

REDISCOVERING *TERNSTROEMIA KILLIPIANA* (PENTAPHYLACACEAE, *S.L.*),  
A COLOMBIAN ANDES SPECIES NOT COLLECTED SINCE 1926:  
ITS GEOGRAPHIC DISTRIBUTION AND CURRENT CONSERVATION STATUS

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**Abstract.** *Ternstroemia killipiana*, a species endemic to Cordillera Oriental de Colombia, was collected by Ellsworth P. Killip in 1926, and described by Clarence E. Kobuski in 1942. Since this date, this taxon it had not been recollected until the new collection reported here. A full description based on recent collection from “Serranía de Las Quinchas” (middle Magdalena river), Boyacá department, which for the first time includes detailed information on calyx and the corolla, an illustration, and an updated key to the 15 species of *Ternstroemia* reported from Colombia are provided. The presence of *T. killipiana*, and other endemic plant species, on both slopes of the Cordillera Oriental demonstrates the important role of intensive biological explorations in understudied areas, and also suggests that plant diversity on the middle Magdalena river slopes has not been thoroughly sampled.

**Keywords:** Pentaphylacaceae, *Ternstroemia*, “Serranía de Las Quinchas,” middle Magdalena river, Endemism, Cordillera Oriental, Colombia

**Resumen.** *Ternstroemia killipiana*, una especie endémica de la Cordillera Oriental de Colombia, fue colectada por Ellsworth P. Killip en el año 1926 y descrita por Clarence E. Kobuski en 1942. Desde esa fecha la especie no había sido observada hasta la nueva colección citada en la presente contribución. Se presenta una descripción completa, basada en la colección de la “Serranía de Las Quinchas” (medio Río Magdalena), departamento de Boyacá, y por primera vez se incluye información detallada del cáliz y la corola y una ilustración; asimismo, se presenta una clave para las 15 especies de *Ternstroemia* registradas para Colombia. La presencia de *T. killipiana* y otras especies de plantas endémicas en ambas vertientes de la Cordillera Oriental, demuestra el importante papel de las exploraciones biológicas intensivas en áreas pocos estudiadas, y a la vez, sugiere que la diversidad de plantas en las vertientes del medio río Magdalena, todavía no ha sido suficientemente estudiada.

**Palabras claves:** Pentaphylacaceae, *Ternstroemia*, “Serranía de Las Quinchas,” medio río Magdalena, Endemismo, Cordillera Oriental, Colombia

*Ternstroemia* Mutis ex L. f. (Mutis, 1781[1782]: 264) is a Pantropical genus, found in tropical and subtropical areas of America, Africa, Australia, China, India, and Southeast Asia, with one species in Korea and Japan; overall encompassing between 100–170 species (Grande Allende, 2018, 2020 [2021]; Cheek et al., 2019). The highest diversity is found in the Neotropics region (between 102–105 species; *vide* Ulloa Ulloa et al., 2018 Onward, WCVF Onward, 2021).

The genus has been traditionally treated as a member of the Theaceae D. Don (Verdcourt, 1962), but phylogenetic studies have greatly altered concepts of the conventional Theaceae group (e.g., Weitzman et al., 2004; Su et al., 2011; Rose et al., 2018; Grande Allende, 2019; Frost and Lagomarsino, 2021). As a result, several genera previously placed in that family are presently in Pentaphylacaceae Engler *nom. cons.* or Ternstroemiaceae Mirb. ex DC. The first name with preference over the later when considered as a sole taxon (Culham, 2007; Stevens, 2001 Onwards). However, Pentaphylacaceae s.s. (including only

*Pentaphylax euryoides* Gardner & Champ., a polymorphic species from Southeast Asia), is the sister group of tribes Frezieraieae and Ternstroemieae, which constitute a monophyletic clade traditionally considered as Ternstroemiaceae. These two morphologically distinct groups, thus, should be treated as separate families (Grande Allende, 2019, 2020 [2021]).

