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Revision of the Micronesian Species of *Peperomia*

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Micronesia as defined here includes those islands in the western part of the Pacific Ocean lying north and east of New Guinea and the Philippines and, for the most part, are included in the Marianas, Caroline and Marshall groups. Many of the islands in this area are low, arid, and unsuited to *Peperomia*, most species of which prefer moist, shady situations in the forests and ravines of more or less mountainous regions. Some of the islands, however, are sufficiently high to have conditions favorable for their development.

The earliest reference which I have found to any Micronesian species is given by Miquel (*Systema Piperacearum*, 120, 1843) who refers a specimen collected by Gaudichaud in the Marianas Islands to *Peperomia membranacea* Hooker and Arnott. Later C. de Candolle [*Prodromus*, 16(1): 442, 1869] correctly pointed out that a specimen collected by Gaudichaud, and which he believed to be the same as that cited by Miquel, was not the same as Hooker and Arnott's *P. membranacea* and described it as new under the name *P. mariannensis*. In 1914 Merrill published "An enumeration of the plants of Guam" (*Philippine Jour. Sci.*, 9: 72, 1914) in which De Candolle contributed the descriptions of two new species from the Marianas group: *P. guamana* from a specimen collected by McGregor on Guam, and *P. saipana* from one obtained by Fritz on the near-by island of Saipan. In 1921 De Candolle (*Engler Bot. Jahrb.*, 56: 503 ff., 1921) described eight additional new species from specimens which had been obtained by collectors in different parts of Micronesia. In 1936 Hosokawa (*Nat. Hist. Soc. Formosa, Trans.*, 25:119, 1936) gave a summary of

the Micronesian species and added the descriptions of three species new to science.

Of those species which have been previously recorded, ten are recognized in the present paper as being valid while one has been reduced to varietal rank. To these are now added *P. pellucida*, an American species of wide distribution in the tropics, *P. leptostachya*, a common species throughout Polynesia, and one species here described as new, thus making a total of thirteen species and one variety as recognized for Micronesia.

Additional small collections of *Peperomia* have recently been made by E. H. Bryan Jr. in Guam, by R. Kanehira in the Marianas and the Carolines, and by M. Takamatzu in the Carolines. Micronesian materials of the genus are meager in American and European herbaria, however, and it is believed that additional species will be discovered after more extensive botanical exploration, especially on the larger islands.

The types of all of the species are deposited in European herbaria with the exception of Hosokawa's which are in the herbarium of the Taihoku Imperial University at Taiwan. I have been unable to locate any duplicates of his specimens in other herbaria nor have I been able to study the specimens at Taiwan. It is very difficult to recognize many species of *Peperomia* without authentic material or photographs for comparison. For this reason it has not been possible to identify Hosokawa's species with any degree of certainty.

With the exception of *P. pellucida*, the species all agree in having the stigmas placed slightly subapically, but the apex of the fruit is not as definitely oblique as is characteristic of many of the Hawaiian and southeastern Polynesian species. In this character they more closely resemble the fruit of some of the Malaysian species. The arrangement of the leaves is indefinite with several of the species having both opposite and alternate leaves on the same stem. No specimens seen, however, have more than two leaves at a node.

Specimens from which this study was made were loaned by the herbaria of the Berlin Museum, B. P. Bishop Museum, Kew Gardens, New York Botanical Garden, and the United States National Museum. Several additional herbaria reported that they had no material from Micronesia. I wish to express my appreciation to the directors of these institutions for their courtesies in making the specimens available for study.

Key to the Species

1. Leaves ovate-cordate, fruit longitudinally ribbed.....1. *P. pellucida*
Leaves never cordate, fruit more or less verrucose but not longitudinally ribbed 2
2. Stems glabrous 3
Stems more or less hairy..... 8
3. Stigmas bilobulate, pilose when young..... 2. *P. Gibbonsii*
Stigmas not bilobulate..... 4
4. Leaves less than 2 cm. long, more or less ovate, plants more or less repent.....3. *P. Kraemeri*
Leaves mostly 2.5-4 cm. long, elliptic or oval to obovate..... 5
5. Leaves obtuse or subacute..... 6
Leaves mostly acute, plants about 15 cm. in height.....4. *P. guamana*
6. Leaves elliptic-ovate, base obtuse.....5. *P. mariannensis*
Leaves elliptic to obovate, base acute to cuneate..... 7
7. Leaves predominately opposite.....6. *P. Volkensii*
Leaves predominately alternate.....7. *P. ponapensis*
8. Stems sparsely hairy to glabrate.....4. *P. guamana* variety *saipana*
Stems moderately to densely hirtellous or hirsute..... 9
9. Rachis more or less hairy, leaves more or less elliptic, 1.5-2.5 times as long as wide.....8. *P. palauensis*
Rachis glabrous, leaves suborbicular or subovate to oval or subobovate, mostly less than 1.5 times as long as wide.....10
10. Leaves opposite or verticillate, spikes much longer than the leaves9. *P. leptostachya*
Leaves mostly alternate.....11
11. Leaves mostly 2 cm. or less in length, the spikes about equaling the length of the leaf blade.....10. *P. breviramula*
Leaves mostly 2 cm. or more in length.....12
12. Leaves mostly 2-3 × 3-4.5 cm., spikes 1.5-2 times as long as the leaf blades.....11. *P. trukensis*
Leaves 1.5-2 × 2.5-3 cm., spikes not exceeding the leaves.....13
13. Spikes as long as the leaf blades.....12. *P. kusaiensis*
Spikes shorter than the leaf blades.....13. *P. pacifica*

1. ***Peperomia pellucida*** (Linnaeus) Humboldt, Bonpland, and Kunth.

Peperomia pellucida (Linnaeus) Humboldt, Bonpland, and Kunth, Nov. Gen. Sp. Pl., 1:64, 1815; Dahlstedt, Kongl. Sv. Vet. Akad., Handl., 33(2):16, tab. 1, fig. 1, 1900; Quisumbing, Philippine Jour. Sci., 43:218, fig. 117, 1930.

Piper pellucidum Linnaeus, Sp. Pl., 30, 1753.

Peperomia yapensis C. de Candolle, in Engler's Bot. Jahrb., 56:504, 1921.

