REVISION OF TETRAMOLOPIUM LIPOCHAETA, DUBAUTIA AND RAILLIARDIA

BY

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BERNICE P. BISHOP MUSEUM
BULLETIN 135

HONOLULU, HAWAII
PUBLISHED BY THE MUSEUM
1935

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INTRODUCTION

The revisional work represented in the following pages could not have been carried on had it not been for the exceptionally generous assistance accorded me by some of the world's principal scientific institutions. Through their coöperation, I have been privileged to examine first-hand a vast number of herbarium specimens. Among these were plants collected by David Nelson, A. Menzies, Charles Gaudichaud, Adelbert von Chamisso, the United States Exploring Expedition under Captain Wilkes, Horace Mann and W. T. Brigham, William Hillebrand, J. M. Lydgate, Valdemar Knudsen, A. A. Heller, C. N. Forbes, J. F. Rock, Otto Degener, and many others whose labors have helped to provide the type bases for a flora of the Hawaiian and other Pacific islands. For such coöperation, I wish to thank particularly the following individuals: Dr. Ludwig Diels, Director, and Dr. Johannes Mattfeld, Curator, Botanical Garden of Berlin; Dr. Herbert E. Gregory, Director, and Mr. Edwin H. Bryan, Jr., Curator of Collections, Bernice P. Bishop Museum; Dr. John Ramsbottom, Keeper of Botany, British Museum of Natural History; Dr. B. P. G. Hochreutiner, Director, Botanical Garden of Geneva and Delessert Herbarium; Dr. Carl Skottsberg, Director, Arboretum of Göteborg; Dr. B. L. Robinson, Curator, and Mr. Chas. A. Weatherby, Assistant Curator, Gray Herbarium; Sir Arthur W. Hill, Director, Royal Botanical Gardens of Kew; Dr. Boris Keller, Director, Botanical Garden of Leningrad; Dr. Jesse M. Greenman, Curator of the Herbarium, Missouri Botanical Garden; Dr. Heinrich Handel-Mazzetti, Curator of Botany, Natural History Museum of Vienna; Dr. Elmer D. Merrill, Director, New York Botanical Garden; Dr. Henri Humbert, Director, Museum of Natural History of Paris; Dr. William R. Maxon, Associate Curator, United States National Museum.

Throughout the progress of the work, I was granted numerous privileges by the authorities of Field Museum of Natural History, at which institution most of the studies were made. Especially do I wish to acknowledge indebtedness to Mr. Stephen C. Simms, Director, Dr. B. E. Dahlgren, Curator, and Dr. P. C. Standley, Associate Curator of the Herbarium, for their numerous kindnesses.

To Mr. Otto Degener, above all others, am I indebted. It was at his urgent solicitation that I undertook the study of the four genera presented in this treatment. At the outset he placed in my hands for the purposes of my researches his entire collection, assembled during some ten years of residence in Hawaii. As many of the collection numbers are represented by 30 or more specimens, I had the opportunity of studying a wide range of field variations and so of fixing more exactly upon essential diagnostic characters.

No pains have been spared to avoid inaccuracies in transcription through manuscript and proof. I have been greatly aided throughout the proof-reading by my wife, Fern Rosetta Sherff, to whom it is a pleasure here to express my appreciation.

In all, I have photographed about 500 of the more important specimens cited. Complete sets of these photographs are in my collection and in the Herbarium of the Field Museum of Natural History. These have been drawn upon exclusively for the illustrations accompanying the text.

In the legends accompanying the illustrations and throughout the text the term "cotype" is used to connote a duplicate of the type, as is usually shown, for example, by the use of the same collection number.

Specimens for study were loaned by the following herbaria (referred to in the text by the names in parentheses): Botanical Garden of Berlin (Berlin); Bernice P. Bishop Museum, Honolulu (Bishop); Boissier Herbarium, Geneva (Boissier); British Museum of Natural History, London (British); University of California, Berkeley (California); Delessert Herbarium, Geneva (Delessert); Field Museum of Natural History, Chicago (Field); Museum of Botany, University of Florence (Florence); Arboretum of Göteborg (Göteborg); Gray Herbarium of Harvard University, Cambridge (Gray); Royal Botanical Gardens of Kew (Kew); Botanical Garden of Leningrad (Leningrad); Missouri Botanical Garden, St. Louis (Missouri); Botanical Garden of Munich (Munich); New York Botanical Garden (New York); Museum of Natural History, Paris (Paris); Academy of Natural Sciences, Philadelphia (Philadelphia); United States National Herbarium, Washington, D. C. (U. S.); Natural History Museum, Vienna (Vienna Mus.); University of Vienna (Vienna Univ.).

Genus **TETRAMOLOPIUM** Nees von Esenbeck

Tetramolopium Nees von Esenbeck, Gen. Sp. Aster., p. 202, 1833 (excluding *T. rupestre*).

Vittadinia, section *Tetramolopium* A. Gray, Am. Acad., Proc., vol. 5, p. 119, 1861.

Small shrubs or more rarely suffruticose, dichotomously or verticillately branched, commonly resinous or viscid. Leaves alternate, simple, entire or

dentate, crowded along the young branches. Capitula 1-many, heterogamous, radiate or subdiscoid, now medium-sized long- and sigillate-pedunculate, now small and corymbose, the peduncles terminating the branches. Involucre obconic or hemispherical, its bracts linear, ± 3-serial, marginally diaphanous, a few outermost ones very short. Receptacle flattish, nude. Ray florets pistillate, in 1-few series, fertile, the ligules now longer than the tube, well-developed, and white, now shorter, revolute, and pale-purple. Disc florets always fewer and for some species very few, hermaphrodite, on manifestly radiate capitula sterile, on subdiscoid capitula fertile, corollas purplish, slender, infundibuliform or tubular, 5-fid. Anthers apiculate, at the base obtuse and entire. Style branches (of disc florets) narrow, complanate, the appendages subulate. Achenes more or less flat, on margin strongly nerved, on faces medianly and longitudinally strongly or obsoletely nerved with now 1 now 2 nerves (these sometimes disappearing or even failing to appear). Pappus setae capillary, 1-2-seriate, subequal among themselves and subequal to the disc, scabrid. (Description correlated in large part with the descriptions given by Bentham and Hooker, Gen. Pl., vol. 2, p. 282, 1873, and by Hillebrand, Fl. Hawaiian Is., pp. 196-197, 1888.)

Type: *Tetramolopium tenerrimum* (Lessing) Nees, Gen. Sp. Aster., p. 203, 1833.

History of the Genus

Tetramolopium was based by Nees von Esenbeck upon, first, *Aster tenerrimus* Lessing and, second, *A. rupestris* Humboldt, Bonpland, and Kunth. The second species, "which is a *Diplostephium,* and with which De Candolle rightly associated two other of Humboldt and Kunth's Asters" (A. Gray, Amer. Acad., Proc., vol. 5, p. 117, 1861), may be excluded at once, leaving *Aster tenerrimus* as the real type of the genus. Of *A. tenerrimus* at least two excellent type specimens are still extant (Berlin), and these, reinforced as they are by Lessing's very ample description (drawn from four specimens), and supplemented by the highly identical material collected by Eschscholtz (Leningrad) and by Macrae (Gray), give a very definite basis for our conception of the genus.

Asa Gray (Amer. Acad., Proc., vol. 5, p. 117, 1861), reduced *Tetramolopium* to sectional rank under *Vittadinia* A. Richard. In this section he placed seven of the species here described: *T. tenerrimum, T. Remyi, T. lepidotum, T. arbusculum, T. consanguineum, T. arenarium,* and *T. conyzoides.* An eighth one of the present species, *T. humile,* he placed in the section *Eurybiopsis* of *Vittadinia.* It is seen that Gray gave the name *Vittadinia* precedence over the earlier name *Tetramolopium,* a procedure that our present rules do not permit.

Bentham and Hooker (Gen. Pl., vol. 2, p. 282, 1873) maintained *Vitta-*

dinia and *Tetramolopium* separately. Under *Vittadinia* they observed: "Sectio tertia Grayi, Tetramolopium, nobis videtur potius genus distinctum Erigeronti multo propius accedens nisi ipsius sectio." Our *T. humile,* which Gray classified under *Vittadinia,* section *Eurybiopsis,* they retained in *Vittadinia.* Under *Tetramolopium,* they observed: "Genus nobis videtur Erigeronti potius quam Vittadiniae proxime affine, habituque magis quam characteribus differt. Styli appendices ut in Vittadinia subulati, quod tamen etiam in Erigerontis sect. Oritrophio observatur."

Hillebrand (Fl. Hawaiian Is., p. 197, 1888) carefully reviewed the work of Gray and of Bentham and Hooker. He concluded by stating that "there would seem to be sufficient ground for maintaining the phylogenetic unity of all our [Hawaiian] species." He therefore reunited generically the *T. humile* of the following treatment with the other species and employed the name *Tetramolopium* for the genus. Hillebrand's procedure has since been followed by Otto Hoffmann (Engler and Prantl, Nat. Pflanzenf., Teil 4, Abt. 5, p. 167, 1894) and in numerous herbarium determinations by such well-known workers as Forbes, Rock, Skottsberg, and Degener, and is the one adopted here. Drake del Castillo (Illustr. fl. ins. maris Pacif., p. 65, 1888), it is true, reduced the Hawaiian species of *Vittadinia* or *Tetramolopium* to *Erigeron.* His course, however, appears to have been purely arbitrary and founded upon very insufficient study of herbarium materials. Thus, for example, he reduced three such distinct species as *Tetramolopium tenerrimum, T. lepidotum,* and *T. consanguineum* all to varieties of the same species (*Erigeron tenerrimus* varieties α, β, and γ.

Key

a. Achenial faces commonly nerveless or obscurely nerved.....**1. T. humile and varieties**
a. Achenial faces commonly 1-2-nerved
  b. Peduncles disposed solitarily at ends of branchlets, monocephalous; ligules exserted
    c. All or some leaves manifestly spatulate or linear-spatulate, flat, commonly wider than 1 mm
      d. Leaves acute at apex, very narrow, 2-4 cm long and only 0.4-2.5 mm wide.....**5. T. polyphyllum**
      d. Leaves obtuse or rounded at apex
        e. Leaves thickish, obsoletely 1-nerved, wide-petioled, 2-3.5 or even 6 mm wide, plant native of Molokai.....**7. T. Rockii**
        e. Leaves very membranaceous, manifestly 1-nerved, filiform-petiolate, 1-2.6 mm wide, plant native of Oahu.....**6. T. tenerrimum**
    c. Leaves commonly filiform or flagelliform, more rarely somewhat broadened above the middle, not (except for those near base of plant or for the early or juvenile ones) spatulate, rather rigid, more or less involute and on the upper surface canaliculate, 0.2-0.9 mm wide
      d. Leaves about 1-1.5 cm long and 0.2-0.5 mm wide; peduncles very slender, ± 2.5 cm long; capitula about 1 cm broad; innermost involucral bracts about 3 mm long; ligulate florets about 30-40.....**4. T. filiforme**

d. Leaves 1.5-2.5 cm long and 0.3-0.4 mm wide; peduncles 1-2.5 cm long; capitula about 1 cm broad; innermost involucral bracts 3-4 mm long; ligulate florets 30-45.....**3. T. Bennettii**

d. Leaves 1.2-3 cm long and 0.3-0.9 mm wide; peduncles up to 16 cm long; capitula 1.2-1.6 cm broad; innermost involucral bracts up to 6.5 mm long; ligulate florets ± 150.....**2. T. Remyi**

b. Peduncles polycephalous or several-many disposed at the end of a single branch; ligules not or scarcely exserted

c. Disc florets 1 or 2; capitula small, commonly 30-60 in a corymb, 2-4 mm broad.....**12. T. conyzoides and variety β dentatum**

c. Disc florets commonly 5-9; capitula fewer, 6-10 mm broad

d. Involucral bracts obtuse, dentate-ciliate.....**10. T. consanguineum and variety β leptophyllum**

d. Involucral bracts commonly acute

e. Leaves very narrowly linear or almost filiform, 0.5-1 (rarely -2) mm wide.....**9. T. arbusculum**

e. Leaves wider, commonly 2-10 mm wide

f. Strongly branched, the branches more often ligneous; leaf surfaces hispid; capitula more often crowded together, their pedicels moderately slender.....**11. T. arenarium and varieties**

f. Sparsely branched, the branches herbaceous; leaf surfaces not manifestly hispid unless along the veins; capitula very often loosely disposed, their pedicels very slender.....**8. T. lepidotum and variety β luxurians**

1. **Tetramolopium humile** (A. Gray) Hillebrand.

Tetramolopium humile (A. Gray) Hillebrand, Fl. Haw. Is., p. 198, 1888.
Vittadinia humilis A. Gray, Amer. Acad., Proc., vol. 5, p. 118, 1861.

a. Leaves all densely hispid

b. Plant very dwarf, peduncles solitary at ends of branches.....**T. humile**

b. Plant taller and more lax, peduncles commonly several at end of a single branch.....variety γ **Skottsbergii**

a. Leaves or at least most of them sparsely and irregularly hispid or sometimes almost glabrous.....**variety β sublaeve**

Dwarf, fruticose, ligneous at base, ditchotomously branched with short branches, glandular-viscid and very villous with curly white hairs, very densely foliose, 1-2 dm high. Leaves linear or very often linear-spatulate, 0.7-1.5 cm long, manifestly or obscurely 1-nerved, at the very apex abruptly glabrate and indurate, commonly flat or flattish, now very narrow and 1.5-3 mm wide now (though more rarely) more or less involute (and perhaps thickish) and only 0.3-1 mm wide. Capitula solitary, 1.2-2.3 cm broad, pedunculate; peduncle terminating a branch, rather rigid, now thickish now slender, bracted with 2-4 linear bracts, 2-5 cm long. Involucral bracts lanceolate-linear, at apex sharp and inner ones often purple, glandular-scabrid or even hispid, the disc a half longer. Ligulate florets about 20-24, uniseriate, scarcely longer than disc, the apically 3-denticulate ligule at least a half shorter than the tube. Tubular florets about 10-18, purple, 6-7 mm long. Achenes all similar but those of disc fertile, linear, gradually dilated from the narrow base almost to the apex, erect-setose, on faces commonly nerveless, the body 3-3.5 mm long, the pappus subfulvous and doubly as long, its setae about 36-40.

Type: collected by the U. S. Exploring Expedition, "on the mountains of Hawaii and Maui," 1840 (U. S.).

Specimens examined: W. T. Brigham, Tempest Anderson, and Ralph Hosmer, Haleakala, Maui, 1909 (Bishop); H. M. Curran 74, Maui, April 1911 (U. S.); Otto Degener 5003, growing in dry cinders, sun-scorched during day and fog-swept during night, near

Koolau Gap, within Haleakala Crater, June 29, 1927 (Berlin, British, Delessert, Field, Gray, Kew, Missouri, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Degener 5004, same location, August 12, 1927 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, New York, Paris); Degener 5005, same location, August 9, 1927 (Berlin, British, Field, Kew, New York); Degener 5006, same location, August 15, 1927 (Field, New York); Abbé Urbain Faurie 943, altitude 3,000 meters, Haleakala, August 1909 (Bishop); O. Finsch 21, above 9,000 feet, Haleakala, July 3, 1879 (Berlin); Finsch 24 and 25, altitude 8,000 feet, same date and location (Berlin); C. N. Forbes, woods above Ukulele, east Maui (Bishop); Forbes, crater of Haleakala, August 1910 (Bishop); Forbes 182-M, slopes of Haleakala, above Ukulele, July 1910 (Bishop; Field, 2 sheets; Missouri; New York); Forbes 182-BM, same date and location (Missouri); Forbes 182-LM, same date and location (New York); Forbes 186, near summit of Puu Hualalai, slopes behind Hanekane, Hawaii, June 16, 1911 (Bishop); Forbes 203-H, summit of Puu Hualalai, June 19-21, 1911 (Bishop, Field, Missouri, New York); Forbes 215-H, same location, June 18-21, 1911 (Bishop, New York); Forbes 869-H, lava flow of 1843, Hawaii, June 17, 1915 (Bishop); Forbes 1066-M, crater of Haleakala, August 6, 1919 (Bishop); Forbes 1824-M, slopes of Haleakala, July 1910 (Bishop); Forbes 1990-M, Kohehamanawa, south slope of Haleakala, March 16, 1920 (Bishop); William Hillebrand, Hawaiian islands (Vienna Mus., U. S.); Hillebrand, altitude 7,000 feet, Haleakala (Berlin); Hillebrand 19, altitude 6,000-8,000 feet, Haleakala (Gray, Kew); Hillebrand 19B, Hawaii (Kew); A. S. Hitchcock 14236, altitude 8,000 feet, Kukaiau Ranch, Hawaii, August 21, 1916 (U. S.); Hitchcock 14951, altitude 6,000-10,000 feet, crater of Haleakala, October 2-5, 1916 (U. S.); Hitchcock 15583, summit of Puu Hualalai, September 2, 1916 (U.S.); J. M. Lydgate, crater of Haleakala, May 1857 and July 1858 (Berlin); H. Mann and W. T. Brigham 516, altitude 8,000-10,000 feet, Haleakala (Delessert; Field, 2 sheets; Gray; Missouri; U. S.); Mann and Brigham 611, Hawaiian islands (Bishop); G. C. Munro 479, near summit of Haleakala, June 24, 1918 (Bishop); Munro 652, summit of Haleakala, April 24, 1918 (Bishop); J. F. Rock 3727, Honuaula, summit of Puu Hualalai, June 9, 1909 (Bishop); Rock 8545, in black cinders, summit of Haleakala, September 1910 (Bishop, Field, Gray, New York); Rock 8618, in much darkened place at entrance of cave, upper slopes of Haleakala, October 1910 (Bishop, Gray); Carl Skottsberg 657, altitude 2,500 meters, summit of Puu Hualalai, September 25, 1922 (Göteborg); Skottsberg 831, altitude about 2,300 meters, on steep wall inside crater of Haleakala, October 16, 1922 (Göteborg); Skottsberg 1971, east slope of Mauna Kea, above Kukaiau, Hawaii, September 27, 1926 (Göteborg); U. S. Exploring Expedition, Hawaii, 1840 (type, U. S.; cotype, Gray; cum varietate Skottsbergii pro parte parva commixtum); U. S. Exploring Expedition, Maui, 1840 (Gray, New York); U. S. Exploring Expedition, Hawaiian islands, 1840 (Missouri, New York, Paris); Heinrich Wawra 1809 and 2307, Maui, 1868-71 (Vienna Mus.); William Wendte, altitude 10,000 feet, Haleakala (Gray).

Some specimens have the leaves especially narrow and much less spatulate in outline, but it appears impossible to draw varietal distinctions.

Distribution: islands of Maui and Hawaii.

Tetramolopium humile variety *β* **sublaeve** Sherff (fig. 1).

Tetramolopium humile variety *sublaeve* Sherff, Bot. Gaz., vol. 95, p. 501, 1934.

Many leaves sparsely and often irregularly setose or even glabrate but very minutely glandular-punctate, peduncles 3-6-congregated on a single branch.

Type: collected by the U. S. Exploring Expedition, Hawaii, 1840 (U. S.).

Specimens examined: U. S. Exploring Expedition, Hawaii, 1840 (type, U. S.; cotype, Gray).

Asa Gray at first had recognized this in the herbarium as a variety, but later included it as a variation in his original description of the species proper ("Variat foliis hirsutioribus vel subglabratis"). The habit of having several peduncles on each branch is, however, quite distinctive and may be relied upon to separate this variety, as also variety γ *Skottsbergii,* from the species itself.

Distribution: island of Hawaii.

FIGURE 1.—*Tetramolopium humile* variety *sublaeve* (type).

Tetramolopium humile variety γ **Skottsbergii** Sherff.

Tetramolopium humile variety *Skottsbergii* Sherff, Bot. Gaz., vol. 95, p. 501, 1934.

Tetramolopium humile variety β Hillebrand, Fl. Haw. Is., p. 199, 1888.

Tetramolopium humile form *laxa* Skottsberg, Medd. Göteb. Bot. Trädg., vol. 2, p. 273, 1926 (ex num. sed sine descript.).

Plant more erect and often less hispid. Peduncles commonly 3-6-congregated on a single branch and shorter, capitula smaller, florets fewer. Achenes obscurely 1-nerved on faces especially at base.

Type: collected by William Hillebrand, on central plateau of Hawaii (Berlin).

Specimens examined: C. N. Forbes 848-H, Humuula Trail to summit of Mauna Kea, Hawaii, June 14, 1915 (Bishop, New York); Hillebrand, central plateau of Hawaii (type, Berlin); A. S. Hitchcock 14278, altitude about 11,000 feet, loose lava, slope of one of the peaks, Mauna Kea, August 22, 1916 (Bishop, U. S.); Jules Remy 244, Hawaii, 1851-55 (Gray); J. F. Rock 8333, altitude 10,000 feet, Mauna Kea, June 1910 (Bishop, Field, Gray, New York); Carl Skottsberg 703, altitude 3,000 meters, Mauna Kea, September 28, 1922 (Göteborg); U. S. Exploring Expedition, Hawaii, 1840 (Gray, U. S., cum specie ipsa commixtum).

Named in honor of Dr. Carl Skottsberg, Director of the Arboretum of Göteborg, who had given particular attention to this form, even designating it form *laxa,* but without description.

Distribution: island of Hawaii.

2. Tetramolopium Remyi (A. Gray) Hillebrand.

Tetramolopium Remyi (A. Gray) Hillebrand, Fl. Haw. Is., p. 197, 1888.

Vittadinia Remyi A. Gray, Amer. Acad., Proc., vol. 5, p. 119, 1861.

Erigeron Remyi (A. Gray) Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 65, pl. 31, 1888.

Woody shrub, 1.5-4.5 dm tall, ramose; branchlets covered below with scars of fallen leaves, elsewhere hispidulous, foliose above. Leaves very closely aggregated, ascending or spreading, rigid, flagelliform, involute above, scabrous, acute at apex, 1.2-2.5 (more rarely -3) cm long and toward apex 0.3-0.9 mm wide, gradually narrowed commonly all the way to the base. Capitula solitary, 12-16 mm broad; peduncles hispidulous, up to 16 cm long remotely bracteate with filiform bracts. Involucre hemispherical, its bracts linear, subscabrid, scarcely subciliate, the inner ones marginally translucent, the outermost ± 1.8 the others up to 6.5 mm long. Receptacle finally manifest, weakly convex. Ligulate florets ± 150, white, more or less biseriate, 6-8 mm long; ligules elongate-linear, twice as long as tube, revolute, 2-3-denticulate. Achenes narrowly obovate, straw-brown, flat, thicker at margins, appressed-hispidulous, on faces longitudinally 1-ribbed, the rib single or rarely double, body about 2.2 mm long; pappus white, the setae few, very minutely antrorse-hispid and to the body more or less equal.

Type: collected by Jules Remy, no. 239, on Maui, 1851-55 (Gray).

Specimens examined: William Hillebrand, Hawaiian islands (U. S.); Hillebrand, Maui and Lanai (Berlin, Gray); Hillebrand, mountain between Lahaina and Wailuku, Maui, July 1858 (Bishop, Vienna Mus.); Hillebrand, between Lahaina and Wailuku Valley, August 1870 (Berlin); Hillebrand 21, altitude 2,500 feet, west Maui, commun. July 1865 (Kew); J. M. Lydgate, Lanai (Berlin); H. Mann and W. T. Brigham 360, Lanai (Bishop, U. S.); Mann and Brigham 373, mountain above Maalaea Bay, western Maui (Delessert; Field, 2 sheets; Gray; Missouri); G. C. Munro, Lanai, June 24, 1915 (Field); Munro, Lanai, June 29, 1915 (U. S.); Munro, Lanai, October 16, 1916 (Bishop); Munro, Lanai, September 1917 (Bishop, Field, New York); Munro, Lanai, May 7, 1918 (U. S.); Munro, Awalua, Lanai, May 1921 (Bishop); Munro 154, Kaohai, Lanai, June 23, 1914 and July 8, 1914 (Bishop); Munro, Kahinahina, Lanai, June 24, 1915 (Bishop, Missouri, New York); Munro 263, same date and location (Bishop); Munro 351, Kaohai, Lanai, June 22, 1914 (Bishop); Remy 239 (type, Gray); Heinrich Wawra, voyage "Donau," 2306, Maui, 1868-71 (Vienna Mus.).

The plants from Lanai tend to exceed in many dimensions most but not all the plants from Maui. They are not, however, separable varietally.

Distribution: islands of Lanai and Maui.

3. Tetramolopium Bennettii Sherff (fig. 2).

Tetramolopium Bennettii Sherff, Bot. Gaz., vol. 95, p. 498, 1934.

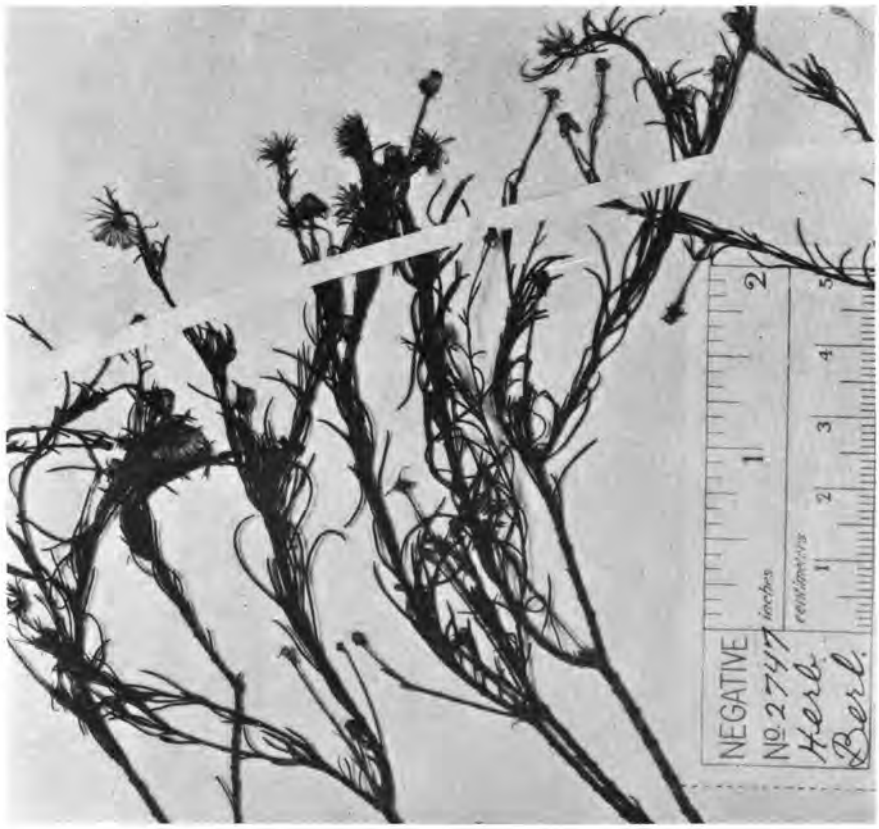

FIGURE 2.—*Tetramolopium Bennettii* (type).

Slender, branched shrub 5-8 dm tall, stem and branches naked below. Leaves disposed rather numerously along ultimate branchlets, commonly suberect, filiform, thick, glabrate, on upper surface canaliculate, at apex somewhat acute, 1.5-2.5 cm long and about 0.3-0.4 mm wide. Capitula about 1 cm broad, slenderly pedunculate; peduncles very minutely glandular, 1-3-bracted, only 1-2.5 cm long, terminating the branches. Involucre about 4 mm tall, its bracts lanceolate-linear, very sharp, and more or less glandular and subciliate. Ligulate florets 30-45, corollas about 3.5-4 mm long, the limb scarcely or no shorter than the tube. Tubular florets ± 16; corollas about 3.5 mm long, purplish at top, surpassing the pappus. Achenes flat, oblanceolate, brownish-stramineous, appressedly erect-hispidulous, on each face singly or sometimes doubly costate, 2 mm long.

Type: collected by Frederick Debell Bennett, no. 18, Maui, 1833-36 (Berlin).

Specimens examined: Bennett 18 (type, Berlin); C. N. Forbes, ridge east of Wainee, Maui, August 1910 (Bishop); Forbes, Lahainaluna, Maui, August 1910 (Bishop).

Distribution: Maui.

4. Tetramolopium filiforme Sherff (fig. 3).

Tetramolopium filiforme Sherff, Bot. Gaz., vol. 95, p. 498, 1934.

FIGURE 3.—*Tetramolopium filiforme* (type).

Shrubby, dwarfed, branched, the branchlets covered with scars from the fallen leaves but otherwise glabrous. Leaves very numerous, filiform, sparsely setose, thick, on upper surface more or less canaliculate, at rounded apex cartilaginous and very glabrous, only about 1-1.5 cm long and 0.2-0.5 mm wide. Capitula solitary, slightly exserted beyond the leaves, about 1 cm broad; peduncles very slender, hispidulous, 2-3 cm long. Involucre campanulate-hemispherical; bracts 2- or sub-3-seriate, narrowly or moderately linear, glistening, at apex acute, dorsally glabrous or glabrate, on margins very minutely ciliate, the innermost about 3 mm long, the outermost almost or fully a half shorter. Ligulate

florets about 30-40, linear, reflexed. Tubular florets ± 12, becoming purple, tube much longer than limb. Achenes glistening, brown, flat, oblanceolate, the thickened margins very glabrous, the faces lengthwise now strongly now weakly unicostate and sparsely hispid above, the body about 2.2 mm long; setae of pappus whitish, very slender, very minutely antrorse-hispidulous, equalling the body.

Type: collected by William Hillebrand, Waianae Mountains, Oahu, 1869 (Gray).

Specimens examined: Hillebrand, Waianae Mountains, Oahu, 1869 (type, Gray; cotypes, Berlin, Kew).

Distribution: known only from type locality on Oahu.

5. Tetramolopium polyphyllum Sherff.

Tetramolopium polyphyllum Sherff, Bot. Gaz., vol. 95, p. 499, 1934.

Shrubby, perhaps dwarf and decumbent, branchlets slender and covered in lower parts with scars from the fallen leaves but otherwise glabrous. Leaves very densely crowded toward apex of stem (± 25 per 1 cm of stem), drooping or the highest ones erect, membranaceous, at apex acute, elongate-narrowed below into very slender petioles 1-1.5 cm long, those included 2-4 cm long and 0.4-2.5 mm wide, 1-nerved with nerve impressed above but raised below, flat or more or less revolute, on margins and median nerve hispid-ciliate but elsewhere scabrid-hispidulous or presently glabrate, very entire or above the middle minutely more or less serrulate with serratures ending in short rigid curved-erect cilia or rarely very sharply 1- or 2-dentate with inflexed teeth up to 2.5 cm long. Capitula solitary, exserted, about 9 mm broad, very slenderly pedunculate; peduncles hispid, 1.5-3 cm long, bracted with filiform bracts up to 1 cm long. Involucre hemispherical or widely obconic; bracts linear, acute, very minutely more or less hispidulous and ciliate, the interior ones marginally diaphanous, the outermost ± 1.5 mm the others up to 3.5 mm long. Ligulate florets ± 30, linear, revolute, at apex subtruncate and subentire. Tubular florets ± 24, corolla lobes somewhat surpassing the pappus. Achenes glistening, brown, oblanceolate or narrowly obovate, flat, on margins rather thickish, on faces commonly unicostate but sometimes weakly or not at all costate, very glabrous or very sparsely long-setose with brown and strongly appressed setae, the body about 2 mm long; pappus white or sordid-white, its very slender and most minutely antrorse-hispidulous setae about 2.5-3 mm long.

Type: collected by Heinrich Wawra, voyage "Donau," 2290, Oahu, 1868-71 (Vienna Mus.).

Specimens examined: William Hillebrand, Waianae Mountains, Oahu (Berlin); Hillebrand, southeast slope of Puu Kaala, Makaha, Waianae Mountains, August 1869 (Berlin, Bishop); Wawra 2290 (type, Vienna Mus.).

Distribution: island of Oahu.

6. Tetramolopium tenerrimum (Lessing) Nees.

Tetramolopium tenerrimum (Lessing) Nees, Gen. Sp. Aster., p. 202, 1833.

Aster tenerrimus Lessing, Linnaea, vol. 6, p. 120, 1831.

Vittadinia tenerrima (Lessing), A. Gray, Amer. Acad., Proc., vol. 5, p. 119, 1861.

Erigeron tenerrimus (Lessing) Drake del Castillo and variety *genuinus* Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 67, 1888.

Dwarf, decumbent, 1.5-2.3 dm tall, shrubby, the ultimate branches foliose, the multicaulous rhizome covered with many scars from the fallen leaves. Leaves spreading, very membranaceous, linear-spatulate, 1-nerved, otherwise veinless, flat, at apex obtuse,

at base narrowed into a flat and filiform petiole subequal to the blade, more or less minutely serrulate with serratures ending in short rigid curved-erect cilia, very glabrous or scabridulous, 1-2.5 cm long including the petiole and 1-2.6 mm wide. Capitula solitary, 8-11 mm broad, terminating the branchlets; these very slender, elongate, erect, bracted (bracts 6-12, filiform, about 2 mm long), subnude for 4-6 cm below the summit. Involucre campanulate, subequal to the disc; bracts oblong-linear, acute, 1-nerved, dorsally glabrous, marginally ciliate and scarious, flat, the exterior ones (often spreading) ± 2 mm, the interior ones about 3.5-4 mm long. Ligulate florets ± 30, exserted, the ligule linear-oblong. Tubular florets (at least in dried state) dark-purple, limb of corolla much shorter than tube. Achenes subglistening, from pale to dark, flat, oblanceolate or subnarrowly obovate, glabrous, on margins thick, on faces lengthwise 1-nerved or sometimes nerveless, the body about 2 mm long; pappus sordid-white, the antrorsely and very shortly scabrid-hispidulous setae 2-2.5 mm long.

Type: collected by Adelbert von Chamisso, on Oahu, 1817. Lessing reported having seen four specimens. Of these I have seen for a certainty only two (Berlin and Leningrad). Many such specimens in Klatt's private herbarium had been abstracted from type collections in various European herbaria. The present description corresponds with the Berlin specimen by Chamisso so exactly that this may indeed have been one of the four Chamisso plants which Lessing studied.

Specimens examined: anonymous in herbarium of F. W. Klatt (Gray); Eschscholtz, Oahu (Leningrad); James Macrae, Oahu, May 1825 (Gray); Chamisso, Oahu, 1816-17 (type collection, Berlin; Leningrad).

The type species of the genus.

Distribution: island of Oahu.

7. **Tetramolopium Rockii** Sherff (fig. 4).

Tetramolopium Rockii Sherff, Bot. Gaz., vol. 95, p. 500, 1934.

Dwarf shrub, erect or more or less depressed, 3-4.5 dm tall, very much branched, the branchlets hispidulous, very densely foliose above. Leaves spatulate, flat, rather thickish, at apex obtuse or rounded, gradually narrowed below into a strong rigid flattish margined hispid-ciliate petiole 4-8 mm long, obsoletely 1-nerved, on faces rugose-papillate and more or less hispidulous and glandular, on margins hispid-ciliate and entire or toward apex very minutely serrulate, 1-1.8 (more rarely -2.7) cm long including petiole and 2-3.5 (more rarely -6) mm wide. Capitula solitary, about 1.2-1.5 cm broad; peduncles moderately strong, hispidulous, few-bracted, 5-12 cm long, terminating the branchlets. Involucre 5-6 mm tall; bracts numerous, oblong-linear, acute, externally glandular-hispidulous. Ligulate florets 60-80, whitish, the ligule a little shorter than the tube. Tubular florets numerous, whitish in the dry state, corolla lobes exserted. Achenes straw-yellowish, obovate, flat, on faces antrorsely appressed-hispidulous and noticeably 1-nerved, on margins callous-thickened and weakly erect-hispid, body about 2 mm long, pappus white and about 3 mm long.

Type: collected by J. F. Rock, no. 10299, on beach, Moomomi, Molokai, March 1910 (Gray).

Specimens examined: Rock 10299 (type, Gray; cotypes, Berlin, Bishop, Field).

Distribution: near west end of northern coast, island of Molokai.

8. **Tetramolopium lepidotum** (Lessing) Sherff.

Tetramolopium lepidotum (Lessing) Sherff, Bot. Gaz., vol. 95, p. 500, 1934.

Erigeron lepidotus Lessing, Linnaea, vol. 6, p. 502, 1831.

Vittadinia Chamissonis A. Gray, Amer. Acad., Proc., vol. 5, p. 119, 1861.

Tetramolopium Chamissonis (A. Gray) Hillebrand, Fl. Haw. Is., p. 199, 1888.

Erigeron tenerrimus variety *lepidotus* (Lessing) Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 67, 1888.

Vittadinia Chamissonis A. Gray, ex Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 67, 1888.

FIGURE 4.—*Tetramolopium Rockii* (type).

Leaves commonly 1.5-2.5 cm long and 1-5 mm wide.....**T. lepidotum**
Leaves 3-5 cm long and 5-10 mm wide.....**variety β luxurians**

Shrubby, erect, 3-4.5 dm tall, very much branched; branches erect, corymbose, terete, puberulous, the younger ones foliose up to the apex, the older ones leafless and at times (in contracted and more ligneous specimens) tuberculate with scars of the fallen leaves. Leaves spatulate-linear or oblanceolate-linear, toward base gradually narrowed, membranaceous, now very entire, now toward apex on both sides sharply and sometimes deeply 1-2-dentate, flat, hirsute-ciliate, along veins more or less appressed-hispid otherwise glabrate but very minutely and very numerously papillose-punctulate, 1-nerved

along middle, otherwise obsoletely penninerved, 1.5-2.5 cm long and 1-3 (or among teeth -5) mm wide, the juvenile or radical ones often larger. Capitula more often 5-10-congregated in a scarcely exserted corymb, about 5-7 mm broad; pedicels very slender, hispid, more often accompanied by a filiform bract, the ultimate ones commonly 0.5-2 cm. long. Involucre 2.5-4 mm. tall; bracts linear, acute or acuminate, moderately ciliate, externally somewhat pilose. Ligulate florets 15-25, shortly exserted, the ligules white, commonly revolute and subequal to the tube. Tubular florets 5-12, purplish, corolla lobes often slightly exserted beyond the uniseriate pappus. Achenes obovate-oblong, on margins callous-thickened and eciliate, on faces glabrate or more often sparsely seldom moderately appressed-hispid, noticeably or almost obsoletely costate (ribs now 1 now 2), body ± 1.6 mm long, pappus sordid and a little longer.

Type: collected by Adelbert von Chamisso on Oahu, 1816-17 (? Berlin).

Specimens examined: Abbé Urbain Faurie, Puu Kaala, Oahu, November 1910 (Bishop, Delessert); C. N. Forbes 509-L in part, Lanai, September 1917 (Bishop, Field, cum varietate luxurianti commixtum); William Hillebrand, Hawaiian islands (Berlin, Vienna Mus.; U. S., cum T. humili commixtum); Hillebrand, Lanai (Berlin); Hillebrand, Waianae, Oahu (Berlin); Hillebrand 20, Waianae Mountains, Oahu, June 1861 (Kew, Vienna Mus.); A. F. Judd and Carl Skottsberg 362, north slope of Puu Kaala, Waianae Mountains, Oahu, August 30, 1922 (Göteborg); James Macrae, Oahu, May 1825 (Gray, Kew); H. Mann and W. T. Brigham 355 in part, Lanai (Delessert; Field, 2 sheets; Missouri; U. S.); A. Meebold, altitude 1,800 feet, Makaleha ridge, Puu Kaala, Oahu, June 1932 (Bishop); D. L. Topping 2863, Puu Kalena, Oahu, September 14, 1924 (New York); U. S. Exploring Expedition, Oahu, 1840 (Gray, New York, U. S., type collection of Vittadinia Chamissonis A. Gray); Chamisso, Oahu, 1816-17 (Berlin, type collection; cum varietate luxurianti commixtum); Heinrich Wawra 2292, Oahu, 1868-71 (Vienna Mus.).

The type herbarium was not cited by Lessing. He stated, however, that he had seen several dried specimens. The Berlin sheet is from Kunth's herbarium and bears three specimens given to Kunth by Chamisso in 1831. While any Chamisso material still extant at Halle or Leningrad would by some be taken as the type, the Berlin sheet is thoroughly ample. One specimen is the form described by Lessing for his *Erigeron lepidotus,* having "folia . . 6-9 ‴ longa," and later described by Asa Gray as *Vittadinia Chamissonis.* The other two specimens are larger and have leaves 3-5.5 cm long. These match the type material at Kew of *Erigeron pauciflorus* Hooker and Arnott and the type material in Berlin of *Tetramolopium Chamissonis* variety *luxurians* Hillebrand.

Distribution: islands of Lanai and Oahu.

Tetramolopium lepidotum variety **β luxurians** (Hillebrand) Sherff.

Tetramolopium lepidotum variety *luxurians* (Hillebrand) Sherff, Bot. Gaz., vol. 95, p. 501, 1934.

Erigeron pauciflorus Hooker and Arnott, Bot. Beechey's Voy., p. 87, 1832.

More robust; leaves 3-5 cm long and 5-10 mm wide, now very entire, now suddenly all very sharply laciniate-dentate with 2-4 teeth on each side. Capitula often a little more numerous and a little more exserted, outermost ligulate florets diminished in size. Achenes glabrate, the faces often nerveless.

Type: collected by William Hillebrand, Waianae, Oahu (Berlin).

Specimens examined: Captain Beechey, Oahu (Kew, type of Erigeron pauciflorus

Hooker and Arnott); Otto Degener and Kwan Kee Park 5000, among rocks on steep slope, partly up Puu Kaala from Waianae Valley, Oahu, April 24, 1932 (Berlin, British, Field, Gray, Kew, Missouri, New York); Degener, Park, and William Bush 5001, wind-swept, comparatively dry but often misty region, near summit of ridge on right side of head of Makua Valley, Oahu, June 26, 1932 (Field, New York); Degener, Park, and Bush 5002, wind- and fog-swept grassy and shrubby slope, northern side of main ridge between Puu Kamaohanui and Puu Pane, Oahu, June 11, 1932 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, New York, Paris, U. S., Vienna Mus. and Univ.); C. N. Forbes 509-L in part, Lanai, September 1917 (Bishop, 2 sheets; Field, 2 sheets, pro parte cum specie ipsa commixtum; New York); William Hillebrand, Lanai, 1870 (Gray, Kew); Hillebrand, Waianae, Oahu (type, Berlin); Hillebrand and J. M. Lydgate, Lanai (Bishop); A. S. Hitchcock 13954, west end of Lanai, September 22, 1916 (Bishop); Hitchcock 14718, open, grassy ground, same time and location (Bishop, U. S.); H. Mann and W. T. Brigham 355, Lanai (Bishop, Gray); G. C. Munro, Lanai (Bishop); Munro, Lanai, February 8, 1916 (U. S.); Munro 221, Miki, Lanai, November 19, 1913 (Bishop); Munro 364, Miki, Lanai, November 14, 1913 (Bishop); Munro 507, Miki, Lanai, February 8, 1916 (Bishop, Field, Missouri, New York); Chamisso, Oahu, 1816-17 (Berlin, cum specie ipsa commixtum).

In his text Hillebrand cited "Lanai! Oahu! *Waianae*" for his variety. Though specimens by him from Lanai are in Kew and Gray Herbaria, his own herbarium, which he used for his text and which is now at Berlin, contains only the Oahu material.

Distribution: islands of Lanai and Oahu.

9. Tetramolopium arbusculum (A. Gray) Sherff (fig. 5, *c*).

Tetramolopium arbusculum (A. Gray) Sherff, Bot. Gaz., vol. 95, p. 502, 1934.

Vittadinia Chamissonis variety *arbuscula* A. Gray, Amer. Acad., Proc., vol. 5, p. 120, 1861.

Tetramolopium Chamissonis variety *arbusculum* (A. Gray) Hillebrand, Fl. Haw. Is., p. 199, 1888.

Erect shrub, the lower branches glabrate. Leaves very densely disposed along ultimate branchlets, the lower ones dead and drooping; the other ones ascending, somewhat rigid, very narrowly linear or almost filiform, flat or canaliculate, glabrous (but very densely resinous-punctulate) or sparsely pilose, 1-nerved, entire or irregularly 1- (rarely 2-) dentate with narrow rigid inflexed teeth 1-2 mm long, at apex acute and callous-indurated, gradually narrowed from below middle to base, 1.5-3 (rarely -4) cm long and 0.5-1 (rarely -2) mm wide. Capitula not exserted, about 1 cm broad, peduncles not conspicuous. Involucre broadly obconic; bracts linear, commonly acute, glabrate or marginally suberose-ciliate, 1-4 mm long, the inner ones scarious. Ligulate florets about 16-20, the linear ligules short and a half shorter than the tube. Tubular florets ± 6, brown-purplish when dry, very slender, the tube 2-3 times as long as the limb. Achenes subglistening, flat, oblanceolate, at margins thicker, on faces appressed-setose above and medianly 1-nerved, the body about 2 mm long; pappus sordid-white, the setae most minutely antrorse-hispidulous and 2.5-3 mm long.

Type: collected by the U. S. Exploring Expedition on the crater of Haleakala, Maui, in 1840 (U. S.).

Specimens examined: U. S. Exploring Expedition, crater of Haleakala, Maui, 1840 (type, U. S.; cotype, Gray).

Distribution: island of Maui.

