

The Genus *Psidium* (Myrtaceae) in Bolivia and Paraguay

Leslie R. Landrum
Natural History Collections, School of Life Sciences
Arizona State University
Tempe, Arizona 85287-4108, U.S.A.

Abstract: The genus *Psidium* in Bolivia and Paraguay is revised and a key to the species is provided. Each of the 18 recognized species is described, illustrated, and a map of known occurrences in Bolivia and Paraguay is provided and representative specimens are cited. Specimens from adjacent countries are sometimes included in the maps and representative specimens. For each species distinguishing features, phenology, habitat, and distribution are discussed. No new taxa or combinations are proposed, and no lectotypes are chosen. *Psidium paranense* O. Berg (=*P. kennedyanum* Morong) is rejected as a later homonym of *P. paraense* O. Berg. Numerous names attributed to Barbosa Robdrigues by Chodat and Hassler are treated as *nomina nuda*. For each species a list of synonyms is provided with the citation of publications and type specimens. In the introduction, relationships with other genera, geography, and distinguishing features of *Psidium* are discussed.

Resumo: Se revisa el género *Psidium* en Bolivia y Paraguay y se proporciona una clave a las especies. Cada una de las 18 especies reconocidas se describe, se ilustra y se proporciona un mapa de ocurrencias conocidas en Bolivia y Paraguay y se citan especímenes representativos. A veces se incluyen en los mapas especímenes de países adyacentes y especímenes representativos. Para cada especie, se discuten las características distintivas, la fenología, el hábitat y la distribución. No se proponen nuevos taxones o combinaciones, y no se eligen lectotipos. *Psidium paranense* O. Berg (= *P. kennedyanum* Morong) se rechaza como un homónimo posterior de *P. paraense* O. Berg. Numerosos nombres atribuidos a Barbosa Robdrigues por Chodat y Hassler se tratan como *nomina nuda*. Para cada especie se proporciona una lista de sinónimos con la cita de publicaciones y especímenes tipo. En la introducción, se analizan las relaciones con otros géneros, la geografía y las características distintivas de *Psidium*.

INTRODUCTION

This is the second in a series of regional taxonomic treatments of *Psidium* L. (Myrtaceae). The first was a revision of the genus in Bahia, Brazil (Landrum 2017; available online at <https://canotia.org/volume13.php>) and included introductory information that will mainly not be repeated here. The reader is referred to that paper for more information on taxonomically important characteristics, geography, cytological studies, phytochemistry, and medicinal uses. A third paper (Parra-O. & Landrum, in review) treats the genus *Psidium* in Colombia.

Psidium is a genus of at least 60 species and perhaps as many as 100 (McVaugh 1968; Govaerts et al. 2008), ranging from Mexico and the Caribbean to Argentina and Uruguay. A few species have been introduced as cultivated plants in the Old World and Pacific Island tropics and subtropics, and some are weedy invasives (Global Invasive Species Database 2017). *Psidium* is one of about 50 genera in the tribe Myrteae (Lucas et al. 2007), which includes all the native American genera and species except *Metrosideros stipularis* (Hook. & Arn.) Hook. f. (=*Tepualia stipularis* [Hook. & Arn.] Griseb.) of southern South America. The distinguishing characters of *Psidium* are discussed in Landrum (2003) and in Landrum and Sharp (1989) and are: flowers (4–)5(–6)-merous (occasional flowers rarely with more petals), with multiovulate locules; placenta often peltate; seed coat hard, difficult to break or cut, the surface rough or dull, covered with a pulpy layer when wet (rarely lustrous, perhaps only when immature); hard portion of seed coat (5–)8–30 cells thick at the narrowest point, with the cells

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

thick-walled, elongate, and overlapping; and the embryo contained in a C-shaped cavity and thus C-shaped also, with the cotyledons much shorter than the hypocotyl.

Based on small samples of two to five species (Lucas et al. 2007; Rivero et al. 2012; Murillo et al. 2013; Vasconcelos et al. 2017; Nadra et al. 2018) and a larger study of 33 species (Proença et al. 2022), recent molecular studies of Myrtaceae indicate that *Psidium* is a monophyletic group and place it in clades with such genera as *Acca* O. Berg, *Amomyrtus* (Burret) Legrand and Kausel, *Campomanesia* Ruiz & Pav., *Legrandia* Kausel, *Mosiera* Small, *Myrrhinium* Schott, and *Pimenta* Lindl. These are all members of the morphologically based subtribe Myrtinae *sensu lato* (i.e., those genera with embryos with relatively small cotyledons and a large hypocotyl) that appears to be a basal, paraphyletic group in the tribe Myrteae.

Lucas et al. (2019) reject the paraphyletic subtribe Myrtinae and have divided the group into six subtribes, considered by them to be monophyletic, based primarily on molecular data. In their classification *Psidium* belongs to the subtribe Pimentinae, along with *Acca*, *Campomanesia*, *Curitiba* Salywon & Landrum, *Legrandia*, *Mosiera*, *Myrrhinium*, and *Pimenta*. Larger samples will be needed to place *Psidium* phylogenetically among its closest relatives.

In the field or herbarium, *Psidium* in our area can be recognized by a combination of: 5-merous flowers; calyx frequently closed in bud; inflorescence uniflorous or a dichasium; seeds often numerous, 2–10 mm long, the seed coat hard, not lustrous, operculate; largest leaves frequently 5–10 cm long. *Psidium* is compared to the several genera of Myrtaceae of Brazil in the illustrated synoptic treatment of Landrum and Kawasaki (1997). The genera of Bolivia (Holst et al. 2014) and Paraguay are nearly a subset of those of Brazil.

Proença et al. (2022) have done a representative molecular study of *Psidium*, confirming its apparent monophyly, and subdivided it into four sections and two subsections (sect. *Psidium* with subsect. *Psidium* and subsect. *Albotomentosa* (O. Berg) Tuler & Proença; sect. *Obversifolia* O. Berg; sect. *Apertiflora* O. Berg; and sect. *Miranthes* (O. Berg) Tuler & Proença. The authors of this study offer much general information about *Psidium* morphology, anatomy, ecology, and cytogenetics based on their own work and an extensive review of previous work.

I have proposed subdivisions (complexes) based on morphology for many of the species of *Psidium* (Landrum 2003, 2005, 2021b) that the reader may want to consult. The molecular phylogeny of *Psidium* of Proença et al. (2022) shows some agreement as well as disagreement with these complexes. For instance, the *P. salutare* complex (Landrum 2003) resides within the sect. *Apertiflora* (Proença et al. 2022); the *P. grandifolium* complex (Landrum 2005) corresponds closely to subsect. *Albotomentosa* (Proença et al 2022); the *P. acidum* complex (Landrum 2021) is represented by two species (*P. acidum* and *P. friedrichsthalianum*) in the study of Proença et al. (2022; fig. 2) where they appear as sister species. One notable disagreement between our studies is that *P. guineense* and *P. guajava*, both of which I have proposed as members of the *P. guajava* complex (Landrum 2021), and both of which belong to sect. *Psidium*, do not appear together in the same subsection *Psidium*. Molecular phylogenetic studies of *Psidium* and its relatives are just beginning, and we can look forward to many more interesting results.

In his Mirtacées du Paraguay, Barbosa Rodrigues (1903) validly published several species of Myrtaceae including eight species of *Psidium*. Four years later, Chodat and Hassler (1907) published numerous names of Myrtaceae, attributing them to Barbosa Rodrigues and stating that they would be the subject of a future publication by Barbosa Rodrigues. These names have appeared in indexes such as Index Kewensis and some publications (e.g., Landrum 1986)

with the authorship cited as Barbosa Rodrigues or Barbosa Rodrigues ex Chodat & Hassler. They were published as a list with minimal, repetitive descriptions and in the opinion of Perret (1999) were not validly published and should be considered *nomina nuda*. In consultation with colleagues, I have come to accept this opinion, but in previous publications I have cited them as valid synonyms. Although the descriptions are not acceptable by modern standards and perhaps were never meant to be considered as true descriptions, the specimens cited with each name indicate clearly the identity of the entities named by Barbosa Rodrigues. The specimens, in general, are very good and are often duplicated in various herbaria. Thus, it is clear to which species these names should be assigned. In my opinion there are no new taxa among the specimens of *Psidium* listed by Chodat and Hassler. I cite them here as *nomina nuda* as a reference for future workers. Bernardi (1985) was of the same opinion and cites these names in the same way.

Bernardi (1985) attempted a taxonomic study of the whole family in Paraguay. Unfortunately, he did not have the time to do a thorough study himself and he realized it would be an enormous undertaking requiring several years by a team of workers. He tried to simplify his task by avoided cryptic characters of the ovary, seed, and embryos, but that was probably an error because the distinction of some genera was not clear. He recognized 7 species of *Psidium* in Paraguay while I recognize 10. The 7 species he did recognize, I would reduce to 5, sometimes using different names. He provided a good summary of the history of taxonomic work on Paraguayan Myrtaceae (Bernardi 1985, pp. 76–78).

The citation of types in this paper is the same as outlined in my publication on *Psidium* of Bahia, Brazil (Landrum 2017). I have left out zeros in specimen numbers that do not change the numerical value of a specimen number. Thus, NY-0005678 is cited as NY-5678. But I have cited any specimens from the ASU herbarium database with the full catalog number, for example, ASU0010503. The full ASU catalog number can be used to search for specific specimens at Symbiota sites such as <https://swbiodiversity.org/seinet/index.php> and <https://cotram.org/>.

Psidium L. Species Plantarum 470. 1753. Guava, Guayaba [Greek name for *Punica*, which it resembles]. Type species. *Psidium guajava* L.

Guajava Mill., Gard. Dict. Abr. ed. 4. 28 Jan 1754. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Cuiavus C. J. Trew, Pl. Sel. Pinx. Ehret 4: 12. 1754. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Guaiava Adanson, Fam. 2: 88, 563 ('*Guaiava*'). Jul-Aug 1763. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Calyptropsidium O. Berg, Linnaea 27: 347, 349. Jan 1856 ('1854'). Type species. *C. friedrichsthalianum* O. Berg [= *Psidium friedrichsthalianum* (O. Berg) Nied.]

Myrtus subg. **Corynemyrtus** Kjaerskou, Enum. Myrt. Brasil. 39: 18. 1893. Type species. *Myrtus corynantha* Kjaerskou [= *Corynemyrtus corynantha* (Kjaerskou) Mattos, = *Psidium myrtoides* O. Berg.]

Mitropsidium Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 30 Mar 1941. Type species. *M. pittieri* Burret [= *P. oligospermum* DC.].

Corynemyrtus (Kjaerskou) Mattos, Loefgrenia 10: 1. 1963.

Subgen. Myrtopsidium Kausel, Lilloa 32: 362. 1966. Type species. *Myrtus mucronata* Cambess. [= *Psidium mucronatum* (Cambess.) Burret, = *Psidium salutare* var. *mucronatum* (Cambess.) Landrum].

Trees and shrubs; hairs simple, unicellular. LEAVES opposite (rarely ternate or alternate), persistent, or drought deciduous, the venation brochidodromous to eucamptodromous. INFLORESCENCE axillary, uniflorous, a dichasium of usually no more than 3 flowers, or a

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

bracteate shoot (raceme-like). FLOWERS (4–)5(–6)-merous, occasionally with extra petals; *calyx lobes* essentially free or more commonly their bases fused together in a bowl-like tube, or in some species the calyx lobes fused together in a cap-like calyptra that encloses the closed corolla or that is open only as a terminal pore, at anthesis tearing between the lobes or irregularly or the calyptra falling as a unit; *stamens* ca. 80 to over 700, attached to the ovary summit or on the inner surface of the bowl-like calyx tube, the petals attached just distal to the stamens; *stigma* usually wider than the style, sometimes peltate; *ovary* inferior, (2–)3–5(–6)-locular; *placenta* bilamellate and often protruding in a peltate structure; *ovules* few to numerous, uniseriate, biseriate or multiseriate on each lamella. FRUITS greenish, yellowish, reddish (rarely purplish) berries, crowned by the calyx lobes, remnants of the calyx, or by a circular scar. SEEDS few to numerous, the seed coat bony, dull or rough, (5–)8–30 cells thick at narrowest point, covered with a thin layer of pulpy tissue when wet (or a glaze or crusty tissue when dry), with a C-shaped or curved cavity that opens by means of an operculum upon germination; *cells* of the hard seed coat surface elongate, overlapping, dense; *embryo* C-shaped to curved, conforming to the seed's inner cavity, oily, the cotyledons short, usually reflexed, the hypocotyl much longer than the cotyledons.

KEY TO THE SPECIES OF *PSIDIUM* IN BOLIVIA AND PARAGUAY

1. Lower surface of at least young leaves densely covered with hairs, the hypanthium surface at anthesis usually obscured by hairs.
 2. Calyx open in flower bud, the lobes usually evident, with tears sometimes forming between the (4–)5 lobes.
 3. Indumentum whitish.
 4. Leaves 2–5.8 cm wide, the marginal veins not present proximally and arching broadly distally; placenta hidden by ovules, not peltate. *P. grandifolium*
 - 4' Leaves usually less than 1.5 cm wide, the marginal vein present through leaf and closely following the margin; placenta peltate, with 1 or 2 rows of ovules on each lamella. *P. salutare* var. *sericeum*
 - 3' Indumentum reddish brown, yellowish, silvery, or gray.
 5. Leaves silvery lanate, usually less than 1.5 cm wide; apex usually sharply acute to abruptly acuminate; hairs of leaves of two lengths, short and tangled and long and nearly straight. *P. salutare* var. *sericeum*
 - 5' Leaves yellowish to grayish short-tomentose, often over 1.5 cm wide; apex acute to rounded; hairs of leaves uniform in length, all tangled. *P. laruotteanum*
 - 2' Calyx closed in flower bud or open only as a terminal pore, with tearing of calyx regular into 4 or 5 nearly equal parts or irregular in 2 to 4 unequal parts as the bud opens.
 6. Lateral veins usually more than 10.
 7. Lateral veins usually 9–22 pairs; young twigs quadrangular, more or less winged; hairs of lower leaf surface appressed, whitish, yellowish, or silvery; calyx usually tearing into 2 or 3 parts; anthers 0.7–1 mm long, usually with fewer than 10 glands. *P. guajava*
 - 7' Lateral veins 5–10(–12) pairs; young twigs more or less terete or compressed (some vigorous shoots sometimes 4-winged); hairs of lower leaf surface more or less erect, reddish brown, or appressed, whitish or grayish; calyx usually tearing into 4 or 5 parts; anthers 1–3 mm long, often with more than 10 glands. *P. guineense*
 - 6' Lateral veins usually less than 10.
 8. Shrubs or trees of various habitats, somewhat weedy; calyx closed or nearly so in the bud; anthers elongate, 1–3 mm long, usually 2–6 times as long as wide; placenta laminar, sometimes peltate; tertiary veins often producing a ladder-like pattern; hairs of lower leaf surface often more or less erect and reddish brown, or whitish and appressed. *P. guineense*
 - 8' Shrubs of grasslands and cerrado; calyx open or with a distinct opening in the closed bud; anthers not elongate, 0.5–1 mm long, about 1–2 times as long as wide; placenta mound-like, not laminar or peltate (occasionally parietal, at least in part); tertiary veins reticulate; hairs of

- lower leaf surface generally appressed and straight to densely tangled, usually whitish.....
..... *P. grandifolium*
- 1' Lower leaf surface of leaves glabrous, thinly puberulent, or only sparsely covered with hairs, the hypanthium surface at anthesis visible under any hairs (except sometimes in *P. missionum*).
 9. Calyx open, bowl-like in the flower bud, the lobes prominent or not.
 10. Leaves lanceolate or ovate, tapering from near the base to an acute apex, often over 10 cm long; petiole 4–14 mm long; bracteoles 10–30 mm long, narrowly elliptic; 3-flowered dichasia common; petals 13–22 mm long; seeds angular; habitat riparian.. *P. densicomum*
 10' Leaves variously shaped, often widest at or above the middle, mainly less than 10 cm long; petiole 0–4 mm long; bracteoles 1–3(–8) mm long, mainly narrowly lanceolate; 3-flowered dichasia occasional, or common in *P. suffruticosum* only; petals 5–12 mm long; seeds rounded or sublenticular (or angular in *P. striatulum*); habitat various.
 11. Proximal lateral veins connecting to a marginal vein, the marginal vein present from near base to the apex; leaves mostly widest at or below the middle, mostly elliptic.
 12. Calyx in closed flower bud with a sinuate margin, the lobes absent or obscure; seeds rounded, lenticular or angular.
 13. Seeds angular; petals 10–12 mm long; style 10–14 mm long; habitat riparian.....
..... *P. striatulum*
 13' Seeds with rounded and flat surfaces, but not angular; petals 5–8 mm long; style 6–8 mm long; habitat cerrado, campo rupestre..... *P. myrsinoides*
 12' Calyx in closed flower bud with easily distinguishable lobes; seeds rounded or lenticular.
 14. Marginal vein closely following the margin; lateral veins prominent; calyx lobes acute.
..... *P. salutare*
 14' Marginal vein arching between the laterals, not closely following the margin; lateral veins not prominent; calyx-lobes rounded..... *P. myrsinoides*
 11' Proximal lateral veins not connecting to a marginal vein, the marginal vein only present from about mid-leaf and distally; leaves mostly widest above the middle, mostly obovate to oblanceolate.
 15. Lateral veins not prominent, 5–12 pairs, leaving midvein at angle of 45–60 degrees; blades drying chocolate brown; young twigs compressed to terete, sometimes with longitudinal ridges. *P. myrsinoides*
 15' Lateral veins prominent, 4–8 pairs, leaving midvein at an angle of 30–45 degrees; blades drying olive-green to reddish brown; young twigs often 4-winged, usually square in section.
 16. Calyx of flower bud with lobes about triangular, 2–5 mm long, about as long as wide; leaves mainly oblanceolate, the apex usually acuminate..... *P. missionum*
 16' Calyx of flower bud nearly closed or the lobes truncate to broadly triangular, about 2 times wider than long; leaves and leaf apices various.
 17. Leaves often 3 or more times as long as wide, lustrous above, glabrous or nearly so below; peduncles usually more than 2 cm long, usually 3-flowered; seeds up to ca. 11. *P. suffruticosum*
 17' Leaves usually less than 3 times as long as wide, usually dull above, usually covered with appressed hairs below (these minute and inconspicuous in var. *australe*); peduncles commonly all less than 2 cm long, usually 1-flowered; seeds up to ca. 50. *P. australis*
 9' Calyx closed or with only a terminal pore, opening by irregular or regular tears or as a calyptra, the lobes usually not notable in the flower bud.
 18. A clear marginal vein not evident in at least lower half of leaf; seeds rounded or flattened-lenticular.
 19. Subshrub to ca. 30 cm high, glabrous or nearly so; leaves often over 3 times as long as wide, the upper surface lustrous; petiole 0–2 mm long; ovules per locule 20 to 50; fruit usually about 1 cm long; seeds up to ca. 10. *P. suffruticosum*
 19' Shrubs or trees usually over 1 m high, usually pubescent on young growth; leaves usually less than 3 times as long as wide, the upper surface not usually lustrous; petiole 1–12 mm long; ovules per locule 50 to over 100; fruit often over 1 cm long; seeds usually 30 or more, sometimes over 100.
 20. Lateral veins usually more than 10; hairs on lower leaf surface appressed, whitish or silvery; plants commonly cultivated. *P. guajava*

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

- 20' Lateral veins usually less than 10; hairs on lower leaf surface lacking or if present spreading or curled and tangled, usually yellowish brown or reddish brown; plants not cultivated (except rarely *P. guineense*).
21. Leaves, twigs and flowers usually abundantly pubescent; tertiary veins usually predominantly ladder-like; calyx closed completely, or nearly closed and with 5 minute lobes at the apex; disturbed habitats (rarely cultivated). *P. guineense*
- 21' Leaves, twigs and flowers glabrous or very sparsely pubescent; tertiary veins often predominantly reticulate, but ladder-like veins common; calyx nearly closed and with 5 minute lobes at the apex; habitats frequently wet. *P. nutans*
- 18' A clear marginal vein evident from near base of leaf to apex; seeds angular or rounded.
22. Stamens attached to inner surface of the calyx tube; tears in calyx penetrating the staminal ring as the flower opens; seeds with rounded and flat surfaces; habitats various.
23. Leaves generally widest above or at the middle; seeds usually more than 15, rounded; stamens 200–400; stigma much wider than style, 1–1.5 mm wide. *P. cattleyanum*
23' Leaves generally widest below or at the middle; seeds generally less than 10, with rounded and flat sides; stamens 80–220; stigma about as wide as style, less than 0.5 mm wide.
..... *P. oligospermum*
- 22' Stamens attached to the summit of the ovary; tears in calyx not penetrating the staminal ring as the flower opens; seeds angular or rounded; habitats usually riparian.
24. Young twigs 4-angled and slightly winged; young growth usually sparsely strigose, the hairs appressed; petals 10–20 mm long; seeds mainly 6–9 mm long.
25. Seeds angular, more or less C-shaped but often irregular in shape; anthers generally with a prominent terminal gland and a few smaller glands below; twigs terete, compressed or quadrangular, sometimes 4-winged, the wings up to ca. 1 mm wide; remnants of calyx 0.1–0.3 mm thick; fruit wall 1–3 mm thick. *P. acutangulum*
25' Seeds kidney shaped to flattened subglobose, more or less regular in shape; anthers generally with a few to several prominent glands of about equal size distributed through the connective; twigs quadrangular, often strongly 4-winged, the wings 1–2.5 mm wide; remnants of calyx usually 0.4–0.7 mm thick; fruit wall 4–13 mm thick.
26. Lateral and marginal veins prominent and easily visible, the laterals mostly 0.3–0.5 mm wide, the principal marginal veins clearly defined, mainly running 3–10 mm from the margin; peduncle 4-angled or winged; flower bud pyriform; dried leaves uniformly colored above; Amazon basin from Tefé, Brazil to east slopes of Ecuador and Peru. *P. acidum*
26' Lateral and marginal veins faint, the laterals mostly 0.1–0.2 mm wide, the marginal veins often not clearly defined, mainly running 1–4 mm from the margin when visible; peduncle flattened to terete; flower bud subglobose, fusiform, or pyriform; leaves commonly with small whitish spots above; southern Mexico, Central America, Colombia, northwestern Ecuador, Amazonian Peru and Acre, Brazil....
..... *P. friedrichsthalianum*
- 24' Young twigs usually terete (weakly 4-angled sometimes in *P. kennedyanum*), unwinged; young growth usually sparsely to moderately puberulent, the hairs spreading; petals 10–12 mm long; seeds mainly 4–5 mm long.
27. Leaves usually lanceolate to narrowly lanceolate, 1.5–6 times as long as wide; anthers oblong, 1.2–1.5 mm long; leaf base attenuate, rounded, or cuneate; petiole 1–7 mm long; marginal veins 1–2 mm from margin; lateral veins rarely over 8 mm apart; calyx closed or with a small obscure terminal pore, tearing in 2–3 parts that fall soon after anthesis, the parts not truncate; seeds 5–6 mm long. *P. kennedyanum*
27' Leaves elliptic, ovate, or oblong lanceolate, 1.5–3 times as long as wide; anthers attenuate, 1.5–4 mm long; leaf base rounded, subcordate or obtuse; petiole 1–3 mm long; marginal veins up to 7 mm from margin; some lateral veins often over 10 mm apart; calyx closed or with a large clear terminal pore, tearing irregularly or in 5 lobes at anthesis, the lobes usually truncate; seeds 4–5 mm long. *P. striatulum*

1. *Psidium acidum* (DC.) Landrum, Brittonia 68: 411. 2016.

Psidium acutangulum* var. *acidum DC., Prodri. 3: 233. 1828. Type. Brazil. “ad Nogueira prov. Rio-Negro,” [near present town of Tefé, in state of Amazonas, 3.35°S, 64.7°W] C. F. P. Martius s.n. (holotype, M!, = ASU photo!, = F neg. 19748!).

***Britoa acida* (DC.) O. Berg, Linnaea 27: 436. 1856.**

Tree or shrub up to 10(–18) m high, glabrous to minutely and sparsely strigose on young growth, strongly glandular on most surfaces; *hairs* whitish, up to ca. 0.2 mm long; *young twigs* quadrangular, 4-winged, the wings mostly about 1 mm wide but sometimes broadening to 2.5 mm wide in auriculate, stipule-like flanges at nodes, the young bark reddish-brown, exfoliating as strips and flakes, the older twigs terete with the bark smooth to minutely flaky. **LEAVES** elliptic, oblanceolate, or lanceolate, 5.4–15 cm long, 2.7–9 cm wide, 1.6–3.2(–3.4) times as long as wide; *apex* acuminate, sometimes abruptly so; *base* rounded, obtuse or acute; *petiole* channeled, 2–10 mm long, 1–2 mm wide; *venation* brochidodromous, the midvein impressed above, prominent below, the lateral veins (5)–6–8(–9), prominent below, often impressed above, straight or curving slightly towards apex, leaving the midvein at about a 60(–75) degree angle, connecting to a generally prominent marginal vein that arches shallowly between them, the marginal vein in larger leaves mainly running 3–10 mm from the margin, a much weaker second marginal vein sometimes running near the margin, the tertiary veins dendritic, arising from adjacent larger veins, the more prominent ones alternating with the laterals; *blades* mainly subcoriaceous, drying dark reddish brown to nearly black or gray-green, somewhat darker above than below, sublustrous or dull above, the lower surface with 4–10 glands/mm². **FLOWER BUDS** pyriform, 10–14 mm long, the hypanthium campanulate, 3–5 mm long, the distal portion of bud subglobose, 6–10 mm long, often apiculate; *indumentum pattern of buds* with all surfaces glabrous except for the puberulent staminal ring, or the outer surface of buds, peduncle, and occasionally the calyx within strigose in part; *peduncles* 1 flowered (occasionally 3-flowered), 10–30 mm long, 1–1.5(–2) mm wide, quadrangular to 4-winged at anthesis; *bracteoles* caducous before anthesis, narrowly triangular, ca. 1 mm long, often with colleters in the axils. **CALYX** closed, often apiculate, tearing irregularly at anthesis in 2 or 3 parts, these up to 0.5 mm thick, usually not persisting in fruits, the tears in the calyx not cutting the staminal ring; *petals* not seen extended, probably 1.5–2 cm long, ciliate; *disk* 5–6 mm across; *stamens* 500–700, ca. 15 mm long, the anthers ca. 1.5 mm long, with 3–15 glands in the connective, of about equal size; *style* 12–16 mm long, the stigma ca. 1 mm across; *ovary* 3–5 locular, the ovules on a peltate placenta, 50–70 per locule. **FRUIT** globose to subglobose, up to 2–5 cm in diameter, the lateral fruit wall 4–13 mm thick; *seeds* up to 60 or more, 6–9 mm long, kidney shaped to flattened subglobose, with rounded and flat sides, more or less regular in shape. (Fig. 3).

Representative specimen examined. **BOLIVIA. Beni:** Prov. José Ballivián, Espiritu, zona de influencia del Río Yacuma (ca. 14.135°S, 66.72°W), 200 m, 29 Mar 1988 (fr), Beck 15137 (ASU0080872).

BRAZIL. Acre: near mouth of Rio Macauhan, (-9.333, -69.000), 27 Aug 1933 (fr), Krukoff 5696 (MO, NY, US); Tarauac, Bacia do Alto Juruá, Rio Tarauacá, margem direita, Reserva Indígena Praia do Carapanã, Colocaçao Vista Alegre, (-8.449, -71.349), 21 Nov 1995 (fl), Silveira et al. 1063 (MO).

PERU. Madre de Dios: Manu, Cocha Cashu Biological Station, Manu National Park, (-11.870, -71.370) 400 m, 17 Aug 1983 (st), Gentry 43654 (MO).

Phenology—Six flowering specimens seen have been collected in February, June, August, October and November. Fruits have been collected in nearly all months, with 6 of the 15 fruiting specimens seen collected in February or November.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Habitat and Distribution—*Psidium acidum* is found in virgin and disturbed lowland forests near rivers on "tierra firme" and in occasionally to frequently flooded areas. Elevations range from 180–500 m, but are mostly from 200–300 m.

Distinguishing Features—Leaves glabrous or nearly so, elliptic, ovate, or lanceolate, 5.4–15 cm long, 2.7–9 cm wide, 1.6–3.2(–3.4) times as long as wide; calyx closed in bud, tearing irregularly, but the tears not cutting the staminal ring; peduncles quadrangular to 4-winged at anthesis. *Psidium acidum* has long been confused with *P. acutangulum*; the species are compared in lead 22 of the key.

I have only seen one poor specimen of *Psidium acidum* from Bolivia. The fruits and seed appear to be typical of that species and it is likely that it may be or have been cultivated in the Amazonian region of Bolivia. For more information about the species see Landrum (2016).

2. *Psidium acutangulum* DC., Prodromus 3: 233. 1828. TYPE. Brazil. "prope Ega," [near present town of Tefé, in state of Amazonas, 3.35°S, 64.7°W] Martius s.n. (M-32369).

Psidium fluviatile DC. Prodr. 3: 235. 1828, illegitimate name because *Psidium guyanense* ["guianense"] Persoon is cited as a synonym. TYPE. French Guiana. "in Cayenna," "Rich. Ex herb Thib." Apparently from the herbarium of Thibaud de Chanvalon, but perhaps not collected by him. (HOLOTYPE: P-258451!).

Psidium acutangulum var. ***crassirame*** O. Berg, in Mart. Fl. bras. 14(1): 409. 1857. Illegitimate name to be replaced by the autonym *P. acutangulum* var. *acutangulum* because Berg cites *P. acutangulum* under this variety.

Psidium acutangulum var. ***tenuirame*** O. Berg, in Mart. Fl. bras. 14(1): 409. 1857. TYPE. Brazil. "Ega ad flumen Amazonas," Martius s.n.? (HOLOTYPE: M-32370). Specimen at P annotated by Berg (*Spruce* 3126; P-258494!) is not a type.

Guajava acutangula (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium personoii McVaugh, Mem. New York Bot. Gard. 18: 255. 1969. TYPE. Brazil. Amapá, Cachoeira Camaraú, about 3 km S of mouth of Riv. Camopi, 3°10'N, 52°19'W, 3 Oct 1960, Irwin et al. 48615 (HOLOTYPE: MICH-1210426!; ISOTYPES: COL-3156, F-65712f, K-565489, NY-1288077!, S-R-9455, U-5186, US-117673).

?***Psidium acutangulum*** var. ***oblongatum*** Mattos, Loefgrenia 94: 12. 1989. TYPE. Brazil. São Paulo, Instituto Agronômico de Campinas, Mattos 31284 (IPRN, not found).

Shrub or small tree 2.5–6(–10) m high, glabrous, or with a few minute hairs on disk and calyx within, or sparsely pubescent on young growth, sometimes densely so on vegetative buds; *hairs*, if any, minute, whitish or reddish brown; *young twigs* terete to flattened and sulcate, or quadrangular and often 4-winged, reddish-brown, the older twigs losing any wings in about 1 year, becoming gray or remaining reddish brown, remaining smooth or becoming slightly flaky. LEAVES elliptic, ovate, or lanceolate, 3.5–13 cm long, 2–5.6 cm wide, 1–3 times as long as wide, the margins entire or slightly sinuate; *apex* acute, acuminate, or obtuse, the tip often minutely mucronate; *base* cuneate, acuminate, rounded, rarely subcordate; *petiole* channeled, (0–)1–6 mm long, 0.5–2 mm wide; *venation* brochidodromous distally, eucamptodromous proximally, the midvein impressed to nearly flat above, prominent below, the lateral veins 6–13 pairs leaving the midvein at an angle of ca. 45–60 degrees, faint or prominent, impressed slightly to raised slightly above, broadly arching or nearly straight, diminishing near the margin or attaching to a well-defined marginal vein, the marginal vein arching deeply, generally approaching within 1–2 mm of the margin, the tertiary veins dendritic, arising from adjacent larger veins; *blades* submembranous to subcoriaceous, drying dark reddish brown to gray-green, somewhat darker above than below, lustrous or dull above, the lower surface with 8–30 glands/mm². FLOWER BUDS pyriform to subfusiform, 7–13 mm long, sometimes constricted between upper and lower portions, the hypanthium obconic, ellipsoid, or campanulate, 3–5 mm long, the distal portion of

bud globose to ovoid, 4–10 mm long; *indumentum pattern of buds* with all external surfaces glabrous to sparsely strigose on peduncles, bracteoles, and hypanthium, the internal surfaces glabrous to sparsely puberulent on calyx within and disk; *peduncles* 1–3 flowered, 1–5.5 cm long, 0.5–1.5 mm wide, the side branches of the dichasium ca. 1 cm long; *bracteoles* caducous before anthesis, 1–1.5 mm long, narrowly triangular to elliptic. CALYX closed, often apiculate, or nearly closed with a smooth edged terminal pore, with no lobes evident, tearing irregularly at anthesis in 2–5 persistent pieces, these 0.1–0.3 mm thick when dry, the tears usually not cutting the staminal ring; *petals* obovate to elliptic, 1–2 cm long; *disk* 4–8 mm across; *stamens* 160–580(–800), 7–15 mm long; *anthers* 0.8–1.5 mm long, usually with a large terminal gland (occasionally without) and 1–4 smaller glands below in the connective; *style* 8–15 mm long, the stigma peltate, 0.5–0.7 mm across; *ovary* (2–)3–4(–5) locular, the placenta more or less peltate; *ovules* 2–3-seriate on each placental lamella, ca. 22–65 per locule. FRUIT subglobose, 1.5–5 cm in diameter, the fruit wall 1–3 mm thick; *seeds* 18–100 or more, angular, C-shaped or irregular, 6–9(–12) mm long, the coat 0.5–2 mm thick. (Fig. 4).

Representative specimens examined. **BRAZIL.** Acre: Senador Guiomard, Basin of Rio Purus, Rio Iquiri, downstream from intersection with Br-364 hwy (10.0667°S, 67.5333°W), 5 Mar 1997 (fr), *Daly et al.* 9225 (ASU0005152). Mato Grosso: Cáceres (16.0667°S, 57.6833°W), Aug 1911, Comissão Rondon, *Hoehne* 4368 (ASU0005083-photo, R).

BOLIVIA. Beni: Prov. Gral. Ballivián, Espíritu en la zona de influencia del Río Yacuma, ribera alta del Río Yacuma, 200 m, 16 Aug 1985 (fl), *S.G. Beck* 5672 (MO, SEL). Pando: Prov. Manuripi, Boca del Manu (ca. 9.87°S, 66.37°W), 97 m, 19 Jun 2006 (fl), *Altamirano et al.* 3381 (MO); Río Madre de Dios, Genechiquia (11°17'S, 66°49'W), 125 m, 5 Sep 1985 (yfr), *Nee* 31784 (ASU0005160, MO); south bank of río Abuná, 7–8 km above mouth (ca. 9.92°S, 65.47°W), 15 Jul 68 (fl), *Prance et al.* 6063 (MICH, NY, R). Santa Cruz: Prov. Velasco, P. N. Kempff M., arroyo Las Londras (14°24'18"S, 61°08'40"W), 150 m, 25 Jul 1996 (fl), *Arroyo* 1363 (MO, ASU0005156); Res. Ecológica El Refugio, puesto La Toledo (14°45'02"S, 61°08'37"W), 220 m, 19 Oct 1996 (fr), *Carrión et al.* 460 (ASU0005151, MO); Prov. Velasco, 1 km N de Lazaretos (ca. 17.789°S, 63.183°W), 210 m, 15 Sep 1995 (fr), *Foster et al.* 113 (ASU0005155, MO); 3 km S del campamento La Toledo, (14°43'16"S, 61°8'58"W), 210 m, 16 Sep 1995 (fr), *Foster et al.* 142 (ASU0005154, MO); Prov. Velasco, P. N. Kempff M., campamento La Torre (13°39"S, 60°46'W), 300 m, 20 May 1994 (fl), *Quevedo et al.* 2644 (ASU0005159, MO).

PERU. Madre de Dios: Tambopata, Las Piedras, (12°29'S, 69°03'W), 200 m, 15 Oct 1991 (fr), *Timaná & Jaramillo* 2596 (ASU0005146).

Phenology—Flowering from May to August; fruiting September to January.

Habitat and Distribution—Wet areas along streams and lakes or in savannas, sometimes intermittently dry. Bolivia, Brazil, Peru, Colombia, Venezuela, and the Guianas, at elevations of about 100 to 300 m.

Distinguishing Features—Leaves glabrous or nearly so, elliptic, ovate, or lanceolate, 3.5–13 cm long, 2–5.6 cm wide, 1–3 times as long as wide; calyx closed in bud, tearing irregularly, but the tears not cutting the staminal ring; young twigs slightly 4-winged; petals 10–20 mm long.

Psidium kennedyanum of the Paraná River basin is similar to *P. acutangulum* and there may be some geographic overlap in Bolivia and Mato Grosso, Brazil. In this area *P. acutangulum* has winged twigs and *P. kennedyanum* does not or the wings are quite weak. Differences are outlined in the key below.

1. Young twigs 4-angled, slightly winged; young growth usually sparsely strigose, the hairs appressed; leaves 3.5–13 cm long, 1.5–5.6 cm wide, 1–3 times as long as wide; petals 1.5–2 cm long; disk 5–8 mm across; style 1.1–3.5 cm long; seed 6–10 mm long *P. acutangulum*
- 1' Young twigs usually terete or weakly 4-angled; young growth usually sparsely to moderately puberulent, the hairs spreading; leaves 2.5–7.5 cm long, 0.8–2.4 cm wide, usually over 3 times as long as wide; petals 1–1.2 cm long; disk 4–6 mm across; style 1.2–1.3 cm long; seed ca. 5 mm long *P. kennedyanum*

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium acutangulum has been confused with *P. acidum* (DC.) Landrum in the past. The two species are compared in lead 22 of the key.

3. ***Psidium australe*** Cambess., in A. St.-Hil., Fl. Bras. Merid. 2: 283. 1833. TYPE. Brazil. “Prope vicum vulgo Capella de Sta. Maria ad fines provinciarum Rio Grande de S. Pedro do Sul et Missionum,” Saint-Hilaire s.n. (HOLOTYPE: P-258487!).

Guajava australis (Cambess.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.

Psidium triphyllum Barb. Rodr., Myrt. Paraguay 12. 1903. TYPE. Paraguay. “Ipê-hú... Sierra de Maracayu,” Hassler 4990 (HOLOTYPE: G-194094).

Psidium mucronatum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “Ipé-hu Sierra de Maracayu,” Hassler 5082 (G [4 sheets, = ASU photos], NY!, P-258433!).

?***Psidium pribebuiense*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “Cordillera de Piribebuy,” Hassler 6632 (G [2 sheets, = ASU photos!], MICH-1210425!, NY-1288078!, P-258395!, P-258396!, S-r-9457, W-762). [Possible hybrid *P. australe* with *P. suffruticosum*].

?***Psidium emilhasslerianum*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTONS. Paraguay. “pr. Tacuaral,” Hassler 1330 (G [2 sheets, = ASU photos]) and “Cordillera de Alto,” Hassler 1258 (G [2 sheets, = ASU photos]).

Psidium submetrale McVaugh, Mem. New York Bot. Gard. 18: 261. 1969. TYPE. Venezuela. “Bolívar: Entre San Félix y Puerto Ordaz..., elev 20 m, 26–27 Jun 1964 (fl),” Steyermark 94275 (HOLOTYPE: MICH-1210421!).

Shrub or subshrub to ca. 1(–1.5) m high, arising from a fire resistant underground stem, with most surfaces appearing glabrous but usually with minute appressed hairs on lower leaf surface (var. *australe*), or with the lower leaf surfaces densely covered with appressed hairs (var. *argenteum*), and in both varieties with pubescent inner calyx lobe surface; *hairs* whitish, appressed, to ca. 0.5 mm long; *young twigs* usually square in cross section, with four wings, reddish brown to gray-green, glabrous to moderately pubescent, glandular, with older bark becoming gray to light brown, the bark flaking off to reveal smooth reddish brown to gray bark. LEAVES obovate, oblanceolate, narrowly elliptic, or elliptic, 3.5–11 cm long, 1.3–6 cm wide, 1.6–4.1 times as long as wide, glabrous to moderately pubescent, sometimes densely pubescent below; *apex* rounded, truncate, to acute, less often with a cuspidate tip; *base* cuneate, acute, acuminate, or rounded; *petiole* shallowly channeled, 0–4 mm long, 1.2–2 mm wide; *venation* usually eucamptodromous proximally to brochidodromous distally, the midvein impressed to flat above, prominent below, the lateral veins usually 4–8, leaving the midvein at an angle of 30–45°, a clear marginal vein not present, the tertiary veins obscure or forming an irregular reticulate pattern; *blades* coriaceous to subcoriaceous, drying light to dark olive green to dark reddish brown, usually darker above than below, lustrous or dull above. FLOWER BUDS pyriform to ovoid, 5–10 mm long, the hypanthium campanulate to obconic, 2–4 mm long, the distal portion of bud subglobose, 3–6 mm long; *indumentum pattern of buds* with all parts essentially glabrous or with peduncles, bracteoles, hypanthium, calyx without, calyx distally within, and disk sparsely to moderately appressed pubescent, with petals, disc, and style glabrous or with scattered hairs; *peduncles* 1-flowered or 3-flowered, 0.1–3.7 cm long, 0.8–1.5 mm wide, the arms of the dichasia 2–13 mm long; *bracteoles* narrowly deltoid-lanceolate, 1–3 mm long, clasping the hypanthium, usually falling before anthesis. CALYX broadly open and bowl-like, with deltoid lobes along the edge of the tube or merely with a sinuate margin, the lobes before anthesis to ca. 1 mm long, to ca. 3 mm wide; *petals* obovate

to suborbicular, elliptic, oblanceolate, 7–10 mm long, glabrous; disk 5–10 mm across; *stamens* 100–300, 6–10 mm long, reflexed in bud so that anthers reach the disk; *anthers* 0.5–0.8 mm long, with 1 apical gland in the connective; *style* 5–8 mm long, the stigma somewhat peltate; *ovary* 3–4-locular, usually with a central hollow area; *ovules* 20–95 per locule, the placenta axile but not peltate, hidden by ovules, sometimes partially parietal when locules are not completely fused. *FRUIT* globose to subpyriform, 1.5–3 cm long; *seeds* subreniform, 3–5 mm long, rounded, 6–50. $2n = 22, 44$. (Fig. 5).

Representative specimens examined. ARGENTINA. **Misiones:** Dep. Gral. Manuel Belgrano, Ruta prov. 17, Campinas de América, Cementerio, zona de campiña (ca. 26.2824°S, 53.840°W), 2 Jul 2006 (fr), *H. A. Keller* 3554 (ASU0052981, CTES); 7 km de B. de Irigoyen, camino a San Pedro, Dep. Bernardo de Irigoyen, 17 Feb 1973 (fr), *Krapovickas et al.* 23378 (CTES, MO); Candelaria, 3 km S of Arroyo Yabebiry, 4 km S of San Ignacio on ruta 12 (27°15'S, 55°35'W), 11 Dec 1987 (fr), *Landrum* 5741 (ASU0005415, CTES); Cainguás, Monte Carlo, 205 m, 28 Feb 1955 (fr), *Montes* 14782 (NY); Cainguás, ruta 8, 1 km S de Campo Grande, camino a Alba Posse, 1 Aug 1987 (fr), *Vanni et al.* 973 (ASU0005199, CTES).

PARAGUAY. **Alto Paraná:** Rva. Tatí Yupí, 14 Feb 1979 (fr), *Itaipu Binacional* 161 (MO). **Amambay:** P. N. Cerro Corá (ca. 22°35'S, 56°5'W), road to Lorito, ca. 150 m, 20 Aug 1995 (st), *Landrum* 8700 (ASU0005413, FCQ). **Caazapá:** Tavaí, destacamento militar (26°10'S, 55°20'W), 30 Oct 1988 (fl), *Basualdo* 1734 (MO); Distr. San Juan Nepomuceno, Res. Nat. privada Tapyta, parcela 3 y alredores, 2 Aug 2012 (fr), *Vera et al.* 3432 (FCQ). **Canendiyu:** circa Ype-jhu, 1 Nov 1978 (fl), *Bernardi* 18306 (NY); Ygatimí, Reserva Natural del Bosque Mbaracayú (ca. 24°10'S, 55°40'W), Ñandu Rocai, 19 Nov 1995 (fr), *Landrum* 8859 (ASU0005411, FCQ). **Itapúa:** Capt. Miranda, 4.2 km N of entrance to Hotel Tirol near CONAVI project (27°12'S, 55°45'W), ca. 210 m, 9 Nov 1995 (fl), *Landrum* 8798 (ASU, FCQ); Capt. Miranda, road to Jesús ca. 0.6 km from main highway (ca. 27°12'S, 55°45'W), ca. 185 m, 9 Nov 1995 (fl), *Landrum* 8816 (ASU0005410, FCQ). **Misiones:** 12 km W de San Ignacio, camino a Pilar, 15 Nov 1978 (fr), *Arbo et al.* 1925 (CTES, MICH, MO); San Juan Bautista, ca. 8.5 km along road to Pilar, ca. 170 m, 8 Nov 1995 (fl), *Landrum* 8789 (ASU0005173, FCQ); rt. 1 between San Ramón to San Patricio at KM A262, ca. 4 km E of rd to Ayolas (ca. 27°5'S, 56°40'W), ca. 240 m, 8 Nov 1995 (fl, fr), *Landrum* 8795 (ASU0005169, FCQ); rt. 1, km A218, E147, between Asunción and Encarnación, ca. 210 m, 10 Nov 1995 (fl), *Landrum* 8825 (ASU0005379, FCQ); Ea. La Soledad, 3 km S de Santiago (56°46'W, 27°10'S), 3–4 Feb 1988 (fr), *Schinini & Vanni* 26054 (ASU0005200, CTES). **Paraguarí:** Parque Nacional Ybycuí, Campo cerrado en NE corner of the park on Arroyo Corrientes (26°03'S, 56°50'W), 21 Dec 1988 (fl), *Zardini et al.* 8980 (MO, PY). **San Pedro:** Estancia Santa Ana, 10 Dec 1992 (fr), *Basualdo* 4862 (FCQ); Estancia San Antonio, potrero al NE de la administración, Nov 1992 (fr), *Soria* 5410 (FCQ).

Phenology—Mainly flowering in October to December; fruiting mainly from November to February.

Habitat and Distribution—Cerrado, campos, gallery forest. Found from Venezuela and the Guianas to northeastern Argentina. This is a common species of campos and cerrados of Minas Gerais, São Paulo, Paraná, and Paraguay. Found at elevations of 290–1250 m.

Distinguishing Features—Calyx bowl-like, not closed; hypanthium glabrous, thinly puberulent, or only sparsely covered with hairs; lower leaf surface of leaves usually covered with inconspicuous, minute appressed hairs (var. *australe*) or moderately to densely covered with a layer of appressed hairs (var. *argenteum*); young twigs often 4-winged; leaves often obovate to oblanceolate. *Psidium australe* may be confused with *P. grandifolium*, with which it seems to hybridize in southern Brazil. I reproduce a key here modified from Landrum (2005) that distinguishes them.

1. Flower bud just before anthesis 6–15 mm long, densely lanate, the underlying surface of hypanthium hidden, the calyx usually nearly closed; leaves whitish lanate below, generally at least some widest near the middle *P. grandifolium*
- 1'. Flower bud just before anthesis 5–10 mm long, moderately covered with hairs to glabrous, the underlying surface of hypanthium visible through hairs (if present), the calyx open; leaves glabrous to densely short pubescent below, generally widest above the middle *P. australe*

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

I have treated *Psidium australe* (Landrum 2005) as a variable species of three varieties. I believe that only *P. australe* var. *australe* occurs in our area. *Psidium australe* var. *argenteum* occurs farther east in Brazil and I now believe that *Psidium australe* var. *suffruticosum* is best recognized as a separate species. The two are compared in lead 11 of the key.

