

PLATE 3B. *PORAQUEIBA PARAENSIS* Ducke (*Burchell* 9590). FIG. 1, habit, $\times \frac{1}{3}$; FIG. 2, bud, $\times 8$; FIG. 3, adaxial surface of a petal, $\times 9$; FIG. 4, pistil, $\times 10$; FIG. 5, diagrammatic section of the pistil; FIG. 6, dorsal view of the three bracts subtending the flowers, showing the point of articulation, $\times 6$; FIGS. 7-9, lateral, abaxial and adaxial views of the stamens, $\times 10$.

II. STUDIES OF THE ICACINACEAE V.

A REVISION OF THE GENUS *CITRONELLA* D. DON

(Plates 4-6)

RICHARD A. HOWARD

Ruiz and Pavon presented two very different concepts in their successive treatments of the genus *Villaresia*. The plant they described in the *Prodromus Flora Peru and Chile* (1793) is a member of the *Celastraceae*. That described in the third volume of the same work (1803) is the *Icacinaceous* genus considered here. This discrepancy was mentioned by Jussieu in 1825 and by Don in 1832, yet all subsequent workers have persisted in accepting for the genus of the *Icacinaceae* their second and invalid epithet *Villaresia*. Since *Villaresia* was a later homonym Don substituted the name *Citronella* for the second genus which Ruiz and Pavon had described.

In 1850 Blume described a plant from Java under the name *Pleuropetalon*. Asa Gray described a second species in 1854 and mentioned the affinities of this genus with *Villaresia*. However, *Pleuropetalon* is also an invalid name, being antedated by *Pleuropetalum* Hook f. of the *Portulacaceae*, established in 1845, and for this reason Miquel (1855) substituted *Chariessa* as the generic name. Bentham and Mueller combined *Villaresia* and *Chariessa* and this treatment has been followed by Valetton, Merrill, Domin, and Howard. Beccari, Engler, and Sleumer maintain them as distinct genera.

Macbride proposed the genus *Briquetina* in 1926 and compared it with several New World genera but not with *Villaresia*. I cannot distinguish between *Briquetina* and *Villaresia* and have combined them. Likewise, it is not possible satisfactorily to distinguish between *Villaresia* and Baillon's genus *Sarcanthidion*, which was apparently separated because of its climbing habit.

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In 1940 Sleumer described the genus *Villaresiopsis*, separating it from the *Citronella-Briquetina* complex through its broader staminal filaments. However, broadening of the filament does occur in other species of *Citronella*, and I see no reason why *Villaresiopsis* cannot be accommodated in the same genus.

CITRONELLA D. Don, Edinb. New Phil. Journ. **13**: 243. 1832; Howard, Journ. Arnold Arb. **21**: 471. 1940.

Villaresia Ruiz & Pavon, Fl. Peruv. Chil. **3**: 9, t. 231. 1803; A. Jussieu, Ann. Sc. Nat. **25**: 14, t. 3, 1832; Miers, Ann. Mag. Nat. Hist. III. **9**: 110. 1862, Contrib. Bot. **2**: 111. 1860-1869; Seem. Journ. Bot. **2**: 257. 1864; Bentham & Hooker, Gen. Pl. **1**: 353. 1862; Valetton, Crit. Overz. Olac. 194. 1886; Engler Fl. Bras. **12** (2): 53. 1872, Nat. Pflanzenfam. **3** (5): 244. 1893; not Ruiz & Pavon, Fl. Peruv. Chil. Prod. 35. 1793.

Pleuropetalon Blume, Mus. Bot. Lugd.-Bat. **1**: 248. 1850, not *Pleuropetalum* Hook. f.

Chariessa Miquel, Fl. Ind. Bat. **1**¹: 794. 1856; Sleumer, Notizbl. **15**: 229. 1940.

Sarcanthidion Baillon, Adansonia **11**: 199. 1874; Valetton, l. c. 200.

Briquetina Macbride, Field Mus. Pub. Bot. **11**: 26. 1931; Sleumer l. c.

Villaresiopsis Sleumer, l. c. 232. 1940.

Trees or shrubs; the branches terete, longitudinally striated, occasionally scandent; leaves petiolate, alternate, coriaceous or submembranaceous, entire or spinose-dentate, the veins oblique-arcuate and anastomosing; inflorescence terminal, axillary, extra-axillary or supra-axillary, paniculate or thyrsoïd; flowers perfect or polygamous, 5-parted, articulated below the calyx; calyx fleshy, persistent, lobes imbricated; petals free, valvate or sub-imbricated, fleshy, their apices inflexed, the midrib prominently developed; stamens free, shorter than the petals, the glabrous and fleshy filaments usually thick and subulate and more or less flattened, the basifixed introrse anthers longitudinally dehiscent; disk none; ovary subgibbous, commonly 1- (rarely 2-) loculed, the locule containing a prominent parietal ridge, the two ovules pendent from near the apex, the glabrous style 1 (rarely 2), rudiments frequently present, the capitate stigma rugose; drupe scarcely fleshy, putamen woody, the locule incompletely septate, the solitary seed longitudinally plicate around the vertical woody dissepiment, hippocrepiform, the embryo small, the endosperm copious, the radicle terete or compressed, the minute cotyledons ovate-orbicular, their margins rarely superposed.

✓TYPE SPECIES: *Villaresia mucronata* Ruiz & Pavon.

DISTRIBUTION: Costa Rica to Chile, Australia, the East Indies, the Philippine Islands, Oceania.

Several of the distinctive morphological characters of this genus are worthy of mention. The plants are trees or shrubs, varying from *C. Moorei* of Australia, which is one of the largest trees of the high rain-forests, to *C. Engleriana*, which is a shrub only one meter high. Climbing habits have been reported for *C. sarmentosum* of New Caledonia and *C. affinis* of Peru, but in both of these the climbing habit is not reflected in the form of the shoots nor in their structure. Apparently the true condition is more a scrambling growth of the branches, comparable to that which occurs in *Mappia*. The leaves are generally thick-coriaceous and rigid, except for *C. Smythii* of Australia and *C. megaphylla* of Brazil, in which they are submembranaceous. The leaf-blades are glabrous in most, but in *C. Smythii* they are persistently wooly-tomentose. In the Old World species they are entire and the midrib is commonly slightly elevated on the upper surface. The blade, petiole and bark in these species turns dark on drying. This latter character, among the New World forms, is found only in *C. megaphylla*. Many of the New World species possess a cartilaginous margin from which spinose teeth may be developed. The teeth are very prominently developed in *C. ilicifolia* and *C. mucronata*. The youngest leaves are entire-margined and the spinose teeth develop later. Since many shoots have strictly entire leaves, it was assumed those having spinose-margined leaves were on sucker shoots; however, Reiche (*Flora Chile* 2: 4. 1898) pointed out that in *C. mucronata* the leaves of the younger plants and their shoots have entire margins and the older plants and shoots from the trunk are extremely spinose-leaved. Miers distinguished between *V. cuspidata* and *V. congonha* on the presence or absence of marginal teeth; however, examination of many specimens shows that the distinctions break down through all stages of intermediates.

An additional peculiarity of the leaves of the New World species is a pore-cavity. Pores are present in the axils of the veins and the midrib and also in the first bifurcation of the lateral veins in most of the New World species. In *C. incarum*

and *C. ilicifolia* pores are absent from the axils of the main veins but minute pores are found in many reticulations along the arcuate veins. Sleumer has regarded the presence or absence of pores as significant in limiting species and, judging from the entire genus, it seems to be a valid conclusion. The pores occur primarily in the mesophyll-tissue and are usually separated from the meristemes by a single layer of cells. Occasionally a plate of tissue will be formed, with the cavity dorsal to it. The orifices and cavities of these pores vary considerably in size and apparently increase in size with the leaf. In small terminal leaves the pores are minute and frequently are revealed only through a hand-lens or by sections. In some material I have examined the pore-cavities were already formed in the leaves before there was any indication of an orifice developing. Hairs are present in many of these pores and frequently the hairs are of two types, short-strigose thick-walled hairs with small lumina and long crisp and frequently thin-walled collapsed hairs which reveal a large lumen when re-expanded. These pores have been reported as glandular or as glands in the earlier literature but Spegazzini (Ann. Soc. Cien. Arg. 49: 124. 1900) examined fresh material and concluded they were not. He called them cecidiodomatia. In the large pores there are frequently small insects. The exoskeletons were in poor condition in the material I have examined but they were tentatively identified as acarina or mites, probably of the *Eriophyidae*.

The inflorescence may be terminal, axillary, or extra-axillary, being either supra-axillary or opposing the leaf. It is a modified panicle in most species. True panicles may be found in the South American species but in the others the main axis is indeterminate and the secondary branches cymose. In *C. latifolia* and *C. Brassii* the basal branches are as long as the main axis but in most of the others all secondary branches are subequal and rarely over 1 cm. long. The flowers are sessile, articulated below the calyx and subtended by bracts. The flowers are conglomerate at the ends of the branches when young but as the axis develops they become secund in a scorpioid cyme. In *C. latifolia* and *C. Brassii* these scorpioid cymose branches are bifurcated. All of the other species have unbranched cymes.

The floral articulation of this genus varies slightly from that found throughout the family. The calyx is extremely fleshy and the portions below the calyx-lobes are gibbous. The vascular strands from the peduncle extend up into the calyx, so that the actual point of articulation is sunken in the base of the calyx. A well developed socket-articulation of the calyx is characteristic of the genus.

Considerable discussion has appeared concerning the type of floral aestivation existing in this genus. The broad usually ovate-obtuse calyx-lobes are imbricate. The corolla, however, has been considered valvate by some workers and imbricate by others. The petals are usually oblong and quite thick. They have a more or less prominently protruding midrib and an inflexed apex. The apices may be broad or may be attenuate, and the ends frequently twist or become agglutinated, hindering the opening of the flower. The bud-apex is sunken, with the back of all five petals exposed. This could not occur if the aestivation was truly imbricate. The arrangement of petals in *Citronella* is either strictly valvate or a modified valvate condition due to the extreme thickness and fleshiness of the parts.

Either perfect or polygamous flowers may be found in *Citronella*. Five species have been reported in monoecious, *C. Moorei*, *C. suaveolens*, with some examples in *C. Gongonha*, *C. apogon*, and *C. costaricensis*. I have seen no authentic material of the first two species but the reduction of one sex is apparently complete, judging from the description. In the latter examples the flowers are functionally unisexual through the depauperization of one organ. Usually it is the stamens that are sterile and much smaller than normal. An occasional flower may be found in which the ovary had failed to develop a locule. In many of these abnormal cases the floral parts may be reduced to four in number.