FIGURE 5.—*Tetramolopium* and *Lipochaeta: a, T. consanguineum* variety *leptophyllum* (type); *b, L. integrifolia* variety *megacephala* (type); *c, T. arbusculum* (cotype, Gray Herbarium).

10. Tetramolopium consanguineum (A. Gray) Hillebrand.

Tetramolopium consanguineum (A. Gray) Hillebrand, Fl. Haw. Is., p. 199, 1888.

Vittadinia consanguineum A. Gray, Amer. Acad., Proc., vol. 5, p. 120, 1861.

Erigeron tenerrimus variety *consanguineus* (A. Gray) Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 67, 1888.

Leaves 1.2-1.8 cm long and 1.5-2.3 mm wide.....**T. consanguineum**
Leaves 3-4.5 cm long and 1-1.5 mm wide.....**variety β leptophyllum**

Shrubby, very much corymbose-branched, the branches sparsely or subsparsely hispid up to the very foliose summits. Leaves linear-spatulate, gradually narrowed below to the base, at apex scarcely mucronate, 1-nerved or toward base obsoletely 3-nerved, very entire, ciliate, on faces very numerously and very minutely glandular and along nerves more or less hispid, flat, 1.2-1.8 cm long and 1.5-2.3 mm wide. Capitula loosely disposed, about 6-8 mm broad; pedicels very slender, hispid, 1-3 cm long, 1-3-bracted with linear bracts. Involucre about 3 mm tall; bracts linear-oblong, very obtuse, the scarious margins very numerously denticulate-ciliate. Ligulate florets 25-30, the ligule a little shorter than the tube. Tubular florets 5-7, in the dry state purple, equalling the pappus. Achenes obovate, sparsely erect-hispid or finally glabrate, on margins thickened, on faces manifestly 1-3-nerved, the body about 1.6-1.75 mm long, the pappus sordid-white and a little longer.

Type: collected by the U. S. Exploring Expedition, on mountains, Kauai, 1840 (U. S.).

Specimens examined: U. S. Exploring Expedition, mountains, Kauai, 1840 (type, U. S.; cotype, Gray, cum varietate leptophyllo commixtum).

Gray cited "Hawaii and the mountains of Kauai" for the habitat. But his description was founded primarily upon the Kauai plants. This is shown by his description of the leaves, "foliis lineari-lanceolatis seu lineari-spathulatis . . . integerrimis (raro 1-2-dentatis)." The official type sheet (U. S.) bears one specimen, and this came from Kauai. The plants from Hawaii differ abruptly in foliage and must be distinguished varietally (variety *leptophyllum*).

Distribution: island of Kauai.

Tetramolopium consanguineum variety **β leptophyllum** Sherff (fig. 5, *a*).

Tetramolopium consanguineum variety *leptophyllum* Sherff, Bot. Gaz., vol. 95, p. 502, 1934.

Leaves narrowly linear, on each side often 1-2-denticulate with small teeth (similar to a finger and ± 0.6 mm long), 3-4.5 cm long and 1-1.5 mm wide.

Type: collected by the U. S. Exploring Expedition at Waimea, Hawaii, 1840 (New York).

Specimens examined: U. S. Exploring Expedition, Waimea, Hawaii, 1840 (type, New York; cotype, Gray, cum specie ipsa commixtum).

Distribution: northern Hawaii.

11. Tetramolopium arenarium (A. Gray) Hillebrand.

Tetramolopium arenarium (A. Gray) Hillebrand, Fl. Haw. Is., p. 199, 1888.

Vittadinia arenaria A. Gray, Amer. Acad., Proc., vol. 5, p. 120, 1861.

a. Leaves entire..... **T. arenarium**
a. Some or all leaves cuspidately 1-2-dentate on each edge
b. Capitula long (1-3 cm)-pedicellate and loosely disposed, 1-1.3 cm broad..... **variety β dentatum**
b. Capitula shorter-pedicellate, crowded together, 4-6 mm broad.... **variety γ confertum**

Suffruticose, erect, hirtellous or hispid, about 6 dm tall, sparsely branched; branches virgate, herbaceous, viscid, foliose from base to summit. Leaves narrowly oblanceolate or oblong-lanceolate, gradually narrowed downwardly to a flat base, at apex mucronate but scarcely acuminate, very entire, membranaceous, at margins hirtous-ciliate, on faces 1-nerved and now weakly now strongly appressed-setose, 2.5-5.5 cm long and 3-7.5 mm wide. Capitula disposed 5-12 in terminal, contracted, shortly exserted corymbs, 6-9 mm broad; pedicels hispid, more often 0.5-1.5 cm long accompanied by linear bracts. Involucre 3-5 mm tall; bracts oblong-lanceolate, submembranaceous, dorsally more or less hispid and apically acute. Ligulate florets 30-35, pluriseriate, corollas 4-5 mm long, the limb scarcely or no shorter than the tube. Tubular florets 5-9, fertile, corollas pale, 3.5-4 mm long, surpassed by the pappus, the limb deeply lobed and much shorter than the tube. Achenes oblanceolate, antrorsely appressed-setose or perhaps rarely glabrate, on faces strongly 1-costate or commonly 2-costate, the body about 2 mm long; pappus silky-whitish, the 20-26 setae about 4 mm long.

Type: collected by the U. S. Exploring Expedition on the sand hills of Maui, 1840 (U. S.). Gray (Amer. Acad., Proc., vol. 5, p. 120, 1861) cited identical material collected on the same expedition in the district of Waimea on the island of Hawaii.

Specimens examined: William Hillebrand, Hawaii (Berlin, Vienna Mus.); Hillebrand, Maui (Berlin); Hillebrand, Kula, eastern Maui (Berlin); Hillebrand 22, altitude 2,500 feet, Kula (Gray, Kew); H. Mann and W. T. Brigham 519, Puu Hualalai, Hawaii (Bishop, Delessert, Gray, Missouri, U. S.); U. S. Exploring Expedition, Maui, 1840 (type, U. S.; cotype, Gray); U. S. Exploring Expedition, district of Waimea, north Hawaii, 1840 (U. S.); Heinrich Wawra 2308, Maui, 1868-71 (Vienna Mus.).

Distribution: islands of Maui and Hawaii.

Tetramolopium arenarium variety **β dentatum** Hillebrand.

Tetramolopium arenarium variety *dentatum* Hillebrand, Fl. Haw. Is., p. 200, 1888.

Leaves cuspidately 1-2-dentate on each edge. Capitula loosely 5-9-congregated, moderately exserted, finally 1-1.3 cm broad, pedicels about 1-3 cm long.

Type: collected by J. M. Lydgate, at Hamakua, east Maui (Berlin).

Specimens examined: Lydgate, Hamakua, Maui (type, Berlin).

In hispidity of leaves and apparently also in habit of branching closer to *T. arenarium,* but in laxity of inflorescence more like *T. lepidotum* variety *luxurians.*

Distribution: known only from type locality in east Maui.

Tetramolopium arenarium variety **γ confertum** Sherff (fig. 6).

Tetramolopium arenarium variety *confertum* Sherff, Bot. Gaz., vol. 95, p. 502, 1934.

FIGURE 6.—*Tetramolopium arenarium* variety *confertum* (type).

More branched, the branchlets commonly under 1 dm long. Leaves 1.5-3 cm long and 3-5 mm wide, often dentate toward the apex with one sharp tooth on each edge. Capitula crowded together, finally 4-6 mm broad, the pedicels not or scarcely noticeable, involucre 2.5-3.5 mm tall.

Type: collected by J. M. Lydgate at Nohoananohea near Waimea, Hawaii, December 1872 (Berlin). The label is Hillebrand's; Lydgate elsewhere spells the place name Nohoananohae. (The correct spelling is Nohonaohae.)

Specimens examined: Hillebrand and Lydgate, growing 2-4 feet tall, Nohoananohea near Waimea, Hawaii, December 1872 (Bishop); Lydgate, same date and location (type, Berlin).

Distribution: known only from type locality on the island of Hawaii.

12. **Tetramolopium conyzoides** (A. Gray) Hillebrand.

Tetramolopium conyzoides (A. Gray) Hillebrand, Fl. Haw. Is., p. 200, 1888.

Vittadinia conyzoides A. Gray, Amer. Acad., Proc., vol. 5, p. 120, 1861.

Leaves 2.5-4 cm long and 3-5 mm wide, very entire.....**T. conyzoides**
Leaves 6-7 cm long and 8-12 mm wide, often minutely few-toothed...**variety β dentatum**

Erect, much branched, hispid-villous, ligneous below, 6-9 dm tall, the ultimate branches herbaceous. Leaves linear-oblanceolate, gradually narrowed below into a petiole, membranaceous, 3-nerved with median nerve manifest and the others obscure, very entire, more or less mucronate at the subobtuse apex, pubescent, 2.5-4 cm long and 3-5 mm wide. Capitula numerous, 30-60 congregated together in an exserted corymb, small, 2-4 mm broad. Involucral bracts few, oblong-linear, subacute, subequal to the disc, sparsely hispidulous. Ligulate florets 16-30, the outermost sterile; ligules very short, commonly erect, not exserted beyond pappus. Tubular florets 1 or 2, fertile. Achenes flat, narrowly obovate, hispid, body about 1 mm long, faces obscurely or obsoletely 1-nerved; pappus white, exceeding body by almost a half.

Type: collected by the U. S. Exploring Expedition, on the sand hills of Maui, 1840 (U. S.).

Specimens examined: William Hillebrand, central plateau of Hawaii (Berlin, Bishop); Hillebrand and J. M. Lydgate, Kula, Maui (Bishop); J. M. Lydgate, Kula, 1884 (Berlin); H. Mann and W. T. Brigham 532, Lanai (Bishop; Delessert; Field, 2 sheets; Gray; Missouri; U. S.); G. C. Munro 675-M, Kumikaipo, Molokai, June 22, 1919 (Bishop); U. S. Exploring Expedition, sand hills of Maui, 1840 (type, U. S.; cotype, Gray).

Distribution: islands of Molokai, Maui, Lanai, and Hawaii.

Tetramolopium conyzoides variety **β dentatum** (H. Mann) Sherff.

Tetramolopium conyzoides variety *dentatum* (H. Mann) Sherff, Bot. Gaz., vol. 95, p. 502, 1934.

Vittadinia conyzoides variety *dentata* H. Mann, Enum. Haw. Pl., under no. 203, Amer. Acad., Proc., vol. 7, p. 173, 1867.

Principal leaves often 2-3-denticulate toward apex, 6-7 cm long and 8-12 mm wide.
Type: collected by Horace Mann and W. T. Brigham, no. 361, on Lanai (Gray).
Specimens examined: Mann and Brigham 361 (type, Gray).

Distribution: island of Lanai.

SPECIES EXCLUDED

Tetramolopium? ochraceum De Candolle, Prodr., vol. 5, p. 262, 1836. = *Diplostephium ochraceum* (Humboldt, Bonpland, and Kunth) Nees, Gen. Sp. Aster., p. 201, 1832.

Tetramolopium? phylicoides De Candolle, Prodr., vol. 5, p. 262, 1836. = *Diplostephium phylicoides* (Humboldt, Bonpland, and Kunth) Weddell, Chlor. And., vol. 1, p. 205, 1855.

Tetramolopium rupestre (Humboldt, Bonpland, and Kunth) Nees, Gen. Sp. Aster., p. 203, 1833. = *Diplostephium rupestre* (Humboldt, Bonpland, and Kunth) Weddell, Chlor. And., vol. 1, p. 206, 1855.

Genus **LIPOCHAETA** De Candolle

Lipochaeta De Candolle, Prodr., vol. 5, p. 610, 1836.

Commonly fruticose or suffruticose, more rarely herbaceous, strigose sericeo-canescent or scabro-pubescent; stems commonly branched, terete or more rarely angulate. Leaves opposite, entire, dentate, lobate, or 1-3-pinnatisect. Capitula medium-sized or rather small, commonly 0.5-2.5 cm broad, pedunculate or pedicellate, solitarily loosely or sometimes subdensely disposed, radiate, heterogamous. Involucre broadly campanulate or hemispherical, more often short; bracts sub-2-seriate, slightly unequal, rigid, herbaceous, or at base coriaceous. Receptacle flat or gently convex, covered with paleae; these somewhat rigid, folded together or finally cucullate, embracing florets or enclosing achenes. Ray florets 1-seriate, pistillate, fertile, yellow, spreading, subentire or at apex barely 2-3-dentate. Disc florets hermaphrodite, the outer ones fertile, their corollas regular, tubular, the narrowly campanulate limb apically 5-fid. Anthers sagittate with minute often mucronulate auricles. Style branches linear, at apex obtuse or shortly and acutely appendiculate. Achenes obovate or oblong, thickish or swollen; the 2-4 (of the ray more often 3, of the disc 2) angles acute or narrowly alate (wings at times interrupted and thickish), more rarely obtuse or tuberculate, faces often tuberculate, apex truncate and with narrow disc at center. Pappus aristae entirely lacking or present and unequal, often some very short (intermediate squamellae or setulae many or none). (Description correlated in large part with the descriptions by Bentham and Hooker, Gen. Pl., vol. 2, p. 372, 1873, and by Hillebrand, Fl. Haw. Is., p. 205, 1888).

Type: *Lipochaeta lobata* (Gaudichaud) De Candolle, Prodr., vol. 5, p. 611, 1836.

History of the Genus

De Candolle (Prodr., vol. 5, p. 610, 1836) created the name *Lipochaeta* as a new name for "Lipotriche *Less. syn.* 231, *et in Linnaea* 1831. p. 310 [510] *non Brown.*" On reference to the first work cited, namely Lessing's "Synopsis Generum Compositarum," we find *Lipotriche* R. Brown described and accompanied by the following synonymy: "*L. gymnolomoides* Linnaea VI. 408, *L. australis* l. c. p. 510—*Verbesina lobata* Gaud." But De Candolle clearly did not intend *L. gymnolomoides* as a basis for his *Lipochaeta,* for on the page next preceding his description of *Lipochaeta* he had already transferred *L. gymnolomoides* to *Perymenium.* He intended, we must conclude, *L. australis* Lessing as a basis. This is indicated, further, by his omission of Linnaea, vol. 6, p. 408, the place where Lessing gave *Lipotriche gymnolomoides,* and his definite citation of Linnaea "6:310" (meaning, of course, vol. 6, p. 510). In this latter place Lessing dealt solely with *L. australis,* a species that had already been described by Gaudichaud (Voy. Freycinet, Bot., p. 464, 1830) under the name of *Verbesina lobata.* Thus, if we use De Candolle's synonymy, we are led directly to the species now known as *Lipochaeta lobata* (Gaudichaud) De Candolle for the type of the genus.

In his arrangement of species, De Candolle placed four American ones first, following those by five from the Hawaiian islands. The American species are now universally referred to *Zexmenia* and the Hawaiian species are just as universally retained for *Lipochaeta.* We may note, however, that Nuttall (Amer. Philos. Soc., Trans., 2d ser., vol. 7, pp. 450-452, 1841), apparently ignoring De Candolle's synonymy and accepting De Candolle's four American species as typifying and validating *Lipochaeta,* created the names *Microchaeta* and *Schizophyllum* for the generically different Hawaiian species (*Microchaeta* including also two species of *Wollastonia* De Candolle). Endlicher (Gen. Pl., suppl. 2, p. 43, 1842) shortly afterwards renamed *Schizophyllum,* calling it *Aphanopappus. Macraea* J. D. Hooker (Linn. Soc., Proc., vol. 1, p. 278, 1845) was based upon a single species from the Galapagos Islands, *Macraea laricifolia* J. D. Hooker. *Trigonopterum* Steetz (Vet. Akad. Handl. Stockh. 1853, p. 183, 1855) was based upon a single species from the Galapagos Islands, *T. Ponteni* Anderson (Vet. Akad. Handl. Stockh. 1853, p. 184, 1855), which was later found to be identical with *Macraea laricifolia* (see Anderson, Sv. Freg. Eugenies Resa 72, pl. 6, fig. 1, 1857).

In 1861, Asa Gray (Amer. Acad., Proc., vol. 5, p. 129) reduced *Microchaeta* Nuttall and *Schizophyllum* Nuttall (together with the latter's synonym *Aphanopappus* Endlicher) to *Lipochaeta,* retaining *Lipochaeta* for the Hawaiian species of De Candolle. He reduced *Macraea* J. D. Hooker (and its synonym *Trigonopterum* Steetz) to *Lipochaeta.* He described several new species. He presented a brief but cogent argument for the retention of *Lipo-*

chaeta as a genus to include a certain assemblage of Hawaiian and Galapagos Island species which are difficultly separable "from *Wedelia* on the one hand and *Zexmenia* on the other." (In the summer of 1932, Dr. S. F. Blake made a somewhat extended examination of the nomenclatural status of *Lipochaeta*. His conclusions he wrote in a letter to Otto Degener under date of August 1, 1932. These have been before me in the writing of this brief historical note. Blake unreservedly agreed with Gray in retaining the name *Lipochaeta,* at least for the Hawaiian species; he did not deal with those of the other islands of the Pacific.)

Bentham and Hooker (Gen. Pl., vol. 2, p. 373, 1873) adopted Gray's treatment essentially but divided the genus into two sections, for which they used the names *Microchaete* and *Aphanopappus*. (Gray seems also to have intended to use *Aphanopappus* as a section, as he included the name parenthetically in the names *L. micrantha, L. Remyi,* and *L. laricifolia.*) They accepted Gray's reduction of *Macraea* and referred it to their section *Aphanopappus*. In a recent paper (Bot. Gaz., vol. 95, p. 82, 1933) I have stated reasons for assigning *Macraea* distinct sectional status, to include the one species *L. laricifolia*. It may be noted that since Gray's time the range for *Lipochaeta* has been re-extended by the finding of *L. lifuana* in the Loyalty and New Hebrides Islands of the southern Pacific Ocean.

Key

a. Principal leaves undivided or at times scarcely lobed
  b. Principal leaves sessile
    c. Principal leaves 0.8-5.5 mm wide
      d. Principal leaves spatulate or linear-oblanceolate, 2.5-5.5 mm wide; plant of the Hawaiian islands ..... **10. L. Degeneri**
      d. Principal leaves linear, 0.8-1.5 (more rarely -3.2) mm wide; plant of the Galapagos Islands ..... **23. L. laricifolia**
    c. Principal leaves much wider
      d. Leaves contracted below into a base 8-12 mm wide
        e. Plants of Kauai and Hawaii ..... **4. L. profusa and variety β robustior**
        e. Plants growing elsewhere ..... **18. L. heterophylla and varieties**
      d. Leaves not contracted below
        e. Principal leaves 2-8 cm long ..... **18. L. heterophylla**
        e. Principal leaves 0.8-2 dm long
          f. Leaves commonly connate at base and often auriculate ..... **1. L. connata**
          f. Leaves otherwise ..... **2. L. acris**
  b. Principal leaves more or less petiolate
    c. Principal leaves linear
      d. Plant of the Galapagos Islands ..... **23. L. laricifolia**
      d. Plants from Hawaiian islands
        e. Leaves narrowly linear, 1-3 mm wide
          f. Leaves 1-2 mm wide, some of the principal ones 1-dentate (or barely 1-lobulate) on each edge below the middle ..... **9. L. integrifolia variety γ gracilis**
          f. Leaves 1.5-3 mm wide, marginally entire or minutely and numerously denticulate ..... **13. L. lavarum variety δ Skottsbergii**
        e. Leaves wider ..... **18. L. heterophylla**

c. Principal leaves wider
  d. Blades of leaves narrowed below to a scarcely petioloid base or more or less alate-petiolate
    e. Leaves small, spatulate or narrowly oblanceolate, commonly 1-4 cm. long
      f. Plants commonly procumbent; leaves subfleshy, when dry more or less twisted and weakly conduplicate; capitula finally thick and 9-11 mm broad.....**9. L. integrifolia and varieties**
      f. Plants commonly erect; leaves membranaceous, flat when dry; capitula slender and 4-7 mm across.....**10. L. Degeneri**
    e. Leaves larger
      f. Stems herbaceous, more or less flexible
        g. Stems succulent, more or less terete.....**8. L. succulenta and varieties**
        g. Stems not succulent, angulate
          h. Stems very slender, very elongate, more or less procumbent; leaves deltoid-lanceolate, about 3.5-5.5 cm long including the petiole; plant of Oahu.....**6. L. tenuis**
          h. Stems thicker, shorter, commonly erect; leaves lanceolate-oblong to narrowly oblong-ovate or rarely subhastulate, 5-9 cm including the petiole; plant of Kauai.....**17. L. Fauriei**
      f. Stems fruticose
        g. Capitula few, more or less solitarily disposed, peduncles often 7-14 cm long.....**18. L. heterophylla and varieties**
        g. Capitula corymbosely or cymosely disposed, pedicels short
          h. No leaves lobulate unless at their very base
            i. Leaves moderately or narrowly rhombic-ovate, their margins sharply and conspicuously (more often doubly or laciniately) dentate.....**2. L. acris**
            i. Leaves broadly deltoid-ovate or rhombic-ovate, their margins sharply and doubly serrate.....**3. L. alata and variety β acrior**
            i. Leaves variously hastulate-ovate, ovate, oblong, or lanceolate, moderately and often crenately serrate.....**11. L. lobata varieties β hastulata and η hastulatoides**
          h. Some leaves lobate
            i. Petiolar bases dilated-connate.....**18. L. heterophylla variety γ malvacea**
            i. Petiolar bases not dilated-connate.....**19. L. Rockii variety β subovata**
  d. Blades of leaves manifestly but sometimes shortly slender-petiolate
    e. Leaves cordate or subcordate even at base.....**5. L. subcordata**
    e. Leaves otherwise
      f. Plants evidently procumbent or scarcely suberect
        g. Plants of Hawaiian islands
          h. Leaves truncate or subtruncate at base, apically obtuse or subacute.....**7. L. perdita**
          h. Leaves subtruncate or very widely cuneate at base, apically acute.....**6. L. tenuis**
          h. Leaves moderately or narrowly cuneate at base, apically obtuse or subrotund.....**9a. × L. procumbens**
        g. Plants from Lifu and Annatam.....**14. L. lifuana**
      f. Plants more or less erect
        g. Leaves more or less cordate at base.....**11. L. lobata variety ε Aprevalliana**
        g. Leaves cuneate or rounded at base
          h. Some leaves more or less hastate
            i. Leaves numerous, many about 2-3 cm, largest about 4-5 cm long; plant of Kahoolawe.....**15. L. Bryanii**

i. Leaves fewer, principal ones commonly 3-6, sometimes up to 8 (more rarely 10) cm long; plant of Oahu.....**11. L. lobata**

h. Leaves commonly not hastate

i. Leaves green in dry state.....**11. L. lobata varieties γ denticulata, δ leptophylla, and θ grossedentata**

i. Leaves pale or canescent in dry state

j. Leaves coriaceous, subglistening and subglabrate above.....**11. L. lobata variety ζ albescens**

j. Leaves thinner or more delicate, canescent or whitish-hispid

k. Capitula 1.8-3 cm across.....**13. L. lavarum and varieties**

k. Capitula 1.2-1.6 cm across.....**12. L. intermedia**

a. Principal leaves manifestly lobed or strongly divided

b. Leaves very delicate, achenes finally more often exaristate

c. Leaves sessile, pedately 3-5-parted down to the base itself.....**25. L. tenuifolia**

c. Leaves petiolate

d. Capitula when expanded at anthesis only 4-5 mm across; radiate florets 2 or 3.....**24. L. micrantha**

d. Capitula when expanded at anthesis 7-14 mm across; radiate florets ± 6.....**26. L. Remyi**

b. Leaves thickish or moderately delicate, achenes aristate

c. Leaf petioles more or less dilated-connate at base

d. Capitula paniculate-cymosely 10-35-congregated together at ends of branches, at anthesis 8-14 mm across and 4-5 mm tall; plant of Kahoolawe.....**22. L. kahoolawensis**

d. Capitula numerous or few but more separately disposed.....**18. L. heterophylla and varieties**

c. Bases of leaf blades or of petioles not dilated-connate

d. Leaves pinnately lobed with 3-5 lobes on each side.....**16. L. flexuosa**

d. Leaves more or less pedately or palmately lobed with 1 or 2 lobes on each side

e. Blades of larger leaves commonly 3-12 cm long.....**8. L. succulenta variety δ trifida**

e. Blades of larger leaves up to about 6.5 cm long

f. Leaf petioles commonly alate-margined

g. Wings of petioles commonly incised-dentate.....**21. L. Forbesii**

g. Wings of petioles commonly entire

h. Principal leaves hastate-trilobed.....**11. L. lobata variety ι maunaloensis**

h. Principal leaves deltoid-ovate or subovate, coarsely dentate or incisely lobulate or variously 3-5-lobed but not hastate.....**19. L. Rockii and variety β subovata**

f. Leaf petioles slender, not truly alate-margined.....**20. L. venosa**

Section 1. MICROCHAETE Bentham and Hooker

Microchaete Bentham and Hooker, Gen. Pl., vol. 2, p. 373, 1873.

Microchaete Nuttall, pro gen., Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 450, 1841.

In habit very diverse but in leaf outline commonly linear-lanceolate or wider and in axils commonly nude. Pappus aristae somewhat prominent. Plants from inlands of the Pacific Ocean other than the Galapagas.—Nos. 1-22.

1. **Lipochaeta connata** (Gaudichaud) De Candolle.

Lipochaeta connata (Gaudichaud) De Candolle, Prodr., vol. 5, p. 611, 1836.
Verbesina connata Gaudichaud, Bot. Freycinet Voy., p. 464, 1830.
Microchaeta connata (Gaudichaud) Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 452, 1841.

Suffruticose, robust, much branched and spreading, 9-15 dm tall, the branches scabrohispid. Leaves sessile, basally connate and often auriculate, often dark green in dry state, rhombic-ovate or oblong-ovate or often some elongate and linear-lanceolate, apically acute or barely acuminate, somewhat thickish and often conspicuously veined, coarsely and doubly serrate, scabrid above, on both surfaces hispid, 1-2 dm long and 4-8 cm wide. Capitula cymose-corymbosely disposed on hispid or viscid-hispid peduncles and pedicels, radiate, at anthesis 2-3 cm across and 6-9 mm tall. Involucre hispid; outer bracts now ovate now ovate-lanceolate, at apex acute or long-acuminate, 3.5-8 mm long. Ligulate florets 10-12, yellow, 1-1.6 (-2) cm long; ligule oblong or obovate-oblong, subentire. Achenes blackish, oblanceolate-cuneate, their body 2-3 mm long, their margins or angles at first narrowly alate finally thickened and suberose and often verrucose, the apex erectly hispid and at center erectly 2-3-aristate with very small aristae.

Type: collected by Charles Gaudichaud in the Hawaiian islands (Paris).

Specimens examined: Otto Degener and Henry Wiebke 2146, arid, sunny slope, Olokele Canyon, Kauai, July 3, 1926 (British, California, Field, Gray, Kew, New York); Abbé Urbain Faurie 1006, Waimea, Kauai, March 1910 (British; Delessert, 2 sheets); Gaudichaud, Hawaiian islands (type, Paris; cotype, Delessert); A. A. Heller 2787, Kaholuamanoa (Kaholuamanu), above Waimea, Kauai, August 31, 1895 (Field, Gray, Missouri, New York, Paris, U. S.); A. S. Hitchcock 15258, altitude 1,400 feet, Olokele Gulch, Kauai, October 18, 1916 (U. S.); William Hillebrand, isthmus of Maui (Berlin); Hillebrand, west Maui (Berlin); Archibald Menzies, Hawaiian islands (British); Jules Remy 271, Kahoolawe, 1851-55 (Gray, Paris); J. F. Rock, Kauai, October 1916 (Bishop); Rock 5133, below Kaholuamanoa (Kaholuamanu), Kauai, September 1909 (Bishop); Carl Skottsberg 1041, Olokele Canyon, Kauai, October 31, 1922 (Göteborg); U. S. Exploring Expedition, Kauai, 1840 (New York); U. S. Exploring Expedition, Maui, western part, 1840 (U. S.).

Drake del Castillo (Illustr. fl. ins. maris Pacif., pl. 35, 1886) illustrates Jules Remy 267 under the name *Lipochaeta peduncularis*. Remy 267 is apparently lacking among the Remy plants at Paris and elsewhere. But Drake del Castillo writes: "Cette espèce se rapproche du *L. connata* par ses feuilles connées; mais elles sont moins profondément incisées; les achaines sont de forme assez semblable dans les deux espèces. Le *L. peduncularis* se distingue surtout du *L. connata* par ses pédoncules allongés et par ses fleurs à tube cilié." From the illustration and accompanying description in the text, it appears that *L. peduncularis* is merely a form of *L. connata,* and that it is matched more or less closely by some of the specimens here cited.

Distribution: islands of Kauai, Maui, and Kahoolawe.

2. **Lipochaeta acris** Sherff (fig. 7).

Lipochaeta acris Sherff, Bot. Gaz., vol. 95, p. 83, 1933.

Fruticose, erect, branched, scabrid with short and appressed setae. Leaves sessile to shortly petiolate with petioles sometimes margined and 0.5-1 cm long, 8-12 cm long including petiole (if present) and 3-7 cm wide, simple, ovate or narrowly rhombic-ovate,

membranaceous, at base widely or subwidely cuneate, at apex moderately or elongately acuminate, on margins sharply and conspicuously (commonly doubly or laciniately) dentate with teeth more often 4-7 mm long and apically subulate. Capitula cymosely disposed, slenderly pedicellate with pedicels more often 1-3 cm long, radiate, at anthesis 2.2-2.5 cm across and about 7-8 mm tall. Involucre hispidulous; outer bracts about 5, oblong-linear or ovate, often narrowed or acuminate above, 3-5 (more rarely -7) mm long, commonly a little longer than the inner. Ligulate florets 10-14, yellowish, 7-12 mm long; ligule oblong or elliptic-oblanceolate, at apex minutely about 3-denticulate. Achenes cuneately obovate, black, more or less triquetrous, faces glabrous and glistening, margins more or less spinulose, body about 2.5 mm long and about 1.5 mm wide, the truncate apex shortly biaristate and minutely setulose.

Type: collected by Horace Mann and W. T. Brigham, no. 540, altitude 2,000-3,000 feet, Waimea, Kauai, 1864-65 (Field).

Specimens examined: C. N. Forbes 951-K, Waimea drainage basin, west side, Kauai, July 3 to August 18, 1917 (Bishop); Forbes 2451-M, Olawalu Valley, Maui, May 21, 1920 (Field); William Hillebrand, Oahu (Berlin); Hillebrand, western Maui (Berlin); Hillebrand, Wailuku Valley, Kahoolawe (Berlin, forma vix typica); V. Knudsen, Kauai (Berlin); J. Lydgate, isthmus of Maui (Berlin); Mann and Brigham 540 (type, Field; cotypes, Delessert, 2 sheets; Gray; U. S.); Carl Skottsberg 960, altitude ± 1,300 meters, near Kokee Ranger Station, Waimea, Kauai, October 27, 1922 (Göteborg); Otto Swezey (Degener distribution no.) 4184, Nualolo, Kauai, July 18, 1932 (Berlin, British, California, Delessert, Field, Gray, Kew, Missouri, New York, U. S.); U. S. Exploring Expedition, Kauai, 1840 (U. S., 2 sheets); Heinrich Wawra 2094, Maui (Vienna Mus.); Wawra 2294, Oahu (Vienna Mus.).

The Kauai specimens have definitely petiolate leaves. Those from Maui and Kahoolawe tend to have sessile leaves, as do those also from Oahu. The last, however, show clearly both types of foliage at times (for example, Wawra 2294) and it seems impossible to maintain a separate varietal status for the sessile-leaved forms.

Distribution: islands of Kauai, Oahu, and Maui.

3. **Lipochaeta alata** Sherff (fig. 8).

Lipochaeta alata Sherff, Bot. Gaz., vol. 95, p. 81, 1933.

Lipochaeta calycosa variety β Hillebrand, Fl. Haw. Is., p. 207, 1888.

Leaves acute or shortly acuminate, at apex obtusely or sharply dentate..... **L. alata**

Leaves very sharply laciniate-dentate, at apex conspicuously acuminate..... **variety β acrior**

Fruticose, erect, about 6 dm tall, branched; branches more or less angulate, at first densely scabro-hispid finally subglabrate. Leaves contracted below into short (4-15 mm), more or less alate-margined, basally often weakly connate petioles, 5-9 cm long including petiole and 3.5-5.5 cm wide; blade undivided, deltoid-ovate or rhombic-ovate, membranaceous (finally often conspicuously veiny), green and scabrid above, paler and canescent-hispid beneath, acute or shortly acuminate at apex, sharply and doubly serrate at margin. Capitula cymosely disposed, slenderly pedicellate, with pedicels now hispid now glabrate, more often 5-10 mm long, radiate, at anthesis 1.5-2 cm across and about 7-8 mm tall. Involucre hispid; outer bracts 4 or 5, oblong or narrowly ovate, 2-3.2 mm long; inner ones wider, often a little longer, narrowed at apex. Ligulate florets commonly 7-10 sometimes 10-14, yellowish, about 7-9 mm long; ligule linear or elliptic-oblanceolate, at apex 2- (or sometimes sub-3-) lobulate. Achenes oblanceolate or obovate, more or less triquetrous, facially glabrous below but verrucose and hispidulous above, black corky-toothed on angles, the body 2.5-3.2 mm long, its apex commonly 2- (often imperfectly 3-) aristate with aristae 0.2-0.5 mm long and also crowned with squamellae among the aristae.

FIGURE 7.—*Lipochaeta acris* (cotype, Gray Herbarium).

Type: collected by A. A. Heller, no. 2563, along the Hanapepe River, near the falls, Kauai, July 12, 1895 (Field).

Specimens examined: Abbé Urbain Faurie 1007, Waimea, Kauai, March 1910 (British; Delessert, 2 sheets); Heller 2563 (type, Field; cotypes, Bishop, Gray, New York, Paris); Heller 2563-a, in a thicket, Hanapepe Valley, some 3 miles above station for 2563, same date (Delessert, Field); H. Mann and W. T. Brigham 542, altitude 2,000-3,000 feet, Waimea, Kauai (Field, Gray).

Distribution: island of Kauai.

FIGURE 8.—*Lipochaeta alata* (cotype, New York).

Lipochaeta alata variety *β* **acrior** Sherff.

Lipochaeta alata variety *acrior* Sherff, Bot. Gaz., vol. 95, p. 82, 1933.

Leaves very sharply laciniate-dentate, at apex conspicuously acuminate.
Type: collected by the U. S. Exploring Expedition, on Kauai, 1840 (U. S.).
Specimens examined: U. S. Exploring Expedition (type, U. S.; cotype, Gray).

Distribution: known only from the island of Kauai.

4. **Lipochaeta profusa** Sherff (fig. 9).

Lipochaeta profusa Sherff, Bot. Gaz., vol. 95, p. 95, 1933.

Capitula finally about 3-4 mm tall and near top about 3-4 mm broad.....**L. profusa**
Capitula finally 5-7 mm tall and near top 6-8 mm broad.....**variety *β* robustior**

Fruticose, erect, shortly but densely hispidulous throughout, branched, the branches subterete. Leaves abruptly contracted below into a connate sharply dentate base 8-12 mm wide, principal ones about 7-9 cm long and 3.5-4.5 cm wide, margins sharply but irregularly serrate, apex shortly acuminate, lower surface conspicuously veiny. Capitula cymosely disposed, numerous (a single branch at times subtending even 50-75 capitula), radiate, at anthesis ± 15 mm broad and 5-6 mm tall, the pedicels (ultimate branchlets) commonly up to 2 cm long. Involucre hispidulous, very small (finally only about 3 mm tall and near top only about 3-3.5 mm broad); exterior bracts 3 or 4, ovate, subacute or more often abruptly acute or even shortly acuminate, when dry more or less black at apex, 2-3.2 mm long. Ligulate florets ± 8, yellow, about 7-8 mm long; ligule elliptic-oblanceolate, at apex more or less bidenticulate. Outer achenes brownish-gray or black, 3-4-angled, sometimes interruptedly cartilaginous-alate upon the angles, cuneate, the body 2-2.2 mm long and near top 1-1.3 mm wide, its apex erectly spinulose-setose and erectly few-aristate with short and antrorsely hispidulous aristae.

Type: collected by Isabella Sinclair (Mrs. Francis Sinclair, Jr.) on island of Hawaii, commun. January 1885 (Kew).

Specimens examined: Mrs. Sinclair (type, Kew).

A species close to *L. alata,* from which it differs in its leaf bases and inflorescence. *L. alata* has the leaves narrowed below into a manifestly winged petiole, while in *L. profusa* the leaf bases (which are distinctly connate), although amounting to a contraction of the blade, are 8-12 mm wide and would not be considered as being winged petioles. Furthermore, *L. profusa* has the inflorescence much more decompound, and, in the species proper, the heads are comparatively minute.

Distribution: known only from the island of Hawaii. (The type label gives "Hawaii," whence it is assumed that the island by that name, rather than the whole archipelago, was meant.)

The type sheet bears the aboriginal name *nehe.* Elsewhere, Mrs. Sinclair (Indig. Fl. Haw. Is., pl. 21, 1885) illustrates a spray of *nehe,* but her plate portrays an entirely different species (a form of *L. connata*).

Lipochaeta profusa variety *β* **robustior** Degener and Sherff.

Lipochaeta profusa variety *robustior* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 96, 1933.

Capitula larger, in fruit 6-8 mm thick and 5-7 mm tall.

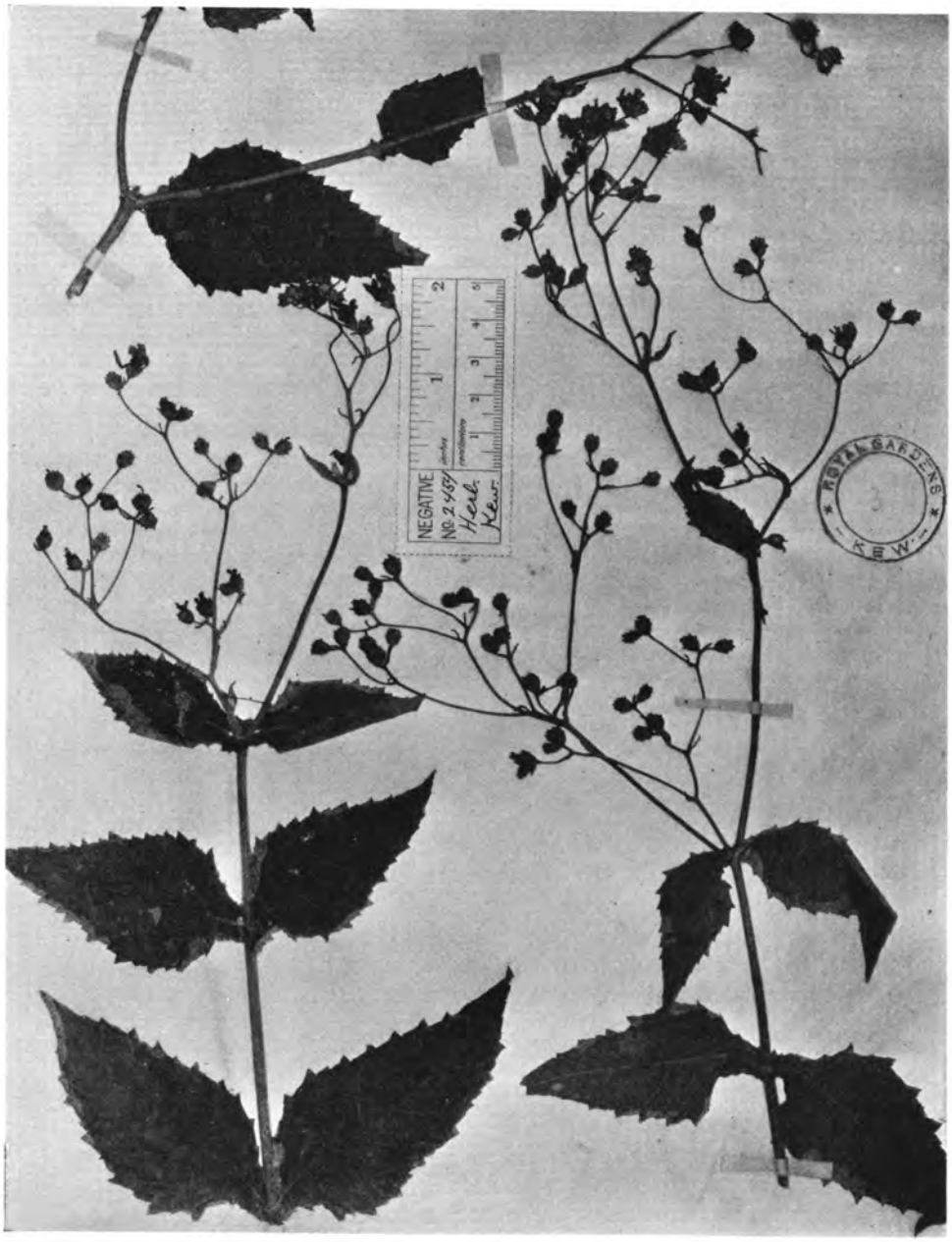

FIGURE 9.—*Lipochaeta profusa* (type).

Type: collected by Otto Swezey (Otto Degener distribution no.) 4185, in lowlands 2 miles from Kekaha, Kauai, July 18, 1932 (Field).

Specimens examined: Swezey (Degener distribution no. 4185) (type, Field; cotypes, Berlin, Kew).

Distribution: known only from the type locality on the island of Kauai.

5. Lipochaeta subcordata A. Gray.

Lipochaeta subcordata A. Gray, Amer. Acad., Proc., vol. 5, p. 130, 1861.

a. Leaves very membranaceous when dry, sparsely hispid beneath..**variety γ membranacea**
a. Leaves moderately or barely membranaceous when dry, very hispid beneath
  b. Leaves moderately or broadly ovate-cordate.....**variety β populifolia**
  b. Leaves from narrowly ovate-cordate to lanceolate-cordate or narrowly deltoid.....**L. subcordata**

Herbaceous, erect, loosely foliose, pubescent, 3-6 dm tall, stems tetragonal. Leaves slenderly petiolate with petioles 1-3 cm long, up to 1.2 dm long including petiole and 6.5 cm wide, from narrowly ovate-cordate to lanceolate-cordate or narrowly deltoid, on margins doubly serrate, at apex acuminate, on lower surface conspicuously veiny and whitish-hispid, at base more or less 3-nerved. Capitula cymosely disposed, few or numerous, pedicellate with pedicels slender and commonly 0.5-3 cm long, radiate, at anthesis 1.2-1.6 cm across and 5-6 mm tall. Involucre hispid; exterior bracts about 4, narrowly or widely ovate, obtuse or subacuminate, ± 4 mm long. Ligulate florets 5 or 6, yellow, about 5-7 mm long; ligule oblong, at apex subentire or denticulate. Achenes black or sometimes becoming reddish; the body 2-2.5 mm long, often conspicuously verrucose, exalate, in outline cuneate or even orbiculate, at the truncate apex densely and erectly whitish-setose also (at circumference) erectly verrucose-spiny and even (at center) often 1- rarely up to 5-aristate with aristae erect and ± 1 mm long.

Type: collected by the U. S. Exploring Expedition on Hawaii, 1840 (U. S.).

Specimens examined: Otto Degener 4189, on shrub-covered a-a lava flows in arid region, between Puuwaawaa and Huehue, Hawaii, August 22, 1926 (Berlin, British, Field, Gray, Kew, U. S.); Degener 4214, on a-a lava in arid forest, same locality, September 13, 1929 (Berlin, Boissier, British, California, Delessert, Field, Florence, Göteborg, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Degener 4302, a-a lava, between Honuapo and Hilea, Hawaii, February 17, 1930 (Berlin, British, California, Delessert, Field, Gray, Kew, Missouri, Munich, New York, U. S., Vienna Univ.); C. N. Forbes 4-H, Puuwaawaa, Hawaii, June 8-14, 1911 (Field, 3 sheets; Missouri); William Hillebrand, Kau, Hawaii (Berlin, 2 sheets; Gray, 2 sheets); Hillebrand, South Kona, Hawaii (Berlin); Hillebrand 38, Hawaii (Kew); John Lydgate, Hawaii (Berlin); David Nelson, Hawaiian islands, 1778-79 (British); J. F. Rock 10049, Puu Keanui Crater, Hawaii, February 13, 1912 (Field, Gray); Rock 10294, Puuwaawaa, Hawaii, April 1912 (Bishop); Carl Skottsberg 674, altitude 660 meters, Puuwaawaa, Hawaii, September 26, 1922 (Göteborg); U. S. Exploring Exepdition, Hawaii (type, U. S.).

In *L. subcordata* proper the leaves tend to be narrowly deltoid, often suggesting in outline an isosceles triangle. They are conspicuously and densely whitish-hispid beneath. Those of variety *populifolia* are broader in outline, much like those of *Populus deltoides* Marshall. Those of variety *membranacea,* of which I have seen only the small branch on the type sheet, are intermediate in outline but are noticeable for their sparse hispidity, this latter character being associated with a more membranaceous texture and a closer similarity in color between the upper and lower surfaces.

FIGURE 10.—*Lipochaeta subcordata* variety *populifolia* (cotype, U. S. National Museum).

Much variation occurs within the species proper as to size of leaves, length of internodes, and size of heads, but these variations appear (in this species) much too inconstant to serve as a basis for the delimiting of varieties.

Distribution: known only from the island of Hawaii.

Lipochaeta subcordata variety β **populifolia** Sherff (fig. 10).