Since my 2005 publication, Proença and Soares-Silva (Proença et al. 2011) have described *Psidium ratterianum* in this complex from the Distrito Federal of Brazil. I think it is closely related to *P. australe* but probably sufficiently different to recognize, apparently having an unusual combination of characters (amphistomatic leaves, persistent bracteoles, ascending leaves, and quite strong venation).

Costa and Forni-Martins (2006) report $n = 22$ (*Costa* 496) and $2n = 44$ (*Costa* 509) for this species using the name *Psidium cinereum* (here considered a synonym of *P. grandifolium*). C. Proença subsequently has identified both as *P. australe* according to SpeciesLink (2017).

4. *Psidium cattleyanum* Sabine, Trans. Roy. Hort. Soc. 4: 315. pl.11. 1821. TYPE. Raised in England by William Cattley from seed from China. *Illustration: Trans. Roy. Hort. Soc. 4: 315. pl. 11. 1821.* (LECTOTYPE: Illustration of Sabine, plate 11, designated by Snow & Veldcamp 2010 and again by Tuler et al. 2018).

Psidium littorale Raddi, Alc. Sp. Pero: 6. Tab. 1, fig. 2. 1821. TYPE. Brazil. Rio de Janeiro. Illustration: Alc. Sp. Pero: 6. Tab. 1, fig. 2. 1821.

Psidium obovatum DC., Prodr. 3: 236. 1828. TYPE. Brazil. “campis prov. Sancti-Pauli,” *Martius s.n.* (HOLOTYPE: M-32379 [annotated by de Candolle]).

Psidium buxifolium Nutt., N. Am. Sylva 1: 115; t. 25. 1842. TYPE. United States. “East Florida, near the river St. Johns,” *Baldwyn s.n.* (possible HOLOTYPE: PHIL-22408).

Psidium sellowianum O. Berg, in *Martius*, Fl. bras. 14(1): 400. 1857. (Illegitimate superfluous name because *Psidium arboreum* Vell. is cited as a synonym.) TYPE. Brazil. “Rio de Janeiro,” *Sellow s.n.* (SYNTYPE: B, lost). *Gaudichaud s.n.* (SYNTYPE: B, lost; possible ISOSYNTYPES: P-258362!, P-258363!).

Psidium variabile O. Berg, in *Martius*, Fl. bras. 14(1): 400. 1857. (Illegitimate superfluous name because *Psidium cattleyanum* Sabine and *P. littorale* Raddi are cited as synonyms.) TYPE. Brazil. General statement on location of types includes B, M, MEL, W, Sprengel. Localities various—Minas Gerais: “Serra d’Itacolumi, haud longe a civitate Mariana,” *St. Hilaire s.n.*, *Widgren* 1194; São Paulo: “ad rivulum Itaque prope S. Paulo, prope Sumidor,” *St. Hilaire s.n.*, *Sellow s.n.*; Santa Catarina: “in insula S. Catharinæ,” *Gaudichaud* 233. Rio Grande do Sul: *Sellow s.n.*; Uruguay: *Sellow s.n.* (SYNTYPES: none found; possible ISOSYNTYPE: *Sellow s.n.* K-565483, mounted with a non-type, *Riedel* 1170).

Psidium coriaceum Mart. ex O. Berg, in *Martius*, Fl. bras. 14(1): 401. 1857. (Illegitimate superfluous name because *Psidium humile* Vell. is cited as a synonym.) TYPE. Brazil. “Rio de Janeiro,” *Martius s.n.* (SYNTYPE B, lost; ISOSYNTYPE: M-32371), *Mikan* and *Schott* 1048 (SYNTYPE: B, lost; ISOSYNTYPES: K-565482, W-46102!), *Sellow s.n.* (SYNTYPE: B, lost; ISOSYNTYPES: K-170080, K-170100, P-258444!), *Raben* 752 (SYNTYPE: B, lost) and “São Paulo, prope Taubaté et Aldea de Escada,” *Martius s.n.* (SYNTYPE: B, lost; ISOSYNTYPE: M-32372), *Sellow s.n.* (SYNTYPE: B, lost). All these specimens were cited by Berg under his *P. coriaceum* var. *obovatum*, which he considered to be the typical variety.

Psidium coriaceum* var. *obovatum O. Berg, in *Martius*, Fl. bras. 14(1): 401. 1857. Illegitimate name to be replaced by the autonym *P. coriaceum* var. *coriaceum* because Berg cites *Psidium coriaceum* under this variety.

Psidium coriaceum* var. *grandifolium O. Berg, in *Martius*, Fl. bras. 14(1): 402. 1857. TYPE. Brazil. “in prov. S. Pauli,” *Sellow s.n.* (HOLOTYPE: B, lost).

Psidium coriaceum* var. *longipes O. Berg, in *Martius*, Fl. bras. 14(1): 402. 1857. TYPE. Brazil. “in prov. S. Pauli,” *Sellow* [5875] (HOLOTYPE: B, lost; ISOTYPES: K-170099, P-258443!).

Guajava cattleyana (Sabine) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava obovata (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava buxifolia (Nutt.) Kuntze, Revis. Gen. Pl. 1: 240. 1891.

Psidium cattleyanum var. *coriaceum* Kiaerskou, Enum. Myrt. bras. 28. 1893. TYPE. Brazil. “Ad São Christovão m. Aug. 1893 florentem,” *Glaziou* 6538 (LECTOTYPE: C, seen as image, designated by Landrum [2021b]); “Blumenau, Bugrebach, prov. S Catharina m. Octb. c. flor. 1866,” *Schenck* 895 (SYNTYPE: C, not found); “In cacumine campiformi Serra do mar ad Santos,” *Lund* s.n. (SYNTYPE: C, seen as image).

Psidium cattleianum f. *lucidum* Degener, New Illustr. Fl. Hawaiian Islands [Fam. 273]. 1939. TYPE. United States. Hawaii. *Degener* 12275 (HOLOTYPE: BISH?).

Psidium littorale var. *longipes* (O. Berg) Fosberg, Proc. Biol. Soc. Wash. 54: 180. 1941.

Psidium cattleianum var. *littorale* (Raddi) Fosberg, Occas. Pap. Bernice Pauahi Bishop Mus. 23: 37. 1962.

Psidium ubatubense Mattos, Cienc. and Cult. 19: 332. 1967. TYPE. Brazil. “São Paulo,” *Fontella and Moura* 102 (HOLOTYPE: SP!, lost in mail, =photo specimen, ASU0074799).

Psidium gaudichaudianum Proença & Faria in Proença, Faria & Mazine, Phytotaxa 308 (2): 262. 2017. TYPE. Brazil. Rio de Janeiro: *Sellow* s.n. (HOLOTYPE [“neotype”]: BM-796903). Intended as a replacement name for *P. sellowianum* O. Berg.

Shrub or tree to 1–12 m high, glabrous or the young growth puberulent to strigose on some floral structures; *hairs* whitish, most less than 0.1 mm long; *young twigs* flattened, becoming subterete, light reddish brown to light gray, the older twigs remaining more or less smooth, usually gray. LEAVES obovate, oblanceolate, elliptic, 3–10.5 cm long, 1.5–6.5 cm wide, 1.5–2.6 times as long as wide; *apex* acute, acuminate, to broadly rounded; *base* acuminate to cuneate, or rarely rounded; *petiole* channeled, 2–14 mm long, 1–2 mm wide; *venation* brochidodromous, the midvein prominent below, nearly flat to shallowly impressed above, the lateral veins 6–13 pairs, leaving the midvein at an angle of 45–60°, prominent to weak, flat or impressed above, the marginal vein arching between the laterals 1–5 mm from the margin, somewhat weaker than laterals, the tertiary veins dendritic, arising near the margin and extending towards the midvein; *blades* coriaceous (rubbery when fresh), drying light or dark reddish brown to gray-green, nearly concolorous, the upper surface after drying often mottled with whitish blotches, the margin slightly revolute. FLOWER BUD subpyriform, 5–14 mm long, the hypanthium obconic to funnel-form, 2–5 mm long, the distal portion of bud subglobose, 3–10 mm long; *indumentum pattern of buds* with all surfaces glabrous or with peduncles, bracteoles, and calyx within sometimes puberulent; *peduncles* 2–8(–13) mm long, ca. 1 mm wide, uniflorous, borne in the axils of leaves, at leafless nodes, or in the axils of leafy to reduced bracts; *bracteoles* ovate, lanceolate, or oblong, 1–2.3 mm long, caducous at anthesis. CALYX fused 3–7 mm beyond the ovary summit, terminating in a sinuate edged terminal pore or in 5 broadly rounded lobes (rarely closed and falling as a calyptra above staminal ring), tearing irregularly or between the lobes at anthesis, the tears cutting through the staminal ring; *petals* suborbicular, obovate to elliptic, 3–8 mm long; *disk* within the staminal ring ca. 4–6 mm across; *stamens* 200–400, 3–8 mm long; *anthers* 0.6–1 mm long, with 1 terminal gland; *style* 4–8 mm long, the stigma 1–1.5 mm wide; *ovary* 3–5-locular, sometimes with a few hairs on inside of locules; *ovules* 10–28 per locule, uniserrate or biseriate on each lamella, the placenta peltate, at least slightly so. FRUIT red or yellow, pyriform to subglobose, 1.5–3 cm long; *seeds* 12–64, 2–6 mm long, smooth, with rounded edges. $2n$ commonly equal to 44, 66, 88 and higher. (Fig. 6).

Representative specimens examined. Known to me by a single cultivated specimen close to our area, but likely to be found naturalized in Paraguay and Bolivia. **ARGENTINA. Buenos Aires:** Jardín Botánico de la Facultad de Agronomía, Boelcke 4669 (MICH).

Phenology—Flowering mainly from November to February; fruiting mainly from January to April.

Habitat and Distribution—Restinga, forest, campo, disturbed areas; frequently cultivated. Apparently native to eastern coastal Brazil in Mata Atlantica and restinga but now

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

widely naturalized in tropical and subtropical regions worldwide. Found at elevations from near sea level to 1450 m.

Distinguishing Features—Plants nearly glabrous, the leaves rubbery coriaceous, usually obovate to oblanceolate; calyx usually with a terminal pore, tearing irregularly on opening (rarely closed and calyprate above the staminal ring), the tears cutting into the staminal ring.

Psidium cattleyanum is a variable species with respect to leaf and fruit size, fruit color, and ploidy level. Chromosome numbers of $2n=44$ and 88 have previously been reported. Machado (2016) reports polyploidy levels as low as $2n=3x=33$ and as high as $2n=12x=132$ with little correlation to geography or fruit color, except that higher ploidy levels may be associated with more adverse habitats. Machado also reports that individuals with red fruits tend to grow at higher elevations than those with yellow fruits. The species can be an aggressive invader in some areas such as Hawaii but is also valued for its edible fruits and ornamental value.

5. *Psidium densicomum* DC., Prodr. 3: 235. 1828. TYPE. Brazil. “ad ripas flum. Solunois et ad lacum Egensem,” [near present town of Tefé, in state of Amazonas, 3.35°S, 64.7°W] *Martius s.n.* (SYNTYPES: M-0146750 [with seeds], M-0146751 [with fruits and seeds], M-146752 [annotated by de Candolle, sterile], M-146753, M-146754). Specimens incorrectly assumed to be types are M-0171037, M-0171036, M-0171038, K-000565301, MEL2396531. They seem to be a species of *Myrcia*.

Psidium ovatifolium O. Berg, in Mart. Fl. bras. 14(1): 385. 1857. TYPE. Brazil. “in vicinia urbis Santarem prov. Paraensis,” Spruce 826 (HOLOTYPE: M-146865!; probable ISOTYPES: G-227727!, K-565303, K-565304, W-18890013473).

Guajava densicoma (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava ovatifolia (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium ovatifolium var. *glabrum* Amshoff, Bull. Torr. Bot. Club 75(5): 538. 1948. TYPE. Guyana. “basin of Rupununi river, Karenambo, lat. about 3°45'N,” A. C. Smith 2253 (HOLOTYPE: NY! [annotated as “typus” by Amshoff]. ISOTYPES: F-76390f!, U-104059 [annotated as “isotypus” by Amshoff], WIS-827. Additional cited specimen, “F. D. (Anderson) 686 (K)” probably not intended as type.

Shrub or small tree 2–8 m high, glabrous to abundantly hirsutulous on flowers and young growth, the trunk smooth barked; *hairs* yellowish or grayish, up to ca. 0.5 mm long; *young twigs* light gray or light brown, darkening with age, smooth or longitudinally striate, remaining relatively smooth in age. LEAVES narrowly lanceolate, lanceolate, or ovate, 5–15(–19) cm long, 1.3–8 cm wide, 1.5–4 times as long as wide, the margin entire, slightly revolute; *apex* acute to acuminate; *base* acute, broadly cuneate, rounded, or subtruncate; *petiole* narrowly channeled, 4–14 mm long, 1–2 mm wide, the epidermis minutely wrinkled; *venation* eucamptodromous to brochidodromous, the midvein shallowly concave above, prominent below, the lateral veins 6–10(–12), leaving midvein at an angle of ca. 45 degrees, broadly arching towards the apex, diminishing near the margin, or sometimes connecting to form a partial marginal vein for part of the leaf, this running 1–5 mm from the margin, the tertiary veins dendritic, weak to obscure; *blades* submembranous to subcoriaceous, drying dark reddish-brown to gray-green, somewhat darker above than below. FLOWER BUDS pyriform, 8–14 mm long, the hypanthium obconic to campanulate, 4–5 mm long, the distal portion of bud subglobose to ovoid, 5–9 mm long, sometimes wider than long; *indumentum pattern of buds* with all surfaces glabrous or peduncles, dichasium branches, bracteoles, hypanthium, calyx within and without hirsutulous, and with petals, disk and style glabrous; *peduncles* uniflorous or bearing a 3-flowered dichasium, more or less fattened, moderately glandular, (0.8–)1.5–5 cm long, 0.8–1 mm wide near middle, wider at the apex, the dichasium branches

1–2.5 cm long; *bracteoles* mostly deciduous by anthesis, sometimes persisting until fruit matures, foliaceous, 10–30 mm long, 1–5 mm wide. CALYX open in bud, cup-like, tearing between the lobes at anthesis, persisting until the fruit matures, the lobes broadly rounded on the rim of the calyx cup, 0.5–1.5 mm long; *petals* obovate, glandular, 13–22 mm long; *disk* 3–4 mm across; *stamens* 150–280, 7–10 mm long; *anthers* ca. 1 mm long; *style* 9–12 mm long; *ovary* 2–3-locular; *ovules* 5–32, uniseriate on each lamella, the placenta slightly peltate. FRUIT globose, 0.8–1.5 cm in diam.; *seeds* 9–18 in fruits seen, C-shaped, angular, 4–7 mm long, the surface dull, gray-yellow. (Fig. 7).

Representative specimens examined. **BOLIVIA.** Pando: Abuná, rapids on Río Abuná above Fortaleza (ca. 9.7833°S, 65.5667°W), 100 m, 8 Jul 1992 (fl), Gentry et al. 78002 (ASU0006142, MO); S bank of Río Abuná, 7–8 km above mouth, 15 Jul 68 (fl), Prance 6064 (MICH, NY).

Phenology—Flowering mainly in July and August; fruiting mainly in November and December.

Habitat and Distribution—Riparian habitats, sometimes seasonally inundated (varzea). Sometimes growing with *Myrciaria dubia* (HBK) McVaugh, the commercially important “camu-camu.” Known from Bolivia, Brazil, Colombia, Guyana, Peru, and Venezuela.

Distinguishing Features—Leaves lanceolate or ovate, tapering from near the base to an acute apex, often over 10 cm long, glabrous in our area; calyx open, bowl-like in the flower bud; petiole 4–14 mm long; bracteoles 10–30 mm long, narrowly elliptic; 3-flowered dichasias common; petals 13–22 mm long; seeds angular.

6. *Psidium friedrichsthalianum* (Berg) Niedenzu in Engl. & Prantl, Nat. Pflanzenfam. 3(7): 69. 1893.

Calyptropsidium friedrichsthalianum O. Berg, Linnaea 27: 350. 1856. TYPE. Guatemala, “ad Grenada,” E. von Friedrichsthal 932 (holotype, W-48024, =F neg. 31421!).

Psidium grandiflorum Ruiz & Pav., Anales Inst. Bot. Cavanilles 15: 194. 1957. TYPE Perú. ‘ad Chicoplaya’, ilustración en Anales Inst. Bot. Cavanilles 15: 237. 1957 (MA-ajb04-d-0751). Illegitimate later homonym of *Psidium grandiflorum* Aubl., Hist. Pl. Guiane 1: 483 (1775), =*Campomanesia grandiflora* (Aubl.) Sagot.

Shrub or tree to 10 m high, minutely puberulent on young growth and flowers, glabrescent with age; *hairs* whitish to reddish brown, to ca. 0.2 mm long, mainly appressed; *young twigs* quadrangular to subquadrangular with four wings, reddish brown, losing wings in about a year, the older bark remaining smooth or becoming stringy or flaky. LEAVES elliptic, elliptic-oblong, 3–15 cm long, 1.7–6 cm wide, 1.7–2.9 times as long as wide; *apex* acute or acuminate; base acuminate, cuneate, or rounded; *petiole* 4–6 mm long, ca. 1–1.5 mm thick, channeled; *venation* brochidodromous, the midvein impressed above, prominent below, the lateral veins ca. 5–10 more or less weak pairs leaving the midvein at angle of ca. 60 degrees, slightly raised above in mature leaves, alternating with weaker (sometimes scarcely visible) dendritic veins that arise from adjacent larger veins, the marginal vein broadly arching between laterals, about equaling them in prominence; *blades* subcoriaceous to coriaceous, drying dark reddish brown to dark gray-green, nearly concolorous, the upper surface after drying often mottled with whitish blotches, often slightly lustrous, the lower surface with 3–6 glands/mm². FLOWER BUD fusiform or subglobose (with the hypanthium and distal portion of bud seamlessly blending together) or subpyriform (constricted at ovary apex), 10–18 mm long, the hypanthium obconic to fusiform-campanulate, 4–6 mm long, the distal portion of bud subglobose to ovoid, 6–12 mm long, with an apiculate apex; *indumentum pattern of buds* with external surfaces subglabrous to moderately strigulose (especially on peduncle and adjacent hypanthium), the disk and calyx within strigulose or to

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

glabrous, the petals glabrous or ciliate, the other surfaces glabrous or with scattered appressed hairs, all surfaces glabresent with age; *peduncles* uniflorous, 0.7–1.6(–3.3) cm long, 1–1.5 wide (–3 mm in fruit), compressed at first, subterete upon fruiting; *bracteoles* deciduous before anthesis, narrowly triangular, ca. 1 mm long. CALYX closed in bud, tearing irregularly into 2 or 3 parts at anthesis, persisting or not, glabrous within, the calyx remnants (0.2–)0.3–0.7 mm thick when dry, up to 12 mm long, the tears not cutting the staminal ring; *petals* ca. 12 mm long; *disk* 6–9 mm across, puberulent at first; stamens 320–800, 10–15 mm long; *anthers* 1–2 mm long, with 4–20 glands in the connective; *style* 10–15 mm long, the stigma 1–1.5(–2.2) mm across dry (fresh: ca. 2 mm across, green, in contrast to white style); *ovary* 4–5–locular; *ovules* about 70–80 per locule, multiseriate on each lamella, the placenta peltae, centrally attached. FRUIT globose to pyriform, 2.4–10 cm in diameter, the wall 4–10 mm thick; *seeds* 13–110, 4–8 mm long, reniform, rounded (or rarely wedge shaped). (Fig. 8).

BOLIVIA. *Pando*: West bank of Río Madeira, 12 km above Abunã, Brazil, (ca. -9.8, -65.4), 20 Jul 1968 (fl), Prance et al 6204 (INPA, MICH, NY, R, US).

BRAZIL. *Acre*: Mun. Placido de Castro, Rio Xipamano, Colocacão Vai-Quem-Quer, (-10.267, -67.188), 14 Jan 1995 (fr), C. Figueiredo 559 (ASU).

PERU. *Madre de Dios*: Tambopata, Dist. Puerto Maldonado, Cusco Amazonico, (-13.133, -69.600), 285m, 25 Nov 2002 (fr), L. Valenzuela & I. Huamantupa 1047 (ASU, MO); *Pasco*: Oxapampa, Dist. Pozuzo, Sector Palmira, Parcela del Sr. Agustin Egg, (-10.200, -75.570), 850m, 1 Jan 1970 (fl), E. Blasido 221(ASU); Oxapampa, comunidad nativa Nueva Aldea - Sector Santa Maria, (-10.374, -75.067), 355m, 20 Mar 2009 (fr), R. Rojas 6562 (ASU).

Phenology—Specimens indicate that flowering and fruiting can occur throughout the year. Cultivated plants in Arizona mainly bloom in the spring and to a lesser extent in the fall. I suspect that flowering is correlated with periods of rapid vegetative growth.

Habitat & Distribution—Forests, especially along streambeds; (30–)100–1000 m elev.; from southern Mexico northern Colombia and western Venezuela.

Distinguishing Features—*Psidium friedrichsthalianum* is most likely to be confused with *P. acutangulum* and *P. acidum*. The three species are compared in leads 25 and 26 of the key.

Common names and uses—El Salvador – arrayán (*Calderon* 1105, NY); Costa Rica – cas (*Skutch* 3914, MO), kas-kra (*Pittier* 12072, CR); Honduras – guayaba de mico (*Nelson* et al. 6673, MO); yunguilla—Esmeraldas, Ecuador, in Chachi language (*Cornejo* 8670, ASU). The name guayaba is also used with such modifiers as: ágria, de agua, cimarrona, de danto, de fresco, de monte, del río. The species has a wide range and is found near sea level to about 1900 m. I suspect that it has been distributed widely by indigenous people because of its edible fruits.

7. *Psidium grandifolium* DC., Prodr. 3: 234. 1828. TYPE. Brazil. “ad Ypanema prov. S. Pauli,” *Martius* s.n. (HOLOTYPE: M-32375).

***Psidium cinereum* DC., Prodr. 3: 234. 1828. TYPE. Brazil. “prov. Sancti Pauli,” *Martius* s.n. (HOLOTYPE: M-146757).**

***Psidium incanescens* DC., Prodr. 3: 234. 1828. TYPE. Brazil. “prope Taubate prov. S. Pauli,” *Martius* s.n. (HOLOTYPE: M-32378; ISOTYPE: BR-528845!).**

***Psidium ternatifolium* Cambess., in A. St.-Hil., Fl. Bras. Merid. 2: 278. 1833. TYPE. Brazil. “Fazenda das Lages in provincia S. Pauli,” *Saint-Hilaire* s.n. (HOLOTYPE: P-258455!).**

***Psidium grandifolium* var. *genuinum* O. Berg, in Mart., Fl. bras. 14(1): 406. 1857. Illegitimate name to be replaced by the autonym *P. grandifolium* var. *grandifolium* because Berg cites *P. grandifolium* under this variety.**

- Psidium grandifolium*** var. ***intermedium*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. Brazil. “prov. Rio Grande do Sul,” *Sellow s.n.* (HOLOTYPE: B, lost; LECTOTYPE: P-258453! [isotype designated as lectotype by Landrum, 2005]; ISOLECTOTYPE: P-258454!).
- Psidium grandifolium*** var. ***ternatifolium*** (Cambess.) O. Berg, in Mart., Fl. bras. 14(1): 407. 1857.
- Psidium grandifolium*** var. ***heterophyllum*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. Brazil. “prov. Minarum,” *Claussen 1527* (HOLOTYPE: W-16677; ISOTYPE: LE-6980).
- Psidium grandifolium*** var. ***tenuinerve*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. Brazil. “prov. Minarum prope urbem S. João,” *Pohl 3630* (HOLOTYPE: W-16681).
- Psidium cinereum*** var. ***angustifolium*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. Illegitimate name to be replaced by the autonym *P. cinereum* var. *cinereum* because Berg cites *P. cinereum* under this variety.
- Psidium cinereum*** var. ***brevipes*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. TYPE. Brazil. “in prov. Minarum,” *Claussen 527* (HOLOTYPE: BR-843772; ISOTYPES: G [= F-neg. 23492], K-565481).
- Psidium cinereum*** var. ***intermedium*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. TYPE. Brazil. “prope urbem Barbacena prov. Minarum,” *St. Hilaire s.n.* (SYNTYPE: B, lost) and “ad Urbem Ypanema prov. S. Pauli,” *Sellow s.n.*, (SYNTYPE: B, lost; LECTOTYPE: P-258482! [isosyntype designated lectotype by Landrum, 2005]; remaining ISOSYNTYPES, P-258480! in part, mixed sheet, K-565480 in part, mixed sheet).
- Psidium incanescens*** var. ***parvifolium*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. TYPE. Brazil. “v. in. herb. Sond. et Mart,” “prov. Minarum prope urbem S. João del Rey,” *St. Hilaire s.n.* (no specimens found), *Widgren 529* (ISOSYNTYPES: LE-6982, R-162761!), and “Chapeo d’Uvas,” *White 4163* (SYNTYPE: BR-843775).
- Psidium incanescens*** var. ***rotundifolium*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. TYPE. Brazil. “prov. Rio Grande do Sul,” *Sellow s.n.* (SYNTYPE: B, lost) and “S. Rita et S. João Baptista,” *Pohl 500* (SYNTYPE: B, lost; LECTOTYPE: W-46100!, [isosyntype designated as lectotype by Landrum, 2005]) and “ad Paracatu,” *Pohl 729* (SYNTYPE: B, lost; ISOSYNTYPE: W-48297!).
- Psidium incanescens*** var. ***cuneatum*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. Illegitimate name to be replaced by the autonym *P. incanescens* var. *incanescens* because Berg cites *P. incanescens* under this variety.
- Psidium cuneatum*** var. ***incanescens*** O. Berg, in Mart., Fl. bras. 14(1): 405. 1857. TYPE. Brazil. “in eadem prov,” [i.e., Minas Gerais], *Regnell I-129* (HOLOTYPE: MEL-2101229; ISOTYPE: U-5181).
- Psidium grandifolium*** var. ***albidum*** O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. Brazil. “Prope Pindamonhangaba et Taubate,” *Riedel [1379]*. (HOLOTYPE: LE-6979).
- Psidium grandifolium*** var. ***incanescens*** O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. Brazil. “Prope Pindamonhangaba et Taubate,” *Riedel [1379]*. (HOLOTYPE: LE-6981).
- Psidium riedelianum*** O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. Brazil. “prope villam Jaguara prov. Minarum,” *Riedel s.n.* (apparent HOLOTYPE, LE-7001).
- Guajava incanescens*** (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
- Guajava grandifolia*** (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
- Guajava cinerea*** (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
- Guajava riedeliana*** (O. Berg) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
- Psidium eriophyllum*** Barb. Rodr., Myrt. Paraguay 12. 1903. TYPE. Paraguay. “vicine Rio Igatemy, prope Yerbales Serra Maracayu,” *Hassler 5659* (HOLOTYPE: G-194090 [2 sheets]).
- Psidium lanatum*** Barb. Rodr., Myrt. Paraguay 13. 1903. TYPE. Paraguay. “Ipe hu.....Serra Maracayu,” *Hassler 5263* (HOLOTYPE: G-194092).
- Psidium spodophyllum*** Barb. Rodr., Myrt. Paraguay 14. 1903. TYPE. Paraguay. “prope Rio Corrientes,” *Hassler 4521* (HOLOTYPE: G-194093).
- Psidium apaense*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “in regione cursus superioris fluminis Apa,” *Hassler 8529* (G [= ASU photo]).
- Psidium paraguayanense*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Igatimi,” *Hassler 4831* (G [3 sheets, = ASU photos], BM-511330).
- Psidium psychrophyllum*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “in alta-planicie Loma guazu in valle fluminis Y-aca,” *Hassler 6805* (G [2 sheets, = ASU photos]).
- Psidium yacaense*** Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Valenzuela,” *Hassler 7099* (G [= ASU photo]).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium cinereum var. *paraguariae* D. Legrand, Fl. Illustr. Catarin., Mirtáceas 694. 1977. TYPE. Paraguay. Rosengurtt 5407 (HOLOTYPE: MVM) and Pedersen 4366 (PARATYPE: MVM? ISOPARATYPES: MO!, NY! [= ASU photo], SI-3060).

Psidium cinereum DC. var. *incanescens* (DC.) D. Legrand, Fl. Illustr. Catarin., Mirtáceas, 692. 1977.

Shrub to ca. 1.5 m high, densely white tomentose or pubescent on young growth; *hairs* white (sometimes with a reddish brown tinge), up to ca. 1.5 mm long; *young twigs* often square in cross section, especially in vigorous growth, densely white tomentose. LEAVES elliptic, obovate, oblanceolate, lanceolate, (rarely suborbicular), 3.6–12 cm long, 2–5.8 cm wide, 1.7–3 times as long as wide, densely white tomentose below, sparsely hairy to glabrescent above when mature, often with somewhat longer, persistent hairs along the midvein above; *apex* acute, rounded, acuminate, often with a cuspidate tip; *base* acute, obtuse, rounded, or cuneate; *petiole* 1–6 mm long, 1–2 mm thick, channeled or not; *venation* usually eucamptodromous proximally to brochidodromous distally, the midvein impressed to flat above, prominent below, the lateral veins usually 4–7, ascending, a clear marginal vein not present, the smaller tertiary veins obscure or forming an irregular reticulate pattern, sometimes impressed above; *blades* subcoriaceous to stiffly coriaceous, dull to lustrous above, drying dark reddish brown to gray-green. FLOWER BUDS pyriform, campanulate, or subobconic, densely white tomentose, 7–15 mm long, the hypanthium obconic, 2.5–7 mm long, the distal portion of bud subglobose, 4–9 mm long; *indumentum pattern of buds* with all external surfaces except petals tomentose to pubescent, the bracteoles glabrous to tomentose within, the petals glabrous to pubescent without, glabrous within, the calyx densely covered with hairs within at least distally, the disk subglabrous to pubescent, the style glabrous; *peduncles* 0.2–5 cm long, 1–2 mm thick; *bracteoles* linear to narrowly elliptic, 2–8 mm long. CALYX nearly closed except for a terminal pore, with small lobes around the margin of the pore that are wider than long, to bowl-like with clearly distinguishable deltoid lobes that are up to 3 mm long and wide, the fused tubular portion of the calyx 1–4 mm long, tearing between the lobes or irregularly at anthesis, the tears sometimes cutting the staminal ring; *petals* elliptic to obovate, 9–10 mm long; *disk* 5–9 mm across; stamens (80–)260–560, 4–11 mm long; *anthers* oblong, 0.8–1 mm long, with 1–3 glands in the connective; *style* 5–10 mm long; *ovary* 2–5-locular, or sometimes the locules not completely fused; *ovules* 25–80 per locule, ca. 6-seriate, the placenta axile but not peltate, hidden by an obconic mass of ovules, sometimes partially parietal when locules are not completely fused. FRUIT subglobose, 1–2.5 cm in diameter; *seeds* (2–)3–4(–6) mm long, smooth, rounded, 19–85 per fruit, frequently attacked by insects and larger than normal. (Fig. 9).

Representative specimens examined. ARGENTINA. Corrientes: Dep. Ituzaingo, 7 km S of río Aguapey on Ruta 39, 27.6°S, 56.68°W, 17 Dec 1981 (fl), Carnevali 4947 (ASU0006708, CTES). Misiones, San Ignacio, new road to Loreto, ca. 1 km from Ruta 12, 27.26°S, 55.54°W, 11 Dec 1987 (fl), L. R. Landrum 5731 (ASU0007324, CTES); San Ignacio, ca. 3 km along road to Peña Victoria, Teyu Cuare, 27°15'S, 55°35'W, 10 Dec 1987 (fl), Landrum 5717 (ASU0007323, CTES).

BRAZIL. Mato Grosso do Sul: Rod. MT-624, 5 km W de Tacuru (ca. -23.623963 S, -55.020423 W), 16 Dec 1983 (fl), Hatschbach 47309 (ASU0007340); Rod. MS-164, Fazenda Itamarati, Mun. Ponta Porã (ca. -23.623963 -55.020423), 11 Mar 2004 (fr), Hatschbach 76918 (ASU0059730); camino a Colonia Estrella, 1 km W del Hito, (ca. 22.3667° S, 55.75° W), 500 m, 10 Dec 1997 (fr), Schinini & Dematteis 33633 (ASU0007380).

BOLIVIA. Santa Cruz: Prov. Chiquitos, 3–5 km a NE de Santiago de Chiquitos (18°20'S, 59°35'W), 22 Oct 1994 (fl), Vargas 3496 (ASU0007387).

PARAGUAY. Amambay: camino a Colonia Estrella, 1 km W del Hito (55°45'W, 22°22'S), 500 m, 10 Dec 1997 (fr), Schinini & Dematteis 33633 (ASU0007380); Colonia Pai Tavytera, camino a Lorito Picada, 23 Feb 1997 (fl), Soria 7867 (FCQ). Caaguzú: Arroyo Yuquyry-Arroyo Taruma, 4 km N of Arroyo Yuquyry (25°13'S, 55°55'W), 12 Jan 1991 (fr), Zardini & Velázquez 25882 (ASU0007314). Caazapá: Tavaí, destacamento militar (26°10'S, 55°20'W), 30 Oct 1988 (fl), Basualdo 1732 (ASU0007325, FCQ). Canindeyú: Res. Nat. Bosque

Mbaracayú, Ypejhú y Villa Ygatimí, Ñandu Rocai, 19 Nov 2020 (fl), *Degan et al.* 4739 (FCQ); Ygatimí, Res. Natural del Bosque Mbaracayú, Ñandu Rocai (ca. 24°10'S, 55°40'W), 19 Nov 1995 (fl), *Landrum* 8855 (ASU0006717, FCQ); Res. Nat. Bosque Mbaracayú, Cerrado Aguara Ñú, campos de Valinoti cue, 23 Feb 2016 (fl), *Rolón et al.* 160 (FCQ). **Itapúa:** Trinidad, 19 Dec 1985 (fl), *Basualdo* 1010 (FCQ); Capitán Miranda, 4.2 km N of entrance to Hotel Tirol beside CONAVI project (ca. 27°12'S, 55°45'W), ca. 210 m, 13 Aug 1995 (fr), *Landrum* 8661 (ASU0007310, FCQ); road to Jesús, 0.6 km from main highway (ca. 27°12'S, 55°45'W), ca. 185 m, 9 Nov 1995 (fl), *Landrum* 8810 (ASU0007327, FCQ); San Juan Bautista, 8.5 km along road to Pilar, ca. 170 m, 8 Nov 1995 (st), *Landrum* 8792 (ASU0007334, FCQ). **Paraguarí:** Salto de Pirareta, 14 Nov 1978 (fr), *Arbo et al.* 1754 (NY); route 1 near km 246, ca. 0.5 N on road to Lago Ypoa (26°S, 57°15'W), ca. 250 m, 7 Nov 1995 (fl), *Landrum* 8766 (ASU0006720, FCQ); National Park Ybycuí, Arroyo Corrientes (26°00'S, 56°46'W), 10 Feb 1993 (fr), *Zardini & Guerrero* 34974 (ASU0007332). **San Pedro:** 36 km N de Tacuara, Ea. La Manina (24°22'S, 56°24'W), 21 Oct 1994 (fl), *Krapovickas et al.* 45798 (ASU0007386, CTES); 70 km N de Tacuara (24°1'S, 56°5'W), 15 Dec 1986 (fr), *Perez et al.* 1465 (ASU0007341).

Phenology—Flowering throughout year but mainly from October to December; fruiting throughout year but mainly from November to March.

Habitat and Distribution—Northeast Argentina, Paraguay, Bolivia, and Brazil (Santa Catarina to Bahia); campo and cerrado at 800 to 1200 m.

Distinguishing Features—Hypanthium and lower surface of at least young leaves densely covered with whitish hairs, the hypanthium surface at anthesis usually obscured by hairs; *venation* usually eucamptodromous proximally to brochidodromous distally, the lateral veins usually 4–7 pairs, ascending; calyx open and bowl-like, to nearly closed.

Common names—Katuava in Paraguay.

Hybridization with *Psidium guineense* appears to be common and confusion with that species is possible. Below is a key that distinguishes *P. grandifolium* from *P. guineense*.

1. Anthers elongate, 1–3 mm long, usually 3–6 times as long as wide; placenta laminar, sometimes peltate; tertiary veins often producing a ladder-like pattern; hairs of lower leaf surface usually more or less erect, mostly nearly straight, usually reddish brown..... *P. guineense*
- 1'. Anthers not elongate, 0.5–1 mm long, about 2 times as long as wide; placenta mound-like, not laminar or peltate; tertiary veins reticulate; hairs of lower leaf surface generally appressed and straight to densely tangled, usually whitish..... *P. grandifolium*

Discussion of the *Psidium grandifolium* complex—The *Psidium grandifolium* complex (Landrum 2005; *P. grandifolium*, *P. australe*, *P. missionum*, and *P. suffruticosum*) is taxonomically difficult because of the frequency of intermediate specimens. *Psidium ratterianum* Proença & Soares-Silva of central Brazil probably belongs to this complex (Proença et al. 2011) as well but is not found in Paraguay or Bolivia. I am mainly following my earlier decisions (Landrum 2005) in the present paper. In general, the species are shrubs and subshrubs of campos and cerrado and are adapted to fire, being able to resprout at about ground level from a woody subterranean base after being burnt or cut down. The difficulty in assigning species limits in the complex may be caused by hybridization or by parallel evolution. In Table 1 I compare the four taxa of our area in their most typical states. I have seen *P. grandifolium*, *P. australe*, and *P. missionum* co-occurring in more than one locality of a few hectares in southern Paraguay or northeastern Argentina.

Psidium grandifolium is a species with densely whitish indumentum covering the lower leaf surface and flower buds. There are three more less distinctive morphologies, or morphs, in our area. In northern Paraguay and beyond in Bolivia (northern, morph 1) the leaves are generally stiffly coriaceous at maturity and often oblanceolate to obovate, and the lateral veins are prominent above and below (Fig. 1A,B); the calyx in the bud may be nearly closed, with the closed corolla hidden or nearly hidden by the calyx before anthesis, and the calyx lobes are

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

not prominent (Fig. 1C,D). In southern Paraguay, and adjacent Argentina, the leaves of *P. grandifolium* tend to be subcoriaceous to coriaceous, but not stiffly so at maturity. These southern plants of Itapua Province, Paraguay and adjacent Misiones and Corrientes Provinces of Argentina can be divided into two additional morphs, 2 and 3. Morph 2 has relatively broad leaves and a nearly closed calyx in the flower bud (Fig. 2A,D) and is similar to the type specimen of the species. Morph 3 has narrow leaves and an open calyx with well-developed calyx-lobes in the flower bud (Fig. 2B,C). This third morph I will call *Itapua-grandifolium* for convenience.

Itapua-grandifolium (morph 3) without its dense indumentum would look very much like *P. missionum*, but the leaf blades in *P. missionum* seem to be more coriaceous than *Itapua-grandifolium*.

Farther north in Paraguarí Province, Paraguay *Itapua-grandifolium* is not found, but a kind of *P. missionum* with a moderate amount of indumentum appears, which for convenience I will call *Paraguarí-missionum*. *Paraguarí-missionum* is generally distinguishable from *P. grandifolium* from the same localities because of its narrower leaves and more clearly defined triangular calyx lobes.

Table 1 – Comparison of the common morphology of each species of the *Psidium grandifolium* complex

Name	Calyx in bud	Leaf surface	Hypanthium surface	Inflorescence	Common leaf shape
<i>P. grandifolium</i>	Nearly closed, tearing irregularly at anthesis	Densely covered with tangled white indumentum below; not lustrous above	Densely covered with tangled white indumentum	Dichasia not common	Elliptic, obovate, oblanceolate; 1.7–3 times as long as wide
<i>P. australe</i> var. <i>australe</i>	Open, the lobes broadly triangular, much wider than long; tears longer than the lobes forming between lobes at anthesis	Moderately covered with appressed hairs to glabrous below [var. <i>argenteum</i> of Brazil densely appressed pubescent]; not lustrous above	Moderately covered with appressed hairs to glabrous	Dichasia not common	Obovate, oblanceolate; 1.5–3.5 times as long as wide
<i>P. suffruticosum</i>	Nearly closed at first, tearing into ca. 5 lobes at anthesis	Glabrous below; lustrous above	Glabrous	Dichasia common	Oblanceolate, narrowly oblanceolate, narrowly elliptic, obovate; 1.7–5.6 times as long as wide
<i>P. missionum</i>	Open, the lobes triangular, slightly wider than long; short tears forming between lobes at anthesis	Glabrous to subglabrous below; not lustrous above	Glabrous to densely covered with appressed hairs	Dichasia not common	Oblanceolate, obovate; 1.8–3.5 times as long as wide

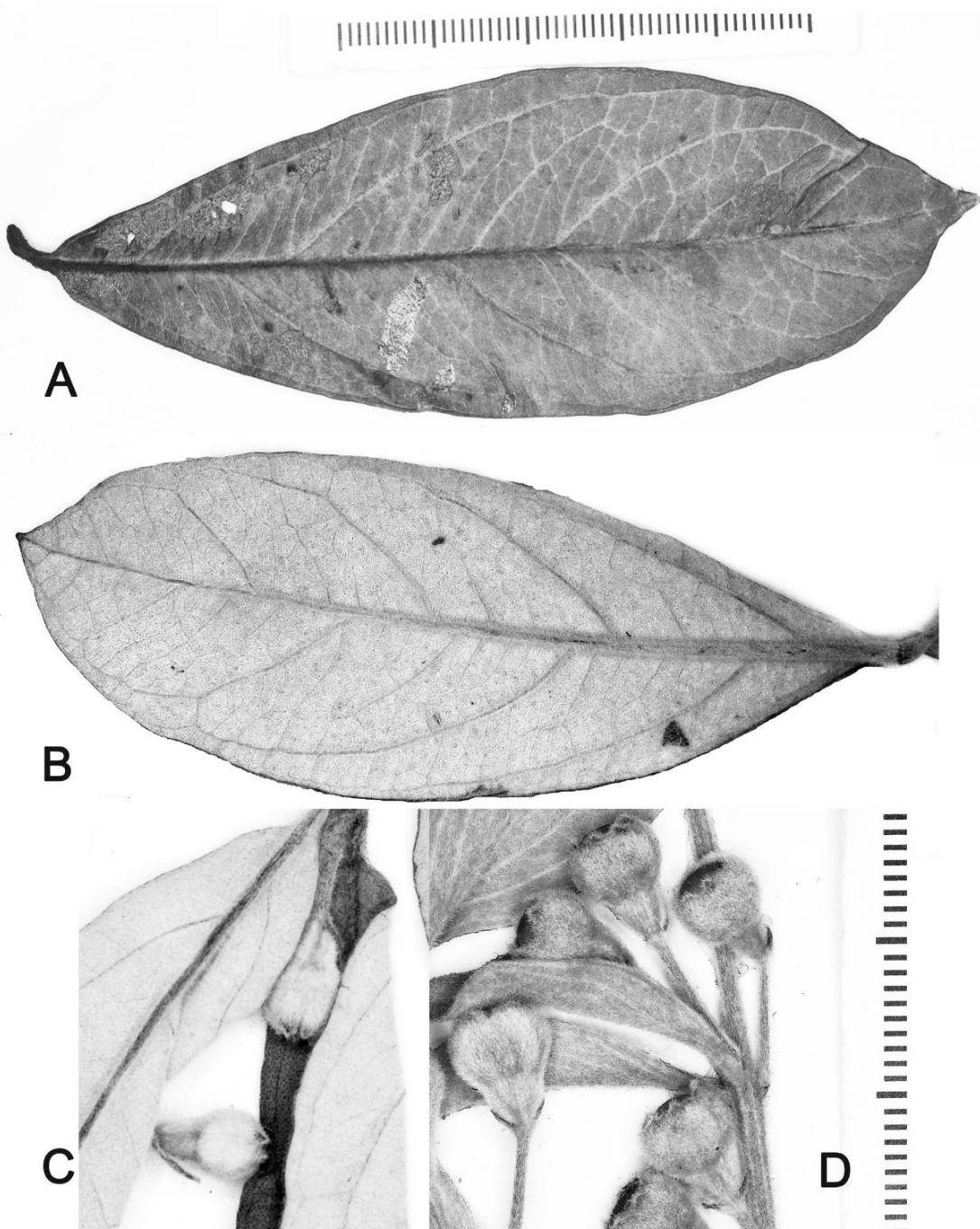


Figure 1. *Psidium grandifolium*, northern morphology (morph 1). A. Paraguay, Canindeyú, upper leaf surface. B. Paraguay, Caaguazú, lower leaf surface. C. Paraguay, Canindeyú, buds. D. Paraguay, San Pedro, buds. Scale bars in mm. (A from Landrum 8855, ASU0006717; B from Zardini & Velázquez 25882, ASU0007314; C from Landrum 8855, ASU0006717; D from Krapovickas et al. 45798, ASU0007386).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

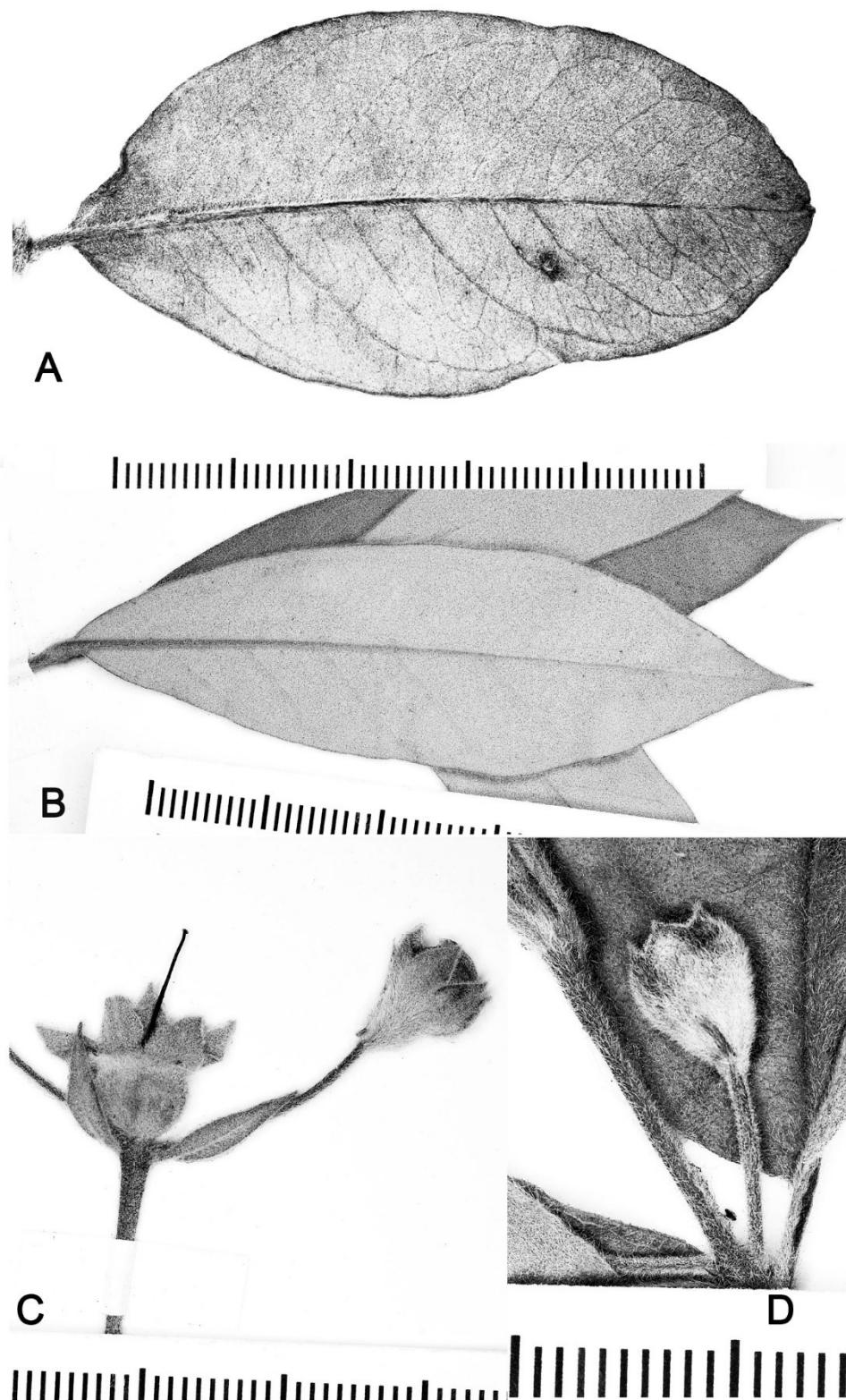


Figure 2. *Psidium grandifolium*, southern morphologies: morph 2(A,D) & morph 3(B,C). Two common leaf shapes: oblong-elliptic (A), and narrowly elliptic (B). Calyx with clearly triangular lobes (C) and calyx nearly closed but with clear lobes (D). Scale bars in mm. (A&D from Landrum 8823, ASU0007309; B&C from Landrum 5709, ASU0007322).

