

Botanical Novelties on the Island of Niihau, Hawaiian Islands

Hawaiian Plant Studies 25¹

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IN 1947 and again in 1949 the writer was so fortunate as to be able to make botanical explorations on the island of Niihau, a remote, high island of the principal group of Hawaiian Islands. A lengthy account of its flora is in preparation. It seems desirable now to put on record the new botanical discoveries made on that island or in connection with the investigation of its flora.

The holotypes of the new species are in the Bernice P. Bishop Museum, Honolulu, (BISH), unless otherwise specified.

GRAMINEAE

Panicum Heupueo sp. nov. (subgenus
Panicum)

Fig. 1

NOM. VERN.: "heupueo" (= fine hairs on the owl); also called, "hakonakona," perhaps in error, as that is the established name of *P. torridum* Gaud.

DIAGNOSIS HOLOTYPI: Breviter annum erectum 16–34 cm. altum plerumque e basi

unicauliferum sed supra basem culmis bifurcatis cum ramis subaequalibus, internodis superioribus villosis inferioribus glabris, internodis plantarum parvarum quam vaginam brevioribus sed plantarum magnarum ad bis longioribus quam vaginam, vaginis 15–29 mm. longis valde nervosis pustulato-albiciliatis, pilis 0.2–0.4 mm. longis, laminis 4–10 cm. longis 2–4 mm. latis planis linearibus acutis albo-villosis in ambis lateris, paniculis 2–8 cm. longis 5–30 mm. latis densis in culmis omnibus terminalibus in basi vaginatis, ramulis adscendentibus valde adpressis sed post florendis ramulis superioribus paene divergentibus, rhachide ad basim sparse piloso sed ad apicem scabro, ramulis scabris, spiculis 1.2–1.5 mm. longis elliptico-ovoideis acutis glabris pallidis scariosis viridi-nervosis, gluma prima 1.9 mm. longa 1.2 mm. lata 3-nervata lanceo-ovata, gluma secunda 1.7 mm. longa 1.4 mm. lata late elliptica acuta 7-nervata, lemma sterilis 1.8 mm. longa 1.1 mm. lata late elliptica acuta, palea sterilis 1.1 mm. longa 0.5 mm. lata elliptica membranacea in basi involuta, lemma fertilis 0.9–1 mm. longa 0.6 mm. lata ovata cartilaginea lucida alba deinde brunneo-plumbaginea indistincte 5-nervata concava marginibus involutis, palea subconcava clausa 3-nervata, antheris 0.4 mm. longis oblongis, stigma dendritica.

DESCRIPTION OF ALL SPECIMENS: Short-lived annual, erect, 10–53 cm. tall, mostly 1-stemmed from the base, but above it the culms repeatedly bifurcate, with subequal branches; internodes villous on upper part, glabrous on lower; on small plants the internodes shorter than the sheaths but on larger ones the internodes as long as twice the length of the sheaths; leaf sheaths 15–48 mm. long, strongly nerved, pustulate white villous;

¹ This is the twenty-fifth of a series of papers designed to present descriptions, revisions, and records of Hawaiian plants. The preceding papers have been published in B. P. Bishop Mus., Occ. Papers 10(4), 1933; 10(12), 1934; 11(14), 1935; 12(8), 1936; 14(8), 1938; 15(1), 1939; 15(2), 1939; 15(22), 1940; 15(28), 1940; 17(12), 1943; Calif. Acad. Sci., Proc. IV, 25(16), 1946; Torrey Bot. Club, Bul. 72: 22–30, 1945; Lloydia 7: 265–274, 1944; Pacific Sci. 1(1): 5–20, 1947; Brittonia 6(4): 431–499, 1949; Gray Herb., Contrib. 165: 39–42, 1947; Pacific Sci. 3(4): 296–301, 1949; 4(4): 339–345, 1950; B. P. Bishop Mus., Occ. Papers 20(6), 1950; Pacific Sci. 6(1): 30–34, 1952; 6(3): 213–255, 1952; 8(2): 140–146, 1954; Polynesian Soc., Jour. 63(1): 27–34, 1954; B. P. Bishop Mus., Occ. Papers 21(15), 1955; Brussels Jard. Bot. de l'État Bul. 27(1): 49–54, fig. 2, 1957.

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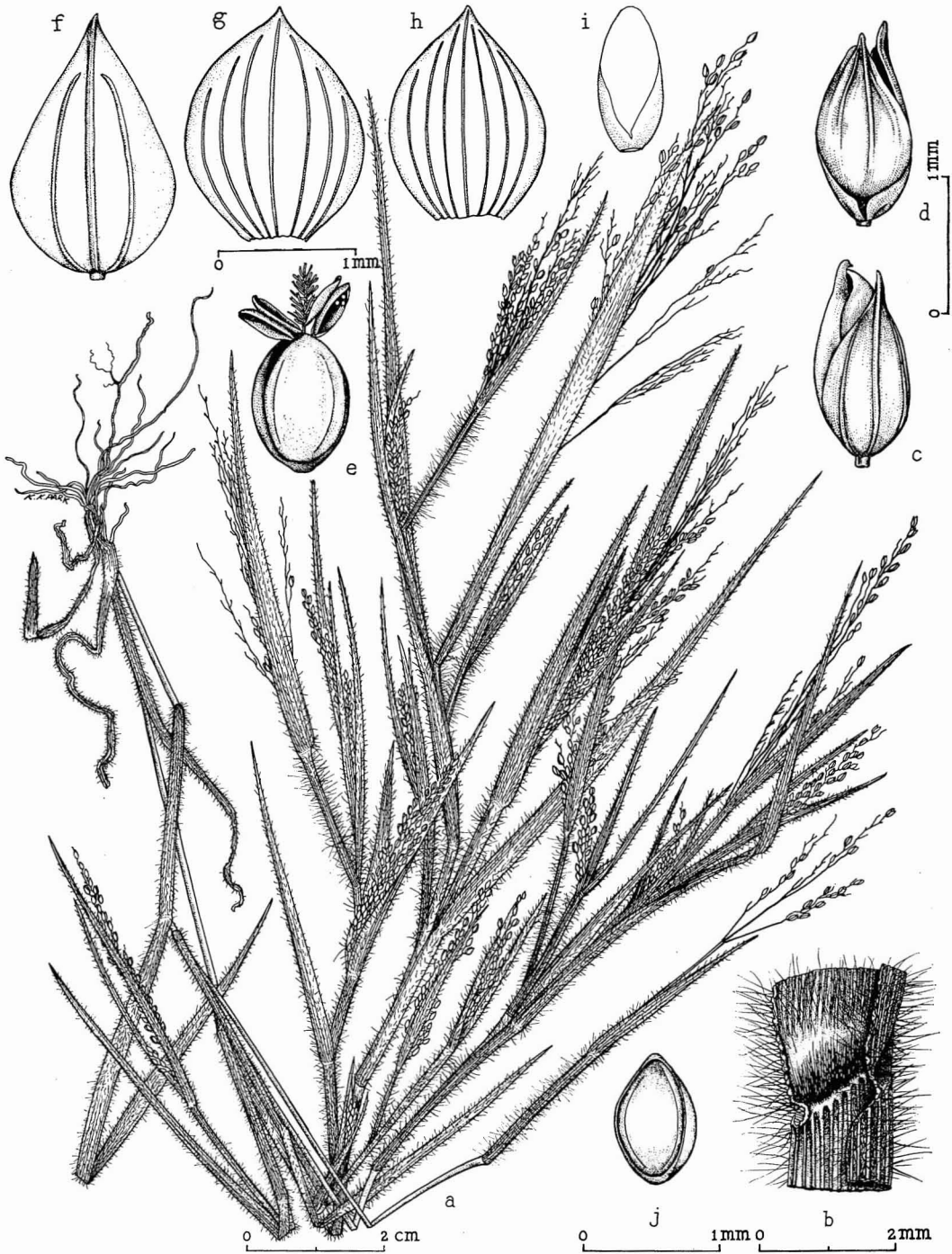


FIG. 1. *Panicum Heupueo*, from the holotype: *a*, habit $\times 1$; *b*, blade and sheath $\times 10$; *c*, spikelet $\times 20$; *d*, spikelet $\times 20$; *e*, floret $\times 20$; *f*, first glume, dorsal view, $\times 20$; *g*, second glume, dorsal view, $\times 20$; *h*, sterile lemma, dorsal view, $\times 20$; *i*, sterile palea, ventral view, $\times 20$.

ligule a narrow membrane, pilosulous ciliate with hairs 0.2–0.4 mm. long; blades 3–13 cm. long, 2–6 mm. wide, flat, linear, acute, white villous on both sides; panicles 2–15 cm. long, 3–50 mm. wide, dense, terminal on all branches, enfolded at base by the leaf blade or sheath, the ascending branches closely appressed, but after anthesis the upper ones slightly diverging; the rhachis sparsely pilosulous towards the base, but towards the apex scabrous; branchlets scabrous; spikelets 1.2–1.5 mm. long, elliptic ovoid, acute, glabrous, pale scarious, with greenish nerves; first glume 1.9 mm. long, 1.2 mm. wide, 3-nerved, lance-ovate; second glume 1.7 mm. long, 1.4 mm. wide, broadly elliptic, acute, 7-nerved; sterile lemma 1.8 mm. long, 1.1 mm. wide, broadly elliptic, acute; sterile palea present, 1.1 mm. long, 0.5 mm. wide, elliptic, membranous, enfolded at base; fertile lemma 0.9–1 mm. long, 0.6 mm. wide, ovate, cartilaginous, shining, white, then brownish lead-colored, faintly 5-nerved, concave, the margins inrolled; palea gently concave, enclosed, 3-nerved; anthers 0.4 mm. long, oblong; stigma dendritic.

HOLOTYPE: Niihau, Kii, between basalt rocks, on rocky knoll, 100 ft. alt., April 2, 1949, *H. St. John* 23,666 (BISH).

SPECIMENS EXAMINED: Kii, with same data, *St. John* 23,665; 23,670.

The new species is a member of the subgenus *Panicum* (formerly *Eupanicum*) but it is not here assigned to a section. Neither the treatment of the genus in North America by Hitchcock and Chase nor the world treatment by Pilger in the second edition of Engler's "Pflanzenfamilien" has any section into which this species will fit. It comes closest to agreeing with the characters of section *Capillaria*, but it disagrees in several characters.

The most closely related species is *P. Fauriei* Hitchc. of the islands of Hawaii, Maui, Molokai, and Oahu. This species differs in having the sheaths appressed puberulous, the ligule a membrane with pilose hairs 1 mm. long; the blades 0.8–3.5 mm. wide,

mostly involute, and below appressed puberulous; the panicle rhachis and branchlets ascending villosulous; the spikelets 1.8–2.1 mm. long, and the fertile lemma 1.2 mm. long. In contrast, *P. Heupueo* is distinguished by having the sheaths villous; the ligule a very narrow membrane pilosulous ciliate with hairs 0.2–0.4 mm. long; blades 2–6 mm. wide, flat, villous above and below; panicle with the rhachis below sparsely pilosulous, above scabrous, the branchlets scabrous; the spikelets 1.2–1.5 mm. long; and the fertile lemma 0.9 mm. long.

Panicum radiatum nom. nov.

Paspalidium radiatum Vickery, N. S. Wales Natl. Herb., Contr. 1(6): 332–334, 1950; non *Panicum radiatum* R. Br., Prodr. Fl. Nov. Holl. 192, 1810 which is *Digitaria tonsa* D. K. Hughes, Kew Bul. 313, 1923.

The genus *Paspalidium* was described in the *Flora of Tropical Africa*, vol. 9, by Stapf. It was published in 1917 in the key only, then in 1920 a description of the genus and of the two species followed. The genus was validly published, but not contrasted with the related genera or discussed. It now has been accepted and enlarged, especially in Australia, but little has been added to substantiate its generic status. The spikelets are biseriate on 1-sided lateral spikes, but in detail are like those of species in the enormous genus *Panicum*. A revision of the Australian species has been announced by S. T. Blake, so a disposition of the other species should await that treatment. However, the structure of the spikelet agrees well with that of *Panicum* and the inflorescence seems to show a reduced state derived from a panicle, so it is here maintained that the best assignment for the species introduced to Hawaii is in the genus *Panicum*. A new name is proposed because of the existence of an earlier homonym in *Panicum*.

Niihau: Short grass that appeared on its own on Niihau, November 1, 1939, G. C. Munro; Kiekie, 50 ft. alt., cultivated pasture

grass, *St. John* 23,661. The Munro collection had once been determined as *Paspalidium caespitosum* C. E. Hubbard.

CYPERACEAE

Eleocharis calva Torr. var. *australis* (Nees) comb. nov.

Fig. 2

E. palustris (L.) R. & S. var. *australis* Nees, Acad. Caes. Leop. Nat. Cur., Nov. Act. 19, Suppl. 1: 96, 1843 (as *E. palustris* R. Br. β *Australis* Nees).

Scirpus nudissimus Steud., Soc. Linn. de Normandie, Bull. II, 9: 280, 1875, synonym. nov.

E. palustris sensu Hbd., Fl. Haw. Is. 474, 1888, and of C. N. Forbes, B. P. Bishop Mus., Occ. Papers 7(5): 48, 1920; not of (L.) R. & S.

E. calva sensu Fernald & Brackets as to Oahu plant, *Rhodora* 31: 68–70, 1929; not of Torr.

E. macrostachya sensu Svenson as to Oahu plants, *Rhodora* 41: 57, 1939; not of Britt. NOM. VERN.: "kohekohe."

Niihau: Loe Lake, 2 miles N. of Puuwai, marshy border of temporary flood-water lake, 10 ft. alt., plants up to 12 dm. tall, basal sheaths red, *St. John* 23,598.

Hillebrand (1888: 474) apparently did not encounter this plant in the Hawaiian Islands, but included it doubtfully in his *Flora of the Hawaiian Islands*, upon the report of Meyen's collection by Kunth (1843: 96). It seems strange that Hillebrand did not find this species. Quite a number of collections of it are now known and some of them were previous to Hillebrand's time in the Islands (1850–71). The collections are as follows:

1825: James Macrae (Herb. Lindley)

1831: Maio, in Oahu insula, F. J. F. Meyen (Vienna Herb.)

1842: Oahu, U. S. Exploring Expedition (Gray Herb.)

1920: Oahu, Kaimuki, creeping in the mud, March 26, 1916, C. N. Forbes 2360.0 (Bishop Mus.)

1927: Oahu, O. Degener 9,002 (N. Y.)

1949: Niihau, Puuwai, H. St. *John* 23,598 (Bishop Mus.)

1950: Niihau, "tohetoe," September, Henry Judd (Bishop Mus.)

In 1929 Fernald and Brackets (p. 68) identified this with *Eleocharis calva* Torr., occurring from Quebec to Alberta and Washington, south to Florida, Oklahoma, and Mexico, and also in Manchuria. It is close to this species because of the close, red sheaths, the linear-lanceoloid spikes with a single basal sterile scale. This primarily American species has the plant loosely stoloniferous to slightly caespitose; culms 1–6.5 dm. tall, 0.5–1.5 mm. in diameter; lower and median fertile scales 1.8–3 mm. long, oblong to ovate, reddish to pale brown; anthers 1.3–1.7 mm. long; achenes 1–1.4 mm. long, 0.7–1 mm. broad; style base 0.2–0.4 mm. broad at base, conical; perianth wanting or of 1–4 delicate bristles usually equaling or slightly exceeding the style base. The local *E. calva* var. *australis* has the plant short stoloniferous but densely caespitose in habit; culms 1–12 dm. tall, 1–3 mm. in diameter; lower and median fertile scales 3–4 mm. long, lance-ovate, castaneous between the hyaline margin and the pale midrib; anther 2 mm. long; achenes 1.7–1.9 mm. long, 1.2–1.3 mm. wide; style base 0.4–0.6 mm. wide, deltoid-ovoid; perianth of 4 stout bristles, retrorse barbellate and nearly or fully as long as the achene. The Hawaiian plant seems clearly separable from *E. calva*.

