

Monograph of the Hawaiian Species of *Gouania* (Rhamnaceae)¹ Hawaiian Plant Studies 34

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THE GENUS *Gouania* was early noted as a part of the Hawaiian flora by F. J. F. Meyen (1835), and he described a new species, basing it upon his own collection made on Diamond Head, Oahu, in 1831. He published the species in his narrative (1835:150) as *G. integrifolia*, but this epithet was a homonym of the earlier one for another species by Lamarck. When Walpers prepared the botanical report on the collections of this voyage of the "Prinzess Louise," he realized that Meyen's binomial was unavailable, so published it anew (1843:323) as *Gossania orbicularis*. There was no existing genus *Gossania*, and it is evident that no new genus was intended. The generic name was apparently the printer's attempt to reproduce the author's handwriting, and it was not corrected in proof-reading. It is apparent that Walpers intended to publish the binomial *Gouania orbicularis*. It was so listed in the Index Kewensis, and this rendering seems to be correct. However, this second binomial was unnecessary, as in 1840 Steudel had already published for it the valid name *Gouania Meyeni* (Steudel, 1840:703).

A second species was collected in 1840 by C. Pickering and W. D. Brackenridge, the botanists of the Wilkes Expedition, in the Waianae district, and published as *G. vitifolia* Gray (1854:283).

There were some other early collections of the genus, but no additional species were published until 1888 when W. Hillebrand's *Flora of the Hawaiian Islands* was printed. In it he added (1888:83) two new species, *G. Bishopii* Hbd., from Lahaina, Maui, and *G. Hillebrandii* Oliver, from Kula and Lahaina, Maui. A fifth species, *G. Fauriei* (Lévl.) St. John, was discovered on Molokai in 1910 and published as *Isodendron Fauriei* by Lévillé (1912:63). That summarizes the full story of the accepted species of

Gouania in the Hawaiian Islands, up to the present.

There is, however, an issue as to the generic placement of the local species that needs discussion. In the first edition of Engler and Prantl's *Pflanzenfamilien* (1896:424–425) Weberbauer published the new genus *Pleuranthodes* to include only the two Hawaiian species, *P. orbiculare* (Walp.) Weberb. and *P. Hillebrandii* (Oliver) Weberb. As printed, both of these epithets were incorrect. As indicated above, the earlier and valid epithet for the first species is *Meyeni*, and that for the second is *Hillebrandii*. This latter confusion was due to there being two German botanists, a more prominent and active one, Johann Maria Hillebrandt, and a lesser known amateur, William Hillebrand, a physician long resident in Hawaii, and author of the standard flora of the Hawaiian Islands. The second species was named in honor of the latter man, and his name contains no letter *t*.

Weberbauer treated *Gouania* as also present in Hawaii, and consisting of 30–40 species of the tropics of the world. He diagnosed the genus as having the style 3-lobed; disk mostly produced into one lobe in front of each calyx lobe; fruit 3-celled, 3-winged; inflorescence a spike or panicle; leaves entire or toothed; vines, or, if shrubs, the fruit wingless. *Pleuranthodes* was said to have the style 2-lobed; disk with 5 short broad lobes in front of the calyx lobes; fruit 2–4-celled, 2–4-winged; inflorescence a cyme; leaves entire; erect shrubs.

In the second edition of this work (Engler and Prantl, 1953:166–171) Suessenguth essentially kept the same classification. He retained the invalid epithet *Pleuranthodes orbiculare* (Walp.) Weberbauer, but corrected that of the second species to *P. hillebrandii* (Oliver) Weberbauer. He concluded with the statement, "Beide Arten vielleicht durch Zwischenformen verbunden." That is: "Both species perhaps are connected by intermediate forms." There were no specimens of either species in his Muenchen

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herbarium, and he cited no evidence to support his depreciation of the two species. Nor did he study and annotate any specimens of these species from other herbaria. His statement was wholly gratuitous. Of the genus *Gouania*, he estimated there were 66 species.

In review of the stated diagnostic characters between *Gouania* and *Pleuranthodes*, there are no significant differences in the lobes of the style, in the disk (five lobes beyond the five calyx lobes is the same as one lobe beyond each calyx lobe), in the cells and wings of the fruit, or in the inflorescence (since we now can state that *Gouania* has panicles, spikes, or cymes, while *Pleuranthodes* has spikes or cymes). There are left only the items that *Pleuranthodes* contains erect shrubs with entire leaves, while *Gouania* has climbing shrubs with tendrils or erect shrubs, and the leaves are toothed or entire. Since the fundamental characters of flower and fruit are identical, and since the only actual differences are overlapping ones of habit, the genus *Pleuranthodes* Weberbauer is here reduced to the synonymy of *Gouania* Jacq.

The Hawaiian species of *Gouania* are native to the dryland scrub or the lower dry forest zone. This is the region most drastically affected by human settlement and by the eating and trampling by introduced grazing animals. The vegetation of these lowlands was largely destroyed before it was observed or collected by scientists. The result of the same wholesale destruction was observed by the writer in his revision of the Hawaiian species of *Isodendron* (1952, p. 216). Most of the recent Hawaiian botanists have never found a living specimen of *Gouania*, and of the 14 species only 3 have been found and collected since 1886.

The four species known to Hillebrand (1888: 82-84) are still considered good and are here accepted. The present writer has found and collected *G. Hillebrandi* and brought it into cultivation, and *G. vitifolia* was rediscovered by Russ in 1929 and by Degener in 1932, and it may well be extant. The writer's study of the genus has been mostly upon early collections now found in the older herbaria. Based upon these collections he now publishes 10 new species, bringing the total in Hawaii to 14 species. Of these, 6 have not been collected since 1855, 3 not since 1865, 2 not since 1886, and 1 not since 1910. Like *Isodendron*, this

genus *Gouania* evidences what has happened to the native flora of the dry lowland regions; it has suffered an almost complete extinction. How many other native plants of the lowland region were exterminated before they were collected and recognized, we cannot even guess.

Significant morphological characters in the local species of *Gouania* are found in the shape and nature of the fruit, in the seeds (known in only three of the species), in the inflorescence, in the sexuality of the flowers, in leaf form, size, and pubescence, and in the plant habit. Several of the species have all their flowers quite similar in appearance, but actually they are polygamous or functionally dioecious. This is certainly so in *G. Hillebrandi*, *G. Meyeni*, *G. Remyi*, *G. sandwichiana*, and *G. vitifolia*. Of most of the other species, the inflorescences are too sparse or too immature to allow observation of this state of sexuality. It is, however, quite likely that they also are polygamous. The polygamous condition is not universal, but is common in the species of *Gouania* in other tropical areas. Carlquist has advanced the theory (1965:267-270) that genera that have migrated to and established themselves in island floras tend in their local speciation to develop polygamous or dioecious flowers. In the Hawaiian flora he lists the examples *Pelea*, *Myrsine*, *Broussaia*, and others. The genus *Gouania* can now be added to this list.

Seed production is rare in the Hawaiian species of *Gouania*. See our discussion of this in the treatment of the extant species *G. Hillebrandi*.

When one surveys the local distribution of the species of *Gouania*, it is seen that the genus was present on all the large islands of the Hawaiian group, except Kauai and Niihau. Maui had 5 species, the largest number, Oahu 3, Kahoolawe 2, Hawaii 2, Molokai 1, and Lanai 1. They were restricted to semiarid habitats, and on all the islands (except Lanai) were found on the leeward lower slopes of the mountains (except for *G. thinophila*, which occurred on Maui on the sand dunes of the windward shore of the isthmus). Two of the species, *G. pilata* and *G. sandwichiana* cannot be mapped precisely, as their locality data are merely the names of the islands, Maui and Hawaii.

KEY TO THE SPECIES

- A. Lianas with tendrils; blades toothed,
 - B. Blades elliptic to ovate, subcordate. 7. *G. Bishopii*
 - B. Blades broadly elliptic, deeply cordate,
 - C. Blades beneath appressed pilosulous on the principal veins. 2. *G. vitifolia*
 - C. Blades beneath densely shaggily pilosulous. 13. *G. hawaiiensis*
- A. Erect shrubs without tendrils; blades entire,
 - D. Blades suborbicular, emarginate. 1. *G. Meyeni*
 - D. Blades narrower, not emarginate,
 - E. Blade intervals below glabrous; blades shortly subacuminate obtuse; leafy branchlets glabrate in lower part. 3. *G. Oliveri*
 - E. Blade intervals hairy below; leafy branchlets with persistent pilosity,
 - F. Blades tapering to an acute apex,
 - G. Blades lanceolate to narrowly so; petioles 15–30 mm long; calyx lobes 1.3 mm long; disk with one broad, evident, retuse lobe opposite each calyx lobe. 10. *G. pilata*
 - G. Blades elliptic to elliptic-ovate; petioles 4–17 mm long; calyx lobes 1–1.1 mm long,
 - H. Hypanthium semiorbicular; disk with one slight emarginate lobe opposite each calyx lobe; flowering spikes 5–10 mm long.
 - 12. *G. cucullata*
 - H. Hypanthium cupulate; disk with 2 prominent rounded lobes opposite each calyx lobe; flowering cymes 25–35 mm long.
 - 11. *G. Remyi*
 - F. Blades elliptic, not tapering to the apex,
 - I. Blades at maturity sparsely hairy beneath,
 - J. Wings of capsule equally wide from base to tip; stipules caducous,
 - K. Peduncle 6–17 mm long; petals 1.3 mm long; calyx lobes 1.5–2 mm long. 6. *G. Hillebrandi*
 - K. Peduncle 20–45 mm long; petals 1 mm long; calyx lobes 1.3 mm long. 14. *G. sandwichiana*
 - J. Wings of capsule broader at apex; stipules long persistent. 4. *G. Fauriei*
 - I. Blades densely appressed pilose beneath,
 - L. Peduncle 10–40 mm long; branchlets half spreading pilose,
 - M. Blades 3–6.5 cm long, the lower surface hidden by the dense pilosity; capsules equally winged from base to tip. 8. *G. Lydgatei*
 - M. Blades 2.2–3.5 cm long, pilose below but the surface visible; capsule wings narrowed to the base. 9. *G. thimophila*
 - L. Peduncle 2–4 mm long; branchlets subappressed stiff villous; blades 1.4–3.7 cm long. 5. *G. Mannii*

1. *Gouania Meyeni* Steud., Nomencl. Pl., ed. 2, 1:703, 1840. (Fig. 1)

G. integrifolia Meyen, Reise 2:150, 1835, non Lam. (1789).

Gossania orbicularis Walp. in Meyen, Obs. Bot., Nov. Acta Acad. Caes. Leop.-Carol. Nat. Curios. 323, 1843, evidently a misprint and intended to be *Gouania orbicularis* Walp., and it was so treated in Ind. Kew.

ORIGINAL DIAGNOSIS: "G. fruticosa, erecta, simplex, foliis longe petiolatis coriaceis subrotundis retusis integerrimis subtus petiolisque puberulis, racemulis axillaribus, paucifloris petiolo brevioribus, calyce hirsuto. Sandwich Is., Oahu, Demant-Hügels, June 29, 1831, F. J. F. Meyen."

EXPANDED DESCRIPTION (from Wilkes Expl. Exped. coll.): Shrub, with curved ascending branches, at least 25 cm tall; stem at base 3 mm in diameter, terete, brown, with longitudinal fissures and with remnants of pubescence; leafy branchlets 1 mm in diameter, rather densely appressed pale puberulent; internodes 2–5 mm long, straight; nodes with a bracket-like enlargement at the leaf scar; stipules 1–1.5 mm long, lanceolate, appressed puberulent on the outer side, persisting nearly as long as the leaves, leaving an elliptic scar; petioles 5–19 mm long, appressed ascending white puberulent; blades 1.3–2.9 cm long, 1–2.5 cm wide, mostly very broadly elliptic, but a few of the apical and largest ones suborbicular and subemarginate, firm chartaceous, entire, the margin smooth, or toward the apex full and slightly undulate, the upper surface olive green and completely glabrous, the lower surface rather sparsely and almost invisibly appressed white pilosulous; inflorescences numerous, axillary, 5–10 mm long, cymose, densely appressed brownish pilosulous; peduncle 2–3.5 mm long; flowers 3–5; buds 1.5 mm long, greenish, obturbinate; the terminal perfect flowers with the calyx in anthesis 2.5–3.5 mm long, closely appressed ascending white puberulent, the tube 1.5 mm long, hemispheric, the 5 lobes 1.5–2 mm long, lance-ovate, thick and coriaceous, within glabrous and the slender tip with a raised triangular thickening; petals 1.2 mm long, white, spatulate, concave and deeply cucullate hooded, enclosing

the stamen; filaments 1.3 mm long, subulate; anthers 0.4 mm long, suborbicular; disk notched to each filament base and shallow retuse between each pair; styles 2 and 0.7 mm long; stigmas apical, discoid; lateral flowers apparently functionally staminate, with the calyx 2.5 mm long, closely appressed ascending white puberulent without, the tube 0.8 mm long, hemispheric, the lobes 2 mm long, lanceolate, ending in an acuminate tip 0.3–0.4 mm long, within glabrous and thickened on the margins and midrib; petals 0.7 mm long, white, clawed at base, obovate, saccate and deeply cucullate and enclosing a stamen; filaments 0.3 mm long, subulate; anthers 0.2 mm long, didymous suborbicular; disk 1.5 mm in diameter, notched at the base of each filament; the style 0.3 mm long, bifid; ovary evidently sterile.

HOLOTYPE: "Sandwich Is., Oahu, Demant-Hügels, June 29, 1831, F. J. F. Meyen." The holotypic specimen, once in the Berlin herbarium, was destroyed in World War II, and no isotype has been found in any of the principal herbaria of the world. Holotype not examined.

SPECIMENS EXAMINED: Sandwich Islands, U.S. Exploring Expedition under Captain Wilkes (GH, US). The expedition made a lengthy stay in Honolulu harbor, and it is likely that the botanists visited the nearby, prominent, Diamond Head.

The epithet honors the collector of this species, Franz Julius Ferdinand Meyen (1804–1840), surgeon and botanist on the world voyage of the Prussian ship "Prinzess Louise." His real specialty was plant physiology, but he did creditable exploring on this voyage.

2. *Gouania vitifolia* Gray, U.S. Expl. Exped., under Wilkes, 15(1): Botany, Phanerogamia 1:283, 1854. (Fig. 2)

Degener, O., and A. Greenwell, Fl. Haw., fam. 215: text and fig. 7/1/47.

EXPANDED DIAGNOSIS OF HOLOTYPE AND ISOTYPE: Woody vine; stems 4 or more mm in diameter, gray, with slight longitudinal ridges, glabrate; branchlets 1–3 mm in diameter, closely subappressed rusty puberulent; leaf scars reniform; nodes slightly swollen; internodes 15–80 mm long on the main stems, 3–10 mm long on

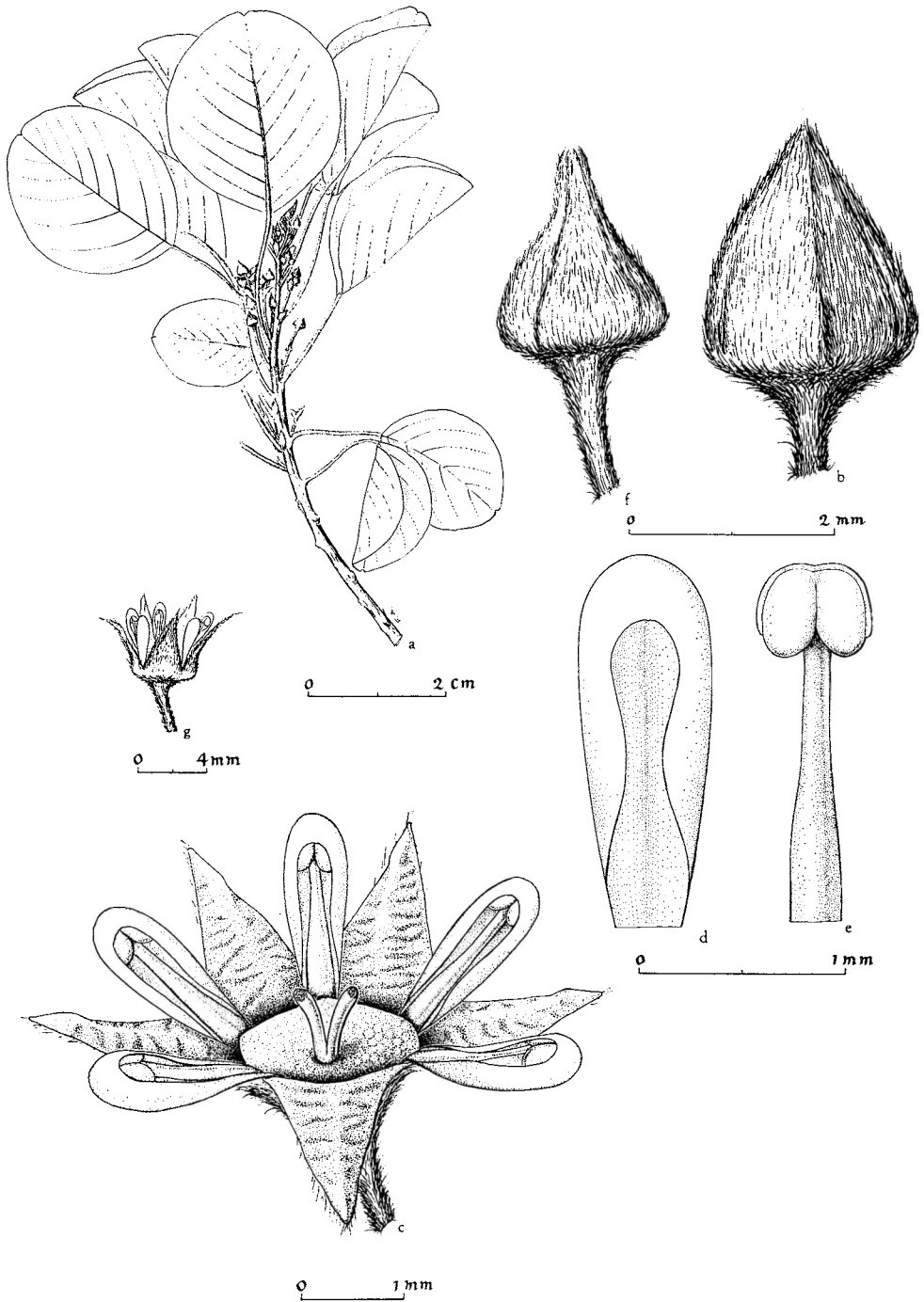


FIG. 1. *Gouania Meyeni* Steud., from Sandwich Is., U.S. Exploring Expedition. *a*, Habit, $\times 1$; *b*, bud of terminal perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, bud of staminate flower, $\times 15$; *g*, staminate flower, $\times 2\frac{1}{2}$.