Lipochaeta subcordata variety *populifolia* Sherff, Bot. Gaz., vol. 95, p. 91, 1933.

Leaves moderately or widely ovate-cordate or ovate-subcordate.

Type: collected by G. C. Munro, no. 670, in Maunalei Valley, Lanai, June 18, 1918 (Field).

Specimens examined: Munro 670 (type, Field; cotype, U. S.).

Distribution: known only from type locality on the island of Lanai.

Lipochaeta subcordata variety γ **membranacea** Sherff.

Lipochaeta subcordata variety *membranacea* Sherff, Bot. Gaz., vol. 95, p. 91, 1933.

Leaves ovate-subcordate or subcordate-deltoid, sparsely appressed-hispid thus conspicuously membranaceous and on both sides green.

Type: collected by E. Bishop, no. 14, back of Lahaina, western Maui (Berlin).

Specimens examined: Bishop 14 (type, Berlin).

The type was originally in Hillebrand's private herbarium and was the basis of his distributional note, "Maui! back of *Lahaina* (leaves deltoid, flower-heads larger)."

Distribution: known only from type locality on the island of Maui.

6. **Lipochaeta tenuis** Degener and Sherff (fig. 11).

Lipochaeta tenuis Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 102, 1933.

Herbaceous or barely suffruticose; stems more or less procumbent, very slender, very elongate, angulate, glabrate or sparsely appressed-hispidulous, ± 1 meter long. Leaves slenderly petiolate with petioles about 1-1.5 cm long, including petiole about 3.5-5.5 cm long, undivided, delicate, deltoid-lanceolate or scarcely deltoid-ovate, on lower surface pale, on both surfaces most minutely appressed-hispidulous, on margins sharply serrate with about 7-9 teeth to each side, at apex acute and mucronate. Capitula very few, slenderly pedunculate with peduncles ± 3 cm long, radiate, at anthesis ± 2.6 cm across and about 6 mm tall. Involucre pale; exterior bracts 4 or 5, oblong-ovate or oblong-lanceolate, at apex acute, ± 6 mm long. Ligulate florets ± 10, intensely golden-colored, about 1.1-1.3 cm long; ligule linear-oblong, at apex sometimes denticulate. Achenes at first aristate finally (a single mature outer one seen) at apex bald, cuneate- obovate, brown, trigonous, obscurely verrucose, on angles weakly or obsoletely interrupted-alate, at apex very minutely setulose, about 2.4 mm long.

Type: collected by Otto Degener, K. K. Park, and William Bush, no. 4258, a long, straggling, suffrutescent herb in the rain forest, Waianae Valley, up toward Puu Kaala, Oahu (on lateral spur leading to summit ridge between Kaala and Kalena), April 24, 1932 (Field, 2 sheets).

Specimens examined: Degener, Park, and Bush 4258 (first and second type sheets, Field; cotypes, Kew, Missouri, New York).

Distribution: known only from the type locality on the island of Oahu.

FIGURE 11.—*Lipochaeta tenuis* (first type sheet).

7. Lipochaeta perdita Sherff (fig. 12).

Lipochaeta perdita Sherff, Bot. Gaz., vol. 95, p. 99, 1933.

Suffruticose, perhaps procumbent or suberect, branched; branches very slender, round-angled, appressed-hispidulous. Leaves petiolate with petioles slender and about 6-14 mm long, including petiole 2-4 cm long and 1-2.2 cm wide, simple, ovate-deltoid, at apex subobtuse or subacute but not acuminate, at base subtruncate or truncate (not truly subcordate), on margins slightly or subsharply crenate-serrate, on upper surface subrigidly on lower surface softly appressed-hispid. Capitula subsolitary, elongately and slenderly pedunculate with peduncles appressed-hispid and up to 9 cm long, finally (when in fruit) about 12-13 mm wide. Involucre appressed-hispidulous; exterior bracts 4 or 5, ovate or subovate, at apex subacute or subobtuse, about 5 mm long. Ligulate florets not seen. Achenes (outer) obovate-cuneate, tumid, 3-4-gonous, conspicuously verrucose, reddish-black, on angles sometimes more or less interrupted-alate, as to body 2.5-2.9 mm long and near top about 2.5 mm thick; at apex sparsely erect-spinulose on the circumference, elsewhere very shortly erect-setose and centrally sometimes few-aristate with sharp antrorsely hispidulous aristae.

Type: collected by David Nelson in the Hawaiian islands, 1778-79 (British).

Specimens examined: David Nelson, Hawaiian islands, 1778-79 (type, British).

The general aspect is deceivingly like that of *L. subcordata* A. Gray. The leaves are smaller, however, than the average leaves of that species and are not acuminate at the tips. The much larger capitula, these solitary or nearly so, are further means of distinction from *L. subcordata.* The type sheet bears five sprays, all closely similar. The species apparently has not been re-collected since the visit of Nelson to the Hawaiian islands more than a century and a half ago, and may well be one of those numerous endemic species which have been destroyed with the advent there of Western civilization. The trivial name has been selected, however, with its double meaning in mind, namely either "ruined" or "lost".

Distribution: Hawaiian islands, exact locality unknown. Perhaps now extinct.

8. Lipochaeta succulenta (Hooker and Arnott) De Candolle.

Lipochaeta succulenta (Hooker and Arnott) De Candolle, Prodr., vol. 5, p. 611, 1836.

Verbesina succulenta Hooker and Arnott, Bot. Beechey Voy., p. 87, 1832.

Microchaeta succulenta (Hooker and Arnott) Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841.

a. Leaves oblongly linear or linear-lanceolate.....**variety γ angustata**
a. Leaves wider
  b. Leaves commonly trifid or trilobed.....**variety δ trifida**
  b. Leaves simple
    c. Leaves apically subacute to acuminate; plant of Molokai.....**variety β decurrens**
    c. Leaves at apex commonly obtuse or rotundate; plants of Kauai and Niihau
      d. Leaves rhomboidally or oblongly obovate or oblanceolate.....**L. succulenta**
      d. Leaves now elliptic-oblong now rhombic-ovate.....**variety ε Barclayi**

Herbaceous or at base suffruticose, more or less succulent, spreading, commonly much branched; stems and branches glabrate, the latter diverging at a small angle.

Leaves often numerous (when dry very membranaceous), commonly 3-8 sometimes up to 13 cm long, rhomboidally or oblongly obovate or oblanceolate, gradually and cuneately narrowed below to the base, above middle crenulate-serrate, at apex more often obtuse or even rounded but commonly mucronulate, on both surfaces weakly and inconspicuously hispid, scarcely 3-nerved. Capitula cymosely disposed, often numerous, slenderly pedicel-

FIGURE 12.—*Lipochaeta perdita* (type).

late with the sparsely setose pedicels 2-5 cm long and (at least when dry) subfiliform, radiate, at anthesis ± 1.2 cm across and ± 6 mm tall. Involucre sparsely appressed-hispidulous; exterior bracts about 4, orbiculate, at apex more often mucronulate, 3.5-5 mm long. Ligulate florets ± 12, ± 6 mm long; ligule linear-oblong, at apex subtruncate and obscurely denticulate. Achenes when mature more or less brownish-red, cuneate-obovate, angulate and upon a single angle sometimes more or less alate with a denticulate wing, at apex truncate and 2-3-aristate, the body about 3 mm long.

Type: collected by G. T. Lay and A. Collie (Captain Beechey's Voyage) on the island of Oneeheow (Niihau), 1826-27 (Kew).

Specimens examined: Abbé U. Faurie 1004, on rocks of the shore at Koloa, Kauai, December 1909 (Delessert, 2 sheets; Paris); Jules Remy 258, Kauai, 1851-55 (Gray); Remy 287, Niihau, 1851-55 (Gray, New York).

The type locality is taken from Hooker and Arnott. The type sheet at Kew is from Hooker's private herbarium, and its inscription says "Oahu." Since, however, the species is not otherwise known to me from Oahu it may be that this citation is erroneous. Or can it be that specimens were collected on both islands, the one from Oahu escaping the notice of the authors originally while the one from Niihau failed to be preserved to the present day?

Distribution: islands of Niihau and Kauai (and perhaps also Oahu).

Lipochaeta succulenta variety **β decurrens** (A. Gray) Sherff.

Lipochaeta succulenta variety *decurrens* (A. Gray) Sherff, Bot. Gaz., vol. 95, p. 86, 1933.

Lipochaeta lanceolata Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841.

Lipochaeta australis variety *decurrens* A. Gray, Amer. Acad., Proc. vol. 5, p. 129, 1861.

Lipochaeta connata variety *decurrens* (A. Gray) Hillebrand, Fl. Haw. Is., p. 206, 1888.

Lipochaeta connata variety *littoralis* Hillebrand, Fl. Haw. Is., p. 206, 1888.

Lipochaeta variolosa Léveillé, Fedde Repert., vol. 10, p. 122, 1911.

Leaves oblong-lanceolate or subrhomboid-ovate, at apex subacute to acuminate.

Type: none cited.

Specimens examined: Otto Degener 4028, Wailau Valley, northern Molokai (ex tabula ined., Degener, Fl. Haw.); Degener and Kazuto Nitta 4200, on talus slope within reach of ocean spray in very rainy valley, Wailau Valley, Molokai, August 5, 1928 (Field, Göteborg, Gray, Kew, Missouri, Munich, Vienna Mus., U.S.); Degener and Nitta 4211, at foot of cliff within reach of ocean spray, Wailau Valley, Molokai, August 11, 1928 (Berlin, Boissier, British, California, Delessert, Field, Göteborg, Gray, Kew, Missouri, Munich, Vienna Mus., New York, Paris, U. S.); Abbé Urbain Faurie 966, Hana, Maui, September 1909 (British); Faurie 1008, Wainiha, Kauai, January 1910 (Delessert, Paris, pro Lipochaeta variolosa a Léveillé habita); C. N. Forbes 71-K, Kalalau Trail, Kauai, July 19, 1909 (Field, 3 sheets); Forbes 274-M, beach at Kipahulu, southeasternmost Maui, July 1910 (Field); Forbes 396-Mo, Manawai, southeastern Molokai, August 1912 (Field, 3 sheets); Forbes 522-Mo, sea cliffs, Wailau Valley, northeastern Molokai, September 1912 (Bishop; Field, 2 sheets); Forbes 577-Mo, Pelekunu Valley, northeastern Molokai, September 1912 (Field); William Hillebrand,

Hawaiian islands (Berlin, pro Lipochaeta connata varietate littorali a Hillebrand habita); Hillebrand, Molokai (Berlin, 2 sheets, una scheda pro L. connata varietate littorali a Hillebrand habita); Hillebrand, Kalawao (Leper Settlement), Molokai (Berlin, pro L. connata varietate littorali a Hillebrand habita); Hillebrand, Hawaii (Berlin, pro L. connata varietate littorali a Hillebrand habita); A. S. Hitchcock 14155, Hilo, Hawaii, August 17, 1916 (U.S.); James Macrae, Mount Kaah (Mauna Kea), Hawaii, June 1825 (Gray); Horace Mann and W. T. Brigham 375, seashore, western Kauai (Gray); Alexander Matthews, Hawaiian islands (Gray); J. F. Rock 7055, Molokai, 1910 (Field, Gray); U. S. Exploring Expedition, Hawaii, 1840 (Gray; New York, 2 sheets); U. S. Exploring Expedition, Oahu (Gray).

Gray cited no type, but it is evident from a study of all the circumstances that he had in mind principally the plants from Hawaii collected by the United States Exploring Expedition, also the plants by Diele from Oahu and by Macrae from "Mt. Kaah." Unfortunately, his description was broadened somewhat to include my *L. acris,* at least two specimens of which (U.S.) the United States Exploring Expedition had collected on the island of Kauai. One of these Gray had labeled "var. *decurrens*" and the other he had labeled as "between vars. *connata* and *decurrens.*" Both must, of course, be excluded. Fortunately Gray's description was drawn to fit primarily the form retained by me as variety *decurrens* and only secondarily the plant later segregated by me as *L. acris.* ("Foliis base in petiolum plerumque alatum contractis, lamina nunc ovata seu rhombea *nunc oblong-lanceolata, in latifoliis saepius* argute duplicato—vel laciniato-serrata"—Gray. The latter part of this description, italicized by me, is seen, when read in conjunction with the various specimens determined by Gray, to provide for the Kauai plants segregated by me as *L. acris.*)

It is not readily apparent how Gray could have erred in relating his variety *decurrens* to *L. australis* Lessing—that is, *L. lobata* (Gaudichaud) De Candolle—unless he was misled by the inflorescence of the Kauai plants (*L. acris*). In fact, there is at Gray Herbarium a specimen probably by A. Matthews (not that cited above) which is positively the variety *decurrens* and yet which Gray had labeled *"L. succulenta."* From this one determination it is apparent how close Gray, whose insight into genetic relationships was often so keen as to excite wonder, came to a correct interpretation of his variety *decurrens.*

Distribution: islands of Kauai, Molokai, Maui, and Hawaii.

Lipochaeta succulenta variety γ **angustata** Sherff.

Lipochaeta succulenta variety *angustata* Sherff, Bot. Gaz., vol. 95, p. 87,

Leaves oblongly linear or linear-lanceolate, the principal ones 6-8 cm long and 3-5 mm wide, now a little longer and 8-12 mm wide.

Type: collected by C. N. Forbes on Kauai, 1909 (Field, 2 sheets).

Specimens examined: Forbes, Kauai, 1909 (Field, 2 type sheets).

Distribution: island of Kauai.

Lipochaeta succulenta variety **δ trifida** Sherff.

Lipochaeta succulenta variety *trifida* Sherff, Bot. Gaz., vol. 95, p. 87, 1933.

Similar to variety *decurrens* but with sharply trifid or trilobed leaves.

Type: collected by C. N. Forbes, no. 397-Mo, at Manawai, Molokai, August 1912 (Field, 3 sheets).

Specimens examined: Forbes 397-Mo (Field, 3 type sheets).

Distribution: known only from type locality in southeastern Molokai.

Lipochaeta succulenta variety **ε Barclayi** Sherff (fig. 13).

Lipochaeta succulenta variety *Barclayi* Sherff, Bot. Gaz., vol. 95, p. 87, 1933.

Fruticose, 9-12 dm tall, often robust, stems when dry 4-6 mm thick. Leaves now elliptic-oblong now rhombic-ovate, up to 1 dm long and 4.3 cm wide, at apex mucronulate and commonly rounded-obtuse, on margins lightly and subremotely denticulate with subulate or mucronulate teeth, when dry subglistening and greenish-brown.

Type: collected by George Barclay, no. 1327, shrub 3 or 4 feet high, in loam soil, hills, island of Atooi (Kauai), July 1837 (British).

Specimens examined: Barclay 1327 (type, British); C. N. Forbes 71-K, Kalalau Trail, Kauai, July 19, 1909 (Field, 3 sheets).

Distribution: island of Kauai.

9. **Lipochaeta integrifolia** (Nuttall) A. Gray.

Lipochaeta integrifolia (Nuttall) A. Gray, Amer. Acad., Proc., vol. 5, p. 130, 1861.

Microchaeta integrifolia Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841; Walpers Repert., vol. 2, p. 620, 1843.

Lipochaeta integrifolia variety β Hillebrand, Fl. Haw. Is., p. 208, 1888.

a. Leaves 1-2 mm wide, certain principal ones 1-dentate or scarcely 1-lobulate below middle.....**variety γ gracilis**

a. Leaves commonly wider (unless for variety *argentea*) the principal ones entire or obscurely denticulate

b. Leaves up to 4 cm long and 1 cm wide

c. Capitula at anthesis about 1.2 cm across.....**variety δ major**

c. Capitula at anthesis 1.5-2 cm across.....**variety ε megacephala**

b. Leaves commonly 0.6-2.5 cm long and 1-7 (rarely -9) mm wide

c. Leaves commonly 1-2.5 cm long and 3-7 (rarely -9) mm wide.....**L. integrifolia**

c. Leaves commonly 6-14 mm long and 1-4 mm wide.....**variety β argentea**

Herbaceous or toward base fruticose, procumbent or more rarely more or less erect, from a thick and lignescent base, densely and appressedly hispid; branches (when dry) commonly brown, angulate, the principal ones ± 3 dm long. Leaves numerous, entire or obscurely denticulate, commonly 1-2.5 cm long and 3-7 (or a few of the principal ones even up to 9) mm wide, pale, now membranaceous now (much more often) subfleshy, spatulate or spatulate-oblong, at base more often narrowed into a petiole 1-7 mm long, at apex obtuse, on lower surface veiny and manifestly 3-5-nerved. Capitula more often solitary, pedunculate with peduncles 2-9 cm long, radiate, at anthesis about 12 mm across and about 6-7 mm tall. Involucre canescent, bracts subequal; exterior ones 4-7, oblong or ovate, at apex obtuse, 1.5-3 mm long. Ligulate florets about 8, yellowish, about 4-5 mm long; ligule more or less oblong, at apex 3-dentate. Paleae of receptacle

rigid, carinate, obtuse, hirsute above. Exterior (and often some interior) achenes obconic, 3-4-angulate, turgid, on angles not truly alate but often dentate or lacerate, at apex truncate and erectly setose, scarcely 2 mm long; interior ones often stunted or abortive, obcompressed, as to body 2.5-3 mm long, at apex erectly setose and often 1-4-aristate with aristae 1-2 mm long.

Type: collected by Thomas Nuttall on Oahu (British). Nuttall cited material also from Kauai (formerly called Atooi).

FIGURE 13.—*Lipochaeta succulenta* variety *Barclayi* (type).

Specimens examined: William Bush (O. Degener's distribution no.) 9301, Waimanalo, Oahu, May 26, 1929 (Field, Kew); E. Christophersen 1368, near the sea, Koko Head Crater, Oahu, June 5, 1930 (Field); C. M. Cooke, Laniloa, Oahu, February 1, 1919 (Bishop); Otto Degener, near Waimanalo, Oahu, January 28, 1927 (Field); Degener 4216, arid region near the sea, near Moomomi, Molokai, April 19, 1928 (Berlin, British, California, Field, Florence, Gray, Kew, Munich); Degener 4216-b, coastal dune, near Waiakanapo, Molokai, April 19, 1928 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, New York, U.S.); Degener 4998, on arid limestone rocks, extremely localized and on verge of extinction, southeast of Kalani (near Moomomi), Molokai, April 19, 1928 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Vienna Mus., New York, Paris, U.S.); Degener 4999, same location, April 25, 1928 (Berlin, British, Delessert, Field, Kew, Gray, Missouri, New York); C. N. Forbes 615-Mo, beach near Kalaekailioilio, Molokai, March 25, 1915 (Field, 2 sheets); Forbes 1507-O, Koko Head, Oahu, June 11, 1909 (Field, Missouri); Forbes 2194-O, Popoia, small island near Kailua, Oahu, April 1914 (Field, variety β Hillebrand); F. R. Fosberg and K. Duker 9138, altitude 370 meters, bare, dry summit of Koko Crater, Maunalua, Oahu, January 27, 1933 (Berlin, Field, Kew); Guppy, sandy soil at Pearl Harbor, Oahu, 1897 (Kew); William Hillebrand, Hawaiian islands (Berlin, U.S.); Hillebrand, Kaena Point (near Waianae), Oahu (Berlin); Hillebrand, Kailua, Oahu (Berlin, type of L. integrifolia variety β Hillebrand); MacCaughey, Waimanalo, Oahu (Field); H. Mann and W. T. Brigham 246, Oahu (Paris); Jules Remy 255, Oahu, 1851-55 (Gray); J. F. Rock 10294, shore at Kalaeokalau, Molokai, 1910 (Gray); Carl Skottsberg 108, beach, Diamond Head, Oahu, August 10, 1922 (Göteborg); U. S. Exploring Expedition, Diamond Hill (Diamond Head), Oahu, 1840 (Gray, New York).

Distribution: islands of Molokai, Oahu, Kauai, Laysan, and Kure. As to Laysan and Kure I am relying upon Christophersen and Caum (Vascular plants of the leeward islands, Hawaii: B. P. Bishop Mus., Bull. 81, p. 39, 1931).

Lipochaeta integrifolia variety β **argentea** Sherff.

Lipochaeta integrifolia variety *argentea* Sherff, Bot. Gaz., vol. 95, p. 84, 1933.

Leaves smaller (commonly 6-14 mm long and 1-4 mm wide), more often oblong-linear, conspicuously canescent or argenteous; branchlets commonly canescent.

Type: collected by Horace Mann and W. T. Brigham, no. 371, on sandy isthmus, Maui (Field).

Specimens: Otto Degener 4203, on arid aeolian deposits of isthmus, far from ocean, Wailuku, Maui, July 9, 1927 (British, Field, Kew, U.S.); Abbé U. Faurie 944, Wailuku, Maui, August 1909 (British); William Hillebrand, above Maalaea Bay, Maui (Berlin); A. S. Hitchcock 15131, sandy beach, western part of Molokai, October 12, 1916 (U. S.); Mann and Brigham 371 (type, Field; cotypes, Delessert, Field, Gray, Missouri, U.S.); D. L. Topping, near Iao Valley, Maui, August 2, 1927 (British, Field, Kew); U. S. Exploring Expedition, sand hills, Maui (New York, U. S.); Heinrich Wawra 1966 and 2297, Maui, 1868-71 (Vienna Mus.).

Distribution: islands of Maui and Molokai.

Lipochaeta integrifolia variety γ **gracilis** Sherff.

Lipochaeta integrifolia variety *gracilis* Sherff, Bot. Gaz., vol. 95, p. 85, 1933.

Of delicate habit; branches (when dry) brownish-black, elongate, very slender; leaves moderately canescent, linear, only 7-12 (rarely -16) mm long and 1-2 mm wide, at base often narrowed into a small petiole, some of the principal ones 1-dentate or barely 1-lobulate on each edge below middle.

Type: collected by Charles Gaudichaud, no. 217, in the Hawaiian islands, September-October, 1836 (Gray).

Specimens examined: Gaudichaud 217 (type, Gray; cotype, Paris); Gaudichaud, no number, same location (Berlin, Paris).

Distribution: Hawaiian islands, exact distribution not known.

Lipochaeta integrifolia variety δ **major** Sherff.

Lipochaeta integrifolia variety *major* Sherff, Bot. Gaz., vol. 95, p. 85, 1933.

Densely appressed-hispidulous but not conspicuously argenteous, branches often 1.2 dm long, leaves up to 4 cm long and 1 cm wide, spatulate, on margins often crenatulate, at apex more often very obtuse, at base often shortly petiolate with petioles up to about 5 mm long.

Type: collected by A. A. Heller, no. 2092, on the old lava flow back of Diamond Head, Oahu, April 8, 1895 (Gray).

Specimens examined: Otto Degener, coastal rocks, Makapuu Point, Oahu, April 8, 1923 (Field); Degener, on rocks along coast, same location, December 1925 (Field); Guppy, rocky seacoast, Oahu, 1897 (Kew); Heller 2092 (type, Gray; cotypes, Delessert, Field, Missouri, New York, Paris, U. S.); D. L. Topping 3006, Waimanalo, Oahu, February 1, 1925 (Field).

Distribution: island of Oahu.

Lipochaeta integrifolia variety ε **megacephala** Degener and Sherff (fig. 5, *b*).

Lipochaeta integrifolia variety *megacephala* Degener and Sherff, ex Sherff, Bot. Gaz. vol. 95, p. 86, 1933.

In habit similar to variety *major* but with leaves at times long-petiolate (petioles up to 1.5 cm), capitula at anthesis 1.5-2 cm across.

Type: collected by Erling Christophersen, no. 1400, in sand at altitude of ± 5 meters, Kaena Point, Oahu, December 14, 1930 (Field).

Specimens examined: Christophersen 1400 (type, Field); Otto Degener, K. K. Park, and W. Hirai (Degener distribution no. 4179), on arid clay soil near the ocean, Kaena Point, Oahu, March 21, 1931 (Field); Guppy, Kaena Point, 1897 (Kew).

Distribution: known only from type locality on the island of Oahu.

This variety probably hybridizes with *L. lobata* variety *denticulata* to form the following hybrid.

9a. × **Lipochaeta procumbens** Degener and Sherff (fig. 14).

× *Lipochaeta procumbens* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 84, 1933.

Fruticose, prostrate, branched, minutely appressed-hispidulous; stems elongate, angulate flexible, ± 8 dm long. Leaves cuneately narrowed below into a petioloid base ± 4-6 mm long, the principal ones 3-7 cm long including base, rhombic-oblong, at apex obtuse or subacute, sparsely and subobsoletely serrulate, thickish, on upper surface mani-

festly 3-nerved, on lower surface veiny. Capitula very slenderly pedunculate with peduncles often 3-7 cm long, loosely disposed, radiate, at anthesis about 1.5 cm across and about 6 mm tall. Involucre's exterior bracts 4 or 5, widely ovate, at apex obtuse, 2-3.2 mm (more rarely 1 or 2 very small ones oblong and ± 1.5 mm long. Ligulate florets golden-yellow, ± 7 mm long, ligule narrowly obovate, at apex 2-3-denticulate. Achenes lacking; ovaries sterile.

Type: collected by Otto Degener, K. K. Park, and W. Hirai (Degener distribution no.) 4178, forming mats on the loose lava rock on arid plain near ocean, Kaena Point, Oahu, March 21, 1931 (Field, 3 sheets).

Specimens examined: Degener, Park, and Hirai 4178 (type, Field, 3 sheets; cotypes, Kew, Munich); Degener 4303, same location, January 31, 1932 (Field).

FIGURE 14.—× *Lipochaeta procumbens* (first type sheet).

The type specimens were growing among specimens of *L. lobata* variety *denticulata* and *L. integrifolia* variety *megacephala,* and were suspected by Degener as being hybrids between those two varieties. His suspicion appears to be confirmed by the intermediate nature of the main diagnostic characters studied, also by the fact that the several hundreds of ripe capitula examined have invariably abortive ovaries, not a single achene having been matured.

Distribution: known only from type locality on the island of Oahu.

FIGURE 15.—*Lipochaeta Degeneri* (type).

10. Lipochaeta Degeneri Sherff (fig. 15).

Lipochaeta Degeneri Sherff, Bot. Gaz., vol. 95, p. 84, 1933.

Fruticose, more or less erect, at least 3-4 dm tall, much branched; branches virgate, gray or reddish-gray, terete, subcanescent with white and much appressed setae. Leaves

scarcely petiolate with petioles ± 1.5 mm long, spatulate or linear-oblanceolate, at apex obtuse or rounded, membranaceous, green, subrevolute, entire or obscurely denticulate, 0.7-3 cm long and 2.5-5.5 mm wide. Capitula numerous, slenderly pedunculate with solitary or 3-5-clustered 1-3 cm long peduncles, radiate, at anthesis ± 1 cm across and about 5 mm tall. Involucre hispid, bracts subequal; exterior ones about 4, ovate, obtuse, about 2 mm long. Ligulate florets 4-6, yellowish, about 5-6 mm long; ligule oblong, at apex 3-denticulate. Achenes black, the outer ones cuneate, triquetrous, on angles suberose-alate, on faces muriculate, as to body 1.5-2 mm tall, at apex erectly 2-3-aristulate and more or less setose; inner ones obcompressed, narrowly cuneate, exalate, on faces glabrous below and erect-setulose above, as to body about 2 mm long, at the truncate apex erectly fimbriate and commonly biaristulate.

Type: collected by Otto Degener, no. 4198, on hot, arid, boulder-covered plain near sea, near southwest point of Molokai, May 16, 1928 (Field).

Specimens examined: Degener 4198 (type, Field; cotypes, Berlin, 2 sheets, Boissier, British, Delessert, Field, Florence, Göteborg, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); C. N. Forbes 59-Mo, Kalaeokalaau, Molokai, June 1912 (Field); J. F. Rock 10288, same location, 1910 (Gray).

Distribution: known only from southwesternmost part of the island of Molokai.

11. **Lipochaeta lobata** (Gaudichaud) De Candolle.

Lipochaeta lobata (Gaudichaud) De Candolle, Prodr., vol. 5, p. 611, 1836.

Verbesina lobata Gaudichaud, Bot. Freycinet Voy., p. 464, "1826" (vere 1830, fide H. Mann, Amer. Acad., Proc., vol. 7, p. 144, 1867).

Lipotriche australis Lessing, Linnaea, vol. 6, p. 510, 1831.

Michrochaeta lobata (Gaudichaud) Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841.

Lipochaeta australis and variety *lobata* (Gaudichaud) A. Gray, Amer. Acad., Proc., vol. 5, p. 130, 1861 (excluding synonym *Verbesina hastulata* Hooker and Arnott and synonym *Lipochaeta hastulata* De Candolle).

a. Leaves (rarely 8-10 cm long) and branchlets and involucral bracts green or greenish
  b. Leaves at base more or less cordate.....variety **ε Aprevalliana**
  b. Leaves at base cuneate or rounded
    c. Leaves more or less hastulate
      d. Principal leaves often 10-12 cm long and 4-6 cm wide; exterior involucral bracts finally 5-7 mm long.....variety **β hastulata**
      d. Principal leaves commonly 3-6, sometimes up to 8 (more rarely 10) cm long
        e. Leaves conspicuously lobed, principal lobe narrowly ovate or rhombic-ovate; plant of Molokai.....variety **ι maunaloensis**
        e. Leaves weakly or moderately lobed, principal lobe narrowly deltoid-oblong; plant of Oahu.....**L. lobata**
    c. Leaves not (or very rarely sub-) hastulate
      d. All or some leaves ovate; exterior involucral bracts oblong-ovate or obovate, at apex rounded-obtuse or subacute
        e. Petioles alate.....variety **η hastulatoides**
        e. Petioles exalate.....variety **γ denticulata**
      d. Leaves lanceolate or lanceolate-linear, serrate or denticulate; exterior involucral bracts ovate, at apex more or less acuminate.....variety **δ leptophylla**
      d. Leaves oblong-lanceolate, coarsely dentate.....variety **θ grossedentata**.
a. Leaves (often 8-13 cm long) pale, branchlets and involucral bracts becoming whitish.....variety **ζ albescens**

Suffruticose, hispid-scabrous, branched, ± 6 dm tall. Leaves very shortly petiolate with petioles only 2-5 (rarely -9) mm long, commonly 3-6 sometimes up to 8 (more rarely 10) cm long including petiole, in outline widely linear-oblong to oblong-lanceolate, on margins (often subincisely) dentate, toward base commonly 1- (very rarely 2-) lobulate on each side and thus hastulate, thickish, pale-green and not whitish, on both surfaces hispid-scabrous, at apex acute or even very obtuse, at base cuneate or rounded, more or less 3-nerved. Capitula cymosely disposed on very slender pedicels (the median much shorter, the lateral often 6-7 cm long), radiate, at anthesis 1.5-2 cm across and about 6-7.5 mm tall. Involucre's exterior bracts 3-5, oblong-ovate or widely lanceolate, hispid, at apex now rounded-obtuse now subacute, finally up to 5 mm long. Ligulate florets ± 10, yellow, 7-10 mm long; ligule oblong-linear, at apex obscurely denticulate. Achenes dark-brown to black, verrucose, sharply angulate or sometimes (at least the exterior trigonous ones) alate, as to body 2.4-2.8 mm long, at apex commonly fimbriate-setose and 2-3-aristate with short aristae.

Type: collected by Charles Gaudichaud (Freycinet's Voyage), in the Hawaiian islands, 1819. The type should be at Paris but I do not find it there. Fortunately, the Gaudichaud specimens in Berlin and Geneva (Delessert) are available and leave no doubt as to the identity of the species.

Specimens examined: Captain Beechey 2797, Oahu (Vienna Mus.); Adelbert von Chamisso, Oahu, "1816 et iterum 1817" (Berlin, Leningrad, type material of Lipotriche australis Lessing); Choris, Hawaiian islands (Leningrad); Otto Degener, K. K. Park, and W. Hirai (Degener distribution no. 4176), on arid, rocky plain 1,000 yards east of Kaena Point, Oahu, March 21, 1931 (British, Field, Kew); Degener and Park (Degener distribution no. 4182), on dry, grassy, weed-covered slopes and ledges in dry region, eastern side of Kuliouou Valley, Oahu, May 3, 1931 (Berlin; British; Delessert; Field, 2 sheets; Gray; Kew; Vienna Mus.; New York; U. S., cum varietate denticulata lecta); Eschscholtz, Oahu (Leningrad); C. N. Forbes (with C. M. Cooke) 1918-O, near beach, Lualualei, southwestern Oahu, July 1914 (Field); Gaudichaud, Hawaiian islands (Berlin); Gaudichaud 138, same location (Delessert); Guppy, rocks near sea, Kaena Point, Oahu, 1897 (Kew); Kastalsky, Oahu (Leningrad, 2 sheets); James Macrae, Oahu, May 1825 (Berlin, Gray, Kew, Vienna Mus.); U. S. Exploring Expedition, Oahu, 1840 (U. S.).

Gaudichaud's *Verbesina lobata* supplied the first published trivial name for this species and was, in fact, cited (although interrogatively) as a synonym by Lessing in 1831 for his *Lipotriche australis*. Asa Gray later retained the trivial name *australis* and reduced *lobata* to varietal rank beneath it—a procedure contrary to our present rules. This procedure becomes inconsequential, however, as the type materials for the two names are identical. Indeed, the only distinction of interest seems to be that for *Lipochaeta lobata* the original Gaudichaud specimens (at least the two cited) lacked mostly the principal leaves and possessed numerous diminutive secondary ones, these with a tendency toward being in some specimens more pedately or digitately 3- (or very rarely 5-) lobed. (See Gaudichaud: "Foliis ovatis, digitato-triquinquelobis, argute et grosse serratis, utrinque hispido-scabris, canescentibus, lobo medio elongato, lanceolato.") For *L. australis* the original specimen examined by me has no pedately lobed leaves, but rather leaves elongate with a tendency toward one basal lobe on each side. Lessing described the leaves as follows:

Folia decussata, petiolulata, parum supra basin tri- s. quintuplinervia, membranacea, reticulato-venosa, strigiloso-hispida, pilis paginae superioris e punctis albis, majoribus oriundis, scabra, parum rugosa, oblongo-ovata, antice longe angustata, obtusiuscula, basi obtusa aut acuta, grosse et profunde crenata, crenis posticis saepe ita magnis ut folia subtriloba evadant, circiter 3″ longa, 1″ lata, superiora minora magisque integra. Petioli 1-2 ‴ longi, hispidi, intus conduplicati.

L. lobata proper, although still extant in the Hawaiian islands (as seen, for example, from Degener, Park, and Hirai 4176, collected in 1931), is highly localized on Oahu and has remained comparatively unknown to collectors. Hillebrand (Fl. Haw. Is. pp. 205, 208, 1888) and others since his day have confused with it forms of *L. Rockii.* Drake (Illustr. fl. ins. maris Pacif., pl. 33, 1888, however, came closer to a correct understanding of *L. lobata,* for he used Remy 273 as the basis of his *L. lobata* plate. Remy 273 is now seen to be hardly typical for *L. lobata.* It is apparently somewhat closer to the variety *denticulata.* The Remy plant at Gray Herbarium was indeed labeled by Asa Gray, *"fere lobata,"* although certain other specimens which today are easily demonstrable as varietally almost if not quite the same, Gray described as new (*L. calycosa*).

Distribution: island of Oahu.

Lipochaeta lobata variety **β hastulata** (Hooker and Arnott) Sherff.

Lipochaeta lobata variety *hastulata* (Hooker and Arnott) Sherff, Bot. Gaz., vol. 95, p. 91, 1933.

Verbesina hastulata Hooker and Arnott, Bot. Beechey's Voy. p. 87, 1832.

Lipochaeta hastulata (Hooker and Arnott) De Candolle, Prodr., vol. 5, p. 611, 1836.

Microchaeta lobata variety *hastulata* (Hooker and Arnott) Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841.

Michrochaeta hastulata (Hooker and Arnott) Nuttall, ex Walpers, Repert., vol. 2, p. 620, 1843.

Leaves more or less hastulate, the principal ones often 10-12 cm long and 4-6 cm wide, subsessile, rounded to cuneate below and gradually narrowed to the petiole, on lower surface sometimes strongly veiny. Involucre's exterior bracts finally 5-7 mm long.

Type: collected by G. T. Lay and A. Collie (Captain Beechey's voyage), on Oahu, 1826-27 (Kew).

Specimens examined: Otto Degener, K. K. Park, and W. Hirai (Degener distribution no. 4181), among rocks, grass, and weeds on talus in dry region, along coast 2 miles east of Kaena Point toward Kawaihapai, Oahu, March 22, 1931 (Field, 2 sheets; Kew; forma vix typica); Lay and Collie (type, Kew).

Asa Gray labeled the type sheet *"Lipochaeta australis* A. Gr. var. γ *lobata."* This is doubtless to be explained by the fact that he had already reduced *L. lobata* (Gaudichaud) De Candolle to a varietal rank and was disinclined to reduce the plant under observation to still lower rank, hence the equation of the two. It is doubtful, however, if the two plants merge in nature.

Distribution: island of Oahu.

Lipochaeta lobata variety γ **denticulata** (Wawra) Sherff.

Lipochaeta lobata variety *denticulata* (Wawra) Sherff, Bot. Gaz., vol. 95, p. 92, 1933.

Lipochaeta calycosa A. Gray, Amer. Acad., Proc., vol. 5, p. 130, 1861.

Lipochaeta australis variety *denticulata* Wawra, Flora, vol. 56, p. 77, 1873. (*Lipochaeta* misspelled *Lypochaeto* by Wawra.)

Leaves commonly oblong-ovate, more rarely either suborbiculate-ovate or lanceolate or deltoid-lanceolate or lanceolate-oblong, membranaceous or sometimes thickish, now crenate-dentate or serrate now subremotely denticulate or even subentire. Involucre's exterior bracts finally up to 8 mm long, widely oblong or even subrotund. Ligulate florets at times up to 18. Achenial bodies scarcely 3 mm long.

Type: collected by Heinrich Wawra, no. 2294, on Oahu, 1868-71 (Vienna Mus.).

Specimens examined: Otto Degener, rocky, arid plain, Makapuu Point, Oahu, April 8, 1923 (Field); Degener, same location, December 1925 (Field); Degener 2482, common in arid *Prosopis-Lantana* thickets, valley opposite Koko Head, Oahu, January 28, 1928 (Berlin, Boissier, British, California, Delessert, Field, Florence, Gray, Kew, Missouri, New York, Paris, Philadelphia, Vienna Mus. and Univ.); Degener 4177-b, Kaena Point, Oahu, January 31, 1932 (Berlin, Boissier, British, California, Delessert, Field, Florence, Göteborg, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Degener 4201, among lava rocks and grass, Kuliouou Valley, Oahu, December 11, 1927 (Field, Kew); Degener and K. K. Park (Degener distribution no. 4180), on lava rocks in hot, arid region, Koko Head, Oahu, December 1930 (Field); Degener and Park 4182-b, on dry, grassy weed-covered slopes and ledges in dry region, eastern side of Kuliouou Valley, Oahu, May 3, 1931 (Berlin; British; Boissier; Delessert; California; Field, 2 sheets; Göteborg; Gray; Kew; Missouri; Munich; New York; Paris; U. S.; Vienna Mus. and Univ.; cum specie ipsa lecta); Degener, Park, and W. Hirai (Degener distribution no. 4177), forming mats on the loose lava rock on hot, arid plain near ocean, Kaena Point, Oahu, March 21, 1931 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); C. N. Forbes 1671-O, Koko Head, Oahu, March 14, 1911 (Field, 2 sheets); Forbes with Dean Lake 2274-O, talus slopes near Kaena Point, Oahu, December 16, 1915 (Field, 2 sheets; a specie ipsa vix differt); Forbes 2451-O, Koko Head, April 5, 1917 (Bishop); Forbes and D. W. Garber 141, right fork of Wailupe Valley, Oahu, January 12, 1920 (Bishop); Guppy, rocky ground, Koko Head, 1897 (Kew); William Hillebrand, Wailupe (Berlin, Gray) and Koko Head, Oahu (Gray); Hillebrand, west end of Oahu (Berlin); Jules Remy 273, Oahu, 1851-55 (Gray, vix typica et a specie ipsa non valde distincta); J. F. Rock, Diamond Head, Oahu, February 1917 (Bishop); Rock 3066, Diamond Head (Field); Rock 17122, Wailupe Valley, right hand branch, April 14, 1918 (Bishop); Otto Swezey (J. F. Rock no.) 10305, Diamond Head, Oahu, January 29, 1907 (Bishop); D. L. Topping 3305 (Otto Degener distribution no. 4215), growing 2 feet at altitude 1,000 feet, wind- and dirt-swept place on Niu Ridge, Oahu, January 13, 1929 (British, Field, Florence, Göteborg, Gray, Kew, New York, U. S.); U. S. Exploring Expedition, on Diamond Hill (Diamond Head), Oahu (Gray, U. S., cotype and type respectively of Lipochaeta calycosa A. Gray); Heinrich Wawra 2294 (type, Vienna Mus.).

This variety appears to hybridize with *L. integrifolia* variety *megacephala* to form × *L. procumbens*.

Distribution: island of Oahu.

Lipochaeta lobata variety δ **leptophylla** Degener and Sherff.

Lipochaeta lobata variety *leptophylla* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 92, 1933.

Leaves lanceolate or lanceolate-linear, often attenuate-acuminate, up to 8 (rarely 9) cm long. Involucral bracts ovate, at apex more or less acuminate.

Type: collected by C. N. Forbes no. 2024-O, at Kolekole Pass, Waianae Mountains, Oahu, February 1-2, 1915 (Field, 3 sheets).

Specimens examined: Otto Degener, cliffs at Manoa, southeastern Oahu, February 6, 1927 (Field); Forbes 2024-O (Field, 3 type sheets); Forbes and Dean Lake 2274-O, talus slopes near Kaena Point, Oahu, December 16, 1915 (Field); C. N. Forbes and J. C. Bridwell 2476-O, ridge between Niu and Wailupe, Oahu, April 11, 1917 (Bishop, Field); E. Y. Hosaka 888, growing 4 feet high, altitude 500 feet, dry slope, Kipapa Gulch, Oahu, December 19, 1932 (Berlin, British, Field, Gray); J. F. Rock 17122, Wailupe Valley, Oahu, April 14, 1918 (Bishop).

Distribution: northwestern and southeastern parts of Oahu.

Lipochaeta lobata variety ε **Aprevalliana** (Drake del Castillo) Sherff.

Lipochaeta lobata variety *Aprevalliana* (Drake del Castillo) Sherff, Bot. Gaz., vol. 95, p. 92, 1933.

Lipochaeta Aprevalliana Drake del Castillo, Illustr. fl. ins, maris Pacif., p. 71, pl. 34, 1888.

Lipochaeta Aprevaliana Drake del Castillo, ex Ind. Kew., Suppl. 1, p. 250, 1901-06 (sphalm).

Differing from species proper in its basally cordate or subcordate leaves.

Type specimen: collected by Jules Remy, no. 272, in the Hawaiian islands.

Specimens examined: Otto Degener, K. K. Park, and W. Hirai (Degener's distribution no. 4175), on hot, arid grassy lava and clay-covered hills and plains, between Makapuu Head and valley opposite eastern side of Koko Crater, Oahu, June 12, 1931 (British; California; Field, 2 sheets; Gray; Kew; Missouri; U. S.; Vienna Univ.).

Distribution: known definitely only from southeasternmost part of Oahu.

Lipochaeta lobata variety ζ **albescens** Sherff (fig. 16).

Lipochaeta lobata variety *albescens* Sherff, Bot. Gaz., vol. 95, p. 92, 1933.

Leaves often 8-13 cm long, pale, coriaceous, on upper surface subglistening and subglabrate; petioles and principal veins also the branchlets and pedicels and widely ovate involucral bracts finally straw-white.

Type: collected by A. A. Heller, no. 2021, on steep slopes at Diamond Hill (Diamond Head), Oahu, March 28, 1895 (Field).

Specimens examined: Heller 2021 (type, Field; cotypes, Gray, Missouri, New York, U. S.).

Distribution: known only from type locality in southeasternmost Oahu.

Lipochaeta lobata variety η **hastuloides** Degener and Sherff (fig. 17).

Lipochaeta lobata variety *hastulatoides* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 93, 1933.

Leaves shortly alate-petioled, ovate or oblong-ovate, subcoriaceous, sharply serrate, at apex more often subacute, 3-6.5 cm long including petiole.

Type: collected by Otto Degener, no. 4305, Pohakea Gulch, southeasternmost part of west Maui, July 11, 1927 (Field, 2 sheets).

Specimens examined: Degener 4305 (Field, 2 type sheets; cotypes, Berlin, British, Gray, Kew, New York).

FIGURE 16.—*Lipochaeta lobata* variety *albescens* (cotype, New York).

Interesting as being the only form of *L. lobata* known from Maui. The leaf characters place the variety between the varieties *hastulata* and *denticulata*. The general aspect of the foliage is deceptively like that of some species of *Prunus* and *Pyrus* in the family Rosaceae.

Distribution: known only from type locality on the island of Maui.

Lipochaeta lobata variety *θ* **grossedentata** Degener and Sherff.

Lipochaeta lobata variety *grossedentata* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 92, 1933.

FIGURE 17.—*Lipochaeta lobata* variety *hastulatoides* (first type sheet).

Leaves more delicate, oblong-lanceolate, scarcely petiolate with petioles about 2-3 mm long, the principal ones 6-8 cm long, on margins coarsely dentate, at apex acute. Capitula at anthesis about 2.5-2.9 cm across; ligules golden-yellow, narrowly obovate, about 5.5-7 mm wide, at apex manifestly bilobulate.