*Ternstroemia* is characterized by its evergreen shrubby to arboreal habit, hermaphrodite or androdioecious. The leaves alternate but often clustered at the apex of branchlets, and pseudovercillate. The flowers are axillar and solitary, pedunculate, and subtended by normally developed nomophylls or grouped in partially defoliated portions of the current-year shoots, seldom on floriferous brachyblasts. Stamens 15→100, in 1 to several whorls. Ovary superior, (1–) 2–4(–5)-loculed with 2–5(–many) ovules per locule, placentation axillar; style 1 or (rarely) 2, entire or apically 2(–4)-lobed, forming with the prolonged apex of the ovary a styloid; stigma punctiform or peltate. Fruit is a capsule

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with either subvalvular or circumscissile dehiscence. Seeds reniform, laterally compressed, covered by red or purple papillae (Grande Allende, 2018, 2019, 2020 [2021]).

The genus has a remarkable ecological plasticity; several species appear to require habitats that are more specific. The taxa are found from lowland (“terra firme”) vegetation (e.g., *T. kruckoffiana* Kobuski), to montane forests (e.g., *T. acrodanthe* Kobuski & Steyermark; *T. camelliifolia* Linden & Planchon). Several species are found over rocky slopes or tabletop mountains called “tepuis,” over oligotrophic soils derived from the Precambrian crystalline basement of the Guayana Shield (i.e., *T. crassifolia* Benth., *T. discoidea* Gleason, *T. duidae* Gleason, *T. dura* Gleason, *sensu* Berry and Weitzman, 2005; *T. tepuiensis* J.R. Grande), and in white sand open vegetation drained by black waters rivers (e.g., *T. campinicola* B. M. Boom; *sensu* Boom, 1989). Some species have wide geographic distributions (e.g., *T. candolleana* Wawra, *T. pungens* Gleason, *T. verticillata* Klotzsch ex Wawra), whereas others are endemic to particular geographical areas, such as some species found only in Caribbean islands (e.g., *T. cernua* Griseb.; *sensu*

Ulloa Ulloa et al., 2018 Onwards), or in Northeast Brazil (i.e., *T. bahiensis* J. Vieira & D. Sampaio; *sensu* Vieira et al., 2021).

*Ternstroemia killipiana* was collected by Ellsworth P. Killip during his 1926–27 trip to Colombia (Killip, 1927), and later described by Clarence E. Kobuski in 1942. No additional specimens of this species were available for examination until the second and last authors identified an additional collection gathered in 2021 in “Serranía de Las Quinchas” by a team of botanists from the project untitled: “Investigación de la biodiversidad de Boyacá: complementación y síntesis a través de gradientes altitudinales e implicaciones de su incorporación en proyectos de apropiación social de conocimiento y de efectos de cambio climático.”

*Ternstroemia* is represented by 15 species in Colombia, instead of 10 species as previously recorded in the “Catálogo de plantas y líquenes de Colombia” (Gradstein, 2016): *T. congestiflora* Triana & Planch., *T. distyla* Gleason, *T. killipiana*, *T. oleifolia* Wawra and *T. urophora* Kobuski were not included.

#### MATERIAL AND METHODS

This work is based on morphological analysis (using a dissecting stereomicroscope) and on the examinations of online collections at A, COL, GH, HUA, MO, NY, US (herbarium codes after Thiers, 2019), and the WCVP Onward (2021).

To evaluate the morphology of the flowers, herbarium material was rehydrated and boiled in a solution of hot water mixed with dish wash detergent until flowers were sufficiently soft and malleable to be examined under a dissecting microscope.