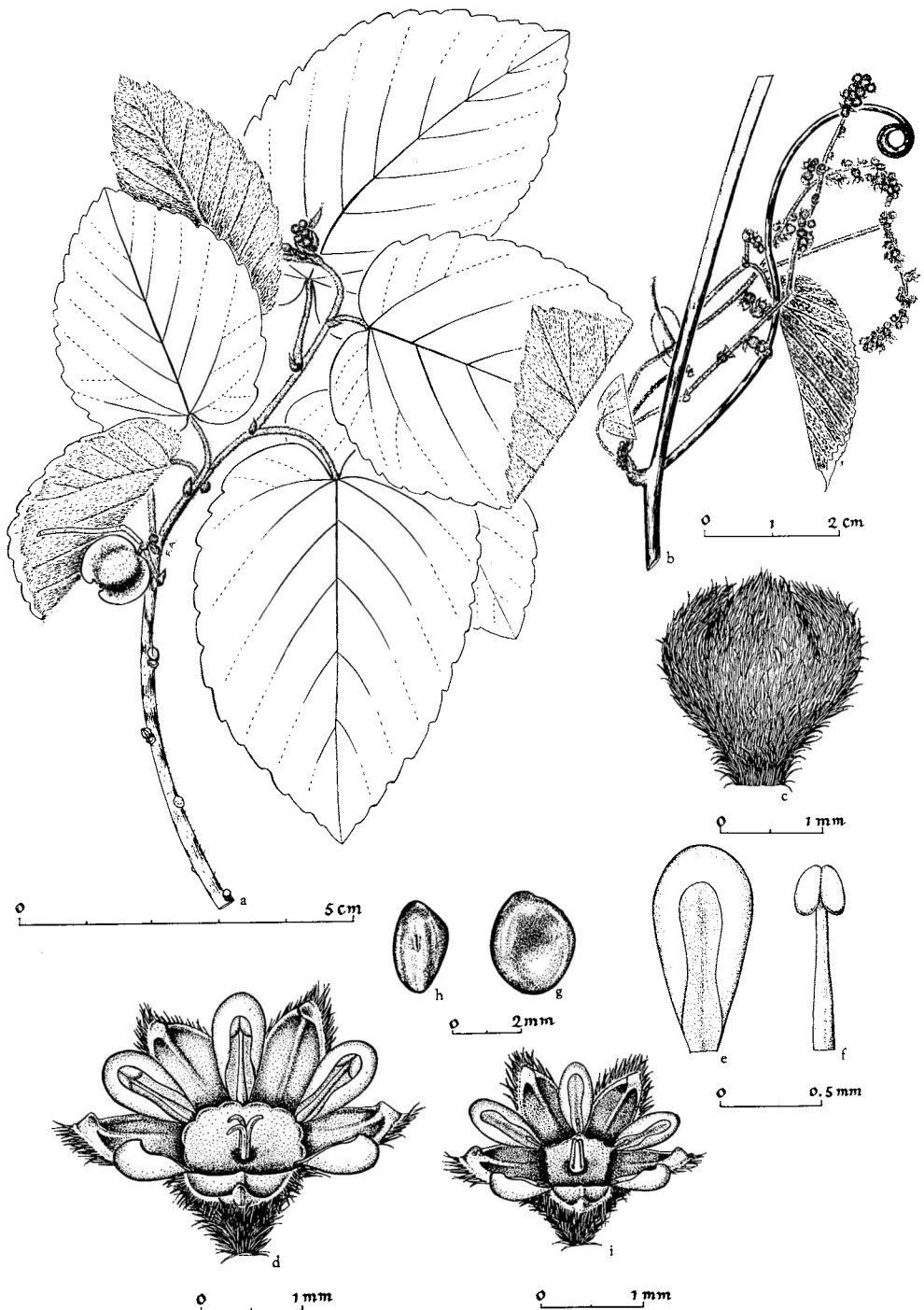


FIG. 2. *Gouania vitifolia* Gray, from holotype, Oahu, U.S. Exploring Expedition. *a*, Habit, $\times 1$; *b*, flowering shoot, $\times 1$; *c*, bud of perfect flower, $\times 15$; *d*, perfect flower, $\times 15$; *e*, petal, $\times 30$; *f*, stamen, $\times 30$; *g*, seed, lateral view, $\times 5$; *h*, seed and hilum, apical view, $\times 5$; *i*, pistillate flower, $\times 15$.

axillary branchlets; tendrils unbranched, coiling, a single one produced at one of the lower nodes of an inflorescence (hence mere leafy branches lack tendrils); stipules 2.5–4 mm long, firm, ovate, acute, appressed rusty pilose, caducous; petioles 3–14 mm long, densely subappressed rusty puberulent; blades 30–63 mm long, 20–46 mm wide, broadly ovate, the base deeply cordate with a narrow sinus, the apex acute or shortly subacuminate, texture firm chartaceous, coarsely crenate, the apex of the teeth tipped with a hydathode, the upper surface dark green and appressed soft puberulous, the lower surface whitish green but rusty soft puberulous only on the principal veins; inflorescences numerous, 1–7 cm long, borne on the short axillary branchlets, densely rusty hirsutulous; flowers spicate in glomerules, these crowded above; buds 1.5 mm long, subglobose, densely reddish brown hirsutulous; perfect flowers (or perhaps only functionally staminate, and it is noted that Gray called the upper flowers sterile) with calyx tube 0.7 mm long, funnel-form; calyx lobes 5 and 1 mm long, broadly ovate, acute, concave, valvate, thick and subcoriaceous, within with a thickened strip up the middle, without densely appressed ascending hirsutulous; petals 0.8–1 mm long, 0.3 mm wide, spatulate, deeply cucullate, the margin and apex infolded and enclosing the stamens; filaments 1 mm long, subulate; anthers 0.3 mm long, quadrate subglobose; disk concave, the margin 10-lobed; pistillate flowers similar but calyx tube 0.7 mm long, funnel-form; the 5 calyx lobes 0.8 mm long, ovate, acute, valvate; petals 0.7 mm long; stamens 0.17 mm long, slender subulate, erect, with a tiny abortive anther; stigmas 3, erect, 0.2 mm long, linear; capsules 9–10 mm long, suborbicular, swollen over the seeds, 2–3-winged, the wings 2.5–3 mm wide, running the full length of the capsule and of equal width throughout; seeds 3.5–3.8 mm long, 3–3.5 mm wide, 1.5–1.8 mm thick, broadly ovoid, in cross section oblate trigonous, but the back convex, dark brown, smooth, very shiny.

EXPANDED DESCRIPTION: Petioles 3–28 mm long; blades 30–110 mm long, 20–69 mm wide.

HOLOTYPE: "Sandwich Islands: on dry hills, in the district of Waianai, Oahu." [= Wai-

anae] U.S. Exploring Expedition, 1838–42 (US)! Isotypes (BISH, GH)! Types examined, and the holotype is here illustrated.

SPECIMENS EXAMINED: Hawaiian Islands, Oahu, Keaau, Aug. 1929, *G. W. Russ* (BISH); first gully makai on south side of Keaau Valley, in dry rocky Aleurites forest climbing to highest trees like grape vine, on verge of extinction, Feb. 7, 1932, *O. Degener, K. Park & Y. Nitta* 8,731 (G, S, US); ditto, same plant, March 23, 1932, *Degener, Park & Westgate* 8,732 (BISH, G, US); ditto, June 1932, *Degener, Dr. & Mrs. Bilger* 8,733 (US).

This is one of the two or three species that have survived until recent times, and may still be extant.

The epithet was obviously derived from the Latin, *vitis*, a vine or grapevine, and *folium*, leaf, and its toothed leaves do bear a resemblance to those of the grape.

3. *Gouania Oliveri* sp. nov. (Fig. 3)

DIAGNOSIS HOLOTYPI: Licet frutex, ramulis 1.5–3 mm diametro mox glabratiss subpurpuratis laevibus sed in sicco longitudinaliter sulcatis, ramulis novellis sparse adpresse adscendente albi-pilosis, internodis 3–15 mm longis rectis, nodis subincrassatis, stipulis 2–4 mm longis linearibus dense adpresse brunnei-pilosis, petiolis 15–44 mm longis teretibus gracilibus sparse adpresse adscendente albi-pilosis, laminis 3.2–6 cm longis 1.6–3.8 cm latis chartaceis subtilibus late ellipticis in basi rotundatis in apice subacuminatis obtusis marginibus integris supra obscure viridibus glabris infra in midnervo sparse adpresse albi-pilosis et minime in nervis secundariis in pagina remote adpresse albi-pilosulis pilis adscendentibus, inflorescentiis 3–5 cm longis axillaribus racemosi-cymosis adpresse adscendente albi-pilosulis 3–5-floriferis, pedunculis 3–4 cm longis gracilibus, pedicellis 1–4 mm longis, alabastris 2–2.5 mm longis ovoideis acutis valde adpresse adscendente albi- vel lutei-pilosulis, lobis calycis 2–2.2 mm longis deltoideis vel anguste deltoideis intra glabris et in midnervo marginibus apiceque triangulari incrassatis extra sparse adpresse adscendente pilosulis, petalis 1.4 mm longis 0.7 mm latis spatulatis cucullatis cum marginibus apiceque involutis et staminem inclusis, filamentis 1 mm

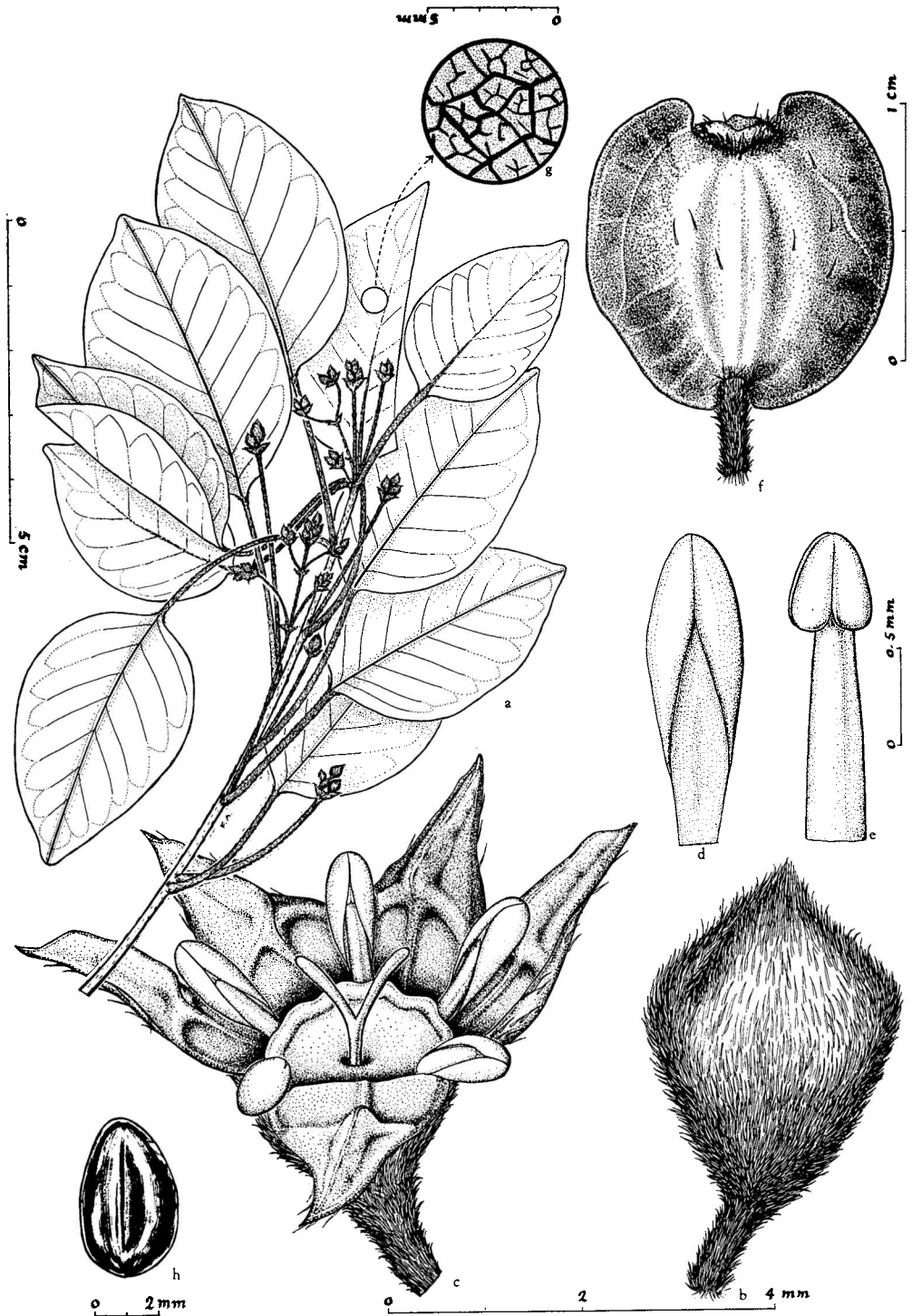


FIG. 3. *Gonania Oliveri* St. John, from holotype, Oahu, Lihue, Hillebrand. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, capsule, $\times 4$; *g*, venation of blade, $\times 4$; *h*, seed, lateral view, $\times 5$.

longis late subulatis, antheris 0.5 mm longis cordati-ovoideis, margini disci vadose undulati 10-lobati, capsulis 11–12 mm longis late ellipticis vel suborbicularibus compressis bilobatis bialatis in basi cordatis in apice late retusis axili 9 mm longo, seminibus 5 mm longis 3 mm latis ellipticis compressis brunneis laevibus lucidis.

DIAGNOSIS OF HOLOTYPE: Evidently a shrub; branchlets 1.5–3 mm in diameter, early glabrate, purplish, smooth, when dried with longitudinal ridges; young branchlets remotely appressed ascending white pilose; internodes 3–15 mm long, straight; nodes very slightly enlarged below the leaf scar; stipules 2–4 mm long, linear, obscured by the brownish appressed pilosity, leaving a rounded scar; petioles 15–44 mm long, terete, slender, rather sparsely appressed ascending white pilose; blades 3.2–6 cm long, 1.6–3.8 cm wide, thin chartaceous, broadly elliptic, the base rounded, the apex shortly subacuminate, obtuse, the margins entire, the upper surface dark green, glabrous, the lower surface sparsely appressed white pilose on the midrib and even less so on the secondaries, the surface remotely appressed white puberulous, the hairs ascending; inflorescences 3–5 cm long, axillary, appressed ascending white pilosulous, racemose-cymose, bearing 3–5 flowers; peduncle 3–4 cm long, slender; pedicels 1–4 mm long; buds 2–2.5 mm long, ovoid, acute, closely appressed ascending white to yellowish pilosulous; calyx lobes 2–2.2 mm long, deltoid or narrowly so, within glabrous, the midrib, margins, and apical triangle thickened, without sparsely appressed ascending pilosulous; petals 1.4 mm long, 0.7 mm wide, spatulate, the margins and apex inrolled and enclosing the stamen; filaments 1 mm long, broad subulate; anthers 0.5 mm long, cordate-ovoid; disk undulate, shallowly 10-lobed; capsules (4 seen) 2-lobed and winged, 11–12 mm long, broadly elliptic to suborbicular, compressed, at base narrowly cordate, at apex broadly retuse, the center axis 9 mm long; seeds 5 mm long, 3 mm wide, elliptic, flat, brown, smooth, shining.

HOLOTYPE: Hawaiian Islands, Oahu, Waianae Range, near Lihue, June '61 [*W. Hillebrand*], (BISH). Isotypes (BISH), and Waianae Range, received July 1865, Dr. *Hillebrand* 126 (K)!

SPECIMENS EXAMINED: [Hawaiian Islands], Oahu, Makaha, ex Mus. Bot. Berolin., [*W. Hillebrand*], (BISH). Sandwich Is., U.S. Exploring Expedition, (P).

DISCUSSION: From the few meager old specimens available, it is not possible to determine the range of sexuality of the flowers.

This collection by Hillebrand formed part of his concept of the species *G. orbicularis* Walp. which is now called *G. Meyeni* Steud., but the Waianae Mountains collections are now found to be specifically distinct from that species. It has not been collected in the last hundred years, and appears to be extinct.

The specific epithet is chosen to honor Daniel Oliver (1830–1916) of Kew who assisted Hillebrand in interpreting the Hawaiian species of the genus.

4. *Gouania Fauriei* (Lévl.) comb. nov.
(Fig. 4) *Isodendron* (= *Isodendron*)
Fauriei (Lévl., Fedde Repert. 11:63,
1912.

