus L.

Distribution. A cosmopolitan weed; in Hawai'i naturalized and common in disturbed areas, 0–800 m, on Kure and Midway atolls, Ni'ihau, Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i.

Cyperus trachysanthos Hook. & Arnott

Distribution. An endemic species occurring in wet sites such as margins of ponds and wet slopes, 3–160 m, on Ni'ihau, Kaua'i, O'ahu, Moloka'i, and Lāna'i. Few collections have been made in recent years.

Cyperus trinervis R. Br.

Distribution. Native to Australia; in Hawai'i known only from 3 collections from disturbed sites in wet forest, Hawai'i Volcanoes National Park, ca. 915 m, Hawai'i Island.

Cyperus virens Michx.

This species has not been previously reported from Hawai'i.

Distribution. Native from southeastern United States through tropical America southward to northern Argentina; in Hawai'i apparently recently naturalized in disturbed, wet sites, 600–1,000 m, in Waiākea and Hilo forest reserves, Hawai'i Island; not previously reported in the literature.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Ōla'a, growing in a marshy area along a cane road 2.6 mi from Mountain View, 1976, *Herbst 5815* (BISH).

Kyllinga Rottb.

Kyllinga brevifolia Rottb.

Distribution. Pantropical; in Hawai'i naturalized in disturbed areas such as gardens and lawns, roadsides, pastures, and along trails in mesic to wet forest, 20–1,220 m, on all of the main islands except Ni'ihau and Kaho'olawe.

Kyllinga nemoralis (J.R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel

Distribution. Pantropical; in Hawai'i naturalized primarily in gardens and lawns, from sea level up to at least 200 m, on Kaua'i, O'ahu, Maui, and Hawai'i, but probably also on other of the main islands.

Mariscus Vahl

Mariscus congestus (Vahl) C.B. Clarke

Distribution. Native to Australia and South Africa, and now naturalized in southern Europe and Japan; in Hawai'i 2 collections from 'Ewa plain, O'ahu, were made in 1916 (*Forbes 2327.O, 2345.O*, BISH). It is not known to have persisted.

Mariscus cyperinus (Retz.) Vahl

Distribution. A common weed of the Paleotropics, Australia, and many Pacific islands; in Hawai'i indigenous, occurring in open, grassy sites on Kaua'i, O'ahu, and Moloka'i.

Mariscus fauriei (Kükenth.) T. Koyama, **comb. nov.** *Cyperus fauriei* Kükenth., Repert. Spec. Nov. Regni Veg. 16: 431. 1920. TYPE: HAWAIIAN IS: MOLOKA'I: Kamalō, VI.1910, *U. Faurie 1276* (B, holotype; BISH 2 sheets!, isotypes).

Distribution. Apparently rare endemic occurring in dry and perhaps mesic and subalpine forest, 300–1,830 m, on Moloka'i, Lāna'i, and Hawai'i.

Mariscus hillebrandii (Boeck.) T. Koyama, **comb. nov.** *Cyperus hillebrandii* Boeck., Flora 63: 436. 1880. TYPE: HAWAIIAN IS: MAUI: S slopes of Haleakalā, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, holotype; MEL, isotype, photo BISH!).

Two subspecies of this endemic species are recognized: (1) subsp. ***decipiens*** with leaves (3–)7–12 mm wide, as long as or longer than the culm, inflorescences relatively lax, with rays 5–18 cm long, spikelets oblong-lanceoloid, 5.5–6 mm long, and glumes pale green, but usually tinged pale reddish brown, 3–3.5 mm long; and (2) subsp. ***hillebrandii*** with leaves 3–8 mm wide, as long as or longer than the culm, inflorescences congested, with rays 1–4 cm long, spikelets ellipsoid to oblong-ellipsoid, 3–5.5 mm long, and glumes reddish brown to brown, 2.5–2.8 mm long.

Mariscus hillebrandii (Boeck.) T. Koyama subsp. ***decipiens*** (Hillebr.) T. Koyama, **comb. et stat. nov.** *Cyperus decipiens* Hillebr., Fl. Hawaiian Isl. 467. 1888. *Cyperus hillebrandii* Boeck. var. *decipiens* (Hillebr.) Kükenth., Pflanzenr. IV. 20(Heft 101, 4): 484. 1936. TYPE: HAWAIIAN IS: MAUI or MOLOKA'I: without further locality, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, holotype).