This is a common American species which has become widely distributed throughout the Pacific area. Some of the plants which I have seen from the Pacific are considerably smaller than most of

the American specimens but other than the difference in size they appear to be the same. *P. pellucida* variety *pygmaea* Willdenow herb. no. 725a, (Kunth Synops., 1:117, 1822, ex Miquel, Syst. Pip., 81, 1843) appears from the description to differ from *P. pellucida* mainly in the smaller size of the plants. Some colonies of *P. pellucida* which I have observed and collected in Central America contained plants exhibiting a wide range in size, and some of the smallest could well represent variety *pygmaea*. I have not seen the type of this variety but from the specimens which I have studied I do not believe that any of the small Micronesian plants are worthy of varietal distinction, and from the evidence at hand I am inclined to interpret the size of the specimens as due to environmental factors.

Caroline Islands: Yap Island, "in dem Moospolster am Fuss einer Kokospalme," January 9, 1900, *G. Volkens* 343 (type of *P. yapensis*, Berlin); Kanif, in shaded place in forest, May 16, 1936, *M. Takamatsu* 1910 (Bishop Mus.); Kusaie Island, Lele, on shaded rock or ground, January 30, 1936, *M. Takamatsu* 332 (Bishop Mus.); Palau Islands, Koror, 20-40 meters altitude, February 9, 1914, *Ledermann* 14129 (Berlin; Kew). This specimen is normal size for the species.

Marianas Islands: Guam, Guam Experiment Station, collected under direction of J. B. Thompson, 234 (Berlin; Kew; N. Y.; U. S. Nat.); *H. L. W. Costenoble* 1197 (U. S. Nat.).

2. *Peperomia Gibbonsii* C. de Candolle (fig. 1).

Peperomia Gibbonsii C. de Candolle, in Engler's Bot. Jahrb., 56:504, 1921.

Spike-bearing branches erect, up to 13 cm. high and 2 mm. thick when dry, dichotomously or trichotomously branching, glabrous, the internodes up to 5 cm. long below. Leaves alternate or more rarely opposite at the upper nodes, up to 1.5 cm. wide and 3 cm. long, glabrous, ciliated near the apex with minute hairs, lanceolate-obovate, apex briefly attenuated, acutish, base acute, veins 5, palmate, the petioles 4 to 6 mm. long, glabrous. Spikes axillary and terminal, single or commonly in umbellate clusters of two or three spikes, or in the axils of small leaf-like bracts forming a loosely branching inflorescence, up to 4 cm. long, moderately to densely flowered, the peduncles up to 1 cm. long, glabrous, the rachis glabrous, the bracts round-peltate, about 0.5 mm. in diameter, punctate with yellow dots, the filaments about equaling the ellipsoidal anthers, the ovary ovoid, apex oblique, stigma divided to form two fleshy, pilose pads, the fruit about 0.8 mm. long, globose-ovoid, verrucose, viscid, eventually on pseudopedicels.

Marshall Islands: "Ailinlaplap [Ailinglapalap?], in der Mitte der Insel auf Steinigem Basaltboden, in Schatten von Kokospalmen," February 26, C. Gibbons 1072 (type, Berlin).

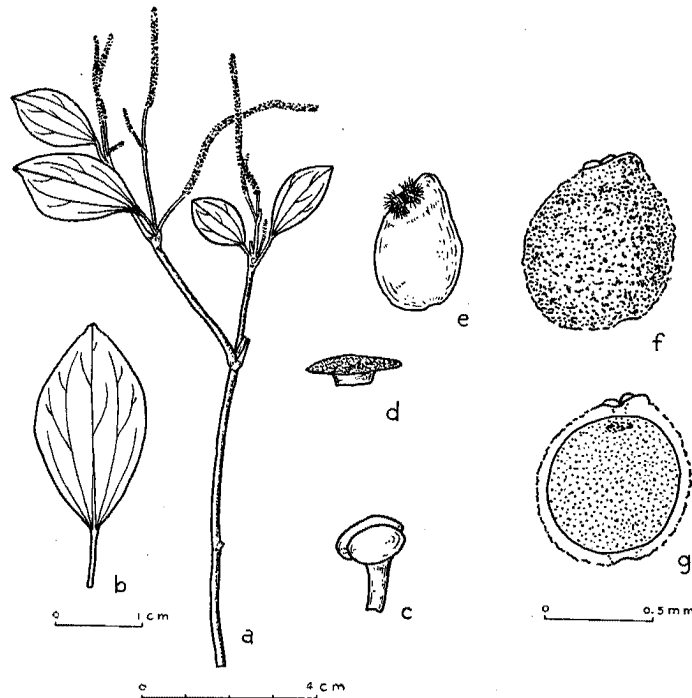


FIGURE 1.—*Peperomia Gibbonsii* C. de Candolle: a, plant; b, leaf; c, stamen, enlarged; d, bract, enlarged; e, ovary, enlarged; f, fruit; g, section of fruit.

The bilobulate stigmas and spike arrangement distinguish this species. None of the several plants on the type sheet have the lower rooting part present, and as only the one collection of this species was seen it has been impossible to determine the characteristics of the basal part of the plants. The specimens, also, have only a few leaves present but I am unable to determine whether this indicates a natural loss of the leaves or not. The only species which I have observed from the Pacific area that readily loses its leaves, especially during the drying process, is *P. leptostachya*. It is not unusual to find herbarium specimens of that species entirely devoid of leaves and I have also observed some old plants in the field in which many of the leaves

had fallen. Most species, however, retain most of their leaves even on herbarium sheets; if the more or less leafless condition of the type specimen of *P. Gibbonsii* is natural it is significant.

3. ***Peperomia Kraemeri*** C. de Candolle (fig. 2).

Peperomia Kraemeri C. de Candolle, in Engler's Bot. Jahrb., 56: 503, 1921.

Peperomia tiniannensis Hosokawa mss., ex Hosokawa, Nat. Hist. Soc. Formosa., Trans., 25:121, 1935.

