Published in Annals of the Missouri Botanical Garden, 2009, Volume 96, Number 4, p. 541-563
which should be used for any reference to this work

A REVISION OF NEOTROPICAL *BONYUNIA* (LOGANIACEAE: ANTONIEAE)[1]

Jason R. Grant[2]

ABSTRACT

A revision of the Neotropical genus *Bonyunia* M. R. Schomb. ex Progel (Loganiaceae, Antonieae) is provided, including a key to species, description, distribution, IUCN Red List status, and discussion. *Bonyunia* is morphologically and ecologically diverse with taxonomically informative characters that include habit, seed and leaf morphology, and the shape and indument of the calyx, bracts, and bracteoles. *Bonyunia* occurs in lowland regions of the Amazon River watershed (Brazil and Bolivia), the Orinoco River watershed (Colombia and Venezuela), tepuis of the Guayana region and outliers (Brazil, Guyana, Venezuela, and Colombia), and lowland regions of Amazon Basin–facing Andes in Peru, throughout on white sands. Ten species are recognized, including four established species: *B. antoniifolia* Progel, *B. aquatica* Ducke, *B. minor* N. E. Br. (including *B. cinchonoides* Gleason & Standl.), and *B. superba* M. R. Schomb. ex Progel. Six species are newly described: *B. excelsa* J. R. Grant (Colombia), *B. magnifica* J. R. Grant (Brazil), *B. nobilis* J. R. Grant (Colombia), *B. pulchra* Ricketson, J. R. Grant & Liesner (Peru), *B. spectabilis* J. R. Grant (Guyana), and *B. venusta* J. R. Grant (Brazil).

Key words: Antonieae, *Bonyunia*, IUCN Red List, Loganiaceae, Neotropics, South America.

The Loganiaceae includes the formerly segregate families Antoniaceae, Gardneriaceae, Geniostomataceae, Spigeliaceae, and Strychnaceae, and comprises 13 genera: *Antonia* Pohl, *Bonyunia* M. R. Schomb. ex Progel, *Gardneria* Wall., *Geniostoma* J. R. Forst. & G. Forst., *Labordia* Gaudich., *Logania* R. Br., *Mitrasacme* Labill., *Mitreola* L., *Neuburgia* Blume, *Norrisia* Gardner, *Spigelia* L., *Strychnos* L., and *Usteria* Willd. (Bremer & Struwe, 1992; Struwe et al., 1994, 1998; Backlund et al., 2000; Angiosperm Phylogeny Group, 2003; Struwe & Motley, in press). The genus of interest here, *Bonyunia*, is a Neotropical woody member closely related to *Antonia* (Mori et al., 2002) and *Usteria*, and, based on both morphology and molecular characters, the three genera (perhaps also *Norrisia*) comprise the tribe Antonieae. While *Bonyunia* has been shown to be distinct from related genera (Struwe & Albert, 1997), a preliminary screening at the Université de Neuchâtel of a series of adequate herbarium samples was unsuccessful in the amplification of DNA (chloroplast *trnL-F*) from enough taxa to establish a genus-wide phylogeny. *Bonyunia* has essentially lain in obscurity, with the exception of several brief references and a revision nearly 40 years ago (Leeuwenberg, 1969). The accumulation of enough interesting material has finally resulted in the need for a full taxonomic revision.

Bonyunia occurs in generally lowland regions of the Amazon River watershed (Brazil and Bolivia), the Orinoco River watershed (Colombia and Venezuela), tepuis of the Guayana region and outliers (Brazil, Guyana, Venezuela, and Colombia), and lowland regions of Amazon Basin–facing Andes in Peru (Fig. 1). It does not occur on the Brazilian plateau, though it is approached there by *B. antoniifolia* Progel, which has a broad distribution in the Amazonian lowlands along the Amazon River and its tributaries in Brazil and Bolivia. Two other species have somewhat broad distributions that overlap each

[1] I thank the following institutions for the loan of material or data/scans/photos* of specimens in their collections: AAU, B*, BM, BR, COL*, F, FMB, G, GH, HUT*, IAN*, K, M*, MA, MG*, MO, NY, P, R*, RB*, S, SP*, U, UC, US, USZ*, W*, WAG, and Z. Information on collections, some of which were not requested on loan, was provided by: Ione Bemerguy (MG), Rodrigo Bernal (COL), José Enrique Castillo (FMB), Inês Cordeiro (SP), Andrea Ferreira da Costa (R), Hans-Joachim Esser (M), Rafaela Forzza (RB), Humberto Mendoza (FMB), Martin Nickol (KIEL), Bruno Rezende (RB), Jon Ricketson (MO), Eric Rodriguez (HUT), Franz Schuhwerk (M), Bruno Wallnöfer (W), and the Tropicos database of the Missouri Botanical Garden (MO). Library research was carried out at the Conservatoire et Jardins botaniques de la Ville de Genève, Switzerland. Bobbi Angell skillfully prepared the illustrations. The geographic information system–based distribution map was prepared by Phillip Miarmi, Rutgers University (CHRB), and modified by Yves Maumary (Neuchâtel). Neil Villard (Neuchâtel) prepared the photographs of seeds and herbarium specimens. Lena Struwe (CHRB) edited the manuscript, and Mary Endress (Z) provided relevant literature.

[2] Laboratoire de botanique évolutive, Institut de Biologie, Université de Neuchâtel, rue Émile-Argand 11, Case Postale 158, 2009 Neuchâtel, Switzerland. jason.grant@unine.ch.

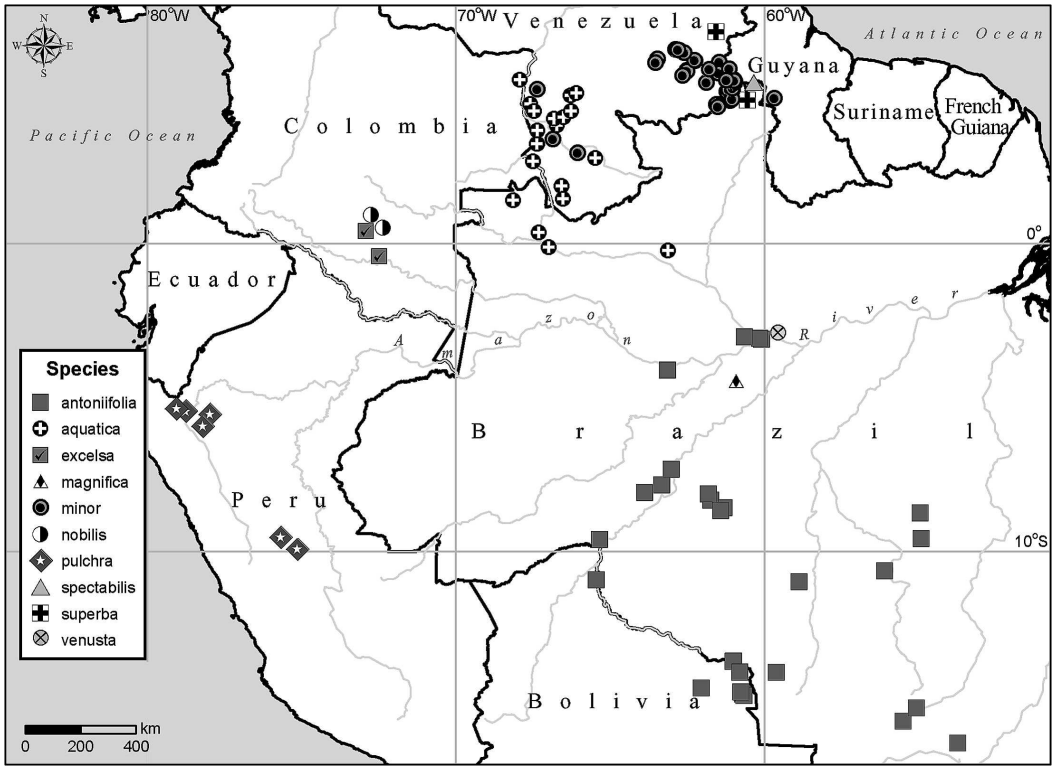

Figure 1. Map of the distribution of *Bonyunia* in South America.

other: *B. aquatica* Ducke and *B. minor* N. E. Br. *Bonyunia aquatica* ranges principally along the lowlands of the Orinoco River watershed in Colombia and Venezuela but also extends to the Rio Negro in Brazil. *Bonyunia minor* occupies higher-elevation savanna and tepui habitats of the Guayana region in Venezuela and Guyana. The remaining seven species are known from only one to 10 collections, and therefore their distribution is poorly known. These mostly occur in areas of high endemism (Sierra de Chiribiquete and Mount Roraima of the Guayana region, and the Andes) and are probably narrow endemics. Both *B. spectabilis* J. R. Grant and *B. superba* M. R. Schomb. ex Progel occur on Mount Roraima along the Venezuela–Guyana border in the Guayana region and are possibly partly sympatric with *B. minor*. *Bonyunia excelsa* J. R. Grant and *B. nobilis* J. R. Grant are known from isolated outliers of the Guayana region in Colombia on the Sierra de Chiribiquete, and *B. magnifica* J. R. Grant and *B. venusta* J. R. Grant occur in the Amazon lowlands of Brazil. *Bonyunia pulchra* Ricketson, J. R. Grant & Liesner occurs in low-elevation areas of Amazon-facing low-Andean slopes in Peru.

With its 10 species (Appendix 1), *Bonyunia* has an overall distribution that nearly mirrors that of two genera of the Gentianaceae: *Potalia* Aubl. with nine species (Struwe & Albert, 2004) and *Tachia* Aubl. with 13 species (Maguire & Weaver, 1975; Peters et al., 2004; Struwe et al., 2005). While each of these three genera is generally composed of narrow endemics, each also has one species that is generally wide ranging in lowland Amazonia: *B. antoniifolia*, *P. resinifera* Mart., and *T. occidentalis* Maguire & Weaver. Further comparative phylogeographic and geographic studies on these groups are currently under investigation (Grant & Struwe, in prep.). In contrast to these less speciose genera, *Macrocarpaea* (Gentianaceae), with more than 100 species, has recently been shown to occur almost exclusively in mountainous regions of the Neotropics (Struwe et al., 2009).

Richard Schomburgk named *Bonyunia* in honor of his friend George Reginald Bonyun, M.D. (ca. 1811–1853), a medical doctor of Georgetown Guyana (Schomburgk, 1848). In the same manner in which his brother Robert Schomburgk reported on his geographic surveys to the governor of British Guiana, Sir Henry Light, George Bonyun was commissioned by Light to report on the general health of immigrants

and the conditions in rural hospitals (Bonyun, 1848: 22). Bonyun also published several articles on the ethnobotanical use of plants, including the Demerara pinkroot, *Spigelia anthelmia* L. (Loganiaceae) (Bonyun, 1844).

Materials and Methods

All available types and specimens of *Bonyunia* from herbaria with large Neotropical collections were examined on loan or via data/scans/photos* of specimens including AAU, B*, BM, BR, COL*, F, FMB, G, GH, HUT*, K, M, MA, MO, NY, P, R*, RB*, S, SP*, U, UC, US, USZ*, W*, WAG, and Z. Additional information was also extracted from Tropicos, the online database of the Missouri Botanical Garden (<http://www.tropicos.org>). One hundred seventy-eight collections were examined, often with multiple duplicates, for a total of 402 sheets, which is a nearly fourfold increase of collections since the revision by Leeuwenberg (1969).

Taxonomic History

Bonyunia was proposed as a monotypic genus in the Loganiaceae (Schomburgk, 1848). However, despite providing locality information, there was no description, diagnosis, or illustration, rendering it a nomen nudum and invalid. Valid establishment of the genus and species was only effected 20 years later by Progel (1868) in his treatment of the Loganiaceae in Martius' *Flora Brasiliensis*. Typification remained problematic, however, because although the genus had been originally proposed by Schomburgk as monotypic (for *B. superba* M. R. Schomb. from Venezuela), Progel added a second species that inadvertently resulted in a simultaneous publication date for both species, *B. superba* M. R. Schomb. ex Progel, and *B. antoniifolia* from Brazil, which was published in the Mantissa (addendum or supplement). Nevertheless, Leeuwenberg (1969) effectively lectotypified the genus on *B. superba*, whereby Schomburgk's original intent of the genus was preserved.

After those first two species, three more were eventually added to the genus: *Bonyunia minor* from Guyana (Brown, 1901), *B. cinchonoides* Gleason & Standl. from Venezuela (Gleason, 1931), and *B. aquatica* from Brazil (Ducke, 1935). Leeuwenberg (1969) revised *Bonyunia* and accepted four species: *B. antoniifolia*, *B. aquatica*, *B. minor* (placing *B. cinchonoides* in synonymy under *B. minor*), and *B. superba*. While this is the only revision of *Bonyunia*, Berry, in the *Flora of the Venezuelan Guayana* (2001), provided a brief synopsis largely based on Leeuwenberg's work. Until now, these two pieces of literature have remained the primary sources of information on *Bonyunia*.

Morphology

Bonyunia is characterized by a white to yellowish white corolla at anthesis that turns pink, red, to purple at maturity (Fig. 2A); thin and double-winged seeds (Fig. 2C); leaves that are opposite, entire, with many variations in shape (Figs. 2B, 3, 5); and 5-merous flowers with a campanulate calyx (Figs. 4, 5). While having only 10 species, *Bonyunia* exhibits a rather extraordinary breadth of morphological diversity, especially in habit, leaves, calyces, and seeds.

habit

Bonyunia is comprised of lowland rainforest riverside trees (*B. aquatica*), lowland rainforest terra firme canopy-level trees (*B. magnifica*, *B. venusta*), shrubs and trees of grasslands and open savanna (*B. antoniifolia*), savanna-tepui shrubs (*B. minor*), tepui-base trees (*B. excelsa*, *B. nobilis*), cloud forest trees (*B. spectabilis*, *B. superba*), and Andean rainforest trees (*B. pulchra*). It occupies a broad range of habitats reflecting its adaptation to the major ecosystems in northwestern South America. Inversely, species have undergone morphological adaptation in habit to these habitats. *Bonyunia antoniifolia* is a 5–9 m tall shrub to tree that occurs in grasslands, fields, or open savanna on terra firme, while *B. aquatica* is a 2–15 m tall lowland rainforest riverside tree, and *B. minor* is a 2–10 m tall savanna-tepui shrub to tree. These three species share their strong hairiness and seed morphology, and they also have a preference for open, sunny localities (river corridors and savannas). The remaining species occur in closed forests and tend to be glabrous and generally decrease in height toward higher elevations: *B. magnifica* and *B. venusta* are 15–20 m tall lowland rainforest terra firme canopy forest–level trees, *B. pulchra* comprise 15–40 m tall Andean rainforest trees, *B. excelsa* and *B. nobilis* are 4–35 m tall tepui-base trees, while *B. spectabilis* and *B. superba* are 1.8–7.6 m tall cloud forest trees.

leaves

The leaves of each species of *Bonyunia* have a unique suite of morphological characters that renders leaf morphology very useful in species identification (Figs. 3, 5). The variable and taxonomically useful characters include the overall shape of the leaves (ovate, elliptic, oval, to obovate), the leaf base (attenuate, cuneate, cordate, to rounded), and the leaf

