OCCASIONAL PAPERS
OF
BERNICE P. BISHOP MUSEUM
HONOLULU, HAWAII

Volume XVIII | September 18, 1946 | Number 16

The Genus Peperomia in the Galapagos Islands

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The late professor William Trelease, the world's foremost authority on the Piperaceae after the death of Casimir deCandolle, made some preliminary notes on the Galapagos species a number of years before his death. Because of my interest in the species of the Pacific Ocean area, he asked me to study those of the Galapagos Islands and gave me his notes. These notes, which I gratefully acknowledge, have been useful in the preparation of the present paper.

Knowledge of the species of *Peperomia* occurring in the Galapagos Islands is based chiefly on the collections of Charles Darwin (1835), N. J. Andersson (1852), George Baur (1891), R. E. Snodgrass and Edmund Heller (1899), Alban Stewart (1905-1906), H. K. Svenson (1930), and Thomas Howell (1932). Extensive descriptions of the flora of the archipelago have been published by J. D. Hooker (Trans. Linn. Soc. **20**: 163-262, 1847), N. J. Andersson (Kgl. Sv. Vet.-Akad. Handl., 61-256, 1853 [issued 1854]; loc. cit., 114, 1857; Linnaea **31**: 571-631, 1861), B. L. Robinson (Proc. Am. Acad. Arts and Sci. **38**: 77-269, 1902), Alban Stewart (Proc. Calif. Acad. Sci. IV, **1**: 7-288, 1911), and H. K. Svenson (Brooklyn Bot. Gard. Rec. **19**: 269-284, 1930).

All specimens which are known to be in American herbaria have been examined. Included are those at the Brooklyn Botanical Garden (B)[1], California Academy of Science (CA), Gray Herbarium (G), University of Illinois (Ill), and the United States National Herbarium (US). Type specimens of two species were also loaned by Kew Herbarium. I wish to thank those in charge who placed these collections at my disposal.

[1] The letters in parentheses will be used throughout the text as herbaria symbols.

Four species and one variety are here recognized. All, so far as known, are indigenous to the islands.

Key to the Species

Leaves opposite or alternate (infrequently verticillate).....**Peperomia petiolata**
Leaves verticillate
  Spikes mostly less than 15 mm. long (infrequently up to 20 mm.)
    Leaves smooth or nearly so.....**Peperomia galapagensis**
    Leaves more or less densely puberulent.....
    .....**Peperomia galapagensis** var. **ramulosa**
  Spikes mostly 20 mm. or more long, rarely shorter
    Leaves not more than 10 mm. long, about twice as long as wide, often reflexed.....**Peperomia obtusilimba**
    Leaves mostly 10-18 mm. long, 2.5-3 times as long as wide, rarely reflexed .....**Peperomia flagelliformis**

Peperomia petiolata Hooker f., Trans. Linn. Soc. **20**: 181, 1847 (fig. 1).

Peperomia Stewartii C. DC., in Stewart, Proc. Calif. Acad. Sci. IV, **1**: 49, 1911. (Sometimes spelled *Stewartsii*.)

Stems decumbent or creeping on humus and rocks or climbing on trees, rooting at the lower nodes, 1-2 mm. thick when dry, glabrate to more or less crisp-hirtellous with hairs commonly curving upward, freely branching, branches ascending up to 15 cm. or more in height; internodes 0.5-3 cm. long, mostly 1-2 cm.

Leaves opposite, less commonly alternate, or rarely verticillate (in some specimens the leaves are all opposite, in others they are predominatingly alternate, and in some both arrangements occur), drying dark green above, yellowish and inconspicuously black-punctate beneath, glabrous or sparingly crisp-hirtellous on the upper surface near the base, ciliated above the middle, 10-15 mm., or occasionally up to 25 mm. long, 5-15 mm. wide, palmately 3-nerved or large leaves inconspicuously 5-nerved, apex rounded, obtuse, rarely somewhat attentuated, base rounded or acutish, leaf scars conspicuous, semicircular in outline; petioles mostly 5-10 mm. long, occasionally up to 15 mm.