Type: collected by Otto Degener, K. K. Park, and William Bush, on rather dry, rocky, partly shaded slope in gulch north of middle of ridge between Puu Pane and Puu Kamaohanui, Oahu, January 10, 1932 (Field, 2 sheets).

Specimens examined: Degener, Park, and Bush, Oahu (type, Field, 2 sheets; cotype, Kew).

Distribution: known only from type locality on island of Oahu.

Lipochaeta lobata variety ι **maunaloensis** Sherff.

Lipochaeta lobata variety *maunaloensis* Sherff, Bot. Gaz., vol. 95, p. 93, 1933.

Principal leaves 4-7 cm long, very membranaceous, manifestly hastate-trilobed with lateral lobes widely oblong to subrotund, terminal lobe elongate and elliptic-oblong.

Type: collected by C. N. Forbes, no. 7-Mo, on Mauna Loa, Molokai (nec alibi), June 1912 (Field).

Specimens examined: Forbes 7-Mo (type, Field).

Distribution: known only from type locality on the island of Molokai.

12. **Lipochaeta intermedia** Degener and Sherff.

Lipochaeta intermedia Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 102, 1933.

Fruticose, foliose, branched, delicate. Leaves petiolate with slender petioles 8-14 mm long, petiole included 3-5.5 cm long, simple, minutely and sharply serrate, deltoid-lanceolate, at base widely cuneate or rounded, at apex moderately acuminate, thickish, on both surfaces whitish-hispid, strongly raised-veiny beneath. Capitula numerous, corymbose-cymosely disposed, very slenderly pedicellate with pedicels up to 2 cm long, radiate, at anthesis 1.2-1.6 cm across and about 5-6 mm tall. Involucre hispid; exterior bracts about 4 or 5, now oblong-lanceolate now ovate, at apex more often subacute, ± 4 mm long. Ligulate florets commonly 5, yellow, only about 6-7 mm long; ligule obovate-oblong, at apex subentire. Achenes black, cuneate, about 2.3-2.5 mm long; exterior ones 3-4-gonal, often tumid, glabrous or on angles obsoletely muriculate, above often spiny and centrally 1-6-aristate with short, slender, antrorsely hispidulous aristae.

Type specimen: collected by Alfred Meebold (Otto Degener distribution no. 4254), among lava, Huehue, Kona district, Hawaii, May 1932 (Field).

Specimens examined: Meebold (O. Degener distribution no. 4254) (type, Field).

A species somewhat intermediate between *L. lavarum* (especially the variety *ovata*) and *L. subcordata*. From *L. lavarum* it differs at once in its smaller and much more numerous capitula; from *L. subcordata* it is easily distinguished by its more slender and basally wide-cuneate or rounded (not subcordate or cordate) leaves, etc.

Distribution: known only from type locality on the island of Hawaii.

13. **Lipochaeta lavarum** (Gaudichaud) De Candolle.

Lipochaeta lavarum (Gaudichaud) De Candolle, Prodr. vol. 5, p. 611, 1836.

Verbesina lavarum Gaudichaud, Freycinet Voy. Bot., p. 464, 1830.

Michrochaeta? lavarum (Gaudichaud) Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 451, 1841.

Michrochaeta cavarum Nuttall ex Walpers, Repert., vol. 2, p. 620, 1843 (sphalm).

Lipochaeta lahainae Wawra, Flora, vol. 56, p. 77, 1873.

a. Principal leaves linear, only 1.5-3 mm wide.....**variety δ Skottsbergii**
a. Principal leaves wider
  b. Principal leaves more or less ovate, 1.8-2.5 cm wide.....**variety β ovata**
  b. Principal leaves narrower
    c. Secondary leaves numerous, oblong-linear or spatulate
      d. Secondary leaves 2-3 cm long.....**variety ε Hillebrandiana**
      d. Secondary leaves commonly 4-7 cm long.....**variety γ salicifolia**
    c. Secondary leaves commonly not numerous, similar to the principal, more or less lanceolate ones
      d. Principal leaves 7-13 cm long including petiole.....**variety η longifolia**
      d. Principal leaves 2.5-8 cm long including petiole.....**L. lavarum**

Suffruticose, erect, 3-5 dm tall, much branched; branches erect, rigid, strigose-canescent, foliose, the internodes often very short some only 3-7 mm long. Leaves suberect, petiolate with petioles up to 1 cm long, petiole included 2.5-8 cm long and 6-12 (rarely -19) mm wide, elliptic-lanceolate or narrowly oblong or rhombic-elliptic, at apex acute or acuminate (rarely obtuse), at base gradually narrowed into a petiole, serrate or crenate or subentire, canescent, thickish, strongly 3-nerved. Capitula simply cymose with slender pedicels strigose-canescent and 2-5 cm long, radiate, at anthesis 1.8-2.6 (rarely -3) cm across and about 5-7 mm tall. Involucre canescent; exterior bracts about 4 or 5, rigid, coriaceous, ovate or ovate-oblong or suborbiculate, obtuse, shorter than the disc. Ligulate florets 7-12, yellow, 6-13 mm long; ligule linear-oblong, at apex tridentate. Exterior achenes 3-4-angled, subrotund in outline, thick, brownish, moderately verrucose, often alate upon the angles, as to body 3-3.5 mm long, at apex fimbriate-setose and irregularly aristate; interior ones more glabrous, more obcompressed, on faces commonly black, on wings and fimbriae of apex yellowish or stramineous, few-aristate with aristae antrorsely spinulose-denticulate and 1-2 mm long.

Type: collected by Charles Gaudichaud (on Freycinet's voyage) in the Hawaiian islands, 1819 (Paris).

Specimens examined: Otto Degener 4027, barren grassy hills, near McGregor, west Maui, July 11, 1927 (Berlin, British, California, Delessert, Field, Florence, Göteborg, Gray, Kew, Missouri, New York, Paris, U. S., Vienna Mus. and Univ.); Degener 4188, in arid, grassy, precipitous ravine, mauka (inland) of Kawaihae, Hawaii, October 1, 1929 (Berlin, Boissier, British, California, Delessert, Field, Florence, Gray, Kew, Missouri, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Degener 4202, barren, grassy hills, near McGregor, west Maui, July 10, 1927 (Berlin, British, Field, Gray, Kew, U. S.); C. N. Forbes 288-L, slopes above Manele, Lanai, June 1913 (Field, 2 sheets); Forbes 507-L, Maunalei Gulch, Lanai, September 1917 (Field, 3 sheets); Forbes 2020-M, Kamana, south slope of Haleakala, Maui, March 28, 1920 (Field); Gaudichaud, Hawaiian islands (type, Paris; cotypes, Berlin, Delessert); William Hillebrand, Maui and Hawaii (Berlin); Hillebrand, between Lahaina and Wailuku, western Maui (Berlin); Hillebrand, Lanai (Berlin); Hillebrand 34, Maui (Gray, Kew); H. Mann, Hawaiian islands (Paris); Mann and W. T. Brigham 358, Lanai (Field, Gray, Missouri, U. S.); G. C. Munro, Lanai (U. S.); J. F. Rock 10286, Molokai, 1910 (Bishop, Gray); J. F. G. Stokes, C. M. Cooke, H. A. Pilsbry, and C. N. Forbes, Molokini, February 10, 1913 (Field); U. S. Exploring Expedition, hills along sea coast, west Maui, 1840 (U. S.); Heinrich Wawra 1792, Maui, 1868-71 (Vienna Mus.).

Wawra incorrectly identified his own no. 1917, of which two sheets of excellent material are preserved in the Natural History Museum at Vienna, as this species. It is, however, *Verbesina encelioides* (Cavanilles) Bentham and Hooker. His no. 1792 (printed 1972; on label altered apparently from 1972 to 1792 rather than vice versa) he naturally construed to be a new species, naming it *Lipochaeta lahainae*. Hillebrand (Fl. Haw. Is., p. 208,

1888) referred this name to his own variety γ (my variety *Hillebrandiana*). The types of *L. lahainae, L. lavarum,* and of all the varieties, as well as all the cotypes here cited, are now before me and *L. lahainae* is seen to be identical with *L. lavarum* proper.

Distribution: islands of Hawaii, Maui, Molokini, Molokai, and Lanai.

Lipochaeta lavarum variety β **ovata** Sherff (fig. 18).

Lipochaeta lavarum variety *ovata* Sherff, Bot. Gaz., vol. 95, p. 88, 1933.

Principal leaves ovate or sometimes subrhombic-ovate, crenate-serrate, canescent, at apex obtuse, 3-nerved with diverging nerves, on lower surface very veiny, at base narrowed into a petiole more often 1-1.5 cm long, petiole included 4.5-6 cm long and 1.8-2.5 cm wide.

Type: collected by J. F. Rock, no. 8674, below the crater at Kahikinui, Maui, November 1910 (Gray).

Specimens examined: C. N. Forbes 2015-M, Puu Onole (Puu Ouli), south side of Haleakala, Maui, March 18, 1920 (Field); Rock 8674 (type, Gray; cotype, Field).

Forbes 2020-M, from much the same vicinity in southeastern Maui (Kamana, southern slope of Haleakala), has foliage not really separable from that of *L. lavarum* proper. Thus *L. lavarum* is seen to be present in the vicinity whence came my type. Indeed, the cited cotype sheet has, besides two sprays of the ovate-leaved form, one spray with numerous smaller and narrower leaves hardly atypic for *L. lavarum.* The ovate-leaved form, however, is known from nowhere else in the Hawaiian islands and appears best construed as an endemic variety.

Distribution: southeastern part of the island of Maui.

Lipochaeta lavarum variety γ **salicifolia** Sherff.

Lipochaeta lavarum variety *salicifolia* Sherff, Bot. Gaz., vol. 95, p. 88, 1933.

Lipochaeta lavarum variety β Hillebrand, Fl. Haw. Is., p. 207, 1888.

Secondary leaves oblong-linear, entire, strongly membranaceous, weakly veiny, green above, weakly hoary below, 3.5-7.5 mm wide.

Type: collected by E. Bishop near Lahaina, Maui (Berlin).

Specimens examined: E. Bishop, near Lahaina, Maui (type, Berlin); C. N. Forbes 2270-M, Lahaina, Maui, May 8, 1920 (Field; forma vix typica).

Hillebrand's type is a small flowering branch, less than 1.5 dm long. This subdivides near the base into branchlets (besides a terminal peduncle) and the leaves present, though numerous, include none of the larger primary or principal ones which on some specimens of *L. lavarum* occur on only the larger branches. Hence the leaf description must needs be regarded as incomplete. The leaves are thin or membranaceous and appear comparatively so green on the upper surface as to seem glabrous, but under a lens abundant, appressed, white hairs can be seen.

Forbes 2270-M was collected in the type locality. The specimen cited is a handsome one, some 5 dm long and with numerous leaves and various flowering and fruiting heads. It is probably to be construed as a slightly atypic form of this variety. The leaves are somewhat more veiny, at the apex

FIGURE 18.—*Lipochaeta lavarum* variety *ovata* (type).

more often acute, and the few principal leaves present measure up to 12 mm in width. The larger the leaves, the more tendency there is to become crenate-denticulate.

Distribution: known only from type locality in west Maui.

Lipochaeta lavarum variety δ **Skottsbergii** Sherff (fig. 19).

Lipochaeta lavarum variety *Skottsbergii* Sherff, Bot. Gaz., vol. 95, p. 89, 1933.

Leaves numerous, strigose-canescent, linear, 2-3.5 cm long and only 1.5-3 mm wide. Type: collected by F. D. Bennett, no. 43, on Mawee (Maui), 1833-36 (Berlin). Specimens examined: Bennett 43 (type, Berlin).

Through this variety *L. lavarum* is seen to approach, in foliage, the erect forms of *L. integrifolia*. The name is chosen in honor of Dr. Carl J. F. Skottsberg, Director of the Arboretum of Göteborg, Sweden, who studied the type in 1925 and treated it as a narrow-leaved form of *L. lavarum*.

Distribution: known only from the island of Maui.

Lipochaeta lavarum variety ε **Hillebrandiana** Sherff (fig. 20).

Lipochaeta lavarum variety *Hillebrandiana* Sherff, Bot. Gaz., vol. 95, p. 89, 1933.

Lipochaeta lavarum variety γ Hillebrand, Fl. Haw. Is., p. 208, 1888.

Dwarf, fruticose, spreading, divaricately branched. Secondary leaves linear-oblong or spatulate, membranaceous or scarcely thickish, in the dry state coriaceous, 3-nerved, canescent, entire, at apex obtuse or even rounded-obtuse, only 2-3 cm long and 3-7 mm wide. Achenes interruptedly alate.

Type: collected by William Hillebrand, on rocks near the sea, Lahaina, Maui (Berlin).

Specimens examined: William Hillebrand, Lahaina (type, Berlin); Hillebrand, gulch back of Lahaina, August 1870 (Berlin, cum specie ipsa commixta); Horace Mann and W. T. Brigham 374, mountain above Maalaea Bay, western Maui (Field, Gray); Jules Remy 277, Hawaii, 1851-55 (Gray, Paris).

The Hillebrand herbarium (Berlin) has five specimens on the type sheet, four of them almost devoid of leaves. An additional sheet, however, bears two sprays of the species proper and one of this variety—all three coming from the type vicinity. Hillebrand himself appears to have overlooked this supplementary specimen of his variety. It bears among the numerous secondary leaves several of the larger primary or principal leaves and these are 10-12 mm wide, but less than 5 cm long. Hillebrand cited Maalaea Bay as a second locality for this variety. Mann and Brigham 374, from a mountain above Maalaea Bay, apparently has the more shrubby, dwarfed, and divaricately branching habit of the variety's type material, but the leaves average nearly twice as long as in the type and display in this respect an approach to those of the species proper.

Distribution: along southern coast of western Maui, also on Hawaii.

FIGURE 19.—*Lipochaeta lavarum* variety *Skottsbergii* (type).

FIGURE 20.—*Lipochaeta lavarum* variety *Hillebrandiana* (type).

Lipochaeta lavarum variety η **longifolia** Sherff (fig. 21).

Lipochaeta lavarum variety *longifolia* Sherff, Bot. Gaz., vol. 95, p. 90, 1933.

Internodes perhaps more elongate, principal leaves 7-13 cm long including petiole.

Type: collected by G. C. Munro, no. 202, Maunalei Valley, Lanai, March 9, 1915 (Bishop).

Specimens examined: Munro 202 (Bishop).

Distribution: known only from the type locality on the island of Lanai.

FIGURE 21.—*Lipochaeta lavarum* variety *longifolia* (type).

14. Lipochaeta lifuana Hochreutiner.

Lipochaeta lifuana Hochreutiner, New York Bot. Gard., Bull., vol. 6, p. 297, 1910.

Weddelia lifuana Hochreutiner, New York Bot. Gard., Bull., vol. 6, p. 298, 1910.

More or less suffruticose, creeping or suberect, appressedly villous-argenteous in all parts, stems rounded-tetragonal and especially at the apex densely villous. Leaves petiolate with petioles 3-12 mm long, including petiole 1.8-4.2 (rarely -5.5) cm long and 3.5-18 (rarely -20) mm wide, extremely variable, from rhombic-ovate or lanceolate-oblong to narrowly lanceolate-linear, at base attenuate into a petiole and so often more or less spatulate, on margins entire or obscurely crenulate-dentate, above flat, below obscurely or conspicuously raised-veiny, at base 3-nerved, at apex obtuse or even rounded. Capitula solitary on peduncles 2-5 cm long, odoriferous, radiate, at anthesis 1.3-1.7 cm across and 6-8 mm tall. Involucral bracts various, from lanceolate to widely ovate-lanceolate or rounded-ovate, at apex somewhat acute but never acuminate, on outer surfaces appressedly villous as are the peduncles and indeed the whole plant, about 4-5 mm long and about 1.6-3 mm wide. Ligulate florets ± 11-16, yellow, about 7-10 mm long; ligule widely or narrowly oblong, sparsely white-pilose, at apex denticulate or emarginate, about 7-10 mm long. Achenes narrowly cuneate, exalate, brownish-black, at truncate apex erectly and very densely whitish-setose but exaristate, 1.5-1.7 mm long, the exterior ones 3-4-angled with subacute angles, the interior ones obcompressed.

Type: collected by Eugène Vieillard, no. 799, on Lifu, Loyalty Islands (New York).

Specimens examined: Anonymous, Annatum, New Hebrides (Gray); Mr. Balansa, New Caledonia, 1868-70 (Paris); Mr. Deplanche, New Caledonia, 1861 (Paris); I. Franc 1926, along shore, Prony, New Caledonia, September 1, 1914 (Paris); Franc 2113, sands of the seashore, Noumea, New Caledonia, April 1917 (Paris); Franc 2243, New Caledonia (New York); Mr. and Mrs. LeRat, New Caledonia, September 1908 (Paris); Mr. Pancher 467, Isle of Pines (Paris); Mr. Thibaud 669, New Caledonia, November 1863 (Paris); Vieillard 699, New Caledonia (New York); Vieillard 799 (type, New York, 2 sheets; cotypes, Kew, Paris; nom. indig. "sesinaya" vel "sesinaja").

The plants are intermediate in aspect between *L. integrifolia* and *L. lavarum*. At times all the leaves of a herbarium specimen have blades only 3.5-5 mm wide, again the width ranges from 1 to 1.7 cm. Various intermediate specimens exist, however, and in some cases a single specimen bears numerous leaves of both extremes in width, thus rendering attempts at varietal distinctions seemingly inadvisable. The flowers are said to have the odor of arnica.

Distribution: Loyalty Islands, also on the island of Annatam (Aneityum) of the New Hebrides.

15. Lipochaeta Bryanii Sherff (fig. 22).

Lipochaeta Bryanii Sherff, Bot. Gaz., vol. 95, p. 97, 1933.

Suffruticose, branched; branches angulate or even subalate, minutely appressed-hispidulous, delicate. Leaves numerous, petiolate with slender petioles up to 1.5 cm long, including petiole the principal ones about 4-5 cm long the others commonly 2-3 cm long, in outline oblong or hastate, at apex obtuse, at base widely cuneate, on margins weakly and crenately few-serrate or at base even 1-lobulate on each side, rugulose, very densely and very minutely appressed-hispidulous, on lower surface raised-veiny. Capitula disposed at ends of branchlets, slenderly pedicellate with pedicels appressed-hispidulous and

1-4 cm long, radiate, at anthesis about 1.4-1.7 cm across and about 4-5 mm tall. Involucre appressed-hispidulous; exterior bracts 4 or 5, ovate or widely oblong, at apex obtuse or rounded, at base weakly gibbous, 3.5-4.5 (rarely -5) mm long. Florets minutely pilose; the 5 ligulate ones yellow and 6-8 mm long; ligule oblong or narrowly obovate, at apex bidenticulate. Exterior achenes tumid, orbiculate or obovate-cuneate, 3-4-gonous, strongly verrucose or even verrucose-spinulose (especially at the apex's circumference), on angles rarely more or less interrupted-alate, as to body about 2-2.5 mm long, at apex erectly hispid and centrally 2-3-aristate; aristae subsquamelliform, sharp, short, erect.

Type: collected by E. H. Bryan, Jr., no. 736, amid pili grass, on slope, Kahoolawe, February 16, 1931 (Bishop).

Specimens examined: Bryan 736 (type, Bishop).

FIGURE 22.—*Lipochaeta Bryanii* (type).

The species is named in honor of the type collector, E. H. Bryan, Jr., Curator of Collections at Bernice P. Bishop Museum. It was largely through his kind coöperation that I was permitted to study the type and various specimens belonging to the herbarium of this institution.

Distribution: island of Kahoolawe.

16. **Lipochaeta flexuosa** Drake del Castillo.

Lipochaeta flexuosa Drake del Castillo, Ill. fl. ins. maris Pacif., p. 73, pl. 36, 1888.

Herbaceous or finally suffruticose, softly or subrigidly scabrid-hispidulous; stems slender, perhaps 7-8 dm tall, above more or less tetragonal, below subterete subflexuous or almost straight. Leaves slenderly petiolate with petioles 1-1.5 (up to 4, fide auctoris) cm long and basally not dilated-connate, including petiole 7-11 long and 3-4 (-6) cm wide, in outline deltoid or deltoid-lanceolate, pinnatisect or trilobed with segments incisely dentate (the teeth mucronate) and extremely membranaceous, at base subcordate or very widely cuneate-rounded, at apex acute or subacuminate. Capitula not numerous, 3-5-clustered on pedicels very slender and 1-6 cm long, radiate, at anthesis 1.5-2.2 cm across and 5-6 mm tall. Involucre's exterior bracts about 4, ovate or lanceolate, at apex acute, about 4 mm long. Ligulate florets 7-9, yellow, about 1 cm long; ligule oblong or widely oblanceolate, at apex 2- or 3-denticulate. Achenes black, as to body about 3 mm long; exterior ones subtrigonous, cuneate-obovate, on dorsal surface gently convex, at apex and on faces more or less verrucose and setulose, on angles often interrupted-alate, aristae of the subcoronuliform pappus often 5-6; interior ones linear, oblong, obcompressed, aristae ± 2.

Type: collected by Jules Remy, no. 265, in the Hawaiian islands, 1851-55. Herbarium not cited, but the type is represented by Drake's published plate.

Specimens examined: Abbé Urbain Faurie 1005, altitude 1,000 meters, Kamalo, Molokai, June 1910 (British, Delessert).

The Faurie specimens examined by me have the lower third or half of many of the leaf blades tending to be wider than the rest, resulting at times in a distinctly trilobate blade. A few leaves, however, match those of Drake's type plate quite closely.

L. Fauriei has the habit of this species but differs sharply in such characters as fewer-rayed and smaller-flowering heads and amount of division in the leaf blades.

Distribution: known only from the island of Molokai.

17. **Lipochaeta Fauriei** Léveillé.

Lipochaeta Fauriei Léveillé, Fedde Repert., vol. 10, p. 122, 1911.

Stem subherbaceous, sharply angled, sulcate, scabrid, puberulent. Leaves slenderly petiolate with petioles about 1-1.5 cm long, including petiole 5-9 cm long, scabrid, membranaceous, lanceolate-oblong to narrowly oblong-ovate or rarely subhastulate, irregularly or subregularly dentate or incisely lobulate, at base dilated-cuneate. Capitula disposed at ends of branchlets, commonly in threes, shortly pedicellate (with pedicels slender, hispid, about 4-15 mm long), surpassed by the leaves, radiate, at anthesis about 11-14 mm across and about 6-7 mm tall. Involucre's exterior bracts few (only about 3), hirsute, lanceolate-ovate, at apex obtuse, at base slightly gibbous, 4-6 mm long. Florets

hispidulous; ligulate ones about 4 or 5, yellow, about 6-8 mm long; ligule widely oblong or flabellate, at apex several-dentate. Achenes unknown.

Type: collected by Abbé Urbain Faurie, no. 1012, at Kolekole, Kauai, March 1910. Herbarium of type not cited. I rely upon cotype (type?) in Museum of Natural History, Paris.

Specimens examined: Faurie 1012 (type collection, Paris).

Rock (Fedde Repert., vol. 13, p. 354, 1914) reduces this to *L. lobata*. While the leaves do in fact make a weak approach to those of *L. lobata* proper (and a stronger approach to those of *L. Rockii*, a species confused by Rock with *L. lobata*), the sharply angled, more or less herbaceous stems and the short pedicels seem to separate *L. Fauriei* quite clearly. The affinity with *L. flexuosa* is closer.

Distribution: known only from type locality on island of Kauai.

18. Lipochaeta heterophylla A. Gray.

Lipochaeta heterophylla A. Gray, Amer. Acad. Proc., vol. 5, p. 130, 1861 (exclud. formam foliis laciniatis vel inciso-pinnatifidis) (Trivial name misprinted "hetrophylla.")

Lipochaeta hastata Hillebrand, Fl. Haw. Is., p. 208, 1888.

Lipochaeta lobata variety *heterophylla* (A. Gray) Hillebrand, Fl. Haw. Is., p. 209, 1888.

Weak, scarcely erect; branches slender, often subtwining or subscandent; leaves extremely polymorphous; plants of Lanai and Maui, rarely of Molokai.....**L. heterophylla**

Robust; branches stronger, neither subtwining nor subscandent; leaves commonly subsimple or hastate-trilobed, in the dry state commonly yellowish-green, seldom pedately 3-5-lobed; plants of Molokai.....**variety β molokaiensis**

In some respects intermediate, commonly very much branched; leaves bluish-green in dry state, more often much divided; capitula extremely numerous, at anthesis commonly under 1 cm across; plants of Molokai.....**variety γ malvacea**

Suffruticose, usually weak, rarely subrobust, scabrid-hispid or rarely scabrid-subglabrate; branches weak, often subtwining or subscandent. Leaves now sessile and at base more or less connate, now petiolate with alate petioles up to 2 cm long and at base dilated-connate, including petiole (when present) 2-8 cm long, extremely polymorphous, now simple, ovate or oblong or oblong-linear (entire or dentate), now more or less pedately 3-5-lobed (with lobes oblong-linear or oblong or lanceolate, obscurely dentate or even conspicuously incised-dentate), at apex mucronate or sometimes emarginate. Capitula not numerous, slenderly pedunculate with peduncles often 7-14 cm long, radiate, at anthesis 1-2.2 cm across and about 6 mm tall. Involucre hispid; exterior bracts about 4, ovate or oblong, often acuminate, 5-7 mm long. Ligulate florets about 8, yellow, 1-1.3 cm long; ligule elliptic-linear, at apex 2-3-denticulate. Achenes more or less cuneate; exterior ones verrucose and reddish-black; interior ones glabrous and black, on angles lacerate, as to body about 3 cm long, at apex truncate and few-aristate with aristae ± 1 mm long.

Type: collected by the U. S. Exploring Expedition in western part of Maui, 1840 (U. S.).

Specimens examined: William Hillebrand, Lanai (type of Lipochaeta hastata Hillebrand, Berlin; cotypes, Berlin, Gray, U. S.); Hillebrand, west Maui (Berlin; Gray, 2 sheets); Hillebrand 27, Maui (Kew); A. S. Hitchcock 14721, common weed in pasture,

west end of Lanai, September 22, 1916 (U. S.); H. Mann and W. T. Brigham 359, Lanai (Delessert; Field, 2 sheets; Gray; Missouri; U. S.); G. C. Munro, Lanai (Bishop); Munro 502, Miki, Lanai, February 8, 1916 (Bishop); Munro 502-x, Maluea, Lanai, same date (Field); J. F. Rock 14003, near Moomomi, about 9 kilometers from west end of north coast of Molokai, May 20, 1918 (Bishop); U. S. Exploring Expedition, west Maui, 1840 (type, U. S.; cotype, Gray, ubi cum L. Rockii varietate dissecta commixta).

Gray had before him at least three sheets of material for this species, all of it collected by the U. S. Exploring Expedition. One sheet is at Gray Herbarium and a second and third sheets are in the United States National Herbarium. The first sheet (Gray) has two sprays, one with the leaves simple or trifid, sessile, and basally connate, the other with the leaves wing-petioled and incisely pinnatifid. Gray regarded this second spray as representing a variety of his species and in fact so designated it on the label. This second spray is seen, from a study of the labels in the U. S. National Herbarium, to have come from eastern Maui, whereas the first spray came from western Maui. The second spray is found to be a variety of *L. Rockii* (variety *dissecta* Sherff) and may here be discarded from *L. heterophylla.*

The second sheet (U.S.) bears exclusively the variety *dissecta* of *L. Rockii,* and likewise may here be discarded from *L. heterophylla.* (So also for still another sheet occurring in the Herbarium of the New York Botanical Garden, the label of which bears Gray's determination but not in his own handwriting.) The third sheet (U.S.) has two sprays, one matching the above retained typical specimen at Gray Herbarium, the other being referable to *L. Rockii* variety *dissecta* (of which it is hardly typical).

Hillebrand's *L. hastata,* from Lanai, is represented by several authentic sheets in Berlin and elsewhere and is seen to be inseparable from *L. heterophylla* Gray. In fact, Hillebrand referred to his own *L. hastata,* "a form from W. Maui . . . stouter, rather hispid, with coarser leaves of 2-3′ in length," which matches quite closely the real type material of *L. heterophylla,* from the same locality.

Gray drew his description to include leaves incisely pinnatifid. It may be remarked that while the specimens which are to be transferred, as already stated, to *L. Rockii* variety *dissecta,* formed his basis for this, *L. heterophylla* does in fact have occasional forms with incisely pinnatifid leaves. These may be recognized at once by their dilate-connate petiole bases. They do not, however, appear to be constant enough to warrant varietal distinction.

Distribution: island of Lanai, western Maui, and northwestern Molokai.

Lipochaeta heterophylla variety *β* **molokaiensis** Sherff.

Lipochaeta heterophylla variety *molokaiensis* Sherff, Bot. Gaz., vol. 95, p. 96, 1933.

More robust, leaves commonly hastate-trilobed and when dry commonly yellowish-green, the blade or principal lobe rotund to lanceolate.

Type: collected by J. F. Rock, no. 10287, at west end of Molokai, 1910 (Field).

Specimens examined: C. N. Forbes 110-Mo, Mauna Loa, western Molokai, June 1912 (Field, 2 sheets); Rock 10287 (type, Field; cotype, Gray; pro specie nova a Rockio habita).

A variety at first considered by me as a valid species and later found to have been previously so treated by Rock, who appears from his several herbarium determinations to have given it special attention.

Distribution: northwesternmost Molokai.

FIGURE 23.—*Lipochaeta heterophylla* variety *malvacea* (first type sheet)..

Lipochaeta heterophylla variety γ **malvacea** Degener and Sherff (fig. 23).

Lipochaeta heterophylla variety *malvacea* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 95, p. 96, 1933.

Fruticose, much and divaricately branched; branches and branchlets terete, whitish, scabrid-hispidulous or finally glistening-subglabrate. Leaves numerous, (sometimes very

widely) alate-petiolate with petioles 5-15 mm long and at the base dilated-connate, 2-6 cm long including petiole, in outline deltoid-ovate; now 3-lobed with lobes obtuse, irregularly dentate or even more or less sublobulate, on both surfaces scabrid-hispid, on lower surface conspicuously veiny; now undivided. Capitula very numerous (a single herbarium sheet bearing ± 100), cymosely disposed on slender pedicels 1-4 cm long, at anthesis very minute (only about 6-7 mm across and about 3 mm tall). Involucre scabrid-hispid; exterior bracts about 6, widely oblong-lanceolate or ovate-lanceolate, at apex more or less acute, finally 3-4 mm long. Ligulate florets about 8, golden-colored, 3-4 mm long; ligule obovate, at apex sharply 2-3-denticulate. Achenes brownish, extremely verrucose, obovate-cuneate, on lateral angles alate with wings often incised or interrupted and at apex produced into a squamelliform arista, as to body 2.4-3 mm long, the exterior ones 3-4-angled above with the median angles more or less produced into an arista, the interior ones obcompressed; commonly all slenderly and erectly 2-aristate from the center of the apical surface and between the aristae erectly several-setose.

Type: collected by Otto Degener, no. 4199, on arid, rocky plain near Kolo, western Molokai, April 5, 1928 (Field, 3 sheets).

Specimens examined: Degener 4199 (type, Field, 3 sheets; cotypes, Berlin, Boissier, British, California, Delessert, Florence, Göteborg, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Degener 4212 pro maxima parte dry, grassy, rocky plain, near Waiahewahewa Gulch, Molokai, April 18, 1928 (Berlin, British, Field, Gray, Kew).

Plants, when characteristically developed, easily separated from *L. heterophylla* proper by their much more numerous heads, these being at anthesis, furthermore, only about 6-7 mm, not as in *L. heterophylla* 1-2.2 cm wide. The foliage when much dissected has a distinctly malvaceous aspect. Were it not for various connecting forms known in the herbaria, one might feel warranted in regarding this as a separate species. Because of the exceptional divergence displayed, as contrasted with *L. heterophylla* proper, a carefully detailed description has been given.

Distribution: known only from western and northwestern Molokai.

A number of specimens of a robust form from western Molokai and having mostly simple, deltoid-ovate, caeruleous leaves, were formerly included by me under variety *molokaiensis*. Recently however, Degener has collected such specimens intermixed with true variety *malvacea*. Whence it appears that variety *malvacea* approaches the robust variety *molokaiensis* in all characters unless the caeruleous color of the dried foliage. Apparently, therefore, variety *malvacea* includes the following additional specimens:

Otto Degener 4213, on arid, rocky, clay plain near coast, near Kepuhi, Molokai, April 28, 1928 (Berlin; Boissier; British; California; Delessert; Field, 2 sheets; Gray; Kew; Missouri; Munich; New York; Paris); C. N. Forbes 617-Mo, toward "Ka Lae Ka Ilio Ilio," northwestern Molokai, March 25, 1915 (Field, 2 sheets); J. F. Rock 14010, Moomomi, northwestern Molokai, May 20, 1918 (Bishop); Rock 14022, cliffs near Ka Lae o Ka Ilio, northwesternmost Molokai, May 24, 1918 (Bishop, Field).

19. Lipochaeta Rockii Sherff (fig. 24).

Lipochaeta Rockii Sherff, Bot. Gaz., vol. 95, p. 100, 1933.

a. Leaves commonly 3-5-parted
  b. Leaf lobes linear-oblong, sharply incised-dentate or pinnatifid; plant of Maui.....**variety γ dissecta**
  b. Leaf lobes broader, moderately dentate and rarely a little incised; plant of Molokai and Oahu.....**L. Rockii**
a. Leaves coarsely dentate or incisely lobulate; plant of Molokai.....**variety β subovata**

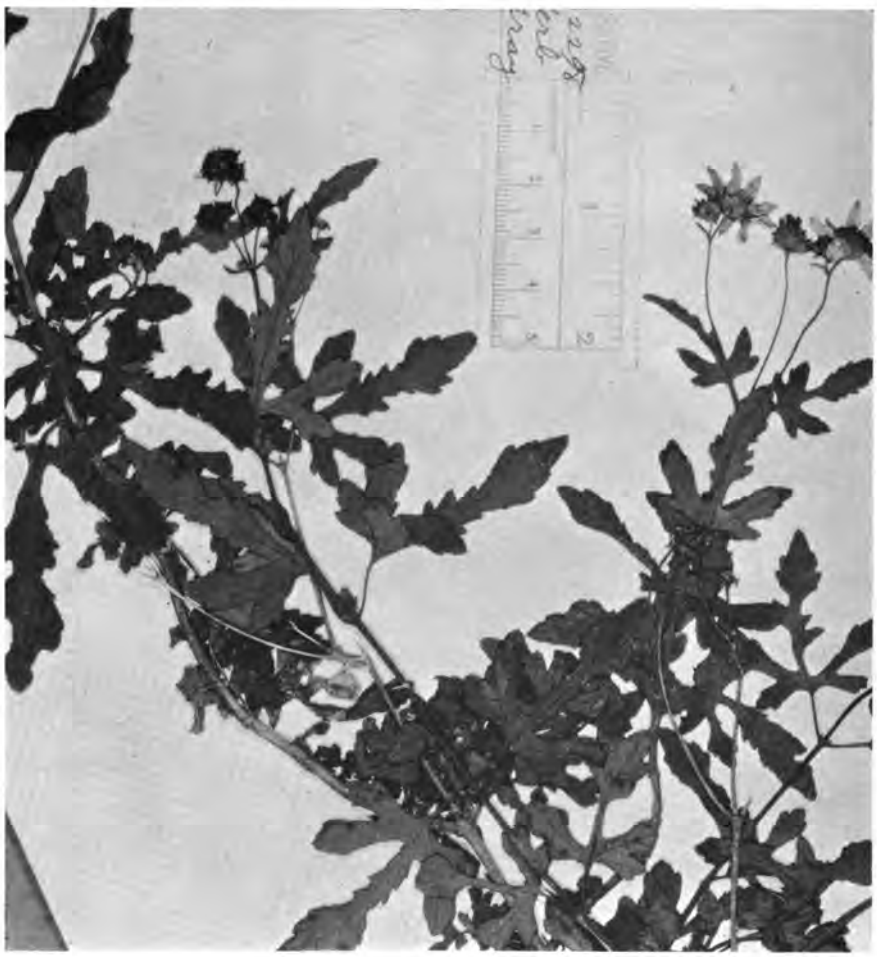

FIGURE 24.—*Lipochaeta Rockii* (type).

Fruticose, branched with branches terete and slightly sulculate, hispidulous. Leaves petiolate with petioles more or less marginate and about 7-14 mm long, petiole included 3-5 cm long, in outline triangulate-ovate to triangulate-cordate, 3-5-lobed or subpedately 3-5-parted; lobes membranaceous, dentate or again lobulate, subrotund to linear-oblong,

commonly obtuse, the terminal one longer or even elongate and laterally laciniate-dentate. Capitula subcorymbose, slenderly pedicellate with pedicels hispidulous and commonly 3-6 cm long, radiate, at anthesis 1.5-2.4 cm across and 5-6 mm tall. Involucre hispidulous; exterior bracts about 5 or 6, now lanceolate-oblong now ovate or obovate but at apex more or less acuminate, 2-4 mm long; ligulate florets about 8, yellow or yellowish, 7-9 mm long; ligule moderately or very widely oblong, at apex sharply bidentate. Achenes black, on faces very minutely appressed-hispidulous and often subverrucose, cuneate, as to body 2-2.8 mm long, at truncate apex erectly setose and (centrally) as a rule 2-aristate with aristae slender and short; the exterior ones 3-4-gonous, more or less alate with interruptedly erose wings.

Type: collected by J. F. Rock, no. 6156, at "Mapulou (west end)," Molokai, March 22, 1910 (Gray).

Specimens examined: Otto Degener 4212 pro minima parte, dry, grassy, rocky plain near Waiahewahewa Gulch, Molokai, April 18, 1928 (Field, Kew); Abbé Urbain Faurie 1001, Kamalo, Molokai, June 1910 (British; Delessert, 2 sheets); Faurie 1002, same date and location (British, Delessert); C. N. Forbes 220-Mo, mountains below Puu Kolekole, Molokai, July 1912 (Field, 3 sheets; Missouri); William Hillebrand, Oahu (Berlin, Kew); Hillebrand, Molokai (Berlin, 2 sheets); Rock 6156 (type, Gray; cotype, Field).

This species and its varieties have commonly been confused with *L. lobata*.

Distribution: islands of Molokai and Oahu.

Lipochaeta Rockii variety *β* **subovata** Sherff (fig. 25).

Lipochaeta Rockii variety *subovata* Sherff, Bot. Gaz., vol. 95, p. 101, 1933.

Principal leaves 4-7 cm long and up to 5 cm wide, deltoid-ovate or subovate, coarsely dentate or incisely lobulate, petioles narrowly alate-margined.

Type: collected by Jules Remy, no. 270, Molokai, 1851-55 (Paris).

Specimens examined: Otto Degener 4210, rocky, dry hillsides near Mokomoko, Molokai, June 7, 1928 (Field; Kew; forma foliis valdius incisis apice saepe elongato-acuminatis, petiolis vix marginatis); Degener 4217, in dry region, east fork of Kawela Valley, Molokai, May 5, 1928 (Field, Kew); Remy 270 (type, Paris).

Distribution: known only from mountainous region of eastern Molokai.

Lipochaeta Rockii variety *γ* **dissecta** Sherff (fig. 26).

Lipochaeta Rockii variety *dissecta* Sherff, Bot. Gaz., vol. 95, p. 101, 1933.

Leaves marginate-petioled, the principal ones 5-7.5 cm long, commonly 3-5-parted with lobes linear-oblong and sharply incised-dentate or pinnatifid.

Type: collected by the U. S. Exploring Expedition, in eastern Maui, 1840 (U. S.).

Specimens examined: William Hillebrand, western Maui (Berlin); Hillebrand 27, Maui (Gray, Kew, cum L. heterophylla commixta); U. S. Exploring Expedition, eastern Maui (type, U. S.; cotype, Gray, cum L. heterophylla commixta); U. S. Exploring Expedition, without location but doubtless western Maui (New York); U. S. Exploring Expedition, western Maui (U. S., cum L. heterophylla commixta); Heinrich Wawra 1926, Maui (Vienna Mus., 2 sheets).

The specimens from western Maui have the leaf lobes less finely dissected, but are hardly to be separated varietally.

Distribution: island of Maui.

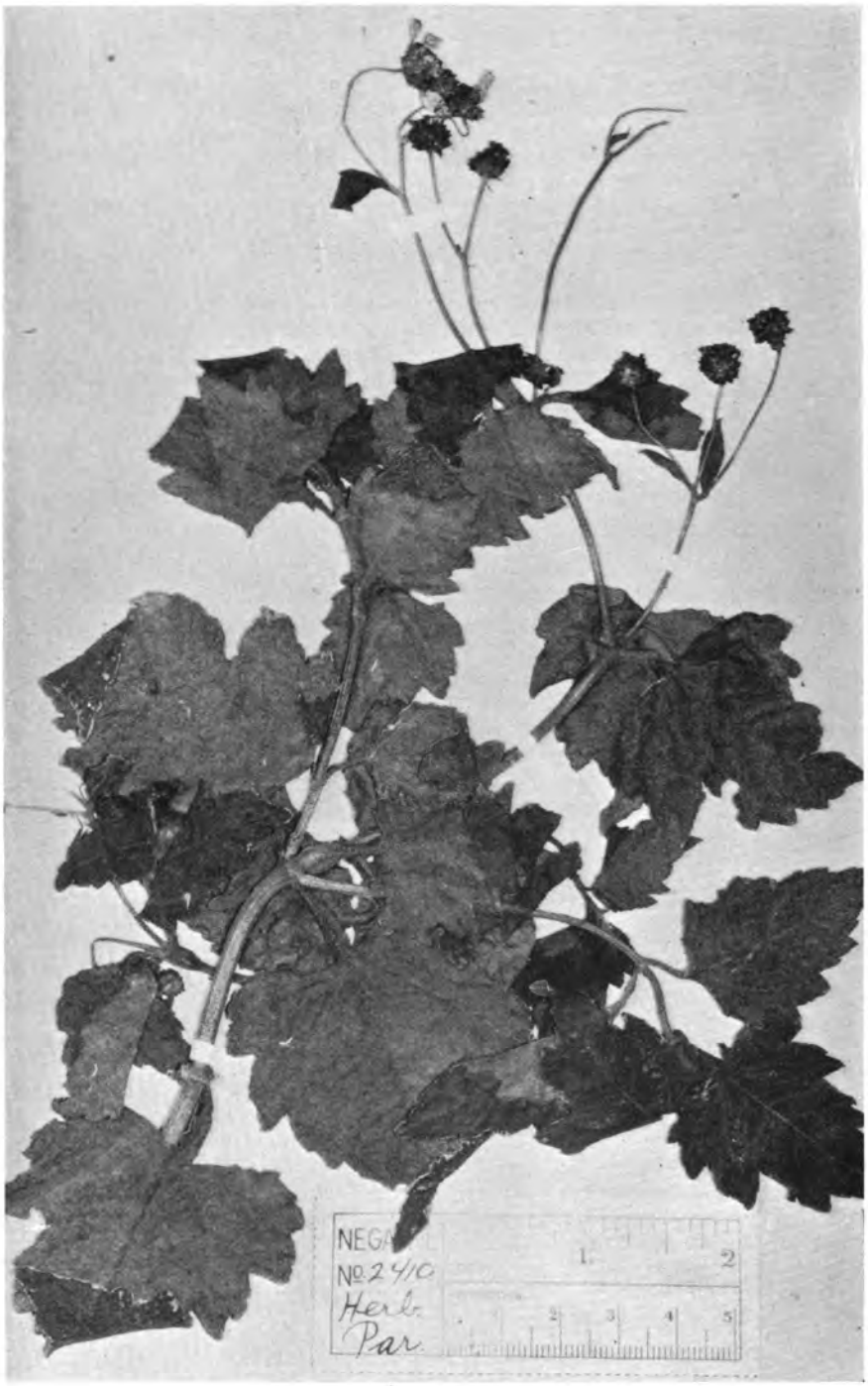

FIGURE 25.—*Lipochaeta Rockii* variety *subovata* (type).