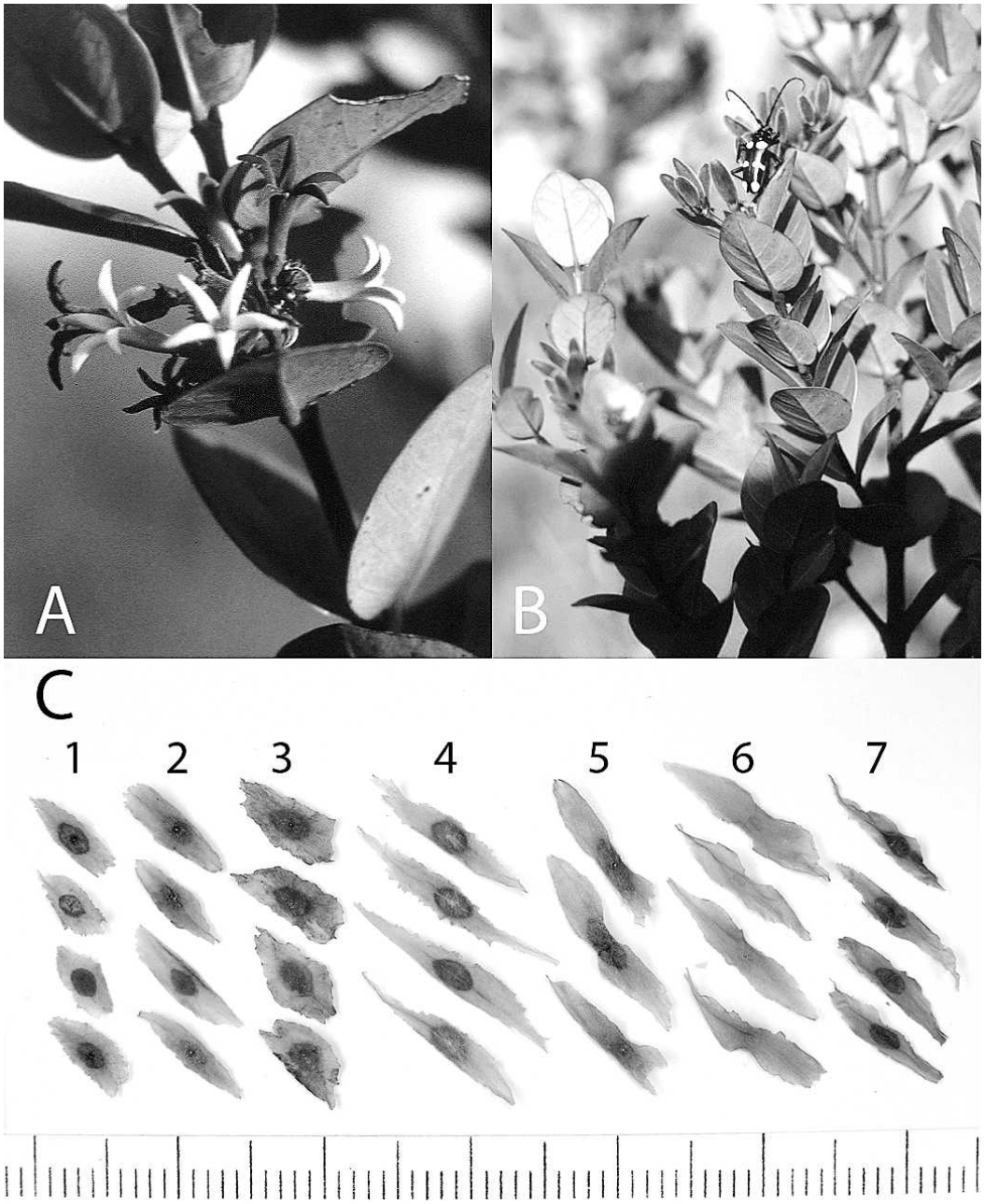

Figure 2. —A. *Bonyunia minor* in flower. Corolla is white to yellowish white at anthesis, yet changes at maturity or perhaps once pollinated to pink, red, or purple. —B. *B. minor* in fruit; notice Cerambycidae insect. —C. Seed morphology of *Bonyunia*. 1. *B. antoniifolia* (*Dambros 356* [US]). 2. *B. minor* (*Maguire & Wurdack 30525* [WAG]). 3. *B. aquatica* (*Ducke 224* [NY]). 4. *B. superba* (*Pinkus 270* [US]). 5. *B. magnifica* (*Prance et al. 22804* [WAG]). 6. *B. nobilis* (*Palacios et al. 2393* [MO]). 7. *B. pulchra* (*Wallnöfer 14-41088* [K]). A, B photos by Robin Foster. C photo by Neil Villard.

apex (acuminate, acute, obtuse, rounded, to retuse), in addition to the texture (thin to thick) and indument on the abaxial leaf surface, especially along the midvein and secondary veins (glabrous to densely hispid). The classification of Leeuwenberg (1969) relied nearly entirely on leaf morphology and is also important in this monograph, although calyx and seed morphology are equally important in this treatment.

STEMS AND INFLORESCENCES

Bonyunia is composed of branched shrubs and trees, and the apex of each branch has an inflorescence composed of a dichasium of paired cymes. The stems of *Bonyunia* are solid and round. In most species, the stems and peduncles are at least sparsely pubescent, though a few species are completely glabrous (*B. magnifica*, *B. minor*, and *B. nobilis*). In several notable cases, the stems are nearly glabrous, or sometimes with only one side pubescent, yet the branches of the inflorescence are contrastingly extremely pubescent, e.g., *B. excelsa*.

FLOWERS

The corolla of *Bonyunia* is white to yellowish white at anthesis and changes at maturity or, perhaps, once pollinated, to pink, red, or purple (Fig. 2A). Nevertheless, the corolla, pistil, and stamens of *Bonyunia* have few taxonomically informative characters. In species with only few flowers available on the herbarium specimens for study, full dissections were not made because the measurements are nearly identical between species and destroying small amounts of precious material was not worthwhile. The outside of the corolla tube and corolla lobes is always appressed strigose, its hairs being shorter than the hairs on the calyx. The inside of the reflexed corolla lobes is glabrous and therefore exposes the color of the corolla (otherwise covered by hairs on the outside).

The shape and indument of the calyx and calyx lobes are among the most important features in species identification (Figs. 4, 5). The calyx indumentum ranges from densely appressed strigose to hispid (in *Bonyunia antoniifolia*, *B. aquatica*, and *B. spectabilis*), hispidulous to glabrous (in *B. pulchra*), glabrous to hispidulous (in *B. venusta* and *B. excelsa*), to glabrous (in *B. magnifica*, *B. minor*, *B. nobilis*, and *B. superba*). Sometimes a few hispid hairs migrate toward the pedicel or peduncle (e.g., in *B. minor*), and sometimes tufts of hairs appear on the apices of the calyx lobes (*B. nobilis*). The overall length of the calyx is rather similar in all species (2–4[–6] mm, including 0.3–1.5 mm calyx lobes), yet one species, *B. superba*, is exceptional in having 5–10 mm calyces, including 2–6 mm calyx lobes. *Bonyunia superba* is also unique in having spatulate-shaped calyx lobes, while all other species have triangular-shaped lobes. The classification presented here is largely based on calyx characters.

FRUITS AND SEEDS

The pistil and mature fruit of all species of *Bonyunia* are extremely hispid throughout. The fruits are erect and appear to have a rather consistent morphology as ovoid, ellipsoid to obovoid, bivalved, dry dehiscent capsules (Fig. 2B), with each locule containing one to 20 thin, flattened, winged seeds per locule (e.g., two to 40 seeds per capsule). *Bonyunia* and its closely related genus *Antonia* have winged seeds in dry capsules that facilitate wind dispersal (Mori & Brown, 1994).

There is a broad and previously unrecognized range of seed morphology in *Bonyunia* (Fig. 2C). In the absence of a molecular-based phylogenetic hypothesis, the seed characters provide a useful insight into the relationships in the genus. Seven of the 10 species have specimens with mature fruits and seeds: *B. antoniifolia*, *B. aquatica*, *B. magnifica*, *B. minor*, *B. nobilis*, *B. pulchra*, and *B. superba* (mature seeds are missing for only *B. excelsa*, *B. spectabilis*, and *B. venusta*). After examination of seeds of several capsules on multiple specimens per species, seed size appears to be consistent within species. Based on seed morphology, these species can be divided into two groups based on morphology and color. Group I (Fig. 2C, 1–4) is comprised of five species that have rather thin, flattened seeds with a large, prominent, brown seed body and tan-colored wings: *B. antoniifolia*, *B. aquatica*, *B. minor*, and *B. superba*; the seeds available from *B. spectabilis* are immature, but the species clearly belongs here. Group II (Fig. 2C, 5–7) comprises three species with a more three-dimensional aspect with slightly curled seed wings, has a less prominent difference in color between the bodies and wings, and is rather orangish in color: *B. magnifica*, *B. nobilis*, and *B. pulchra*. Despite disjunct localities, the unique shared seed morphological characters of *B. magnifica* (Amazonian Brazil) and *B. nobilis* (Colombia) support their close relationship, as seen in their similar leaf morphologies. Seeds are not available for *B. excelsa* or *B. venusta*, but, based on general morphology, they probably belong to group I. To summarize, *Bonyunia* can be divided into two groups based on seed morphology:

Group I: *B. antoniifolia*, *B. aquatica*, *B. minor*, *B. spectabilis*, *B. superba* (Amazon River basin of Brazil and Bolivia, the Orinoco River basin of Colombia and Venezuela, and the Guayana region: Guyana, Venezuela)

Group II: *B. magnifica*, *B. nobilis* (Brazil, Colombia), *B. pulchra* (lowland Andes of Peru)

Unknown: *B. excelsa*, *B. venusta* (Colombia, Brazil)

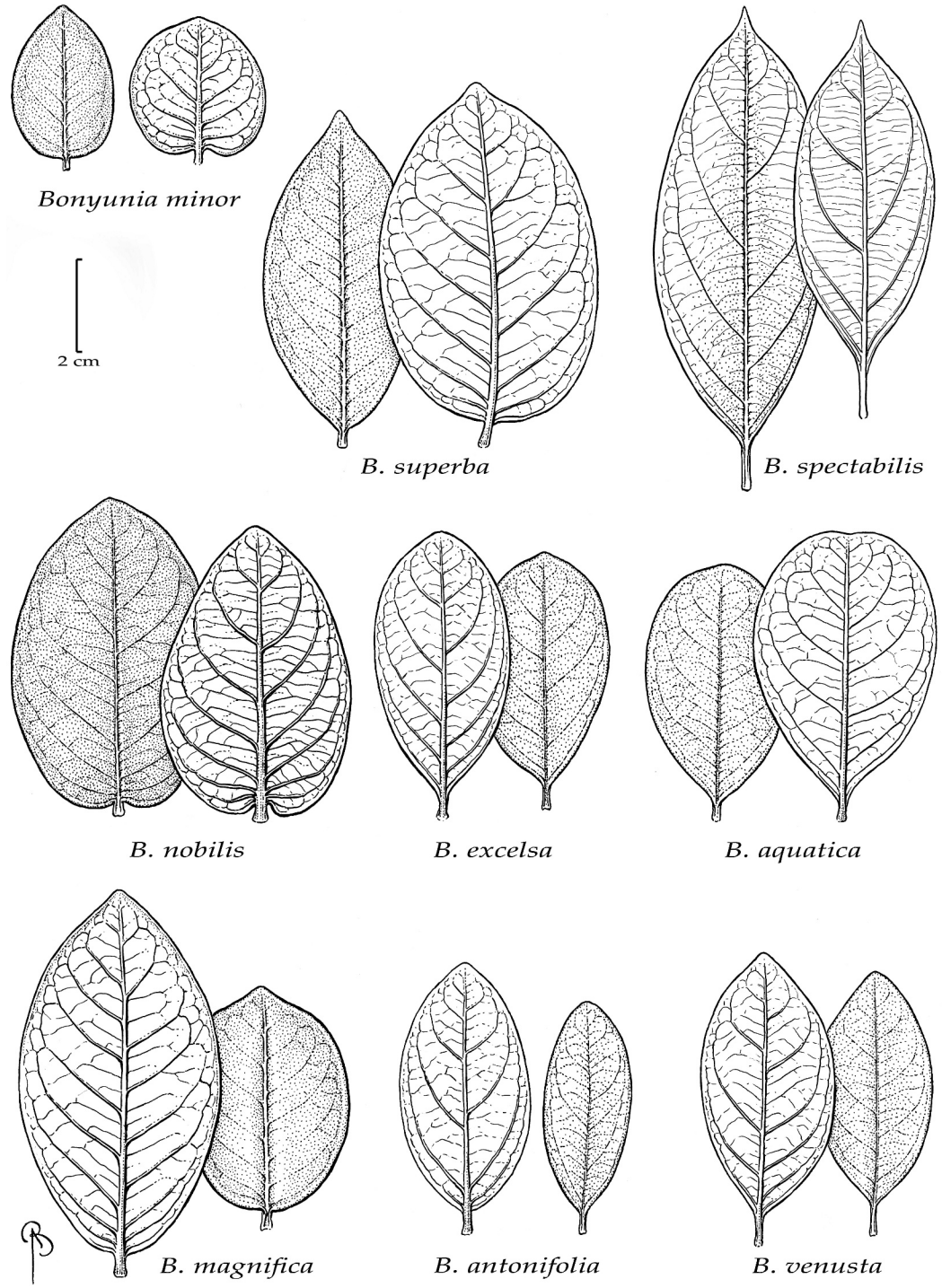

Figure 3. Leaf morphology of *Bonyunia*. *Bonyunia antoniifolia* (drawn from *Prance 5758* [S]), *B. aquatica* (drawn from *Huber 1932* [NY]), *B. excelsa* (drawn from *Restrepo 387* [MO]), *B. magnifica* (drawn from *Prance et al. 22804* [NY]), *B. minor* (drawn from *Maguire 40482* [NY], left, and *Maguire 46143* [NY], right), *B. nobilis* (drawn from *Palacios 2393* [MO]), *B. spectabilis* (drawn from *Hahn & Gopaul 5420* [F]), *B. superba* (drawn from *Schomburgk 613* [BM]), and *B. venusta* (drawn from *Ribeiro et al. 1103* [NY]).

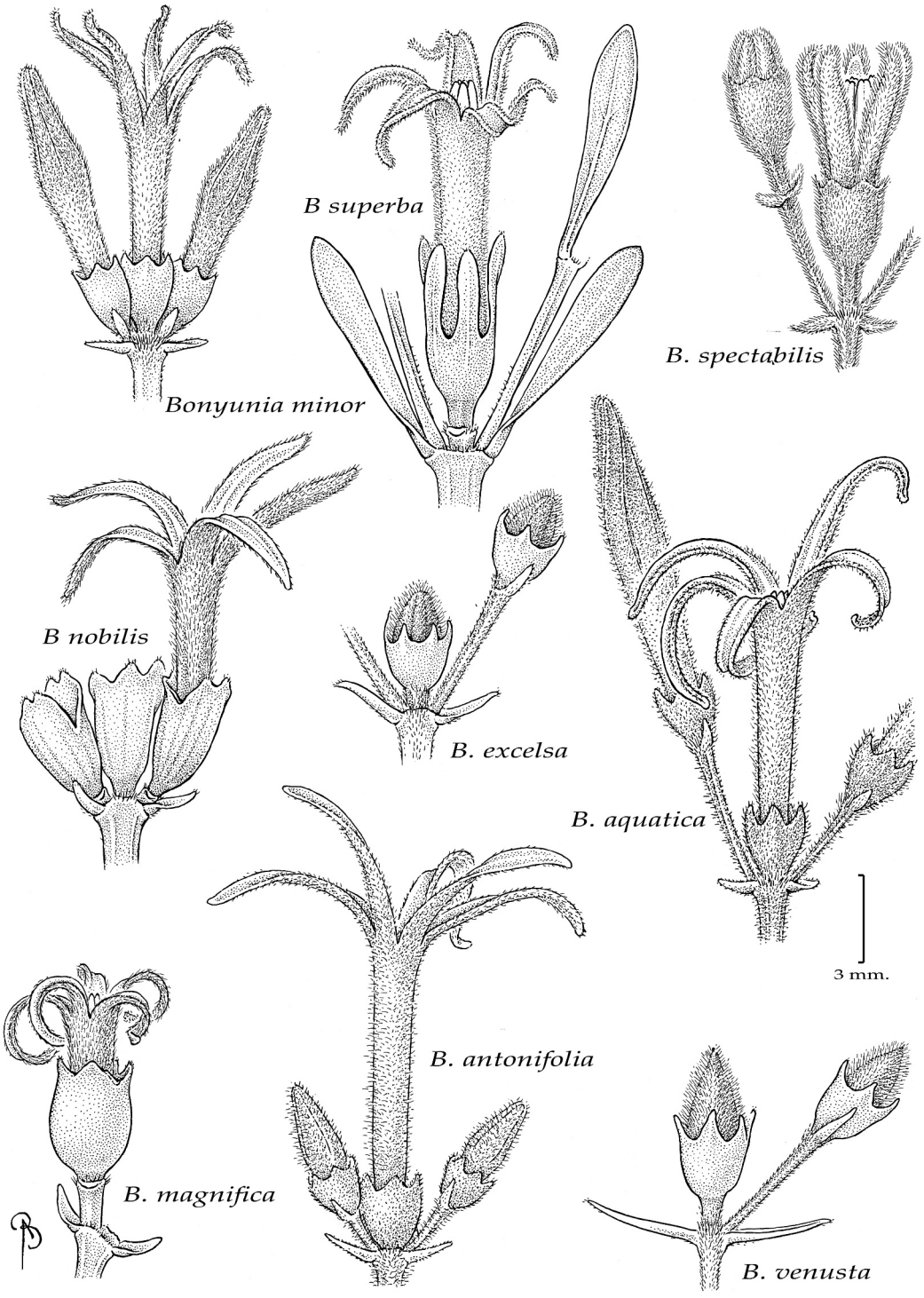

Figure 4. Floral morphology of *Bonyunia* demonstrating morphological differences in the shape and indument of the calyx. *Bonyunia antoniifolia* (drawn from *Ferreira 5688* [MO]), *B. aquatica* (drawn from *Foldats 9423* [NY]), *B. excelsa* (drawn from *Restrepo 387* [MO]), *B. magnifica* (drawn from *Prance et al. 22804* [NY]), *B. minor* (drawn from *Maguire 46143A* [NY]), *B. nobilis* (drawn from *Mendoza 9558* [FMB]), *B. spectabilis* (drawn from *Hahn & Gopaul 5420* [US]), *B. superba* (drawn from *Schomburgk 613* [BM]), and *B. venusta* (drawn from *Ribeiro et al. 1103* [NY]).

