

A New *Hedyotis* from Kauai, Hawaiian Islands

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THE MOST RECENT revision of the Hawaiian species of *Hedyotis* (Rubiaceae) is that of F. R. Fosberg (1943), who treated all the Polynesian species, describing many new forms. The genus as considered by Fosberg includes, with good reason, the segregate genera *Oldenlandia* L., *Gerontogea* Cham. and Schlecht., *Kadua* Cham. and Schlecht., *Diplophragma* Meisn., as well as *Gouldia romanzoffiensis* A. Gray, a species not properly in *Gouldia*.

The type species of *Hedyotis* is *H. auricularia* L., which forms also the basis of the subgenus *Hedyotis*. This subgenus contains the species native to southern Asia which have axillary inflorescences, indehiscent or septicidal fruits, and usually a depressed habit of spermacocoid appearance. The sections and subgenera found in Polynesia are as follows.

Subgenera: *Oldenlandia*, including only *Hedyotis biflora* L., a wide-spread plant of tropical Asia, the islands of the Indian Ocean, Malaysia, Micronesia, Melanesia, Fiji, and, in Polynesia, Samoa and Tonga.

Diplophragma, of southern and western Polynesia, eastern Melanesia, and Micronesia, but not known from Hawaii.

Kadua, two variable species confined to the Hawaiian Islands.

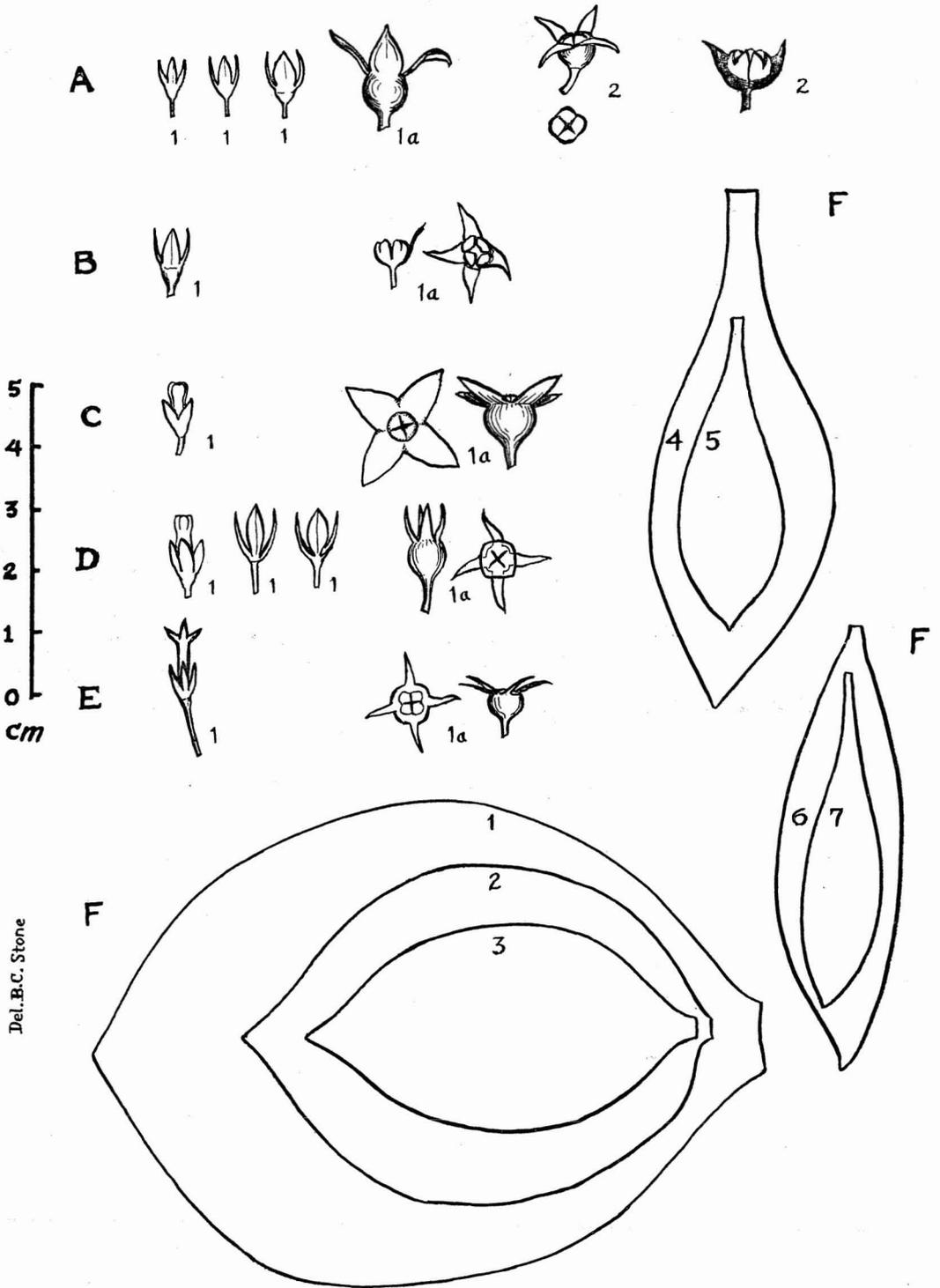
Oceanica, comprising the single species transferred from *Gouldia*, and present only in southern and central Polynesia.

