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**Nyctaginaceae of southeastern Polynesia
and other Pacific islands¹**

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INTRODUCTION

This paper includes a complete compilation of my studies on the extensive Nyctaginaceae material brought back by the Mangarevan Expedition from southeastern Polynesia, Society, and Pacific equatorial islands. Additional material from Hawaii, Samoa, and Fiji is included in the study. However, in essential points it concerns only the genera *Boerhaavia* and *Ceodes*. In *Boerhaavia* the peculiar development in form and habit seems to me to merit illustration. As for *Ceodes umbellifera* of which the Expedition brought so much material, since the visits to these islands were made at a time when no ripe fruit, and for the most part, no flowers of either sex were obtainable, I have had some difficulty, and because of incompleteness, only two new forms in addition to a new variety, *coronata*, are cited. The rest of my paper deals with new forms of both *Boerhaavia* and *Ceodes*.

The types of the species described are in Bernice P. Bishop Museum.

Genus **MIRABILIS** Linnaeus

Mirabilis Jalapa Linnaeus.

All specimens belong to the common form, cultivated everywhere; stem and leaves glabrous; perianth large, outside either smooth or scattered with hairs; anthocarps smooth.

¹ Mangarevan Expedition Publication 16.

Austral Islands: Rurutu, Moerai, in coconut grove, altitude 1 meter, weed, flower crimson, closed in morning, August 29, 1934, F. R. Fosberg no. 11953; Tubuai, Toahuaia, roadside, spreading from cultivation, altitude 1 meter, erect herb, 0.8 meter high, flower magenta, August 8, 1934, H. St. John no. 16378.

Pitcairn: Adamstown, around cultivated places, altitude 65 meters, weed, flower white with pink stamens, June 13, 1934, F. R. Fosberg and B. Christian no. 11170.

Genus *BOERHAAVIA* Linnaeus

Boerhaavia diffusa Linnaeus² variety *tetrandra* (Forster) Heimerl.

Boerhaavia diffusa Linnaeus variety *tetrandra* (Forster) Heimerl:

Beiträge z. System. d. Nyctagin, p. 27, 1897.

Boerhaavia tetrandra Forster: Florulae insul. austr., Prodromus n. 2, 1786.

Root stout, brown, fusiform, either simple or branched. Stems ("vine," "trailing") often many, prostrate, up to 2 meters long, not very thick (hardly more than 3 mm), when dry often dark brown, lightly striped, internodes especially towards the end, up to 10-11 cm long, slightly thickened at the nodes, sometimes branched, with either short or long branches, frequently leafy (only in the apical part decreasing more or less), at the base often without leaves, rarely glabrous, either slightly or rather closely covered with very minute hairs, more or less appressed, without glands, puberulent or powdery, inflorescence partly (falsely) axillary, commonly rising erect from a procumbent stem, apical panicle ordinarily lacking, rarely slightly developed. Leaves, except more or less acute apical ones, similar, borne on a petiole commonly shorter than the blade, 1-1.5 mm thick, smooth or minutely hairy, the blade more or less broadly elliptic, round or broadly ovate (rarely tending towards deltoid or obovate), up to 53 mm long and 43 mm wide, but commonly smaller, often rounded on both sides, but sometimes with obtuse to subtruncate base and rather obtuse at apex, commonly hardly contracted into the petiole, glabrous, near the costae sparingly and minutely hairy; when dry more or less thick, dark, either brown or greenish, of the same color or paler underneath, entire (rarely margin slightly wavy), with costa and lateral nerves (up to 5 on each side), branching out, prominent below. Inflorescence smooth, peduncle slight at first, 24-70 mm long, afterwards more or less elongate (up to 125 mm), stiff, erectly spreading, few flowered, 5-20 mm long, branches thin, few (often 3-4), bracteate at the base, arranged in umbels or panicles, erect or erect-spreading, often short at anthesis, finally lengthening to 10-30 mm, bearing either one-flowered or few, 2-6 flowered cymes. Flowers commonly short-pedicelled (1-3 mm), pedicels bracteate at the base (similar to the perianths). Perianths either ebracteolate or more often (at or below the base) with 1-3 bractlets, which are lanceolate, membranaceous, 1-2 mm long, acute, bearing hairs, 4-5 mm (rarely up to 6 mm) long; inferior part 1-2 mm long, 1-1.2 mm wide, ellipsoidal, or shortly obovoid or globose, 5-ribbed, with ribs more or less densely glandular-

² As types of *Boerhaavia diffusa* Linnaeus, I designate plants from India and Ceylon.

pubescent; superior part ("pink," "pinkish white," "purplish pink," very rarely "yellow"), campanulate, tube lacking at the base, glabrous, 5-nerved and reticulate-veined, expanded limb commonly 3.5-4.5 mm (rarely up to 6 mm) wide, lobes short, obtuse, slightly emarginate. Stamens 4-5 (rarely and singly 3 or 6 or some rudimentary, the number varying in one and the same inflorescence), more or less unequal lengths, 1.75-3.5 mm long, not or hardly exerted. Style either equalling the stamens or exceeding them, 1.75-4 mm long. Anthocarps either sessile or pedicellate (the pedicel sometimes about 20 mm long), 4-7 mm long, 1.5-2 mm wide, linear-clavate or nearly prismatic, brownish or greenish or griseous, apex obtuse or rounded or truncate, costae moderately prominent, obtuse, rather narrow, with more or less short, sticky hairs, intercostal areas wider than the costae. Fruit 2 mm long, 1 mm wide, oblong-ellipsoidal, brownish, base obtusely apiculate and dark brown, raphe inconspicuous.

For the preceding description I had access to a great many specimens which were more complete than any I have seen before.

Fanning Island: English Harbor, coral shingle, prostrate, flower pink, fruit sticky, April 23, 1934, K. P. Emory and C. Gessler.

Flint Island: copra plantation, fine broken coral, altitude 2 meters, prostrate, flower pink, October 16, 1934, H. St. John and F. R. Fosberg no. 17462; coconut plantation, fine broken coral, altitude 2 meters, prostrate vine, flower magenta pink, October 16, 1934, H. St. John and F. R. Fosberg no. 17439.

Tuamotu Archipelago: Tepoto, coral sand in woods, altitude 1 meter, prostrate, flower pink, May 16, 1934, H. St. John no. 14347; South Marutea, northwest islet, coral sand near beach, altitude 1 meter, trailing, May 22, 1934, H. St. John no. 14438; Anaa, Tuku-hora, on coral sand, altitude 1 meter, prostrate, flower yellow, May 13, 1934, H. St. John no. 14268. Native names, *runa runa* (no. 14347), *runa* (no. 14268).

Austral Islands: Maria Island, southeast islet, *Scaevola* brush, altitude 3 meters, prostrate, flower pink, large, September 6, 1934, F. R. Fosberg no. 12071; Maria Island, northeast islet, open woods on coral sands, altitude 2 meters, repent, flower pink, September 6, 1934, H. St. John no. 16952; Maria Island, middle islet, coral sand in open forest, prostrate, flower pink, September 6, 1934, F. R. Fosberg no. 12121; Tubuai, Rautaro islet, altitude 1 meter, trailing in grass or sand, repent, flower purplish-pink, August 19, 1934, H. St. John no. 16385; Tubuai, Tapapatauai islet, on grass, altitude 1 meter, repent, flower purplish-pink, August 19, 1934, H. St. John no. 16404; Raivavae, Motu Tehau, coral gravel, altitude 1 meter, creeping vine, flower pink, August 11, 1934, H. St. John and S. G. Wight no. 16145.