Distribution. Occurring on ridges, gulches, and along streams, dry forest to mesic forest, 360–1,070 m, Kaua'i, Wai'anae Mountains, O'ahu, Lāna'i, and West Maui.

Mariscus hillebrandii (Boeck.) T. Koyama subsp. ***hillebrandii***

Cyperus mauiensis Hillebr., Fl. Hawaiian Isl. 469. 1888. *Cyperus hillebrandii* Boeck. var. *mauiensis* (Hillebr.) Kükenth., Pflanzenr. IV. 20(Heft 101, 4): 484. 1936. TYPE: HAWAIIAN IS: MAUI: 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, holotype).

Cyperus hillebrandii Boeck. var. *helleri* Kükenth., Pflanzenr. IV. 20(Heft 101, 4): 484. 1936. TYPE: HAWAIIAN IS: O'AHU: Nu'uanu Pali, 425 m, 1896, *A.A. Heller 2363* (B, presumably destroyed, holotype; GH, MO, NY, isotypes).

Distribution. Occurring on dry ridges, *'a'ā* lava, dry forest, subalpine forest, and sometimes mesic forest, (60–)250–1,980 m, O'ahu, Lāna'i, East Maui, and Hawai'i.

Mariscus hypochlorus (Hillebr.) C.B. Clarke

Two subspecies of this endemic species are recognized: (1) subsp. ***brevior*** with lax habit, leaves 3–7 mm wide, spikelets 6–7 mm long, usually 3–5–flowered, and glumes 3.5–4.5 mm long; and (2) subsp. ***hypochlorus*** with leaves 8–15 mm wide, spikelets 10–16 mm long, 6–8-flowered, and glumes 4.5–5.5 mm long.

Mariscus hypochlorus (Hillebr.) C.B. Clarke subsp. ***brevior*** (Kükenth.) T. Koyama, **comb. et stat. nov.** *Cyperus hypochlorus* Hillebr. var. *brevior* Kükenth., Pflanzenr. IV. 20(Heft 101, 3): 409. 1936. TYPE: HAWAIIAN IS: O'AHU: 'Ewa Dist, Wai'anae Mts, Pālehua, 25.VIII.1922, *C. Skottsberg 300* (B, presumably destroyed, holotype; BISH!, isotype).

Distribution. Occurring in mesic forest, 350–760 m, Kaua'i, O'ahu, Moloka'i, and Maui.

Mariscus hypochlorus (Hillebr.) C.B. Clarke subsp. ***hypochlorus***

Cyperus hypochlorus Hillebr. var. *densespicatus* Skottsb., Acta Horti Gothob. 15: 303. 1944. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, Wai'alae Val near Ranger Station, 28.VIII.1938, *L.M. Cranwell, O. Selling & C. Skottsberg 2530* (S, syntype).

Distribution. Occurring in open sites in wet forest, especially waterways, occasionally mesic forest, 850–1,280 m, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i.

Mariscus javanicus (Houtt.) Merr. & Metcalfe

Distribution. Native to tropical Africa and Asia; in Hawai'i indigenous and common in marshes and taro paddies, along streams and ditches, in coastal pastures, and on rocky coastal sites and cliffs, 0–180 m, on Midway Atoll and documented from all of the main islands except Kaho'olawe.

Mariscus kunthianus Gaud.

Distribution. A rare endemic species of wet forest on West Maui.

Mariscus meyenianus (Kunth) Nees

Distribution. Native to the Neotropics from the West Indies, Brazil and adjacent Uruguay, Paraguay, and northern Argentina; in Hawai'i naturalized in wet, disturbed sites in mesic to wet forest, especially along trails, 30–1,050 m, on Kaua'i; a single collection from Mākua Valley, O'ahu, also appears to represent this species.

Mariscus pennatiformis (Kükenth.) T. Koyama, **comb. nov.** *Cyperus pennatiformis* Kükenth. in Christoph. & Caum, Bernice P. Bishop Mus. Bull. 81: 23. 1931. TYPE: HAWAIIAN IS: MAUI: Hāna, IX.1909, *U. Faurie 1262* (presumably B, holotype; BISH!, isotype).

This endemic species is subdivided into 2 subspecies: (1) subsp. ***bryanii*** with spikelets 8–12 mm long, 3–4 mm wide, loosely 8–12-flowered, glumes grayish brown, slightly spreading, narrowly oblong, 4–5.5 mm long, 1.5–2.2 mm wide, and achenes ellipsoid, ca. 1 mm long; and (2) subsp. ***pennatiformis*** with spikelets 10–14(–20) mm long, 1.7–3.5 mm wide, densely 15–24 flowered, glumes yellowish brown, oblong-ovate, closely imbricate, 4–5 mm long, 2–2.5 mm wide, and achenes oblong, ca. 2 mm long.