Thus, Itapua-*grandifolium* and Paraguarí-*missionum* seem to represent steps between *P. grandifolium* and *P. missionum* but I have not yet found them from the same area. No formal names will be proposed for now. More field studies or other techniques may help to elucidate these relationships.

I previously recognized *Psidium suffruticosum* as a variety of *P. australe* (Landrum 2005). I find that it is nearly always distinguishable from typical *P. australe*, and problems in distinguishing them may be principally caused by the condition of the specimens. I therefore now accept this taxon at the species level. Differences are found in the key and in discussion of the species.

The distinction between *Psidium australe* and *P. grandifolium* is generally clear in our area, but it is sometimes not clear in parts of Brazil (Minas Gerais to Santa Catarina).

8. *Psidium guajava* L., Sp. Pl. 470. 1753. TYPE. “Habitat in India,” cultivated plant from Hort. Cliff. (LECTOTYPE: BM-628598 [designated by McVaugh, 1989]).

Psidium cujavus L., in Stickman, Herb. Amboin.: 7. 1754. Based on a manuscript of Rumphius? Specimen in LINN (LINN-hl635-6] apparently not *Psidium*.

Psidium pomiferum L., Sp. Pl. ed. 2. 672. 1762. A new superfluous name for *P. guajava*; lectotype of *P. guajava* is cited under this species.

Psidium pyriferum L., Sp. Pl. ed. 2. 672. 1762. TYPE. “in indiis,” “Pluk. Alm. 181,” (possible type material LINN-hl635-1, LINN-hl635-2).

Psidium cujavillus Burm. f., Fl. Ind. 114. 1768. TYPE. “Rumph. Amb. I. p. 145. T. 49,” “Habitat in India,” (HOLOTYPE. Illustration [T. 49] of Rumphius in Herbarium Amboinense).

Psidium angustifolium Lamarck, Encyc. 3: 17. 1789. Lamarck cites same description and illustration of Rumphius that Burmann used (“Rumph. Amb. I. p. 145. T. 49,”), so this is a superfluous name.

Psidium sapidissimum L., Jacq. Pl. Hort. Schoenbr. 3: p. 62. t. 366. 1798. TYPE. Illustration of Jacquin.

Psidium pumilum Vahl, Symb. Bot. 2. 56. 1791. A new superfluous name for *P. cujavillas* Burm.f.

Psidium pumilum var. *rufescens* Blume, Mus. Bot. Lugd. Bat. 1: 71. 1821. TYPE. “In maritimus Archipelagi Indici et Moluccarum,” (No specimen found).

Psidium pumilum var. *intermedium* Blume, Mus. Bot. Lugd. Bat. 1: 72. 1821. TYPE. “In maritimus Javae, Amboinae etc,” (No specimen found).

Psidium pumilum var. *guadalupense* DC., Prodromus 3: 233. 1828. TYPE. “in Guadalupa. Bertero,” (No specimen found.)

Psidium pomiferum var. *sapidissimum* (Jacq.) DC., Prodromus 3: 234. 1828.

Psidium aromaticum Blanco, Fl. Filip. ed. I. 417. 1837. Philippines. Description and vernacular names indicate that this is *P. guajava*. This is a later homonym of *P. aromaticum* Aublet [=Campomanesia aromatica (Aublet) Griseb.]

Psidium pyriferum var. *glabrum* Benth., J. Bot. (Hooker) 2: 318. 1840. Nomen nudum.

Psidium fragrans Macfad., Fl. Jamaica 2: 108. 1850. TYPE. Jamaica. “Salt Hill, Port Royal Mountains,” Macfadyen s.n. (no specimen found.)

Guajava pumilia (O. Berg) Kuntze, Revis. Gen. Pl. 1: 240. 1891.

Guajava pyrifera (L.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium guajava var. *cujavillum* (Burm.f.) Krug & Urb., Bot. Jahrb. Syst. 19: 566. 1894.

Syzygium ellipticum K. Schum. and Lauterb., Fl. Schutzgeb. Südsee: 476. 1900. TYPE. Papua New Guinea. “Bei Finschhafen, in der Nähe von Ibekippo bei Bonga,” “fruchtend am 26. August 1890,” Lauterbach 785 (HOLOTYPE: BM?). Illegitimate later homonym of *S. ellipticum* Wall. 1831.

Psidium igatemyense Barb. Rodr., Myrt. Paraguay 10. 1903. TYPE. Paraguay. “vicine Rio Igatemy,” Hassler 4753 (HOLOTYPE: G-194284).

Psidium chodatianum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Igatimi,” Hassler 4792 (G [2 sheets, = ASU photos]).

Psidium crispum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “Cordillera de Altos,” Hassler 1442 (G [2 sheets, = ASU photos]).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium ellipticum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Igatimi,” Hassler 4745 (G [3 sheets, = ASU photos], MICH-1210413!, MPU-10984, NY-1288045!, NY-1288046!, S-r-9450, UC!, W-3585!).

Psidium subrenatum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Bellavista, Apa,” Hassler 7793 (G, = ASU photo).

Psidium globosum Larrañaga, Escritos D. A. Larrañaga 2: 168. 1923. TYPE. Uruguay. (HOLOTYPE: presumably Larrañaga collection, “Abril 30 de 1814,” “proprios para jardines.” No specimen found.)

Psidium guajava forma *cujavillum* (Burm. f.) O. Deg. & I. Deg., New Illustr. Fl. Hawaiian Islands [Fam. 273]. 1959.

Psidium guajava var. *minor* Mattos, Loefgrenia 70: 5. 1976. TYPE. Brazil. São Paulo, Instituto Agronomico de Campinas. Mattos 16234. (HOLOTYPE: HAS 87515 according to SpeciesLink, not seen).

Shrub or tree up to ca. 12 m high, subglabrous to densely appressed pubescent on young growth and lower leaf surfaces, the trunk smooth, light brown to light gray-green, with large flaky scales; hairs whitish, yellowish, or silvery, up to ca. 0.7 mm long, erect or appressed; *young twigs* quadrangular, slightly to strongly winged, often sulcate (at least when dry), densely to moderately appressed-pubescent, the older twigs at first scaly with longitudinal striations or fibers, eventually smooth with irregular scales falling as patches. LEAVES elliptic, oblong, elliptic-ob lanceolate, elliptic-ob ovate, or lanceolate, 4.5–14 cm long, 2.4–7.5 cm wide, 1.6–4 times as long as wide, densely to sparsely appressed pubescent below, subglabrous except for puberulent midvein above, the immature leaves covering the twig apex in 2 decussate pairs; *apex* acute, acuminate, to rounded; *base* rounded to slightly cordate; *petiole* 2–5 mm long, 1–2 mm thick, channeled, densely pubescent to subglabrous; *venation* brochidodromous distally to eucamptodromous proximally, the midvein impressed above, prominent below, the lateral veins 9–22 prominent pairs, ascending at angle of ca. 45°, nearly straight, curving toward apex near the margin and connecting with the next lateral, the marginal vein not clearly present or arching between the laterals, the tertiary veins connecting the laterals in a ladder-like to reticulate pattern; *blades* coriaceous to submembranous, drying yellow-green, gray-green, to dark reddish brown. FLOWER BUDS subfusiform to pyriform, 9–14 mm long, sometimes strongly constricted near the midpoint, the hypanthium narrowly campanulate, barrel shaped or fusiform 4–6 mm long, the distal portion of bud more or less ovoid, sometimes strongly so with a conical apex, 4.5–9.5 mm long; *indumentum pattern of buds* with peduncles, hypanthium, and bracteoles sparsely to moderately appressed pubescent, the calyx without glabrous to sparsely pubescent (usually less densely covered than that hypanthium), the calyx glabrous or densely pubescent within, the petals, disk, and style glabrous; *peduncles* 1–3-flowered, 1–3.5 cm long, 1–1.5 mm thick, terete; *bracteoles* linear to narrowly triangular, 2–5 mm long. CALYX closed, tearing irregularly as the bud opens, persisting or falling in ca. 3 parts; *petals* obovate to elliptic, 13–22 mm long; *disk* 4–6 mm across; *stamens* 280–720, 7–15 mm long; *anthers* 0.7–1 mm long, with 1–7(–10) glands; *style* 10–15 mm long; *ovary* 3–6-locular; *ovules* 90–180 per locule, multiseriate. FRUIT globose to pyriform, 2–6(–8) cm long, green to yellow without, with pink, yellow, or white flesh, aromatic; *seeds* 100–400, perhaps more in large fruits, subreniform to subtriangular, 2–4 mm long, more or less smooth, the seed coat 0.2–0.25 mm thick at narrowest point. $2n = 22, 44$. (Fig. 10).

Representative specimens examined. ARGENTINA. Chaco: San Fernando, río Paraná, Isla Soto (ca. 27.8°S, 58.83°W), 28 Nov 1978, Renvoize 3655 (ASU0007439). Corrientes: Dep. General Paz, Arroyo Sta. Isabel at ruta 12 E of Ita Ibate, (ca. 27.3333°S, 57.5°W), 9 Dec 1987 (fl), Landrum et al. 5677 (ASU0004998, CTES); Dep. General Paz, between Rosario and Lomas de Vallejos on ruta 5 (27.75°S, 57.5°W), 12 Dec 1987 (fl), Landrum et al. 5742 (ASU0004995, CTES); Dep. Empedrado, Estancia La Yela (ca. 27.95°S, 58.8°W), 2 Dec 1994 (fl), Pedersen 16180 (ASU0007428, MBM); Dep. General Paz, Ea. La Tilita, 3 km W de Ita Ibate, ruta

prov 13, a 5 km SW de ruta 12, cerca de casco de la estancia (ca. 27.75°S, 57.62°W), 20 May 1998 (fl), *Torres 4* (ASU0007399, CTES). **Formosa:** Pilcomayo, Dep. Pilcomayo, Sol de Mayo, 14 km SW de Laguna Blanca (58°25'W, 25°7'S), 25 Oct 1995 (fl), *A. Schinini & G. Cuadrado 30328* (ASU0007427). **Jujuy:** Ledesma, 4 km pasando río Agua Negra, camino a Valle Grande (ca. 23.8342°S, 64.7919°W), 23 Oct 1971 (fl), *Legname & Cuezzo 8752* (LIL); Dep. Calilegua, Parque Nacional Calilegua, Mesada de Las Colmenas, Ruta 83 km 21, (ca. 23.7606°S, 64.8503°W), 1200 m, 27 Nov 2004 (fl), *Novara et al. 12125* (ASU0052982, MCNS). **Misiones:** Puerto Iguazú (ca. 25.5968°S, 54.5686°W), 13 Apr 57 (fl), *Cuezzo & de la Sota 1594* (MO); Dep. El Dorado, Ruta 17, paraje Pozo Azul, Aldea Guaraní Teko'a Arandu (ca. 26.3465°S, 54.1518°W), 10 Dec 2003 (yfr), *Keller & Acosta 2569* (ASU0083563); San Ignacio, near Paraná River, ca. 8 km SW of San Ignacio, ca. 1 km, before Peña Victoria (ca. 27°15'S, 55°35'W), 10 Dec 1987 (yfr), *Landrum et al. 5726* (ASU0005003, CTES). **Salta:** Dep. Santa Victoria, Serranía Finca Arazayal sobre arroyo Arazayal, afluente del Bermejo, 19 km al NW de Aguas Blancas, 22°40'S 64°26'W, 650 m, 4 Dec 2005 (yfr), *Arbo et al. 9009* (ASU0057302, CTES, MCNS); Oran, camino a Finca de Yaculika, a ca. 5 km de Puente Intern. del río Bermejo, 480 m, 6 Nov 1975 (fl), *Figueroa et al. 11923* (CAS).

BOLIVIA. **El Beni:** Prov. Vaca Díez, Chacobo village Alto Ivón (11°45'S, 66°02'W), 200 m, 1 Dec 1983 (fl), *Boom 4068* (CAS); Yacuma, 1 km E of the Río Matos, then 6 km S on track, Estancia La Pascana (ca. 14.82°S, 66.33°W), 250 m, 4 Nov 1985, *Solomon 14552* (MO). **Cochabamba:** Prov. Carrasco, Sajta propiedad de la Universidad, 17°05'54"S, 64°43'50" W, 219 m, 22 Oct 2009 (fl), *Teran et al. 4206* (ASU0080861). **La Paz.** Tipuani-Guanai, *Bang 1688* (MO). **Pando:** Cocamita, (11°11'S, 68°41'W), 260 m, 27 Oct 1987 (yfr), *Buchanan-Smith 78* (ASU0007441); Prov. Nicolás Suárez, Bajo Avemano (ca. 10.964065°S, 68.047751°W), 1 Sep 1990 (yfr), *Gonzales 92* (ASU0060505). **Santa Cruz:** Prov. Velasco, Reserva Ecologica El Refugio, a 300 m al SO del campamento, en la pampa de Las Islas (14°47'9" S; 61°3'14" W), 150 m, 21 Jan 1995 (fr), *Guillén & Chore 2945* (ASU0007463, MO); Prov. Ñuflo de Chávez, Lomerío, campamento Las Trancas, parcelas permanentes de BOLFOR, (16°35'46"S, 61°51'58"W), 450 m, 19 Nov 1994 (fr), *Guillén & Medina 2605* (ASU0007464); Prov. Andrés Ibáñez, along road from Santa Cruz to Samaipata, 1 km SW of Angostura (18°15'S, 63°31'W), 650 m, 13 Jan 1987 (fr), *Nee 33462* (ASU0007408, NY); Prov. Ichilo, 7 km N of Buena Vista, N end of Laguna Madrejon (17°23'S, 63°40'W), 295 m, 31 Oct 1990 (fl), *Nee 39638* (ASU0007410, NY); Prov. Sara, near río Asuvicito, 0.5 km N of abandoned railroad line, 15.5 km N of Portachuelo on road to Loma Alta 17°13'S, 64°24'30"W, 260 m, 20 Dec 1995 (fr), *Nee 46389* (ASU0007461, NY); Prov. Andrés Ibáñez, 1 km al NW del centro de Santa Cruz (17°46'30"S, 63°11'35"W), 415 m, 20 Apr 1988 (fl), *Saldias 323* (ASU0007420).

PARAGUAY. **Amambay:** Bella Vista, 2 km S of town, ranch of Felix Ocariz (56°30'W, 22°10'S), 22 Mar 1983 (fr), *Hahn 1279* (ASU0007433, MO, PY); Parque Nacional Cerro Corá, NE limit of Parque, Naranja-hai (ca. 22°35'S, 56°5'W), 150 m, 20 Aug 1995 (st), *Landrum 8711* (ASU0007451, FCQ). **Caaguazú:** Arroyo Yakare'i, along northern side from route 2 (ca. 25.4696°S, 56.0153°W), 8 Feb 1989 (fr), *Zardini & Aguayo 10715* (ASU0060491, MO). **Caazapá:** Tavaí, Destacamento Militar (ca. 26°10'S, 55°20'W), 6 Aug 1989 (fr), *Basualdo 2672* (FCQ). **Canindeyú:** Ygatimi Reserva Natural del Bosque Mbaracayu, Valtinotti Cue, (ca. 24°10'S, 55°40'W), 18 Nov 1995 (yfr), *Landrum & Basualdo 8843* (ASU0007448). **Central:** Tavarory, río Paraguay (25°28'20.6"S, 57°33'3.1"W), 100 m, 17 Jul 1995 (st), *Landrum et al. 8564* (ASU0007465, FCQ); Estero del Ypoá, 13 km SW of Nueva Italia, NW of Pindoty (ca. 25°20'S 57°28'W), 27 Jan 1990 (yfr), *Zardini & Velásquez 18503* (ASU0052805). **Concepción.** 1–2 km SE of Arroyo Tagatiyá-Mi (ca. 22°38'S, 57°31'W), 16 Mar 1994 (fl), *Zardini 38840* (ASU0018602); Paso Horqueta, Río Aquidaban (ca. 23°07'S, 57°20'W), 18 Nov 1993 (fl), *Zardini & Tilleria 37474* (ASU0018589). **Cordillera:** Río Salado basin on road to Arroyos y Esteros (ca. 25°09'S 57°30'W), 21 Jul 1990 (fl), *Zardini & Velásquez 22329* (ASU0052806, MO); Confluente of río Paraguay and Río Salado, along Río Salado (ca. 25.15°S, 57.5°W), 4 Aug 1990 (yfr), *Zardini & Velázquez 22767* (ASU0007455, MO). **Guaira:** Cordillera de Ybytyruzú, destacamento de Tororo (ca. 25°55'S, 56°15'W), 400 m, 11 Nov 1988 (fl), *Zardini 7951* (ASU0052798). **Itapúa:** Opposite Puerto Piray, Misiones Prov. Argentina (ca. 26.4586°S, 54.725°W), 200 m, 23 Oct 1978 (fl), *S. A. Renvoize et al. 3225* (ASU0007440). **Misiones:** Río Tebicuary, (26°23'43"S, 57°07'45"W), 28 Jul 1994 (fr), *Zardini & Guerrero 40153* (ASU0018593). **Paraguarí:** Acahay, Cerro Acahay, ca. 5 km from main highway, near area of rock extraction (ca. 25.8333°S, 57.1667°W), 3 Aug 1995 (fr), *Landrum 8618* (ASU0007459); road to Lago Ypoá, ca. 23 km N of Caapucú, 3.5 km W of main Asunción-Encarnación Highway (26°S, 57.25°W), 250 m, 10 Nov 1995 (fl), *Landrum 8833* (ASU0007422, FQC); between Nueva Italia and Carapeguá, 30.2 km SE of Nueva Italia (25°43'S, 57°16'W), 14 Dec 1989 (fl), *Zardini & Velásquez 16734* (ASU0052804); Estero del Ypoá, Trinchera Cué (ca. 25°53'S, 57°23'W), 5 Aug 1993 (st), *Zardini & Tilleria 36818* (ASU0018597). **Presidente Hayes:** cuenca de Río Pilcomayo, Fortín Gral. Delgado (24°31'S, 59°19'W), 100 m, 12 Nov 1985 (fl), *Brunner 1377* (PY); along Río Paraguay, ca. 3 km NW of Puente Remanso connecting Asunción and Villa Hayes (ca. 25.33°S, 57.66°W), 15 Dec 1995 (yfr), *Landrum*

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

8877 (ASU0007449); Pto. Militar (ca. 23°25'S, 57°29'W), 9 Dec 1989 (fl), *Mereles* 3451 (FCQ). **San Pedro:** 7 km al S del cruce a Lima (ca. 23°9'S, 56°5'W), 15 Dec 1986 (fl), *Perez et al.* 1480 (PY).

PERU. Madre de Dios: Tambopata, 30 air km SSW of Puerto Maldonado at effulgence of Río Tabopata (12°49'S, 69°17'W), 260 m, 5 Dec 1980 (fr), *Barbour* 5263 (MO).

Phenology—Flowering mainly in October and November; fruiting throughout year but mainly from January to September.

Habitat and Distribution—Disturbed areas such as roadsides, pastures, and also frequently cultivated, from near sea level to 1000 m. Widely distributed as a cultivated and escaped-weedy species in tropical and subtropical regions around the world.

Common names—Goiaba (Portuguese); guayaba (Spanish); guava (English); gobaya (French Guiana).

Distinguishing Features—Calyx closed in flower bud or open only as a terminal pore, tearing irregularly as the bud opens, usually in 2 or 3 parts; lateral veins usually more than 10 pairs; hairs on lower leaf surface appressed, whitish, or silvery.

Psidium guajava is frequently confused with similar *P. guineense*; they have been hypothesized to hybridize (Landrum et al. 1995). They are contrasted in the key below.

1. Lateral veins usually 9–22 pairs; young twigs quadrangular, more or less winged; indumentum of lower leaf surface appressed, whitish, yellowish, or silvery; calyx usually tearing into 2 or 3 parts; anthers 0.7–1 mm long, usually with less than 10 glands. *P. guajava*
- 1'. Lateral veins 5–10 pairs; young twigs more or less terete or compressed (some vigorous shoots sometimes 4-winged); indumentum of lower leaf surface more or less erect, reddish brown, or less often appressed, whitish or grayish; calyx usually tearing into 4 or 5 parts; anthers 1–3 mm long, usually with more than 10 glands. *P. guineense*

The earliest archaeological remains known that are thought to be of *Psidium guajava* come from South American sites (Arévalo-Marín et al. 2021). The oldest is from Teotonio, Rondônia, Brazil (5000 – 9000 cal. BP), a locality especially good for fishing along the Madeira River (a tributary of the Amazon River) with evidence of human habitation as early as 9000 years ago. Evidence of other edible plants includes remains of squash (*Cucurbita* sp.), beans (*Phaseolus vulgaris* L.), manioc (*Manihot esculenta*), pequiá (*Caryocar* sp.) (Watling et al. 2018). There are several sites on the coast of Peru that are as much as 6000 years old (Arévalo-Marín et al. 2021). Other plants such as squash, beans, camote (*Ipomoea batatas* [L.] Lam.), and cotton (*Gossypium barbadense* L.), were grown at Caral, Peru (ca. 4000 years ago), for instance, but not corn (*Zea mays* L.) (Shady Solís et al. 2001). These South American sites are quite different in climate and separated by the Andes mountain range, but geographically separated by only 1500 km. So, for the present this part of South America between coastal Peru and the Amazon basin seems like a likely area of origin for cultivated *Psidium guajava*. It is also an area where a narrow endemic relative, *P. rutidocarpum* Ruiz & Pav., grows (Landrum 2021a).

In Central America and Mexico the earliest archeological record of *P. guajava* is about 2000 years old in the Tehuacán Valley of Mexico (Smith 1965). The earliest records of peanut (*Arachis hypogaea* L., another cultivated plant from South America) in Mexico are also from the Tehuacán Valley and of the same approximate age (Smith 1965).

By the time of European contact *Psidium guajava* was widely cultivated in the Caribbean region and various cultivars had been selected according to Fernandez de Oviedo y Valdez (1851, vol. 1, p. 304) who wrote his account in the early 1500s.

It is interesting that “goiaba” is the common name frequently used for this species in Brazil, a variant of “guayaba” reported by Fernández de Oviedo y Valdés (1851) and the name frequently used in Spanish speaking countries. Other species of *Psidium* in Brazil are usually called “araçá” (Legrand and Klein 1977), a name from Guarani. So, it is possible that *P. guajava* is a relatively recent arrival in much of Brazil (Landrum 2021a).

9. *Psidium guineense* Sw., Prodr. 77. 1788. TYPE. “Insula principis Africes, in Domingo culta.” On type specimens: “Culta in Hispaniola,” “ex Africa”. Presumably, *Swartz s.n.* (HOLOTYPE: S-r-5302; ISOTYPES: BM-616940, SBT-12641).

Psidium polycarpon Lambert, Trans. Linn. Soc. London 11: 231. 1813. TYPE. “indigenous to the grassy savannahs of Trinidad; from whence plants were sent to the St. Vicent’s garden in 1792,” (HOLOTYPE: BM; ISOTYPE: MICH-1210424!, W [= ASU photo]).

Psidium araca Raddi, Opusc. Sci. Bologna 4: 252. pl. 7, fig. 2. 1815. TYPE. Brazil. Rio-Janeiro. (HOLOTYPE: FI-5202).

Campomanesia tomentosa HBK, Nov. Gen. et Sp. 6: 151. 1823. TYPE. Colombia. “prope Ibagué Novo-Granatensium,” *Humboldt and Bonpland s.n.* (HOLOTYPE: P-679485; ISOTYPE: F! [= ASU photo]).

Psidium dichotomum Weinm. Syll. Ratisb. 2: 166. 1828. TYPE. Brazil. “In Brasilia,” (probable HOLOTYPE: LE [= ASU photo]).

Psidium hians DC., Prodr. 3: 234. 1828. TYPE. Brazil. “ad Vaodo Parana in Tabuleiro et Catingas,” *Martius [1791]* (SYNTYPES: M-32376 [annotated by de Candolle], M-32377 [with description by Martius used by de Candolle], M-146873!). This was mistakenly considered a synonym of *Campomanesia pubescens* by Landrum (1986).

Psidium multiflorum Cambess. in Saint-Hilaire, Fl. Bras. merid. 2: 281. 1833. TYPE. Brazil. “In sylvis caeduis prope urbem S. Pauli,” *Saint-Hilaire s.n.* (SYNTYPES: P-258410!, P-258411!, P-258412!). Cambessèdes named a separate species (p. 287) *Psidium multiflorum*, based on a separate collection (P-1902177! the apparent holotype, and MPU-10990 an isotype), that is *Campomanesia pubescens* (DC.) O. Berg.

Psidium molle Bertol. in Alessandrini, Nuovi Ann. Sci. Nat. 3: 136. 1840. Later again published in Fl. Guatimal. 22, Tab. IX. 1840 (see Baldini et al. 2019). TYPE. Guatemala. (HOLOTYPE: *Velasquez s.n.* BOLO0508016, seen as digital image, = ASU0310765).

Psidium sericiflorum Benth., Pl. hartw. 176. 1845. TYPE. Ecuador. “In campis circa Popayan,” *Hartweg 980* (possible HOLOTYPE: K-565585 [labeled “possible isotype”]; ISOTYPES: BM-796855, F-65716!, LD-1514512).

Psidium schiedeanum O. Berg, Linnaea 27: 368. 1856. TYPE. Mexico. *Schiede 541* (HOLOTYPE: B, lost). Possible original material: LE-7006 (*Schiede 512*) annotated specimen by Berg as *P. schiedeanum*.

Psidium molle* var. *robustum O. Berg, Linnaea 27: 370. 1856. TYPE. [Guatemala]. “In monte Candelaria,” *Oersted 21* (HOLOTYPE: C-10015956).

Psidium molle* var. *gracile O. Berg, Linnaea 27: 370. 1856. TYPE. Costa Rica. “Irasu,” *Oersted 27* (HOLOTYPE: C-10015957).

Psidium laurifolium O. Berg, Linnaea 27: 364. 1856. TYPE. Nicaragua. “in monte Masaya in Costa Rica,” *Oersted s.n.* (HOLOTYPE: C-10015959).

Psidium costaricense O. Berg, Linnaea 27: 368. 1856. TYPE. Costa Rica. “ad Iaru [Irazú] in Costa Rica,” *Oersted 17* (HOLOTYPE: C-10015950).

Psidium benthamianum O. Berg, Linnaea 27: 362. 1856. TYPE. Guyana [“Guiana Anglica”]. *Rob. Schomburgk 836* (SYNTYPE: B, lost; ISOSYNTYPES: BM-796849, G-227697!, K-170097, K-170098, MICH-1210415!, P-258486!, W-46097!) and *Rich. Schomburgk 314* (SYNTYPE: B, lost).

Psidium ooideum O. Berg, in Mart., Fl. bras. 14(1): 398. 1857. TYPE. Brazil. “prov. S. Pauli,” *Sellow s.n.* (HOLOTYPE: B, lost; ISOTYPES: P-2428285, K-170093).

Psidium hians* var. *truncatum O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. Illegitimate name to be replaced by the autonym *P. hians* var. *hians* because Berg cites *P. hians* under this variety.

Psidium hians* var. *cuneatum O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. TYPE. Brazil. Locality unclear. *Sellow s.n.* (HOLOTYPE: B, lost; ISOTYPE: K-170094). An additional specimen annotated by Berg but not cited is *Pohl 2154* [=W-48022!].

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

- Psidium ypanemense* O. Berg, in Mart., Fl. bras. 14(1): 395. 1857. TYPE. Brazil. “v. in hb. Mart. et Berol,” “ad pagum Ypanema in prov. S. Pauli,” Raben 757 (SYNTYPE: BR-843781) and Sellow s.n. (SYNTYPE: BR-843783; ISOSYNTYPES: K-565299, LE-7014, W-46099!).
- Psidium ooideum* var. *parvifolium* O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. Illegitimate name to be replaced by the autonym *P. ooideum* var. *ooideum* because Berg considers it to include the type of the species.
- Psidium ooideum* var. *intermedium* O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. TYPE. Brazil. “prope Batataes,” Riedel [2293]. (HOLOTYPE: LE-6994).
- Psidium ooideum* var. *grandifolium* O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. TYPE. Brazil. “prope Batataes et Itu,” Riedel [2059] (SYNTYPES: LE-6989, LE-6990, LE-6991, LE-6992, LE-6993; ISOSYNTYPES: G-227729!, P-258402!, P-258403!).
- Guajava ypanemensis* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava polycarpa* (Lambert) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava multiflora* (Cambess.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava hians* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava rubescens* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava guineensis* (Sw.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava ooidea* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.
- Guajava schiedeana* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 240. 1891.
- Guajava costaricensis* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 240. 1891.
- Guajava laurifolia* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 240. 1891.
- Guajava mollis* (Bertol.) Kuntze, Revis. Gen. Pl. 1: 240. 1891.
- Guajava benthamiana* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 240. 1891.
- Psidium ooideum* var. *longipedunculatum* Rusby, Mem. Torrey Bot. Club 3(3): 27. 1893. TYPE. Bolivia. “Yungas,” Bang 287 (HOLOTYPE: NY-1288067!; ISOTYPES: BM-1125476, CORD-3582, E-504661, F-42755, M-146745!, MICH!, PH-22411, PUL-384, R-162777!, US-117670, W-1372!).
- Psidium hasslerianum* Barb. Rodr., Myrt. Paraguay 9. 1903. TYPE. Paraguay. “prope Igatemy, ad Brasil,” Hassler 4870 (HOLOTYPE: G-194091).
- Psidium lehmannii* Diels, Bot. Jahrb. Syst. 37: 594. 1906. TYPE. Colombia. “circ. Popayan 1000-1800 m,” Lehmann, F. C. 5820 (HOLOTYPE: B, lost; ISOTYPES: K-170070, NY-887977).
- Psidium cordillerense* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTIONS. Paraguay. “Cordillera de Altos,” Hassler 1689 (G!) as well as “in campis Nu-guazu,” Hassler 1687 (G!) and Hassler 1723 (G!, BM-511342, K-170078, P-258474!).
- Psidium glandulosum* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “Cordillera de Piribebuy,” Hassler 6633 (G [3 sheets, = ASU photos]).
- Psidium macrophyllum* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “Cordillera de Altos,” Hassler 3393 (G [4 sheets, = ASU photos], BM-511324, K-565295, NY-1288061!, P-258427!, P-258428!, W-2678!).
- Psidium tomasense* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “in Colle So-Tomas,” Hassler 6554 (G [3 sheets, = ASU photos], A-71261, MICH-1210420!, MPU-10993, NY-1288093!, P-258360!, P-258361!, S-r-9460, W-763!).
- Psidium laurifolium* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Igatimi,” Hassler 4762 (G [3 sheets, = ASU photos]).
- Psidium atiraense* Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTIONS. Paraguay. “pr. Atira [3641] and in valle fluminis Y-aca pr. Chololo [6751],” Hassler 3641 (G [3 sheets, = ASU photos], K-565296, NY-1288033!) and Hassler 6751 (G, BM-511341).
- Psidium schippii* Standley, Publ. Field Mus., Bot. 8: 319. 1931. TYPE. Belize. “All Pines,” Schipp 595 (HOLOTYPE: F-65683; ISOTYPES: G-227694!, K-565291, MICH-1210422!, NY-1288088!).
- Psidium rotundifolium* Standley, Publ. Field Mus., Bot. 8: 318. 1931. TYPE. Belize. “All Pines,” Schipp S-85 (HOLOTYPE: F-65682; ISOTYPES: G-227693!, MICH-1210423!, MO!, NY-1288084!, WIS-v0255107).
- Mosiera guineensis* (Sw.) Bisce, Revista Jard. Bot. Nac. Univ. Habana 6(3): 4. 1986 [“1985”].

Shrub or small tree up to about 6 m high, typically densely covered with velvety to subtomentose indumentum on the inflorescence and young growth but sometimes nearly glabrous, the trunk smooth to scaly; hairs simple, spreading (loosely appressed) to erect, often tangled together, grayish to reddish brown, ca. 0.3–0.5 mm long; young twigs densely to moderately velutinous, or less often glabrous, compressed to terete in section, losing

indumentum in about 1 year, usually not angled but sometimes grooved when young, vigorous shoots sometimes weakly angled, the older bark usually remaining more or less smooth, less often somewhat flaky or stringy. LEAVES elliptic, elliptic-oblong, obovate, 4–11.5 cm long, 2–8 cm wide, 1.3–2.4 times as long as wide, usually densely to moderately velutinous below, glabrous to covered with hairs along the midvein above, the margin entire; *apex* obtuse, rounded, or acute; *base* rounded to acute; *petiole* 4–12 mm long, 1.5–2 mm thick, channeled, densely to sparsely pubescent, rarely glabrous; *venation* brochidodromous to eucamptodromous distally, the midvein impressed or nearly flat above, prominent below, the lateral veins 5–10 pairs, ascending at an angle of ca. 45°, diminishing and looping near the margin to connect with the next lateral, a clear marginal vein not formed, the tertiary veins, connecting the laterals in a ladder-like to reticulate pattern; *blades* coriaceous, drying yellowish brown to reddish brown, concolorous to somewhat darker above, when dry often mottled and/or lustrous above. FLOWER BUDS pyriform, 8–15(–17) mm long, the hypanthium ellipsoid to obconic, 3.5–7 mm long, the distal portion of bud ellipsoid, subglobose, or ovoid, 4.5–10 mm long; *indumentum pattern of buds* with all external surfaces moderately to densely pubescent (rarely subglabrous), the calyx pubescent without, but less densely so than hypanthium, distally pubescent within, the petals pubescent without, the disk sparsely pubescent (less often glabrous), the style glabrous; *peduncles* terete to compressed, 9–25(–30) mm long, 1–2 mm wide, uniflorous or triflorous, the branches of the dichasium when present 2–12 mm long; *bracteoles* narrowly triangular, ca. 2–3 mm long, caducous at about anthesis. CALYX closed completely, or with a terminal, pore-like opening at the apex, tearing longitudinally to the staminal ring, usually in 5 parts, these sometimes persisting until the fruit matures, the margin of calyx pore if present sinuate or with 5 small lobes; *petals* elliptic to obovate, concave, 7–15 mm long, 7–10 mm wide, sometimes more than 5; *disk* 4–5 mm across; *stamens* 180–300, 7–10 mm long; *anthers* 1–3 mm long, more or less introrsely dehiscent, the glands in the connective 1 to over 50; *style* 8–12 mm long; *ovary* 3–5-locular; *ovules* 50–100 per locule, ca. 8-seriate. FRUIT subglobose to ellipsoidal, 1–3 cm long; *seeds* 19–250 per fruit, 2.5–5 mm long, the seed coat 0.2–0.3 mm thick at narrowest point. $2n = 44$. (Fig. 11).

Representative specimens examined. ARGENTINA. Corrientes: Empedrado, Estancia Las Tres Marías, 18 Dec 1974 (fl), Burkart 31006 (MICH); Dep. Ituzaingó, 7 km S of Río Aguapey on Ruta 39 (ca. 27.5833°S, 56.25°W), 9 Dec 1987 (fl), Landrum *et al.* 5708 (ASU0004996); Dep. General Paz, Arroyo Sta. Isabel at ruta 12 E of Ita Ibate (ca. 27.3333°S, 57.5°W), 9 Dec 1987 (fl, yfr), Landrum *et al.* 5676 (ASU0004988, CTES), Landrum 5682 (ASU0004999, CTES); Dep. Ituzaingó, Arroyo Garape, 45 km al E de Ituzaingó, 11 Dec 1974 (yfr), Quarín *et al.* 2830 (MICH); Dep. Empedrado, R. Paraná near Ao. Sombrero (ca. 27.952°S, 58.804°W), 27 Nov 1978 (fl), Renvoize 3634 (ASU0007555); Dep. Santo Tomé, Paraje Galarza, (ca. 28°06'02"S, 56°40'W), 30 Oct 2001 (fl), Schinini *et al.* 35655 (ASU0069697, CTES); Isla Apipé Grande, Pto. Arazá (ca. 27.5°S, 56.9°W), 26 Nov 1988 (fl, yfr), Tressens *et al.* 3470 (ASU0007486, CTES). Misiones: Posadas, La Granja, 21 Nov 1907 (fl), Ekman 2041 (MICH, NY); San Ignacio, Peña Victoria, on Paraná River ca. 8 km SW of San Ignacio (ca. 27.25°S, 55.583°W), 10 Dec 1987 (fl), Landrum *et al.* 5723 (ASU0005002, CTES); Iguazú, Puerto Segundo, km 17, 24 Oct 1950 (fl), Montes 9520 (NY); Cainguas, Monte Carlo, 205 m, 23 Feb 1955 (fr), Montes 14789 (CAS, NY); Candelaria, 2 Feb 1945 (fl), Schwarz 621 (NY); San Ignacio, Teyú Cuaré, 3 km S de Gendarmería (ca. 27.26°S, 55.53°W), 10 Dec 1987 (fr), Vanni 1067 (ASU0007489, CTES). Salta: Santa Victoria, Los Toldos, Reserva Nacional El Nogalar de Los Toldos (ca. 22.28°S, 64.70°W), 1639 m, 10 Jan 2010 (fl), Del Valle (MCNS); Santa Victoria, volviendo del PN Baritú, Vallecito, 28 Apr 2008 (fr), Hilgert 2639 (MCNS); Santa Victoria, Nacientes del Bermejo, frente a Momora, entre El Condado y Campo de Cazón, 22 km N de Los Toldos (ca. 22°S, 64.96°W), 1100–1400 m, 29 Oct 1987 (fl), Novara 7074 (MCNS).

BOLIVIA. Beni: Prov. Ballivián, Espíritu, 200 m, 28 Sep 1979 (fl), Beck 2531 (MICH); Prov. Marban, San Rafael, 220 m, 6 Oct 1979 (fl, fr), Beck 2672 (MICH); Yacuma, 1 km E of the Río Matos, then 6 km S on track, Estancia La Pascana (14°49'S, 66°20'W), 250 m, 4 Nov 1985 (fl), Solomon 14564 (ASU0007528); Chuquisaca: Prov. Hernando Silas, Mun. Huacareta, cima Serranía Los Milagros, Laguna Milagros (20°19'46"S, 64°02'32"W), 1854 m, 25 Dec 2005 (fl), Serrano *et al.* 6900 (ASU0080866). La Paz: Prov. Franz Tamayo,

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Parque Nacional Madidi, Río Tuichi, arroyo Pintata ($14^{\circ}26'34''S$, $68^{\circ}34'47''W$), 1150 m, 4 Dec 2005 (fl), Araujo-*M.* et al. 2629 (ASU0053041); Prov. Inquisivi, comunidad Khora-Charapampa, cuenca del río Miquillas, ruinas en terrazas, aprox. 22 km al N de Choquetanga ($16^{\circ}40'S$, $67^{\circ}20'W$), 1340 m, (fl), Salinas 2924 (ASU0053025, LPB); Prov. Nor Yungas, 4.5 km below Yolosa, then 10 km W on road up Río Huarinilla ($16^{\circ}12'S$, $67^{\circ}50'W$), 1450 m, 19–20 Oct 1982 (fl), Solomon 8504 (CAS, MO); Prov. Sud Yungas, 3.8 km W of Huancané on the road to Chuspipata ($16^{\circ}23'S$, $67^{\circ}33'W$, 2000 m, 29 Sep 1985 (fl), Solomon & Nee 14305 (ASU0007529, MO). **Santa Cruz:** Ángel Sandoval, Prov. Germán Busch, Parque Nacional Otuquis, Estancia Quebracho, en las lajas ($19^{\circ}21'30''S$, $58^{\circ}5'54''W$), 140 m, 5 Nov 1998 (fl), Carrión et al. 689 (ASU0053024, MO); Prov. Florida, El Fuerte, Samaipata, Pradera sub-montana en la pendiente ($18^{\circ}10'11.4''S$, $63^{\circ}49'2.35''W$), 1890 m, 5 Feb 1994 (fl, ft), Jardim et al. 342 (ASU0007524); Prov. Velasco, Reserva Ecologica El Refugio, al final de la pista del campamento Refugio sector N Barbecho ($14^{\circ}45'35.8''S$; $61^{\circ}1'58.1''W$), 180 m, 27 Apr 1995 (fr), Guillén & Roca 3372 (ASU0007526); Prov. Ñulfo de Chávez, Rancho Puesto Nuevo, 40 km S of Concepción ($16^{\circ}25'S$, $62^{\circ}00'W$), 1 Mar 1987 (fr), Killeen 2359 (ASU0007495); Ichilo, 11 km NE of Buena Vista, 1 km N Buena Vista-Portachuelo highway, on road to Palacios ($17^{\circ}23'S$, $63^{\circ}35'W$), 300 m, 8 Dec 1990 (fr), Nee 40273 (ASU0007530); Prov. Vallegrande, 5.5 km S of Vallegrande, vic. Santa Rosita, Quebrada Huasacañada ($18^{\circ}32'S$, $64^{\circ}06'W$), 2050 m, 31 Dec 1988 (fl, fr), Nee & Vargas 37455 (ASU0007533). **Tarija:** Prov. B. O'Connor, Entre Ríos, subiendo de Valle del Medio hacia la divisoria del valle de Chiquiacá ($21^{\circ}39'13''S$, $68^{\circ}07'38''W$), 1480 m, 28 Feb 2006 (fr), Beck et al. 31843 (ASU0053027); Prov. Arce, camino de Emborozú, prox. a La Mamora (ca. $21.1785'S$, $64.6651'W$), 1220 m, 13 Mar 1974 (fr), Turpe et al. 4774 (LIL).

BRAZIL. Mato Grosso do Sul: Fazenda Agua Amarela, between Boqueirao and Bela Vista (ca. $22.0825'S$, $56.5259'W$), 27 Sep 1996 (fl), Ratter et al. R-7567 (ASU0007475).

PARAGUAY. Alto Paraná: sud du Río Monday (ca. $25.3'S$, $55.2'W$), 250 m, 12 Sep 1983 (fr), Stutz 1897 (ASU0057652). **Amambay:** Parque Nacional Cerro Corá ($22^{\circ}40'S$, $55^{\circ}05'W$), 1 Nov 1983 (fl), Haber 1772 (ASU0008036). **Caaguazú:** 3 km N of Yhu ($25^{\circ}00'S$, $55^{\circ}55'W$), 13 Dec 1982 (yfr), Hahn et al. 872 (MO, PY). **Caazapá:** Tavaí, bosque del Dest. militar ($26^{\circ}10'S$, $55^{\circ}20'W$), 6 Aug 1989 (fr), Basualdo 2675 (FCQ); Estancia Tapyta of Shell Forestry Ltd. ($26^{\circ}15'11''S$, $55^{\circ}46'08''W$), 15 Dec 1999 (fr), Zardini & Britez 53074 (ASU0060387, MO). **Canindeyú:** Ygatimí, Reserva Natural del Bosque Mbaracayú, Valinotti Cue in E side of Reserva (ca. $24^{\circ}10'S$, $55^{\circ}40'W$), 18 Nov 1995 (fl), Landrum & Basualdo 8842 (ASU0008038, FCQ). **Concepción:** Arroyo Trementina, 15 km east of Paso Barreto ($23^{\circ}2'39''S$, $57^{\circ}0'41''W$), 210 m, 1 Jul 1994 (fl), Zardini & Leongino 39917 (ASU0060412, MO). **Cordillera:** 5 km SE of Emboscada on road to Nueva Columbia ($25^{\circ}08'S$, $57^{\circ}15'W$), 9 Jun 1990 (fr), Zardini & Velásquez 21157 (ASU0008030, MO). **Guaira:** Cordillera de Ybytyruzú, isolated peak 10 km W of Melgarejo ($25^{\circ}45'S$, $56^{\circ}25'W$), 16 Oct 1989 (fl), Zardini & Aguayo 14951 (ASU0007584). **Itapúa:** Capt. Miranda, 4.2 km N of entrance to Hotel Tirol beside and behind CONAVI project ($27.151881'S$, $55.75973'W$), 210 m, 9 Nov 1995 (fl), Landrum 8807 (ASU0010503); Capt. Miranda, road to Jesús ca. 0.6 km from main highway from Asunción to Encarnación (ca. $27^{\circ}12'S$, $55^{\circ}45'W$), 185 m, 9 Nov 1995 (fl), Landrum & Landrum 8813 (ASU0010502, FCQ); Isla Yacyretí, costa sur ($27.42843'S$, $56.76038'W$), 4 Apr 1994 (fr), Pin et al. 587 (PY). **Misiones:** Rt. 1 between San Patricio and Santa Rosa at km A250 (ca. $27^{\circ}S$, $56^{\circ}45'W$), 265 m, 14 Aug 1995 (fr), Landrum 8672 (ASU0007541, FCQ); between San Juan Bautista and road San Ignacio-Pilar, Lafuente cué, 20 km SE of San Juan Bautista ($26^{\circ}42'S$, $57^{\circ}16'W$), 23 Feb 1994 (fr), Zardini & Guerrero 38496 (ASU0060409). **Paraguarí:** Rt. 1, between Quindy and Caapucú, near km 246, ca. 0.5 km N of road to Lago Ypoa ($26^{\circ}S$, $57^{\circ}15'W$), 250 m, 7 Nov 1995 (fl), Landrum 8773 (ASU0007481); Sapucai, Cnia. Loma Grande ($25^{\circ}38'14''S$, $56^{\circ}57'49''W$), 22 May 2000 (fr), Mereles & Parini 7874 (ASU0060437, FCQ); National Park Ybycu'i, 3 km south of northwestern corner of park ($26^{\circ}03'S$, $56^{\circ}46'W$), 22 Jun 1991 (fr), Zardini & Velázquez 27725 (ASU0060334, MO).

Phenology—Flowering throughout year but mainly from September to November; fruiting throughout year but mainly from January to March.

Habitat and Distribution—Forest, restinga, cerrado, varzea, campo, caatinga, disturbed areas from near sea level to 1650 m. *Psidium guineense* is a widespread species of disturbed habitats, ranging from northern Argentina to Mexico and the Caribbean. It has been widely introduced in subtropical and tropical areas around the world.

Distinguishing Features—Calyx closed or with a small terminal pore in bud, usually tearing into 5 parts; lateral veins 5–10 pairs, usually with a ladder-like pattern of tertiary veins; indumentum of lower leaf surface more or less erect, reddish brown, or more or less appressed, whitish or gray; anthers 1–3 mm long, often with more than 10 glands.

I believe that *Psidium guineense* hybridizes with at least a few other species, namely, *P. guajava*, *P. australe*, and *P. grandifolium*. Some hybrids seem to be locally common. Most of the hybrids tend to be similar in having more or less obovate leaves that are usually densely appressed pubescent below. Thus, it is not always clear what species has crossed with *P. guineense* to produce a hybrid. In *P. guineense* × *P. guajava* the calyx is closed or nearly so in the bud, while in *P. guineense* × *P. australe* the calyx is usually open. Otherwise, these two hybrids can be quite similar. In *P. guineense* × *P. grandifolium* the leaves are often quite large (e.g., *Landrum* 8862, ASU0008015). If one has not seen the hybrids and their parents in the field, it can be difficult to know the parentage of individuals.