Mangareva Islands: Taraururoa, on coral gravel, altitude 2 meters, repent, flower pink, May 28, 1934, H. St. John no. 14593; second islet northwest of Taraururoa, broken coral, under trees, altitude 1 meter, prostrate, flower pinkish white, fruit sticky, June 6, 1934, F. R. Fosberg no. 11126; Vaiatekeua, broken coral, altitude 2 meters, prostrate, flower pinkish white, fruit sticky, June 6, 1934, F. R. Fosberg no. 11154.

Timoe Island: north islet, on coral gravel, altitude 2 meters, trailing, flower light pink, June 25, 1934, H. St. John and F. R. Fosberg no. 15209.

Oeno Island: open woods, altitude 3 meters, prostrate, flower pink, about 6 mm across, June 23, 1934, H. St. John and F. R. Fosberg no. 15203; coral sands, altitude 2 meters, flower pink, plant repent, June 23, 1934, H. St. John and F. R. Fosberg no. 15191; coral sand in open wood, altitude 2 meters, prostrate, 2 meters long, flower pink, June 23, 1934, H. St. John and F. R. Fosberg no. 15196.

Similar and related to the preceding (but flowers were unopened): Pacific equatorial islands, Christmas Island, Motu Tabu, leaves pallid beneath, light green above, October 21, 1934, H. St. John and C. M. Cooke, Jr. no. 17483.

Boerhaavia diffusa Linnaeus variety **tetrandra** (Forster) Heimerl forma **ramosa** Heimerl, new form (pl. 1).

Differt a typica var. *tetrandra* caulibus (hinc inde ad nodos radicantibus) saepe iam inferne frequenter v. alterne v. opposite ramosis, ramis eodem modo iterum partitis, tenuibus, f. virgatis, ramificationibus ultimis in sympodia brevia, paucifoliata ad aphylla, inflorescentias partiales paucas, minores, paucifloras gerentia abeuntibus; foliis late ovatis ad elliptico-orbiculatis, sensim sursum diminutis et denique in foliola minuta, elliptica, \pm obtusiuscula transeuntibus.

Among numerous specimens from Hao, the forms at hand both approach the typical variety *tetrandra* and a few are identical with it.

Tuamotu Archipelago: Hao, Boring Bay, on coral gravel in open coconut woods, altitude 2 meters, trailing, flower pink, May 18, 1934, H. St. John, no. 14365 (type). Native name, *runa*.

Timoe Island: north islet, open place in forest on broken coral, altitude 3 meters, prostrate, flower pinkish, June 25, 1934, H. St. John and F. R. Fosberg no. 15211.

Boerhaavia diffusa Linnaeus variety **tetrandra** (Forster) Heimerl, abnormal forms.

I. (pl. 2). Almost a small shrub with many stems, about 28 cm long and 17 cm wide, much branched, rather tangled, very leafy. Ramifications frail, brittle,

jointed. Leaves nearly equal, blades up to 19 mm long and 10 mm wide (but in the last ramifications only 3-5 mm long), shortly elliptic to obovate-elliptic, the petioles for the most part attaining half the length of the blade. The flowers (only a few present) not open. Stamens 3 in a single bud. Anthocarps lacking.

A single specimen, no. 14365A, among specimens of no. 14365 was collected on the island of Hao, Tuamotu Archipelago, and differs from them in general appearance.

II. The specimen at hand has 3 stems, all very different, rising from the same root (remark on the label: "all one plant"). One stem as in typical variety *tetrandra*; another stem often and wide-branched, the last branches especially slender, differing in being remotely and small-leaved; the third stem differing greatly in habit, much branched, very frequently and decreasingly leaved, leaves ovate to orbiculate, sometimes ovate-elliptic; inflorescences in ultimate branches, slender, apical, borne on filiform peduncles which are 8-20 mm long, small, with only 3-4 flowers, umbellate, flowers similar to typical variety *tetrandra*, stamens 3 (rarely 4), anthocarps about 5 mm long.

Flint Island: coconut plantation, fine broken coral, altitude 2 meters, prostrate, flower pink, October 16, 1934, H. St. John and F. R. Fosberg no. 17435.

III. At hand is a single stem, slender, up to 60 cm long, frequently with opposite lateral branches from prominent nodes, branches up to about 17 cm long, ascending or suberect, forked, becoming more or less decreasingly leafy, last branches appear to be ascending, because of very frequent and intricate small-leaved ramifications forming as it were one little shrub about 25 cm wide and high. Leaves ovate to elliptic, not rarely subspathulate, the blades up to 34 mm long and 18 mm wide, base narrowing cuneately to a more or less elongate long and 18 mm wide, base narrowing cuneately to a more or less elongate petiole, apex obtuse to rounded. Inflorescence and flowers as in no. 17435.

Flint Island: coconut plantation, in fine broken coral, altitude 2 meters, low bushy plant with prostrate runners, flower magenta pink, October 16, 1934, H. St. John and F. R. Fosberg no. 17436.

Boerhaavia diffusa Linnaeus variety **mutabilis** (R. Brown) Heimerl.

Boerhaavia diffusa Linnaeus variety *mutabilis* (R. Brown)

Heimerl: Beiträge z. System. d. Nyctagin. p. 27, 1897.

Boerhaavia mutabilis R. Brown: Prodrömus florum N. Holland., I. p. 422, 1810; F. v. Müller, Plants of Victoria II, Tab. 67.

Austral Islands: Rurutu, Naa, raised dissected coral, top of cliff, altitude 50 meters, prostrate, flower pinkish, August 30, 1934, F. R. Fosberg no. 12005; Raivavae, west cliff of Mount Muatapu, ledge at base of cliff, altitude 180 meters, prostrate, flower pinkish, fruit sticky, August 11, 1934, F. R. Fosberg no. 11773.

Boerhaavia diffusa Linnaeus variety **pubescens** (R. Brown) Choisy.

Boerhaavia diffusa Linnaeus variety *pubescens* (R. Brown)

Choisy: C. De Candolle, *Prodromus*, XIII, 2, p. 453, 1849.

Boerhaavia pubescens R. Brown: *Prodromus florae* N. Holland., I, p. 422, 1810.

Pacific equatorial islands: Christmas Island, Joe's Hill, sandy slope, *Sida fallax*—*Lepturus repens* formation, prostrate, flower pinkish, fruit sticky, October 26, 1934, H. St. John and F. R. Fosberg no. 17495.

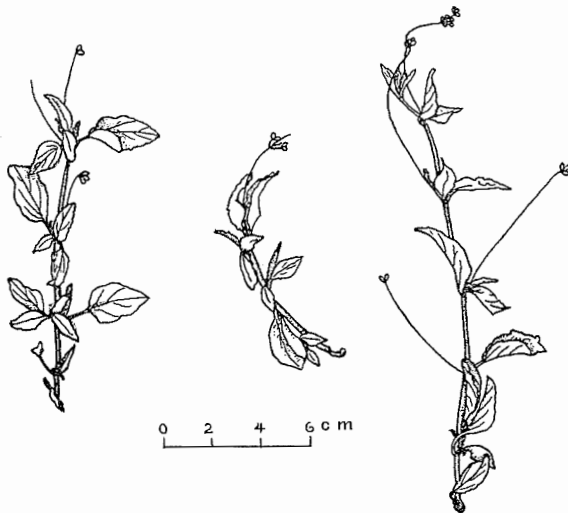


FIGURE 1. *Boerhaavia diffusa* variety *sandwicensis*.

Boerhaavia diffusa Linnaeus variety?

Specimens (imperfect) with rather dense indumentum towards apices, stamens 2-3 (in buds), possibly approaching variety *pubescens*.