The filaments are usually thick, broad, and subulate. The width may be uniform from the base upwards to shortly below the anther, where it tapers rapidly, or the filament may be broadest at the base and taper uniformly. In the Old World forms the anthers are usually oblong, with an obtuse or flattened apex and a cordate base. In the New World species the anthers are elliptic-oblong and not cordate at the base.

The characters of styler length and obliqueness of the stigma, which Engler used to distinguish three genera among this complex, do not hold true if sufficient material is examined. The ovary is essentially gibbous, since the style is slightly eccentrically situated. There is commonly but one locule developed, with two anatropous ovules pendent from near the apex. Two locules may appear in some flowers, each with two ovules and the ovary with two styles.

The fruit of the genus *Citronella* is unique in the family. The drupe has a thin sarcocarp, only moderately fleshy, and a thin putamen. The putamen may be smooth, irregularly rugose, or strongly prismatic and angled. Characteristic of this fruit is the development of a dissepiment or partial partition along a radius of the locule, extending from the apex to the base. This dissepiment is present in the ovary as a small ridge and contains the vascular supply to the ovules. One ovule is pendant on each side of the ridge. In the ovary the ridge is curved with the ovary-wall, but as the drupe develops the thickened portion, containing the vascular supply, remains straight and at maturity is vertical in the center of the locule. A thin wall is formed between this thickened central column and the ovarian wall. Only one of the two pendant ovules develops and this seed has a minute embryo and a copious amount of endosperm. The endosperm conforms with the shape of the locule and is folded around the dissepiment, being hippocrepiform. The funicle is enclosed in the central column and enters the locule at the apex. The raphe is short and the vascular strands fimbriate promptly, so that no definite chalaza is found. The pattern of the raphe just described for *Citronella* is slightly variant from that found in other genera. It is possible that the endocarp-canal found in the other genera or the groove of the endocarp, which houses the funicle in some, may be comparable to the central column in *Citronella*. The fimbriation of the raphe has no counterpart in the other New World genera examined; however, there is a strong median vascular strand running down the seed at 90° from the dissepiment.

The frequent occurrence of two locules and two styles in *Citronella* raises the question, what was the primitive condition

in this genus. In a normal one-celled ovary of *Citronella* there is evidence of one or two rudimentary styles and locules. At the base of the style may be found small protuberances which have been interpreted as styler rudiments. They contain no vasculature. In the ovary also there will be a cavity or a mass of differentiated tissue between the vascular strands of the dissepiment and the ovarian wall. As many as two definite cavities without any indication of ovules have been found, although, commonly, only one such cavity is present. In many ovaries no evidence of this nature has been found.

Since the vasculature of the dissepiment is eccentric in the two-loculed ovary it is possible to presume, as Miers has done, that the primitive condition was a three-loculate ovary. It is evident in this genus that the uniloculate ovary was derived from the biloculate by abortion of one locule. On this basis the closest affinities of the genus are with *Emmotum* which has a regularly pluri-ocular ovary. *Citronella* has a more primitive wood-structure than does *Emmotum* and compares more favorably with *Dendrobangia* on this basis.

More economic uses have been reported for *Citronella* than for any other genus of the Icacinaceae. *Citronella Gongonha* has an extensive use in South America as an inferior substitute for *Ilex paraguayensis* in making maté. The two plants have a remarkably similar appearance and it is possible that this use arose through a confusion of the plants. The essential oil necessary for maté is in much smaller quantities in the foliage of *C. Gongonha*. It is possible to distinguish between these plants on anatomical characters of the leaves. In addition to this use *C. Gongonha* is frequently cultivated as a shade-tree, a pot-plant or as a greenhouse shrub. Along with *C. mucronata* it is reported to be an excellent hedge-plant, probably because of its rigid, frequently spinose-margined leaves. *C. Moorei* is one of the largest trees of the Australian rain-forests and its use as a lumber tree is well known. It is frequently used for a veneer in cabinet work. Other Old World species are used locally by the natives for axe-handles and general construction, because of the hardness of the wood.

Specimens cited in this paper are from the following herbaria.

Arnold Arboretum (A), Brisbane Botanical Gardens, Brisbane, Australia (B), Field Museum of Natural History (FM), Gray Herbarium (G), Herbarium, Bureau of Science, Manila, Philippine Islands (M), New York Botanical Gardens (NY), Herbarium, Instituto Lillo, Univ. Nacional de Tucuman, Argentina (T), United States National Museum (US). The author is grateful to the directors of these institutions for the use of the materials.

KEY TO THE SECTIONS

- Inflorescence axillary, terminal or rarely extra-axillary; buds globose; filaments short, stout; anthers ovate-oblong, apex and base rounded; leaves commonly with axillary pores, rarely darkening on drying, margin cartilaginous, entire or spinose-dentate. Species of the New World.....*Eucitronella*
- Inflorescence extra-axillary or terminal; buds obovate; filaments broadly awl-shaped, attenuate at the apex; anthers oblong, cordate at the base; leaves without axillary pores, turning black on drying, margin entire, not cartilaginous. Species of the Old World.....*Euchariessa*

Section: **Eucitronella** sect. nov.

Plantae americanae, inflorescentiis axillaribus, gemmis globosis, antheris ovato-oblongis apice et basi rotundatis, axillis nervorum foliorum cavositatem porosam gerentibus, margine foliorum cartilagineo integro vel spinoso-dentato.

KEY TO THE SPECIES

- Ovary densely to sparsely pilose.
 - Inflorescence opposing the leaves or terminal; flowers polygamous.....*C. costaricensis*
 - Inflorescence axillary or terminal, flowers perfect.
 - Ovary densely pilose; leaves membranaceous; petals glabrous.....*C. megaphylla*
 - Ovary sparsely pilose; leaves coriaceous, rigid; petals pubescent outside.....*C. paniculata*
- Ovary glabrous.
 - Leaves cuspidate, margin cartilaginous.
 - Inflorescence terminal; leaves oblong-lanceolate to ovate, 4-6.5 cm. long, midrib and veins only slightly prominent, petioles short.....*C. mucronata*
 - Inflorescence axillary or terminal; leaves ovate to elliptic, 7-14 cm. long, midrib and veins prominent, petioles long.....*C. Gongonha*
 - Leaves not cuspidate, margin slightly cartilaginous.
 - Inflorescence terminal or axillary.
 - Leaves oblong to obovate, 7-10 cm. long, flat, veins distinct; calyx pubescent; flowers polygamous.....*C. apogon*
 - Leaves obovate, 4-6 cm. long, margin revolute, veins masked in fleshy lamina; calyx glabrous or only ciliate; flowers perfect.....*C. Engleriana*

Inflorescence extra-axillary.

Leaves with pores in axils of primary veins, entire, sweet-smelling.....

C. melliodora

Leaves without large axillary pores in axils of primary veins but with numerous small pores in the bifurcations of these veins.

Leaves entire.....

C. incarum

Leaves spinose-dentate.....

C. ilicifolia

CITRONELLA COSTARICENSIS (Donn. Sm.) Howard, Journ. Arnold Arb. **21**: 471. 1940.

Villaresia costaricensis Donn. Sm., Bot. Gaz. **31**: 110. 1901; Standley, Field Mus. Pub. Bot. **18**: 636. 1937.

Trees to 20 m. tall, the trunk-diameter 40 cm., the bark light brown, the crown dense; branches light brown, sparsely strigose, becoming glabrate; petioles 4–8 mm. long, sulcate above, puberulous, soon glabrate; lamina oblong-elliptic, 9–12 cm. long, 4–5 cm. wide, coriaceous, rigid, green, shining above, gray and dull when dry, light brown below, very sparsely strigose, becoming glabrate, acuminate or acute, the base acute or rounded, the midrib sulcate above, prominent below, bearing large pores in the axils of the 5–6 pairs of primary veins, the entire margin slightly revolute; inflorescence extra-axillary, commonly opposing the leaf, the panicle 5–9 cm. long, its cymose branches 1 cm. long, the rachis sparingly strigose, the bracts ovate; flowers sessile, glomerate, slightly secund, polygamous; calyx fleshy, 2 mm. in diameter, 1.3 mm. high, hirsute, the broadly triangular obtuse lobes 0.6–0.8 mm. high and 1 mm. wide; petals oblong-elliptic, 3.5 mm. long, 1.5–2 mm. wide, glabrous, apex attenuate; fertile stamens 2.6–3 mm. high, the filaments broadest below the middle, the oblong anthers 0.9–1 mm. long; the sterile stamens shorter than the ovary; fertile pistil 2.5 mm. long, the hirsute ovary globose, the short style glabrous, the stylar rudiments present, the capitate stigma rugose, sterile pistil 1–1.2 mm. high, the hirsute ovary globose, undifferentiated, the glabrous stylar rudiments 2–3 and equal; drupe elliptic-obloid, 2–3.5 cm. long, 1.6–1.8 cm. in diameter, the putamen longitudinally ridged, the minute embryo to 2 mm. long.

TYPE SPECIMEN: *Tonduz* 11664 (US 1394149), collected at Copey, Costa Rica.

ILLUSTRATION: PLATE 5A.

SPECIMENS SEEN: Costa Rica. Cartago: Copey, *Tonduz* 11664 (US type, FM, G, NY isotypes), 7351 (G, NY, US), 7388b (US), 11695 (G, US), 11791 (US); El Rosario de Orosi, *Pittier* 16625 (US); La Brisa de Zarcero, *Austin Smith* H-440 (FM), H-1357 (FM), 4112 (FM); San José, Santa María de Dota, *Standley* 42841 (FM); La Ventoleñ, S. slope of Volcán de Poas, *Standley* 34575 (US).

Occasionally completely unisexual flowers are found in *C. costaricensis*. Examples of flowers with sterile stamens are known for other species but this is the only instance where completely sterile pistils have been reported among the New World species. Among the staminate specimens there were no fertile pistils in any of the flowers of an inflorescence. In an inflorescence with fertile pistils some perfect flowers were found. In the flowers with functional pistils the ovary is one-celled, with one other smaller cavity eccentric to the fertile one. Two styler rudiments are usually present at the base of the functional style. The sterile stamens are usually perfectly formed but much smaller than normal and their anthers develop no pollen.