DIAGNOSIS HOLOTYPE: Licet frutex, ramis 2–6 mm diametro teretibus deinde glabratis et cortice griseo vel brunneo et squamato, ramulis novellis densiter subadpresse pilosis pilis albis vel rubri-brunneis et persistentibus, internodis 2–7 mm longis rectis, nodis incrassatis et ad cicatricem projectentibus, stipulis 3–5 mm longis lanceo-linearibus densiter adpresse pilosis persistentibus, petiolis 10–20 mm longis teretibus gracilibus dense pilosis pilis in parte adpresse adscendentibus in parte subdivergentibus, laminis 2.3–3.8 cm longis 1–2.2 cm latis subtiliter coriaceis ellipticis in basi rotundatis in apice subcutis plerumque mucronatis marginibus integris supra obscure viridibus glabris infra sparse adpresse albi-pilosulis midnervo et nervis secundariis cum pilis pluribus, inflorescentiis 1.5–2.5 cm longis axillaribus racemosis subadpresse albi-brevi-pilosulis 2–5-floriferis, pedunculo 9–10 mm longo, pedicellis 5–6 mm longis, alabastris 1.3 mm longis ovoidei-suborbicularibus densiter adpresse adscendente brunnei-pilosulis, lobis calycis 1.5 mm longis subovati-deltoides apiculatis intra glabris et midnervo marginibus apiceque incrassatis apice umbonato extra hirusutulis pilis 0.1 mm longis, petalis 1 mm longis 0.5 mm latis spatulatis cucullatis marginibus apiceque involu-

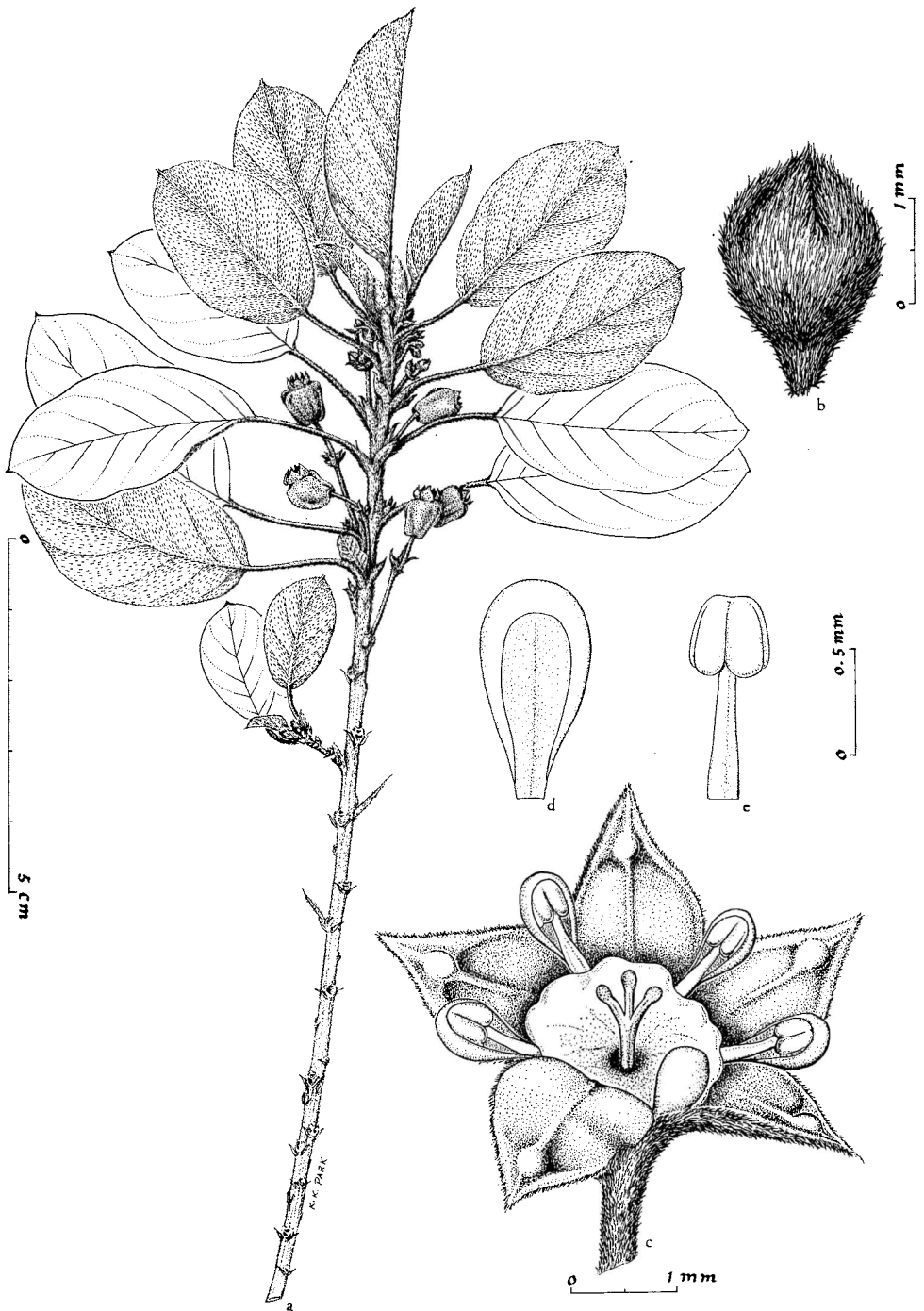


FIG. 4. *Gouania Fawceti* (Lévl.) St. John, from Molokai, Makolelau, Forbes 123.Mo. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$.

tis staminem inclusis, filamentis 0.7 mm longis subulatis, antheris 0.25 mm longis thecis elliptici-oblongis in basi divergentibus, disco cum 10 lobis rotundatis, stylis 3 et 0.7 mm longis parte $\frac{1}{2}$ infera connatis, capsulis 8 mm longis suborbicularibus cuneatis sparse adpresse breve albi-pilosulis 3-lateratis 3-alatis, alis 1–1.5 mm latis subsymmetricis sed in basi auriculatis.

DIAGNOSIS OF HOLOTYPE: Evidently a shrub; branchlets 2–6 mm in diameter, terete, finally glabrate and with gray or brown checkered bark; young branchlets densely subappressed pilose, the hairs white to reddish brown, long persistent; internodes 2–7 mm long, straight; nodes enlarged and bracket-like beneath the leaf scars; stipules 3–5 mm long, lance-linear, densely appressed pilose, persistent, usually well outlasting the leaves, leaving a rounded scar; petioles 10–20 mm long, terete, slender, densely pilose, the hairs partly appressed ascending, partly half spreading; blades 2.3–3.8 cm long, 1–2.2 cm wide, thin coriaceous, elliptic, the base rounded, the apex subacute, mostly mucronate, the margins entire, upper surface dark green, glabrous, lower surface sparsely appressed white pilosulous, the hairs ascending, the midrib and secondaries more densely appressed pilose; inflorescences 1.5–2.5 cm long, axillary, racemose, half appressed white short pilosulous, bearing 2–5 polygamous flowers; peduncle 9–10 mm long; pedicels 5–6 mm long; buds 1.3 mm long, ovoid-suborbicular, densely appressed ascending brownish pilosulous; apical perfect flower with its calyx lobes 1.5 mm long, subovate-deltoid, apiculate, within glabrous and the midrib and margins thickened, merging into the much thickened tip, triangular and with a projecting umbo, without appressed hirsutulous, the hairs 0.1 mm long; petals 1 mm long, 0.5 mm wide, spatulate, the margins and apex inrolled, cucullate, enclosing the stamen; capsule 8 mm long, cuneate suborbicular, sparsely white appressed short pilosulous, 3-sided, and the 3 wings subequally developed, 1–1.5 mm wide from base to tip and at base downward auriculate.

HOLOTYPE: Molokai, Kamolo [= Kamalo], 1,000 m alt., junio 1910, *Faurie* 693 (BISH), isotype of *Isodendrion Fauriei* Lév.

SPECIMENS EXAMINED: Hawaiian Islands,

Molokai, Makolelau, July 1912, C. N. *Forbes* 123. Mo. (BISH). Isotypes (UC, US).

Isodendrion Fauriei Lév. was one of the many new Hawaiian species ill-conceived by Lévillé. His diagnosis is $2\frac{1}{4}$ lines long, and contains five descriptive words, phrased as a contrast with *I. pyriformis* Gray, a member of the *Violaceae*. There are two excellent isotypes of *I. Fauriei*, *Faurie* 693, from Kamolo, Molokai, in the Bishop Museum. It did represent a new species, but, as was often the case with Lévillé, he placed it in the wrong genus, and this time in the wrong family.

As shown by the original labels, Lévillé had difficulty in placing this plant, and he first put it in *Chrysophyllum*, then changed his mind, and described it as a new *Isodendrion*.

Rock (1914:355), when reviewing Lévillé's publications on Hawaiian plants, reduced *I. Fauriei*, but Rock, too, made a misidentification in referring it to *I. pyriformis* (as *Isiodendron*).

St. John (1952:255), when monographing *Isodendrion*, referred *I. Fauriei* to the synonymy of *Gouania Hillebrandi* Oliver.

The epithet here accepted honors the missionary and botanist Urbain Faurie (1846–1915).

5. *Gouania Mannii* sp. nov. (Fig. 5)

DIAGNOSIS HOLOTYPI: Licet frutex, ramis cum cortice brunneo squamato, ramulis foliosis subadpresse brunneis rigidis villosis, internodis 3–19 mm longis rectis, nodis paene incrassatis, stipulis 3–5 mm longis anguste lineari-lanceolatis et densiter adpresse villosis et cum foliis persistentibus, petiolis 7–17 mm longis gracilibus et subadpresse adscendente rigidi-villosis, laminis 1.4–3.7 cm longis 1.1–2.2 cm latis subcoriaceis ellipticis vel obovatis late obtusis marginibus integris supra olivaceis glabris infra adpresse albi-pilosulis et in nervis principalibus adpresse brunnei-villosis, inflorescentiis 3–6 mm longis axillaribus spicatis (vel cymosis?), pedunculo 2–4 mm longo densiter adpresse rigide brunnei-villosis, floribus 2–5 congregatis, alabastris ovoidei-subglobosis, calycibus in flore 3 mm longis extra densiter adpresse adscendente brunnei-hirsutululis lobis 1.2 mm longis deltoideis ovatis crassis, petalis 0.4 mm longis 0.3 mm latis spatulatis profunde cucullatis et staminem inclusis, filamentis 0.4 mm longis lanceolatis

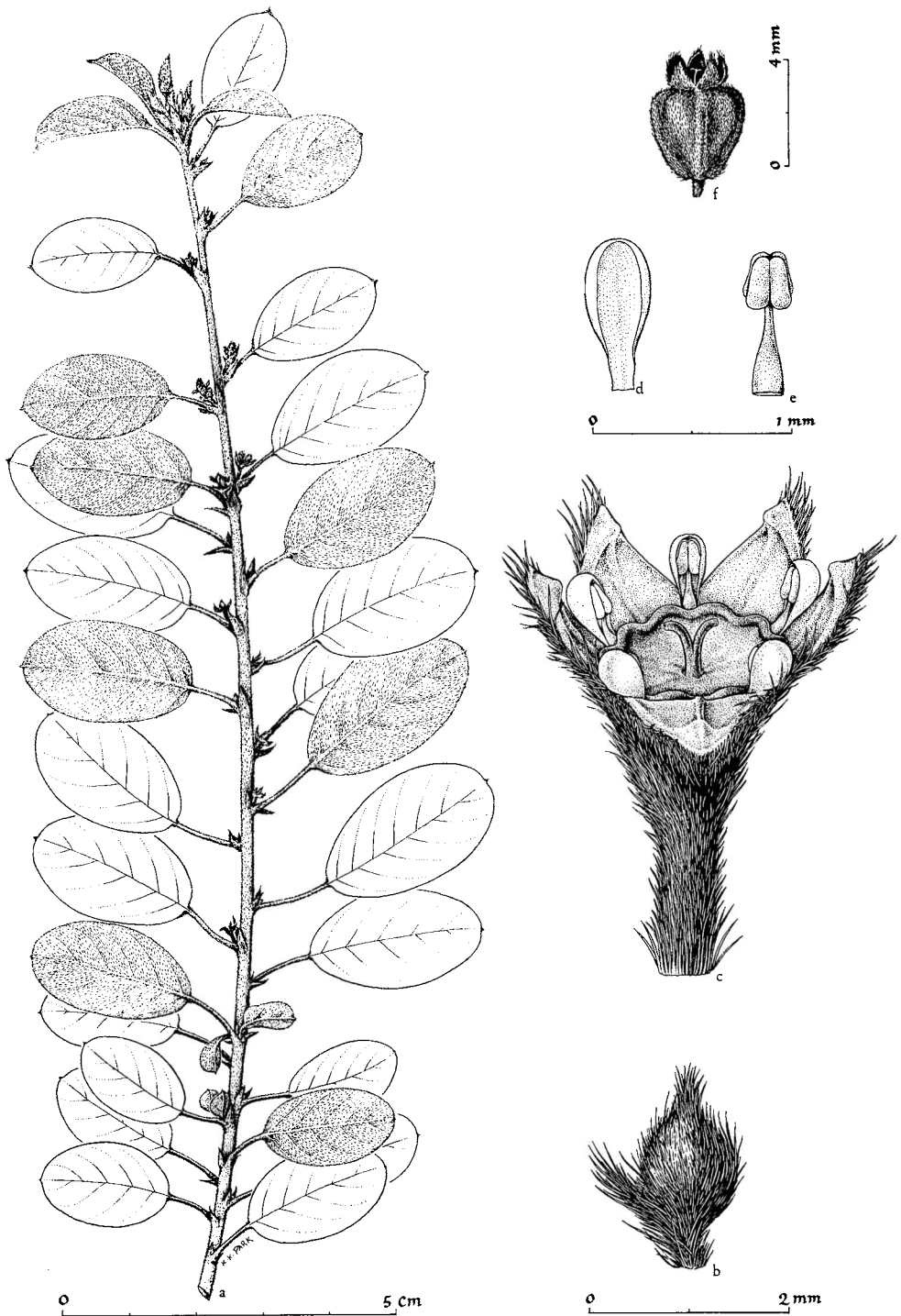


FIG. 5. *Gouania Mannii* St. John, from holotype, Lanai, Mann & Brigham 344. *a*, habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, immature capsule, $\times 4$.

attenuatis, antheris 0.25 mm longis obcuneatiblongis retusis, margini disci undulati et ad lobis calycorum bilobati, stylis 2–3 et 0.6 mm longis, capsulis immaturis 4–5 mm longis adpresse pilosulis orbicularibus sed acute trigonis et 3-alatis, alis symmetricis.

DIAGNOSIS OF HOLOTYPE: Probably a shrub; branches with brown flaky bark; leafy branches shiny brown, subappressed stiff villous; internodes 3–19 mm long, straight; nodes scarcely enlarged; stipules 3–5 mm long, narrowly linear-lanceolate, concealed by the dense appressed similar villosity, persistent almost as long as the leaves; petioles 7–17 mm long, slender, concealed by the brownish stiff subappressed ascending villosity; blades 1.4–3.7 cm long, 1.1–2.2 cm wide, subcoriaceous, elliptic to obovate, the apex broadly obtuse, appearing mucronate, but this appearance is from the tuft of villosity from the apex of the midrib, the margins entire, the upper surface olive green, completely glabrous, the lower surface appressed brownish villous on the principal veins, and closely white appressed pilose on the intervals; inflorescences 3–6 mm long, axillary, spicate (or perhaps cymose); peduncle 2–4 mm long, densely appressed brownish stiff villous; flowers 2–5, crowded; buds of perfect flowers ovoid subglobose; calyx in anthesis 3 mm long, densely appressed ascending brownish hirsutulous without, glabrous within; calyx lobes 1.2 mm long, deltoid ovate, thick; petals 0.4 mm long, 0.3 mm wide, spatulate, deeply hooded, enclosing the stamen; filament 0.4 mm long, lanceoloid, attenuate; anther 0.25 mm long, obcuneate oblong, retuse; disk with margin undulate and 2-lobed opposite each calyx lobe; styles 2–3 and 0.6 mm long; immature capsule 4–5 mm long, appressed pilosulous, orbicular in outline but sharply trigonous and with salient wings on the angles, equally developed above and below.

HOLOTYPE: Hawaiian Islands, Lanai, *H. Mann & W. T. Brigham 344* (BISH). Isotypes (K, UC, US).

DISCUSSION: Though the holotype and isotypes have several good branches in flower, the inflorescences are small and young, and it has not been possible to determine the exact kind of sexuality represented.

The new epithet is chosen to honor Horace Mann, Jr. (1844–1866), disciple of Professor Asa Gray, and early explorer of the Hawaiian flora, and the author who began the first published flora of the islands.

6. *Gouania Hillebrandi* Oliver, in Hillebrand, *Fl. Haw. Is.*, 83, 1888. (Figs. 6, 9g–j, 16a, b)

Pleuranthodes Hillebrandii (Oliver) Weberb., in Engler and Prantl, *Nat. Pflanzenfam.* 3(5):424, 1897 (Sphalm.).

P. hillebrandii (Oliver) Weberb. emend. Suessenguth, Engler and Prantl, *Nat. Pflanzenfam.* ed. 2, 20d:166, 1953.

REVISED DIAGNOSIS OF LECTOTYPE: "Shrub; the slender branches with a rust- or ash-colored pubescence. Leaves ovate-oblong $1\frac{1}{2}$ – $2\frac{1}{2}$ × $\frac{3}{4}$ –1 inch, on petioles of $\frac{1}{2}$ –1 inch, obtusely pointed, entire, dark green, pubescent and pale below, thin chartaceous. Stipules 3–4 lines. Cymes tomentose, 1– $1\frac{1}{2}$ inch long, 3–5-flowered, the slender naked peduncle 6–15 lines, the pedicels 1– $1\frac{1}{2}$ lines, bracteolate at the base. Calyx coriaceous, tomentose, 2 lines, shortly 5-lobed, the tube continued beyond the ovary and in the fertile flowers constricted below the throat. Disk plane and continuous without style in the sterile flowers. Style in the fertile flower short, with 3 obtuse stigmas."