Pacific equatorial islands: Christmas Island, Motu Tabu, stems and lower sides of leaves slightly purplish (in no. 17484 distinctly reddish) tinged, October 21, 1934, H. St. John and C. M. Cooke, Jr. nos. 17482 and 17484.

Boerhaavia diffusa Linnaeus variety **sandwicensis** Heimerl, new variety (fig. 1).

Suppetunt caules pauci et florentes et fructigeri, ex axi lignoso orientes. Caules breves, prostrati, tenuiores, sed firmi, sicco brunneoli, laeviusculi, nodis vix incrassatis, internodiis brevibus (usque 4 cm lg.), simplices, frequenter usque

ad apices foliati, in apicali parte et ad insertiones dense et paulo longius pubescentes, ceterum brevissime et parcius hirtuli, basin versus deglabrati (pilis glanduliferis nullis), panicula florali deficiente, inflorescentiis partialibus (spurie) axillaribus. Folia (summis magis acutis exceptis) subconformia, minora, petiolo c. 1 mm crasso, apud folia inferiora summopere laminae dimidiam v. tertiam partem attingente, apud cetera ea plurimo breviora, initio densius hirta, dein deglabrata suffulta, lamina usque 30 mm lg. et 15 mm lt., ovato-elliptica, basi obtusa v. rotunda v. subtruncata, in petiolum vix contracta, sursum \pm angustata, apice obtusiuscula v. acutiuscula, iuniora dorso hirtula, adulta glabra, vivo verisimile paulo succulenta, sicco griseobrunneola v. griseoviridula, opaca, infra paulo pallidiora, in margine obscure v. haud lobulata. Inflorescentiae partiales glabrae, initio pedunculo debili, 10-18 mm lg., denique valde (ad 30-54 mm) elongato, f. setacco, saepe leviter arcuato, rigide laterale patulo suffultae, initio subcapitatum contractae, solum 4-5 mm lt., mox laxiores, breviter paniculatae, e ramis paucis, brevibus, umbellatim ordinatis, apice 1-v. paucifloris et ex axi paulo magis elongato (c. 10 mm lg.), capitulum 2-5 florum gerente constantes. Flores f. sessiles, bracteis bracteolisque lanceolato-subulatis. Perianthia "pink" (non aperta) 2.5 mm lg.; pars ovarialis pyriformis ac clavata, sparse ad sparsissime hirtula. Stamina minuta, 2 v. 3. Anthocarpia parva, f. sessilia, 3 mm lg., 1 mm crassa, clavata, superne obtuse attenuata, versus basin sensim attenuata, f. glabra, viridi-brunneola, costis obtuse prominulis, areis intercostalibus raphidophoris, q. costis paulo solum latioribus.

Oahu: in Diamond Head crater, prostrate shrub, flower pink, May 11, 1930, E. Christophersen and H. St. John no. 1325.

At hand is also a fragment of a robust specimen of this variety, stem 5 mm thick, internodes to 8 cm long, blade (of a single leaf well developed) up to 56 mm long and 40 mm wide, ovate, inflorescence below of 2 opposite branches, above formed of 3 umbellate branches; flowers and fruits as in 1325.

Oahu: Maunaloa, altitude 0-50 feet, March 25, 1933, N. H. Krauss.

Boerhaavia diffusa Linnaeus variety **gymnocarpa** Heimerl, new variety (pl. 3).

Caules prostrati, ultra metrales, tenuiores (infra solum 2.5 mm crassi), sicco griseoviridescens ad brunneoli, paulum striati, internodiis \pm elongatis (usque 12 cm lg.), ad nodos leviter incrassati, glabri, frequenter ramosi, inferne magis axilliflori, superne \pm conspicue in paniculas florales, remote et decrescente foliatis abeuntes. Folia (summis diminutis magis oblongis ad sublanco-latis, \pm acutis exclusis) petiolo quam lamina plurimo breviora, c. 1 mm crasso, glabro suffulta, \pm late ovata ad ovato-oblonga, lamina usque 23 mm lg. et 15 mm lt., basi rotundata, antice \pm obtusa, glabra, veris. succulenta, sicco opaca, viridigriseola, concolori, integra. Inflorescentiae partiales glabrae, pedunculo ad anthesin tenui, 8-20 mm lg., dein usque ad 60 mm elongato, rigido, erecto v. patulo suffultae, capitulum densum, pluriflorum, c. 5 mm lt. formantes. Flores subsessiles, bracteolis lanceolatis, cuspidatis, c. 1-2 mm lg. Perianthia (rubra?) 3-3.5 mm lg. (non aperta); pars ovarialis subovoidea ad ellipsoidea, c. 1.5 mm lg. et f. 1 mm lt., glaberrima. Stamina 2 v. 3, c. 3-4 mm lg. Stylus \pm 3 mm lg.

Anthocarpia subsessilia, 4-5 mm. lg., usque 1.5 mm lt., lineari-fusififormia, basin et apicem versus f. aequae angustata, apice obtusiuscula, glaberrima, costis modice et obtuse prominulis, angustis, brunneis, areis intercostalibus griseobrunneolis, q. costis latoribus. Fructus (vix maturus) \pm 2 mm. lg., clarius brunneus, cuneatus.

Differs from variety *tetrandra* to which it is similar in habit as follows: stems and branchlets, petioles, and blades very glabrous, with inflorescences head-like, dense, several-flowered; flower sessile, lower part of perianth glabrous, with 2-3 stamens only; with anthocarps subsessile, glabrous, and more or less linear-fusifiform.

Oahu, Makua, top of beach, prostrate creeper, October 20, 1929, H. St. John no. 9947.

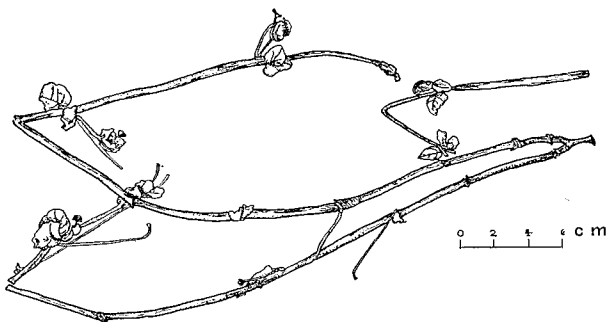


FIGURE 2. *Boerhaavia diffusa* variety *pseudotetrandra*.

***Boerhaavia diffusa* Linnaeus variety *pseudotetrandra* Heimerl, new variety (fig. 2).**

Caules prostrati, longissime ("6-8 feet") repentes, ramosi, inferne lignosi et ad 5 mm crassi, pallide brunnei, rugulosi, nodosi, aphylli, ceterum (et in ramificationibus) tenuiores, griseobrunnei, laeviusculi, internodiis usque 11 cm lg., leviter solum ad nodos incrassati, frequenter et superne \pm decresceter foliati, sparsius et brevissime hirtuli, tamen indumento in nodis et summitates versus densiore et longiore, non glandulosi, inflorescentiis partialibus (spurie) axillariibus, paniculam apicalem vix formantibus. Folia pleraque conformia, minora, petiolo quam lamina \pm breviora, \pm dense pilis inaequilongis pubescente suffulta, lamina usque 28 mm lg. et lt., suborbiculata ad latissime ovata, basi rotunda ad subtruncata, antice late rotundata, subglabra v. sparse hirtula, verisimile f. succulenta, sicco concolori, brunnea, opaca, f. integra. Inflorescentiae partiales f. glabrae, initio pedunculo c. 9 mm. lg., dein \pm stricte patente, usque ad 75 mm elongato suffultae, capitatae, pluriflorae, densae. Flores sessiles v. subsessiles, bracteis bracteolisque 1-2 mm lg., oblongis, acutiusculis. Perianthia (rubra?, omnia clausa) 3 mm lg.; pars ovarialis 1 mm lg., f. 1 mm lt., globoso-obovoidea, sparsius piligera. Stamina 2 v. 3. Anthocarpia (misera) 4 mm lg., clavata, breviter patule hirta.