The inflorescence is commonly opposite the leaf in this species. Its secondary branches are cymose, with the flowers glomerate at first, becoming slightly secund-scorpoid. The leaves have exceedingly large pores in the axils of the veins and the midrib. The drupe is larger than those of the other New World species. In all of these characters, except the pores, this species shows a closer relationship with species of the Old World than with those of the New World.

Plants have been collected from the high altitudes of Costa Rica between 1800 and 2500 meters. The trees are large and in deep forests. The fruit looks like a plum but is inedible.

CITRONELLA MEGAPHYLLA (Miers) Howard, Journ. Arnold Arb. **21**: 472. 1940.

Villaresia megaphylla Miers, Ann. Mag. Nat. Hist. III. **9**: 114. 1862, Contrib. Bot. **2**: 119. 1860-69.

Villaresia citrifolia Borzi, Boll. Ort. Bot. Palermo **1**: 44. 1897.

Villaresia grandiflora Fisch. ex Regel, Gartenfl. **5**: 61. 1856, **6**: 1, t. 180. 1857, *V. grandifolia* on plate.

Villaresia grandifolia Fisch. ex Engler, Fl. Bras. **12** (2): 54. 1872, as synonym of *V. megaphylla*.

Villaresia megaphylla var. *acuminata* Miers, Ann. Mag. Nat. Hist. III. **9**: 115. 1862, Contrib. Bot. **2**: 120. 1860-69.

Tree, the branches glabrous; petioles slender, 2 cm. long, canaliculate above, glabrous; lamina oblong to narrowly elliptic, 16-19 cm. long, 5-8 cm. broad, subcoriaceous, glabrous, dull gray-green above when dry, lighter below, acute, the base acute, axillary pores rare, the midrib sulcate above and prominent below, the slightly prominent to inconspicuous veins 5-9 pairs;

margin entire; inflorescence axillary, paniculate, the lower branches as long as the main axis, slightly hirsute, the bracts ovate, the ultimate branches 3-5 flowered; the oblong calyxlobes 1.5 mm. long, 0.7-0.9 mm. broad, sparsely hirsute; petals oblong or obovate, 4-4.5 mm. long, 1.5-2 mm. wide, glabrous; stamens 3-3.2 mm. long, the ovate anthers 0.8-1 mm. long; ovary globose, 2 mm. diameter, densely hirsute, the glabrous style short, the capitate stigma rugose; fruit not seen.

TYPE COLLECTION: *Miers* s. n. from Freichal, at the foot of the Organ mountains, Rio de Janeiro, Brazil (not seen).

ILLUSTRATION: *Miers*, *Contrib. Bot.* **2**: pl. 71. 1860-69, as *V. macrophylla*.

SPECIMENS SEEN: Brazil. Rio de Janeiro: Chacara do Fonsica, *Occhioni*, Herb. Jard. Bot. Rio 3456 (US). São Paulo: cultivated in the Botanic Garden, *Hoehne* 29752 (FM, NY).

VERNACULAR NAMES: Congonha, Mborebi-cao, Palo de anta, Yerba de anta, Mborevi-Kaá.

This tree is frequently used as a source of paper-pulp and, more commonly, as firewood, according to Spegazzini.

CITRONELLA PANICULATA (Mart.) Howard, *Journ. Arnold Arb.* **21**: 473. 1940.

Leonia paniculata Mart. *Flora* **24** (2): Beibl. 26. 1840; DC. *Prod.* **8**: 669. 1844.

Lereticia paniculata Miquel in Mart. *Fl. Bras.* **7**: 17. 1856.

Villaresia paniculata Miers, *Ann. Mag. Nat. Hist.* III. **9**: 116. 1862, *Contrib. Bot.* **2**: 121. 1860-69.

Villaresia paniculata var. *intermedia* Hassler, *Fedde Repert.* **14**: 164. 1915.

Trees to 10 m. tall; the branches stout, glabrous; petioles stout, to 1 cm. long, broadly canaliculate above, glabrous; lamina lance-oblong to oblanceolate, 9-11 cm. long, 3-5 cm. wide, coriaceous, glabrous, dull yellow-green above, lighter below, acute, slightly mucronate, the base cuneate or acute, the midrib sulcate above and prominent below, the 5 pairs of veins inconspicuous, the pores present in the axils of the veins, the margins entire, frequently cartilaginous; inflorescence axillary, paniculate, the basal branches as long as the main axis and densely sericeous-hirsute, the densely pubescent ovate bracts 3 mm. long and 1.5 mm. wide; flowers in clusters of 3-5, perfect; calyxlobes broadly ovate, 1 mm. long, 0.7-0.9 mm. wide, densely hirsute; petals oblong, 3-3.5 mm. long, 1.2-1.6 mm. wide, sparsely short-strigose along the median line outside, glabrous inside; stamens 2-2.3 mm. long, the filaments broadest below the middle, the oblong anthers 0.5 mm. long; ovary globose, 1.2-2 mm. in diameter, densely hirsute,

the short style glabrous, the capitate stigma rugose; drupe obovate, the apex cuspidate, the base acute or rounded, 1–1.5 cm. long, 1–1.2 cm. in diameter, glabrous, purple when ripe.

TYPE COLLECTION: *Martius* Herb. 460, made in Brazil, Capocapanae, prov. Sebastiano-politanae.

ILLUSTRATION: PLATE 4A.

SPECIMENS SEEN: Brazil. Minas Geraës: Fazenda do Paraíso, *Mexia* 5128 (FM, G, NY, US); Caldas, *Regnell* III-381 (US); *Widgren* s. n. (G). Rio de Janeiro: Macahé, *Riedel & Luschnaff* 1195 (NY); *Glaziou* 88288 (FM). No state given: *Mart.* Herb. 460 (type photo FM); *Warming* s. n. (photo type of var. *obtusifolia* FM, G). Paraguay. Cordillera de Altos, *Fiebrig* 135 (A, FM, G, US); Paraguay centralis, Sapucay, *Hassler* 11872 (A, G, US). Argentina. Misiones: Gobon, Puerto León, *Venturi* 111 (T).

VERNACULAR NAME: Perobossu.

I tentatively place *C. ramiflora* Miers (Ann. Mag. Nat. Hist. III. 9: 116. 1862, Contrib. Bot. 2: 120. 1860–69), *C. paraguayensis* Hassler (Fedde Rep. 14: 164. 1915), and *C. virescens* Miers (Ann. Mag. Nat. Hist. III. 9: 115. 1862, Contrib. Bot. 2: 120. 1860–69) in synonymy with *C. paniculata*. I have not seen authentic material of these species. When Miers described *C. ramiflora* and *C. virescens* he did not know *C. paniculata* and he recognized the possibility that either of the two species might be identical with *C. paniculata*. Miers established these species on slight differences in the pubescence of the ovary, a variable character in *C. paniculata*, where the ovary may be slightly pubescent or may have only a few hairs on the sulca. Since all stages of variation are found it is not possible to draw satisfactory lines between the extremes, as Miers has done. For this reason I consider *C. paniculata* a variable species and include *C. ramiflora* and *C. virescens* in it. Hassler's distinctions for *C. paraguayensis* are unsatisfactory and that species, too, must be included here.

More material may also prove that the differences between *C. paniculata* and *C. megaphylla* are not substantial. At the present time the pubescence on the outside of the corolla and the larger submembranaceous leaves are the characters which seem to distinguish the present species from its relatives.

Both Engler and Miers have cited the wrong type specimen in

their discussion of this species. The type specimen is *Leonia paniculata* Martius Herbarium, number 460 not 420. I have seen a photograph of it.

The collection by Warming, on which Engler based *Villaresia megaphylla* var. *obtusifolia*, is referable to *Villaresia paniculata*. I have seen a photograph of the type.

CITRONELLA MUCRONATA (Ruiz & Pavon) D. Don. Edinb. Phil. Journ. **13**: 243. 1832; Howard, Journ. Arnold Arb. **21**: 473. 1940.

Villaresia mucronata Ruiz & Pavon, Fl. Peruv. Chil. **3**: 9, t. 231. 1803; A. Juss. Ann. Sci. Nat. **25**: 14, t. 3, fig. 2. 1832; Reiss., Fl. Bras. **11** (1): 75. 1861.

Villaresia chilensis Stuntz, U. S. Dept. Agr. Bur. Pl. Ind. Invent. Seeds Pl. Imp. **32**: 39. 1914, not *Citrus chilensis* Molina.

Villaresia pungens Miers, Ann. Mag. Nat. Hist. III. **9**: 112. 1862, Contrib. Bot. **2**: 116. 1860-69.

Villaresia Congonha var. *pungens* Engler, Fl. Bras. **12** (2): 57. 1873.

Villaresia mucronata var. *laeta* Miers, Ann. Mag. Nat. Hist. III. **9**: 111. 1862, Contrib. Bot. **2**: 116. 1860-69.

Patagua chilensis Poepp. ex Neger, Bot. Centralbl. **84**: 307. 1900.

Small tree, to 8 m. tall; the branches yellow-puberulous, frequently fasciated; petioles 0.5 cm. long, sulcate above, puberulous to glabrate, stout; lamina broadly ovate to ovate-oblong, 4-6.5 cm. long, 2-4 cm. wide, coriaceous, rigid or membranaceous when young, dull gray-green above, yellow below, acute or mucronate, the base acute to obtuse or truncate, the sulcate midrib pubescent and prominent above but glabrous below with large pores in axils of primary veins, the 5-6 pairs of veins slightly prominent on both surfaces, the cartilaginous margin entire or spinose-dentate, the cartilaginous teeth to 2 mm. long; inflorescence terminal, the panicles 4-10 cm. long, rhachis yellow-brown-tomentose, the ovate bracts 2 mm. long and pubescent, flowers in clusters of 3-5 at the ends of the branches; calyx-lobes broadly ovate, 1-1.5 mm. long, 1-1.3 mm. wide, pubescent along the median line, ciliate; petals oblong, 3.5-4.5 mm. long, 1.5-2 mm. wide, glabrous; stamens 2.8-3.4 mm. long, the filament dilated below and broadest at the base, the oblong to ovate anthers 0.8-1.1 mm. long; pistil glabrous, conical, the style frequently grooved, the small capitate stigma rugose; drupe 9-12 mm. long, 6-7 mm. in diameter.

TYPE COLLECTION: *Ruiz & Pavon*, s. n. made at Concepcion, Chile.