In 1939 Svenson in his monograph reduced *Scirpus nudissimus* Steud. He called it a "nomen subnudum" (*Rhodora* 41: 57, 1939) but there is no such designation in our present International Code. There is the term "nomen nudum" for names published without any description. Steudel's description was as follows:

"5. Le *S. nudissimus*, Steud., se compose d'une tige terminée par un épi grêle, d'ou son nom spécifique; mais Steudel ajoute: nisi forte *Eleocharis palustris*, var?" This original publication included two items of descrip-

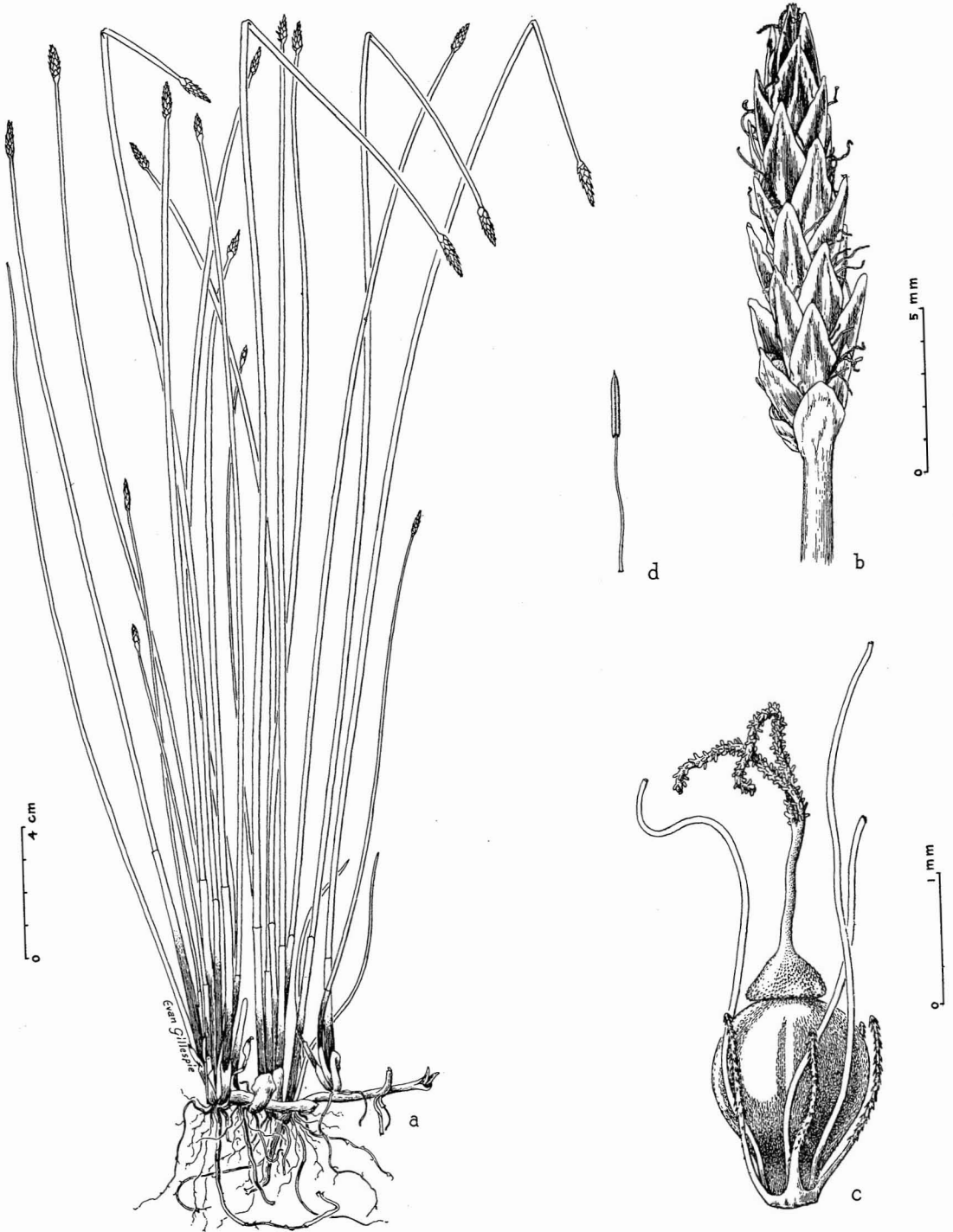


FIG. 2. *Eleocharis calva* var. *australis*, from St. John 23,598: *a*, habit $\times \frac{1}{2}$; *b*, spike $\times 5$; *c*, achene $\times 20$; *d*, stamen $\times 5$.

tion: spikelet slender; plant appearing like a variety of *Eleocharis palustris*. If this plant (see Fig. 2) is compared with *E. palustris* (see Rhodora 31: pl. 181, figs. 1–4), it will be seen that the spikelets are much more slender.

Svenson also refers to *E. macrostachya* the Oahu plant described from the collection by Meyen. This was published as: "E. palustris R. Br. (β Australis Nees squamis spicae acutiusculis albis tenuibus nervo medio pallide viridi litura cuspidato fusco cincto.)."

In Oahu insula, Maio 1831, Meyen; ex eadem insula Macrae in Herb. Lindl."

Both *Scirpus nudissimus* Steud. and *Eleocharis palustris* var. *australis* were referred by Svenson to *E. macrostachya* Britt. This species, occurring from Illinois to British Columbia, south to Louisiana, California, and Michigan, is recognizable by having culms compressed, soft, very flat after pressure; lowest sterile scales 2–3; achenes averaging 1 mm. wide; bristles 5–6 (or –8, or 0) very delicate, often overtopping the achene and style base, the teeth slender. On the other hand, the Hawaiian *E. palustris* var. *australis* has the culm terete, soft, little flattened under pressure; lowest sterile scale 1, encircling the base $\frac{3}{4}$ way; achenes 1.2–1.3 mm. wide; the 4 bristles stout, nearly or quite equalling the achene body, with stout retrorse teeth.

It is also related to *E. palustris* (L.) R. & S., and more closely to its var. *major* Sonder which occurs from Labrador to British Columbia and south to Pennsylvania, Iowa, Wyoming, and California. This var. *major* has the sheaths 3–30 cm. long, comparatively loose; culms 5–19 dm. tall; spikelets 0.7–2.6 cm. long, 2.5–7 mm. thick, lanceolate to ovoid, $\frac{1}{3}$ as wide as long; basal scales 2–3; lower and median fertile scales 3.2–5.5 mm. long; bristles 4, slender, commonly reaching to the middle of the style base; style base lanceoloid-conic, much higher than broad. The Hawaiian var. *australis* has the sheaths 3–8 cm. long, close; culms 1–12 dm. tall; spikelets 1.3–1.7 mm. long, 2.5–3.5 mm. thick, narrowly linear-lanceoloid, $\frac{1}{4}$ as wide

as long; basal scale 1; lower and median fertile scales 3–4 mm. long; the 4 bristles stout, nearly or quite equalling the achene; style base deltoid-ovoid, as wide as long. In any other group, this isolated Hawaiian kind, having significant characters that separate it in the keys from the American and Eurasian species, in this instance from *E. palustris*, *E. calva*, and *E. macrostachya*, and even by its truncate, indurate, apiculate sheaths from subseries *Palustres*, a natural conclusion would be that it too should be classed as a species. However, consideration should be given to the commentary on the subseries *Palustres* by the recent monographer of the genus, H. K. Svenson (1939: 55, 59).

In the eastern United States . . . the entities are clear; in Europe and in the western United States, the situation seems to be chaotic. The *Palustres*, chiefly of holarctic distribution, have probably spread out in post-glacial time, achieving a variation comparable with that of *Rubus* or *Crataegus*. In Western United States, with its natural barriers and diversified terrain, numerous intergrading geographical races have developed, the most noteworthy of which I have illustrated by drawings and photographs. It would be perfectly easy to describe more species in this group, adding to the plethora of intangible species, but I have made little or no change. In my mind, there is even some question whether more than a single good species of the *Palustris* group exists in northwestern Europe, and whether in Europe these are not environmental responses to sea-strand, meadow, and bog, which parallel the variation of *E. palustris* in western America. Although I have spent an inordinate amount of time on this group and have seen a vast amount of material, the problems do not appear to be close to solution. . . . The *Palustris* group appears to be equally complex in Asia. . . .

He gives many details of the variability or plasticity of *E. palustris* and its relatives in Europe.

Realizing these facts, it does not appear wise to give the Hawaiian *Eleocharis* specific rank, even though there is a name available

for transfer. The plant is related to *E. palustris*, but that natural group has the spikelet with 2-3 sterile basal scales. Since the Hawaiian plant has, like *E. calva*, the single basal scale, the similar linear-lanceoloid spikes, the similar shaped achene and style base, and prominent red basal sheaths, it appears to be most closely related to that species. The differences between the two are tabulated a few pages back. When evaluated, these morphological differences are of some significance, but in the subseries *Palustres* with its variable or merging taxa distributed well around the northern hemisphere, the best method of classification seems the ultraconservative. It is concluded that the Hawaiian plant is a local, endemic variety, allied to *E. calva*, and best placed as a variety of it. Hence, the combination for it as a variety of that species is here made.

Now that abundant and complete material of this plant from Oahu and Niihau is at hand, it is possible to tabulate its characters, and re-evaluate its distinctions. Knowing the high endemism in the Hawaiian flora (92 per cent or more), one could easily take the view that with any clear differences, this plant could well be classed as an endemic Hawaiian species. It was collected as early as 1825 when there were few adventives present. It has been collected five times since then. Though it is not common, it must be remembered that it is a lowland plant of fresh marshy habitats. Most of the collections on Oahu were in present or former cultivated lands—taro patches. It was thus a weed in the taro patch. Most weeds are adventives, but in wet cultivations the percentage of native plants persisting in the taro patch, cranberry bog, or rice paddy is much higher than in dry land agricultural fields. On Niihau it was not in agricultural land, but by the edge of a small lake on the coastal plain bordering the mountainous upland. Flood waters make a lake that may last for several months, then for the remainder of the year the spot is parched and completely dry and alkaline. There is no taro

cultivation anywhere in the vicinity. From the habitat and the manner of its occurrence, it seemed to the collector to be a native plant on Niihau. It may also be a native of Oahu, persisting only in existing or former taro patches. On a small island like Oahu, with a large population depending on taro as the basic crop, nearly all natural fresh ponds and swamps were converted into taro patches. Also, almost every lowland alluvial spot to which irrigation water could be conducted, was made into a taro patch. Thus, even in aboriginal times, the swampy habitats, natural to *Eleocharis*, were converted to intensively cultivated taro patches. Since the discovery and westernization of the islands, these lands on Oahu have in part been used continually as taro patches, but in recent times more largely occupied for sugar cane plantations or for house lots. The *Eleocharis* is now rare on Oahu, but well preserved on Niihau, and visible there for a few months after heavy southerly winter rains.

It is also significant that the deep red basal sheaths were gathered by the native Hawaiians on Niihau and plaited to form ornamental geometrical patterns, mostly small triangles, near the border of the plant, fine mats called "pawehe" to distinguish them from the pure white ones called "makaloa," made solely of the stems of *Cyperus laevigatus* and lacking the red, ornamental inlay. It appears that the "pawehe" mats were made only on Niihau. Aylmer F. Robinson wrote (in a letter of July 26, 1952), "I believe the art is very old, and indigenous, though right now I do not think of any proof of it." There are in the Bishop Museum several of these mats, but none of the older ones are definitely dated. One was probably made at least as long ago as early in the 19th century. Hence, from the early occurrence on Oahu and Niihau, from the artistic use in fine matting by the natives, and from its distinctive morphology, it is concluded that *Eleocharis calva* var. *australis* is a variety endemic to the Hawaiian Islands. Since it has not been illustrated, and since

most of the older collections are incomplete or immature, an illustration made from the Niihau collection, *St. John* 23,598, is included.

PALMAE

Pritchardia Aylmer-Robinsonii sp. nov.

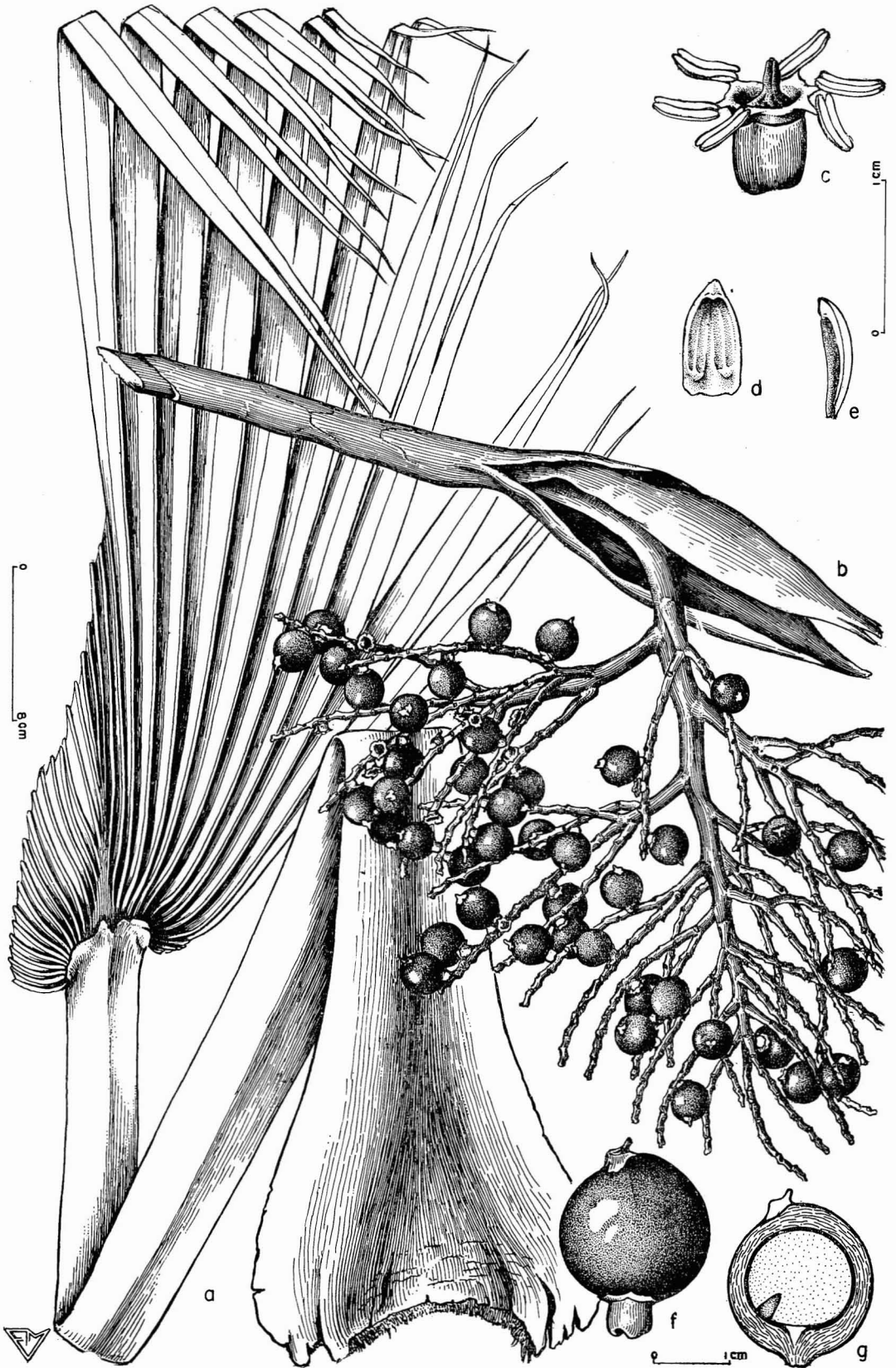
Fig. 3

NOM. VERN.: "wahane," or occasionally "hawane."

DIAGNOSIS HOLOTYPI: Arbor, stirpe unica erecta 7 m. alta, 2 dm. diametro, summa turbinata densa 35–40-folifera, foliis adscendenti-divergentibus, deinde foliis marcidis pendentibus, petiolis 92 cm. longis in basi 19 cm. latis in apice 3.7 cm. latis clariter viridibus glabris, scutello 2–4 cm. longo glabro valde obliquo late obtuso apice anguste acuminato fugaceo, laminis 1 m. longis clariter viridibus et in maturis in lateribus ambis glabris, segmentis multis per 4 dm. partitis apicibus bilobatis tenuibus pendulis sensim diminuentibus acutisque, paginis ambis cum nervulis transversis minute striatis, segmentis centralibus in basi 17 mm. latis, segmentis immaturis complicatis infra in costis et petiolis dense fusco-lanatis, pilis omnibus similibus gracilibus et implicatis vel cum lepidiis paucis permixtis, spadiceis glabris apicibus liberis expansis 15–20 cm. longis anguste ellipticis concavis, inflorescentiis geminatis 6–9 dm. longis glabris, pedunculis 40–55 cm. longis, paniculis 25–30 cm. longis, 25–30 cm. diametro ovoideis, ramis secundariis ferentibus 2–9 ramulis floriferis 4–13 cm. longis 2–4 mm. diametro glabris, bracteis et alabastris in exemplare desunt, calycibus 4 mm. longis minime tridentatis subcylindricis, nervis obscuris sed in apicibus ad dentibus manifestis et convergentibus, petalis 7.5 mm. longis 3.8–4 mm. latis ellipticis in basi truncatis intra cum impressio antherarum sulcatis caducis, circulo staminali extra calycem 1–1.5 mm. exserto et distento, filamentis rotatis parte libera 1.5–2 mm. longa, antheris 4.5 mm. longis divergentibus anguste oblongis ob-

tusis et emarginatis, ovario sulcato apici conico, stigmati trigonali truncato, fructibus orbicularibus 18–20 mm. diametro nigris duris, pericarpis 2.5–3.5 mm. crassis, mesocarpis grumosis et fibrosis pallidis, endocarpis 0.5 mm. crassis brunneis, testis levigatis atrobunneis, endospermis albis osseosis, perianthiis fructiferis 3.5–4 mm. longis 4–5 mm. latis subcylindratis a latere compressis.