Psidium guineense is contrasted with *P. guajava* and *P. grandifolium* in the discussion of those species. One possible intermediate between *P. guineense* and *P. grandifolium* is a population in the area of Parque Nacional Cerro Corá, Amambay, Paraguay that I assign to *P. guineense*. *Landrum* 8675 (ASU0018816) and *Landrum* 8692 (ASU0018815) are good examples. This population should be the subject of additional research.

There are two common morphologies (morphs) found in *Psidium guineense* that seem to intergrade and that often grow together. I contrast them in a key below.

1. Leaves usually oblong-elliptic; lower leaf surface with spreading to erect reddish or yellowish brown hairs; anthers 0.9–2(–3) mm long. Typical morph
- 1' Leaves elliptic to obovate; lower leaf surface with appressed grayish to silvery hairs; anthers 0.8–1.3(–2) mm long. Atypical morph (e.g., type of *Psidium ooideum*).

At least some of these atypical specimens have been hypothesized to be hybrids between *Psidium guineense* and *P. guajava* (*Landrum* et al. 1995). I now know that the atypical entity is often locally more common than the typical and sometimes the only morph known to occur in a locality. It is possible that the atypical specimens are due to introgression from *P. grandifolium*, *P. guajava*, or *P. australe*. Perhaps additional field studies in conjunction with molecular studies will shed light on this taxonomically difficult situation.

The following are examples of pairs of specimens of typical and atypical morphs of *Psidium guineense* growing near one another:

Argentina, Corrientes, Depto. General Paz: *Landrum* 5676, ASU0004988 (typical) and *Landrum* 5682, ASU0004999 (atypical).

Paraguay, Paraguarí: *Landrum* 8773, ASU0007481 (typical) and *Landrum* 8785, ASU0010497 (atypical).

Paraguay, Itapúa: *Landrum* 8802, ASU0007538 (typical) and *Landrum* 8807, ASU0010503 (atypical).

Paraguay, Canindeyú: *Landrum* 8866, ASU0007536 (typical) and *Landrum* 8847, ASU0008040 (atypical).

Images of each specimen are available at <http://swbiodiversity.org/seinet/index.php>. Search on collector plus number or herbarium catalog number.

- 10. *Psidium kennedyanum*** Morong, Ann. N. Y. Acad. Sci. 7: 104. 1893. TYPE. Paraguay. Pilcomayo River, *T. Morong* 890 (SYNTYPES: NY-1288056!, NY-1288057!. ISOSYNTYPES: BM-511326, GH-71255, NDG-34691, NY-405565 [exWELC], PH-22410, US-117665).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium paranense O. Berg, in Mart. Fl. bras. 14(1): 604. 1859, an illegitimate later homonym of *Psidium paraense* O. Berg, Fl. Bras. 14(1): 386. 1857. TYPE. Brazil. São Paulo, “Tieté prov. Paranense,” Riedel [376] (SYNTYPES: LE-6996, LE-6995 [both annotated by L. R. Landrum but seen as images only]).

Psidium striatulum var. *paranense* O. Berg, in Mart. Fl. bras. 14(1): 603. 1859. TYPE. Brazil. São Paulo, “R. Pardo, Tieté, Parana, florebat Augusto,” Riedel [411] (SYNTYPES: LE-7010, LE-7011 [both annotated by L. R. Landrum but seen as images only]).

Psidium striatulum var. *australe* O. Berg, in Martius, Fl. bras. 14(1): 604. 1859. TYPE. Brazil. “prov. Rio Grande do Sul, florebat Julio” Riedel [2394] (SYNTYPES: LE-7008 [annotated by L. R. Landrum, but seen as an image only], LE-7009. ISOSYNTYPE: K-565400).

This is an unusual case. First, the specimens are annotated by Berg as “*Psidium striatulum* β *paranense*.” Since he also described a related species as *P. paranense* (= *P. kennedyanum*), did he think at one time that this collection was the same taxon and planned to change *P. paranense* to a varietal status? Before publishing Berg appears to have changed his mind and called the collection *P. striatulum* γ [var.] *australe*, apparently because he thought it came from southern Brazil. The labels say only “Rio grande.” Rio Grande probably refers to a tributary of the Paraná River that now defines the border between São Paulo and Minas Gerais. It is north of the Rio Tieté in São Paulo, where Riedel was a month later. It is unlikely that these specimens truly come from Rio Grande do Sul, Brazil (where the species has not yet been found) as Berg thought.

Guajava paranensis Kuntze, Revis. Gen. Pl. 1: 239. 1891, not *Guajava paraensis* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891. Based on the same type as *Psidium paranense* O. Berg, an illegitimate name.

Psidium tripartitum S. Moore, Trans. Linn. Soc. ser. 2, 4: 353. 1895. TYPE. Brazil. Mato Grosso, S. Moore 971 (HOLOTYPE: BM-796859; ISOTYPES: K!, NY-1288096!).

Psidium sabulosum Barb. Rodr. ex Chodat & Hassler, Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “ad ripam fluminis Paraguay,” Hassler 7402 (G [= ASU photos], A-71260, BM-511333, MICH-1210418!, MIN-1002846!, MPU-10991, NY-1288087!, P-258379!, S-r-9459, W-19040001086!).

Tree or shrub 1.5–12 m high, glabrous or puberulent on young growth; *hairs* erect, up to ca. 0.3 mm long; *young twigs* thinly puberulent to glabrous, terete or weakly 4-angled, the young bark light tan, falling in strips and flakes, the older bark smooth. LEAVES lanceolate, narrowly lanceolate, less often ovate or elliptic, 2.5–7.5 cm long, 0.8–2.4 cm wide, 1.5–6 times as long as wide; *apex* acute or obtuse; *base* attenuate, rounded, or cuneate; *petiole* 1–7 mm long, 0.5–1 mm wide, usually channeled, glabrous or thinly puberulent; *venation* brochidodromous, the midvein impressed to nearly flat above, prominent below, the lateral veins obscure or evident, raised or flat above and below, 6–10 pairs, extending straight towards margin, connecting with marginal vein near margin, the marginal vein arching slightly between laterals, about equalling them in prominence, mostly up to 1(–2) mm from the margin, the tertiary veins usually obscure, forming an irregular reticulate pattern between the laterals; *blades* submembranous to subcoriaceous, drying olive green to dark reddish brown. FLOWER BUDS pyriform, 8–10 mm long, the hypanthium campanulate, obconic, to narrowly fusiform, 2.5–4.5 mm long, the distal portion of bud subglobose to ovoid, 4.5–7.5 mm long; *indumentum pattern of buds* with all surfaces glabrous or with the peduncles puberulent, or sometimes with bracteoles, rim of the calyx pore, and petals ciliate, the style sometimes puberulent proximally; *peduncles* 1.2–2.5 cm long, 0.5–0.8 mm wide, glabrous or puberulent; *bracteoles* narrowly lanceolate, up to ca. 1.5 mm long, caducous before anthesis. CALYX closed completely or with a small terminal pore, subglobous in the bud, ca. 4–5 mm long, ca. 2 times as wide at the ovary summit, usually tearing in 2 or 3 parts that fall soon after anthesis, the tears not cutting the staminal ring; *petals* elliptic-obovate, 1–1.2 cm long; *hypanthium* obconic to ellipsoid, 2.5–4 long; *disk* 4–6 mm across; *stamens* 230–400, 7–12 mm long; *anthers* oblong, 1.2–1.5 mm long, with a large terminal gland and sometimes with 1–2 smaller glands below; *style* 12–13 mm long, glabrous or puberulent basally; *ovary* 2–3-locular, the locules sometimes puberulent

within; *ovules* 25–72 per locule, ca. 2 seriate on the edge of a peltate placenta. FRUIT globose, to 2.5 cm in diam., the wall 0.7–1.2 mm thick; *seeds* 20–60, flattened, angular, 5–6 mm long. (Fig. 12).

Representative specimens examined. **ARGENTINA.** **Chaco:** vicinity of Barranqueras (ca. 27.482°S, 58.933°W), 35–40 m, Nov-Dec 1913 (fl), *Curran* 71 (NY); orillas Río Negro, frente a Fontana (ca. 27.416°S, 59.032°W), 55 m, 12 May 1945 (fr), *Meyer* 8599 (NY); Isla del Cerrito (ca. 27.342°S, 58.683°W), 22 Jul 1983 (fr), *Neiff* 1577 (CTES); Ayo. Zapiran, Dep. Bermejo (ca. 26.846°S, 58.745°W), 26 Feb 1985 (fl), *Neiff* 1670 (CTES); Isla Guascara, Dep. 1 de Mayo, 2 Dec 1980 (fl), *Rumiz* 36 (CTES); Riacho Guaycuru y Ruta 11, Dep. 1 de Mayo (ca. 27.347°S, 58.682°W), 27 Jan 1982 (fr), *Rumiz* 173 (CTES); 2 km N de Makalle, Dep. Gral. Donovan (ca. 27.208°S, 59.288°W), 19 Feb 1980 (fr), *Schinini* 20027 (CTES); Marg. Belén, La Loma (ca. 27.261°S, 58.969°W), 11 Jan 1948 (fl), *Schulz* 6848 (CTES); Col. Benítez, ribera Río Tragadero (ca. 27.2611°S, 58.969°W), 12 Nov 1959 (fl), *Schulz* 10231 (CTES, MICH); Isla Brasilera, 19 Feb 1963 (fl), *Schulz* 12110 (CTES); Paranacito (ca. 27.651°S, 58.899°W), 11 Jun 1968 (fr), *Schulz* 16291 (CTES). **Corrientes:** 16 km NE de Ituzaingó, costa Río Paraná, 10 Apr 1978 (fr), *Ahumada et al.* 2462 (CTES, NY); vicinity of Goya (ca. 29°8'S 59°15'W), 15–30 m, 3 Sep 1913 (fl), *Curran s.n.* (MO); Puerto Luján (ca. 27.366°S, 56.166°W), Dep. Ituzaingó, Jan 1990 (fl), *Heinonen et al.* 281 (CTES); San Cosme, Isla Toledo (ca. 27.2906°S, 58.4908°W), 10 Apr 1945 (fl), *Huidobro* 1920 (NY); General Paz, Itá Ibaté, costa Río Paraná (ca. 27.422°S, 57.321°W), 8 Jan 1946 (fl), *Ibarrola* 4022 (MO); San Cosme, Paso de la Patria, 7 Nov 1969 (fl), *Krapovickas & Cristóbal* 15587 (CTES, MBM, MICH); Itatí, Dep. Itatí, 23 Jan 1972 (fl, fr), *Krapovickas & Cristóbal* 20861 (CTES); Dep. Capital, Quinta "La Eloisa" costa del Río Paraná, 15 Dec 1976 (fl, fr), *Schinini* 13846 (CTES, NY). **Formosa:** Est. Agric. Guaycolec, Dep. Formosa (ca. 25.982°S, 58.162°W), 19 Feb 1982 (fl), *Rumiz* 220 (CTES). **Misiones:** Posadas (ca. 27.383°S, 55.967°W), 4 Nov 1907 (fl), *Ekman* 2045 (NY); Nemesio Parma, Dep. Capital (ca. 27.356°S, 56.017°W), 22 Jul 1993 (fl), *Honfi et al.* 308 (CTES). **Santa Fe:** altura Los Laureles (ca. 29.368°S, 59.737°W), 23 Dec 1986 (fr), *Blanchoud* 2243 (CTES).

BOLIVIA. **Beni:** Prov. Yacuma, Bosque de Chimanés, ca. 20 km SW of San Ignacio, rd. to Hervel sawmill (ca. 15°10'S, 64°45'W), 24 Oct 1989 (fl), *Foster* 13368 (ASU0015615). **Santa Cruz:** Dep. Chiquitos, Tucavaca, rd. from Santiago de Chiquitos to Santo Corazón (18°10'26"S, 59°26'29"W), 200 m, 30 Jan 1995 (fr), *Abbott* 15905 (ASU0008063-photo, FLAS); Dep. Chiquitos Río Tucabaca, 20 km al NE de Santiago de Chiquitos (ca. 18.2125°S, 59.4656°W), 200 m, 22 Oct 1994 (fl), *Foster et al.* 3426 (ASU0008065).

PARAGUAY. **Alto Paraná:** Pto. Indio, 9 Jun 1981 (fr), *Caballero Marmori* 893 (CTES, MO). **Caazapá:** ruta 6 y Río Tebicuary (56°15'W, 26°40'S), 22 Mar 1993 (fr), *Schinini et al.* 27706 (ASU, CTES). **Central:** Tavarory, Avai River near confluence with Paraguay river (25°30'S, 57°30'W), 18 Jun 1991 (fr), *Zardini & Velázquez* 27492 (ASU). **Concepción:** Río Nopegue, 30 km desembocadura del Río Paraguay, 1 Aug 1988 (fr), *Mereles* 1379 (ASU0052808, FCQ). **Cordillera:** confluence of Río Paraguay and Río Salado (25°09'S, 57°30'W), 23 Dec 1989 (fr), *Zardini & Velázquez* 17336 (ASU); Parque Nacional Vapor Cue, Arroyo Yaghuy (25°20'S, 56°40'W), 7 Jul 1990 (fr), *Zardini & Velázquez* 21849 (ASU); Río Piribebuy basin, 17 km W of Arroyos y Esteros (25°8'S, 57°18'W), 11 Jan 1991 (fr), *Zardini & Velázquez* 25759 (ASU). **Presidente Hayes:** Río Paraguay, 3 km NW of Puente Remanso (25°10'S, 57°34'W), 15 Dec 1995 (fl), *Landrum* 8879 (ASU).

Phenology—Flowering mainly from October to February; fruiting mainly from December to March.

Habitat and Distribution—Riparian habitats from northeastern Argentina, Paraguay, Bolivia, and Brazil (Paraná, São Paulo, and Minas Gerais).

Distinguishing Features—Riparian shrub or tree, glabrous or thinly puberulent; leaves 1.5–6 times as long as wide; calyx closed or nearly so; seeds angular, 5–6 mm long.

Psidium kennedyanum is most likely to be confused with *P. striatum* in our area. The two species are compared directly in lead 18 of the key. It might also be confused with *P. acutangulum*, which is compared to *P. kennedyanum* in the key below.

1. Young twigs 4-angled and slightly winged; young growth usually sparsely strigose, the hairs appressed; petals 10–20 mm long; leaves mainly elliptic, mostly over 2.5 cm wide, 1–3 times as long as wide; fruit usually over 2.5 cm wide, the wall usually 1.5–3 mm thick..... *P. acutangulum*

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

- 1' Young twigs usually terete to weakly 4-angled; young growth usually sparsely to moderately puberulent, the hairs spreading; petals 10–12 mm long; leaves mainly lanceolate, mostly less than 2 cm wide, 1.5–6 times as long as wide; fruit usually under 2.5 cm wide, the wall usually about 1 mm thick.....*P. kennedyanum*

All specimens known to me come from the Paraná River basin except for *Foster 13368*, cited above, from Yacuma, Beni, Bolivia. The leaves of this collection are not typical for *Psidium kennedyanum* (see Fig. 12B). More collections would be useful in determining if this population might be described as a variety of *P. kennedyanum*.

- 11. *Psidium laruotteanum*** Cambess., in Saint-Hilaire Bras. merid. 2: 282. 1833. TYPE. Brazil. “Prope Alto da Varginha (prov. Minas Geraes),” *Saint-Hilaire s.n.* (HOLOTYPE: P-258429!).

Campomanesia suffruticosa O. Berg, in Mart., Fl. bras. 14(1): 448. 1857. TYPE. Brazil. “v. in hb. Vindob. et Mart.” “in prov. Ceará,” *Gardner 1611* (LECTOTYPE: W-16669! [syntype designated as lectotype by Landrum, 1986]. ISOLECTOTYPES: BR-526717!, F-64891!, K-13353? [no collection number visible, note by Gardner], G-227703!, G-227704!, HAL-89778, K-13354!, NY-386799, P-258522!, P-258524!, SP-112, W-116295!) and *Gardner 1610* (SYNTYPES: W-16668!, W-339892!, W-116293!; ISOSYNTYPES: F-64892? [no collection number visible], G-227705, K-18470!, NY-386800, P-258521!, P-258526!, P-258527!, US-117708!).

Psidium glaucescens O. Berg, in Mart., Fl. bras. 14(1): 600. 1859. TYPE. Brazil. “Serra da Chapada prov. Minarum,” *Riedel 1171*. (HOLOTYPE: LE-6978; ISOTYPES: F-65695, NY-686161!, P-258462!).

Psidium basanthum O. Berg, in Mart., Fl. bras. 14(1): 601. 1859. TYPE. Brazil. “prope Paracatu et Mugi prov. S. Pauli,” *Riedel s.n.* (HOLOTYPE: LE, = ASU photo).

Guajava laruotteana (Cambess.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava glaucescens (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava basantha (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Myrtus bergiana Nied., in Engl. and Prantl, Naturl. Pflanzenfam. 3, Abt. 7: 66. 1893. New name for *Campomanesia suffruticosa* O. Berg.

Psidium warmingianum Kiaersk., Enum. Myrt. bras. 28. 1893. New name for *Campomanesia suffruticosa* O. Berg.

Psidium warmingianum var. *verticillata* Kiaersk., Enum. Myrt. bras. 28. 1893. TYPE. Brazil. “Lagoa Santa,” *Lund s.n.* (SYNTYPE: C-10015970) and *Warming s.n.* (SYNTYPES: C-10015969, C-10015971, C-10015972).

Psidium savannarum Donn. Sm., Bot. Gaz.: 244. 1897. TYPE. Costa Rica. “Savana at Buenos Ayres, Comarca de Puntarenas,” *Tonduz CR-4033* (HOLOTYPE: CR [image of “isotype” at <http://ecobiosis.museocostarica.go.cr/especimenes/Buscador.aspx>]; ISOTYPES: BR-526720!, US-117677).

Psidium bergianum (Nied.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 485. 1941.

Myrtus formosa Barb. Rodr., Myrt. Paraguay 16. 1903. TYPE. Paraguay. “Ipe hu....Sierra Maracayu,” *Hassler 5079* (HOLOTYPE: G!, = ASU photo).

Psidium capibaryense Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 797. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Vaqueria Capibary,” *Hassler 4387* (two sheets at G!, = ASU photos).

Psidium quinquedentatum Amshoff, Recueil Trav. Bot. Neer. 39: 164. 1942. TYPE. Surinam. “Upper Sipaliwini R. near Brazilian frontier,” *H. E. Rombouts 329* (HOLOTYPE: U-8499; ISOTYPES: MO!, NY-1288079!).

Shrub up to ca. 1.5 m high, often less than 0.5 m high, with new shoots arising from a woody subterranean base or rhizome, densely tomentose to sparsely pubescent over most surfaces; hairs to ca. 1.5 mm long, grayish, yellowish white, to rusty, usually curled and tangled; young twigs usually densely tomentose, remaining so for more than 1 year, the bark of older twigs becoming rough and scaly. LEAVES normally opposite (rarely in whorls of 3, or spirally arranged) obovate, oblanceolate, elliptic, or oblong, 3–9(–11) cm long, 1.6–4.5(–6) cm wide, 1.6–3.2 times as long as wide; apex rounded, acute, or acuminate; base obtuse to cuneate; petiole 0–2 mm long, ca. 2 mm wide, tomentose; venation brochidodromous, the

midvein flat or slightly raised above, prominent below, usually more densely hairy above than surrounding blade, the lateral veins 7–13 pairs, these weak to prominent, slightly raised above in mature leaves, ascending at an angle of ca. 45°, nearly straight, joining an equally prominent, shallowly arching marginal vein that runs 1–2 mm from the margin, the tertiary veins weaker, alternating with the laterals, branching, arising from the marginal vein; *blades* stiffly coriaceous at maturity, drying gray-green to reddish brown (under hairs), the lower surface usually densely tomentose, the upper surface usually sparsely to moderately pubescent. FLOWER BUD obovoid to pyriform, 5–12 mm long, the hypanthium obconic, 2–3.5 mm long, the distal portion of bud subglobose, 3–8.5 mm long; *indumentum pattern of buds* with all external surfaces except petals densely to moderately pubescent or tomentose, the calyx sometimes notably less densely so than the hypanthium, the calyx pubescent within, the petals and style glabrous or essentially so, the disk pubescent or glabrous centrally; *peduncles* 1(–3)-flowered, solitary in the axils of leaves or bracts, 0.2–3 cm long, 1–1.5 mm wide; *bracteoles* linear to narrowly elliptic, 5–8 mm long, 1–1.5 mm wide, caducous at about anthesis. CALYX open, bowl-like, tearing slightly between the lobes, the tubular portion prolonged ca. 1 mm beyond the ovary summit, the lobes mostly broadly triangular, less often narrowly so, 1–4 mm long, 1–3 mm wide; *petals* suborbicular to obovate, 8–10 mm long; *disk* ca. 4 mm across; *stamens* 70–200, 5–9 mm long; *anthers* suborbicular, 0.5–1 mm long, with 1–4 glands; *style* 6–8 mm long; *ovary* (2–)3(–4)-locular; *ovules* 7–19 per locule, reflexed, usually uniserrate on the margin of a peltate placenta. FRUIT subglobose, 1.2–2 cm long; *seeds* 5–20, more or less rounded, 4–7 mm long. (Fig. 13).

Representative specimens examined. BOLIVIA. Santa Cruz: Prov. Velasco, P. N. Noel Kempff M., Campamento Las Gamas (14°48'52"S, 60°24'08"W), 900 m, 1 Nov 1995 (fr), Killeen & Grinwood 7819 (ASU0008102); Prov. Chiquitos, Serranía Santiago (18°19'41"S, 59°34'18"W), 650 m, 26 Nov 1999 (fr), Guillén et al. 4806 (ASU0053023, MO); Prov. Velasco, P. N. Noel Kempff Mercado, 3 km NW del campamento Las Gamas (14°48'11"S, 60°23'34"W), 850 m, 27 Oct 1995 (fr), Rodriguez & Surubi 506 (ASU0008101, MO).

PARAGUAY. Canindeyú: Ygatimí, Reserva Natural del Bosque Mbaracayú, Ñandu Rocai (ca. 24°20'S, 55°40'W), 19 Nov 1995 (st), Landrum 8860 (ASU0008096, FCQ); Reserva de Campo Comunal del asentamiento Mandu'ará, Compañía Yasy Cañy Curuguaty (24°21'a 24°32'S, 55°52' a 55°03'W), 7 Sep 1996 (fl), Torres Figueiredo 6 (FCQ); Mbaracayú Natural Reserve (24°11'16"S, 55°16'45"W), 15 Jan 1998 (fr), Zardini & Guerrero 47997 (ASU0060397, MO); Mbaracayú Natural Reserve, Aguará-ñú-Horqueta Mi (24°09'35"S, 55°17'06"W), 24 Sep 1999 (fl), Zardini & Ramirez Benitez 51392 (ASU0060417, MO).

Phenology—Flowering mainly in September and October; fruiting from November to March.

Habitat and Distribution—Cerrado, campo, at elevations of 550 to 1250 m. Found in Paraguay, Bolivia, Surinam, Brazil (Paraná to Ceará and Mato Grosso), Guyana, Venezuela, Colombia, and Costa Rica.

Distinguishing Features—Shrub to 1.5 m high; calyx open, the lobes triangular or subtriangular, 1–4 mm long; indumentum grayish, yellowish, or reddish brown, usually curled and tangled, obscuring the lower surface of mature leaves; marginal veins present throughout leaf, closely following the margins.

Psidium laruotteanum is variable as to leaf size and shape. Smaller plants, especially new sprouts, tend to have small elliptic leaves and larger plants tend to have larger oblanceolate or obovate leaves. Since a similar pattern is seen throughout the range, I do not suspect a genetic basis for this difference. The species is reported to have medicinal qualities in Paraguay and Costa Rica at least.

12. *Psidium missionum* D. Legrand, Darwiniana 9: 284. 1950. TYPE: Argentina. “Misiones, Depto. Candelaria, Santa Ana,” Rodriguez 16 (HOLOTYPE: MVM; ISOTYPES: F-76388F!, K-565516, LIL-1030!, SI-3045, SI-3046, SI-3047, SI-3048).

Shrub or subshrub to ca. 1 m high, with a persistent underground stem from which shorter lived above ground shoots arise, resprouting after being burnt or cut to the ground, glabrous to moderately pubescent on young growth and flowers; *hairs* when present whitish, up to ca. 1 mm long but usually shorter; *young twigs* reddish brown, glabrous to pubescent, smooth, the older twigs at first scaly, later smooth, gray. LEAVES oblanceolate, obovate, or elliptic, 2.5–8.8 cm long, 1.1–4 cm wide, 1.8–3.5 times as long as wide; *apex* abruptly acuminate to acute; *base* cuneate to acute; *petiole* 1–2 mm long, 1–1.5 mm thick, flat or channeled above; *venation* eucamptodromous proximally to brochidodromous distally, the midvein flat to slightly impressed above, prominent below, the lateral veins usually 4–6 pairs ascending and arching upwards, connecting to form a weaker marginal vein in the distal half, the smaller tertiary veins between the laterals forming a reticulate pattern; *blades* lustrous or not above, drying olive green, gray-green, to blackish brown, nearly concolorous, coriaceous. FLOWER BUDS pyriform, glabrous (southern localities) to moderately pubescent (northern localities), 6.5–9(–12) mm long, the hypanthium campanulate, 2–3.5 mm long, the distal portion of bud subglobose, 4–6 mm long; *indumentum pattern of buds* with peduncles, bracteoles, hypanthium, calyx and disk glabrous to pubescent, the petals glabrous to subglabrous, sometimes ciliate, the style usually with scattered hairs; *peduncles* 1(–3)-flowered, 1–2.3 cm long, ca. 1 mm wide, flattened; *bracteoles* linear to narrowly lanceolate, 3–8 mm long, ca. 1 mm wide, deciduous at about anthesis. CALYX open in the bud, cup-like, tearing up to ca. 1 mm between the lobes after anthesis, the lobes triangular, 2–4 mm long, 3–4 mm wide, the apex acute to acuminate; *petals* obovate to oblanceolate, ca. 9 mm long; *disk* 4–6 mm across; *stamens* 130–235, 9–11 mm long; *anthers* subglobose to oblong, ca. 0.5–1 mm long, with 3–5 glands; *style* 7–9 mm long, the stigma only slightly wider than style; *ovary* 3–4-locular; *ovules* 43–70 per locule, about 8-seriate, the placenta not peltate, hidden by ovules. FRUIT globose, ca. 1–1.5 cm long; *seeds* 14–20 in fruits seen, ca. 5 mm long, the seed coat several cells thick. (Fig. 14).

Representative specimens examined. ARGENTINA. Misiones: San Ignacio, ca. 3 km along road to Peña Victoria, Teyu Cuaré (ca. 27°15'S, 55°35'W), 10 Dec 1987 (fr), *Landrum* 5718 (ASU0008126, CTES); Candelaria, 4 km S of Santa Ana on ruta 12 (ca. 27°25'S, 55°40'W), 11 Dec 1987 (fl), *Landrum* 5735 (ASU0008127); San Ignacio, new road to Loreto, ca. 1 km from ruta 12, 11 Dec 1987 (fr), *Landrum* 5738 (ASU0008128); Candelaria, 3 km S of Arroyo Yabebiry, 4 km S of San Ignacio on ruta 12 (ca. 27°15'S, 55°35'W), 11 Dec 1987 (st), *Landrum* 5740 (ASU0008129, CTES); Cainguás, Monte Carlo, 205 m, 2 Feb 1955 (fr), *Montes* 14806 (CAS, NY).

PARAGUAY. Caazapá: Tavaí, destacamento militar (ca. 26°10'S, 55°20'W), 1988 (fl), *Basualdo* 2076 (FCQ). Guairá: Iturbe, 0.50–0.80 m, 3 Oct 1952 (fl), *Montes* 1260 (CTES). Itapúa: Trinidad, 19 Dec 1985 (fr), *Basualdo* 1030 (CTES, FCQ); Capitán Miranda, 4.2 km N of entrance to Hotel Tirol, behind CONAVI project (27°12'S, 55°45'W), 9 Nov 1995 (fl), *Landrum* 8808 (ASU0008123, FCQ); Capitán Miranda, road to Jesús, ca. 0.6 km from main highway (ca. 27°12'S, 55°45'W), 9 Nov 1995 (fl), *Landrum* 8812 (ASU0008134, FCQ). Paraguarí: road to Lago Ypoa, ca. 23 km N of Caapucú, 3.5 km W of main Asunción-Encarnación highway, ca. 250 m, 10 Nov 1995 (fl), *Landrum* 8838 (ASU0008138, FCQ).

Phenology—Flowering mainly from October to December; fruiting December to February.

Habitat and Distribution—Found in campos and cerrado; known only from southern Paraguay and Misiones, Argentina.

Distinguishing Features—Leaves oblanceolate, obovate, or elliptic, 2.5–8.8 cm long, 1.1–4 cm wide, 1.8–3.5 times as long as wide, glabrous to moderately pubescent; *apex* abruptly acuminate to acute; *base* cuneate to acute; without a clear lateral vein in proximal half; calyx lobes about triangular, 2–5 mm long; placenta not peltate; seeds not angular.

Psidium missionum frequently grows with *Psidium salutare* var. *mucronatum* and may be confused with that entity. The two are contrasted in the key below.

1. Leaves 2–4.5 cm long, 0.7–2.3 cm wide, 1.5–5 times as long as wide; marginal vein distinct, closely following the margin; placenta protruding, peltate; style 5–6 mm long, glabrous. *P. salutare* var. *mucronatum*
- 1' Leaves 2.5–8.8 cm long, 1.1–4 cm wide, 1.8–3.5 times as long as wide; marginal vein evident only in distal portion of leaf, arching broadly between laterals; placenta protruding only slightly, not peltate; style 7–9 mm long, usually with a few scattered hairs. *P. missionum*

Psidium missionum and *P. grandifolium* are both members of the *P. grandifolium* complex. The variation patterns and the distinction of these species is discussed under the latter species.

13. *Psidium myrsinoides* DC., Prodr. 3: 236. 1828. TYPE. Brazil. “desertis prov. Minarum [Rio de S. Francisco]”. *Martius s.n.* (HOLOTYPE: M-146869!).

Psidium myrsinoides O. Berg, in Mart., Fl. bras. 14(1): 384. 1857. TYPE. Brazil. “v. in hb. Vidob. et Berol.” “ad Carmo et Natividade prov. Goyazensis,” Pohl 1020 (SYNTYPES: B, lost, W-16672, W-16671; ISOSYNTYPES: F-65706, K-565280).

Psidium gardnerianum O. Berg, in Mart., Fl. bras. 14(1): 389. 1857. TYPE. Brazil. Ceará. Gardner 1610 (SYNTYPES: W-116282!, W-16680; ISOSYNTYPES: BM-796822, F-76384!, G-227710!, GH-71252, K-18450, K-18451, NY-1288049!, OXF, P-258463!, S-R-9451, US117659).

Guajava myrsinoides (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava myrsinoides (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava gardneriana (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium malmei Kausel, Lilloa 33: 108. 1972. TYPE. Brazil. Matto Grosso, Cuyaba. Malme 1240 (SYNTYPES: S-R-9454, S08-6868).

Tree or shrub 1–5(–9) m high, sparsely to densely pubescent on young growth to subglabrous; *hairs* whitish or tinged with reddish brown, ca. 0.5(–1) mm long; *young twigs* drying gray-green to reddish brown, often pubescent, the first bark with age becoming light gray, cracking, the older twigs rough, scaly, reddish brown to gray. LEAVES oblong, oblong-oblanceolate, obovate, or elliptic, 3.5–13.2 cm long, 1.5–4.6 cm wide, 1.5–4 times as long as wide, subglabrous or the midvein pubescent above, especially at base; *apex* bluntly acute, obtuse, or rounded; *base* rounded, obtuse, or acute; *petiole* essentially none, or ca. 1 mm long and thick, glabrous or pubescent; *venation* brochidodromous to eucamptodromous proximally, the midvein above flat or slightly raised, longitudinally wrinkled, pubescent or glabrous, prominent below, the lateral veins 5–12 pairs, not prominent, leaving the midvein at an angle of 45–60°, the marginal vein not prominent, arching broadly between laterals, running within 0.5–6 mm of the margin, often only evident distally, the tertiary veins forming an intricate dendritic pattern between the laterals; *blades* coriaceous at maturity (subcoriaceous at anthesis), about flat, lustrous above, drying chocolate brown, darker above than below, the margins not revolute. FLOWER BUD 6–9 mm long, pyriform, the hypanthium obconic to infundibular, 2–4.5 mm long, the distal portion of bud subglobose, sometimes wider than long, 3.5–6 mm long; *indumentum pattern of buds* with the peduncles and branches of dichasialia usually sparsely to moderately covered with more or less spreading hairs, less often

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

subglabrous, the hypanthium subglabrous to sparsely pubescent but usually less densely so than peduncle, the calyx densely pubescent within, subglabrous without, the petals pubescent without, glabrous within, the disk sparsely to moderately pubescent, the style often villous proximally; *peduncles* 1(–3)-flowered, solitary in the axils of leaves or bracts, or borne at leafless nodes, 7–45 mm long, ca. 1 mm wide, usually sparsely to moderately covered with more or less erect hairs, sometimes glabrous, longitudinally wrinkled when dry, the bracts narrowly triangular, membranous, up to ca. 5 mm long; *bracteoles* narrowly triangular, 2–3 mm long, caducous before anthesis. CALYX bowl-like, tearing between the lobes ca. 1 mm at anthesis, the lobes broadly rounded, up to ca. 1.5 mm long, ca. 2–3 mm wide, sometimes scarcely detectable before anthesis; *petals* elliptic to obovate, 5–8 mm long; *disk* ca. 5 mm across; *stamens* 160–210, 6–8 mm long; *anthers* 0.5–0.9 mm long, with a terminal gland and 0–5 smaller additional glands; *style* 6–8 mm long; *ovary* 3-locular; *ovules* 17–44 per locule, ca. 2-seriate on each lamella, the placenta slightly peltate. FRUIT subglobose, up to ca. 2 cm in diam.; *seeds* 15–22, 3–5 mm long, with rounded and flat surfaces. (Fig. 15).

Representative specimens examined. BRAZIL. Mato Grosso do Sul: 25 km from Bodoquena on road to Miranda, MS339 (ca. 20°23'S, 56°31'W), 12 Sep 1996 (fl), Ratter et al. 7675 (ASU0008160).

BOLIVIA. Santa Cruz: Prov. Chiquitos, above La Mina, zona Matacuzal, Chochís (ca. 18.149838°S, 60.031180°W), 700 m, 18 Nov 2001 (fl), Wood & Landívar 17551 (ASU0078686-photo, LPB).

Phenology—Flowering mainly from August to November; fruiting mainly from November to February.

Habitat and Distribution—Cerrado, campo rupestre at elevations of 230 to 1500 m. Found mainly in Brazil from Maranhão to Goias and Minas Gerais but collected as far north as Roraima and Surinam.

Distinguishing Features—Calyx bowl-like, the lobes broadly rounded; hypanthium subglabrous to sparsely pubescent but usually less densely so than peduncle; marginal vein not prominent, arching broadly between laterals, running within 0.5–6 mm of the margin, often only evident distally; blades drying a chocolate color; petiole to ca. 1 mm long.

Psidium myrsinifolium can be confused with *P. salutare*, which has a marginal vein that closely parallels the margin and scarcely arches (broadly arching between laterals in *P. myrsinifolium*).

14. *Psidium nutans* O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. TYPE. Brazil. “in prov. Piauhiensi,” Gardner 2592 [=2598 on some specimens] (SYNTYPES: W-16673, W-116302!; ISOSYNTYPES: BM-796904, F-76389!, G-227721!, NY-1288066!, P-258405!, US-7838).

Guajava nutans (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium campicolum Barb. Rodr., Myrt. Paraguay 11. 1903. TYPE. Paraguay. “in regiones fluminis Corrientes,” Hassler 4522 (HOLOTYPE: G-194283).

Psidium mattogrossense Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Valenzuela,” Hassler 7135 (G [two sheets, = ASU photos]).

Psidium verrucosum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Tobaty,” Hassler 6384 (G [= ASU photo]).

Psidium popenoei Standley, Ceiba 1: 41. 1950. TYPE. Honduras. Comayagua, Siguatepeque, Standley & Chacón 6369 (HOLOTYPE: F-76375!).

Tree or shrub 1–5 m high, glabrous or sparsely appressed antrorsely pubescent on distal inner surface of calyx (rarely puberulent on young growth); hairs if present colorless, to ca. 0.5 mm long; young twigs reddish brown to blackish brown when dry, smooth with numerous darker glands, the bark of older twigs lighter brown or tan, falling as flakes. LEAVES elliptic

to obovate, 5–17 cm long, 3–12 cm wide, 1.4–2.6 times as long as wide; *apex* acute, acuminate, obtuse to rounded, often with a cuspidate tip; *base* cuneate, obtuse, rounded, oblique, or subcordate; *petiole* shallowly channeled, 3–10 mm long, 1–2.5 mm thick; *venation* eucamptodromous proximally, brochidodromous distally, the midvein impressed proximally to nearly flat above, prominent below, the lateral veins 4–8(–10) pairs, leaving the midvein at an angle of 30–60°, nearly straight near midvein, arching distally towards apex, the marginal vein usually evident distally, arching mostly between 1–3 mm from the margin, the tertiary veins dendritic to ladder-like in pattern; *blades* coriaceous, often lustrous above and below, drying reddish to blackish brown, often mottled above with lighter spots when dry, the margin sometimes crenulate in part. FLOWER BUDS pyriform, moderately to strongly constricted at ovary summit, 7–12(–14) mm long, the hypanthium ellipsoid to campanulate, 3–6 mm long, the distal portion of bud ovoid to subglobose, 4–6.5(–9.5) mm long; *indumentum pattern of buds* with all surfaces glabrous or essentially so; *peduncles* 1–3(–7)-flowered, 0.4–3(–5) cm long, flattened, 1–2 mm wide, the branches of the dichasia 0.4–2 cm long; *bracteoles* narrowly triangular, ca. 2 mm long, caducous at or before anthesis. CALYX closed, or with a small apical pore-like opening, with 5 minute lobes on the margin of the opening, tearing irregularly at anthesis, usually in 4–5 persistent pieces 4–8 mm long, the tears not cutting the staminal ring, glabrous to sparsely pubescent distally within; *petals* elliptic to obovate, 0.8–1.4 cm long; *disk* ca. 3.5 mm across; *stamens* 110–240, 6–10 mm long; *anthers* 1.2–2(–3) mm long, with a few to several glands in the connective; *style* 9–13 mm long, the stigma peltate, 0.5–0.8 mm across; *ovary* 3–5-locular; *ovules* 50–105 per locule, the placenta protruding, sometimes somewhat peltate. FRUIT globose, to subpyriform, 0.7–2 cm long; *seeds* numerous (50 in one fruit), subtriangular with rounded edges, 3–4 mm long. (Fig. 16).

Representative specimens examined. ARGENTINA. Corrientes: Ituzaingó, Ea. San Pedro (ca. 27°45'S 56°52'W), 10 Nov 1976 (fl), Arbo *et al.* 1505 (CTES); San Cosme, Ensenada Grande, Ruta 1 (ca. 27.3°S, 58.4°W), 6 Oct 1971 (fl), Krapovickas *et al.* 20026 (CTES); Berón de Astrada, Campo Yaguá-Cuá (ca. 27.55°S, 57.53°W), 19 Jan 1957 (fl), Pedersen 4449 (CTES, MO, NY).

BOLIVIA. La Paz: Prov. Iturralde, Luisita, W del Río Beni (13°5'S, 67°15'W), 180 m, 26 Feb 1984 (fl), Beck & Haase 10046 (ASU0078685-photo). Santa Cruz: Prov. Velasco, campamento El Refugio a 7 km al E de la casa (14°44'19"S, 61°0'17"W), 9 Jul 1994 (flyfr), Guillén & Choria 2142 (ASU0008010); Prov. Velasco, Parque Nacional Noel Kempff M., Flor de Oro (13°32'4"S, 61°0'1"07"W), 18 Nov 1993 (yfr), Gutierrez *et al.* 509 (ASU0008004).

BRAZIL. Mato Grosso do Sul: Fazenda Salina, Pantanal do Rio Negro (ca. 19°30'S, 56°10'W), 24 Sep 1987 (fl), Dubs 373 (ASU0008001).

PARAGUAY. Canindeyú: Ygatimí, Reserva Natural del Bosque Mbaracayú, Valinotti Cué (ca. 24°10'S, 55°40'W), 18 Nov 1995(yfl), Landrum 8841 (FCQ, ASU0008012). Cordillera: Piribebuy, Salto Amambay (ca. 25.4713°S, 56.991°W), 720 m, 13 Feb 1991 (fr), Degen 1791 (NY). Misiones: between San Juan Bautista and road San Ignacio-Pilar, Lafuente cué, 20 km SE of San Juan Bautista (ca. 26°42'S, 57°16'W), 23 Feb 1994 (fr), Zardini & Guerrero 38496 (ASU0060409, MO). Ñeembucú: 4 km before entrance to Estancia Redondo (26°36'26"S, 58°3'59"W), 27 Jan 2005 (fl), Peña-Chocarro *et al.* 2366 (ASU0060333, BM).

Phenology—Flowering mainly from October to January; fruiting mainly January to February.

Habitat and Distribution—Apparently humid grasslands or riparian habitats at elevations of 150 to 750 m. Found in Pará, Amazonas, Piauí, Bahia and Minas Gerais in Brazil, in Corrientes, Argentina, Paraguay, Bolivia, and Venezuela. Perhaps extending into Central America as well.

Distinguishing Features—Usually glabrous or nearly so; calyx closed, or with a small apical pore-like opening, with 5 minute lobes on the margin of the opening, tearing in 4 or 5 lobes at anthesis; anthers 1.2–2(–3) mm long; tertiary veins dendritic to ladder-like in pattern.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium nutans is quite similar to *P. guineense*, except that it generally lacks abundant indumentum of that species. There seems to be a habitat difference: *P. guineense* usually in drier habitats and *P. nutans* often growing along streams or in wet grasslands. This is a species that requires further study, but it is provisionally accepted here because it seems to be ecologically distinct from *P. guineense*.

15. *Psidium oligospermum* DC., Prodr. 3: 236. 1828. TYPE. Brazil. "prov. Bahiensis," Martius [2203]. (HOLOTYPE: M-146868! [specimen annotated by de Candolle with description by Martius]; ISOTYPE: M-146867).

Calyptanthes eugenoides Cambess., Fl. Bras. merid. 370. 1833. TYPE. Brazil. Bahia, "prope Bom Jardim...provinciae Minas Geraes," St. Hilaire s.n. (SYNTYPES: P-801004 ["Type"], P-801005, P-801006 ["Isotype"]; ISOSYNTYPE: MPU-10976).

Psidium galapagaeum Hook. f., Trans. Linn. Soc. 20: 224. 1847. TYPE. Ecuador. Galapagos, "James Island" [=Isla Santiago]. [Scouler s.n.] (LECTOTYPE: K-565485 [designated by Porter, 1969]).

Mitranthes eugenoides (Cambess.) O. Berg, Linnaea 27: 317. 1856.

Mitranthes gardneriana O. Berg, in Mart., Fl. bras. 14(1): 354. 1857. TYPE. Brazil. "prov. Alagoas," Gardner 1311 (HOLOTYPE: W; ISOTYPES: F-65402, F-76367!, K-18789, K-18790, NY-405343, NY-405344, P-258499!, P-258500!, P-258501!).

Mitranthes sartoriana O. Berg, Linnaea 29: 248. 1858. TYPE. Mexico, Vera Cruz, "prope Mirador," C. Sartorius (HOLOTYPE: location not stated, B? ISOTYPE: G-227668!).

Calycorectes protractus Griseb., Cat. Pl. Cub. 284. 1866. TYPE. Cuba. "Cuba Occ., pr. Hanabana," Wright [3557]. (HOLOTYPE: GOET; ISOTYPES: GH-68862, K-170083, US-118238!).

Guajava oligosperma (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium sartorianum (O. Berg) Niedenzu, in Engler and Prantl, Nat. Pflanzenfam. 3(7): 69. 1893.

Psidium eugenoides (Cambess.) Niedenzu, in Engler and Prantl, Nat. Pflanzenfam. 3(7): 69. 1893. Illegitimate combination. An earlier homonym is *Psidium eugenoides* Cambess.

Calyptanthes tonduzii Donn. Smith, Bot. Gaz. 23: 245. 1897. TYPE. Costa Rica. San José, Río Virilla. Tonduz CR-9822 (HOLOTYPE: CR; ISOTYPES: BM-796882, BR-530471, BR-530438, G-227669!, K-330940, M-137148, MO-187176, NY-386754, US-117854 [annotated as holotype], US-731227!, US-117855).

?*Myrtus paucinerve* Urban, Symb. Ant. 9: 82. 1923. TYPE. Cuba. Prov. Oriente prope Río Piloto, Ekman 2505 (HOLOTYPE: B, lost).

Psidium claraense Urban, Symb. Ant. 9: 466. 1928. TYPE. Cuba. Prov. Santa Clara prope Casilda. Ekman 18887 (HOLOTYPE: B, lost; ISOTYPES: A-71238, G-227690!, NY-1288040!, S-r-8385 [annotated as lectotype by Urquiola, 1997 but apparently never published]).

Psidium microphyllum Britton, Botany of Puerto Rico and the Virgin Islands, 555. 1930. TYPE. Puerto Rico. Mayaguez Experiment Station, July 1930. T. B. McClelland s.n. (HOLOTYPE: NY-1365088!).

Psidium socorense I. M. Johnst., Proc. Calif. Acad. Sci. 20: 81. 1931. TYPE. Mexico. Revillagigedo Islands, on east slope of Socorro Island. Mason 1639 (HOLOTYPE: CAS-4159; ISOTYPES: GH-71233, K-565290).

Mitropsidium oligospermum (DC.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 1941.

Mitropsidium eugenoides (Cambess.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 1941.

Mitropsidium ob lanceolatum Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 487. 1941. TYPE. Colombia. Santa Marta, H. H. Smith 403 (HOLOTYPE: B, lost; ISOTYPES: CM-1521, F-65406, GH-71039, K-565517!, LL-208130, MICH-1109446, NY-1365084!, NY-1365085!, P-258374!, P-258375!, S-7-8339, S-5-3134, TEX-372173, U-5187, WIS-255103, US-731229!, US-117681).

Mitropsidium pittieri Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 488. 1941. TYPE. Venezuela. La Guairita, bei Petare, Miranda, am Wegrand," H. Pittier 9277 (HOLOTYPE: B, lost; ISOTYPE: NY-405350, VEN!).

Mitropsidium sartorianum (O. Berg) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 487. 1941.

Psidium yucatanense Lundell Contr. Univ. Michigan Herb. 7: 35. 1942. TYPE. Belize. Belize Dist., Belize-Sibun Road. Gentle 9 (HOLOTYPE: MICH-1210419!; ISOTYPES: F-65684, K-565289, NY-1365092!, US-117680!).

Psidium solissii Standley, Field Mus. Nat. Hist., Bot. Ser. 23: 133. 1944. TYPE. Costa Rica. "Hatillo, Finca de J. F. Rojas, 1100 m, 26 Dec 1936," Solis 509 (HOLOTYPE: F-76376!).

Psidium molinae Amshoff, Acta Bot. Neerland. 5: 277. 1956. TYPE. Honduras. Dept. Morazán: trail from La Quince, El Zamorano, to El Jicarito, 800-900 m, 15 Jul 1949. P. C. Standley 21255. (HOLOTYPE: F-76374!).

Psidium sartorianum var. *yucatanense* (Lundell) McVaugh, Fieldiana, Bot. 29: 527. 1963.