ILLUSTRATIONS: Miers, Contrib. Bot. **2**: 67. 1860–69 as *V. mucronata* Ruiz & Pavon, Fl. Peruv. Chil. **3**: pl. 231 b. 1803; Fl. Bras. **11** (1): t. 22. 1861.

SPECIMENS SEEN: Chile: Coquimbo, Dept. Ovalle, Bosque de Fray Jorge, *Muños & Coronel* 1394 (G); Quillota, *Bertero* 1394 (FM, G); Rancagua, La Leona, *Bertero* 749 (FM, G); Temuco, *Sargent* s. n. (G); Bureo, *Joseph* 3445 (G); Temuco *Joseph* 4681 (G); Antuco, *Poeppig* 703 (photo FM, G). No locality given. *Dombey* 595 (FM); *Cuming* s. n. (FM, G); *Ruiz & Pavon* (FM, ex Herb. Horti. Bot. Matritensis, photo FM).

VERNACULAR NAMES: Naranjillo, Patagua, Guilli-patagua, Citronnier, Congonha do sertão, Herva de anta com espinho.

Citronella mucronata is frequently cultivated as a shade or park tree. The wood is used for fuel and for paper-pulp. The leaves lack the aromatic oil necessary for maté. Gay reports a superstition that hernias may be cured by lying under the tree or by the use of the plant.

Engler incorrectly attributed the specimen collected by Cuming to Concepcion, Paraguay, instead of Chile. This is the specimen upon which Miers based *V. pungens*. An isotype of the species is definitely identical with *C. mucronata*, so that I have referred *V. pungens* and *V. congonha* var. *pungens* to synonymy under *C. mucronata*.

Spinose-margined leaves are reported both for older plants and for sucker-shoots. The normal leaves are entire and cartilaginous-margined. *V. mucronata* var. *laeta*, established by Miers for plants with leaves truncate at the base, is not a substantial entity. Such leaf-forms are common and frequently may be found on the same branch with leaves having acute bases.

Stuntz made the new combination, *Villaresia chilensis*, for this plant, as Miers has referred *Citrus chilensis* Molina to the synonymy here. I have pointed out in an earlier paper (Howard, l. c. 473) that *Citrus chilensis* cannot belong here and probably represents a true *Citrus*. The new combination made by Stuntz is not applicable to this Chilean plant.

Occasional female flowers may be found with depauperate stamens having sterile anthers.

CITRONELLA GONGONHA (Mart.) Howard, Journ. Arnold Arb. **21**: 471. 1940.

Cassine Gongonha Mart. Reise Bras. 1: 285. 1823; Travels Braz. 2: 100. 1824.

Ilex Gongonha D. Don, Lambert, Gen. Pinus, 2: app. 7** t. 6. 1824.

Villaresia Congonha Miers, Ann. Mag. Nat. Hist. III. 9: 112. 1862, Contrib. Bot. 2: 117. 1860-69.

Myginda Gongonha DC., Prod. 2: 12. 1825.

Villaresia cuspidata Miers, Ann. Mag. Nat. Hist. III. 9: 113. 1862, Contrib. Bot. 2: 118. 1860-69.

**Villaresia Gongonha* C. Muell. Walp. Ann. 7: 569. 1868.

**Villaresia mucronata* sensu Reiss. in Mart. Fl. Bras. 12 (2): 75, t. 22. 1872, not Ruiz & Pavon.

**Villaresia mucronata* sensu Sprague, Bot. Mag. 137: t. 8376. 1911, not Ruiz & Pavon.

Tree to 8 m. tall; branches yellow, glabrous, frequently fasciated; petioles short, 0.5-1 cm. long, stout, deeply canaliculate above, glabrous, yellow; lamina oblong-lanceolate, ovate, elliptic or obovate, 7-12 cm. long, 3.5-6 cm. wide, coriaceous, rigid, glabrous, yellow-green and frequently shining above, yellow below, the apex rounded, cuspidate, the cartilaginous cusp to 3 mm. long, the base acute or rounded, the midrib sulcate above and prominent below, bearing pores in the axils of veins, the 5-8 pairs of veins slightly raised and sulcate above and slightly prominent below, the entire margin cartilaginous, slightly revolute or sinuate-dentate or denticulate, the cartilaginous teeth to 2 mm. long; inflorescence axillary, paniculate, to 4 cm. long, densely hirsute, the hirsute ovate bracts to 1 mm. long; flowers clustered; sepals ovate 1-1.5 mm. high, 0.7-1.3 mm. wide, fleshy, hirsute, ciliate; petals oblong, 3-4 mm. long, 1.5-3 mm. wide, glabrous; stamens 2-3 mm. long, the ovate-oblong anthers 0.3-0.6 mm. long; pistil glabrous, the ovary globose-conical, the stout style slightly eccentric, the capitate stigma rugose; fruit not seen.

ILLUSTRATION: Miers, Contrib. Bot. 2: pl. 69, pl. 70 as *V. cuspidata*. 1860-69; Bot. Mag. 137: t. 8376. 1911; Rev. Chil. Hist. Nat. 21: 129. 1917; Lambert, Genus Pinus 2: t. 6. 1824.

DISTRIBUTION: Brazil, Paraguay, Uruguay, Argentina.

SPECIMENS SEEN: Brazil. São Paulo: Butantan, *Hoehne* 385 (A, FM, NY), 802 (FM), 2352 (G, NY). Paraná: Curityba, *Dusén* 17165 (G). Miñas Geraes: Caldas, *Regnell* 1404 (US); Uberana, *Riedel & Luschnatt* 2836 (NY). Rio Grande de Sul: Neu Württemberg, Estancia Luiz, *Bornmüller* 749 (A, G); Palmeira, *Bornmüller* 734 (A, G). Prov. not stated; *Sellow* 2857 (G). Argentina. Misiones: Santa Ana, *Rodriguez* 535 (T); Formosa: Colonia Clorinda, *Venturi* 9111 (US). Uruguay. Treinta-y-tres: Tacuari, *Herter* 1624 (FM, G); San Bernardino

between Pirayó and Tacural, *Osten* 9121 (T). Paraguay. Carapagua, *Rojas* 3343 (NY, US); Ygatimí, Yerbales & Sierra de Maracayú, *Hassler* 5495 (A); Villa Rica, *Jorgensen* 4492 (US), 4498 (A, FM, NY, T, US); Yuguiri, Lague, *Rojas* 1736 (T); Asuncion, Areguá, *Malme* 856 (G).

VERNACULAR NAMES: Yapon, Maté, Yerba de palos los paraguayos, Gongonha, Congonha, Congoña, Caá-guazú, Caá-rá, Caona, Tarumá del pantano, Palo de pantano, Congonha de bugre, Congonha falsa, Falsomaté, herba de anta.

The branches of this species are often either clustered at a node or actually fasciated and flattened. A rare flower may possess a few scattered hairs on the ovary. The cartilaginous margin and the cuspidate tip of the leaf readily distinguish this species.

The collection by Bornmüller (749) is the host for the type-specimen of fungus, *Pyenoderma Villaresiae* Sydow.

Engler reduced *Villaresia pungens* of Miers to the status of a variety and referred it here. The type specimen was collected by Cuming at "Concepcion," which Engler mistook to be the Concepcion in Paraguay. I have referred *V. pungens* and *V. Congonha* var. *pungens* to synonymy with *C. mucronata*. Most of Cuming's work was done in Chile and the plant is obviously a spiny shoot of *C. mucronata*.

CITRONELLA apogon (Griseb.), comb. nov.

Emmotum apogon Griseb. Göttung. Abhandl. 24: 149. 1879.

Small tree; the branches strigose or hirsute when young, becoming glabrate, yellow, often fasciated; petioles 1 cm. long, sulcate above, hirsute or glabrate, yellow; lamina elliptic to oblanceolate, 7–10 cm. long, 3–4 cm. wide, rigid-coriaceous, glabrous, olive-green above, yellow-brown below, obtuse, the base acute or cuneate, the midrib sulcate above and prominent below, the 3–5 pairs of veins slightly prominent and bearing pores in the axils of the primary veins, the margin entire, slightly revolute, cartilaginous; inflorescence axillary, fasciated, the panicles to 2 cm. long, rhachis hirsute, bracteate, the hirsute ovate bracts 1.5 mm. long; flowers 3–5, clustered at the ends of the branches; calyx-lobes ovate, 1 mm. long, 0.8–0.9 mm. wide, obtuse or acute, fleshy, sparsely hirsute; petals oblong, 2.7–3.5 mm. long, 0.9–1.7 mm. wide, the apex extended to a narrow spatulate appendage, midrib prominent; stamens 1–1.2 mm. long, partially sterile, the oblong anthers slightly diverging at the base; pistil glabrous, the globose ovary 1 mm. in diameter, the

eccentric style strongly sulcate and 1 mm. long, the capitate stigma rugose; fruit immature.

TYPE COLLECTION: *Lorentz* and *Hieronymus* 438, from Oran near San Andres, Argentina.

ILLUSTRATION: PLATE 5B.

SPECIMENS SEEN: *Argentina*. Oran near San Andres, *Lorentz* & *Hieronymus* 438 (NY, photo FM, ISOTYPE). *Bolivia*. Santa Cruz: Samaipata, *Steinbach* 8245 (FM, NY).

VERNACULAR NAME: Laurel.

Steinbach's plant was collected at 1400 meters altitude and was in flower in October. The flowers are functionally unisexual. In the specimens cited above, the flowers were mostly pistillate, although a few flowers with fertile pistils had stamens with a small number of pollen grains. Usually the pistil was well developed but the stamens were minute, well formed, but completely sterile. The ovary, which *Grisebach* described as three-loculate, is commonly one-celled, as in other species of *Citronella*. In *C. apogon* the vascular mass of the dissepiment protrudes into the locule of the ovary but at the junction of this partition and the ovarian wall are remnants of other locules. These are two more or less distinct regions of soft punky tissue which may represent the two other locules mentioned by *Grisebach*. No indication of ovules could be found in this tissue and only one small cavity was present. The fruits are not known. Older flowers, with enlarged pistils or young fruits, show only one locule and two ovules, one of which is clearly shrunken.

C. apogon is clearly distinct from the other species by the flat oblanceolate or elliptic leaves and the polygamous flowers.

CITRONELLA ENGLERIANA (Loesn.) Howard, Journ. Arnold Arb. 21: 471. 1940.

Villaresia Engleriana Loesner, Notizbl. 3: 20. 1900.