In addition, historical and current taxonomic literature on *Ternstroemia* was examined using Biodiversity Heritage Library website (<http://www.biodiversitylibrary.org>), in particular the protologue of the species in Kobuski (1942). Current bibliography on *Ternstroemia* was studied, mainly the treatments for the Flora of the Venezuelan Guayana (Berry and Weitzman, 2005), and the checklist: *Catálogo de plantas y líquenes de Colombia* (Gradstein, 2016). Type

specimens of *Ternstroemia* species involved in this study were examined using on-line images from JSTOR Global Plants (<https://plants.jstor.org/>). Finally, the International Plant Names Index (<https://www.ipni.org/>) and Tropicos (<http://legacy.tropicos.org/Home.aspx>) were also consulted to update the current nomenclature and geographical information.

The specific terminology for vegetative characters, vestiture description, inflorescences, flowers, and fruit morphology follow Font-Quer (2001), Harris and Harris (2006), and Endress (2010).

To determine the conservation status of *T. killipiana* (according to IUCN categories and criteria; IUCN, 2017), the extent of occurrence (EOO) and area of occupancy (AOO) were calculated using the supporting Red List threat assessments with GeoCAT (Bachman *et al.* 2011), constantly updated through the <https://www.kew.org/science/our-science/projects/geocat-geospatial-conservation-assessment-tool>.

#### TAXONOMY

***Ternstroemia killipiana*** Kobuski, J. Arnold Arb. 23: 341. 1942. TYPE: COLOMBIA. Santander: Mesa de Los Santos [ca. aprox. 6.9425°N, 73.0358°W], “Tree 25–30 ft. [ca/ 8–10 m], dense woods”, 1500 m, 11–16 December 1926, E. P. Killip & A. C. Smith 15294 (Holotype: GH; Isotypes: A, NY, US). Fig. 1.

Small tree 7–10 m tall; branches terete, glabrous, brown. Leaves pale green or brown when dried, opaque on both surfaces, blades 7–10 × 2–4 cm, coriaceous, oblong-elliptic or oblong-obovate, glabrous on both surfaces, sparsely punctate on the lower surface, apex acuminate, base attenuate, margins entire or slightly crenate-serrulate, venation pinnate, brochidodromous; midvein canaliculate on the upper surface, plane or slightly elevated on the lower surface; secondary veins obscure, 10–12 pairs, petiole 5–10 mm long. Flowers (on immature state) solitary, axillar, glabrous, peduncles 5–10 mm long, recurvate, bracteoles 2,

ca. 2 × 1.5–2 mm, subopposite, ovate-triangular, apiculate, rigid-coriaceous, brown, margins glandular-denticulate. Sepals 5, subequal, outer sepals 2, 2–3 × 1.5–2 mm, broadly-oblong, base slightly adnate, rigid-coriaceous, glabrous on both sides, margins glandulose-denticulate, middle sepal 1, ca. 3 × ca. 1.5 mm, oblong, rigid-coriaceous, one of the margins glandulose-denticulate, inner sepals 2, 2.5–3 × ca. 2 mm, broadly ovate, cucullate, membranaceous, white, glabrous on both sides, margins entire, scarious. Petals 5, subequal, 1–2 × 1–1.5 mm, basely connate, tube ca. 1/3 of the corolla total length, oblong at the base, ovate at the apex, apex acuminate, white, glabrous and reticulate on both sides. Stamens ca. 60, 1.5–2.5 mm long, filaments 0.3–0.8 mm long, in 2 whorls, unequal, laminar, slightly connate at the base, glabrous, anthers 1.2–1.5 mm long, linear, glabrous, connective apiculate or submuticous; ovary conical, ca. 1.5 mm long, ca. 2 mm diameter basally, glabrous, 2-locular,