Polynesiotis, with 19 species, principally developed in Hawaii, with a secondary center in southern Polynesia. This subgenus has five sections: *Wiegmannia*, *Protokadua*, *Gouldiopsis*, *Bikkiocarpa*, and *Austrogouldia*.

The new species described herein fits well into the subgenus *Polynesiotis* and into the section *Wiegmannia*. However, it differs in two of the key characters employed in Fosberg's key to the subgenera. First, in our specimens the stigmas are consistently quadrid, not bifid; second, the width of the corolla tube is not "much less than $\frac{1}{3}$ the length" of the corolla tube, as the key states, but is in some cases as wide as it is long. At first glance the inflorescences seem axillary, but on closer inspection it can be seen that they are strictly terminal; however, the first axillary bud below the inflorescence grows into a stem (or in some cases both of the two axillary buds), and these in turn eventually terminate in inflorescences; this gives the plants an aspect of branching which might be termed subscorpioid.

Within the section *Wiegmannia* of the subgenus *Polynesiotis*, our specimens are evidently very closely related to *Hedyotis littoralis* (Hbd.) Fosberg, a striking and characteristic species distinguished by its fleshy leaves, which are closely set on a decumbent corky stem, and by its habitat on cliffs or rocks close to the sea. It is known mostly from Molokai and Maui; although there exist specimens from Kauai, Oahu, and Hawaii, they are old (Hillebrand's from Kauai and Oahu, Abbé Faurie's

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from Hawaii), and there have been apparently no other collections in these localities since the original specimens were taken. Fosberg says "the plant has become quite rare, except on the windward coast of east Molokai. I searched for it without avail at Hanalei, Kauai, in 1935. It has not been found on Oahu since Hillebrand's time."

Our specimens exhibit many features characteristic of *H. littoralis*, including its habitat preference, but in flower color, corolla shape, and fruit shape they show clear-cut differences. The general aspect of both species is very similar, and the two are both quite different in this regard from the majority of the other Hawaiian species of *Hedyotis*.

The following changes in the keys should be made to accommodate this new species. In the key to the subgenera (Fosberg, 1943: 19), under the second number 2, read: "Corolla fleshy or at least thickened, salverform, anthers included or the tips barely exerted, style shorter than or subequal with tube, bifid or quadrifid (lobes may cohere), seeds angular. . . . 3." Under the second 3, read: "Inflorescence terminal, terminal and axillary, or seemingly axillary but terminating the main stem, the branch below arising from the first axillary bud(s). . . . 4." Under the second 4, read: "Width of corolla tube usually much less than 1/2 the length, but in some as wide as long; cyme usually many-flowered; fruit dry, or if fleshy, calyx lobes much over 1 mm. long. . . . *Polynesiotes*."