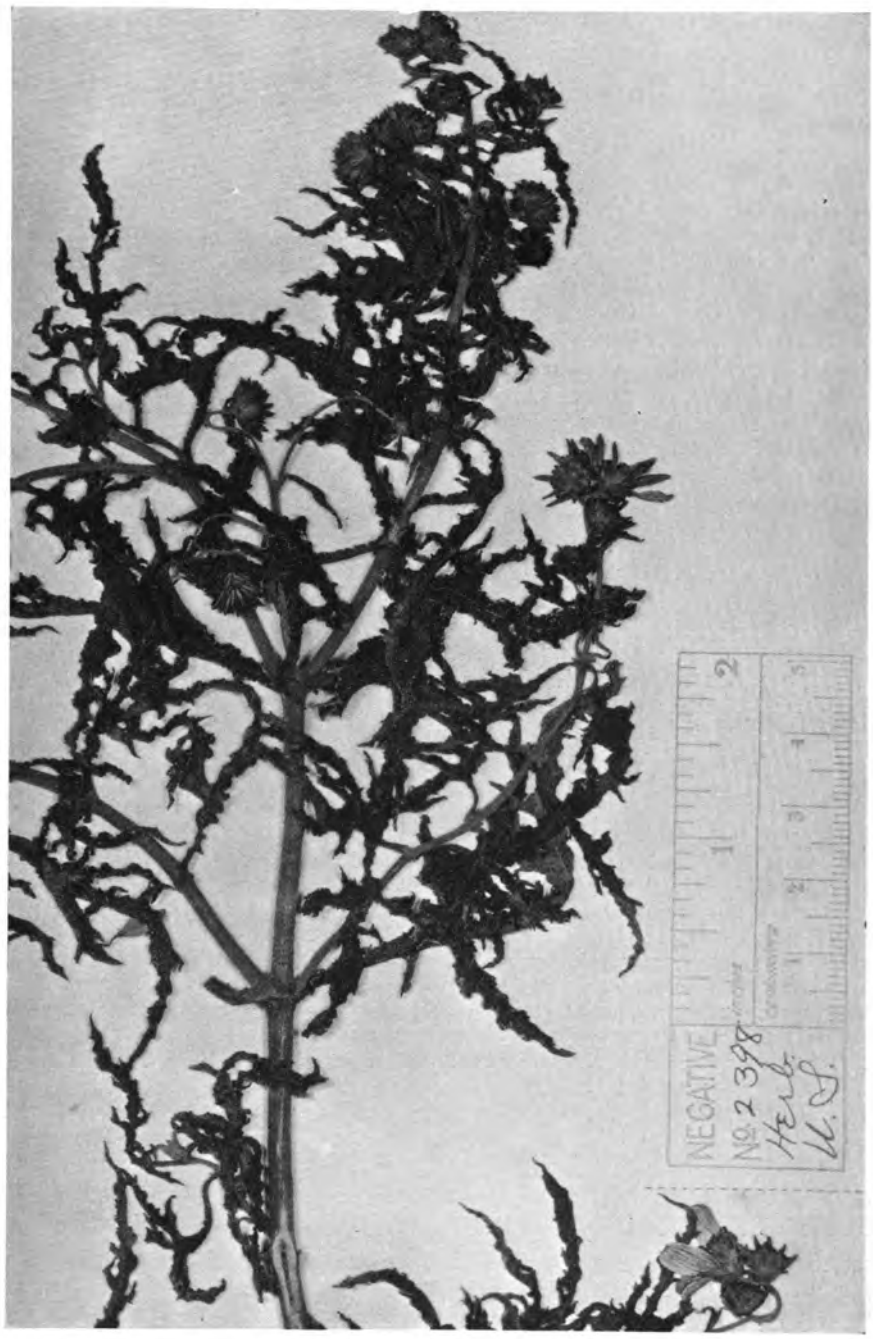

FIGURE 26.—*Lipochaeta Rockii* variety *dissecta* (type).

20. Lipochaeta venosa Sherff.

Lipochaeta venosa Sherff, Bot. Gaz., vol. 95, p. 100, 1933.

Subherbaceous, branched, the slender branches angulate and scabrid-hispid. Leaves numerous, slenderly petioled with petioles commonly 4-10 mm long, including petiole now all only 1-2 cm now some 3-5 cm long, bluish-green, hastulate-trilobed, on upper surface conspicuously depressed- on lower conspicuously raised-veiny, sparsely and shortly hispidulous above, densely hispid beneath, lobes irregularly crenate-dentate. Capitula disposed at ends of branchlets, slenderly pedicellate on villous pedicels, radiate, at anthesis ± 1.3 cm across and about 5 mm tall. Involucre villous-hispid; exterior bracts about 5, oblong or widely ovate or even conspicuously dilated and subrotund, at apex obtuse, often spreading, 3-4.5 mm long. Ligulate florets about 6-8, yellow, ± 6 mm long; ligule more or less oblong, at apex denticulate. Achenes even when mature very minute, black, cuneate or obovate, below glabrous, above minutely setulose, on angles exalate or above slightly cartilaginous-verrucose, as to body 1.5-2.2 mm long, commonly 5-6-aristate; aristae short, sharp, stramineous, antrorsely hispidulous.

Type: collected by J. F. Rock, no. 8349, at Nohonaohae crater, Waimea, Hawaii, June 1910 (Field).

Specimens examined: Rock 8349 (type, Field; cotype, Gray).

Resembling *L. heterophylla* variety *malvacea* in general appearance of foliage, but differing at once in the slender petioles.

Distribution: known only from type locality on the island of Hawaii.

21. Lipochaeta Forbesii Sherff (fig. 27).

Lipochaeta Forbesii Sherff, Bot. Gaz., vol. 95, p. 83, 1933.

Fruticose, erect, very shortly but densely appressed-hispidulous throughout, branched with subterete and grayish-brown branches. Leaves petiolate (with petioles laciniate, more or less alate-margined, about 1.5-2 cm long), including petiole 5-9 cm long, as a rule incisely 3-5-lobed, membranaceous; lobes sharply or even laciniately dentate, at apex acute or acuminate, the terminal one much larger and rhombic-ovate to oblong-lanceolate. Capitula numerous, cymosely disposed, pedicellate with pedicels commonly 0.5-2.5 cm long, radiate, at anthesis ± 2 cm across and about 5-6 mm tall. Involucre hispid; exterior bracts 4-6, oblong-lanceolate or linear-oblong, at apex more or less acute, 2-3 (rarely -3.5) mm long. Achenes polymorphous, black; exterior ones moderately or widely cuneate, 3-4-gonous, on angles interruptedly alate (the wings' segments often erectly and inwardly hooked or beaked), on faces especially above spinulose-verrucose, as to body 2.5-3 mm long, at apex shortly and squamellately few-aristate.

Type: collected by C. N. Forbes, no. 1916-M, at Nuu, south slope of Haleakala, Maui, March 9, 1920 (Field).

Specimens examined: Forbes 1916-M (type, Field).

Named for the late Mr. Forbes, who during the last few years preceding his death sent many specimens of *Lipochaeta* and *Bidens* to the Field Museum of Natural History for the express purpose of supplying me with materials for my researches. As to foliage the habit suggests that of *L. Rockii* variety *subovata* of Molokai, but in the abundance and size of capitula the resemblance to *L. kahoolawensis* of Kahoolawe is closer.

Distribution: known only from type locality in southeastern Maui.

FIGURE 27.—*Lipochaeta Forbesii* (type).

22. **Lipochaeta kahoolawensis** Sherff (fig. 28).

Lipochaeta kahoolawensis Sherff, Bot. Gaz., vol. 95, p. 98, 1933.

Fruticose, more or less branched; branches terete, sulculate, appressedly hispidulous. Leaves alate-petioled with petioles 1-2.2 cm long and widely dilated-connate below, 2-6 mm wide above, petiole included 6-8 (rarely -9) cm long, in outline of blade more or less deltoid-ovate, palmately 3-5-lobed with acute or subacute lobes, on margins sharply and irregularly serrate, on upper surface appressedly scabrid-hispidulous, on lower surface softly and densely pilose. Capitula paniculate-cymosely disposed at ends of branches (10-35-clustered), very slenderly pedicellate with pedicels hispid and more often 3-10 mm long, radiate, at anthesis 8-14 mm across and 4-5 mm tall. Involucre hispid, small; exterior bracts about 4, oblong-linear or lanceolate-oblong, at apex subacute, commonly about 2 mm long. Ligulate florets 5-8, yellow, about 6-7 mm long; ligule narrowly

FIGURE 28.—*Lipochaeta kahoolawensis* (type).

obovate, at apex denticulate. Achenes black or blackish-brown; exterior ones cuneate, 3-4-gonous, on faces minutely verrucose, on angles more or less (sometimes interruptedly) alate, as to body scarcely 2 mm long, more or less erect-setose above, at apex (centrally) more often 2-3-aristate with short aristae, at top of wings produced into erect-incurved, slender, sharp teeth.

Type: collected by Jules Remy, no. 269, on Kohoolave (Kahoolawe), 1851-55 (Paris).

Specimens examined: Remy 269 (type, Paris).

The leaves suggest those (particularly the more definitely lobed ones) found on *L. heterophylla* variety *molokaiensis*. The inflorescence, however, is very distinct. This appears at first glance to be a true panicle. The heads are numerous, minute, and in measurements for the exterior involucral bracts and exterior achenes may easily be distinguished from those of all related species (or difficultly from *L. Forbesii,* which species, however, has the leaf petioles narrow at their base).

Distribution: known only from the island of Kahoolawe.

Section 2. **MACRAEA** (J. D. Hooker) Sherff

Macraea (J. D. Hooker) Sherff, Bot. Gaz., vol. 95, p. 82, 1933.

Macraea J. D. Hooker, Linn. Soc., Proc., vol. 1, p. 278, 1845.

Trigonopterum Steetz, Vet. Akad. Stockh. Handl. 1853, p. 183, 1855.

Principal leaves often subtending fascicles of smaller ones in axils, thickish, conspicuously linear, on margins revolute, at apex mucronulate. Achenes topped by a fimbriate corona or the interior ones sometimes 1-2-aristulate. A single species from the Galapagos Islands.—No. 23.

23. Lipochaeta laricifolia (J. D. Hooker) A. Gray.

Lipochaeta laricifolia (J. D. Hooker) A. Gray, Amer. Acad., Proc., vol. 5, p. 131, 1861.

Macraea laricifolia J. D. Hooker, Linn. Soc., Proc., vol. 1, p. 278, 1845; etiam Linn. Soc., Trans., vol. 20, p. 209, 1847.

Trigonopterum Ponteni Andersson, Vet. Akad. Handl. Stockh. 1853, p. 184, 1855; etiam Veg. Galap. in Voy. Eugen., Bot., pl. 6, fig. 1, 1857.

Macraea lancifolia J. D. Hooker, in Ind. Kew., vol. 3, p. 141, 1895 (sphalm).

Fruticose, branched with slender and foliose branches, more or less strewn with minute whitish appressed hairs, 1.2-2.4 meters tall. Leaves (the principal ones often subtending fascicles of smaller ones in their axils) sessile or barely attenuate at base into a petiole, linear, revolute, thickish, often subglistening above, paler below, at apex mucronulate, commonly 1-3 (more rarely up to 5.5) cm long and 0.8-1.5 (more rarely up to 3.2) mm wide. Capitula very slenderly pedunculate with peduncles terminating the commonly canescent branchlets and more often 2-4 cm long, radiate, at anthesis about 1.3 cm across and 6-8 mm tall. Involucre whitish-hispid; exterior bracts 4-7, ovate or ovate-lanceo-

late, at apex acute, 2-4 mm long, commonly a little longer than the interior ones. Ligulate florets about 10-12, whitish-yellow, about 4-6 mm long; ligule oblong, at apex marginate or more or less 3-dentate. Achenes 2-4.3 mm long; the exterior ones triquetrous, obovate-cuneate, on angles alate, on faces rugose or muriculate, at apex surrounded with a squamose-fimbriate corona; interior ones obcompressed, obovate or oblanceolate, on margins alate, on faces more often glabrous, at apex surrounded with a fimbriate or erectly setose and 1-2-aristulate corona.

Type: collected by Charles Darwin on Charles Island, Galapagos Islands.

Specimens examined: Alexander Agassiz, Charles Island, April 1, 1891 (U. S.); N. J. Andersson, Charles Island, 1852 (Gray, 3 sheets; Missouri; Paris, Vienna Mus.); Andersson, Galapagos Islands, 1852 (Missouri); Andersson, Albemarle Island, 1858 (Delessert); Andersson 95, Galapagos Islands (Berlin, Vienna Mus.); G. Bauer 127, southwest part of Chatham Island, August 1891 (Gray); Bauer 181, Albemarle Island, July 1891 (Gray); Bauer 182, Cowley Bay, Albemarle Island, August 1891 (Gray); Heindachner 37, Charles Island (Vienna Mus.); L. A. Lee, Charles Island, April 8, 1888 (U. S.); James Macrae, Albemarle Island, 1825 (Delessert, Kew); R. E. Snodgrass and E. Heller 146, Tagus Cove, Albemarle Island, January 20, 1899 (Gray); Snodgrass and Heller 166, commonest bush on hills near cove up to 600 feet, also inland up to 1,500 feet, same location, March 1899 (Gray); Snodgrass and Heller 335, bushes 4-6 feet high, abundant, altitude 1,000-2,000 feet, southern part of Narborough Island, March 1899 (Gray); Snodgrass and Heller 408, Charles Island, May 1899 (Gray); Snodgrass and Heller 830, Abingdon Island, June 1899 (Gray); Alban Stewart 641, occasional bushes, altitude 75-600 feet, Villamil, Albemarle Island, November 2, 1905 (Gray, U. S.); Stewart 642, common bushes on tufaceous soil near shore and on sides of the mountain, Tagus Cove, Albemarle Island, March 24, 1906 (Gray); Stewart 643, occasional clumps of bushes near the shore, abundant in scattering bunches at altitude 450-1,000 feet, and in dense thickets of bushes 6-8 feet high at altitude 1,000-1,450 feet, Charles Island, October 1, 1905 (Gray); Stewart 644, common bushes at altitude 450 feet, Wreck Bay, Chatham Island, January 27, 1906 (Gray, Missouri, U. S.); Stewart 645, bushes 6-8 feet high on the edges of recent lava flows at altitude 850 feet, James Bay, James Island, December 29, 1905 (Gray, U. S.).

In the original publication of his genus (Linn. Soc., Proc., vol. 1, p. 278, 1845) J. D. Hooker cited no type, nor did he describe any species (of *Macraea*). His context had to do with more than 100 new species and 5 other new genera of the Galapagos Islands. The entire text was based mostly upon Charles Darwin's plants. The use of the name *Macraea* would seem to indicate Macrae's plant (cited by me under "specimens examined") as the type. However, in his next publication (Linn. Soc., Trans., vol. 20, p. 209, 1847), J. D. Hooker definitely published the specific name *Macraea laricifolia,* citing first a plant collected by Darwin: "Hab. Charles Island, Charles Darwin, Esq., Albemarle Island, Mr. Macrae & Charles Darwin, Esq."

Distribution: known only from Galapagos Islands.

Section 3. **APHANOPAPPUS** (Endlicher) Bentham and Hooker

Aphanopappus (Endlicher) Bentham and Hooker, Gen. Pl. vol. 2, p. 373, 1873.

Aphanopappus Endlicher pro gen., Gen. 2d suppl., p. 43, 1842.

Leaves lanceolate or wider in outline. Pappus commonly reduced to a minute corona or entirely lacking (rarely few-aristate and deciduous). Plants of Hawaiian islands.—Nos. 24-26.

24. Lipochaeta micrantha (Nuttall) A. Gray.

Lipochaeta micrantha (Nuttall) A. Gray, Amer. Acad., Proc., vol. 5, p. 131, 1861.

Schizophyllum micranthum Nuttall, Amer. Philos. Soc., Trans., 2d ser., vol. 7, p. 453, 1841.

Aphanopappus Nuttallii Walpers, Repert., vol. 2, p. 620, 1843.

Lipochaeta Remyi variety γ Hillebrand, Fl. Haw. Is., pp. 209 and 210, 1888.

Aphanopappus micranthus (Nuttall) Heller, Minnesota Bot. Studies, vol. 1, p. 915, 1897.

Lipochaeta artemisifolia Léveillé ex Rock, Fedde Repert., vol. 13, p. 354, 1914.

Perennial herb, minutely strigulose; stems tetragonal, weak, prostrate or subscandent, commonly 1.5-1.8 meters long. Leaves delicate, slenderly petiolate with petioles 4-15 mm long, including petiole up to 8 cm long; blade extremely membranaceous, now simple or trilobed with margins very sharply incised-dentate (teeth often again serrate), now 2-3-pinnatipartite with ultimate segments small, subcuneate, often 2-3-lobed. Capitula small, shortly pedunculate or subsessile at ends of branchlets, subradiate, at anthesis 4-5 mm across and 3-5 mm tall. Involucre hispid; exterior bracts 3 or 4, oblong or lanceolate, acute, 2-5 mm long. Ligulate florets 2 or 3, pale yellow, 3-5 mm long; ligule subrotund or widely obovate, at apex 2-3-denticulate; disc florets only about 6-8. Achenes cuneate-oblanceolate, black, exalate, 1.3-1.6 mm long, the exterior ones 3-4-gonous and turgid the others more often obcompressed, on angles sometimes verrucose, at apex truncate and finally more or less bald although at first (as ovaries) pubescent (the short hairs forming a minute corona similar to a pappus).

Type: collected by Thomas Nuttall in shady woods near Koloa, Atooi [Kauai]. If extant, should be in London (British). Nuttall gave the locality as Kolao, but I assume that Koloa (where later the U. S. Exploring Expedition collected this same species) was meant.

Specimens examined: Otto Degener and Henry Wiebke 2143, long, straggling herb, sunny secondary canyon, Olokele Canyon, Kauai, July 3, 1926 (Berlin, British, Field, Kew); Degener and Wiebke 2144, side of Olokele Canyon, same date (Field); Abbé Urbain Faurie 932, Hanapepe Falls, Kauai, December 1909 (British); Faurie 959, Waimea, Kauai, March 1910 (Paris, type collection of L. artemisifolia Léveillé ex Rock); C. N. Forbes 304-K, Hanapepe Valley, Kauai, August 28, 1909 (Field, 2 sheets); A. A. Heller 2439, on moist, shaded banks along Hanapepe River, near the falls, Kauai, June 24-26, 1895 (Field, Gray, New York, Paris, U. S.); A. S. Hitchcock 15239, altitude 1,400 feet, Olokele Gulch, Kauai, October 18, 1916 (U. S.); Hitchcock 15244, same date and location (U. S.); William Hillebrand, main mountain range of Oahu (Berlin, type of L. Remyi variety γ Hillebrand); Horace Mann and W. T. Brigham 536, Hanapepe, Kauai (Delessert; Field, 2 sheets; Gray; Missouri; U. S.); Jules Remy 245, Kauai, 1851-55 (Paris); J. F. Rock, Kauai, October 1916 (Bishop, 2 sheets); Carl Skottsberg 1035, Olokele Canyon, Kauai, October 31, 1922 (Göteborg); U. S. Exploring Expedition, in mountains, Koloa, southern Kauai, 1840 (Gray, New York, U. S.).

Herbarium specimens with leaves all simple and coarsely incised offer a strikingly different aspect when compared with the average specimens, in

which the leaves are delicately decompound. Heller has studied these in the field, however, and found them to belong to the same form. "The leaves of this species are somewhat variable, and one who sees a branch with young leaves only, might be tempted to suppose that it is a distinct plant from one which has older leaves. The stems are usually five or six feet long, weak and somewhat climbing. . . It is plentiful in Hanapepe Valley, Kauai, on moist, shaded banks, and was also collected above Waimea, at the base of the plateau. June to September." (Minn. Bot. Stud. vol. 1, p. 915, 1897).

Hillebrand's description of his *L. Remyi* variety γ gives the leaves as "pedately 5-parted to the base," although from his note under *L. micrantha* it is seen that his variety γ had petiolate leaves. The type of his variety γ (Berlin) has the several leaves very distinctly petiolate with the petioles slender and about 1.5 cm long. Capitula are lacking, but the leaves match exactly those of some specimens from Kauai.

Distribution: southern part of Kauai and main range of Oahu.

25. Lipochaeta tenuifolia A. Gray.

Lipochaeta tenuifolia A. Gray, Amer. Acad., Proc., vol. 5, p. 131, 1861.

Herbaceous from a ligneous base, delicate, moderately and appressedly whitish-setose or almost glabrous; branches decumbent, 3-6 dm long, the branchlets shorter and suberect. Leaves sessile, 5-9 cm long, pedately 3-5-parted to the very base; leaflets 1-2-pinnatipartite; ultimate segments and rhachis very narrowly linear or filiform, very entire, membranaceous, at apex subulate. Capitula commonly solitary, slenderly pedunculate with peduncles more often 3-6 cm long, radiate, at anthesis 1.5-2.2 cm across and about 5-6 mm tall. Involucre hispid; exterior bracts at least 6, linear or lanceolate, above more or less elongate, at apex subulate, 4-6 mm long, sometimes slightly surpassing the disc. Ligulate florets 8-10, yellow, 6-9 mm long; ligule narrowly to widely obovate, at apex 2-3-dentate. Achenes blackish, cuneate, 2-4-angulate, on faces glabrous or very minutely verrucose, on angles often lightly or scarcely interrupted-alate, as to body 2-2.5 mm long, at truncate apex erectly and very shortly hispid and at first 2-4-aristate with aristae short, subulate, more or less deciduous.

Type: none mentioned. Gray had before him the specimens by Remy and by the U. S. Exploring Expedition. The Remy specimen was a fragment with a single flowering head. Of the Exploring Expedition specimens, the one at Gray Herbarium is clearly the one relied upon by Gray for his description. It is mounted on the same sheet with the Remy specimen.

Specimens examined: Otto Degener, K. K. Park, and William Bush 4174, partly sprawling over bushes and grass on dry talus slope, small gulch on south side of upper Makua Valley, Oahu, May 10, 1931 (Berlin, British, Delessert, Field, Florence, Göteborg, Gray, Kew, Missouri, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); William Hillebrand, Makaha, Waianae Mountains, Oahu (Berlin); Hillebrand, Kaala (Waianae) Mountains, Oahu, 1869 (Berlin); Horace Mann, Hawaiian (Sandwich) islands (Paris); Mann and W. T. Brigham 534, Kaala (Waianae) Mountains, Oahu (Delessert; Field, 2 sheets; Gray; Missouri; U. S.); Jules Remy 276, Oahu, 1851-55 (Gray, Paris); U. S. Exploring Expedition, Kaala (Waianae) Mountains, Oahu, 1840 (Gray, New York, U. S.); Heinrich Wawra 2296, Oahu, 1868-71 (Vienna Mus.).

Distribution: western Oahu.

26. Lipochaeta Remyi A. Gray.

Lipochaeta Remyi A. Gray, Amer. Acad. Proc., vol. 5, p. 131, 1861.

Lipochaeta Remyi variety β Hillebrand, Fl. Haw. Is., p. 209, 1888.

Herbaceous, annual, erect, now moderately now very much branched, 1.5-6 dm tall; stem and branches angulate, often very slender, densely or sparsely hispid. Leaves membranaceous, hispid, upper ones alternate, rest opposite, now (for the dwarf, most abundantly branched specimens) all very minute, shortly but slenderly petiolate, including petiole 0.7-3 cm long, in outline of blade ovate or deltoid or oblong, more or less dentate or sublobate or palmately dissected into 3-5 sinuate or incised lobes; now (for tall, moderately or very slightly branched specimens) much larger with very slender petioles up to 4 cm long, including petiole up to 1.3 dm long, in outline oblong-lanceolate to rhombic-ovate, at base subcordate to widely cuneate, at apex acute or scarcely subobtuse, simple or irregularly and incisely 3-5-lobed, on margins dentate with obtuse but apically mucronulate teeth. Capitula few or very numerous (± 250), more or less separately disposed at ends of branchlets, slenderly pedunculate with peduncles hispid and up to 2 cm long, radiate, at anthesis about 7-14 mm across and 3-6 mm tall. Involucre very densely hispid; exterior bracts 4 or 5, oblong, obtuse or subacute, 2-6 mm long. Ligulate florets ± 6, yellowish, 3-5 mm long; ligule widely oblong or obovate, at apex 2-dentate. Achenes black, cuneate, glabrous or toward top slightly pilose and elsewhere sometimes sparsely verrucose; the exterior ones sometimes interruptedly subalate on angles 1.6-2 mm long, at apex epappose or sometimes armed with a single arista.

Type: collected by Jules Remy, no. 260, on Oahu, 1851-55 (Gray).

Specimens examined: Otto Degener and K. K. Park 4186, on grass-covered, spring-fed ledges in dry region, hills east of Kawaihapai, Waianae Mountains, Oahu, April 12, 1931 (Berlin, Field, Kew); Degener and Park 4187, same location, December 1930 (Berlin, Field, Kew); C. N. Forbes (with H. A. Pilsbry and C. M. Cooke) 1840-O, Kawaihapai, Oahu, February 14, 1913 (Field, 2 sheets); William Hillebrand, north slope of Puu Kaala, Oahu (Berlin, type of L. Remyi variety β Hillebrand); Horace Mann and W. T. Brigham 533, Kaala (Waianae) Mountains, Oahu (Gray, Missouri, U. S.); Jules Remy 260 (type, Gray); J. F. Rock 17011, Makaleha side of Waianae Mountains, Oahu, April 1918 (Bishop).

The type plant is small, very much branched, and has perhaps 250 capitula, these borne at various levels except at the plant's very base. The leaves are minute and mostly simple. The root seems to be that of an annual. Plants such as Forbes 1840-O and Degener and Park 4187 have an unmistakably annual root, a much less branched habit, leaves much larger and frequently divided, and capitula twice as large. It should be noted, however, that these larger plants have the appearance of having grown in moist, shady locations ("grass-covered, spring-fed ledges in dry region" ex Degener and Park 4187). In my judgment, they differ from the type only in such respects as may correctly be attributed to differences in light and moisture supply. I have therefore recast Gray's description to include the larger plants.

Distribution: western part of Oahu.

Species Excluded

Lipochaeta amazonica Poeppig and Endlicher, Nov. Gen. et Sp., vol. 3, p. 49, pl. 256, 1845. =*Blainveillea amazonica* Bentham and Hooker, Gen. Pl., vol. 2, p. 370, 1873.

Lipochaeta asymetrica Léveillé, Fedde Repert., vol. 10, p. 122, 1911.= *Bidens asymmetrica* Sherff, Bot. Gaz., vol. 81, p. 49, 1926.

Lipochaeta asymmetrica Léveillé, ex Ind. Kew, Suppl. 5, p. 153, 1921.= *Bidens asymmetrica* Sherff, Bot. Gaz., vol. 81, p. 49, 1926.

Lipochaeta costaricensis Bentham ex Bentham and Hooker, Gen. Pl., vol. 2, p. 373, 1873 (sphalm). = *Zexmenia frutescens* (Miller) Blake, Gray Herb., Contrib., new ser., vol. 52, p. 50, 1917.

Lipochaeta fasciculata De Candolle, Prodr., vol. 5, p. 610, 1836. = *Zexmenia fasciculata* Hemsley, Biol. Centr. Amer., Bot., vol. 2, p. 172, 1881.

Lipochaeta goyazensis Gardner, London Jour. Bot., vol. 7, p. 406, 1848. =*Zexmenia goyazensis* Bentham and Hooker, Gen. Pl., vol. 2, p. 373, 1873.

Lipochaeta hastata Kellogg, Calif. Acad., Proc., vol. 2, p. 106, fig. 31, 1863. =*Verbesina hastata* Kellogg, ex Curran, Calif. Acad., Bull., vol. 1, p. 140, 1885.

Lipochaeta lantanifolia Schauer, Linnaea, vol. 19, p. 729, 1847. = *Zexmenia lantanifolia* Schultz-Bipontinus in Seemann, Bot. Voy. Herald, p. 306, 1856.

Lipochaeta longipes Bentham ex Bentham and Hooker, Gen. Pl., vol. 2, 373, 1873 (sphalm). = *Zexmenia longipes* Bentham ex Oersted, Kjoeb. Vidensk. Meddel. 1852, p. 95, 1852.

Lipochaeta macrocephala Hooker and Arnott, Bot. Beech. Voy., p. 436, 1840-41. = *Zexmenia macrocephala* Hemsley, Biol. Centr. Amer. Bot., vol. 2, p. 173, 1881.

Lipochaeta monocephala De Candolle, Prodr., vol. 5, p. 610, 1836. = *Zexmenia monocephala* Heynhold, Nom., 1st ed., p. 863, 1840; 2d ed., p. 772, 1850; Schultz-Bipontinus in Seemann, Bot. Voy. Herald, p. 306, 1856.

Lipochaeta scaberrima Bentham, Jour. Bot., vol. 2, p. 43, 1840. = *Oyedaea scaberrima* Blake, U. S. Nat. Herb., Contrib., vol. 20, p. 414, 1921.

Lipochaeta serrata De Candolle, Prodr., vol. 5, p. 611, 1836. = *Zexmenia serrata* La Llave in La Llave and Lexarza, Nov. Veg. Descript., fasc. 1, p. 13, 1824 (*Z. scandens* Hemsley, Biol. Centr. Amer. Bot., vol. 2, p. 174, 1881—fide S. F. Blake in litt.).

Lipochaeta strigosa De Candolle, Prodr., vol. 5, p. 610, 1836. = *Zexmenia strigosa* Schultz-Bipontinus, in Seemann, Bot. Voy. Herald, p. 306, 1856.

Lipochaeta tagetiflora G. Don in Sweet, Hort. Brit., 3d ed., p. 360, 1839. =*Zexmenia tagetiflora* D. Don in Sweet, Hort. Brit., 2d ed., p. 309, 1830 (nomen).

Lipochaeta texana Torrey and Gray, Fl. N. Amer., vol. 2, p. 357, 1843. =*Zexmenia hispida* A. Gray, Synoptical Flora N. Amer., vol. 1, pt. 2, p. 286, 1884.

Lipochaeta umbellata De Candolle, Prodr., vol. 5, p. 610, 1836. = *Zexmenia ceanothifolia* (Wildenow) Schultz-Bipontinus in Seemann, Bot. Voy. Herald, p. 305, 1856.

Lipochaeta umbellata variety **conferta** De Candolle, Prodr., vol. 5, p. 610, 1836. =*Zexmenia microcephala* Hemsley, Biol. Centr. Amer. Bot., vol. 2, p. 173, 1881.

Genus **DUBAUTIA** Gaudichaud

Dubautia Gaudichaud, Freycinet Voy., Bot., p. 469, p. 84, 1830.

Shrubs or small trees, resinous. Leaves opposite or verticillate in threes, sessile or subsessile, at base more or less clasping, the principal nerves parallel. Capitula homogamous, discoid, the commonly 6-20 florets all hermaphrodite and fertile. Involucre cylindric-obconic or turbinate; bracts 5-10, equal, 1-seriate, narrow, subherbaceous, distinct (or for 2 species connate), subtending or half-clasping the exterior florets. Receptacle small, naked or accompanied with paleae (these similar to the involucral bracts and subtending the interior florets). Corollas regular, tubular, the tube slender, the limb campanulate and deeply 5-fid with reflexed lobes. Anthers basally truncate or with minute auricles sagittate. Style branches revolute, apically subtruncate or shortly conic-appendiculate. Achenes narrowly linear-cuneate, more or less hispid, black, 4-5-costate (the faces often in turn costulate), basally attenuate. Pappus sordid, its rays about 20, now slenderly aristate now widely squamose, 1-seriate, ciliate-lacerate or shortly (and not elongately) pectinate-plumose.

Type: *Dubautia plantaginea* Gaudichaud, Freycinet Voy. Bot., p. 469, pl. 84, 1830.

History of the Genus

Gaudichaud named the genus for Mr. J. E. Dubaut, an officer of the French Royal Marine, and used for a type species *D. plantaginea.* The several species assigned to the genus since Gaudichaud's time have been charac-

terized by rather close morphological similarity and for this reason, as doubtless also from considerations of endemism, the genus has been left undisturbed by various botanists. Asa Gray (Amer. Acad., Proc., vol. 5, p. 134, 1861) presented a short revision of the species known to him, four in number (*D. plantaginea, D. laevigata, D. laxa,* and *D. paleata*), and made certain observations as to the receptacular paleae and other characters. Hillebrand (Fl. Haw. Is., p. 221, 1888) added two new species (*D. Knudsenii* and *D. Railliardioides*) and presented a detailed comparison of the genus with *Railliardia.* More recently, Skottsberg (Meddel. Göteborgs Bot. Trädgård, vol. 2, p. 276, 1926) has placed on record observations or illustrations for several of the known species (*D. plantaginea, D. laxa,* and *D. paleata*) and has described a new species (*D. microcephala*) and two new varieties (*D. plantaginea* variety *strigosa* and *D. laxa* variety *pseudoplantaginea*).

KEY

a. Leaves commonly opposite
  b. Inflorescence paniculate; leaves oblanceolate or oblong-lanceolate or narrower
    c. Involucral bracts more or less distinct
      d. Leaves strongly nerved, more or less sessile
        e. Involucral bracts 5-8, narrow-lanceolate, 4-6 mm long; florets commonly 6-8, yellow-orange.....**1. D. plantaginea and varieties**
        e. Involucral bracts and about 5, narrowly obovate, 2.5-3 mm long; florets 3-5, sordidly dark-red.....**2. D. microcephala**
      d. Leaves weakly nerved and areolate-reticulate, at base more or less marginate-petioled.....**3. D. laevigata and variety β parvifolia**
    c. Involucral bracts strongly connate.....**4. D. magnifolia**
  b. Inflorescence corymbose; leaves narrowly or widely obovate or more rarely oblanceolate (very rarely linear)
    c. Leaves thick or thickish; capitula subsessile or borne upon a rigid and suberect pedicel.....**5. D. laxa and varieties**
    c. Leaves membranaceous; capitula long-pedicellate, the pedicel commonly arcuate or drooping.....**6. D. Knudsenii**
a. Leaves in threes
  b. Involucral bracts more or less distinct
    c. Leaves loosely disposed, 4.5-8 cm long and 1-1.5 cm wide; pappus paleaceous, its paleae widely lanceolate.....**7. D. paleata**
    c. Leaves very densely grouped, 1-5.3 cm long and 3-11 mm wide.....**9. D. waialealae and variety β megaphylla**
  b. Involucral bracts connate.....**8. D. Railliardioides**

1. **Dubautia plantaginea** Gaudichaud.

Dubautia plantaginea Gaudichaud, Voy. Freycinet Bot., p. 468, pl. 84, 1830; see Engler and Prantl Nat. Pflanzenfam., Teil 4, Abt. 5, fig. 120, G (achene), 1894.

a. Principal leaves 1-2 dm long and commonly 1-3.4 cm wide
  b. Leaves 1-2 (rarely -3) cm wide, toward base more or less narrowed; involucral bracts hispid
    c. Leaves becoming glabrous on lower surface
      d. Principal branches of panicle opposite.....variety **β Chamissonis**
      d. Principal branches of panicle alternate.....**D. plantaginea**

c. Leaves strigose with rigid hairs on lower surface
d. Rhachis of panicle moderately hispid, leaves weakly denticulate.....**variety δ strigosa**
d. Rhachis of panicle strongly hispid (with setae white, upwardly arcuate, disposed in 8-12 parallel lines), leaves sharply denticulate toward apex.....**variety ε acridentata**
b. Leaves 1.6-3.4 cm wide, toward base broad or broadish; involucral bracts glabrous or sparsely hispidulous on back
c. Foliar teeth spinulose, spreading; plant of west Maui.....**variety ζ platyphylla**
c. Foliar teeth small and neither spinulose nor spreading; plant of east Maui.....**variety ζ platyphylla form 1. occidentalis**
a. Principal leaves about 1.2-1.9 dm long and 0.7-1.3 (rarely -1.6) cm wide.....**variety γ angustifolia**

Shrub or small tree, branches spreading-hispid and slightly viscid. Leaves sessile, now oblong-oblanceolate now widely oblong-lanceolate, at base more or less widened and clasping the stem, sharply but very minutely denticulate above the middle, at apex very acuminate, on margins sparsely ciliate, on faces glabrate and 7-15-nerved, when dry becoming brownish, 1-1.5 dm long and 1.6-2.5 cm wide. Capitula in a pyramidal panicle (this subviscidly long-pilose and ± 1 dm long, the principal branches alternate), very numerous. Involucre obconic; bracts 5-8, hispid, narrow-lanceolate, purplish, 4-6 mm long. Florets commonly 6-8, somewhat yellowish; tube of the scarcely exserted corolla slender, twice as long as the abruptly campanulate limb. Achenes black, suberectly whitish-setose, as to body 3-3.5 mm long, pappus sordid, the slender aristae antrorsely hispid and subequal to the body.

Type: collected by Charles Gaudichaud in the Hawaiian islands, 1819.

Specimens examined: Gaudichaud, Hawaiian islands, 1819 (Berlin, type collection); G. C. Munro 48, Lanaihale (face of western side), Lanai, December 23, 1913 (Bishop); Munro 271, face of pali above Waiopaa, Lanai, same date (Bishop).

Gaudichaud's type plate portrays very definitely a form with leaves broad-clasping at the base and with the branches of the inflorescence alternate. Asa Gray (Amer. Acad., Proc., vol. 5, p. 135, 1861) criticized Gaudichaud's plate for having the leaves "much too broad at the base." But Gray evidently had been misled by the almost complete lack in herbaria of his day of true *D. plantaginea* material. At least six Gaudichaud specimens were extant (Berlin, 1 sheet; Delessert, 4 sheets; Paris, 1 sheet) but four of them had been collected on the voyage of the *Bonite* in 1836 and so constituted no type basis for *D. plantaginea.* The remaining specimens clearly were collected on Gaudichaud's original voyage (on the *Uranie*), but one of them (Delessert) is of the form set off below as variety *β Chamissonis*, a form that had already been collected on Oahu some two or three years before Gaudichaud's first voyage by Chamisso and described fully by Lessing (Linnaea, vol. 6, p. 164, 1831). (Gaudichaud used the expression "foliis amplexicaulibus," while Lessing, in describing Chamisso's varietally different plant, wrote "folia semiamplexicaulia)." The sixth specimen (Berlin) clearly is the form which Gaudichaud selected for his plate (as may be recognized quickly by the uniquely alternate branches of the panicle) and which is known today only from Lanai.

Distribution: known only from the island of Lanai.

Dubautia plantaginea variety *β* **Chamissonis** Sherff (fig. 29).

Dubautia plantaginea variety *Chamissonis* Sherff, Amer. Jour. Bot., vol. 20, p. 616, 1933.

Leaves more or less narrowed toward base and semiamplexicaulous; panicle 1-3 dm long, its principal branches opposite.

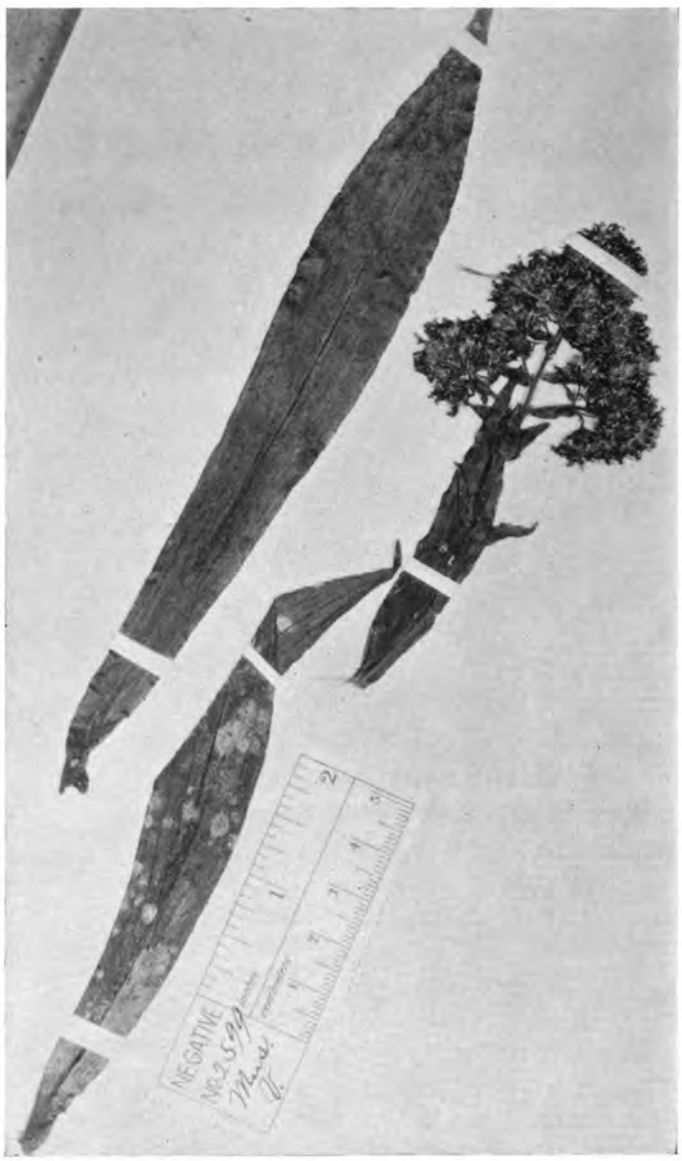

FIGURE 29.—*Dubautia plantaginea* variety *Chamissonis* (cotype, Mus. Nat. Hist., Vienna).

Type: collected by Adelbert von Chamisso on Oahu, 1816-17 (Kew).

Specimens examined: E. H. Bryan, Jr., 711, shrub or small tree 3-5 meters tall, in rain forest above 700 meters, east slope of Puu Kaala, Oahu, September 14, 1930 (Bishop); Otto Degener 4325, shrub up to 12 feet tall, along summit ridge, between Puu Manawahua and Palikea, Oahu, September 27, 1931 (Berlin, British, Field, Kew, New York, Paris, Vienna Mus.); Degener 4333, open rain forest, northern rim of Mount Tantalus, Oahu, October 26, 1932 (Berlin, British, California, Delessert, Field, Gray, Kew, Missouri, Vienna Mus., New York, Paris, Philadelphia); Degener 4337, Manana Gulch, Oahu, October 4, 1931 (Berlin, Field, Kew, New York); Degener and K. K. Park 4338, north side of South Halawa Gulch, Oahu, April 17, 1932 (Field, New York); Degener and Park 4342, frequently fog-swept toward evening, western slope of Palikea, Oahu, October 23, 1932 (Berlin, British, Delessert, Field, Gray, Kew, Missouri, New York, Paris); C. N. Forbes, 284-L, in mountains, east end of Lanai, June 1913 (Bishop); Forbes 299-L, Lanai, September 1917 (Bishop); Forbes 18480, Waolani Ridge, Oahu, October 27, 1913 (Bishop, Field); F. R. Fosberg 8598, bush 2.5 meters tall, altitude 680 meters, wet forest, peak at head of Pauoa Flats, Koolau Range, Oahu, October 30, 1932 (British, Field, New York); Fosberg 9007, bush 2 meters tall, altitude 940 meters, moist forest, east ridge, Puu Kaua, Waianae Mountains, Honouliuli, Oahu, November 6, 1932 (British, Field, New York); D. W. Garber 140, Konahuanui Trail near Pauoa, Oahu, January 4, 1920 (Bishop); Gaudichaud, Voyage "Uranie", Hawaiian islands, 1819 (Paris); Gaudichaud, Voyage "Bonite", same location, October 1836 (Delessert); A. A. Heller 2909, altitude 2,500 feet on lower slopes of Puu Konahuanui, above Manoa, Oahu, November 2, 1895 (Bishop; Delessert; Field, 2 sheets; Gray; Kew; New York; Paris; Leningrad; U. S.); William Hillebrand, Hawaiian islands (Gray, Vienna Mus.); Hillebrand, Makaleha, Oahu (Berlin); Hillebrand, Niu, Oahu (Berlin, forma paniculae ramis superioribus alternis); Hillebrand 6, Oahu (Kew); Hillebrand and J. M. Lydgate, Nuuanu, Puu Konahuanui, Oahu, October 1872 (Bishop); G. C. Munro, Mahana, Lanai, November 11, 1916 (Bishop); J. F. Rock 915 and 915-a (mss. no. 215-a), Punaluu Mountains, Oahu, November 14-21, 1908 (Bishop); Rock 1055, head of Pauoa Valley, Oahu, January 7, 1909 (Bishop); Carl Skottsberg 902, altitude about 400 meters, Palolo Valley, Oahu, October 23, 1922 (Göteborg); Harold St. John 10095, altitude 2,200 feet, upper ridges, Kaluanui, Oahu, November 30, 1929 (Bishop); Yoshio Tanaka, Puu Kaala, Oahu, November 13, 1929 (Bishop); U. S. Exploring Expedition, mountains behind Honolulu, Oahu, 1840 (Gray; New York, 2 sheets); Chamisso, Oahu, 1816-17 (type, Kew; probably cotypes, Berlin; Leningrad; Vienna Mus.); Chamisso, Oahu, 1816 (Berlin, probably a cotype); Heinrich Wawra 2293, Oahu, 1868-71 (Vienna Mus.).

Distribution: islands of Kauai, Oahu, Maui, and Hawaii.

Dubautia plantaginea variety γ **angustifolia** Sherff.

Dubautia plantaginea variety *angustifolia* Sherff, Amer. Jour. Bot., vol. 20, p. 616, 1933.

Leaves narrow, narrowed below, principal ones about 1.2-1.9 dm long and 0.7-1.5 cm wide; branches of panicle opposite, its bracts (leaves) more elongate.

Type: collected by William Hillebrand, on high mountain to the right of Pali of Nuuanu, Oahu, September 1860 (Kew).

Specimens examined: H. F. Bergman, altitude 1,700 feet, on moist, rocky slope near Keaau Makua, Oahu, February 22, 1928 (Bishop); Otto Degener 4222, Mount Tantalus, Oahu, in 1925 (New York); Abbé Urbain Faurie 917, Kalihi, Oahu, October 1909 (Delessert); Faurie 921, Hawaiian islands, May 1910 (Delessert, Paris); C. N. Forbes, Waolani Ridge, Oahu, October 14, 1908 (Bishop); F. R. Fosberg and K. Duker 8776, shrub 2 meters tall, altitude 650 meters, wet forest, Waikane-Schofield Trail, Koolau Range, Kahana, Oahu, October 16, 1932 (Field, New York); Fosberg and Duker 8795, bush 2 meters tall, altitude 670 meters, same date and location (British,

Field, New York); Charles Gaudichaud, voyage "Bonite", Hawaiian islands, October 1836 (Delessert, 2 sheets; Gray, fragment; Paris, sub num. 218-d'); William Hillebrand, west Maui (Kew); Hillebrand, high mountain to the right of the Pali of Nuuanu, Oahu, September 1860 (type, Kew); E. K. Yoshinaga, Puu Konahuanui, Oahu, December 26, 1929 (Bishop).