Spikes solitary or less frequently in clusters of 3 to 5, terminal or in the axils of the upper leaves, up to about 10 cm. long but mostly about 6-8 cm., moderately flowered, peduncles 5-15 mm. long but commonly about 8-10 mm., glabrous or sparingly crisp-hirtellous, rachis glabrous, bracts oval-orbicular, peltate, margins irregular, with yellow or black glandular dots; fruit about 0.8 mm. long, in pits on the rachis or eventually on pseudopedicels, subglobose, verrucose, viscid, the stigma subapical, pilose when young.

Some specimens examined are glabrate but none has been found to entirely lack hairs. The pubescence varies considerably in amount on different specimens as well as on different parts of the same plant. Hooker's description of Darwin's plant agrees with the glabrate specimens included here. The type of *P. Stewartii* is moderately hairy but

not sufficiently so to warrant its segregation as a separate species or variety.

Abingdon Island: common on rocks at 1,050 ft. alt., Sept. 21, 1906, *Stewart 1163* (CA, G).

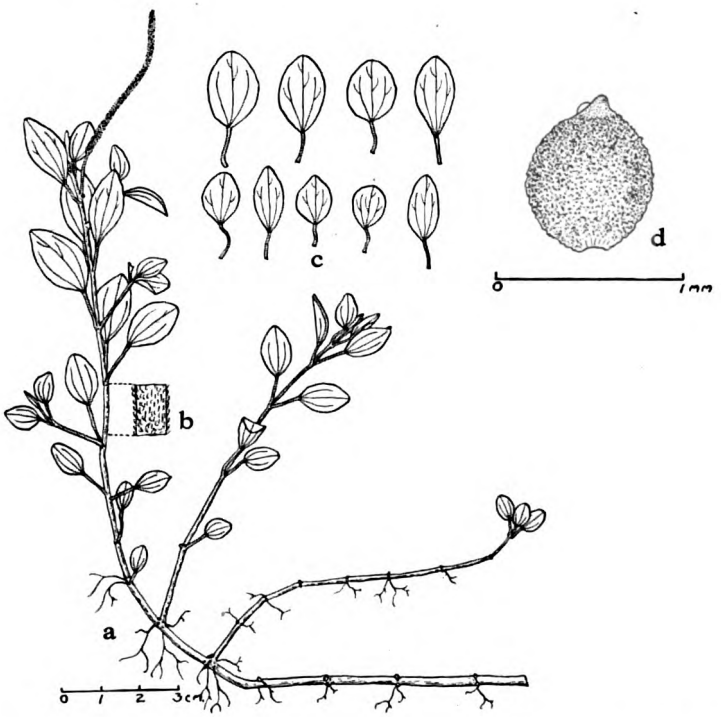

FIGURE 1.—*Peperomia petiolata:* **a,** habit; **b,** section of stem, enlarged; **c,** leaves, showing variation in shape; **d,** fruit.

Albemarle Island: Villamil, common among rocks in woodland, 350-1,500 ft. alt., Aug. 29, 1906, *Stewart 1165* (CA, US); same locality, Aug. 24, 1906, *Stewart 1164* (CA); on wood in shady lava crevice, east side, 1,750 ft. alt., three miles south of equator, May 30, 1932, *Garland Rotch* (*Howell 9629A*) (CA). This is a sterile specimen represented by slender, prostrate, rooting stems which appear to be entirely glabrous. The leaves are small but otherwise typical with crisp-hirtellous petioles. It is believed to be a juvenile specimen of this species.

Charles Island: in moist shady places at 1,000 ft. alt., Oct. 10, 1905, *Stewart 1166* (CA).

Chatham Island: southwest end, middle region, 1891, *Baur* (G).

Duncan Island: occasional among rocks at 1,200 ft. alt., Dec. 2, 1905, *Stewart 1167* (CA).

Indefatigable Island: near Fortuna, May 12, 1932, *Howell 9279* (CA); Academy Bay, damp crevices in lava rocks, 250 ft. alt., April 1, 1930, *Svenson 76* (B, G, Ill); common in shade at 950 ft. on northwest side, July 23, 1906, *Stewart 1170* (CA); climbing along tree trunks, vicinity of the plantation, six miles north of Academy Bay, 800 ft. alt., April 6, 1930, *Svenson 113* (B, G, Ill); Academy Bay, in shady places, 50-400 ft. alt., Nov. 11, 1905, *Stewart 1168 (562)*,[2] type of *P. Stewartii* C. DC. (CA); rain forest, Fortuna, May 8, 1932, *Howell 9154* (CA); Academy Bay, on rocks at 400 ft. alt., Nov. 11, 1905, *Stewart 1169* (CA, US); Academy Bay, May 4, 1932, *Howell 9097* (CA).