EXPANDED DESCRIPTION FROM ALL SPECIMENS EXAMINED: Shrub, decumbent or erect and forming a rounded clump; stems 0.2–2 m tall, to 1 cm in diameter, arching; branchlets 2–4 mm in diameter, the older parts persistent pilosulous; young branchlets ascending and half spreading dense pale to brownish pilosulous; internodes 3–15 mm long, straight; nodes scarcely thickened; stipules 2–3 mm long, lance-linear, appressed white pilosulous, caducous, leaving a linear scar; petioles 8–35 mm long, densely subappressed white pilose; blades 1.7–5.9 cm long, 0.8–3.8 cm wide, chartaceous, broadly elliptic to elliptic, the base rounded, the apex shallowly emarginate (or in dwarfed leaves minutely mucronate), the margin entire, the upper surface olive green, glabrous, the lower surface in youth densely appressed ascending white pilosulous, but in age the hairs spaced; inflorescences cymose, axillary, 15–45

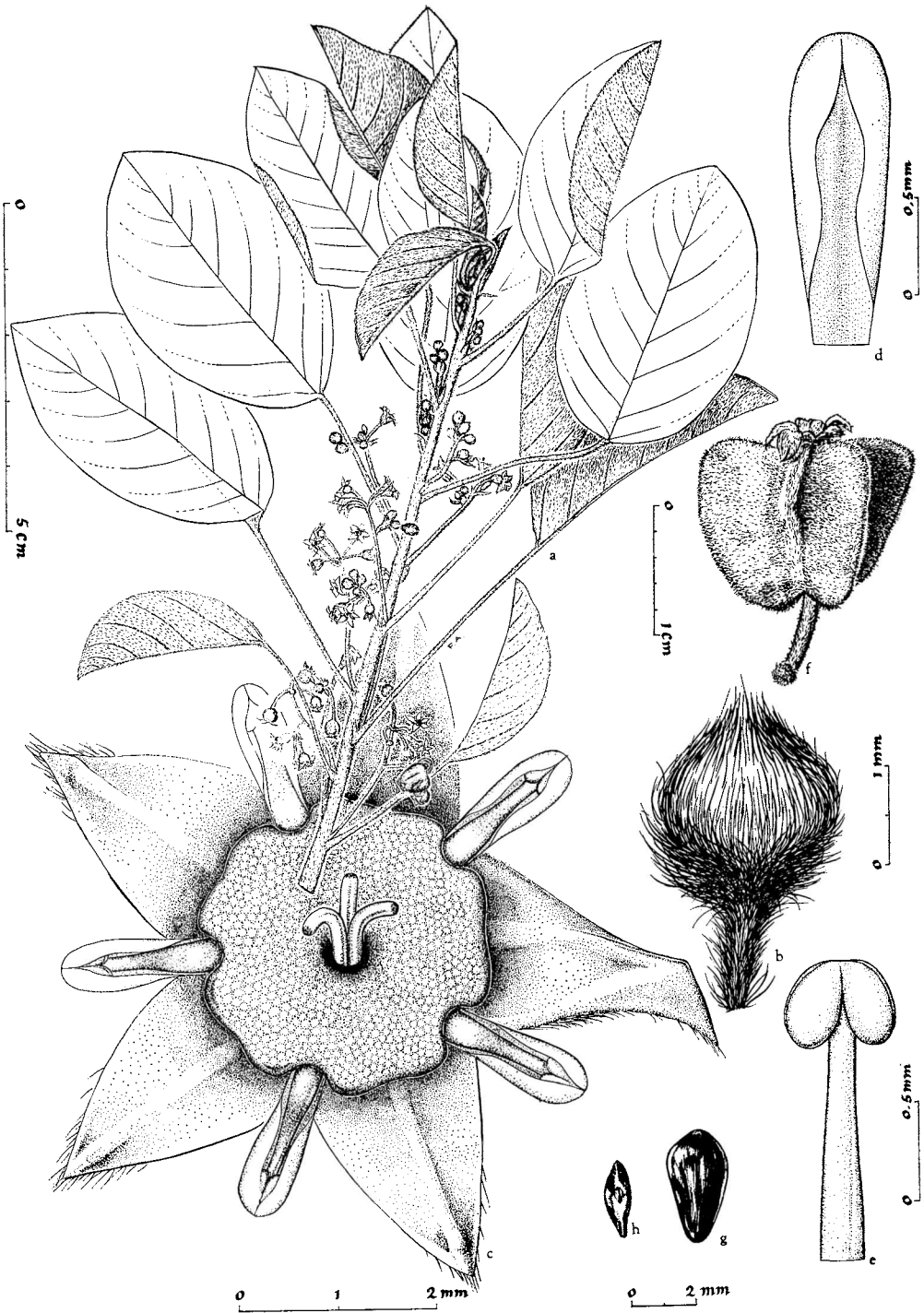


FIG. 6. *Gouania Hillebrandi* Oliver, from Maui, Lahainaluna, St. John 25,609. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, capsule, $\times 4$; *g*, seed, lateral view, $\times 5$; *h*, seed and hilum, apical view, $\times 5$. (*f*, *g*, *h* from St. John 26,723.)

mm long, subappressed or appressed ascending white pilosulous; peduncle 6–17 mm long, slender; flowers 3–10, at first crowded; pedicels 1–6 mm long; buds 1.5 mm in diameter, globose; flowers polygamous, with heavy sweet scent; the one or most flowers from the apical node perfect; and with the calyx tube 2–2.2 mm long, in anthesis funnellform, largely concealed by the dense white ascending hirsutulous pubescence, the 5 lobes 2–2.5 mm long, densely white appressed ascending hirsutulous but less so near the upper margins, deltoid ovate, acute, coriaceous, valvate, then rotate, within white, glabrous and the margins and midrib thickened and merging with the short, triangular thickened apex; petals 5 and 1.5 mm long, 0.3 mm wide, white, membranous, the margins and cucullate apex inrolled, enclosing the stamen; filaments 0.8 mm long, slender subulate; anther 0.3 mm long, subglobose cordate; disk 2.5–3 mm wide, the 5 lobes between the filament bases each with 2 low rounded lobes; styles 0.8–1 mm long, parted $\frac{2}{3}$ way, with capitate stigma; lateral flowers staminate (from *St. John* 26, 719), the calyx tube 1.5 mm long, funnellform, concealed by the dense ascending white hirsutulous pubescence; the 5 lobes 1.8–2 mm long, deltoid, without densely white appressed ascending hirsutulous except at the upper margins, within glabrous, thickened along the margins and the midrib to the high triangular thickened apex; petals 1.2 mm long, 0.5 mm wide, white, spatulate, the margins and apex inrolled and cucullate, enclosing the stamen; filaments 1 mm long, stout subulate; anthers 0.3 mm long, elliptic-subglobose, fertile; disk 2.5 mm in diameter, projecting a little beyond the filament bases and truncate or slightly retuse; styles 0.3–0.4 mm long, separate, bearing a larger capitate, magenta stigma; ovary abortive; capsules from the perfect flowers 5–7 mm long and wide, 3-sided, 3-winged, densely appressed soft white puberulous, suborbicular in outline, the wings 2.2–3.5 mm wide, equal throughout or somewhat cuneate towards the base, distinctly cordate at each end; seeds 3.5–3.8 mm long, 1.5–1.7 mm wide, 0.8 mm thick, narrowly ellipsoid, compressed, symmetric or broader at one end, smooth, brown, shining.

TYPE: "Maui! gulches of Kula and Lahaina."

LECTOTYPE: "W. Maui, Gulch back of Lahaina, Aug. 1870, Herb. *Hillebrand*." (B), see Figure 16a. The specimen, which from its label would be an isotype (BISH), consists of a single detached capsule, but it differs from those of *G. Hillebrandi* and is identical with the collection which Hillebrand described as his var. β , that is our new *G. Lydgatei*.

SPECIMENS EXAMINED: West Maui, Lahainaluna, Aug. 1910, C. N. *Forbes* 308 (BISH, UC, US); Lahainaluna mauka, Puu Paupau makai, in abundance, 2 inches to 6 feet tall, Dec. 1943, W. *Holt* (BISH); Lahainaluna, Kuia area, on hillside in scrub with *Wikstroemia*, *Dodonaea*, *Lantana*, klu, 1,100–1,600 ft alt., Dec. 18, 1955, G. A. *Pearsall* 24 (BISH), he was a student in St. John's party; Lahainaluna, Kuia, dry thicket with *Dodonaea*, *Wikstroemia*, *Sida*, 1,500 ft alt., Dec. 18, 1955, H. *St. John* 25,603 (BISH); ditto, 1,300 ft alt., older blades white-margined on outer half, 25,606 (BISH); ditto, 25,607 (BISH); ditto, 1,200 ft alt., 25,609 (BISH); ditto, rare, 900 ft alt., Dec. 29, 1965, *St. John* 26,719 (BISH); ditto, 900 ft alt., Feb. 6, 1966, *St. John* 26,723 (BISH).

DISCUSSION: This species occurs only on an outcrop of trachyte, a mineral of mostly orthoclase feldspar which weathers easily into a white soil. This occurs above Lahainaluna in an exposed band about 200 feet wide. All the collections were certainly made from this one colony above Lahainaluna. The discrepancy in the altitudes stated is considered a difference in estimates. The writer's later and well considered estimates place the trachyte band at from 900 to 950 feet altitude. When first encountered by the writer in December 1955, the *Gouania* was abundant, forming 25 percent of the brush, and growing into wide-spreading, much-branched clumps 1–1.5 m tall. The place was twice revisited, on December 29, 1965 and February 6, 1966 with George R. Cooley, but the plants were much diminished, none being fully bushed out and most being young single shoots less than a meter tall. No evidently mature fruits were found at any time, though eagerly sought. On February 6, in the shade of a *Grevillea robusta* tree, a cluster of healthy seedlings 10–20 cm tall was found, and several were carefully and successfully transplanted, and are now

in the Foster Botanic Garden, Honolulu. During a prolonged visit to West Maui, Mr. Cooley traced the outcrop of trachyte across three small ridges to the south, and tallied 517 plants of *G. Hillebrandi*. That gives some hope for the survival of the species, but it occurs only on this one outcrop of a special mineral, and, in the writer's experience, is much reduced in vigor and abundance since 1955. Though it is an everbloomer and flowers abundantly, the young capsules form, but then shrivel and fall off. Seed production is rare. Since its only locality is in a cow pasture, it is probably doomed to extinction.

On each visit the writer looked for fruit of this species, and on the last search on February 6, 1966, he and Cooley made a prolonged and careful search for them. After flowering, the terminal, perfect flowers all begin to set fruit, but when about half grown all wither, dry, and are shed. A handful of these were gathered. They all seemed immature and infertile, but when carefully examined in the museum, several of them seemed a little plump. When opened each contained a single good seed. So, the plants of this colony are setting a few seeds.

The epithet *Hillebrandi* was chosen by Oliver to honor William Hillebrand. Many botanists now change all epithets to make them end in *-ii*. They do so, doubtless, because of the article, first in the 1956 International Code of Botanical Nomenclature, now in the 1966 Code as Art. 73, Note 3, and Rec. 73Cb, which are so worded as to seem to require such a change. This is in agreement with Latin grammar, if the epithet is an adjective, and at this part of the Code no other word form is provided for. However, Art. 23, paragraph 7, clearly states that an epithet may be either an adjective or a substantive. For such nouns, if masculine, the genitive singular, second declension, ends in a single *-i*. Further legal basis for such usage is in Art. 23, paragraph 2, "The epithet of a species may be taken from any source whatever, and may even be composed arbitrarily." Then, Art. 73, first paragraph states, "The original spelling of a name or epithet must be retained, except for the correction of typographic or orthographic errors." The epithet *Hillebrandi* was well formed and grammatical, not erroneous,

and it is here retained just as published by the original author.

Hillebrand had in his herbarium, and Oliver included in his diagnosis, three different collections. Flowering material collected at Lahaina by Hillebrand had the smaller "ovate-oblong" blades and polygamous flowers, but lacked fruit. This specimen, once in Berlin (our photo, Fig. 16a), is selected as the lectotype. The other collection by Hillebrand, from Maui without other locality, was the plant with lanceolate, larger blades and sparse inflorescences, but no fruit. It is here separated and made the holotype of *G. pilata*. The third plant was published by Hillebrand as the unnamed variety β , from Kula, East Maui, collected by Lydgate, no. 134. This was cited as both the variety and the species. There was a good sheet of this in the Berlin Herbarium (Fig. 17b), there is one still at Kew, and three duplicate sheets are in Bishop Museum. They show herbage, flowers, and fruit. They are here the basis of our new species *G. Lydgatei*. In Bishop Museum there is also a specimen consisting of a single detached capsule. Its label would indicate it to be a clastotype of *G. Hillebrandi*, but it differs from that and is identical with the collection which Hillebrand described as var. β , that is our new *G. Lydgatei*.

G. Hillebrandi was named by the English botanist Oliver in honor of William Hillebrand (1821–1886), a German physician and botanist, long resident in Hawaii. When in 1897 the family *Rhamnaceae* was written up by the German Weberbauer, he spelled the epithet *Hillebrandii*. It is probable that he confused Dr. W. Hillebrand with Johann Maria Hildebrandt (1847–1881), a German gardener and botanical collector who spent many years in German East Africa, the Comoro Islands, and Madagascar. His very numerous plant collections were in various European herbaria, and made his name a very familiar one in botany. It appears that Weberbauer mixed up the family names of the two men.

7. *Gouania Bishopii* Hbd., Fl. Haw. Is. 83–84, 1888. (Fig. 7, 17a)

EXPANDED DIAGNOSIS OF HOLOTYPE: Decumbent cirrhiferous shrub; stems long persistent pilosulous; young stems densely divergent rusty

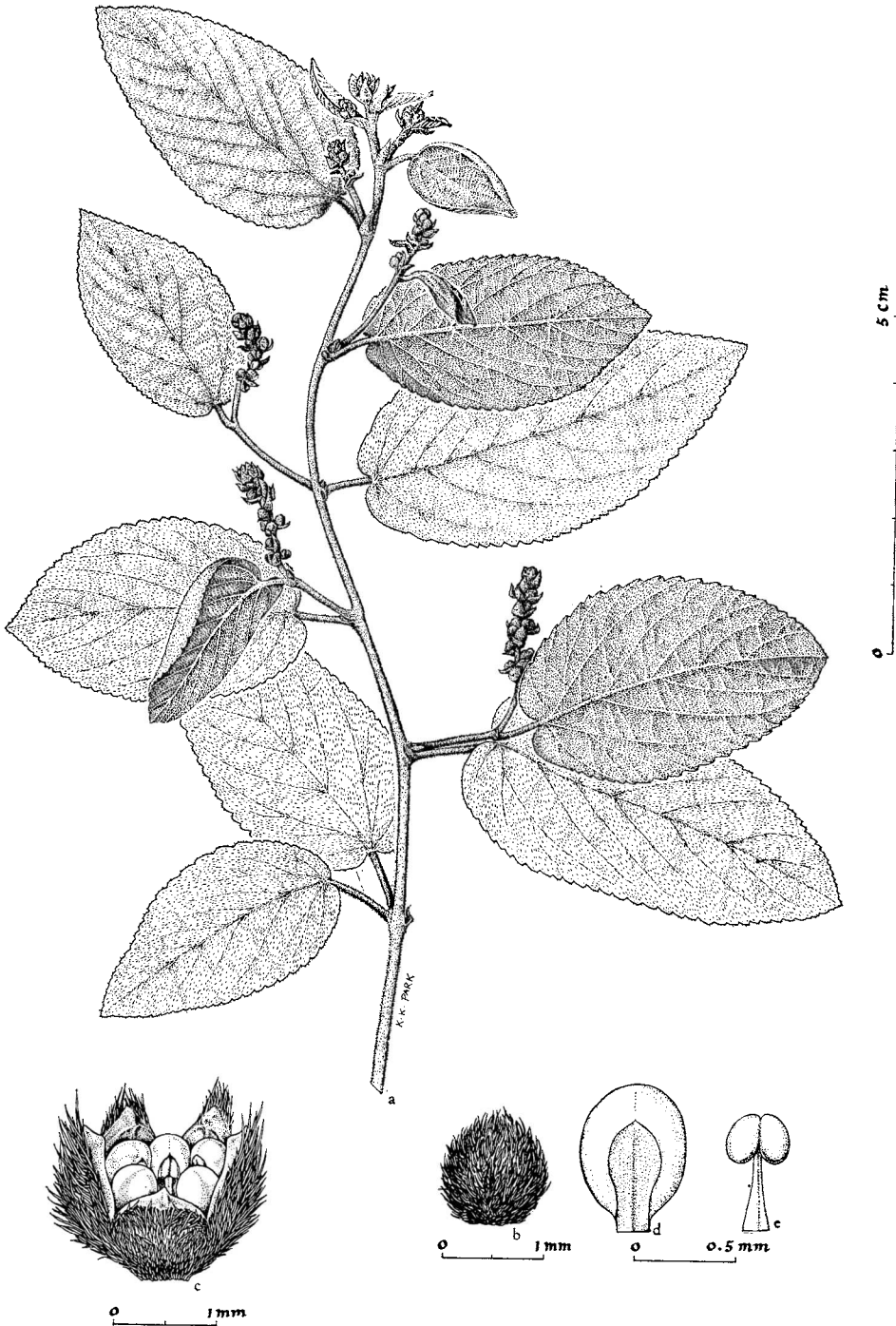


FIG. 7. *Gouania Bishopii* Hbd., from isotype, Maui, Lahaina, Bishop 43. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, immature perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$.

pilosulous; internodes 4–25 mm long, straight; nodes scarcely swollen below the leaf scars; stipules "less than 1/2 inch [long], broad and obtuse," caducous, leaving a narrow lunate scar; petioles 5–15 mm long, terete, densely ascending rusty pilosulous; blades 4–8 cm long, 2.8–4.8 cm wide, elliptic to ovate, firm chartaceous, the base shallowly subcordate, the apex obtuse or subobtuse, the margins with larger hemispheric teeth alternating with smaller dentate ones, all with salient blunt glandular tips, the upper surface dark green and moderately subappressed white pilosulous above, almost equally so on veins and intervals, the lower surface pale green and with more dense similar pubescence; inflorescences terminal, on short axillary branches with 1–2 leaves and, fide Hillebrand, "a stiff revolute tendril in their axils," the floriferous spicate rhachis 8–19 mm long, densely spreading rusty pilosulous, and bearing numerous crowded flowers; bracts 2.5–3 mm long, lance-ovate, with similar pubescence; buds 1.5–2 mm long, oblate globose, immature, obscured by the dense rusty pilosity of the calyx; calyx lobes 1.1 mm long, ovate concave, acute, thick and coriaceous, glabrous within; calyx tube 1.5 mm long, funnelform; immature petals 0.7 mm long, spatulate, obovate, concave and deeply cucullate, white, hooded, enclosing the stamen; filaments 0.3 mm long, broad subulate; anthers 0.25 mm long, wider than long, the two sacs ellipsoid; disk margin convex, emarginate, then V-cleft to each filament base; styles 3 and 0.2 mm long (immature), then united below for 0.2 mm. "Capsule tomentose, 3 lines high and 4 lines wide, 3-winged, with wings continued to the base, finally separating into 3 cocci, each coccus suspended by two filaments of the 6-partite axis. Seeds plano-convex, brownish."