Psidium galapageium var. *howellii* D. M. Porter, Ann. Missouri Bot. Gard. 55: 370. 1969. TYPE. Ecuador. Galapagos Islands, Isla San Cristóbal (Chatham Island), 3.5 km above Puerto Bacque, along road to El Progreso, 8 Feb 1967, Wiggins and Porter 398 (HOLOTYPE: MO; ISOTYPES: CAS-4158, GH-71251, NY-1288048!).

Psidium protractum (Griseb.) Lundell, Wrightia 5(3): 70. 1974.

Tree up to ca. 30 m high, glabrous or sparsely to moderately pubescent on young growth; *hairs* simple, whitish, yellowish or reddish brown, minute or up to ca. 0.2(–0.4) mm long, curly, suberect or antrorse; *young twigs* reddish brown to light yellow-green, glabrous to moderately pubescent, in age becoming glabrescent, gray, smooth, or slightly striate. LEAVES lanceolate to elliptic, 1.6–7.5(–8.3) cm long, 0.4–3.3 cm wide, 1.7–4(–5) times as long as wide, glabrous, or often sparsely pubescent along the margin and midvein above, the margin entire; *apex* sharply or obtusely acuminate, acute, or less often obtuse; *base* rounded, cuneate, acuminate; *petiole* channeled or not, 1–6 mm long, 0.3–1 mm wide, glabrous or pubescent; venation brochidodromous, the midvein about flat or less often slightly impressed proximally above, prominent below, the lateral veins weak, 4–10 pairs, leaving the midvein at an angle of ca. 45°, united near the margin by a broadly arching marginal vein, tertiary veins usually obscure, dendritic, appearing to arise mainly from the marginal vein; *blades* coriaceous to subcoriaceous, drying dark olive-green, reddish brown, or nearly black, often mottled with lighter spots above when dry, or sometimes the whole upper surface grayish. FLOWER BUD pyriform to subfusiform, 3–9 mm long, the hypanthium obconic to campanulate, 1–4 mm long, the distal portion of bud ovoid to subglobose, 2.5–6 mm long; *indumentum pattern of buds* with all external surfaces glabrous to sparsely puberulent or pubescent (rarely moderately so), the hypanthium and calyx often with less indumentum than peduncle, the calyx glabrous to puberulent within, often with an apical tuft of hairs, the petals glabrous or ciliate, or sometimes pubescent if exposed in the bud; disk within the staminal ring usually glabrous, the staminal ring sparsely puberulent, the style glabrous or sparsely puberulent proximally; *peduncles* 6–25 mm long, 0.5–1 mm wide, solitary, uniflorous, or less often triflorous, the branches of the dichasium up to ca. 7 mm long; *bracteoles* narrowly triangular to linear, 1–5 mm long, caducous before anthesis. CALYX completely closed, sometimes with an apiculate apex, or scarcely open with a sinuate margin, or with 4 or 5 short verrucose protuberances at the apical tip, thus appearing puckered at the apex, circumscissile above the staminal disk or tearing in 5 lobes or irregularly at anthesis, persisting briefly as a disk-shaped or conical calyptra or calyx pieces, the remains of the calyx usually falling before the fruit matures, the staminal disk borne on inner surface of the bowl-like calyx tube, the tube tearing as the fruit matures, the calyx (including tube with stamens) sometimes evident only as a circular scar in mature fruits; *petals* suborbicular, 2.5–6 mm long (perhaps sometimes falling with the calyptra); *disk* 1–5 mm across; *stamens* 4–12 mm long, 80–220; *anthers* 0.3–0.5 mm long, with a terminal gland and up to 4 smaller glands below; *style* 4–5 mm long; *ovary* 2–3-locular; *ovules* (4)–10–34 per locule, uniseriate or biserrate on each lamella, the placenta slightly peltate. FRUIT subglobose to pyriform, 5–25 mm long; *seeds* 1–13 per fruit, 3–7 mm long, sublenticular to hemispheric, usually with somewhat angular edges and at least one nearly flat surface. (Fig. 17.)

Representative specimens examined. ARGENTINA. Jujuy: Ledesma, Sierra de Calilegua (23°47'S 64°47'W), 700 m, 10 Sep 1927 (fr), Venturi 5197 (US).

BOLIVIA. Beni: Prov. Moxos, Concesión Forestal de Monte Grande en la Reserva Forestal Chimanes, parcela permanente de estudio de Río Chocolatón y Chirisi (15°30'S, 66°30'W), 250 m, 8–12 Sept 1991 (st), Killeen 3463 (ASU0015598). La Paz: Prov. Franz Tamayo, Parque Nacional Madidi, NW de Apolo, senda Azariamas-San Fermín (14°9'26"S, 68°43'23"W), 1093 m, 11 Jun 2006 (st), Loza et al. 475 (ASU0057548); Prov. Sud Yungas, Alto Beni, Colonia Tauro (ca. 15.8°S, 67.2°W), 495 m, 18 May 1995 (st), Rodríguez 13

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

(ASU0057581). **Santa Cruz:** Prov. Ñuflo de Chávez, 110 km al W de Concepción, 3 km W de Monteverde, camino al Salitral Colorado ($15^{\circ}22'S$, $62^{\circ}22'W$), 9 Nov 1992 (fl), *Arroyo et al.* 125 (ASU0015597); Prov. Velasco, Parque Nacional Noel Kempff Mercado, Campamento Huanchaca-2 ($14^{\circ}31'16"S$, $60^{\circ}44'14"W$), 700 m, 25 Jun 1996 (fr), *Arroyo et al.* 1281 (ASU0015588); Prov. Velasco, Res. Ecológica El Refugio puesto La Toledo ($14^{\circ}42'18"S$, $61^{\circ}09'37"W$), 200 m, 21 Jan 1997 (fr), *Castro et al.* 16 (ASU0015599); Prov. Velasco, Hacienda Acuario a 24 km de San José de Campamento ($15^{\circ}14'46"S$, $61^{\circ}14'34"W$), 300 m, 29 Apr 96 (fr), *Guillén et al.* 4 (ASU0015603); Prov. Velasco, San José de Campamento, a 3 km sobre camino hacia San Roque ($15^{\circ}09'20"S$, $60^{\circ}59'29"W$), 230 m, 9 May 1996 (fr), *Guillén & Lazo* 4340 (ASU0015601); Prov. Chiquitos, Bocamina, Serranía de Sunsas, Tucavaca, cerca el campamento de Emicruz/RTZ (ca. $18.6^{\circ}S$, $58.917^{\circ}W$), 3 Jul 1995 (st), *Jardim et al.* 2125 (ASU0015594); Prov. Ñuflo de Chávez, Cabañas Selváticas Motacú, a 53 km NW del pueblo de San Javier ($15^{\circ}56'55"S$, $62^{\circ}22'45"W$), 11 Dec 1994 (fl), *Ortiz S.* 81 (ASU0053036); Prov. Ichilo, Buenavista (ca. $16.925^{\circ}S$, $63.628^{\circ}W$), 10 Nov 1924 (fr), *Steinbach* 6675 (K).

BRAZIL. Acre: Mun. Sena Madureira, Rio Purus basin, Rio Macauã, Colocacão Cachorra Macho ($9^{\circ}40'$, $69^{\circ}02'W$), 2 Apr 1994 (yfr), *Daly et al.* 8149 (ASU0014400). **Rondônia:** Mun. Ariquemes, Mineracão Mibrasa, Setor Alto Candeias, km 128, SW de Ariquemes ($10^{\circ}35'S$, $63^{\circ}35'W$), 19 May 1982 (yfr), *Teixeira et al.* 616 (ASU0014397).

PERU. Madre de Dios: Tambopata, Las Piedras, Cusco Amazónico, Inventario Permanente, trocha B, ($12^{\circ}29'S$, $69^{\circ}3'W$), 11 Nov 1991 (fl), *Timaná & Jaramillo* 3117 (ASU0014406).

Phenology—Flowering and fruiting throughout year, probably mainly in spring (early rainy season) months.

Habitat and Distribution—Forests at elevations from 180–1100 m in our area. Found from Mexico to northwest Argentina, Caribbean islands to São Paulo, Brazil; Galapagos and Isla Socorro in eastern Pacific.

Distinguishing Features—Calyx closed or nearly so, if open usually with 4 to 5 minute lobes at the apex, glabrous to puberulent, falling as a calyptra above the stamens or tearing between apical lobes; leaves lanceolate to elliptic; fruit subglobose to pyriform, 5–25 mm long, with a circular terminal scar, with evidence of the staminal ring lost or nearly lost; seeds 1–13 per fruit, 3–7 mm long.

As recognized here *Psidium oligospermum* is a widespread and variable species. Characters that vary are: habit tree versus shrub; flower bud size; presence or absence of dichasia; closure of calyx with or without an apical pore; presence or absence of apical protuberances on the calyx; mode of tearing of calyx; indumentum density and hair size; leaf size, shape, and thickness; fruit size and shape. The most commonly used name has been *P. sartorianum*, but a few other specific epithets have priority as long as a broadly defined species is recognized.

Variations in the calyx (closed or nearly so, falling as a calyptra vs. slightly open with apical protuberances and tearing between apical lobes) have caused taxonomists to recognize more than one taxon in some areas. Examples of this bimodal variation are found in the Galapagos Islands (where the names *P. galapageium* var. *galapageium* and *P. galapageium* var. *howellii* have been used) and in Honduras (where *P. sartorianum* and *P. molinae* have been used).

In Bahia, Brazil a similar situation exists and two usually distinct species are recognized: *P. oligospermum* and *P. schenckianum*. These entities hybridize and the hybrids are often similar to specimens of *P. oligospermum* from other regions. Thus, one potential explanation for the pattern of variation is that *P. oligospermum* originated in the area of Bahia (a region of high diversity in *Psidium*), acquired genes of *P. schenckianum* through hybridization and has carried those genes to other regions. A second hypothesis might be that the ancestor of the *P. oligospermum* complex had enough genetic variability in it that it was able to evolve two

morphologies in multiple areas. In Bahia, these are distinct enough that they are called separate species.

A geographically broad study of *Psidium oligospermum*, including related species such as *P. schenckianum*, *P. glaziovianum*, and *P. appendiculatum*, using molecular techniques, would be valuable. Working in the Atlantic Rainforest of Brazil, Tuler et al. (2015) have found that specimens they identified as *P. oligospermum* and *P. sartorianum* differ in the molecular characters they used. This kind of study should help to better understand this widespread and taxonomically difficult complex.

16. *Psidium salutare* (HBK) O. Berg, Linnaea 27: 356. 1856.

Myrtus salutaris HBK, Nov. gen. sp. 6: 132. 1823. TYPE. Venezuela. “Carichanam, ad ripam Orinoci”, Humboldt & Bonpland s.n. (HOLOTYPE: P-679449; ISOTYPE: B [=B1263/11 photo at MICH]).

Subshrub or shrub up to ca. 1.5 m high (often less than 0.5 m high), with new shoots arising from a woody subterranean base or rhizome, with shoots often short lived, or in *Psidium salutare* var. *pohlianum* sometimes reaching tree size (up to 10 m high), glabrous, glabrous except for disk and calyx lobes within, or sparsely to moderately pubescent on young growth, or silvery lanate in one variety; *hairs* when present whitish, 0.3–1 mm long; *young twigs* glabrous to densely pubescent, reddish brown, becoming grayish, the older bark gray to reddish brown, becoming flaky. LEAVES opposite or alternate on some shoots (rarely ternate), ovate, lanceolate, elliptic, narrowly elliptic, obovate, oblanceolate, (1–)2–9 cm long, 0.6–5.5 cm wide, 1.4–5 times as long as wide, drying gray-green to reddish brown, the margin entire to somewhat revolute; *apex* obtuse, acute to acuminate, abruptly acuminate, sometimes apiculate; *base* cuneate, obtuse, or rounded; *petiole* 0–2(–3) mm long, 1–1.5(–2) mm wide; *venation* brochidodromous, the midvein normally flat or slightly raised above, prominent below, the lateral veins 5–12 pairs, prominent to scarcely visible, leaving the midvein at an angle of ca. 45 degrees or less, nearly straight, the marginal veins arching shallowly between laterals, equaling laterals in prominence, running 0.2–2 mm from the margin, the tertiary veins forming a dendritic pattern between the laterals, sometimes appearing to arise from the marginal vein or the midvein; *blades* stiffly coriaceous at maturity, drying reddish brown to gray-green, dull or lustrous above. FLOWER BUDS pyriform, 4–7 mm long, the hypanthium obconic to campanulate, 1–3 mm long, the distal portion subglobose, wider than long, 2.5–4.5 mm long; *indumentum pattern of buds* with all surfaces glabrous, glabrous except for disk and calyx lobes within, or sparsely to moderately pubescent or silvery lanate except for glabrous petals, disk, and style; *peduncles* axillary, uniflorous or triflorous, 0.4–3.5 cm long, 0.5–0.8 mm wide; *bracteoles* linear to lanceolate, deciduous or persisting, 2–9 mm long, 0.5–2 mm wide. CALYX open, bowl-like, tearing ca. 1 mm between the lobes at anthesis, the lobes broadly rounded to ovate-triangular, 0.5–5(–6) mm long, 2–3(–4) mm wide; *petals* obovate to suborbicular, 5–11 mm long; *disk* 3–4(–5) mm across; *stamens* 100–200, 5–12 mm long; *anthers* subglobose to oblong, 0.3–0.8 mm long, with 1–3 glands; *style* 5–8 mm long; *ovary* 2–3-locular; *ovules* 9–48 per locule, uniseriate or biseriate along edge of the placenta, this strongly to scarcely peltate. FRUIT globose to subglobose, 8–10 mm in diam.; *seeds* 4–20, 4–8 mm long, subovoid. (Figs. 18–20).

Distinguishing Features—*Psidium salutare* is differentiated from other species of the genus by: usually being a subshrub or shrub (but reaching tree size in var. *pohlianum*); glabrous or sparsely pubescent except in var. *sericeum*; mainly living in grasslands or low shrubby growth (cerrado) that is frequently burned; an ability to sprout back from underground stems

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

even after fires; leaves with a well-marked marginal vein that closely follows the margin and tertiary veins that form a reticulate-dendritic pattern; relatively small flower buds (4–7 mm) with the calyx open; and a peltate placenta with one or two rows of ovules on the edge of each lamina. In our area *P. salutare* var. *sericeum* may be confused with *P. laruotteaum*; the two entities are compared in lead 5 of the key.

Psidium salutare is a widespread and variable species. I have recognized five varieties in the species (Landrum 2003), four of which occur in our area. Others may consider these entities to be species and have even recognized additional segregates (Soares-Silva & Proen  a 2006). Legrand and Klein (1977, p. 723) noted difficulty in distinguishing some of these entities but chose to retain them at the specific level. One might speculate that these morphological entities represent adaptive syndromes of characters for somewhat different niches. In-depth studies of these varieties, including population samples, field studies, estimates of genetic distinctness and exchange, and transplant experiments should prove interesting in the future, especially for sympatric varieties (e.g., var. *sericeum* and var. *mucronatum*). As recognized here, there is still considerable variation in var. *salutare* to which specimens unassignable to any of the other varieties are tentatively placed. The four varieties in our area are distinguished in the key below.

1. Young leaves densely covered with hairs beneath, the lower surface of the leaf often hidden; Argentina, Uruguay, Paraguay, Rio Grande do Sul, Santa Catarina, Paran  a..... *P. salutare* var. *sericeum*
- 1' Young leaves glabrous to moderately pubescent beneath; distributions various.
 2. Venation clearly evident above and below, the marginal vein within 1 mm of the margin; leaves often narrowly elliptic or lanceolate, often 3 or more times as long as wide, often lustrous; leaf apex often apiculate; calyx-lobes longer than calyx tube; Argentina, Uruguay, Paraguay, Rio Grande do Sul, Santa Catarina, Paran  a *P. salutare* var. *mucronatum*
 - 2' Venation clearly evident or not, the marginal vein usually more than 1 mm from the margin; leaves mostly less than 3 times as long as wide, lustrous or not; leaf apex usually without an apiculum; calyx-lobes longer or shorter than calyx tube.
 3. Leaves 4–9 cm long, 2–5 cm wide, elliptic to obovate; usually shrubs to small trees; plants glabrous; central Brazil, Bolivia to Venezuela..... *Psidium salutare* var. *pohlianum*
 - 3' Leaves 3.3–7 cm long, 1–3.3 cm wide, usually lanceolate, ovate, or elliptic; normally subshrubs; plants glabrous or pubescent; Paraguay to Mexico and Caribbean. ..*Psidium salutare* var. *salutare*

16a. *Psidium salutare* var. *salutare*

Psidium salutare (HBK) O. Berg, Linnaea 27: 356, as to type. 1856.

Myrtus arayan HBK, Nov. gen. sp. 6: 133. 1823. TYPE. Ecuador. “prope Gonzanamam Peruvianorum, ad ripam fluminis Catamayo,” Humboldt & Bonpland s.n. (HOLOTYPE: P-679197; ISOTYPE: P-258353!).

Psidium ciliatum Benth., J. Bot. (Hooker) 2: 318. 1840. TYPE. Guyana. “dry savannahs,” Schomburgk s.n. (HOLOTYPE: K-565505!; ISOTYPES: [Schomburgk 365], P-258378!, = ASU photo!, W, = F neg.-31434!).

Eugenia guayavillo Benth., Plantas Hartwegianas, 174. 1845. TYPE. Colombia. “Popayan,” Hartweg 977 (HOLOTYPE: K-170068, = ASU photo!).

Psidium guayabita A. Rich., Ess. Fl. Cub. 581. 1846. TYPE. Cuba. “Vuelta de Abajo,” J. M. Valenzuela s.n., (LECTOTYPE: P-87092! [syntype designated as lectotype by Landrum, 2003], = ASU photo!; ISOLECTOTYPE: P-258510!).

Psidium salutare var. *subalternum* O. Berg, Linnaea 27: 357. 1856. TYPE. Guyana. “ad flumen Tacutu,” Rich. Schomburgk 498 & 1252; Rob. S. 365 (SYNTYPES: B, lost; LECTOTYPE: Schomburgk 365, P-258378!: [isosyntype designated as lectotype by Landrum, 2003], = ASU photo!).

Psidium oerstedeanum O. Berg, Linnaea 27: 360. 1856. TYPE. Costa Rica & Guatemala. “Provincia Guanacaste” (Oersted) & “Rinc  n in Guatemala” (Friedrichsthal), Oersted s.n. & Friedrichsthal 1226 (SYNTYPES: W and “hb. Oersted. no16”; SYNTYPE: C-10015962 [Oersted 4004], = ASU photo!).

Psidium salutare var. *laxum* O. Berg, Linnaea 27: 357. 1856. TYPE. Venezuela. “Orinoco, ad Upata,” Otto 987 (HOLOTYPE: B, lost; LECTOTYPE: LE-7005 [isotype designated as lectotype by Landrum, 2003], = ASU photo!; ISOTYPES: MEL-2397977, possible isotype W, = F neg.-31435!).

Psidium salutare var. *stricta* O. Berg, Linnaea 27: 356. 1856. Illegitimate name to be replaced by *P. salutare* var. *salutare* because *Myrtus salutaris* HBK is cited as a synonym.

Myrtus rigida O. Berg, in Mart., Fl. bras. 14(1): 417. 1857. TYPE. Brazil. “ad Paranapitanga distr. Itapeva in prov. S. Pauli,” Sellow s.n. (HOLOTYPE: B, lost; LECTOTYPE: P-258328! [isotype designated as lectotype by Landrum, 2003], = ASU photo!).

Myrtus blanchetiana O. Berg, in Mart. Fl. bras. 14(1): 418. 1857. TYPE. Brazil. “Bahia,” Blanchet 3310 (HOLOTYPE: B, lost; LECTOTYPE: P-258350! [isotype designated as lectotype by Landrum, 2003], = ASU photo!; ISOLECTOTYPES: F-76369f!, G-227665!, P-258351!, P-258505!).

Myrtus sagraea O. Berg, Linnaea 30: 710. 1860. TYPE. Cuba. without locality, *De la Sagra* s.n. (HOLOTYPE: P-258327!, = ASU photo!).

Psidium lanceolatum O. Berg, Linnaea 30: 704. 1861. TYPE. Brazil. without specific locality, (HOLOTYPE: P-258430!, = ASU photo!).

Psidium guayabita var. *oblongatum* Griseb., Cat. Pl. Cub. 91. 1866. TYPE. Cuba. without locality, Wright 2436 (HOLOTYPE: GOET; ISOTYPES: MICH!, MO!, NY-1365086!, NY-1365087!, = ASU photo!, P-258509!).

Psidium guayabita var. *angustifolium* Griseb., Cat. Pl. Cub. 91. 1866. TYPE. Cuba. without locality, Wright 2436a (HOLOTYPE: GOET).

Calycolpus parviflorus Sagot, Ann. Sci. Nat. (Paris) VI. 20: 181. 1885. TYPE. French Guiana. without locality, Leprieur s.n. (LECTOTYPE: P-258376! [syntype designated as lectotype by Landrum, 2003], = ASU photo!; ISOLECTOTYPE: P-258377!).

Psidium deltosepalum Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 799. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Vaqueria Capibary,” Hassler 4400 (G![3 specimens, = ASU photos!], K-565504, NY-1288044!, P-258470!).

Psidium valenzuelense Barb. Rodr. ex Chodat & Hassl., Bull. Herb. Boissier 7: 798. 1907, nomen nudum. CITED COLLECTION. Paraguay. “pr. Valenzuela,” Hassler 6947 (G!, 2 specimens, NY-1288097!).

Psidium arayan (HBK) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 484. 1941.

Psidium gentlei Lundell, Amer. Mid. Nat. 29: 483. 1943. TYPE. Belize. Toledo Dist., “Monkey River, Jenkins Creek,” 1 Aug 1942 (fr), Gentle 4062 (HOLOTYPE: MICH-1210412!; ISOTYPES: MO!, LL-372191!, NY-1288050!).

Myrcianthes reptans D. Legrand, Bol. Univ. Paraná Fac. Farm. 27: 1–3. 1971. TYPE. Brazil. Paraná, “Mun. Palmeira, Faz. S. Amelia,” Hatschbach 17697 (HOLOTYPE: MVM; ISOTYPES: HB!= ASU photo!, MICH-1210166, UC-1387361, US-288636).

Psidium reptans (D. Legrand) Soares-Silva & Proença, Kew Bull. 61(2): 203. 2006.

Usually a subshrub less than 0.5 m high; leaves elliptic, lanceolate, oblanceolate, ovate, or obovate, 3–7 cm long, 1–3.3 cm wide, 1.6–3.2 times as long as wide, glabrous to moderately pubescent; venation obscure to moderately pronounced, the marginal vein usually about 1 mm from margin; apex usually without an apiculum; peduncle 1–5 cm long, uniflorous or triflorous; calyx-lobes shorter or longer than the calyx tube, acute to rounded. (Figs. 18C,D; 20D).

Representative specimens examined. **BOLIVIA. Santa Cruz:** P. N. Noel Kempff Mercado, Los Fierros (14°36'20"S, 60°51'30"W), 200 m, 26 Oct 1993 (fr), Killeen et al. 5943 (ASU0005043); P. N. Noel Kempff Mercado, Los Fierros, pampa La Toledo (13°33'00"S, 60°49'25"W), 250 m, 6 Nov 1993 (fr), Mostacedo & Menacho 1207 (ASU0005044); P. N. Noel Kempff Mercado, 6 km NE del campamento Las Gamas (13°53'41"S, 60°48'46"W), 850 m, 28 Oct 1995 (fl), Rodriguez & Surubí 549 (ASU0005032).

PARAGUAY. Caaguazú: inter oppidula Caaguazú et Yhú (ca. 25.234°S, 55.973°W), 11 Dec 1982 (fr), Fernández Casas et al. 7396 (NY); Ea. La Esmeralda, 11 Dec 1982 (fr), Schinini 22902 (CTES, MICH).

Cordillera: Cabaña María Auxiliadora between Eusebio Ayala and Itacurubi de la Cordillera, km 80 (25°26'06"S, 56°54'38"W), 26 Nov 1997 (fr), Zardini & Guerrero 47698 (ASU0304784, MO). **San Pedro:** Yaguaréte Forest, Sustainable Forest Systems site (23°48'34"S, 56°06'46"W), 180 m, 30 Oct 1996(yfr), Zardini & Zavala 45687 (ASU0060391).

Phenology—Flowering mainly in October and November in our area; fruiting shortly after.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Habitat and Distribution—Found from Paraguay to Mexico and the Caribbean; a shrub or subshrub of open habitats.

Distinguishing Features—See key to varieties.

16b. *Psidium salutare* var. *mucronatum* (Cambess.) Landrum, Sida 20(4): 1463. 2003.

Myrtus lurida Spreng., Syst. Veg. 2: 480. 1825. TYPE. Uruguay. “Monte Video”, *Sello s.n.* (holotype: B?, probably lost).

Myrtus pauciflora Cambess., in Saint-Hilaire, Fl. Bras. merid. 2: 296. 1833. TYPE. “Encapamento do Ricao das galinhas in parte occidentali provinciae Cisplatinae”, *Martius s.n.* (HOLOTYPE: P!, = F-36439!, = ASU photo!).

Myrtus mucronata Cambess., in Saint-Hilaire, Fl. Bras. merid. 2: 295. 1833. TYPE. Saint-Hilaire s.n. “ad ripas fluminum Rio de la Plata et Uruguay in provincia Cisplatina”, *Martius s.n.* (LECTOTYPE: P-258377! [syntype designated as lectotype by Landrum, 2003], = F neg. 36436!; ISOLECTOTYPES: K-565511, MPU-10996, P-258355!, P-258336!).

Myrtus cuspidata O. Berg, in Mart., Fl. bras. 14(1): 415. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (SYNTYPES [the types of two varieties]: B, lost; LECTOTYPE: SGO! [isotype of *Myrtus cuspidata* var. *pentamera*, designated as lectotype by Landrum, 2003], = ASU photo!

<http://swbiodiversity.org/seinet/collections/individual/index.php?occid=660531>).

Myrtus cuspidata* var. *pentamera O. Berg, in Mart., Fl. bras. 14(1): 415. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost; ISOTYPE: SGO!). Illegitimate name to be replaced with *Myrtus cuspidata* var. *cuspidata*.

Myrtus cuspidata* var. *tetramera O. Berg, in Mart., Fl. bras. 14(1): 415. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost; LECTOTYPE: SGO! [isotype designated by Landrum, 2003], = ASU photo! <http://swbiodiversity.org/seinet/collections/individual/index.php?occid=660532>).

Myrtus mucronata* var. *perforata O. Berg, in Mart., Fl. bras. 14(1): 416. 1857. Illegitimate name to be replaced by *M. mucronata* var. *mucronata* (*Myrtus mucronata* cited as a synonym).

Myrtus mucronata* var. *opaca O. Berg, in Mart., Fl. bras. 14(1): 416. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost).

Myrtus ovalis O. Berg, in Mart., Fl. bras. 14(1): 417. 1857. Illegitimate later homonym of *Myrtus ovalis* Spreng. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost).

Myrtus suffruticosa O. Berg, in Mart., Fl. bras. 14(1): 418. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (SYNTYPES [the types of two varieties]: B, lost; (LECTOTYPE: P-258323! [isotype of *Myrtus suffruticosa* var. *latifolia*; designated as lectotype by Landrum, 2003]); ISOLECTOTYPES: BR-8489753!, K-565512, W-16662!).

Myrtus suffruticosa* var. *latifolia O. Berg, in Mart., Fl. bras. 14(1): 418. 1857. Illegitimate name to be replaced by *M. suffruticosa* var. *suffruticosa*.

Myrtus suffruticosa* var. *angustifolia O. Berg, in Mart., Fl. bras. 14(1): 419. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost).

Myrtus acutata O. Berg, in Mart., Fl. bras. 14(1): 415. 1857. TYPE. Uruguay. “in Montevideo,” *Sellow s.n.* (HOLOTYPE: B, lost; LECTOTYPE: P-258355!, = F neg. 36424 [isotype designated as lectotype by Landrum, 2003]; ISOLECTOTYPES: BR-8489708!, P-258354!).

Myrtus sellowiana O. Berg, in Mart., Fl. bras. 14(1): 413. 1857. TYPE. Brazil. “ad Tapanhoacanga prov. Minarum,” *Sellow s.n.* (HOLOTYPE: B, lost; LECTOTYPE: P-258326!, = F-36445 [isotype designated as lectotype by Landrum, 2003]; ISOLECTOTYPE: K-276984).

Psidium thea Griseb., Pl. Lorentz. 91. 1874, and in Abh. Königl. Ges. Wiss. Göttingen 19: 139. 1874. TYPE. Argentina. “Cordoba, in monte Cerro negro pro. San Bartolo.,” *Lorentz* 377 [Feb 1871] (LECTOTYPE chosen by Landrum (2021b): GOET-7309; ISOLECTOTYPE: CORD-5688) and “Tucuman, in sylvis primaeviis,” *Lorentz* 63 [May 1872] (SYNTYPE: GOET-7310; ISOSYNTYPE: CORD-5687).

Myrtus mucronata* var. *thea (Griseb.) Griseb., Abh. Königl. Ges. Wiss. Göttingen 24: 127. 1879.

Psidium luridum (Spreng.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 484. 1941.

Psidium pubifolium Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 484. 1941. New name for *Myrtus ovalis* O. Berg.

Psidium luridum* var. *cinereum Mattos, Loefgrenia 64: 2. 1975. TYPE. Brazil. Santa Catarina, “Campo Erê, 17 km W of Campo Erê, ca. 26°22'S, 53°08'W, 900–1000 m,” Smith & Klein 13807 (HOLOTYPE: HBR, ISOTYPE: R-127745!).

Psidium pubifolium f. *nanum* Rotman, Darwiniana 20: 433. 1976. TYPE. Brazil. Santa Catarina, “Campo Erê, 37 km W of Campo Erê, ca. 26°22'S, 53°08'W, 900–1000m,” Smith & Klein 13807 (HOLOTYPE: MVM, ISOTYPE: R-127745!).

Usually a subshrub less than 0.5 m high; leaves mostly narrowly elliptic to lanceolate, (1.5–)2–6 cm long, 0.7–2.3 cm wide, (1.4–)1.5–5 times as long as wide, glabrous to subglabrous, often lustrous; venation pronounced, raised on both surfaces, the marginal vein usually within 1 mm of the margin; apex apiculate; peduncle often over 2 cm long, uniflorous; calyx-lobes usually longer than hypanthial tube plus calyx tube, usually acute. Figs. 18A;20A).

Representative specimens examined. ARGENTINA. Buenos Aires: Mar del Plata, Sierra de los Difuntos, Reserva Paititi 37°53'40.5"S 57°50'36.4"W, ca. 220 m, 13 Mar 2021 (fr), J. L. Méndez (ASU-photos).

Corrientes: 2.5 km de la ciudad de Monte Caseros, 28 Dec 1968 (fr), Carnevali 1317 (CTES); Paso de Los Libres, Bonpland, costa río Uruguay, 19 Jan? 1945 (fr), Ibarrola 2135 (NY); Santo Tomé, 33 km N de Santo Tomé, 27 Jan 1976 (fl), Krapovickas & Cristóbal 28934 (CTES, NY); Ituzaingó, Rincón Ombú Chico, 3–5 Jul 1974 (fl), Krapovickas et al. 25477 (CTES, MICH); Dep. Mercedes, Mercedes a Itá Corá, Ayo. Pay-Ubre, 2 Feb 1974 (fr), Quarín & Gonzalez 2069 (CTES); Berón de Astrada, 15 km W of Itá Ibaté, Ayo. Santa Isabel, 16 Jan 1977 (fl), Schinini 14105 (CTES); Estación Experimental INTA, Dep. Empedrado, 7 Dec 1978 (fl), Schinini 16225 (CTES); Co. Nazareno (Co. de Susini), 15 Feb 1979 (fr), Schinini et al 17192 (CTES); Santo Tome, Ea. San Lorenzo 4 km N de Galarza (28°04'S, 56°38'W), 30 Mar 2000 (fr), Tressens et al. 6640 (ASU0015580). Entre Ríos: Dep. Federación, Santa Ana, 15 Oct 1968 (fl), Gomez Sosa 99 (CTES). Misiones: Posadas, Bonpland, 11 Jan 1908 (fl), Ekman 2048 (MICH, NY); Concepción, aldea aborigena Yraka Miri, 15 Sep 2008 (fl), Keller et al. 6078 (ASU0078679); Candelaria, Bonpland, arroyo Mártires Chico, 16 Jan 1976 (fl), Krapovickas & Cristóbal 28785 (CTES); Cainguás, Monte Carlo, 205 m, 2 Feb 1955 (fr), Montes 14806 (NY); Apóstoles, 29 Jan 1948 (fr), Schulz 6889 (CTES). Tucumán: Villa Nongues, Jan 1918 (fr), Lillo 1351 (MO).

BRAZIL. Paraná: Palmas, Rio Chopim, 7 km abaixo da nascente, 20 Nov 1990 (fl), Hatschbach 54810 (ASU0015549, MBM). Rio Grande do Sul: São Francisco de Paula, (fr), Rambo 30793 (MICH); Bom Jesus, Fazenda B. Velho, 4 Jan 1947 (fr), Rambo 35177 (MO, NY).

PARAGUAY. Itapúa: Arroyo Guazú Acatí, 15 Sep 1983 (fl), Basualdo s.n. (FCQ); Capitán Miranda, 4.2 km N of entrance to Hotel Tirol (ca. 27°12'S, 55°45'W), ca. 210 m, 9 Aug 1995 (fl), Landrum 8796 (ASU0015535); Capt. Miranda, road to Jesús, ca. 0.6 km from main highway (27°12'S, 55°45'W), ca. 185 m, 9 Nov 1995 (fl), Landrum 8814 (ASU0015536). Paraguarí: National Park Ybycuí, 6 km S of NE corner of the park (26°04'S, 56°46'W), 25 Nov 1991 (fr), Zardini & Garcete 29111 (ASU0015538).

URUGUAY. Artigas: ruta 30, 7 km S de Artigas, 10 Dec 1995 (fr), Solis Neffa et al. 242 (ASU0015534, CTES); Cerro Largo: S of Melo, 4.8 km, 9 Jan 1944 (fr), Bartlett 21279 (MICH). Maldonado: Sierra de Áimas, ca. 65 km E of Montevideo (ca. 34°45'S, 55°30'W), 22 Nov 1981 (fl), Landrum 3856 (NY). Montevideo: Punta Espinillo, (fl), Legrand 2710 (MICH); Chapicuy, orillas del río Uruguay, Sta. Sofia, 15 Nov 1942 (fl), Rosengurtt et al. B-4183 (MO, NY); Rocha: Santa Teresa, (fl), Legrand MVM-1064 (MICH). San José: Rincón Gallinas, 5 m, Dec 1931 (fl), Herter 88052 (NY, RB). Tacuarembó: Gruta de los Cuervos, 17 Jan 1944 (fr), Legrand 3338 (NY).

Phenology—Flowering mainly September to November; fruiting mainly December to March.

Habitat and Distribution—Northern Argentina, Brazil (Paraná to Rio Grande do Sul), Paraguay, and Uruguay; a shrub or subshrub of open habitats that are occasionally burnt.

Distinguishing Features—See key to varieties.

Grisebach (1874) reports that the vernacular name of his *Psidium thea*, a synonym of this variety, is “alpamato” and that it is used as a substitute for tea.

There are many intermediates between typical var. *mucronatum* (which is glabrous) and typical var. *sericeum* (which is densely covered with silvery hairs). The fact that these varieties also have similar distributions, leads me to suspect that there is a simple genetic difference between them. Intermediates have mainly been identified as var. *sericeum*.

Psidium salutare var. *mucronatum* frequently grows with *P. missionum* and can easily be confused with that species. The two are contrasted in the key below.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

1. Leaves 2–4.5 cm long, 0.7–2.3 cm wide, 1.5–5 times as long as wide; marginal vein distinct, closely following the margin; placenta protruding, peltate; style 5–6 mm long, glabrous.....*P. salutare* var. *mucronatum*
- 1' Leaves 2.5–8.8 cm long, 1.1–4 cm wide, 1.8–3.5 times as long as wide; marginal vein evident only in distal portion of leaf, arching broadly between laterals; placenta protruding only slightly, not peltate; style 7–9 mm long, usually with a few scattered hairs.....*P. missionum*

If the entity here called *Psidium salutare* var. *mucronatum* is recognized at the specific level, the name *P. luridum* (Spreng.) Burret should be used. There may be no type specimen of *Myrtus lurida* in existence, having been at B and now destroyed. Burret (1941), who studied the type shortly before it was destroyed, listed *Myrtus cuspidata* as a synonym. That coupled with Sprengel's protologue leave little doubt as to its identity. The type of *Myrtus ovalis* O. Berg at B was also destroyed, but the protologue is sufficient to consider it a synonym of this variety.

16c. *Psidium salutare* var. *pohlianum* (O. Berg) Landrum, Sida 20(4): 1466. 2003.

Psidium pohlianum O. Berg, in Mart., Fl. bras. 14(1): 390. 1857. TYPE. Brazil. "v. fructif. in hb. Vindob., sine fruct. et florib. in hb. Berol," "ad S. Luzia in prov. Goyazensi," Pohl 913 (SYNTYPE: W-48043; ISOSYNTYPE: F-65713!) and Sellow s.n. (SYNTYPES: B, lost, W-48042; ISOSYNTYPE: K-170088, P-258394!, P-258394!). [P-258394 was erroneously designated as a lectotype by Landrum (2003), but a syntype at W could be selected].

Psidium pohlianum var. *brevipes* O. Berg, in Mart., Fl. bras. 14(1): 601. 1859. TYPE. Brazil. "prope S. Carlos prov. S. Pauli," Riedel s.n. (apparent HOLOTYPE LE-6998 [mixed with other collections]).

Shrub or tree to 10 m high, the trunk bark rough, deeply cracked; leaves mostly elliptic, to obovate, or oblanceolate, 4–9 cm long, 2–5.5 cm wide, 1.4–2.7(–3.5) times as long as wide, glabrous; venation pronounced, raised on both surfaces, the marginal vein usually about 1 mm from the margin; apex usually without an apiculum; peduncle 0.4–2 cm long, often triflorous; calyx lobes shorter or about as long as the calyx tube, rounded to obtuse. (Fig. 19; 20C).

Representative specimens examined. BOLIVIA. Santa Cruz: P. N. Noel Kempff Mercado, Pista Las Gamas, (14°48'11"S, 60°23'35"W), 815 m, 9 Nov 1993 (fr), Guillén & Centurión 1023 (ASU); P. N. Noel Kempff Mercado, 6 km SW del campamento Las Gamas (14°49'36"S, 60°23'10"W), 850 m, 30 Oct 1995 (fr), Rodriguez & Surubi 592 (ASU); P. N. Noel Kempff Mercado, Huanchaca I, (13°53'55"S, 60°48'46"W), 850 m, 3 Nov 1995 (fr), Rodriguez & Surubi 630 (ASU).

Phenology—Flowering mainly from September to December; fruiting mainly from January to March.

Habitat and Distribution—Cerrado, campo rupestre, areas subject to burning at 1000 to 1600 m. *Psidium salutare* var. *pohlianum* is found in Bolivia, from São Paulo to Ceará and Mato Grosso in Brazil, and also in Venezuela.

Distinguishing Features—See key to varieties. This variety is distinguished from most other Myrtaceae by its rough, deeply cracked, trunk bark.

16d. *Psidium salutare* var. *sericeum* (Cambess.) Landrum, Sida 20(4): 1467. 2003.

Myrtus sericea Cambess., in Saint-Hilaire, Fl. Bras. merid. 2: 295. 1833. TYPE. Uruguay [Brazil]. "Capilha de Mercedes... provinciae Cisplatinae, necnon... Rincao de Saneloés ad ripam amnis Ibicuy in provincia Missionum," Saint-Hilaire s.n. (HOLOTYPE: P, = F-36446!; ISOTYPE: P-258325!).

Myrtus nivea O. Berg, in Mart., Fl. bras. 14(1): 414. 1857. TYPE. Uruguay. "ad P[alacio?]° dos Inforcados in Montevideo," Sellow s.n. (HOLOTYPE: B, lost; LECTOTYPE: P-258334! [isotype designated as lectotype by Landrum, 2003]; ISOLECTOTYPES: BR-8489760!, W-48023!, = F-31405).

Myrtus sericea var. *fruticosa* O. Berg, in Mart., Fl. bras. 14(1): 414. 1857. TYPE. Uruguay. “ad Cerro in Montivedeo,” Sellow s.n. (HOLOTYPE: B, lost; LECTOTYPE: P-258324! [isotype designated as lectotype by Landrum, 2003]).

Myrtus sericea var. *suffruticosa* O. Berg, in Mart., Fl. bras. 14(1): 414. 1857. TYPE. Brazil. Illegitimate name to be replaced by *M. sericea* var. *sericea* because *Myrtus sericea* Cambess. is cited as a synonym.

Myrtus incana O. Berg, in Mart., Fl. bras. 14(1): 416. 1857. TYPE. Brazil. “ad Cassapava in Rio Grande do Sul,” Sellow s.n. (HOLOTYPE: B, lost; LECTOTYPE: P-258432! [isotype designated as lectotype by Landrum, 2003]; ISOLECTOTYPE: BR-8489746!).

Myrtus pubescens O. Berg, in Mart., Fl. bras. 14(1): 415. 1857. Illegitimate later homonym of *Myrtus pubescens* HBK. TYPE. Brazil. “ad Andre’ Ferrina,” Sellow s.n. (HOLOTYPE: B, lost; LECTOTYPE: P-258329! [isotype designated lectotype by Landrum, 2003], = F-36441; ISOLECTOTYPE: K-276996).

Myrtus hassleriana Barb. Rodr., Myrt. Paraguay 16. 1903. TYPE. Paraguay. “prope Rio Curuguatay,” Hassler 4609 (HOLOTYPE G, = ASU photo).

Psidium incanum (O. Berg) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 485. 1941.

Psidium niveum (O. Berg) Herter, Rev. Sudamer. Bot. 7: 221. 1943.

Psidium tomentellum Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 485. 1941. New name for *Myrtus sericea* Cambess., proposed because of the prior existence of *P. sericeum* O. Berg.

Usually a subshrub less than 0.5 m high; leaves elliptic, ovate, obovate, narrowly elliptic, oblanceolate to lanceolate, 2–7 cm long, 0.6–2.8 cm wide, 2–3.7 times as long as wide, densely covered with silvery gray hairs when young; venation pronounced under hair cover, the marginal vein usually within 1 mm of the margin; apex apiculate; peduncle often over 2 cm long, uniflorous; calyx-lobes usually longer than hypanthial tube plus calyx tube, usually acute. (Fig. 19B; 20B).

Representative specimens examined. ARGENTINA. **Corrientes:** Santo Tomé, ruta 41, 5–6 km al N de Galarza (ca. 28°4'S, 56°39'W), 17 Nov 1994 (fl), Arbo et al 6402 (CTES); Estancia Ana Cuá, 17 Dec 1970 (fl), Carnevali 2243 (CTES); Estancia Garruchos, cachuera, Ayo. Chimiray, 6 Feb 1972 (fr), Krapovickas et al 21174 (CTES); General Paz, Arroyo Sta. Isabel at ruta 12 E of Itá Ibaté (ca. 57°30'W, 27°20'S), 9 Dec 1987 (fr), Landrum 5701 (ASU, CTES); Dep. Paso de los Libres, Estancia El Recreo, 21 km E Bonpland, costa río Uruguay, 18 Nov 1973 (fl), Lourteig et al 2737 (CTES); Monte Caseros, 19 Feb 1975 (fr), Prause s.n. (CTES); Empedrado, Estación Experimental INTA, 7 Dec 1978 (fl), Schinini 16188 (CTES); 10 km S de Bella Vista, 8 Nov 1978 (fl), Schinini & Ahumada 15894 (CTES, MO); 11 km S de Mercedes, antiguo camino a Curuzú Cuatiá, Co. Pajarito, 23 Feb 1984 (fr), Tressens et al 2420 (CTES). **Entre Ríos:** Concordia, Dec 1946 (fl), Meyer 11007 (LIL). **Misiones:** Posadas, Lareto, Casa de Drewes, 26 Jan 1908 (fr), Ekman 2056 (MICH, NY); San José, Feb 1961 (st), Martinez Crovetto 8D-1 (CTES). **Tucumán:** Burruyacú, Cerro del Campo, 1000 m, Nov 1978 (fl), Venturi 7582 (F).

BOLIVIA. **Santa Cruz:** Prov. Florida, 4 km N of center of Samaipata (18°08'S, 63°52'W), 2000–2100 m, 31 Dec 1992 (fr), Nee & Vargas 43465 (ASU).

BRAZIL. **Rio Grande do Sul:** Continuacão da estrada Alegrete-Cerro do Tigre, apos o Cerro do Tigre, direçao rio Ibicuí, 11 Feb 1990 (fr), Falkenberg & Sobral 15235 (MBM); Pôrto Alegre, Montserrat, 13 Nov 1941 (fl), Emrich 8380 (LIL); Fazenda Faxinal, Arroio dos Ratos, 5 Nov 1980 (fl), Hagelund 13420 (CTES, NY); Morro das Abertas, 9 Jan 1949 (fl), Rambo 39674 (LIL); São Vicente do Sul, estrada a Cacequi, rio Ibicuí, Dec 1985 (st), Sobral & Marchiori 4544 (UB).

PARAGUAY. **Central:** Itá, Granja Isapy, orilla arroyo Lazarillo, 30 Jan 1966 (fr), Krapovickas et al 12231 (CTES). **Cordillera:** Ypacarai, 6 Dec 1950 (fr), Sparre & Vervoost 814 (LIL). **Misiones:** San Juan Bautista, ca. 8.5 km along road to Pilar, ca. 170 m, 8 Nov 1995 (fr), Landrum 8790 (ASU); Ea. La Soledad, 3 km S de Santiago (56°46'W, 27°10'S), 3–4 Feb 1988 (fr), Schinini & Vanni 26108 (ASU, CTES). **Paraguarí:** Rt. 1, between Quindy and Caapucú, near km 246 (26°S, 57°15'W), ca. 250 m, 7 Nov 1995 (st), Landrum 8764 (ASU).

URUGUAY. **Cerro Largo:** Arroyo Zapallar, 22 Dec 1961 (fr), Praderi 740 (LIL). **Durazno:** Est. Las Palmas, Mar 1922 (st), Osten 16563 (NY). **Montevideo:** La Colorada, 17 Nov 1947 (fl), Legrand 2711 (NY).

Paysandú: Chapiuy, orillas del río Uruguay, Sta. Sofia, 15 Nov 1942 (fl), Rosengurtt B-3250 (MO, NY).

Rivera: Tranqueras, (fl), Legrand 4145 (MICH, NY). **San José:** Rincón Gallinas, Dec 1931 (fl), Herter 8051 (MO). **Tacuarembó:** Cerro Dos Hermanos, Mar 1922 (fr), Osten 16651 (NY).

Phenology—Flowering mainly in November and December; fruiting from December to February.

Habitat and Distribution—Open habitats such as “campos” and grasslands, that are occasionally burned; Argentina and Uruguay to southeastern Brazil, Paraguay and Bolivia.

Distinguishing Features—See key to varieties.

This entity has long gone by the name *Psidium incanum* (O. Berg) Burret, which is the correct name if one recognizes it at the specific level. It most closely resembles var. *mucronatum* and intergrades with it. It also resembles southern morph 3 of *P. grandifolium*. The two are distinguished in lead 4 of the key.

17. *Psidium striatum* DC., Prodr. 3: 233. 1828. TYPE. Brazil. *Martius s.n.* (HOLOTYPE: M-32386, annotated by de Candolle).