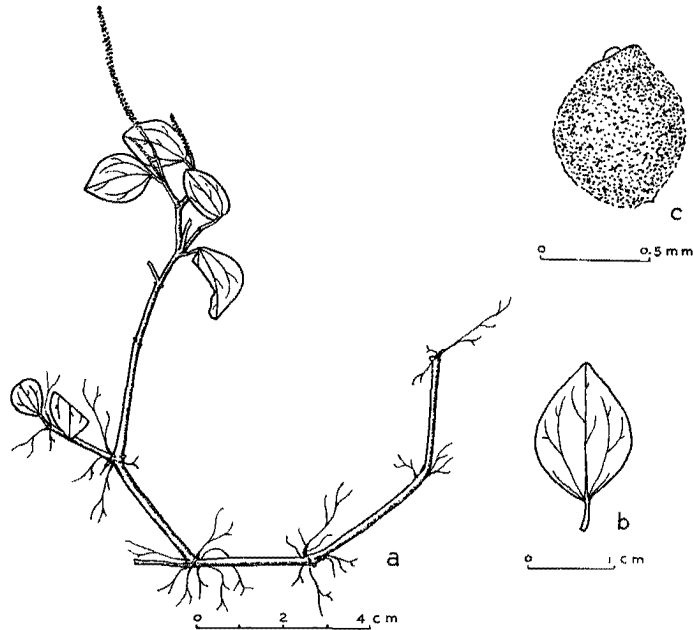


FIGURE 2.—*Peperomia Kraemeri* C. de Candolle: a, plant; b, leaf; c, semi-mature fruit.

Stems decumbent and rooting at the nodes, leafy, spike-bearing branches arising up to 8 cm. high, 2 mm. thick near the base when dry, glabrous, branching, the internodes 1 cm. long above, up to 3 cm. long below. Leaves mostly alternate, some lower leaves opposite, 1 to 1.3 cm. wide and 1.5 to 2 cm. long, the upper surface dark, sparingly puberulent at the base and more or less upward along the veins and near the margin at the apex, the lower surface lighter, glabrous, marginally ciliated near the apex, oval-ovate, apex obtuse to somewhat acutish, base acute, veins 3 or 5, palmate, the petioles about 3 mm. long, glabrous. Spikes terminal or opposite the upper leaves, 3.3 cm. long, moderately to densely flowered, the peduncle about 1 cm. long, glabrous, the rachis glabrous, the bracts round-peltate, about 0.5 mm. wide, punctate with yellow dots, the

filaments somewhat longer than the ellipsoidal anthers, the ovary ovoid, apex oblique, stigma subapical, the fruit about 0.8 mm. long, subglobose, verrucose, viscid.

Caroline Islands: Palau Islands, Koror, *Kraemer* (type, Berlin).

The type of this species, the only specimen which I have seen, is poor and it is probable that with more abundant material the description will need some modification. The size and shape of the leaves and the presence of hairs on the upper surface distinguish it from the other Micronesian species. Hosokawa's description and measurements of the leaves, etc., do not agree entirely with those of De Candolle nor with the type specimen which makes one suspect that his specimens, collected in the Marianas Islands, may be different, though he considered his name *P. tinianensis* as synonymous with *P. Kraemeri*.

4. *Peperomia guamana* C. de Candolle (fig. 3).

Peperomia guamana C. de Candolle, Philippine Jour. Sci. 9:72, 1914.

Peperomia Hoeferi C. de Candolle, in Engler's Bot. Jahrb., 55:505, 1921.

? *Peperomia mariannensis* Hosokawa, Nat. Hist. Soc. Formosa, Trans., 25:120, 1935.

Plants terrestrial or epiphytic. Stems erect or ascending up to 15 cm. or more high from a short decumbent base, rooting from the lower nodes, about 2 mm. thick near the base when dry, simple or commonly branching, glabrous, the internodes mostly from 1 cm. long above up to 3.5 cm. below or more rarely up to 5 cm. Leaves alternate but not uncommonly some leaves opposite, drying membranous, glabrous, not ciliated or with a few minute hairs at the extreme apex, elliptic-lanceolate to oval or more rarely subobovate, 1.2 to 2.5 cm. wide and 2 to 4.5 cm. long, but mostly 1.5 to 2 cm. wide and 2 to 3.5 cm. long, veins 3 or 5, palmate, when 5-veined the outermost pair indistinct and short, the midrib and innermost pair of lateral veins prominent and more or less impressed above, apex acute or in lower leaves obtusish, base acute to cuneate, the petioles glabrous, 5 to 8 mm. long, leaf scar semicircular. Spikes terminal or opposite the upper leaves, or more rarely axillary, up to 6 cm. long, mostly 3 to 5 cm. long, the peduncles glabrous, 5 to 8 mm. long, the rachis glabrous, the bracts round-peltate, about 0.4 mm. wide, the filaments somewhat longer than the ellipsoidal anthers, the ovary obovoid, apex oblique, stigma subapical, smooth or pilose, the fruit about 0.9 mm. long, globose-ovoid, verrucose, viscid, eventually on pseudopedicels.

Marianas Islands, Guam: *R. C. McGregor* 629 (type number, U. S. Nat.); *H. L. W. Costenoble* 1196 (U. S. Nat.); *P. Nelson* 13 (U. S. Nat.); Talofof Point, on a rock in moist lower forest, alti-

tude 90 meters, April 11, 1936, *E. H. Bryan Jr. 1116* (Bishop Mus.; N. Y.); on a rock on the north side of Talofoto valley, about half a mile from sea, altitude 10 meters, April 1, 1936, *E. H. Bryan Jr. 1044* (Bishop Mus.); Ritidian Point, on rocks in trail to lighthouse, altitude 190 meters, April 16, 1936, *E. H. Bryan Jr. 1174* (Bishop Mus.); on rocks on limestone slope, under moist forest, altitude 50 to 150 meters, April 16, 1936, *E. H. Bryan Jr. 1156* (Bishop Mus.); Machanao District, on rocks and tree trunks in moist limestone forest, altitude 110 meters, April 16, 1936, *E. H. Bryan Jr. 1187* (Bishop Mus.); Upi (N. E. point) on rocks in moist limestone forest, altitude 175 meters, May 5, 1936, *E. H. Bryan Jr. 1265* (Bishop Mus.).

