

## Novelties in *Lipochaeta* (Compositae). Hawaiian Plant Studies 119<sup>1</sup>

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**ABSTRACT:** Included are descriptions, based on morphology, of 12 new species and three new varieties of *Lipochaeta* (Compositae) of the Hawaiian Islands.

AN IMPORTANT ELEMENT in the flora of the arid lowlands of the Hawaiian Islands is the genus *Lipochaeta* (Compositae). While preparing a revision of this genus<sup>3</sup> the author has detected several new species and varieties. To make them known, they are here described and most of them are illustrated.

### *Lipochaeta acris* Sherff

var. *lata* var. nov.

A specie differt in phyllariis lanceolatis.

Differs from the species by having the outer phyllaries lanceolate. The species has them lance-linear.

**HOLOTYPE:** Hawaiian Islands, Kauai Island, bottom of Kaaweiki, 3/6/69, Robert W. Hobdy 94 (BISH).

There are 20 other collections of the new var. *lata* in the Bishop Museum. They were found all along the Na Pali coast of Kauai, at Kokee, and in the Waimea Valley region. This variety and var. *acris* are sympatric.

### *Lipochaeta Christophersenii* sp. nov. (sect. *Aphanopappus*), fig. 1

**DIAGNOSIS HOLOTYPE:** Frutex 1 m altus est, ramulis foliosis adpresse hirsutulibus, petiolis 2–4 mm longis adpresse hirsutulibus, laminis 3–12 × 0.8–3.2 cm firme chartaceis lanceolatis vel anguste lanceolatis acutis basi

cuneata marginibus depresso serrulatis dentibus in hydathodo globoso terminantibus supra sparse adpresse hirsutulibus infra cum pilis simulantibus densioribus nervis secundariis 8–10 in dimidio quoque, cymis cum 1–4 capitulis, pedunculis 2–9 cm longis adpresse hirsutulibus, capitulis 2.5–3 cm diametro, involucro hemisphaerico, 4–5 phyllariis exterioribus 6–10 (–12) mm longis lanceo-ovatis dense adpresse hirsutulibus, flosculis radiatis 10–14, tubo 3 mm longo, radiis 11 mm longis 4 mm latis oblongo-ellipticis in apice paullo bifidis, squamis disci 5 mm longis 2 mm latis oblanceo-navicularibus proxima apicem puberulis, flosculis disci fere 40 cum 2 setis 2–2.5 mm longis, corollis cum dimidio infero 2 mm longo anguste tubuloso dimidio supero anguste campanulato et cum 5 lobis anguste ovatis, achaeneis radiatis 3 × 2–2.7 × 1.1 mm deltoideo-obovoideis laevibus badiis cum 2 aculeis exterioribus 1 mm longis et 2 interioribus 0.5 mm longis, achaeneis disci 2.9 × 0.8 × 0.2 mm ellipsoideis plano-convexis acum 2 aculeis 0.8–1 mm longis.

**DIAGNOSIS OF HOLOTYPE:** Shrub 1 m tall; leafy branchlets 1–3 mm in diameter, stramineous, appressed ascending white hirsutulous; internodes 1–7 cm long; nodes with an elevated ring but not perfoliate; petioles 2–4 mm long, white appressed ascending hirsutulous, broadly channeled above; blades 3–12 cm long, 8–32 mm wide, firm chartaceous, lanceolate to narrowly lanceolate, acute, the base cuneate, the margins remotely low serrulate, the teeth ending in a globose hydathode, above dark green, shining, and sparsely appressed white hirsutulous, below pale green and with similar but more dense pubescence, secondary veins 8–10 in

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<sup>3</sup> The sections of the genus proposed by Gardner (1979) are used in this paper, but since the difference between them is only on a majority count of the disk corolla lobes, it is not considered significant.

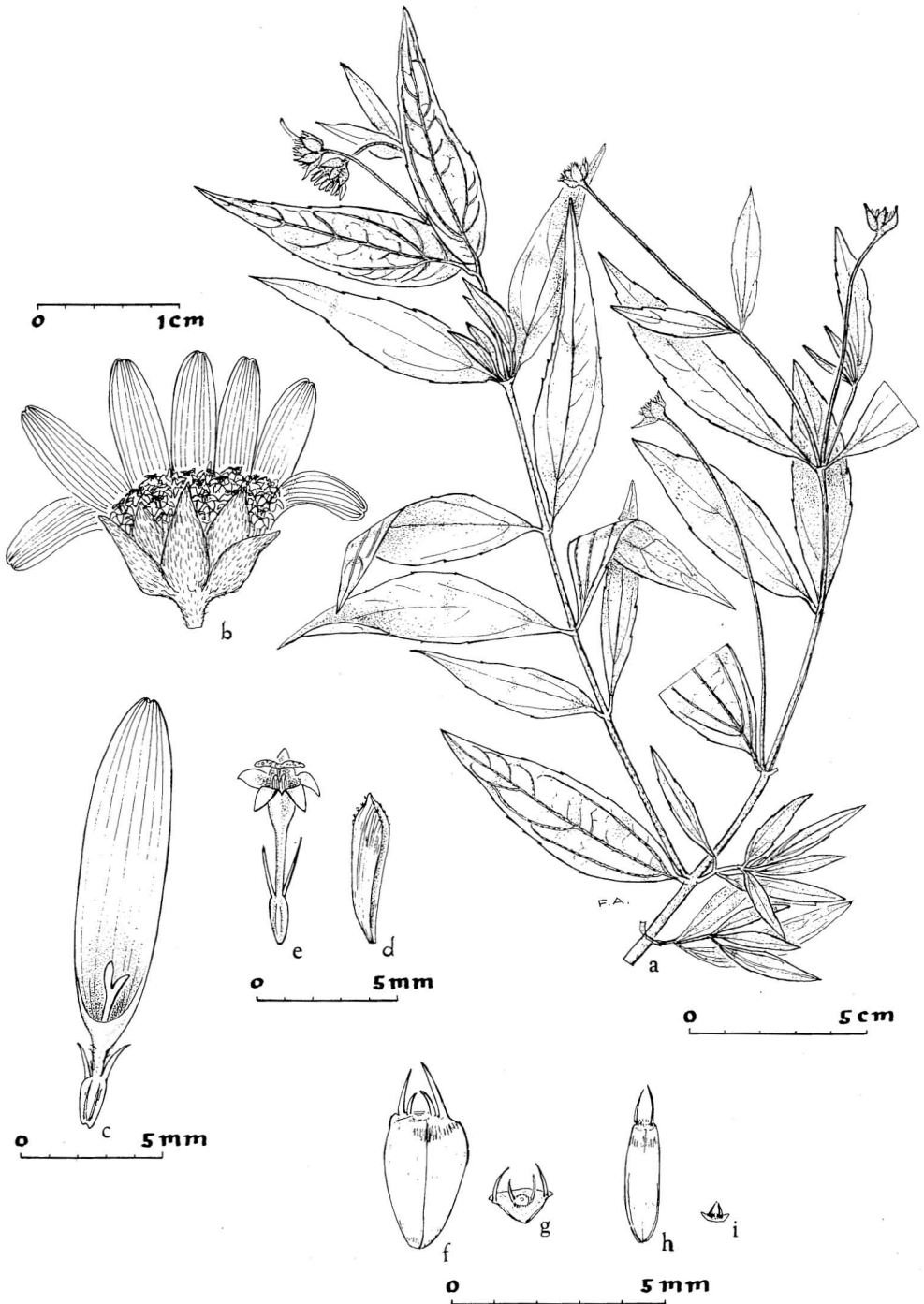


FIGURE 1. *Lipochaeta Christophersenii* St. John, from holotype. *a*, habit  $\times \frac{1}{2}$ ; *b*, head,  $\times 2$ ; *c*, ray floret,  $\times 4$ ; *d*, chaff,  $\times 4$ ; *e*, disk floret,  $\times 4$ ; *f*, *g*, ray achene,  $\times 6$ ; *h*, *i*, disk achene,  $\times 6$ .

each half, arcuate ascending, and a pair of the lower ones strong and thickened; cymes with 1–4 heads; peduncles 2–9 cm long, appressed ascending white hirsutulous; heads 2.5–3 cm in diameter; involucre hemispheric; 4–5 outer phyllaries 6–10 (–12) mm long, lance-ovate, densely appressed ascending white hirsutulous; inner phyllaries similar; ray florets 10–14, the ovary 3 mm long, subelliptic; 2 pappus awns 1.3 mm long; the tube 3 mm long, the ray 11 mm long, 4 mm wide, oblong elliptic, slightly bifid at apex; chaff 5 mm long, 2 mm wide, oblance navicular, near the apex puberulous; disk flowers about 40, with the ovary 1.9 mm long, ellipsoid, the 2 awns 2–2.5 mm long; corolla with the lower half 2 mm long, narrowly tubular, the upper half narrowly campanulate and bearing 5 narrowly ovate lobes; ray achenes 3 mm long, 2–2.7 mm wide, 0.1 mm thick, deltoid obovoid, smooth, brown, with 2 outer awns 1 mm long, and 2 inner ones 0.5 mm long; disk achenes 2.9 mm long, 0.8 mm wide, 0.2 mm thick, ellipsoid, brown, smooth, plano-convex, bearing 2 awns 0.8–1 mm long.

HOLOTYPE: Hawaiian Islands, Oahu Island, Waianae Mts., Central Lualualei, head of valley 2, foot of cliffs below Kanehoa, 450 m alt., June 1, 1922, *Erling Christophersen* 3,691 (BISH).

DISCUSSION: *Lipochaeta Christophersenii* is a member of the section *Aphanopappus*. Its closest relative, *L. Garberi* St. John, of Oahu, is a species with the blade margins remotely low serrulate; outer phyllaries 6–10 (–12) mm long, densely appressed ascending white hirsutulous; ray florets 10–14 and 11 × 4 mm, oblong elliptic; disk florets about 40, and the lobes 5. *Lipochaeta Christophersenii* has the blade margins remotely coarsely crenate; outer phyllaries 5–6 mm long, densely appressed ascending white hirsute; ray florets 10–14, the ray 10 × 2.5–3 mm, ligulate; disk florets 25, and the lobes 4.

This species is named in honor of the collector, Erling Christophersen. He was born on April 17, 1898 in Christiania, Norway. He studied at the Royal Frederick University in Christiania during 1916–1917, 1921–1922; he earned his Ph.B. at Yale University in 1920,

specializing in plant ecology. He served as botanist for the Bishop Museum in 1924 on the Tanager Expedition to Nihoa and Necker; and on the Whippoorwill Expedition to Fanning, Christmas, Jarvis, Washington, Palmyra, Howland, and Baker islands, and published two bulletins on them. From 1929 to 1934 he was botanist at the Bishop Museum and made three trips to Samoa to study its ecology. Since there was no useable flora of it, he found that he had first to collect the plant specimens, then on return to Honolulu to study their taxonomy. He published two floristic bulletins about Samoa, but nothing on ecology. Because of his wife's ill health, he resigned from his museum position in 1934 and returned to Oslo, Norway, where he worked as a member of the Norwegian foreign service.

*Lipochaeta elliptica* sp. nov. (sect. *Lipochaeta*), fig. 2

DIAGNOSIS HOLOTYPE: Frutex multi-ramosus 6.5 dm altus est, ramulis foliosis dense adpresse setulosis, petiolis 2–12 mm longis cuneatis alatis cum pilis simulantibus, laminis 1.5–3 × 0.9–2 cm subcoriaceis ovatis apice acuto vel subacuto basi cuneata marginibus serratis cum 4–7 dentibus in dimidio quoque paginis ambis dense adpresse setulosis et scabris nervis secundariis 3–4 in dimidio quoque infra elevatis prominentibus, inflorescentiis terminalibus, cymis cum 3 (–5) capitibus cum pilis simulantibus, pedunculis 1–3 cm longis, capitulis 10–12 mm diametro, involucre in flore 3–3.5 mm alto 3.5–4 mm diametro hemisphaerico, 4 phyllariis exterioribus 2.5–3 mm longis 1.7–2 mm latis late ellipticis viridibus et adpresse setulosis, illis interioribus 3.7–4 mm longis ovatis acutis, flosculis radiatis 5–8, ovario 2 setas pappi 0.6–0.7 mm longas ferrenti, tubo corollae 1 mm longo, laminis radiatis 5.5 × 2.6 mm ellipticis emarginatis, flosculis disci circa 24 et cum 2 setas pappi 0.7–0.8 mm longas ferrenti, tubo corollae 2 mm longo parte 2/3 infera anguste tubulosa parte supera campanulata, 4 lobis 0.5–0.6 mm longis ovatis, antheris 0.7 mm longis separatis, achaeneis radiatis 2 × 1.8 × 1.2 mm trigonobovoides obscure badiis laevibus angulis subtilibus, 3 setis pappi 1–1.3 mm longis,

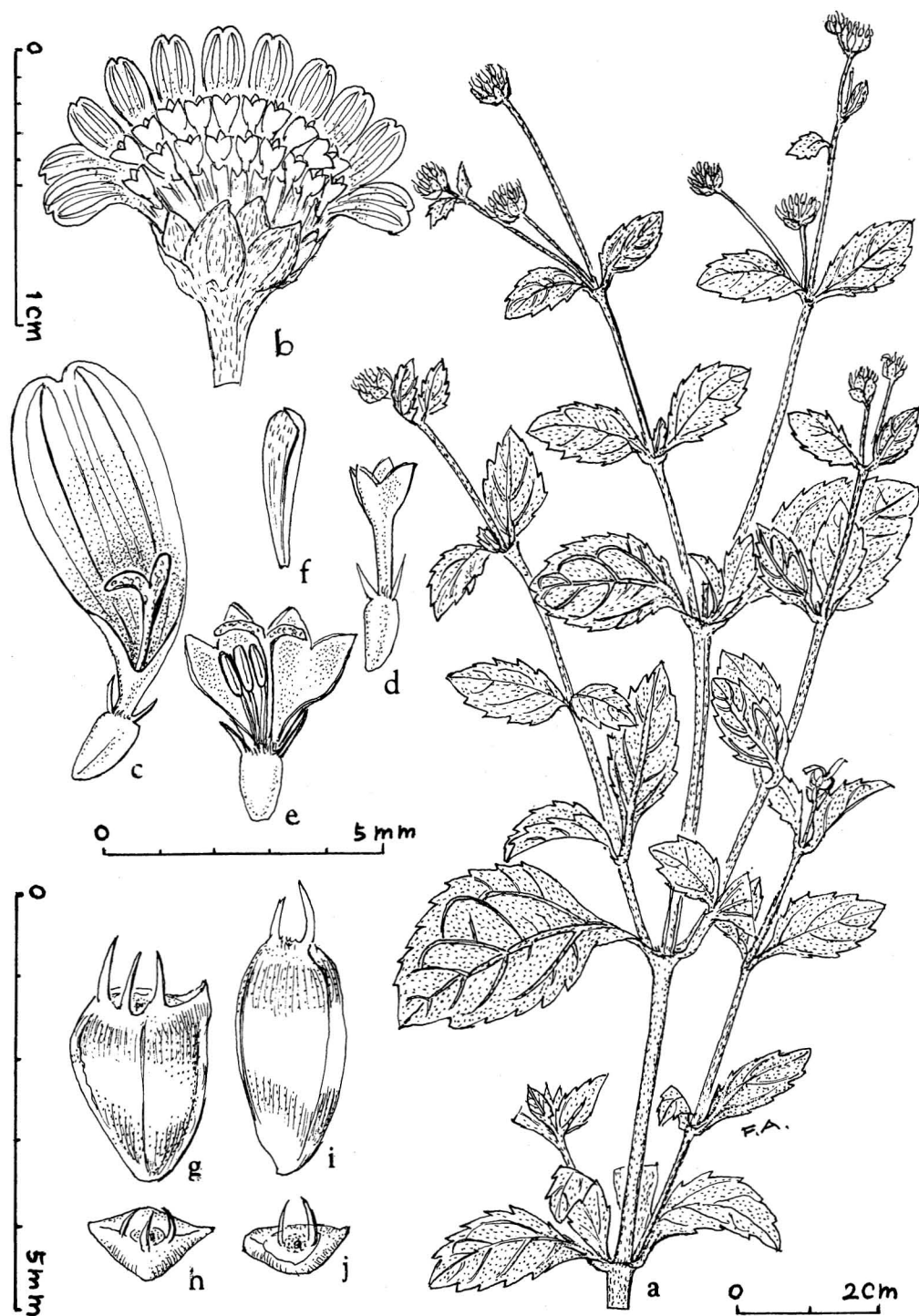


FIGURE 2. *Lipochaeta elliptica* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 4$ ; *c*, ray floret,  $\times 8$ ; *d*, *e*, disk floret,  $\times 8$ ; *f*, chaff,  $\times 8$ ; *g*, *h*, ray achene,  $\times 12$ ; *i*, *j*, disk achene,  $\times 12$ .

achaeneis disci  $4.4 \times 1.3 \times 0.5$  mm ellipsoideis compressis planoconvexis badiis laevibus marginibus subtilibus, 2 aculeis pappi  $0.5\text{--}0.7$  mm longis.