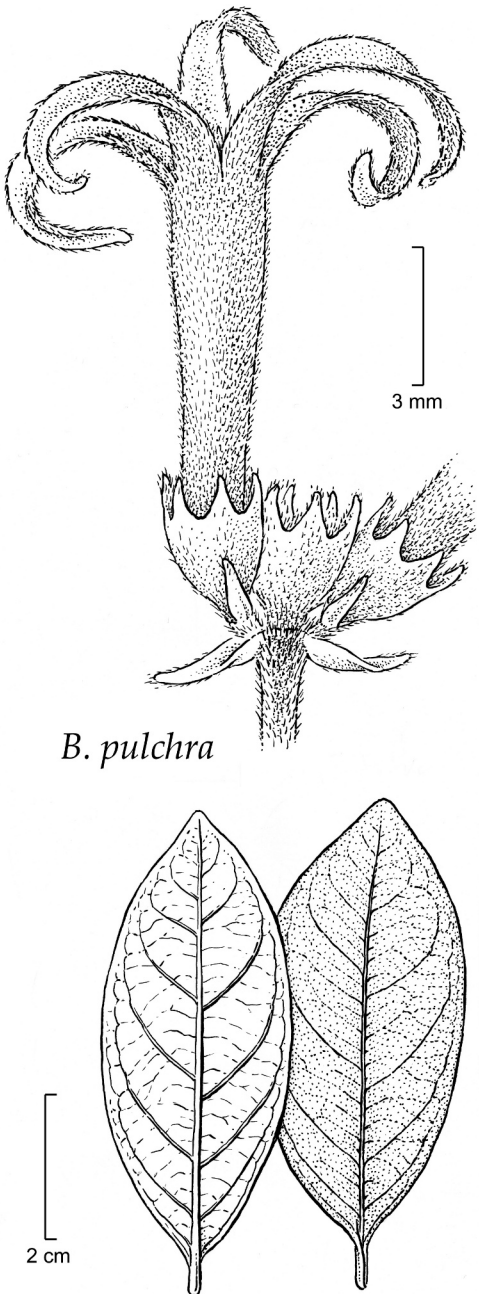

Figure 5. Floral and leaf morphology of *Bonyunia pulchra* (drawn from *Rojas 478* [F, MO]) from Peru.

Taxonomic Treatment

Bonyunia M. R. Schomb. ex Progel, Fl. Bras. (Martius) 6(1): 267, t. 72. 1868. TYPE: *Bonyunia superba* M. R. Schomb. ex Progel, Fl. Bras. (Martius) 6(1): 267, tab. 72. 1868 (lectotype, designated by Leeuwenberg, 1969: 158).

Branched shrubs or trees, 2–40 m tall, glabrous to hispid; stems round, solid. Leaves opposite, short to long-petiolate; blades simple, pinnately veined, thin and membranous to thick and coriaceous, margins entire, variously shaped (ovate, oval, elliptic, orbicular, obelliptic, obovate, lanceolate, to oblanceolate). Inflorescence a terminal dichasium of paired cymes, 3 to 7 flowers per cyme; bracts (organs on peduncles that subtend inflorescence branches, or flowers) leafy, often similar to the leaves, sessile to short-petiolate; bracteoles (organs on pedicels that subtend individual flowers) triangular to spatulate. Flowers sessile to pedicellate, 5-merous (calyx, corolla, and stamens), bracteolate; calyx green, campanulate to urceolate, glabrous to hispid, ecarinate to slightly keeled, calyx lobes triangular, spatulate to obovate, apices acute to acuminate; corolla white to yellowish white at anthesis, turning pink, red, to purple at maturity, trumpet-shaped with a long fused tube to 2/3 of the total length, and 5 reflexed linear-long lobes; outside of the corolla tube and corolla lobes densely pubescent (appressed strigose), inside of the reflexed corolla lobes glabrous and therefore exposing the corolla color (otherwise obscured); stamens 5, included, equal, one on each of the corolla lobes inserted just below sinuses; filaments adnate to the corolla, the free portion less than 0.5 mm; anthers basifixed, linear-oblong, sagittate at the base; pistil included within the corolla tube, much shorter than the stamens, hispid; ovary superior, ovoid, placentation axile; style straight; stigma bilobed, the lobes acute, acuminate to spatulate; style and stigma deciduous in fruit. Capsules septicidally dehiscent, ellipsoid to obovoid, pubescent, erect, tan to brown, surface hispid, bilocular, 1 to 20 seeds per locule (e.g., 2 to 40 seeds per capsule); seeds oblong, flattened, yet overall concave to one side, winged all around; seed body ellipsoid, brown; seed wings straw-gold to dark orange, reticulate.

Species are based on discrete suites of morphological characters, especially habit and leaf, calyx, and seed morphology. Some unique characters include indumentum (hispid in *Bonyunia antoniifolia*, *B. aquatica*, and *B. spectabilis* vs. glabrous in all other species), calyx shape (urceolate in *B. magnifica* vs. campanulate in all other species), and calyx lobe shape (obovate in *B. superba* vs. triangular in all other species).

Key to the Species of *Bonyunia*

1a. Calyx densely pubescent throughout (appressed strigose to hispid).
  2a. Leaves consistently broadly to narrowly obovate; lowlands along the Orinoco River and its tributaries in Venezuela and Colombia, and along the upper Rio Negro in Brazil . . . . . 2. *B. aquatica*

2b. Leaves elliptic or ovate.
3a. Leaves short-petiolate (petiole 2–4 mm), elliptic to ovate, rarely obovate, base cuneate to rounded, apex obtuse to rounded; stems and peduncles hispid; calyx appressed strigose to hispid; widespread in lowlands along the Amazon River and its major tributaries in Brazil and Bolivia . . . . . 1. *B. antoniifolia*
3b. Leaves long-petiolate (petiole 5–10 mm), elliptic to nearly narrowly lanceolate, base long attenuate to cuneate, apex acuminate to acute; stems glabrous, peduncles hispid; calyx densely appressed strigose to hispid; Mount Roraima, Guyana . . . . . 8. *B. spectabilis*
1b. Calyx glabrous or nearly so, tufts of hispid hairs may occur on calyx lobe apices, or hairs may approach the calyx from the pedicel beneath, or sparse hairs may occur, especially in Peruvian material.
4a. Calyx lobes spatulate to obovate, equaling to much exceeding the length of the calyx tube; bracteoles prominent, spatulate to obovate, equaling to exceeding the calyx in length; Venezuela and Guyana . . . 9. *B. superba*
4b. Calyx lobes triangular, shorter than the length of the calyx tube; bracteoles inconspicuous, triangular to linear-triangular, shorter than the calyx.
5a. Leaves thick-coriaceous; leaf bases rounded to cordate (seldom cuneate); pedicels glabrous to glabrescent throughout to rarely with tufts of hairs at the uppermost part under the calyx; calyx lobes acute.
6a. Leaves small, up to 4.5(–8.6) cm long, adaxial surface even in color; seed body brown, wings straw-gold; savanna shrubs or forest trees from 2–10 m tall at higher-elevation savanna and tepui habitats of Venezuela and Guyana . . . . . 5. *B. minor*
6b. Leaves larger, up to 10 cm long, adaxial surface minutely etched revealing a lighter color with small alphabet/hieroglyphic-shaped marks; seed body and wings dark orange; forest trees 7–20 m tall.
7a. Calyx narrowly campanulate, glabrous, striate, with tufts of hairs on calyx lobe apices; Sierra de Chiribiquete in Colombia . . . . . 6. *B. nobilis*
7b. Calyx urceolate to campanulate, calyx lobe apices glabrous; terra firme of the Amazon lowlands of Brazil . . . . . 4. *B. magnifica*
5b. Leaves thin coriaceous; leaf bases cuneate; pedicels pubescent throughout; calyx lobes acuminate to acute.
8a. Secondary flowers sessile to subsessile; Peru . . . . . 7. *B. pulchra*
8b. Secondary flowers pedicellate; Colombia or Brazil.
9a. Stems glabrous, to hispid along one side, but branches of the inflorescence always hispid; leaves with 5 to 7 pairs of nearly parallel to arching secondary veins; Sierra de Chiribiquete in Colombia . . . . . 3. *B. excelsa*
9b. Stems and branches of the inflorescence equally lightly hispid; leaves with 3 to 6 pairs of arching secondary veins; Amazon lowlands of Brazil . . . . . 10. *B. venusta*

1. Bonyunia antoniifolia Progel, Fl. Bras. (Martius) 6(1): 288. 1868. TYPE: Brazil. Mato Grosso: "In saxosis S. da Chapada" [Santa Ana da Chapada, near Cuiabá], Sep. 1827, *L. Riedel 1149* (holotype, BR!; isotypes, LE not seen, MO!, NY!). Figures 1, 2C, 3, 4, 6A, B.

Branched shrub to tree to 5–9 m tall, densely hispid throughout, glabrous only on adaxial leaf surfaces; trunk to 10–30 cm diam.; bark thick fissured to corky. Leaves oval, elliptic, to ovate, rarely obovate, short-petiolate, 3.2–7.2 cm, petiole 2–4 mm; blades 3.5–7.4 × 1.8–5 cm, thin-coriaceous, darker adaxially, slightly glossy adaxially and more opaque abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with slightly raised secondary veins; base cuneate to rounded; apex obtuse to rounded. Inflorescence 2–8 cm; branches 1–6 cm; bracts oval, ovate, to obovate, short-petiolate, 4–20 × 2–15 mm; base cuneate to rounded; apex obtuse to rounded; bract petioles 1–3 mm; primary flower sessile to subsessile, secondary flowers pedicellate; pedicels 1–5 mm; bracteoles triangular, 0.75–3 × 0.5–1 mm. Calyx campanulate, 2–3 ×1.5–2 mm, appressed strigose to hispid, ecarinate; calyx lobes triangular, 0.3–1 × 1.5–2 mm, apex acute; corolla 17–30 mm; tube 8–11 × 1–1.5 mm; lobes 7–9 × 0.75–2 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1.8–2 × 0.3–0.5 mm; pistil ca. 8 mm; ovary ovate, orbicular to obovate, 1–1.5 × ca. 1 mm; style 6–7 × 0.3–0.5 mm; stigma bilobed, each lobe spatulate, 0.50–0.75 × ca. 0.5 mm. Capsules ellipsoid to ovoid, 12–16 × 5–8 mm (excluding style base), tan, 4 to 12 seeds per locule (e.g., 8 to 24 seeds per fruit); seeds 4.5–7.5 × 2–2.75 mm, seed body brown, seed wings straw-gold, reticulate.

Morphology and similarities. *Bonyunia antoniifolia* is distinctive in being densely hispid throughout (as in *B. aquatica* and, to a lesser extent, *B. spectabilis*) and having similar-sized elliptic to ovate leaves with a cuneate to rounded base and apex. It appears to be most similar to *B. aquatica*, *B. minor*, *B. superba*, and *B. spectabilis*. These five species share flattened seeds with a large, prominent, brown seed body and tan-colored wings.

Distribution and habitat. *Bonyunia antoniifolia* occurs in grasslands, fields, or open savanna on terra firme, throughout on white sandy to stony soils. It has a broad distribution in the Amazon River basin and its tributaries in Brazil and Bolivia (Fig. 1) at elevations of 80–800 m. It has the broadest distribution of all species in the genus and a rather consistent morphology across its range.

IUCN Red List category. *Bonyunia antoniifolia* has a broad distribution in Brazil and Bolivia and has

been collected in formally protected areas such as the Parque Nacional Noel Kempff Mercado (Bolivia). It is assigned a preliminary IUCN status of Least Concern (LC) as set forth in the IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from *Antonia* and the Latin "folium," named for the resemblance of its leaves to that of the genus *Antonia* (Loganiaceae).

Typification. The disparity of the type locality as published in the protologue of *Bonyunia antoniifolia* and printed on the herbarium label of its type (*L. Riedel 1149*) is resolved here. The protologue of Progel identifies the collection site as "Serra da Chapada, Prov. Minarum," and accordingly, most references to *Bonyunia* have listed the type or at least *B. antoniifolia* as coming from Minas Gerais, Brazil (e.g., Ducke, 1935; Berry, 2001). However, the herbarium label reads "In saxosis S. da Chapada. Sept 1827. Brazilia. Riedel Nro. 1149 Rubiacea." In the list of itineraries for *Flora Brasiliensis*, it is noted that Riedel did not collect in Minas Gerais in September 1827, but rather in Mato Grosso: "Rio S. Lourenço ad Cuyabá (I.–IX. 27), Serra Chapada (V., VI.)" (Urban, 1906: 91). The collection site of Serra da Chapada probably refers to Santa Ana da Chapada, which is near Cuiabá in Mato Grosso. This fits in perfectly well with the distribution of *B. antoniifolia* as mapped here. *Bonyunia* does not occur in Minas Gerais. A sheet of *Riedel 1149* should be at R since a full set of his material was deposited there; however, a recent search at R has uncovered a catalogue indicating that Riedel numbers 1147 to 1182 were never sent (A. Costa, pers. comm.). The MO and NY sheets are identified here for the first time as isotypes of *B. antoniifolia*. Both match the material on the BR sheet, but the labels are completely different. Ludwig Riedel, the collector of the type, deposited the main set of his collections at St. Petersburg, Russia (LE), and the second in Rio de Janeiro. The MO and NY sheets were distributed from LE, and the labels are standard-issue typeset labels in Russian, with only the following handwritten information to identify the specimen: "Indetercei, No 1149, Brasilia, Riedel."