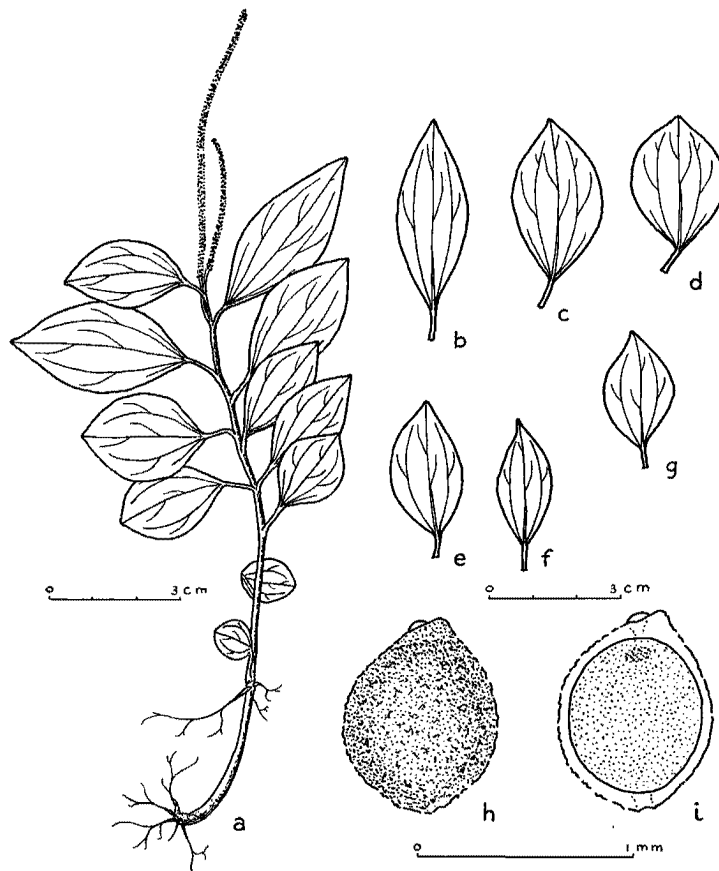


FIGURE 3.—*Peperomia guamana* C. de Candolle: *a*, plant; *b-g*, leaves, showing variation in size and shape; *h*, fruit; *i*, section of fruit.

Saipan: on limestone, February 13, 1903, *Hoefler 38* (type of *P. Hoefleri*, Berlin).

Peperomia guamana C. de Candolle variety ***saipana*** (C. de Candolle), new combination.

Peperomia saipana C. de Candolle, in Engler's Bot. Jahrb., **56**: 505, 1921.

Stems sparingly hirtellous. Leaves marginally ciliated at least when young.

Marianas Islands: Saipan, 1903, *Fritz* (type of *P. saipana*, Berlin).

Peperomia Hoefleri was distinguished by De Candolle as having apical stigmas and opposite leaves whereas he described *P. guamana* as with alternate leaves and subapical stigmas. On specimens of the type number of *P. guamana* leaves are both alternately and oppositely arranged. In other collections, believed to be of the same species, some plants have most of the leaves opposite while others may be predominately alternate. I also find on the type specimen of *P. Hoefleri* both alternate and opposite leaves. I likewise find the stigmas to be subapical on the types of both species.

In describing his *P. mariannensis* as a new species Hosokawa evidently overlooked the fact that De Candolle had previously given this name to a species in 1869. In his key Hosokawa uses the presence or absence of hairs on the stigmas as a primary character in separating his *P. mariannensis* from *P. guamana*. While this character is of some value under ideal conditions, I have found that the hairs are often early deciduous and easily lost and hence I do not believe that it has much value when used alone in distinguishing species from dry herbarium specimens. From Hosokawa's description I am unable to distinguish his species from some of the specimens I am including here.

De Candolle described the stigma as apical in *P. saipana* but I find it to be subapical as in *P. guamana*. Other than the presence of hairs, I am unable to distinguish the type specimen of *P. saipana*, which is fragmentary and the only one which I have examined, from *P. guamana*.

5. *Peperomia mariannensis* C. de Candolle (fig. 4).

Peperomia mariannensis C. de Candolle, *Prodromus* **16**:(1): 442, 1869.

Stems ascending from a decumbent (?), rooting base, up to 12 cm. high, 2 mm. thick near the base when dry, glabrous, the internodes up to 3.5 cm. long. Leaves opposite, up to 2 cm. wide and 3.5 cm. long, glabrous, not ciliated or with a tuft of minute hairs at the very apex, drying thin and membranous, elliptic-ovate, apex obtuse, base obtuse, veins 5, palmate, the petioles up to 6 mm. long, glabrous. Spikes terminal, 3 cm. long, moderately flowered, the peduncle 5 mm. long, glabrous, the rachis glabrous, the bracts about 0.5 mm. wide, round-peltate, the filaments about equal to the ellipsoidal anthers, the ovary obovoid, apex oblique, stigma subapical, the fruit not matured.

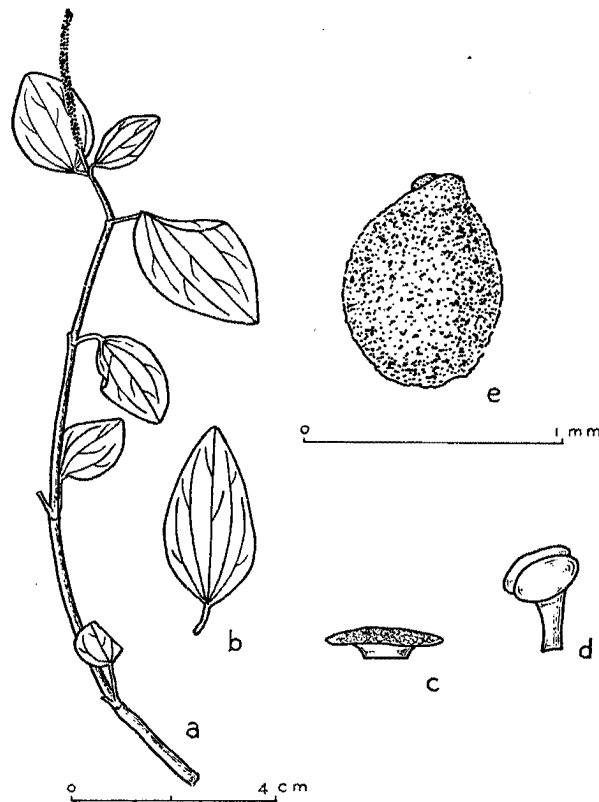


FIGURE 4.—*Peperomia mariannensis* C. de Candolle: a, plant; b, leaf; c, bract, enlarged; d, stamen, enlarged; e, fruit.

Marianas Islands: *Gaudichaud* (type, Berlin).