James Island: 1835, *Darwin* (Kew?, type, not seen); James Bay, in woodland at 850 ft. alt., not common, Dec. 30, 1905, *Stewart 1171* (CA).

Peperomia galapagensis Hooker f., ex Miquel in London Jour. Bot. **4**: 426, 1845 (spelled *gallapagensis* in DC Prodromus) (fig. 2).

Plants cespitose, on rocks and trees, drying reddish brown. Stems up to about 15 cm. in height and 2-3 mm. in thickness near the base when dry but more slender above, somewhat ridged longitudinally, freely branching with the branches strongly divergent with ascending tips, velvety puberulent, internodes 1 cm. or less long above to 2 or 3 cm. long below.

Leaves verticillate with up to 7 leaves at a node but commonly with 3 or 4, glabrous or sparingly puberulent on the upper surface when young, ciliated at the apex, drying dark above, lighter beneath, flat or more commonly with revolute margins and folded lengthwise along the midrib with the upper surface within, frequently reflexed, more or less coriaceous and roughened beneath when dry, oval-oblong or subspatulate, mostly 5-8 mm. long, 2-3 mm. wide, obscurely 1-nerved, lateral veins if present very inconspicuous, apex rounded, obtuse, occasionally retuse; petioles puberulent, channeled above, 1-2 mm. long but commonly about 1 mm. or less.

Spikes numerous, terminal or in the axils of the upper leaves, 5-20 mm. long but commonly 8-12 mm., occasionally branching, peduncles puberulent, mostly 3-4 mm. long, rarely up to 8 mm., rachis glabrous, bracts round, peltate, about 0.4 mm. in diameter; fruit subglobose, about 0.5-0.7 mm. long, verrucose, viscid, on pseudopedicels, stigma subapical.

[2] Stewart employed two sets of numbers. One was given to individual field collections, the other to the herbarium labels as the specimens were assembled. The herbarium numbers are the same as those published in his paper, but, unfortunately, the field numbers are applied to some specimens in herbaria. If known, the field number is given within parentheses after the herbarium number.

Abingdon Island: 1,700 ft. alt., June 1899, *Snodgrass and Heller 837* (G). This specimen is sterile but it agrees well in its vegetative characters with this species.

Albemarle Island: Villamil, common on the branches of trees above 400 ft., *Stewart 1148* (*6286*) (CA, G, US).

Charles Island: June 1891, *Baur* (G); *Charles Darwin* Sept. 1835 (Kew).

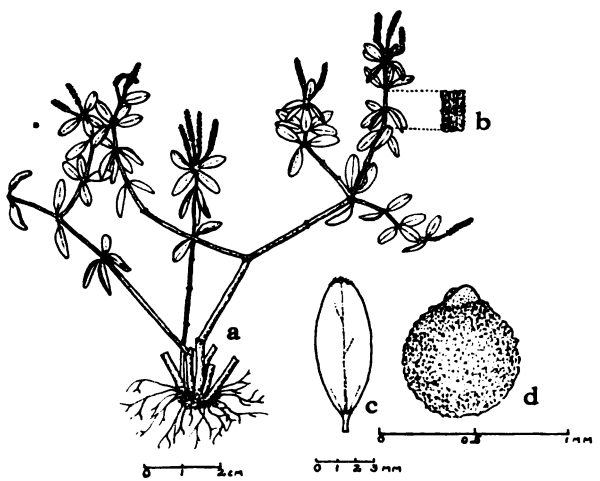

FIGURE 2.—*Peperomia galapagensis:* **a**, habit; **b**, section of stem, enlarged; **c**, leaf; **d**, fruit.

Duncan Island: on rocks and bushes at 1,275 ft., Dec. 2, 1905, *Stewart 1149* (*3156*) (CA, G).