DIAGNOSIS OF HOLOTYPE: Shrub 6.5 dm tall, freely branching; leafy branchlets 0.5–4 mm in diameter, brownish, densely appressed ascending white setulose; internodes 1.2–6 cm long; nodes enlarged; leaves opposite, divergent; petioles 2–12 mm long, cuneate winged, similarly setulose; blades  $1.5\text{--}3 \times 0.9\text{--}2$  cm, subcoriaceous, ovate, the apex acute or subacute, the base cuneate, the margins serrate with 4–7 teeth to a side, on both sides densely appressed white setulose and scabrous, above dark green, below green, the secondary veins arcuate ascending, 3–4 in each half, below the veins elevated and prominent; inflorescences terminal, cymose, with 3 (–5) heads, similarly setulose; peduncles 1–3 cm long; heads 10–12 mm across; involucre in flower 3–3.5 mm high, 3.5–4 mm in diameter, hemispheric outer phyllaries 4 and 2.5–3 mm long, 1.7–2 mm wide, broadly elliptic, green, and appressed ascending white setulose; inner phyllaries 3.7–4 mm long, ovate, acute; ray florets 5–8, the ovary 1.3 mm long, trigonous ovoid, bearing 2 pappus awns  $0.6\text{--}0.7$  mm long; corolla tube 1 mm long; ray  $5.5 \times 2.6$  mm, elliptic, emarginate; disk florets about 24, with ovary 1.5 mm long, narrowly oblong obovoid, compressed, bearing 2 pappus awns  $0.7\text{--}0.8$  mm long; the corolla tube 2 mm long, the lower  $2/3$  narrowly tubular, the upper third campanulate, bearing 4 ovate lobes  $0.5\text{--}0.6$  mm long; anthers 0.7 mm long, separate; ray achenes  $2 \times 1.8 \times 1.2$  mm, trigonous obovoid, dark brown, smooth, the angles thin margined, bearing 3 pappus awns 1–1.3 mm long; disk achenes  $4.4 \times 1.3 \times 0.5$  mm, ellipsoid, compressed, plano-convex, brown, thin margined, smooth; bearing 2 pappus awns  $0.5\text{--}0.7$  mm long.

EXPANDED DESCRIPTION: Plants 4–6.5 dm tall; internodes 1.2–9 cm long; blades ovate, narrowly ovate, (or lanceolate), entire (or rarely shortly 3-lobed); peduncles 1–5.5 cm long; outer phyllaries 2–3.5 mm long; inner phyllaries 3–4 mm long.

HOLOTYPE: Hawaiian Islands, Kahoolawe Island, alongside jeep road from Hanakanaea Bay, past the dump and just s. of the concrete observation post, sww exposure, in full sun, very rocky substrate, 90 ft elev., 4-21-1980, *G. Clarke & C. Corn* 370 (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Kahoolawe Island, Hanakanaea Bay, back of shoreline,  $1/8$  mile nw of barracks, about 10 plants, in full sun, with exotic weeds, on laterite soil with scattered rocks, 30 ft elev., 4/21/1980, *G. Clarke & C. Corn* 371; 372; and 383; nw of Kaukukapapa beach, 40–50 ft from shore, in rock outcropping, with *Heteropogon* and *Prosopis*, colony of 6 plants, some leaves ovate, others 3-lobed, 150 ft elev., 4-22-1980, *L. W. Cuddihy & W. Char* 379; all in (BISH).

DISCUSSION: *Lipochaeta elliptica* is most similar to *L. porophila* Deg. & Deg., of Hawaii, a species with the habit as a procumbent shrub; blades  $10\text{--}40 \times 3\text{--}15$  mm, thin fleshy, narrowly elliptic, acute at apex, cuneate at base, sparsely serrulate; outer phyllaries  $2.5 \times 1.5$  mm, oval oblong; and the ray florets 4. *L. elliptica* is an erect shrub, with the blades  $15\text{--}30 \times 9\text{--}20$  mm, subcoriaceous, ovate, serrate with 4–7 teeth to a side; outer phyllaries  $2.5\text{--}3 \times 1.7\text{--}2$  mm, broadly elliptic; and the ray florets 5–8.

The new epithet is the Latin adjective *ellipticus*, elliptic, and it is given with reference to the elliptic phyllaries.

*Lipochaeta elliptica* St. John, var. *artialata*, var. nov., fig. 3

DIAGNOSIS HOLOTYPI: A specie differt in petiolis alatiorebus, involucri floralibus 4 mm altis 5 mm diametro, phyllariis exterioribus  $3.5\text{--}4$  mm longis, illis interioribus  $4.2\text{--}5$  mm longis.

DIAGNOSIS OF HOLOTYPE: Differs from the species by having the petioles very narrowly winged; blades  $2.5\text{--}4 \times 1.5\text{--}3.2$  cm; involucre in flower 4 mm high, 5 mm in diameter; outer phyllaries  $3.5\text{--}4$  mm long; inner phyllaries  $4.2\text{--}5$  mm long.

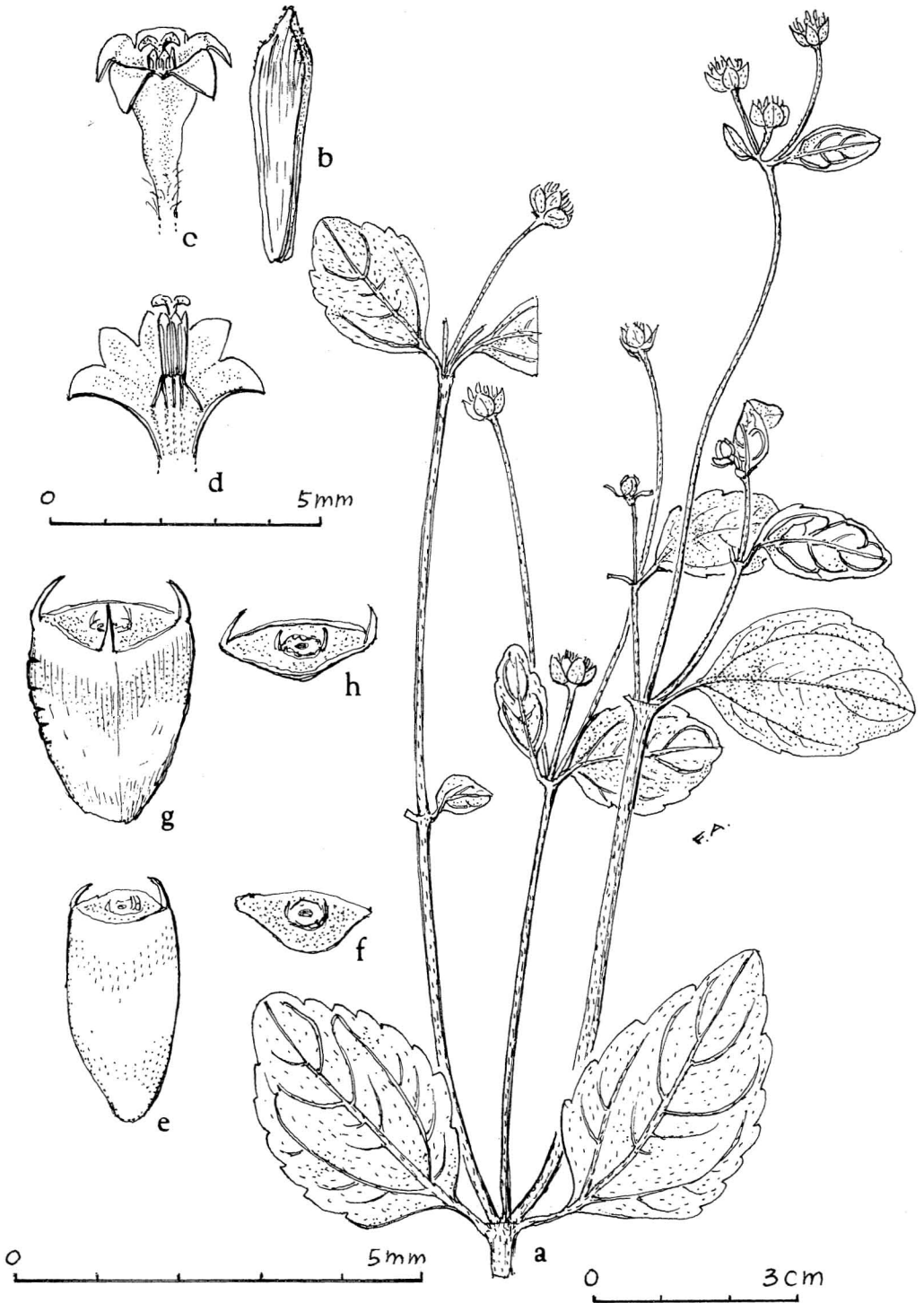


FIGURE 3. *Lipochaeta elliptica* St. John, var. *artialata* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, chaff,  $\times 8$ ; *c*, *d*, disk floret,  $\times 8$ ; *e*, *f*, disk achene,  $\times 12$ ; *g*, *h*, ray achene,  $\times 12$ .

HOLOTYPE: Hawaiian Islands, Kahoolawe Island, w. side of island, just n. w. of Hanakanaea Bay, rocky substrate, with *Prosopis*, *Chloris inflata*, and *Atriplex semibaccata*, colony of 15–20 plants, 20–40 ft elev., 4/22/1980, L. W. Cuddihy & W. Char 382 (BISH).

DISCUSSION: The new epithet is formed from the Latin words, *artus*, narrow; *alata*, winged, and it refers to the narrowly winged petioles.

*Lipochaeta Garberi* sp. nov. (sect. *Lipochaeta*), fig. 4

DIAGNOSIS HOLOTYPE: Planta suffrutescens ultra 35 cm alta est, ramulis dense ascendente hispidulis pilis ex basibus pustulatis, petiolis 2–5 mm longis dense adpresse hirsutulis, laminis 2.5–8.4 × 0.6–2.3 cm firme chartaceis lanceolatis (vel anguste lanceolatis) apice angusto subacuto basi late cuneata (vel rotundata) marginibus remote grosse crenatis supra omnino adpresse hirsutulis pilis ex basibus pustulatis infra in intervallis cum pilis simulantibus sed midnervo et 3–5 secundariis cum pilis simulantibus sed longioribus, cymis 2–3-capitatis laxis, pedicellis 8–40 mm longis adpresse hirsutulis, capitibus 2.5–3 cm diametro, involucre 4.5–6.5 mm alto hemisphaerico, phyllariis exterioribus 4 et 5–6 × 2–2.2 mm lanceolatis cartilagineis dense adpresse hirsutulis, phyllariis interioribus 5 mm longis lanceolatis chartaceis, flosculis radiatis 8–9, ovario 1.7 × 0.4–0.6 mm cuneoideo trigono, 2 aculeis pappi 0.2–0.6 mm longis subulatis, tubo corollae 2 mm longo, lamina 10 × 2.5–3 mm ligulata apice breve tridentato, 25 flosculis disci, ovario 1.8 × 0.3 mm cuneoideo proxima apicem ascendente puberulo, 2 aristis pappi 0.3–0.5 mm longis, tubo corollae 4 mm longo, 4 lobis corollae 1 mm longis ovatis, tubo filamentarum 1.5 mm longo, 4 antheris 1.3 mm longis, stylo 3 mm longo, 2 stigmatibus 0.8 mm longis linearibus.

DIAGNOSIS OF HOLOTYPE: Suffrutescent plant, more than 35 cm tall; branchlets 0.5–2 mm in diameter, densely white ascending hispidulous from pustulate bases; internodes 2–5 cm long; nodes scarcely enlarged;

leaves ascending or diverging; petioles 2–5 mm long, densely appressed ascending white hirsutulous, channeled above; blades 2.5–8.4 cm long, 6–23 mm wide, firm chartaceous, lanceolate (or narrowly so), the narrow apex subacute, the base broadly cuneate (or rounded), the margins remotely coarsely crenate, above generally appressed white hirsutulous from pustulate bases, below similarly pubescent on the intervals, but the midrib and 3–5 secondaries with numerous similar but longer hairs; cymes 2–3-headed, loose; peduncle 8–40 mm long, appressed ascending white hirsutulous; heads 2.5–3 cm in diameter; involucre 4.5–6.5 mm tall, hemispheric; outer phyllaries 4 and 5–6 mm long, lanceolate, densely appressed ascending white hirsute; inner phyllaries 5 mm long, lanceolate, chartaceous; receptacle convex; chaff 4 mm long, oblong elliptic, cartilaginous, navicular, scabrous on the midrib; ray florets 8–9; ovary 1.7 mm long, 0.4–0.6 mm wide, cuneoid, trigonous; 2 pappus bristles 0.2–0.6 mm long, subulate; corolla tube 2 mm long; ray 10 mm long, 2.5–3 mm wide, ligulate, the apex shortly tridentate; 25 disk florets; ovary 1.8 mm long, 0.3 mm wide, cuneoid, ascending puberulous near the tip; 2 pappus bristles 0.3–0.5 mm long; corolla tube 4 mm long; 4 corolla lobes 1 mm long, ovate; filament tube 1.5 mm long; 4 anthers 1.3 mm long, dark brown; style 3 mm long; 2 stigmas 0.8 mm long, linear.

HOLOTYPE: Hawaiian Islands, Oahu Island, right fork of Wailupe Valley, 12 Jan. 1920, D. Wesley Garber 141 (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Oahu Island, talus slope near Kaena Pt., diffuse, 1 ft high, Dec. 16, 1915, C. N. Forbes & D. Lake 2,274.0 (BISH).