In the key to the sections of *Polynesiotes* (Fosberg 1943: 23), under the first 2, read: "Calyx lobes foliaceous, longer than hypanthium in flower, conspicuously accrescent in fruit, distinctly nerved, subscabrous in some; corolla limb not quadrangular in bud, inflorescence usually quite glaucous. . . . *Wiegmannia*."

In the key to the species of section *Wiegmannia*, insert in place of the lead to *H. littoralis*: "2. Leaves, bracts, calyx lobes, and ovary fleshy; leaves mainly sub-basal. . . . 3.

3. Corollas white, the tube two or three times longer than wide; fruits subglobose, crowned by the persistent enlarged calyx *H. littoralis*

3. Corollas green, the tube as long as wide or up to twice as long as wide; fruits usually conspicuously flattened, the persistent enlarged calyx lobes spreading from the equatorial plane of the fruits. *H. St.-Johnii*"

DESCRIPTION

Hedyotis St.-Johnii B. C. Stone and I. Lane
sp. nov. (Subgen. POLYNESIOTES sect.
WIEGMANNIA)

Suffrutex parvus non-vel pauci-ramosus decumbens in scopulis saxatilis maritimis Kauaiensibus habitans, caulis lignosus longitudinaliter sulcatus, petiolis connatis et fasciis suberosis inter foliosis ambis cinctis, folia opposita dense conferta irregulariter elliptico-acuminata ad apicem saepe asymetrice curvata in vivo subcarnosa convexa supra fusco-viridia et nitida infra subglaucula pullovenosa, bases foliorum lati-petiolatae vel alatae bases bini connatae, laminae 5-14 cm. longae 2-5.5 cm. latae marginibus integribus, superficies foliorum (et bracteorum et calicorum) minute albo-scabratum, costa nervique leviter prominulentes, nervi laterales 4-10 arcuatim adscendentes vix anastomosantes (rete venularum conspicuum sed minutum), folia emortui persistentes vestirentes, inflorescentia stricte terminalis pauci-ramosa usque 17 cm. longa remote bracteata thyrsoida tripartite cymosa, ramus quisque dichasius fere

FIG. 1. A-F, *Hedyotis littoralis*. A-1, Faurie 374, Molokai; 1, calyces, 1a, fruit; 2, Faurie 375, Halawa, Hawaii, fruits. B, Skottsberg 800, East Maui, 250 m. alt.; 1, calyx, young; 1a, fruit. C, Degener and Nitta 9430, Wailau, Molokai; 1, bud; 1a, fruit. D, same, 2d sheet; 1, buds and young calyces; 1a, fruit. E, Forbes 237-M, Keaneae, East Maui; 1, flower; 1a, fruits. F, leaves, 1, 2, Rock 7003, Wailau, Molokai; 3, Faurie 374; 4, Fosberg 13451, Wailau, Molokai; 5, Forbes 237-M; 6, Skottsberg 800; 7, Degener and Nitta 9430, sheet 2. (All in Bishop Mus.) All natural size.