Indefatigable Island: Academy Bay, on rocks and trees above 350 ft., Nov. 9, 1905, *Stewart 1152* (*470*) (G); southeast side on trees and bushes at 625 ft., Oct. 28, 1905, *Stewart 1151* (*1786*) (CA, G); vicinity of the plantation six miles north of Academy Bay. Epiphyte. Abundant. 750 ft. alt., April 6, 1930, *Svenson 111* (B, Ill); rain forest near Fortuna, May 8, 1932, *Howell 9150* (CA); Academy Bay, epiphyte in *Scalesia* forest, leaves light green with brown margins, 500 ft. alt., April 2, 1930, *Svenson 55* (B, G, Ill).

James Island: October 1835, *Darwin* (Kew, type); James Bay, on the branches of trees above 1,300 ft., Dec. 26, 1905, *Stewart 1150* (*3882*) (CA, G, US).

Peperomia galapagensis Hooker f. var. **ramulosa** (Andersson) Yuncker, n. comb.

Peperomia ramulosa Andersson, Kgl. Sv. Vet.-Akad. Handl., 158, 1853 [issued 1854].

Peperomia Snodgrassii C.DC. in Robinson, Proc. Am. Acad. Arts and Sci. 38: 131, 1902.

Leaves more or less densely puberulent. Otherwise resembling the species.

Abingdon Island: Occasional on trees at 1,500 ft., Sept. 21, 1906, *Stewart 1153* (*8712*) (CA).

Albemarle Island: Iguana Cove, on trees and bushes, May 1899, *Snodgrass and Heller 130* (G), type number of *P. Snodgrassii*. This specimen is composed of only a few fragments of stems, leaves and spikes but they agree in all respects with the others included here: Villamil Mt. above San Tomas, epiphytic, April 29, 1932, *Howell 8988* (CA).

Charles Island: 1852, *Andersson* (Stockholm?, type, not seen); common in decayed moss on the branches of trees at 1,700 ft., Oct. 7, 1905, *Stewart 1162* (*794*) (CA, G).

Indefatigable Island: South slope of the mountain, epiphyte on *Xanthoxylon* trees, not uncommon, 2,000 ft. alt., April 9, 1930, *Svenson 217* (B, G, Ill); Mt. Crocker, May 9, 1932, *Howell 9233* (CA).

The numerous short spikes and folded, often reflexed leaves, especially on mature specimens, serve to identify this species. With the exception of the amount of pubescence, I can find no essential difference between *P. ramulosa* as described by Andersson and *P. galapagensis* as here constituted.

Peperomia obtusilimba C. DC. in Stewart, Proc. Calif. Acad. Sci. IV, **1**: 49, 1911 (fig. 3).

Plants epiphytic or on rocks, somewhat cespitose, mostly scarcely up to 15 cm. tall, freely and divaricately branching, branches curving upward. Stems up to 3 mm. thick near the base when dry, branches slender, moderately to densely puberulent, internodes commonly 5-10 mm. long above, up to 15 mm. long below.

Leaves whorled, commonly 3 to 5 at a node, mostly drying thin and membranous and not folded but frequently reflexed on older branches as found in herbarium specimens, dark above, lighter beneath, glabrous on both surfaces or sometimes sparingly puberulent near the base on the upper surface, obscurely ciliated at the apex, elliptic-oblong, mostly 6-11 mm. long, 3.5-5 mm. wide, apex rounded, obtuse or occasionally sub-retuse, base rounded or subacute, palmately 3-nerved or, if 5-nerved, with the outermost pair of veins indistinct, main veins branching, a slender submarginal vein present in the upper half of the leaf; petioles up to 2 mm. long, flattened, puberulent.

Spikes numerous with up to 15 spikes on a branch, terminal and in the axils of the upper leaves, slender, up to 7 cm. long but mostly 2-3 cm., occasionally branched to form a short lateral spike near the base, moderately to sparingly flowered, peduncle up to 5 mm. long, commonly somewhat shorter, sparingly puberulent to glabrescent, rachis glabrous, bracts round, peltate, about 0.4 mm. wide, anthers ellipsoidal, fruit ovoid, glandular, viscid, about 0.5-0.6 mm. long, stigma subapical.