DISCUSSION: The chromosome number,  $2n = 26_{II} + 4B$ , was counted by R. C. Gardner. *Lipochaeta Garberi* is a member of the section *Lipochaeta*. Its closest relative is *L. Christophersenii* St. John, of Oahu, a species with the blades 3–12 × 0.8–3.2 cm, narrowly lanceolate, the base cuneate, the margins remotely low serrulate, the secondary veins 8–10 in each half; peduncles 2–9 cm long; outer phyllaries 6–10 (–12) mm long, lance ovate; ray florets 10–14, the pappus awns 1.3 mm long,

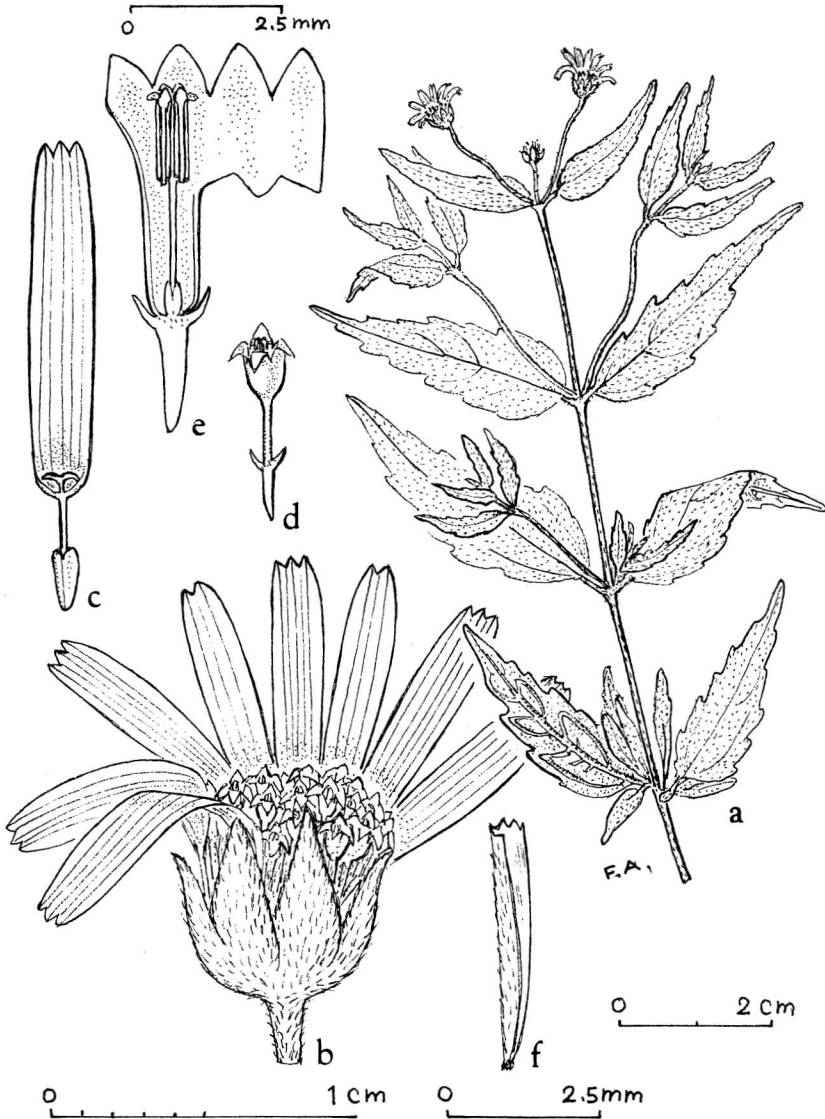


FIGURE 4. *Lipochaeta Garberi* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 4$ ; *c*, ray flower,  $\times 4$ ; *d*, disk floret,  $\times 4$ ; *e*, disk floret,  $\times 8$ ; *f*, chaff,  $\times 8$ .

the ray  $11 \times 4$  mm; chaff 5 mm long, the apex puberulous; disk florets about 40, and the corolla lobes 5. *Lipochaeta Garberi* has the blades  $2.5-8.4 \times 0.6-2.3$  cm, the base broadly cuneate (or rounded), the margins remotely coarsely crenate, the secondary veins 3-5 in each half; peduncles 0.8-4 cm long; outer phyllaries 5-6 mm long, lanceolate; ray florets 8-9, the pappus awns 0.2-0.6 mm long; ray

$10 \times 2.5-3$  mm; chaff 4 mm long, the midrib scabrous; disk florets 25, and the corolla lobes 4.

*Lipochaeta kaenaensis* sp. nov. (sect. *Lipochaeta*), fig. 5

DIAGNOSIS HOLOTYPI: Planta suffruticosa multiramosa est, ramulis foliosis adpresse his-



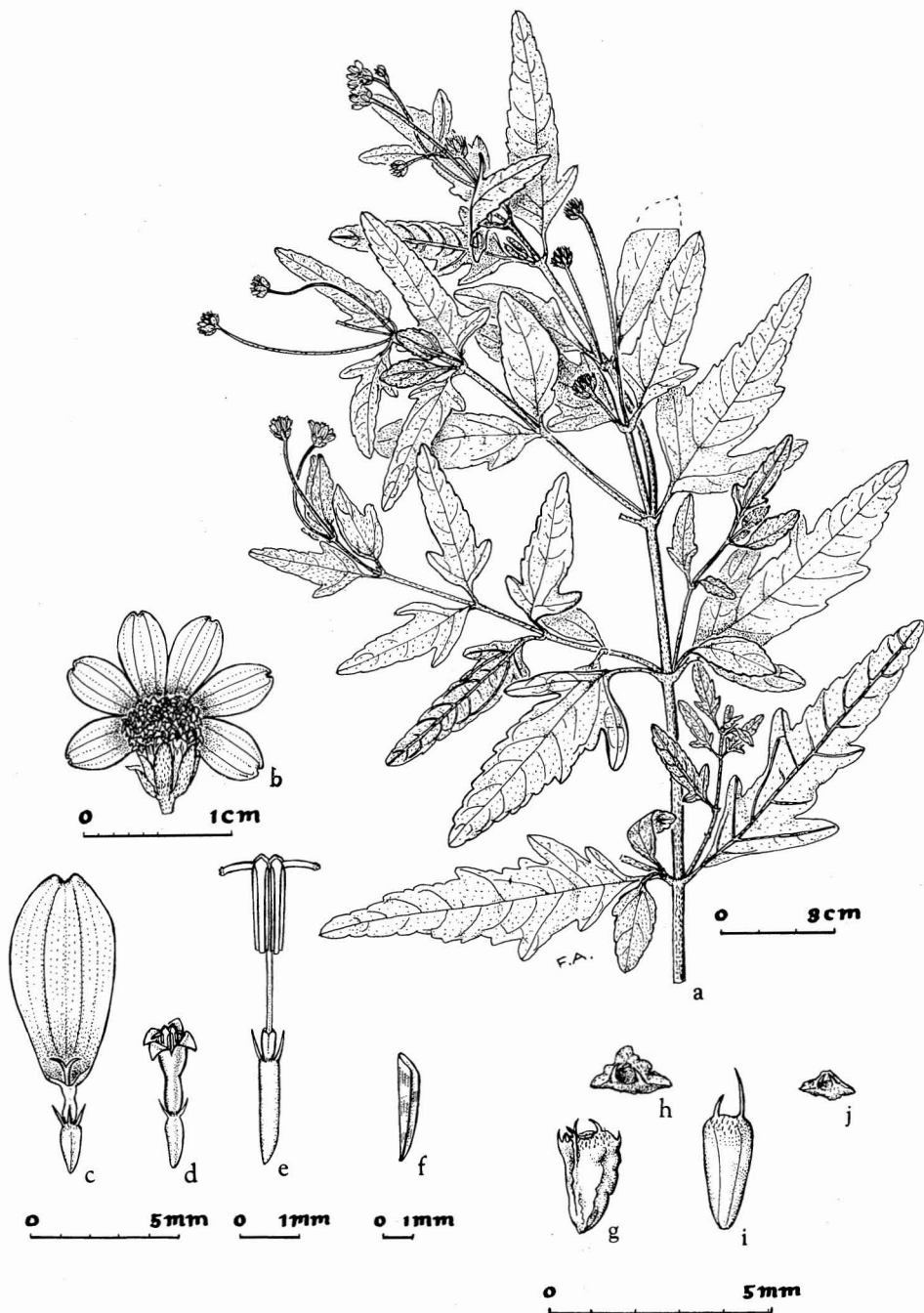


FIGURE 5. *Lipochaeta kaenaensis* St. John, from holotype. *a*, habit,  $\times \frac{1}{2}$ ; *b*, head,  $\times 2$ ; *c*, ray floret,  $\times 4$ ; *d*, disk floret,  $\times 4$ ; *e*, dissected disk floret,  $\times 8$ ; *f*, chaff,  $\times 4$ ; *g*, ray achene, lateral view,  $\times 6$ ; *h*, ray achene, apical view,  $\times 6$ ; *i*, disk achene, lateral view,  $\times 6$ ; *j*, disk achene, apical view,  $\times 6$ .

pidulis, basibus petiolorum paulum perfoliatis, petiolis 2.8 mm longis adpresse hirsutulis, laminis 3–9 × 1.2–5 cm subcoriaceis proxima basem 3–5-lobatis corpore anguste lanceolato apice obtuso marginibus cum lobis minoribus ovatis sursum decrescentibus, lobis basalibus majoribus 1–3 × 0.6–0.7 cm ligulatis obtusis, laminis scabris infra in paginis ambis a basibus rotundatis pilorum hispidulorum dispersorum punctatis, inflorescentiis terminalibus cum 2 (1–3) capitibus, pedunculis (1.2–) 3–6 cm longis erectis ebracteatis adpresse hispidulis, capitibus 15 mm diametro, involucre 3 mm alto hemisphaerico, 4–5 phyllariis exterioribus 3–4 × 1.2–1.5 mm late ovatis adpresse puberulis, phyllariis interioribus 2.5–3 mm longis ellipticis membranaceis, squamis 3 mm longis elliptico-oblongis conduplicatis apice eroso, flosculis radiatis 8–11, tubo corollae 1.3 mm longo, ligulis 5 × 2.5–3 mm ellipticis apice minute bidentato, 12 flosculis disci cum 2 squamis lanceolatis papi 0.4–0.5 mm longis, corollis 3 mm longis per 1.3 mm basi anguste tubulosas parte supera campanulata, 4 lobis 0.3 mm longis deltoideo-ovatis, 4 antheris 1 mm longis, achaeneis radiatis 2 × 1.3 × 1 mm deltoideo-cuneoideis acriter angulosis apice truncato badio-maculatis in apice adscendente puberulis 3 aristis pappi 0.4–0.5 mm longis subulatis, achaeneis disci 2.4 × 1.2 × 0.8 mm cuneoideis biconvexis truncatis badio-maculatis, 2 aristis pappi 0.3–0.8 mm longis.

DIAGNOSIS OF HOLOTYPE: Suffruticose, many-branched shrub; leafy branchlets 1–3 mm in diameter, square, pale brown, and appressed ascending white hispidulous; internodes 1–6 cm long; nodes enlarged, and ringed by the slightly perfoliate petiole bases; leaves opposite; petioles 2–8 mm long, appressed ascending white hirsutulous, broadly channeled above; blades 3–9 cm long, 1.2–5 cm wide, subcoriaceous, 3–5-lobed near the base, the body narrowly lanceolate, the apex obtuse, the margins with smaller ovate lobes, decreasing upwards, the larger basal lobes 1–3 cm long, 6–7 mm wide, ligulate, obtuse, the blades scabrous, and above dark green, below green, on both surfaces white dotted from the expanded rounded

bases of the spaced appressed white hispidulous pubescence; inflorescence of 2 (1 or 3) heads, terminal; peduncles (1.2–) 3–6 cm long, erect, bractless, appressed ascending white hispidulous; heads 15 mm in diameter, the involucre 3 mm high, hemispheric; 4–5 outer phyllaries 3–4 mm long, 1.2–1.5 mm wide, broadly ovate, appressed ascending white puberulous; inner phyllaries 2.5–3 mm long, elliptic, membranous; chaff 3 mm long, elliptic oblong, conduplicate, the apex erose; ray florets 8–11; ovary 1.5 mm long, trigonous ellipsoid; pappus of 3 subulate scales 0.5 mm long; corolla tube 1.3 mm long; ray 5 mm long, 2.5–3 mm wide, elliptic, the apex minutely bidentate; disk florets 12; ovary 1.5 mm long, oblong ellipsoid, biconvex; pappus of 2 lanceolate scales 0.4–0.5 mm long; corolla 3 mm long, the lower 1.3 mm narrowly tubular, the upper part campanulate, the 4 lobes 0.3 mm long, deltoid ovate; 4 anthers 1 mm long, dark; style base 0.3 mm long, cuneoid; style 2 mm long; 2 stigmas 0.8 mm long, divergent; ray achenes 2 mm long, 1.3 mm wide, 1 mm thick, deltoid cuneoid, sharply angled, the apex truncate, mottled brown, ascending puberulous at the apex; pappus bristles 3, and 0.4–0.5 mm long, subulate; disk achenes 2.4 mm long, 1.2 mm wide, 0.8 mm thick, cuneoid, biconvex, truncate, mottled brown; 2 pappus bristles 0.3–0.8 mm long.

HOLOTYPE: Hawaiian Islands, Oahu Island, Waiialua Dist., Kaena, near base of cliff near Manini Gulch, talus, *Leucaena-Myoporum* Association, 120 ft elev., rare, 25 April 1978, K. Nagata, B. Kimura & G. Spence 1,626 (BISH).

DISCUSSION: *Lipochaeta kaenaensis* is a member of the section *Lipochaeta*, as is its closest relative, *L. lobata* (Gaud.) DC., var. *Hosakae* St. John, of Oahu, a variety with the petioles 2–4 mm long; blades 2.5–5.3 × 0.4–2.4 cm, entire to remotely serrulate, the base rounded, the apex mostly acute; pedicels ascending hirsutulous; and the outer phyllaries 4 mm long, ovate. *Lipochaeta kaenaensis* St. John has the petioles 2–8 mm long; blades 3–9 × 1.2–5 cm, 3-lobed at base, the apex obtuse; pedicels appressed ascending

hirsutulous; and the outer phyllaries 3–4 mm long, broadly ovate.

*Lipochaeta lavarum* (Gaud.) DC., var. *scaposa* var. nov., fig. 6

DIAGNOSIS HOLOTYPE: A specie differt in pedunculis plerumque 10–30 cm longis, involucris floralibus 10–11 mm diametro, phyllariis exterioribus 5–6 mm longis obovatis.

DIAGNOSIS OF HOLOTYPE: Branching shrub 5 dm tall; principal leaves having petioles 15–20 mm long; blades 6–9 × 3–3.7 cm, oblanceolate, white appressed strigose; heads solitary; peduncles mostly 10–30 cm long, scapose; involucre in flower 10–11 mm in diameter; outer phyllaries 5–6 mm long, obovate; ray flowers 15, the rays 12 mm long, oblance ligulate, acute; disk flowers 5-lobed, about 160; disk achenes with the body 2.5 × 1.3 mm cuneoid, compressed, pale brown, with dark brown angles, pale scaly at apex, the 2–3 awns 0.5–0.7 mm long, narrowly lanceolate; ray achenes with the body 3–3.5 mm long, trigonous obovoid, pale brown, the sharp angles scabrous, the apex truncate, its rim ciliate with scales 0.3–0.5 mm long; disk achenes with the body 3 mm long, 2 mm wide, 1 mm thick, stramineous, 4-angled, slightly compressed, cuneoid, the 4 lanceolate awns 0.2–0.3 mm long.