Mariscus pennatiformis (Kükenth.) T. Koyama subsp. ***bryanii*** (Kükenth.) T. Koyama, **comb. et stat. nov.** *Cyperus pennatiformis* Kükenth. var. *bryanii* Kükenth. in Christoph. & Caum, Bernice P. Bishop Mus. Bull. 81: 23. 1931. TYPE: HAWAIIAN IS: LAYSAN: V.1911, *W.A. Bryan 8732* (not located, syntype); May 1911, *W.A. Bryan 8733* (BISH-502528!, syntype); 1896, *H.H. Schauinsland* (BISH!, syntype); 1902, *Snyder s.n.* (US, syntype).

Distribution. Growing between clumps of *Eragrostis variabilis*, sand dunes, northeastern Laysan; in 1980, only 12 individuals were observed by Herbst.

Mariscus pennatiformis (Kükenth.) T. Koyama subsp. ***pennatiformis***

Distribution. Rare in low-elevation grasslands, open sites such as ridges, and mesic forest, 0–1,200 m, Kaua'i, O'ahu, Maui, and Hawai'i.

Mariscus phleoides Nees ex Kunth

Two subspecies of this endemic species are recognized: (1) subsp. ***hawaiiensis*** with culms up to 90 cm tall, much longer than the leaves, inflorescences with rays up to 6 cm long and

often further branched, and glumes, bracteoles, and prophylls smooth on keel and nerves; and (2) subsp. ***phleoides*** with culms 10–50 cm tall, much shorter than the leaves, inflorescences with rays 0.3–3 cm long, only rarely further branched, and glumes, bracteoles, and prophylls spinulose-scabrous on the keel and nerves.

Mariscus phleoides Nees ex Kunth subsp. ***hawaiiensis*** (H. Mann) T. Koyama, **comb. et stat. nov.** *Cyperus hawaiiensis* H. Mann, Proc. Amer. Acad. Arts 7: 208. 1868. *Cyperus phleoides* (Nees ex Kunth) Hillebr. var. *hawaiiensis* (H. Mann) Kükenth. in Hochr., Candollea 6: 424. 1936. TYPE: HAWAIIAN IS: KAUA'I: Waimea, 610–915 m, 1864–65, *H. Mann & W.T. Brigham 246* (CU, holotype).

Distribution. Occurring on bog margins and open sites or cliffs in mesic forest, (230–)490–1,100 m, on all of the main islands except Kaho'olawe and Hawai'i.

Mariscus phleoides Nees ex Kunth subsp. ***phleoides***

Distribution. Occurring in coastal sites in grasslands, on cliffs, and among rocks on beaches, Kaua'i, Moloka'i, Lāna'i, Maui, and Hawai'i.

Mariscus rockii (Kükenth.) T. Koyama, **comb. nov.** *Cyperus rockii* Kükenth., Repert Spec. Nov. Regni Veg. 16: 431. 1920. TYPE: HAWAIIAN IS: KAUA'I: Waimea Dist, swampy forest near Wai'alae Stream, 1,220 m, X.1911, *J. F. Rock 9019* (B, presumably destroyed, holotype; BISH! 3 sheets, isotypes).

Distribution. A possibly extinct endemic species known only from 4 collections from the type locality, Wai'alae Valley, ca. 1,200 m, Kaua'i.

Mariscus sandwicensis (Kükenth.) T. Koyama, **comb. nov.** *Cyperus sandwicensis* Kükenth., Repert. Spec. Nov. Regni Veg. 16: 430. 1920. TYPE: HAWAIIAN IS: MOLOKA'I: on high palis, 610 m, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype); MOLOKA'I: Makanalua, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype); O'AHU: 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype); MAUI [actually KAUA'I]: summit bog, Mt Wai'ale'ale, 1,585 m, *J. F. Rock 8892* (B, presumably destroyed, BISH-117115 [not located], syntypes).

Cyperus sandwicensis Kükenth. var. *pseudo-prescottianus* Kükenth., Pflanzenr. IV. 20(Heft 101, 3): 406. 1936. TYPE: HAWAIIAN IS: O'AHU: 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype); MOLOKA'I: Kala'e, pali of Makanalua, 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype).