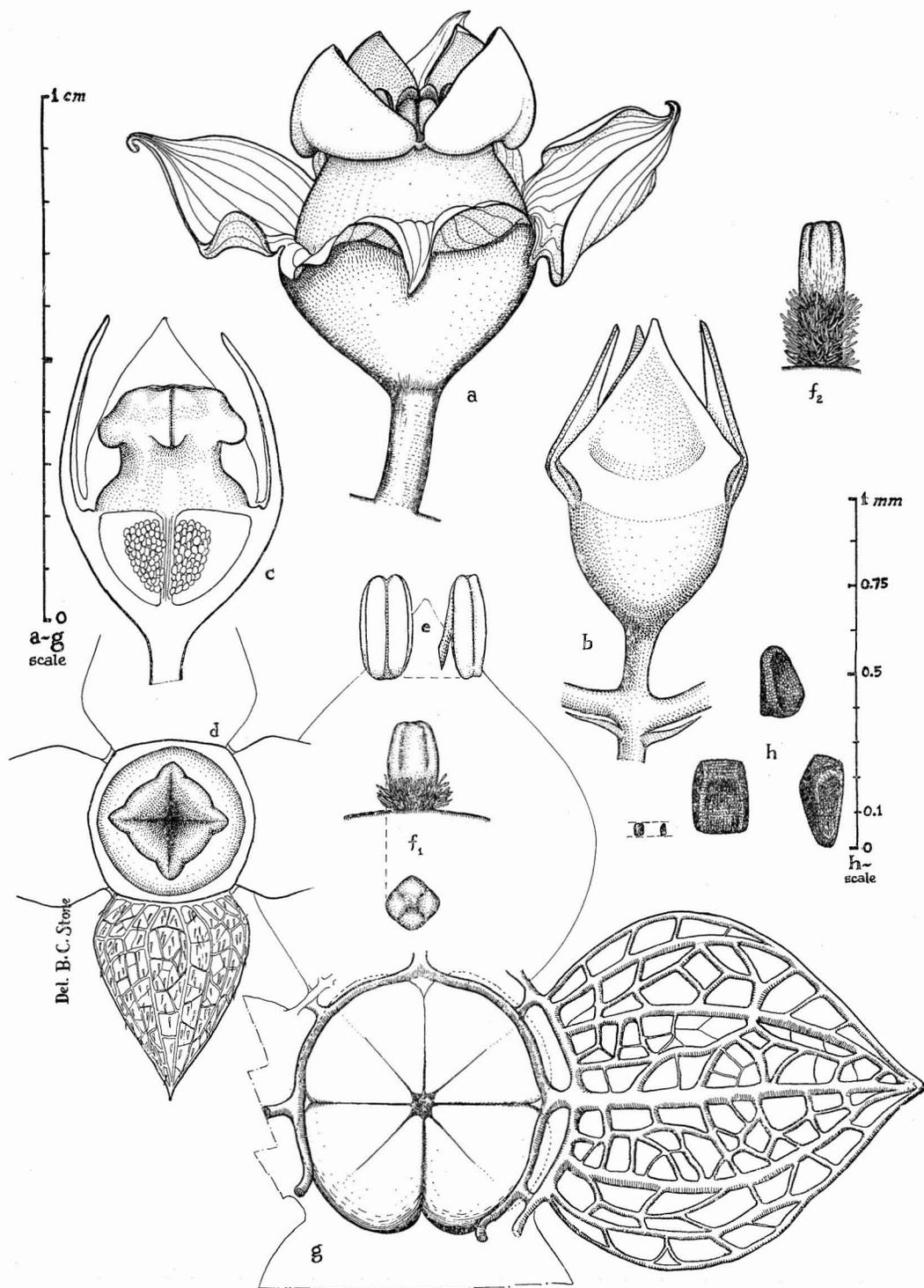


FIG. 2. *Hedyotis St.-Johnii*. a, Young flower; b, bud showing calyx; c, cross-section of bud, showing young corolla; d, top view of bud with calyx lobes spread; e, anther, front and side; f_1 , young pistil; f_2 , older pistil; g, fruit, top view, showing calyx expansion and dehiscence lines; h, seeds. All $\times 7\frac{1}{2}$.