Tree with single erect trunk 7 m. tall, 2 dm. in diameter; crown turbinate, dense with the numerous (35–40) leaves, ascending, spreading, then on withering becoming pendent, and the inflorescences making the same descending, semicircular course of movement; petiole 92 cm. long, 19 cm. wide just above the base, 3.7 cm. wide at apex, after expansion bright green, glabrous; scutellum 2–4 cm. long, glabrous, very oblique, broadly obtuse with a narrow acuminate, fugaceous apex; blade parted into numerous segments, measuring 1 m. from the ligula to the apex, bright green and glabrous on both sides long before maturity; segments parted for about 4 dm., rather thin and drooping, deeply parted into two, gradually tapering acute tips; both surfaces finely striate with oblique transverse veinlets; central and largest segments 17 mm. wide at their disjunction points; young unexpanded leaves having the back of the petiole and the costae of the lower blade surface densely lanate with a fawn-colored coat, the hairs fine and tangled, uniform or mixed with a few lepidia; spadices glabrous, the free expanded tips 15–20 cm. long, narrowly elliptic, concave; inflorescences paired, 6–9 dm. long, glabrous; peduncle 40–55 cm. long; panicle 25–30 cm. long, 25–30 cm. in diameter, ovoid; secondary branches bearing 2–9 floriferous branches, these 4–13 cm. long, 2–4 mm. in diameter, slightly zigzag between the nodes, glabrous; bracts and buds not collected; calyx 4 mm. long, perceptibly 3-toothed, subcylindric, nerves obscure but their tips visible and converging towards the calyx teeth; petals 7.5 mm. long, 3.8–4 mm. wide, elliptic, the base truncate, the apex



subacute, thick and coriaceous, within longitudinally furrowed by the impress of the anther sacs, caducous; staminal ring exerted 1–1.5 mm. beyond the calyx and wide flaring; filaments diverging almost horizontally, the free part 1.5–2 mm. long; anthers 4.5 mm. long, divergent, narrowly oblong, obtuse and emarginate; ovary with the exposed tip conical, furrowed and ridged below; stigma trigonous, truncate; fruit spherical, 18–20 mm. in diameter, black, hard; pericarp 2.5–3.5 mm. thick; mesocarp grumous and fibrous, pale, endocarp 0.5 mm. thick, brown; seed coat smooth, dark brown; endosperm white, bony; fruiting perianth subcylindric, 3.5–4 mm. long, 4–5 mm. wide, laterally compressed.

HOLOTYPE: Niihau, Mokouia Valley, south ridge of, knoll, protected by basalt boulders, 875 ft. alt., August 15, 1947, *H. St. John* 22,813 (BISH).

This new species of palm was the most interesting find made during the visit to Niihau, and is a vivid reminder of the various other indigenous plants that doubtless formed a scrub or forest growth on the uplands, before their destruction by grazing animals. First a single palm tree was seen, at the head of the entrenched lower part of Haa Valley at 250 feet altitude. It was rooted in a rugged rocky talus just below the cliffs forming the cirque-like head wall. The trunk was about 15 meters tall and 30 centimeters in diameter, and it projected high above the cliff walls. The crown was unhealthy, and there were no inflorescences, probably due to a large hole bored into the trunk near the apex, probably by some animal. The next specimens were seen on the south divide of Mokouia Valley at 875 feet altitude, on the top of a prominent summit. Here in a forbidding jumble of great basalt boulders was one tree, healthy, and in flower and fruit, and it furnished the type specimens. At its foot were several seedlings with good leaves, but scarcely any trunk de-

veloped as yet. The crown of the large tree was dense and it bore many inflorescences in flower and fruit. The writer shinnied up the trunk, 7 meters tall, grasped a lower leaf and hung there to rest, but then was too tired to scramble into the crown. He cut off a leaf, inflorescences with flowers and ones with fruits, then slid exhausted down the trunk. More specimens could have been obtained by felling the tree, but to do that to a rare survival near extinction would have been vandalism. A third grove was shown to the collector on the lower north slope of Kapaka Valley which is the next major valley northeast of Mokouia Valley, and debouching on the plain about one eighth mile east of Puu Alala. Here, rising out of a tangle of *Prosopis chilensis* trees, was a small clump of the *Pritchardia*, several smaller ones and two mature trees reaching about 7 and 10 meters in height. The native guide who knew the island thoroughly did not know of any other existing trees. These few survivors were in localities where the rugged and steep rocky slopes gave them some protection from the grazing sheep and cattle. Even so, the species is on the point of extinction.

The new species is named in compliment to Aylmer F. Robinson, in recognition of his keen interest in and wide knowledge of the natural productions of Niihau. His suggestions made the time in the field much more productive, and he has kindly reviewed both the botany and the Hawaiian names in this report. It is a pleasure to name this Niihau tree for Mr. Robinson.

The report by David Samuel who visited Niihau on January 29, 1778, with Captain Cook, that he saw "two or three palm trees," might have referred to the new species of *Pritchardia*, or to *Cocos nucifera*. From the vague nature of his statement, it is not now certain what palm he saw. His words are quoted by Handy (1940: 153).

FIG. 3. *Pritchardia Aylmer-Robinsonii*, from the holotype: a, leaf $\times \frac{1}{4}$; b, fructescence $\times \frac{1}{4}$; c, flower $\times 2$; d and e, petals $\times 2$; f, fruit $\times 1$; g, fruit in longitudinal section $\times 1$.

AMARANTHACEAE

Nototrichium sandwicense (Gray ex Mann)
Hbd. var. *niihauense* var. nov.

Fig. 4

DIAGNOSIS HOLOTYPE: Frutex 1–3 m. alta, laminis 5.7–15.8 cm. longis, 2.8–9.1 cm. latis, spicis 2–6 cm. longis recurvatis pervillosis et floribus clausis, bracteis rhachidis 2–2.5 mm. longis, bracteis florum 2.3–2.7 mm. longis, sepalis 3–3.5 mm. longis obscure plurinervis dense albo villosis in omnibus partibus excepta margine, antheris 0.5 mm. longis cellulis connectis.

DESCRIPTION OF ALL SPECIMENS: Shrub 1–3 m. tall, as much as 2 cm. in diameter at base; petioles 8–25 mm. long; blades 5.7–15.8 cm. long, 28–91 mm. wide, ovate, obtuse, abruptly cuneate and short decurrent, above short appressed pilosulous, below whitened by the appressed pilose tomentum; peduncles 3–30 mm. long, 2-bracted; spikes 2–6 cm. long, 8–10 mm. in diameter, recurving and the tips pendent, the axis pilose, with glabrous, scarious lanceolate bracts 2–2.5 mm. long, these exposed after the shedding of the fruits; flowers almost hidden by the abundant silky villosity, the paired bracts persisting below the flower 2.3–2.7 mm. long, sparsely pilose or villous; the four sepals 3–3.5 mm. long, broadly lanceolate, densely white villous except near the margins; stamens $\frac{3}{5}$ the length of the perianth; filament ring prominent, dark; anthers 0.5 mm. long, oblong-ellipsoid, the cells joined; ovary subglobose; utricle 1.5 mm. long, cylindric, transparent; seed 0.5 mm. long, brown, obliquely elliptic.

HOLOTYPE: Niihau, first valley west of Kaali Cliff, top of steep basalt talus, 100 ft. alt., shrubs 1–2 m. tall, August 16, 1947, *H. St. John 22,830* (BISH).

SPECIMENS EXAMINED: Niihau, Mokouia Valley, basalt rock beneath *Prosopis* tree, 700 ft. alt., March 30, 1949, *H. St. John 23,589*. It was also observed by the writer, but not collected, on Kaali Cliff.

The holotypic collection is abundant and with abundant flowering and fruiting spikes, but not a whole leaf was left on the plant. Some insects had eaten of the foliage, till the leaves were reduced to a mere lacework. The second collection, made after a heavy winter rain, has lush new growth and unharmed leaves. A branch of this is shown on the illustration (Fig. 4) and may be classed as a paratype.

No Hawaiian vernacular name for this species was known to the informant, Kalani Niau. Being a large and conspicuous shrub, a specimen was taken to the village and shown to the best informed, older native Hawaiians, but none knew a name for it. This is regretted, for as a perusal will show, the natives of Niihau still remember the Hawaiian vernacular names for almost all of the native plant species, and they have given Hawaiian names to most of the well-established adventive and cultivated species.

These are the first available collections of *Nototrichium* from the island of Niihau, so it is not surprising to have them turn out to be undescribed. There is an earlier record by Forbes (1913: 21) of this species from Niihau in his account of the Stokes collections. This early collection is lost. It is not now to be found in the Bishop Museum, and it does not appear in their card index of the herbarium as ever having been inserted in the collection.

The closest relative seems to be var. *longespdatum* Hbd. from Molokai (and perhaps formerly from Maui). This differs by having smaller blades, the principal ones 4–6 cm. long and 2.5–4.2 cm. wide; shorter spikes 2.5–5 cm. long, usually straight, less hairy, and with the flowers well exposed; bracts of the rhachis 1.5–2 mm. long; floral bracts 1.5–2 mm. long; sepals 2.7–3.2 mm. long, strongly 5–9-nerved, villous at base, the hairs diminish and becoming few on the pilose back, the apex and broad margins glabrous; anthers 0.2 mm. long, the cells separate, much diverging towards the base. On the other hand var. *niihauense* has the



FIG. 4. *Nototrichium sandwicense* var. *niibauense*: a, habit $\times 1$; b, inflorescence $\times 1$; c, flower $\times 8$; d, utricle $\times 8$; e, funiculus and seed $\times 8$; figs. b, c, d, e from holotype; fig. a from St. John 23,589.

blades 5.7–15.8 cm. long, 2.8–9.1 cm. wide; spikes 2–6 cm. long, recurving and with pendent tips, and so villous that the flowers are almost concealed; bracts of the rachis 2–2.5 mm. long; floral bracts 2.3–2.7 mm. long; sepals 3–3.5 mm. long, obscurely several nerved, densely white villous except near the margin; anthers 0.5 mm. long, the cells joined.

In Mann's Enumeration (1867: 200) was also published *Ptilotus Sandwicensis* Gray ex Mann, var. β *Kavaiensis* Gray ex Mann. Sherff has recently (1951: 16), following Hillebrand (1888: 373), taken up this as *Nototrichium sandwicense* var. *kauaiense*. In Hillebrand's time the rules of nomenclature were less precise and, as was customary, authors assumed the right to "correct" the spelling of names of taxa, particularly those derived from geographic place names. Hillebrand changed all previously published names like: *maviensis*, *kavaiensis*, *owbyhensis*, and *wabuensis* to *mauiensis*, *kauaiensis*, *hawaiiensis*, and *oahuensis*. The recent international codes of nomenclature (Amsterdam 1935, Stockholm 1950, and Paris 1954) do not permit this free alteration of validly published scientific names (1954 code: art. 73). Unless it can be proved that the original author made a typographical error or a mistake in spelling, his scientific name must be retained as published. Once-current geographic names are not now erroneous, even though a different spelling of the geographic name has been officially adopted and standardized. In latinizing the Hawaiian name Kauai, Gray chose to render the letter u by the Latin v, and he had good precedent for this course. Hence, even though Sherff in his revision of the genus has adopted the spelling *kauaiensis*, one must in conformity with the rules return to the original spelling: *Nototrichium sandwicense* var. *kavaiense*. It is given a neuter ending, because the varietal name must agree in gender with that of the genus, in this case it being neuter.

Since it has not been illustrated, there is included here a drawing made from the holo-

type: Kauai, Hanapepe, Mann & Brigham 590 (GH), of *N. viride* Hbd. var. *viride* (Fig. 5).

LEGUMINOSAE

Abrus precatorius (L.) L. forma *luteoseminalis* forma nov.

Seminibus pallide luteis. Seeds pale yellow.

NOM. VERN.: "pukeawe lenalena" (= Yellow Pukeawe). On the larger Hawaiian Islands the vernacular name "pukeawe" is applied to the native shrubs in the genus *Styphelia*.

HOLOTYPUS: Niihau, Nonopapa, 20 ft. alt., in scrub on dry limestone flat, seeds pale yellow, August 13, 1947, *H. St. John* 22,768 (BISH).

The typical form of the species with black-ended scarlet seeds occurred near by, but in one section of the thicket all the plants produced wholly seeds that were of a pale yellow color. This is not a common form of the species, and seems to have been mentioned previously only by Pollacci (1918: pl. 18, fig. 10). The new name is from the Latin *luteus*, yellow, *seminalis*, pertaining to a seed, in allusion to the seed color.

Erythrina sandwicensis Degener var. *sandwicensis* forma *sandwicensis*

E. sandwicensis Degener, Fl. Haw. fam. 169c: 12/5/'32, with fig.

E. monosperma Gaud., Voy. Freyc. Uranie, Bot. 486, 93, (1826) [=1830]; and Atlas pl. 114, 1826–30; not *E. monosperma* Lam. (1786) = *Butea monosperma* (Lam.) Taubert.

Corollas orange, or varying from yellow to scarlet; seeds bright red.

The name *E. sandwicensis* Degener was merely a renaming of the long known common lowland tree first called *E. monosperma* Gaud., this name having proven invalid, being a later homonym. Hillebrand, Rock, and other Hawaiian authors had accepted this tree as indigenous in both Hawaii and Tahiti, and listed as a synonym *E. tahitensis* Nad., described from a locality at 700–800 meters

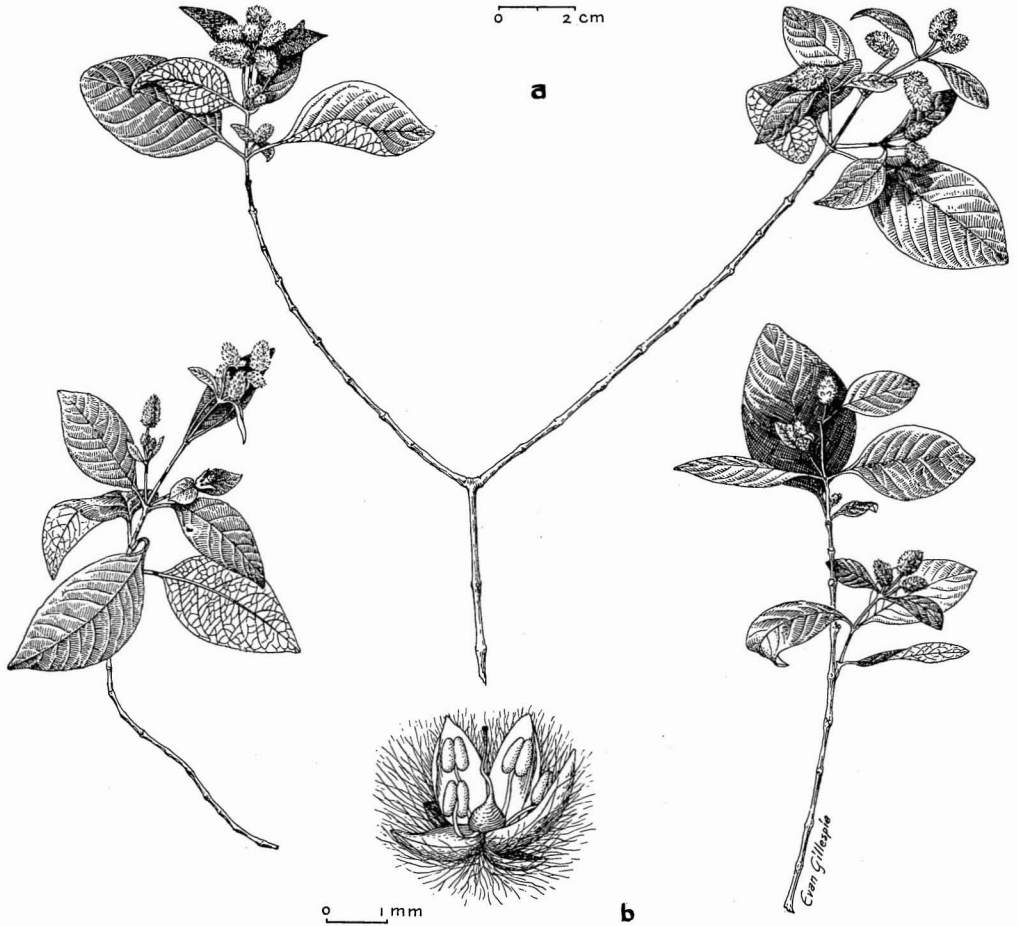


FIG. 5. *Nototrichium viride* var. *viride*, from isotype: a, habit $\times \frac{1}{2}$; b, flower $\times 8$.

in the mountains of Tahiti. Degener gives the new name *E. sandwicensis*, and his publication is valid, though it is not well documented. He says merely, not *E. tabitensis*, giving no differentiating characters to separate his newly named species from the Tahitian one. Later, Krukoff (1939: 226–227) discussed the relationship between *E. sandwicensis* Degener and *E. tabitensis* Nad. "The rediscovery of the very rare *E. tabitensis* in Tahiti seems to be essential for ascertaining the nomenclatural status of the Hawaiian plant now known as *E. sandwicensis*. I have seen *Nadeaud* 499 (type of *E. tabitensis*), deposited at Geneva. It consists of a single inflorescence

with small flower buds, two flowers, one pod, one seed, and no leaflets. From this available material it is impossible to decide whether or not the plant is specifically distinct from the plant native to Hawaii."