Differs from variety *tetrandra* as follows: in very long stems, woody below, in part with longer hairs, in petioles covered more or less densely with soft hairs of unequal length, in capitate, many flowered, dense inflorescence, in 2-3 stamens.

Molokai: Kawakui Road, Kaluakoi, sand dune, with wind, altitude 550 feet, prostrate, stems 6-8 feet long, December 22, 1932, H. St. John, R. J. Baker, J. W. Coulter, F. R. Fosberg, T. G. Yuncker no. 12451.

Similar and related to the preceding is a fragment from Fiji: Naiabo Island, with *Portulaca* on sand or coral beach, altitude 1.5-2 meters, prostrate herb, 10-20 cm high, flower white, fruit not mature, August 7, 1924, E. H. Bryan, Jr. no. 451.

Genus BOUGAINVILLEA Commerson

Bougainvillea spectabilis Willdenow.

Austral Islands: Raivavae, Raiurua, altitude 3 meters, cultivated, climbing over trellis, vine, flower perianth white, bracts magenta, August 9, 1934, F. R. Fosberg no. 11796.

Bougainvillea glabra Choisy.

Mangareva: Point Teone Kura, altitude 2 meters, cultivated, climbing over porch, vine, 4 meters high, flower bracts magenta, June 5, 1934, F. R. Fosberg no. 11122.

Bougainvillea glabra Choisy (form with broadly ovate leaves).

Mangareva: Point Teone Kura, altitude 2 meters, cultivated vine, flower apparently red, but very young, June 5, 1934, F. R. Fosberg no. 11120.

Bougainvillea (form intermediate between *B. glabra* and *B. spectabilis*).

Austral Islands: Tubuai, Mataura, altitude 1 meter, cultivated, vine, flower corolla white, bracts magenta, August 16, 1934, F. R. Fosberg no. 11807.

Genus PISONIA Plumier

Pisonia grandis R. Brown.³

Fanning Island: Cable Islet, old woods, altitude 2 meters, erect tree, 10 meters high, 40 cm diameter, bark smooth, gray, April 21,

³The types of Robert Brown bear the locality citation: Australia, north coast, *iter austr.*, 1802-1805 (♂, ♀, fr.).

1934, H. St. John and F. R. Fosberg no. 14111 (leafy branch with very large leaves, blade up to 310 mm long and 142 mm wide).

Christmas Island: Motu Tabu, on coral gravels, tree, October 21, 1934, H. St. John and C. M. Cooke, Jr. no. 17479 (branches with juvenile pistillate inflorescence).

Flint Island: *Tournefortia* thicket by beach, on fine broken coral, altitude 1 meter, tree, rare, 8 meters high, 70 cm diameter, flower greenish, bark gray, wood white, soft, October 16, 1934, H. St. John and F. R. Fosberg no. 17465 (branches bearing pistillate flowers and good foliage).

Tuamotu Archipelago: Tepoto, coral gravel, common tree back of beach, altitude 2 meters, erect tree, 15 meters high, 100 cm diameter, May 16, 1934, H. St. John no. 14337 (branch with staminate flowers); Tepoto, altitude 2 meters, woods near shore, erect tree, 10 meters high, 60 cm diameter, May 16, 1934, H. St. John no. 14340 (branch with good leaves); Hao, Tekotika, coral gravel, altitude 2 meters, erect tree, 8 meters high, 60 cm diameter, bark smooth, greenish gray, sapwood white, May 19, 1934, H. St. John no. 14375 (branches with good leaves, the blade up to 222 mm long and 90 mm wide). Native names, *puka* (no. 14337), *gatae* (nos. 14340, 14375).

Austral Islands: Maria Island, southeast islet, broken coral, altitude 3 meters, tree, sterile, September 6, 1934, F. R. Fosberg no. 12065 (branch with large leaves, the blade up to 230 mm long and 100 mm wide); Maria Island, middle islet, thick forest, coral sand, altitude 2 meters, tree 8 meters high, sterile, September 6, 1934, F. R. Fosberg no. 12102 (branches with good leaves); Maria Island, southwest islet, *Pandanus* forest, broken coral, altitude 3 meters, tree, 5 meters high, sterile, September 6, 1934, F. R. Fosberg no. 12114 (branches with good leaves); Maria Island, northeast islet, woods on coral sand, altitude 2 meters, tree, 15 meters high, diameter 200 cm, September 6, 1934, H. St. John no. 16953 (leafy branches); Rurutu, Moerai, above beach, altitude 1 meter, hollow tree, 20 meters high, 360 cm diameter, sterile, August 29, 1934, F. R. Fosberg no. 11945 (branch stout, bearing leaves); Rimatara, Amaru, woods on coastal sandy flat, altitude 3 meters, tree 20 meters high, 400 cm diameter, September 5, 1934, H. St. John no. 16920 (sterile branches); Tubuai, Rautaro Islet, woods on coral sand, common, altitude 1 meter, tree 8 meters high, flower with very sweet fragrance, perianth pale

green, slightly lobed, the tube at summit pleated between the lobes, stigma branches many, white, August 19, 1934, H. St. John no. 16380 (pistillate-flowering branch with large leaves, blade up to 260 mm long and 170 mm wide); Raivavae, Motu Tehau, coral gravel, altitude 1 meter, shrub, 2 meters high, August 11, 1934, H. St. John and S. G. Wight no. 16141 (sterile, large-leaved branch).

Oeno Island: *Tournefortia* woods on coral sand, altitude 3 meters, shrub, 2 meters high, common as shrub, only 1 tree seen, June 23, 1934, H. St. John and F. R. Fosberg no. 15186 (leafy branches).

Henderson Island: north end, jungle on elevated coral, altitude 30 meters, tree 6 meters high, 20 cm diameter, flower white, June 17, 1934, H. St. John and F. R. Fosberg no. 15075 and no. 15131 (tree 10 meters high, 30 cm diameter, bark gray, June 18, 1934) (branches with pistillate flowers); north center, woods on elevated dissected coral, altitude 30 meters, tree 7 meters high, fruit sticky, June 20, 1934, H. St. John and F. R. Fosberg no. 15170 (branches bearing fruit).

Genus *CEODES* Forster

Ceodes umbellifera Forster.⁴

Austral Islands: Rurutu, 1.5 kilometers north of Avera, open slope, altitude 350 meters, tree 7 meters high, 20 cm diameter breast high, flower sweet, white, August 25, 1934, H. St. John and Don Anderson no. 16628 (pistillate flowers, perianth tetramerous).

Mangareva: Mount Mokoto, south side, upper forest, moist old woods, altitude 310 meters, tree 7 meters high, flower pinkish, deeply lobed, June 2, 1934, H. St. John no. 14849 (staminate flowers, perianth tetramerous); Mount Mokoto, south side, moist old woods, base of basalt cliff, altitude 290 meters, erect tree, 8 meters high, 20 cm diameter, flowers pinkish, June 4, 1934, H. St. John no. 14872 (staminate flowers, perianth tetramerous); Mount Mokoto, south side, woods at base of basalt cliff, altitude 330 meters, tree 10 meters high, 70 cm diameter, flower pink, deeply lobed, June 7, 1934, H. St. John no. 14897 (staminate flowers, perianth tetramerous). Native name, *pokea* (no. 14849).