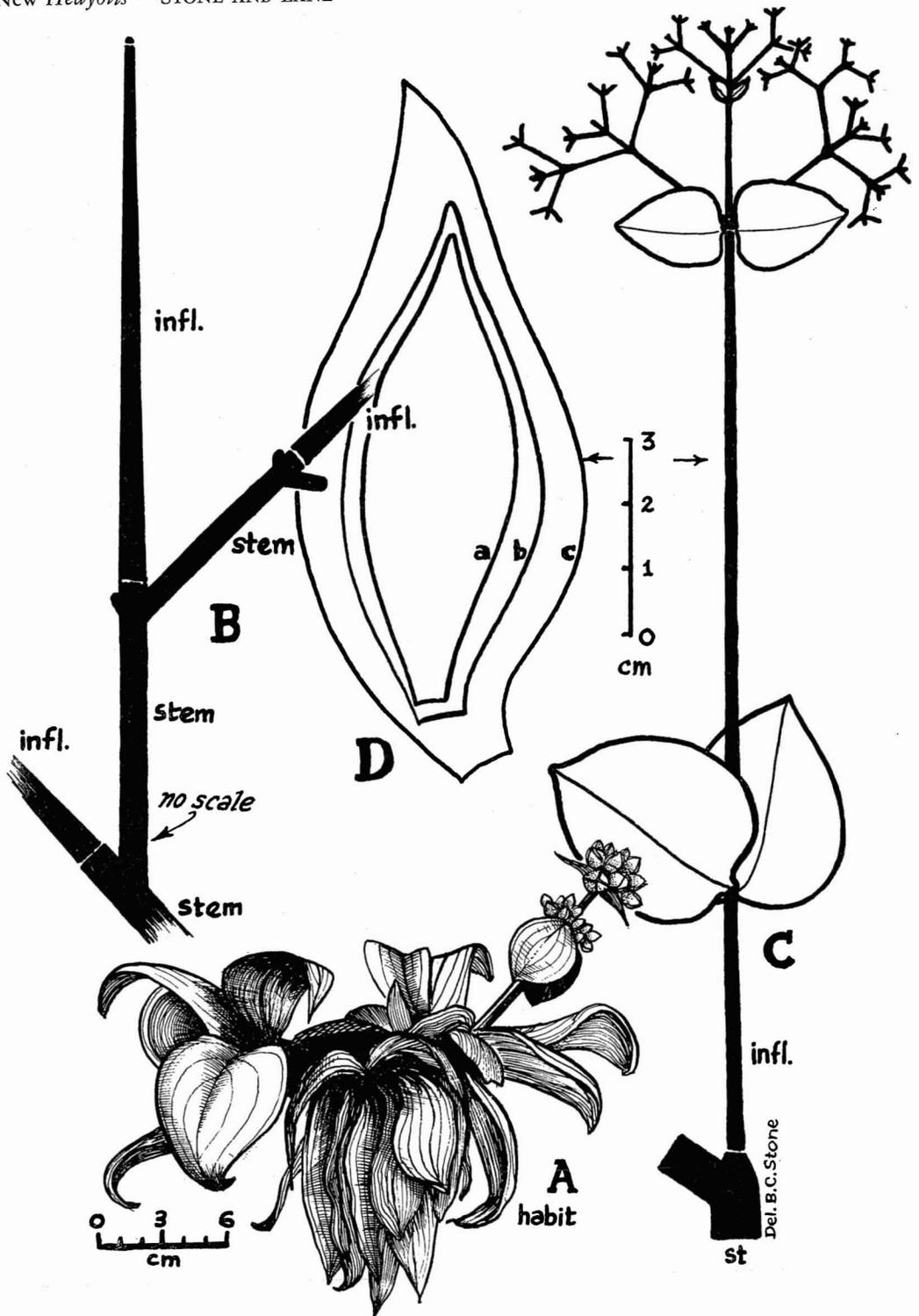


FIG. 3. A, *Hedyotis St.-Johnii*, habit sketch, (from Kodachrome by B. C. Stone); B, stem, branching pattern, showing terminal inflorescences; C, inflorescence; D, representative leaves. A- $\times \frac{1}{2}$; B-D, $\times 1$.