Distribution. An endemic species occurring in open wet forest on cliffs, steep slopes, and valley floors, (90–)370–1,160 m, Kaua'i, O'ahu, Moloka'i, and Maui.

Pycreus P. Beauv.

Pycreus polystachyos (Rottb.) P. Beauv.

Pycreus polystachyos is a polymorphic species, primarily with regard to the size of spikelets, the color of the glumes, and the relative contraction of the inflorescences. Two subspecies are indigenous to Hawai'i: (1) subsp. ***holosericeus*** with leaves often longer than the culm, inflorescences usually open, forming a simple or partially compound corymb, with 2–7 slender rays 2–6 cm long, spikelets pale or yellowish brown, 8–26-flowered, 5–12 mm long, 1–1.2 mm wide, and glumes yellowish brown; and (2) subsp. ***polystachyos*** with inflorescences ± contracted, forming a head-like cluster or with 2–5 short rays up to 5 cm long, spikelets pale to dark reddish brown, 10–40-flowered, 10–25 mm long, 1.5–2 mm wide, and glumes reddish brown.

A form with extremely short culms 2–5 cm long and simple, head-like inflorescences is sometimes separated as var. *miser*. This form appears to represent an ecotype (e.g., *Hobdy 1365*, BISH).

Subspecies *holosericeus* is usually rather easily recognizable by the characters cited above. However, plants with intermediate features are known in Hawai'i (e.g., *Rock 8738*, *Hitchcock 12891*, *Munro 149*, and *Forbes s.n.* in 1912, all BISH). These intermediate forms are usually sterile with abortive achenes, suggesting that subsp. *holosericeus* may best be treated as a species with its overall distinctness partially obscured by hybridization between it and *Pycreus polystachyos* subsp. *polystachyos*.

Pycreus polystachyos (Rottb.) P. Beauv. subsp. ***holosericeus*** (Link) T. Koyama, **comb. et stat. nov.** *Cyperus holosericeus* Link, Hort. Berol. 1: 317. 1827.

Cyperus polystachyos Rottb. var. *pallidus* Hillebr., Fl. Hawaiian Isl. 463. 1888. TYPE: HAWAIIAN IS: EAST MAUI: 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype); HAWAI'I: 1851–71, *W. Hillebrand s.n.* (B, presumably destroyed, syntype).

Cyperus polystachyos Rottb. var. *pallidus* Hillebr. f. *pernanus* Kükenth., Pflanzenr. IV.20(Heft 101, 3): 371. 1936. TYPE: HAWAIIAN IS: Lehua, 18.IV.1931, *E.L. Caum 17* (B, presumably destroyed, holotype; BISH! 2 sheets, isotypes).

Cyperus polystachyos Rottb. var. *miser* Kükenth., Pflanzenr. IV.20(Heft 101, 3): 370. 1936. TYPE: HAWAIIAN IS: HAWAI'I: Kīlauea, IV.1911, *W.M. Giffard s.n. (J.F. Rock's no. 8738, 8739)* (B, presumably destroyed, syntype; BISH! 2 sheets, syntypes); AUSTRALIA: NEW SOUTH WALES: Port Jackson Dist, *Boorman s.n.* (B, presumably destroyed, syntype); Botany Bay, *Boorman s.n.* (B, presumably destroyed, syntype).

Distribution. Native to tropical and subtropical regions worldwide; in Hawai'i occurring on open or grassy, often disturbed areas, from mesic coastal sites to mesic and wet forest, 0–1,420 m, on all of the main islands except Kaua'i and Kaho'olawe.

Pycreus polystachyos (Rottb.) P. Beauv. subsp. ***polystachyos***

Distribution. Native to tropical and subtropical regions worldwide; in Hawai'i occurring on open or grassy, often disturbed areas, from mesic coastal sites to mesic and wet forest, 0–1,420 m, on Midway Atoll, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i.

Pycreus sanguinolentus (Vahl) Nees

This species has not been previously reported for Hawai'i.

Distribution. Native to Southern Canada, United States, and Mexico; in Hawai'i naturalized in marshy sites, 910–920 m, Hawai'i Island.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Kona Dist, *mauka* of Captain Cook, 1949, *Degener 20251* (BISH).

Torulinium Desv.