EXPANDED DESCRIPTION: Shrub 3–6 dm tall; petioles of principal leaves 12–25 mm long; blades 2–3.7 cm wide; outer phyllaries 5–7 mm long; ray flowers 8–15, the rays 12–17 mm long.

HOLOTYPE: Hawaiian Islands, Kahoolawe Island, e. end of Waikahalulu Bay, top of talus slope below sea cliff, west exposure, 45 ft elev., 4-22-1980, G. Clarke & C. Corn 377 (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Kahoolawe Island, e. coast of Waikahalulu Bay, talus slope, 45 ft elev., 4-22-1980, Clark & Corn 376; and 379; 380; w. coast of Kamohio Bay, talus slope with *Heteropogon*, *Euphorbia prostrata*, *Setaria*, 4-22-1980, Clarke & Corn 382; 383; 384; 385; 386; and 390 (BISH).

Molokini Island, Bishop Museum Expedition, Feb. 10, 1913, C. N. Forbes (BISH).

Maui: makai of Kahikinui, common on aa lava near coast, Dec. 23, 1948, O. Degener 19,343.

All these specimens are in (BISH).

DISCUSSION: The most similar plant is *Lipochaeta lavarum*, var. *ovata* Sherff, of leeward Maui, a variety with the peduncles mostly 2–5 cm long; involucre in flower 5–7 mm in diameter; and the outer phyllaries 4–5 mm long and ovate. The var. *scaposa* has the peduncle 10–30 cm long; involucre in flower 10–11 mm in diameter; and the outer phyllaries 5–6 mm long, and obovate.

The new epithet is the Latin adjective derived from *scapus*, a shaft, and in botany meaning a long, naked peduncle.

*Lipochaeta lobata* (Gaud.) DC., var. *Hosakae* var. nov.

DIAGNOSIS HOLOTYPE: Petiolae 2–4 mm longae sunt, laminis 2.5–5.3 cm longis 9–24 mm latis subcoriaceis lanceolatis vel anguste lanceolatis subacutis integribus vel remote serrulatis basi rotundata supra scabra adpresse puberulis infra subadpresse pilosulis, phyllariis exterioribus 4 mm longis ovatis, corollis disci 4-lobatis.

DIAGNOSIS OF HOLOTYPE: Petioles 2–4 mm long; blades 2.5–5.3 cm long, 9–24 mm wide, subcoriaceous, lanceolate or narrowly so, subacute, entire to remotely serrulate, the base rounded, above scabrous appressed puberulous, below subappressed pilosulous; outer phyllaries 4 mm long, ovate; disk corollas 4-lobed.

EXPANDED DESCRIPTION: Blades 2–7 cm long, 7–30 mm wide.

HOLOTYPE: Hawaiian Islands, Oahu Island, Kipapa Gulch, Waipio, on dry slope, Feb. 24, 1935, E. Y. Hosaka 1,281 (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Oahu Island, Makapuu Pt., Dec. 1925, O. Degener 7,453; right fork of Wailupe Valley, 12 June 1920, D. W. Garber & C. N. Forbes 141; Kaena Pt., dry scrub, April 8, 1950, W. H. Hatheway & V. Hess 119; s. side of Diamond Head, thicket on ridge, 150 ft alt., May 1, 1955, H. St. John 25,523. Also there



FIGURE 6. *Lipochaeta lavarum* (Gaud.) DC., var. *scaposa* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 2$ ; *c*, ray floret,  $\times 8$ ; *d*, *e*, disk floret,  $\times 8$ ; *f*, chaff,  $\times 8$ ; *g*, *h*, ray achene,  $\times 12$ ; *i*, *j*, disk achene,  $\times 12$ .

are 16 other collections, like the above in (BISH).

RANGE: Oahu, Makapuu Pt. to Kipapa Gulch, Lualualei; Kaena Pt.

DISCUSSION: *L. lobata*, var. *lobata* differs from the above in having the blades ovate (or lanceolate); and the outer phyllaries 4–8 mm long, ovate to elliptic.

The new variety is dedicated to the writer's former student, Edward Yataro Hosaka (1906–1961), who became distinguished for his study of Kipapa Gulch, and his work on *Myrsine*, on range legumes and grasses.

*Lipochaeta mauiensis* sp. nov. (sect. *Lipochaeta*), fig. 7

DIAGNOSIS HOLOTYPE: Frutex caespitosus est, ramulis foliosis adpresse setulosis, petiolis 7–18 mm longis anguste alatis cum pilis simulantibus, laminis 1.5–4.5 × 0.6–3 cm subcoriaceis eis principalibus late lanceolatis acutis basi cuneata proxima basem bilobatis marginibus laciniate serratis supra adpresse setulosis scabrisque infra densiore nervis secundariis 2–4 in dimidio quoque infra nervis elevatis prominentibusque, inflorescentiis terminalibus cymosis cum 4–9 capitulis eis etiam setulosis, pedunculis 4–12 mm longis, capitulis 14–22 mm diametro, involucri in flore 4 mm alto 5–7 mm diametro hemisphaerico, phyllariis exterioribus 4–5 et 4–5.5 mm longis anguste lanceolatis illis interioribus 5 mm longis oblanceolatis ciliatis tenuioribus, squamis 4 mm longis oblanceolatis plicatis ad apicem scabris, flosculis radiatis 7–8 ovario 2.1 mm longo anguste deltoideo-obovoideo in apice hispidulo et aculeis pappi 3 et 1 mm longis, tubo corollae 1 mm longo, radiis 10.5 mm longis 5 mm latis oblanceolatis apice retuso et 6-dentato, flosculis disci circa 36 ovario 2 mm longo anguste oblonge oblanceoloideo in apice hispidulo et cum 3 aculeis pappi 0.8 mm longis, tubo corollae 2.2 mm longo dimidio infero anguste tubuloso dimidio supero campanulato, 4 lobis 1.2 mm longis ovatis subacutis, antheris 2 mm longis connatis, (achaeneis maturis incognitis).

DIAGNOSIS OF HOLOTYPE: Caespitose shrub; leafy branchlets 1–2 mm in diameter, brown-

ish, and appressed ascending white setulose; internodes 1–6.5 cm long; nodes slightly enlarged; petioles 7–18 mm long, narrowly winged, similarly setulose; blades 1.5–4.5 × 0.6–3 cm, subcoriaceous, the principal ones broadly lanceolate, acute, cuneate at base, 2-lobed near the base, the margins lacinate serrate, above green, below paler green, appressed ascending white setulose and scabrous above, densely so below, secondary veins 2–4 in each half, arcuate ascending, below the veins elevated and prominent; inflorescences terminal, cymose, with 4–9 heads, similarly setulose; peduncles 4–12 mm long; heads 14–22 mm across; involucre in flower 4 mm high, 5–7 mm in diameter, hemispheric; outer phyllaries 4–5 and 4–5.5 mm long, narrowly lanceolate; inner phyllaries 5 mm long, oblanceolate thin, ciliate, thinner; chaff 4 mm long, oblanceolate, plicate, scabrous towards the apex; ray florets 7–8, the ovary 2.1 mm long, narrowly trigonous obovoid, hispidulous at apex and with 3 pappus awns 1 mm long; corolla tube 1 mm long; ray 10.5 mm long, 5 mm wide, oblanceolate, the apex notched and 6-toothed; disk florets about 36, having the ovary 2 mm long, narrowly oblong oblanceoloid, hispidulous at apex and with 3 pappus awns 0.8 mm long; corolla tube 2.2 mm long, the 4 lobes 1.2 mm long, ovate, subacute; anthers 2 mm long, connate; (ripe achenes unknown).

HOLOTYPE: Hawaiian Islands, east Maui Island, highway 31, and 5.5 miles s. e. of Ulupalakua Ranch Office, on exposed aa lava, 500 m alt., 18 Feb., 1975, R. Gardner 378 (OS). Isotype (BISH).

DISCUSSION: *Lipochaeta mauiensis* is a member of the section *Lipochaeta*, as is its closest relative, *L. nesophila* St. John, of Niihau, a species with the blades firm chartaceous, and all except the smallest pinately 3-lobed, 10–17 mm long, 6–10 mm wide, the central body 12–17 mm long, oblanceolate; the 4 outer phyllaries 3–3.5 (–4) mm long, ovate; rays 2.5 mm wide, broadly elliptic; and the disk florets about 15, the lobes 0.2 mm long. *Lipochaeta mauiensis* has the blades subcoriaceous, and only the larger principal leaves 3-lobed, 15–45 mm long,

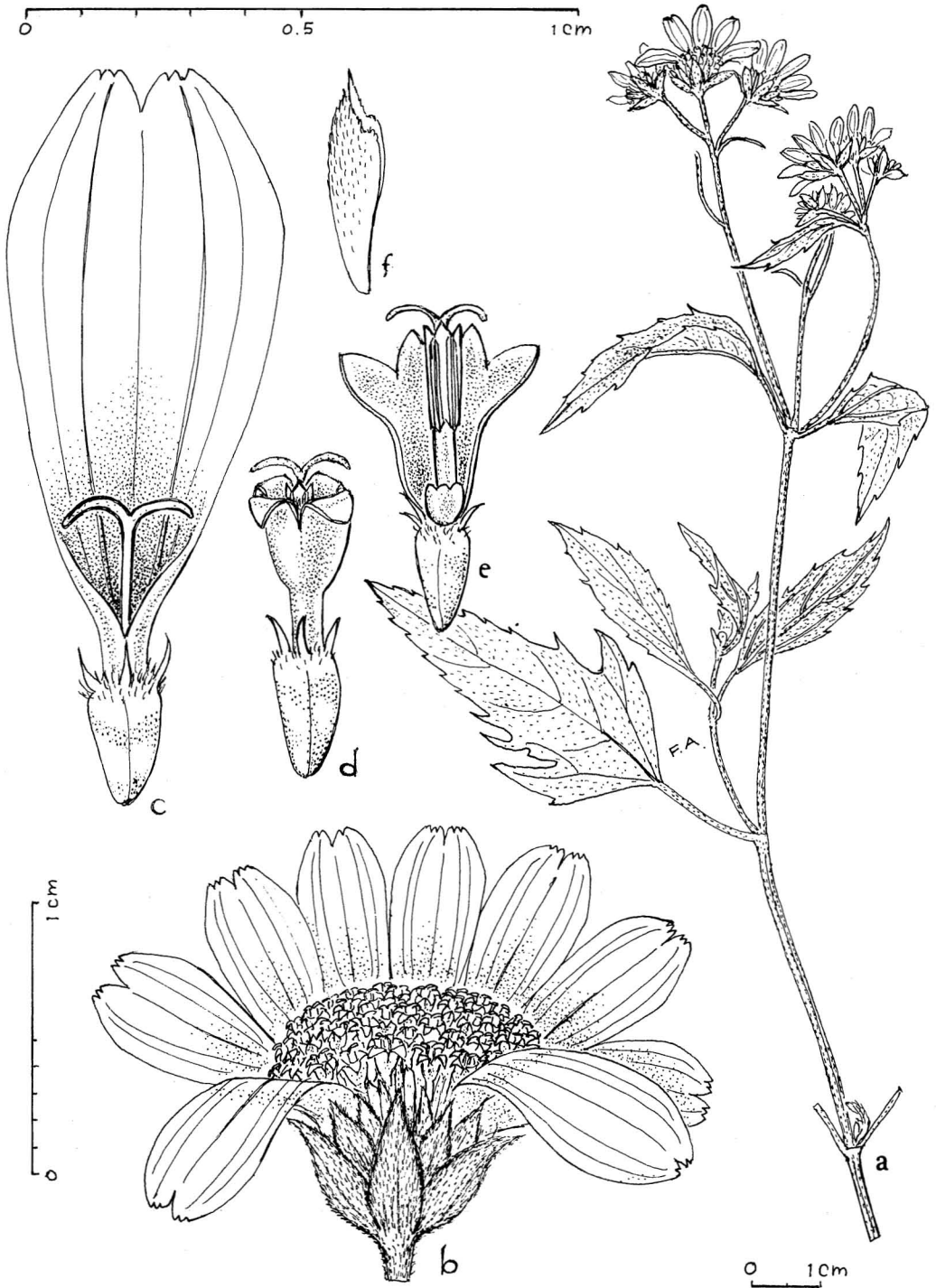


FIGURE 7. *Lipochaeta mauiensis* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 4$ ; *c*, ray floret,  $\times 8$ ; *d*, *e*, disk floret,  $\times 8$ ; *f*, chaff,  $\times 8$ .

6–30 mm wide, the central body 20–40 mm long, lanceolate, the 4–5 outer phyllaries 4–5.5 mm long, narrowly lanceolate; rays 5 mm wide, oblanceolate; and the disk florets about 36, the lobes 1.2 mm long.

The new epithet is formed from the name of the type locality, Maui, and *-ensis*, the Latin adjectival suffix.

*Lipochaeta molokiniensis* sp. nov. (sect. *Aphanopappus*), figs. 8, 9

DIAGNOSIS HOLOTYPE: Frutex humilis ramosus ultra 30 cm altus est, ramulis foliosis adpresse setosis, nodis setulose cinctis, petiolis 7–20 mm longis ascendente setulosis, laminis 2.7–6.2 × 1.3–3 cm subcoriaceis ellipticis apice anguste obtuso basi cuneata marginibus minute depresso serrulatis supra adpresse setulosis infra cum pilis simulantibus supra nervis evidentibus sed infra elevatis supra basem triplinervis tum in dimidio quoque cum 2–3 nervis secundariis ascendentibus, inflorescentiis cum 2 (–3) scapis solitariis ex nodis superis, pedunculis 5–8 cm longis ascendentibus et ascendente setulosis, capitulis 2.5 cm diametro, involucre in flore 8–10 mm alto 10–11 mm diametro hemisphaerico, 4–5 phyllariis exterioribus 9–11 × 2.5–3 mm oblongis apice rotundato minute subacuto rigidibus viridibus tarde stramineis adpresse setulosis, phyllariis interioribus 12–13 mm longis lineari-lanceolatis, receptaculo vadose convexo, squamis 6.2–6.5 mm longis oblanceolatis navicularibus valde carinatis tertia apicali viridi et scabrae puberula, flosculis radiatis 7–8 luteis laminis 10–12 × 4 mm elliptico-ligulatis 7-nervis apice retuso trifido, flosculis disci multis, tubo corollae 4 mm longo tertia mediali majori et 0.9 mm diametro, tertia apicali campanulata, 5 lobis 0.7 mm longis deltoideo-ovatis, achaeneis radiatis 3.5 × 2 × 1.8 mm obovoideis subtruncatis tetragonis aculeatis, setis pappi 3–4 et 0.5–1 mm longis etiam cum squamis minoribus lanceolatis multis, achaeneis disci 4–5 × 3–4 × 1.7–2 anguste obovoideis biconvexis subtruncatis lateribus laevibus setis pappi 3–4 et usque ad 1 mm longis multis et cum squamis brevibus lanceolatis.