Specimens examined. BOLIVIA. **Beni:** Itenez, Serranía San Simon, *R. Quevedo et al. 973* (G, MO, NY, USZ not seen); Vaca Diez, entre Guayaramerin y Río Yata, carr. a Riberalta, 14 km SO de Guayaramerin, *L. Vargas et al. 830* (WAG). **Santa Cruz:** Catarata del Encanto, Huanchaca, La Meceta, *R. Guillén 2513* (G, MA, MO, NY, USZ not seen); Velasco, Camp. El Refugio, *R. Guillén & G. Salvatierra 2315* (MA, NY, USZ not seen); Parque Nacional Noel Kempff Mercado, Los Fierros, La Meseta, *R. Guillén et al. 4161* (F, MA, NY, USZ not seen); Velasco, Parque Nacional Noel Kempff Mercado, *E. Gutiérrez et al. 1323* (G, MO, NY, USZ not seen), *T. Killeen 2749* (NY); Nuflo de Chavez, Mesetea de Caparuch, *E. Gutiérrez et al. 1444* (MO, USZ not seen); Velasco, Parque Nacional Noel Kempff Mercado, Serranía de Caparuch, 750 m, *T. Killeen et al. 6501* (F, MO, NY, USZ not seen); Velasco, Parque Nacional Noel Kempff Mercado, Serranía de Caparuch, a 20 km SE del Camp. Los Fierros, *T. T. Killeen et al. 7080* (MO, NY, USZ not seen); Velasco, Parque Nacional Noel Kempff Mercado, Serranía S y NE de la pista Noel Kempff Mercado, *B. Mostacedo et al. 1815* (G, NY, USZ not seen); Parque Nacional Noel Kempff Mercado, Serranía S y NE de la posta Noel Kempff Mercado, *B. Mostacedo et al. 1861* (G, MO, NY, USZ not seen); Velasco, Est. Flor de Oro, margen del Río Iténez (Guapaoré), 30 km N Serrania de Huanchaca, ca. 85 km E Río Paragua, *M. Peña & R. B. Foster 170* (NY). BRAZIL. s. loc., 10°37′S, 56°06′W, *B. Pena 2005* (MG not seen, RB). **Amazonas:** Rio Negro infer., Bahia Boiassú, Camp Amelia, *A. Ducke 379* (S), *A. Ducke 680* (F, MG not seen, MO, NY, UC, US); Manaus, [80 m], *A. Ducke 738* (F), *A. Ducke 5738* (S), *A. Ducke 11184* (BM, G, RB, S, U), *A. Ducke 11534* (G), *A. Ducke 12197* (BM, G, P, US); Coary, campinas, *A. Ducke 12384* (BM, G, RB, US); Novo Aripuanã, BR 230, 150 km al. L de Humaitá e 30 km para o S na rodovia do Estanho, *C. A. C. Ferreira 5603* (MO, NY, WAG); Humaitá Fazenda Paraiso dos Campos, *A. Janssen 640* (M); Humaitá, Fazenda Arlindo Marmentini, *Janssen & Gemtchujnicov 306* (M); Humaitá, Campos at Km 15 on rd. to Manaus, *K. Kubitzki & H. H. Poppendieck 79-47* (MG not seen, NY); Rd. Porto Velho–Humaitá, Km 75, *E. Lleras et al. P19452* (U, WAG); Rio Negro, margem direita, 50 km acima de Manaus, Campo Amélia (Faz Belo Horizonte), *B. Nelson et al. 1388* (MO, WAG); Fortaleza Savanna, Río Puciari trib. Río Ituxi, *G. T. Prance et al. 13796* (K, MG not seen, MO, NY, RB, U, US, WAG); Campo Amélia (Faz. Belo Horizonte), entre ig. Acajatuba e margem direita do rio Negro, *G. T. Prance et al. 30033* (MO, NY, WAG); Manaus, campina da Ponta Negra, *W. Rodrigues et al. 8547* (US); Humaitá, estrada Humaitá–Porto Velho, Km 38, *L. O. A. Teixeira et al. 266* (NY, WAG); Humaitá, estrada Humaitá–Jacarecanga, Km 150, *L. O. A. Teixeira et al. 1268* (MG not seen, MO, NY, RB, US, WAG); rodovia do Estanho, margem da rodovia 150 km de Humaitá, *G. Vieira et al. 149* (K, NY, US, WAG). **Mato Grosso:** Vale do Cuaporé, *B. L. Amaral 44* (RB); Castanheira, *T. B. Cavalcanti et al. 2377* (K); Guiratinga, Morro da Arnica, *L. A. Dambrós 356* (US); Proc. Mpio. Chapada dos Guimarães, *J. E. de Paula 1907* (Z); Novo Aripuanã, rodovia do Estanho a 120 km da Transamazônica, *C. A. C. Ferreira 5688* (MO, NY, WAG); Cuiabá, MT. Río Caxipozinho, prox. a Cachoeira Véu de Noiva, *C. A. C. Ferreira 6540* (MO, NY, WAG); Entre, *J. G. Kuhlmann 2233* (SP); Colider, estrada Santarém–Cuiabá, BR 163, Km 762, Serra do Cachimbo a 30 km da cidade de Guarantã, *M. N. Silva et al. 28* (MO, NY, WAG). **Pará:** Itaituba, estrada Santarém–Cuiabá, BR 163, Km 877, Serra do Cachimbo, *I. L. Amaral et al. 112495* (NY). **Rondônia:** basin of Rio Madeiro, Km 215–216 Madeira–Mamorá railroad near Abuna, *G. T. Prance et al. 5758* (COL, F, GH, K, MG not seen, NY, R, S, U, US, Z).

2. Bonyunia aquatica Ducke, Arq. Inst. Biol. Veg. 1: 211. 1935. TYPE: Brazil. Amazonas: "frequens in ripis profunde et permanenter inundates fluminis Curicuriary inferioris (affluentis Río Negro superioris, civitate Amazonas)," 21 Dec. 1931, *A. Ducke 23760* (holotype, RB!; isotypes, G!, K!, P!, RB [2]!, S!, U!, US!). Figures 1, 2C, 3, 4, 6C, D.

Branched shrub to tree to 2–8(–15) m tall, densely hispid throughout especially on the midvein of the undersides of leaves, petioles, peduncles, inflorescences, calyces, and corollas (glabrous only on adaxial leaf surfaces). Leaves broadly obovate to narrowly obelliptic, short-petiolate, (2.5–)5–7(–9) cm, petiole 2–6 mm; blades (2.3–)5–7(–8.6) × (1.8–)3–5.2 cm, thin-coriaceous, darker adaxially, lighter abaxially, slightly glossy adaxially and more opaque abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with slightly raised secondary veins; base aequilateral; apex rounded to retuse. Inflorescence 3–9 cm; branches 2.5–6 cm; bracts obovate to obelliptic, sessile to short-petiolate, (3–)6–28 × (1–)3–12 mm; base aequilateral; apex rounded to retuse; bract petioles 0–2 mm; primary flower sessile to subsessile, secondary flowers pedicellate; pedicels 0.5–3 mm; bracteoles triangular, 0.75–1.75 × 0.5–0.75 mm. Calyx campanulate, 2.5–3.5 × 1.5–2.5 mm, appressed strigose to hispid, ecarinate; calyx lobes triangular, 0.3–1.2 × 1.5–2.5 mm, apex acute; corolla 17–32 mm; tube 8–19 × 1.3–2 mm; lobes 9–13 × 0.75–1.2 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1.25–2 × 0.25–0.5 mm; pistil 7–9 mm; ovary ovate, 1.25–2 × ca. 1.5 mm; style ca. 7 × 0.5 mm; stigma bilobed, each lobe spatulate, 0.75–1 × 0.3–0.5 mm. Capsules ellipsoid to obovoid, 13–22 × 8–9 mm (excluding style base), tan, 3 to 12 seeds per locule (e.g., 6 to 24 seeds per fruit); seeds 7–9 × 3–4.5 mm, seed body brown, seed wings straw-gold, reticulate.

Morphology and similarities. *Bonyunia aquatica* is distinct in its obovate leaves with rounded to retuse apices. Its inflorescence and calyx are hispid as in *B. antoniifolia* and *B. spectabilis*, while other species are glabrous or nearly so. *Bonyunia aquatica* appears to be most similar to *B. antoniifolia*, *B. minor*, *B. superba*, and perhaps *B. spectabilis*.

Distribution and habitat. *Bonyunia aquatica* is a facultative emergent tree of inundated forests along riverbanks and on white sand savannas. It ranges principally along the lowlands of the Orinoco River watershed in Colombia and Venezuela, but also extends to the upper Rio Negro in Brazil at elevations of 80–180(–350) m (Fig. 1). Its range overlaps with that of outlier populations of *B. minor* in southwestern Venezuela.

IUCN Red List category. *Bonyunia aquatica* occurs in lowland areas of Brazil, Colombia, and Venezuela and has been collected in several formally protected areas such as the Reserva Florestal do Rio Negro (Brazil) and the Parque Nacional Natural El Tuparro (Colombia). It is assigned a preliminary IUCN status of Least Concern (LC) as set forth in the IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "aquaticus," meaning "living in or near water," for its facultatively aquatic habit, growing along river corridors and inundated forests.

Specimens examined. BRAZIL. **Amazonas:** Rio Curicuriary affl. Rio Negro, *A. Ducke 224* (NY [2]), *A. Ducke 354* (F, GH, MO, NY, S, US); Rio Negro, Içana, *R. L. Fróes 22260* (IAN, U); Rio Negro, Içana, Cachoeira Tunuhy, *R. L. Fróes 22278* (IAN, U); Barcelos, Río Aracá bajo, *O. Huber et al. 10815* (NY [2], WAG); Rio Negro, Rio Marié, village Macobeta, *K. Kubitzki et al. 79-198* (M, NY, US); s. loc., *J. M. Pires et al. 14155* (IAN, RB). COLOMBIA. **Guianía:** Río Guianía, Puerto Colombia (opposite Venezuelan town of Maroa), Raudal Sapo, *R. E. Schultes et al. 18240* (GH, US [2]). **Vichada:** Cumaribo, Parque Nacional Natural El Tuparro, *H. Mendoza & A. Robles 15691* (FMB). VENEZUELA. **Amazonas:** Laja Alta del Guasacavi, on N bank of black-water Río Guasacavi, *P. E. Berry et al. 5771* (F, K, MO, NY); Laja Suiza, upstream from mouth of black-water Río Guasacavi, 3.5 km SSW of Santa Cruz, *P. E. Berry et al. 5973* (MO, NY); Atabapo, Cucurital de Caname, *G. Davidse et al. 16912* (MO); Rio Negro, lower part of the Rio Baria, *G. Davidse 27650* (WAG); Rio Negro, Rio Pasimoni, betw. its mouth and its jct. with the Río Baria and the Río Yatua, *G. Davidse 27767* (MO, WAG); Atures, Río Guayapo, *E. Foldats & J. Velazco 9423* (NY); Río Negro, final de la "lenguenta" N la Serranía Unturan, *F. Guánchez 881* (MO); Atures, riberas del Río Sipapo desde la boca del Río Guayapo, *F. Guánchez 2641* (MO); Atabapo, alrededores de Canaripó, bajo Río Ventuarí, a unos 20 km al. E de la confluencia con el Río Orinoco, *O. Huber 1932* (COL, K, NY, US, WAG); Atabapo, sabanita ubicada a unos 10 km al. NE del Cerro Moricha, en la ribera E del medio río Ventuarí, *O. Huber 3440* (NY); Atabapo, 22 km al. S de la confluencea sobre los ríos Manapiare y Ventuarí, *O. Huber 3470* (B, NY, WAG); Atabapo, bajo Río Ventuarí, a unos 10 km al. NE de la desembocadura del Caño Marueta, 110 m, *O. Huber 6122* (WAG); Cerro Moriche, Río Ventuarí, *B. Maguire et al. 31012* (COL, F, NY, S, US [2], WAG); Atabapo, en planicie Suelo Faa, *E. Marin 1126* (MO); Atabapo, 44 km al. SE de Sta. Bárbara del Orinoco, *E. Marin 1188* (MO); Cano Cupaven, rt. bank of Rio Orinoco opposite mouth of Rio Atabapo, *J. J. Wurdack & L. S. Adderley 42814* (COL, F, NY, S, US, WAG); Río Guainia betw. Cano San Miguel & Maroa, *J. J. Wurdack & L. S. Adderley 43261* (NY, WAG).

3. Bonyunia excelsa J. R. Grant, sp. nov. TYPE: Colombia. Caquetá: Solano, Parque Nacional Natural Serranía de Chiribiquete, cuenca media del Río Cuñare, creciendo sobre suelo arenoso en un sitio cercano a un tepui en donde predominan *Pagamea thyrsiflora* y *Tepuianthus*, 00°29′55.32″N, 72°37′11″W, 350 m, 15 Nov. 2002, *H. Mendoza*, *A. Escobar*, *S. Medina & M. Leptuama 9456* (holotype, FMB!). Figures 1, 3, 4, 7A.

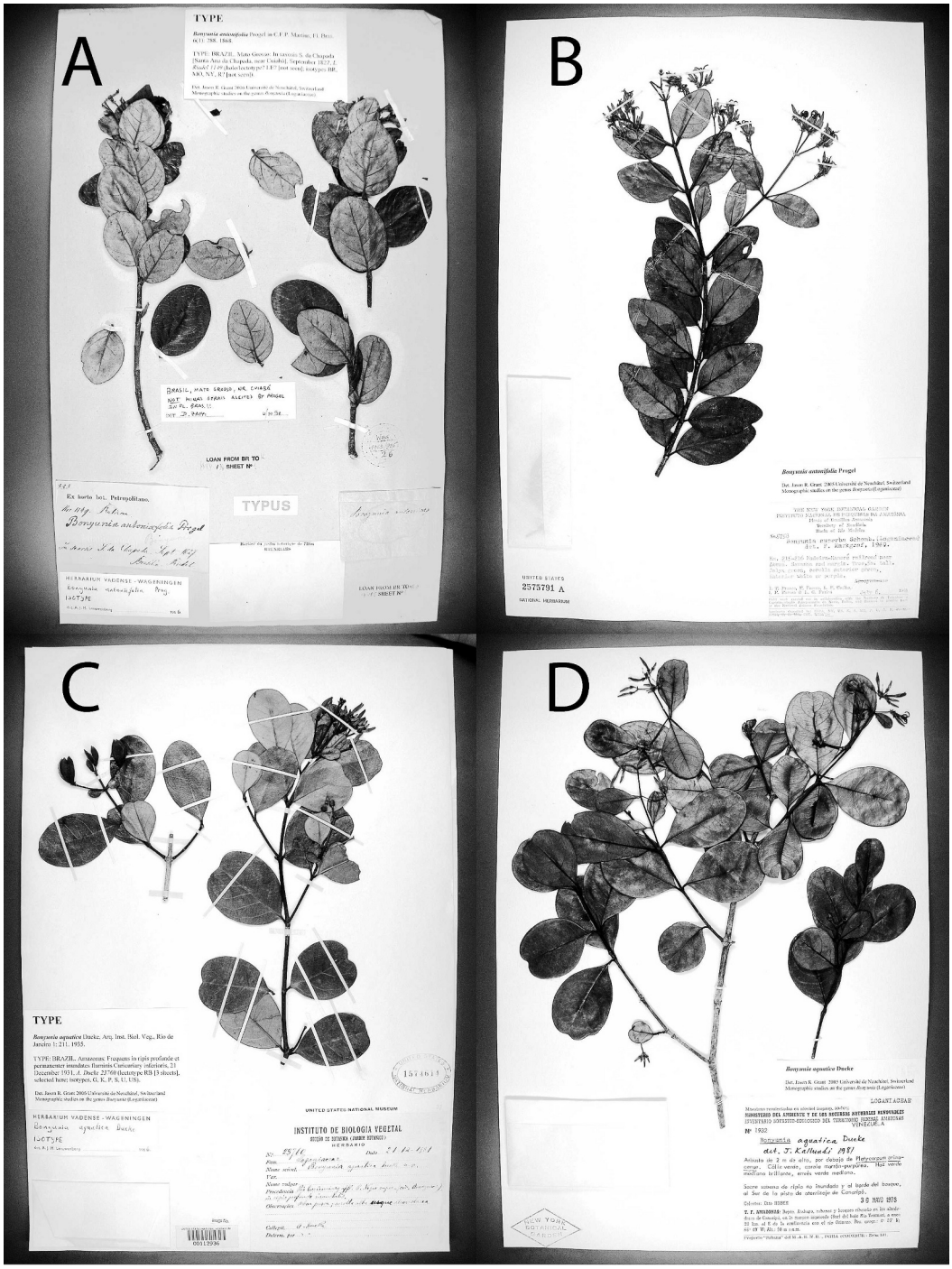

Figure 6. Types and exemplar specimens of *Bonyunia*. —A. Isotype of *B. antoniifolia* Progel (*Riedel 1149* [BR]). —B. Specimen of *B. antoniifolia* Progel (*Prance et al. 5758* [US]). —C. Isotype of *B. aquatica* Ducke (*Ducke 23760* [US]). —D. Specimen of *B. aquatica* Ducke (*Huber 1932* [NY]).

Species nova *Bonyunia antoniifolia* Progel cui affinis, sed ab ea habitu arboris excelsae (4.5–35 m vs. 5–9 m), foliis glabris, calycibus glabris vel hispidulis atque lobis calycis acuminatis vel acutis differt; etiam Sierra de Chiribiquete habitat.

Branched tree to 4.5–35 m tall, hispidulous on petioles, stems (along one side), peduncles, inflorescences, calyces, and corollas. Leaves obovate to elliptic, 4.5–6.2 cm, petiole 3–6 mm; blades 4–5.8 × 1.7–4.2 cm, glabrous, thin-coriaceous, darker adaxially, lighter abaxially, slightly glossy adaxially and more opaque abaxially, with 5 to 7 pairs of nearly parallel to arching secondary veins, smooth with slightly impressed veins adaxially, with slightly raised secondary veins abaxially; base cuneate; apex obtuse to acute. Inflorescence 5–9 cm; branches 2–5 cm, always hispid; bracts obovate to spatulate, sessile to short-petiolate, 20–28 × 7–10 mm; base attenuate to cuneate; apex obtuse, acute, to rounded; bract petioles 1–3 mm; primary flowers subsessile, secondary flowers pedicellate; pedicels 1–7 mm; bracteoles linear-triangular, 1.5–3 × 0.3–0.75 mm. Calyx campanulate, 2–3 × 2–2.5 mm, glabrous to hispidulous, ecarinate; calyx lobes triangular, 0.5–1 × 2–2.5 mm, apex acuminate to acute; corolla 12–14 mm; tube 6–7 × 1–1.5 mm; lobes 6–7 × 0.75–1 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1–1.25 × 0.3–0.5 mm; pistil ca. 10 mm; ovary ovate, 1–1.5 × ca. 1 mm; style 7–8 × 0.3–0.5 mm; stigma bilobed, each lobe acuminate, 0.75–1 × 0.3–0.5 mm. Capsules ellipsoid, 23–30 × 8–9 mm (excluding style base), brown, erect, bilocular; seeds unknown.