HOLOTYPE: Flora Hawaiensis, W. Maui, back of Lahaina, *E. Bishop* 43 (B)! Isotype (BISH).

The accompanying photograph of the holotypic sheet once in Berlin shows one good leafy branch and five small detached branchlets. Seven tendrils are visible, all originating from the axil of the ultimate leaf on a short, lateral, flowering branchlet. None are produced from the principal leafy nodes of the main stem. The isotype

(Bishop Mus.) has a straight stem 26 cm long, with 12 principal leaves. None of these have tendrils. There are 9 axillary flowering branchlets and most of them with reduced leaves on the peduncle, but none bear tendrils. This collection is indubitably an isotype, and there is no hint of a confusion. It seems that the species is a climbing shrub, with tendrils, but that the tendrils are few, and when produced, are only on the lateral flowering branchlets.

Hillebrand dedicated the species to Edward Fletcher Bishop (1853–1875) of Lahaina, Maui who had cooperated with him in the collection and study of the Hawaiian flora.

8. *Gouania Lydgatei* sp. nov. (Fig. 8, 17b)

G. Hillebrandi Oliver var. β Hillebrand, Fl. Haw. Is. 83, 1888.

DIAGNOSIS HOLOTYPI: Frutex, ramulis 2–3 mm diametro densiter molliter subdivergente pallidi-pilosis, internodis 2–10 mm longis rectis, nodis incrassatis, stipulis 2–3 mm longis anguste lanceolatis adpresse albi-villosis caducis, petiolis 14–25 mm longis teretibus gracilibus densiter subadpressi-pilosulis, laminis 3–6.5 cm longis 2–3.5 cm latis firme subcoriaceis latiter ellipticis in basi rotundatis in apice rotundatis sed minime subcucullatis et revolutis marginibus integris supra obscure viridibus glabris sed midnervo ad basim minime pilosulis infra densiter adpresse albis sericeis pilosulis pilis adscendentibus et cum nervis lateralibus parallelis, inflorescentia 2–5 cm longis cymosis, pedunculis 10–40 mm longis axillaribus adscendentibus gracilibus et adscendente subadpresse albi-pilosulis, floribus 4–9 congregatis, rhachidi 2–7 mm longo pilosulo, bracteis 2–3 mm longis lanceolatis adpresse pilosulis, alabastris 1–1.5 mm longis subglobois dense adpresse hirsutulis, lobis calycis in floribus bisexualibus 1.5 mm longis deltoideis intra glabris extra adscendente adpresse hirsutulis, tubo 1.2 mm longo semiglobois, petalis 1 mm longis spatulatis cucullatis et staminem inclusis, filamentis 0.6 mm longis subulatis, antheris 0.3 mm longis et latioribus thecis oblatis-subglobois in basi divergentibus, marginibus disci ad filamentas V-fidis et inter filamentas concavis, stylis 3 et 0.3 mm longis in tertia infera connatis, capsulis 7–11 mm longis 7–9 mm diametro semiorbicularibus axili 6–7 mm longo

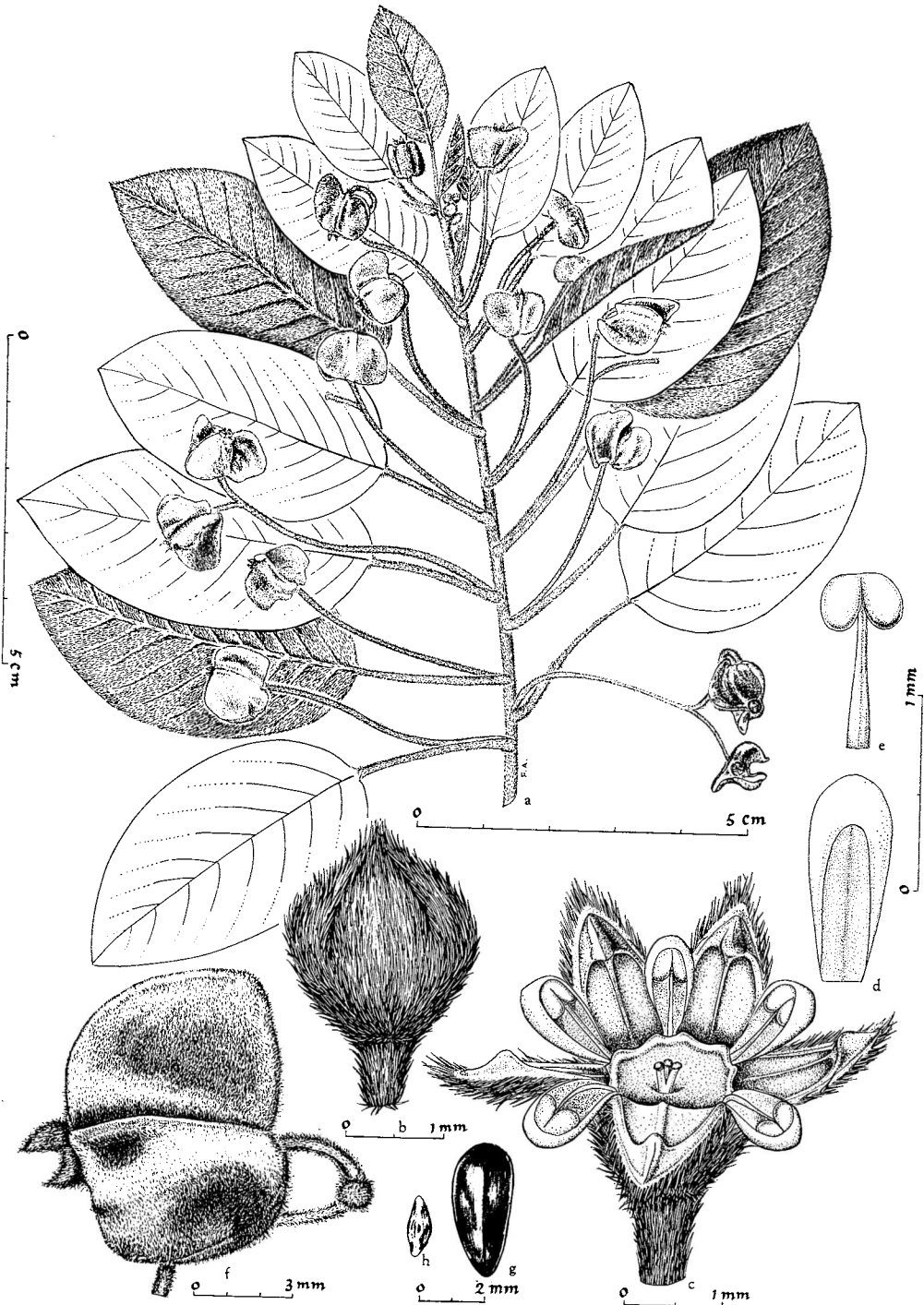


FIG. 8. *Gouania Lydgatei* St. John, from holotype, Maui, Kula, Lydgate 134. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, capsule, $\times 5$; *g*, seed, lateral view, $\times 5$; *h*, seed and hilum, apical view, $\times 5$.

corpore 3-laterato et 3-alato alis adscendente arcuatis lanceolatis obtusis cuneatis dimidiis tam longis quam axili densiter adpresse albi-pilosulis, seminibus 3.3–4 mm longis 1.5–1.6 mm latis 0.5 mm crassis elliptici-oblongis compressis subcurvatis brunneis rigidis laevibus lucidis.

DIAGNOSIS OF HOLOTYPE: Shrub; branchlets 2–3 mm in diameter, densely soft half spreading pale pilose; internodes 2–10 mm long, straight; nodes swollen around the leaf scars; stipules 2–3 mm long, narrowly lanceolate, appressed white villous, caducous, leaving a short elliptic scar; petioles 14–25 mm long, terete, slender, densely half appressed pilosulous; blades 3–6.5 cm long, 2–3.5 cm wide, firm subcoriaceous, broadly elliptic, the base rounded, the apex rounded except for the slight cucullate revolute tip, the margins entire, the upper surface dark green, glabrous except that the midrib is slightly pilosulous just at the base, below densely appressed white silky pilosulous, the hairs ascending parallel to the lateral veins; inflorescence 2–5 cm long, cymose; peduncle 10–40 mm long, axillary, ascending, slender, and subappressed ascending white pilosulous; flowers 4–9, crowded; rhachis 2–7 mm long, similarly pilosulous; bracts 2–3 mm long, lanceolate, appressed pilosulous; buds 1–1.5 mm long, subglobose, obscured by the dense appressed hirsutosity; perfect flowers having the calyx lobes 1.5 mm long, deltoid, glabrous within, ascending appressed hirsutulous without; calyx tube 1.2 mm long, semiglobose; petals 1 mm long, spatulate, hooded, enclosing the stamen; filament 0.6 mm long, subulate; anthers 0.3 mm long, wider than long, the two sacs oblate subglobose, divergent at base; disk margin V-cleft to each filament base, the rest of the margins shallow concave; styles 3 and 0.3 mm long, united for lower $\frac{1}{3}$; capsules 7–11 mm long, 7–9 mm in diameter, in outline semiorbicular, the center axis 6–7 mm long, the body 3-sided and strongly 3-winged, the wings ascending arcuate, lanceolate, obtuse, about half as long

as the axis, the wing tapering downward to the narrow base, the surface closely appressed white pilosulous; seeds 3.3–4 mm long, 1.5–1.6 mm wide, 0.5 mm thick, elliptic oblong, compressed, the longitudinal axis curved, the testa hard smooth shining brown.

HOLOTYPE: Hawaiian Islands, E. Maui, lower part of Kula, *J. M. Lydgate 134*, ex Herb. Hillebrand and Lydgate (BISH). Isotypes, Kula, E. Maui, Herb. Hillebrand (BISH); and (B), see photo; and received July 1865, Dr. *Hillebrand 125* (κ)!

DISCUSSION: The specimen in Bishop Museum labeled as an isotype of *G. Hillebrandi* consists of a single detached capsule. From its morphology, it is clearly Hillebrand's var. β , that is, the plant here described as *G. Lydgatei*.

The well-developed flowers examined were all perfect or bisexual. The available lateral flowers on the four sheets are numerous, but mostly are too small and young to be worth dissecting. The largest one of these was boiled and dissected, and though but half grown, it seemed to be perfect also. In conclusion, the mature flowers seen are perfect. Whether or not there are any imperfect flowers has not been determined.

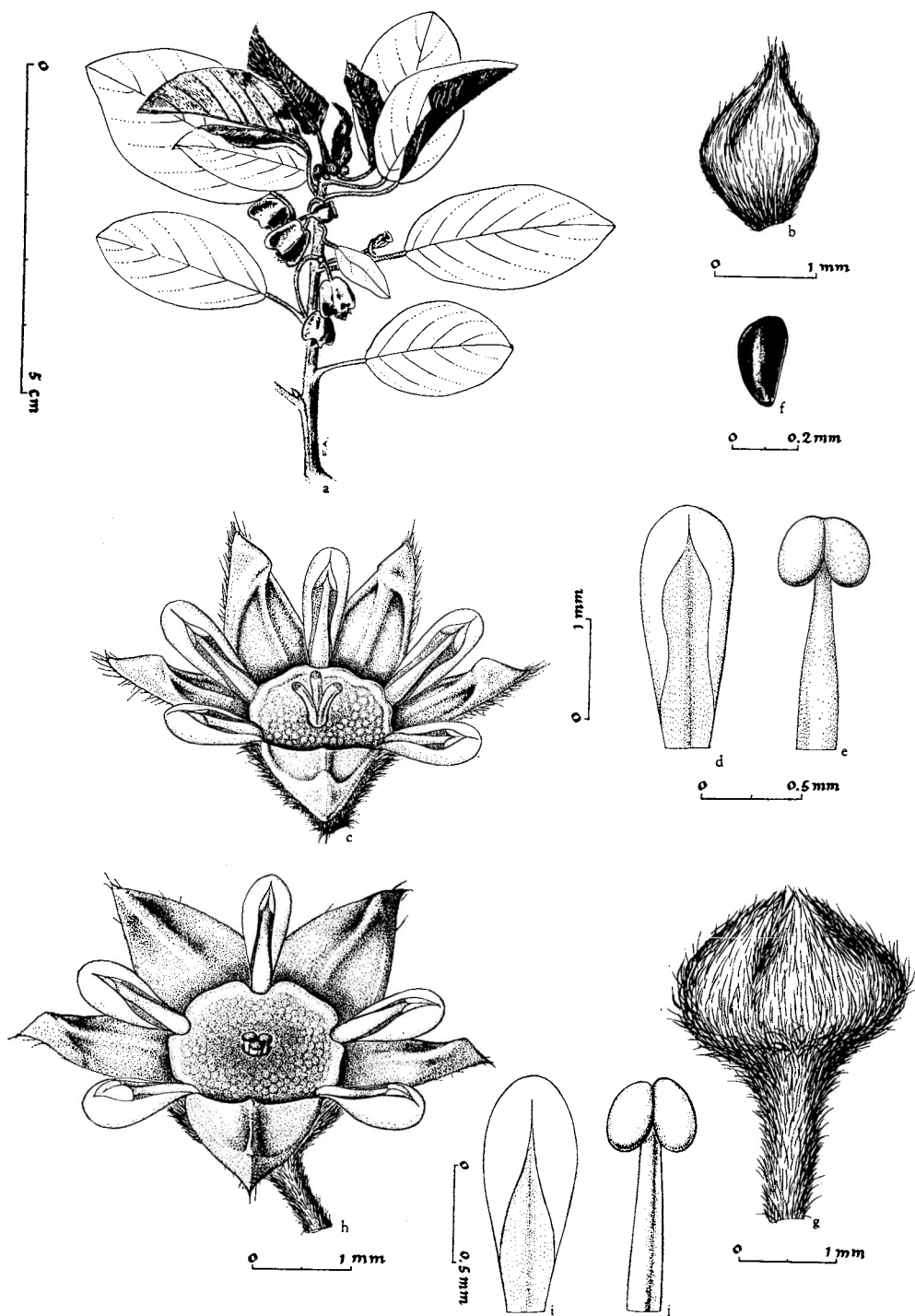
The new epithet is chosen to honor the Reverend John Mortimer Lydgate (1854–1922) early assistant and long a collaborator with W. Hillebrand in collecting and studying the flora of Kauai, Oahu, and Maui.

9. *Gouania thinophila* sp. nov. (Fig. 9a–f)

DIAGNOSIS HOLOTYPI: Frutex 13–19 cm altus, radici verticali elongati robusti, radicibus superficialibus paucis, caule erecto unico vel cum ramis paucis in basi 2.5–3 mm diametro teretibus sublaevibus sed cortice brunneo cum squamis latis, ramulis foliosis 1.5 mm diametro dense subdivergenti-pilosis, internodis 1–6 mm longis rectis, nodis incrassatis et sub cicatrici projectentibus, stipulis 2–3 mm longis caducis linearibus

FIG. 9. *Gouania thinophila* St. John, from holotype, Maui, U.S. Exploring Expedition. a, Habit, $\times 1$; b, bud of perfect flower, $\times 15$; c, perfect flower, $\times 15$; d, petal, $\times 30$; e, stamen, $\times 30$; f, seed, lateral view, $\times 5$.

Gouania Hillebrandi Oliver, from Maui, Lahainaluna, St. John 26,719. g, Bud of staminate flower, $\times 15$; h, staminate flower, $\times 15$; i, petal, $\times 30$; j, stamen, $\times 30$.



dense adpresse pilosis, petiolis 7–14 mm longis gracilibus et dense subadpresse fusci-pilosis, laminis 1.4–3.5 cm longis 0.8–2.2 cm latis subcoriaceis ellipticis planis integris supra obscure lutei-viridibus glabris infra pallidioribus et adpresse pilosulis in apice breve umbonato, inflorescentiis multis 7–15 mm longis cymosis densiter subadpresse albi-pilosulis 2–5-floriferis eis congregatis, floribus licet polygamis, floribus terminalibus perfectis et cum calycibus in flore 2.7–3 mm longis densiter subadpresse adscendente albi-pilosulis tubo 1.3–1.5 mm longo obovoidei-hemispherico, 5 lobis 1.8–2 mm longis ovatis subacutis crassis coriaceis intra glabris et parte $\frac{2}{5}$ supera incrassata, petalis 1 mm longis 0.4 mm latis albis spatulatis concavis et profunde cucullatis et staminem inclusis, filamentis 0.7 mm longis subulatis; antheris 0.3 mm longis suborbicularibus bilobatis, disco concavo margine ad filamentas indentato et inter eas retuso, stylis 3 et 0.5 mm longis parte $\frac{1}{2}$ infera conata parte supera trilobata, stigmatibus apicali discoideo, floribus masculis ignotis; capsulis immaturis 6 mm longis obovoidei-suborbicularibus densiter adpresse albi-puberulentis 3-alatis, eis 1.5–2 mm latis ad apicem latioribus.

DIAGNOSIS OF HOLOTYPE: Shrub 13–19 cm tall; tap root elongate, strong; surface roots few; stem erect, simple or few-branched, at base 2.5–3 mm in diameter, terete, rather smooth, but checking into broad flakes, brown; leafy branches 1.5 mm in diameter, obscured by the dense, half spreading pilosity; internodes 1–6 mm long, straight; nodes enlarged by a bracket-like swelling at the leaf scar; stipules 2–3 mm long, linear, densely appressed pilose, caducous; petioles 7–14 mm long, slender, covered by a dense subappressed tawny pilosity; blades 1.4–3.5 cm long, 0.8–2.2 cm wide, subcoriaceous, elliptic, short umbonate, flat, entire, the upper surface dull yellowish green, glabrous, the lower surface slightly paler green, appressed white pilosulous, but the blade surface visible between the hairs; inflorescences numerous, 7–15 mm long, cymose, densely subappressed whitish pilosulous; flowers 2–5, crowded, apparently polygamous, the apical perfect flowers with calyx in anthesis 2.7–3 mm long, densely subappressed ascending whitish pilosulous, the tube 1.3–1.5 mm long, ovoid-hemispheric, the 5

lobes 1.8–2 mm long, ovate, subacute, thick and coriaceous, within glabrous and with a triangular thickening running down $\frac{2}{5}$ way from the tip; petals 1 mm long, 0.4 mm wide, white, spatulate, concave and deeply cucullate hooded, enclosing the stamen; filaments 0.7 mm long, subulate; anthers 0.3 mm long, suborbicular, 2-lobed; disk concave, the margin notched to each filament base and retuse between each pair; the three styles 0.5 mm long, united below, 3-parted half way down; stigma apical discoid; immature capsules 6 mm long, obovoid suborbicular, densely appressed white puberulent, with 3 lateral wings 1.5–2 mm wide, these broadest near the apex, narrowing toward the base; lateral flower buds very immature, too young to reveal whether perfect or staminate.