DIAGNOSIS OF HOLOTYPE: Low, compact, branching shrub, somewhat over 30 cm tall; leafy branchlets 1–3 mm in diameter, at first square, pale brownish, appressed ascending white setose; internodes 0.6–5 cm long; nodes enlarged and setulose ringed; leaves opposite; petioles 7–20 mm long, ascending, white setulose, broadly channeled above; blades 2.7–6.2 × 1.3–3 cm, subcoriaceous, elliptic, the apex narrowly obtuse, the base cuneate, the margins minutely flattened serrulate, above dark green, and closely appressed ascending white setulose, below green, and similarly setulose, above the veins evident, but below raised and very prominent, triplinerved well above the base, and above there with 2–3 secondary nerves on each side, curved ascending; inflorescence of 2 (–3) scapes, solitary at upper nodes; peduncles 5–8 cm long, ascending, appressed ascending white setulose; heads 2.5 cm across; involucre in flower 8–10 mm high, 10–11 mm in diameter, hemispheric; outer phyllaries 4–5, and 9–11 mm long, 2.5–3 mm wide, oblong, the rounded apex minutely subacute, rigid, at first green, later stramineous, appressed (or ascending) white setulose; inner phyllaries 12–13 mm long, linear lanceolate; receptacle low convex; chaff 6.2–6.5 mm long, oblanceolate, navicular, strongly keeled, the apical third green and scabrous puberulous; ray florets 7–8, yellow, the rays 10–12 mm long, 4 mm wide, elliptic ligulate, 7-nerved, the apex trifid, retuse; ovary 1.5 mm long, ellipsoid, 4-angled, the angles ciliate and scaly; pappus of unequal scales 0.3–1 mm long, lanceolate, puberulous and ciliate; disk flowers numerous, the ovary 2 mm long, narrowly obovoid, compressed, puberulous; pappus of several unequal scales 0.3–1 mm long, lanceolate, scabrous puberulous; corolla tube 4 mm long, the median third enlarged and 0.9 mm in diameter, the apical third campanulate; the 5 lobes 0.7 mm long, deltoid ovate; free filament tips 1 mm long; anthers 2 mm long, dark, the pale ovate tips 0.3 mm long; the 2 stigmas 0.7 mm long, lanceolate, exerted; ray achenes 3.5 mm long, 2 mm wide, 1.8 mm thick, obovoid, subtruncate, 4-angled, stramineous, aculeate, the pappus of 3–4 awns 0.5–1 mm long and numerous smaller lanceolate scales; disk achenes



FIGURE 8. *Lipochaeta molokiniensis* St. John, from holotype. a, habit,  $\times 1$ .



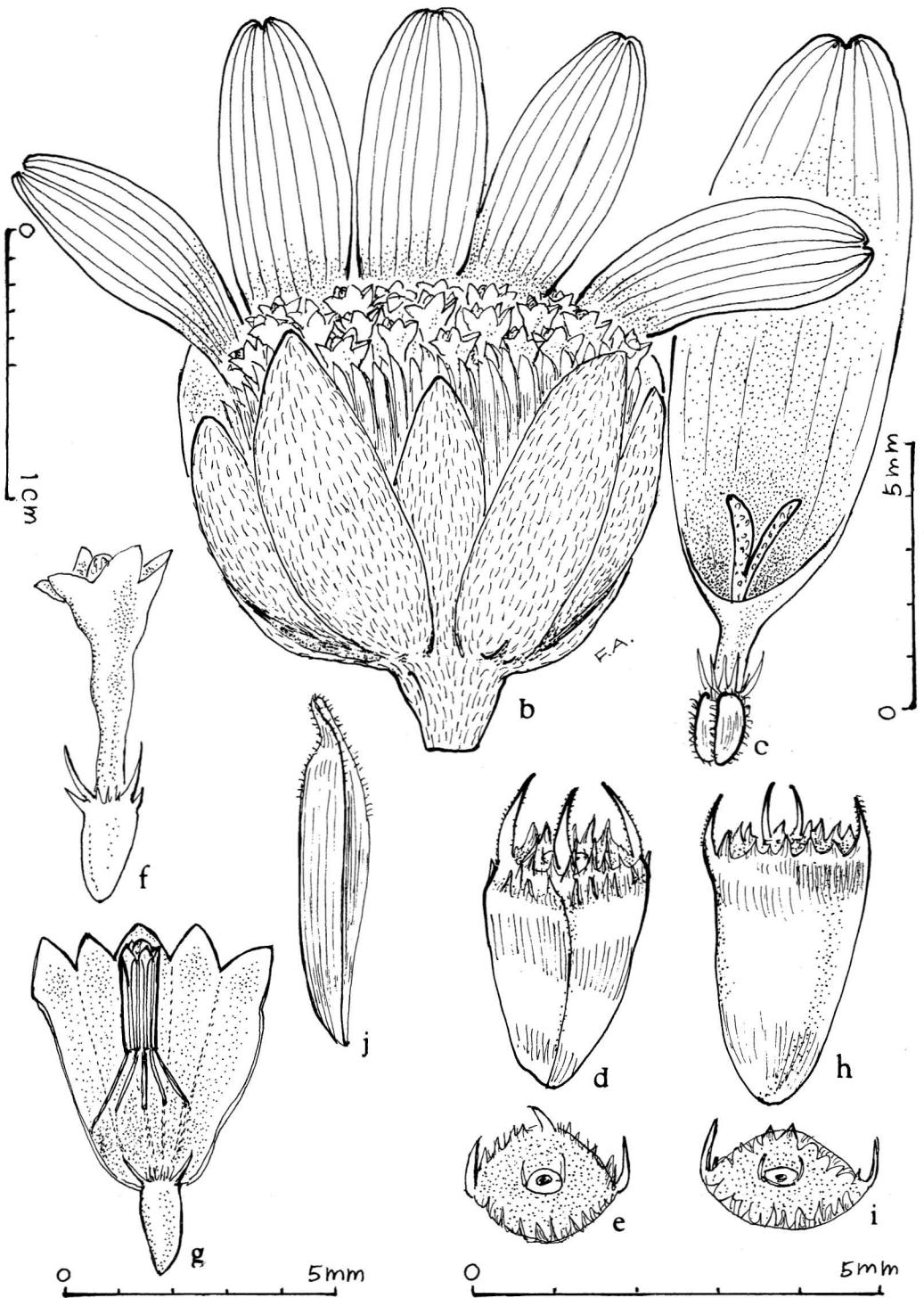


FIGURE 9. *Lipochaeta molokiniensis* St. John, from holotype; *b*, head,  $\times 4$ ; *c*, ray flower,  $\times 8$ ; *d*, *e*, ray achene,  $\times 12$ ; *f*, *g*, disk flower,  $\times 8$ ; *h*, *i*, disk achene,  $\times 12$ ; *j*, chaff,  $\times 8$ .

4–5 × 3–4 × 1.7–2 mm, narrowly obovoid, biconvex, subtruncate, the sides smooth, the pappus of 3–4 awns up to 1 mm long, and numerous shorter lanceolate scales.

EXPANDED DESCRIPTION: Blades 1.3–4.4 cm wide, elliptic to ovate; heads 2.5–6 cm across; outer phyllaries 9–14 mm long; ray flowers 7–10, the rays 10–17 mm long.

HOLOTYPE: Hawaiian Islands, Molokini Island, w. side, n. e. exposure, slope 45°, 90 ft elev., just n. of lighthouse, only 2 plants seen, low and compact, vigor good, with scattered bunches of *Nicotiana glauca* and *Cenchrus ciliaris* as dominant ground cover, 4-23-1980, G. Clarke 401 (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Molokini Island, near coast, w. of lighthouse, one large decumbent plant 1½ ft tall, spreading about 10 ft, Feb. 18, 1982, R. Hobdy 1,252 (BISH); dry slopes, 60–160 ft alt., shrub 16 inches high, 8–13–1925, Harold Palmer 9 (BISH).

DISCUSSION: *Lipochaeta molokiniensis* is a member of the section *Aphanopappus*, as is its closest relative, *L. lavarum* (Gaud.) DC., of Molokai, Molokini, Maui, and Hawaii, a species with the petioles up to 11 mm in length; blades 1.5–7 cm long, 0.6–1.9 cm wide; peduncle 2–5 cm long; and the outer phyllaries 4.5–7 mm long, elliptic. *L. molokiniensis* has the petioles 7–20 mm long; blades 2.7–6.2 cm long, 1.3–4.4 cm wide; peduncle 5–8 cm long; and the outer phyllaries 9–14 mm long, oblong, obtuse.

*Lipochaeta nesophila* sp. nov. (sect. *Lipochaeta*), fig. 10

DIAGNOSIS HOLOTYPI: Planta suffruticosa multiramosa ultra 45 cm alta est, ramulis foliosis 6-angulosis adpresse setulosus scabris, ramis vetustioribus subteretibus, nodis in basibus petiolorum paulo perfoliatis cinctis, petiolis 4–10 cm longis adpresse setulosus, laminis 2–5 × 0.5–3.5 cm firme chartaceis excepta minimis omnibus pinnate 3-lobatis lobis basalibus et in foliis majoribus 10–17 mm longis 6–10 mm latis oblique ellipticis ascendentibus remote serratis loba centrali 12–17 mm longa oblanceolata acriter serrata

apice subacuto basi lata tum subito cuneata supra albe setulosus scabris infra profusiore setulosus, cymis laxis cum 5 vel 7 capitulis, pedunculis 1.3–5.5 cm longis adpresse setulosus, capitulis fere 15 mm diametro, involucre 4 mm alto hemisphaerico, 4 phyllariis exterioribus 3–3.5 (–4) mm longis ovatis adpresse setosis squamis floralium 4 mm longis oblanceolatis carinatis proxima apicem puberulis, flosculis radiatis compluribus tubo corollae 1.5 mm longo, radiis 6 × 2.5 mm late ellipticis apice emarginato, flosculis disci fere 15, ovario 2–2.2 mm longo anguste cuneato compresso glabro, setis pappi 2–3 rigidis 0.5–1 mm longis, corollis 3.1 mm longis parte 3/4 infera anguste tubulosa parte supera campanulata, 4 lobis 0.2 mm longis ovatis, achaeneis radiatis 2.5 × 1–1.3 × 0.8 mm trigono-cuneoideis lateribus tuberculatis angulis anguste alatis ascendente hirsutulis proxima apicem ascendente puberulis, setis pappi 3–4 erectis 0.5–1.5 mm longis.

DIAGNOSIS OF HOLOTYPE: Suffruticose, more than 45 cm tall, many-branched shrub; leafy branchlets 0.5–2 mm in diameter, 6-angled, reddish brown, and appressed ascending white setulose, scabrous; older stems 3–4 mm in diameter, brown, subterete; internodes 1–6 cm long; nodes enlarged, and ringed by the slightly perfoliate petiole bases; leaves opposite; petioles 4–10 mm long, slender, channeled above, appressed ascending white setulose; blades 2–5 cm long, 5–35 mm wide, firm chartaceous, all except the smallest pinnately 3-lobed, the lobes basal and on the larger blades 10–17 mm long, 6–10 mm wide, obliquely elliptic, ascending, remotely serrate, the central lobe 12–17 mm long, oblanceolate, sharply serrate, the apex subacute, the base wide, then abruptly cuneate, above dark green and spaced ascending white setulose, scabrous, below pale green and more abundantly setulose; inflorescence loosely cymose, with 5 or 7 heads; peduncles 1.3–5.5 cm long, densely appressed ascending white setulose; heads about 15 mm in diameter, the involucre 4 mm high, hemispheric; 4 outer phyllaries 3–3.5 (–4) mm long, ovate, appressed ascending white setose; inner phyllaries 4 mm long, broadly ovate, acute, thinner than the outer;



FIGURE 10. *Lipochaeta nesophila* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 4$ ; *c*, *d*, ray flower,  $\times 8$ ; *e*, chaff,  $\times 8$ ; *f*, *g*, ray achene,  $\times 8$ ; *h*, *i*, disk achene,  $\times 8$ .

chaff 4 mm long, oblanceolate, keeled, with strong longitudinal veins, puberulous near the apex; ray flowers several; corolla tube 1.5 mm long; ray 6 mm long, 2.5 mm wide; broadly elliptic, the apex emarginate; disk florets about 15; ovary 2–2.2 mm long, narrowly cuneate, compressed, glabrous; pappus of 2–3 stiff awns 0.5–1 mm long; corolla 3.1 mm long, the lower 3/4 narrowly tubulate, the upper part campanulate, the 4 lobes 0.2 mm long, ovate; ray achenes 2.5 mm long, 1–1.3 mm wide, 0.8 mm thick, trigonous cuneoid, brown, the sides tuberculate, the angles narrowly winged and ascending hirsutulous, near the apex ascending puberulous; pappus of 3–4 erect bristles 0.5–1.5 mm long.

HOLOTYPE: Hawaiian Islands, Niihau Island, south half of island, Jan. 1912, *J. F. G. Stokes* (BISH).

DISCUSSION: The nearest relative of this new species is *Lipochaeta trifida* (Sherff) St. John, a species of Molokai, and it has the blades 8–13 × 2.5–6.5 cm, with 1–3 lobes on each side, the lobes broadly lanceolate, acute; outer phyllaries broadly lanceolate to broadly ovate and acute; and the disk florets 20–25 in number. *Lipochaeta nesophila*, of Niihau, has the blades 2–5 × 0.5–3.5 cm, 1-lobed near the base on each margin, the lobes obliquely elliptic; outer phyllaries ovate; and the disk florets about 15 in number.

Gardner annotated the type specimen of *Lipochaeta nesophila* as *L. Rockii*, of Molokai, saying, "This specimen appears to be identical to type of *L. lobata*, var. *maunaloensis*. Perhaps the label got mixed." The present writer disagrees with Gardner's classification, and sees no reason to suggest that the Stokes collection did not come from Niihau.

The new epithet is formed from the Greek *nesos*, island, and *phileo*, to love, and it refers to the island habitat of the species.

***Lipochaeta pinnatifida*** sp. nov. (sect. *Aphanopappus*), fig. 11

DIAGNOSIS HOLOTYPI: Frutex lignosus gracilis est, herba omnino adpresse setosa, petiolis 2–4 mm longis a pilis velatis, laminis 6–20 × 5–12 mm coriaceis eis minoribus in

circulis brevibus axillaribus et ovatis subintegribus sed plurimis ovatis ad sagittatis et cum lobis basalibus binis parte apicali longa pinnata vel bipinnata marginibus remote serratis apice subacuto basi cuneata, cymis 3-(vel 1-) capituliferis, pedunculis 2–4 mm longis, capitulis 12–14 mm diametro, involucre 4 mm alto 6 mm diametro hemisphaerico, phyllariis exterioribus 4 et 3.5–4 × 1.3–1.5 mm ellipticis subacutis adpresse setosis, phyllariis interioribus simulantibus sed angustioribus, flosculis radii 5–6, tubo corollae 0.5 mm longo radio 7 × 4 mm elliptico retuso, flosculis disci circa 22, corolla 3 mm longa tubo 2.8 mm longo dimidio infero anguste tubuloso parte supera campanulata, 5 lobis 0.8 mm longis ovatis acutis, squamis 4.5 mm longis oblanceolatis plicatis ad apicem puberulis, achaeneis radii 2.3 mm longis trigonobovoides tuberculatis apice puberulo, aristas 0.5–1 mm longis puberulis, achaeneis disci 2.2–2.5 mm longis cuneate prismaticis tuberculosis apice convexo puberulo, aristas puberulis.