Torulinium odoratum (L.) S. Hooper subsp. ***auriculatum*** (Nees & Meyen ex Kunth) T. Koyama, **comb. et stat. nov.** *Cyperus auriculatus* Nees & Meyen in Nees, Linnaea 9: 285. 1834; ex Kunth, Enum. Pl. 2: 83. 1837. *Cyperus ferax* Rich var. *auriculatus* (Nees & Meyen ex Kunth) Kükenth. TYPE: Needs to be lectotypified.

Distribution. Subspecies *auriculatum* is endemic to the Hawaiian Islands, apparently rare in low-elevation wet sites such as margins of ponds and vernal pools, taro paddies, and along streams, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i.

Remarks. The Hawaiian populations are characterized by larger glumes 3–3.5 mm long, in contrast to glumes 2–2.5(–3) mm long in subsp. *odoratum*.

Fimbristylis Vahl

There are 5 species of *Fimbristylis* in Hawai'i, including 1 endemic species (*F. hawaiiensis* Hillebr.), 2 indigenous species [*F. cymosa* R. Br. and *F. dichotoma* (L.) Vahl], and the 2 previously unrecorded naturalized species treated here.

Fimbristylis aestivalis (Retz.) Vahl

Native from Japan and China south to India, Malesia, and Australia; in Hawai'i apparently only sparingly naturalized and known from 2 collections from ca. 3 m in taro paddies, Hanalei Valley, and 1 collection from a pond in Lāwa'i Valley, Kaua'i.

Representative specimen examined. HAWAIIAN IS: KAUA'I: Hanalei Dist, Hanalei Val, common along the edges of taro paddies, 1977, *Herbst 5953* (BISH).

Fimbristylis schoenoides (Retz.) Vahl

Native to India, southern China, Malesia, and Australia; in Hawai'i known only from a few collections from wet ground near an abandoned runway at Hilo Airport, Hawai'i Island.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: South Hilo Dist, Hilo Airport, growing in wet areas along an abandoned runway, 1984, *Stemmermann 6884* (BISH).

Gahnia J.R. Forster & G. Forster

The endemic taxon previously treated as *Gahnia kauaiensis* Benl is very closely related to *G. vitiensis* Rendle. They differ in only a few relatively minor features. Therefore, it seems reasonable to treat the Hawaiian and Fijian populations as subspecies of a single species.

Gahnia vitiensis Rendle, J. Linn. Soc. Bot. 39: 179. 1909. TYPE: FIJI IS: VITI LEVU: Vicinity of Nandarivatu, Mba Province, X.1907, *Gibbs 613* (BM).

Distribution. Indigenous to Viti Levu, Vanua Levu, and Taveuni in Fiji, and Kaua'i and Hawai'i in Hawai'i.

The following key summarizes the essential differences.

Key to Subspecies of *Gahnia vitiensis*

1. Leaves 10–15 mm wide; spikelets obovoid, 3–3.5 mm long; achenes (1.8–)2–2.6 mm long . . . . . subsp. ***kauaiensis***
1. Leaves 7–10 mm wide; spikelets oblanceoloid, 2–3 mm long; achenes 1.7–2 mm long . . . . . subsp. ***vitiensis***

Gahnia vitiensis Rendle subsp. ***kauaiensis*** (Benl) T. Koyama, **comb. et stat. nov.** *Gahnia kauaiensis* Benl, Bot. Arch. 40: 190. 1940. *Gahnia javanica* Moritzi var. *ellipsoidea* Kükenth., Repert. Spec. Nov. Regni Veg. 16: 433. 1920. TYPE: HAWAIIAN IS: KAUA'I: Kauluweli Swamp, X.1911, *J. F. Rock 9020* (BISH–502529!, lectotype, selected by Benl [1940]).

Distribution. Subspecies *kauaiensis* occurs in open sites in wet forest and margins of bogs, vicinity of Alaka'i Swamp to Mount Wai'ale'ale, 610–1,590 m, Kaua'i.

Rhynchospora Vahl

There are 5 species of *Rhynchospora* in Hawai'i, including 3 indigenous species (*R. sclerioides* Hook. & Arnott and 2 taxa for which new classifications are here proposed), and 2 newly recorded naturalized species, both of which are native to North America.

Rhynchospora caduca Elliott

This species is native to the southern United States. It was first collected on Hawai'i in 1972. It now is naturalized in wet, disturbed areas, sometimes locally common, 320–1,400 m, on Maui and Hawai'i.

Representative specimens examined. HAWAIIAN IS: MAUI: Hāna Dist, Waimoku Falls, 1982, *Hobdy 1392* (BISH); HAWAI'I: South Hilo Dist, Kaūmana, 1972, *Shinbara H110* (BISH).