Distribution: islands of Oahu, Maui, and Hawaii.

Dubautia plantaginea variety **δ strigosa** Skottsberg.

Dubautia plantaginea variety *strigosa* Skottsberg, Meddel. Göteborg Bot. Trädgård, vol. 2, p. 277, 1926.

Leaves up to 1.8 dm long and 3 cm wide, on upper surface glabrous or sparsely pilose, on lower surface strigose with numerous long and rigid hairs; branches of panicle opposite; involucral bracts weakly hispid or dorsally glabrate.

Type: collected by Carl Skottsberg, no. 733, at altitude of about 1,100 meters, Kohala Mountains above Kamuela, Hawaii, September 29, 1922 (Göteborg).

Specimens examined: Otto Degener, Kaupo Gap, Haleakala Crater, Maui, August 20, 1927 (Berlin, British, Delessert, Field, New York, Paris); C. N. Forbes 490-H, Kohala Mountains, Waimea, Hawaii, September 1911 (Berlin, British, Field, Gray); Forbes 2135-M, east of Puu Pane, south slope of Haleakala, Maui, March 4, 1920 (Bishop); William Hillebrand, Kohala, Hawaii (Berlin, 4 sheets); Hillebrand 4, altitude 1,500-7,000 feet, Kohala, commun. 1865 (Kew); Hillebrand 14, Hawaiian islands (Gray); Hillebrand and J. M. Lydgate, Kohala, Hawaii (Bishop); Hillebrand and Lydgate, west Maui (Bishop); Jules Remy 237, Hawaii, 1851-55 (Gray); J. F. Rock 215, Pauoa Valley, Oahu, January 8, 1910 (Bishop, Gray); Rock 3679, altitude 5,000 feet, Puuli Crater, Puu Hualalai, Hawaii, June 11, 1909 (Bishop, Gray); Rock 8652, Kahikinui, Maui, October 1910 (Bishop, Gray, forma capitulis paucioribus; Skottsberg 733 (type, Göteborg).

Distribution: islands of Oahu, Maui, and Hawaii.

Dubautia plantaginea variety **ε acridentata** Sherff.

Dubautia plantaginea variety *acridentata* Sherff, Amer. Jour. Bot., vol. 20, p. 616, 1933.

Principal leaves up to 2.1 dm long and 4 cm wide, narrowed at base, on both surfaces strigose with appressed hairs, on margins sharply dentate toward apex with teeth 1-2 mm long and often spreading. Rhachis of panicle strongly hispid with white setae, these upwardly arcuate and disposed in 8-12 parallel lines; branches of panicle opposite.

Type: collected by J. F. Rock, no. 6135, Maunahui Gulch, Molokai, March 21, 1910 (Bishop).

Specimens examined: Rock 6135 (type, Bishop; cotypes, Field, Gray).

Distribution: island of Molokai.

Dubautia plantaginea variety **ζ platyphylla** Hillebrand.

Dubautia plantaginea variety *platyphylla* Hillebrand, Fl. Haw. Is., p. 222, 1888.

Leaves up to 2 dm long and 4 cm wide, at base wider and amplexicaulous, on margins spinulose-denticulate with teeth spreading and about 0.4-0.7 mm long; rhachis of panicle softly spreading-pilose, the branches opposite; involucral bracts dorsally glabrous or sparsely hispidulous but marginally ciliate.

Type: collected by J. M. Lydgate, at altitude of 4,000 feet, on north slope of Haleakala, Maui (apparently no longer extant).

Specimens examined: Otto Degener 4252, treelike shrub with many branches, on comparatively dry cliffs, Kaupo Gap, Haleakala Crater, Maui, August 20, 1927 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Univ.); C. N. Forbes 157-M, woods near Ukulele, Maui, July 1910 (Bishop); Forbes 1038-M, Keanae (Koolau) Gap, Haleakala Crater, Maui, August 3, 1919 (Bishop); Forbes 1219-M, north slope of Haleakala, August 20, 1919 (Bishop); Forbes 1835-M, Maui, March 4, 1920 (Bishop); G. C. Munro 791, altitude 5,250 feet, above Haleakala ranch pipe line, eastern Maui, February 19, 1928 (Bishop); J. F. Rock 8600, Kaupo Gap, Haleakala, Maui, October 22, 1910 (Bishop, Gray); Rock 8639, Koolau Gap, Haleakala, October 1910 (Bishop, Gray).

Distribution: eastern Maui.

Dubautia plantaginea variety **ζ platyphylla** form **1 occidentalis** Sherff.

Daubautia plantaginea variety *platyphylla* form *occidentalis* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Foliar teeth small and neither spinulose nor spreading.

Type: collected by Horace Mann and W. T. Brigham, no. 365, mountain of western Maui (Bishop).

Specimens examined: C. N. Forbes 603, ridge leading to Puu Kukui, western Maui, September 24, 1916 (Bishop); William Hillebrand and J. M. Lydgate, western Maui (Bishop); A. S. Hitchcock 14792, shrub in upper forest, altitude 3,000-5,000 feet, Puu Kukui, western Maui, September 24-26, 1916 (U. S.); Mann and Brigham 365 (type, Bishop; cotypes, Missiouri, U. S.); J. F. Rock 8141, Kaanapali, western Maui, August 1910 (Bishop, Field, Gray, New York);

Distribution: western Maui.

1a. × **Dubautia fucosa** Sherff (fig. 30).

× *Dubautia fucosa* Sherff, Bot. Gaz., vol. 96, p. 149, 1934.

Branches (branchlets?) slender, below glabrate and moderately or very densely foliose, above hispidulous and subnude. Leaves opposite or the upper ones alternate, more or less drooping, revolute, linear or narrowly lanceolate-linear, at base margined and somewhat narrowed, at apex sharply attenuate, very glabrous, subcoriaceous, toward apex minutely 1-4-denticulate on each side, manifestly 3- or sub-5-nerved, 4.5-6.5 cm long and 3-5 mm wide. Strongly similar to *D. plantaginea* proper as to the alternate principal branches of the panicle and as to characters of the capitula (except for the sometimes slightly more plumose pappus). Achenes fertile.

Type: collected by J. M. Lydgate on Lanai (Berlin).

Specimens examined: Lydgate, Lanai (type, Berlin).

An undoubted hybrid. The inflorescence is that of *Dubautia plantaginea* proper, although the pappus is slightly more plumose than in that species and approaches that of *Railliardia*. The foliar habit, however, is quite unlike that of any *Dubautia* species but is much the same as that found regularly or at times in *Railliardia scabra* variety *leiophylla, R. coriacea, R. demissa,* and × *Dubautia fallax*. The type was formerly in Hillebrand's private herbarium and by him had been determined as *Railliardia molokaiensis* (see his citation of

"Lanai," Fl. Haw. Is., p. 226, 1888). From a consideration of geographic distribution, this hybrid would seem to be *Dubautia plantaginea* × *Railliardia scabra* variety *leiophylla*.

Distribution: known only from the island of Lanai.

FIGURE 30.—× *Dubautia fucosa* (type).

1b. × **Dubautia media** Sherff (fig. 31).

× *Dubautia media* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

FIGURE 31.—× *Dubautia media* (type).

In inflorescence exactly similar to *D. laxa* proper (which has not yet been collected on Kauai). Leaves (a single branch seen) crowded under the slightly exserted inflorescence (the petioles or petioloid bases imbricated), oblong-oblanceolate, gradually narrowed to a base below as if petioled, at apex acuminate, on margins eciliate but obscurely denticulate; on surfaces pale, subcoriaceous, 7-15-nerved with nerves parallel and subobscure; in habit similar to those of *D. plantaginea* variety *Chamissonis*. A branch itself glabrous below, ligneous, 4-6 mm thick; the scars of the fallen leaves numerous (the upper ones commonly 1-6 mm, the lower commonly ± 8 mm apart), eciliate.

Type: collected by H. N. Wells, eastern end of Kauai (Field).

Specimens examined: H. N. Wells, eastern end of Kauai (type, Field).

Distribution: eastern Kauai.

1c. × **Dubautia fallax** Sherff (fig. 32).

× *Dubautia fallax* Sherff, Bot. Gaz., vol. 96, p. 150, 1934.

Branches hispid, 2-4 dm long. Lower leaves often extremely crowded and drooping, upper ones loosely disposed; all linear-lanceolate, at apex acute or subattenuate, very glabrous, coriaceous, on each side 1-6-denticulate, 3-8 cm long and 5-8 mm wide.

FIGURE 32.—× *Dubautia fallax* (type).

In inflorescence similar to *Railliardia demissifolia* and to *R. thyrsiflora* but with sterile achenes and in pappus near to *Dubautia.*

Type: collected by A. S. Hitchcock, no. 14955, at altitude of 6,000-10,000 feet, on rocky slope of Haleakala Crater, Maui, October 2-5, 1916 (U. S.).

Specimens examined: Otto Degener 4242, on rain- and fog-swept lava flow at top of Koolau Gap, within Haleakala Crater, Maui, August 17, 1927 (British, Field, New York); Degener 4273-b, same locality, August 11, 1927 (Berlin, British, Delessert, Field, Gray, Missouri, New York, Paris, U. S.), cum Railliardia demissifolia et R. thyrsiflora commixta); Hitchcock 14955 (type, U. S.).

On comparison with the somewhat similarly leaved hybrid *Railliardia fucosa,* the inflorescence and habitat of which betray *Dubautia plantaginea* as indisputably one of the parents, *R. fallax* seems to be likewise a derivative from *D. plantaginea* in part or rather from a variety of *D. plantaginea,* as that species itself is known only from Lanai. The shortly ciliate pappus bristles are, moreover, characteristic of *Dubautia.* In most characters of the inflorescence it is near to *R. demissifolia* and *R. thyrsiflora,* with which two species it was found by Degener to be growing intermixed.

Distribution: vicinity of Haleakala Crater, eastern Maui.

2. **Dubautia microcephala** Skottsberg.

Dubautia microcephala Skottsberg, Meddel. Göteborg Bot. Trädgård, vol. 2, p. 277, 1926.

Involucral bracts 2.5-3 mm long; achenial bodies 1.8-2.5 mm long.....**D. microcephala**
Involucral bracts 4-5.5 mm long; achenial bodies 3-3.5 mm long.....**variety β Forbesii**

In habit very similar to *D. plantaginea.* Leaves linear-lanceolate, the larger ones 14-17 cm long and 1.5-2 cm wide, at apex long-acuminate and minutely subspinulose-denticulate, toward amplexicaulous base gradually narrowed and at least when dry more or less reddish-purple, on both surfaces very glabrous, closely (12-15-) nerved. Capitula narrowed at base, cylindric-campanulate, small, 5-flowered; panicle as in *D. plantaginea,* pyramidal, apical or axillary, rather dense or lax or at itmes very lax, the opposite branches white-villous, their foliose bracts lanceolate and spreading-reflexed. Involucral bracts about 5, dark-purple or blackish, only 2.5-3 mm long, narrowly obovate, flat and thin, obscurely or quite densely white-villous, at margins pectinate- and rather long-ciliate, not glandular. Florets similar in size to those of *D. plantaginea,* with genital structures 7-8 mm long and hence strongly exserted, except for the ovary very glabrous; corolla purple, its 2-2.2 mm long tube gradually narrowed into a non-campanulate limb, the lobes ovate-lanceolate and about 1-1.2 mm long by 0.4 mm wide, their margins thickened. Achenes very narrowly cuneate-oblanceolate, black, antrorsely hispid, as to body 1.8-2.5 mm long, the pappus rays slender and 2.5-3 mm long.

Type: collected by Carl Skottsberg, no. 947, altitude 1,000-1,100 meters, in forests in the vicinity of Kokee Ranger Station, Waimea, Kauai, October 27, 1922 (Göteborg).

Specimens examined: C. N. Forbes 399-K, Kaholuamanu behind Waimea, Kauai, September 1909 (Berlin, Bishop, British, Field, Gray, Kew, Missouri, New York, Paris, Vienna Mus.); William Hillebrand, Kauai, commun. 1865 (Kew); J. F. Rock 5185, Waialae Stream, Kauai, September 1909 (Bishop, Field, Gray); Rock 5477 and 5478, Olokele, Kauai, September 30, 1909 (Bishop); Rock 9003 and 9004, same location, October 1911 (Bishop, Gray); Skottsberg 947 (type, Göteborg).

Distribution: island of Kauai.

Dubautia microcephala variety *β* **Forbesii** Sherff.

Dubautia microcephala variety *Forbesii* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Capitula larger. Involucral bracts 4-5.5 mm long and obovate to linear-oblong. Corolla limb more or less urceolate. Achenes narrower, the body 3-3.5 mm long.

Type: collected by C. N. Forbes, no. 399-aK, Kaholuamanu, Kauai, September 1909 (Bishop).

Specimens examined: Forbes 399-aK (type, Bishop); A. S. Hitchcock 15361, altitude 3,600 feet, Kaholuamanu, Kauai, October 20, 1916 (U. S.).

Distribution: island of Kauai.

3. **Dubautia laevigata** A. Gray.

Dubautia laevigata A. Gray, Amer. Acad., Proc., vol. 5, p. 135, 1861.

Dubautia plantaginea variety *laevigata* (A. Gray) H. Mann, Enum. Haw. Pl. no. 231, Amer. Acad., Proc., vol. 7, p. 175, 1867.

Principal leaves 1-1.6 dm long and 2-2.5 cm wide.....**D. laevigata**
Principal leaves 7-10 cm long and 8-14 mm wide.....**variety *β* parvifolia**

In habit highly similar to *D. plantaginea,* a shrub 1.8-2.4 meters high, the branches very glabrous. Leaves opposite, oblong-lanceolate or cuneate-oblanceolate, gradually narrowed below into petioles (these purplish, margined, subamplexicaulous, subconnate, very glabrous or at times ciliate); blade very glabrous, subcoriaceous, subglossy, pale, eciliate, sharply and appressedly serrulate from the acuminate apex to the middle or even almost to the base, 1-1.6 dm long and 2-2.5 cm wide, the nerves more or less purple beneath, the principal ones obscure, their interspaces commonly areolate-reticulate. Panicle large, up to 3.8 dm long, the lowest branches at times 2.8 dm long. Involucre obconic; bracts 5-8, extremely pubescent, only about 3 (rarely 4) mm long. Florets 12-16, not or rarely exserted, the tube often arcuate. Achenes more or less hispid, body about 2.5 mm long; pappus aristae sordid, slender, antrorsely hispid.

Type: collected by the U. S. Exploring Expedition on the mountains of Kauai, 1840 (U. S.).

Specimens examined: Abbé Urbain Faurie 915, altitude 1,000 meters, Waimea, Kauai, March 1910 (Delessert, foliis planta vulnerata majoribus); C. N. Forbes 348-K, Kaholuamanu, Kauai, September 1909 (Bishop); Forbes 931-K, Waimea drainage basin, west side, Kauai, July 3 to August 18, 1917 (Bishop); A. A. Heller 2616, altitude 3,000 feet, on ridge west of Hanapepe River, Kauai, July 23, 1895 (Field, New York, U. S.); J. M. Lydgate, Wahiawa mountains, Kauai, 1911 (Bishop); J. F. Rock 1801, Kaholuamanu, Kauai, March 3-10, 1909 (Bishop); Rock 1802, same location, September 1909 (Gray); Rock 9000, same location, October 1911 (Gray); Rock 9000-a, same date and location, (Bishop); U. S. Exploring Expedition, mountains of Kauai, 1840 (type, U. S.); Heinrich Wawra 2053, Kauai, 1868-71 (Berlin).

Distribution: island of Kauai.

Dubautia laevigata variety *β* **parvifolia** Sherff.

Dubautia laevigata variety *parvifolia* Sherff, Amer. Jour. Bot., vol. 20, p. 616, 1933.

Principal leaves 7-10 cm long and 8-14 mm wide.

Type: collected by Horace Mann and W. T. Brigham, no. 538, altitude 2,000-3,000 feet, Waimea, Kauai (Gray).

Specimens examined: William Hillebrand, Kauai, commun. 1865 (Kew); V. Knudsen, Waimea, Kauai (Berlin, Bishop); Mann and Brigham 538 (type, Gray; cotypes, Bishop, Missouri).

Besides the smaller leaves, the panicle seems more lax and open. In the type it is small, but in one of the cotypes examined (Missouri) it is large, the lowermost branches attaining a length of 2-2.5 dm.

Distribution: known only from the island of Kauai.

3a. × Dubautia mendax Sherff (fig. 33).

× *Dubautia mendax* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Intermediate as to leaves between *D. laevigata* and *D. laxa*, the upper leaf surfaces glabrous, the lower surfaces and margins appressed-hispid, the principal leaves ± 1 dm long and ± 1.5 cm wide. Inflorescence paniculate, more or less contracted, capitula as in *D. laxa*, disc finally about 6.5 mm tall, bracts hispid, corolla tube glandular. A hybrid probably between *D. laevigata* and *D. laxa*.

Type: collected by C. N. Forbes, no. 1042-K, Waimea drainage basin, west side, Kauai, July 3 to August 18, 1917 (Bishop).

Specimens examined: Forbes 1042-K (type, Bishop).

Distribution: island of Kauai.

4. Dubautia magnifolia Sherff.

Dubautia magnifolia Sherff, Amer. Jour. Bot., vol. 20, p. 616, 1933.

Probably fruticose, the branches very glabrous. Leaves opposite, oblong-lanceolate, downwardly long-attenuate as if petiolate, at base subamplexicaulous and subconnate, very glabrous, on lower surface pallid and subconspicuously ± 9-nerved, on upper surface very obscurely nerved and coriaceous but only slightly glossy, on eciliate margins subcrenulately and very obscurely denticulate above the middle, at apex elongately and very sharply acuminate, 1.5-2.6 dm long and 2.5-3.3 cm wide. Capitula numerous, loosely disposed in a pyramidal panicle (this ± 2.5 dm long, its branches softly and spreadingly long-pilose), very slenderly pedicellate with pedicels leafy-bracted (the bracts oblong-lanceolate, sparsely hispid, more often 1-1.5 cm long). Involucre cylindric or cylindric-obconic; bracts 5-8, glabrous, often purple, strongly connate almost to apex or very rarely a few subseparate, 5-6 mm long. Florets about 8, purple or purplish; corolla tube slender, often arcuate, three times as long as the exserted limb. Achenes sparsely hispid, the body 3.5-4 mm long; pappus aristae very slender, sordid, antrorsely hispid, 3-4 mm long.

Type: collected by J. F. Rock, no. 9012, at Waialae Stream, Kauai, October 1911 (Gray).

Specimens examined: Rock 9012 (type, Gray; cotypes, Bishop, 3 sheets).

In general habit nearest to *D. plantaginea* and *D. laevigata*. In habitat and obscure venation of upper surfaces of leaves closer to the latter, from which it differs, however, in such characters as its larger leaves, the larger and more conspicuous bracts at the bases of the pedicels, the fewer and much larger capitula, the glabrate and narrower involucres with their bracts connate almost to the top as in *Railliardia*.

Distribution: known only from type locality on the island of Kauai.

FIGURE 33.—× *Dubautia mendax* (cotype, Field Museum).

5. Dubautia laxa Hooker and Arnott.

Dubautia laxa Hooker and Arnott, Bot. Beechey's Voy., p. 87, 1832.

a. Leaves up to 14 cm long and 5.5 cm wide
  b. Capitula shortly pedicellate, the ultimate pedicels more often under 6 mm long
    c. Leaves very hispid.....variety δ **hirsuta**
    c. Leaves glabrous.....variety ζ **pseudoplantaginea**
  b. Capitula loosely disposed, the ultimate pedicels more often 1-2.2 cm long.....variety ε **pedicellata**
a. Leaves 6-10 (rarely -12) cm long and 1.5-3.3 cm wide
  b. Involucral bracts very hispid; leaves appressed-hispid on both surfaces
    c. Leaves obovate or ovate, capitula loosely disposed, pedicels often 1-2 cm long.....variety ι **waianensis**
    c. Leaves oblanceolate, capitula more densely disposed, pedicels shorter.....variety β **hispida**
  b. Involucral bracts externally more or less glabrate
    c. Leaves commonly oblong or oblanceolate, more rarely somewhat narrowly obovate
      d. Florets 5-8.....variety η **Bryanii**
      d. Florets 10-15
        e. Leaves papillose-hispid beneath.....**D. laxa**
        e. Leaves glabrescent on both surfaces
          f. Leaves now obovate now oblanceolate.....variety γ **obovata** form **1 glabrescens**
          f. Leaves linear or at times narrowly oblanceolate.....variety θ **Blakei**
    c. Leaves obovate
      d. Leaves conspicuously appressed-hispid on both surfaces.....variety γ **obovata**
      d. Leaves glabrescent at least above.....variety γ **obovata** form **1 glabrescens**

Shrub 1.5-3 meters tall, branches hispidulous. Leaves opposite, now crowded together now farther apart, oblong or oblanceolate or barely obovate, at apex more or less acuminate, below gradually narrowed into a margined petiole up to ± 1.5 cm long, sharply serrate or serrulate, membranaceous and not truly coriaceous, above glabrate or sparsely (seldom densely) hispid, below shortly and appressedly papillose-hispid, 5- or sub-7-nerved, including petiole 6-10 cm long and 1.5-3.2 cm wide. Capitula disposed in a corymb (this foliose-bracted, hispid, not or scarcely exserted), shortly pedicellate, the ultimate pedicels more often 1-6 mm long. Involucral bracts 6-10 (-12), more often becoming purple, on outer surface commonly glabrate more rarely somewhat hispid, ciliate, about 5-5.5 mm long. Florets 10-15, not exserted, corolla purple and at least below conspicuously glandular. Style branches shortly thick-conic at apex. Achenes with bodies about 3 mm long, pappus more or less purple, aristae very slenderly erect-hispidulous and about 3 mm long.

Type: collected by Captain Beechey's Expedition, Oahu, 1826-27 (Kew).

Specimens examined: anonymous, Eke, Maui (Bishop); Beechey, Oahu (type, Kew; cotype, Delessert); F. R. Fosberg 8707, bush 2 meters tall, altitude 580 meters, in wet forest, ridge, south Kipapa Gulch, Koolau Range, Waipio, September 18, 1932 (Field, New York); D. W. Garber 75, first peak of Puu Konahuanui, Oahu, November 23, 1919 (Bishop); Garber 528, ridge to Kaau Crater peak, Oahu, August 1, 1920 (Bishop); Charles Gaudichaud, voyage "Bonite," 218-a, September-October, 1836 (Gray, Paris); A. A. Heller 2902 in part, on and near summit of Puu Konahuanui, Oahu, November 2, 1895 (Delessert; Field, 2 sheets; Gray; New York; Paris, 2 sheets; Leningrad); William Hillebrand, west Maui (Gray, Kew); Hillebrand, Mount Eeka (Eke), west Maui (Berlin); G. C. Munro 598, ridge leading to Puu Kukui, Maui, September 26, 1916 (Bishop); Carl Skottsberg 779, altitude about 1,700 meters, boggy forest below summit, Puu Kukui, Maui, October 9, 1922 (Göteborg); Heinrich Wawra 1677 and 2291, Oahu, 1868-71 (Vienna Mus.).

D. laxa appears to hybridize with *D. plantaginea* or a variety of that species (forming × *D. media*) and with *D. laevigata* (forming × *D. mendax*).

Distribution: islands of Maui and Oahu.

FIGURE 34.—*Dubautia laxa* variety *hispida* (type).

Dubautia laxa variety *β* **hispida** Sherff (fig. 34).

Dubautia laxa variety *hispida* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Leaves oblanceolate, on both surfaces appressed-hispid; inflorescence exserted, the involucral bracts very hispid.

Type: collected by Charles Gaudichaud, voyage "Bonite", no. 218 in part, Hawaiian islands, September-October, 1836 (Delessert).

Specimens examined: Gaudichaud 218 in part (type, Delessert; cotypes, Gray, Paris).

The type of *D. laxa* proper has the involucral bracts more or less glabrous, as have the various other specimens cited for the species. The variety *hispida* differs at once in its very hispid bracts. The inflorescence, too, is more exserted, much as in the broader-leaved variety *hirsuta*.

Distribution: one of the Hawaiian islands. Apparently not collected since Gaudichaud's visit in 1836.

Dubautia laxa variety γ **obovata** Sherff.

Dubautia laxa variety *obovata* Sherff, Bot. Gaz., vol. 95, p. 80, 1933.

Leaves obovate, on both surfaces conspicuously appressed-hispid, including petiole about 6-7 cm long, and 2-3.3 cm wide.

Type: collected by A. A. Heller, no. 2902 in part, on and near the summit of Puu Konahuanui, Oahu, November 2, 1895 (Kew).

Specimens examined: Heller 2902 in part (type, Kew; cotypes, Bishop, Field, Gray, U. S.); William Hillebrand and J. M. Lydgate, Puu Konahuanui, Oahu (Bishop, cum forma glabrescenti commixtum).

Distribution: southeastern Oahu.

Dubautia laxa variety δ **obovata** form **1 glabrescens** Sherff.

Dubautia laxa variety *obovata* form *glabrescens* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Leaves glabrescent above and sometimes also below, now obovate now oblanceolate.

Type: collected by the U. S. Exploring Expedition, on mountains behind Honolulu, Oahu, 1840 (New York).

Specimens examined: Abbé Urbain Faurie 918, Kalihi, Oahu, October 1909 (Delessert); C. N. Forbes 448-Mo, Kaluaaha, Molokai, August 1912 (Bishop); William Hillebrand 5, Puu Konahuanui, Oahu, April 1861 (Kew); Hillebrand and J. M. Lydgate, same location (Bishop, cum varietate ipsa commixtum); E. Y. Hosaka 705, shrub 4 feet tall, altitude 2,800 feet, on main divide, Kipapa Gulch, Oahu, September 18, 1932 (Bishop, Field); Horace Mann and W. T. Brigham 133, Oahu (Bishop); U. S. Exploring Expedition, mountains behind Honolulu, Oahu, 1840 (type, New York; cotypes, Gray, U. S.).

Distribution: southeastern Oahu and southeastern Molokai.

Dubautia laxa variety δ **hirsuta** Hillebrand.

Dubautia laxa variety *hirsuta* Hillebrand, Fl. Haw. Is., p. 223, 1888.

Branches more strongly hispid; the setae rigid, subspreading, brownish. Leaves obovate or widely spatulate-obovate, at apex abruptly narrowed and subacute or shortly acuminate, serrulate, on both surfaces strongly and appressedly papillose-hispid, when dry dark-brown, 6-14 cm long and 2-5.5 cm wide. Capitula numerous, disposed in

hirsute and exserted corymbs. Involucral bracts 10-14, green, strongly hispid. Florets 16-22.

Type: collected by William Hillebrand on forested mountain slopes, Lanai (Berlin).

Specimens examined: Abbé Urbain Faurie 920, Wailuku, Maui, August 1909 (Bishop, cotype of Dubautia Fauriei Léveillé); C. N. Forbes 222-L, mountains at east end of Lanai, June 1912 (Bishop); Forbes 272-K, Wahiawa mountains, Kauai, August 1909 (Bishop); Forbes 461-M, Eke, west Maui, September 25 to October 17, 1917 (Bishop); Forbes 310-I., Lanai, September 1917 (Bishop); Forbes 1846-O, Waolani Ridge, Oahu, October 27, 1913 (Bishop); Forbes 1616-O, summit of Kaala, Oahu, November 13, 1910 (Bishop, Missouri); William Hillebrand, forested mountain slopes, Lanai (Berlin, type); Hillebrand, west Maui (Berlin); Hillebrand, Lanai (Berlin, Gray, Kew—doubtless cotypes); Hillebrand, Mount Eeka (Eke), west Maui (Berlin); Hillebrand and J. M. Lydgate, west Maui or Lanai (Bishop); R. S. Hosmer (J. F. Rock distribution no. 10315), Puu Kaala, Oahu, in 1912 (Bishop, Gray); A. Meebold, altitude 4,000 feet, Puu Kaala, Waianae Mountains, Oahu, June 1932 (Bishop); G. C. Munro, Lanaihale, Lanai, July 2, 1914 (Bishop); Munro 12, mountain top, Lanai (Bishop); Munro 128, Lanaihale, Lanai, August 1914 (Bishop); Jules Remy 238, Lanai, 1851-55 (Gray); J. F. Rock 8054, main ridge, Lanai, July 22, 1910 (Bishop, Gray); Rock 8187, altitude 4,500 feet, ridge above Kaanapali, west Maui, August 22, 1910 (Bishop); Carl Skottsberg 268, altitude about 800 meters, Green Peak (Palikea), Waianae Mountains, Oahu, August 23, 1922 (Göteborg); Heinrich Wawra 2250, Oahu, 1868-71 (Vienna Mus.).

Resembles variety *hispida* in its hispid involucral bracts and exserted inflorescence. Resembles somewhat the variety *obovata* in the shape and hispidity of its leaves. From both of these it differs at once in the greater size of the leaves. These are similar to those of variety *pedicellata*. Except for the overlapping of characters displayed by these varieties, the variety *hirsuta* might seem worthy of separate specific rank. It is so outstanding in its habit (except as to the very close variety *pedicellata*) that a rather full description has been given.

An apparent hybrid of variety *hirsuta* with some other form of *Dubautia* has been collected by C. N. Forbes (nos. 1034-K and 1697-K, Kalalau Pali, Kauai, July 3 to August 18, 1917, Bishop). The leaves are as in variety *hirsuta* or slightly narrower. The inflorescence, which is immature and apparently abortive, is a panicle.

Distribution: islands of Kauai, Oahu, Lanai, and Maui.

Dubautia laxa variety ϵ **pedicellata** Rock.

Dubautia laxa variety *pedicellata* Rock, Indig. Trees Haw. Is., p. 501, 1913.

A tree 4.5-5.5 meters tall. Leaves obovate or widely oblanceolate, on both surfaces strongly and subappressedly papillose-hispid, 7-13 cm long and 2.5-4 cm wide. Capitula dark orange-colored, rather loosely disposed on softly long-pilose pedicels (the ultimate pedicels more often 1-2.2 cm long). Involucral bracts dorsally glabrate or loosely hispid, often becoming purple. In habit very similar to variety *hirsuta*.

Type: collected by J. F. Rock, no. 8850, on ridge leading to Waialeale, Kauai, October 21, 1911.

Specimens examined: A. S. Hitchcock 15494, altitude 3,600-5,080 feet, Waialeale, October 22-24, 1916 (U. S.); J. F. Rock, Kauai, October 1916 (Bishop); Rock 5005,

Waialeale, September 21, 1909 (Berlin, British, Field, Gray, Kew); Rock 8850 (cotypes, British, Field, Gray, Kew); Carl Skottsberg 956, altitude about 1,300 meters, Alakai swamps above Kokee, Waimea, Kauai, October 27, 1922 (Göteborg).

Distribution: vicinity of Waialeale, island of Kauai.

Dubautia laxa variety ζ **pseudoplantaginea** Skottsberg.

Dubautia laxa variety *pseudoplantaginea* Skottsberg, Meddel. Göteborgs Bot. Trädgård, vol. 2, p. 280, 1926.

Leaves glabrous, oblanceolate or narrowly obovate, the larger ones commonly 10-12 cm long.

Type: collected by Carl Skottsberg, no. 172, altitude 500-600 meters, Nuuanu-Kalihi Ridge, Oahu, August 13, 1922 (Göteborg).

Specimens examined: Otto Degener 4255, on mountain ridge, Hauula, Oahu, November 13, 1927 (Berlin, Field, Gray, New York); C. N. Forbes, Waolani ridge, Lanihuli Trail, Oahu, September 17, 1908 (Bishop, Field, Kew); F. R. Fosberg 8667, altitude 500 meters, in thick brush, ridge, Kipapa Gulch, Koolau Range, Waipio, Oahu, September 18, 1932 (Field, New York); Fosberg 8702, bush 2 meters tall, altitude 875 meters, in scrubby rain forest, summit of Koolau Range, above Kipapa Gulch, Waipio, September 18, 1932 (British, Field, New York); Charles Gaudichaud 218 in part, Hawaiian islands (Berlin, sub nom. D. plantaginea Gaudichaud sed a Gaudichaudii tabula valde diversa); E. Y. Hosaka 714, shrub 3 feet high, altitude 2,000 feet, wet, denuded south ridge, Kipapa Gulch, September 18, 1932 (Bishop); Hosaka 812, shrub 3 feet tall, altitude 2,200 feet, same location (Field); Skottsberg 172 (type, Göteborg).

Appearing at times superficially similar in habit to *D. laxa* variety *obovata* form *glabrescens* (with which I confused it in certain herbaria). The capitula and leaves vary considerably, and the plants should be studied in the field for evidences of hybridity. Hosaka 705 from Kipapa Gulch is positively variety *obovata* form *glabrescens*; Hosaka 812, likewise from Kipapa Gulch, is variety *pseudoplantaginea*.

Distribution: island of Oahu.

Dubautia laxa variety η **Bryanii** Sherff (fig. 35).

Dubautia laxa variety *Bryanii* Sherff, Amer. Jour. Bot. vol. 20, p. 617, 1933.

Leaves oblanceolate, glabrous, 8-12 cm long. Capitula 5-8-flowered, small; bracts 5-8, only about 2.3 mm long. Achenial bodies about 1.9-2.2 mm long, aristae sometimes a little longer.

Type: collected by C. N. Forbes and C. M. Cooke, Koolauloa mountains between Punaluu and Kaipapau, Oahu, May 3-8, 1909 (Bishop).

Specimens examined: H. F. Bergman, altitude 1,700 feet, Keaau Makua, Oahu, February 22, 1928 (Bishop, Field); Otto Degener 4254, on exposed ridge in rain forest, near summit of Eke, west Maui, August 29, 1927 (Berlin, British, California, Delessert, Field, Gray, Kew, Missouri); Degener and K. K. Park 4343, in rain forest, near summit of Pig-God Trail, Punaluu Valley, Oahu, January 17, 1932 (British, Field, Kew, New York); Degener, Park, and Wallace Hirai 4263, in windy rain forest, along Waikane-Schofield trail, Oahu, April 4, 1931 (Field, New York); C. N. Forbes 1707-O, Wahiawa gulches, Oahu, April 9, 1911 (Bishop, British, Field, Kew); Forbes and Cooke, Koolauloa mountains (type, British; cotypes, British, Field, Gray, Kew, Mis-

souri); F. R. Fosberg and M. Chong 9425, shrub 3 meters tall, altitude 640 meters, wet forest, Waimea-Malaekahana divide, Koolau mountains, Oahu, April 15, 1933 (Berlin, Field, Gray, New York); A. S. Hitchcock 14805, Puu Kukui, west Maui, September 24-26, 1916 (Bishop); E. Y. Hosaka 593, shrub 3 feet tall, altitude 2,800 feet, wet, denuded south ridge, Kipapa Gulch, Oahu, July 4, 1932 (Bishop); Hosaka 713, altitude 2,000 feet, wet forest on denuded south ridge, Kipapa Gulch, September 18, 1932 (Bishop); J. F. Rock 216, Hawaiian islands (Bishop); Rock 756, Punaluu mountains, Oahu, December 3-14, 1908 (Bishop; forma foliis magis elongatis, inflorescentia magis fastigiata); Rock 3027, Kaukonahua Gulch, Wahiawa, Oahu, May 15, 1909 (Bishop, Gray).

Distribution: islands of Oahu and Maui.

FIGURE 35.—*Dubautia laxa* variety *Bryanii* (Rock 3027, Gray Herbarium).

Dubautia laxa variety *θ* **Blakei** Degener and Sherff.

Dubautia laxa variety *Blakei* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 96, p. 151, 1934.

Leaves linear or narrowly oblanceolate, at apex sharply attenuate, acutely and spinulosely few-dentate, glabrous but often ciliate and very minutely glandular, more or less 3-5 (sub-7-) nerved. Involucral bracts externally glabrate or sparsely hispid.

Type: collected by Otto Degener, no. 4234, in windy rain forest, ridge north of Pohakea Gulch, Maui, July 23, 1927 (Field, 3 sheets).

Specimens examined: Degener 4234 (type, Field, 3 sheets; cotypes, Berlin, Boissier, British, California, Delessert, Gray, Kew, Missouri, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.).

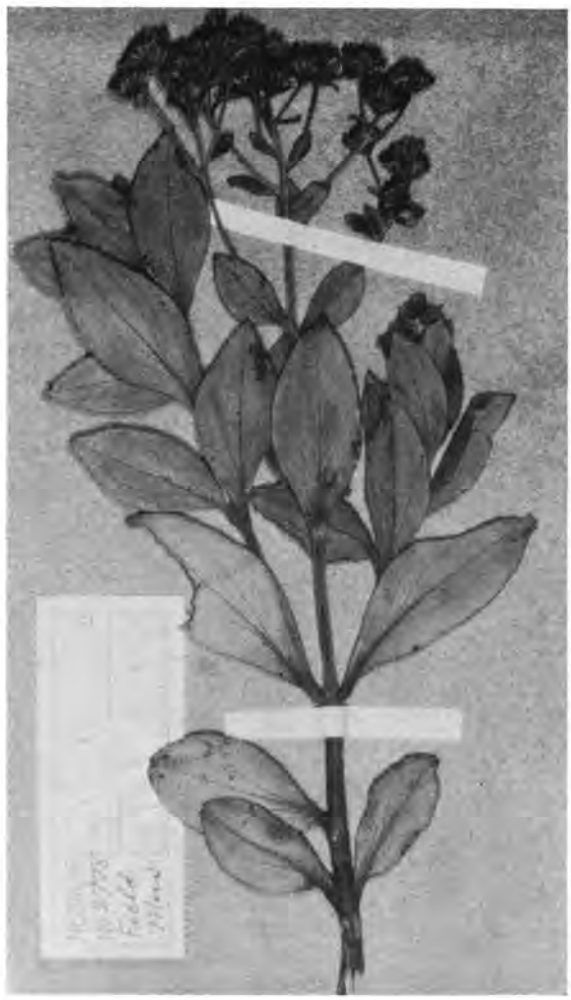

FIGURE 36.—*Dubautia laxa* variety *waianensis* (type).

Distribution: known only from type locality in southeasternmost part of western Maui.

Dubautia laxa variety ι **waianensis** Degener and Sherff (fig. 36).

Dubautia laxa variety *waianensis* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 96, p. 151, 1934.

Leaves oblongly obovate or ovate, toward the obtuse or abruptly acute apex very minutely denticulate, on both surfaces subappressedly papillose-hispid, up to 5.5 cm long and 2.2 cm wide. Inflorescence corymbose, more lax; pedicels slender, pilose, suberect, often 1-2 cm long. Involucral bracts externally hispid.

Type: collected by Kazuto Nitta (Otto Degener distribution no. 4340), altitude 2,500 feet, in moderately wet locality, Puu Kaala, Waianae Mountains, Oahu, 1929 (Field).

Specimens examined: Otto Degener and K. K. Park 4327, about 3-5 feet tall, along summit ridge, between Puu Manawahua and Palikea, Oahu, September 27, 1931 (British, Delessert, Field, Gray, Kew, Missouri, New York); Nitta (Degener distribution no. 4340) (type, Field; cotype, New York).

Perhaps passes into variety *hirsuta*.

Distribution: western Oahu.

6. **Dubautia Knudsenii** Hillebrand.

Dubautia Knudsenii Hillebrand, Fl. Haw. Is., p. 223, 1888.

Leaves more often oblong, weakly nerved, plant of Kauai.....**D. Knudsenii**
Leaves more often obovate, manifestly nerved, plant of Molokai.....**variety β Degeneri**

Branched shrub, ± 1.8 meters tall; branches slender, glabrous, brownish, angled, spreading. Leaves disposed subdensely toward ends of branchlets, opposite, pallid, oblong or obovate, extremely membranaceous, on both surfaces very glabrous, on margins obsoletely or sparsely ciliate but sharply serrulate, at apex shortly acuminate, at base narrowed into a margined sparsely hispid petiole 1-2 cm long, the principal leaves 7-15 cm long including petiole and 1.5-4.3 cm wide. Capitula dark-purple, disposed in a bracted loose and scarcely or not exserted corymb, pedicellate; pedicels very slender, hirtellous, often drooping, commonly 1-3 cm long. Involucre obconic; bracts 7-9, flattish, dorsally glabrous, marginally fimbriate-ciliate with white hairs, about 4.5 mm. long. Receptacle convex, finally nude. Florets 8-13, corolla purple not exserted. Achenial bodies about 2.5 mm long; pappus aristae purple, slender, antrorsely and very delicately hispidulous, ± 2.5 mm long.

Type: collected by Valdemar Knudsen, on the mountains of Waimea or at Halemanu, Kauai (Berlin).

Specimens examined: Otto Degener 4223, loosely branched shrub about 15 feet tall, rain forest, Kalalau Trail near Kokee, Kauai, July 4, 1926 (Berlin, British, Delessert, Field, Gray, Kew, New York); Abbé Urbain Faurie 914, altitude 1,000 meters, Waimea, Kauai, March 1910 (Delessert, Paris); C. N. Forbes 383-K, Kaholuamanu, Kauai, September 1909 (Bishop); Forbes 1017-K, Waimea drainage basin, west side, Kauai, July 3 to August 18, 1917 (Bishop); A. A. Heller 2856, altitude 4,000 feet, on banks of forest stream, plateau above Waimea, Kauai, September 30, 1895 (Bishop, Delessert, Field, Gray, Kew, Missouri, New York, Paris, U. S.); Knudsen, Kauai (type, Berlin); J. F. Rock, Kauai, October 1916 (Bishop); Rock 1799, Halemanu, Kauai, February 14-26, 1909 (Bishop); Rock 1811, Kaholuamanu, Kauai, March 3-10, 1909 (Bishop, Gray); Rock 4958, Hawaiian islands (Bishop); Rock 5191, Kaholuamanu, Kauai, September 1909 (Bishop, Gray); Rock 10308, ridge leading to Waialae Stream, Kauai, October 1911 (Bishop).

Distribution: island of Kauai.

Dubautia Knudsenii variety *β* **Degeneri** Sherff.

Dubautia Knudsenii variety *Degeneri* Sherff, Bot. Gaz., vol. 96, p. 151, 1934.

Shrub ± 1.5 meters tall, branchlets hispid. Leaves obovate, in dry state brownish-green, distinctly 5-nerved, subsparsely ciliate, below and especially along veins more or less hispid.

Type: collected by Otto Degener, no. 4259, shrub 5 feet high, in open rain forest, north of Pepeopae, northeastern Molokai, May 8, 1928 (Field).

Specimens examined: Degener 4259 (type, Field; cotype, New York); Degener 4261, in rainy region, on crest of Waikolu Valley, Molokai, May 1, 1928 (Field, New York).

Distribution: vicinity of Waikolu Stream, northeastern Molokai.

7. Dubautia paleata A. Gray.

Dubautia paleata A. Gray, Amer. Acad., Proc., vol. 5, p. 135, 1861.

Branches ligneous and hirsute. Leaves verticillate in threes or sometimes opposite, sessile or seemingly marginate-petioled, lanceolate, at both ends scarcely narrowed or at apex barely acuminate, on margins remotely denticulate and (at least when dry) very narrowly more or less revolute, on upper surface subcoriaceous, on both surfaces (especially the lower) appressed-hispid, lengthwise about 9-11-nerved, now 4.5-8 cm long and 1-1.5 cm wide now up to 1.7 dm long and 3 cm wide. Capitula subglobose, few or numerous, disposed in a foliose-bracted and contracted corymb, pedicellate with ultimate pedicels hispid and 0.5-2.5 cm long. Involucre hispid or above rarely glabrate; bracts about 5 or 6, oblong, flattish, 5-6.5 mm long. Receptacle conic; paleae numerous, concave, lanceolate, marginally erose-denticulate. Florets 20-30; corolla straw-yellowish and becoming purple or purplish, its tube surpassing the pappus paleae and its throat slightly enlarged. Achenes moderately hispid, often curved, as to body 4-5 mm long; paleae of the paleaceous pappus widely lanceolate, ciliate, at apex often incised, half the length of the body.

Type: collected by the U. S. Exploring Expedition, on mountains of Kauai, 1840 (U. S.).

Specimens examined: C. N. Forbes 914-K, Alakai Swamp, Waimea, Kauai, July 3 to August 18, 1917 (Bishop); Valdemar Knudsen, Waimea, Kauai (Berlin; Bishop, fragment); J. M. Lydgate, Wahiawa mountains, Kauai (Bishop); J. F. Rock 4998, Wailenalena, Kauai, September 1909 (Bishop, British, Field, Gray); Rock 5009, Wailenalena swamps, Kauai, September 1909 (Bishop); Rock 8879, altitude 5,000 feet, plateau of Kauai, and summit of Waialeale, October 20, 1911 (Bishop, Paris); Rock 17101, swamp, Wailenalena plateau, October 1916 (Bishop, 3 sheets); Carl Skottsberg 955, altitude about 1,300 meters, Alakai Swamp near Kilohana, Waimea, Kauai, October 27, 1922 (Göteborg); U. S. Exploring Expedition, Kauai, 1840 (type, U. S.; cotype fragment and sketches, Gray).

Distribution: island of Kauai.

Dubautia paleata × D. waialealae (fig. 37).

Dubautia paleata × D. waialealae, Sherff, Bot. Gaz., vol. 96, p. 152, 1934.