The writer had studied the original description of *E. tabitensis* Nad. It is detailed and 12 lines long. The following characters seem diagnostic. They are, in translation: lateral leaflets cordate, acuminate, glabrous; calyx 4-toothed; keel broad, rounded, emarginate; stamens monadelphous; seeds orange. After the writer studied the collections of *Erythrina* in Paris and Geneva, he was able to complete the description of *E. tabitensis* Nad. and to

establish it as distinct from the Hawaiian *E. sandwicensis* Degener (see St. John, 1955: 293-299).

Degener gives under his new name, *E. sandwicensis*, a list of synonyms and usages, but the earliest and the basic one is *E. monosperma* Gaud., the first name given to the Hawaiian "wiliwili" tree. This is confirmed by the fact that Degener gives a type locality: "In insulis Sandwicensibus (Alt. 350-400 hex.)." This is a quotation from the single locality given by Gaudichaud for his new *E. monosperma*. Hence, Degener's concept rests primarily on that of Gaudichaud. Gaudichaud obtained a specimen and this was illustrated in his atlas in detail, showing stem, leaves, buds, flowers, fruit, seeds, and details. He mentions the plant in his phytogeographic discussion (1827: 93) where he describes the second region, where, after leaving the lowland cultivated areas, and entered as one begins to ascend and to encounter the first indigenous plants, but he gives no further details here, other than the vernacular name, "ouliwiri." His brief description (1830: 486) is here quoted:

"1. *Erythrina monosperma*. Pl. 114.

E. arborea; *inermis*; *foliolis late ovato-reniformibus*, *obtusis*, *subtus calycibusque molliter fuscenti-tomentosis*; *fructibus monospermis*.

In insulis Sandwicensibus (Alt. 350-400 hex.)."

There are trees or branches of trees of the "wiliwili" that are unarmed, but usually there are numerous branches beset with short spines, so the unarmed branches are not diagnostic. The smaller pods may be 1-seeded, but much more characteristically the pods are several-seeded. Gaudichaud's description omits mention of the color of flower or fruit, but in the Explanation of Plates in his Atlas (1826-30: 21) for plate 114, fig. 9, he states, "Graine rouge foncé. . . ." Thus we know that his specimen was red-seeded, but the color of flower was not recorded. The flowers are fleshy, and are borne in heavy, dense

racemes, so that even today, with the best drying methods using artificial heat, it is expected to have the flowers fade to dull brown.

Degener (1932: family 169c) describes his *E. sandwicensis*, as with, "Standard . . . orange-red to rarely yellow or even white . . .; wings greenish yellow . . .; keel greenish yellow. . . ." This seems a composite description of the plant population that he included in the species, but it is clear that he included the common form of the species which has the corollas orange or shading from yellow to scarlet. In some, the bases of the corollas are greenish, but the predominant colors are as stated above. This color form is also the biological type of the species, and the writer here chooses it as the nomenclatural type. In the Bishop Museum the specimens of this forma *sandwicensis* for which there is record of the color, have it given as follows: orange, orange, orange, red, green and pink. Various other botanists in Hawaii have published accounts of the tree now called *E. sandwicensis*, and below are quoted their descriptions of the flower colors. Mann wrote (1867: 185) flowers "red, much the color of red coral, with some yellow, showy." Mrs. Sinclair said (1885: pl. 18 with text), "The flowers vary in colour from pale yellow to orange scarlet. There is no perceptible difference in the trees, but the natives say the wood of those with scarlet flowers is slightly harder and more durable than the other. . . ." Her colored plate shows the corolla orange blending to scarlet, the seeds bright red. Hillebrand (1888: 99) stated, flowers "pale red or orange, rarely yellow." Rock recorded (1913: 191) the "flowers pale yellow or brick red. . . ." Then later (1919: 49), flowers "brick red, orange or pale yellow." He later repeats this same description (1920: 183). Degener's flower description has already been quoted. Nearly all of these writers agree that the tree has flowers that are orange or yellow shading to scarlet. This is the kind here selected as the type form. The other ones with different flower colors are here described as color

forms, and one new seed color is distinguished. C. Judd (1920: 96) stated that the "blossoms vary in color from an orange scarlet to pale yellow." There is an early collection from Niihau, Foot of Plateau, S. E., January 1912, *J. F. G. Stokes*. This now has faded, brown flowers, and is without color notes. However, the native informants on Niihau reported that the majority of the trees had orange flowers and red seeds.

One of these color forms was marked in the herbarium by Dr. Rock with a name as a new variety. We refrain from adopting this name of his, since in his three publications on the subject he did not publish it, and apparently has not done so elsewhere. It seems that he decided not to publish it. In any case, the writer treats the plant not as a variety but as a forma.

E. sandwicensis Degener forma *alba*, forma nov.

Floribus albis. Corollas white.

HOLOTYPUS: Oahu, between Koko Crater and Makapuu, level plain, alt. 30 m., tree 6 m. tall, flowers white, April 19, 1931, *E. P. Hume* 187 (BISH).

E. sandwicensis Degener forma *lutea*, forma nov.

Floribus luteis vel luteo-viridibus. Corollas yellow, greenish yellow, or yellowish green; seeds red.

HOLOTYPUS: Niihau, Apana Valley, 400 ft. alt., rocky dry gulch, tree 6 m. × 2 dm., flowers yellowish green, seeds red, August 14, 1947, *H. St. John* 22,806 (BISH). Vernacular name: "wiliwili."

SPECIMENS EXAMINED: Molokai, Kamalo, Kapulei Ridge, arid rocky region, common, June 25, 1928, *O. Degener* 7,216.

Maui, East Maui, Ulupalakua district, fl. greenish yellow, August 26, 1948, *Karl H. Korte*.

Lanai, Mauna Lei, July 13, 1910, *J. F. Rock* 8,118; Paomai, yellow flowered, September

14, 1913, *G. C. Munro* 39, and 94, these last two probably being duplicates.

All but one of these collections are leafless, as this is the common condition at anthesis.

E. sandwicensis Degener var. *luteosperma*, var. nov.

Seminibus luteis, corollis pallide viridibus. Seeds dull yellow; corollas pale green.

HOLOTYPUS: Niihau, Nonopapa, 20 ft. alt., thicket on dry flat, tree 7 m. × 2 dm., fl. pale green, seeds dull yellow, August 13, 1947, *H. St. John* 22,769 (BISH). Vernacular name: "wiliwili lenalena."

No other collections of this are known. Since it has distinctive color characters of both flower and seed, it is classed as a variety.

ARALIACEAE

Cheirodendron trigynum (Gaud.) Heller var. *Hillebrandii* Sherff

Panax ovatum H. & A., Bot. Beechey Voy. 84, 1832. (See Fig. 6.)

Not found by any recent collector, its record being from a collection by Lay and Collie of the Beechey Voyage (Hooker and Arnott, 1832: 84). It is certainly extinct now. This collection, the holotype of *P. ovatum*, is in the herbarium at Kew. A complete revision of the genus *Cheirodendron* in Hawaii has just been published by Sherff. In this he mentions (1954: 3, 4) *Panax? ovatum* H. & A. and discusses (1954: 28) its placement. He repeats the descriptive characters given by Hooker and Arnott, but does not definitely place the species or key it. He tentatively suggests (1954: 27) that it is a synonym of *C. trigynum* (Gaud.) Heller var. *halawanum* Sherff. Because the holotype of *P. ovatum* was a sterile specimen, one cannot be positive as to its identity. However, Sherff's placement of it in var. *halawanum* does not seem to be justified. This variety, known from abundant collections on Oahu, Molokai, and Lanai, has the petioles 4–10 cm. long; the lateral petiolules 7–34 mm. long; the terminal petiolules 17–42

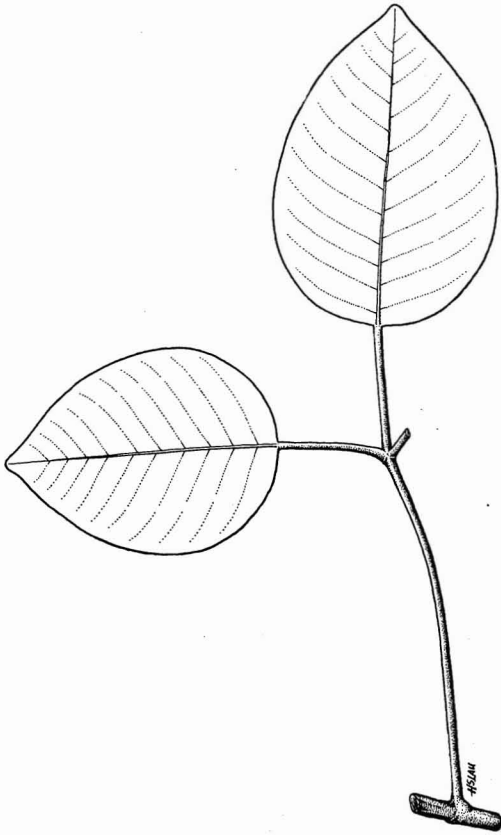


FIG. 6. *Panax?* *ovatum*, from holotype: a, leaf $\times \frac{1}{2}$.

mm. long; the leaflets when dried, thinnish, obsolete to sharply 1-9-denticulate, and the lateral ones 28-63 mm. wide, and the terminal ones 44-75 mm. wide. *P. ovatum* H. & A. has, on the other hand, the petioles 7.5-11 cm. long; the lateral petiolules 22-30 mm. long; the terminal petiolules 26-38 mm. long; the leaflets when dried, thick chartaceous to subcoriaceous, entire, the lateral ones 50-60 mm. wide; and the terminal ones 55-65 mm. wide. This is the third species that was described in the group that is now called *Cheirodendron*. The type specimen is well preserved and is available in the Kew herbarium. The writer studied it there in 1954. The accompanying drawing shows a leaf from this holotype. It is not clear why Sherff did not examine it, as it

is available at Kew, and he studied and cited other specimens from the Kew herbarium.

It is possible that *P. ovatum* H. & A. is a species endemic to the island of Niihau, but there seems no chance of establishing that now, as the native forest has vanished and this species has not been found there by any of the recent collectors. The island of Kauai is nearest to Niihau, being only 9 miles distant. There are, according to Sherff, four species and six varieties of *Cheirodendron* on Kauai. None of them has foliage matching that of the Niihau tree. The next closest island, Oahu, is about 120 miles away. Though all described taxa have been checked, it seems that it is most like a variety that occurs on both mountain ranges of Oahu, *C. trigynum* var. *Hillebrandii* Sherff. This variety usually has the leaflets serrate and elliptic or elliptic-lanceolate to elliptic-ovate. However, there are some collections of it with entire and broader leaflets, ovate, entire, abruptly obtuse, and with long petiolules. These exactly match the holotype of *P.?* *ovatum* H. & A. When and if fertile material of the Niihau plant is found, the taxonomic placement can be reviewed. Till then the best placement seems to be as a synonym of *C. trigynum* (Gaud.) Heller var. *Hillebrandii* Sherff.

Reynoldsia sandwicensis Gray

NOM. VERN.: "ohe'ohe."

The only record of this is in the publication by C. N. Forbes (1913: 23) on the collection by J. F. G. Stokes. The species is listed without comment. The specimen is not now in the Bishop Museum nor does it appear in the card catalogue of the herbarium as ever having been inserted there. When exploring Niihau in 1947 the writer did not see the tree. It was one of the four native trees reported by Forbes, so its rediscovery was much desired. When asked, the guide K. Niau immediately replied that he knew the "ohe'ohe," that it was now very rare. He said there was only one living tree left, and he then led the way on August 13th to a spot on a steep side

of upper Kanaha Valley. At the site which he knew, there was now no sign of a tree, it having died and the soft stems having rotted away since the guide's last visit to the spot. Without doubt it is now extinct on Niihau. The record is a credible one, as the tree once, and to some degree still, makes a scattered arborescent growth on the low, very dry sections of all of the Hawaiian Islands. In the revision of the genus by Sherff (1952: 7), he states, "I have seen as yet no specimens from Kauai, Niihau, or Kahoolawe."

SOLANACEAE

Solanum Nelsoni Dunal var. *Nelsoni*

- S. Nelsoni* Dunal in DC., Prodr. 13: 123, 1852.
S. laysanense Bitter, Nat. Ver. Bremen, Abh. 16(3): 432–435, pl. 4, fig. A–D, 1900.
S. nelsoni Dunal var. *typicum* F. Br., in Christopersen & Caum, Bernice P. Bishop Mus., Bul. 81: 35, 1931.
S. nelsoni Dunal var. *intermedium* F. Br., 1. c. 35–36.
S. nelsoni Dunal var. *caumii* F. Br., 1. c. 36.
S. nelsoni Dunal var. *acuminatum* F. Br., 1. c. 36.

NOM. VERN.: "akia."

Niihau, south end, sand country; also cliff at, November 1, 1939, G. C. Munro; Kawae-wae, under *Prosopis* thicket, 75 ft. alt., *St. John* 22,731; Leahi, in coral sand near beach, 10 ft. alt., *St. John* 23,621.

Two isotypes of *S. laysanense* as well as the holotypes and the paratypes of the varieties of *S. Nelsoni* described by Dr. F. B. H. Brown and all the specimens in the Bishop Museum have been studied. The shrubs are all similar; the flowers are identical; the fruits essentially so, though the collectors recorded a few as with red berries, while the majority recorded black berries. The berries recorded as red when fresh are now black when dried. There is some apparent variation in the size of the berries, but as they were juicy, then were pressed, the variation does not seem significant. The seeds are identical. The leaves vary

in shape from cordate to orbicular, ovate, or elliptic; the base from cordate to rounded, truncate, or cuneate; the apex from obtuse to acute; the margin from entire to slightly or markedly sinuate. The measurements of the hairs meet or overlap, and the leaf shapes are variable and difficult to define. Upon these characters the species and varieties listed have been described. The larger the leaves, the more apt they are to be acute at apex and with sinuate margins. An isotypic sheet of *S. laysanense* shows some blades subcordate at base, as well as ones rounded or cuneate. The holotype of *S. Nelsoni* var. *acuminatum*, Caum 68 from Nihoa I., has most of the blades sinuate, a key character, but several adult leaves on the same branch are entire. The same is true on an isotype, while on a second isotypic sheet, most of the blades are entire, while only a few show a slight waviness in the margin. The holotypes and isotypes of var. *Caumii* and var. *intermedium* are relatively constant to the characters alleged. *S. Nelsoni*, as shown by a photo of the holotype, David Nelson, from the Sandwich Islands, and by the several recent collections from Molokai, is relatively constant in its cordate, entire blades, but one sheet of several collected by Rock, March 1910, from Momomi (= Moomomi) beach, Molokai, shows both leaves with cordate bases and ones with rounded bases on the same stem. *S. Nelsoni* var. *intermedium* was keyed as having the leaves cordate to subacute at the base, and the several specimens show stems with leaves that are cordate, rounded, or subcuneate at base.

At hand are two unmounted collections with numerous duplicates. These would be classified as *S. Nelsoni* or its var. *typica*. *St. John* 19,962 from Moomomi, Molokai, consists of 22 separate plants or branches. Mostly these show small, cordate, entire blades, but four bear also some leaves that are shallowly sinuate. *St. John* 22,731 from Kawae-wae, Niihau, consists of numerous sheets with a total of 50 branches. These all have the leaves cordate or ovate-cordate, obtuse or subacute, and

most of them entire. Four of them have some of the blades slightly sinuate, and one has a single large leaf strongly sinuate. From this review of the characters of the leaves, the writer is convinced that the shapes and shallow lobing of the leaves mentioned are mere fluctuations in a single population and usually on the same individual branch. Hence, the specific and varietal names based upon plants showing these characters are here reduced to the synonymy of *S. Nelsoni* Dunal.

Early there was described another variety, *S. Nelsoni* var. *thomasiaefolium* Seem. (Jour. Bot., Brit. and Foreign 1: 209, 1863), based upon a collection by T. Nuttall on Atoi (=Kauai). This may well be the greatest extreme among the lobed-leaved plants. At hand is a photo of the type in the British Museum. Three years after publishing the variety Seeman again listed it (1866: 174) and repeated this original account; "foliis cordato-ovatis sinuato-lobatis, lobis (5-7) obtusis vel cordatis integris. . . . This has quite the look of *Thomasia solanacea*, Gay, and would probably be described as a new species by anyone not having seen the evident transition there is in some specimens of what Nuttall has called *S. rotundifolium* and A. Gray justly considers identical with the original *S. Nelsoni*, Dun., preserved at the British Museum. In these specimens some of the leaves have a tendency to become sinuato-lobate, whilst again several leaves of my var. *thomasiaefolium* are cordate and entire." The photo of the holotype confirms this, that there are several leaves that are cordate and entire, but mostly they are strongly sinuately lobed, with two large, sinuate lobes on a side, cut half-way to the midrib. Seeman well states the inconstancy in this group of the characters of leaf shape and lobing, and the writer has stated his observations on the same points. However, no recent collections or any others seen show blades with the deep rounded lobes like those of var. *thomasiaefolium*. It is a marked extreme, and no intermediates have been seen that fill in the gap. Hence, until the variety is again

collected and more knowledge can be gained of its variability and occurrence, it seems best to accept var. *thomasiaefolium* as a variety, peculiar to Kauai. The writer and his several assistants searched for it in December, 1947, on the sandy shores of Kauai without success.