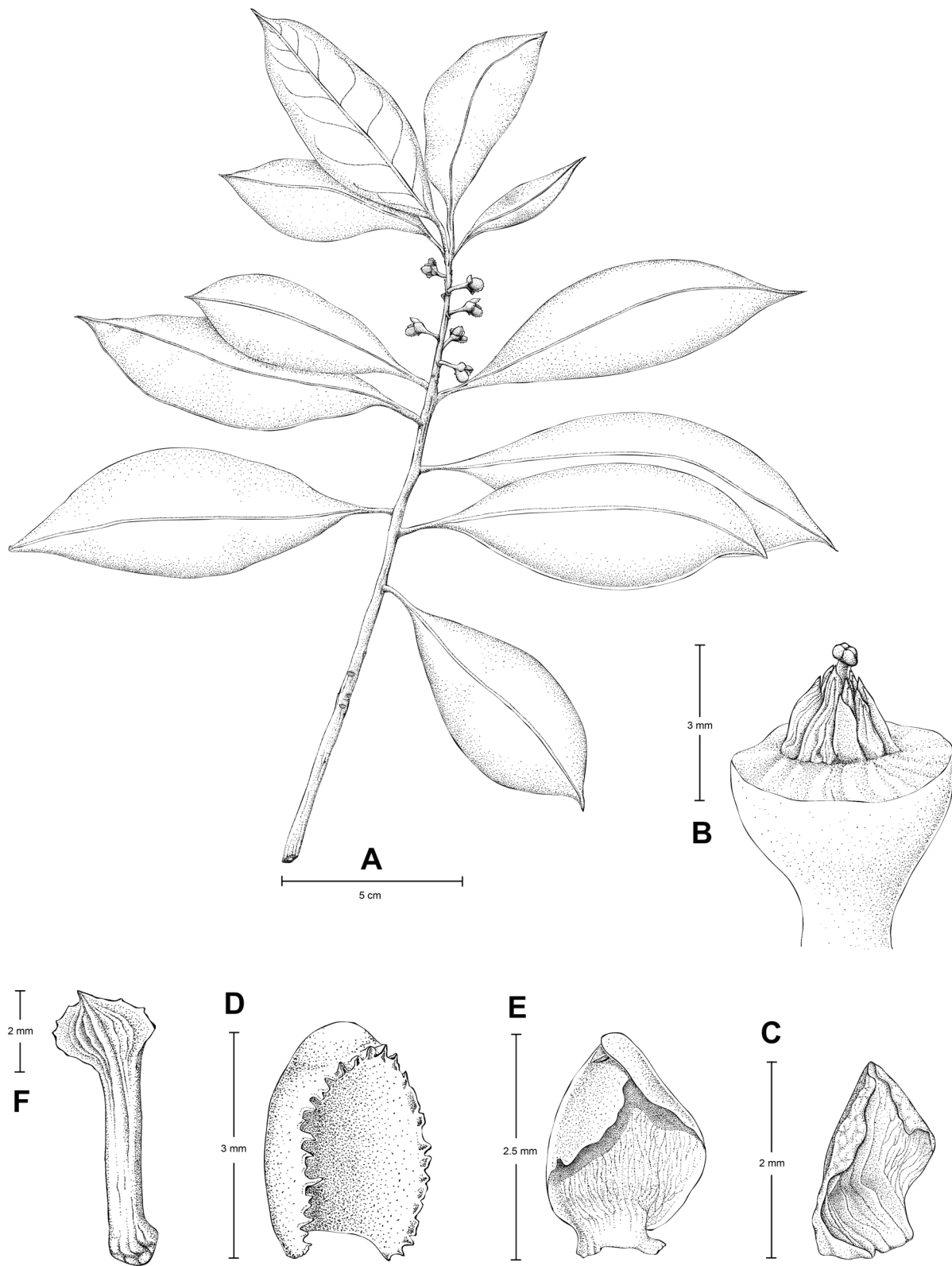


FIGURE 1. *Ternstroemia killipiana* Kobuski **A**, habit showing the branch and the solitary flowers; **B**, detail of a flower showing the stamens and the stigma, the bracteoles, sepals and petals were removed, **C**, ventral view of a corolla lobe, **D**, ventral view of the outer sepal showing the glandulose-denticulate margin, **E**, ventral view of the inner sepal, **F**, bracteole on peduncle. Drawn by A. Valenzuela Zúñiga based on the additional specimen.