Rhynchospora chinensis Nees & Meyen subsp. ***spiciformis*** (Hillebr.) T. Koyama, **comb. et stat. nov.** *Rhynchospora spicaeformis* Hillebr., Fl. Hawaiian Isl. 477. 1888. TYPE: HAWAIIAN IS: MAUI: in the swamp on the summit of Mt Eeka ['Eke], before 1871, *W. Hillebrand s.n.* (B, presumably destroyed, holotype).

Distribution. Indigenous to China, Japan, India, Malesia, and Hawai'i; in Hawai'i occurring in open, wet sites in pastures, wet forest, and bogs, (150–)550–1,750 m, on Kaua'i, Moloka'i, Maui, and Hawai'i.

Rhynchospora globularis (Chapm.) Small

This species is native to the coastal plains of the United States from Delaware south to Florida and west to Texas. In Hawai'i it is apparently recently naturalized and local in disturbed sites along the Saddle Road, 400–1,500 m, Hawai'i Island.

Representative specimen examined. HAWAIIAN IS: HAWAI'I: S Hilo Dist, 4.7 mi E along Saddle Rd from jct. with road to Pi'ihonua in Kaūmana, 1982, *Wagner & Warshauer 4656* (BISH).

Rhynchospora rugosa (Vahl) Gale subsp. ***lavarum*** (Gaud.) T. Koyama, **comb. et stat. nov.** *Rhynchospora lavarum* Gaud., Voy, Uranie, part 10: 415. 1829. TYPE: HAWAIIAN IS: "Insulis Sandwicensibus (alt. 400–500 hexap."), 1819, *C. Gaudichaud-Beaupré s.n.* (P, holotype).

Distribution. Native to the Neotropics and Hawai'i; in Hawai'i occurring in wet forest and bogs, occasionally in mesic forest, 280–1,620 m, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i.

Subdivision of *Scirpus*

The genus *Scirpus* L. *sensu lato* is heterogeneous when compared to other genera in the Cyperaceae (Kern 1974). It traditionally comprises all of the species of the subfam. Cyperoideae except for a number of homogeneous groups relegated to separate genera. To make the classification of this assemblage more consistent within the family, the groups of species usually treated as sections should be elevated to generic status. These segregate genera are still often treated as sections within a more broadly delimited genus *Scirpus* (see Tucker 1987). The Hawaiian species have been traditionally treated as members of *Scirpus* (e.g. Koyama and Stone 1960); they are here relegated to 2 segregate genera, *Bolboschoenus* Palla and *Schoenoplectus* (Rchb.) Palla. These genera can be distinguished by the following key. A synopsis of the Hawaiian species is given after the key.

Key to *Bolboschoenus* and *Schoenoplectus*

1. Culms nodose, leafy; inflorescences subtended by 2 to few leaf-like bracts . . . . . ***Bolboschoenus***
1. Culms not nodose above base, naked with all leaves reduced to bladeless sheaths grouped at base of culms; inflorescences pseudolateral to the lowest erect, culm-like bract . . . . . ***Schoenoplectus***

Bolboschoenus Palla

In Hawai'i there is one indigenous species of *Bolboschoenus*.

Bolboschoenus maritimus (L.) Palla subsp. ***paludosus*** (A. Nels.) T. Koyama, **comb. et stat. nov.** *Scirpus paludosus* A. Nels., Bull. Torrey Bot. Club 26: 5. 1899. TYPE: U.S.A.: WYOMING: Granger, 30.VII.1897, *A. Nelson 3874* (RM).

Distribution. Widely distributed in saline or fresh water, on mudflats and in marshes at low elevations in temperate and tropical areas nearly worldwide; in Hawai'i primarily in coastal sites, 0–6 m, on Ni'ihau, Kaua'i, O'ahu, Moloka'i, and Maui.

Schoenoplectus (Rchb.) Palla

In Hawai'i there are 3 species of *Schoenoplectus*.

Schoenoplectus californicus (C.A. Mey.) Palla

Distribution. Native to coastal areas of southern United States (south of South Carolina and California) south to Argentina and Chile in salt or freshwater marshes at low elevations; in Hawai'i naturalized or possibly indigenous, 0–1,220 m, on all of the main islands except Kaho'olawe.