Morphology and similarities. *Bonyunia excelsa* is a distinctive species in the open diffuse branching pattern of the inflorescence. It appears to be most similar to *B. venusta* in generally diffuse inflorescences, yet differs in having generally glabrous stems that are hispid along one side, branches of the inflorescence that are hispid all the way around, and leaves with five to seven pairs (vs. three to six pairs) of nearly parallel to arching secondary veins. It differs from *B. antoniifolia* in being a tall tree (4.5–35 m tall vs. 5–9 m), much less pubescent throughout (hispidulous vs. hispid), with glabrous calyces and acuminate to acute calyx lobes.

Distribution and habitat. *Bonyunia excelsa* occurs on plateaus and river basins on sandy soils. Both *B. excelsa* (230–350 m) and *B. nobilis* (350–400 m) are known from the Sierra de Chiribiquete, which is an isolated outlier or tepui of the Guayana region in Colombia (Fig. 1). *Bonyunia excelsa* has also been found in the Araracuara region and Río Mesay.

IUCN Red List category. *Bonyunia excelsa* is only known from three collections, one collected inside a formally protected area, the Parque Nacional Natural Serranía de Chiribiquete (Colombia). It is assigned a preliminary IUCN status of Vulnerable (VU) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "excelsus," meaning "high" or "lofty."

Paratypes. COLOMBIA. **Caquetá:** Araracuara, meseta de areniscas, 200–300 m, *D. Restrepo & A. Matapi 387* (MO); Solano, Río Mesay, bocas del Yavilla, 230 m, *D. Cárdenas et al. 6788* (COAH not seen, MO).

4. Bonyunia magnifica J. R. Grant, sp. nov. TYPE: Brazil. Amazonas: BR 319, Km 190, Manaus–Pôrto Velho hwy., forest on terra firme, 11 Oct. 1974, *G. T. Prance*, *T. D. Pennington*, *M. Leppard*, *P. P. Monteiro & J. F. Ramos 22804* (holotype, NY!; isotypes, INPA not seen, K!, MG not seen, MO!, S!, U!, US!, WAG!). Figures 1, 2C, 3, 4, 7B.

Species nova *Bonyunia minor* N. E. Br. et *B. nobilis* J. R. Grant cui affines, sed a hac calycis lobis apice glabris, ab illa habitu arboris excelsae (usque ad 20 m), foliis majoribus (3–9.1 × 2.5–5.5 cm) discoloribus atque seminibus atro-aurantiacis, ab ambabus calyce urceolato vel campanulato differt.

Branched tree to 20 m tall, glabrous throughout, except for hairs on the midvein of the undersides of leaves, pedicels, corollas, and fruits; trunk to 20 cm diam. Leaves ovate to oval, short-petiolate, 4–10 cm, petiole 3–5 mm; blades 3–9.1 × 2.5–5.5 cm, thick, coriaceous, glossy on both surfaces, distinctly discolored with the adaxial leaf surface distinctly olive-green and speckled, and the abaxial surface a solid gold-green, distinctly etched revealing a lighter color adaxially with small hieroglyphic-shaped marks, adaxial surface smooth with some slightly impressed veins, abaxial surface with prominently raised midvein and secondary veins; base rounded to slightly cordate to rarely cuneate; apex obtuse to acuminate. Inflorescence 5–9 cm; branches 2–7 cm; bracts ovate to oval, short-petiolate, 24–40 × 14–22 mm; base rounded to slightly cordate to rarely cuneate; apex obtuse to acuminate; bract petioles 1–2 mm; primary flower sessile to subsessile, secondary flowers sessile to short-pedicellate; pedicels 0–3 mm; bracteoles triangular, 1.5–3 × 0.5–1 mm. Calyx urceolate to campanulate, 4–6 × 2.5–4 mm, glabrous, ecarinate; calyx lobes triangular, 0.5–1 × 2.5–4 mm, apex acute; corolla 10–13 mm; tube 6–7 × 1–1.5 mm; lobes 5–6 × 0.5–0.75 mm, apex rounded to obtuse; stamens and pistil unknown. Capsules ellipsoid to obovoid, 15–23 × 7–8 mm (excluding style base), tan, 3 to 4 seeds per locule (e.g., 6 to 8 seeds per fruit);

seeds 14–14.5 × 1.5–3 mm, seed body dark orange, seed wings dark orange, reticulate.

Morphology and similarities. *Bonyunia magnifica* is unique in the genus in having an urceolate calyx. Its large, thick, coriaceous leaves are glossy on both surfaces, olive-green and specked adaxially and solid gold-green abaxially (at least when dried), with a prominent, thick, brown, raised midvein adaxially and rounded to cordate leaf base. The adaxial leaf surface of both *B. magnifica* and *B. nobilis* is covered in light specks caused by the deterioration or etching of the upper layer of cells, creating a uniform specked surface; the specks when examined under microscope have the appearance of alphabetic or hieroglyphic marks of differing shapes. The seeds of these two species have a three-dimensional aspect where the wings are slightly curled, have a less prominent difference in color between the bodies and wings, and are rather orangish in color. *Bonyunia magnifica* is related to *B. nobilis*, with which it shares its unique leaf and seed morphology as described above. It differs from *B. nobilis* in its urceolate to campanulate calyx with glabrous calyx lobes, and from *B. minor* in being a 7–20 m tall forest tree with larger discolored leaves (3–9.1 × 2.5–5.5 cm).

Distribution and habitat. *Bonyunia magnifica* occurs in primary forest on terra firme in the Amazon lowlands of Brazil. It is only known from its type collection found at Km 190 on BR 319, the Manaus–Pôrto Velho Highway. Although the elevation is not specified, *B. magnifica* was certainly found between 50 and 100 m, the general elevation of lowland Amazonia. It is disjunct from its morphologically most similar species, *B. nobilis* of Colombia.

IUCN Red List category. *Bonyunia magnifica* is only known from the type collection. It is assigned a preliminary IUCN status of Critically Endangered (CR) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "magnificus," meaning "magnificent."

5. Bonyunia minor N. E. Br., Trans. Linn. Soc. London, Bot. ser. 2, 6: 49, pl. 9, figs. 1–5. 1901. TYPE: Guyana. Mt. Roraima Exped., Kotinga Valley, autumn 1894, *J. J. Quelch & F. McConnell 161* (lectotype, designated by Leeuwenberg, 1969: 156, K!). Figures 1, 2A–C, 3, 4, 7C.

Bonyunia cinchonoides Gleason & Standl., Bull. Torrey Bot. Club 58: 448. 1931. TYPE: Venezuela. Amazonas: summit of Mt. Duida, 4400 ft., Savanna Hills, Aug. 1928–Apr. 1929, *G. H. H. Tate 770* (holotype, NY!; isotype, F!).

Branched shrub to tree to 2–10 m tall, glabrous throughout, except for hairs on the petioles, peduncles, pedicels, and corolla; trunk to 5 cm diam. (*Maguire & Fanshawe 32528*). Leaves variable from individuals in savanna habitat (smaller, broadly ovate, ovate, to nearly orbicular or reniform and distinctly cordate at the base) to forest plants (larger, ovate to oval, and nearly cuneate at the base), short-petiolate, 1.1–8.6 cm, petiole 1–4 mm; blades (1–)3.2–8.4 × (0.8–)3.3–4.5 cm, thick coriaceous, darker adaxially, lighter abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with prominently raised midvein and secondary veins; base cordate, to rounded to cuneate; apex rounded to obtuse, to acute to nearly acuminate. Inflorescence 1.5–6 cm; branches 1–5 cm; bracts (generally as in the leaves) spatulate, obovate to ovate, short-petiolate, 5–17 × 1.5–15 mm; base attenuate to cordate; apex obtuse to rounded; bract petioles 1–2 mm; primary and secondary flowers generally sessile; pedicels 0–1 mm; bracteoles triangular, 1–4 × 0.5–1 mm. Calyx campanulate, 2–3.5 × 2–2.5 mm, glabrous (to sometimes receiving a few hispid hairs from the pedicel or peduncle), ecarinate; calyx lobes triangular, 0.5–1.5 × 2–2.5 mm, apex acute; corolla 11–17 mm; tube 7–9 × 1.25–2.25 mm; lobes 4–8 × 0.75–1 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1.8–2 × 0.5–0.75 mm; pistil 5.5–6 mm; ovary ovate, 1–1.5 × ca. 1 mm; style 4–4.5 × 0.2–0.4 mm; stigma bilobed, each lobe spatulate, 0.5–0.75 × ca. 0.5 mm. Capsules ellipsoid to obovoid, 15–24 × 5–8 mm (excluding style base), tan to brown, 1 to 4 seeds per locule (e.g., 2 to 8 seeds per fruit); seeds 8–10 × 2–3 mm, seed body brown, seed wings straw-gold, reticulate.

Morphology and similarities. *Bonyunia minor* is not only the most morphologically variable species in the genus, but is also easily identifiable by its generally small cordate coriaceous leaves. Part of this variation led to the naming of *B. cinchonoides* Gleason & Standl., later reduced to synonymy under *B. minor* by Leeuwenberg (1969: 156) and also accepted here. The leaf morphology of *B. minor* varies considerably depending on whether the plants occur in open savanna or closed forest. Specimens collected in savanna tend to have smaller, more closely bunched leaves and have a tight, bushy branching pattern, while specimens collected in closed canopy forest have larger leaves in a lax branching pattern. In the savanna, the leaves are smaller, broadly ovate, ovate, to nearly orbicular or reniform, distinctly cordate at the base and rounded to obtuse at the apex; in the forest the leaves are larger, ovate to oval, and cuneate to rounded at the base, to acute to nearly acuminate at

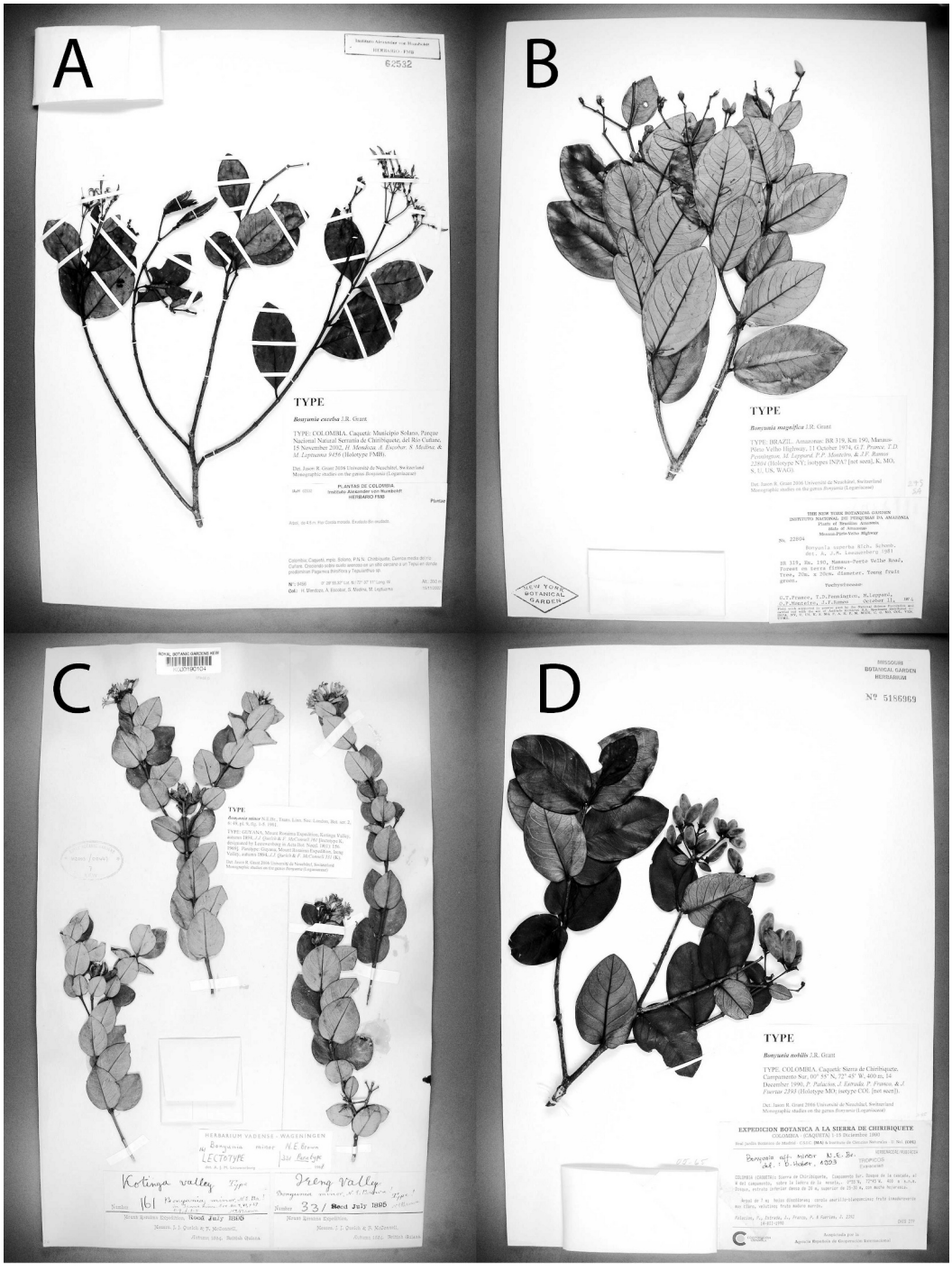

Figure 7. Types and exemplar specimens of *Bonyunia*. —A. Holotype of *B. excelsa* J. R. Grant (*Mendoza et al. 9456* [FMB]). —B. Holotype of *B. magnifica* J. R. Grant (*Prance et al. 22804* [NY]). —C. Lectotype of *B. minor* N. E. Br. (*Quelch & McConnell 161* [K]). —D. Holotype of *B. nobilis* J. R. Grant (*Palacios et al. 2393* [MO]).

the apex. *Bonyunia minor* appears to be most similar to *B. antoniifolia*, *B. aquatica*, *B. superba*, and perhaps *B. spectabilis*.

Distribution and habitat. *Bonyunia minor* is a distinctive shrub or tree of savanna, forest edges, and tepui habitats in the Guayana region in Venezuela and Guyana, especially of the Gran Sabana (Fig. 1). Its range overlaps that of *B. aquatica* to the east and *B. spectabilis* and *B. superba* to the west. It also has the widest range in elevation in the genus, ranging from 100–1450 m.

IUCN Red List category. *Bonyunia minor* occurs in the Guayana region in Venezuela and Guyana and has been collected in several formally protected areas such as the Parque Nacional Canaima, Parque Nacional Duida-Marahuaca, and Parque Nacional Yapacana of Venezuela. It is assigned a preliminary IUCN status of Least Concern (LC) as set forth in the IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "minor," "less," for the small stature of some individuals, at the time described, probably in comparison to the only two other species in the genus at the time: *Bonyunia antoniifolia* and *B. superba*.