2-ovules by locule, style ca. 0.8 mm long, glabrous, stigma punctiform, 2-lobulate. *Fruit* not seen.

**Distribution and ecology:** the species is hitherto known to occur on primary or secondary wet forest at 1000–1500 m elevation, located in “Serranía de Las Quinchas” and “Mesa de Los Santos”, in the Boyacá and Santander departments (Fig. 2). The “Serranía de las Quinchas” is placed in Magdalena Valley biogeographical region, which is located on the western slope of the Cordillera Oriental, in the western sector of the department of Boyacá, and borders the departments of Santander and Cundinamarca, between 380–1500 m (Bohórquez-Osorio et al., 2020). The middle Magdalena river natural region is well known by its interesting plant diversity and types of low (100–250 m), foothill (300–500 m) and medium forest (600–1200 m) (Balcázar et al., 2000; Restrepo et al., 2016) and an extensive rural tradition in the knowledge of useful plants (Bohórquez-Osorio et al., 2020). In addition, the region harbor many Amazonian, biogeographical Chocó or “Chocó biogeográfico,” and Mesoamerican elements (Balcázar et al., 2000), the presence of several Colombian endemic genera (i.e., *Orphanodendron* Barneby & J.W. Grimes [Leguminosae], *Romeroa* Dugand [Bignoniaceae]) and numerous endemic taxa (i.e., *Andira chigorodensis* T.R. Penn. [Leguminosae], *Aphelandra fernandezii* Leonard, [Acanthaceae], *Ephedranthus colombianus* Maas & Setten [Annonaceae]).

**Additional specimen examined:** COLOMBIA. Boyacá. Otanche. Parque Regional Nacional “Serranía de las Quinchas”, selva húmeda mesotérmica del medio río Magdalena, 5°48'39.6"N; 74°15'15.3"W, 1035 m, 15 June 2021, *M. Escobar, D. Rodríguez, J. García & P. Hernández* 498 (COL, UPTC).

**Conservation status:** currently, this species is only known from the type and one additional collection, and it is reported here as rare species. However, under IUCN (2017) guidelines two localities constitute deficient data (DD) to determine its conservation status. Nevertheless, it should be regarded as Critically Endangered (CR) due to the lower number of known localities (two), and its smaller estimated Area of Occupancy, with less 0,001 km<sup>2</sup>, an estimated Extent of Occurrence of 8,000 km<sup>2</sup> (IUCN, 2017). Also, the conservation of these forests are in risks due the continuous deforestation and degradation of the “Serranía de Las Quinchas” and their surrounding areas on middle Magdalena river. These areas had been highly deforested during the last six decades mainly by selective logging activities (Restrepo et al., 2016) and the conversion of the forests for livestock cattle and illicit crops. However, the region where *T. killipiana* was found, “Parque Natural Regional Serranía de Las Quinchas” is apparently well protected by Corpoboyacá, a regional institution in charge of protected areas in Boyacá department.