HOLOTYPE: Sandwich Islands [Hawaiian Is.]; Maui, sand hills, U.S. South Pacific Exploring Expedition, 1838–42 (GH). Isotype with only the locality, Sandwich Islands (US)! On the sheets of this species in both the herbaria there is another different species. In the Gray Herbarium, this has a separate label, *Gouania orbicularis*, Sandwich Islands. These extraneous specimens are here redetermined as *G. Meyeni* Steud.

The new epithet is formed from the Greek, *this*, sand hills, and *phileo*, to love, and is given with reference to the habitat of the plant, on sand dunes.

10. *Gouania pilata* sp. nov. (Fig. 10)

DIAGNOSIS HOLOTYPI: Licet frutex, ramulis 2–2.3 mm diametro densiter subadpresse albi-pilosis et pilis persistentibus, internodis 12–38 mm longis rectis, nodis subincrassatis, stipulis 4–8 mm longis caducis lancei-linearibus densiter adpresse pilosis, petiolis 15–30 mm longis teretibus gracilibus densiter adpresse albi-pilosis, laminis ramulorum principalium 5–6.5 cm longis 1.6–2.5 cm latis subtiliter chartaceis lanceolatis vel anguste lanceolatis in basi rotundatis in apice anguste obtusis marginibus integris supra obscure viridibus omnino glabris infra ab initio densiter adpresse adscendente albi-pilosis et in midnervo et nervis principalibus cum pilis majoribus sed in foliis vetustioribus infra cum pilis separatis, inflorescentiis 22–35 mm longis racemosis densiter subadpresse adscendente albi-

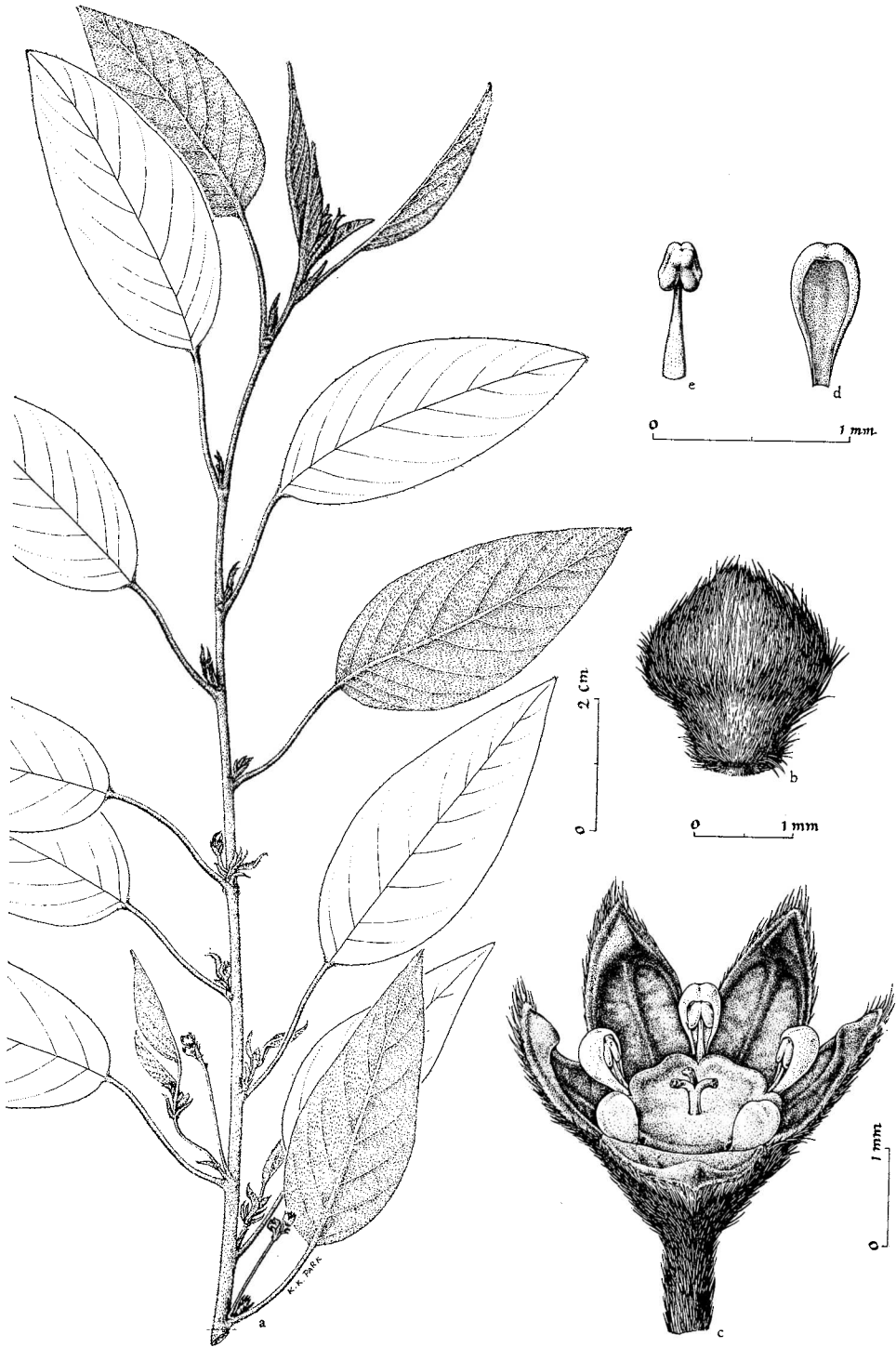


FIG. 10. *Gouania pilata* St. John, from holotype, Maui, Herb. Hillebrand. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$.

pilosulis, pedunculo 13–30 mm longo gracili, pedicellis 1–2 mm longis, alabastris 1.3 mm longis oblate ovoidei-subglobosis densiter adpresse albi-pilosulis, lobis calycorum 1.3 mm longis ovati-ellipticis intra glabris et midnervo marginibus apiceque triangulari incrassatis, petalis 0.7 mm longis 0.3 mm latis obovate spatulatis marginibus apiceque involutis et staminem inclusis, filamentis 0.5 mm longis subulatis, antheris 0.25 mm longis thecis elliptici-oblongis in basi valde divergentibus, 3 stylis 0.6 mm longis parte $\frac{1}{2}$ supera libera, disco cum lobis 5 latis retusis.

DIAGNOSIS OF HOLOTYPE: Evidently a shrub; branchlets 2–2.3 mm in diameter, densely subappressed white pilose, the hairs long persistent; internodes 12–38 mm long, straight; nodes slightly enlarged beneath the leaf scar; stipules 4–8 mm long, lance-linear, concealed by the dense appressed pilosity, early caducous, leaving an orbicular scar; petioles 15–30 mm long, terete, slender, concealed by the dense appressed ascending white pilosity; blades of main branches 5–6.5 cm long, 1.6–2.5 cm wide, thin chartaceous, lanceolate to narrowly lanceolate, the base rounded, the apex narrowly obtuse, the margins entire, the upper surface dark green, wholly glabrous, the under surface at first hidden by the dense white appressed ascending pilosity, the midrib and laterals more coarsely pilose, but the older leaves with the hairs spaced and the under surface easily visible; inflorescences 22–35 mm long, racemose, densely subappressed ascending white pilosulous; peduncle 13–30 mm long, slender; pedicels 1–2 mm long; buds of perfect flower 1.3 mm long, oblate ovoid-subglobose, densely appressed white pilosulous; calyx lobes 1.3 mm long, ovate-elliptic, within glabrous and the midrib, margins, and apical triangle thickened; petals 0.7 mm long, 0.3 mm wide, obovate spatulate, the margins and apex inrolled and enclosing the stamen; filaments 0.5 mm long, subulate; anthers 0.25 mm long, the cells elliptic oblong, widely diverging at base; 3 styles 0.6

mm long, free for upper half; disk with 5 broad retuse lobes.

HOLOTYPE: Hawaiian Islands, Maui, ex Herb. *Hillebrand* (BISH). There was also an isotype (B)! Also W. & E. Maui, *Hillebrand* (GH).

DISCUSSION: This is a segregate from *G. Hillebrandi* Oliver which was based upon two Maui collections. The one from Lahaina, with broadly elliptic blades, is the lectotype of *G. Hillebrandi*. The one with lanceolate blades, labeled merely Maui (though *Hillebrand* cited it as from Kula), a specimen without collector and without precise locality, is the holotype of our new *G. pilata*.

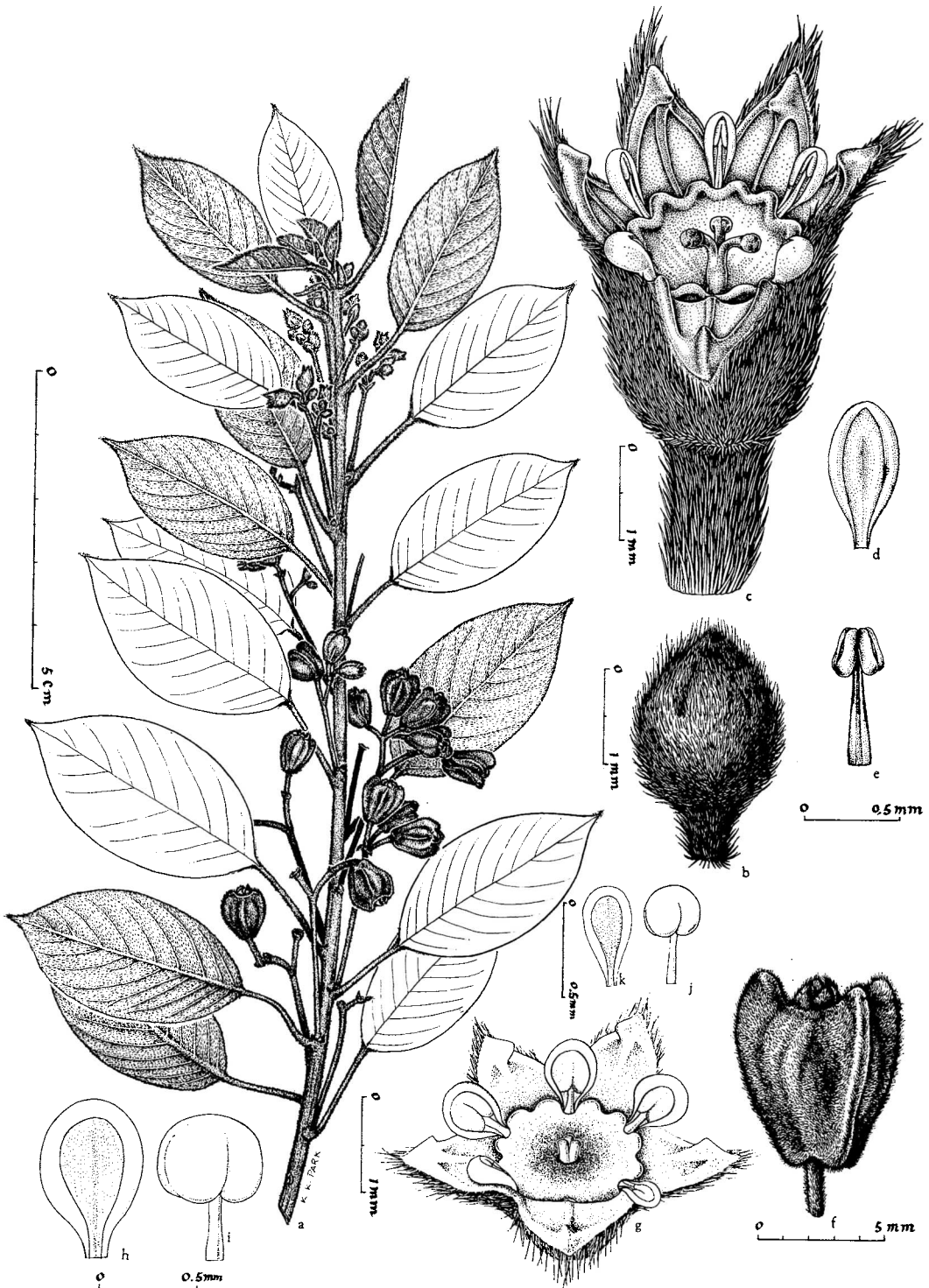
There is nothing to indicate whether this specimen was collected by *Hillebrand* himself, or by one of his collaborators.

The new epithet is the Latin adjective *pilatus*, armed with a javelin, and is given with reference to the shape of the lanceolate stipules.

11. *Gouania Remyi* sp. nov. (Fig. 11)

DIAGNOSIS HOLOTYPI: Licet frutex, ramulis 2–3 mm diametro densiter subadpresse persistente albi pilosis, internodis 6–10 mm longis rectis, nodis subincrassatis, stipulis 3–4 mm longis caducis lineari-lanceolatis valde adpresse albi-pilosis, petiolis 14–17 mm longis teretibus gracilibus dense subadpresse albi-pilosis, laminis 3.2–3.7 cm longis 1.5–1.8 cm latis subcoriaceis ellipticis subacuminatis in basi rotundatis marginibus integris supra obscure viridibus in toto adpresse pilosis pilis ad lateres disponitis midnervo et nervis secundariis cum pilis laxioribus, inflorescentiis 25–35 mm longis axillaribus cymosis densiter subadpresse albi-pilosulis 5–11-floriferis, pedunculo 10–18 mm longo, pedicellis 1–7 mm longis, alabastris 2 mm longis late ellipsoideis dense adscendente albi-pilosis, lobis calycis 1 mm longis ovati-deltoides crassis coriaceis intra glabris et marginibus midnervo apiceque triangulari incrassatis extra dense pilosis, petalis 0.6 mm

FIG. 11. *Gouania Remyi* St. John, from holotype, Kahoolawe, Remy 587. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, capsule, $\times 4$; *g*, staminate flower, $\times 15$; *h*, larger petal, $\times 30$; *i*, fertile stamen, $\times 30$; *j*, sterile stamen, $\times 30$; *k*, smaller petal, $\times 30$.



longis ellipticis marginibus apiceque involutis et staminem inclusis, filamentis 0.5 mm longis subulatis, antheris 0.2 mm longis et thecis oblongi-ellipsoideis in basi divergentibus, stylis 3 et 0.4 mm longis cylindricis crassis paene parte $\frac{1}{2}$ supera libera, disco undulato 10-lobato, capsulis 8 mm longis 7 mm latis subglobosis cuneatis dense subadpresso albi-pilosis axili 6–6.5 mm longo 3-lateratis 3-alatis, alis in basi 1 mm latis in apice 2 mm latis et cum loba 1 mm longa ovata adscendenti.

DIAGNOSIS OF HOLOTYPE: Apparently a shrub; branchlets 2–3 mm in diameter, densely subappressed persistent white pilose; internodes 6–10 mm long, straight; nodes slightly enlarged around the leaf scar; stipules 3–4 mm long, linear lanceolate, concealed by their white appressed pilosity, caducous, leaving a discoid scar; petioles 14–17 mm long, terete, slender, concealed by the subappressed white pilosity; blades 3.2–3.7 cm long, 1.5–1.8 cm wide, subcoriaceous, elliptic, the apex sharply subacuminate, the base rounded, the margins entire, the upper surface dark green, completely glabrous, the lower surface concealed by the dense white appressed pilosity, the hairs directed laterally, the midrib and secondaries with looser similar pubescence; inflorescences 25–35 mm long, axillary, cymose, densely subappressed white pilosulous, bearing 5–11 polygamous flowers; peduncle 10–18 mm long; pedicels 1–7 mm long; terminal flowers perfect, their buds 2 mm long, broadly ellipsoid, concealed by the ascending white pilosity; calyx lobes 1 mm long, ovate deltoid, thick coriaceous, within glabrous and with thickened margins, midrib and triangular apex, without densely pilose; petals 0.6 mm long, elliptic, with inrolled margins and apex, hooded over and enclosing the stamen; filaments 0.5 mm long, subulate; anthers 0.2 mm long, of 2 oblong-ellipsoid sacs, diverging at base; styles 3 and 0.4 mm long, cylindrical, stout, parted nearly half way; disk undulately 10-lobed; lateral flowers functionally staminate, the buds 2.2 mm long, almost concealed by the appressed ascending white pilosity, the tube 1.2 mm long, hemispheric, the 5 lobes 1 mm long, ovate, acute, coriaceous, within glabrous and the midrib raised, the margins much thickened and the acute tip with a tri-

angular thickening $\frac{1}{3}$ as long as the lobe; petals 0.5–0.8 mm long, white, saccate cucullate and enclosing a stamen; stamens unequal, two of them with anthers 0.3 mm long on filaments 0.2 mm long, three of them 0.5 mm long, containing pollen, and on filaments 0.3 mm long; the 3 styles 0.2 mm long, separate, each bearing an apical red stigma; disk 1.6 mm in diameter, almost circular, but notched to the base of each filament, and the intervals with 2 rounded lobes; capsules 8 mm long, 7 mm wide, cuneate, subglobose, densely white subappressed pilose, the central axis 6–6.5 mm long, 3-sided and with 3 lateral wings 1 mm or less wide at the bottom, 2 mm wide at the top, and projecting upwards as ovate lobes $\frac{1}{6}$ as long as the axis.

HOLOTYPE: Iles Sandwich, Kahoolawe, 1851–1855, *J. Remy* 587 (P, the left hand specimen).