The treatment of this group by Dr. F. B. H. Brown (1931: 37) raises a question of typification. He gives a generalized description for *S. Nelsoni* Dunal (as *nelsoni*), then a detailed one for each of the four varieties, including var. *typicum* F. Br., new var. As var. *typicum* he recognized the plants with cordate, entire leaves. For this he cites only two collections, both in the Bishop Museum, and both from Moomomi, Molokai: *J. F. Rock*, March 1910, sheet A (which lettering was added to Rock's label in a later hand, apparently Brown's); and *C. N. Forbes* no. 613.Mo. No type was designated in the publication, but in the Bishop Museum the specimens are marked: the *Rock* sheet A is marked in Brown's writing, "Type of Descript."; the *Forbes* 613.Mo. is marked in Brown's writing, "Type! of amplif. descript."; and there is a third, unlisted, sheet, *Forbes* 604.Mo., marked in Brown's writing, "Type of amplif. descript." On checking Forbes's field number book, it is evident that both of his numbers written by him on his labels were wrong, that his collection of this *Solanum* from the sand dunes at Moomomi was no. 607.Mo., and that both of his sheets should be corrected to so read, as does an unmounted duplicate. Thus Brown, in describing *S. Nelsoni* Dunal var. *typica* F. Br., published no choice of a type in the bulletin, which was issued by Christophersen and Caum, but in the herbarium he marked as type three sheets collected in 1910 and 1915 by two different collectors. Not every possible detail concerning the selection of types is covered in the International Code of Botanical Nomenclature, but the practice is established and legalized. It is clearly improper to choose either the Forbes or the Rock collections to be the type of var. *typica* (now called var. *Nelsoni*). The type must be the same specimen

described as *S. Nelsoni* Dunal, that is the specimen in the British Museum collected "in insulis Sandwich," by David Nelson in 1788. There is a photo of this in the Bishop Museum. It has small, cordate, entire leaves, like the ones described by Brown for var. *typica*.

CUCURBITACEAE

Sicyos niuhauensis, sp. nov.

Fig. 7

NOM. VERN.: "pua o Kama" (= the flower of Chief Kama; or perhaps merely a modification of "kaukama" = cucumber).

DIAGNOSIS HOLOTYPI: Liana annua herbaea, caulibus ad 10 m. longis supra arbores frutesque scandentibus vel decumbentibus gracilibus pallide viridibus deinde glabratis, novellis puberulentis pilis in initio glandulosis, pilis in nodis persistentioribus, internodis 6–20 cm. longis cirrhis oppositifoliosis cum pedunculo rigido 8–30 mm. longo puberulento 2-3-partitis, partibus 7–15 cm. longis ad basim puberulis ad apicem glabris dense spiralis, foliis multis, petiolis 13–50 mm. longis scabro-puberulentis, laminis subvariabilis sed frequentissime 4.5–11.5 cm. longis 4.2–14 cm. latis suborbicularibus tenuiter 3-lobatis digitatis cum sinibus late U-formatis 3–15 mm. profundis apicibus acutis basi profunde cordata membranaceis supra pustulato-scabris pallide viridibus cum nervis pallidioris infra dense pustulato-scabris et in nervis scabro-puberulentis marginibus subintegris nervis palmatis 3-fidis, nervis lateralibus dichotomis, ramis juvenalibus fortioribus cum laminis 6.7–9.5 cm. longis 6.2–11.3 cm. latis suborbicularibus 3–5-lobatis lobis 2.5–4 cm. longis sinibus late U-formatis marginibus subintegris vel paucis dentatis et remote apiculato-denticulatis, paniculis masculis 1.5–9.5 cm. longis glanduloso-puberulentis, pedunculo 12–70 mm. longo, pedicellis 2.7 mm. longis gracilibus, alabastris 2–3 mm. diametro forte depresso-suborbicularibus pallide lutescentibus vel albis, perianthiis in flore 8–8.5 mm. diametro

tubo 1.5 mm. longo subrotato, lobis 5 inaequalibus 3–3.5 mm. longis 1.8–2.2 mm. latis late lanceo-ovatis extra capitato-glanduloso-puberulentis intra minute ita, columna staminali 1.5 mm. alta, 5 antheris 1 mm. longis hipocrepiformis, inflorescentiis femineis capitatis axillaribus, pedunculis 10–15 mm. longis 9–13-floriferis capitato-glanduloso-puberulentis, corollis epigynis patelliformis vel subrotatis extra minute capitato-glanduloso-puberulentis et intra etiam minute ita, tubo 1.2 mm. diametro, lobis 1 mm. longis elliptico-ovatis, stylo 1 mm. longo glabro, lobis stigmatis 3 ligulatis recurvatis, ovario 3–5 mm. longo anguste turbinato tertia infera nuda vel sparse hirsutula, parte supera velata cum incrementis multis digitatis vel spatulatis dense hirsutis pilis in initio minute capitato-glanduloso, capitis in fructu 12–17 mm. diametro globosis dense hirsutis, fructibus 6–7 mm. longis 5–6 mm. latis 2–3.5 mm. crassis late lanceolatis infra albo-puberulentis supra velata cum incrementis adscendentibus 1.5–3 mm. longis digitatis vel spatulatis integris vel furcatis dense catenulato-glanduloso-hirsutis, seminibus solitaribus 3.9 mm. longis 3.5 mm. latis 1.9 mm. crassis lenticularibus marginibus rotundatis, testis pallide luteis vel brunneis duris lucidis, hilo 1.9–2 mm. longo elevato cartilagineo albo simili ad duam partem labias in linea formata.

Annual climbing herbaceous vine; stems climbing as much as 10 m. over trees or bushes, or decumbent, slender, pale greenish, at length glabrate; young shoots puberulent and the hairs at first glandular, the hairs persisting longer near the nodes; internodes 6–20 cm. long; tendrils oppositifolious, with a stout rigid, common stalk 8–30 mm. long, puberulent, forking into 2 or 3 tendrils 7–15 cm. long, puberulous towards the base, glabrous towards the tip, closely coiling; leaves numerous; petioles 13–50 mm. long, scabrous puberulent; blades slightly variable in form, but the commonest shape 4.5–11.5 cm. long, 4.2–14 cm. wide, suborbicular, shallowly palmately 3-lobed, the broad U-shaped sinuses

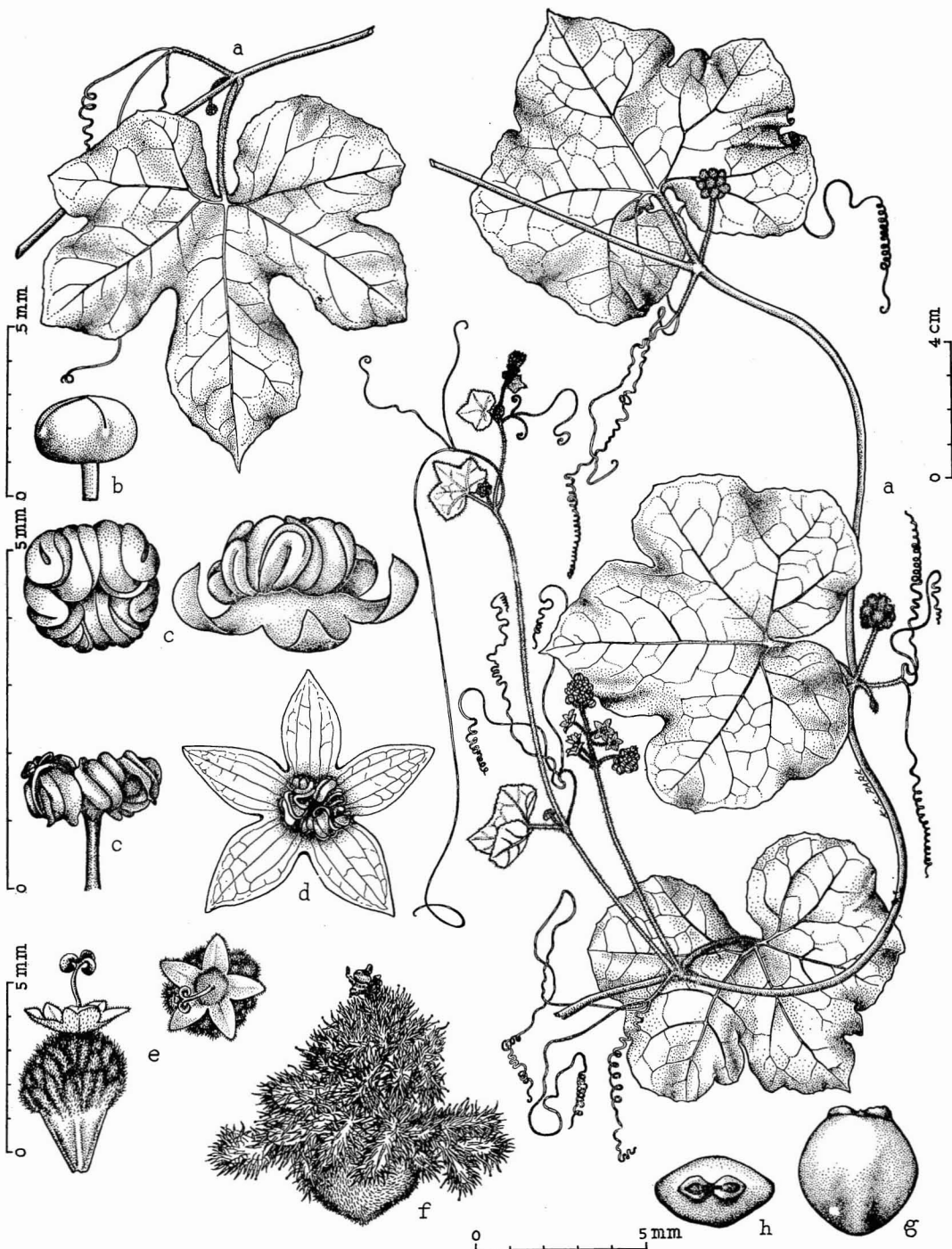


FIG. 7. *Sicyos niibauensis*, from holotype: a, habit $\times \frac{1}{2}$; b, staminate bud $\times 5$; c, anthers $\times 10$; d, staminate flower $\times 5$; e, pistillate flower $\times 5$; f, fruit $\times 5$; g, seed, lateral view, $\times 5$; h, seed, apical view, $\times 5$.

3–15 mm. deep, the apex acute, the base deeply cordate, texture membranous, above pustulate scabrous, pale green, the veins lighter green, below densely pustulate scabrous and on the veins scabrous puberulent, the margins appearing subentire but under a lens seen with a few veins ending in minute apiculate projections, palmately 3-nerved from the base, the lateral veins forking; blades of more vigorous juvenile branches 6.7–9.5 cm. long, 6.2–11.3 cm. wide, suborbicular 3–5-lobed about halfway to base, the sinuses 2.5–4 cm. deep, wide U-shaped, the margins subentire or few-dentate and remotely apiculate denticulate; staminate panicle 1.5–9.5 cm. long, glandular puberulent; peduncle 12–70 mm. long; pedicels 2–7 mm. long, slender; bud much depressed suborbicular, 2–3 mm. in diameter, pale yellowish or whitish; perianth in anthesis rotate, 8–8.5 mm. in diameter, the tube 1.5 mm. long, almost rotate, the five lobes unequal, 3–3.5 mm. long, 1.8–2.2 mm. wide, broadly lance-ovate, capitate glandular puberulous without, minutely so within; staminal column 1.5 mm. tall; the five anthers 1 mm. long, hippocrepiform; pistillate inflorescences capitate, axillary; peduncles 10–15 mm. long, capitate glandular puberulent; pistillate flowers 9–13 in a head; corolla epigynous, shallow saucer-shaped or almost rotate, minutely capitate glandular puberulous without and even more minutely so within; the tube 1.2 mm. in diameter, the lobes 1 mm. long, elliptic ovate; style 1 mm. long, glabrous; stigma lobes 3, recurving, ligulate; ovary 3–5 mm. long, narrowly top-shaped, the lower third naked or but sparsely hirsutulous, the upper two-thirds covered with many fingerlike or thick spatulate processes and each of these densely shaggy hirsute, the hairs at first minutely capitate glandular; fruiting heads 12–17 mm. in diameter, globose, densely hairy; fruits 6–7 mm. long, 5–6 mm. wide, 2–3.5 mm. thick, broadly lanceolate, the lower part white puberulent, the upper part covered with ascending processes which are 1.5–3 mm. long,

thick fingerlike or spatulate, simple or forked and densely shaggy catenulate gland-tipped hirsute; seed single, 3.9 mm. long, 3.5 mm. wide, 1.9 mm. thick, lenticular, the edges rounded, the testa pale yellow or brownish, hard, smooth, shining, the hilum 1.9–2 mm. long, raised, cartilaginous, white, shaped like two pairs of slightly open lips in a line.

HOLOTYPE: Niuhau, 1 mile W. of Kii, 50 ft. alt. (also common on Kaali cliff), grassy, sandy flats, elongate vine climbing *Prosopis* tree, leaves, pale green, veins lighter, staminate flowers white, March 29, 1949, *H. St. John* 23,567 (BISH).

The closest known species is *S. pachycarpus* H. & A. of Oahu which has the petioles glabrate; blades shallowly 5-lobed; fruits 2.3–2.8 mm. wide and 1–1.8 mm. thick with the upper part glabrous; seed 2.8 mm. wide, and the hilum 0.8 mm. long. *S. niibauensis* differs by having the petioles scabrous puberulent; blades shallowly palmately 3-lobed; fruits 5–6 mm. wide, 2–3.5 mm. thick, and the upper part covered with ascending fingerlike processes, densely glandular hirsute; seeds 3.5 mm. wide, and the hilum 1.9–2 mm. long.

LOBELIACEAE

Delissea niibauensis, sp. nov.

Fig. 8

DIAGNOSIS HOLOTYPE: Frutex, caule 1–2 cm. diametro glabro, cicatricibus 9–10 mm. latis 4–5 mm. altis aggregatis stramineis depresso-scutelliformis, fasciculis 8–11 exsertis in ellipso disponsitis, internodis reductis ad oras inter cicatrices congregatis, foliis glabris in fasciculo terminali denso aggregatis, petiolis plerumque divergentibus 2–4 cm. longis sed in sicco 1–1.5 mm. diametro, laminis 5.5–7.5 cm. longis 3.4–5 cm. latis chartaceis late ovatis apice acuto marginibus crenatis nervis lateralibus ad apicem diffuse ramosis, costa paulo recurvata sed lateribus foliae adscendentibus, inflorescentiis axillaribus multis tam numerosis quam petiolos obscurantur, cymis

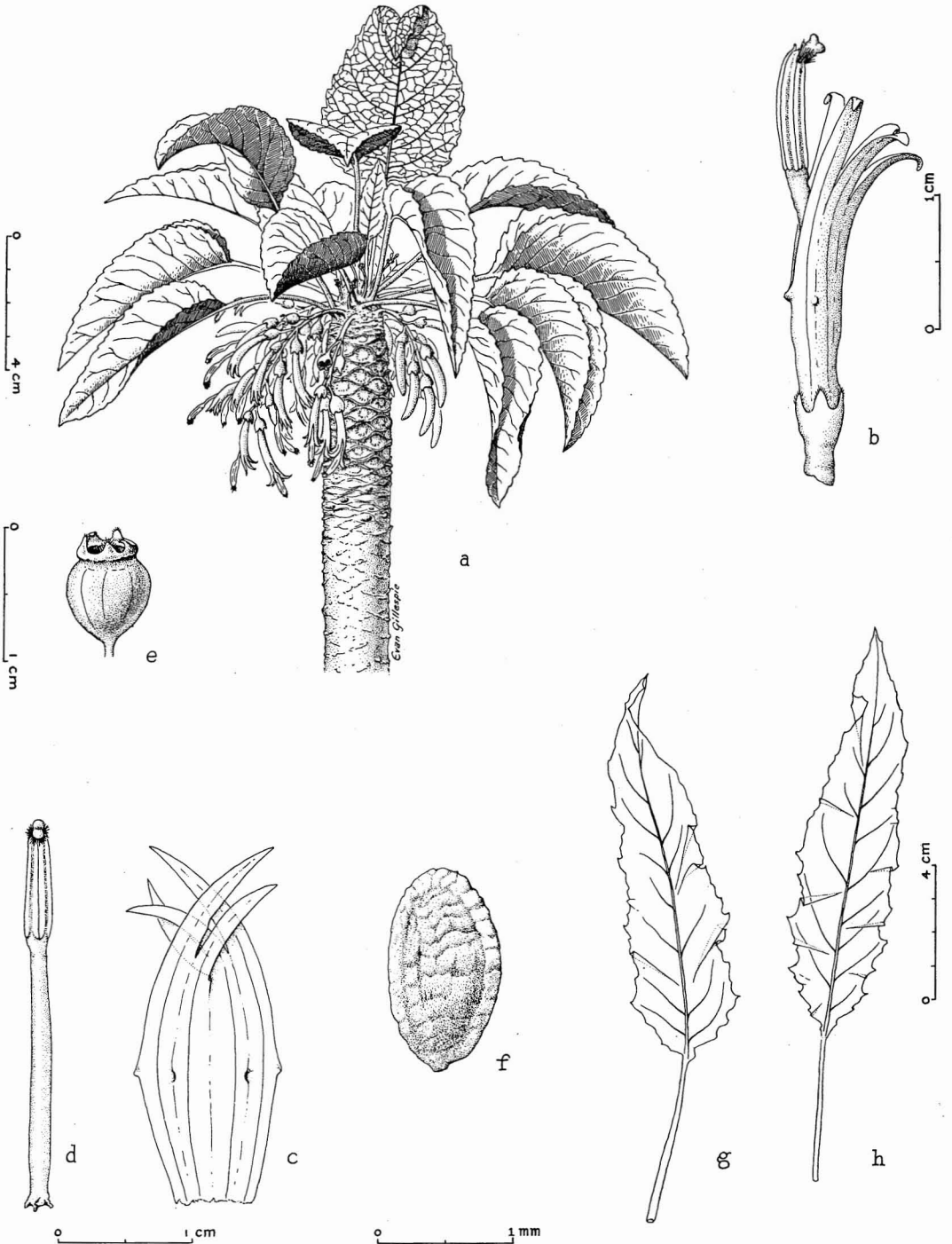


FIG. 8. *Delissea niibauensis*, from holotype: *a*, habit $\times \frac{1}{2}$; *b*, flower $\times 2$; *c*, corolla $\times 2$; *d*, stamens and stigmas $\times 2$; *e*, fruit $\times 2$; *f*, seed $\times 20$; *g*, *h*, leaves of *D. undulata*, from holotype, Paris, $\times \frac{1}{2}$.