Specimens examined. BRAZIL. **Roraima:** Serra dol Sol, *Ph. Luetzelburg 21503* (M); Rio Quino Igarapé, *Ph. Luetzelburg 21514* (M); Brazilian side of divide near Serra do Sol, *B. Maguire & C. K. Maguire 40374* (NY, RB). GUYANA. **Cuyuni-Mazaruni:** Upper Mazaruni Distr., Imbaimodai, *Forest Dept. of British Guiana 7921* (K, NY). **Potaro-Siparuni:** Pakariama Mtns., Upper Ireng River watershed, Malakwalai-Tipu, *T. W. Henkel 5699* (US); S Pakaraima Mtns., margins of Chimapu Savanna, *B. Maguire et al. 46143A* (F, NY, US, WAG); Pakaraima Mtns., Upper Mazaruni River, Samwarakna-tipu (Holi-tipu), *B. Maguire & Fanshawe 32528* (K, NY, P, UC); 1842, *Robert Schomburgk 966* (BM, P [not seen, but listed by van Dam, 2002]); Utshi River trail to Santa Elena, *H. D. Clarke 913* (NY, US); Paramakatoi, 0.5–6 km from trail to Youwang & Monkey Mtn., *H. D. Clarke 1238* (MO, NY, US); Mt. Roraima Exped., Ireng Valley, *J. J. Quelch & F. McConnell 331* (K). VENEZUELA. **Amazonas:** Río Orinoco, Cerro Yapacana, NW slopes, *B. Maguire et al. 30525* (NY, WAG); Cerro Moriche, Río Ventuarí, *B. Maguire 30857* (NY); summit of Mt. Duida, Savanna Hills, *J. A. Steyermark 58291* (F, NY); summit of Mt. Duida, Savanna Hills, *Tate 770* (F [isotype], NY [holotype, *Bonyunia cinchonoides*]); Felsen von Serra de Mairary, Río Branco, Suramu, *E. Ule 8469* (K, MG not seen). **Bolivar:** Sabanas a orillas del Río Hacha, Región de Canaima, *G. Agostini 358* (US); Gran Sabana, desde Santa Elena en el Km 274, *C. Benítez & W. G. D'Arcy 5202* (MO); Río Caroui, region de Urimán, *A. L. Bernardi 852* (NY); Region de los ríos Icabari, Hacha, *A. L. Bernardi 2624* (NY); Gran Sabana, Ayavaparú, 10–15 km W of Wadakapiapuétepui, *P. E. Berry & L. Brako 5522* (MO, NY), *P. E. Berry & L. Brako 5525* (MO, NY); Gran Sabana, Km 195 S of El Dorado, *P. E. Berry & L. Brako 5530* (MO, NY); Luepa along unpaved rd. to Minicentral La Ciudadela, *P. E. Berry et al. 6559* (MO); Ucaima, 600 m, *J. Bogner 1080* (K, M); orillas del Río Uaiparú, afluente del Ikabarú, Caroní, *F. Cardona 1914* (NY, US); cumbre del Cerro Arepuchi, Río Caroní, *F. Cardona 1946* (NY, US, WAG); Cerro Upuimak, Caroni, *F. Cardona 2243* (US); Gran Sabana, Parque Nacional Canaima, *L. Chacon 595* (MO), *L. Chacon 624* (MO), *L. Chacon 679* (MO); Cantarrana, entre Sta. Elena e Icabarú, altoplano del Abismo, *G. Colonnello-Aznar 845* (MO); Piar, descent from Salto Aicha to the upper basin of Río Purpur, along trail to Uriman, *G. Davidse & O. Huber 22948* (MO, NY); Piar, lower section of Río Ambutuir, along trail to Uriman, *G. Davidse & O. Huber 23067* (NY); Sifontes, Gran Sabana, Kavanayen, *A. Fernandez & B. Bracamonte 3186* (MO); Atures, 1 km abajo del raudal "Ceguera" en la margen derecha del río Autana, *F. Guánchez & E. Melquiero 3633* (WAG); Carretera El Dorado–Santa Elena de Uairen, Km 127, *Holmquist 15* (GH); Roscio, 15 km al. ESE de S. Ignacio de Yuruaní, en la cuenca alta del Río Mapaurí, *O. Huber et al. 9130* (NY); Roscio, 10–15 km al. ENE de San Ignacio de Yuruaní, *O. Huber 9163* (AAU); Piar, entre el Río Yuné (afluente occidental del Río Karuay inferior) y el Caserío de Kukenán, al. ESE de la punta SE del Churi-tepui, *O. Huber 9767* (NY); Heres, Meseta del Guaiquinima, *O. Huber 9873* (NY); Sifontes, confluencia Yuruaní-Karaurín, *O. Huber 11748* (US); Gran Sabana, 10 km al. SW del Wadakapiapué-tepui, *O. Huber 11954* (AAU, NY); Heres, Meseta del Guaiquinima, a lo largo del Río Carapo, aprox. 8 km al. N del Salto Carapo, *O. Huber 12382* (AAU, NY, US); Roscio, cuenca del Río Kanayeuta, 15 km al. NW de Sta. Elena de Uairén, *O. Huber & C. Alarcon 6680* (K, NY, US, WAG); Roscio, Salto "La Milagrosa," aprox. 15 km al. SW de S. Ignacio de Yuraní, *O. Huber & C. Alarcon 7562* (NY, U, US, WAG); Roscio, WSE del Ilu-tepui, en la region del Río Caraurín medio, *O. Huber & C. Alarcon 7696* (NY); Uaipan-tepui, SW foot of the west peak of Uaipan, along upstream of Río Pulpul, *T. Koyama & G. Agostini 7521* (NY); Salto Yurani, *R. Kral 72137* (NY); Alto Caroní, alrededores de Sta. Elena de Uairen, *T. Lasser 1472* (US, NY); *T. Lasser 1478* (NY); 17 km E of El Pauji, Río Las Ahallas, *R. L. Liesner 19300* (MO); 0–4 km N of El Pauji on trail to Uaipaur, *R. L. Liesner 19463* (NY); Gran Sabana, 10 km NW of Karaurin Tepui at jct. of Río Karaurin and Río Asadon (Río Sanpa), *R. L. Liesner 23930* (MO), *R. L. Liesner 24014* (MO); Gran Sabana, ca. 10 km NW of Karaurin Tepui at jct. of Río Karaurin and Río Asadon (Río Sanpa), *R. L. Liesner 24016* (MO); Gran Sabana, ca. 10 km SW of Karaurin Tepui at jct. of Río Karaurin & Río Asadon (Río Sanpa), *R. L. Liesner 24028* (MO, NY); Gran Sabana, ca. 15 km WSW of Karaurin Tepui, Quebrada Tanuan, *R. L. Liesner 24101* (MO); Gran Sabana, 5 km S of San Ignacio de Yuraní, *R. L. Liesner 24438* (MO); Piar, Río Acanán, 2–5 km SW of SW corner of Amaruay-tepui, *R. L. Liesner & Holst 20485* (MO, NY); Gran Sabana, Ilu-Tepui, Gran Sabana at Kamarang Head, *B. Maguire 33296* (NY, W); Gran Sabana, Ilu-Tepui, betw. Enemasic & San Rafael, *B. Maguire 33591* (NY, US); Gran Sabana, Ilu-Tepui, Kavanayen, *B. Maguire 33685* (NY); S Pakaraima Mtns., Chimapu Savanna, *B. Maguire et al. 46149A* (NY, US, WAG); betw. Vista Geral & Serra Sabang Territorio do Río Branco, *B. Maguire & C. K. Maguire 40281* (IAN, NY, RB); betw. Caju & Vista Geral, *B. Maguire & C. K. Maguire 40482* (NY); Mission Santa Teresita de Kavanayén, 4 km E of Mission, *B. Maguire & J. J. Wurdack 33994* (G, NY, U); Kavanayén, trail from Misión de Santa Teresita de Kavanayén to Río Pakairau, *H. E. Moore, Jr. et al. 9618* (NY); Gran Sabana, E de Sabanita, 1120 m, *G. Picón Nava 1191* (US); Sabana de Medio Carrao, 8–10 km NNE of the Carrao-Churun confluence, *G. T. Prance & O. Huber 28457* (MO, NY, WAG); Ucaima, Río Carrao above Salto Hacha, *G. T. Prance & O.*

Huber 28501 (MO, NY, US, WAG); Gran Sabana, 100 m NE of the mission at Kavanayen, *J. Pruski & J. A. Steyermark 1405* (MO, NY); La Gran Sabana, Carretera a Santa Elena de Uairen, *C. Sastre et al. 8502* (MO); Santa Teresita de Kavanayén, *J. A. Steyermark 60919* (NY); Carretera El Dorado hacia Santa Elena de Uairen, *J. A. Steyermark et al. 105489* (NY); Gran Sabana, 2 km al. N la Misión de Santa Teresita de Kavanayén, *J. A. Steyermark et al. 115510* (MO); Km 146, al. S de El Dorado, *J. A. Steyermark et al. 117557* (MO); quebrada El Cajón, Puente Luis Raúl Vásquez Z., 26.5 km al. E de Icabarú, 750 m, *J. A. Steyermark et al. 117819* (F, MO); Piar, Guadequen (Buadequen), Río Acanán (affluent of Río Carrao), W of Cerros Los Hermanos, 470 m, *J. A. Steyermark et al. 131853* (MO); Río Uarama below Uarama-tepui, NE of Luepa, *J. A. Steyermark & L. Aristegueta 68* (NY, US); Gran Sabana, formación Roraima, Río Aponguao, selva de galeria a lo largo del Arautá-parú, *J. A. Steyermark et al. 104146* (NY, US); Roscio, 7.5 km al. NE de Santa Elena de Uairén, *J. A. Steyermark & R. Liesner 127575* (MO, NY); Gran Sabana, selvas de galería del Río Uarí, *F. Tamayo 3132* (US).

6. Bonyunia nobilis J. R. Grant, sp. nov. TYPE: Colombia. Caquetá: Sierra de Chiribiquete, Camp. Sur, al. W del campamento, sobre la ladera de la meseta, 00°55′N, 72°45′W, 400 m, 14 Dec. 1990, *P. Palacios*, *J. Estrada*, *P. Franco & J. Fuertas 2393* (holotype, MO!; isotypes, COL not seen, MA not seen). Figures 1, 2C, 3, 4, 7D.

Species nova *Bonyunia magnifica* J. R. Grant et *B. minor* N. E. Br. cui affines, sed a hac habitu arboris excelsae, foliis majoribus discoloribus atque seminibus atro-aurantiacis, ab illa calyce anguste campanulato striato lobis apice pilosis differt.

Branched tree to 7–8 m tall, glabrous throughout, except for tufts of hairs on the base of the pedicels and the apex of the calyx lobes. Leaves ovate to oval, short-petiolate, 3–9 cm, petiole 1–3 mm; blades 3–8.8 × 2–5 cm, thick coriaceous, glossy on both surfaces, distinctly discolored (adaxial leaf surface distinctly olive-green and specked, abaxial surface solid gold-green), distinctly etched, revealing a lighter color on the adaxial surface with small alphabet/hieroglyphic-shaped marks, adaxial surface smooth with some slightly impressed veins, abaxial surface with prominently raised midvein and secondary veins; base cordate to rarely rounded; apex obtuse to acute. Inflorescence 6–10 cm; branches 3–7 cm; bracts ovate to oval, sessile to short-petiolate, 11–18 × 4–10 mm; base cuneate to rounded; apex acute; bract petioles 0–1 mm; primary and secondary flowers sessile to subsessile; pedicels 0–2 mm; bracteoles triangular, 2–2.5 × 0.5–0.75 mm. Calyx narrowly campanulate, 3.5–4.5 × 2–2.5 mm, glabrous except for tufts of hairs on apex of lobes, ecarinate, striated vertically; calyx lobes triangular, 0.3–0.75 × 2–2.5 mm, apex acute; corolla 13–16 mm; tube 7–9 × 1–1.5 mm; lobes 6–7 × 0.5–0.75 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers ca. 2 × 0.5 mm; pistil ca. 4 mm; ovary ovate, ca. 1.5 × 1 mm; style ca. 2 × 0.2–0.4 mm; stigma bilobed, each lobe spatulate, ca. 0.5 × 0.3–0.5 mm. Capsules ellipsoid to obovoid, 22–25 × 8–10 mm (excluding style base), tan, 2 to 5 seeds per locule (e.g., 4 to 9 seeds per fruit); seeds 9–14 × 1.5–3 mm, seed body dark orange, seed wings dark orange, reticulate.

Morphology and similarities. *Bonyunia nobilis* is unique in its striated, narrowly campanulate calyx with tufts of hairs on its calyx lobe apices. Its large, thick, coriaceous leaves are glossy on both surfaces, olive-green and speckled adaxially, and solid gold-green abaxially (at least when dried), with a prominent, thick, brown, raised midvein abaxially and a rounded to cordate leaf base. The leaves and seeds of *B. nobilis* and *B. magnifica* are similar and described above under *B. magnifica*. It differs from *B. magnifica* in its narrowly campanulate striate calyx that has tufts of hairs on the calyx lobe apices, and from *B. minor* in its discolored leaves and dark orange seeds.

Distribution and habitat. *Bonyunia nobilis* occurs in forests on slopes of the plateau of the Sierra de Chiribiquete, isolated outliers of the Guayana region in Colombia (Fig. 1), at 350–400 m, with another species, *B. excelsa*.

IUCN Red List category. *Bonyunia nobilis* is only known from two collections, both collected inside a formally protected area, the Parque Nacional Natural Serranía de Chiribiquete (Colombia). It is assigned a preliminary IUCN status of Vulnerable (VU) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "nobilis," meaning "noble."

Paratypes. COLOMBIA. **Caquetá:** Solano, Parque Nacional Natural Serranía de Chiribiquete, 350 m, *H. Mendoza*, *A. Escobar*, *S. Medina & M. Leptuama 9558* (FMB [2]).

7. Bonyunia pulchra Ricketson, J. R. Grant & Liesner, sp. nov. TYPE: Peru. Amazonas: Bagua, Imaza, Tayu Mujaji, comunidad de Wawas, bosque primario, 5°15′25″S, 78°21′41″W, 800 m, 25 Oct. 1997 (fl.), *R. Rojas et al. 478* (holotype, MO!; isotypes, F!, G!, HUT!, NY!, US!, USM not seen). Figures 1, 2C, 5, 8A.

Species nova quoad seminum formam *Bonyunia magnifica* J. R. Grant et *B. nobilis* J. R. Grant ut videtur cui affinis, sed ab eis foliis tenuiter coriaceis basi cuneatis, pedicellis omnino pubescentibus atque calycis lobis acuminatis vel acutis differt.

Branched tree to 15–40 m tall, sparsely hispidulous on petioles, stems, peduncles, inflorescences, calyces,

and corollas (leaves glabrous, with random hairs on abaxial surface); trunk 11–43 cm DBH (*Morawetz & Wallnöfer V79-13888*; *Wallnöfer V62-121088*). Leaves elliptic, obovate to ovate, 3–6.5(–9.3) cm, petiole 2–6 mm; blades 2.8–6.2(–9) × 1.2–2.7(–5) cm, thin-coriaceous, darker adaxially, lighter abaxially, slightly glossy adaxially and more opaque abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with slightly raised secondary veins; base cuneate; apex obtuse, rounded, to acute. Inflorescence 4–8 cm; branches 1.5–6 cm; bracts obovate, spatulate to triangular, sessile to short-petiolate, 3–27(–42) × 0.75–10 mm; base attenuate to cuneate; apex acuminate, acute, obtuse, to rounded; bract petioles 0–4 mm; primary and secondary flowers sessile to subsessile; pedicels 0–3 mm; bracteoles triangular, 1.5–5 × 0.5–1 mm. Calyx campanulate, 2–4 × 2–3 mm, hispidulous to glabrous, ecarinate; calyx lobes triangular, 0.75–1.5 × 2–3 mm, apex acuminate to acute; corolla 14–18 mm; tube 7–12 × 1–2 mm; lobes 5–9 × 0.75–1 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1–1.5 × 0.2–0.5 mm; pistil 8–9 mm; ovary ovate, 1–2 × ca. 1.5 mm; style 5.5–7.5 × 0.3–0.5 mm; stigma bilobed, each lobe acute to acuminate, 0.75–1 × 0.5–0.75 mm. Capsules ellipsoid to obovoid, 18–23 × 5–6 mm (excluding style base), tan, 8 to 9 seeds per locule (e.g., 16 to 18 seeds per fruit); seeds 10–12 × 2–2.5 mm, seed body dark orange, seed wings dark orange, reticulate.

Morphology and similarities. *Bonyunia pulchra* has generally small leaves that are bunched together at the branch apices. Based on its seed morphology, it appears to be related to both *B. magnifica* (Brazil) and *B. nobilis* (Colombia).

Distribution and habitat. *Bonyunia pulchra* is a 15–40 m tall tree known from primary forest in the Amazon Basin–facing Andes in Amazonas and Huánuco provinces, Peru, at elevations of 500–800 m (Fig. 1).

IUCN Red List category. *Bonyunia pulchra* is known from a few collections in unprotected areas. It is assigned a preliminary IUCN status of Vulnerable (VU) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "pulcher," meaning "beautiful."

Notes. *Bonyunia pulchra* is co-authored by three persons, John Ricketson, Jason Grant, and Ron Liesner, who each independently determined this to be a new species.