Small tree or shrub; the branches clustered at the nodes, dark brown, strigose or hirsute to glabrate; petioles 0.5–1 cm. long, sulcate above, hirsute; lamina oblanceolate to lance-oblong, 4–6 cm. long, 1–1.5 cm. wide, rigid-coriaceous, sparsely strigose or hirsute above, becoming glabrate, olive-brown, concolorous, acute, the base cuneate, the midrib sulcate above and slightly prominent below, the inconspicuous veins 3–4 pairs, the pores present, the margin revolute entire and not cartilaginous or only slightly so; inflorescence terminal, paniculate, to 2 cm. long, the rachis yellow-hirsute, ovate hirsute bracts 1.6 mm. long; flowers

clustered at the ends of the branches; calyx 2.1 mm. in diameter, fleshy, the broadly ovate glabrous or slightly ciliate lobes 1–1.2 mm. long and 1–1.2 mm. wide with apex rounded; petals lance-oblong, 2.5–2.7 mm. long, 1.3–1.6 mm. wide, glabrous; stamens 3.1–3.3 mm. long, the filaments oblong to broadly subulate, the oblong anthers 0.8–1 mm. long; pistil conical, glabrous, the ovary subglobose, 1.1 mm. in diameter, the style short, the capitate stigma rugose; fruit unknown.

TYPE COLLECTION: *Glaziou* 17575, from Serra des Orgas, Rio de Janeiro, Brazil.

ILLUSTRATION: PLATE 4B.

SPECIMENS SEEN: *Glaziou* 17575 (FM[✓] isotype, photo. of TYPE FM, G).

The size and shape of the leaves allow this species to be readily recognized.

CITRONELLA *melliadora* (Sleumer), comb. nov.

Briquetina melliadora Sleumer, Notizbl. **15**: 230. 1940.

Tree 12–15 m. high, trunk-diameter 20–30 cm.; the branches glabrous; petioles 1.2–1.7 cm. long; lamina oblong, rarely ovate-oblong, 18–25 cm. long, 7–19 cm. wide, subcoriaceous, glabrous, shining both sides, entire, short-acuminate with a subacute curved acumen 1.3–2 cm. long, the broadly cuneate or rarely round base almost equal, the veins 4–5 pairs, axils of primary veins bearing pores; inflorescence 6–10 (20) cm. long, rhachis laxly pilose, the cymes manifestly peduncled; flowers subsessile, sweet-smelling, the scarious bracts ciliate; pubescent ovate sepals 1 mm. long; petals oblong, glabrous, 1.5 mm. long, yellow; stamens one half the corolla-length, the filaments subulate, the anthers ovate-oblong; ovary ovoid, glabrous, the style short, the stigma subcapitate; fruit unknown.

TYPE SPECIMEN: *Tessmann* 4474 (Herb. Berlin, not seen), collected in Peru, Upper Maranon, Mundung des Santiago.

Further study may show that this species is not distinct from *C. incarum* for, according to the description, it differs only in the possession of pores in the axils of the primary veins and the midrib and has a sweet odor. I have not seen material of it.

CITRONELLA INCARUM (Macb.) Howard, Journ. Arnold Arb. **21**: 472. 1940.

Briquetina incarum Macbride, Field Mus. Pub. Bot. **11**: 26. 1926.

Briquetina mollis Sleumer, Notizbl. **15**: 231. 1940.

Briquetina affinis Standley ex Sleumer, Notizbl. **15**: 232. 1940, nomen.

Tree or shrub with scrambling branches; the terete branches chestnut brown and ferruginous-tomentose or sparsely hirsute and becoming glabrate, the old branches ash-gray, the bark fissured; petioles stout, 0.7–1.5 cm. long, broadly canaliculate above, tomentose when young, becoming glabrate; lamina elliptic to oblong or ovate, 10–18 cm. long, 6–8 cm. wide, hirsute-tomentose above, becoming glabrate, shining, crispose-tomentose below, becoming sparsely pubescent or glabrate, thick-coriaceous, acute, the base acute to rounded, unequal, the midrib sulcate above and prominent below, the 5 pairs of veins sulcate above, the reticulate veinlets with pores in the axils of the secondary bifurcations, the pores absent from the axils of the primary veins, the entire margin crenulate on drying; inflorescence extra-axillary, commonly opposing the leaf, the panicle 8–15 cm. long, the subequal branches to 2 cm. long, rhachis hirsute or tomentose; flowers sessile, subtended by ovate yellow-hirsute bracts, secund-scorpoid; calyx 1.2 mm. high, the broadly ovate and obtuse lobes densely hirsute; petals oblong, 1.5–2 mm. long when immature; stamens immature, to 1.7 mm. long, the oblong anthers 0.7 mm. long; pistil conical, 2 mm. long, glabrous, the style subulate, two rudiments present, the capitate stigma rugose; drupe ovoid or ellipsoid, 1 cm. long, 0.8 cm. in diameter, dark brown when dry.

TYPE SPECIMEN: *Macbride* 4050 (FM 535116).

SPECIMENS SEEN: Peru. Huanuco: Muña, *Macbride* 4050 (FM TYPE). Yanano: *Macbride* 3748 (FM, US). San Martin: Juan Jui, upper Rio Hullaga, *Klug* 3807 (FM, G, NY). Libertad: prov. Patáz, valley of Mishiollo below Ongón, *Weberbauer* 7056 (FM, G, US).

Sleumer published the name *Briquetina affinis* and attributed it to Standley. Such a plant has never been described. Although Sleumer referred a collection cited above to such a species and gives a key to distinguish them I find the key-differences very unsatisfactory. While there is a large difference in the altitudinal ranges of these two plants and a slight difference in the general appearance, I can find no substantial differences in the flowering specimens available. It seems best to refer all the collections to *C. incarum*.

I cannot distinguish between *B. mollis*, as described by Sleumer, and the type specimen of *C. incarum*. The latter is often persistently crispose-tomentose on the lower surface of the leaves and it is upon this character that *B. mollis* was established.

Unique in this plant is the absence of large pores in the axils of the primary veins and the midrib. Instead, many small pores are found in the bifurcations of the secondary veinlets or along the primary arcuate veins, especially where they parallel the margin of the leaf.

CITRONELLA ilicifolia (Sleumer), comb. nov.

Villaresiopsis ilicifolia Sleumer, Notizbl. **15**: 232. August, 1940.

Citronella peruviana Howard, Journ. Arnold Arb. **21**: 474. October, 1940.

Trees 5 m. high; branches yellow-hirsute, becoming glabrate; petioles 6 mm. long, canaliculate above; lamina lance-elliptic to oblong, 12–18 cm. long, 5–8 cm. wide, coriaceous, rigid, olive-brown when dry, acuminate, the base rounded, the midrib sulcate above and prominent below, the 5 pairs of veins slightly immersed above but prominent below and bearing pores in the axils of the primary veins, the margin entire when young but becoming sinuate-dentate, the rigid and cartilaginous teeth 2–3 mm. long and 4–7 mm. apart; panicle extra-axillary, 8 cm. long when immature, the cymes 0.5–1.5 cm. long, rachis densely yellow-hirsute or -pilose, the ovate bracts minute; flowers sessile, agglomerate when young becoming secund-scorpoid; sepals ovate-oblong, 1.7–2 mm. long, obtuse, loosely pilose outside; petals oblong to 5 mm. long, 2 mm. wide, the apex inflexed, appendage $\frac{1}{3}$ – $\frac{1}{4}$ the petal-length; stamens 2.2–2.8 mm. long, the subulate filaments 1.3–2 mm. long and broadest below the middle, the ovate-oblong anthers 0.5–0.8 mm. long and diverging at the base; pistil glabrous, to 2.5 mm. long, the ovary ovoid, the style 0.8 mm. long, the capitate stigma oblique and rugose; fruit unknown.

TYPE SPECIMEN: *Weberbauer* 6617 (Herb. Berlin, not seen), collected in Peru, Junin, prov. Jauja, along the Rio Comas.

ILLUSTRATION: Howard, Journ. Arnold Arb. **21**: pl. 4. 1940, as *Citronella peruviana*.

SPECIMENS SEEN: *Weberbauer* 6617 (FM, G, US isotypes).

Sleumer and I each described a new species of *Citronella* based on a collection by Weberbauer. I have pointed out (l. c.) that this specimen is intermediate in position between the South American species of *Villaresia* and *Briquetina* and that it forms a link rather than a new genus, as Sleumer proposed for it.

Section: **Euchariessa** sect. nov.

Plantae gerontogae, inflorescentiis extra-axillaribus vel terminalibus, gemmis obovatis, antheris oblongis apice rotundatis basi

cordatis, laminis foliorum non poros gerentibus margine non cartilagineis integerrimis.

KEY TO THE SPECIES

- Inflorescence paniculate, basal branches elongate; cymes bifid.
 Fruit ovoid, 1.5 cm. in diameter; putamen 1-2 mm. thick, rugose. Philippine Islands. *C. latifolia*
 Fruit ellipsoid, 1-1.5 cm. long, 0.6-0.9 mm. in diameter; putamen 0.5 mm. thick, smooth. New Guinea. *C. Brassii*
- Inflorescence thryoid, cymes simple, subequal.
 Flowers monoecious.
 Ovary densely hirsute, styler rudiments present. Australia. *C. Moorei*
 Ovary glabrous, styler rudiments absent. Java, Celebes. *C. suaveolens*
- Flowers perfect.
 Semiscandent shrub; leaves obovate to oblong. New Caledonia. *C. sarmentosum*
- Erect trees.
 Fruit prismatic, base rounded, apex attenuate; putamen rugose, strongly angled. Fiji Islands. *C. vitiensis*
 Fruit globose; putamen slightly rugose, not angled.
 Leaves submembranaceous, persistently pubescent; inflorescence opposing the leaves or terminal. Australia. *C. Smythii*
 Leaves coriaceous, glabrous; inflorescence supra-axillary or terminal.
 Petals prominently keeled, keel protruding equal to half the width of the petal; petioles 2-3 cm. long. Philippine Islands. *C. philippinensis*
 Petals not prominently keeled, petioles 1-1.5 cm. long.
 Leaves ovate, 9-14 cm. long, 6-11 cm. wide, the apex acute, the base subtruncate. Samoa. *C. samoensis*
 Leaves elliptic, 6-10 cm. long, 5-6.5 cm. wide, the apex rounded, the base cuneate or rounded. *C. lucidula*

CITRONELLA LATIFOLIA (Merr.) Howard, Journ. Arnold Arb. **21**: 472. 1940.