Shrub or small tree 1–6 m high, the young growth densely to sparsely hirsutulous-pubescent; *hairs* 0.1–0.6 mm long, on external surfaces soft, whitish, usually spreading to erect, on inner surfaces of calyx and disk reddish brown, appressed; *young twigs* moderately to densely covered with spreading hairs or rarely glabrous, soon glabrescent, the young bark reddish brown to light gray, becoming dark reddish brown or dark gray, remaining smooth or becoming longitudinally striate or cracked or slightly flaky in age. LEAVES elliptic, ovate, or oblong-lanceolate, usually widest at the middle or below, 2.2–7(–12) cm long, 1.5–3(–5) cm wide, 1.5–3 times as long as wide, glabrous or with scattered hairs, or sparsely to densely pubescent along the midvein, the margin usually obscurely sinuate-crenulate; *apex* acute, acuminate, less often rounded-obtuse (rarely emarginate), often apiculate; *base* rounded, subcordate, or obtuse; *petiole* pubescent or glabrous, channeled, 1–3 mm long, 0.8–1.5 mm thick; *venation* brochidodromous, sometimes eucamptodromous proximally, the midvein impressed above, prominent below, the lateral veins 4–10 pairs, leaving the midvein at an angle of 45° to nearly 90°, the marginal vein broadly arching between the laterals, as much as 7 mm from margin between arches, the tertiary veins obscure or pronounced, irregularly dendritic; *blades* submembranous to subcoriaceous, drying gray-green to dark reddish brown, slightly lighter below than above, lustrous to dull above, usually densely dotted with glands. FLOWER BUDS 8–14 mm long, pyriform, the hypanthium campanulate, narrowly campanulate or fusiform, 3–5 mm long, the distal portion of bud subglobose to barrel-shaped, sometimes wider than long, 5–9.5 mm long; *indumentum pattern of buds* with peduncles moderately to thinly pubescent with spreading hairs, or glabrous, the bracteoles pubescent, the hypanthium pubescent to glabrous, the calyx puberulent within, pubescent to glabrous without, the petals glabrous or ciliate, the disk puberulent, the style glabrous; *peduncles* uniflorous (rarely 3-flowered), solitary, borne in the axils of leaves, usually terete, 0.9–2.3 cm long, 0.8–1 mm wide, thicker and somewhat woody at fruit maturation, usually puberulent with erect hairs; *bracteoles* narrowly triangular to filiform, ca. 1–2 mm long, caducous before bud matures. CALYX bowl-like, closed except for an apical pore nearly as wide as closed corolla, or completely closed, with no clear lobes evident before anthesis, extending 3–6(–8) mm beyond the ovary summit, densely glandular, at anthesis tearing somewhat irregularly or in 5 nearly equal lobes, the tears not cutting the staminal ring; *petals* obovate, 10–15 mm long; *hypanthium* densely glandular; *disk* ca. 4–5 mm across; *stamens* ca. 200–300, 8–15 mm long; *anthers* ca. 0.7–1 mm long, oblong, with a terminal gland and 0–2 smaller glands below, or 3–4 mm long, attenuate, with a terminal gland and up to at least 5 smaller glands below; *style* 10–15 mm long, the stigma peltate, 0.5–1 mm wide; *ovary* 3-locular, the placenta not peltate; *ovules* ca.

30–60 per locule, about 4-seriate (2-seriate on each lamella). FRUIT globose, 1–1.5 cm long, brown to green, sometimes tinted red; seeds ca. 80 in 1 fruit, probably often more, compressed, angular, C to L-shaped, ca. 4–5 mm long. (Figs. 21; 22).

Phenology—Flowering and fruiting throughout year; mainly flowering in November in Bolivia.

Habitat and Distribution—Along rivers or on islands in rivers, in sandy or rocky places; reported also from a white sand savanna. Found from Venezuela, the Guianas, Roraima to Mato Grosso do Sul in Brazil, and Bolivia.

Distinguishing Features—Calyx bowl-like, closed except for an apical pore, or completely closed, with no clear lobes evident before anthesis, extending 3–6(–8) mm beyond the ovary summit, at anthesis tearing somewhat irregularly or in 5 nearly equal lobes, the tears not cutting the staminal ring; peduncle usually terete, 0.8–1 mm wide, thicker and somewhat woody at fruit maturation, usually puberulent with erect hairs; seeds angular.

Psidium striatum has not been found in Paraguay. The population in northeastern Bolivia I recognize as var. *rondoniense* because of its unusual stamens. A specimen of *P. striatum* var. *striatum* with typical stamens has been collected in Mato Grosso, Brazil about 100 km east of southeastern Bolivia and northeastern Paraguay and possibly might be found in either country. A key distinguishing the varieties is provided below.

1. Stamens with filaments ca. 10 times as long as anthers; anthers oblong, 1–1.5 mm long.....
..... *P. striatum* var. *striatum*
- 1' Stamens with filaments 1.5–3 times as long as anthers; anthers elongate, narrowly sagittate, 2–3.5 mm long...
..... *P. striatum* var. *rondoniense*

17a. *Psidium striatum* var. *striatum*

Psidium striatum DC., Prodr. 3: 233, as to type, 1828.

Psidium turbiniflorum DC., Prodr. 3: 234. 1828. TYPE. Brazil. “in Brasilia,” Martius s.n. (HOLOTYPE: M-32388, annotated by de Candolle. Possible ISOTYPES: from Ega on Rio Negro, M-32387, M-146858!).

Psidium aquaticum Benth., J. Bot. (Hooker) 2: 318. 1840. TYPE. Guyana. Schomburgk 191 (HOLOTYPE: K-565506; ISOTYPES: BM-796830, BR-5281459!, E-167679, F-76381!, F-76382!, MICH-1210416, P-2428283, US-117654, W-46098!).

Psidium parviflorum Benth., J. Bot. (Hooker) 2: 318. 1840. TYPE. Guyana. “on the Essequibo and Rupunoony,” Schomburgk 110 (SYNTYPES: K-565174 [annotated as isotype], K-565402; ISOSYNTYPES: BM-796861, E-167680, F-65709, P-258400!, P-258401!, TCD-4963, US-117671, W-48041).

Psidium aquaticum var. *uniflorum* O. Berg, Linnaea 27: 354. 1856. Illegitimate name to be replaced by the autonym *Psidium aquaticum* var. *aquaticum* because Berg cites *P. aquaticum* under that variety.

Psidium aquaticum var. *triflorum* O. Berg, Linnaea 27: 355. 1856. TYPE. Guyana [“Guiana Anglica”]. Rich. Schomberg 539 (HOLOTYPE: B, lost).

Psidium leptocladium O. Berg, in Mart., Fl. bras. 14(1): 409. 1857. TYPE. Brazil. “ad flumen Rio Maranhao in prov. Goyazensi,” Pohl 1018 (SYNTYPES: W-16678, W-16679).

Psidium persicifolium O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. Brazil. “in montibus Serra d’Acurua prov. Bahiensis, [11.5S, 42.5W]” “v. in hb. Berol., Mart., Vindob,” Blanchet 2916 (SYNTYPES: BR-528154!, W-16676, W-18890124691; ISOSYNTYPES: BM-796800, E-167674, F-65711, G-227672!, HAL-89787, K-18468, LE-6997, MICH-1210427!, P-258398!, P-258397!, P-258399!).

Guajava [*s*]*striatula* (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava *parviflora* (Benth.) Kuntze, Revis. Gen. Pl. 1: 240. 1891.

Guajava *persicifolia* (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Guajava *turbiniflora* (DC.) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Myrtus *striatula* (DC.) O. Kuntze, Revis. Gen. Pl. 3(3): 92. 1898.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Psidium parviflorum var. *saramaccense* Amshoff, Bull. Torr. Bot. Club 75: 537. 1948. TYPE. Surinam. "Saramacca River," Maguire 24930 (HOLOTYPE: NY-1288075!; ISOTYPES: F-76391!, K-565403, U-5190, US-117672).

Psidium parviflorum var. *coppename* Amshoff, Fl. Suriname 3, pt. 2: 153. 1951. TYPE. Surinam. "Coppename R," Boon 1083 (SYNTYPE: U?), "Raleighfalls" Stahel 4654 (SYNTYPE: U?) and "Raleighfalls" Lanjouw 997 (SYNTYPES: U-5188, U-5189; ISOSYNTYPES: K-565418, NY-1288072!).

Leaves lustrous above or not, the base obtuse to subcordate; stamens with filaments ca. 10 times as long as the anthers; anthers oblong, 1–1.5 mm long.

Representative specimen examined. BRAZIL. Mato Grosso: Fazenda Barranco, Pantanal do Rio Negro (19°30'S, 56°10'W), 26 May 1989 (fl), Dubs 981 (ASU0015614).

17b. *Psidium striatulum* var. *rondoniense* Landrum, J. Bot. Res. Inst. Texas 15(2): 540. 2021. TYPE. Brazil. Rondônia: Mineração Campo Novo, ca. 100 km SW of Ariquemes, forest on terra firma, 10°34'S, 63°37'W, 16 Oct 1979 (fl), J. L. Zarucchi, M. G. Viera, R. H. Petersen, C. D. Mota, & J. F. Ramos 2722 (HOLOTYPE: INPA (seen as image); ISOTYPES: MICH!, NY!, R!, US!).

Leaves often lustrous above, the base usually subcordate; stamens with filaments 1.5–3 times as long as the anthers; anthers elongate, narrowly sagittate, 2–3.5 mm long.

Representative specimens examined. BOLIVIA. Beni: Prov. Yacuma, Bosque de Chimanés, ca. 20 km SW of San Ignacio, road to Hervel sawmill (ca. 15°10'S, 65°45'W), 250 m, 24 Oct 1989 (fl), Foster & Terceros 13368 (F). Santa Cruz: Prov. Velasco, a 150 km de Florida a Bella Vista, (13°42'10"S, 61°31'59"W), 4 Nov 1994 (fl), Guillén et al. 2541 (ASU0015611); P. N. Noel Kempff M., Las Torres (13°39'20"S, 60°49'08"W), 200 m, 29 Nov 1994 (fl), Jardim & Quevedo 189 (ASU0015619); P. N. Noel Kempff M., Campamento Flor de Oro (13°38'24"S, 60°47'45"W), 200 m, 22 Nov 1993 (fr), Quevedo et al. 2533 (ASU0015620).

18. *Psidium suffruticosum* Berg, in Martius, Fl. bras. 14(1): 387. 1857. TYPE. Brazil. "in pascuis desertorum Brasiliae," Pohl 1021 (original material cited at B, M, W; LECTOTYPE: W-0046104! [isotype designated as lectotype by Landrum, 2005]; ISOLECTOTYPES: M-146859!, = F neg 19727, BR-5267231!, K-565293, K-565294).

Psidium alatum O. Berg, in Mart., Fl. Bras. 14(1): 604. 1859. TYPE. Brazil. "Serra da Chapada prov. Minarum," Riedel s.n. (HOLOTYPE: LE-6973, = ASU photo).

Psidium suffruticosum var. *alata* Kiaersk., Enum. Myrt. bras. 27. 1893. TYPE. Brazil. "Lagoa Santa," "São Simão," Warming s.n. (SYNTYPE: C) and Lofgren 212 (SYNTYPE: C; ISOSYNTYPE: SP!, = photo specimen ASU0116498) and Glaziou 16972 (SYNTYPE: C; ISOSYNTYPE: R-8952!, = ASU photo).

Guajava suffruticosa (O. Berg) Kuntze, Revis. Gen. Pl. 1: 239. 1891.

Psidium australe var. *suffruticosum* (O. Berg) Landrum, SIDA 21(3): 1344. 2005.

Shrub up to ca. 30 cm high, sprouting from a fire-resistant underground stem, glabrous or essentially so except for puberulent inner calyx-lobe surface and young growth, the surfaces often with numerous raised glands; hairs minute, whitish; young twigs 4-angled, gray-green, becoming darker gray to light brown with age, the bark of older stems becoming flaky, reddish brown. LEAVES oblanceolate, obovate, narrowly elliptic, 5–9 cm long, 1.3–4.6 cm wide, 1.6–5.6 times as long as wide; apex acute, acuminate or rounded, often with an abruptly acuminate tip; base cuneate to acute; petiole essentially none to ca. 2 mm long, 2–1.5 mm wide, usually channeled; venation eucamptodromous proximally to brochidromous distally, the midvein flat to slightly impressed above, prominent below, the lateral veins 5–8, ascending at an angle of less than 45 degrees, raised above and below, the marginal vein only evident distally, up to 3(–6) mm from the margin, the tertiary veins branching dendritically, often more prominent

above than below; *blades* coriaceous, lustrous above, drying gray-green, dark olive green, to dark reddish brown above, usually lighter below. FLOWER BUDS pyriform, 5–8 mm long, the hypanthium campanulate to infundibular, 2–3.5 mm long, the distal portion of bud subglobose, 3–5 mm long, sometimes wider than long; *indumentum pattern of buds* with all surfaces glabrous except for the puberulent inner surface of the calyx; *peduncles* 1–3-flowered, (2–)10–37 mm long, 0.8–1.5 mm wide, the arms of the dichasia 2–13 mm long; *bracteoles* narrowly deltoid-lanceolate, 2–3 mm long, usually falling before anthesis. CALYX in young bud closed except for an apical pore surrounded by 5 minute lobes, tearing more or less regularly between at least some lobes at anthesis for about 1/2 of bud's length to staminal ring; *petals* suborbicular to obovate, ca. 9 mm long; *disk* ca. 5–10 mm across; *stamens* 6–9 mm long, 140–300; *anthers* 0.5–1 mm long, with a single gland; *style* ca. 8 mm long; *ovary* 3–4-locular; *ovules* 20–47, the placenta not peltate, hidden by the ovules. FRUIT subglobose, 1–2 cm in diameter; *seeds* 6–11 per fruit, 3–5 mm long. (Fig. 23).

Representative specimens examined. **BOLIVIA.** Santa Cruz: Prov. Velasco, Parque Nacional Noel Kempff Mercado (13°53'41"S, 60°48'46"W), 500 m, 28 Jan 1997 (fl), *Soto et al.* 424 (ASU0005422); José Miguel de Velasco, Ñuflo de Chávez, 15 km por el camino de Santa Rosa a Piso Firme (15.8117"S, 61.4846"W), 358 m, 14 Nov 2008 (fr), *Wood & Soto* 25359 (ASU0078689-photo).

BRAZIL. Mato Grosso. 13°50"S, 60°08'W, 29 Nov 1977 (fr), *Silva Costa* 1300 (ASU0005423).

PARAGUAY. Amambay: Sierra de Amambay (ca. 23°S, 56°W), 1912–1913 (fl), *Hassler* 11401 (ASU0005421-photo, NY); Canindeyu: Ygatimi', Res. Natural del Bosque Mbaracayú, Nandu Rocai (ca. 24°10"S, 55°40'W), 19 Nov 1995 (fl), *Landrum* 8857 (ASU0005424).

Phenology—Flowering mainly in October and November; fruiting from November to May.

Habitat and Distribution—Campos, cerrado, grasslands, frequently burnt areas; Mato Grosso, Minas Gerais, and São Paulo in Brazil; Bolivia and Paraguay.

Distinguishing Features—Calyx of flower bud nearly closed in young flower bud, tears forming between lobes as flower bud opens; leaves often 3 or more times as long as wide, lustrous above, glabrous or nearly so below; peduncles usually more than 2 cm long, usually 3-flowered; seeds up to ca. 11; placenta not peltate, hidden by ovules.

I have previously recognized this entity as a variety of *Psidium australe*, to which it seems to be closely related and with which it may hybridize (e.g., *Souza et al.* 7135, ASU0005418). They are compared in lead 11 of the key.

Excluded species

Psidium rufinerum Barb. Rodr., Myrt. Paraguay 15. 1903. TYPE. Paraguay. "Sierra de Maracayú" *Hassler* 5232 (HOLOTYPE: G-72801!) =*Campomanesia pubescens* (DC.) O. Berg.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

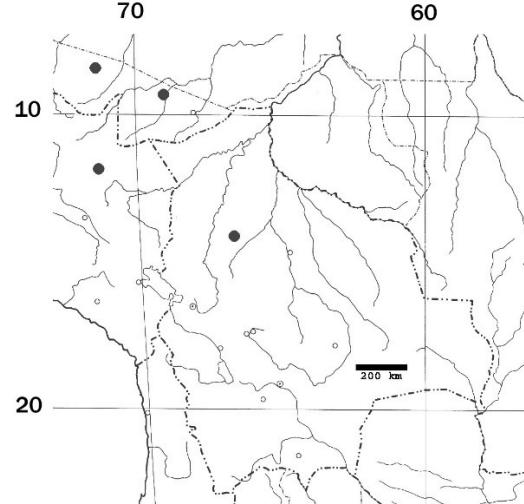
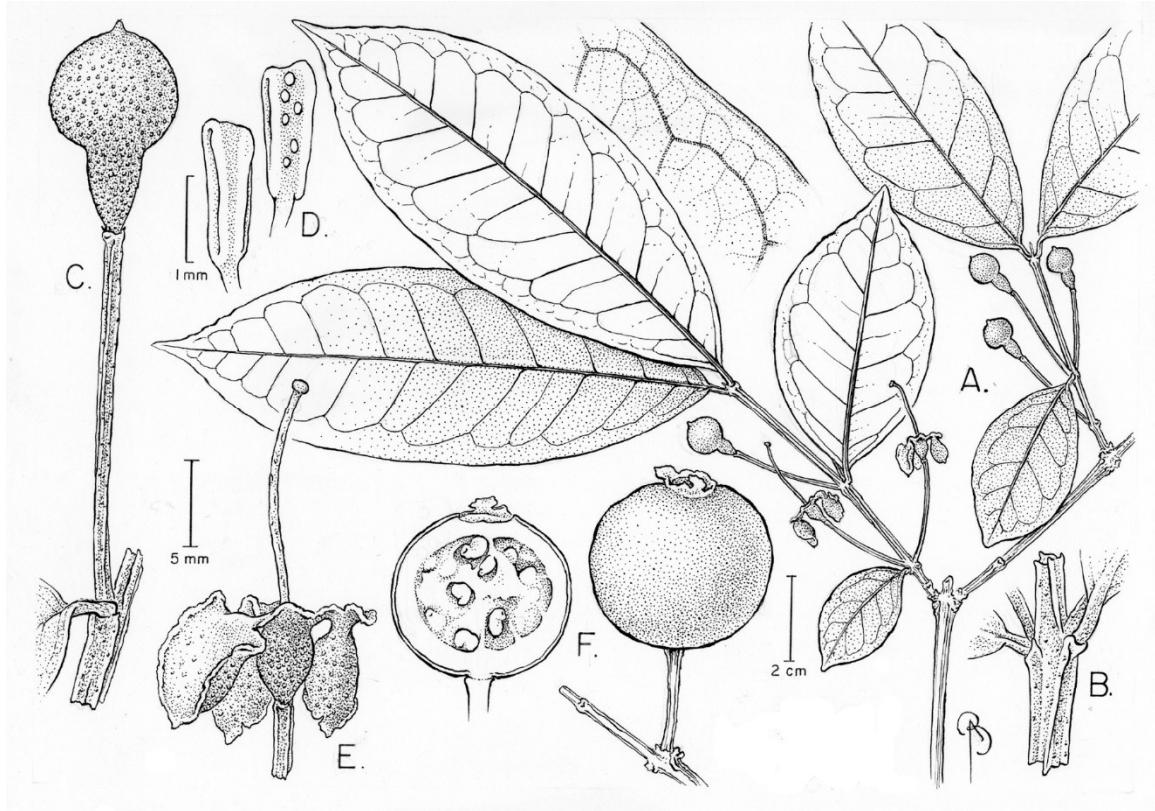


Figure 3. *Psidium acidum*: illustration, photo, and map. **A.** Flowering branch. **B.** Detail of winged twig. **C.** Closed flower bud. **D.** Anthers with multiple glands. **E.** Flower after anthesis. **F.** Fruit, whole and sectioned. **G.** Seeds. (A–E from Perea et al. 2098, ASU0005139; F, G from Cerón 3634, ASU0005129).

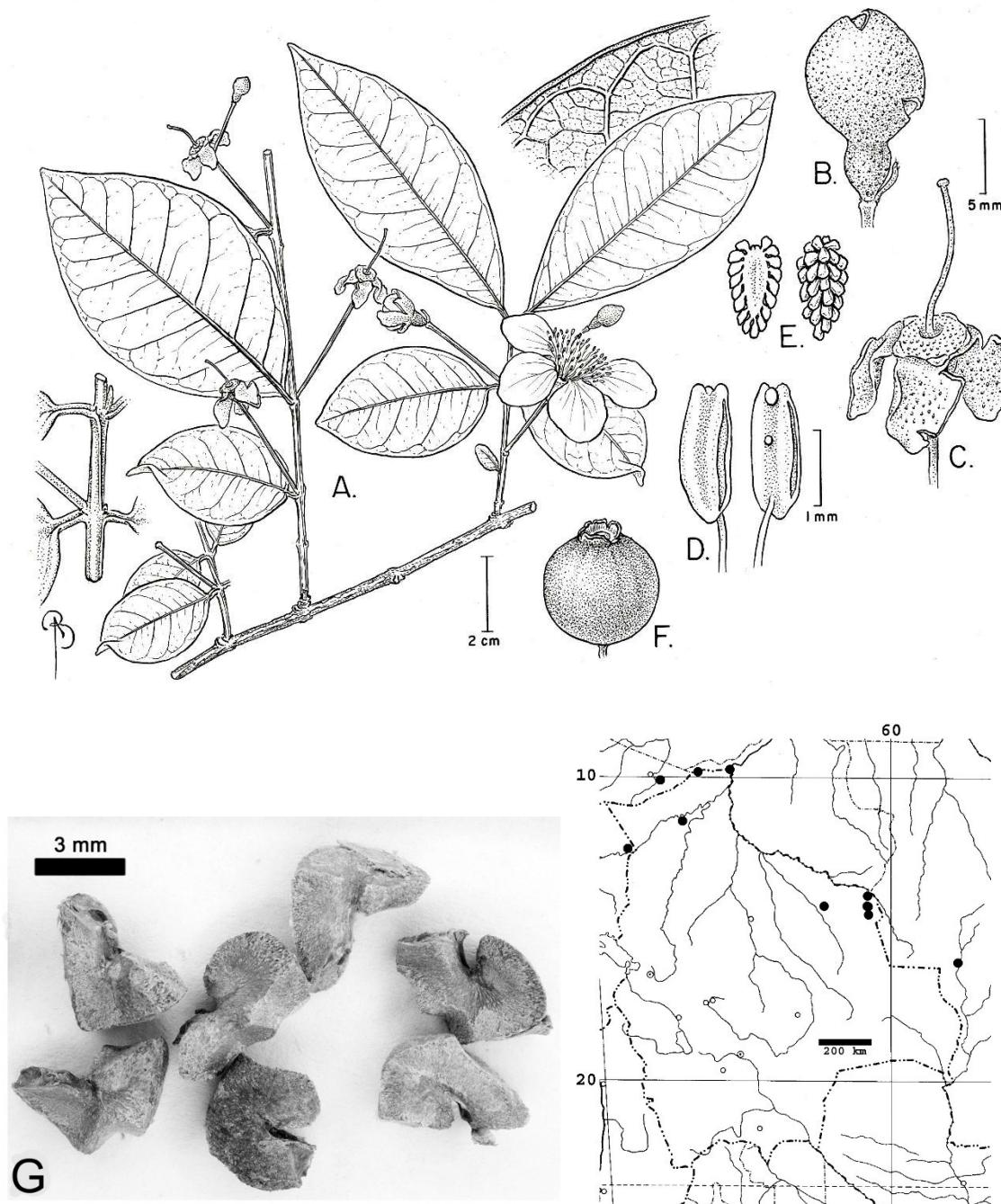


Figure 4. *Psidium acutangulum*: illustration, photo, and map. **A.** Branch with flowers at various stages; uniflorous and dichasial inflorescences; detail of leaf venation and winged twigs. **B.** Flower bud beginning to open; with one persistent bracteole. **C.** Flower after anthesis showing irregular opening of calyx. **D.** Two views of anther, showing terminal gland and additional gland below. **E.** Two views of peltate placenta with ovules, outwardly directed on left, inwardly directed on right (placenta attachment not included would be a membrane near center of right view). **F.** Fruit with the calyx mainly detached. **G.** Angular shaped seeds. (A–C from Oliveira 572, ASU0005124; D from Huamantupa 7813, ASU0018795; E from Foster 738, ASU0005150; F, from Mutchnick 1041, ASU0005090; G from Mutchnick 1275, ASU0005080).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

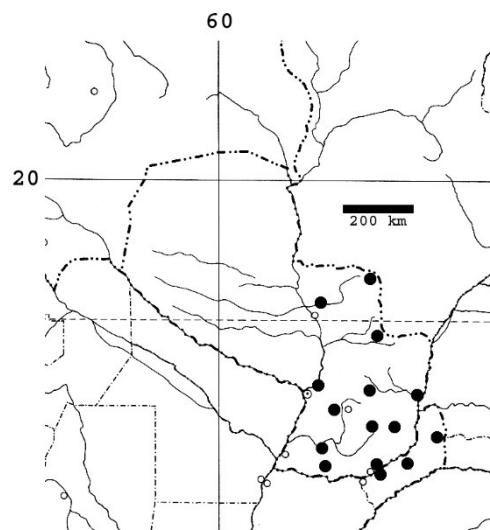
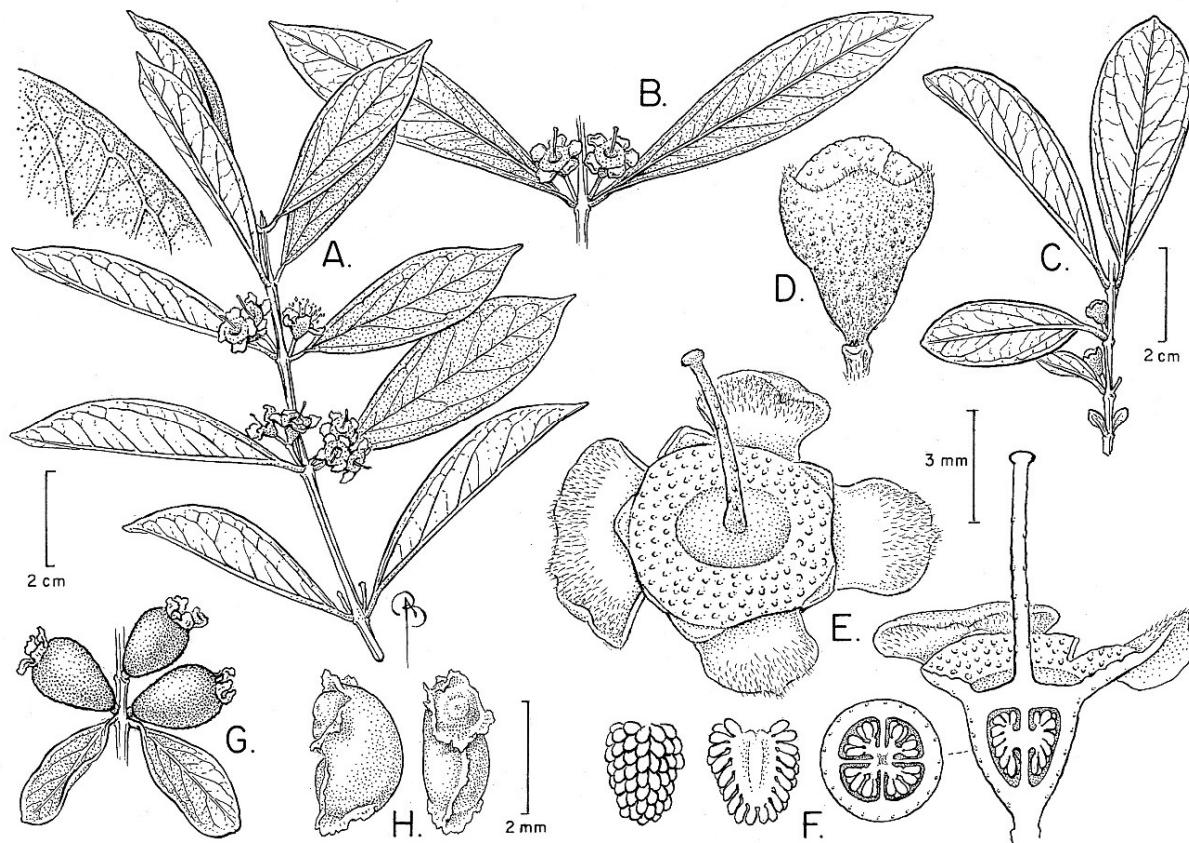


Figure 5. *Psidium australe* var. *australe*: illustration and map. **A.** Flowers, twig, and portion of leaf showing venation. **B.** Twig, leaves, and old flowers. **C.** Twig, leaves and flower buds. **D.** Closed flower bud. **E.** Distal view of flower after anthesis. **F.** Longitudinal section of flower bud; cross section of ovary; extracted placenta and ovules: adaxial view on right and abaxial view on left. **H.** Two views of seed with remnants of endocarp attached. (A, E and F from Silva 739, ASU0005175; B from Hatschbach 55798, ASU0005167; C, D from Landrum 8798, ASU0005172; G from Zardini 9027, ASU0005408; H from Oliveira 359, ASU0005409).

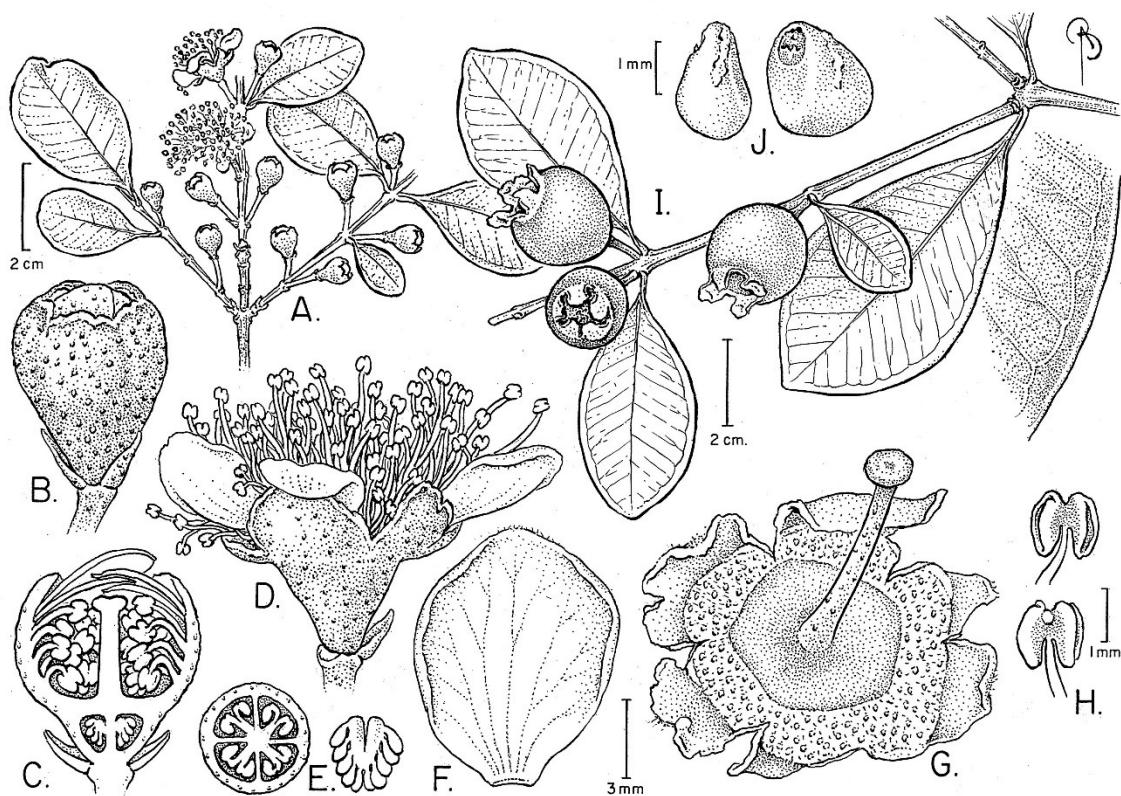


Figure 6. *Psidium cattleyanum*: illustration. **A.** Twig at beginning of anthesis. **B.** Flower bud. **C.** Longitudinal section of flower bud. **D.** Opening flower. **E.** Cross section of ovary and extracted placenta with ovules. **F.** Petal. **G.** Apical view of flower after anthesis showing tears in calyx cutting into staminal ring. **H.** Two views of stamen and anther with single terminal gland. **I.** Fruiting twig. **J.** Seeds. (A–C from Rossato et al. 4855, ASU0006118; D from photograph of live specimen; E–H from Folli 4925, ASU0006103; I from Baitello 414, ASU0006091; J from Carvalho et al. 6859, ASU0006121).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

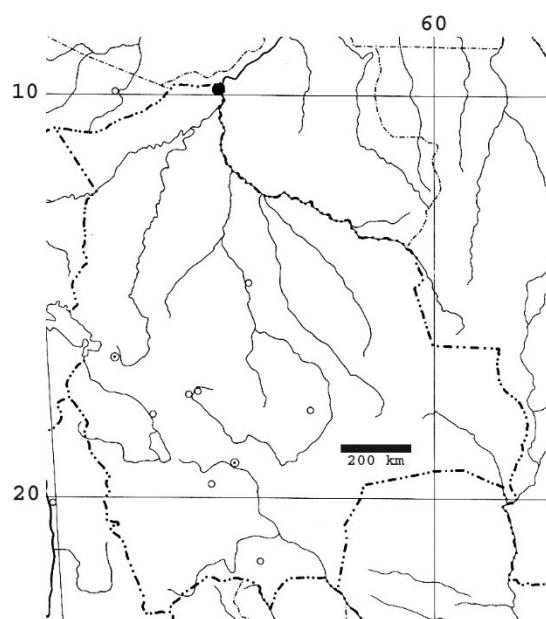
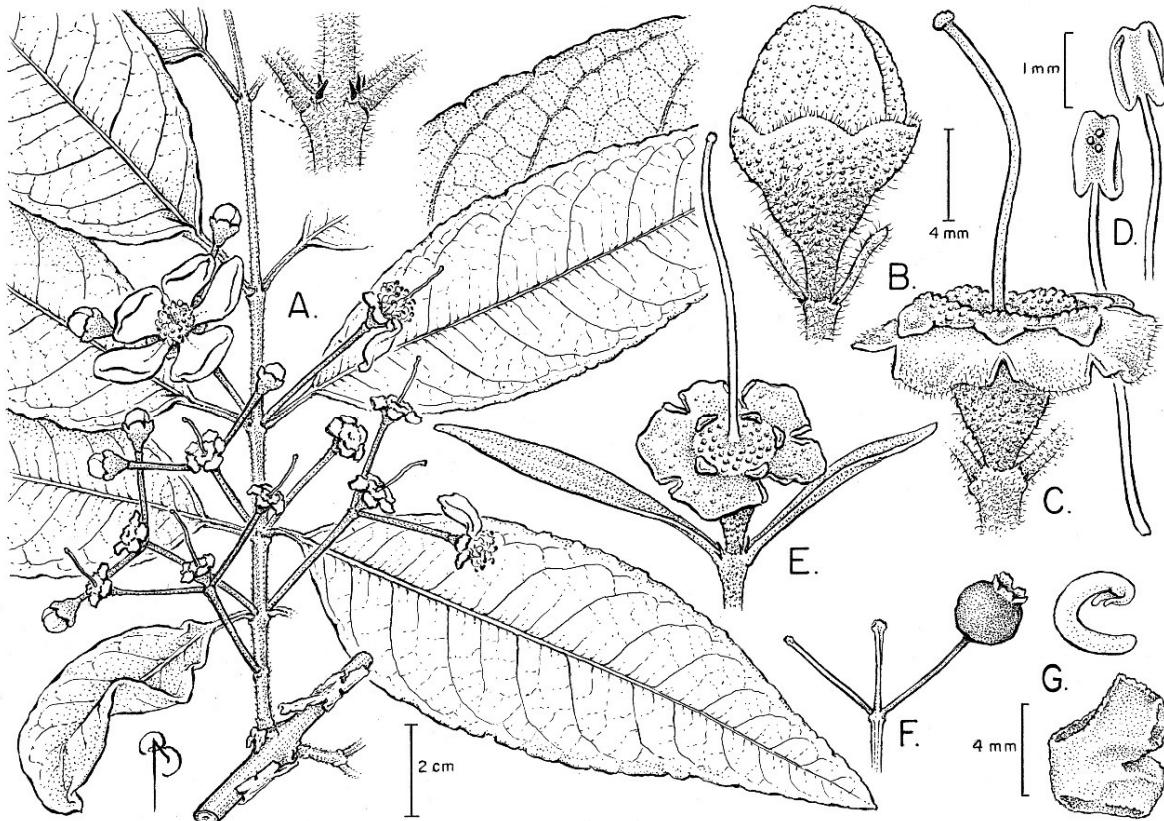


Figure 7. *Psidium densicomum*: illustration and map. A. Branch with dichasial inflorescences; close-up of node with colleters present in leaf axils. B. Closed flower bud. C. Flower after anthesis (pubescent), with tears forming between lobes of calyx. D. Stamens with glands in some anthers. E. Flower after anthesis (subglabrous). F. Fruit. G. Angular seed; embryo. (A–D from *Cid* 4144, ASU0006143; E from *Gentry & Perry* 78002, ASU0006142; F, G from *Pipoly et al.* 14846, ASU0006149).

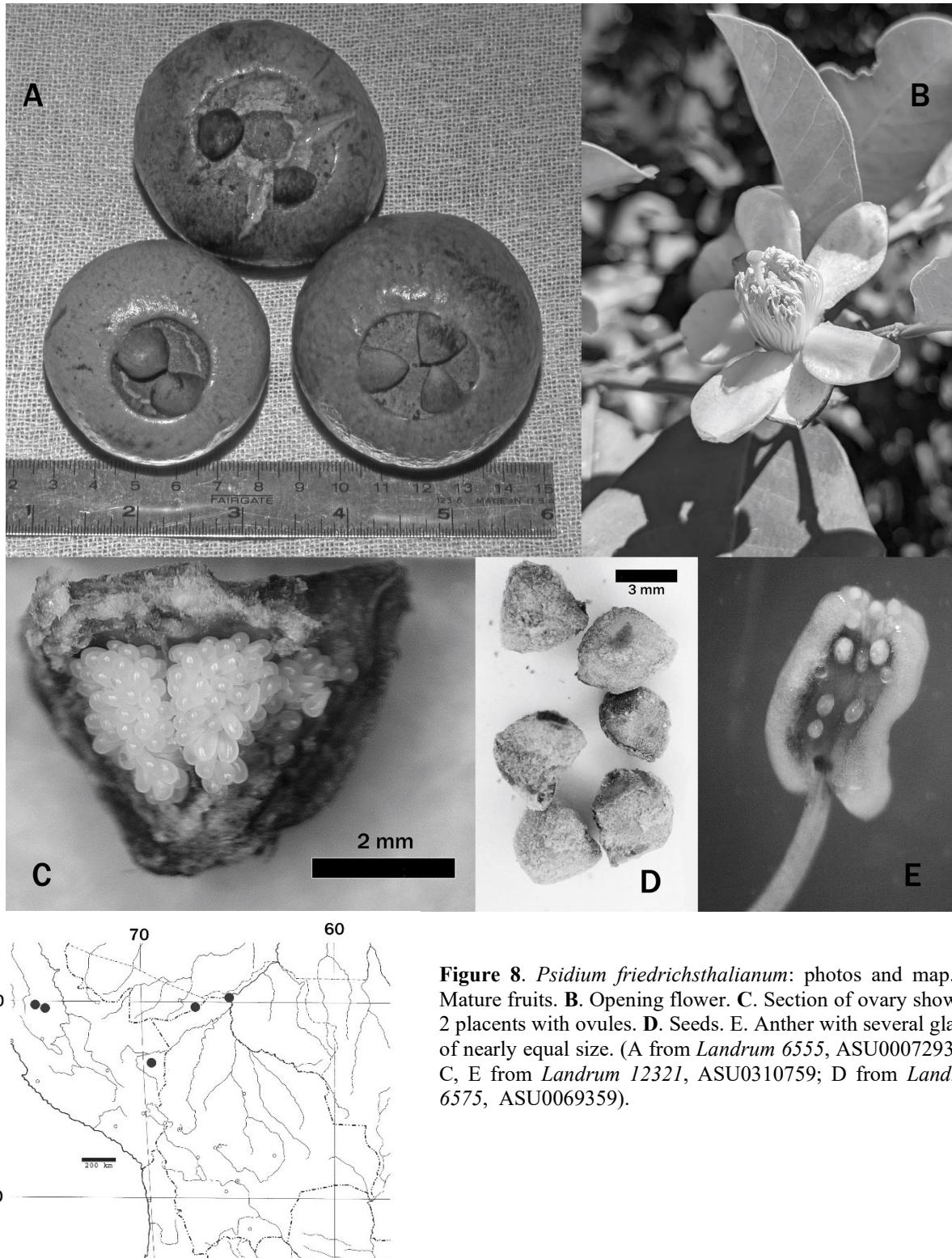
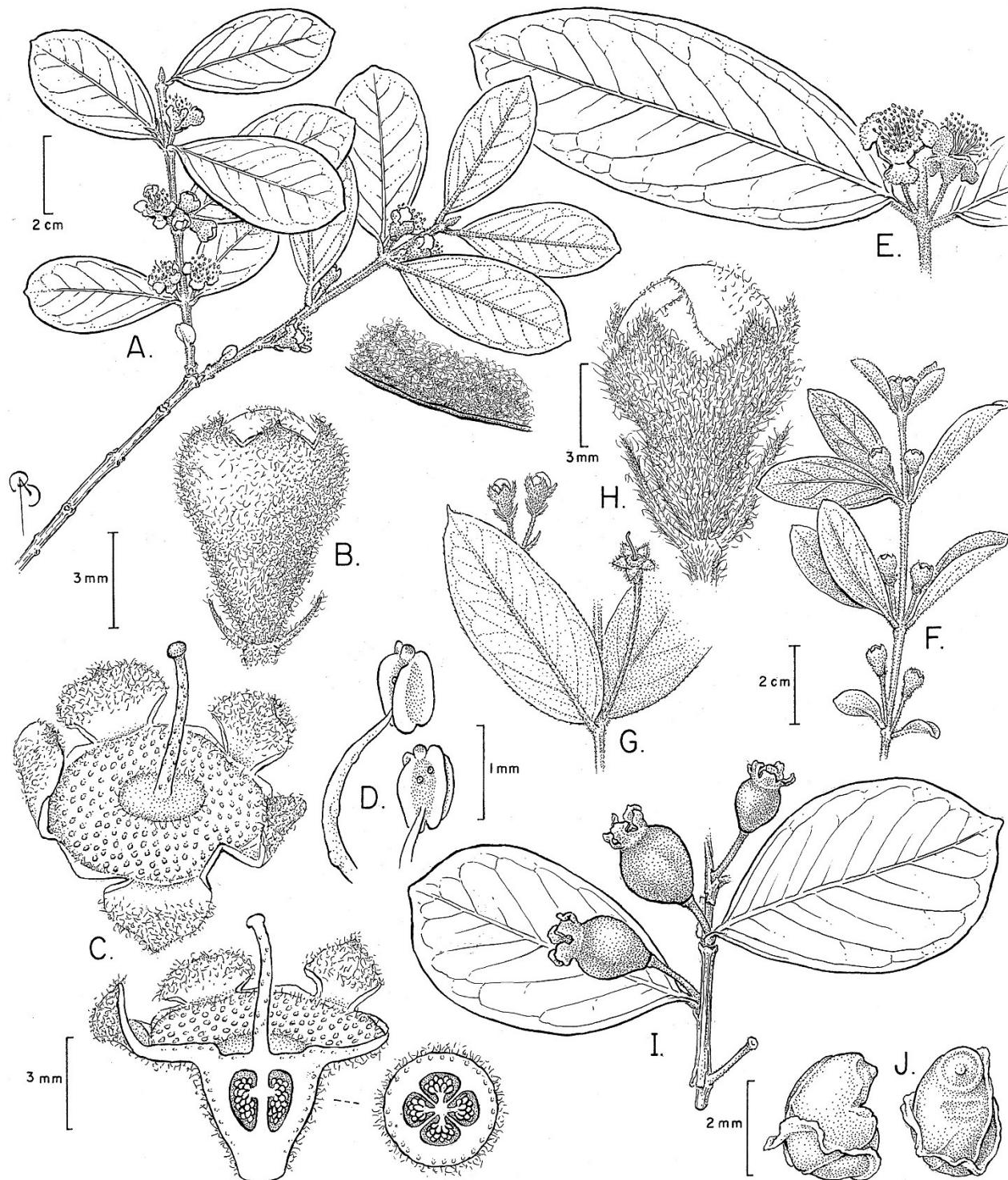


Figure 8. *Psidium friedrichsthalianum*: photos and map. **A.** Mature fruits. **B.** Opening flower. **C.** Section of ovary showing 2 placentas with ovules. **D.** Seeds. **E.** Anther with several glands of nearly equal size. (A from Landrum 6555, ASU0007293; B, C, E from Landrum 12321, ASU0310759; D from Landrum 6575, ASU0069359).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY



Psidium grandifolium See caption on following page.