The type of this species is fragmentary. It appears to be closely related to *P. guamana* but the single specimen studied differs from those specimens which I refer to *P. guamana* mainly because of the

obtuse apex and base of the leaves. The leaves also are opposite but whether this character is constant or not can be determined only by the examination of more abundant materials. The specimen upon which this species is based may be the one which Miquel referred to *P. membranacea* Hooker and Arnott.

6. ***Peperomia Volkensii*** C. de Candolle (fig. 5).

Peperomia Volkensii C. de Candolle, in Engler's Bot. Jahrb., 56: 503, 1921.

Stems ascending up to 15 cm. or more high from a decumbent, rooting base, up to 3 mm. thick when dry, abundantly branching, glabrous, the internodes from 1.5 cm. long above up to 7 cm. long below. Leaves opposite or rarely alternate, up to 2.6 cm. wide and 4 cm. long, mostly 1.5 to 2 cm. wide and 2.5 to 3.3 cm. long, drying pale and moderately membranous, glabrous on both surfaces, not ciliated or with a few minute hairs at the very apex, elliptical to oval-obovate, apex shortly attenuated, obtuse, base acute to subcuneate, palmately 3-veined or larger leaves 5-veined with the outermost pair of veins inconspicuous, the petioles 5 to 10 mm. long, glabrous. Spikes terminal and axillary, numerous, up to 4.3 cm. long but mostly about 3 cm. long, the peduncle about 1 cm. long, glabrous, the rachis glabrous, bracts round-peltate, about 0.5 mm. in diameter, the filaments about equal to the ellipsoidal anthers, the ovary obovoid, apex oblique, stigma subapical, pilose, the fruit about 0.9 mm. long, ovoid, verrucose, viscid.

Caroline Islands: "Auf Mauern in Lele bei Kussai" (Kusaie), October 9, 1899, *G. Volkens* 2 (type, Berlin).

7. ***Peperomia ponapensis*** C. de Candolle (fig. 6).

Peperomia ponapensis C. de Candolle, in Engler's Bot. Jahrb., 56: 504, 1921.

Stems ascending up to 30 cm. or more high from a decumbent base, rooting from the lower nodes, 3 mm. thick near the base when dry, branching abundantly, glabrous, the internodes 1.5 to 6 cm. long. Leaves alternate or more rarely opposite, glabrous, not ciliated or with a few short hairs at the extreme apex, obovate to oval-obovate, mostly 2 to 2.8 cm. wide and 3 to 5 cm. long, veins 5, palmate, apex shortly attenuated, obtuse, base acute to cuneate, the petioles 5 to 9 mm. long or the lower leaves with petioles up to 1.5 cm. long, glabrous. Spikes terminal or opposite the upper leaves, up to 7 cm. long, moderately flowered, the peduncles 0.8 to 1.5 cm. long, glabrous, the rachis glabrous, the bracts round-peltate, about 0.5 mm. wide, the filaments about equal to the ellipsoidal anthers, the ovary globose to obovoid, apex oblique, stigma subapical, pilose or smooth, the fruit about 0.8 mm. long, globose-ovoid, verrucose, viscid, eventually on pseudopedicels.

Caroline Islands: Ponape, Nanmatal, Kalau-Buschwald auf den Ruinen der alten Stadt, auf den Basaltblöcken der Ruine, January 8, 1914, *Ledermann* 13984 (De Candolle cited this number in error as

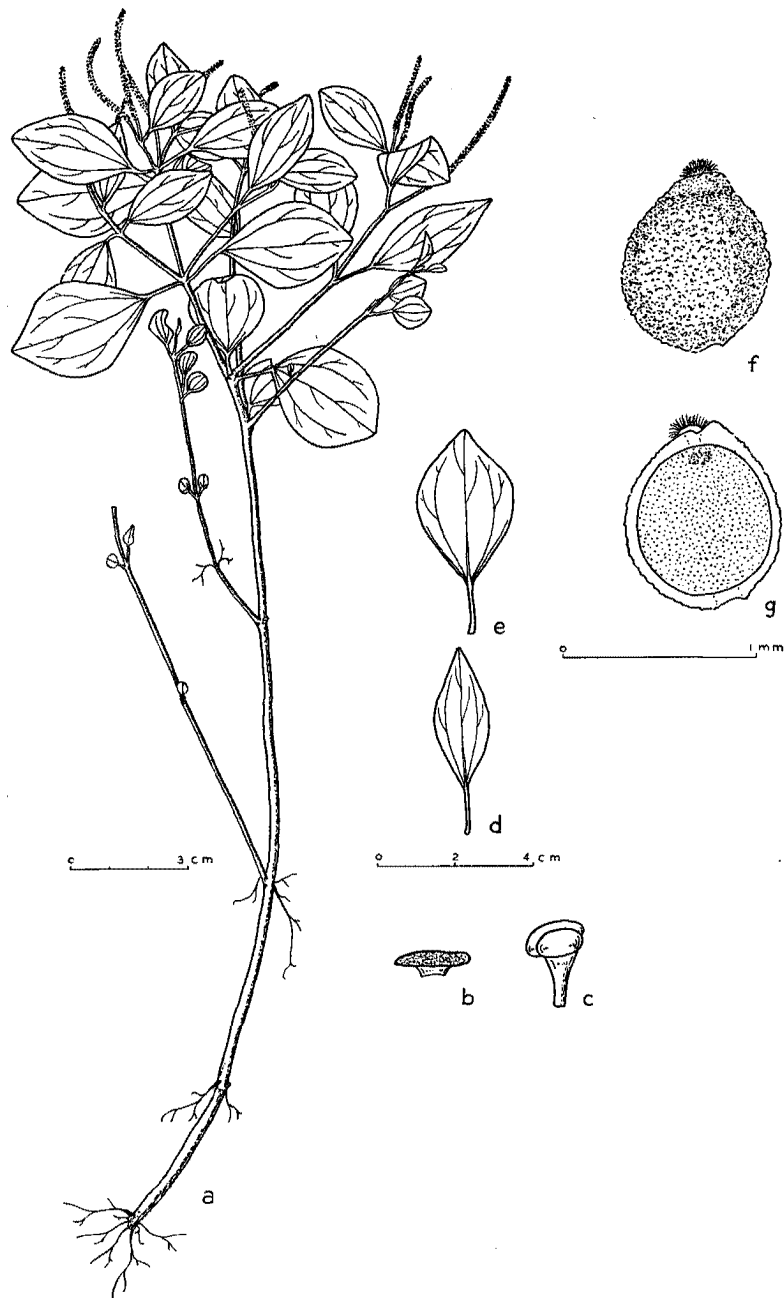


FIGURE 5.—*Peperomia Volkensii* C. de Candolle: a, plant; b, bract, enlarged; c, stamen, enlarged; d-e, leaves; f, fruit; g, section of fruit.