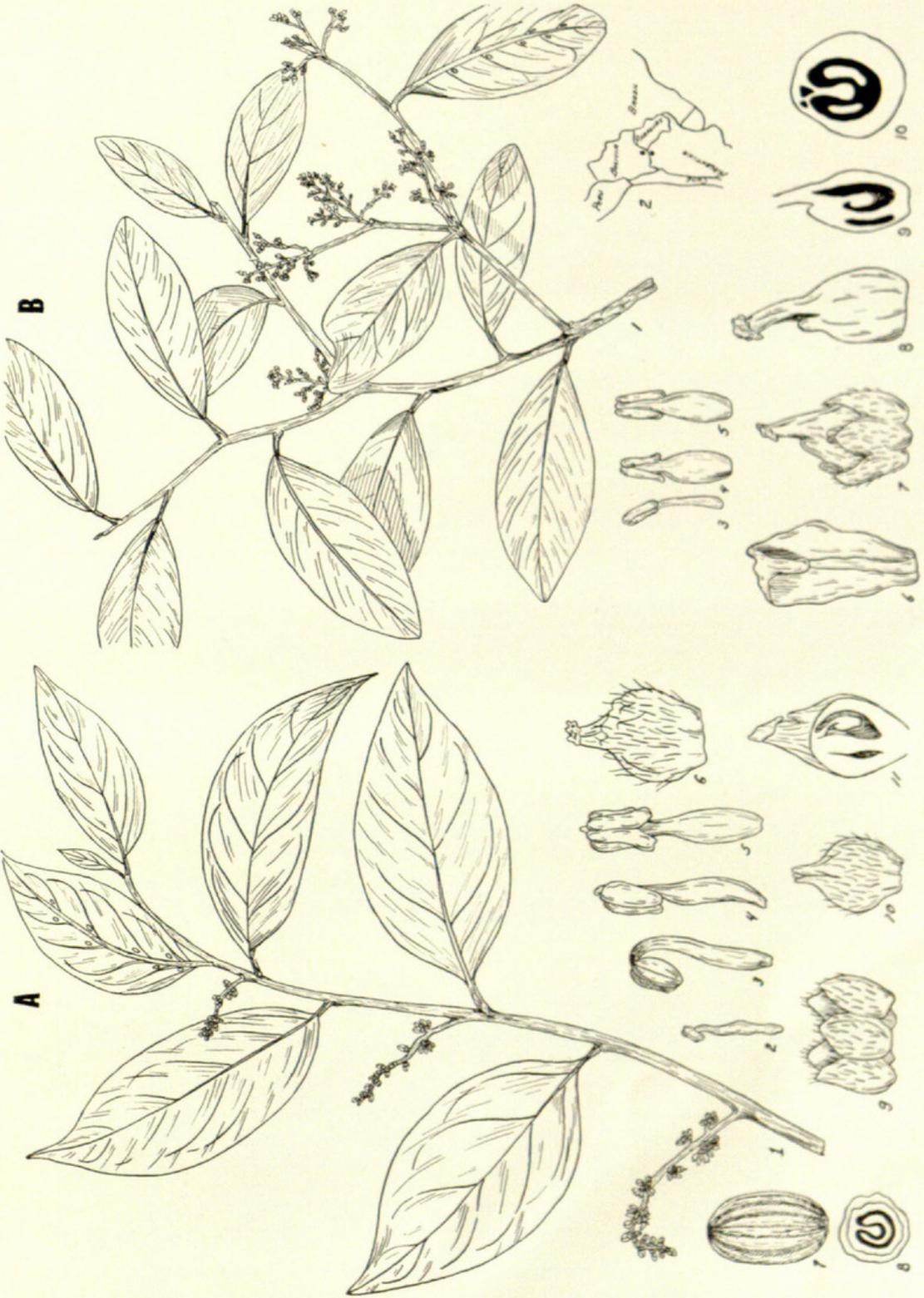
Villaresia latifolia Merr., Phil. Journ. Sci. Bot. **14**: 415. 1919.

Tree; the branches dark brown, glabrous; petioles stout, 1.5-2 cm. long, broadly sulcate above, glabrous; lamina elliptic-oblong to obovate, 14-18 cm. long, 8-10 cm. wide, coriaceous, rigid, glabrous, shining above, obtuse, slightly mucronate, plicated, the base rounded to broadly cuneate, the sulcate midrib slightly arched at least at the tip, the veins 5-paired, the margin entire and slightly revolute; inflorescence terminal, the panicle to 15 cm. long, the branches 2 cm. long, bifurcated; flowers not known; fruits ovoid, 2 cm. long, 1.5 cm. in diameter.

TYPE COLLECTION: Ramos Herb. Phil. Bur. Sci. 24557, collected at Pinipisakan, on the Catubig river, Samar, Philippine Islands.

ILLUSTRATION: PLATE 6, FIGS. 9-12.

SPECIMENS SEEN: Ramos 24557 (A, NY isotypes).



A, CITRONELLA COSTARICENSIS.

B, CITRONELLA APOGON.



FIGS 1-8, CITRONELLA PHILIPPINENSIS; FIGS. 9-12, C. LATIFOLIA.

CITRONELLA **Brassii**, sp. nov.

Arbor 20–30 m. alta; ramulis teretibus adpresse fulvo-hirsutis vel glabratis, petiolis crassis 1–1.5 cm. longis canaliculatis, laminis foliorum ovatis vel ellipticis 12–17 cm. longis 5.5–9 cm. latis coriaceis glabris utrinque lucidulis margine integris, apice acutis vel subrotundatis base rotundis costa supra valida elevata subtus prominente nervis 4 obliquis vel subarcuatis laxe anastomosantibus venulis subdense reticulatis, infrutescentibus paniculatis supra axillaribus vel terminalibus 10–16 cm. longis, ramis inferioribus usque ad 3 cm. longis, cymis bifidis subaequalis ad 1 cm. longis rhachi sparse adpresse pubescentibus fructu secundo-scorpioideis utrinque rotundatis putamine 0.3 mm. crasse leve.

SPECIMENS SEEN: *Brass & Versteegh* 13173 (A TYPE), 13591 (A), collected at the Bernhard camp on the Idenburg river, New Guinea.

Trees of primary forests on ridges and higher slopes at altitudes of 350–850 meters. The bark is thin (4 mm.) and brown and scaly. The type specimen was collected in fruit in April. This species is similar to *C. latifolia* in the inflorescence, which has several long branches at the base; however, it is different from all other species in the small ellipsoid drupes, which possess extremely thin walls and essentially smooth putamens. The leaves are unique in being thick-coriaceous and shining on both surfaces. They turn black on drying.

CITRONELLA MOOREI (F. Muell.) Howard, Journ. Arnold Arb. **21**: 472. 1940.

Villaresia Moorei F. v. Muell. in Bentham & Mueller, Fl. Austral. **1**: 396. 1863; Journ. Austr. For. Leag. **1**: 12. 1938.

Chariessa Moorei Engl. Nat. Pflanzenfam. **3** (5): 245. 1893.

Tree to 40 m. tall; branches hirsute, becoming glabrous, turning black on drying; petioles tenuous, 1–1.5 cm. long, sparsely hirsute or glabrate, sulcate above; lamina ovate-lanceolate to oblong, 9–12 cm. long, 3–5 cm. wide, glabrate or sparsely hirsute, thin, coriaceous, turning black on drying, acuminate or acute, the base acute or tapering, the midrib slightly sulcate above but prominent below, the veins 5-paired, the margins entire; inflorescence extra-axillary or terminal, the panicle 6–16 cm. long, the rhachis hirsute, the branches subequal and up to 1 cm. long; flowers sessile, secund-scorpoid, subtended by minute ovate bracts, unisexual or polygamous; pistillate flowers with ovate obtuse ciliate calyx lobes 1 mm. long and 0.9 mm. wide; petals obovate to oblong, 4.5–5 mm. long, 1.3–1.7 mm. wide, thick-fleshy, the midrib stout and glabrous; stamens 4 mm. long,

the flattened filaments narrowed at the apex, the oblong anthers 0.9–1.1 mm. long and divaricate at the base, sterile; pistil 3.4 mm. long, the globose ovary hirsute, the stout and fleshy style sulcate, styler rudiments present, the capitate stigma rugose; drupe globose, 1–1.3 cm. in diameter.

TYPE COLLECTION: *Charles Moore* in F. Muell. herbarium (not seen), collected on the Clarence river, New South Wales, Australia.

ILLUSTRATIONS: Proc. Linn. Soc. N. S. Wales **25**: 4, t. 38. 1901; Proc. Roy. Soc. Queensland **38**: pl. 12, 13, fig. 12. 1926.

SPECIMENS SEEN: Australia. Queensland: Bunya Mts. *Tryon* s. n. (B); Roberts Plateau, Lamington Nat. Park, *Tryon* and *White* s. n. (B); Atherton Tableland, Gadgarra reserve, *Kajewski* 1125 (A, NY), 1015 (A, NY).

VERNACULAR NAMES: Churnwood, Soap Box, Corduroy beech, Australian beech, White Maple, Corduroy, Scrub Silky Oak.

Mueller based this species on a specimen in Mueller's herbarium collected by Dr. Charles Moore, Director of the Sydney Botanic Garden. This specimen was described as male and it apparently had no female parts, since none were described. Functional unisexuality of flowers in this genus has been reported from some of the South American species; however, in all of these examples the males are represented by well developed organs. Among the specimens which I have referred to this species are some completely sterile specimens and some with fertile pistils but completely sterile anthers to the stamens. I have not seen the type specimen and, while my material compares favorably in leaf-characters with the original description, I cannot be sure of their identity. The pubescent ovary is the first reported among the Old World species of this genus and easily separates *C. Moorei* from *C. suaveolens*.

Plants of this species are among the largest trees of the family and are found at higher altitudes in dense tropical rain forests. The wood is light grey in color, close-grained and used in cabinet making as a veneer.

CITRONELLA SUAVEOLENS (Blume) Howard, Journ. Arnold Arb. **21**: 475. 1940.

Pleuropetalon suaveolens Blume, Mus. Bot. Lugd.-Bat. **1**: 248. 1850.

Chariessa suaveolens Miq. Fl. Ind. Bat. **1**¹: 794. 1856; Sleumer, Notizbl. **15**: 229. 1940.

Villaresia suaveolens Valetton, Crit. Overz. Olac. 199. 1886.