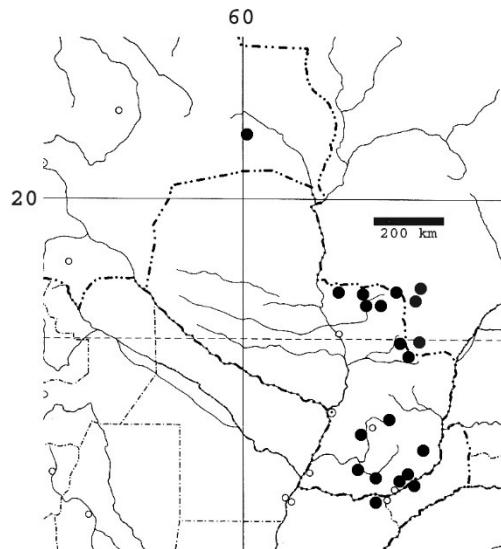


Figure 9. *Psidium grandifolium*: map and illustration (on previous page) showing some of the geographic variation in this species. **A.** Branch with leaves, flower buds, and open flowers; detail of lower leaf surface. **B.** Closed flower bud (northern morphology). **C.** Apex of flower after anthesis, tears in the calyx scarcely cutting the staminal ring; longitudinal and cross sections of similar flowers. **D.** Two views of anther with terminal gland and 2 smaller glands below. **E.** Node with two leaves and two open flowers (northern morphology 1). **F.** Shoot with 3-leaved whorls at 2 nodes and flower buds. **G.** Node with 2 leaves, 2 flower buds (part of a dichasium) and a single flower after anthesis (southern morphology). **H.** Closed flower bud (southern morphology). **I.** Shoot with two alternate leaves (occasionally found in this species) and 3 fruits. **J.** Two views of a seed with remnants of endocarp attached. (A–D from Harley 26964, Bahia, Brazil, ASU0007317; E from Gottsberger 11-27990, Minas Gerais, Brazil, ASU0007315; F from Krapovickas 45798, ASU0007391, San Pedro, Paraguay; G, H, Carnevali 4947, Corrientes, Argentina, ASU0006708; I–J from Souza 10407, São Paulo, Brazil, ASU0007377). See explanation of morphologies under species discussion.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

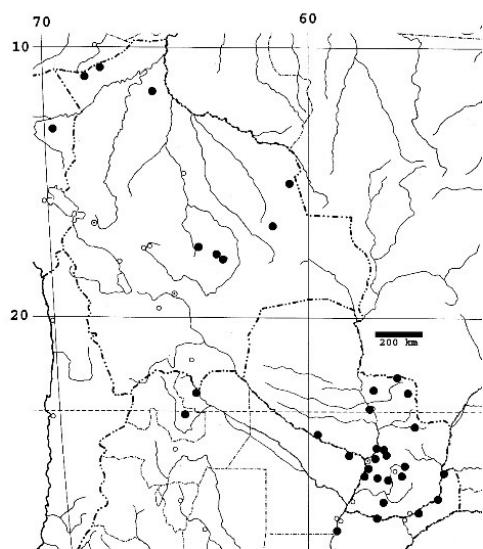
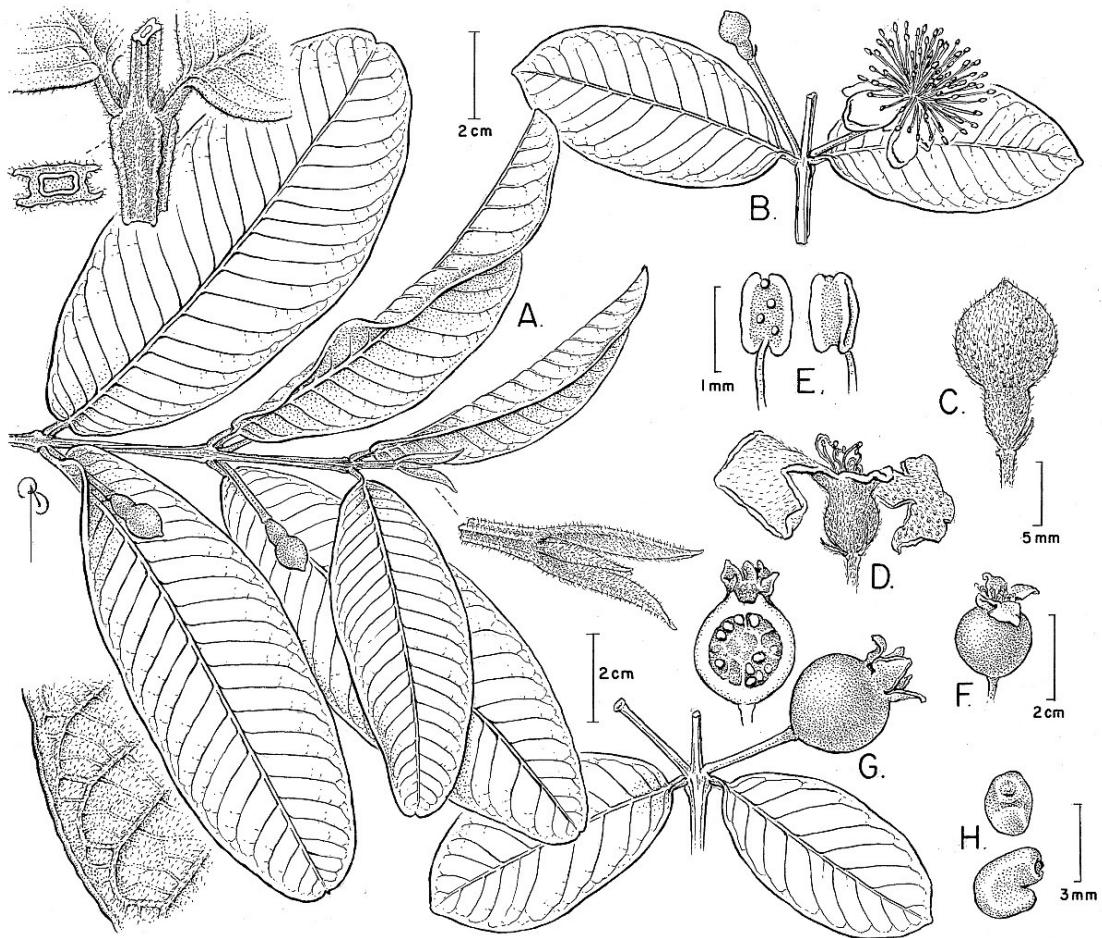
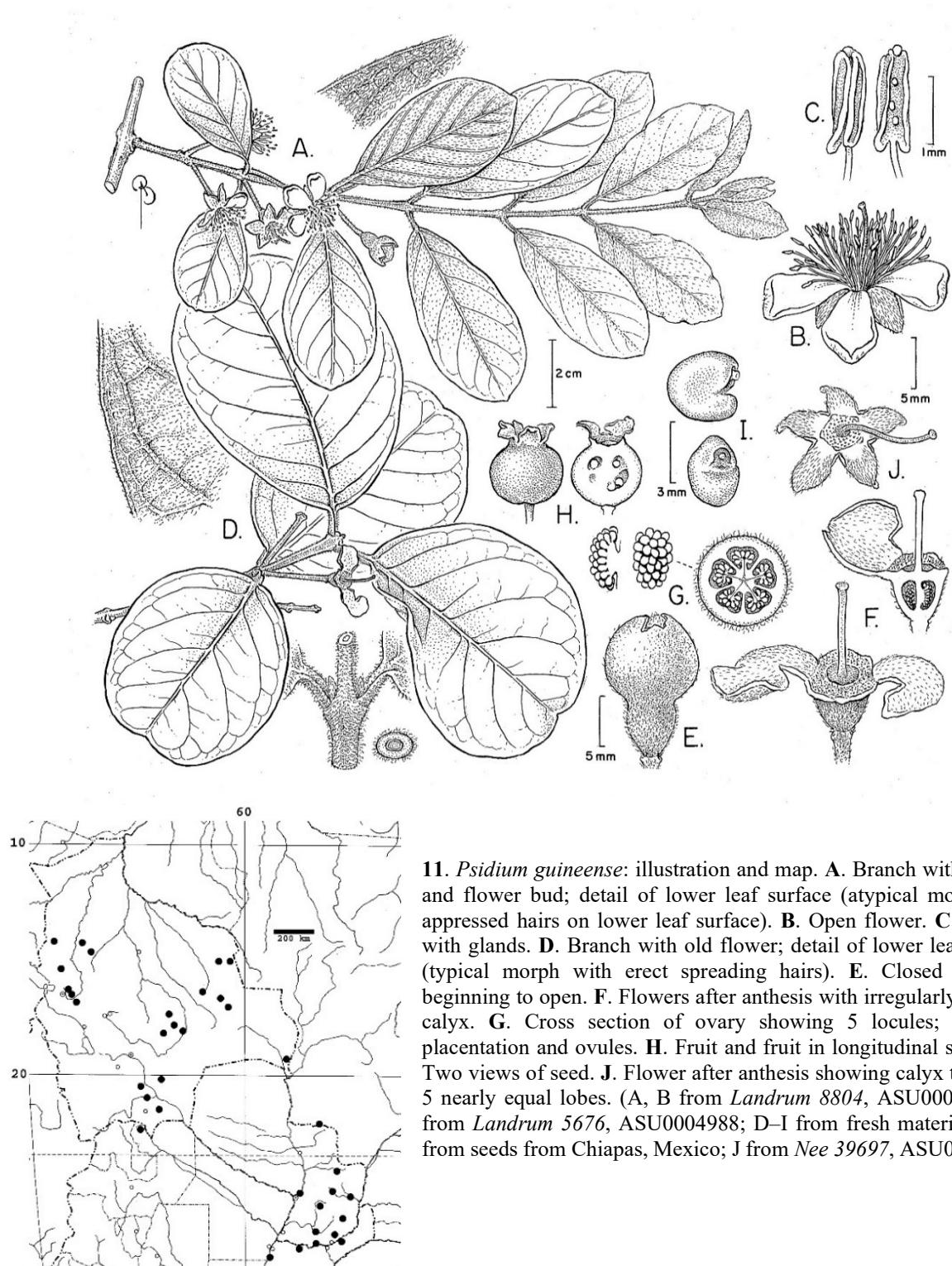


Figure 10. *Psidium guajava*: illustration and map. **A.** Branch with flower buds, including close-ups of node showing wings on twigs (upper left) and growing tip with two decussate pairs of immature leaves (right). **B.** Node with open flower and closed bud. **C.** Closed bud with one persistent bracteole. **D.** Flower after anthesis with irregularly torn calyx. **E.** Two views of anther with multiple glands. **F.** Fruit. **G.** Node with fruit attached and longitudinal section of fruit showing seeds. **H.** Two views of a seed. (A from fresh material from Tempe, Arizona, unknown origin; B, E from Sanders 8615, ASU0004830; C, D & F from Landrum 6301, ASU0004836; G, H from Landrum 6343, ASU0004869).



THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

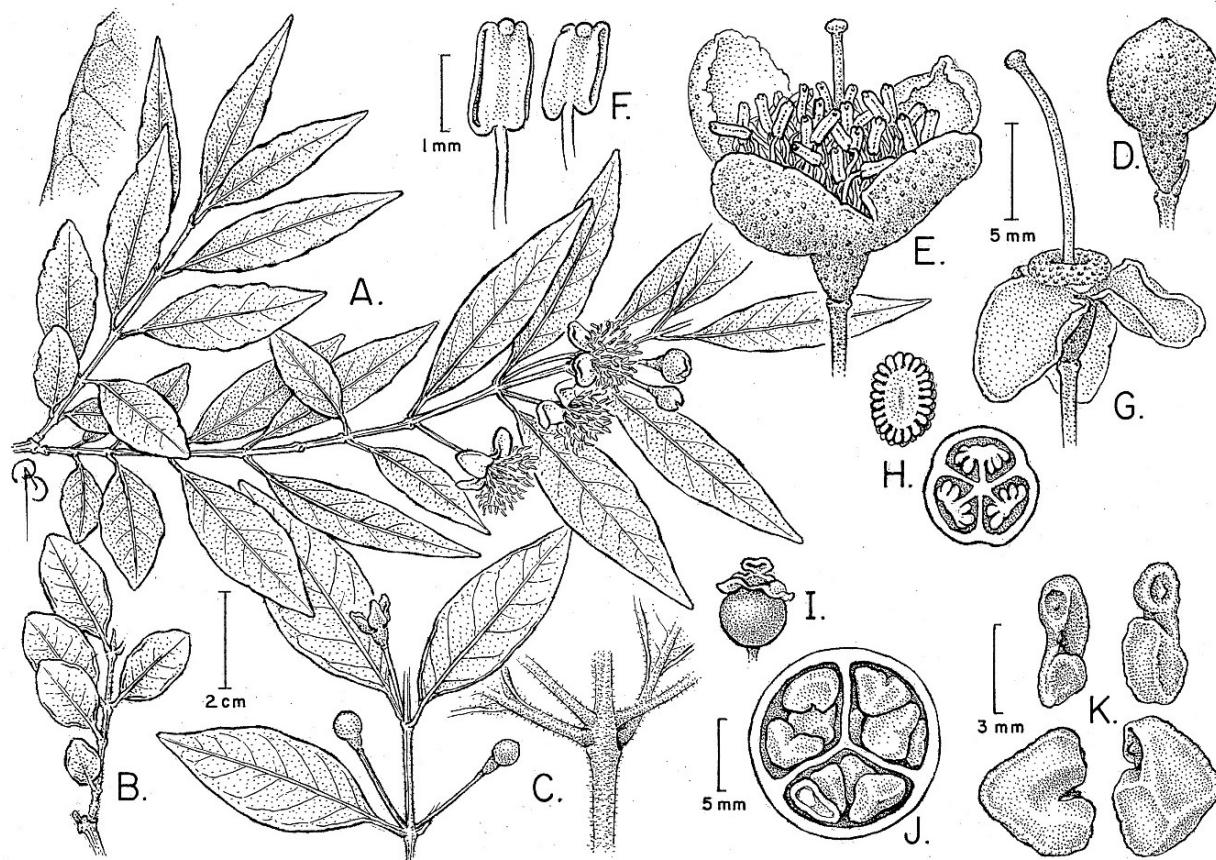
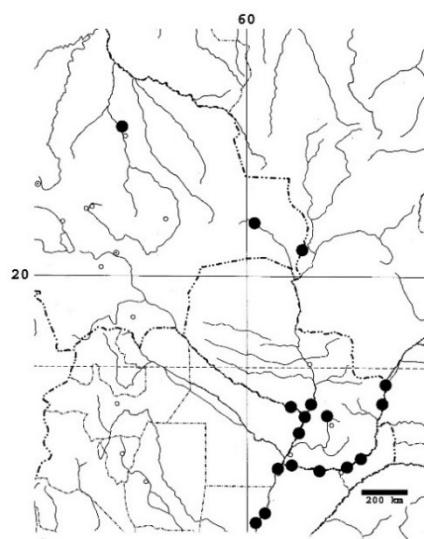


Figure 12. *Psidium kennedyanum*: illustration and map. A. Branch with buds and flowers, typical morphology (from Villa Hayes, Presidente Hayes, Paraguay). B. Morphology with small elliptic leaves (from Yacuma, Beni, Bolivia). C. Portion of twig with flower buds and opening flower; detail of node and peduncles. D. Closed flower bud. E. Opening flower. F. Anthers with one terminal gland. G. Flower after anthesis. H. Ovary in cross-section and extracted placenta with ovules. I. Fruit with persistent calyx. J. Cross-section of fruit showing angular seeds. K. Views of angular seeds. (A, D, & F-I from Landrum 8879, ASU0008073; B from Foster 13368, ASU0015615; C, E from Hatschbach 52495, ASU0008064; J, K from Zardini 25759, ASU0008070).





Psidium laruotteanum. See caption on following page.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

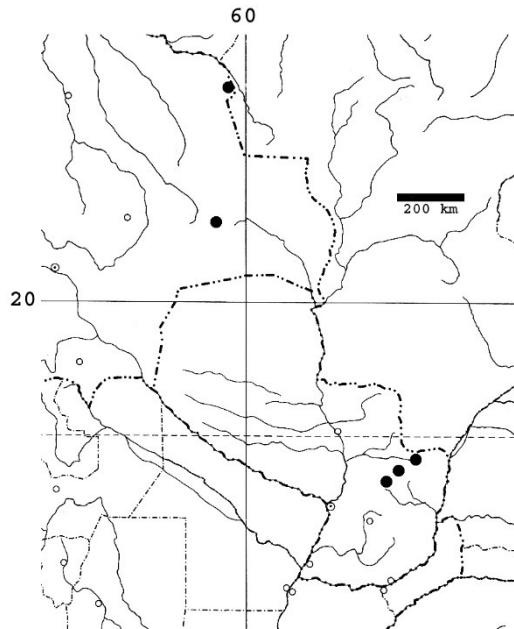


Figure 13. *Psidium larotteanum*: photographs (see previous page) and map. **A.** Young branch of 0.7 m shrub; note large leaves. **B.** Portion of an herbarium specimen showing full stature of plant with new growth arising from ground level stem. **C.** Close view of flowers. (A, from Ribas & Pereira 1812, ASU0008094; B, C, from Hatschbach 53638, ASU0008095). Reproduced from Landrum (2003).

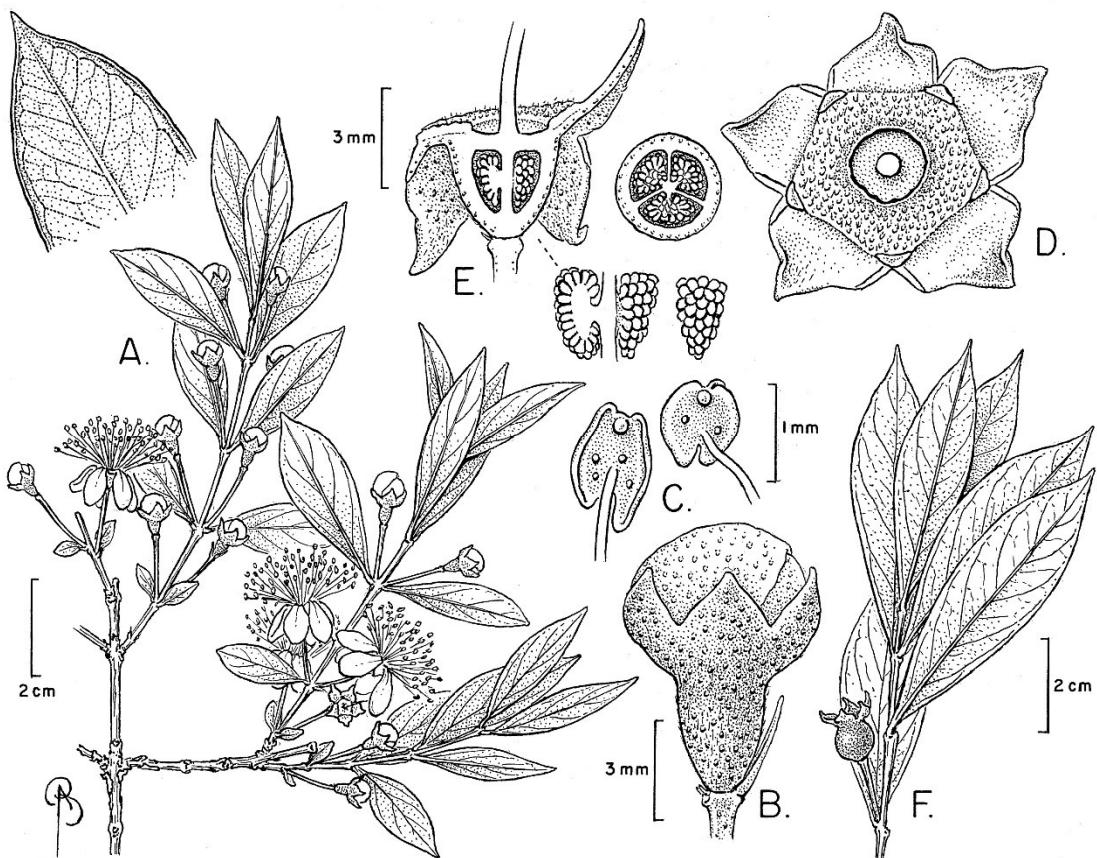


Figure 14. *Psidium missionum*: illustration and map. **A.** Branch with flowers and buds at various stages plus detail of venation in distal portion of leaf. **B.** Closed flower bud. **C.** Anthers with terminal gland and additional glands below. **D.** View of flower apex after anthesis with small tears between calyx lobes. **E.** Sections of ovary and extracted placenta with ovules. **F.** Branchlet with leaves and fruit. (A-C from Keller 7576, ASU0066964; D, E from Krapovickas 44607, ASU0008130; F from Landrum 5718, ASU0008126).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

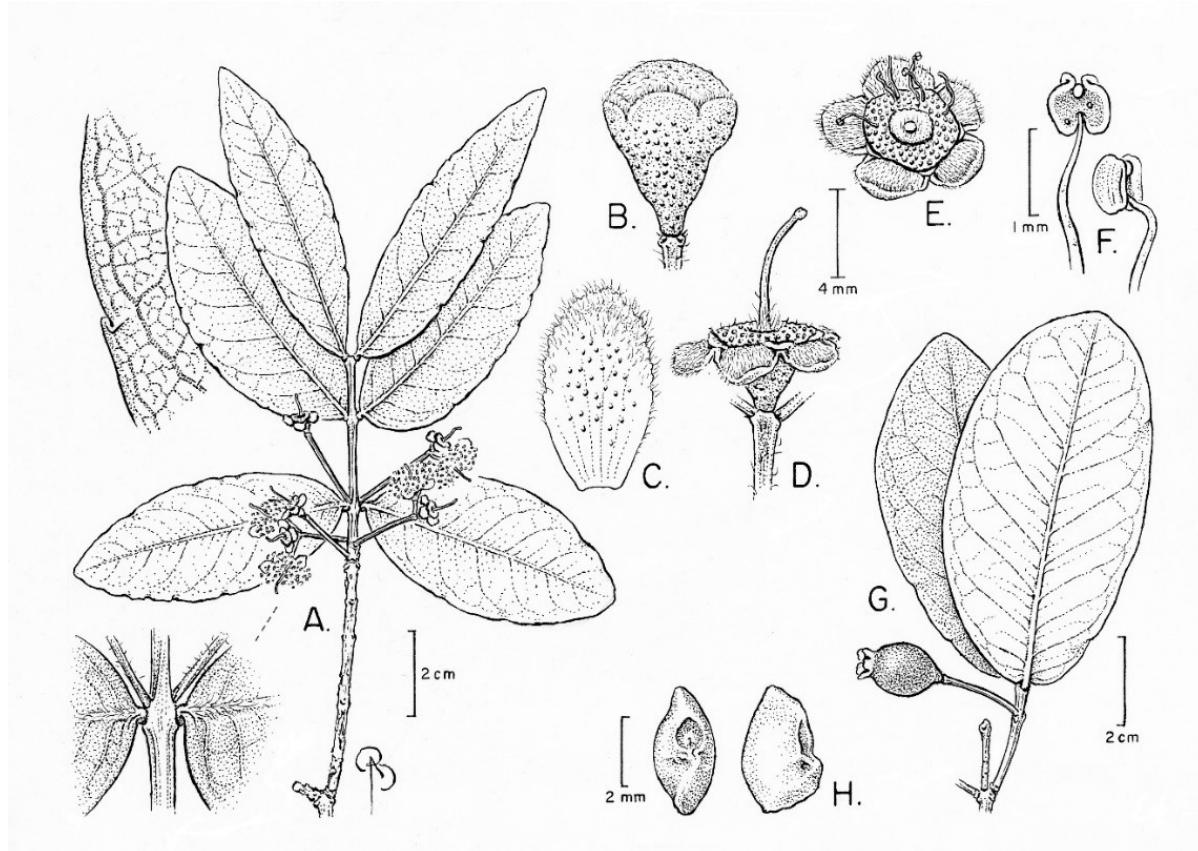
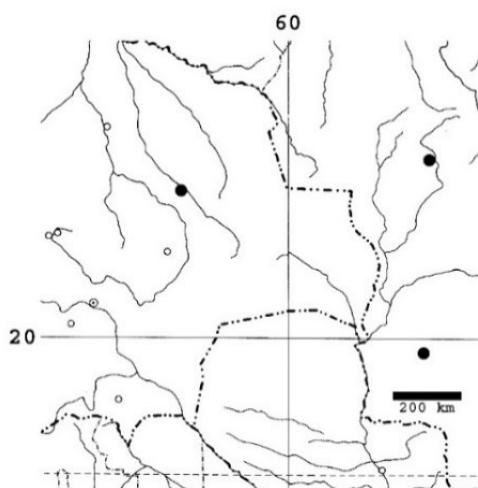


Figure 15. *Psidium myrsinoides*: illustration and map. A. Branch with 3-flowered and uniflorous peduncles; detail of node and venation pattern. B. Flower bud. C. Petal. D. Central flower of a dichasium after anthesis. E. Apex of flower after anthesis showing short tears between the calyx lobes not penetrating the staminal ring. F. Anther with terminal gland and 2 smaller glands below. G. Twig with leaves and fruit. H. Two views of seed. (A—D, F Alvarenga 876, ASU0007595; E Stadnick 101, ASU0075035—photos; G, H Azevedo et al. 1098, ASU0008147).



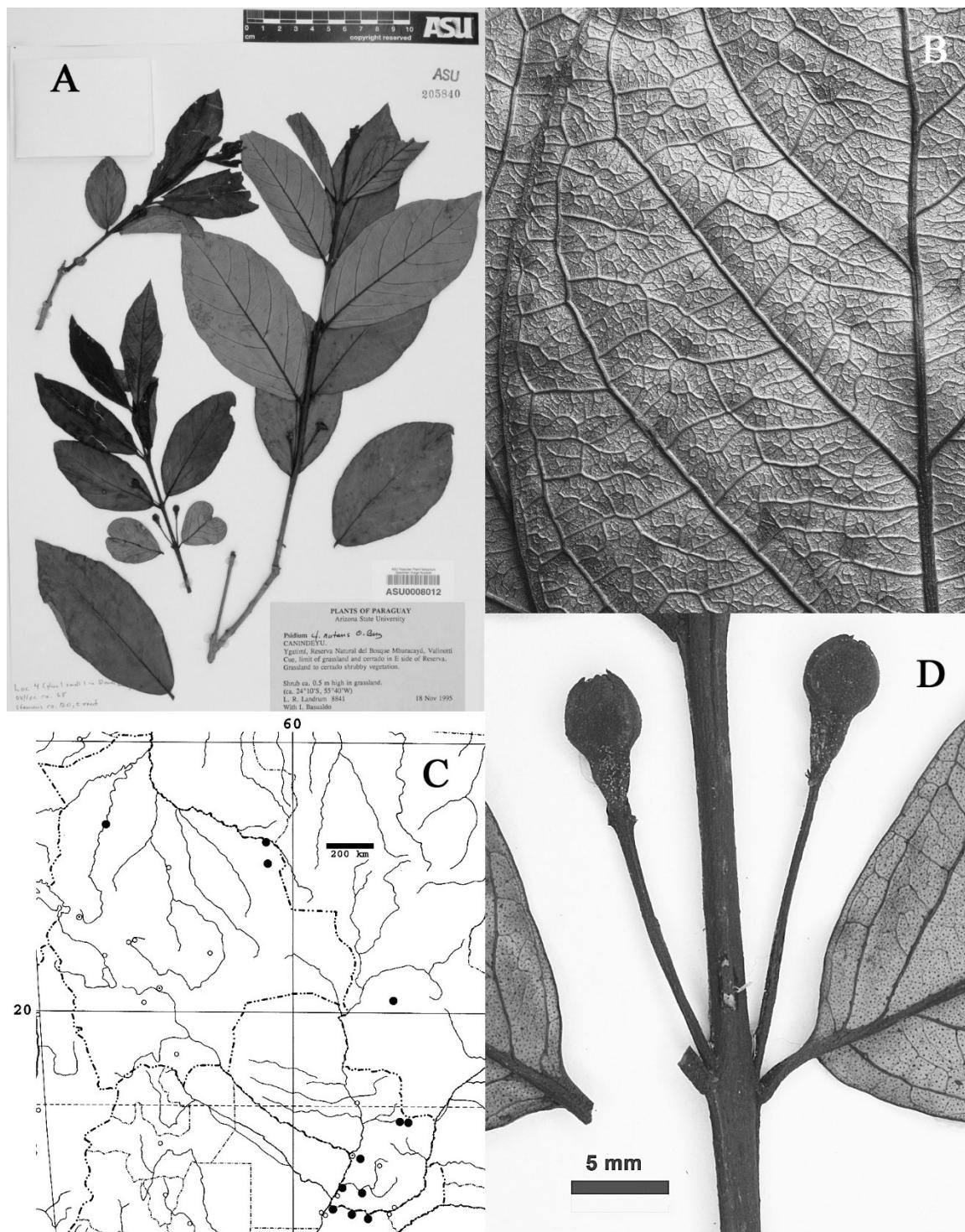
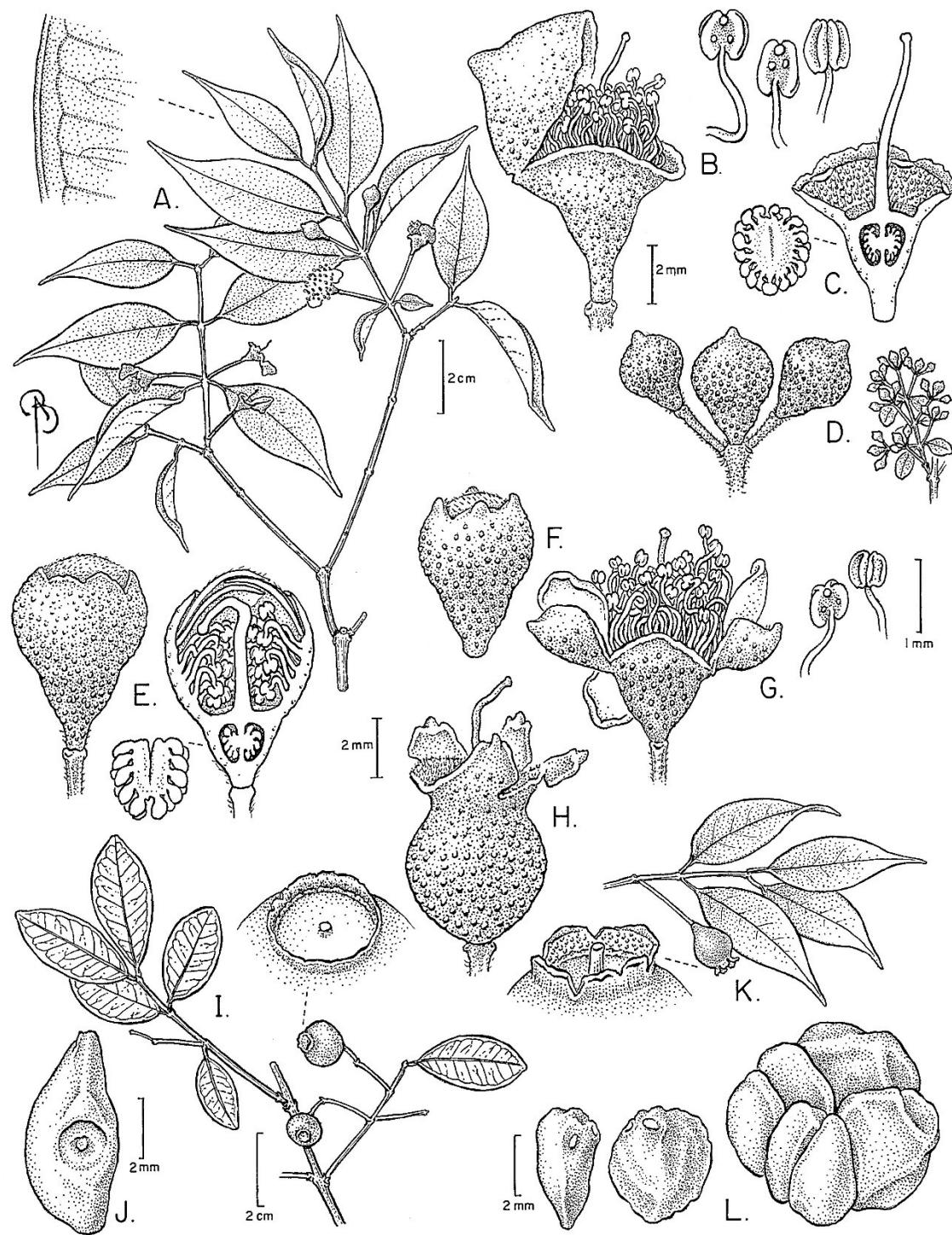


Figure 16. *Psidium nutans*: photos and map. **A.** Herbarium sheet of *P. nutans* from Reserva Natural del Bosque Mbaracayú, Canindeyú, Paraguay. **B.** Leaf venation. **C.** Map. **D.** Flower buds. (A, D from Landrum 8841, ASU00008041; B from Killeen 6974, ASU00008011).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY



See caption on next page.

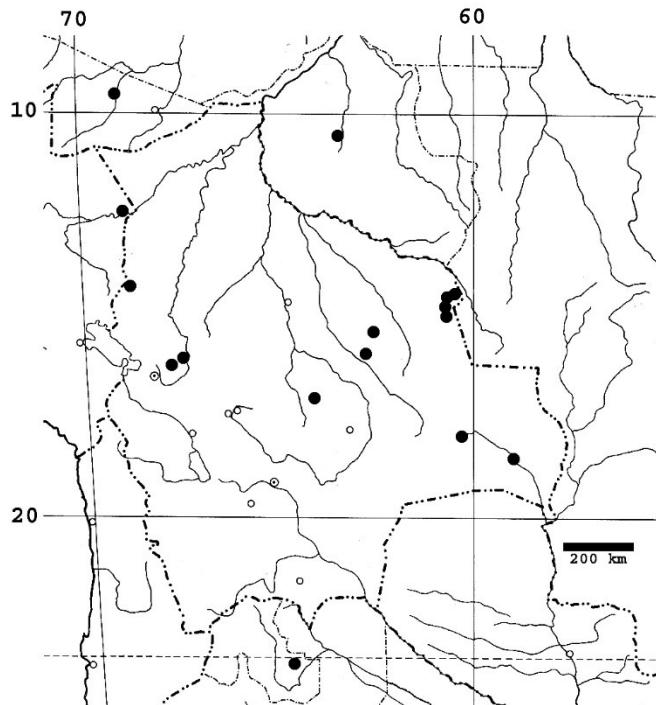


Figure 17. *Psidium oligospermum*: illustration (on previous page) and map. **A.** Flowering branch with detail of venation. **B.** Opening flower with calyptra; anthers with terminal gland and two smaller glands below. **C.** Longitudinal section of flower with peltate placenta extracted. **D.** Three-flowered dichasium and cluster of dichasias. **E.** Flower bud, placenta with ovules extracted and longitudinal section of bud. **F.** Flower bud from side; calyx with apical protuberances, these evident in G and H also. **G.** Opening flower from side; two views of an anther, one showing terminal gland and two smaller glands below. **H.** Young fruit from side. **I.** Twig with fruits; apical view of fruit with calyx and staminal ring having fallen. **J.** Seed. **K.** Twig with leaves and fruit; view of fruit apex with calyx having fallen and staminal ring persisting. **L.** Cluster of seeds from a fruit and two individual seeds showing flat and rounded sides. (A–C from Pirani & Kallunki 2664, ASU0014404; D from Nuñez 8602, ASU0014407; E from Smith 9729, ASU0014343; F–G from Landrum 6524, ASU0005024; H from Landrum 6518, ASU0005010; I–J from Guillén & Lazo 4340, ASU0015601; K–L from Landim 561, ASU0014337).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY



Figure 18. *Psidium salutare*: branchlets with leaves and flowers or young fruits. **A.** var. *mucronatum*. **B.** var. *sericeum*. **C.** var. *salutare*. **D.** var. *salutare*. (A from Landrum 3856, NY; B from Venturi 7582, F; C from Zardini & Zavala 45687, ASU0060391; D from Rodriguez & Surubi 549, ASU0005032).

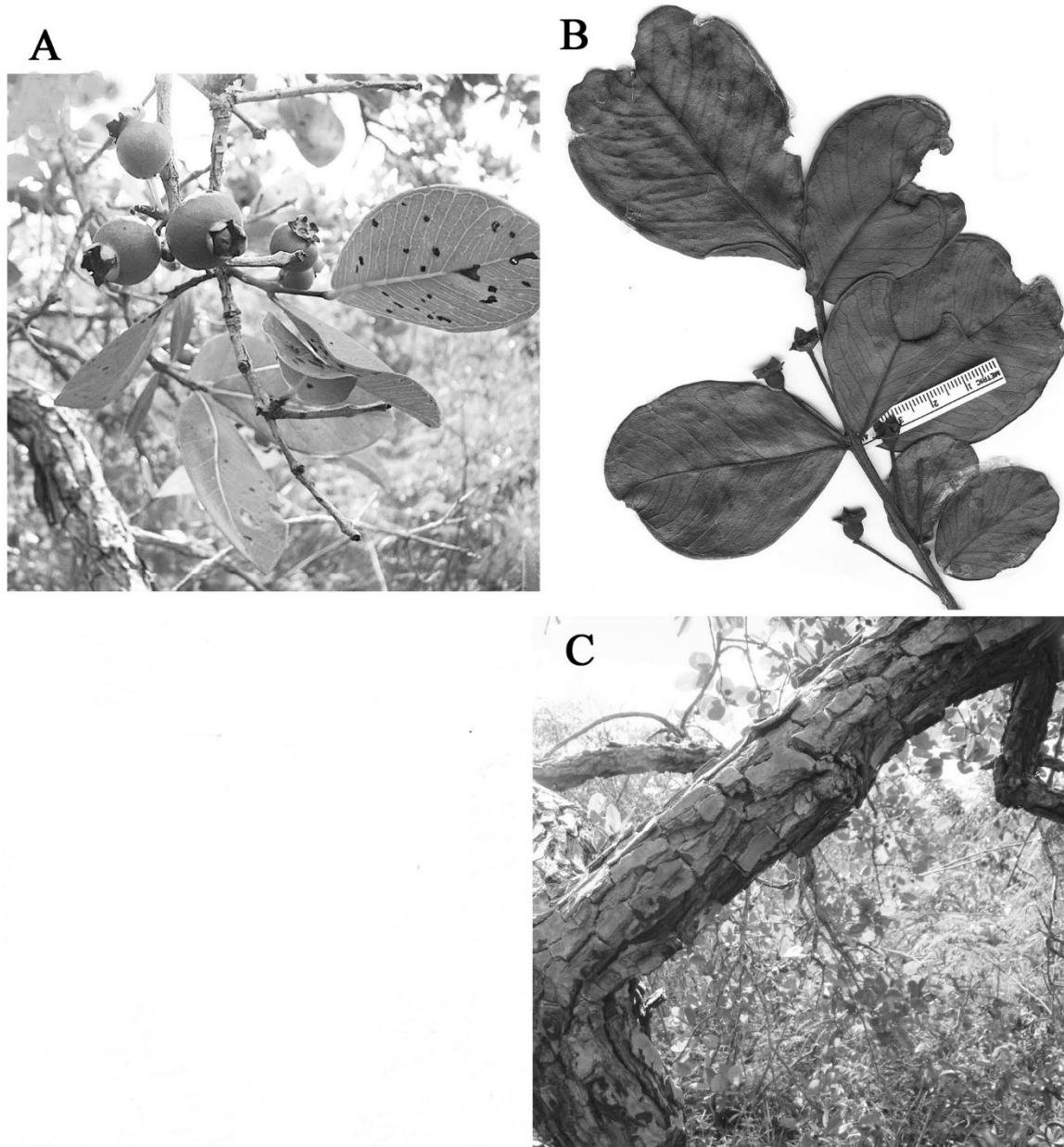


Figure 19. *Psidium salutare* var. *pohlianum*. **A.** Young branch with fruits. **B.** twig with very young fruits. **C.** Stem showing rough bark. (A, C photos by M. Alves of Roque et al. 3363, photo specimen at ASU; B from Irwin et al. 9101, NY).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

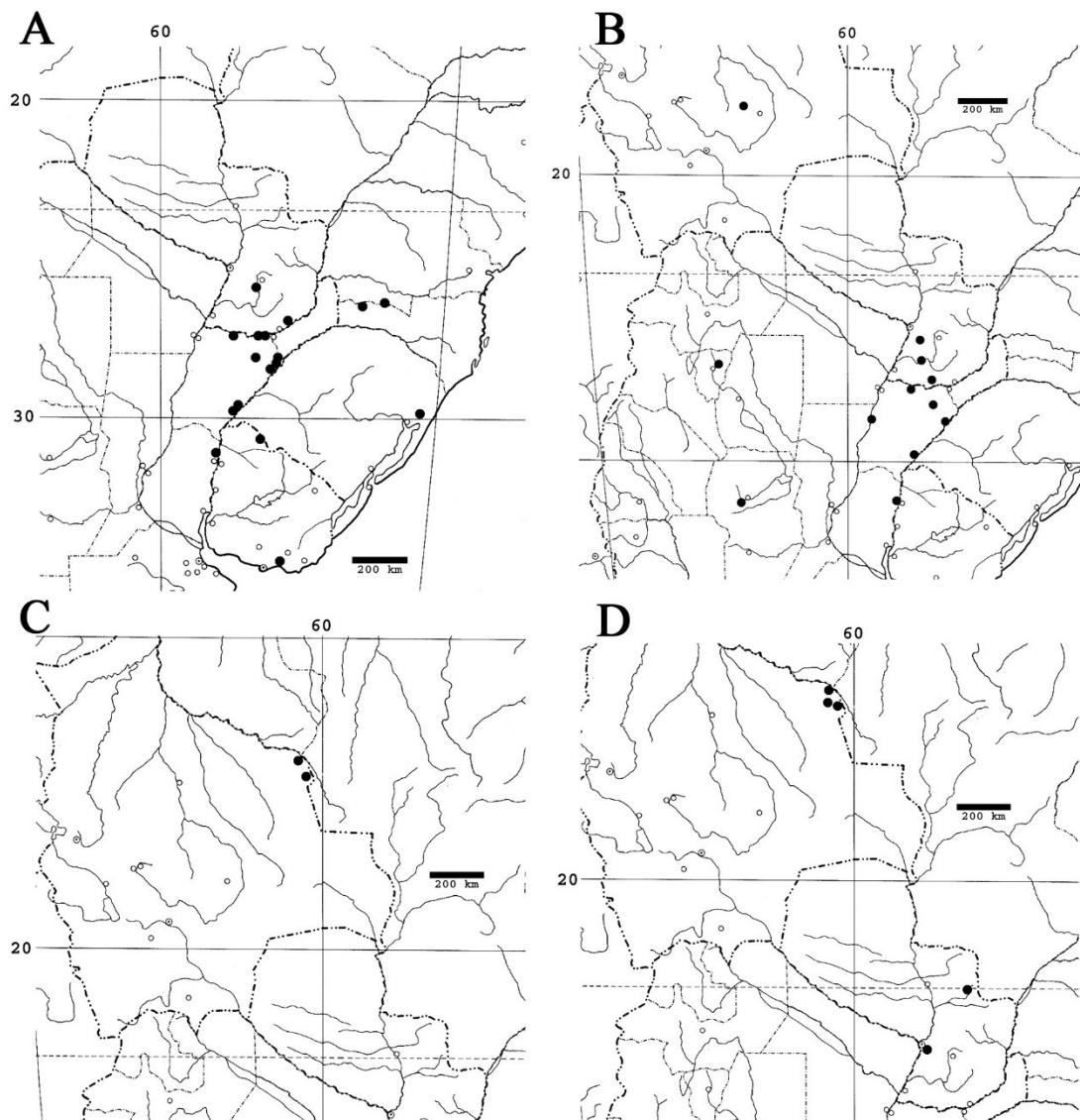


Figure 20. *Psidium salutare*: distribution maps. **A.** var. *mucronatum*. **B.** var. *sericeum*. **C.** var. *pohlianum*. **D.** var. *salutare*.



Figure 21. *Psidium striatum* var. *rondoniense*. Herbarium sheet from Bolivia, Santa Cruz, Prov. Velasco. (Quevedo 2389, ASU0015612).

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

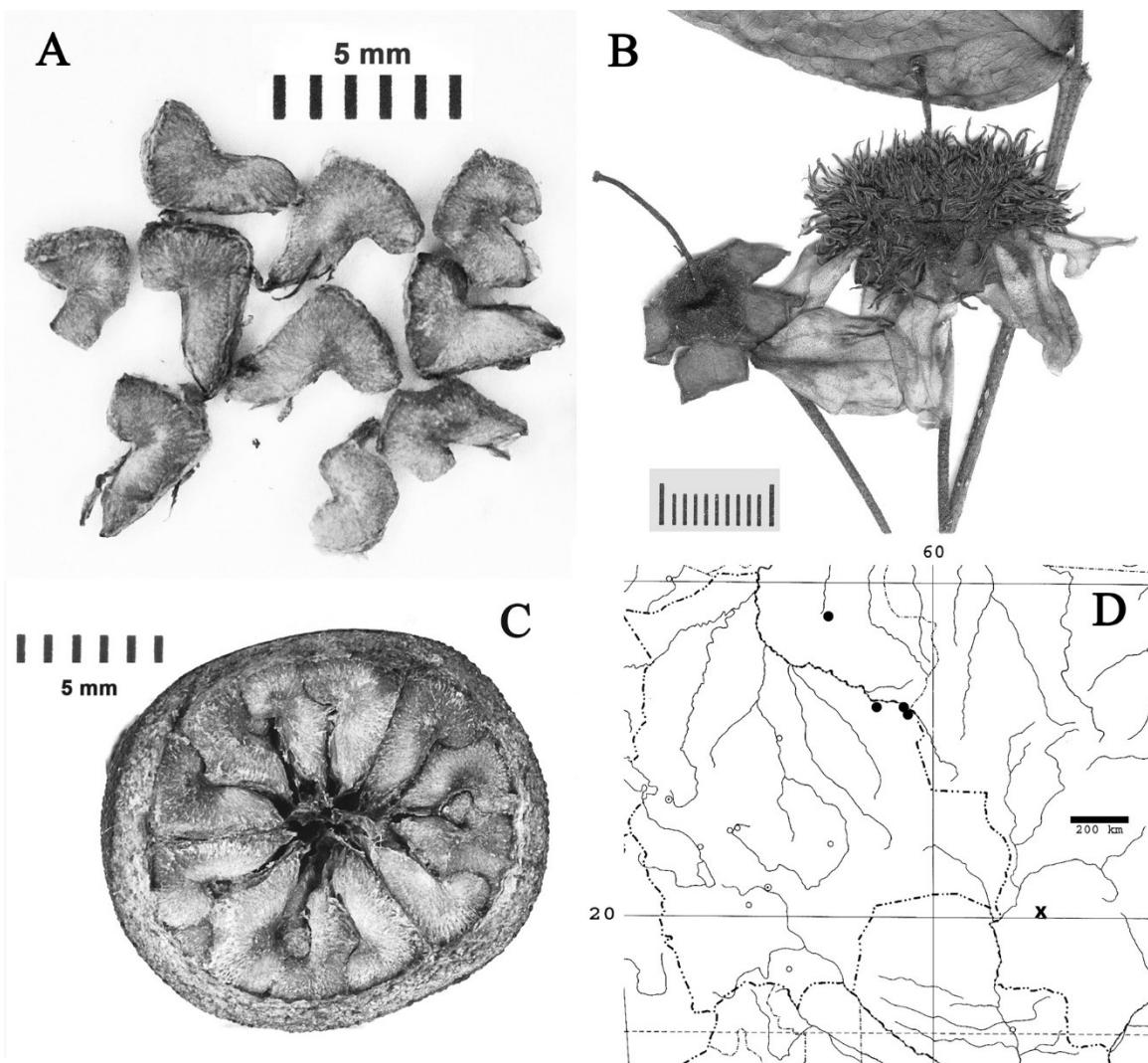


Figure 22. *Psidium striatulum*: photos of details and map. **A.** Seeds with typical angular shape; **B.** flowers of at anthesis and post anthesis. **C.** Cross section of fruit showing arrangement of seeds. **D.** Map of distribution in Bolivia and adjacent Brazil, dots = *P. striatulum* var. *rondoniense*, X = *P. striatulum* var. *striatulum*. (A & C, Davis 807, NY; from Guyana; B, Zarucchi 2722, NY, isotype of *P. striatulum* var. *rondoniense*).