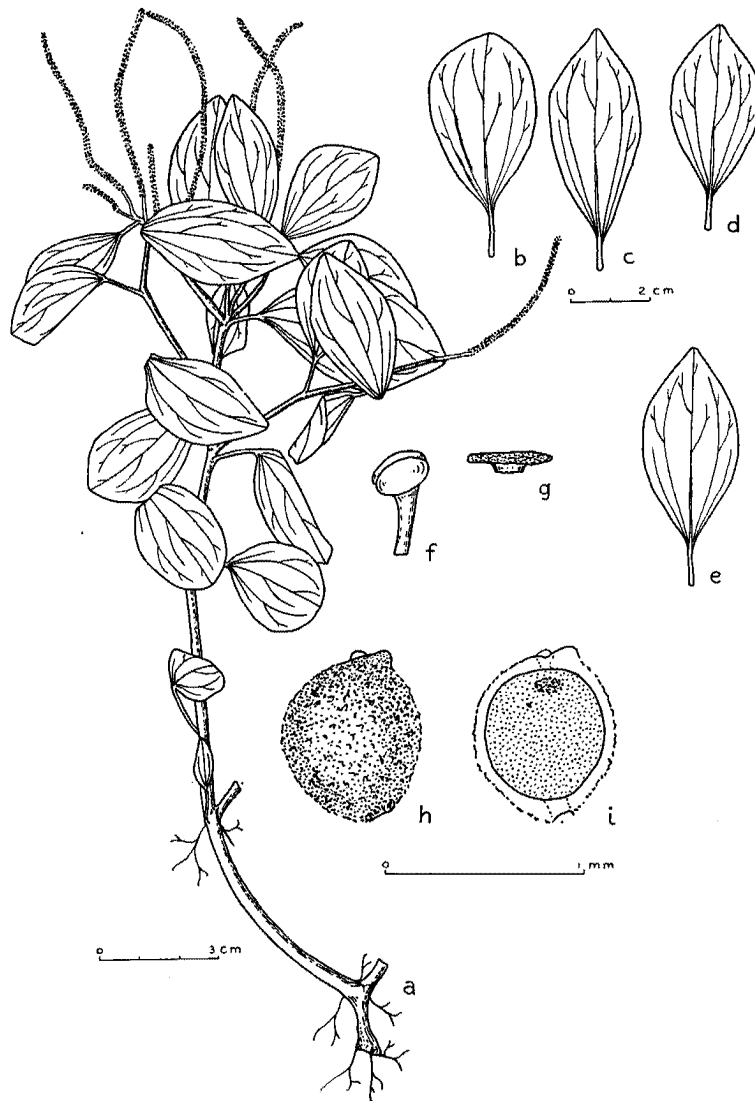


FIGURE 6.—*Peperomia ponapensis* C. de Candolle: a, plant; b-e, leaves, showing variation in size and shape; f, stamen, enlarged; g, bract, enlarged; h, fruit; i, section of fruit.

13914) (type, Berlin; Kew); in strand, August 16, 1929, *R. Kanehira* 858 (N. Y.). The leaves of this specimen are somewhat smaller than those on the type specimen.

Marianas Islands: Saligan, July 5, 1933, *R. Kanehira* 2171 (N. Y.). This is a sterile and poorly prepared specimen with leaves smaller than those of the type. It agrees sufficiently well, however, in the characters which are present to warrant placing it here. Saipan, *R. Kanehira* 986 (N. Y.). This is likewise a poorly prepared specimen with the leaves mostly 2 to 3 cm. long. Although these specimens seem to agree best with *P. ponapensis*, it is possible that with more abundant and better prepared materials these small-leaved forms may be found to be distinct.

8. *Peperomia palauensis* C. de Candolle (fig. 7).

Peperomia palauensis C. de Candolle, in Engler's Bot. Jahrb., 56: 505, 1921.

Stems slender, repent, branching, rooting at the nodes, up to 2 mm. thick when dry, leafy branches ascending up to 10 cm. or more high, moderately to densely hirtellous, hairs subappressed, less than 0.5 mm. long, the internodes up to 5 cm. long, mostly 1 to 2 cm. long in the leafy branches. Leaves alternate or rarely opposite, dark above, lighter beneath, drying thin and membranous, both surfaces sparsely hirtellous to glabrescent, more or less ciliated with hairs up to 0.5 mm. long, some leaves completely so, others ciliated only at the apex, elliptic-lanceolate or more rarely oval, some lower leaves obovate to suborbicular, the upper leaves mostly 2 to 3.2 cm. long and 0.8 to 1.5 cm. or rarely up to 1.9 cm. wide, the lower leaves commonly much smaller, veins 3, palmate, or the larger leaves 5-veined, apex acute to obtusish, base acute, the petioles hirtellous, mostly 2 to 5 mm. or rarely up to 1 cm. long. Spikes terminal or opposite the upper leaves, up to 7 cm. long, the peduncle hirtellous, about 1 cm. long, the rachis sparingly hirtellous at least toward the base, less so above, the bracts round-peltate, about 0.5 mm. wide, punctate with yellow dots, the filaments about equal to the ellipsoidal anthers, the ovary obovoid, apex oblique, stigma slightly subapical, the fruit about 0.8 mm. long, ovoid, verrucose, viscid, stigma slightly subapical.

Caroline Islands, Palau Islands: Koror, 10-100 meters altitude, auf Kalkfelsen, February 7, 1914, *Ledermann* 14102 (type, Berlin; Kew); Ponape, Sankaku-Yama, in forest at low altitude, August 12, 1929, *R. Kanehira* 756 (N. Y.); *Ledermann* 13175 (Kew); Tolomail, in forest, common, February 11, 1936, *M. Takamatsu* 981, 986 (Bishop Mus.).