Schoenoplectus juncoides (Roxb.) Palla

Distribution. Occurring in wet sites, often in rice fields, from Japan south to Malesia and India, disjunct in Hawai'i and Fiji; in Hawai'i indigenous, occurring in and around bogs, pond margins, and in wet forest, (5–)180–1,370 m, on Kaua'i, and recently collected once in the Kohala Mountains, Hawai'i (*Stemmermann 6694*, BISH).

Schoenoplectus lacustris (L.) Palla subsp. ***validus*** (Vahl) T. Koyama **comb. et stat. nov.** *Scirpus validus* Vahl, Enum. Pl. 2: 268. 1805. TYPE: "in Caribaeis."

Distribution. Widely distributed in the New World and Pacific Basin; in Hawai'i indigenous, occurring in freshwater or brackish marshes, 0–1,220 m, on Ni'ihau, Kaua'i, O'ahu, Moloka'i, and Hawai'i.

IRIDACEAE

Aristea Aiton

Aristea gerrardii Weim.

Native to coastal Natal, South Africa; in Hawai'i naturalized plants documented only from Volcano, ca. 1,130 m, Hawai'i.

Specimen examined. HAWAIIAN IS: HAWAI'I: Puna Dist, Volcano, near Wright Road, recently naturalized on sunny, hard, packed lava under rock, 1975, *Degener & Degener 33566* (BISH).

TYPHACEAE

Typha L.

Typha latifolia L.

This species is native to Eurasia, northern Africa, and North America. In Hawai'i it is sparingly naturalized in low-elevation, marshy sites at least along the Wailua River, Kaua'i, and in the Salt Lake and Pearl Harbor areas, O'ahu, and perhaps also on Hawai'i. It can be distinguished from *T. domingensis* Pers., the other naturalized species of the genus in Hawai'i, by its pistillate flowers without scales, staminate flowers with simple hairs instead of scales, and by

contiguous (occasionally separated by an interval up to 2.5 cm long) staminate and pistillate spikes. The staminate and pistillate spikes of *T. domingensis* are separated by a gap of (0.5–)2–6 cm.

Representative specimens examined. HAWAIIAN IS: KAUA'I: Līhu'e Dist, in marshy places along Wailua River, 1988, *Wagner et al. 6000* (BISH); O'AHU: Honolulu Dist, in standing fresh water, Honolulu International Country Club, Salt Lake, 1979, *Liu s.n.* (BISH).

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LITERATURE CITED

Austin, D.F. 1987[1988]. Note on the identity of *Ipomoea koloaensis* Léveillé (Convolvulaceae). Pacific Sci. 41: 62–63.

Benl, G. 1940. Die Systematik der Gattung *Gahnia* Forst. Bot. Arch. 40: 151–257.

Carolin, R.C. 1964. The genus *Geranium* L. in the south western Pacific area. Proc. Linn. Soc. New South Wales 89: 326–61.

Davidse, G. In press. A new species, new variety, and new combinations in Hawaiian *Panicum* (Poaceae: Paniceae). Ann. Missouri Bot. Gard. 75.

Fosberg, F.R. 1937a. Immigrant plants in the Hawaiian Islands. I. Occas. Pap. Univ. Hawaii 32: 1–11.

——. 1937b. The genus *Gouldia* (Rubiaceae). Bernice P. Bishop Mus. Bull. 147: 1–82.

——. 1943. The polynesian species of *Hedyotis* (Rubiaceae). Bernice P. Bishop Mus. Bull. 174: 1–102.

——. 1966. Miscellaneous notes on Hawaiian plants—4. Occas. Pap. Bernice P. Bishop Mus. 23(8): 129–38.

——. 1987. A new *Pisonia* (Nyctaginaceae) from the Hawaiian Islands. Phytologia 62: 177–78.

Hayden, W.J. 1987. The identity of the genus *Neowawraea* (Euphorbiaceae). Brittonia 39: 268–77.

Heller, A.A. 1897. Observations on the ferns and flowering plants of the Hawaiian Islands. Minnesota Bot. Stud. 1: 760–922.

Henrickson, J. & D.R. Herbst. 1988. *Uncinia* Pers. (Cyperaceae) in the Hawaiian Islands. Pacific Sci. 42: 230–36.

Hillebrand, W. 1888. Flora of the Hawaiian Islands: A description of their phanerogams and vascular cryptogams. Carl Winter, Heidelberg, Germany; Williams & Norgate, London; B. Westermann & Co., New York, 673 p. (Facsimile ed., 1965, Hafner Publ. Co., New York, 673 p.; facsimile ed., 1981, Lubrecht & Cramer, Monticello, N.Y., 673 p.)