Pitcairn: Parlver Valley Ridge, moist upper woods, altitude 300 meters, erect tree, 8 meters high, 50 cm diameter, flower pink, lobed,

⁴ Professor C. Skottsberg has recently published: *Svensk Botan. Tidskrift*, XXX, pp. 724, 725, (1936), figs. 1 and 2, photos of types of *Ceodes umbellifera* (♂).

heavy sweet fragrance, June 13, 1934, H. St. John no. 14975 (staminate flowers, perianth tetramerous). Native name: *wærwæe* (no. 14975).

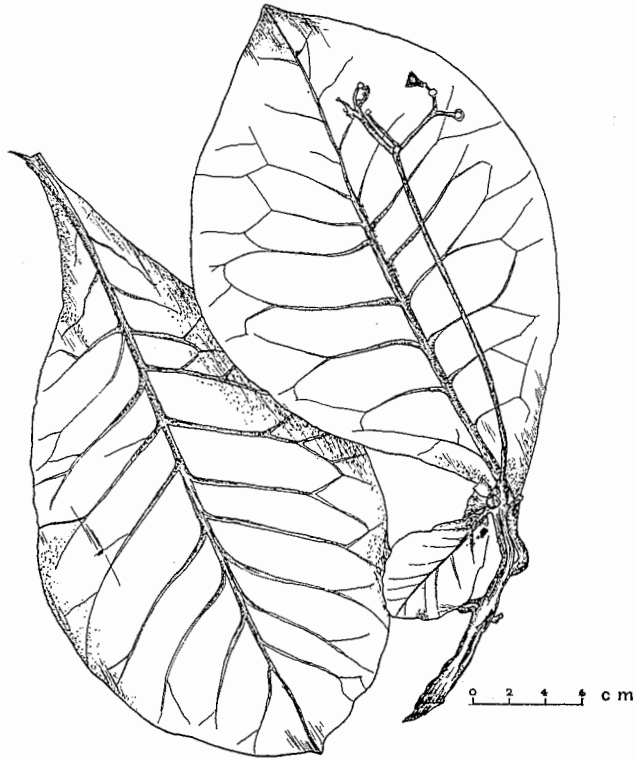


FIGURE 3. *Ceodes umbellifera* forma *amplifolia*.

***Ceodes umbellifera* Forster forma *amplifolia* Heimerl, new form (fig. 3).**

Arbor usque 7 metralis, ramis validis, foliis magnis (lamina usque 335 mm lg. et 197 mm lt.), aut (propter laminam usque ad insertionem decurrentem) sessilibus aut bene (petiolo anguste solum alato, usque 25 mm lg.) petiolatis, late ad latissime obovatis v. obovato-ellipticis, basin versus v. citius v. longe angustatis ad attenuatis, antice obtusis ad late rotundatis, raro paululo et obtuse in apice productis; inflorescentiis pedunculis validis (2.5 mm crassis) 75-195 mm lg. suffultis, ♀ usque 60 mm lt.; perianthiis ♂ c. 8 mm lg., infundibuliformibus, 4 lobatis, staminibus 7, 10, germinis rudimento 3.5 mm lg., stylo brevi, crasso, apice obtuso; perianthiis ♀ (± defloratis) ex ovata basi campanulatis, usque ad faucem 4-5 mm lg., limbo 6-7 mm lt., 4-lobato, stylo limbum 2 mm superante, staminodiis 2-3 mm lg.

Austral Islands: Tubuai, Taitaa, northeast slope, dense upper woods, altitude 320 meters, tree 7 meters high, 10 cm diameter, August 16, 1934, H. St. John no. 16352 (sterile branches); Raivavae, Mount Muanui, south slope, woods at bottom of ravine, altitude 180 meters, tree 4 meters high, flower reddish green outside, August 8, 1934, F. R. Fosberg no. 11698 (type), (staminate flowers; the few perianths examined tetramerous); Raivavae, Mount Muanui, east slope, moist woods, altitude 220 meters, tree 6 meters high, 4 cm diameter, flower pink, perianth lobed, August 8, 1934, H. St. John no. 16039 (pistillate flowers; perianth tetramerous).

Ceodes umbellifera Forster forma *cyclophylla* Heimerl, new form (fig. 4).

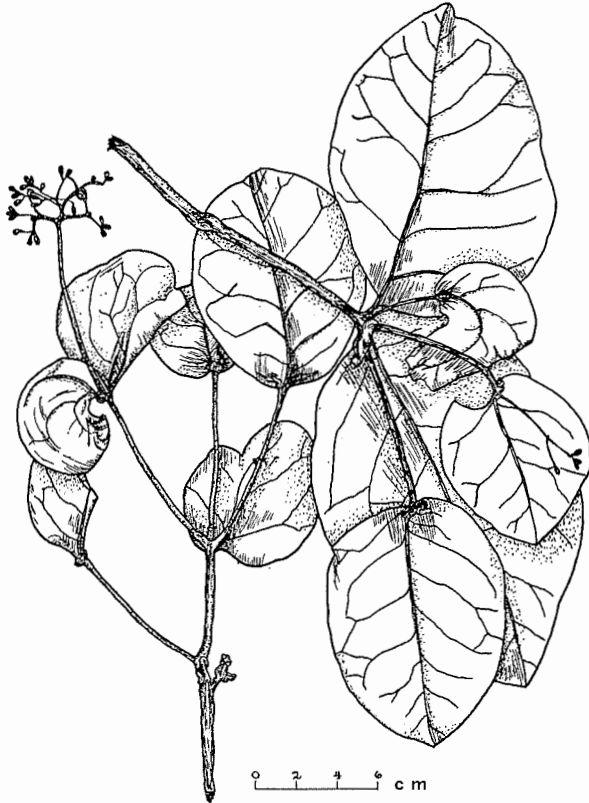


FIGURE 4. *Ceodes umbellifera* forma *cyclophylla*.

Differt a forma *amplifolia* ramis tenuioribus, foliis (lamina usque 222 mm lg. et 155 mm lt.) sessilibus, in ambitu f. orbiculatis v. latissime ellipticis, basi rotundatis ad levissime cordatis, antice v. late v. obtuse rotundatis; florum gemmis ♂ eodem germinis rudimento ut in forma *amplifolia*.

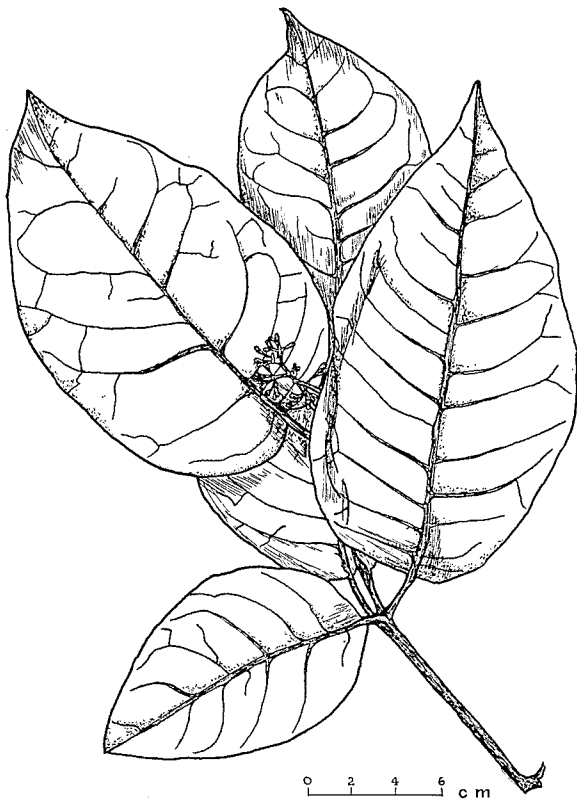


FIGURE 5. *Ceodes umbellifera* forma *samoensis*.