Paratypes. PERU. **Amazonas:** Bagua, Imaza, Región del Marañon, Com. Yamayaket, Quebrada Kusu–Chapi, *R. Vásquez et al. 19847* (MO); Distr. Imaza, Comunidad Yamayakat, bosque primario, transecto 2 × 500 m, 5°03′24″S, 78°20′17″W, 600 m, arbol 15.2 cm DAP × 30 m, estéril [sterile], 29 May 1997, *R. Vásquez, A. Peña, & E. Chávez 23812* (G, HUT, MO); Bagua, Imaza, Tayu Mujaji, comunidad de Wawas, 600 m, *R. Vásquez et al. 24694* (DLF not seen, F not seen, G, HUT, MO, USM not seen); Bagua, Yamayakat, trocha a Putuim, 500 m, *R. Vásquez & N. Jaramillo 20312* (MO, WAG). **Huánuco:** Pachitea, region of Pucallpa, western "Sira Mountains" & adjacent lowland, from 20–24 km SE of Puerto Inca, 800 m, *B. Wallnöfer 14-41088* (K, W); Pachitea, Pucallpa, W part of the Sira Mtns. and adjacent lowland, from ca. 20–24 km SE of Puerto Inca, *W. Morawetz & B. Wallnöfer V30-13888* (W), *W. Morawetz & B. Wallnöfer V79-13888* (W), *W. Morawetz & B. Wallnöfer 15-10288* (W), *B. Wallnöfer V62-121088* (K, W).

8. Bonyunia spectabilis J. R. Grant, sp. nov. TYPE: Guyana. Cuyuni-Mazaruni: 2–5 km NW of tip of N prow of Roraima, 5°15′N, 60°35′W, 800–1000 m, mixed upland and cloud forest on talus slopes of Roraima, 22 Feb. 1989, *W. Hahn & D. Gopaul 5420* (holotype, U!; isotypes, CAY not seen, F!, MO!, NY!, US!). Figures 1, 3, 4, 8B.

Species nova *Bonyunia antoniifolia* Progel cui affinis, sed ab ea caulibus glabris, pedunculis hispidis, foliis ellipticis lanceolatis oblanceolatisve longi-petiolatis basi longi-attenuatis apice acuminatis atque calyce dense appresso-strigoso vel hispido differt; etiam montem Roraimam habitat.

Branched tree to 10 m tall, glabrous throughout, except for hispid hairs on the petioles, peduncles, pedicels, corollas, and fruits. Leaves elliptic, lanceolate, to oblanceolate, long-petiolate, 7–11 cm, petiole 5–10 mm; blades 6.5–10 × 2.3–4.4 cm, thin, darker adaxially, lighter abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with slightly raised secondary veins; base attenuate to cuneate; apex acuminate to acute. Inflorescence 2.5–4 cm; branches 1–2 cm; bracts elliptic, lanceolate, to oblanceolate (as in the upper leaves, except the petioles are pubescent; the true leaves have glabrous petioles), petiolate, 27–39(–71) × 6–10(–30) mm; base attenuate to cuneate; apex acuminate to acute; bract petioles 3–10 mm; primary and secondary flowers pedicellate; pedicels 3–7 mm; bracteoles triangular, 1–2 × 0.5–1 mm. Calyx campanulate, 3–4.5 × 2.5–4 mm, densely appressed strigose to hispid, ecarinate; calyx lobes triangular, 0.75–1 × 2.5–4 mm, apex acuminate to acute; corolla poorly known (a single immature corolla on *Hahn & Gopaul 5420* [US] is illustrated, but measurements not taken); stamens and pistil unknown. Capsules somewhat immature, but description still prepared, narrowly ellipsoid, 11–13 × 3–4 mm (excluding style base), tan, 14 to 20 seeds per locule (e.g., 28 to 40 seeds per fruit). Only immature seeds seen.

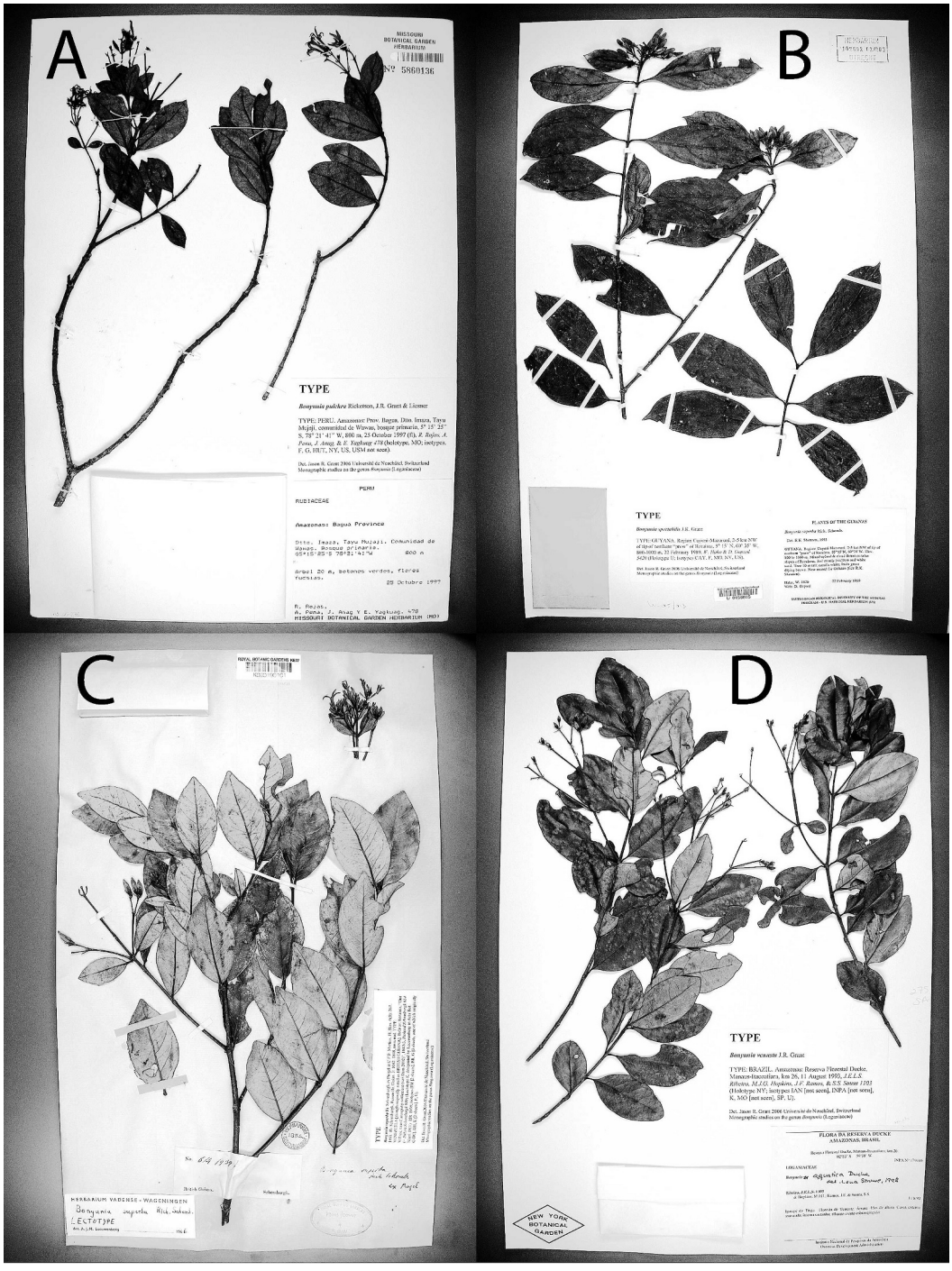

Figure 8. Types of *Bonyunia*. —A. Holotype of *B. pulchra* Ricketson, J. R. Grant & Liesner (*Rojas et al. 478* [MO]). —B. Holotype of *B. spectabilis* J. R. Grant (*Hahn & Gopaul 5420* [U]). —C. Lectotype of *B. superba* M. R. Schomb. ex Progel (*Schomburgk 614* (*939*) [K]). —D. Holotype of *B. venusta* J. R. Grant (*Ribeiro et al. 1103* [NY]).

Morphology and similarities. *Bonyunia spectabilis* has several unique characters, notably in that the inflorescence is pubescent (peduncles, petioles of bracts, calyces, and corolla), yet the leaves and stems are glabrous below. It is similar to *B. antoniifolia* and *B. aquatica* in having pubescent calyces, but is much more densely hispid than the other two. It is also the only species in the genus with long petioles (5–10 mm) and narrowly elliptic leaves. *Bonyunia spectabilis* appears to be most similar to *B. antoniifolia*, *B. aquatica*, *B. minor*, and *B. superba*. Even if only immature seeds are known from *B. spectabilis* and therefore not illustrated or described in full, they resemble those of these four species.

Distribution and habitat. *Bonyunia spectabilis* occurs on talus slopes of mixed upland cloud forest on white sand and boulders. It is only known from its type specimen collected on Mount Roraima along the border of Brazil, Guyana, and Venezuela (Fig. 1). It may be sympatric with *B. minor* and *B. superba*, especially *B. superba*, which has been most often collected on Mount Roraima.

IUCN Red List category. *Bonyunia spectabilis* is only known from the type collection, from a formally protected area, the Parque Nacional Canaima (Venezuela). It is assigned a preliminary IUCN status of Critically Endangered (CR) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "spectabilis," meaning "showy."

9. Bonyunia superba M. R. Schomb. ex Progel, Fl. Bras. (Martius) 6(1): 267, tab. 72. 1868. TYPE: Venezuela. Bolivar: Mt. Roraima, "Our Village, near Canaupang settlement (van Dam, 2002)," 1842–1843 [28 Oct.–4 Dec. 1842], *Robert Schomburgk 614* [= *Richard Schomburgk 939*] (lectotype, designated by Leeuwenberg, 1969: 158, K!; isotypes, BM [2]!, BR!, F [2]!, G [3]!, GH!, K [2]!, P!, U!, W!). Figures 1, 2C, 3, 4, 8C.

Branched shrub to tree to 1.8–7.6 m tall, hispid throughout especially on the midvein and secondary veins of the undersides of leaves, petioles, peduncles, inflorescences, and corollas, glabrous only on abaxial leaf surfaces and notably glabrous on the calyx; trunk up to 20 cm in diam. (*Pinkus 270*). Leaves ovate, oval, to elliptic, short-petiolate, (3.5–)6–9 cm, petiole 3–5 mm; blades (3.2–)5.5–8.5 × (2.3–)3–5.5 cm, thick coriaceous, darker adaxially, lighter abaxially, slightly glossy adaxially and more opaque abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with prominently raised midvein and secondary veins; base rounded to cuneate; apex obtuse to acuminate. Inflorescence 2.5–6 cm; branches 2–6 cm; bracts ovate, elliptic, lanceolate, to spatulate (as in the bracteoles above), sessile to short-petiolate, 9–37 × 3–18 mm; base rounded to cuneate; apex obtuse to acute; bract petioles 0–2 mm; primary flower sessile to subsessile, secondary flowers pedicellate; pedicels 1–10 mm; bracteoles distinctly spatulate to obovate, with a prominent midvein, equaling to much exceeding the length of the calyx lobes, 6–10 × 1–2 mm. Calyx campanulate, 5–10 × 2–2.5 mm, glabrous, ecarinate to slightly keeled along midvein; calyx lobes spatulate to obovate, as in the bracteoles, 2–6 × 2–2.5 mm, apex rounded to obtuse; corolla 15–17 mm; tube 10–17 × 1.5–2 mm; lobes 5–7 × 0.75–1 mm, apex rounded to obtuse; stamens included; filaments less than 0.5 mm; anthers 1.8–2 × 0.25–0.5 mm; pistil 6–7 mm; ovary ovate, 1.5–2 × ca. 1.5 mm; style 4–5 × 0.2–0.4 mm; stigma bilobed, each lobe spatulate, 0.75–1 × 0.3–0.5 mm. Capsules fusiform to ellipsoid, 15–33 × 5–8 mm (excluding style base), tan, 3 to 10 seeds per locule (e.g., 6 to 20 seeds per fruit); seeds 11–17 × 2.5–3 mm, seed body brown, seed wings straw-gold, reticulate.

Morphology and similarities. *Bonyunia superba* is exceptional in the genus in having long pedicels (1–10 mm), spatulate to obovate bracteoles equaling to much exceeding the length of the calyx lobes, and spatulate to obovate calyx lobes. In its hispid pubescence nearly throughout it is similar to both *B. antoniifolia* and *B. aquatica*. *Bonyunia superba* appears to be most similar to *B. antoniifolia*, *B. aquatica*, *B. minor*, and perhaps *B. spectabilis*.

Distribution and habitat. *Bonyunia superba* occurs with *B. spectabilis* in the forest of Mount Roraima on the Venezuela–Guyana border on the Pantepui of the Guayana region (Fig. 1). The two species are possibly sympatric with outlying populations of *B. minor*. Despite being so distinct, *B. superba* has actually been seldom collected in comparison to *B. minor*.

IUCN Red List category. *Bonyunia superba* is known from few collections, most from a formally protected area, the Parque Nacional Canaima (Venezuela). It is assigned a preliminary IUCN status of Vulnerable (VU) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "superbus," meaning "excellent."

Typification. The herbarium labels of *Schomburgk 614* (*939*) have little text, but collection locality can be pieced together from the labels and the protologues. The two separate collection "numbers" refer to the two numbering systems of Richard and Robert

Schomburgk (van Dam, 2002). The first number, 614, is from Robert's second collection series, which corresponds to number 939 in Richard's series (van Dam, 2002). There are samples of both at Kew.

Richard Schomburgk (1848) gives the locality of *Bonyunia superba* as "In der Umgebung von *Our Village* an den Rändern der Waldungen" (In the surroundings of Our Village, at the forest edge). Progel (1868) translates this text to Latin as "In Guyanae anglicae montibus Roraima, ad margines silvarum propre Our Village in formatione arenacea" (In British Guiana on Mount Roraima, at forest edges near Our Village on sandy soils). When Robert and Richard Schomburgk traveled to Mount Roraima, they set up camp on the Kukenaam River, naming their site "Our Village." From there, they made their ascent to Mount Roraima and, in this region, collected many plants including *B. superba*. According to van Dam (2002), however, Our Village was near the settlement of Canapang and is actually situated in present-day Venezuela rather than Guyana. Richard collected around Our Village and Mount Roraima from 28 October–4 December 1842. The original material on which Schomburgk based his description was deposited at Berlin but destroyed during World War II, which probably led Leeuwenberg to lectotypify *B. superba* on material at K.

Specimens examined. GUYANA. **Cuyuni-Mazaruni:** Krabu Mountain slope, shrub to 6 ft. in height [1.8 m] found in scrubby forest on the slope of Krabu Mountain, 6.11.1966, Field No.: R.B. 160, Record No.: *Forest Dept. of British Guiana 7993* (NY). VENEZUELA. **Bolívar:** 2–10 km from El Dorado–Santa Elena Rd. on rd. to Kavanayen, 1200–1250 m, Gran Sabana, gallery forest and grassland, *A. Gentry et al. 10511* (MO, NY, US); Mt. Roraima Distr., vic. of Arabupu, 4200 ft. [1280 m], *A. S. Pinkus 270* (F, G, NY [2], S, US).

10. Bonyunia venusta J. R. Grant, sp. nov. TYPE: Brazil. Amazonas: Reserva Florestal Ducke, Manaus–Itacoatiara, Km 26, 2°53′S, 59°58′W, [ca. 50–100 m], Igarapé do Tinga, Floresta de Vertente, INPA No. 179666, 11 Aug. 1993, *J. E. L. S. Ribeiro, M. J. G. Hopkins, J. F. Ramos & S. S. Sousa 1103* (holotype, NY!; isotypes, IAN not seen, INPA not seen, K!, MO not seen, SP!, U!). Figures 1, 3, 4, 8D.

Species nova *Bonyunia antoniifolia* Progel cui affinis, sed ab ea foliis et calycibus glabris, lobis calycis acuminatis vel acutis, inflorescentia diffusa atque pedicellis interdum longioribus (1–10 vs. 1–5 mm) differt.