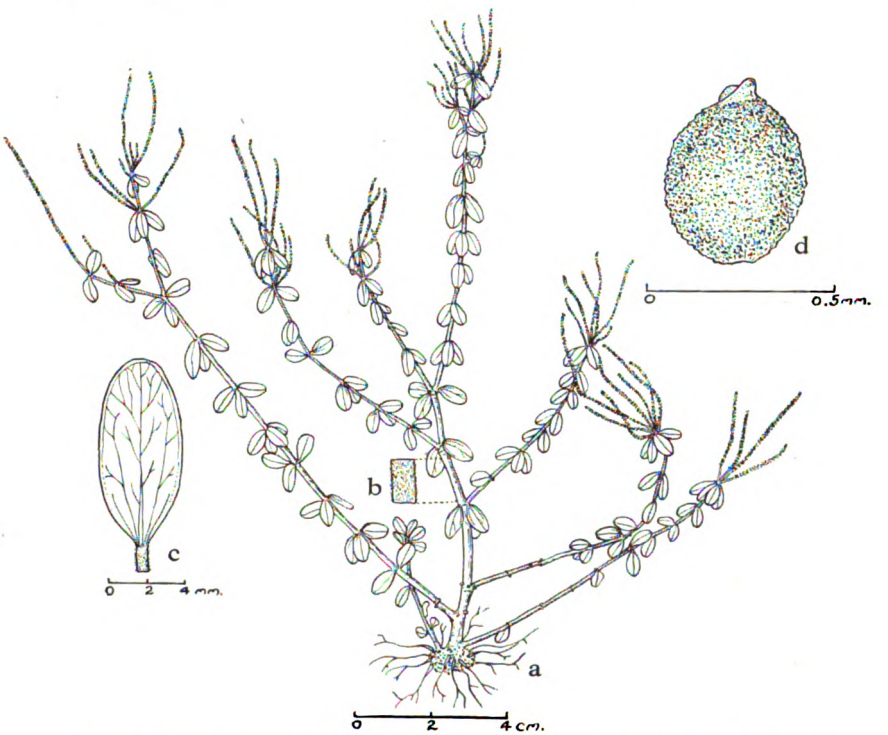

FIGURE 3.—*Peperomia obtusilimba:* **a,** habit; **b,** section of stem, enlarged; **c,** leaf; **d,** fruit.

Albemarle Island: summit, Tagus Cove Mt., May 26, 1932, *Howell 9576* (CA).

Charles Island: Common on rocks and low bushes at 1,400 ft., Oct. 9, 1905, *Stewart 1161* (CA); same locality, *Stewart 1160* (*867*) (CA). Type.

Indefatigable Island: Academy Bay, on rocks and trees above 350 ft., Nov. 9, 1905, *Stewart 1152* (*470*) (CA). The sheet carrying this number in the Gray Herbarium is *P. galapagensis.* The sheet in the

California Academy of Science herbarium is *P. obtusilimba* but with a small fragment of *P. galapagensis*. Presumably, this is the result of mixing at the time of mounting the specimens.

Snodgrass and Heller's 232 in the Gray Herbarium, cited by C. deCandolle in Robinson (Proc. Am. Acad. Arts and Sci. **38**: 132, 1902) as a new species without name, is a small, sterile fragment. The specimen appears to be identical with young basal branches of *P. obtusilimba*, to which it is now referred.

P. obtusilimba resembles *P. galapagensis* in some respects but differs because of its thin, flat, glabrate, palmately veined leaves, and slender, loosely flowered spikes.

Peperomia flagelliformis Hooker f., ex Miquel in London Jour. Bot. **4**: 423, 1845 (fig. 4).

Peperomia galioides Auct. as to the Galapagos Islands.

Plants (growing on vegetable mold and rocks) up to 45 cm. tall, but commonly somewhat shorter. Stems up to 3 or 4 mm. thick near the base when dry, minutely and abundantly puberulent, freely branching, branches slender and generally ascending, internodes up to 6 cm. long, commonly 1-4 cm.

Leaves verticillate, commonly 4 to 6 at a node, mostly spreading to ascending, 3-6 mm. wide, 10-18 mm. long, or lower leaves may be somewhat smaller, drying membranous, oblong-spatulate or oblong-elliptical, apex rounded, obtuse, base obtuse or acutish, glabrous or sparingly puberulent and ciliated at the base, ciliated with a few bristle-like hairs at the very apex, 3-5-palmately nerved, if 5-nerved, the outermost pair of nerves indistinct, the mid-vein pinnately branched above, a submarginal vein present about the upper part of the leaf, punctate with yellow, glandlike dots, petioles 1-2 mm. long, finely puberulent, leaf scars somewhat raised.