Austral Islands: Tubuai, Taitaa, northeast slope, moist upper woods, altitude 350 meters, tree 7 meters high, 10 cm diameter, flower white, August 20, 1934, H. St. John no. 16443 (the branches at hand sterile, only one branch with juvenile staminate inflorescence).

***Ceodes umbellifera* Forster forma *samoensis* Heimerl, new form** (fig. 5).

Specimina (omnia pulchre foliata) imprimis foliorum forma spectabilia videntur: foliis magnis, \pm longe (usque 32 mm) petiolatis, in lamina usque 238

mm lg., in speciminibus Rechargingianis usque 86 mm, in iis a Christophersen lectis usque 118 mm lt., plerisque infra laminae dimidium v. c. in inferiore tertia parte latissimis, e basi late rotundata v. f. subcordata v. \pm obtusata sursum angustatis ad acuminatis, in apice ipso (nonnunquam f. producto) acutiusculis ad acutis; inflorescentiis δ (iuvenilibus) tenuiter pedunculatis; perianthiis δ (nondum apertis) staminibus 10, germinis rudimento stylo obtuse truncato; perianthio φ (singulo inspecto) tetramero, ovato-campanulato, a basi usque ad loborum apices 4.5 mm lg., lobis ovatis, 2 mm lg., 1.5 lt., obtusiuculis, erecto-patulis, limbo c. 4 mm. lt., stylo limbum 2 mm superante, staminodiis 6, 1.5-2.5 mm lg.

Samoa: Upolu, at Laulii in primeval forest, shrub, flowers white (branches bearing juvenile staminate flowers), June 12, 1905, nos. 241 and 847; Upolu, region above Utumapu, altitude about 400-500 meters, shrubby tree, June 23, 1905 (branches bearing very few pistillate flowers), K. and L. Recharging no. 1537, in herbarium of Museum of Vienna. ("Reise nach den Samoa-Inseln 1905, No. 241, 847. Insel Upolu. Bei Laulii im Urwald. Strauch, Blüten weiss. 12. VI. No. 1537. Insel Upolu. Kammgebiet ober Utumapu, c. 400-500 m. Strauchartiger Baum. 23. VI. Coll. K. und L. Recharging.") Savaii, Tapueleele forest, altitude \pm 200 meters, tree, 3-4 meters high, December 19, 1931, E. Christophersen no. 3461 (type), (branch bearing juvenile staminate flowers). Native name, *taipoipo* (no. 3461).

***Ceodes umbellifera* Forster forma *acuminata* Heimerl, new form (fig. 6).**

Differt a forma samoensis foliis minoribus (lamina summopere 150 mm lg. et 80 mm lt.), vulgo f. exacte in dimidio latissimis, late ellipticis ad elliptico-lanceolatis, saepe utrinque f. aequae acuminatis, tamen p. p. basi magis obtusiusculis breviterque in petiolum (usque 40 mm lg.) attenuatis, antice acutis ad acutissimis; inflorescentiis δ pedunculo tenui, 30-55 mm lg. suffultis, vix ultra 33 mm lt., v. breviter paniculatis v. corymbosis, ramificationibus tenuibus, ramis apice paucifloris; floribus δ pedicellis tenuibus, c. 4-6 mm lg. suffultis; perianthiis δ minoribus, ovato-campanulatis, a basi ad faucem 3 mm lg., limbo 4.5-6 mm lt., saepe 4- (etiam 5-) partito, lobis acutiusculis, staminibus 7-8, 3.5-5.5 mm lg., germinis rudimento 4.5-5 mm lg., stylo + 1 mm lg., e limbo exserto, apice paulo curvato et truncato, unilaterale papilloso.

Fiji: Taviani, vicinity of Waiyevo, altitude 300 meters, February 27, 1928, John W. Gillespie no. 4737 (many branches staminate).

***Ceodes umbellifera* Forster variety *coronata* Heimerl, new variety (fig. 7).**

Arbor ramis saepe f. regulare furcatim partitis, frequenter verticillatim foliatis, inflorescentiis φ (iuvenilibus) et in ramificationum angulis et in earum apicibus compluribus, approximatis, initio omnibus partibus dense ferrugineo-

puberulis. Folia varia, saepius tamen \pm late elliptica v. ad formam obovato-ellipticam vergentia, in lamina usque 155 mm lg. et 87 mm lt., in v. paulo supra dimidium latissima, e basi cuneata v. obtusata in petiolum (8-40 mm lg.) v. contracta v. longius angustata ad acuminata, antice v. rotundata v. obtusata v. modice attenuata et obtuse paululo producta. Inflorescentia \varnothing (adest singula, iam in fructif. vergens) pedunculo crassiore, 70 mm lg. suffulta, c. 75 mm lt., corymboso-convexa, f. exacte biumbellata, subdensiflora, ramis apice pleiochasia umbelliformia, usque 15-flora gerentibus. Perianthia \varnothing ("fruit green") pedicellis 2-10 mm lg., paulo crassioribus suffulta, e basi ovata infundibuliformi-campanulata, a basi usque ad lobos 4-7 mm lg., limbo 7-8 mm lt., vulgo 4- (p. p. etiam 5-) lobato, lobis maiusculis, ovatis, 3-4 mm lg. et 2-3 mm lt., sicco intus brunneis, extus atris, sed in margine incrassato et revoluto pallide brunneis, itaque bicoloribus. Staminodia \pm 2 mm lg. Stylus limbum 2-4 mm superans.

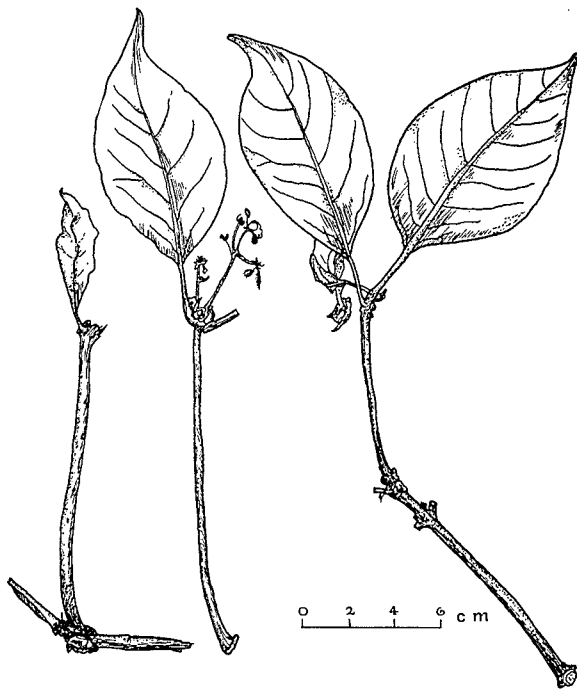


FIGURE 6. *Ceodes umbellifera* forma *acuminata*.

New variety with lobes of perianths noteworthy in being margined, bicolored and twice as large as other forms of *C. umbellifera*.

Rapa: Itaraia, dense woods, altitude 30 meters, tree 10 meters high, flower buds pink, fruit green, July 10, 1934, H. St. John and Jean Maireau no. 15463.

Ceodes siphonocarpa Heimerl, new species from the group *C. umbellifera* (fig. 8).