Trees; petioles short; lamina ovate to elliptic-oblong, lanceolate, 6–17 cm. long, 3–7 cm. wide, coriaceous, shining, with 4–5 pairs of veins, reticulate, the margins entire; inflorescence terminal, paniculate, the branches short, densely flowered, rhachis yellow-tomentose; flowers monoecious by abortion; calyx-lobes ovate, ciliate; petals with prominent midribs; filaments subulate or filiform, fleshy, the anthers cordate and obtuse; ovary glabrous, globose, the style filiform, rudiments absent, the stigma minute and capitate; fruit elongate-globose, 15–20 mm. long, the putamen thin.

TYPE COLLECTION: Jerukie, from the Sundaice Mts. of Java occidentale.

ILLUSTRATION: Valetton, Crit. Overz. Olac. pl. 5, fig. 32. 1886.

DISTRIBUTION: Specimens have been reported from Java, Celebes, and British North Borneo.

SPECIMEN SEEN: Celebes, Gowa, Lembaja, *Beroe* ex Herb. Bot. Bog. 20434 (A, NY).

I have not seen any of the material previously cited for this species. The specimen here cited agrees with the very general descriptions now in the literature. A re-examination of the type material and a complete description of this species is much desired. Bentham thought that *V. suaveolens* might be the same as *V. Moorei* but the pubescent ovary in the female flowers of the latter species is easily separated from the glabrous ovary described for *V. suaveolens*.

CITRONELLA SARMENTOSA (Baill.) Howard, Journ. Arnold Arb. 21: 475. 1940.

Sarcanthidion sarmentosum Baill., Adansonia 11: 199. 1874.

Woody climber, 3–4 m. tall; stems terete, hirsute to glabrate; petioles 1–2 cm. long, canaliculate; lamina oblong-obovate, 8–10 cm. long, 3–5 cm. wide, coriaceous, glabrous, entire, obtuse to abruptly acuminate, the base attenuate and slightly decurrent on the petiole; inflorescence terminal, the panicle 10–15 cm. long, with secund-scorpoid branches to 1 cm. long; flowers perfect, sessile, subtended by minute bracts; calyx-lobes broadly ovate, obtuse, ciliate; petals obovate-oblong, 3.8–4.5 mm. long, 1.2–1.6 mm. wide, fleshy, with midrib prominent; stamens 3–4 mm. long, the oblong anthers 0.8–1 mm. long; pistil glabrous, 3–4 mm. long, the ovary globose, 1–2-celled, the styles 1–2, the subcapitate, oblique stigma grooved and rugose; drupe grooved on one side.

TYPE COLLECTION: *Deplanche* 547, from Pum, Yate and Pic de Pueblo, New Caledonia.

ILLUSTRATION: Engler Bot. Jahrb. **39**: 175. 1906.

SPECIMEN SEEN: New Caledonia, *Prony* 1576-A (A).

There is no adequate basis for maintaining *Sarcanthidion* as a distinct genus. Baillon describes the plant as a climbing shrub; however, judging from the wood-structure, it is not a vine or liana and the structure is that of a normal erect shrub and is scarcely distinguishable from that of the other species of *Citronella*. This is the only member of the genus reported from New Caledonia.

CITRONELLA VITIENSIS, Howard, *Sargentia* **1**: 53. 1942.

Arbor parva; ramulis teretibus glabris; foliis 1–1.5 cm. longe petiolatis, lamina late ovata vel elliptica 10–16 cm. longa 6–12 cm. lata subcoriacea glaberrima integra, apice acuminata ad 1 cm. longa, basi rotundata vel subcordata costa supra vix subtus valde prominente nervis lateralibus utroque latere 4–5 arcuatis anastomosantibus; paniculis terminalibus 8–19 cm. longis, cymulis ad 1 cm. longis apice flores plures subcapitato-congestos vel secundo-scorpioides gerentibus, rhachi adpresse flavido-pubescente; calycis lobis ovatis 1 mm. longis, 1.5 mm. latis ciliatis; petalis oblongis 5 mm. longis 1.4 mm. latis glabris costa prominula ornatis; staminibus ad 4.5 mm. longis, filamentis crassiusculis, antheris oblongis 1.2 mm. longis basi cordatis; ovariis ovoideis glabris in stylum attenuatis; stigmatibus capitato rugoso; fructibus oblongo-ovoides ad 3 cm. longis 1.5 cm. latis complanatis basi truncatis vel subcordatis apicem versus angustatis; putamine lignoso conspicue angulare prominenter costato.

TYPE SPECIMEN: *Degener* and *Ordenez* 14007 (A), collected in the Fiji Islands, Vanua Levu, Thakaundrove, Savu Savu bay region of Vatunivumonde Mt.

SPECIMENS SEEN: Fiji Islands. Viti Levu; Naitasiri, Suva pumping station, *Degener* & *Ordenez* 13773 (A); Nasinu, *Gillespie* 3590 (G, NY, US). Ovalu: Levuka reservoir, *Gillespie* 4527 (G, NY), 4511 (G, US).

This is the first report of the genus from the Fiji Islands. *C. vitiensis* is a clearly distinct species with angular prismatic drupes.

CITRONELLA SMYTHII (F. v. Muell.) Howard, *Journ. Arnold Arb.* **21**: 475. 1940.

Villaresia Smythii F. v. Muell. *Frag.* **5**: 156. 1866.

Chariessa Smythii Becc. *Mal.* **1**: 118. 1877.

Villaresia adenophylla Domin, *Bibliot. Bot.* **89**: 50. 1921.

Tree to 20 m. tall; branches ferruginous-tomentose; petioles slender, 1.2–1.7 cm. long, canaliculate above, puberulous; lamina ovate-oblong, 9–14 cm. long, 4–7 cm. wide, sparsely hirsute above, densely so below, membranaceous, green, concolorous, acuminate or acute, the base rounded, the sulcate midrib densely pubescent below, the 3–4 pairs of veins slightly prominent, the margin entire; inflorescence terminal or opposing the leaf, the panicle 5–7 cm. long, with branches scorpioid; flowers sessile, glomerate, subtended by ovate bracts; calyx hirsute, deeply lobed, the ovate lobes 0.7–0.8 mm. long and 0.5–0.7 mm. wide; petals obovate to oblong, 3.8–4.5 mm. long, 1–1.3 mm. wide, attenuate, the inflexed glabrous apex 1–1.6 mm. long, the midrib well developed; stamens 4–4.3 mm. long, the oblong anthers 0.8–1 mm. long and slightly diverging at the base; pistil glabrous, the ovoid to conical ovary 1.5 mm. long, the terete style 1.5 mm. long, rudiments present, the capitate stigma minute; drupe elliptic-oblong, 1.2–1.4 cm. long, 1 cm. in diameter, pointed, the base rounded, the putamen thin and smooth.

TYPE COLLECTION: *Dallachy* s. n., from Rockingham bay, North Queensland, Australia.

SPECIMENS SEEN: Australia. North Queensland: Atherton Tableland, Boonjie, *Doggrell* s. n. (A); *C. T. White* s. n. (B); *Tardent* 136 (A); Taizali, *White* s. n. (B); Daintree river, *White* 1408 (NY), Gadgarra, *White* 1568 (A); Innisfall, *Michael* 203 (B, G); Mt. Spec, near Bambaroo, NW of Townsville, *Francis* (A); Rockingham Bay, *Mueller* s. n. (G, US); Johnstone river, *Michael* s. n. (B); Ravenshoe, *Manuell* s. n. (B).

This is the only species in the Old World to have persistently pubescent leaves.

CITRONELLA PHILIPPINENSIS (Merr.) Howard, *Journ. Arnold Arb.* **21**: 474. 1940.

Villaresia philippinensis Merr. *Phil. Journ. Sc. Bot.* **14**: 414. 1919.

Chariessa philippinensis Sleumer, *Notizbl.* **15**: 229. 1940.

Tree 4–5 m. tall; the branches smooth and glabrous; petioles 2–3 cm. long, slender, terete, narrowly sulcate; lamina elliptic-oblong, 6–12 cm. long, 4–6 cm. wide, coriaceous, rigid, glabrous, shining on both surfaces, acuminate, the base acute or rounded and slightly decurrent on the petioles, the midrib sulcate above but prominent below, the 4–5 pairs of arcuate veins slightly prominent, the margin entire; inflorescence terminal, the panicle to 10 cm. long, the lateral branches sub-equal and up to 1 cm. long, the rachis appressed-hirsute; flowers sessile, secund, sub-

tended by minute lanceolate bracts; calyx 1.5 mm. in diameter, 1.5 mm. high, sparsely hirsute, the ciliate ovate lobes rounded; petals obovate-oblong, 2.5–3 mm. long, 1–1.2 mm. wide, the prominent midrib keel-shaped and extending the lower half of the petal; filament to 4.5 mm. long, the broadly oblong anthers 0.8–1 mm. long, cordate and slightly diverging at the base; pistil glabrous, 5 mm. long, the globose ovary 1.5 mm. in diameter and 1–2 loculed, the 1–2 glabrous and equal styles 3–4 mm. long, the minute and grooved stigma capitate; drupe ovoid, 2–3 cm. long, 2 cm. in diameter, the putamen rugose.

TYPE COLLECTION: *Ramos*, Herb. Bur. Sci. 33267, collected on Mt. Palimlin, Ilocos, Luzon, Philippine Islands.

ILLUSTRATION: PLATE 6, FIGS. 1–8.

SPECIMENS SEEN: Philippine Islands. *Ramos*, Herb. Phil. Bur. Sci. 33267 (A, US isotypes), 33308 (A, US).

Pistils with two styles and two-locular ovaries are very common in the collections cited above. The styles of these are equally developed and strongly grooved on the adjoining surfaces. There are two locules in each ovary. The pistil noticeably elongates after anthesis of the flower. *Citronella philippinensis* is readily distinguished by the large prominent keel on the lower portion of the petals. The keel may protrude a distance equal to one-half the width of the petal. The petioles are longer than those of any other species.

Specimens here cited were collected in flower and fruit during August at an altitude of 1000 meters.

The combination *Chariessa philippinensis*, which I have attributed to Sleumer, was incorrectly made in Notizbl. 15: 229. 1940, where Sleumer cites "*Chariessa philippinensis* (Merr.) Sleumer" but cited the name-bearing synonym as "*Chariessa latifolia* Merr." Sleumer's intentions are obvious and the mistake was evidently a slip of the pen.