11 floris ferrens, flos omnis bracteolo unico subulato fere 1 mm. longo subtentus, bracteae 2 rare 4-6 ovatae vel subcordatae ad apicem acutae vel subacuminatae 1-3 cm. longae 1.3-2.1 cm. latae inferiores longiores, flos junior subcuboideus, flos vetustior urceolatus 8-11 mm. diam., pedicellus 2 mm. longus, calyx in alabastro valvatus 4-lobatus, lobi calycis hastati subrhomboidali 4-6 mm. longi quam corollam longiori, corolla in alabastro ad apicem depressa 5-8 mm. longa lobi in flore leviter divergentes 1.5-2.5 mm. longi viridi, stamina subsessilia cum corolla adnata vix exserta, antherae 1.5 mm. \times 0.8 mm., pistil 1, ovarium inferius, hypanthio discoideo, stylus ca. 3 mm. longus in basi pubescenti ad apicem quadrifidem, fructus siccus lentiformis vel subglobosus calyx persistens accrescens ad mediam fructus cinctus, fructus 4-ocularis dehiscens primo loculicidalis illo tempore septicialis, maturitas 4-6 mm. diam., semina angulosa nigra 0.2 mm. longa.

Ab. *H. littoralis* corolla brevioribus urceolati viridi (non albi) et fructu lentiformi differt.

Suffrutescent, decumbent, sparsely branching plants growing on rocky cliffs near the sea (known only from near Kalalau, Kauai), with woody stems up to 30 cm. long covered by a corky, longitudinally grooved epidermis and banded by corky rings and the connate bases of the petioles, the stems usually hidden by the congested persistent opposite dead and living leaves, the branching pattern subscorpioid and the branches somewhat parallel, inflorescences terminating each branch and a new branch growing from the axillary bud just below the inflorescence (or sometimes both buds developing into branches), these branches in turn terminating in inflorescences, etc. The stems may reach a diameter of 1-2 cm. at the base, and are light brown to whitish in color. Leaves simple, entire, elliptical-acuminate with assymmetric curved apices, the length-width ratio rather variable, the petioles broad or alate and conspicuously connate, the blades 5-14 cm. long and 2-5.5

cm. wide, the surfaces minutely white-scabrous, the leaves when living rather fleshy, convex, dark shining green above and rather glaucous, but with darker veins, below; veins barely prominent, the 4-10 lateral nerves curving parallel, hardly anastomosing; the vein-reticulae apparent but delicate. Inflorescence terminal but seemingly axillary because of subscorpioid branching, the inflorescence up to 17 cm. long, a thyrsoid compound tripartite cyme, with each branch a strict dichasium of about 11 flowers, each flower subtended by a bracteole 1 mm. long, subulate in form; the dichasial branches average 1.5 cm. in length; the entire cluster of flowers may reach 2-3 cm. in width. Flowers in bud subcuboid, at anthesis urceolate, when mature 8-11 mm. in diameter; calyx glaucous green, glabrous except for minute white scabrae, in bud valvate, subcuboid, with four hastate subrhomboidal lobes whose basal corners are recurved-approximate, free; calyx longer than the corolla; the calyx-lobes in bud ca. 2 mm. long, in flower ca. 3 mm. long, in fruit ca. 8-10 mm. long; corolla green, in bud valvate, the four lobes inflexed at the top of the bud and forming a depression; in flower spreading or barely ascending, darker green within; corolla in bud 2-3 mm. long, in flower 5-8 mm. long, the lobes 1.5-2.5 mm. long, subtriangular, the neck constricted, the outer edges of the petals somewhat recurved or appearing ridged. Stamens 4, subsessile, adnate to the constricted neck of the corolla, the tips barely exserted, anthers 1.5 \times 0.8 mm., the connective-filament 0.1-0.2 mm. long, anther-cells 4. Pistil 1, the ovary inferior, the hypanthium discoid, in flower not squared but becoming slightly so in fruit, 3-4 mm. wide in flower; style deeply quadrifid, the 4 lobes cohering; basal part of the style pubescent; lobes of the style 0.4 \times 0.15 mm. Fruits dry, flattened-lentiform to depressed-subglobose, the calyx-lobes persisting-accrescent to about twice the size they are in flower, lobes fenestrate, 5-7+ nerved, spreading, attached at the equator of the fruit; fruit