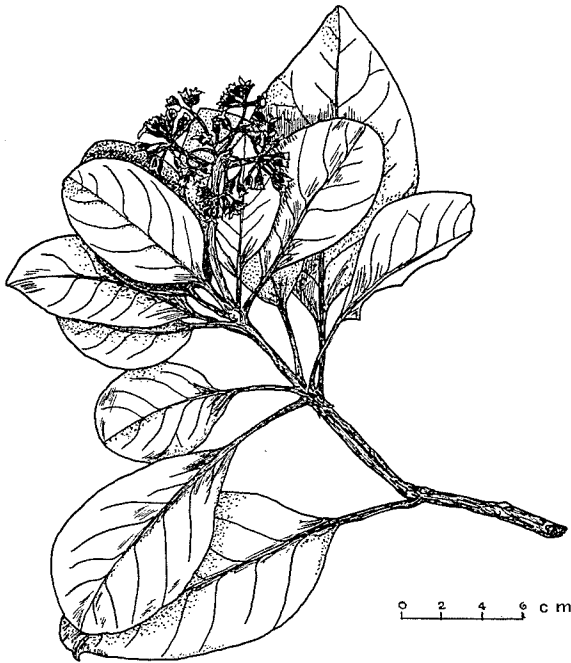


FIGURE 7. *Ceodes umbellifera* variety *coronata*.

"Spreading tree, 10 feet high." Ramus (singulus, qui suppetit) simplex, validiusculus, strictus, griseo-brunneolus, glaber, tenuiter striolatus, internodiis 4-9 cm lg., ad nodos \pm incrassatus, opposite foliatus et apice foliorum verticillum gerens, inflorescentiis fructigeris certe (ut in affinibus) ramum terminantibus. Folia (adsunt pauca) petiolo 12-18 mm lg. et 3 mm crasso suffulta, late elliptica, in lamina 170-180 mm lg., 92-98 mm lt., f. aequae utrinque angustata, dimidio latissima, basi obtusiuscula et paululo secus petiolum decurrentia, apice \pm obtusiuscula, glabra, coriacea, opaca, margine non revoluto, in sicco concoloria, e viridi brunneola, nervatura f. utraque in facie aequae evoluta, costa valida, prominente, nervis lateralibus 10-12 utrinque, sub 60-80° abeuntibus, rectiusculis, tenuibus, ante marginem coniunctis, ceterum f. eramosis, paulo solum prominentibus. Inflorescentiae δ (adsunt 3, separatim agglutinatae) "small in branches," inconspicuae, usque 25 mm lt., pedunculo 36-53 mm lg., tenui suffultae, glabrae, ramis 3-4, f. umbellatim dispositis, usque 12 mm lg., apice flores paucos portantibus. Flores δ (exstant paucissimi) tenuiter (4 mm) pedunculati. Perianthia infundibuliformia, usque ad apicem 6-7 mm lg., lobis 5, ovato-triangularibus, obtusiusculis, usque 2.5 mm lg. et 2 mm lt., subrectis. Stamina 9 (in singulo

flore), usque 9 mm lg. Germinis rudimentum 3 mm lg., stylo oblique truncato, stigmate oblongo, unilaterali, minute papilloso. Inflorescentiae fructigerae (adsunt 2) pedunculo 10-37 mm lg. et f. 3 mm crasso suffultae, minores, c. 80 mm lg., f. glabrae, ramis usque 5, f. umbellatim dispositis, usque 35 mm lg. (basi et apice contractis), ramulis 2-3, tenuibus, (vix 1 mm crassis), 10-20 mm lg., anthocarpia singula in apice gerentibus. Anthocarpia (submatura) 34-42 mm lg., basi breviter in pedunculum angustata, c. tubuliformia, rectiuscula v. leviter arcuata, f. glabra, vivo "viridia," sicco infra pallidius, supra saturatius brunnea, infra dimidium v. in inferiore tertia parte fusiformia, 3-4 mm crassa, dein sursum in rostrum longum, 1-1.5 mm crassum v. sensim v. citius attenuata, rostro in apice coronam cyathiformem, 3 mm lg. et lt., prominenter 4-5 lobulatam (lobulis breviter ovatis, in margine incrassatis) gerente, in sectione transversa 4-5 angulata, angulis angustis, brunneis v. atris, inferne leviter, in parte rostriformi magis prominulis, paululo (denique verisimile magis) glutinosus. Fructus (c. 14 mm lg., 2 mm lt.) solum partem inferiorem, fusiformem anthocarpium obtegens, anguste cylindricus, basi annulo staminodiorum, c. 2 mm lg. circumdatus, apice styli rudimentum filiforme gerens.

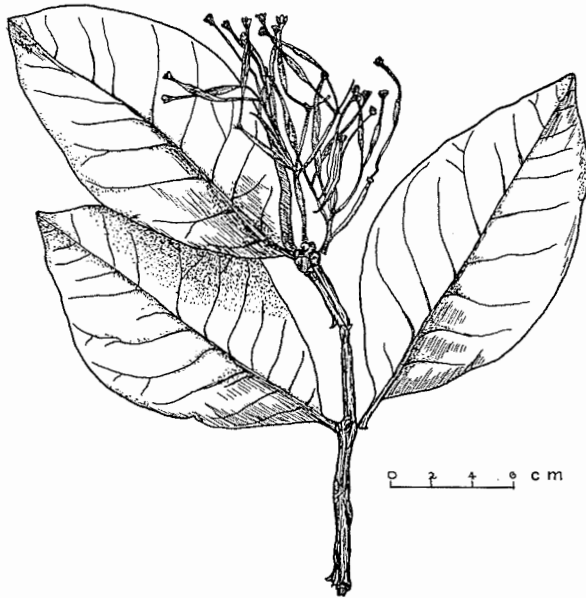


FIGURE 8. *Ceodes siphonocarpa*.

Society Islands: Moorea, Opunohu Valley, dense woods, damp, altitude 300 feet, September 25, 1926, G. P. Wilder no. 510. Native name, *pukatea*.