DISCUSSION: The holotype of *G. Remyi* is the left hand specimen on the sheet of Remy 587 in the Paris herbarium. The sheet bears two branches of quite different looking specimens of *Gouania*. The right hand one is now marked 587a, and is here described as *G. cucullata*.

This species and *G. cucullata*, both from Kahoolawe, are lost species and certainly extinct.

The story of the utilization of the island of Kahoolawe is a sad one of destructive exploitation. The island is eleven by six miles, and is 1,491 feet high. Being of only moderate height and situated in the lee of the 10,025-foot Haleakala Volcano, Maui, it receives only a low rainfall, from 10–20 inches (in 1911–1917) or 23–27 inches a year (in 1936–1938) fide Stearns (1940:124), and was not or little inhabited. Under the Hawaiian native kings it was used as a convict colony as early as 1830, and this continued at least until 1852. In 1832 there were 80 inhabitants, but in 1841 there were only 15 convicts and a few fishermen. These settlers introduced pigs and goats and used them for food, but apparently both escaped and persisted, as did dogs.

Early accounts of the island describe it as forested on top. Of this tree growth only *Erythrina sandwicensis* persisted, and specimens of it were collected by Forbes in 1913 from one of the few surviving individual trees

(1913:4, 6, when still called *E. monosperma*). He learned from previous visitors that they had also seen on the island the tree *Reynoldsia sandwicensis*, and the shrubs *Dodonaea sandwicensis*, *Styphelia Tameiameiae*, *Myoporum sandwicense*, and *Euphorbia multiformis*. Another shrub, *Neraudia kahoowawensis*, described by Hillebrand in 1888, had become extinct by 1913. Among these species, the only real trees are the *Erythrina* and the *Reynoldsia*, both of which will grow to good size, even in arid places, but there they occur as scattered individuals and can scarcely be said to produce much of a forest. At least it is of a wide open savannah type. The other known native plants which are shrubs would have made some thickets between the trees, and filling in would be the common "pili" grass, *Heteropogon contortus*. These shrubs were the *Neraudia*, *Dodonaea*, *Styphelia*, *Myoporum*, and *Euphorbia*, and to these we now add *Gouania Remyi* and *G. cucullata*. Several other shrubs in the vegetation of the littoral zone are here omitted because they would not have formed part of the upland savannah forest vegetation. There was one other endemic species collected by Remy, *Lipochaeta kahoowawensis* Sherff, and an indigenous one, *L. connata* (Gaud.) DC. These are doubtless gone, but another endemic one was collected by Bryan in 1931, *L. Bryanii* Sherff. Together, then, the known endemics of the now desolated island Kahoolawe are five: *Gouania cucullata*, *G. Remyi*, *Neraudia kahoowawensis*, *Lipochaeta Bryanii*, and *L. kahoowawensis*.

Jules Rémy was in the Hawaiian Islands from 1851 to 1855, and once during that period he visited Kahoolawe. This was just at the end of the penal colony period, and probably the natural vegetation was but little disturbed. He collected twelve plant species on it, including the native shrubs *Santalum ellipticum*, *Hibiscus Brackenridgei*, and the two endemic species of *Gouania* here described. The *Santalum* might have grown all over, from the shore to the volcanic crests, and a single bush of it was later found at the southwest end of the island by Stearns (1940:124). The *Hibiscus* probably grew in rocky gulches in the upland. It is a stout shrub or small tree, and may have added to the forest cover.

The island was subsequently exploited as a

ranch. In 1863 the Hawaiian king leased the island for \$250 a year to Charles G. Hopkins, and the lease was later assigned to a succession of others, Elisha H. Allen, R. von Tempsky, A. McPhee, H. H. Baldwin, and others. The first sheep ranch there failed. Later lessees introduced sheep, cattle, horses, and pigs, and particularly the sheep and the goats multiplied and ran wild. In 1887 there were 900 cattle, and 12,000 sheep. This overstocked the arid island, and the edible vegetation was soon consumed. The sod and the soil cover were destroyed, especially by the sheep by their close cropping and by their trampling, exposing the fine-particled soil, which on the broad, flattish top of the island was from 4 to 10 feet deep. Throughout nearly all of the year the Hawaiian Islands receive a brisk north-northeast trade wind. This hits Puu Kukui, the mountain mass of west Maui. Further east it hits the 10,025-foot Haleakala in east Maui and in general fails to blow over it; instead it divides and passes around either flank. There is a broad isthmus between the two mountain masses, and the wind blows through this funnel-like opening in the direction of Kahoolawe. A turbulence of the air here is due to the current skirting the flank of the mountain, being diverted and mixing with the straight trade passing over the isthmus. Those winds which climb on the mountain slope lose most of their moisture there. After overpassing Maui, they blow on and reach Kahoolawe, 6¾ miles to leeward. Seldom do they bring rain to that bit of land. Any strong wind picked up the exposed fine soil of the upland of Kahoolawe and carried it for miles out to sea as a cloud of red dust (Bryan, 1933:53). In this way all the good soil of the uplands down to bed rock, was blown away and lost. The lower slopes of the island, where not cliffs, are rocky slopes. The general absence of soil on these slopes is explained by Stearns as due to wave erosion during a period when the island was submerged to the present 800-foot level (1940:147). This process ruined the pasture and has nearly destroyed the native flora.

In 1910 the Territory of Hawaii repossessed the island, as a forest reserve, but the Board of Forestry was not given the finances and resources with which to carry out a reclamation.

Efforts to exterminate the stock then reduced these feral animals to 150 sheep and 4,300 goats. In 1939 the animal population was estimated as 500 cattle, 200 wild sheep, 25 wild goats, 17 horses, 3 mules, 500 wild turkeys, and plenty of rats, mice, and cats. The island is now used by the U.S. Military as a bombing target, and is off limits to visitors.

The new epithet honors the French botanist, Jules Rémy (1826–1893), who lived on and explored the Hawaiian Islands from 1851 to 1855. His visit to Kahoolawe was fortunately just before the thousands of sheep and other grazing animals were placed on the island.

12. *Gouania cucullata* sp. nov. (Fig. 12)

DIAGNOSIS HOLOTYPE: Licet frutex; ramulis 2.5–3 mm diametro densiter subadpresso pallide pilosis, internodis 3–7 mm longis, nodis paene incrassatis, stipulis 2–2.5 mm longis lanceolatis obscuratis densiter adpresso pilosis caducis, petiolis 4–14 mm longis cernuis densiter subadpresso flavescens pilosis, laminis principalibus 3–4.1 cm longis 1.5–2.2 cm latis subtiliter subcoriaceis elliptico-ovatis in basi rotundatis in apice acutis et apiculatis marginibus integris supra obscure viridibus omnino glabris infra densiter adpresso albi-pilosis, pilis cum nervis lateralibus parallelis, inflorescentiis axillaribus 5–10 mm longis adpresso pallide pilosulis spicatis et 3–5-floriferis, pedunculis 2–4 mm longis, alabastris 1.5 mm longis subglobosis acutis, lobis calycis 1.1 mm longis latiter ovatis acutis intra glabris et in midnervo marginibus apice triangularique incrassatis extra adpresso pilosulis, petalis 0.6 mm longis 0.3 mm latis obovatis marginibus et apice involutis cucullatis et staminem inclusis, filamentis 0.3 mm longis subulatis, antheris 0.3 mm longis ellipsoidei-oblongis, saccis in basi subdivergentibus, disco subundulato, stylo non partitis, fructibus incognitis.

DIAGNOSIS OF HOLOTYPE: Evidently a shrub; branchlets 2.5–3 mm in diameter, densely subappressed pale pilose; internodes 3–7 mm long; nodes slightly enlarged around the leaf scar; stipules 2–2.5 mm long, lanceolate, concealed by the dense appressed pilosity, caducous, leaving an oval scar; petioles 4–14 mm long, cernuous, densely subappressed pale yellowish

pilose; major blades of main shoot 3–4.1 cm long, 1.5–2.2 cm wide, thin subcoriaceous, elliptic ovate, the base rounded, the apex acute and apiculate, the margins entire, the upper surface dark green, completely glabrous, the lower surface with dense appressed whitish pilosity, the hairs directed laterally parallel to the lateral veins; inflorescences 5–10 mm long, axillary, appressed pale pilosulous, spicate, bearing 3–5 flowers; peduncle 2–4 mm long; buds 1.5 mm long, subglobose, acute; calyx lobes 1.1 mm long, broadly ovate, acute, within glabrous, the midrib, margins, and triangular apex thickened, without appressed pilosulous; petals 0.6 mm long, 0.3 mm wide, obovate, the margins and apex inrolled, cucullate, enclosing the stamen; filament 0.3 mm long, subulate, anther 0.3 mm long, ellipsoid-oblong, the sacs only slightly divergent at base; disk only slightly undulate; style 0.3 mm long, fully united; fruit unknown.

HOLOTYPE: Iles Sandwich, Kahoolawe, 1851–1855, *J. Remy 587a* (P, the right hand specimen).

This species, endemic to Kahoolawe, is certainly now extinct. For an account of the destructive exploitation of this small island, see the discussion under *G. Remyi*.

The new epithet is the Latin adjective *cucullatus*, hooded, and it is given with reference to the hooded apex of the petals.

13. *Gouania hawaiiensis* sp. nov. (Fig. 13)

DIAGNOSIS HOLOTYPE: Liana lignosa cum cirris, caulibus vetustioribus glabratis, cortice griseo, ramulis densiter ferruginiter divergente pilosulis, internodis 10–38 mm longis rectis, nodis incrassatis, stipulis caducis, petiolis 11–21 mm longis, teretibus densiter divergente ferruginiter pilosulis supra canaliculatis, laminis 5.7–8.5 cm longis 4.2–6.5 cm latis crassis et firme chartaceis latiter ellipticis (vel suborbicularibus) in basi profunditer cordatis in apice obtusis vel breve subacutis marginibus breve rotunditer dentatis supra obscure viridibus et persistente breviter subadpresso albi-pilosulis sed pilis non congregatis nervis cum pilis simulantibus pluribus densis infra albescenti-viridibus et spissiter pilosulis et in nervis optime pilosulis, cirris ex apice ramulis lateralibus et 3–4 cm longis in-

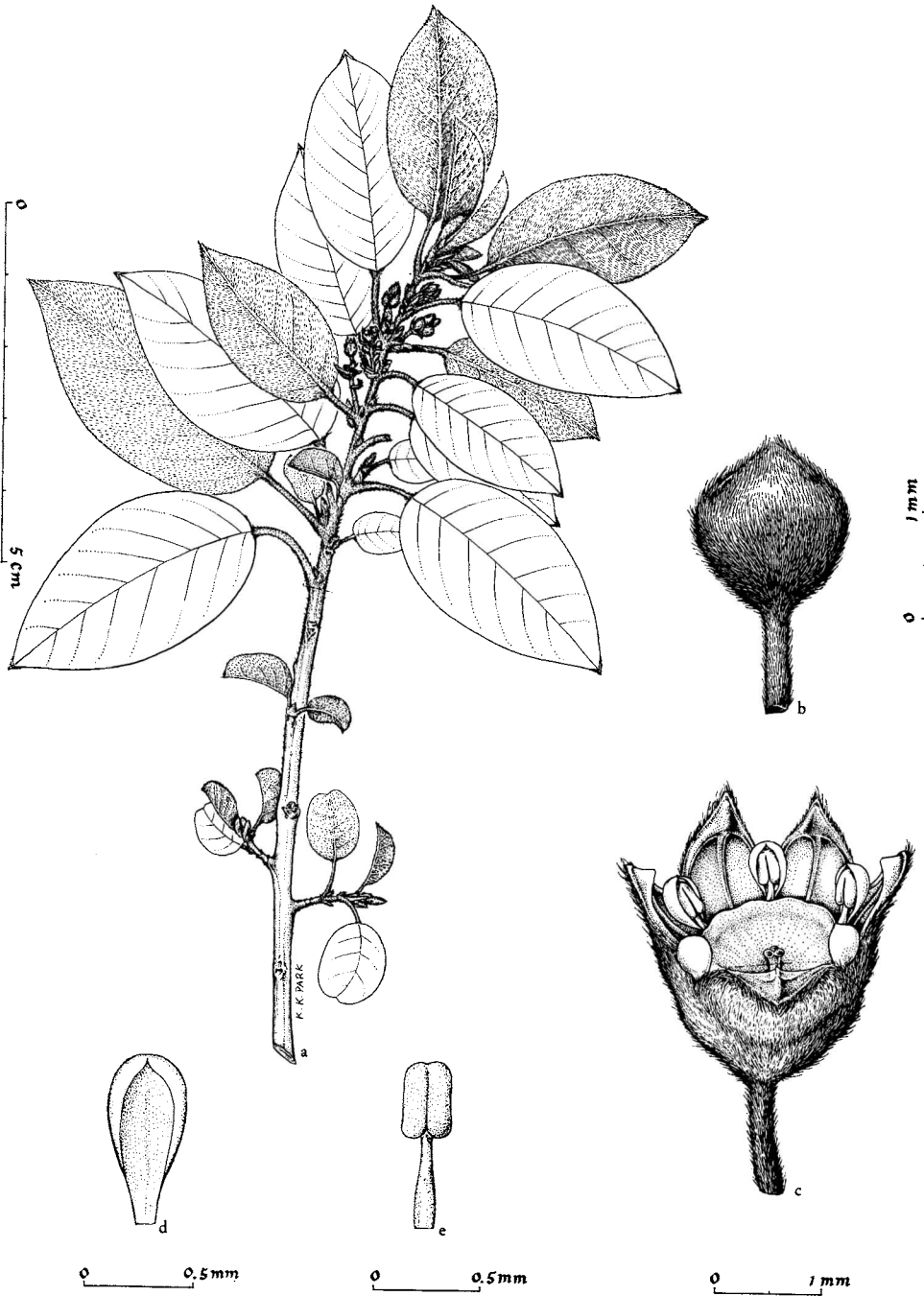


FIG. 12. *Gouania cucullata* St. John, from holotype, Kahoolawe, Remy 587a. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$.

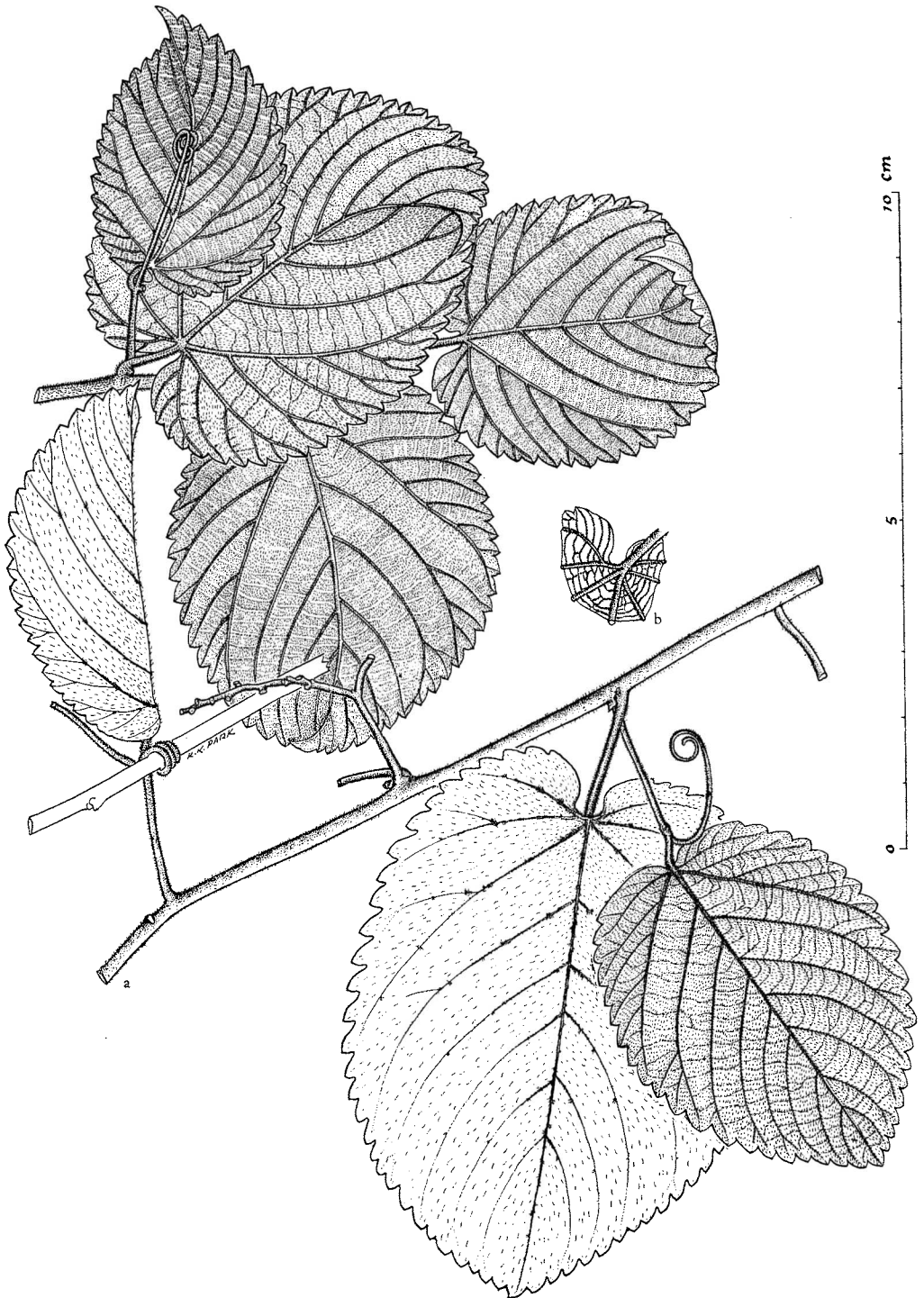


FIG. 13. *Gouania hawaiiensis* St. John, from holotype, Hawaii Island, Keaa, Remy 588. *a*, Habit, $\times 1$; *b*, leaf base, lower side, $\times 1$.