17–19-pluri-floriferis divergentibus sive deflexis, pedunculis 11–16 mm. longis nudis, bracteis ad 1 mm. longis hirsutulis deinde subglabratibus, pedicellis 3–8 mm. longis glabris aggregatis in cyma condensa, axile 8–15 mm. longa, hypanthiis 3–4 mm. longis ellipsoideis truncatis, dentibus calycorum 0.8–1.3 mm. longis deltoideis obtusis crassis foliaceis hirsutulis, alabastris 18–20 mm. longis subarcuatis apice in 55° decurvato, corollis in flore 22–25 mm. longis glabris subcylindricis curvatis in basi 2–2.5 mm. diametro supra majoribus in fauce 3.5–4 mm. diametro, gibbo proximo 1 mm. alto asymmetrico-conico obtuso reflexo et e basi 10 mm. distante, gibbis lateralibus binis dimidiis et ad basem proximioribus, tubo corollae 10 mm. longo, labia supera bilobata sino 8–10 mm. longo, lobis 1.7–1.8 mm. latis ligulatis subito diminuendis ad apicem obtusam decurvatis, labia infera subaequaliter trilobata sinibus 7–9 mm. profundis, lobis 1.5–1.7 mm. latis subiter ad apicem subacutam contractis, lobis corollae intra sparse papillois, columna staminalis 17–21 mm. longis paene decurvatis glabris pallidis, antheris superis 8–8.5 mm. longis glabris, antheris inferis binis 6–8 mm. longis in apice penicillatis pilis hispidosis 1.5–2 mm. longis albis, stigmatibus exsertis 1–1.3 mm. convexis, ovario 1.5 mm. longo ellipsoideo, baccis 6–7 mm. diametro globoso-turbinatis apophysatis subviridescentibus, seminibus 1.4–1.5 mm. longis 0.7–0.9 mm. latis 0.2–0.3 mm. crassis ellipticis compressis cum jugis transversis sinuosis parallelis in parte muriculatis, marginibus e raphi prominenti crassi straminei, lateribus brunneis.

Shrub, apparently erect and single stemmed, stature unknown; stem 1–2 cm. in diameter below the lowest leaf, glabrous, the surface covered with the crowded straw-colored leaf scars 9–10 mm. wide, 4–5 mm. high, depressed shield-shaped, the 8–11 bundle scars protruding, in a broad ellipse complete except at top; internodes inconspicuous, merely pale brown protruding rims between the crowded leaf scars; leaves glabrous, numer-

ous, in a terminal dense plume, the petioles mostly diverging; petioles 2–4 cm. long, when dried 1–1.5 mm. in diameter; blades 5.5–7.5 cm. long, 3.4–5 cm. wide, chartaceous, broadly ovate, the apex acute, the margin crenate, lateral veins 7–9 on a side, arched ascending, becoming diffusely branched near the tip, the midrib gently recurved, the sides of the leaf upturned, so that the blade will not lie flat; inflorescences axillary, numerous, forming a mass so dense as to obscure the petioles; cymes 17–19-more-flowered, divergent or deflexed; peduncle 11–16 mm. long, naked; bracts subtending the pedicels nearly 1 mm. long, at first hirsutulous, later subglabrate; pedicels 3–8 mm. long, glabrous, crowded on the condensed cyme with the axis 8–15 mm. long; hypanthium 3–4 mm. long, truncate, ellipsoid, apparently green; calyx teeth 0.8–1.3 mm. long, deltoid, obtuse, thick foliaceous, hirsutulous; bud 18–20 mm. long, gently arcuate, the apex decurved at 55° from the axis of the ovary and corolla base; corolla in anthesis 22–25 mm. long, glabrous, curved subcylindric, at base 2–2.5 mm. in diameter, gradually slightly enlarging upwards to the throat where 3.5–4 mm. in diameter; proximal protruding knob 10 mm. from the base of the corolla, asymmetric conic, obtuse, pointed backwards, 1 mm. high, the two lateral knobs about half as large and slightly nearer the pale corolla base; the dorsal suture in late anthesis parted to the knob, so the tube only 10 mm. long; corolla 2-lipped; upper lip 2-lobed, the lateral sutures split down only 8–10 mm., the lobes strap-shaped, 1.7–1.8 mm. wide, abruptly narrowed to the obtuse tip, decurved below the column which is exserted through the upper suture; lower lip subequally 3-lobed, the sutures 7–9 mm. deep, the lobes 1.5–1.7 mm. wide, strap-shaped, abruptly contracted to the subacute tip, all corolla lobes sparsely papillose within; staminal column 17–21 mm. long, gently decurved, glabrous, pale; upper anthers 8–8.5 mm. long, glabrous; two lower anthers 6–8 mm. long, the apex penicillate,

the stiff hairs 1.5–2 mm. long, white; stigmas briefly short exerted (for 1–1.3 mm.), low rounded, with a central crease; ovary 1.5 mm. long, ellipsoid; berry 6–7 mm. in diameter, globose-turbinate, apophysate, greenish; seeds 1.4–1.5 mm. long, 0.7–0.9 mm. wide, 0.2–0.3 mm. thick, elliptic, flat, with strong wavy parallel transverse ridges, the eminences rounded or muriculate, the raphe forming a prominent, thickened, straw-colored margin, the flat faces dull brown, but the color in places masked by the pale epidermis.

HOLOTYPE: Niihau, *W. T. Brigham* (distributed by *Mann & Brigham*), (BISH).

SPECIMENS EXAMINED: Kauai ou Nihau (=Niihau), 1851–55, *J. Remy 300 bis* (GH; and photo in BISH).

H. Mann, Jr., commented (1867: 180) on this Remy collection, "more probably Niihau—where it was also found by Mr. W. T. Brigham." Rock (1919a: 357) observed that, "The plants from Niihau collected by Remy are much more robust, the stems being nearly 5 cm. in diameter." The three sheets of the type collection, by Brigham, in the Bishop Museum, contain seven branches, all of them sections split longitudinally from the heavy and densely flowered stems. The longitudinal stem sectors were flattened in pressing, so that one cannot be sure of their original diameter. A revised estimate is 1–2 cm. at the base of the lowest leaves.

The occurrence of a *Delissea* on Niihau is very noteworthy, for the lobelias in general and all of the species of *Delissea* in particular, occur in moist forests, usually in the rain-forest. That a *Delissea* was twice collected between 1850 and 1865 by different botanists is an indication of the occurrence then on the uplands of a moist forest. Brigham, then the director of the Bishop Museum, is quoted by Forbes (1913: 25) as saying, "this is the only *lobelia* that he saw on the island, and that it was more plentiful over the area where it occurred than perhaps any other lobeliaceous plant occurring in an equal area on the [Hawaiian] group." The species is certainly ex-

tinct now, having vanished when domestic grazing animals destroyed the native forest.

Delissea undulata, collected by Gaudichaud in 1819 was described by him (1829: 457 and pl. 78). His description in Latin consists of 12 words, only 9 of which are descriptive. His own type specimen, now in Paris, gives the locality Iles Sandwich. No more precise localization has been found. A photograph of his type specimen has been published by Rock (1919: 201) and this shows a specimen in fruit and flower, and with slender, linear-lanceolate blades, coarsely and irregularly sinuate dentate. Though with broader leaves, a collection by Hillebrand, August 1870, dry pali of Olualu (Olowalu) gulch, West Maui, was photographed by Rock when in Berlin and this excellent photograph is in the Bishop Museum. It is similar to the generalized drawing published by Gaudichaud (1826–30, Atlas: pl. 78). The plant has broader, less deeply lobed blades, but it appears to be of the same species, *D. undulata* Gaud., and it was so determined by Rock.

There is a *D. undulata* Gaud. var. *serrulata* Wawra, described from fruiting material, Wawra 1,943, from Waihee, Maui. Rock (1919: 353) reduced this to the synonymy of the species and cited Wawra's specimen which he had studied in Vienna. This may well belong in the synonymy of *D. undulata*, but in lack of flowers it cannot be placed with certainty. It appears, then, that the *D. undulata* Gaud. was probably collected by Gaudichaud in the adjacent mountains when the "Uranie" was anchored at Lahaina, Maui. *D. undulata* Gaud. has the blades linear-lanceolate, coarsely and irregularly sinuate-dentate, and apparently much larger, while *D. niibauensis* has the blades broadly ovate, crenate, and 5.5–7.5 cm. long.

D. fallax Hbd., apparently the closest relative, has the blades 7–23 cm. long, 2.3–5.8 cm. wide, narrowly elliptic, apiculate, serrate; petioles 3–13 cm. long; calyx lobes subulate, glabrous; corolla 15–17 mm. long, with a single, inconspicuous dorsal knob;

anthers 4.5–6 mm. long; penicillate brush 1–1.3 mm. long; berry 10–12 mm. in diameter. In contrast, *D. niibauensis* has the blades 5.5–7.5 cm. long, 3.4–5 cm. wide, broadly ovate, crenate; petioles 2–4 cm. long; calyx teeth deltoid, hirsutulous; corolla 22–25 mm. long, with one conspicuous dorsal and two lateral knobs; anthers 6–8.5 mm. long, the penicillate brush 1.5–2 mm. long; berry 6–7 mm. in diameter.

Rock (1919a: 353, 357) lists two of his own collections, 3,950 and 10,053, from the western side of the island of Hawaii, simple stalked trees more than 30 feet high, and relates his surprise at finding these on Hualalai, Puuwaawaa, and Pulehua. A similar specimen, *Forbes 263.H*, from Kanahaha, Kona, Hawaii, has recently been described as *Cyanea argutidentata* E. Wimm. Its only two mature flowers scarcely show the single gibbous corolla hump, but it is evident on the flowers of other collections of what is considered the same species, all from Kona, Hawaii: Puuwaawaa, *Rock 3,950*; Pulehua, Mauna Loa, *Rock 10,053*, and Kanehaha (=Kanahaha) *Forbes 264.H*; and Hanehane, *Forbes 196.H*. For the latter there is a drawing showing the single, proximal gibbous swelling at the apex of the corolla tube, and recording the swelling as red, while the lower part of the corolla as white, the upper part with reddish dots, the corolla lobes, filament tube apex, and stigmas pea green. Since this population has the technical characters, the following transfer is proposed.

Delissea argutidentata (E. Wimm.) comb. nov.

Cyanea argutidentata E. Wimm., Engler's Pflanzenreich IV, 276b(1): 75–76, fig. 21, 1943.

HOLOTYPE: Hawaii, "Wald unterhalb Koa Kanehaha-Kona, blühend im Juni (C. N. Forbes n. 263 H)" (BISH). This was a translation by Wimmer of the original data: Growing in the forest under koa, Kanehaha (=Kanahaha), Kona, June 26, 1911. J. F.

Rock has subsequently redetermined Wimmer's species as *Delissea undulata* Gaud., reaffirming his opinion of the Hawaiian plants expressed in his monograph of 1919. That grouped the diverse plants of Kauai, Niihau, Maui, and Hawaii as one species. The writer here shows that the holotype was from West Maui, a plant having flowers with three gibbous humps; that the Kauai record is dubious; that the Niihau one is a new species, *D. niibauensis*; and that the one from Hawaii having calyx lobes 1–2 mm. long, and usually smaller, shorter leaves is still a different one, *D. argutidentata*. This latter is very close to *D. fallax* Hbd. from the Hilo region on eastern Hawaii, which is known only from the type collection and shows calyx lobes "about 3 mm. long." When more collections are found to represent *D. fallax*, its placement should probably again be re-examined. Concerning the other segregates, the evidence is more abundant, and the conclusions more certain.

A close examination of Forbes's field notebooks reveals that his no. 263.H was an undetermined grass, and that no. 264.H is the correct number of this collection of Lobeliaceae. Forbes himself made the correction on one sheet (BISH), but the duplicate sent to Wimmer went under the number 263.H. Thus the holotypic collection of *D. argutidentata* should now read Kanehaha (=Kanahaha).

COMPOSITAE

Lipochaeta kawaihoaensis sp. nov.
(§ *Lipochaeta*)

Fig. 9

NOM. VERN.: "ko'oko'olau."

DIAGNOSIS HOLOTYPE: Perennis suffruticosa erecta 3–8 dm. alta, corona pluri-ramifera, caulibus principalibus griseis deinde brunneis longitudinaliter sulcatis multi-ramosis in basi 2–7 mm. diametro, ramis lateralibus anguste pluri-angulosis adpresso-hispidulosis late divergentibus, petiolis 4–18 mm. longis gracili-

bus adpresso-hispidulis, laminis 1.2–4 cm. longis 7–28 mm. latis ovatis ad deltoideo-ovatis acutis vel obtusis firme crasse chartaceis et scabrissimis marginibus grosse crenatis vel etiam serratis supra obscure olivaceis in nervis adpresso-hispidis in intervallis adpresso-hispidulosus pilis cum basibus pustulatis infra pallide viridibus et adpresso-hispidulosus, capitulis terminalibus solitariis vel raro in ramulis parvis cum bracteis reductis et cymis elongatis 3-capitatis simulantibus, pedunculis 3–17 cm. longis nudis, involucris in flore 6 mm. altis 10–12 mm. diametro sed in fructu rotatis et subreflexis, phyllaris biseriatis viridibus crassis coriaceis 13-nervosis subacutis ellipticis vel lanceolatis extra et infra adpressi-hispidulosus, phyllaris exterioribus 5 et 4–8 mm. longis, interioribus 6–7 et simulantibus, receptaculo in flore lanceoloideo in fructu conico 4 mm. alto, paleis 5–6 mm. longis oblanceolatis scabris carinatis pluri-nervosis, floribus radiatis 6–9 luteis, laminis 7–9 mm. longis late ellipticis pluri-nervosis emarginatis et subtridentatis, tubo 1 mm. longo, setis pappi 3–5 inaequalibus 1–2 mm. longis linearibus vel oblanceo-linearibus crassis rigidis scaberulis eis majoribus canaliculatis, stylo 2 mm. longo filiformibus, stigmatibus 2 ligulatis 1.5–2 mm. longis, achaeneis juvenalibus 1.8–2 mm. longis 1.7–1.9 mm. latis trigonatis latere distali convexo late cuneiforme apice dense breve albo-hispiduli, achaeneis maturis 2.7–3.1 mm. longis 1.9–2.7 mm. latis trigonatis late cuneiformibus lateribus brunneis et nigro-maculatis forte tuberculatis apice subplanato luteo-hispiduloso, aristis 1.5–2 mm. longis subulatis adscendenti-hispidulosus subpersistentibus, floribus disci ca. 80, corollis 4 mm. longis luteis, tubo 1.5 mm. longo tubuloso, limbo anguste infundibuliforme 2.5 mm. longo 5-lobato, lobis 0.8 mm. longis deltoideis divergentibus, filamentis 1 mm. longis filiformibus pallidis, tubo staminalis 1.8 mm. longo in apice 0.5 mm. diametro ad basim attenuato, saccis antherae nigris, apicis connectivi pallidis deltoideo-ovatis, stylo 3 mm. longo pallido basi 0.4–

0.5 mm. longo cylindrico subnigro firmo, stigmatibus 1 mm. longis ligulatis acutis, arista pappi unica ligulata subulata 2.1–2.3 mm. longa, achaeneis disci juvenalibus 1.8–2 mm. longis 0.7–0.9 mm. latis cuneiformibus compressis lateribus convexis glabris apice obliquo hispidulo, achaeneis disci maturis 2.5 mm. longis 1.7–2 mm. latis late cuneiformibus subluteis et pallide brunneo-maculatis in parte levibus in parte tuberculatis tetragonis basi obtusa vel truncata apice lato dense luteo-hispiduli marginibus tuberculatis, seta pappi plerumque una 1–2.3 mm. longa subulata hispidula curvata.