Leaves crowded (internodes hispid, more often 2-6 mm long), spatulate-oblanceolate, now 4-5 cm long and 7-12 mm wide now 7-9 long and 1.2-1.6 cm wide, at apex acute at base 3-6 mm wide, on both surfaces appressed-hispid. Capitula paniculately or compact-corymbosely disposed, varying but allied to those of *D. waialealae.*

Specimens examined: A. S. Hitchcock 15468, in bog, altitude 3,600-5,080 feet, Waialeale, Kauai, October 22-24, 1916 (U. S.); Hitchcock 15492, same date and location (U. S.).

FIGURE 37.—*Dubautia paleata* × *Dubautia waialealae* (Hitchcock 15492, U. S. National Museum).

Closer to *D. paleata* in size, shape, texture, and arrangement of leaves, but closer to *D. waialealae* in compactness of the inflorescence and in most characters of the capitula. This indubitable occurrence of hybridity shown between the bizarre *D. waialealae* and one of the more orthodox species of *Dubautia* is important in that it raises a query as to the integrity of *D. waialealae* variety *megaphylla*.

8. Dubautia Railliardioides Hillebrand.

Dubautia Railliardioides Hillebrand, Fl. Haw. Is., p. 224, 1888.

Fruticose or perhaps arborescent; branches glabrate but the scars of the fallen leaves ciliate, branchlets purple and herbaceous. Leaves verticillate in threes, lanceolate, at apex very sharply acuminate, at base membranaceous-marginate (also subamplexicaulous and elongate-narrowed as if petioled), remotely and very minutely sharp-denticulate or toward base subentire, thin, glabrous and almost to proximal end eciliate, 1-1.5 dm long and 1.5-2.5 cm wide. Capitula subloosely and racemosely disposed along the branches in a large corymb (this decompound, foliose, viscid-pubescent, scarcely exserted); ultimate pedicels very glandular, slender, often 1-2 cm long. Involucre cylindric-obconic, glabrous, purple, 6.5-8 mm long; bracts 6-8, oblong-lanceolate, below more or less strongly connate. Receptacle flat, in many-flowered capitula accompanied by 2 or 3 small, flat paleae. Florets 8-14; corolla exserted beyond pappus, in dry state ochroleucous. Style branches long, plano-convex, clavate, shortly conic-appendiculate. Achenes narrowly oblanceolate, sparsely hispid or finally almost glabrate; body 5-6 mm long, pappus sordid and a little shorter.

Type: collected by Valdemar Knudsen, (fide Hillebrandii in Waimea,) island of Kauai (Berlin).

Specimens examined: C. N. Forbes, Kauai, 1909 (Bishop); Forbes, Wahiawa mountains, Kauai, 1911 (Bishop); Forbes 275-K, same location, August 1909 (Bishop); William Hillebrand, Kauai (Gray); Knudsen, Kauai (type, Berlin); J. F. Rock, Kauai, October 1916 (Bishop); Rock 10309, Waialeale, Kauai, September 1911 (Bishop); Heinrich Wawra, Kauai (Berlin); Rock 2104, Halemanu, Kauai, 1868-71 (Vienna Mus.).

Besides the specimens cited were sheets of teratological or abortive flowering material (Bishop), apparently hybridized with another species. The petioles were glabrous, but nodal ciliation on the stems was lacking, and the lateral leaf veins were especially obscure.

Distribution: island of Kauai.

9. Dubautia waialealae Rock.

Dubautia waialealae Rock, Bull. Torr. Bot. Club, vol. 37, p. 303, fig. 5, and p. 304, 1910.

Leaves 1.2-2 cm long and 3-6 mm wide, more or less hispid.....**D. waialealae**
Leaves 3.5-5.3 cm long and 7-11 mm wide, on surface glabrous.....**variety β megaphylla**

Fruticose, hirsute, 2-3 meters tall; branches robust, branchlets (after the falling of the leaves) very numerously and very conspicuously scarred. Leaves very densely crowded, in threes, sessile, lanceolate or oblanceolate, thickish, coriaceous, lengthwise several-nerved, on surfaces now sparsely and shortly now subdensely and more elongately hispid, on margins hispid-ciliate and entire or toward apex remotely erose-denticulate, at apex acute, 1.2-2 cm long and 3-6 mm wide. Capitula 4-18, paniculately disposed, pedicellate; pedicels long- and spreading-pilose, the ultimate ones 4-27 mm long. Involucre narrowly obconic, strongly appressed-hispid; bracts 5 or 6, more or less connate below, 6-8 mm long. Receptacle conic, hirsute, few-paleate. Florets 6-30; corolla yellowish or intensely purple, inserted. Achenes with body about 3.5 mm long; aristae slenderly linear, shortly erect-hispidulous, about 3-4 mm long.

Type: collected by J. F. Rock, no. 5030, altitude 5,250 feet, on summit of Waialeale, Kauai, September 23-24, 1909 (Bishop).

Specimens examined: William Hillebrand, Hawaiian islands, commun. 1865 (Kew); A. S. Hitchcock 15462, altitude 3,600-5,080 feet, Waialeale, Kauai, October 22-24, 1916

(U. S.); J. F. Rock, Waialeale, September 1909 (Bishop); J. F. Rock, altitude 5,200 feet, same location, October 1911 (Gray); Rock 5030 (cotypes, Bishop, Gray); Rock 8862, altitude 5,000-5,250 feet, Waialeale, October 20, 1911 (Bishop, Gray, Paris); Rock 17109, same location, October 1916 (Bishop); Heinrich Wawra 2175, Kauai, 1868-71 (Vienna Mus.).

Hybridizes with *D. paleata.*

Distribution: island of Kauai.

Dubautia waialealae variety *β* **megaphylla** Sherff.

Dubautia waialealae variety *megaphylla* Sherff, Amer. Jour. Bot., vol. 20, p. 617, 1933.

Leaves pale, on surfaces glabrous, toward apex sharply serrulate, 3.5-5.3 cm long and 7-11 mm wide. Perhaps a hybrid?

Type: collected by J. F. Rock, no. 5022, on Waialeale, Kauai, September 1909 (Gray).

Specimens examined: Rock 5022 (type, Gray; cotype, Bishop).

Rock, as may be seen from his herbarium label, regarded the type material as a variety of *D. waialealae.* The dried leaves have much the same color and venation as are found in *D. plantaginea,* thus hinting at hybridization. In a specimen collected by Forbes (1700-K, Waimea drainage basin, west side, Kauai, July 3 to August 18, 1917, Bishop), an inflorescence is lacking, but the numerous leaves are dark-brownish, closely appressed-hispid, and more obscurely denticulate.

Distribution: island of Kauai.

Genus **RAILLIARDIA** Gaudichaud

Railliardia Gaudichaud, Freycinet Voy. Bot., p. 469, pl. 83, 1830.

Shrubs or small trees, branchlets more or less resinous. Leaves opposite, ternately verticillate or alternate, sessile or rarely subsessile, more often coriaceous and glossy, entire or obsoletely denticulate. Capitula of medium or small size, homogamous, discoid, as a rule paniculately or racemosely more rarely corymbosely disposed, all florets hermaphrodite and fertile. Involucre cylindric or campanulate; bracts 1-seriate, equal, more or less connate or finally distinct. Receptacle small, convex or subconic, nude or few-paleate. Corollas regular, yellow, tube slender, limb campanulate and 5-fid. Anthers basally obtuse and entire. Style branches elongate, clavate-complanate, tipped with appendages; these lanceolate-subulate, acute, recurved or spirally twisted. Achenes slender, glabrous or pilose, at base attenuate, 4-5-angled; setae of the sordid-brown pappus about 12-20, long- and plumose-ciliate, at least equal to achenial body, 1-seriate, their rhachis rigid and subcorneous. The arborescent species said to diffuse a strange odor for a great distance (J. F. Rock, Indig. Trees Haw. Is., p. 503, 1913).

Type: *Railliardia lincaris* Gaudichaud, Freycinet Voy. Bot., p. 469, pl. 83, 1830.

History of the Genus

Gaudichaud (Freycinet, Voy. Bot., p. 469, pl. 83, 1830) named the genus for the French Royal Marine officer, L. Railliard. The spelling was *Railliardia,* not only for the type illustration and the text but even in the index to Gaudichaud's volume. This spelling was subsequently altered by certain authors, apparently with little restraint. (The date 1830 for Gaudichaud's work is taken from H. Mann, Enum. Haw. Pl., Amer. Acad., Proc., vol. 7, p. 144, 1867. Gaudichaud's work itself bears the date 1826 on the title page.) Sprengel (Gen. Pl., vol. 2, p. 796, 1831) set the name forth as *Raillardia.* This is the spelling later adopted by Asa Gray (Amer. Acad., Proc., vol. 5, p. 132, 1861). De Candolle, in the body of his "Prodromus" (vol. 6, p. 440, 1837), gave "*Railliarda* Gaudich." The spelling in his index, however, was "*Raillarda*". Endlicher (Gen. Pl., p. 460, 1838) employed this latter spelling, "*Raillarda*", perhaps taking it directly from the index to De Candolle's volume of the previous year. In general, however, the spelling used by Sprengel and later by Gray was followed by various authors (Bentham and Hooker, Gen. Pl., vol. 2, p. 442, 1873; Hillebrand, Fl. Haw. Is., p. 224, 1888). Gaudichaud's own spelling, *Railliardia,* taking precedence as it does for orthographic accuracy and (apparently) for priority is that used here.

Bentham and Hooker (Gen. Pl., vol. 2, pp. 393, 442) placed *Railliardia* quite apart from *Dubautia* (with 132 other genera of Compositae intervening!). They assigned *Dubautia* to the tribe Helianthoideae, subtribe Galinsogeae, whereas they assigned *Railliardia* to the tribe Senecionideae, subtribe Eusenecioneae. The two genera are exceedingly close, however. Thus Asa Gray (Amer. Acad., Proc., vol. 5, 1861), in treating *Railliardia,* wrote: "Although the rays of the pappus are setae instead of paleae, the true place of this genus is next to *Dubautia.*" Gray assigned both genera to the Helenieae. Later, however, on treating the genus *Raillardella* as one of the Senecionideae (Bot. Calif., vol. 1, p. 416, 1876) he wrote. "This interesting genus, along with the Hawaiian *Raillardia,* seems rather to belong to the Helenioideae, next to *Dubautia*; but the technical characters would cause it to be looked for here, where Bentham has placed these genera, although the bristles of the pappus are somewhat too stout and flattish." Hillebrand (Fl. Haw. Is., p. 221, 1888) likewise recognized the strong affinities of these two genera, describing *Dubautia* as "closely allied" to *Railliardia,* but put both genera in the tribe Senecionideae.

It is not my purpose here to pass judgment upon the necessarily somewhat

arbitrary assignments of *Railliardia* to one of the various tribes of Compositae. We may note, however, that Gray (Amer. Acad., Proc., vol. 5, 1861) subdivided the genus into three sections, each with only such description as was conveyed in the one or two words of designation, but well typified by one or more species. In a subsequent paper (Amer. Acad., Proc., vol. 6, p. 550, 1865) Gray proposed a fourth section, *Raillardella,* to include certain species of continental North America, but in still later works (Bentham and Hooker, Gen. Pl., vol. 2, p. 442, 1876; A. Gray, Bot. Calif., vol. 1, p. 416, 1876; A. Gray, Synopt. Fl. No. Amer., vol. 1, pt. 2, p. 380, 1884) he regarded *Raillardella* as a valid genus.

His first and third sections are here retained, *Venoso-reticulatae,* typified by *R. latifolia*; and *Nervosae,* typified by *R. linearis, R. Menziesii, R. platyphylla, R. arborea,* and *R. struthioloides.* His second section, *"Uninerviae, aveniae,"* typified by *R. scabra, R. laxiflora* De Candolle, and *R. ciliolata,* and based as it was upon the uninervate character of the foliage—a character that may vary considerably within a species (see *R. ciliolata* and variety *trinervia*) seems best merged for the present with his third, the *Nervosae.* When more information has been gleaned by future collectors as to the relative roles of such factors as, for example, hybridism and endemism, in the remarkable diversification that has taken place within this small genus, it may well be that a redistribution of the species here referred by me to the *Nervosae* will be justified, perhaps upon the basis of characters associated with size of capitula.

Key

a. Leaves pinnately nerved, areolate, entire, 7-11 cm long and up to 6 cm wide.....**1. R. latifolia**

a. Leaves 1-nerved

b. Principal leaves alternate or rarely in threes.....**2. R. scabra and varieties**

b. Principal leaves often in threes

c. Stems or branches subnude above.....**3. R. ciliolata variety δ laxiflora**

c. Stems or branches foliose up to the inflorescence.....**3. R. ciliolata and varieties β, γ**

a. Leaves 3-nerved or rarely 1- or sub-5-nerved

b. Principal leaves commonly in threes

c. Leaves closely sessile

d. Leaves 1.2-2.5 cm long

e. Leaves ovate-lanceolate, 1.2-1.8 cm long, capitula 5-12-flowered.....**11. R. Hillebrandii**

e. Leaves narrowly ovate-lanceolate or oblongly linear-lanceolate, 1.7-2.5 cm long, capitula 15-17-flowered.....**3. R. ciliolata variety β trinervia**

d. Leaves about 1.8-3.5 cm long.....**4. R. demissifolia variety β verticillata**

d. Principal leaves 3-6.5 cm long.....**7. R. thyrsiflora and variety β cernua**

c. Leaves subpetiolate.....**10. R. linearis**

b. Principal leaves alternate

c. Capitula ± 14-flowered, involucre 8-9.3 mm long; leaves loosely disposed, ascending-spreading or the lowest ones drooping.....**15. R. Rockii**

c. Capitula 5-12-flowered, involucre 5-8 mm long

d. Leaves very much crowded together, on upper surface very coriaceous-glossy, revolutely more or less convolute, the lower ones drooping.....**9. R. coriacea**
d. Leaves loosely disposed, weakly coriaceous and subglossy, flat or at margin minutely revolute, the lower ones ascending or spreading or rarely subdrooping.....**5. R. molokaiensis**
b. Principal leaves opposite
c. Leaves 4-7.5 cm long.....**5. R. molokaiensis variety β oppositifolia**
c. Leaves 1.8-2.7 cm long.....**4. R. demissifolia**
a. Leaves 5-11-nerved
b. Leaves, at least the larger ones, 4-9 cm long and 1.2-3 cm wide
c. Leaves opposite.....**18. R. platyphylla and variety β leptophylla**
c. Leaves in threes.....**17. R. arborea**
c. Leaves alternate.....**8. R. lonchophylla**
b. Leaves shorter or narrower
c. Leaves very much crowded together, more or less imbricated, erect or rarely at last spreading, canescent, thick, more or less concave, not glossy.....**14. R. struthioloides**
c. Leaves diverse
d. Capitula very numerous, small; involucre narrowly cylindric, about 6-7 mm long and below the lobes about 1.5-2.5 mm thick
e. Leaves in threes.....**6. R. ternifolia**
e. Leaves opposite.....**13. R. reticulata**
d. Capitula fewer, larger; involucre obconic or cylindric-obconic, 7-8 mm long and below the lobes 2.5-4.5 (-5.5) mm thick
e. Pedicellar bracts foliaceous and apically obtuse.....**16. R. Menziesii and variety β angustifolia**
e. Pedicellar bracts commonly linear or depauperately lanceolate-linear, apically acute.....**12. R. montana and variety β longifolia**

Section 1. VENOSO-RETICULATAE A. Gray

Venoso-reticulatae A. Gray, Amer. Acad., Proc., vol. 5, p. 132, 1861.

Leaves opposite, large, oblong, pinnately nerved, finely reticulate-veined. —No. 1.

1. **Railliardia latifolia** A. Gray.

Railliardia latifolia A. Gray, Amer. Acad., Proc., vol. 5, p. 132, 1861; see

A. A. Heller, Minnesota Bot. Studies, vol. 1, p. 921, 1897.

Fruticose, scandent or a true vine, glabrous, the principal stem often 5-7.5 m long and toward base often 5 cm thick; branches long, virgate, flowering, often ascending trees, internodes commonly 7-12 cm long. Leaves opposite, flat, subpetiolate, oblong or elliptic-oblong, entire, coriaceous but not thick, subglossy, pinnately nerved, finely reticulate-veined, at apex acute but in dry state commonly mutilated, 7-11 (-16) cm long and up to 6 cm wide, the highest leaves often spreading or reflexed. Capitula 4- or 5-flowered, very numerous, disposed in a panicle (this bracteate, decompound, 2-5 dm long), commonly about 3-5-clustered, pedicellate, pedicels ± 3 mm long, the whole inflorescence puberulous. Involucre cylindric, cinereo-pubescent, about 6 mm tall; bracts 4 or 5, strongly connate. Corollas inserted in pappus. Achenes hispidulous, body 4-5 mm long, pappus a little longer.

Type: collected by the U. S. Exploring Expedition, on the mountains of Kauai, 1840 (U. S.).

Specimens examined: A. A. Heller 2887, on Kaholuamanoa (Kaholuamanu), above Waimea, Kauai, October 11-16, 1895 (Field, Gray, Kew, Missouri, New York, Paris, Leningrad, U. S.); V. Knudsen, Kauai (Berlin, 2 sheets); Horace Mann and W. T. Brigham, Halemanu, Kauai (Gray); J. F. Rock 1588, Halemanu, February 14-26, 1909 (Bishop); Rock 1600, same date and location (Gray); Rock 5156, Kaholuamanu, Kauai, September 1909 (Gray, Paris); Rock 5158, same date and location (Bishop); Rock and Marshall 210, Halemanu, Kauai, October 10, 1909 (Bishop); Carl Skottsberg 957, altitude about 1,200 meters, forests around Kokee, Waimea, Kauai, October 27, 1922 (Göteborg); U. S. Exploring Expedition, mountains of Kauai, 1840 (type, U. S.; fragment and sketches, Gray).

Distribution: known only from the island of Kauai.

Section 2. **NERVOSAE** A. Gray

Nervosae A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

Leaves often in threes or alternate, lengthwise 1-11-nerved but not or hardly pinnate-nerved.—Nos. 2-18.

2. **Railliardia scabra** De Candolle.

Railliardia scabra De Candolle, Prodr., vol. 6, p. 441, 1837; pro var. A. Gray ex Hillebrand, Fl. Haw. Is., p. 225, 1888.

Railliardia scabra variety *hispidula* A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

a. Principal leaves commonly 5-7.5 cm long and 4-6 mm wide.....**variety γ Munroi**
a. Principal leaves commonly 1-4.5 (more rarely -6.5) cm long and under 4 mm wide
  b. Principal leaves 1-3.5 cm long and commonly 2-3 (more rarely 1.5-6) mm wide.....**R. scabra**
  b. Principal leaves commonly 3-5.5 cm long and only 1.5-2.4 mm wide.....**variety β leiophylla**

Dwarf shrub, decumbent, ligneous below; branches slender, purple, hispidulous or glabrate, subherbaceous, erect, 1.5-5 dm long, toward apex subnude. Leaves alternate (lower ones crowded), sessile, spreading or reflexed, now linear now linear-oblong now linear-lanceolate, on upper surface impressed lengthwise with a single nerve, entire or more often on each side 1- or 2- (very rarely 3-) denticulate, coriaceous, on both surfaces more or less scabrous, on lower often hispid, on upper sometimes glossy, on margins revolute and spinulose-ciliate, at apex acute, at base narrow or wide, 1-3.5 cm long and commonly 2-3 (more rarely 1.5-6) mm wide. Capitula numerous, disposed in corymbs (these paniculate, bracteate, long-exserted), 4-7-flowered; corollas pale sulphur-yellow or whitish and scarcely exserted beyond pappus; ultimate pedicels very slender, hispidulous, 2-10 mm long. Involucre cylindric-campanulate, becoming purple, 5.5-7 mm tall; bracts about 5 or 6, hispidulous, finally often more or less distinct. Achenes linear-clavate, hispidulous, toward base conspicuously attenuate, body 4-5 mm long.

Type: collected by James Macrae, near a volcano of the Hawaiian islands, in 1825 (Delessert).

Specimens examined: Otto Degener, bottom of Kilauea Iki, Hawaii, November 15, 1929 (Berlin, British, Field, New York); Degener H-99, volcanic ash near crater, Kilauea, Hawaii, December 13, 1922 (New York); Degener 4220, in scrub vegetation, Kilauea, December 15, 1922 (Berlin, Field, New York); Degener 4221, in volcanic ash near crater, Kilauea, December 18, 1922 (Field, Gray, Kew, New York); Degener 4237, on lava, within Haleakala Crater, Maui, August 9, 1927 (Berlin, British, Field, Gray,

Kew, New York); Degener 4238, on a-a lava near Koolau Gap, within Haleakala Crater, August 10, 1927 (Field, Kew, New York); Degener 4240, on rain- and fog-swept a-a lava flow at top of Koolau Gap, within Haleakala Crater, August 11, 1927 (British, Field, Kew, Missouri, New York); Degener 4249, same location, August 19, 1927 (Field, New York); Degener 4262, among scrub vegetation, near Napau Crater, Hawaii, December 5, 1929 (Field, New York); Degener 4264, in scrub vegetation, 29 Miles, Kilauea, Hawaii, June 1929 (New York); Degener 4267, on dry lava, Uwekahuna Bluff, Kilauea, June 18, 1929 (New York); Degener and Y. Nitta 3913, among rocks in scrub vegetation, 29 Miles, Kilauea, April 19, 1930 (Berlin, British, Field, Gray, Kew, Missouri, New York, U. S.); John Embree 11, on way to Halemanu, Hawaii, April 1932 (Bishop); C. N. Forbes 185-M, Ukulele, woods, Maui (Bishop, Field); Forbes 225-aM, slopes of Haleakala above Ukulele, Maui, July 1910 (Bishop); Forbes 278-H, Kealapuali, Kona, Hawaii, June 29, 1911 (Bishop, Missouri); Forbes 370-Mo, Kaluaaha Valley, Molokai, August 1912 (Bishop); Forbes 427-H, above Pahala, Kau, Hawaii, August 9-11, 1911 (Bishop); Forbes 498-H, Kohala mountains, Hawaii, September 1911 (Bishop); Forbes 608-H, lava flow of 1880-81, near Kaumana Caves, Hawaii, May 21, 1915 (Bishop); Forbes 691-H, lava flow of 1855, near Haleloulu, Hawaii, June 4, 1915 (Bishop); Forbes 772-H, lava flow of 1855, near Halealoha, Hawaii, June 9, 1915 (Bishop); Forbes 865-M, east of Ukulele, Maui, July 20, 1919 (Bishop); Forbes 867-H, lava flow of 1843, Hawaii, June 17, 1915 (Bishop); Forbes 873-H, same date and location (Bishop); Forbes 954-H, on lava flow of 1852, Hawaii, June 27, 1915 (Bishop); Forbes, W. T. Brigham, and C. L. Thompson, Volcano Kilauea, Hawaii, September 1908 (Bishop); L. S. Gibbs 2528, one of the first colonists on recent lava flow surrounding crater, altitude 4,000 feet, Kilauea, Hawaii, October 1909 (Kew); William Hillebrand, Hawaii (Vienna Mus.); Hillebrand, Kilauea, Hawaii (Berlin, 2 sheets); A. S. Hitchcock 14523, Puu Hualalai, Hawaii, September 2, 1916 (U. S.); James Macrae, at volcano, Hawaiian islands, June 1825 (Berlin; Gray; Kew, 2 sheets, type collection); Horace Mann and W. T. Brigham 366, Kilauea, Hawaii (Bishop); Archibald Menzies, Hawaiian islands (Kew); J. F. Rock 3620, altitude 3,000 feet, lava bed slopes of Puu Hualalai, Huehue, Hawaii, June 7, 1909 (Bishop); Rock 3707, Kalulu lava beds, Puu Hualalai, Hawaii, June 11, 1909 (Bishop); Rock 3821, lava beds of Puu Hualalai, June 10, 1909 (Gray); Rock (similiter) 3821, altitude 6,000 feet, Puu Hualalai, June 11, 1909 (Bishop); Rock 4441, Kawainui, Hawaii, July 12, 1909 (Gray); Rock (similiter) 4441, Alakahi Gorge, altitude 4,500 feet, summit ridge, Kohala, Hawaii, July 12, 1909 (Bishop); Rock 4443, altitude 4,500 feet, Alakahi-Kawainui, Kohala, Hawaii, July 12, 1909 (Field); Rock 8328, Kohala Swamps, Waimea, Hawaii, June 1910 (Bishop, Gray); Rock 10324, Kilauea Volcano, Hawaii, April 1911 (Bishop, Gray); Carl Skottsberg 535, altitude 1,200 meters, Volcano Observatory, Kilauea, Hawaii, September 16, 1922 (Göteborg); Skottsberg 596, altitude 1,200 meters, stream bed, south slope of Mauna Loa, Hawaii, September 19, 1922 (Göteborg); Skottsberg 648, crater slopes, Puu Hualalai, Hawaii, September 25, 1922 (Göteborg); U. S. Exploring Expedition, Hawaii, 1840 (New York, 2 sheets; Paris; U. S.); Henry Wiebke (Degener distribution no. 3716), in scrub vegetation, near 29 Miles, Kilauea, Hawaii, June 15, 1929 (Berlin, Delessert, Field, Gray, Kew, Missouri, New York, Vienna Mus.).

Many specimens previously determined by me as variety *leiophylla* will be found to belong here. I have omitted a puzzling specimen collected by Alfred Meebold, altitude 4,000 feet, Kilauea Crater Road, Hawaii, May 1932 (Bishop), which perhaps must be referred to *R. ciliolata* variety *laxiflora*.

Distribution: islands of Hawaii, Maui, and Oahu.

Asa Gray proposed two varieties of *Railliardia scabra:* "Var. β *hispidula:* gracilior, foliis anguste linearibus utrinque hispidulis. γ *leiophylla:* foliis anguste linearibus laevigatis vel superne obsolete marginibusque hispidulo-

scabris. Hawaii and Maui." His type of variety *hispidula* is still extant (U. S.) It has been collected at Hilo, Hawaii. It is a slender, unbranched specimen, about 3.7 dm tall, and with the leaves drooping, conspicuously hispid, the larger ones 2-2.6 cm long and 1.2-2.5 mm wide. It is too close to the species proper to admit of varietal segregation. Gray's type of variety *leiophylla* (U. S.) is labeled as coming from Hawaii and east Maui. It has the principal leaves about 3.5 cm long and 1.6-2 mm wide, and is of a form unknown to me from Hawaii but very common on Maui. It is found also on Molokai and Lanai. The name *leiophylla* is somewhat unfortunate, as the chief claim to varietal distinction rests more on the elongate, narrower leaves. In my previous herbarium determinations this form was erroneously construed as being variety *hispidula.* Not until now have the real types of the two varieties (U. S., nec alibi) been accessible to me.

Through its variety *leiophylla, R. scabra* apparently hybridizes with *Dubautia plantaginea* Gaudichaud (forming × *D. fucosa*).

Railliardia scabra variety *β* **leiophylla** A. Gray.

Railliardia scabra variety *leiophylla* A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

More slender; leaves narrowly linear, on margins often 3- or 4-denticulate, commonly 3-5.5 cm long and 1.5-2.4 mm wide, often obscurely sub-3- or sub-5-nerved, now thin now coriaceous, on surfaces hispidulous or glabrate.

Type: collected by the U. S. Exploring Expedition on Hawaii or eastern Maui, 1840 (U. S.).

Specimens examined: Alexander, Molokai (Berlin); Otto Degener 4230, in comparatively dry, shrubby region often subject to fog, north mauka (inland) of Ulupalakua, Maui, July 4, 1927 (Field, New York); Degener 4233, in rain forest, in canyon along pipe line trail, Olinda, Maui, July 16, 1927 (Field, New York); Degener 4256, in moderately rainy region, southeast brink of Waikolu Valley, Molokai, April 8, 1928 (Field, New York); Degener 4257, partly sunny slope in rain forest, between Waikolu Valley and northern base of Puu Alii, April 10, 1928 (Field, New York); Degener 4260, open woods, near Laianui, Molokai, May 18, 1928 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); C. N. Forbes 87-Mo, Poholua, Molokai, June 1912 (Bishop); Forbes 126-M, west Maui, June 1910 (Bishop); Forbes 228-M, ridge east of Iao Valley, west Maui, July 1910 (Bishop); Forbes 539-Mo, Wailau Valley, Molokai, September 1912 (Bishop); Forbes 881-M, east of Ukulele, east Maui, July 20, 1919 (Bishop); Forbes 939-M, Ukulele, July 1919 (Bishop); Forbes 1192-M, north slope of Haleakala, Maui, August 10, 1919 (Bishop); Forbes 2689-M, mountains above Hana, Maui, July 5, 1920 (Bishop); Forbes and C. M. Cooke, Jr., 2-M, Maunahooma, Maui, May 1910 (Bishop, Missouri); Mrs. C. N. Forbes, Haalelepaakai, Lanai, April 11, 1916 (Bishop); William Hillebrand, Molokai (Berlin, Bishop, vix typica); Hillebrand, Maunahui, Molokai (Berlin); Hillebrand, Lanai (Berlin); Hillebrand, Wailuku Valley, west Maui (Berlin); Hillebrand, Haleakala, Maui (Berlin); Hillebrand and J. M. Lydgate, west Maui (Bishop); Horace Mann and W. T. Brigham 366, mountain of west Maui (Bishop, Delessert, Field, Gray, Missouri, U. S.); G. C. Munro, Lanai (Bishop); Munro 277, Haalelepaakai, Lanai, December 26, 1913 (Bishop); Munro 385 and 567, Kamoku, Molokai, June 5, 1916 (Bishop); J. F. Rock 8163, above Kaanapali, west Maui, August 26, 1910

(Bishop); U. S. Exploring Expedition, Hawaii or east Maui, 1840 (type, U. S.). (See p. 113.)

Distribution: known definitely only from Lanai, Molokai, and Maui.

Railliardia scabra variety γ **Munroi** Sherff.

Railliardia scabra variety *Munroi* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

More robust; principal leaves 3-nerved, 5-7.5 cm long and 4-6 mm wide.

Type: collected by G. C. Munro, no. 747, altitude 4,250 feet, at edge of thick forest, Haleakala Ranch pipe line, east Maui, November 23, 1927 (Bishop).

Specimens examined: Munro 747 (type, Bishop; cotype, Field); J. F. Rock 16008, Kilauea Volcano, Hawaii, August 1918 (Bishop); Rock 17008, same date and location (Bishop); Rock 8602-a, Kaupo Gap, Haleakala, Maui, October 22, 1910 (Bishop).

Distribution: islands of Maui and Hawaii.

3. **Railliardia ciliolata** De Candolle.

Railliardia ciliolata De Candolle Prodr., vol. 6, p. 441, 1837.

Railliardia ciliolata variety *laxifolia* A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

a. Leaves densely crowded, more or less erect and imbricated.....**variety γ juniperoides**
a. Leaves loosely or subloosely disposed, presently spreading or reflexed
  b. Leaves 1-nerved
    c. Branches foliose up to inflorescence, upper leaves opposite.....**R. ciliolata**
    c. Branches subnude above, upper leaves alternate.....**variety δ laxiflora**
  b. Leaves more or less 3-nerved.....**variety β trinervia**

Erect shrub, 9-12 dm tall; branches numerous, rigid, hispidulous or pubescent; densely foliose up to inflorescence. Leaves verticillate in threes or the upper ones opposite, oblongly linear-lanceolate, sessile, flattish, spreading or ascending, 1-nerved with nerve impressed on upper surface, scarcely subglossy, on both surfaces hispidulous or perhaps sometimes glabrate, on margins hispid-ciliate and commonly entire, at apex subacute, 1-2.3 cm long and about 3-4 mm wide. Capitula commonly disposed in racemes (these foliose-bracted, erect or inclined, 3-7.5 cm long), 5-14-flowered, pedicellate; pedicels slender, hispidulous, more often 5-15 mm long. Involucre cylindric-obconic, at times becoming purple, hispid, about 6 mm tall; bracts 7-9, permanently connate. Achenes linear-oblanceolate, glabrate or perhaps sometimes hirsute, the body ± 4 mm long.

Type: collected by James Macrae on volcano on island of Hawaii, in 1825. Seen by De Candolle in Lindley's herbarium. Perhaps the type was a duplicate of Macrae's specimens from "Mt. Kaah" (Mauna Kea), Hawaii, June 1825, studied by me (Gray; Kew). However, the specimen of *R. ciliolata* De Candolle sent by Lindley in 1832 to Kunth and now in Berlin bears on its label: "Ins. Owyhee, ad montem ignivomem. *Macrae.* Junio, 1825."

Specimens examined: Otto Degener 4265, on rather bare cinders, Uwekahuna Bluff, Kilauea, Hawaii, July 10, 1929 (New York); C. N. Forbes 157-H, slopes of Puu Hualalai above Hanekane, Hawaii, June 16, 1911 (Bishop, Missouri); Forbes 440-H, Puu Huluhulu near Kilauea, Hawaii, August 1911 (Bishop); Forbes, W. T. Brigham, and C. L. Thompson, Volcano Kilauea, Hawaii, September 1908 (Bishop, 2 sheets); William Hillebrand, Laieha, Hawaii (Berlin); Hillebrand 10-a, Hawaii (Gray); Hillebrand and J. M. Lydgate, Mauna Kea (Bishop); A. S. Hitchcock 14596, in woods, near Crater Hotel, Hawaii, September 6, 1916 (U. S.); J. M. Lydgate, Laieha, Hawaii (Berlin);

James Macrae, "Mt. Kaah" (Mauna Kea), Hawaii, June 1825 (Gray, Kew); Macrae, on volcanic mountain, Hawaii, June 1825 (Berlin, Kew, type collection); Alfred Meebold, shrub 2-3 feet high, altitude 4,000 feet, Kilauea Crater Road, Hawaii, May 1932 (Bishop); J. F. Rock 8778, altitude 4,000 feet, Kilauea, Hawaii, July 1911 (Gray); Rock 10320, Kilauea Volcano, July 1911 (Bishop); Carl Skottsberg 449, altitude 1,200 meters, common on crater banks, Kilauea, Hawaii, September 12, 1922 (Göteborg); Skottsberg 637, altitude 1,200 meters, on a-a flow, Puu Hualalai, Hawaii, September 23, 1922 (Göteborg); Skottsberg 649, Pua Hualalai, September 25, 1922 (Göteborg); Skottsberg 1970 and 1970-B, altitude 2,500 meters, eastern slope of Mauna Kea, above Kukaiau, Hawaii, September 27, 1926 (Göteborg); U. S. Exploring Expedition, Hawaii, 1840 (Gray, New York); U. S. Exploring Expedition, Hawaiian islands, 1840 (U. S., type of R. ciliolata variety laxifolia A. Gray).

Distribution: island of Hawaii.

Railliardia ciliolata variety *β* **trinervia** Hillebrand.

Railliardia ciliolata variety *trinervia* Hillebrand, Fl. Haw. Is., p. 226, 1888.

Leaves narrowly ovate-lanceolate or oblongly linear-lanceolate, more or less 3-nerved, 1.7-2.5 cm long and 5-8 mm wide. Inflorescence erect. Florets 15-17.

Type: no particular plant cited by Hillebrand, but his private herbarium (Berlin) contains a single specimen, this from the central plateau of Hawaii.

Specimens examined: C. N. Forbes 396-H, Kau Desert, Hawaii, August 3, 1911 (Bishop, Missouri); William Hillebrand, central plateau of Hawaii (Berlin, type material); Hillebrand 106, altitude 6,000 feet, same location (Kew); Jules Remy 247, Hawaii, 1851-55 (Gray, Kew, New York).

Distribution: island of Hawaii.

Railliardia ciliolata variety *γ* **juniperoides** A. Gray.

Railliardia ciliolata variety *juniperoides* A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

Railliardia ciliolata form *viscosa* Skottsberg, Meddel. Göteb. Bot. Trädg., vol. 2, p. 281, 1926 (nom. subnud.).

Leaves thick, glossy, densely crowded, appressed-erect and more or less imbricated, commonly involute-canaliculate, 1-2 cm long, inflorescence reduced.

Type: collected by the U. S. Exploring Expedition, on Hawaii, 1840 (U. S.).

Specimens examined: "Challenger" Expedition, Hawaii, August 1875 (Kew); Otto Degener H-98, on disintegrating lava, brink of Kilauea Crater, Hawaii, August 26, 1922 (Field, N. Y.); Degener 4219, in volcanic ash at brink of Kilauea Crater, December 14, 1922 (Field, New York); Degener 4224, on loess-covered lava, Kau Desert, Hawaii, July 15, 1926 (Field, New York); Degener 4225, in open, east of Kilauea Iki, Hawaii, July 17, 1926 (Field); Degener 4266, on rather bare cinders, Uwekahuna Bluff, Kilauea, Hawaii, June 18, 1929 (New York); C. N. Forbes 156-H, slopes of Puu Hualalai, above Hanekane, Hawaii, June 15, 1911 (Bishop); Forbes 244-H, Kanehaha, Kona, Hawaii, June 23, 1911 (Bishop); Forbes 266-H, above Honomalino Water Hole, Kona, Hawaii, June 27, 1911 (Bishop; Missouri, 2 sheets); Forbes 267-H, Kanehaha, Hawaii, same date (Bishop); Forbes 328-H, Papaloa, Kona, Hawaii, July 15, 1911 (Bishop, Missouri); Forbes 341-H, lava flow of 1907 above Puu o Keokeo, Hawaii, July 21, 1911 (Bishop); Forbes 821-H, Aina Hou, Hawaii, June 12, 1915 (Bishop); Forbes 842-H, Humuula Trail to summit of Mauna Kea, Hawaii, June 14, 1915 (Bishop, British, Delessert, Field, Kew); Forbes 888-H, slopes of Mauna Kea, June 19, 1915 (Bishop); Forbes 895-H,

source of Wailuku River, Mauna Kea, June 18, 1915 (Bishop); William Hillebrand, Hawaii (Vienna Mus., 2 sheets); Hillebrand, central plateau of Hawaii (Berlin); Hillebrand, altitude 5,000 feet, same location (Berlin, Bishop); Hillebrand 15 and 15', Hawaii (Kew); Hillebrand, altitude 6,000 feet, central plateau of Hawaii (Kew); Hillebrand and J. M. Lydgate, near top of Mauna Kea, Hawaii (Bishop); A. S. Hitchcock 14281, altitude 8,000-11,000 feet, north side of Mauna Kea, August 29, 1916 (Bishop); J. M. Lydgate, near peak of Mauna Kea (Berlin); Lydgate, Kilauea, Hawaii (Berlin); James Macrae, on volcanic mountain, Hawaiian islands, June 1825 (Gray); Horace Mann and W. T. Brigham 517, Puu Hualalai, Hawaii (Gray; Missouri); Mann and Brigham 517-bis, same location (Gray); Mann and Brigham (similiter) 517, Kilauea, Hawaii (Bishop); Mann and Brigham 602 and 603, Hawaiian islands (Bishop); Archibald Menzies, Hawaiian islands (Kew); Jules Remy 251, Hawaii, 1851-55 (Gray); Remy 252, same date and location (Gray; Paris); Remy 253, same date and location (Gray); J. F. Rock 211, Mauna Kea, Hawaii, October 28, 1909 (Bishop); Rock 3699, altitude 6,000 feet, lava flows of Puu Hualalai, Hawaii, June 11, 1909 (Bishop, Gray); Rock 8340, altitude 10,000 feet, Mauna Kea, Hawaii, June 1910 (Bishop, Gray); Rock 8341, altitude 10,000 feet, above Waikii, Mauna Kea, June 1910 (Bishop, 2 sheets; Gray); Rock 8343, altitude 9,000 feet, Waikii, June 1910 (Bishop, Field, Gray); Rock 10008, altitude 6,000 feet, south slopes of Mauna Loa, Hilea, Hawaii, January 13, 1912 (Bishop, 2 sheets; Field, Gray); Rock 10050, altitude 6,000 feet, central plateau of Hawaii, Mauna Loa February 14, 1912 (Bishop, Field, Gray); Rock 10320, Kilauea Volcano, Hawaii, July 1911 (Field, Gray); Rock and Copeland, same location, summer of 1915 (Bishop); Carl Skottsberg 510, altitude 2,000-3,000 meters, east slope of Mauna Kea, Hawaii, September 15, 1922 (Göteborg); Skottsberg 697, altitude 3,200 meters, west slope of Mauna Kea, September 28, 1922 (Göteborg, sub nom. R. ciliolata varietas viscosa Skottsberg); Skottsberg 1965, altitude 2,800 meters, eastern slope of Mauna Kea, above Kukaiau, September 27, 1926 (Göteborg, sub nom R. ciliolata forma nana Skottsberg); U. S. Exploring Expedition, Hawaii, 1840 (U. S., type and 5 other sheets; Gray, 4 sheets, including one cotype; New York, 3 sheets, at least one specimen from Mauna Loa; Paris; Leningrad).

Distribution: island of Hawaii.

Railliardia ciliolata variety δ **laxiflora** (De Candolle) Sherff.

Railliardia ciliolata variety *laxiflora* (De Candolle) Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Railliardia laxiflora De Candolle, Prodr., vol. 6, p. 441, 1837.

Railliardia Fauriei Léveillé, Fedde Repert., Spec. Nov. Regn. Veg., vol. 10, p. 122, 1911.

Suffruticose, erect, 4-6 cm tall; branches hispidulous, densely foliose below, subnude above. Leaves verticillate in threes or the upper often alternate, sessile, flat or subrevolute, oblongly linear-lanceolate, on upper surface commonly glossy, on both surfaces glabrous or very minutely scabrid-hispidulous, on margins entire or 1-3-denticulate and minutely spinulose-ciliate, 1-nerved with nerve impressed on upper surface, 0.7-2 cm long and 2-4 mm wide. Capitula now paniculately now paniculate-corymbosely disposed, often numerous, pedicellate (pedicels hispidulous, often very slender and up to 1.5 or rarely to 2.5 cm long), 7-13-flowered, the yellow corollas not exceeding the pappus. Involucre hispid, becoming purple, cylindric-campanulate, 5-6.5 mm tall; bracts 4-6, finally more or less distinct, achenes black, oblanceolate, glabrate below, narrowed moderately at base, the body 4-5 mm long.

Type: collected by James Macrae at volcano on island of Hawaii, 1825. De Candolle mentioned having seen a specimen in Lindley's herbarium.

Specimens examined: Abbé Urbain Faurie 1015, Mauna Kea, Hawaii, July 1909 (Bishop; Paris; type collection of R. Fauriei Léveillé); C. N. Forbes 157-H, slopes of Puu Hualalai above Hanekane, Hawaii, June 16, 1911 (Bishop, Missouri); Forbes 819-H, lava flow of 1899, Hawaii, June 12, 1915 (Bishop); Forbes 919-H, Hawaii, June 23, 1915 (Bishop); William Hillebrand, Kilauea, Hawaii (Berlin); Jules Remy 250, Hawaii, 1851-55 (Gray, New York, Paris); J. F. Rock 10326, Volcano Kilauea, Hawaii, July 1911 (Bishop, 4 sheets; Field; Gray, 2 sheets); Rock 10328, same date and location (Bishop); U. S. Exploring Expedition, Hawaii, 1840 (Gray, New York, Paris, U. S.). (Perhaps Meebold's specimen cited on page 113 should be referred here.)

De Candolle suspected his *R. laxiflora* of being a mere variety of *R. ciliolata* ("Hab. cum priore R. ciliolata cujus forte mere varietas"). Asa Gray (Amer. Acad., Proc., vol. 5, p. 133, 1861) regarded *R. laxiflora* as probably distinct. Thus, having placed it between *R. scabra* and *R. ciliolata* in his treatment, he wrote: "Intermediate between the preceding and the following, apparently very different, species." J. F. Rock, who had had abundant opportunity to study these plants in the field, wrote on the label for his no. 10326 (Bishop): "There seems to be little difference between *Railliardia laxiflora* DC. and *Railliardia ciliolata* DC. The inflorescence is practically the same in both species and so are the leaves. They are alternate in the upper portion and ternate in the lower in *R. laxiflora,* while in *R. ciliolata* the upper ones are opposite and the lower ones ternate. These characters are not constant." My own studies in the herbarium appear to indicate a varietal status for *R. laxiflora* under *R. ciliolata* as best in accord with nature.

Distribution: island of Hawaii.

4. Railliardia demissifolia Sherff (fig. 38).

Railliardia demissifolia Sherff, Bot. Gaz., vol. 95, p. 78, 1933.

Leaves opposite.....**R. demissifolia**
Principal leaves more often in threes.....**variety β verticillata**

Fruticose, ± 3 dm tall; branches pubescent, densely foliose up to inflorescence. Leaves opposite, sessile, in dry state flat or at times convolute, 3-nerved with nerves impressed above, spreading or presently drooping, lanceolate-oblong, coriaceous, on surfaces now hispid (with setae sharp, white, rigid, appressed, upwardly pointing) now glabrate or beneath very sparsely appressed-hispid, on upper surface subglossy, on margins entire or scabrid-ciliate and often 1- or 2-denticulate, at apex subobtuse or acute, about 1.8-3.5 cm long and 5-9 mm wide. Capitula loosely disposed in a panicle (this ± 1.8 dm long), subnumerous, pedicellate (pedicels slender, glandular-hispid, ultimate ones 0.5-2 cm long), ± 8-flowered. Involucre green or becoming purple, subcylindric or obconic, 6-8 mm tall; bracts about 6 or 7, hispid, connate. Achenes linear-clavate, black, appressedly erect-hispid, the body 4-5.3 mm long.