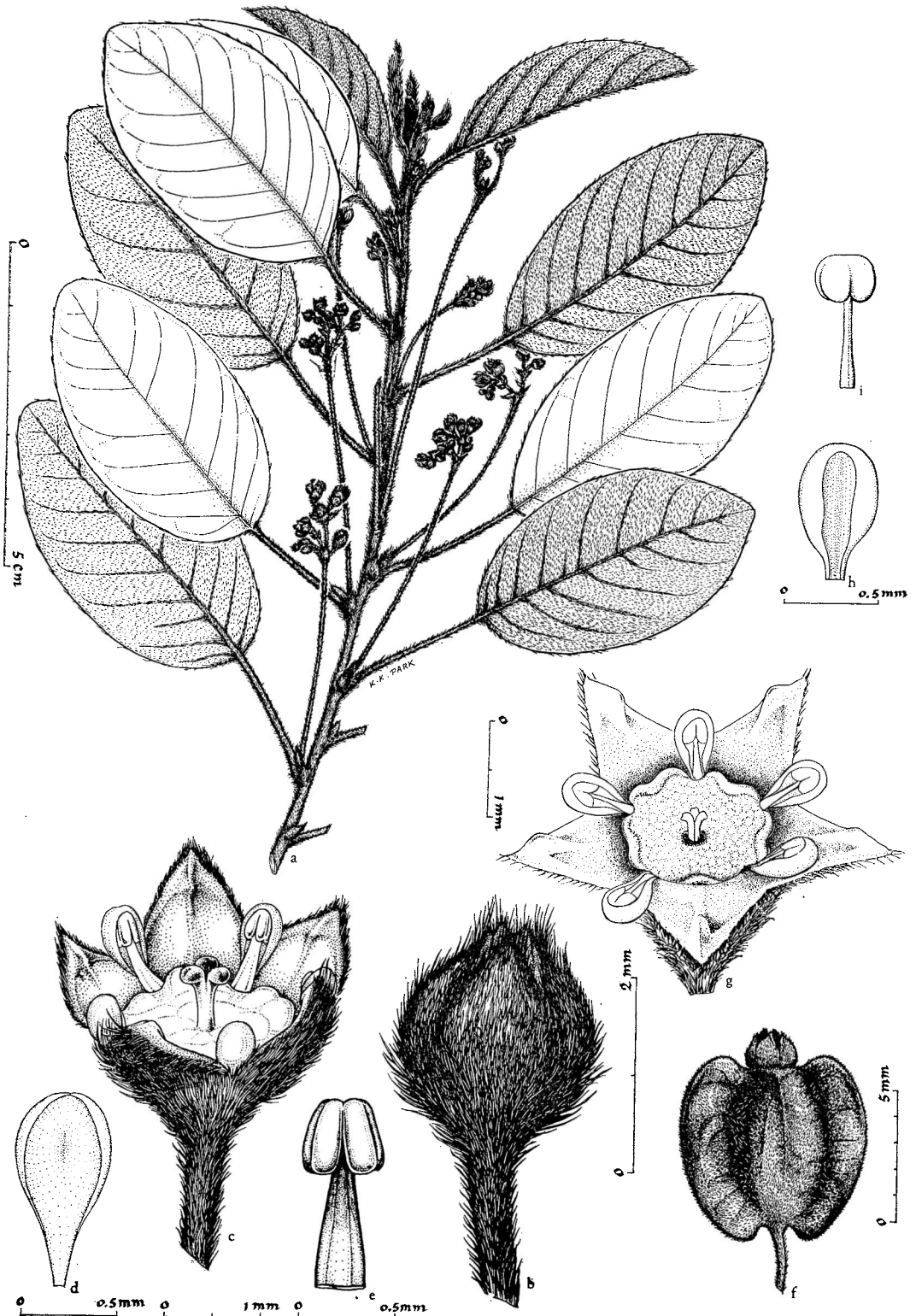


FIG. 14. *Gouania sandwichiana* St. John, from holotype, Hawaii Island, Remy 586. *a*, Habit, $\times 1$; *b*, bud of perfect flower, $\times 15$; *c*, perfect flower, $\times 15$; *d*, petal, $\times 30$; *e*, stamen, $\times 30$; *f*, capsule, $\times 4$; *g*, sterile flower, $\times 15$; *h*, petal, $\times 30$; *i*, stamen, $\times 30$.

tigris intorquentibus densiter divergente ferrugini-pilosulis, spicis cum pedunculo 5 mm longo, rhachidibus 20 mm longis ambis divergente ferruginei-pilosulis, nodis 13, floribus et fructibus perditis.

DIAGNOSIS OF HOLOTYPE: Climbing cirrhiferous shrub; older stems glabrate, with gray bark; young stems densely divergent rusty pilosulous,

and the hairs long persisting; internodes 10–38 mm long, straight; nodes swollen below the leaf scars; stipules caducous, leaving a narrow lunate scar; petioles 11–21 mm long, terete, channeled above, densely divergent rusty pilosulous; blades 5.7–8.5 cm long, 4.2–6.5 cm wide, thick and firm chartaceous, broadly elliptic (or suborbicular), the base deeply cordate, the apex obtuse or shortly subacute, the margins



FIG. 16a. *Gouania Hillebrandi* Oliver, holotype, Lahaina, Maui, herb. Hillebrand (Berlin).

rounded short dentate, the surface above dark green and permanently subappressed short white pilosulous, but the hairs not crowded, the veins with similar but dense pubescence, below the surface whitish green and shaggy pilosulous, and all the veins outstandingly so; tendrils from the tips of lateral shoots, 3–4 cm long, unbranched, coiling, densely ascending to divergent rusty pilosulous; inflorescence spicate (or perhaps racemose); peduncle 5 mm long; rhachis 20 mm long, both divergent rusty pilosulous; nodes 13; flowers and fruit lost.

HOLOTYPE: Iles Sandwich, Hawaii I., petit bois au-dessus de Keaa, Kau, liane inconnue des indigènes, Juillet 1853, *J. Remy* 588 (P).

DISCUSSION: This seems closely related to *G. vitifolia* Gray, of the Waianae Mountains, Oahu, a species which has the blades 4–12 cm long, 3–9 cm wide, membranous, broadly cordate, crenate, the upper half mostly narrowing to the tip; petioles subglabrate. *G. hawaiiensis* has the blades 5.7–8.5 cm long, 4.2–6.5 cm wide, thick chartaceous, broadly elliptic (or suborbicular), rounded dentate, the upper half rounding to the tip; petioles with persistent shaggy pilosity.

It is unfortunate that Rémy's specimen shows only vegetative parts and a bare inflorescence from which the flowers and fruit have fallen. The land section Keaa is a small area in the dry lowlands near the southern end of the island

of Hawaii. With Rémy's unique plant in mind, in 1965 William Meinecke searched in vain the rough lava flows and intervening thickets of that area near Waiohinu for this plant.

The new epithet is a coined adjective, formed of the place name, Hawaii, and the Latin adjectival place ending, *-ensis*.

14. *Gouania sandwichiana* sp. nov. (Fig. 14)

G. orbicularis Walp. var. β Mann, Proc. Am. Acad. Arts Sci. 7:162, 1867.

DIAGNOSIS HOLOTYPE: Licet frutex, ramis 2–3 mm diametro obscure rubris et pilosis, ramulis dense albi- vel brunnei-pilosis pilis in parte subdivergentibus in parte subadpressis, internodiis 3–25 mm longis rectis, nodis subincrassatis, stipulis 2–3 mm longis caducis anguste lanceolatis et densiter adpresse pilosis, petiolis 14–24 mm longis teretibus gracilibus subadpressiter albi- vel brunnei-pilosulis, laminis 2.6–5.1 cm longis 1–2.7 cm latis subtiliter chartaceis ellipticis in basi rotundatis in apice rotundatis vel minime emarginatis marginibus integris supra olivaceis glabris infra palliditer viridibus et adpresse adscendente breve pilosis, inflorescentiis 25–55 mm longis cymosis axillaribus, pedunculo 20–45 mm longo filiformi sparse subdivergente pilosulo 5–13-florifero, floribus polygamis ab inito congregatis tum separatis, pedicellis 1–5 mm longis dense semiadpresse pilosulis, ala-



FIG. 16b. *Gouania Hillebrandi* Oliver, at Lahainaluna, Maui, St. John 26,723.

bastris ovoideis, floribus terminalibus perfectis cum calycibus in flore 2–2.3 mm longis densiter adpresse adscendente brunnei-pilosulis lobis 1.3 mm longis ovatis acutus intra glabris et mid-nervo marginibus apiceque triangulari incrassatis, petalis 1 mm longis 0.5 mm latis spatulati-

obovatis albis marginibus apiceque involutis et cucullatis et staminem inclusis, filamentis 0.8 mm longis crassis subulatis, antheris 0.4 mm longis thecis binis oblongi-ellipsoideis in basi divergentibus, disco cum 10 lobis latis rotundatis, stylis 3 et 0.2 mm longis in toto connatis,

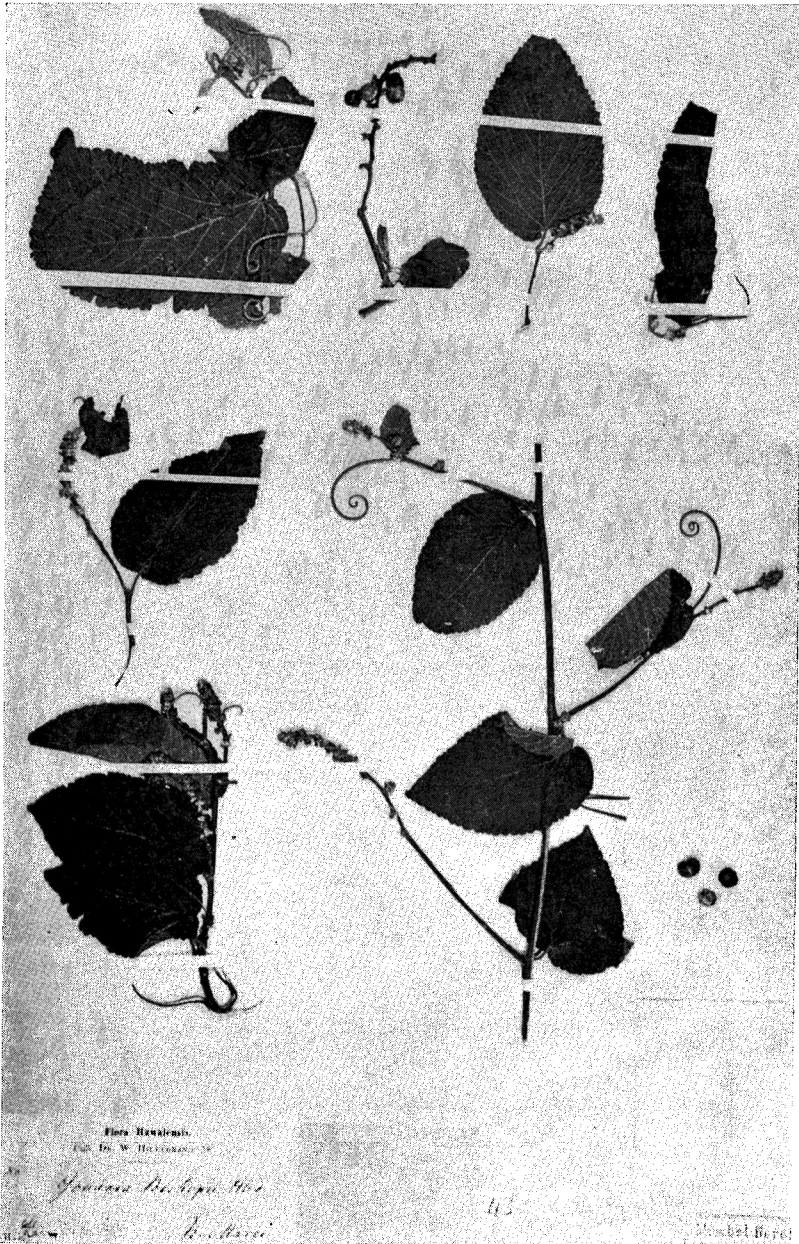


FIG. 17a. *Gouania Bishopii* Hbd., holotype, Lahaina, Maui, Bishop 43 (Berlin).

capsulis 7–8 mm longis 6–7 mm latis sub-orbicularibus in apice et basi emarginatis 3-lobatis 3-alatis adpresse remote albi-puberulentis alis 1.5–2.5 mm latis subsymmetricis.

DIAGNOSIS OF HOLOTYPE: Evidently a shrub; branchlets 2–3 mm in diameter, the older ones dark reddish and with persistent pilosity; young branchlets with abundant pilosity white to brownish, partly half spreading, partly sub-appressed; internodes 3–25 mm long, straight;

nodes slightly enlarged beneath the leaf scars; stipules 2–3 mm long, narrowly lanceolate, concealed by the appressed pilosity, caducous, leaving a roundish scar; petioles 14–24 mm long, terete, slender, subappressed white to brownish pilosulous; blades 2.6–5.1 cm long, 1–2.7 cm wide, thin chartaceous, elliptic, the base rounded, the apex rounded or minutely emarginate, the margins entire, the upper surface olive green, glabrous, the lower surface pale green and with dark reticulate venation,

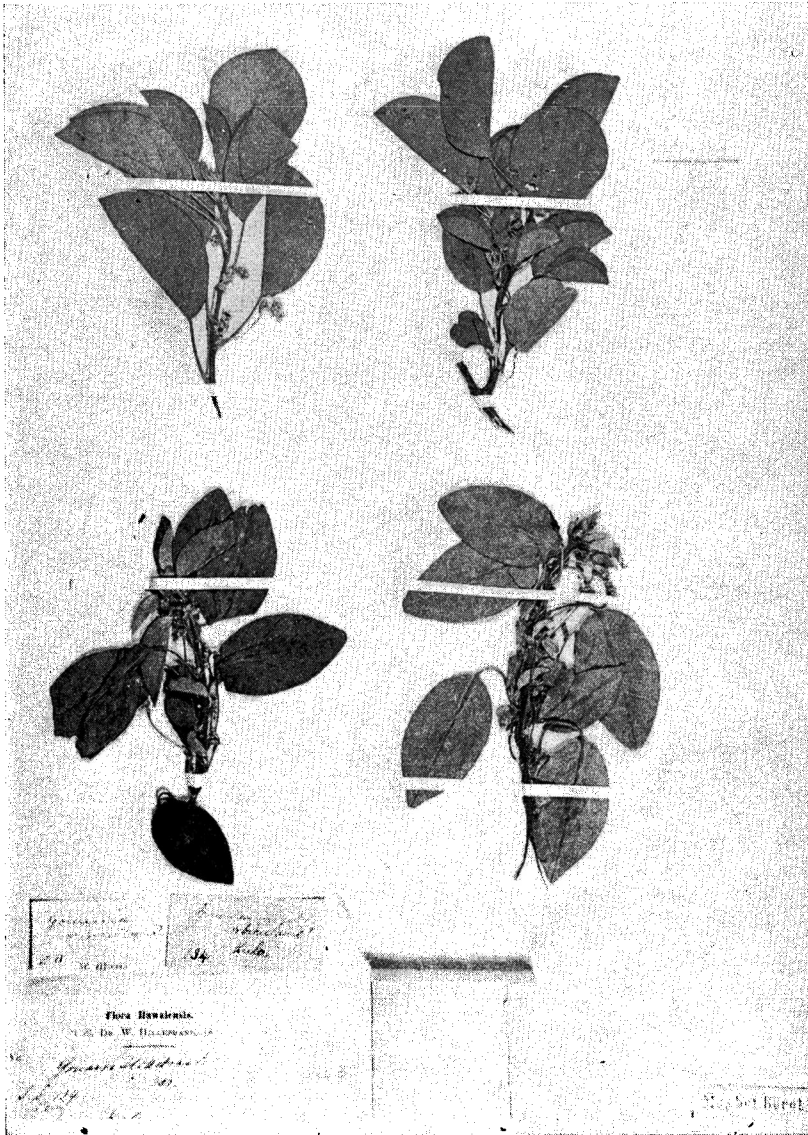


FIG. 17b. *Gouania Lydgatei* St. John, holotype, Kula, Maui, Lydgate 134 (Berlin).

and the surface with spaced, very short, appressed ascending white pilosity; inflorescences 25–55 mm long, cymose, axillary; peduncle 20–45 mm long, filiform, sparsely half spreading pilosulous; cyme 5–13-flowered, the flowers polygamous, at first crowded, but in young fruit separated; pedicels 1–5 mm long, densely semi-appressed pilosulous; buds ovoid; terminal perfect flowers with the calyx in anthesis 2–2.3 mm long, densely appressed ascending brownish pilosulous; calyx lobes 1.3 mm long, ovate, acute, within glabrous, and the midrib, margins, and apical triangle thickened; petals 1 mm long, 0.5 mm wide, spatulate obovate, white, the margins and apex inrolled, hooded and enclosing the stamen; filament 0.8 mm long, stout subulate; anthers 0.4 mm long, the 2 oblong-ellipsoid sacs divergent at base; disk with 2 broad rounded lobes opposite each calyx lobe; 3 styles 0.2 mm long, fully united; lateral flowers evidently sterile, the calyx 3 mm long, densely appressed ascending brownish pilosulous without, the tube 2 mm long, funnel-form, the 5 lobes 1 mm long, valvate, broadly ovate, acute, within glabrous, fleshy and thickened at the margins, up the narrow midrib, and at the triangular apex; petals 0.7 mm long, obovate saccate, deeply cucullate and enclosing a stamen; filaments 0.5 mm long, acicular; anthers 0.3 mm long, cordate suborbicular; disk 1.7 mm in diameter, with a broad, emarginate lobe opposite each calyx lobe; the 2 styles 0.2 mm long, distinct, subcapitate; ovary evidently sterile; capsules of perfect flowers 7–8 mm long 6–7 mm wide, suborbicular, emarginate at both ends, appressed white spaced puberulent throughout, 3-lobed, 3-winged, the wings 1.5–2.5 mm wide, of nearly equal width from base to tip.

HOLOTYPE: Iles Sandwich, Hawaii I., 1851–1855, *J. Remy* 586 (P). Isotype (GH)!

DISCUSSION: The new epithet is formed of the geographic name Sandwich, and the Latin adjectival suffix *-ianus*.

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