DIAGNOSIS OF HOLOTYPE: Slender woody vine, the herbage densely appressed white setose throughout; leafy branchlets 0.5–1 mm in diameter, red, square; internodes 1–25 mm long; nodes enlarged; leaves opposite; petioles 2–4 mm long, reddish, but the color masked by the white pubescence; blades 6–22 × 5–12 mm coriaceous, stiff, and mostly more or less folded, the smallest ones on short axillary shoots, ovate and almost entire, but most of the leaves ovate to sagittate in outline, but with 2 deep basal lobes, but the long upper part pinnate or bipinnate, the margins remotely serrate, the apex subacute, the base cuneate, below the midrib and laterals green or red, secondary veins 3–4 in each half, prominent; cymes (1- or 3-headed); peduncles 2–4 cm long; heads 12–14 mm across; involucre in flower 4 mm tall, 6 mm in diameter, hemispheric; outer phyllaries 4, and 3.5–4 mm long, 1.3–1.5 mm wide, elliptic, subacute, densely appressed ascending white setose; inner phyllaries similar but narrower; ray flowers 5–6, the ovary 1.7 mm long, trigonous narrow obovoid, hispidulous at apex, and with 2–3 pappus awns 0.5–1 mm long, and

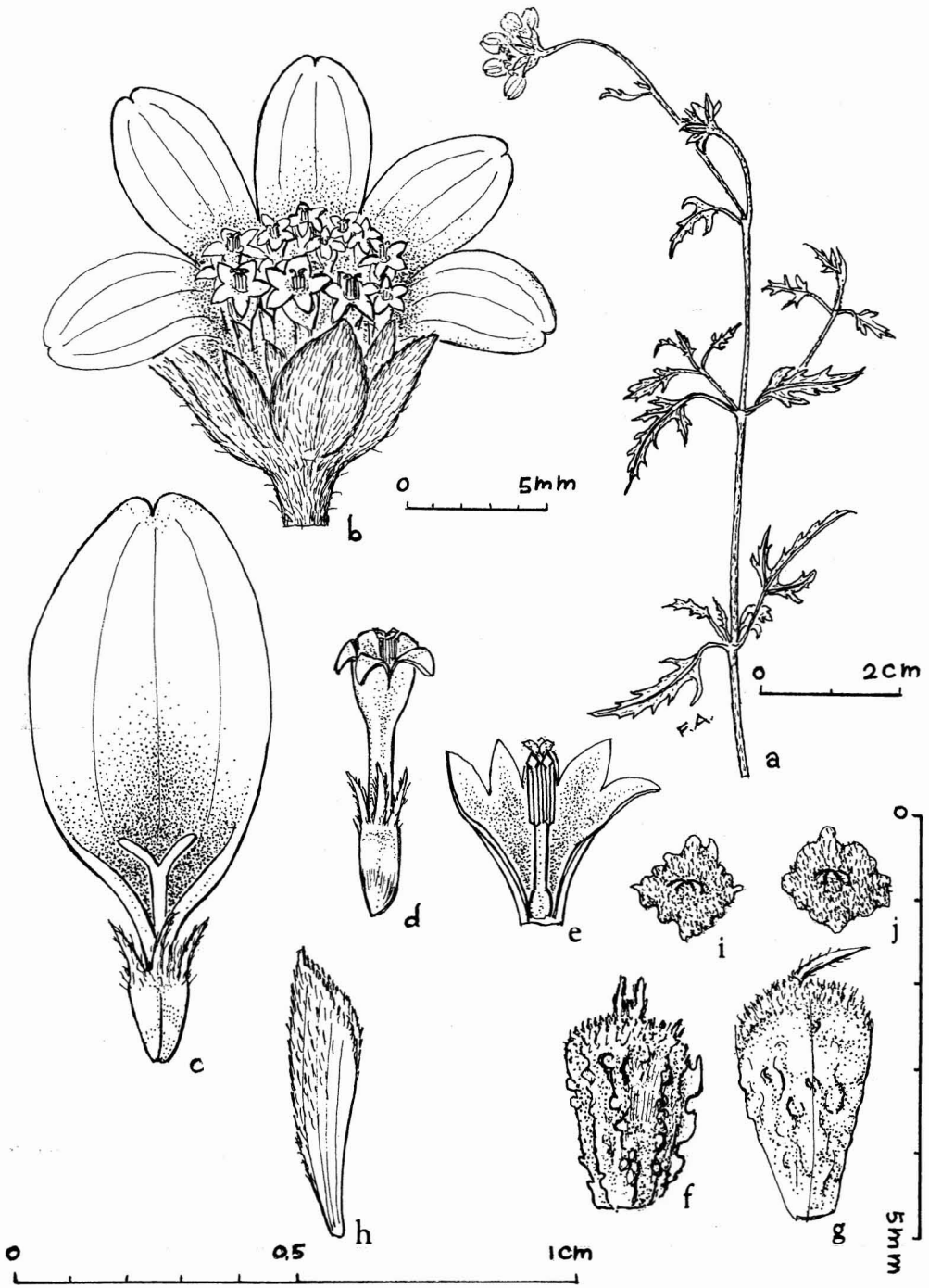


FIGURE 11. *Lipochaeta pinnatifida* St. John, from holotype. *a*, habit,  $\times 1$ ; *b*, head,  $\times 4$ ; *c*, ray flower,  $\times 8$ ; *d*, *e*, disk flower,  $\times 8$ ; *f*, ray achene,  $\times 12$ ; *g*, disk achene,  $\times 12$ ; *h*, chaff,  $\times 8$ ; *i*, ray achene,  $\times 12$ ; *j*, disk achene,  $\times 12$ .

ascending puberulous; corolla tube 0.5 mm long; ray 7 mm long, 4 mm wide, elliptic, retuse; disk flowers about 22, the ovary 1.5 mm long, prismatic, hispidulous at apex and with 1–3 pappus awns 1 mm long, ascending puberulous; corolla 3 mm long, the tube 2.8 mm long, the lower half narrowly tubular, the upper campanulate, the 5 lobes 0.8 mm long, ovate, acute; anthers 1.2 mm long, connate, chaff 4.5 mm long, oblanceolate, plicate, magentatipped, and ciliolate and puberulous towards the apex; ray achenes 2.3 mm long, trigonous obovoid, tuberculate, the subtruncate apex puberulous as are the 0.5–1 mm awns; disk achenes 2.2–2.5 mm long, cuneate prismatic, tuberculate, the convex apex puberulous, as are the pappus awns.

HOLOTYPE: Hawaiian Islands, Hawaii Island, Waimea, several hundred meters n. of Pu'u Pa'a, near tank road, population of 2–4 dozen plants, samples taken from 6–10 plants to show the considerable variability, (mixed with no. 3,160A), 2,400 ft elev., 1 Feb. 1981, *F. R. Warshauer 3,160* (BISH).

DISCUSSION: *Lipochaeta pinnatifida* is a member of section *Aphanopappus*. Its closest relative, *L. nesophila* St. John, of Niihau, a species with the petioles 4–10 mm long; blades 20–50 mm long, 5–35 mm wide, firm chartaceous, pinnately 3-lobed, the basal lobes 6–10 mm wide, central lobe oblanceolate; cymes with 5 or 7 heads; outer phyllaries ovate; ray 6 mm long, 2.5 mm wide; disk florets about 15; and the ray achenes with the sides hirsutulous. *Lipochaeta pinnatifida* has the petioles 2–4 mm long; blades 6–20 mm long, 5–12 mm wide, coriaceous, pinnately 3-lobed, the basal lobes 1–4 mm wide; central lobes narrowly lanceolate; cymes with 3 or 1 heads; outer phyllaries elliptic, subacute; ray 7 mm long, 4 mm wide; disk florets about 22; and the ray achenes with the sides glabrous.

The new epithet is chosen with reference to the shape of the leaf blades.

*Lipochaeta robusta* sp. nov. (sect. *Lipochaeta*), fig. 12

DIAGNOSIS HOLOTYPI: Frutex 4 m altus est, ramulis foliosis adpresse puberulis subglab-

ratis, nodis cum circulo angusto herbaceo interpetiolarum, laminis 6.5–14.5 × 1.7–4.5 cm chartaceis ellipticis et aequaliter in apicibus ambis deminuentibus apice acuto marginibus omnino integris vel in eis majoribus remote umbonatis ab apicibus venularum in paginis ambis adpresse puberulis basibus albis pustulatis, cymis 4–10 cm longis laxis et cum 2–5 capitibus adpresse puberulis, pedunculo 2.5–4 cm longo, pedicellis 0.6–7 cm longis, capitulis 15 mm diametro, involucri 4 mm altis hemisphaericis, phyllariis exterioribus 4 et 3.5–4 mm longis late lanceolatis adpresse puberulis, illis interioribus simulantibus sed latioribus, squamis 2.8 mm longis oblanceolatis, flosculis radiatis 6, tubo corollae 1.7 mm longo, radiis 4.5 × 2.2 mm ellipticis retusis, flosculis disci 12–16, tubo corollae 1.2 mm longo, 4 lobis 0.7–1.2 mm lanceo-ovatis, achaeneis radiatis 1.9 × 1 mm oblongo-ellipsoideis in apice puberulentis, achaeneis disci 2.2 × 0.8 mm oblongo-ellipsoideis in apice puberulis.

DIAGNOSIS OF HOLOTYPE: Shrub 4 m tall, freely forking; older stems 5–13 mm in diameter, strongly woody, but becoming hollow; bark brown, nearly smooth, but with fine longitudinal ridges; leafy branchlets 0.7–4 mm in diameter, appressed ascending white puberulent, subglabrate; internodes 1–15 cm long; nodes with a narrow herbaceous interpetiolar ring; leaf scars 4–5 mm wide, narrowly lunate; bundle scars 3; petioles 2–12 cm long; leaves opposite; blades 6.5–14.5 × 1.7–4.5 cm, chartaceous, elliptic and tapering equally to either end, the apex acute, the margins completely entire or on large blades with a few remote ascending umbonate veinlet tips, on both sides appressed ascending white puberulous, the hairs separate and from white pustulate bases, above dark green, below paler, the secondary veins 4–6 in each half, curved ascending; inflorescence a cyme 4–10 cm long, loose and 2–5-headed, appressed ascending white puberulent; peduncle 2.5–4 cm long; bracts 2–4 cm long, foliaceous; pedicels 0.6–7 cm long; heads 15 mm in diameter; involucre 4 mm high, hemispheric; outer phyllaries 4, and 3.5–4 mm long, broadly lanceolate, appressed

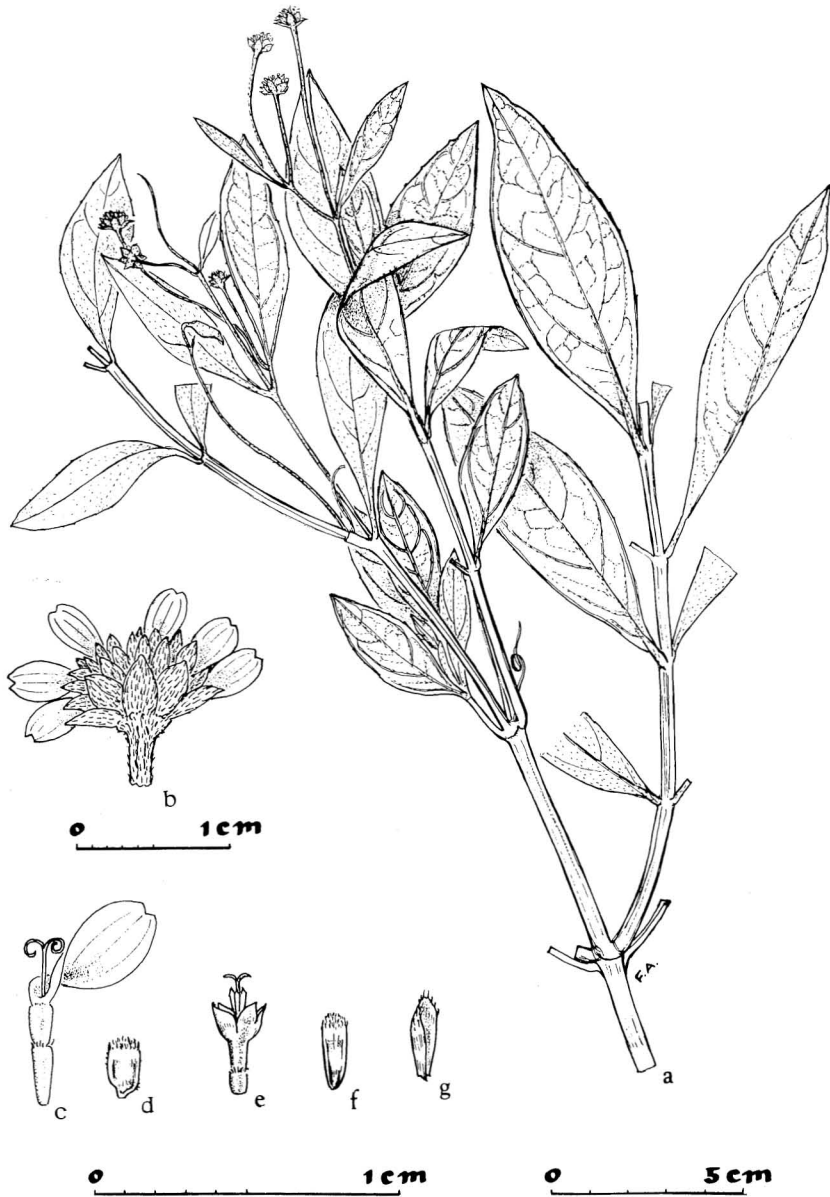


FIGURE 12. *Lipochaeta robusta* St. John, from holotype. *a*, habit,  $\times \frac{1}{2}$ ; *b*, head,  $\times 4$ ; *c*, ray flower,  $\times 8$ ; *d*, ray achene,  $\times 8$ ; *e*, disk flower,  $\times 8$ ; *f*, disk achene,  $\times 8$ ; *g*, chaff,  $\times 8$ .

ascending white puberulent; inner phyllaries of equal length, similar, but broader; receptacle convex; chaff 2.8 mm long, oblanceolate, navicular, cartilaginous, minutely puberulous; ray flowers 6, the ovary 2 mm long, 0.7 mm wide, cuneoid, puberulous at apex; corolla tube 1.7 mm long; ray  $4.5 \times 2.2$  mm,

elliptic, retuse; 12–16 disk florets; ovary  $0.7 \times 0.5$  mm, oblong ellipsoid, puberulous at tip; corolla tube 1.2 mm long; 4 corolla lobes 0.7–1.2 mm long, lance ovate, acute; filament tube 1.7 mm long; 4 anthers 1 mm long; style 3 mm long; stigmas 0.5 mm long, linear; ray achenes  $1.9 \times 1$  mm, oblong ellipsoid, puber-

ulous at apex; disk achenes  $2.2 \times 0.8$  mm, oblong ellipsoid, puberulent at apex.

HOLOTYPE: Hawaiian Islands, east Maui, Hana, Puu Ki, edge of lower woods, 900 ft alt., Dec. 31, 1936, *H. St. John & R. J. Catto 17,891* (BISH).