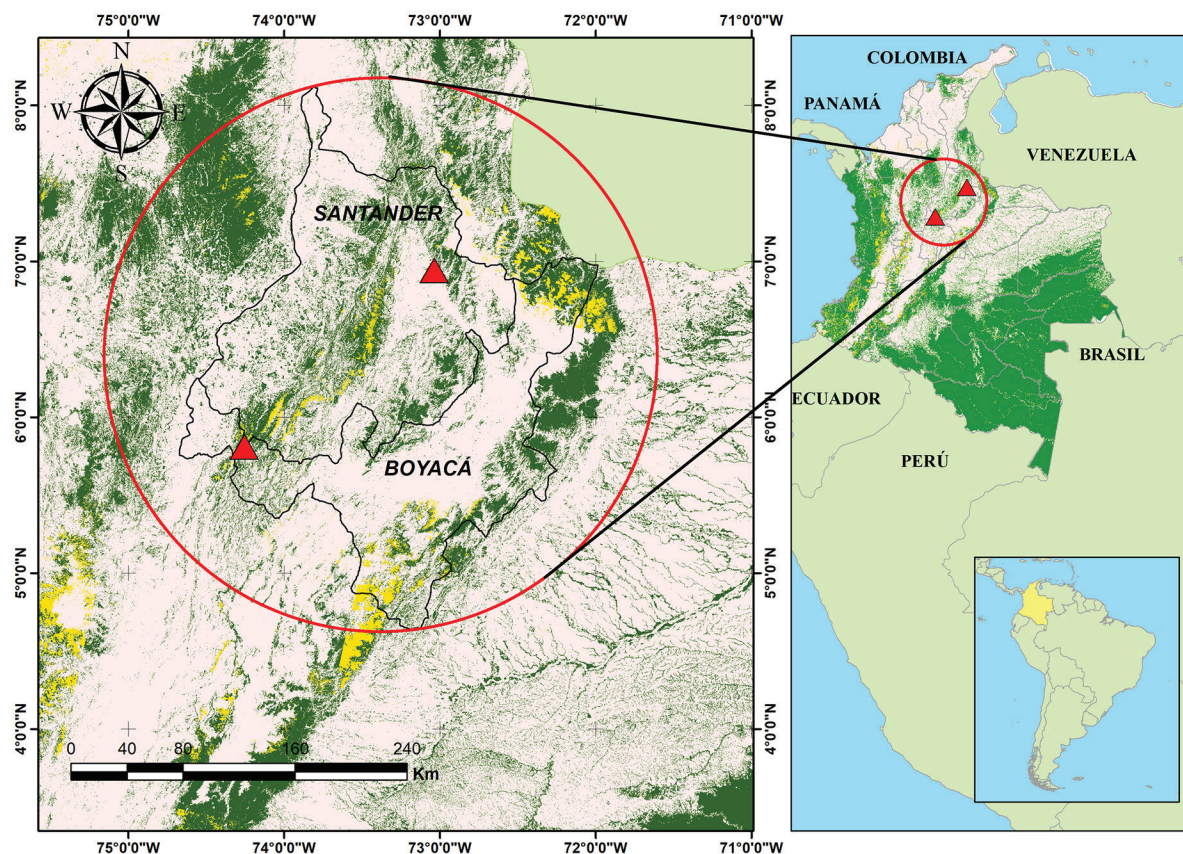


FIGURE 2. Geographical distribution of *Tersntroemia killipiana* Kobuski.