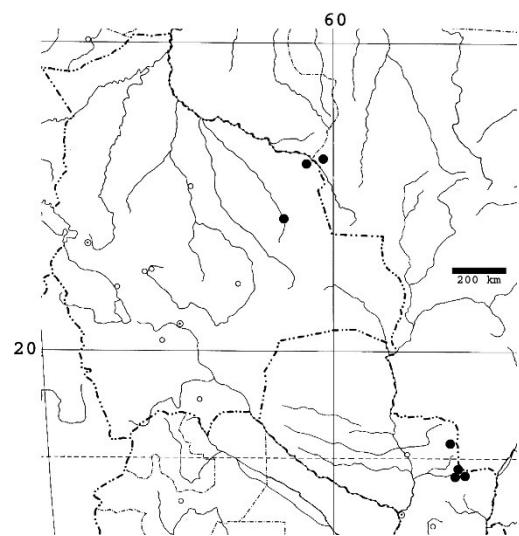
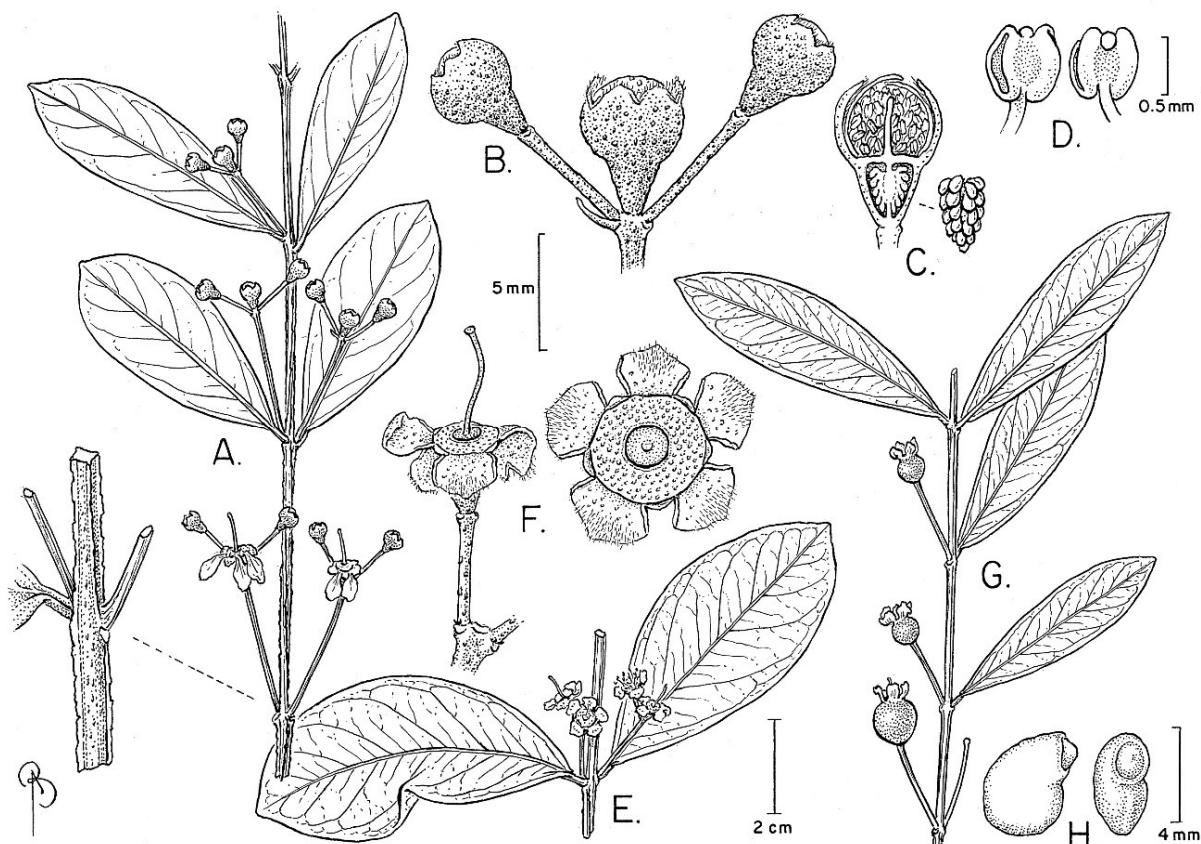


Figure 23. *Psidium suffruticosum*: illustration and map. **A.** Branch with leaves and dichasial inflorescences; detail of winged twigs. **B.** Dichasial 3-flowered inflorescence with flowers at various stages (flower buds have the calyx nearly closed at first). **C.** Longitudinal section of flower with ovules extracted. **D.** Two views of anther with a single terminal gland. **E.** Node with two leaves and remnants of two dichasia. **F.** Flower after anthesis showing tears between calyx lobes. **G.** Twig with fruits. **H.** two views of seed with prominent operculum. (A–D from Gottsberger 11-121079, ASU0005191; E, F from Hatschbach 50322, ASU0005426; G, H from Souza et al. 10752, ASU0005420).

ACKNOWLEDGEMENTS

Many people have helped me in this study that has lasted over 36 years. My botanical colleagues have provided specimens, sent photos, offered suggestions and opinions, and/or provided help in doing fieldwork. I especially thank: F. Barrie, I. Basualdo, R. Bye, X. Cornejo, C. Cristobal, R. Degan, J. Faria, J. Fernández Casas, F. França, L. Funch, G. Hatschbach, B. Holst, M. Ibrahim, A. Kapovickas, L. Kawasaki, E. Lucas, E. Makings, E. Melo, F. Mereles, A. Morschbacker, E. Nic Lughadha, C. Parra-O., C. Proença, A. Radovancich, N. Roque, A. Rotman, A. Salywon, A. Sennikov, L. Soares-Silva, M. Sobral, N. Soria, A. Stadnick, A. Tuler, R. Vanni, and E. Zardini. A Fulbright American Republics fellowship allowed me to visit many South American herbaria in 1995. The following herbaria have kindly allowed me to visit their collections and/or have provided specimens on loan or as images for my studies of *Psidium*: A, AAU, ALCB, ARIZ, AS, ASU, BM, BOLO, BR, CAS, CEPEC, CTES, F, FCQ, G, GH, GUA, HB, HOXA, HUEFS, HRB, K, LE, M, MA, MBM, MICH, MO, NY, OXF, P, PY, R, RB, S, SGO, SP, SPF, UC, US, W, and WIS. Bobbi Angell has provided the excellent species illustrations and Daryl Lafferty helped with programing representative specimens and maps. My wife Sonia Suanes Landrum has been a field assistant, aid during herbarium visits, a proof-reader, and has provided moral support during all my studies for which I am very grateful. The Global Plants Initiative project, funded by the Mellon Foundation, the International Plant Name Index (IPNI), and the Biodiversity Heritage Library, have together made the work of a plant taxonomist easier and more efficient, for which I am very grateful. I have been able to access these essential resources thanks to the Arizona State University library. Michael Nee, Carolyn Proença, and Frauke Ziemmeck and have provided very helpful reviews that have improved this manuscript greatly.

LITERATURE CITED

- Arévalo-Marín, E., A. Casas, L. R. Landrum, M. P. Shock, H. Alvarado-Sizzo, E. Ruiz-Sánchez and C. R. Clement. 2021. The Taming of *Psidium guajava*: Natural and Cultural History of a Neotropical Fruit. *Front. Plant Sci.* 12:714763. doi: 10.3389/fpls.2021.714763
- Baldini, R. M., A. L. MacVean, G. Cristofolini, T. F. Daniel, A. Managlia and M. Galloni. 2019. Synopsis and typification of the names published by Antonio Bertoloni in *Florula Guatimalensis* and in preceding publications. *Phytotaxa* 420 (3): 199–223.
- Barbosa Rodrigues, J. 1903. *Myrtacées du Paraguay*. Bruxelles: Imprimerie typo-lithographique J. Goffin Fils.
- Bernardi, L. 1985. Contribución a la Dendrología Paraguaya, secunda parte, Myrtaceae. *Boissiera* 37: 75–151.
- Burret, M. 1941. Myrtaceen—Studien. *Notizbl. Bot. Gart. Berlin-Dahlem* 15: 479–550.
- Chodat, R. and E. Hassler, 1907. Myrtaceae det. J. Barbosa Rodrigues. *Bull. Herb. Boissier ser. 2.* 7: 796-808.

Costa, I. R. and E. R. Forni-Martins. 2006. Chromosome studies in Brazilian species of *Campomanesia* Ruiz and Pávon and *Psidium* L. (Myrtaceae Juss.). *Caryologia* 1: 7–13.

Global Invasive Species Database. Accessed May 2017. <http://www.iucngisd.org/gisd/>

Global Plants Initiative. Accessed 2014–2022. <http://plants.jstor.org/>

Govaerts, R., M. Sobral, P. Ashton, F. Barrie, B. K. Holst, L. R. Landrum, K. Matsumoto, F. Mazine, E. Nic Lughadha, C. Proença, L. H. Soares-Silva, P. G. Wilson, and E. Lucas. 2008. World Checklist of Myrtaceae. Kew Publishing, Royal Botanic Gardens, Kew.

Grisebach, A. 1874. Plantae Lorentzianae. Abh. Königl. Ges. Wiss. Göttingen. 19: 49–279.

Holst, B. K., M. Serrano, N. W. Snow, L. R. Landrum, & P. M. Jorgensen. 2014. Myrtaceae. Pp. 870–880. In: Jorgensen, P. M., M. H. Nee, S. G. Beck, (eds.). *Catálogo de las Plantas Vasculares de Bolivia*, pp. 870-880. Missouri Botanical Garden Press, St. Louis.

Landrum, L. R. 1986. *Campomanesia*, *Pimenta*, *Blepharocalyx*, *Legrandia*, *Acca*, *Myrrhinium*, and *Luma* (Myrtaceae). *Flora Neotropica Monographs* 45: 1–179.

Landrum, L. R. 2003. A revision of the *Psidium salutare* complex (Myrtaceae). *Sida* 20(4): 1449–1469.

Landrum, L. R. 2005. A revision of the *Psidium grandifolium* complex (Myrtaceae). *Sida* 21(3): 1335–1354.

Landrum, L. R. 2016. Re-evaluation of *Psidium acutangulum* (Myrtaceae) and a new combination in *Psidium*. *Brittonia* 68(4): 418–421.

Landrum, L. R. 2017. The Genus *Psidium* (Myrtaceae) in the State of Bahia, Brazil. *Canotia* 13: 1–101.

Landrum, L. R. 2021a. *Psidium guajava* L.: Taxonomy, Relatives, and possible Origin, Pp. 1–21. In: S. K. Mitra (ed.). *Guava: botany, production and uses*. CABI, Boston, Massachusetts.

Landrum, L. R. 2021b. Nomenclatural notes on *Amomyrtus*, *Campomanesia*, and *Psidium* (Myrtaceae). *J. Bot. Res. Inst. Texas* 15(2): 535–544.

Landrum, L. R., W. D. Clark, W. P. Sharp, and J. Brendecke. 1995. Hybridization between *Psidium guajava* and *P. guineense* (Myrtaceae). *Economic Botany* 49(2): 153–161.

Landrum, L. R. and M. L. Kawasaki. 1997. The genera of Myrtaceae in Brazil: an illustrated synoptic treatment and keys. *Brittonia* 49: 508–536.

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

- Landrum, L. R. and W. P. Sharp. 1989. Seed coat characters of some American Myrtinae (Myrtaceae): *Psidium* and related genera. Systematic Botany 14: 370–376.
- Legrand, C. D. and R. M. Klein. 1977. *Psidium*. Flora Illustr. Catarin. [MIRT.]: 684–724.
- Lucas E., S. Harris, F. Mazine, S. R. Belsham, E. M. Nic Lughadha, A. Telford, P. Gasson, M. W. Chase. 2007. Suprageneric phylogenetics of Myrteae, the generically richest tribe in Myrtaceae (Myrtales). Taxon 56: 1105–1128.
- Lucas, E. J., B. Holst, M. Sobral, F. F. Mazine, E. M. Nic Lughadha, C. E. Barnes Proença, I. R. da Costa, and T. N. C. Vasconcelos. 2019. A New Subtribal Classification of Tribe Myrteae (Myrtaceae). Systematic Botany 44(3): 560–569.
- Machado, M. M. 2016. *Distribuição geográfica e análise cariotípica de citótipos de Psidium cattleianum Sabine (Myrtaceae)*. Master thesis, Universidade Estadual de Campinas. Campinas, São Paulo, Brazil.
- McVaugh, R. 1968. The genera of American Myrtaceae—An interim report. Taxon 17: 354–532.
- McVaugh, R. 1989. Myrtaceae, Pp. 463–532. In: R. A. Howard (ed.). *Flora of the Lesser Antilles Vol. 5*. Arnold Arboretum, Harvard University, Jamaica Plain.
- Murillo-A, J., T. F. Stuessy, and E. Ruiz. 2013. Phylogenetic relationships among *Myrciaria*, *Blepharocalyx*, and *Luma* (Myrtaceae) based on paired-sites models and the secondary structures of ITS and ETS sequences. Plant Systematics and Evolution 299: 713–729.
- Nadra, M. G., N. P. Giannini, J. M. Acosta, and L. Aagesen. 2018. Evolution of pollination by frugivorous birds in Neotropical Myrtaceae. PeerJ 6:e5426; DOI 10.7717/peerj.5426
- Oviedo y Valdés, G. Fernández de. 1851. Historia general y natural de las Indias, islas y tierra firme del mar océano, Volume 1. D. J. Amador de Los Rios (ed.). Madrid: Real Academia de La Historia.
- Perret, P. 1999. Validez de los nombres publicados por J. Barbosa Rodrigues a partir de las colecciones de la Familia Myrtaceae en Paraguay por E. Hassler. Candollea 54: 442–447.
- Proença, C. E. B., L. H. Soares-Silva, P. Í. T. Silva, and S. M. Fank-de-Carvalho. 2011 [“2010”]. Two new endemic species of Myrtaceae and an anatomical novelty from the Highlands of Brazil. Kew Bulletin 65: 466–468.
- Rivero, G., G. Salazar, D. Pacheco, A. Sánchez, M. Quirós, and G. Sthormes. 2012. Relaciones filogenéticas entre especies de *Psidium* (Myrtaceae) presentes en el occidente de Venezuela a partir de secuencias de ADN nuclear (ITS) y plastidial (*trnH-psbA*). Interciencia 37(11): 838–844.

- Shady-Solís, R., J. Haas, and W. Creamer. 2001. Dating Caral, a Preceramic Site in the Supe Valley on the Central Coast of Peru. *Science* 292: 723–726.
- Smith, C. E. 1965. The Archeological Record of Cultivated Crops of New World Origins. *Economic Botany* 19(4): 322–334.
- Snow, N. and Veldkamp, J. F. 2010. Miscellaneous taxonomic and nomenclatural notes for Myrtaceae. *Austrobaileya* 8(2): 177–186.
- Soares-Silva, L. and C. Proença. 2006. An Old Species Revisited and a New Combination Proposed in *Psidium* (Myrtaceae). *Kew Bulletin* 61(2): 199–204.
- SpeciesLink. Accessed 2014-2022. <http://splink.cria.org.br/>
- Tuler, A. C., T. T. Carrijo, L. R. Nória, A. Ferreira, A. L. Peixoto and M. F. da Silva Ferreira. 2015. SSR markers: a tool for species identification in *Psidium* (Myrtaceae). *Molecular Biology Reports* 42: 1501–1513.
- Tuler, A. C., C. E. B. Proença, T. T. Carrijo, and A. L. Peixoto. 2018. Typification and nomenclatural notes on *Psidium cattleyanum* (Myrtaceae). *Taxon* 67(6): 1194–1198.
- Vasconcelos, T. N. C, C. E. B. Proença, B. Ahmad, D. S. Aguilar, R. Aguilar, B. S. Amorim, K. Campbell, I. R. Costa, P. S. De-Carvalho, J. E. Q. Faria, A. Giaretta, P. W. Kooij, D. F. Lima, F. F. Mazine, B. Peguero, G. Prenner, M. F. Santos, J. Soewarto, A. Wingler, and E. J. Lucas. 2017. Myrteae phylogeny, calibration, biogeography and diversification patterns: Increased understanding in the most species rich tribe of Myrtaceae. *Molecular Phylogenetics and Evolution* 109: 113–137.
- Watling, J., M. P. Shock, G. Z. Mongeló, F. O. Almeida, T. Kater, P. E. De Oliveira, and E. G. Neves. 2018. Direct archaeological evidence for Southwestern Amazonia as an early plant domestication and food production centre. *PLOS ONE* 13 (7): e0199868 DOI: [10.1371/journal.pone.0199868](https://doi.org/10.1371/journal.pone.0199868)

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Abbott 15905	P. kennedyanum	Brunner 1377	P. guajava
Ahumada 2462	P. kennedyanum	Buchanan-Smith 78	P. guajava
Altamirano 3381	P. acutangulum	Buchtien 630	P. guineense
Araujo-M. 2629	P. guineense	Buchtien 7391	P. guineense
Arbo 1239	P. guineense	Burkart 30989	P. guajava
Arbo 1505	P. nutans	Burkart 31006	P. guineense
Arbo 1754	P. grandifolium	Buttura 1004	P. australe var. australe
Arbo 1925	P. australe var. australe	Caballero M. 893	P. kennedyanum
Arbo 1926	P. salutare var. sericeum	Caballero M. 1234	P. australe var. australe
Arbo 6402	P. salutare var. sericeum	Caballero M. 1413	P. salutare var. salutare
Arbo 9009	P. guajava	Caballero M. 1878	P. australe var. australe
Arroyo 125	P. oligospermum	Cabral 186	P. grandifolium
Arroyo 1341	P. acutangulum	Cabral 199	P. missionum
Arroyo 1363	P. acutangulum	Cabrera 28988	P. guineense
Arroyo 24046	P. oligospermum	Carnevali 1317	P. salutare var. mucronatum
Balderama 161	P. guineense	Carnevali 2243	P. salutare var. sericeum
Bang 253	P. guajava	Carnevali 3191	P. salutare var. mucronatum
Bang 287	P. guineense	Carnevali 4947	P. grandifolium
Bang 1688	P. guajava	Carnevali 5169	P. grandifolium
Bang 2830	P. guineense	Carrión 460	P. acutangulum
Bang 2831	P. guineense	Carrión 689	P. guineense
Bang 2832	P. guineense	Castro 16	P. oligospermum
Bartlett 21162	P. salutare var. mucronatum	Cuezzo &	
Bartlett 21279	P. salutare var. mucronatum	de la Sota 1594	P. guajava
Basualdo 766	P. guajava	Curran 33	P. guineense
Basualdo 784	P. guajava	Curran 71	P. kennedyanum
Basualdo 862	P. missionum	Degen 459	P. guajava
Basualdo 1010	P. grandifolium	Degen 899	P. australe var. australe
Basualdo 1027	P. guineense	Degen 1004	P. guineense
Basualdo 1030	P. missionum	Degen 1244	P. grandifolium
Basualdo 1085	P. guajava X guineense	Degen 1245	P. grandifolium
Basualdo 1103	P. australe var. australe	Degen 1670	P. guajava X guineense
Basualdo 1197	P. guajava	Degen 1791	P. nutans
Basualdo 1365	P. guajava	Degen 2093	P. guineense
Basualdo 1510	P. guajava	Degen 2101	P. grandifolium
Basualdo 1514	P. guajava	Degan 4737	P. grandifolium
Basualdo 1685	P. australe X guineense	Degan 4738	P. grandifolium
Basualdo 1713	P. australe var. australe	Degan 4739	P. grandifolium
Basualdo 1732	P. grandifolium	Degan 4740	P. grandifolium
Basualdo 1734	P. australe var. australe	Degan 4741	P. grandifolium
Basualdo 2074	P. australe var. australe	Degan 4742	P. grandifolium
Basualdo 2076	P. missionum	Degan 4743	P. grandifolium
Basualdo 2267	P. australe var. australe	Degan 4744	P. grandifolium
Basualdo 2315	P. guineense	Degan 4764	P. grandifolium
Basualdo 2316	P. australe var. australe	Del Valle 170	P. guineense
Basualdo 2319	P. guajava X guineense	Dure 112	P. grandifolium
Basualdo 2597	P. guajava	Ekman 2041	P. guineense
Basualdo 2672	P. guajava	Ekman 2045	P. kennedyanum
Basualdo 2673	P. guajava	Ekman 2048	P. salutare var. mucronatum
Basualdo 2675	P. guineense	Ekman 2056	P. salutare var. sericeum
Basualdo 2724	P. australe var. australe	Eliceche 3	P. guajava
Basualdo 3186	P. guajava	Ervard 8285	P. guineense
Basualdo 3303	P. guineense	Fernandez C. 4186	P. guineense
Basualdo 4862	P. australe var. australe	Fernandez C. 7396	P. salutare var. salutare
Beck 2531	P. guineense	Figueroedo 6	P. laruotteanum
Beck 2672	P. guineense	Figueroa 11923	P. guajava
Beck 3451	P. guineense	Foster 113	P. acutangulum
Beck 5487	P. acutangulum	Foster 142	P. acutangulum
Beck 5672	P. acutangulum	Foster 162	P. guineense
Beck 10046	P. nutans	Foster 358	P. acutangulum
Beck 15137	P. acidum	Foster 738	P. acutangulum
Beck 31843	P. guineense	Foster 3426	P. kennedyanum
Bernardi 18306	P. australe var. australe	Foster 13368	P. kennedyanum
Bernardi 18348	P. salutare var. salutare	Garvizu &	
Bertoni 1236	P. kennedyanum	Fuentes 359	P. acutangulum
Blanchoud 2243	P. kennedyanum	Gentry 43654	P. acidum
Boelcke 4669	P. cattleianum	Gentry 78002	P. densicomum
Boom 4068	P. guajava	Gomez Sosa 99	P. salutare var. mucronatum
Bordas 4013	P. guineense	Gonzales 92	P. guajava
Bordas 4260	P. guineense	Guillén 4	P. oligospermum

Guillén 177	P. oligospermum	Hawkes 4385	P. guineense
Guillén 464	P. striatum	Heinonen 179	P. kennedyanum
Guillén 509	P. nutans	Heinonen 205	P. grandifolium
Guillén 994	P. striatum	Heinonen 281	P. kennedyanum
Guillén 1023	P. salutare var. pohlianum	Herter 52	P. salutare var. mucronatum
Guillén 1766	P. acutangulum	Herter 930	P. salutare var. mucronatum
Guillén 1868	P. oligospermum	Herter 8051	P. salutare var. sericeum
Guillén 2142	P. nutans	Herter 8052	P. salutare var. mucronatum
Guillén 2426	P. nutans	Hessler 4830	P. grandifolium
Guillén 2541	P. striatum	Hieronymus 895	P. salutare var. mucronatum
Guillén 2605	P. guajava	Hilgert 2453	P. guineense
Guillén 2728	P. guineense	Hilgert 2639	P. guineense
Guillén 2945	P. guajava	Honfi 308	P. kennedyanum
Guillén 3372	P. guineense	Huidobro 1920	P. kennedyanum
Guillén 3602	P. oligospermum	Huidobro 2221	P. guajava
Guillén 3811	P. oligospermum	Ibarrola 1434	P. salutare var. sericeum
Guillén 4340	P. oligospermum	Ibarrola 2135	P. salutare var. mucronatum
Guillén 4806	P. laruoteanum	Ibarrola 2143	P. salutare var. sericeum
Haber 1772	P. guineense	Ibarrola 2481	P. salutare var. mucronatum
Hahn 872	P. guineense	Ibarrola 3129	P. kennedyanum
Hahn 1279	P. guajava	Ibarrola 3971	P. salutare var. sericeum
Hahn 1364	P. grandifolium	Ibarrola 4022	P. kennedyanum
Hahn 1772	P. australe var. australe	Itaipu Binac. 161	P. australe var. australe
Hahn 2350	P. guineense	Jardim 189	P. striatum
Hahn 2393	P. guineense	Jardim 342	P. guineense
Hahn 2610	P. guineense	Jardim 2125	P. oligospermum
Hahn 2714	P. guineense	Jardim 3286	P. oligospermum
Hartweg 977	P. salutare	Jardim 3572	P. guineense
Hartweg 980	P. guineense	Jorgensen 2113	P. guajava
Hassler 1330	P. australe	Jorgensen 2114	P. kennedyanum
Hassler 1442	P. guajava	Jorgensen 3261	P. guajava
Hassler 1689	P. guineense/guajava	Jorgensen 3643	P. guajava
Hassler 3393	P. guineense	Jorgensen 3645	P. grandifolium
Hassler 3498	P. salutare var. sericeum	Keller 2569	P. guajava
Hassler 3641	P. guineense	Keller 3554	P. australe var. australe
Hassler 4387	P. laruoteanum	Keller 6078	P. salutare var. mucronatum
Hassler 4400	P. salutare var. salutare	Keller 7576	P. missionum
Hassler 4521	P. grandifolium	Killeen 2359	P. guineense
Hassler 4522	P. nutans	Killeen 3463	P. oligospermum
Hassler 4609	P. salutare	Killeen 5614	P. salutare
Hassler 4648	P. grandifolium?	Killeen 5943	P. salutare var. salutare
Hassler 4662	P. guineense	Killeen 6757	P. nutans
Hassler 4745	P. guajava	Killeen 6947	P. acutangulum
Hassler 4753	P. guajava	Killeen 6974	P. acutangulum
Hassler 4762	P. guineense	Killeen 7819	P. laruoteanum
Hassler 4792	P. guajava	Killeen 7822	P. salutare var. salutare
Hassler 4830	P. grandifolium	Krapovickas 12231	P. salutare var. sericeum
Hassler 4831	P. grandifolium	Krapovickas 13352	P. australe
Hassler 4870	P. guineenseXgrandifolium?	Krapovickas 13913	P. grandifolium
Hassler 4990	P. australe	Krapovickas 14193	P. guineense
Hassler 5076	P. australe	Krapovickas 16687	P. salutare var. sericeum
Hassler 5079	P. laruoteanum	Krapovickas 16925	P. salutare var. mucronatum
Hassler 5082	P. australe	Krapovickas 17164	P. salutare var. mucronatum
Hassler 5263	P. grandifolium	Krapovickas 18307	P. australe var. australe
Hassler 5659	P. grandifolium	Krapovickas 20026	P. nutans
Hassler 6384	P. nutans	Krapovickas 20974	P. salutare var. mucronatum
Hassler 6554	P. guineense	Krapovickas 21174	P. salutare var. sericeum
Hassler 6632	P. australe	Krapovickas 21222	P. salutare var. mucronatum
Hassler 6633	P. guineense	Krapovickas 23378	P. australe var. australe
Hassler 6751	P. guineense	Krapovickas 25477	P. salutare var. mucronatum
Hassler 6805	P. grandifolium	Krapovickas 25876	P. salutare var. mucronatum
Hassler 6947	P. salutare	Krapovickas 25985	P. salutare var. mucronatum
Hassler 7099	P. grandifolium	Krapovickas 28713	P. grandifolium
Hassler 7135	P. nutans	Krapovickas 32613	P. grandifolium
Hassler 7402	P. kennedyanum	Krapovickas 41066	P. nutans
Hassler 7793	P. guajava	Krapovickas 44151	P. guineense
Hassler 8231	P. grandifolium	Krapovickas 45632	P. kennedyanum
Hassler 8529	P. grandifolium	Krapovickas 45767	P. grandifolium
Hassler 9556	P. grandifolium	Krapovickas 45779	P. grandifolium
Hassler 11401	P. suffruticosum		

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Krapovickas 45798	P. grandifolium	Landrum 5732	P. guineense
Krapovickas 46065	P. grandifolium	Landrum 5733	P. grandifolium
Krapovickas 46176	P. missionum	Landrum 5734	P. guineense
Krapovickas & Cristóbal 13255	P. guineense	Landrum 5735	P. missionum
Krapovickas & Cristóbal 13269	P. australe var. australe	Landrum 5738	P. missionum
Krapovickas & Cristóbal 13609	P. kennedyanum	Landrum 5740	P. missionum
Krapovickas & Cristóbal 15587	P. kennedyanum	Landrum 5741	P. australe var. australe
Krapovickas & Cristóbal 16511	P. guajava	Landrum 5742	P. guajava
Krapovickas & Cristóbal 20861	P. kennedyanum	Landrum 5747	P. guajava
Krapovickas & Cristóbal 20867	P. kennedyanum	Landrum 8553	P. guajava
Krapovickas & Cristóbal 28658	P. australe var. australe	Landrum 8564	P. guajava
Krapovickas & Cristóbal 28785	P. salutare var. mucronatum	Landrum 8608	P. guajava
Krapovickas & Cristóbal 28934	P. salutare var. mucronatum	Landrum 8609	P. guineense
Krapovickas & Cristóbal 44444	P. grandifolium	Landrum 8614	P. guineense
Krapovickas & Cristóbal 44607	P. missionum	Landrum 8618	P. guajava
Krapovickas & Cristóbal 44629	P. guajava X guineense	Landrum 8648	P. guineense
Landrum 3856	P. salutare var. mucronatum	Landrum 8649	P. missionum
Landrum 5676	P. guineense	Landrum 8650	P. guajava
Landrum 5677	P. guajava	Landrum 8652	P. guineense
Landrum 5678	P. guineense	Landrum 8661	P. grandifolium
Landrum 5679	P. guineense	Landrum 8662	P. grandifolium
Landrum 5680	P. guineense	Landrum 8663	P. grandifolium
Landrum 5681	P. guajava	Landrum 8664	P. grandifolium
Landrum 5682	P. guajava X guineense	Landrum 8665	P. salutare var. mucronatum
Landrum 5683	P. guajava	Landrum 8666	P. missionum
Landrum 5684	P. guajava	Landrum 8667	P. grandifolium
Landrum 5685	P. guajava	Landrum 8668	P. guineense
Landrum 5686	P. guajava X guineense	Landrum 8669	P. grandifolium
Landrum 5687	P. guajava X guineense	Landrum 8670	P. australe var. australe
Landrum 5688	P. guineense	Landrum 8671	P. guineense
Landrum 5689	P. guajava	Landrum 8672	P. guineense
Landrum 5690	P. guajava	Landrum 8675	P. guineense
Landrum 5691	P. guajava	Landrum 8692	P. guineense
Landrum 5692	P. guajava	Landrum 8700	P. australe var. australe
Landrum 5693	P. guajava X guineense	Landrum 8711	P. guajava
Landrum 5694	P. guajava X guineense	Landrum 8729	P. grandifolium
Landrum 5695	P. guajava X guineense	Landrum 8730	P. guajava
Landrum 5696	P. guajava X guineense	Landrum 8732	P. grandifolium
Landrum 5697	P. guajava	Landrum 8764	P. salutare var. sericeum
Landrum 5698	P. guajava X guineense	Landrum 8765	P. salutare var. sericeum
Landrum 5699	P. guajava	Landrum 8766	P. grandifolium
Landrum 5700	P. guineense	Landrum 8767	P. grandifolium
Landrum 5701	P. salutare var. sericeum	Landrum 8768	P. grandifolium
Landrum 5702	P. salutare var. sericeum	Landrum 8769	P. missionum
Landrum 5704	P. grandifolium	Landrum 8770	P. guineense
Landrum 5705	P. grandifolium	Landrum 8771	P. guineense
Landrum 5706	P. grandifolium	Landrum 8772	P. guajava X guineense
Landrum 5707	P. grandifolium	Landrum 8773	P. guineense
Landrum 5708	P. guineense	Landrum 8774	P. guajava
Landrum 5709	P. grandifolium	Landrum 8776	P. grandifolium X guineense
Landrum 5717	P. grandifolium	Landrum 8777	P. guineense
Landrum 5718	P. missionum	Landrum 8779	P. guineense
Landrum 5723	P. guineense	Landrum 8780	P. guineense
Landrum 5726	P. guajava	Landrum 8784	P. grandifolium
Landrum 5727	P. guineense	Landrum 8785	P. guajava X guineense
Landrum 5730	P. missionum	Landrum 8787	P. guajava
Landrum 5731	P. grandifolium	Landrum 8788	P. guajava X guineense
		Landrum 8789	P. australe var. australe
		Landrum 8790	P. salutare var. sericeum
		Landrum 8791	P. australe var. australe
		Landrum 8792	P. grandifolium
		Landrum 8794	P. grandifolium
		Landrum 8795	P. australe var. australe
		Landrum 8796	P. salutare var. mucronatum
		Landrum 8797	P. missionum
		Landrum 8798	P. australe var. australe
		Landrum 8799	P. missionum
		Landrum 8800	P. grandifolium
		Landrum 8801	P. grandifolium
		Landrum 8802	P. guineense

Landrum 8803	P. grandifolium	Martinez C. 8669	P. missionum
Landrum 8804	P. guineense	Martinez C. 8864	P. australe var. australe
Landrum 8805	P. missionum	Martinez C. 9449	P. grandifolium
Landrum 8806	P. grandifolium	Martinez C. 9888	P. australe var. australis
Landrum 8807	P. guineense	Martinez C. 11080	P. salutare var. mucronatum
Landrum 8808	P. missionum	Mereles 1379	P. kennedyanum
Landrum 8810	P. grandifolium	Mereles 1689	P. guajava
Landrum 8811	P. grandifolium X guineense	Mereles 2174	P. australe var. australis
Landrum 8812	P. missionum	Mereles 3451	P. guajava
Landrum 8813	P. guineense	Mereles 4218	P. guineense
Landrum 8814	P. salutare var. mucronatum	Mereles 7874	P. guineense
Landrum 8816	P. australe var. australis	Mexia 4266	P. guineense
Landrum 8817	P. grandifolium	Meyer 8599	P. kennedyanum
Landrum 8818	P. guineense	Meyer 11007	P. salutare var. sericeum
Landrum 8819	P. missionum	Meyer 11513	P. grandifolium
Landrum 8820	P. australe X guineense	Meyer 21738	P. guineense
Landrum 8821	P. missionum	Meyer 23541	P. guajava
Landrum 8823	P. grandifolium	Molas 677	P. salutare var. mucronatum
Landrum 8824	P. missionum	Molas 899	P. guineense
Landrum 8825	P. australe var. australis	Montes 851	P. australe var. australis
Landrum 8826	P. guineense	Montes 1260	P. missionum
Landrum 8827	P. guajava X guineense	Montes 1554	P. missionum
Landrum 8828	P. missionum	Montes 9520	P. guineense
Landrum 8830	P. grandifolium	Montes 10997	P. grandifolium
Landrum 8831	P. guineense	Montes 14743	P. grandifolium
Landrum 8832	P. grandifolium	Montes 14781	P. missionum
Landrum 8833	P. guajava	Montes 14782	P. australe var. australis
Landrum 8834	P. guajava X guineense	Montes 14785	P. guineense
Landrum 8835	P. grandifolium	Montes 14789	P. guineense
Landrum 8836	P. grandifolium	Montes 14794	P. grandifolium
Landrum 8838	P. missionum	Montes 14806	P. missionum
Landrum 8839	P. guineense	Montes 16212	P. missionum
Landrum 8841	P. nutans	Montes 27604	P. guineense
Landrum 8842	P. guineense	Morong 118	P. guajava
Landrum 8843	P. guajava	Morong 890	P. kennedyanum
Landrum 8844	P. guajava X guineense	Mostacedo &	
Landrum 8853	P. grandifolium	Menacho 1207	P. salutare var. salutare
Landrum 8855	P. grandifolium	Munoz 1783	P. salutare var. sericeum
Landrum 8856	P. grandifolium	Nee 31784	P. acutangulum
Landrum 8857	P. suffruticosum	Nee 33462	P. guajava
Landrum 8858	P. grandifolium	Nee 33760	P. guineense
Landrum 8859	P. australe var. australis	Nee 39638	P. guajava
Landrum 8860	P. laruotteanum	Nee 39697	P. guineense
Landrum 8862	P. grandifolium X guineense	Nee 40273	P. guineense
Landrum 8863	P. grandifolium X guineense	Nee 40733	P. guineense
Landrum 8865	P. grandifolium	Nee 42094	P. guineense
Landrum 8866	P. guineense	Nee 43465	P. salutare var. sericeum
Landrum 8867	P. guajava	Nee 46389	P. guajava
Landrum 8868	P. australe var. australis	Nee & Coibra 35829	P. guajava
Landrum 8869	P. grandifolium	Nee &	
Landrum 8873	P. grandifolium X guineense	Coimbra 35836	P. guineense
Landrum 8877	P. guajava	Nee & Vargas 37455	P. guineense
Landrum 8879	P. kennedyanum	Nee & Vargas 43465	P. salutare var. sericeum
Legname &		Neiff 1405	P. kennedyanum
Cuezzo 8752	P. guajava	Neiff 1560	P. kennedyanum
Legrand 1064	P. salutare var. mucronatum	Neiff 1577	P. kennedyanum
Legrand 2710	P. salutare var. mucronatum	Neiff 1670	P. kennedyanum
Legrand 2711	P. salutare var. sericeum	Nicora 5198	P. salutare var. mucronatum
Legrand 3338	P. salutare var. mucronatum	Novara 5111	P. guineense
Legrand 4145	P. salutare var. sericeum	Novara 7074	P. guineense
Lillo 1351	P. salutare var. mucronatum	Novara 12125	P. guajava
Lorents 87	P. kennedyanum	Ortiz 847	P. australe var. australis
Lourteig 2736	P. salutare var. mucronatum	Ortiz 918	P. grandifolium
Lourteig 2737	P. salutare var. sericeum	Ortiz 929	P. guineense
Loza 475	P. oligospermum	Ortiz 1236	P. guajava
Mandon 633	P. guineense	Ortiz 1274	P. guineense
Martinez C. 8	P. salutare var. sericeum	Ortiz S. 81	P. oligospermum
Martinez C. 22	P. missionum	Ortiz S. 212	P. oligospermum
Martinez C. 34	P. missionum	Osten 16563	P. salutare var. sericeum
Martinez C. 4739	P. salutare var. mucronatum	Osten 16651	P. salutare var. sericeum

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Palaci 475	P. guineense	Schinini 11476	P. kennedyanum
Panfil 1371	P. striatum	Schinini 13068	P. salutare var. sericeum
Panfil 1374	P. salutare var. pohlianum	Schinini 13846	P. kennedyanum
Paul 16	P. guajava	Schinini 14105	P. salutare var. mucronatum
Pedersen 935	P. guajava	Schinini 14127	P. salutare var. sericeum
Pedersen 4366	P. grandifolium	Schinini 15894	P. salutare var. sericeum
Pedersen 4439	P. kennedyanum	Schinini 16021	P. kennedyanum
Pedersen 4449	P. nutans	Schinini 16188	P. salutare var. sericeum
Pedersen 15587	P. salutare var. mucronatum	Schinini 16225	P. salutare var. mucronatum
Pedersen 16180	P. guajava	Schinini 17110	P. salutare var. sericeum
Pena-Chocarro 2366	P. nutans	Schinini 17192	P. salutare var. mucronatum
Pena-Chocarro 2366	P. nutans	Schinini 17373	P. salutare var. sericeum
Perez 380	P. salutare var. mucronatum	Schinini 20027	P. kennedyanum
Perez 1465	P. grandifolium	Schinini 21735	P. kennedyanum
Perez 1480	P. guajava	Schinini 21893	P. grandifolium
Perez 1518	P. guineense	Schinini 21915	P. missionum
Pin 587	P. guineense	Schinini 21915	P. missionum
Pittier 2920	P. guajava	Schinini 22902	P. salutare var. salutare
Praderi 740	P. salutare var. sericeum	Schinini 23646	P. salutare var. mucronatum
Prance 6063	P. acutangulum	Schinini 26053	P. grandifolium
Prance 6064	P. densicomum	Schinini 26054	P. australe var. australe
Prance 6204	P. acutangulum	Schinini 26106	P. guineense
Quarin 2069	P. salutare var. mucronatum	Schinini 26108	P. salutare var. sericeum
Quarin 2830	P. guineense	Schinini 27706	P. kennedyanum
Quevedo 804	P. oligospermum	Schinini 27820	P. australe var. australe
Quevedo 2382	P. acutangulum	Schinini 30328	P. guajava
Quevedo 2389	P. striatum	Schinini 31690	P. guajava
Quevedo 2533	P. striatum	Schinini 35655	P. guineense
Quevedo 2644	P. acutangulum	Schmeda 792	P. guineense
Renvoize 3225	P. guajava	Schmeda 801	P. nutans?
Renvoize 3634	P. guineense	Schmeda 803	P. guajava
Renvoize 3655	P. guajava	Schmeda 817	P. guajava
Rodriguez 13	P. oligospermum	Schmeda 824	P. guineense
Rodriguez 16	P. missionum	Schultz 7690	P. guineense
Rodriguez 239	P. grandifolium	Schulz 6848	P. kennedyanum
Rodriguez &		Schulz 6889	P. salutare var. mucronatum
Surubi 506	P. laruotteanum	Schulz 9826	P. kennedyanum
Rodriguez &		Schulz 10231	P. kennedyanum
Surubi 549	P. salutare var. salutare	Schulz 12110	P. kennedyanum
Rodriguez &		Schulz 16291	P. kennedyanum
Surubi 592	P. salutare var. pohlianum	Schulz 18601	P. salutare var. mucronatum
Rodriguez &		Schwarz 402	P. kennedyanum
Surubi 630	P. salutare var. pohlianum	Schwarz 621	P. guineense
Rojas 12664	P. nutans	Schwarz 10969	P. salutare var. sericeum
Rolon 160	P. grandifolium	Serrano 6900	P. guineense
Rosengurtt 2344	P. salutare var. mucronatum	Sesmero 100870	P. guineense
Rosengurtt 3250	P. salutare var. sericeum	Seta 447	P. guineense
Rosengurtt 4183	P. salutare var. mucronatum	Silveira 1063	P. acidum
Rosengurtt 5407	P. grandifolium	Simonis 173	P. guajava
Rumiz 36	P. kennedyanum	Solis N. 242	P. salutare var. mucronatum
Rumiz 173	P. kennedyanum	Solomon 7040	P. guineense
Rumiz 220	P. kennedyanum	Solomon 8504	P. guineense
Rusby 2083	P. guajava	Solomon 8871	P. guineense
Rusby 2460	P. guineense	Solomon 18044	P. guineense
Saldias 323	P. guajava	Solomon &	
Saldias 2526	P. oligospermum	Kuijt 11616	P. guineense
Saldias 3596	P. oligospermum	Solomon &	
Saldias 3744	P. oligospermum	Nee 14305	P. guineense
Salinas 2924	P. guineense	Soria 2518	P. guineense
Salomon 14564	P. guineense	Soria 2536	P. australis var. australis
Sanchez 305	P. salutare var. salutare	Soria 2544	P. australis var. australis
Saravia 11705	P. grandifolium	Soria 3034	P. grandifolium
Schiede 512	P. guineense	Soria 3036	P. guineense
Schiede 541	P. guineense	Soria 3066	P. grandifolium
Schinini 2126	P. nutans	Soria 3383	P. australis var. australis
Schinini 4392	P. grandifolium	Soria 3836	P. guineense
Schinini 8462	P. salutare var. mucronatum	Soria 4929	P. grandifolium
Schinini 8831	P. grandifolium	Soria 5410	P. australis var. australis
Schinini 10678	P. salutare var. mucronatum	Soria 7867	P. grandifolium
Schinini 11099	P. guineense	Soto 424	P. suffruticosum

Sparre &		Zardini 9460	P. guajava
Vervoort 2272	P. grandifolium	Zardini 10168	P. guajava
Sparre &		Zardini 10227	P. guineense
Vervoort 814	P. salutare var. sericeum	Zardini 10249	P. guineense
Steinbach 389	P. guajava	Zardini 10534	P. guineense
Steinbach 6652	P. guajava	Zardini 10715	P. guajava
Steinbach 6653	P. guineense	Zardini 10721	P. guajava
Steinbach 6675	P. oligospermum	Zardini 10780	P. guajava
Stutz 1897	P. guineense	Zardini 10785	P. guineense
Teran 4206	P. guajava	Zardini 11662	P. guineense
Torres 2	P. guineense	Zardini 11672	P. guineense
Torres 3	P. guineense	Zardini 12548	P. guineense
Torres 4	P. guajava	Zardini 12593	P. guineense
Torres 6	P. laruotteanum	Zardini 14951	P. guineense
Tressens 1491	P. salutare var. mucronatum	Zardini 15347	P. guineense
Tressens 2420	P. salutare var. sericeum	Zardini 15360	P. guineense
Tressens 2651	P. salutare var. mucronatum	Zardini 15408	P. guajava
Tressens 2878	P. salutare var. mucronatum	Zardini 15437	P. guineense
Tressens 3470	P. guineense	Zardini 15452	P. salutare var. mucronatum
Tressens 5014	P. guineense	Zardini 15653	P. guajava
Tressens 6640	P. salutare var. mucronatum	Zardini 15857	P. guajava
Troll 143	P. guineense	Zardini 15871	P. guineense
Turpe 4774	P. guineense	Zardini 16254	P. guajava
Vanni 4	P. guajava	Zardini 16557	P. guajava
Vanni 68	P. kennedyanum	Zardini 16568	P. guineense
Vanni 973	P. australe var. australe	Zardini 16734	P. guajava
Vanni 1067	P. guineense	Zardini 17281	P. guineense
Vanni 1571	P. guajava X guineense	Zardini 17336	P. kennedyanum
Vanni 3815	P. guajava	Zardini 17425	P. guajava
Vargas 2703	P. acutangulum	Zardini 17878	P. guajava
Vargas 3426	P. acutangulum	Zardini 18503	P. guajava
Vargas 3496	P. grandifolium	Zardini 19797	P. kennedyanum
Vattuone &		Zardini 19804	P. kennedyanum
Bianchi 141	P. grandifolium	Zardini 20132	P. guajava
Velásquez 15871	P. guineense	Zardini 21076	P. guajava
Venturi 1362	P. salutare var. mucronatum	Zardini 21157	P. guineense
Venturi 5197	P. oligospermum	Zardini 21421	P. guajava
Venturi 7582	P. salutare var. sericeum	Zardini 21849	P. kennedyanum
Venturi 9862	P. salutare var. mucronatum	Zardini 21971	P. grandifolium
Vera 3432	P. australe	Zardini 22329	P. guajava
Werdermann 2677	P. guineense	Zardini 22389	P. kennedyanum
White 264	P. guineense	Zardini 22767	P. guajava
Williams 238	P. nutans	Zardini 22991	P. kennedyanum
Wood 17551	P. myrsinites	Zardini 23214	P. guajava
Wood 23462	P. laruotteanum	Zardini 23498	P. kennedyanum
Wood 23727	P. grandifolium	Zardini 24372	P. kennedyanum
Wood 23889	P. laruotteanum	Zardini 24379	P. kennedyanum
Wood 25359	P. suffruticosum	Zardini 25759	P. kennedyanum
Zardini 3504	P. nutans?	Zardini 25882	P. grandifolium
Zardini 3611	P. guajava	Zardini 25892	P. grandifolium
Zardini 4079	P. guineense	Zardini 26407	P. australe var. australe
Zardini 4241	P. guajava	Zardini 27492	P. kennedyanum
Zardini 4967	P. guajava	Zardini 27725	P. guineense
Zardini 5784	P. guajava	Zardini 28735	P. guineense
Zardini 6281	P. guajava	Zardini 29061	P. guineense
Zardini 6695	P. guajava	Zardini 29081	P. guineense
Zardini 6817	P. guajava	Zardini 29111	P. salutare var. mucronatum
Zardini 7230	P. guineense	Zardini 34974	P. grandifolium
Zardini 7247	P. salutare var. mucronatum	Zardini 35346	P. guajava
Zardini 7495	P. guajava	Zardini 35371	P. guajava
Zardini 7805	P. australe var. australe	Zardini 36818	P. guajava
Zardini 7951	P. guajava	Zardini 37378	P. australe var. argenteum
Zardini 8354	P. guajava	Zardini 37474	P. guajava
Zardini 8784	P. guineense	Zardini 37596	P. missionum
Zardini 8812	P. guajava	Zardini 37601	P. guajava
Zardini 8980	P. australe var. australe	Zardini 37763	P. missionum
Zardini 9015	P. salutare var. mucronatum	Zardini 38251	P. kennedyanum
Zardini 9020	P. guineense	Zardini 38496	P. nutans
Zardini 9027	P. australe var. australe	Zardini 38840	P. guajava
Zardini 9333	P. guajava	Zardini 39026	P. australe

THE GENUS *PSIDIUM* (MYRTACEAE) IN BOLIVIA AND PARAGUAY

Zardini 39917	<i>P. guineense</i>	Zardini 51392	<i>P. laruotteanum</i>
Zardini 40153	<i>P. guajava</i>	Zardini 51395	<i>P. grandifolium</i>
Zardini 41001	<i>P. guajava</i>	Zardini 52092	<i>P. guajava X guineense</i>
Zardini 41069	<i>P. guajava</i>	Zardini 52192	<i>P. grandifolium</i>
Zardini 41464	<i>P. guajava</i>	Zardini 52777	<i>P. australe</i> var. <i>australe</i>
Zardini 41709	<i>P. kennedyanum</i>	Zardini 52826	<i>P. australe</i> var. <i>australe</i>
Zardini 45687	<i>P. salutare</i> var. <i>salutare</i>	Zardini 52836	<i>P. australe</i> var. <i>australe</i>
Zardini 46493	<i>P. grandifolium</i>	Zardini 53074	<i>P. guineense</i>
Zardini 47569	<i>P. guineense</i>	Zardini 53172	<i>P. guineense</i>
Zardini 47580	<i>P. guineense</i>	Zardini 53218	<i>P. guineense</i>
Zardini 47765	<i>P. nutans</i>	Zardini 53812	<i>P. grandifolium</i>
Zardini 47997	<i>P. laruotteanum</i>	Zardini 53882	<i>P. grandifolium</i>
Zardini 48007	<i>P. grandifolium</i>	Zardini 53956	<i>P. grandifolium</i>
Zardini 49116	<i>P. australe</i> var. <i>australe</i>	Zardini 54307	<i>P. guajava</i>
Zardini 49442	<i>P. grandifolium</i>	Zardini 55373	<i>P. missionum</i>
Zardini 49521	<i>P. suffruticosum</i>	Zardini 55694	<i>P. guineense</i>
Zardini 50729	<i>P. grandifolium</i>	Zardini 59825	<i>P. guineense</i>
Zardini 51202	<i>P. suffruticosum</i>		