DISCUSSION: *Lipochaeta robusta* is a member of the section *Lipochaeta*. Its closest relative, *L. Christophersenii* St. John, of the Waianae Mts., Oahu, a species with the leafy branchlets appressed hirsutulous; petioles 2–4 mm long; blades 3–12  $\times$  0.8–3.2 cm, lanceolate to narrowly so, appressed hirsutulous, the margins remotely low serrulate, the secondary veins 8–10 in each half; heads 2.5–3 cm in diameter; outer phyllaries 6–10 (–12) mm long, appressed hirsutulous; chaff 5 mm long; ray florets 10–14, the rays 11  $\times$  4 mm; disk florets about 40, each with 5 corolla lobes; ray achenes 3  $\times$  2–2.7 mm, and with two 1-mm awns; disk achenes 2.9  $\times$  0.8 mm, and with two awns. *Lipochaeta robusta* has the leafy branchlets appressed puberulent; petioles 3–12 mm long; blades 6.5–14.5  $\times$  1.7–4.5 cm, elliptic, acute, appressed puberulous, the margins entire, the secondary veins 4–6 in each half; heads 1.5 cm in diameter; outer phyllaries 3.5–4 mm long, appressed puberulent; chaff 2.8 mm long; ray florets 6, the rays 4.5  $\times$  2.2 mm; disk florets 12–16 and each with 4 corolla lobes; ray achenes 1.9  $\times$  1 mm, awnless; disk achenes 2.2  $\times$  0.8 mm, awnless.

The new epithet is the Latin adjective *robustus*, robust, and it is given with reference to the unusual large stature of the plant.

*Lipochaeta Rockii* Sherff, var. *parva* var. nov.

DIAGNOSIS HOLOTYPE: A specie differt in phyllariis exterioribus 2–3.2 mm longis ellipticis.

DIAGNOSIS OF HOLOTYPE: Resembling *Lipochaeta Rockii* in having the blades appressed setulose and very scabrous, in having the alate petioles perfoliate, and in having the larger blades slightly pinnately lobed. Differing in having the outer phyllaries 2–3.2 mm long and elliptic.

HOLOTYPE: Hawaiian Islands, Kahoolawe Island, alongside jeep road from Hanakaha Bay, just s. of the concrete observation post, rocky substrate, 90 ft elev., 3 plants 20–28 inches high, 4-21-1980, *G. Clarke & C. Corn 374* (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Kahoolawe Island, Hanakanaea Bay, s. of concrete observation post, rocky substrate, 90 ft elev., 4-21-1980, *G. Clarke & C. Corn 373* (BISH); first small bay s. w. of Honokaoa Bay, under *Prospis*, with *Bidens pilosa*, *Chenopodium album*, 10 ft elev., 4-21-1980, *Clarke & Corn 357* (BISH).

*Lipochaeta setosa* sp. nov. (sect. *Aphanopappus*), fig. 13

DIAGNOSIS HOLOTYPE: Frutex scandens omnino dense adpresse setulosus est, petiolis 5–15 mm longis, caule principali cum laminis principalibus 3.3–3.6  $\times$  2–2.1 cm coriaceis deltoideo-lanceolatis integribus lanceolatis varie deltoideo-lanceolatis basi cuneata varie subcordata marginibus profunde serratis infra midnervo et nervis secundariis elevatis nervis secundariis 2–3 in dimidio quoque supra et infra dense adpresse setosis scabrisque, ramis lateralibus cum petiolis 5–12 mm longis laminis 1.5–3.2  $\times$  0.8–2 cm anguste varie late lanceolatis, cymis terminalibus cum 1–2 (–4) capitibus, pedunculis 11–50 mm longis, capitibus 15 mm diametro, involucre in flore 4–5 mm diametro, phyllariis exterioribus 4 et 5–7 mm longis ellipticis acutis adpresse setulosis, flosculis radii 4–6, tubo corollae 1 mm longo, radio 12.5  $\times$  7 mm elliptico emarginato, flosculis disci 24 et ovario cum 2 setis pappi 1 mm longis ascendente puberulis, tubo corollae 3 mm longo dimidio basali anguste tubuloso dimidio apicali anguste campanulato, 5 lobis 1 mm longis anguste ovatis acutis, achaeneis radiatis 2.5  $\times$  1.5 mm deltoideo-obovoideis tuberculatis et cum marginibus tuberculatis apice conico puberulo et cum 1–2 aristis pappi 1 mm longis ascendente puberulis deciduis, achaeneis disci 2–2.5 mm longis deltoideo-oblancoideis minute tuberculosis apice puberulo aristis deciduis.



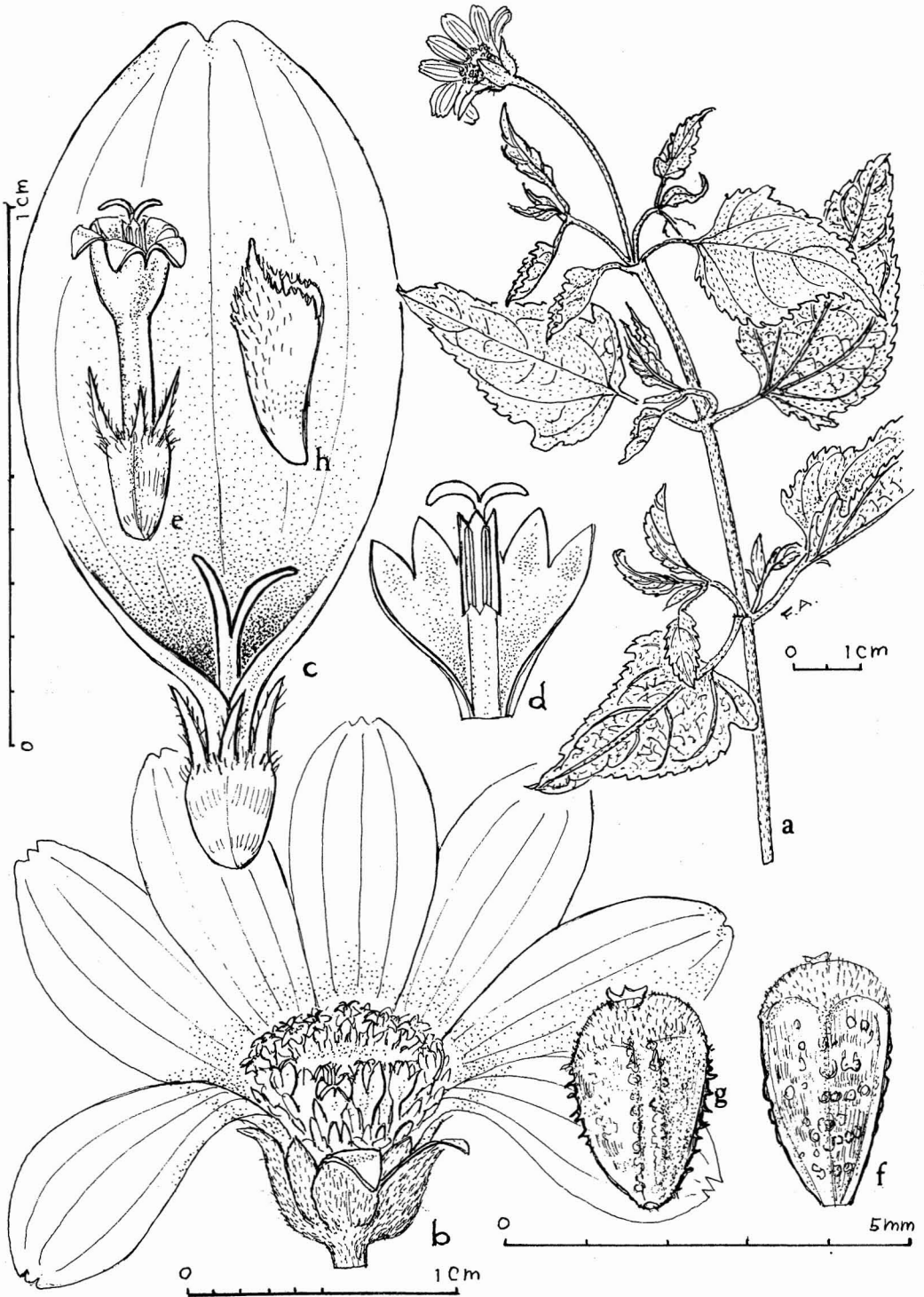


FIGURE 13. *Lipochaeta setosa* St. John, from holotype. a, habit,  $\times 1$ ; b, head,  $\times 4$ ; c, ray floret,  $\times 8$ ; d, e, disk floret,  $\times 8$ ; f, disk achene,  $\times 12$ ; g, ray achene,  $\times 12$ .

DIAGNOSIS OF HOLOTYPE: Scandent shrub, densely white appressed ascending setulose and scabrous throughout; leafy branchlets 1–2 mm in diameter, square; internodes 1–10.5 cm long; nodes slightly enlarged; leaves opposite; petioles 5–15 mm long, green; principal blades of the main stem 3.3–3.6 × 2–2.1 cm, coriaceous, entire, lanceolate to deltoid lanceolate, cuneate to subcordate, the apex acute, the margins deeply serrate, green, below the midrib and secondaries elevated, secondary veins 2–3 in each half, arcuate ascending; above and below densely appressed setose and scabrous; leaves of lateral branches with petioles 5–12 mm long, the blades 1.5–3.2 × 0.8–2 cm, narrowly lanceolate; cymes terminal, 1–2 (–4) headed; peduncles 11–50 mm long; heads 15 mm across; involucre in flower 4–5 mm tall, 6–7 mm across; outer phyllaries 4, and 5–7 mm long, elliptic, acute, appressed ascending white setulose, inner phyllaries similar; ray flowers 4–6, the ovary 2 mm long, obovoid, puberulous at apex, and with 3 pappus awns 1.7 mm long, ascending puberulous; corolla tube 1 mm long; ray 12.5 mm long, 7 mm wide, broadly elliptic, emarginate; disk flowers 24, and the ovary 1.5 mm long, prismatic, puberulous at apex, with 2 pappus awns 1 mm long, ascending puberulous; corolla tube 3 mm long, the lower half narrowly tubular, the upper half narrowly campanulate, the 5 lobes 1 mm long, narrowly ovate, acute; anthers 2 mm long, connate; ray achenes 2.5 mm long, 1.5 mm wide, trigonous obovoid, tuberculate and tuberculate margined, the conic apex puberulous, with 1–2 pappus awns 1 mm long, ascending puberulous, deciduous; disk achenes 2–2.3 mm long, trigonous oblanceoloid, blackish, minutely tuberculate, the apex puberulous, the awns deciduous.

HOLOTYPE: Hawaiian Islands, Hawaii Island, USFWS, Forest Bird Survey, Waimea, several hundred m n. of Pu'u Pa'a, near tank road, 2, 400 ft elev., 1 Feb. 1981, *F. R. Warshauer 3,160A* (BISH).

DISCUSSION: *Lipochaeta setosa* is a member of the section *Aphanopappus*, as is its closest relative, *L. populifolia* (Sherff) Gardner, of Hawaii, a species with the petioles 8–30 mm

long; blades 3.5–10 cm long, 2.5–8 cm wide, broadly deltoid ovate to lance ovate, below appressed setulose on the veins and veinlets; outer phyllaries 5–8.5 mm long, lance elliptic; ray florets 7–8, the rays 9.3 mm long, 4 mm wide; anthers 1.5 mm long; ray achenes 2.8 mm long; disk flowers 45, the corolla 3.3 mm long; and the disk achenes 2.8 mm long, 2.2 mm wide. *Lipochaeta setosa* has the petioles 5–17 mm long; blades 0.9–3.7 cm long, 0.5–2.2 cm wide, deltoid to narrowly lanceolate, and on both sides densely appressed setose and scabrous; outer phyllaries 5–7, elliptic, acute; ray florets 4–6; rays 12.5 mm long, 7 mm wide, elliptic; anthers 2 mm long; ray achenes 2.5 mm long; disk florets 20–30, the corolla 4.5 mm long; disk achenes 2–2.8 mm long, and 1–1.2 mm wide.

The new epithet is the Latin adjective *setosa*, bristly, and it is given in reference to the pubescence of the plant.

*Lipochaeta vittata* sp. nov., (sect. *Lipochaeta*), fig. 14

DIAGNOSIS HOLOTYPE: Planta suffrutescens 1 m alta ramosa est, ramulis foliosis sparse adpresse hirsutulis, petiolis 4–13 mm longis cum pilis simulantibus, laminis 3.5–8 × 0.7–2 cm chartaceis anguste lanceolatis obtusis basi anguste cuneata marginibus subintegribus supra remote adpresse hirsutulis infra cum pilis simulantibus sed paulum cumulatoribus, cymis terminalibus 1–3-capitatis erectis laxis, pedunculis 2–11.5 cm longis cum pilis simulantibus, capitibus 2.3–2.8 cm diametro, involucre 6–8 mm alto hemisphaerico, 4 phyllariis exterioribus 7–9 mm longis parte 2/5 basali ligulate naviculari valde incrassata et rigida straminea et adpresse ascendente grosse hispida parte 3/5 apicali elliptica foliacea pilis plerumque sursum midnervo, receptaculo humiliter convexo, 8 flosculis radiatis luteis 14 × 2.5 mm ligulatis tubo 2 mm longo, 25 flosculis disci 6 mm longis, corollis luteis tubo 3 mm longo parte basali 1 mm longa 0.4 mm diametro tubulosa parte apicali campanulata, 4 lobis 0.7–1 mm longis ovatis subacutis, squamis 5 mm longis oblanceolatis apiculatis apice purpureo, achaeneis

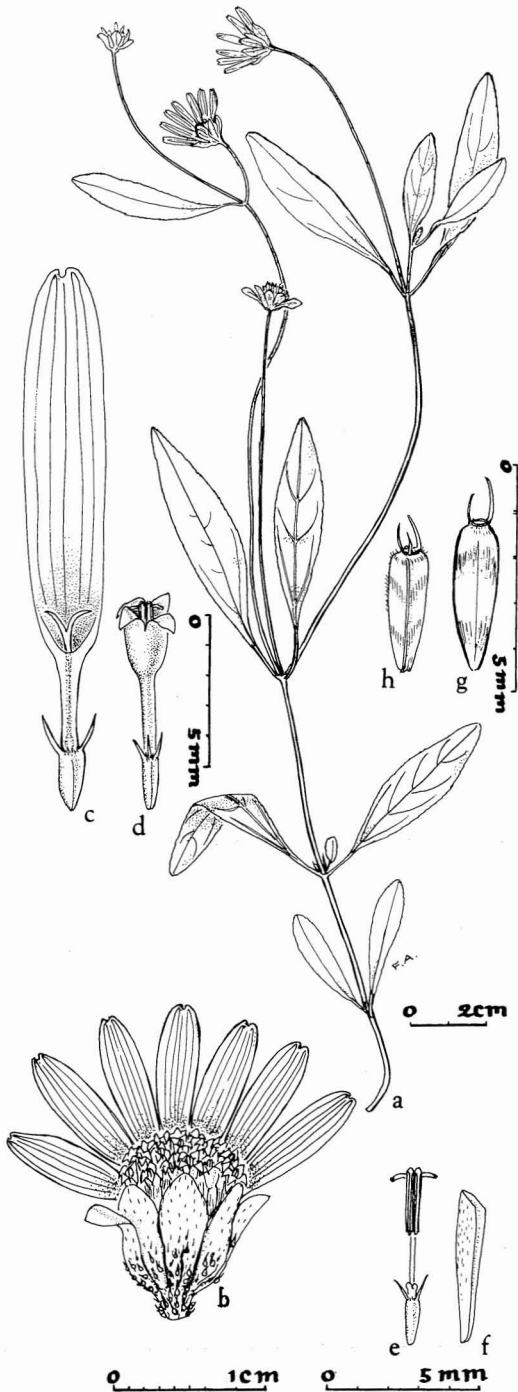


FIGURE 14. *Lipochaeta vittata* St. John, from holotype. a, habit,  $\times \frac{1}{2}$ ; b, head,  $\times 2$ ; c, ray floret,  $\times 4$ ; d, e, disk floret,  $\times 4$ ; f, chaff,  $\times 8$ ; g, disk achene,  $\times 6$ .

radiatis cum corpore  $3 \times 1 \times 0.7$  mm deltoide oblanco-ellipsoideo laevibus marginibus membranaceo-alatis, 3 seti subulatis 0.6–0.8 mm longis, achaenis disci cum corpore  $3.1\text{--}3.3 \times 0.7\text{--}0.8$  mm anguste ellipsoideo compresso laevi marginibus in tertia apicali paulum membranaceo-alatis, 2 aristis pappi 0.5–0.8 mm longis subulatis.