This species bears some resemblance to *P. huahinensis* Yuncker of the Society Islands but differs chiefly in its more slender stems

and in the character and abundance of the hairs. It also resembles *P. Elmeri* C. de Candolle of the Philippines but differs in the smaller size of the plants, smaller and more hairy leaves, etc. The rather slender, hirtellous, repent stems, and especially the more or less hirtellous rachis distinguish this from the other Micronesian species.

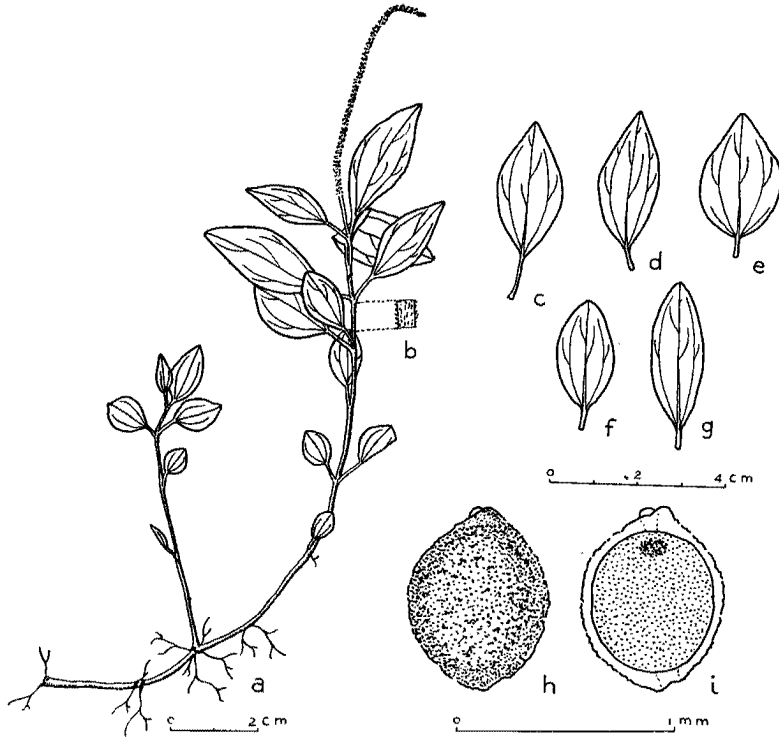


FIGURE 7.—*Peperomia palauensis* C. de Candolle: *a*, plant; *b*, section of stem, enlarged; *c-g*, leaves, showing variation in size and shape; *h*, fruit; *i*, section of fruit.

The hirtellous condition of the rachis is very evident on the type which is of ample material and with well developed spikes. The other specimens included here have only immature spikes or lack them entirely so that the presence or absence of hairs on the rachis cannot be determined, but they agree very well in their vegetative characteristics. The amount of ciliation varies considerably, with the type showing the least of any of the specimens cited.

9. *Peperomia leptostachya* Hooker and Arnott.

Peperomia leptostachya Hooker and Arnott, Bot. Beechey, 96, 1832; Yuncker, B. P. Bishop Mus., Bull. 112, 57, fig. 16, 1933.

This species is characterized by having more or less densely hirtellous stems and leaves which are opposite or verticillately arranged. It is very abundant in the Hawaiian islands (B. P. Bishop Mus., Bull. 112, 57, 1933), and is the commonest and most widely distributed species throughout southeastern Polynesia (B. P. Bishop Mus., Bull. 143, 58, 1937). It is apparently uncommon in the Fijian group (B. P. Bishop Mus., Bull. 141, 46, 1936) and has not been found in the Philippines, according to Quisumbing [Philippine Jour. Sci., 43(1), 1930].

The only specimen of this species from Micronesia which I have seen is one collected by R. Kanehira (no. 243, July 9, 1929) on an unnamed island near Corol [Koror] in the Pelew [Palau] group and now in the herbarium of the New York Botanical Garden. This specimen is not well preserved but it exhibits opposite and characteristically shaped leaves with the typical hairiness of *P. leptostachya*. The internodes are somewhat longer than is common for that species but it agrees sufficiently well in other characters to warrant reference to it. Furthermore, it was found growing on a coral reef near the sea, a situation common for *P. leptostachya* which is frequently found growing at lower altitudes and in more exposed localities than those tolerated by other species. The varieties *pilosior* and *longispica* of *P. recurvata* (Blume) Miquel from the Philippines closely resemble *P. leptostachya* in many respects.

10. *Peperomia breviramula* C. de Candolle (fig. 8).

Peperomia breviramula C. de Candolle, in Engler's Bot. Jahrb., 56: 503, 1921.

Epiphytic. Stems decumbent and stoloniferous, rooting from the lower nodes, frequently branching, leafy branches ascending up to 8 cm. high, 1.5 mm. thick near the base when dry, abundantly subappressed hirtellous, hairs less than 0.5 mm. long, the internodes mostly 1 to 2 cm. long. Leaves alternate, moderately hirtellous on both surfaces when young, becoming more or less glabrate when older, abundantly ciliated, oval-elliptic to subovate or suborbicular, more or less rhombic, up to 1.6 cm. wide and 2.2 cm. long, mostly 1 to 1.4 cm. wide and 1.5 to 1.8 cm. long, veins 3, palmate, white beneath in dry specimens, apex obtuse, rounded or shortly attenuated, base acute or obtusish, the petioles mostly 3 to 5 mm. long, hirtellous. Spikes 1 to 1.8 cm. long, terminal or opposite the upper leaves, moderately flowered, the peduncles 5 to 9 mm.

long, hirtellous, rachis glabrous, the bracts round-peltate, about 0.5 mm. wide, punctate with yellow dots, the filaments about equal to the ellipsoidal anthers, the ovary obovoid, apex oblique, stigma subapical, the fruit about 0.8 mm. long, globose-ovoid, verrucose, viscid, eventually on pseudopedicels.

Caroline Islands: Ponape, Paue, Montesanto, 7-800 meters altitude, December 14, 1913, *Ledermann 13739* (type, Berlin; Kew).

The small plants, shape and size of the leaves, and short spikes distinguish this from the other Micronesian species.