CITRONELLA SAMOENSIS (A. Gray) Howard, Journ. Arnold Arb. 21: 475. 1940.

Pleuropetalon Samoense A. Gray, U. S. Explor. Exped. Bot. Phan. 1: 299, pl. 27. 1854.

Chariessa samoensis Engler, Nat. Pflanzenfam. 3 (5): 245. 1893.

Villaresia Samoense Valetton, Crit. Overz. Olac. 199. 1886.

Shrub or small tree, 4 m. tall; branches glabrous, smooth; petioles 1–1.5 cm. long, sulcate above, glabrous; lamina broadly

ovate, 9–14 cm. long, 6–9 (11) cm. wide, coriaceous, frequently shining above, glabrous, acute, the base rounded, truncate or subcordate, the slightly immersed midrib prominent below, the veins 3–4-paired; inflorescence terminal or extra-axillary, the panicle to 19 cm. long, the subequal branches 1–1.8 cm. long, the rhachis puberulous; flowers perfect, sessile, glomerate, becoming secund-scorpoid, subtended by minute bracts; calyx-lobes broadly ovate, obtuse, ciliate; petals obovate-oblong, 4.3–4.8 mm. long, 1.3–1.8 mm. wide, thick, fleshy; stamens 4 mm. long, the thick and flattened filaments lingulate, the oblong anthers cordate at the base; pistil glabrous, 4 mm. long, the ovary globose, the style filiform or subulate, the rugose or grooved stigma capitate; drupe oblong-elliptic, 2.5–3 cm. long, 1.5–2 cm. in diameter, the apex acute, the base rounded to subcordate, the putamen obscurely longitudinally ridged.

TYPE SPECIMEN: U. S. 10543, collected by the U. S. Exploring Expedition, Samoa.

ILLUSTRATION: U. S. Exploring Exped. Bot. Atlas 1: t. 27. 1857.

SPECIMENS SEEN: Samoa. Savaii, Papa'afu, *Christophersen* 2721 (A, NY, US); Safotu, *Christophersen & Humes* 2362 (NY, US), Aopo, *Christophersen* 3459 (NY); Aopo-Gagamalae, *Christophersen* 3433 (NY, US); Tutuila: Tago-tago, *Setchell* 261 (G); Hua Pass, Stofoura, *Setchell* 217 (US); *Wilder* 36 (NY); U. S. Explor. Exped. (US 10543 type). Tonga. Eua Island: Powell Place, *Parks* 16205-a (G, NY); 16014 (US); Liku Cliffs, *Parks* 16205 (US). Solomon Islands, San Cristoval, Hinuahaoro, *Brass* 2911 (A).

VERNACULAR NAMES: Alo alovao, filifiloa, alaa.

Christophersen reports a great variation in the shape of the leaves found on a single plant. The plants occur at altitudes of 100–1500 meters. The wood is used by the natives for "digging up the ground." It is also used for general construction.

CITRONELLA **lucidula** (Sleumer), comb. nov.

Chariessa lucidula Sleumer, Notizbl. **15**: 229. 1940.

Small tree; branches gray, glabrous; petioles 0.6–1 cm. long; lamina broadly elliptic, 6–10 cm. long, 5–6.5 cm. wide, round at apex broadly cuneate to almost round at base, coriaceous, glabrous, olive-shining above, the slightly prominent veins 5–6-paired, the margin entire and slightly revolute; inflorescence terminal or supra-axillary, the panicles to 10 cm. long, the rhachis appressed-yellow-pubescent, the thick branches to 1 cm. long; flowers sessile, bracteate, congested in capitate clusters becoming secund-scorpoid; calyx-lobes ovate-oblong, 1 mm. long and wide, obtuse, ciliate; petals oblong, 4.3–4.6 mm. long, 1–1.6 mm.

wide, glabrous; filaments 2–3 mm. long, the elliptic anthers 0.8–1.1 mm. long; ovary ovoid, glabrous, the style as long or twice as long, the stigma sub-capitate; fruit immature.

TYPE SPECIMEN: *Franc* 1282 (Herb. Berlin, not seen), collected on Ile Mare, near Tadina, Loyalty Islands.

SPECIMEN SEEN: Solomon Islands, Guadalcanal Island, Uulolo, Tutuve Mt., *Kajewski* 2562 (A).

VERNACULAR NAME: Goring.

This species is very similar to *C. samoensis* but it differs in the smaller elliptic leaves which have cuneate bases and rounded apices. Dimensions of floral parts supplied in the original description were probably taken from very immature flowers.

Kajewski reports that the wood is very tough and is used for house-frames and axe-handles. Kajewski's specimen was collected at an altitude of 1200 meters.

I have seen a specimen in the herbarium of the Arnold Arboretum bearing the label "Plants of New Caledonia." It was collected by Franc and is numbered 1282. It fits the description published by Sleumer for *C. lucidula*, based on a collection by Franc also number 1282, but from the Loyalty Islands. The two localities are close together and it is possible that the specimen I have has only a general label and may actually be an isotype.

SPECIES EXCLUDED

Villaresia dichotoma Miers, Seem. Journ. Bot. **2**: 266, t. 21. 1864.

At the time Miers described this Brazilian species he was maintaining that the genus *Villaresia* belonged in the *Aquifoliaceae* and this species constituted part of his proof. I have not seen any material of it but from the excellent plate and the description conclude that the species does belong in the *Aquifoliaceae* and not in the genus *Citronella*. There are numerous characters which exclude it from the *Icacinaceae*, such as the imbricated ciliate petals which lack the inflexed tip, the ovarian disk and the strictly cymose inflorescence.

Villaresia emarginata Ruiz & Pavon, Fl. Peruv. Chil. Prod. 35. 1793.

This is the type species of the genus *Villaresia* which does not belong in the *Icacinaceae*. The fruits are bivalved dehiscent

capsules with two tetragonal arillate seeds. The genus and species probably belong in the *Celastraceae*.

Villaresia macrocarpa Scheff. Ann. Jard. Buitenz. **1**: 13. 1876 equals *Gonocaryum pyriforme* Scheff. l. c. 100.

Villaresia scandens Hassk. equals *Chailletia timoriensis* DC.

Chariessa cauliflora Pulle, Nouva Guinea **8**: 657. 1912 equals *Pseudobotrys cauliflora* (Pulle) Sleumer, Notizbl. **15**: 235. 1940.

EXPLANATION OF PLATES

PLATE 4A. CITRONELLA PANICULATA (Mart.) Howard (*Mexia* 5128). FIG. 1, habit $\times \frac{1}{3}$; FIGS. 2-4, three views of a fertile stamen, $\times 7$; FIG. 5, mature fruit, $\times \frac{1}{3}$; FIGS. 6-7, face- and side-views of the hippocrepiform seed, $\times \frac{1}{3}$; FIG. 8, diagrammatic cross-section of the fruit; FIG. 9, abaxial view of a petal, $\times 7$; FIG. 10, adaxial view of the outer surface of a petal, showing the sparse pubescence, $\times 7$; FIG. 11, a fertile pistil, showing the sparse pubescence, $\times 8$.

PLATE 4B. CITRONELLA ENGLERIANA (Loesner) Howard (*Glaziou* 17575). FIG. 1, habit, $\times \frac{1}{3}$; FIG. 2, mature stamen, $\times 8$; FIG. 3, an erect stamen taken from a bud, $\times 7$; FIG. 4, fertile pistil, $\times 10$; FIG. 5, a parasagittal diagrammatic section of the fertile pistil; FIG. 6, an abaxial view of a petal, $\times 8$; FIG. 7, a bud, $\times 10$.

PLATE 5A. CITRONELLA COSTARICENSIS (Donn. Sm.) Howard (*Tonduz* 11664). FIG. 1, habit, showing the extra-axillary position of the inflorescence, $\times \frac{1}{3}$; FIG. 2, pauperized stamen from a functional female flower, $\times 7$; FIGS. 3-5, three views of a fertile stamen, showing the connective-tip extending beyond the anther sacs, $\times 7$; FIG. 6, fertile pistil, $\times 7$; FIG. 7, fruit, $\times \frac{2}{3}$; FIG. 8, diagrammatic cross-section of the fruit; FIG. 9, calyx, $\times 7$; FIG. 10, sterile pistil, showing the three evenly developed styles, $\times 8$; FIG. 11, diagrammatic parasagittal section of a fertile pistil, showing the styler rudiments.

PLATE 5B. CITRONELLA APOGON (Griseb.) Howard (*Steinbach* 8245). FIG. 1, habit, $\times \frac{1}{3}$; FIG. 2, map, showing the distribution of the two known specimens; FIGS. 3-5, lateral, abaxial and adaxial views of the sterile stamens, $\times 12$; FIG. 6, abaxial view of a petal, showing the narrowed inflexed apex, $\times 7$; FIG. 7, functional female flower with the petals removed to show the pauperized stamens, $\times 6$; FIG. 8, functional pistil, $\times 7$; FIG. 9, diagrammatic longitudinal section of the pistil to show extent of one extra cavity; FIG. 10, diagrammatic cross-section of a fertile pistil to show the two extra cavities.

PLATE 6. FIGS. 1-8 CITRONELLA PHILIPPINENSIS (Merr.) Howard (*Ramos*, Herb. Phil. Bur. Sc. 33267). FIGS. 9-12 CITRONELLA LATIFOLIA (Merr.) Howard (*Ramos*, Herb. Phil. Bur. Sc. 24557). FIG. 1, habit of *C. PHILIPPINENSIS*, $\times \frac{1}{3}$; FIG. 2, side view of the pistil, $\times 12$; FIG. 3, face view of the pistil, $\times 12$; FIGS. 4-5, side and abaxial views of the petal, showing the prominent keel, $\times 10$; FIG. 6, abaxial view of a fertile stamen, $\times 6$; FIG. 7, fruit, $\times \frac{2}{3}$; FIG. 8, diagrammatic cross-section of the fruit; FIG. 9, habit of *C. LATIFOLIA*, $\times \frac{1}{3}$; FIGS. 10-11, two views of the fruit, $\times \frac{2}{3}$; FIG. 12, diagrammatic cross-section of the fruit, showing the relatively smooth putamen.



Howard, Richard A. 1942. "Studies of the Icacinaceae V. A revision of the genus *Citronella* D. Don." *Contributions from the Gray Herbarium of Harvard University* (142), 60–89. <https://doi.org/10.5962/p.336266>.

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