Jones, A.G. 1984. Nomenclatural notes on *Aster* (Asteraceae)—III. The status of *A. sandwicensis*. Brittonia 36: 463–66.

Kern, J.H. 1974. Cyperaceae. Fl. Males. I. 7: 435–753.

Koyama, T. & B.C. Stone. 1960. The genus *Scirpus* in the Hawaiian Islands. Bot. Mag. (Tokyo) 73: 288–94.

Krauss, R.W. 1950. A taxonomic revision of the Hawaiian species of the genus *Carex*. Pacific Sci. 4: 249–82.

Lackey, J.A. 1977. *Neonotonia*, a new generic name to include *Glycine wightii* (Arnott) Verdcourt (Leguminosae, Papilionoideae). Phytologia 37: 209–12.

Lammers, T.G. 1988. New taxa, new names, and new combinations in the Hawaiian Lobelioideae (Campanulaceae). Syst. Bot. 13: 496–508.

Mann, H. 1866. Revision of the genus *Schiedea*, and of the Hawaiian Rutaceae. Proc. Boston Soc. Nat. Hist. 10: 309–19.

——. 1867. Enumeration of Hawaiian plants. Proc. Amer. Acad. Arts 7: 143–235.

Medeiros, A.C. & H. St. John. 1988. *Geranium hanaense* (Geraniaceae), a new species from Maui, Hawaiian Islands. Brittonia 40: 214–20.

Nagata, K.M. 1987. Observations on some adventive species in the Hawaiian flora. Bishop Mus. Occas. Pap. 27: 126–31.

——. 1988. Notes on some introduced flora in Hawai'i. Bishop Mus. Occas. Pap. 28: 79–84.

Nagata, K.M. & S.M. Gon III. 1987. *Sanicula mariversa* (Apiaceae), a new species from 'Ōhikilolo Ridge, Wai'anae Mountains, O'ahu in the Hawaiian Archipelago. Syst. Bot. 12: 406–09.

Orchard, A.E. 1975. Taxonomic revisions in the family Haloragaceae I. The genera *Haloragis*, *Haloragodendron*, *Glischrocaryon*, *Meziella* and *Gonocarpus*. Bull. Auckland Inst. Mus. 10: 1–299.

Pax, F. & K. Hoffmann. 1934. Caryophyllaceae. Nat. Pflanzenfam. ed. 2, 16c: 275–364.

Rollins, R.C. 1986. Alien species of *Lepidium* (Cruciferae) in Hawaii. J. Arnold Arbor. 67: 137–41.

St. John, H. 1973. List and summary of the flowering plants in the Hawaiian Islands. Pacific Trop. Bot. Gard. Mem. 1: 1–519.

Sherff, E.E. 1938. Studies in the genus *Labordia* Gaud., with a new variety in *Megalodonta* E. L. Greene. Amer. J. Bot. 25: 579–89.

——. 1944. Some additions to our knowledge of the flora of the Hawaiian Islands. Amer. J. Bot. 31: 151–61.

Skottsberg, C. 1944. On the flower dimorphism in Hawaiian Rubiaceae. Ark. Bot. 31A(4): 1–28.

——. 1953. Chromosome numbers in Hawaiian flowering plants. Ark. Bot. 3: 63–70.

Stone, B.C. 1967. A review of the endemic genera of Hawaiian plants. Bot. Rev. (Lancaster) 33: 216–59.

Tucker, G.C. 1987. The genera of Cyperaceae in the southeastern United States. J. Arnold Arbor. 68: 361–445.

Wagner, W.L. 1988. Reevaluation of *Chamaesyce forbesii* (Euphorbiaceae). Bishop Mus. Occas. Pap. 28: 71–78.

Wagner, W.L. & D.R. Herbst. 1987. A new species of *Remya* (Asteraceae: Astereae) on Kaua'i and a review of the genus. Syst. Bot. 12: 601–08.

Wagner, W.L., D.R. Herbst & S.H. Sohmer. 1986. Contributions to the flora of Hawai'i I. Acanthaceae-Asteraceae. Bishop Mus. Occas. Pap. 26: 102–22.

——. In press. Manual of the flowering plants of Hawai'i. University of Hawaii Press and Bishop Museum Press, Honolulu.

Wawra, H. 1874. Beiträge zur Flora der Hawai'schen Inseln. Flora 57: 273–78.