DIAGNOSIS OF HOLOTYPE: Suffrutescent plant 1 m tall, branching; leafy branchlets 0.7–2 mm in diameter, stramineous and sparsely appressed ascending white hirsutulous; internodes 3.5–10 cm long; nodes enlarged; leaves opposite, ascending; petioles 4–13 mm long, with similar pubescence, broadly channeled above; blades 3.5–8 cm long, 7–20 mm wide, chartaceous, narrowly lanceolate, obtuse, the base narrowly cuneate, the margins subentire, above dark green and remotely appressed white hirsutulous, below pale green, and with similar hairs, a little more abundant, secondary veins 4–6 in each half, the middle and upper ones arcuate ascending; cymes terminal, 1–3-headed, erect, loose; peduncles 2–11.5 cm long, slender, bractless, with similar pubescence; heads 2.3–2.8 cm across; involucre 6–8 mm high, hemispheric; 4 outer phyllaries 7–9 mm long, the basal  $\frac{2}{5}$  1.3–2 mm wide, ligulate, navicular, much thickened and rigid, stramineous, and appressed ascending coarse hispidulous; the apical  $\frac{3}{5}$  elliptic, foliaceous, hairy mostly up the midrib; inner phyllaries slightly shorter, elliptic, foliaceous; receptacle low convex; ray florets 8, yellow, 14 mm long, 2.5 mm wide, ligulate, 7-nerved, the apex minutely bifid, the tube 2 mm long; ovary 2 mm long, narrowly ellipsoid, compressed; pappus of 2 subulate bristles 0.6–0.7 mm long; style 3 mm long; 2 stigmas 1 mm long; disk flowers 25, and 6 mm long; ovary 1.8 mm long, oblanceoloid, compressed; pappus of 2 subulate bristles 0.6–0.7 mm long; corolla yellow, the tube 3 mm long, the lower part 1 mm long, 0.4 mm in diameter, tubular, the upper part campanulate, 1.5–2 mm long; the 4 lobes 0.7–1 mm long, ovate, subacute; style base 0.5 mm long, urceolate, dark; style 3 mm long; 2 stigmas 0.5 mm long; chaff 5 mm long, oblanceolate, apiculate, purple-tipped; ray achenes with the

body 3 mm long, 1 mm wide, 0.7 mm thick, deltoid oblance ellipsoid, blackish, smooth, the margins membranous alate, the 3 awns 0.6–0.8 mm long, subulate; disk achenes with the body 3.1–3.3 mm long, 0.7–0.8 mm wide, 0.3 mm thick, narrowly ellipsoid, compressed, dark brown, smooth, the margins slightly membranous alate in the apical third; 2 awns of the pappus 0.5–0.8 mm long, subulate.

HOLOTYPE: Hawaiian Islands, Oahu Island, Kaena Point, N. Shore Road,  $\frac{1}{2}$  mile w. of improved road end, 100 yards from ocean, in tangled shrubby clumps, 10 m alt., 7 Jan. 1974, R. Gardner 281 (BISH).

DISCUSSION: The chromosome number was determined by R. C. Gardner as  $2n = 26_{II} + 4B$ . He determined this specimen as *Lipochaeta lobata*, var. *lobata*.

*Lipochaeta vittata* is a member of the section *Lipochaeta*, but the most similar species, *L. Christophersenii* St. John, is in the section *Aphanopappus*, and it has the petioles 2–4 mm long; blades 3–12  $\times$  0.8–3.2 cm, the margins low serrulate, secondary veins 8–10 in each half; outer phyllaries 6–10 (–12) mm long, lance ovate, herbaceous; ray florets 10–14, the rays 11  $\times$  4 mm, oblong elliptic; chaff puberulous near the apex; disk florets about 40, the tube 2 mm long, 5-lobed, and the disk achenes with the body 2.9 mm long. *L. vittata* has the petioles 4–13 mm long; blades 3.5–8  $\times$  0.7–2 cm, the margins subentire, the secondary veins 4–6 in each half; outer phyllaries 7–9 mm long, ligulate, thickened and rigid; ray florets 8, the rays 14  $\times$  2.5 mm, ligulate; chaff glabrous; disk florets 25, the tube 5 mm long, 4-lobed; and the disk achenes with the body 3.1–3.3 mm long.

*Lipochaeta Warshaueri* sp. nov. (sect. *Aphanopappus*), fig. 15

DIAGNOSIS HOLOTYPE: Frutex perennis suffrutescens ramosus ultra 45 cm altus est, ramulis in valleculis adpresse setulosus, foliis omnino setulosus, petiolis 6–11 mm long, laminis 25–50  $\times$  4–20 mm coriaceis scabris lanceolatis in basi decurrentibus marginibus vadose serratis prominente triplinervis, cymis 3 (–1); pedunculis 1.5–10 cm longis,

capitibus 2.7–3 cm diametro, phyllariis exterioribus 4–5 et 4 mm longis ovatis subacutis adpresse ascendente setulosus, flosculis radiatis 9 tubo 2 mm longo, radiis 17.7  $\times$  7.5 mm ellipticis extra puberulis tridentatis, flosculis disci circa 32 tubo 3 mm longo 5 lobis 1 mm longis ovatis, staminibus separatis, antheris 1.9 mm longis, achaeneis radiatis cum corpore 3  $\times$  2.2  $\times$  1.5 mm obovoideis 4-angulosis, setis 4 et 0.5–1.2 mm longis, achaeneis disci cum corpore 2.5  $\times$  1  $\times$  0.5 mm oblanceoloideis 4 setis 0.7 mm longis subulatis.

DIAGNOSIS OF HOLOTYPE: Suffrutescent branching perennial shrub, more than 45 cm tall; branches 1–4 mm in diameter, subterete, but with 6–7 strong rounded ridges, these glabrate, but the valleys persistently white appressed setulose; internodes 1–8 cm long; nodes ringed, but only slightly enlarged; leaves ascending or later diverging, white appressed ascending setulose throughout, scarcely scabrous; petioles 6–11 mm long, blades 25–50  $\times$  4–20 mm, coriaceous, scabrous, lanceolate to narrowly so, the base narrowly cuneate and attenuate decurrent, the margins low serrate, the veins evident above and prominently raised below, prominently 3-pleined, the two laterals strongly ascending, and beyond them only 2–3 laterals to a side; cymes (1–) or 3-headed; peduncles 1.5–10 cm long; heads 2.7–3 cm in diameter; involucre 5–6 mm tall, hemispheric; outer phyllaries 4–5 and 4 mm long, ovate, subacute, white, but green tipped, white appressed ascending setulose throughout; inner phyllaries 4–4.5 mm long, similar but thinner; chaff 3.7 mm long, broadly spatulate, appressed puberulous without; ray florets 9, the tube 2 mm long; ray 17.7  $\times$  7.5 mm, elliptic, puberulous without, at tips with 3 rounded teeth; style 3 mm long; disk flowers about 32, the ovary 2 mm long, obovate, with 2 awns, the tube 3 mm long, the upper 1 mm obovoid; the 5 lobes 1 mm long, ovate; filaments 1.2 mm long, separate; anthers 1.9 mm long, almost linear, the connective at tip ovoid, projecting 0.2 mm; style 3 mm long; 2 stigmas 0.7 mm long, recurving; ray achenes with the body 3  $\times$  2.2  $\times$  1.5 mm, obovoid, compressed, with 4 prominent rounded angles, at apex with 4

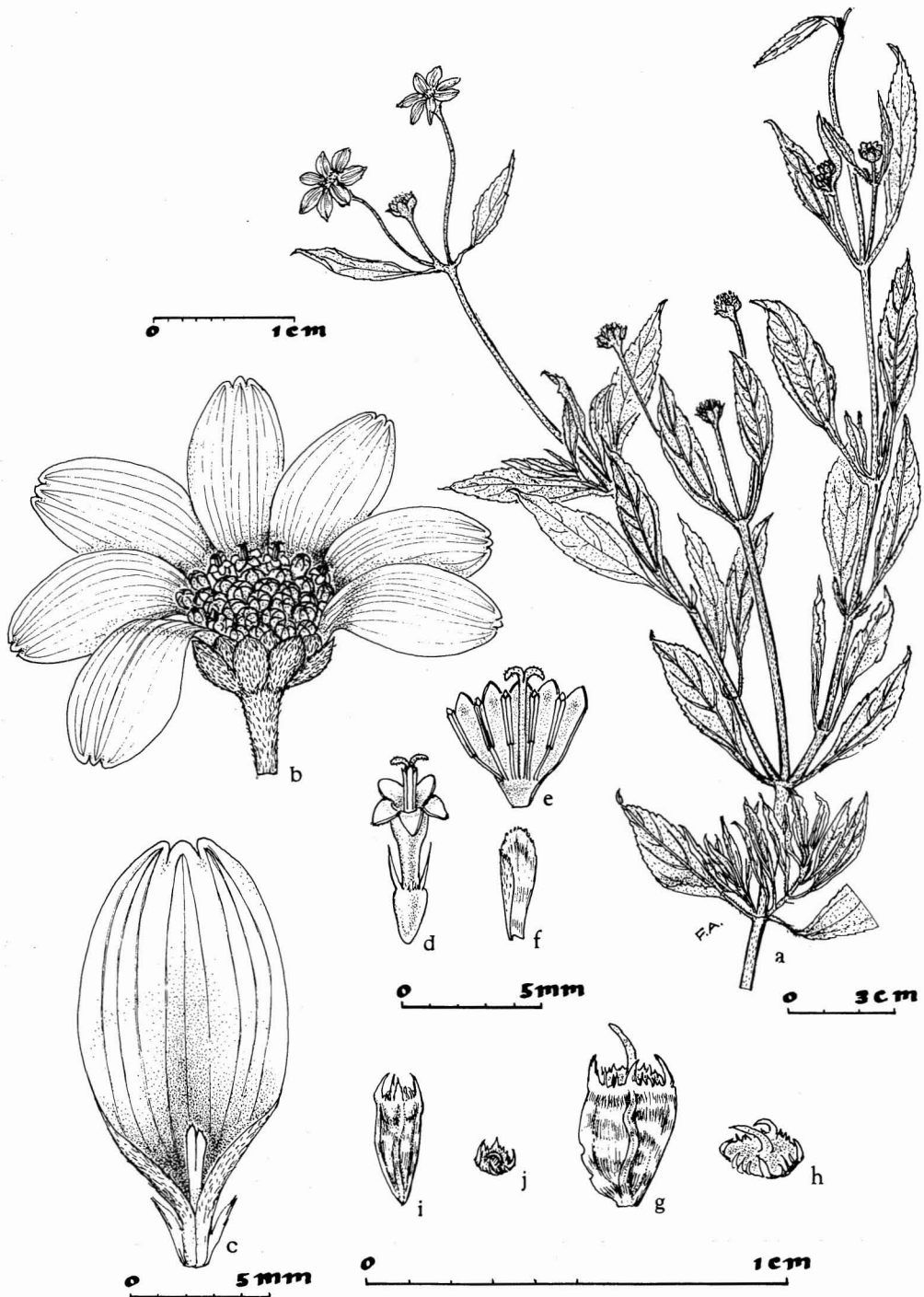


FIGURE 15. *Lipochaeta Warshaueri* St. John, from holotype. a, habit,  $\times \frac{1}{2}$ ; b, head,  $\times 2$ ; c, ray floret,  $\times 4$ ; d, e, disk floret,  $\times 4$ ; f, chaff,  $\times 4$ ; g, h, ray achene,  $\times 6$ ; i, j, disk achene,  $\times 6$ .

awns 0.5–1.2 mm long, and numerous smaller ones; disk achenes with the body  $2.5 \times 1 \times 0.5$  mm, oblanceoloid, the 4 awns 0.7 mm long, subulate.

SUPPLEMENTARY DESCRIPTION: Petioles 4–11 mm long; blades 20–50  $\times$  3–20 mm; peduncles 1–10 cm long; outer phyllaries 2.5–5, mostly 4 mm long.

HOLOTYPE: Hawaiian Islands, Hawaii Island, Kohala Dist., Waimea Plain, near base of Kohala slopes, gulch next to Waikamali Gulch, 1,680 ft elev., 31 Jan. 1981, U.S.F.W.S. Forest Bird Survey, *F. R. Warshauer 3,159* (BISH).

SPECIMENS EXAMINED: Hawaiian Islands, Hawaii Island, Kohala Dist., Waimea-Kawaihae Road corridor, lower part, 17 Sept. 1980, *P. H. McEldowney 80-41*, and *80-42* (BISH); ditto, 18 Jan. 1980, *McEldowney s. n.* (BISH).

DISCUSSION: *Lipochaeta Warshaueri* is a member of the section *Aphanopappus*, as is its closest relative, *L. porophila* Deg. & Deg., of Kau District, Hawaii, a species with a procumbent habit; blades 10–40  $\times$  3–15 mm, pinnately nerved; cymes 1-(2-) headed; pedun-

cles 1–2 cm long; heads 8–10 mm in diameter; outer phyllaries 2.5 mm long, glabrous; ray florets 4; ray 3 mm long, bidentate; disk florets with the tube hirsutulous. *L. Warshaueri* has an erect habit; blades 25–50  $\times$  4–20 mm, trip-linerved; cymes 3-(1-) headed; peduncles 1.5–10 cm long; heads 27–30 mm in diameter; outer phyllaries 4 mm long, ascending setulose; ray florets 9; rays 17.7 mm long, tridentate; disk florets with the tube glabrous.

The new epithet is given in honor of the collector, Frederick Richard Warshauer (1946– ), born in Denver, Colorado, son of Dr. Frederick B. and Faye Anne Dale Warshauer. He earned in 1960 a B.S. in zoology at Colorado State University, and in 1970 an M.S. at the University of Hawaii, and recently worked as botanist for the Forest Bird Survey in Hawaii, by the U.S. Fish and Wildlife Service.

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