Perennial suffruticose, erect, 3–8 dm. tall; the crown bearing several branches; the main stems much branched, gray, becoming brown, longitudinally fissured, 2–7 mm. in diameter at base; the lateral branchlets sharply several-angled, appressed hispidulous; petioles 4–18 mm. long, slender, appressed hispidulous; blades 1.2–4 cm. long, 7–28 mm. wide, ovate to deltoid-ovate, acute or obtuse, thick, firm chartaceous and very scabrous, the margin coarsely crenate or even serrate, above dull olive green, appressed hispid on the veins, on the intervals closely appressed hispidulous from pustulate bases, below pale green and closely appressed hispidulous; heads terminal, usually solitary at tips of branches but rarely on small shoots with reduced bracts simulating an elongate 3-headed cyme; peduncles 3–17 cm. long, naked; heads heterogamous, radiate; involucre in anthesis 6 mm. tall, 10–12 mm. in diameter, but in fruit widespreading and rotate or somewhat reflexed; phyllaries in 2 rows, green, thick, coriaceous, with about 13 longitudinal nerves, subacute, broadly or narrowly elliptic or lanceolate, rough appressed hispidulous without and within, the outer ones mostly 5 in number, 4–8 mm. long, the inner ones 6–7, similar; receptacle in anthesis lanceoloid, in fruit conic, about 4 mm. tall and taller than broad; chaff 5–6 mm. long, oblanceolate, cartilaginous, rough scabrous, carinate, the back keeled, with numerous close longitudinal

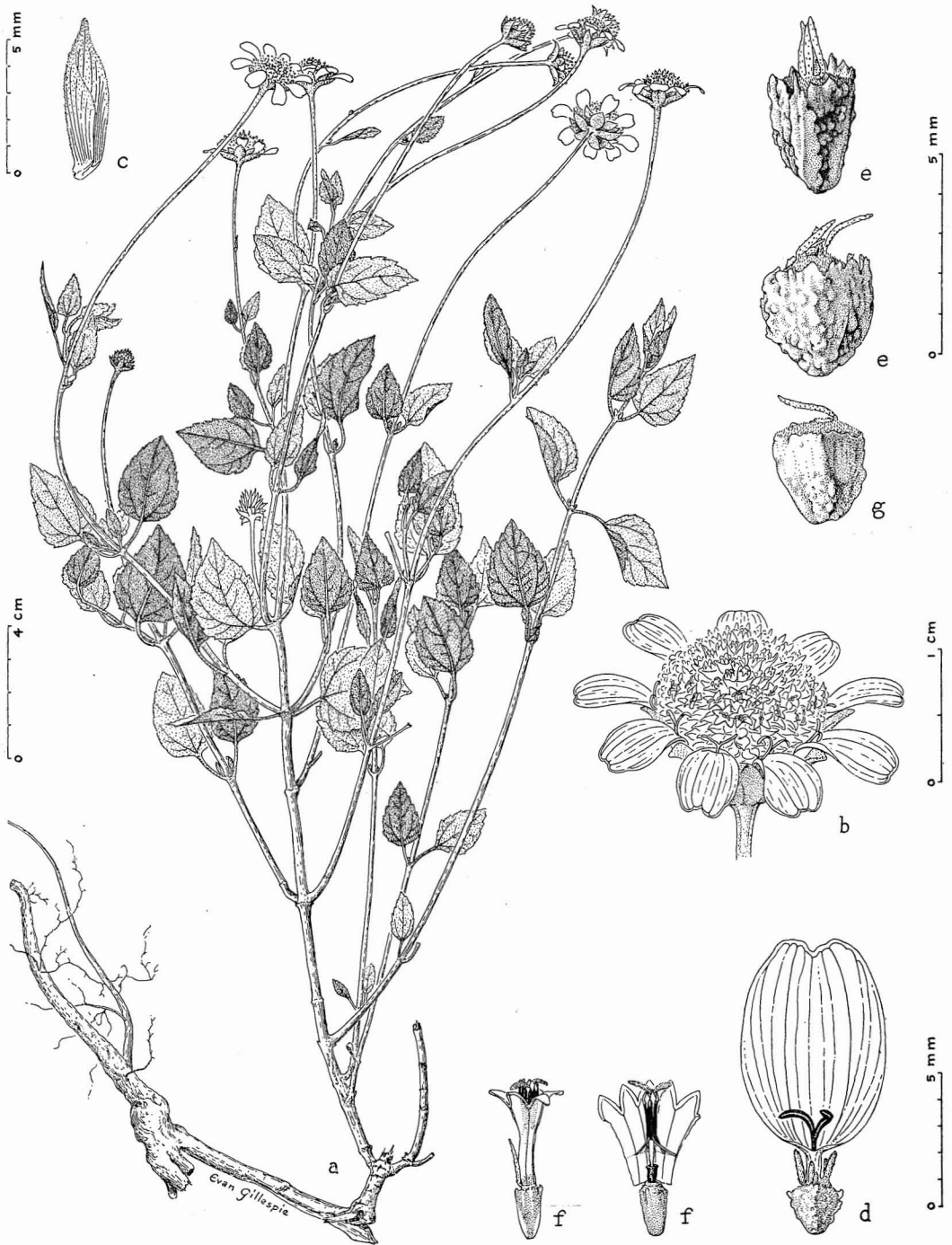


FIG. 9. *Lipochaeta kawaihoensis*, from holotype: a, habit $\times \frac{1}{2}$; b, head $\times 2$; c, chaff $\times 4$; d, ray flower $\times 4$; e, ray achene $\times 6$; f, disk flower $\times 4$; g, disk achene $\times 6$.

parallel veins; ray flowers marginal, 6–9, bright yellow, the ray 7–9 mm. long, broadly elliptic, with numerous longitudinal parallel nerves, at apex emarginate and more or less 3-toothed; corolla tube 1 mm. long; pappus awns unequal, 3–5, and 1–2 mm. long, linear or oblance-linear, thick, rigid, ascending scaberulous, the larger ones channelled on the inner side; style 2 mm. long, filiform, the base not distended; stigmas 2, ligulate, 1.5–2 mm. long; the young ray achene 1.8–2 mm. long, 1.7–1.9 mm. broad, trigonous, and the broad distal face convex, broad cuneiform, the apex densely short white hispidulous; when mature the ray achenes 2.7–3.1 mm. long, 1.9–2.7 mm. wide, almost as thick, trigonous, broadly cuneiform, the sides brown, mottled with black and strongly tuberculate, the broad apex flatish or sloping, yellowish hispidulous, awns 1.5–2 mm. long, subulate, ascending hispidulous, several of them persistent; disc flowers about 80; disc corollas 4 mm. long, yellow, the tube 1.5 mm. long, tubular, the limb narrow funnel-form, 2.5 mm. long, 5-lobed, the lobes 0.8 mm. long, deltoid, spreading; filaments 1 mm. long, filiform, pale; staminal tube 1.8 mm. long, 0.5 mm. in diameter at apex, narrowing below, the linear anther sacs black, the apical connective tips pale, deltoid-ovate; style 3 mm. long, pale, springing from a dark firm style base 0.4–0.5 mm. long, cylindrical, slightly tapering below, and with an expanded apical marginal rim; the 2 stigmas 1 mm. long, ligulate, acute; pappus of a single ligulate, subulate awn 2.1–2.3 mm. long, attached apically near the base of the corolla tube; the young disk achenes 1.8–2 mm. long, 0.7–0.9 mm. wide at apex, narrowly cuneiform and tapering downwards, compressed, the two sides convex, glabrous, the sloping apex densely hispidulous; disk achenes when mature 2.5 mm. long, 1.7–2 mm. wide, broadly cuneiform, yellowish, mottled with pale brown, partly smooth, partly low tuberculate, less thick than wide, but clearly tetragonal, the base obtuse or truncate, the apex broad,

gently sloping, closely yellowish hispidulous, the margin with low tubercles, the usually single awn apical, 1–2.3 mm. long, subulate, ascending hispidulous, sharply bent.

HOLOTYPE: Niihau, Kawaihoa Point, 300 ft. alt., in dry tuff, head of steep gully, erect, much branched shrubs, rays yellow, disk dark yellow, March 31, 1949, *H. St. John* 23,611 (BISH).

This plant has been carefully compared with the known species and varieties of *Lipochaeta*. It is outstanding in the genus by having the receptacle at first lanceoid, then ultimately conic, instead of flat or gently convex. It is most similar to *L. lobata* var. *denticulata* of the island of Oahu, but this variety has the petioles 2–5 (-9) mm. long; inner and outer phyllaries oval, subequal; chaff obtuse; ligulate flowers 8–18; and the achenes 2.9–3.6 mm. long, verrucose, sharply angulate, narrowly obdeltoid, compressed. *L. kawaihoaensis* differs from it by having the petioles 4–18 mm. long; the inner phyllaries lanceolate, longer and narrower than the outer ones; chaff acute; ligulate florets 6–9; and the achenes 2–3.1 mm. long, 1.7–2.7 mm. wide, the sides tuberculate, the angles not winged or margined. There is a lesser similarity in appearance to *L. tenuis* var. *Sellingii* of Puu Hapapa, Oahu, which variety is different in having the habit decumbent or suberect; blades oblong-lanceolate, at base broadly cuneate, the margin sharply serrate; peduncles 2–5 cm. long; disk flowers with corolla lobes equaling the tube, the pappus of 4 bristles as long as the corolla tube, and the achenes obovate, triangular with the angles more or less winged. On the other hand, *L. kawaihoaensis* can be known by having the habit erect; blades ovate to deltoid-ovate, at base rounded, the margin coarsely crenate or even serrate; peduncle 3–17 cm. long; disk flowers with corolla lobes $\frac{1}{2}$ as long as the tube, pappus of a single ligulate-subulate awn slightly more than $\frac{1}{2}$ as long as the corolla tube; achenes broadly cuneiform, tuberculate, not winged.

The new species is named from its only known locality, the volcanic, mountainous point at the south end of Niihau Island; to its name is added the Latin suffix, *-ensis*, indicating place of origin.

Lipochaeta lobata DC., var. *incisior* var. nov.

Fig. 10

L. lobata sensu C. N. Forbes, not of DC.

L. lobata DC. var. *Aprevalliana* sensu Sherff as to Niihau specimen, not of (Drake) Sherff.
NOM. VERN.: "nehe."

Foliis majoribus inciso-serratis lobatisque.

It has the larger blades incised serrate and lobed.

HOLOTYPUS: Niihau, Kaaliwai, in thicket with *Euphorbia celastroides* and *Artemisia australis*, 750 ft. alt., shrub 1-1.5 m. tall; leaves scabrous, chartaceous; involucre green; rays

yellow, March 29, 1949, *H. St. John* 23,572 (BISH).

SPECIMENS EXAMINED: Niihau, Kaali, January 1912, *J. F. G. Stokes*. This is an immature specimen, only 34 cm. tall, and with the blades lance-ovate, merely incised serrate, but it is from the same locality, has blades similar to the smaller ones on the holotype, and is certainly of the same variety.

The most similar variety to this new one is *L. lobata* var. *denticulata* of Oahu, which has the blades subentire to crenate-dentate or serrate, but not lobed. The new varietal name is from the Latin, *incisior*, more deeply cut.

Lipochaeta lobata DC. var. *maunaloensis* Sherff

L. lobata sensu C. N. Forbes, not of DC.
Niihau, south half of Island, January 1912, *J. F. G. Stokes*.

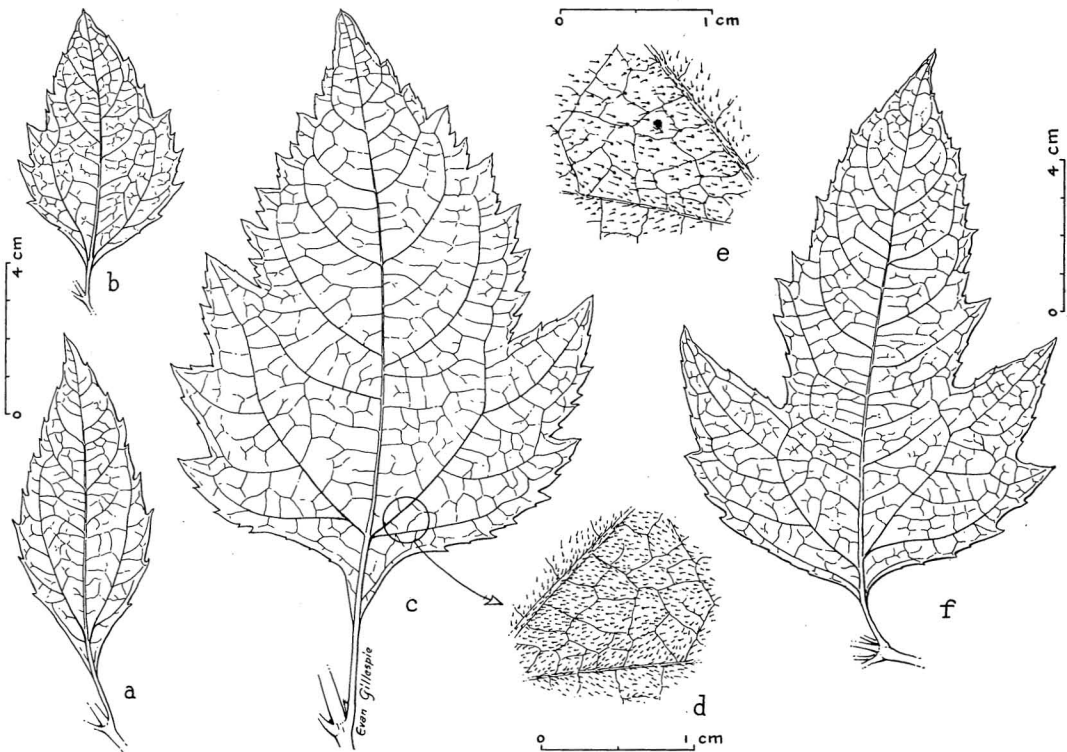


FIG. 10. *Lipochaeta lobata* var. *incisior*, from holotype: a, b, c, f, leaves $\times \frac{1}{2}$; d, lower leaf surface $\times 2$; e, upper surface $\times 2$.

This is a good flowering and fruiting specimen and it matches nicely the holotypic specimen from Mauna Loa, the dry end of Molo-kai. This Niihau specimen was not seen by Sherff.

Lipochaeta niibauensis, sp. nov.
(§ *Lipochaeta*)

Fig. 11

NOM. VERN.: "pa'apa'aina" (= crackle; probably in allusion to the stiff, brittle leaf blades).