dehiscing first loculicidally across the disc, the pyrenes later separating by a septicial slit. Seeds angular, blackish, papillose to granulate, small, ca. 0.2 mm. long.

HOLOTYPE: Hawaiian Islands, Kauai: Between Kalalau and Honopu, cliffs at end of beach; plants growing on rocky ledges and in crevices dashed by ocean spray, 10–30 ft. elevation, in association with *Artemisia australis* and *Lipochaeta succulenta*, December 24, 1956, Benjamin C. Stone no. 1470 (2 sheets, in Bishop Museum). (This locality is actually the same as the following.)

SPECIMENS EXAMINED: Hawaiian Islands, Kauai: Third gulch from east end of Honopu (Kalalau Trail), rare, in crevices of vertical basalt sea cliff, 10 ft. alt., herbaceous, leaves fleshy, above dark shiny green, below pale green with darker veins; infl. green, the buds cuboid, the calyx lobes valvate, within pale green, the corolla lobes valvate, within dark green, without pale green, assurgent; anthers exerted, yellow; December 31, 1947, Harold St. John, E. J. Britten, and R. S. Cowan no. 23,207 (2 sheets, in Bishop Museum).

DISCUSSION

Because of the close vegetative similarity of the species *Hedyotis littoralis* (Hillebrand) Fosberg and the newly described *H. St.-Johnii* Stone and Lane, there is the possibility that Hillebrand's collection from Hanalei, Kauai, might represent *H. St.-Johnii* rather than *H. littoralis*. Hillebrand (1888) added after the description of his *H. littoralis*, "On rocks near the seashore in Waikolu, Molokai! and Hanalei, Kauai! A single damaged corolla only was available for examination; the position of the anthers, shape of corolla lobes, and relative length of style remain therefore doubtful." Possibly also the color of the corolla in the Hanalei specimen was unknown. At any rate, until new and definite collections of *H. littoralis* are made on Kauai, it must remain a matter of doubt whether both of these species are actually present there. Since, however, the

only two collections of *H. St.-Johnii* are from nearly the same locality along the Napali coast (Honopu and Kalalau are only about 3 miles apart, as the crow flies), and Hillebrand's specimen was from Hanalei, perhaps 15 miles away and in a less rugged and rocky area, the possibility still exists that this latter specimen represents *H. littoralis*.

Hedyotis St.-Johnii was first collected in 1947, by St. John, Britten, and Cowan, and was rediscovered in 1956, during a trip into the isolated and remote Kalalau Valley led by Harold St. John. About 10 plants were seen, at various heights from 10 to 30 feet up, on the vertical basalt faces of the cliffs at the west end of the beach between Kalalau Valley and Honopu Valley. Flowers and fruit seemed abundant, and the colony though small seemed healthy. The plants were continuously sprayed by a fine spume from the breaking waves. The only plant associates were *Artemisia australis* Less. and *Lipochaeta succulenta* DC., though other species were growing nearby at the base of the cliffs back of the beach.

ACKNOWLEDGEMENTS

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REFERENCES

- FOSBERG, F. RAYMOND. 1943. The Polynesian species of *Hedyotis* (Rubiaceae). *Bernice P. Bishop Mus., Bul.* 174: 1–101.
- HILLEBRAND, WILLIAM. 1888. *Flora of the Hawaiian Islands*. Heidelberg. I—XCIV + 1–673 pp. Cf. p. 167.