KEY TO SPECIES OF *TERNSTROEMIA* AS YET REPORTED FOR COLOMBIA

- 1a. Stigma punctiform or subpunctiform; sepals ovate to suborbicular; stamens conspicuously apiculate, the apicules notably longer than 1/10 the length of the anthers; filaments *ca.* 1/3 the total length of the stamens; fruits with subvalvular dehiscence ..... 2
- 1b. Stigma peltate; sepals orbicular; stamens discretely apiculate, the apicules blunt and not exceeding 1/10 the length of the anthers; filaments  $\leq$  1/4 the total length of stamens; fruits with either subvalvular or circumscissile dehiscence ..... 8
- 2a. Sepals acuminate; petals conspicuously acute; style bifid (rarely trifid) in its upper half; stigma punctiform ..... *T. pungens* (Caquetá, Guanía, Vaupés)
- 2b. Sepals obtuse or rounded, rarely acute; anthers conspicuously apiculate; style entire or subentire; stigma punctiform (in some specimens of *T. campinicola* and *T. oleifolia*, the stigmatic lobes are extended, giving the appearance of a peltate stigma) ..... 3
- 3a. Leaf blades with flat margins, crenate or entire, punctate below, usually < 5 cm long, coriaceous, hyphodromous; petioles inconspicuous (usually < 5 mm long) ..... 4
- 3b. Leaf blades with revolute margins, punctate to crenate-serrulate, usually > 5 cm long, coriaceous or chartaceous; secondary venation evident, but sometimes obscure; petioles conspicuous ( $\geq$  5 mm long) ..... 6
- 4a. Leaf blades widely to narrowly obovate, crenate, apically rounded and emarginate; hypophyll wrinkled when dry ..... *T. verticillata* (Amazonas, Caquetá)
- 4b. Leaf blades elliptic to obovate-elliptic, entire, apically obtuse or acute (rarely rounded and emarginate); hypophyll smooth when dry ..... 5
- 5a. Leaf blades elliptic to obovate-elliptic; upper leaf surface with a conspicuously impressed midvein ..... *T. campinicola* (Caquetá, Guaviare, Guanía, Vaupés)
- 5b. Leaf blades narrowly elliptic; the midvein not evident ..... *T. oleifolia* (Caquetá, Vaupés)
- 6a. Leaf blades elliptic to oblong-elliptic, abruptly acuminate, with 10–12 pairs of secondary veins; outer sepals ovate, apically acute or acuminate ..... *T. urophora* (Guanía)
- 6b. Leaf blades elliptic, oblong-obovate or oblanceolate, discretely acuminate, with <10 pairs of veins; outer sepals broadly ovate, apically obtuse or rounded ..... 7
- 7a. Leaf blades oblanceolate, 6.0–8.5 × 1.5–2.5 cm; peduncles 1.5–2.5 cm long ..... *T. mutisiana* (Antioquia, Chocó)
- 7b. Leaf blades elliptic or oblong-obovate, 7–10 × 2–4 cm; peduncles 0.5–1 cm long ..... *T. killipiana* (Boyacá, Santander)
- 8a. Leaf blades 9–16 × 5–8 cm; sepals 11–13 × 11–14 mm; fruits reaching 2 cm diam. .... *T. macrocarpa* (Boyacá, Cundinamarca, Risaralda, Santander, Norte de Santander)
- 8b. Leaf blades 2–10(–12) × 1.5–5 cm; sepals 5–8 × 6–8 mm; fruits smaller, seldom exceeding 1 cm diam. .... 9
- 9a. Leaf blades elliptic; fruits with circumscissile dehiscence ..... *T. distyla* (Caquetá, Guanía)
- 9b. Leaf blades elliptic to obovate; fruits with subvalvular dehiscence ..... 10
- 10a. Leaf blades relatively small, 2–6 cm × 1.5–2.5 cm, apically rounded ..... 11
- 10b. Leaf blades relatively large, 5–10(–12) × 2–5 cm, for the most part with an obtuse, acute or acuminate apex ..... 12
- 11a. Petioles 3–5 mm long; peduncles 5–10 mm long, stout ..... *T. meridionalis* (Antioquia, Boyacá, Cundinamarca, La Guajira, Magdalena, Meta, Norte de Santander, Tolima)
- 11b. Petioles *ca.* 5 mm long; peduncles 1.0–1.5 mm long, slender ..... *T. cuneifolia* (Antioquia)
- 12a. Peduncles 0.4–10 cm long ..... 13
- 12b. Peduncles 1.2–1.7 cm long ..... 14
- 13a. Leaf blades 6–10(–12) × 3–5 cm; stamens >100 ..... *T. camelliifolia* (Magdalena, Quindío)
- 13b. Leaf blades 5–8 × 2–3 cm; stamens *ca.* 60 ..... *T. congestiflora* (Boyacá)
- 14a. Leaf blades punctate, apically obtuse; peduncles 1.2–1.5 cm long; sepals 5–6 cm long; stamens *ca.* 100 ..... *T. clusiiifolia* (Antioquia)
- 14b. Leaf blades crenate-serrulate, apically acuminate; peduncles 1.5–1.7 cm long; sepals 6–8 × 7–8 mm; stamens > 200 ..... *T. lehmannii* (Antioquia)

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