DIAGNOSIS HOLOTYPI: Frutex 1 m. altus erectus ramosus, caulibus principalibus terti-bus scabris, ramulis angulosis scabris et adscendenti-adpressi-hirsutululis, petiolis 4–20 mm. longis oppositis minime connatis et perfoliatis in apice basique dilatatis et adscendenti-albo-hispidulis, laminis 1.5–6.2 cm. longis 8–56 mm. latis crasse chartaceis sed rigidis et maxime hirsutulo-scabris et subadpresso-albo-hispidulis late ovatis in basi rotundatis vel subcordatis apice abrupte subacuti marginibus bisdentato-serratis infra pallidioribus proxime basi triplinervatis, capitulis in cyma laxa 3-capitata vel ita cum ramulis axillaribus tardis tenuibus cymis tricapitatis ferrentibus, pedunculis 1.5–6.5 cm. longis nudis dense subadpresso-albo-hispidulis, capitulis in flore cum involucre 4–5 mm. alto 8–10 mm. diametro sed in fructu patelliforme, phyllaris bi- (vel tri-) seriatis subviridibus exterioribus 5 (-7) subacutis 3–3.5 mm. latis late ovatis in marginibus et extra adpressi-hirsutululis firmis coriaceis 7-nervosis in basi carnosa, phyllaris interioribus paullo longioribus 2.5 mm. latis obovatis acutis, receptaculo in flore depresso-conico 1 mm. alto 2 mm. lato, paleis 3.5–5 mm. longo anguste cuneatis conduplicatis lateribus 0.8–1 mm. latis plurinervis scariosis apicibus exsertis hispidulis, floribus radiatis marginalibus 8–14 in flore luteis, ligulis 8–9 mm. longis 3.8–4 mm. latis late ovalibus subtridentatis in latere distali valde bicostatis nervis gracilioribus 8, tubo 1.4 mm. longo aristis pappi plerumque

3 inaequalibus 0.6–0.9 mm. longis subulatis adscendenti-scaberulis, stylo 2.5 mm. longo, stigmatibus 0.7 mm. longis filiformibus, achaeneis radiatis juvenalibus 1.2–1.4 mm. longis trigonatis cuneiformibus in marginibus et apice hispiduli-ciliatis, achaeneis maturis 2.5–2.8 mm. longis 1.2–1.8 mm. latis valde trigonatis late cuneiformibus nigro-brunneis et griseo-maculatis ad apicem scabro-hispidulis ad basim ita diminuendis ad basim marginibus lacero-alatis, aristis 3 (-4) inaequalibus 0.6–1.2 mm. longis subulatis, floribus disci ca. 100, corollis in flore viridi-luteis 4 mm. longis tubo 1 mm. longo cylindrico, limbo anguste infundibuliforme 0.9 mm. diametro 4-lobato lobis 0.5–0.6 mm. longis deltoideis adscendentibus, filamentis 1 mm. longis ligulatis pallidis, tubo staminalis 1.4 mm. longo 0.5 mm. diametro, sacis antheris subnigris apice connectivi pallidi deltoideo-ovatis, stylo 3.5 mm. longo filiforme pallidi et basi 0.3 mm. longi cylindrici subnigri, stigmatibus 0.7–0.8 mm. longis ligulatis apice rhomboidei, aristis pappi binis 0.7–1.3 mm. longis subulatis barbellatis, achaeneis disci juvenalibus 1.3–1.9 mm. longis 0.6–0.8 mm. latis gracili-biconvexis cuneiformibus in marginibus et apice hispidulis, achaeneis maturis 2.8–3.2 mm. longis 1.1–1.7 mm. latis valde compressis et biconvexis medie vel anguste elliptico-obovatis basi obtusi apice truncati vel excavati brunneis et griseis maculatis ad apicem tuberculato-hispidulis marginibus cum alis membranaceis sive integris sive laceratis sive hispidulo-ciliato-laceratis, aristis binis 0.7–1.7 mm. longis aequalibus vel inaequalibus subulatis barbellatis in apice affixis.

DESCRIPTION OF ALL SPECIMENS: Shrub 1 m. tall, erect, with several branches; main stems terete, brown, scabrous from the remnants of pubescence; branchlets several-angled, roughened and ascending appressed hirsutulous; petioles 4–20 mm. long, opposite, connate and slightly perfoliate, dilated at base and apex, ascending white hispidulous; blades 1.5–9 cm. long, 8–77 mm. wide, thick chartaceous but stiff and very hirsutulous sca-

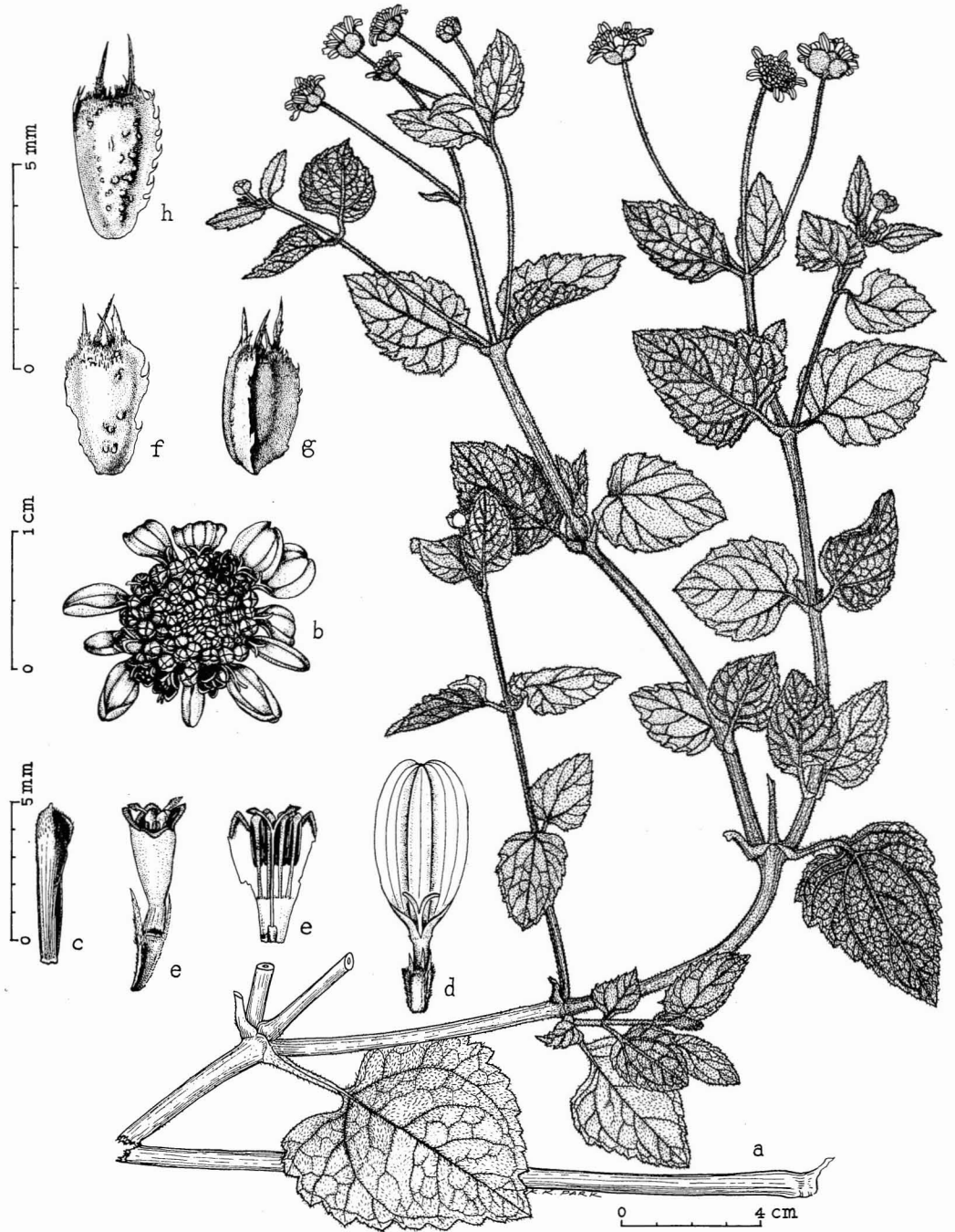


FIG. 11. *Lipochaeta niibauensis*, from holotype: a, habit $\times \frac{1}{2}$; b, head $\times 2$; c, chaff $\times 4$; d, ray flower $\times 4$; e, disk flower $\times 4$; f, ray achene, dorsal view, $\times 6$; g, ray achene, lateral view, $\times 6$; h, disk achene, dorsal view, $\times 6$.

brous, and white subappressed hispidulous, broadly ovate, the base rounded or subcordate, the apex abruptly subacute, the margin doubly dentate-serrate, below a little paler, triplinerved from just above the base; heads in a loose, mostly 3-headed terminal cyme, or with 3-headed cymes on weak, late, lateral branchlets, peduncles 1.5–6.5 cm. long, naked, closely subappressed white hispidulous; heads heterogamous, radiate; involucre in anthesis 4–5 mm. tall, 8–10 mm. in diameter, but in fruit more widely spreading, knee-pan-shaped; phyllaries in 2 (or 3) rows, greenish, the outer ones 3–3.5 mm. wide, 5 (-7) in number, broadly ovate, subacute, appressed hirsutulous on the outer surface and the margin, firm coriaceous except at the firm fleshy base, 7-nerved; inner phyllaries slightly longer, 2.5 mm. wide, obovate, acute; receptacle in anthesis low conical, 1 mm. tall, 2 mm. broad; chaff 3.5–5 mm. long, narrowly wedge-shaped, the apex rounded to an acute tip, folded along the midrib, the sides 0.8–1 mm. wide, many nerved, scarious, the exposed tips hispidulous; ray flowers marginal, 8–14, when fresh yellow, the ray 8–9 mm. long, 3.8–4 mm. wide, broadly oval, shallowly 3-toothed at apex, on the distal side with 2 strong salient ribs from which the sides are infolded, weaker longitudinal ribs 8; ray corolla tube 1.4 mm. long; pappus awns mostly 3, unequal, 0.6–0.9 mm. long, subulate, ascending scaberulous; styles 2.5 mm. long; stigmas 0.7 mm. long, filiform; the young ray achenes 1.2–1.4 mm. long, trigonous cuneiform, the margins and apex hispidulous ciliate; when mature the ray achenes 2.5–2.8 mm. long, 1.2–1.8 mm. wide and nearly as thick, sharply trigonous, broadly cuneiform, dark brown, mottled with gray, towards the apex rough hispidulous and less so towards the base, the angles lacerate winged, awns 0.6–1.2 mm. long, 3 (or 4), unequal, subulate; disk flowers about 100; disk corollas when fresh greenish yellow, 4 mm. long, the tube 1 mm. long, cylindrical, the limb very narrowly funnel-form, 0.9 mm. in diameter, 4-lobed, the lobes 0.5–0.6 mm.

long, deltoid, ascending; filaments 1 mm. long, ligulate, pale; staminal tube 1.4 mm. long, 0.5 mm. in diameter, tapering downwards, the anther sacs blackish, the apical connective tips pale, deltoid-ovate; style 3.5 mm. long, filiform, pale, springing from a dark, cylindrical style base 0.3 mm. long, with the upper rim expanded and lobed; the 2 stigmas 0.7–0.8 mm. long, ligulate with a narrowly rhombic tip; pappus of two subulate awns 0.7–1.3 mm. long, upward barbellate, attached above the lateral angles; the young disk achenes 1.3–1.9 mm. long, 0.6–0.8 mm. wide, thin biconvex, wedge-shaped, hispidulous on margins and apex; when mature the disk achenes 2.8–3.2 mm. long, 1.1–1.7 mm. wide, strongly compressed and biconvex, elliptic-obovate or narrowly so, the base obtuse, the apex truncate or excavate, the surface mottled brown and gray, the sides smooth towards the base, but upwards tuberculate hispidulous; each of the margins bearing a thin wing that is entire, lacerate, or hispidulous-ciliate lacerate; awns two 0.7–1.7 mm. long, equal or unequal, subulate, upwardly barbellate, attached apically.

HOLOTYPUS: Niihau, Kii, among rocks on basalt knoll, 100 ft. alt., April 2, 1949, *H. St. John* 23,664 (BISH).

SPECIMENS EXAMINED: Niihau, Kii, between basalt boulders on rocky knoll, 75 ft. alt., April 2, 1949, *H. St. John* 23,671.

L. niihauensis is a member of the section *Lipochaeta* (*Microchaete*). Its closest relative is *L. subcordata* Gray var. *populifolia* Sherff of the island of Lanai, which variety is distinguished by having the stems 3–6 dm. tall; petioles 1–3 cm. long, slender; blades from narrowly ovate-cordate to lanceolate-cordate or narrowly deltoid, the principal ones broadly ovate, subcordate, the margins doubly sharply attenuate serrate; outer phyllaries about 4 mm. long; ray flowers 5–6, and 5–7 mm. long, their achenes 2–2.5 mm. long, 1.8–2 mm. wide, black, oblong-cuneate, trigonous, wingless, the apex truncate, the back with many high tubercles; disk corollas 3 mm. long,

narrowly funnellform, not contracted, pilosulous, their achenes 2–2.5 mm. long, 3-angled on the high convex back, giving a 4-angled appearance, the margins bluntly lobed or toothed, the sides high tubercled. *L. niibauensis* differs in having the stems 1 m. tall; petioles 4–20 cm. long, slightly dilated at base and connate; blades broadly ovate, the margins doubly dentate-serrate; outer phyllaries 5–6 mm. long; ray flowers 8–14, and the ray 8–9 mm. long, their achenes 2.5–2.8 mm. long, 1.2–1.8 mm. wide, dark brown mottled with gray, broad cuneiform, the angles lacerate winged, the apex crateriform, the back hispidulous; disk corollas 4 mm. long, cuneate-cylindric, contracted near the base, glabrous, their achenes 2.8–3.2 mm. long, thin biconvex wedge-shaped, the margins with a thin wing that is entire, lacerate, or hispidulous ciliate lacerate, the sides tuberculate hispidulous above but smooth towards the base.

The specific epithet is coined from the name of the island; and the Latin place ending, *-ensis*.

REFERENCES

- BROWN, F. B. H. 1931. Solanaceae. IN Erling Christophersen and Edward L. Caum. Vascular plants of the Leeward Islands, Hawaii. *Bull. Bishop Mus.* 81: 35–37.
- FERNALD, M. L., and A. E. BRACKETT. 1929. The representatives of *Eleocharis palustris* in North America. *Rhodora* 31: 57–77, pls. 181–184; also, *Contr. Gray Herb. Harv.* 83: 57–77, pls. 181–184.
- FORBES, CHARLES N. 1913. An enumeration of Niihau plants. *Occ. Pap. Bishop Mus.* 5(3): 17–26, 3 pls. 1 map.
- GAUDICHAUD, CHARLES. 1826–30. *Voyage autour du monde, Uranie et la Physicienne* 1–522. Atlas 1–22, pls. 1–120, 1826 [= 1826–30]. Pillet Aîné, Paris.
- HANDY, E. S. CRAIGHILL. 1940. *The Hawaiian Planter, Volume 1, His Plants, Methods and Areas of Cultivation*. *Bull. Bishop Mus.* 161. Pp. iii + 227, 21 figs., 8 pls.
- HILLEBRAND, WILLIAM. 1888. *Flora of the Hawaiian Islands*. XCVI + 673, frontispiece, 4 maps. Carl Winter, Heidelberg.
- HOOKE, WILLIAM JACKSON, and G. A. W. ARNOTT. 1830–41. *The Botany of Captain Beechey's Voyage*. H. M. S. "Blossom." 485 pp., 94 pls. Treuttel & Würtz, Treuttel, jun. & Richter, London.
- INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE, PARIS, 1954. J. Lanjouw (ed.). 1956. *Regnum Vegetabile* 8: 1–338.
- JUDD, CHARLES S. 1920. The Wiliwili tree. *Hawaii. For. Agric.* 17(4): 95–97, 2 pls.
- KRUKOFF, B. A. 1939. Preliminary notes on Asiatic-Polynesian species of *Erythrina*. *J. Arnold Arbor.* 20: 225–233.
- MANN, HORACE [JR.]. 1867. Enumeration of Hawaiian plants. *Proc. Amer. Acad. Arts. Sci.* 7: 143–235.
- POLLACCI, GINO. 1918. Sull' "*Abrus precatorius*" L. *R. Ist. Bot. Univ. Pavia* 15: 285–290, tav. XVIII.
- ROCK, JOSEPH F. 1913. *The Indigenous Trees of the Hawaiian Islands* [VI] + 518, 215 pls. Hawaiian Gazette Co., Honolulu.
- 1919. The Arborescent Indigenous Legumes of Hawaii. *Bot. Bull. Hawaii* 5: 1–53, 18 pls. Territory of Hawaii, Board of Agriculture and Forestry, Division of Forestry.
- 1919a. *A Monographic Study of the Hawaiian Species of the Tribe Lobelioideae, Family Campanulaceae*. Mem. Bishop Mus., Vol. 7, No. 2. XVI + 395 pp. 217 pls.
- 1920. *The Leguminous Plants of Hawaii*. X + 234 pp., 93 pls. Hawaiian Sugar Planters' Association Experiment Station, Honolulu.
- ST. JOHN, HAROLD. 1955. The relationship between the species of *Erythrina* (Leguminosae) native to Hawaii and Tahiti. Pacific Plant Studies 13. *Webbia* 11: 293–299, fig. 1.
- SEEMAN, BERTHOLD. 1865–73. *Flora Vitiensis*. XXXIII + 453 pp., 100 col. pls., 1 map, portr. L. Reeve & Co., London.
- SHERFF, EARL EDWARD. 1951. A revision of the Hawaiian Island genus *Nototrichium*

- Hillebr. (fam. Amaranthaceae). *Bot. Leafl.* 4: 2-21.
- 1952. Further studies of Hawaiian Araliaceae: Additions to *Cheirodendron Helleri* Sherff and a preliminary treatment of the endemic species of *Reynoldsia* A. Gray. *Bot. Leafl.* 6: 6-19.
- 1954. Revision of the genus *Cheirodendron* Nutt. ex Seem. for the Hawaiian Islands. *Fieldiana, Bot.* 29(1): 1-45.
- SINCLAIR, MRS. FRANCIS. 1885. *Indigenous Flowers of the Hawaiian Islands*. [vii] + 44 pls. with text. Sampson Low, Marston, Searle, and Rivington, London.
- SVENSON, H. K. 1939. Monographic studies in the genus *Eleocharis* V. *Rhodora* 41: 1-19, 43-77, 90-110, pls. 537-547; also *Brooklyn Bot. Gdn. Contr.* 85.