Spikes terminal and axillary, occasionally branched, commonly several, up to 6 cm. long, moderately to loosely flowered, rachis glabrous, peduncle up to 1 cm. long but commonly 5-8 mm., puberulent to glabrescent, bracts round, peltate, punctate with yellow, glandular dots, about 0.4 mm. wide, anthers ellipsoidal; fruit globose-ovoid, about 0.7 mm. long, glandular, verrucose, in pits on the rachis, stigma subapical.

Abingdon Island: common in woodland at 1,650 ft., Sept. 19, 1906, *Stewart 1154* (CA, G, US).

Albemarle Island: Villamil, occasional in vegetable mold among rocks, 1,300-1,500 ft., Aug. 29, 1906, *Stewart 1157 (8198)* (CA, G); same locality, *Stewart 1156 (8043)* (CA). It is a juvenile plant which appears to be this species.

Chatham Island: Wreck Bay, on rocks, 650-700 ft., Jan. 27, 1906, *Stewart 1158* (CA, G).

Indefatigable Island: Academy Bay, occasional in vegetable mold among rocks in open woodland at 400 ft., Nov. 9, 1905, *Stewart 1159*

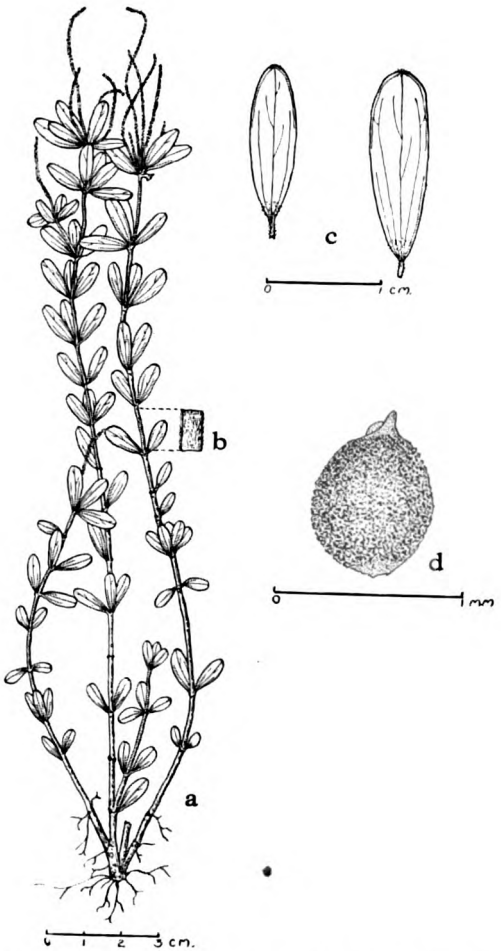

FIGURE 4.—*Peperomia flagelliformis:* **a,** habit; **b,** section of stem, enlarged; **c,** leaves; **d,** fruit.

(*490*) (CA, G, US); vicinity of the plantation six miles north of Academy Bay, 800 ft. alt., April 6, 1930 "epiphyte, heteromorphous, entire plant upright; flowering portion yellowish," *Svenson 112* (B, G, Ill); in 1926, *Borghild Rorud 100* (G); northwest side, common above 500 ft., July 23, 1906, *Stewart 1155* (CA).

James Island: October 1835, *Darwin* (Kew, type).

P. flagelliformis was originally described as glabrous. All of the specimens examined, including the type, have been found to have the stems minutely puberulent. The leaves are generally glabrous and the stem hairs are not obvious without rather strong magnification. This species is to be distinguished from *P. galapagensis* and *P. obtusilimba* by its usually larger plants, longer internodes and proportionately longer leaves which are not reflexed.

A specimen collected by Baur on Chatham Island is listed as "Peperomia sp." by Robinson and Greenman (Proc. Am. Acad. Arts and Sci. 38: 132, 1902). They state: "specimen not in hb. Gr. but sent as unicate to hb. Clark Univ." So far as can be determined, there is no specimen of *Peperomia* collected by Baur now in the herbarium of Clark University. It has been impossible, therefore, to check this citation.