Type: collected by J. F. Rock, altitude 6,000 feet, Haleakala, Maui, October 1910 (Gray).

Specimens examined: Otto Degener along Olinda pipe line trail, east Maui, August 17, 1927 (Field, Kew, New York); Degener 4236, among ledges on northwest side, within Haleakala Crater, Maui, August 9, 1927 (Field, New York); Degener 4239, on cliffs not far from Koolau Gap, within Haleakala Crater, August 10, 1927 (Berlin, British, Field, Gray, New York); Degener 4245, at rain- and fog-swept Koolau Gap, within Haleakala Crater, August 17, 1927 (Field, Gray, New York, Paris, Philadelphia, U. S., Vienna Univ.); Degener 4246, shrub ± 1 foot tall, same date and locality (Field, New

York); Degener 4250, same locality, August 19, 1927 (Field, Gray, New York); Degener 4273-a, same place, summo hiatu, August 11, 1927 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Vienna Mus., New York, Paris, Philadelphia, U. S.); C. N. Forbes 629-M, east of Ukulele, Maui, July 17, 1919 (Bishop); Forbes 836-M, same date and location (Bishop); Forbes 1056-M, Keanae (Koolau) Gap, crater of Haleakala, Maui, August 15, 1919 (Bishop, 3 sheets); Forbes 1169-M, north slope of Haleakala, August 17, 1919 (Bishop); J. F. Rock, Kaupo Gap, Haleakala, September 1910 (Bishop, Field); Rock, altitude 6,000 feet, Haleakala, October 1910 (type, Gray); Rock 8604, Kaupo Gap, October 22, 1910 (Bishop, 2 sheets).

FIGURE 38.—*Railliardia demissifolia* (type).

Differs from *R. ciliolata* and its varieties by the subordinate clustering of the heads in the panicle, and in other characters. The flowers are described by collectors (for example, Degener) as yellow when fresh. Either this spe-

cies or *R. thyrsiflora* appears to hybridize with a variety of *Dubautia plantaginea* Gaudichaud (to form × *D. fallax*).

Distribution: island of Maui.

Railliardia demissifolia variety β **verticillata** Sherff.

Railliardia demissifolia variety *verticillata* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Principal leaves more often in threes.

Type: collected by C. N. Forbes, no. 1171-M, on north slope of Haleakala, Maui, August 17, 1919 (Bishop).

Specimens examined: Forbes 1171-M (type, Bishop).

Distribution: eastern Maui.

5. Railliardia molokaiensis Hillebrand.

Railliardia molokaiensis Hillebrand, Fl. Haw. Is., p. 226, 1888.

a. Principal leaves commonly alternate
  b. Achenes gradually narrowed below to the base.....**R. molokaiensis**
  b. Achenes very narrowly stipitate below.....**variety γ stipitata**
a. Principal leaves commonly opposite.....**variety β oppositifolia**

Shrub, spreading over the ground, 6-12 dm tall; branches rigid, ligneous, hispid or pubescent, loosely foliose up to the inflorescence. Leaves commonly alternate, sessile, spreading or scarcely reflexed, widely oblong-linear, thickish, flat, glabrous, on upper surface sometimes glossy, manifestly 3-nerved, gradually narrowed to a sharp apex, on margins 2-4-denticulate also eciliate and weakly revolute, 4-6.5 (-7.5) cm long and 5-7 (-8) mm wide. Capitula numerous (-100 in a single inflorescence), paniculately disposed with panicle foliose and sometimes 2.5 dm long, pedicellate (pedicels hispid, slender, the ultimate very short, more often 2-4 mm long), 5-7-flowered, corollas deep-yellow and not surpassing the pappus. Involucre narrowly cylindric, 6-8 mm tall; bracts 5-7, loosely connate, pubescent at top. Achenes black, linear, hispid, gradually narrowed below to the base, body 4-5.2 mm long.

Type: collected by William Hillebrand at Maunahui, Molokai, in 1870 (Berlin).

Specimens examined: C. N. Forbes 165-Mo, slopes of Puu Kolekole, Molokai, July 1912 (Bishop); Hillebrand, Maunahui, Molokai (type, Berlin, 2 sheets; cotypes, Gray, Kew, Leningrad); Hillebrand and J. M. Lydgate, same location (Bishop).

Distribution: island of Molokai.

Railliardia molokaiensis variety β **oppositifolia** Sherff.

Railliardia molokaiensis variety *oppositifolia* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Differs from the species proper in having the principal leaves commonly opposite.

Type: collected by Abbé Urbain Faurie, no. 936, Kamalo, Molokai (Delessert, 2 sheets).

Specimens examined: Faurie 936 (type, Delessert, 2 sheets; cotype, Bishop); C. N. Forbes 86-Mo, Poholua, Molokai, June 1912 (Bishop).

Distribution: island of Molokai.

Railliardia molokaiensis variety γ **stipitata** Sherff.

Railliardia molokaiensis variety *stipitata* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Differs from the species proper in having the achenes more elongately hispid and very narrowly stipitate in lower part.

Type: collected by C. N. Forbes, no. 2603-M, along upper trail, Waikamoi, Maui, June 25, 1920 (Bishop).

Specimens examined: Otto Degener 4229, in rain forest, along Olinda ditch trail (pipe line trail), Maui, June 17, 1927 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); Forbes 2603-M (type, Bishop).

Distribution: island of Maui.

6. **Railliardia ternifolia** Sherff.

Railliardia ternifolia Sherff, Amer. Jour. Bot., vol. 20, p. 618, 1933.

Perhaps fruticose; only a single branch seen; this herbaceous, subarcuate-straight, brownish, more or less angled, subsparsely now erectly appressed- now ascending-hispid, including inflorescence about 4 dm long, lower internodes 1-1.5 cm, upper 3-5 cm long. Leaves all conspicuously in threes, suberect, sessile and subclasping, oblong-linear or narrowly lanceolate-linear or oblanceolate-linear, at apex subacute, lengthwise 5-nerved with nerves impressed above, pallid, on upper surface subcoriaceous and subglossy, on both surfaces glabrous, on each margin sharply hispid-ciliate and above the middle minutely 1-6-denticulate with subspreading teeth, 4.5-6 cm long and 7-8 mm wide. Capitula subracemosely disposed in a panicle (this somewhat loose, foliose, erect, ± 1.9 dm long), ± 8-flowered, at anthesis about 1.1 cm tall. Involucre cylindric or cylindric-obconic, green or barely purplish, appressed-erectly more or less setose, 6-7 mm tall; bracts 5-8, strongly connate, the subacute lobes about 1 mm long. Florets ochroleucous, limb of glabrate corolla not exserted. Submature achenes linear, glabrous, as to body about 4 mm long; pappus hardly purplish, its aristae plumose and ± 5 mm long.

Type: collected by C. N. Forbes, no. 1175-M, on north slope of Haleakala, Maui, August 20, 1919 (Bishop).

Specimens examined: Forbes 1175-M (type, Bishop).

Distribution: eastern Maui.

7. **Railliardia thyrsiflora** Sherff.

Railliardia thyrsiflora Sherff, Amer. Jour. Bot., vol. 20, p. 618, 1933.

Principal leaves 3-4.5 (more rarely -5.5) cm long, capitula at anthesis mostly erect.....**R. thyrsiflora**

Principal leaves 5-6.5 cm long, capitula at anthesis mostly cernuous.....**variety β cernua**

Perhaps a shrub; branches ligneous below, herbaceous above, more or less purplish, glabrate, below very densely above loosely foliose (internodes below hardly 1-2 mm, above ± 1 cm long). Upper leaves suberect, alternate or sometimes opposite, narrowly or widely linear, on surfaces glabrous and 3-nerved, when dry more or less brownish-purple, on margins ciliate and more or less revolute and on each very minutely 1-3-denticulate; other leaves often subternately disposed and commonly drooping; all sessile, the principal ones 3-4 (more rarely -5.5) cm long and 4-8 mm wide. Capitula subloosely or subdensely disposed in a panicle (this erect, villous, foliose, contracted or open, up to 1.5 dm long), at anthesis commonly erect, slenderly pedicellate with ultimate pedicels 4-9 mm long, ± 8-flowered, at anthesis 11-12 mm tall, the yellowish corollas not exserted.

Involucre cylindric-obconic, sparsely hispidulous, 7-8.5 mm tall; bracts 6-8, definitely connate, the subacute lobes 1-2 mm long. Achenes black, oblanceolate, glabrous, gradually narrowed below, as to body + 3 mm long; pappus sordid, its aristae plumose and ± 5 mm long.

Type: collected by C. N. Forbes, no. 1203-M, on north slope of Haleakala, Maui, August 23, 1919 (Bishop).

Specimens examined: Otto Degener 4273-c, on fog- and wind-swept a-a lava at top of Koolau Gap, within Haleakala Crater, Maui, August 11, 1927 (Berlin, British, Field, Gray, New York, cum × R. fallax et R. demissifolia commixta); Forbes 1203-M (type, Bishop; cotypes, British, Field, Gray, Kew).

Either this species or *R. demissifolia* appears to hybridize with a variety of *Dubautia plantaginea* Gaudichaud (to form × *D. fallax*).

Distribution: eastern Maui.

Railliardia thyrsiflora variety *β* **cernua** Sherff.

Railliardia thyrsiflora variety *cernua* Sherff, Amer. Jour. Bot., vol. 20, p. 618, 1933.

Branches more elongate. Leaves alternate, 5-6.5 cm long and about 5-6.5 mm wide. Panicle more lax, ± 2 dm long, capitula commonly cernuous at anthesis.

Type: collected by C. N. Forbes, no. 1233-M, on north slope of Haleakala, Maui, August 23, 1919 (Bishop).

Specimens examined: Forbes 1233-M (type, Bishop; cotype, Field).

Distribution: eastern Maui.

8. Railliardia lonchophylla Sherff (fig. 39).

Railliardia lonchophylla Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

In habit similar to *Dubautia plantaginea* Gaudichaud. Branches very sparsely setose, herbaceous. Leaves crowded, alternate, oblong-oblanceolate, at apex acuminate, below middle narrowed all way to base as if subpetiolate, pallid, lengthwise and conspicuously 7-11-nerved, on lower surface glabrous, on upper hispid along veins and margins, sharply denticulate with teeth spreading and under 1 mm long, 8-12 cm long and ± 2 cm wide. Capitula disposed in a panicle (this villous, its ascending or spreading branches alternate), very slenderly pedicellate, about 6-8-flowered, at anthesis about 1 cm tall. Involucre obconic-campanulate, subsparsely hispid; bracts 6-8, more or less connate, about 5.5-6 mm long. Florets yellowish, limb of corolla not exserted. Submature achenes hispid, linear, gradually narrowed downwardly all way to base, the body scarcely 3 mm long; aristae of pappus sordid, plumose, about 3 mm long.

Type: collected by J. F. Rock, no. 8599, Laie, Kaupo Gap, Haleakala Crater, Maui, October 22, 1910 (Bishop, 2 sheets).

Specimens examined: Rock 8599 (2 type sheets, Bishop).

Interpreted by Rock (in herbaria) as a valid species, but may prove to be a hybrid between one of the varieties of *Dubautia plantaginea* Gaudichaud and some species of *Railliardia*.

Distribution: island of Maui.

9. Railliardia coriacea Sherff (fig. 40).

Railliardia coriacea Sherff, Bot. Gaz., vol. 95, p. 80, 1933.

FIGURE 39.—*Railliardia lonchophylla* (first type sheet).

FIGURE 40.—*Railliardia coriacea* (type).

Fruticose, stem perhaps decumbent; branches erect, very densely foliose, ± 4 dm tall. Leaves sessile, more or less ternately verticillate but upper ones alternate, oblong-linear, strongly reflexed or upper ones ascending, coriaceous, on faces very glabrous, very glossy above, 3-nerved with nerves impressed above, on revolute margins sparsely spinulose-ciliate and toward apex 1-4-denticulate, flattish or convolute, 4-5.5 cm long and when flattened out about 5-6.5 mm wide. Capitula numerous (± 60-80 in a single inflorescence), disposed in a panicle ± 2 dm long, ± 10-flowered, ultimate pedicels slender and more often 3-7 mm long, corollas yellow and scarcely equalling pappus. Involucre cylindric-campanulate, hispidulous, becoming purple, 5-6.5 mm tall; bracts 6-9, finally more or less distinct. Achenes black, oblanceolate, glabrous, as to body about 3.8-4.2 mm long.

Type: collected by J. F. Rock, no. 8638, Koolau Gap, Haleakala, Maui, October 1910 (Gray).

Specimens examined: Rock 8638 (type, Gray; cotypes, Bishop, Field).

Distribution: known only from type locality in eastern Maui.

10. **Railliardia linearis** Gaudichaud.

Railliardia linearis Gaudichaud, in Freycinet Voy., Bot., p. 469, pl. 83, 1830.

Leaves commonly in threes, entire.....**R. linearis**
Leaves commonly opposite, on each side 1-3-denticulate.....**variety β opposita**

Diffuse shrub, much branched, 1.2-1.8 meters tall; branches slender, hispid or finally glabrate, foliose up to their top. Leaves spreading, commonly in threes, subpetiolate, now linear now narrowly lanceolate-oblong or subrhomboidally elliptic-lanceolate, at both ends acute, entire, flat but at margins revolute, glabrous, thickish or subcoriaceous, eciliate, 3- or more rarely 5-nerved, 2.5-5 cm long and 2.5-9.5 mm wide. Capitula disposed in panicles (these many, small, dense, leafy-bracted, 3-8 cm long, terminating the branchlets), ultimate pedicels very slender (also hispidulous and more often 1-4 mm long), 4-8-flowered, corollas not exserted. Involucre green, pubescent, now narrowly cylindric (at apex not or hardly dilated) and 4-5 mm tall, now (on same branch) suburceolate and only 1.5-2.5 mm tall; bracts 4-6, connate. Achenes black, glabrous, the body only 2.5-4 mm long.

Type: collected by Charles Gaudichaud in the Hawaiian islands in 1816 (Paris).

Specimens examined: C. N. Forbes, ridge west of Lahainaluna, Maui, August 1910 (Bishop); Forbes 110-M, ridge of Iao Valley, west Maui, June 1910 (Bishop); Forbes 144-L, mountains near Koele, Lanai, June 1913 (Bishop); Forbes 405-H, Kapapala, Kau, Hawaii, August 8, 1911 (Bishop); Forbes 1785-M, Kanaio, south slope of Haleakala, March 1, 1920 (Bishop); Forbes 2092-M, Auwahi, east Maui (Bishop); Forbes, Brigham, and Thompson, Volcano Kilauea, Hawaii, September 1908 (Bishop, Field); Gaudichaud, Hawaiian islands, in 1816 (type, Paris; cotypes, Berlin, Delessert); William Hillebrand, Hawaiian islands (Gray, Vienna Mus.); Hillebrand, Hunuaula (Humuula?) on Mauna Kea, Hawaii (Berlin); Hillebrand, south Haleakala, Maui (Kew); Hillebrand, Maui and Lanai (Berlin); Hillebrand, Lanai (Berlin, 2 sheets; Bishop); Hillebrand and J. M. Lydgate, Brown Hill, Kula, Haleakala (Bishop); J. M. Lydgate, Nohoanaauhae (Nohonaohae) near Waimea, Hawaii (Berlin); Lydgate, Haleakala, Maui (Berlin); Horace Mann and W. T. Brigham 356, Lanai (Bishop; Delessert; Field, 2 sheets; Gray; Missouri; U. S.); G. C. Munro, near Kahanui, Lanai, October 20, 1915 (Bishop, Field, Missouri); Munro 370, north Waiapaa, Lanai, December 16, 1914 (Bishop) and October 20, 1915 (Bishop); J. F. Rock 8059, Koele, Lanai, July 27, 1910 (Bishop, Gray); Rock 8123, dry, open slopes, back of Koele, August 5-15, 1910 (Bishop, Gray); Rock 8342, at or near Nohonaohae, Hawaii, May-June 1910 (Bishop, 3 sheets; Gray); Rock 8673, altitude 2,500 feet, lava fields, Auahi (Auwahi), east Maui, November 1910 (Bishop, Gray); Rock 10043, Puu Keanui, central plateau of Hawaii, February 13, 1912 (Bishop, 2 sheets); U. S. Exploring Expedition, Kaala (Waianae) mountains, Oahu, 1840 (Gray, New York); U. S. Exploring Expedition, Hawaii, 1840 (Gray);

U. S. Exploring Expedition, crater, east Maui, 1840 (U. S.); Heinrich Wawra 1930 and 2305, Maui, 1868-71 (Vienna Mus.).

Much variation in foliage occurs, but it is impossible to draw varietal distinctions.

Distribution: eastern Maui, western Oahu, Lanai, and Hawaii.

Railliardia linearis variety *β* **opposita** Sherff.

Railliardia linearis variety *opposita* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Leaves commonly opposite, on each margin 1-3-denticulate.

Type: collected by J. F. Rock, no. 6126, at Maunahui Gulch, Molokai, March 21, 1910 (Gray).

Specimens examined: Otto Degener 4232, along Olinda pipe line trail, Maui, July 16, 1927 (Berlin, Boissier, British, California, Delessert, Field, Gray, Kew, Missouri, Munich, New York, Paris, Philadelphia, U. S., Vienna Mus. and Univ.); A. S. Hitchcock 18167, shrub, altitude 3,000 feet, central Molokai, October 13, 1916 (Bishop); Rock 6126 (type, Gray; cotype, Bishop).

A plant from Maui (C. N. Forbes 2150-M, Kula side of Haleakala, April 5, 1920, Bishop, *foliis supra subnitidis et coriaceis, planis*) may be a form of this variety or perhaps is a hybrid with some other form.

Distribution: islands of Molokai and Maui.

10a. × **Railliardia vafra** Degener and Sherff.

× *Railliardia vafra* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 96, p. 153, 1934.

Shrub, ± 9 dm tall. Leaves opposite, elliptic-oblong or lanceolate-oblong, sessile, at apex subacute, entire, subcoriaceous, commonly 5-nerved, glabrous and eciliate but very minutely more or less glandular, 3-4 cm long and 6-10 mm wide. In characters of inflorescence and capitula similar to *Railliardia linearis*. A hybrid, probably between *R. linearis* and *R. Menziesii*.

Type: collected by Otto Degener, no. 2134, a shrub 3 feet tall, 25 miles from Waimea toward Kona, pahoehoe desert, Hawaii, August 18, 1926 (Field, 2 sheets).

Specimens examined: Everett Brumaghim (Otto Degener distribution no.) 4336, near Kilauea on Kau side, Hawaii, October 1932 (Field, New York); Otto Degener 2134 (type, Field, 2 sheets; cotypes, Berlin, British, Gray, Kew, Missouri, New York); Degener 4226, 25 miles from Waimea toward Kona, pahoehoe desert, Hawaii, August 18, 1926 (Field, New York).

Distribution: island of Hawaii.

11. Railliardia Hillebrandii H. Mann.

Railliardia Hillebrandii H. Mann, Enum. Haw. Pl., no. 238, Proc. Amer. Acad., vol. 7, p. 175, 1867.

Diffuse shrub, branched, probably up to 1.8 meters tall; branches slender, pubescent, loosely foliose up to inflorescence. Leaves now in threes now opposite or upper ones sometimes alternate, suberect, sessile and subclasping, ovate-lanceolate or perhaps rarely ovate, not glossy, thickish, subobscurely 3- (rarely 1-) nerved, on faces now appressed-

hispid now most minutely glandular-scabrid, on margins entire and hispid-ciliate, at apex acute, equalling or twice or thrice surpassing an internode, 1.2-1.8 cm long and 4-6 mm wide. Capitula leafy-bracted, disposed in a raceme or subsimple panicle, 5-12-flowered; pedicels slender, hispid, up to 1.5 cm long; corollas slightly surpassing the pappus. Involucre now green now becoming purple, cylindric or at apex sometimes dilated, pubescent, 5-6 mm tall; bracts commonly 6, connate. Achenes oblanceolate, at base slightly narrowed, the body 4-5 mm long.

Type: collected by the U. S. Exploring Expedition at Waimea, Hawaii, 1840 (U. S.).

Specimens examined: William Hillebrand, Hawaii (Vienna Mus.); Hillebrand, altitude 6,000-7,000 feet, Hualalai, Hawaii (Berlin, Bishop, Gray); Hillebrand 14, same location (Gray, Kew); H. Mann, Hualalai (Berlin).

Distribution: island of Hawaii (western part).

12. **Railliardia montana** H. Mann.

Railliardia montana H. Mann, Enum. Haw. Pl. no. 243, Amer. Acad., Proc., vol. 7, p. 176, 1867.

a. Leaves thin
  b. Leaves narrowly oblong, 2.7-4 cm long.....**R. montana**
  b. Leaves subrhomboidally elliptic-lanceolate, 5-6.5 cm long.....**variety β longifolia**
a. Leaves coriaceous.....**variety γ robustior**

Shrub, 1.8-2.5 meters tall; branches spreading, green, pubescent, now subloosely now rather densely foliose. Leaves suberect or scarcely spreading, sessile and often subclasping, now in threes, now opposite, now alternate, flat or at margins scarcely subrevolute, narrowly oblong (but often on one edge convex, on the other straight or concave), at base wide or narrow, at apex barely acute, on both surfaces glabrate or slightly pubescent, on upper surface subglossy, thin, manifestly 3-5-nerved with nerves impressed above, on margins scabrid-ciliate and entire or very minutely 3-4-denticulate, 2.7-4 cm long and 6-9.5 mm wide. Capitula disposed in a panicle (this loose and 1-1.8 dm long), pedicellate (pedicels slender, glandular-pubescent, the ultimate up to ± 1.5 cm long, bracted with now foliaceous now very slenderly linear bracts), 15-24-flowered, the yellow corollas not truly exserted beyond the pappus. Involucre obconic, glandular, sparsely pubescent, 7-8 mm tall; bracts 8-12, green, connate. Achenes black, linear-clavate, glabrate or sparsely hispid, body 3.5-4.2 mm long.

Type: collected by Horace Mann and W. T. Brigham, no. 521 in part, altitude 6,000 feet, on Hualalai, Hawaii, 1864-65 (Gray).

Specimens examined: C. N. Forbes 462-H, Waikii, slopes of Mauna Kea, Hawaii, August 1911 (Bishop, Missouri); William Hillebrand, lava stream of 1856, central plateau of Hawaii, 1862 (Berlin); Hillebrand 13, central plateau of Hawaii (Kew); Horace Mann and W. T. Brigham 521 in part (type, Gray; cotypes, Bishop, Delessert, Field, Missouri).

Distribution: island of Hawaii.

Railliardia montana variety **β longifolia** Sherff.

Railliardia montana variety *longifolia* Sherff, Amer. Jour. Bot., vol. 20, p. 618, 1923.

Branches brown-purplish. Leaves opposite, spreading, subrhomboidally elliptic-lanceolate, weakly coriaceous, not glossy, glabrate, 5- or 7-nerved, 5-6.5 cm long. Capitula about 8-10-flowered. Achenes with bodies 4.5-5.5 mm long.

Type: collected by J. F. Rock, no. 8603, Kaupo Gap, Haleakala, Maui, October 22, 1910 (Gray).

Specimens examined: Rock 8603 (type, Gray; cotype, Bishop).

Distribution: known only from type locality on island of Maui.

Railliardia montana variety γ **robustior** Sherff.

Railliardia montana variety *robustior* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1923.

Differs from species proper in its leaves; these coriaceous, often ovate-elliptic, narrowly cuneate-obovate, a little larger.

Type: collected by J. F. Rock, no. 8594, Puu Nianiau, Haleakala, Maui, October 11, 1910 (Gray).

Specimens examined: Rock 8594 (type, Gray; cotypes, Bishop, Field).

The type of variety *robustior* at Gray Herbarium had been determined as *R. montana*. The cotype at Bishop Museum had been determined by Rock himself as a new variety of *R. Menziesii*. The general habit accords well with what might be expected of a geographic variety of *R. montana*. The recent finding by Degener of numerous unquestionable and (to this variety) somewhat similar hybrids (apparently *R. Menziesii* × *R. platyphylla*: see × *R. dolosa*) in the same locality casts, however, real doubt upon the integrity of this variety. If a hybrid, as now seems possible, it would appear to have derived on one side from *R. Menziesii*. The leaves are mostly shorter, thicker, more elliptic, and apically more bluntly or abruptly narrowed than in Degener's hybrids (× *R. dolosa*). In this connection it may be remarked that Hillebrand suspected a specimen of *R. montana* proper (Hillebrand 13, Kew) of being a variety of *R. platyphylla*. In his "Flora of the Hawaiian Islands", however, he retained *R. montana* as a valid species, but with the qualification that it and *R. arborea* might "have to be united in one species."

Distribution: eastern Maui.

13. **Railliardia reticulata** Sherff (fig. 41).

Railliardia reticulata Sherff, Bot. Gaz., vol. 95, p. 78, 1933.

Fruticose or arborescent, finally 6-7.5 meters tall, much branched; branches pubescent and becoming purple. Leaves opposite, spreading, sessile, flat or on margins rarely subrevolute, oblongly lanceolate or linear-spatulate, at base scarcely subclasping, at apex acute, coriaceous, on upper surface more or less subglossy, on both surfaces appressedly white-hispid, on margins ciliate and very minutely few-denticulate, lengthwise about 5-7-nerved but between nerves commonly reticulate, 3.5-5.5 cm long and now subnarrow and 5-7 now wider and 7-13 mm wide. Capitula paniculately or more rarely paniculate-subcorymbosely disposed, often very numerous, crowded, ± 6-flowered, pedicellate; pedicels slender, glandular-hispid, more often 2-4 mm long. Involucre narrowly cylindric, very glandular, sparsely villous, about 6-7 mm tall; bracts 4-8, not finally distinct. Achenes black, slenderly linear-obconic, suberectly white-hispid (or glabrate below), body about 4.5 mm long.

FIGURE 41.—*Railliardia reticulata* (first type sheet).

Type: collected by J. F. Rock, no. 8573, a shrub on Puu Nianiau Crater, Haleakala, Maui, October 1910 (Gray, 2 sheets).

Specimens examined: G. C. Munro 785, altitude 6,750 feet, in crack, mauka (inland) of Puu Nianiau Crater, Haleakala, Maui, February 28, 1928 (Bishop); Rock 8573 (2 type sheets, Gray; cotypes, Bishop, Field); Rock 8574, Puu Nianiau Crater, Haleakala, October 1910 (Bishop; ramo atypico foliis usque ad 7 cm longis et 1.5 latis, inflorescentia imperfecte aucta capitulis paucis et paulo majoribus); Rock 8590, a tree 20-25 feet high, altitude 6,000 feet, above Ukulele, Haleakala, October 11, 1910 (Bishop; Gray, 3 sheets).

Confused by Rock (in herbaria) with *R. montana,* from which it differs in lacking some ternately disposed leaves, in having about two more lengthwise leaf veins but all these appearing less distinct because of pronounced cross-veining, and in having the more numerous and much smaller heads (which are about 6-flowered, not 15-24-flowered) cylindrical or at top barely campanulate, not obconical or campanulate throughout.

Distribution: known only from eastern Maui.

14. **Railliardia struthioloides** A. Gray.

Railliardia struthioloides A. Gray, Amer. Acad., Proc., vol. 5, p. 134, 1861.

Fruticose or at higher altitudes (about 3,100-3,800 meters) arborescent and about 6 meters tall with stem about 2.3 dm thick; branches sericeo-canescent, not glandular. Leaves imbricately crowded along the branches, in threes, erect or finally spreading, sessile, subclasping, more or less concave, very rarely subglossy, narrowly oblong- or elliptic-lanceolate, at apex somewhat acute, on faces cinereo-hispidulous or scabrid with soft and appressed hairs, lightly or below obsoletely 3-5-nerved, on margins entire but hispid-ciliate; in size variable, now about 2.5 cm long and 4-6 mm wide, now even 4.8-5.3 cm long and 1-1.3 cm wide. Capitula disposed in a raceme or narrow panicle 10-15 cm long, pedicellate (pedicels slender, whitish-villous but not glandular-viscid, sometimes subrecurved, 5-15 mm long), 12-22-flowered, corollas not exserted beyond pappus. Involucre obconic, appressedly whitish-hispid, 8-9 mm tall; bracts 7-11, permanently connate. Achenes linear-clavate, black, glabrate, body 4.5-5 mm long.

Type: collected by the U. S. Exploring Expedition on Mauna Kea, Hawaii, 1840 (U. S.).

Specimens examined: William Hillebrand, Mauna Kea, Hawaii (Berlin); Hillebrand 11, altitude 6,000 feet, near the lava stream of 1856, central plateau, Hawaii (Kew); U. S. Exploring Expedition, Mauna Kea, Hawaii, 1840 (type, U. S.; cotypes, Gray; N. Y., 2 sheets).

Distribution: island of Hawaii.

15. **Railliardia Rockii** Sherff.

Railliardia Rockii Sherff, Bot. Gaz., vol. 95, p. 79, 1933.

Fruticose; branches pilose, becoming purple, moderately foliose. Leaves alternate, flat or flattish, spatulate-oblong or the upper ones oblong-lanceolate, coriaceous, on upper surface glossy, more often gradually narrowed below to a sessile base, at apex subobtuse, on margins hispidulous-ciliate and ± 3-denticulate, on faces glabrous or obsoletely appressed-hispid, manifestly 3-nerved with nerves impressed above, 3.5-4.5 cm long and 7-9.5 mm wide. Capitula paniculately or subracemosely disposed, ± 45 in an inflorescence (this ± 1.9 dm long, its slender and villous branches bracted with sometimes large and

foliaceous bracts), ± 14-flowered, the sulphur-yellow corollas slightly shorter than the pappus. Involucre subnarrowly campanulate, green or finally becoming purple, hispidulous, 8-9.3 mm tall; bracts 7.9, connate or occasionally becoming somewhat distinct. Achenes black, linear-clavate, at base manifestly narrowed, hispid or below glabrate, body 4-5 mm long.

Type: collected by J. F. Rock, no. 8601, Laie, Kaupo Gap, Haleakala, Maui, October 22, 1910 (Gray).

Specimens examined: Rock 8601 (type, Gray; cotype, Bishop).

Distribution: eastern Maui.

16. **Railliardia Menziesii** A. Gray.

Railliardia Menziesii A. Gray, Amer. Acad., Proc., vol. 5, p. 133, 1861.

Railliardia Menziezii A. Gray, ex Drake del Castillo, Illustr. fl. ins. maris Pacif., p. 214, 1890.

Principal leaves commonly more or less ovate-elliptic, up to 4 cm long.....**R. Menziesii**
Principal leaves linear or narrowly oblong-elliptic, 4-5.5 cm long....variety β **angustifolia**

Fruticose or arborescent, 1.8-3.7 meters tall; branches rigid, robust, ascending, commonly very densely foliose, hispid with white and appressed or spreading hairs. Leaves flat, now opposite now in threes or alternate, sometimes loosely arranged and subspreading, sometimes imbricately crowded, closely sessile, oblong-lanceolate or ovate-elliptic, more or less glossy, 3-5-nerved with nerves impressed above, thickish and coriaceous, on surfaces finally more or less glabrate but at the sometimes conspicuously revolute margins rigidly hispid- or spinulose-ciliate, entire or very obscurely and very remotely denticulate, at apex commonly obtuse, 1.5-4 cm long and 6-14 mm wide. Capitula disposed in a raceme or panicle (this subsimple, foliose, 5-9 cm long), pedicellate (pedicels slender, elongately white-villous, up to 2 cm long), 17-25-flowered, the yellow corollas not exserted beyond the pappus. Involucre green or finally dark-purple, cylindric-obconic, hispid, 7-8 mm tall; bracts 9-13, weakly connate or finally distinct. Achenes black, linear-clavate, at base more or less narrowed, on faces very sparsely hispid, body 5-6 mm long.

Type: collected by the U. S. Exploring Expedition, on mountain of eastern Maui, 1840 (U. S.). Gray cited no type among the plants of the U. S. Exploring Expedition, but gave the localities as "Hawaii and Maui." A study of the 4 sheets at Washington (U. S.) shows that the material taken as typical was from a mountain of eastern Maui. The lone specimen of this typical material (U. S., no. 57431) had been found by Gray to be the form collected by Menzies; hence, as stated by Gray in pencil on label, he had selected the name *Menziesii*.

Specimens examined: H. F. Bergman, altitude 7,500 feet, slope of Haleakala above Olinda, Maui, December 26, 1927 (Bishop); Otto Degener 4227, dry, rocky hill usually fog-swept toward evening, back of Olinda on way to Haleakala Crater, Maui, June 15, 1927 (British, Field, Gray, New York); Degener 4240, on lava, at top of Koolau Gap within Haleakala Crater, August 11, 1927 (Field, New York, forma foliis vix typica); Degener 4241, same location (fog-swept), August 15, 1927 (Field, New York); Degener 4244-a, on rain- and fog-swept lava at top of Koolau Gap, within Haleakala Crater, August 17, 1927 (Field); Degener 4251, same location (rain- and fog-swept), August 19, 1927 (Field, New York); Degener 4269, on arid a-a lava, within Haleakala Crater near Kaupo Gap, August 20, 1927 (British, Field, Gray, Kew, New York); C. N. Forbes, slope of Mauna Kea above Lau Maia, on Puu Kaala, Hawaii, June 19, 1915, (Bishop, 2 sheets); Forbes 293-M, crater of Haleakala, Maui, August 1910 (Bishop, Missouri); Forbes 788-M, east of Ukulele, Maui, July 16, 1919 (Bishop); Forbes 987-M, sliding sands, crater of Haleakala, July 31, 1919 (Bishop); Forbes 1124-M, Kaupo Gap, same location, August 10, 1919 (Bishop); Forbes 1151-M, north slope of Haleakala, August

15, 1919 (Bishop); William Hillebrand, Hawaiian islands (Gray); Hillebrand, Haleakala (Berlin, Bishop); A. S. Hitchcock 14950, altitude 6,000-10,000 feet, on lava, Haleakala Crater, October 2-5, 1916 (U. S.); Hitchcock 14982, same time and location (U. S.); R. S. Hosmer 2626 and 2629, altitude 8,000 feet, west slope of Haleakala, April 26, 1909 (Bishop); Horace Mann and W. T. Brigham 367, altitude 8,000-10,000 feet, Haleakala (Bishop, Delessert, Field, Gray, Missouri, U. S.); G. C. Munro 477, near summit of Haleakala, April 24, 1918 (Bishop); Munro 659, same time and location (Bishop); Munro 783, altitude 6,570 feet, mauka (inland) of Puu Nianiau, on slopes and through crater of Haleakala, February 28, 1928 (Bishop); J. F. Rock 8339, altitude 10,000 feet, above Kemole, Mauna Kea, Hawaii, June 1910 (Bishop, Field, Gray); Rock 8546, a shrub 3-4 feet high, altitude 6,000 feet, Ukulele, Haleakala, Maui, September 1910 (Gray); Rock 8585, summit of Haleakala, October 1910 (Bishop); Rock 8621, same location, September 1910 (Bishop, 3 sheets; Gray, 2 sheets); Carl Skottsberg 822, altitude about 2,200 meters, on the floor of the crater of Haleakala, October 16, 1922 (Göteborg); Skottsberg 1969, altitude 2,500 meters, eastern slope of Mauna Kea above Kukaio (Kukaiau), Hawaii, September 27, 1926 (Göteborg); U. S. Exploring Expedition, Mauna Kea, Hawaii, 1840 (Gray); U. S. Exploring Expedition, east Maui, 1840 (Gray; U. S., 2 sheets, one bearing type proper); Wawra 1896, Maui, 1868-71 (Vienna Mus.).

Distribution: islands of Hawaii and Maui.

Railliardia Menziesii variety *β* **angustifolia** Sherff (fig. 42).

Railliardia Menziesii variety *angustifolia* Sherff, Amer. Jour. Bot., vol. 20, p. 618, 1933.

Leaves opposite, linear or narrowly oblong-elliptic, 3-5.5 cm long and 5-12 mm wide.

Type: collected by J. F. Rock, no. 8546, altitude 6,000 feet, Haleakala, Maui, September 1910 (Gray).

Specimens examined: Otto Degener 4227-a, dry, rocky hill usually fog-swept toward evening, back of Olinda on way to Haleakala Crater, Maui, June 15, 1927 (Field); Rock 8546 (type, Gray; cotypes, Bishop, 2 sheets); Rock 8579, summit of Haleakala, October 1910 (Bishop, Gray).

Besides the following apparent hybrid with *R. platyphylla* (× *R. dolosa*), *R. Menziesii* appears to produce a hybrid with *R. linearis* (× *R. vafra*).

Distribution: known only from Haleakala, Maui.

16a. × **Railliardia dolosa** Degener and Sherff.

× *Railliardia dolosa* Degener and Sherff, ex Sherff, Bot. Gaz., vol. 96, p. 152, 1934.

Leaves opposite, spreading or drooping, oblongly and sometimes narrowly lanceolate or oblanceolate, sessile, rigid, toward the acute apex obsoletely serrulate, 5-7-nerved, on faces glabrate, on margins ciliate, principal ones 3.5-5.5 cm long and about 1-1.4 cm wide. Capitula loosely and racemoso-paniculately disposed; pedicels pilose, suberect, more often 1-3 cm long; involucre obconic-campanulate, 6-8 mm tall. Hybrid, probably between *Railliardia Menziesii* and *R. platyphylla*.

Type: collected by Otto Degener, no. 4271, on inner slopes of Haleakala Crater and on driest lava at bottom, near Kaupo Gap, Maui, August 20, 1927 (Field, 3 sheets).

Specimens examined: Otto Degener, Koolau Gap, Haleakala Crater, Maui, August 19, 1927 (Field); Degener 4243, tree 10 feet tall, in rain forest just below summit of Koolau Gap, August 17, 1927 (Field, New York); Degener 4270, sparingly branched

FIGURE 42.—*Railliardia Menziesii* variety *angustifolia* (type).

shrub about 2-4 feet tall, found especially on inner slopes of and on driest lava at bottom of Haleakala Crater, August 20, 1927 (Field, New York); Degener 4271 (type, Field, 3 sheets; cotypes, Berlin, Boissier, British, California, Delessert, Gray, Kew, Missouri, New York, U. S., Vienna Mus.).

Distribution: Haleakala Crater, eastern Maui.

17. **Railliardia arborea** A. Gray.

Railliardia arborea A. Gray, Amer. Acad., Proc., vol. 5, p. 134, 1861; J. F. Rock, Indig. Trees Haw. Is., pl. 212, 1913.

Small tree, about 6 meters tall, trunk about 3 dm thick, inflorescence and younger branches glandular-hirsute, nodes erectly white-ciliate. Leaves crowded, in threes, more or less spreading, sessile but not clasping, elliptic-oblong, flat, thickish, finally more or less glossy, entire or toward apex remotely denticulate, commonly 5-nerved, at both ends obtuse, above moderately, below scarcely glandular-scabrid, rigidly glandular-ciliate, 4-7.3 cm long and 1.2-2.5 cm wide. Capitula disposed in a panicle 7-10 cm long, 22-45-flowered, pedicellate with pedicels thickish and 0.5-2 cm long. Involucre campanulate, about 9 mm tall; bracts 10-14, glandular-hispid. Corollas moderately surpassing the pappus. Achenes glabrate, glossy, 5-costate, linear-oblanceolate, body 3-5 mm long. Native name, *naenae*.

Type: collected by the U. S. Exploring Expedition on Mauna Kea, Hawaii, 1840 (U. S.).

Specimens examined: C. N. Forbes 213-H, summit of Puu Hualalai, Hawaii, June 19-21, 1911 (Bishop); Forbes 459-H, Waikii slopes of Mauna Kea, August 1911 (Bishop, Missouri); Forbes 857-H, Humuula Trail to summit of Mauna Kea, June 14, 1915 (Bishop); J. F. Rock 3419, altitude 9,000 feet, Kaluamakani, Mauna Kea, July 6, 1909 (Bishop, 2 sheets; Gray); Rock 8338, Mauna Kea, June 1910 (Bishop, Gray); Rock 8344, altitude 10,000 feet, Kemole Crater, Mauna Kea, June 1910 (Bishop, Gray); Rock 10,319, Puu Laau, Mauna Kea, August 1911 (Bishop, 2 sheets; Gray); U. S. Exploring Expedition, Mauna Kea, 1840 (type, U. S.; cotypes, Gray; New York, 3 sheets).

Distribution: island of Hawaii.

18. **Railliardia platyphylla** A. Gray.

Railliardia platyphylla A. Gray, Amer. Acad., Proc., vol. 5, p. 134, 1861.

Leaves 4-9.5 cm long and 1.5-3 cm wide.....**R. platyphylla**
Leaves commonly 6-7 cm long and 1-1.5 cm wide.....variety β **leptophylla**

Shrub, 1.5-3 meters tall; branches robust, glandular-hirsute, densely foliose. Leaves opposite, spreading, sessile, flat but at very margins revolute, ovate-lanceolate, at base cordate-clasping, gradually narrowed all way to apex, thick, coriaceous, finally more or less glossy above, strongly 7-11-nerved with nerves impressed above, on both surfaces strongly scabrous and when young glandular-pubescent, on margins scabrid and toward apex very minutely 2-7-denticulate, 4-9.5 cm long and 1.5-3 cm wide. Capitula loosely disposed in a panicle (this foliose and 7-15 cm long), not numerous, pedicellate with pedicels glandular-hispid and often 2-3 cm long, 12-24-flowered, corollas yellow and barely exserted beyond pappus. Involucre campanulate, glandular-hispid, about 8-9 mm tall (in age much thickened); bracts 9-11, finally (often almost to the base) distinct. Achenes black, linear and gradually narrowed below all way to base, sparsely hispid or glabrate, body 4.5-5 mm long.

Type: collected by the U. S. Exploring Expedition, on banks of crater, eastern Maui, 1840 (U. S., 2 sheets).

Specimens examined: Otto Degener 4228, dry, rocky hill usually fog-swept toward evening, back of Olinda on way to Haleakala Crater, Maui, June 15, 1927 (Field, Kew, New York); Degener 4244, on rain- and fog-swept lava at top of Koolau Gap, within Haleakala Crater, August 17, 1927 (Field); Degener 4248, bush 3-5 feet tall, dry hills and among cliffs, within Haleakala Crater on northwest side, August 18, 1927 (Berlin, Field, Kew, New York); Degener 4253, on dry lava, Kaupo Gap, within Haleakala

FIGURE 43.—*Railliardia platyphylla* variety *leptophylla* (cotype, Bishop Museum).

Crater, August 20, 1927 (Field); Degener 4272, on inner slopes of Haleakala Crater and in driest lava at bottom, near Kaupo Gap, August 20, 1927 (Berlin, British, Field, Gray, Kew, New York); Abbé Urbain Faurie 916-k, altitude 2,500 meters, Haleakala, Maui, August 1909 (Paris); C. N. Forbes 196-M, slopes of Haleakala, above Ukulele, July 1910 (Bishop, Missouri); Forbes 772-M, east of Ukulele, July 15, 1919 (Bishop); Forbes 1101-M, crater of Haleakala, Maui, August 9, 1919 (Bishop); Forbes 2003-M, south slope of Haleakala, March 17, 1920 (Bishop); William Hillebrand, Haleakala (Bishop); J. M. Lydgate, crater of Haleakala (Berlin); J. F. Rock 8578, in part, Puu Nianiau Crater, Haleakala, October 1910 (Bishop, 2 sheets); Rock and T. Hashimoto 16035, Puu Nianiau, Haleakala, September 1918 (Bishop); Carl Skottsberg 820, altitude about 2,300 meters, on steep wall in the crater of Haleakala, October 16, 1922 (Göteborg); U. S. Exploring Expedition, banks of crater, east Maui, 1840 (type, 2 sheets, U. S.; cotypes, Gray, New York); W. Wendte, Kaihonao Kaupo, Haleakala, 1899 (Gray).

Distribution: eastern Maui.

Railliardia platyphylla variety *β* **leptophylla** Sherff (fig. 43).

Railliardia platyphylla variety *leptophylla* Sherff, Amer. Jour. Bot., vol. 20, p. 619, 1933.

Leaves very densely crowded, narrowly lanceolate, commonly 6-7 cm long and 1-1.5 cm wide.

Type: collected by J. F. Rock, no. 8578 in part, on Puu Nianiau crater, Haleakala, Maui, October 1910 (Gray).

Specimens examined: Rock 8578 in part (type, Gray; cotype, Bishop).

Appears to hybridize with *R. Menziesii* (see × *R. dolosa*).

Distribution: known only from eastern Maui.

Species Excluded

Railliardia argentea A. Gray, Amer. Acad., Proc., vol. 6, p. 550, 1865.
= *Raillardella argentea* A. Gray, Bot. Calif., vol. 1, p. 417, 1876.

Railliardia scaposa A. Gray, Amer. Acad., Proc., vol. 6, p. 551, 1865.
= *Raillardella scaposa* A. Gray, Bot. Calif., vol. 1, p. 417, 1876.

Addendum

According to the revised International Rules of Nomenclature (1930) the name × *Railliautia* (nomen novum ex nomine generis *Railliardiae* Gaudichaudii et nomine generis *Dubautiae* Gaudichaudii pro hybridis intervenientibus factum) may be employed; the name × *Dubautia fucosa* thus becomes × *Railliautia fucosa* (comb. nov.) and the name × *Dubautia fallax* becomes × *Railliautia fallax* (comb. nov.). (See pp. 89, 92.)