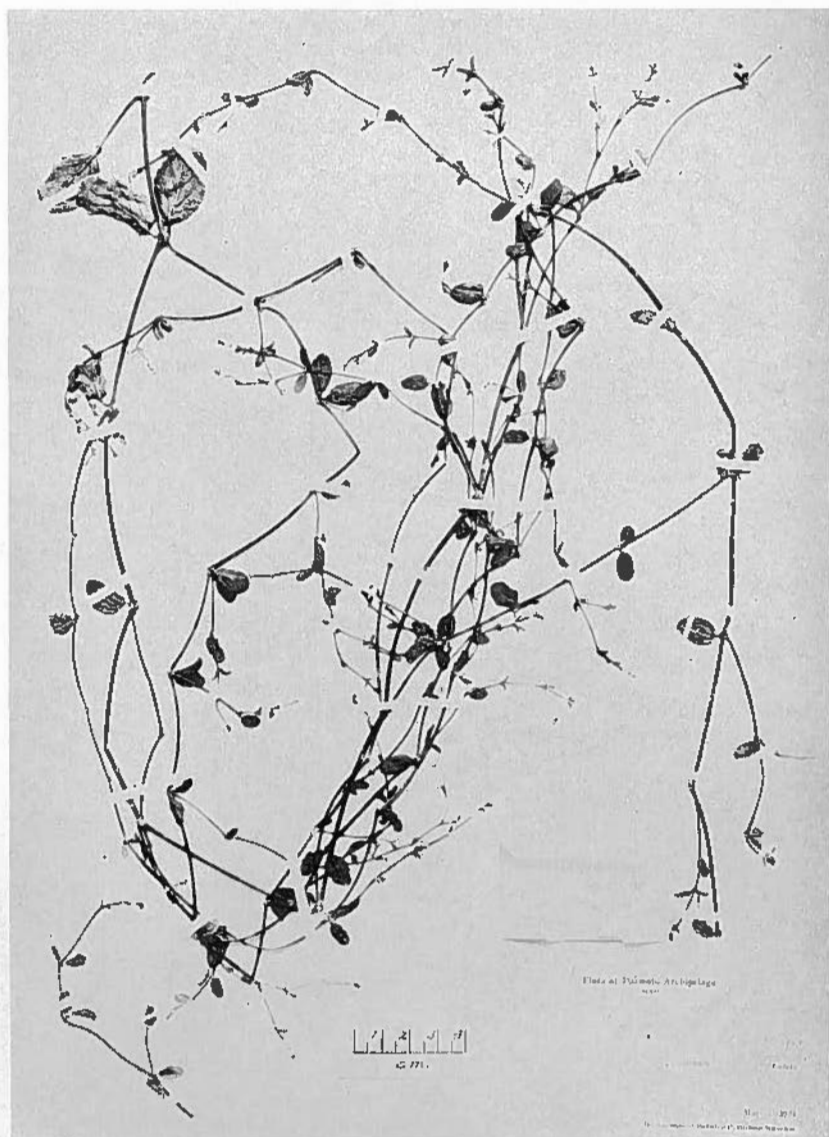


PLATE 1. *Boerhaavia diffusa* variety *tetrandra* forma *ramosa*.

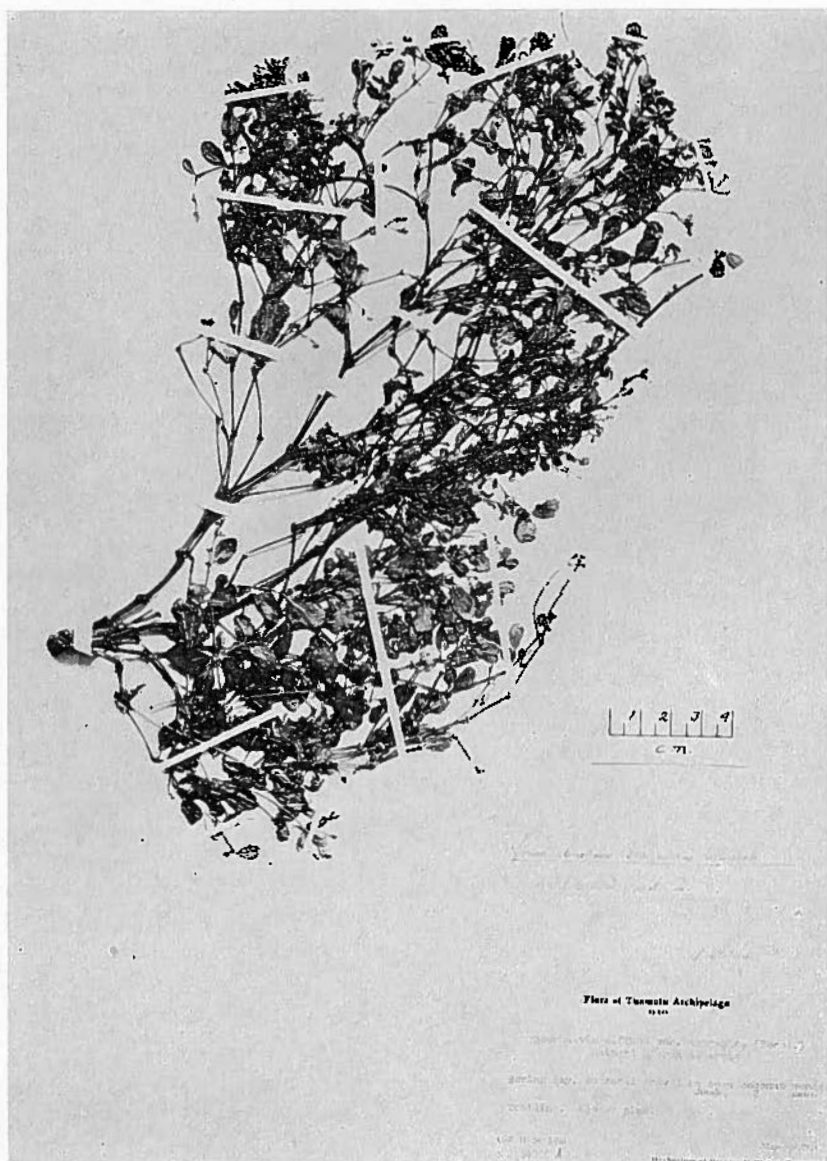


PLATE 2. *Boerhaavia diffusa* variety *tetrandra*, abnormal form.

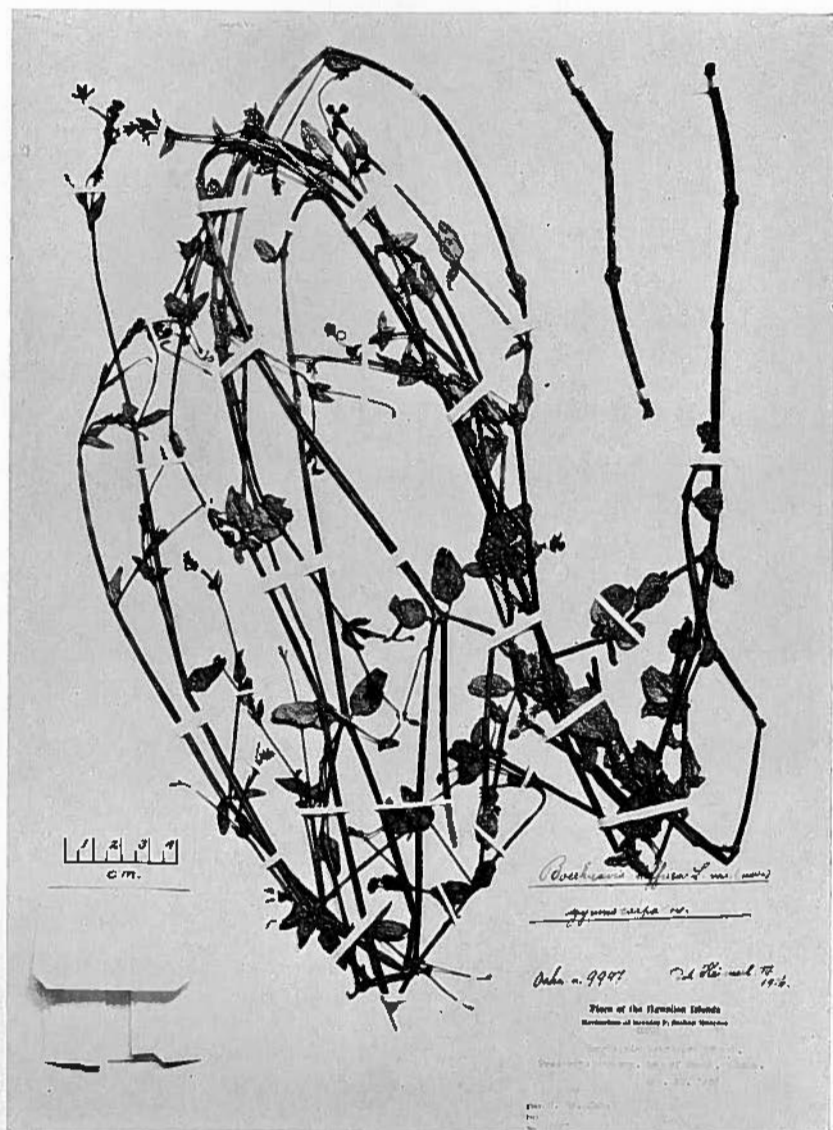


PLATE 3. *Boerhaavia diffusa* variety *gymnocarpa*.