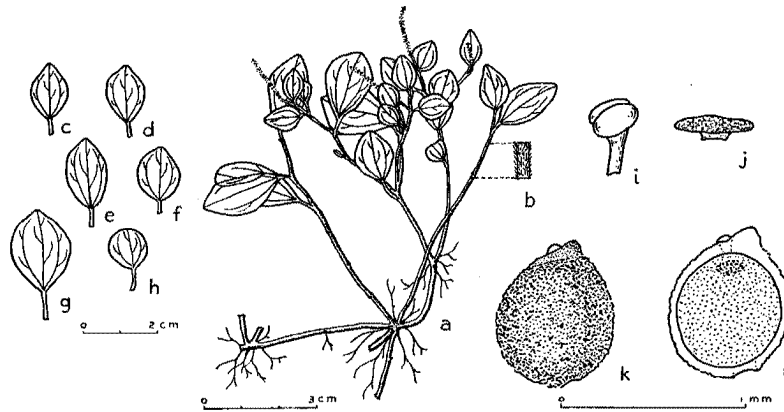


FIGURE 8.—*Peperomia breviramula* C. de Candolle: *a*, plant; *b*, section of stem, enlarged; *c-h*, leaves, showing variation in size and shape; *i*, stamen, enlarged; *j*, bract, enlarged; *k*, fruit; *l*, section of fruit.

11. *Peperomia trukensis*, new species (fig. 9).

Caules ascendentes usque ad 15 + cm. alti, ramosi, modice hirtelli, pilis fuscis, usque ad 0.5 mm. longis, internodis usque ad 4 cm. longis, plerumque 1-2 cm. Folia alterna, supra modice ad sparse hirtelli aut glabra, subter modice hirtelli, ciliata, ovata, usque ad 3.5 cm. lata et 5 cm. longa, plerumque 2-3 cm. lata et 3.5-4.5 cm. longa, palmatim 3- aut 5-nervia, apice subattenuata, obtuso aut subacuto, basi acuta, petiolo 0.8-1.2 cm. longo, hirtelli. Spicae terminales aut supra folio-opposita, usque ad 6 cm. longae, pedunculo usque ad 1.5 cm. longo, hirtello, ovarium obovoideum, apice obliquo, stigmatibus subapice; fructus circiter 0.8 mm. longus, globosus.

Stems ascending up to 15 cm. or more high from a decumbent base, rooting at the lower nodes, 3 mm. thick near the base when dry, branching, moderately hirtellous, hairs fuscous, up to 0.5 mm. long, the internodes mostly 1 to 2 cm. long, or the lower internodes up to 4 cm. Leaves alternate, drying thin and membranous, the upper surface dark colored and moderately to sparsely hirtellous or glabrate, the lower surface lighter and moderately hirtellous, ciliated at least above the middle, oval, up to 3.5 cm. wide and 5 cm. long, mostly 2 to 3 cm. wide and 3.5 to 4.5 cm. long, veins 3 or 5, palmate, when 5-veined the

outermost pair of veins slender and inconspicuous, apex subattenuate, obtuse or acutish, base acute, the petioles 0.8 to 1.2 cm. long, hirtellous. Spikes terminal or opposite the upper leaves, up to 6 cm. long, densely flowered, the peduncles hirtellous, up to 1.5 cm. long, the bracts round-peltate, about 0.5 mm. wide, the ovary obovoid, apex oblique, stigma single, subapical, the filaments about equaling the ellipsoidal anthers, the fruit about 0.8 mm. long, globose, stigma slightly subapical, verrucose, viscid, eventually on pseudopedicels.

Caroline Islands: Truk Islands, Suiyoto (Tol I.), on shaded ground or rock, January 3, 1936, *M. Takamatsu 21* (type, Bishop Mus.).

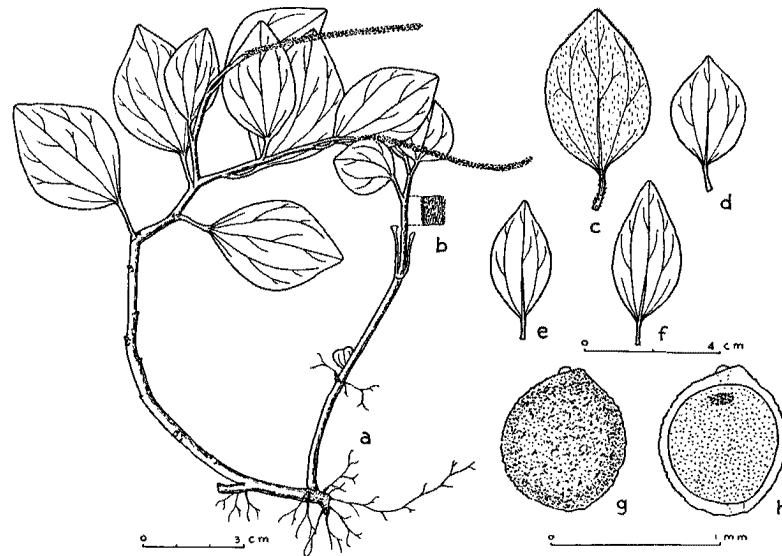


FIGURE 9.—*Peperomia trukensis* Yuncker: *a*, plant; *b*, section of stem, enlarged; *c-f*, leaves, showing variation in size and shape; *g*, fruit; *h*, section of fruit.

The hairiness of the plants and the large, oval leaves distinguish this from the other Micronesian species. It bears some resemblance to *P. samoensis* Warburg but differs from that species in its alternate leaves, shorter hairs, etc. The name is taken from the islands where the type was collected.

12. *Peperomia kusaiensis* Hosokawa.

Peperomia kusaiensis Hosokawa, Nat. Hist. Soc. Formosa, Trans., 25: 120, 1935.

Plants hirsute or hirtellous, ascending from a decumbent and rooting base. Leaves alternate, 1.5×2.5 cm., margins densely ciliated, spikes about equaling the blades. This species appears from the description to differ sufficiently from the other species here included.

Caroline Islands: Kusaie, in a *Eugenia-Astromia* forest at upper altitudes of Mount Buache, July 29, 1933, *T. Hosokawa 6278* (type not seen, Taihoku Imp. Univ.).

13. *Peperomia pacifica* Hosokawa.

Peperomia pacifica Hosokawa, Nat. Hist. Soc. Formosa, Trans., 25: 119, 1935.

This is an erect, hirsute or hirtellous species with alternate or rarely opposite leaves, 2×3 cm., and spikes shorter than the leaves. In these characters it differs from the other species which have been studied.

Marianas Islands: Saipan, in a secondary forest at middle altitudes, July 17, 1933, *T. Hosokawa 6654* (type not seen, Taihoku Imp. Univ.).