Branched tree to 15 m tall, hispidulous on petioles, stems, peduncles, inflorescences, calyces, and corollas (leaves glabrous adaxially and abaxially); bark violet on the outside, chestnut inside, albumen whitish cream. Leaves oval, elliptic, to ovate, short-petiolate, 4–7.5 cm, with 3 to 6 pairs of arching secondary veins, petiole 4–6 mm; blades 3.5–7 × 2–3.3 cm, thin-coriaceous, darker adaxially, lighter abaxially, slightly glossy adaxially and more opaque abaxially, adaxial surface smooth with some slightly impressed veins, abaxial surface with slightly raised secondary veins; base cuneate; apex obtuse to acute. Inflorescence 7–12 cm; branches 2.5–7 cm; bracts ovate, elliptic, to lanceolate, petiolate, 18–27 × 3–10 mm; base attenuate to cuneate; apex obtuse, acute, to rounded; bract petioles 3–6 mm; primary and secondary flowers pedicellate; pedicels 1–10 mm; bracteoles linear-triangular, 1.5–4 × 0.3–0.75 mm. Calyx campanulate, 2–3.5 × 1.5–1.75 mm, glabrous to rarely hispidulous, ecarinate; calyx lobes triangular, 0.3–1 × 1.5–1.75 mm, apex acuminate to acute; corolla, stamens, pistil, capsules, and seeds unknown.

Morphology and similarities. *Bonyunia venusta* appears to be most similar to *B. excelsa* and perhaps also to *B. antoniifolia*. It differs from *B. excelsa* in having stems and branches of the inflorescence equally hispidulous and leaves with three to six pairs of arching secondary veins. It differs from *B. antoniifolia* in being much less pubescent throughout, with glabrous leaves and calyces, a more diffuse inflorescence, and longer pedicels (1–10 mm vs. 1–5 mm).

Distribution and habitat. *Bonyunia venusta* is only known from its type material collected on terra firme in closed canopy forest in the Amazon lowlands of Brazil in the Reserva Florestal Ducke just north of Manaus, at elevations of 50–100 m (Fig. 1). Of the four types of terra firme forest in the park, it was collected on "Floresta de Vertente," which is a sloped transition zone between a higher and lower type forest. It was described and illustrated in the *Flora da Reserva Ducke* as *B. aquatica* (Ribeiro et al., 1999: 564).

IUCN Red List category. *Bonyunia venusta* is only known from the type collection, from a formally protected area, the Reserva Florestal Ducke (Brazil). It is assigned a preliminary IUCN status of Critically Endangered (CR) according to IUCN Red List Categories and Criteria (IUCN, 2001).

Etymology. The epithet is taken from the Latin "venustus," meaning "attractive" or "graceful."

Literature Cited

Angiosperm Phylogeny Group. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. Bot. J. Linn. Soc. 141: 399–436.

Backlund, M., B. Oxelman & B. Bremer. 2000. Phylogenetic relationships within the Gentianales based on *ndhF* and *rbcL* sequences, with particular reference to the Loganiaceae. Amer. J. Bot. 87: 1029–1043.

Berry, P. E. 2001. *Bonyunia* (Loganiaceae). Pp. 24–26 *in* P. E. Berry, K. Yatskievych & B. K. Holst (editors), Flora of the Venezuelan Guayana, Vol. 6: Liliaceae–Myrsinaceae. Missouri Botanical Garden Press, St. Louis.

Bonyun, G. R. 1844. On the Demerara Pink-root, or *Spigelia Anthelmia*. Ann. Mag. Nat. Hist. 14: 461–463.

———. 1848. Colonial Office and Predecessors: British Guiana, Formerly Berbice, Demerara, and Essequibo, Original Correspondence CO 111/250. Despatch No. 10: Dr. Bonyun's Report on State of Immigrants. The National Archives of the United Kingdom, Kew.

Bremer, B. & L. Struwe. 1992. Phylogeny of the Rubiaceae and the Loganiaceae: Congruence or conflict between morphological and molecular data? Amer. J. Bot. 79: 1171–1184.

Brown, N. E. 1901. Report on two botanical collections made by Mssrs. F. V. McConnell and J. J. Quelch of Mount Roraima in British Guiana. Trans. Linn. Soc. London, Bot. ser. 2, 6: 1–107.

Ducke, A. 1935. Plantes nouvelles ou peu connues de la région amazoniene (VII^{ème} série). Arq. Inst. Biol. Veg. 1: 205–212.

Gleason, H. A. 1931. Botanical results of the Tyler-Duida Expedition. Bull. Torrey Bot. Club 58(7): 406–464.

IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.2. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Leeuwenberg, A. J. M. 1969. Notes on American Loganiaceae III: Revision of *Bonyunia* Rich. Schomb. Acta Bot. Neerl. 18(1): 152–158.

Maguire, B. & R. E. Weaver Jr. 1975. The neotropical genus *Tachia* (Gentianaceae). J. Arnold Arbor. 56(1): 103–125.

Mori, S. A. & J. L. Brown. 1994. Report on wind dispersal in a lowland moist forest in central French Guiana. Brittonia 46: 105–125.

———, G. Cremers, C. A. Gracie, J. J. de Granville, S. V. Heald, M. Hoff & J. D. Mitchell. 2002. Guide to the Vascular Plants of Central French Guiana. Mem. New York Bot. Gard. 76(2).

Peters, W., M. O. Kinkade, A. M. Pohlit & L. Struwe. 2004. *Tachia* Field Guide. Rutgers University–Cook College, New Brunswick, New Jersey.

Progel, A. 1868. Loganiaceae. *In* C. F. P von Martius, Flora Brasiliensis, Vol. 6, Pt. 1: 249–290.

Ribeiro, J. R. L. da S., M. J. G. Hopkins, A. Vicentini, C. A. Sothers, M. A. da S. Costa, J. M. de Brito, M. A. D. de Souza, L. H. P. Martins, L. G. Lohmann, P. A. C. L. Assunção, E. da C. Pereira, C. F. da Silva, M. R. Mesquita & L. C. Procópio. 1999. Flora da Reserva Ducke: Guia de Identificaçâo das Plantas Vasculares de uma Floresta de Terra-firme na Amazônia Central. INPA-DFID, Manaus.

Schomburgk, Richard. 1847–1848. Reisen in Britisch-Guiana in den Jahren 1840–1844, Vols. 1–3. J. J. Weber, Leipzig.

Struwe, L. & V. A. Albert. 1997. Floristics, cladistics, and classification: Three case studies in Gentianales. Pp. 351–352 *in* J. Dransfield, M. J. E. Coode & D. A. Simpson (editors), Plant Diversity in Malesia III. Royal Botanic Gardens, Kew, Richmond.

——— & ———. 2004. A monograph of neotropical *Potalia* Aublet (Gentianaceae: Potalieae). Syst. Bot. 29(3): 670–701.

——— & T. J. Motley. Loganiaceae (including Antoniaceae, Geniostomaceae, Spigeliaceae, and Strychnaceae). *In* J. W. Kadereit (editor), Families and Genera of Vascular Plants: Asteridaeã Gentianales. Springer Verlag, Berlin. In press.

———, ——— & B. Bremer. 1994. Cladistics and family level classification of the Gentianales. Cladistics 10: 175–206.

———, M. Thiv, J. W. Kadereit, A. S.-R. Pepper, T. J. Motley, P. J. White, J. H. E. Rova, K. Potgieter & V. A. Albert. 1998. *Saccifolium* (Saccifoliaceae), an endemic of Sierra de la Neblina on the Brazilian-Venezuelan border, related to a temperate-alpine lineage of Gentianaceae. Harvard Pap. Bot. 3(2): 199–214.

———, M. P. Kinkade & P. J. M. Maas. 2005. Two new Brazilian species of *Tachia* (Gentianaceae: Helieae). Blumea 50: 457–462.

———, S. Haag, E. Heiberg & J. R. Grant. 2009. Andean speciation and vicariance in Neotropical *Macrocarpaea* (Gentianaceae–Helieae). Ann Missouri Bot. Gard. 96: 450–469.

Urban, I. 1906. Vitae itineraque collectorum botanicorum, notae collaboratum biographicae, flora brasiliensis ratio edendi chonologica, systema, index familiarum. *In* C. F. P. Martius, Flora Brasiliensis, Vol. 1, Pt. 1: 1–268.

van Dam, J. A. C. & M. J. Jansen-Jacobs (editors). 2002. Flora of the Guianas: Supplementary Series: Fasc. 3. The Guyanan Plant Collections of Robert and Richard Schomburgk. Kew Publishing, Kew, Richmond.

Appendix 1. Numbered collections of *Bonyunia* examined. Species in boldface in the List of Species represent new species. The numbers in brackets indicate identifications following the List of Species. Collections are arranged by collector's last name. Type collections are indicated by asterisks.

List of Species

1. *B. antoniifolia* Progel
2. *B. aquatica* Ducke
3. ***B. excelsa* J. R. Grant**
4. ***B. magnifica* J. R. Grant**
5. *B. minor* N. E. Br.
6. ***B. nobilis* J. R. Grant**
7. ***B. pulchra* Ricketson, J. R. Grant & Liesner**
8. ***B. spectabilis* J. R. Grant**
9. *B. superba* M. R. Schomb. ex Progel
10. ***B. venusta* J. R. Grant**

Agostini, *G. 358* (US [5]). *Amaral*, *B. L. 44* (RB [1]). *Amaral*, *I. L. 112495* (NY [1]).

Benítez, *C. 5202* (MO [5]). *Bernardi*, *A. L. 852* (NY [5]), *2624* (NY [5]). *Berry*, *P. E. 5522* (MO, NY [5]), *5525* (MO, NY [5]), *5530* (MO, NY [5]), *5771* (F, K, MO, NY [2]), *5973* (MO, NY [2]), *6559* (MO [5]). *Bogner*, *J. 1080* (K, M [5]).

Cárdenas, *D. 6788* (COAH, MO [3]). *Cardona*, *F. 1914* (NY, US [5]), *1946* (NY, US, WAG [5]), *2243* (US [5]). *Cavalcanti*, *G. P. 2377* (K [1]). *Chacon*, *L. 595* (MO [5]), *624* (MO [5]), *679* (MO [5]). *Clarke*, *H. D. 913* (NY, US [5]), *1238* (MO, NY, US [5]). *Colonnello-Aznar*, *G. 845* (MO [5]).

Dambrós, *L. A. 356* (US [1]). *Davidse*, *G. 16912* (MO [2]), *22948* (MO, NY [5]), *23067* (NY [5]), *27650* (WAG [2]), *27767* (MO, WAG [2]). *Ducke*, *A. 224* (NY [2]), *354* (F, GH, MO, NY, S, US [2]), *379* (S [1]), *680* (F, MG, MO, NY, UC, US [1]), *738* (F [1]), *5738* (S [1]), *11184* (BM, G, RB, S, U [1]), *11534* (G [1]), *12197* (BM, G, P, US [1]), *12384* (BM, G, RB, US [1]), *23760** (G, K, P, RB, S, U, US [2]).

Fernandez, *A. 3186* (MO [5]). *Ferreira*, *C. A. C. 5603* (MO, NY, WAG [1]), *5688* (MO, NY, WAG [1]), *6540* (MO, NY, WAG [1]). *Foldats*, *E. & J. Velazco 9423* (NY [2]). *Forest Dept. of British Guiana 7921* (K, NY [5]), *7993* (NY [9]). *Fróes*, *R. L. 22260* (IAN, U [2]), *22278* (IAN, U [2]).

Gentry, *A. 10511* (MO, NY, US [9]). *Guánchez*, *F. 881* (MO [2]), *2641* (MO [2]), *3633* (WAG [5]). *Guillén*, *R. 2315* (MA, NY, USZ [1]), *2513* (G, MA, MO, NY, USZ [1]), *4161* (F, MA, NY, USZ [1]). *Gutiérrez*, *E. 1323* (G, MO, NY, USZ [1]), *1444* (MO, USZ [1]).

Hahn, *W. & D. Gopaul 5420** (CAY, F, MO, NY, U, US [8]). *Henkel*, *T. W. 5699* (US [5]). *Holmquist 15* (GH [5]). *Huber*, *O. 1932* (COL, K, NY, US, WAG [2]), *3440* (NY [2]), *3470* (B, NY, WAG [2]), *6122* (WAG [2]), *6680* (K, NY, US, WAG [5]), *7562* (NY, U, US, WAG [5]), *7696* (NY [5]), *9130* (NY [5]), *9163* (AAU [5]), *9767* (NY [5]), *9873* (NY [5]), *10815* (NY, WAG [2]), *12382* (AAU, NY, US [5]), *11748* (US [5]), *11954* (AAU, NY [5]).

Janssen, *A. 640* (M). *Janssen & Gemtchujnicov 306* (M).

Killeen, *T. 2749* (NY [1]), *6501* (F, MO, NY, USZ [1]), *7080* (MO, NY, USZ [1]). *Koyama*, *T. 7521* (NY [5]). *Kral*, *R. 72137* (NY [5]). *Kubitzki*, *K. 79-47* (MG, NY [1]), *79-198* (M, NY, US [2]). *Kuhlmann*, *J. G. 2233* (SP [1]).

Lasser, *T. 1472* (NY, US [5]), *1478* (NY [5]). *Liesner*, *R. L. 19300* (MO [5]), *19463* (NY [5]), *20485* (MO, NY [5]), *23930* (MO [5]), *24014* (MO [5]), *24016* (MO [5]), *24028* (MO, NY [5]), *24101* (MO [5]), *24438* (MO [5]). *Lleras*, *E. P19452* (U, WAG [1]). *Luetzelburg*, *Ph. 21503* (M [5]), *21514* (M [5]).

Maguire, *B. 30525* (NY, WAG [5]), *30857* (NY [5]), *31012* (COL, F, NY, S, US [2], WAG), *32528* (K, NY, P, UC [5]), *33296* (NY, W [5]), *33591* (NY, US [5]), *33685* (NY [5]), *33994* (G, NY, U [5]), *40281* (IAN, NY, RB [5]), *40374* (NY, RB [5]), *40482* (NY [5]), *46143A* (F, NY, US, WAG [5]), *46149A* (NY, US, WAG [5]). *Marin*, *E. 1126* (MO [2]), *1188* (MO [2]). *Mendoza*, *H. 9456** (FMB [3]), *9558* (FMB [6]), *15691* (FMB [2]). *Moore*, *H. E. 9618* (NY [5]). *Morawetz*, *W. 15-10288* (W [7]), *V30-13888* (W [7]), *V79-13888* (W [7]). *Mostacedo*, *B. 1815* (G, NY, USZ [1]), *1861* (G, MO, NY, USZ [1]).

Nelson, *B. 1388* (MO, WAG [1]).

Palacios, *P. 2393** (COL, MA, MO [6]). *Paula*, *J. E. de 1907* (Z [1]). *Pena*, *B. 2005* (MG, RB [1]). *Peña*, *M. 170* (NY [1]). *Picón Nava*, *G. 1191* (US [5]). *Pinkus*, *A. S. 270* (F, G, NY, S, US [9]). *Pires*, *J. M. 14155* (IAN, RB [2]). *Prance*, *G. T. 5758* (COL, F, GH, K, MG, NY, R, S, U, US, Z [1]), *13796* (K, MG, MO, NY, RB, U, US, WAG [1]), *22804** (INPA, K, MG, MO, NY, U, US, WAG [4]), *28457* (MO, NY, WAG [5]), *28501* (MO, NY, US, WAG [5]), *30033* (MO, NY, WAG [1]). *Pruski*, *J. 1405* (MO, NY [5]).

Quelch, *J. J. 161** (K [5]), *331* (K [5]). *Quevedo*, *R. 973* (G, MO, NY, USZ [1]).

Restrepo, *D. 387* (MO [3]). *Ribeiro*, *J. E. L. S. 1103** (IAN, INPA, K, MO, NY, SP, U [10]). *Riedel*, *L. 1149** (BR, LE, MO, R, NY [1]). *Rodrigues, W. 8547* (US [1]). *Rojas*, *R. 478** (F, G, HUT, MO, NY, US, USM [7]).

Sastre, *C. 8502* (MO [5]). *Schomburgk*, *R. 614** (BM, BR, F, G, GH, K, P, U, W [9]), *939* (F [9]), *966* (BM, P [5]). *Schultes*, *R. E. 18240* (GH, US [2]). *Silva*, *M. N. 28* (MO, NY, WAG [1]). *Steyermark*, *J. A. 68* (NY, US [5]), *58291* (F, NY [5]), *60919* (NY [5]), *104146* (NY, US [5]), *105489* (NY [5]), *115510* (MO [5]), *117557* (MO [5]), *117819* (F, MO [5]), *127575* (MO, NY [5]), *131853* (MO [5]).

Tamayo, *F. 3132* (US [5]). *Tate*, *G. H. H. 770* (F, NY [5]). *Teixeira*, *L. O. A. 266* (NY, WAG [1]), *1268* (MG, MO, NY, RB, US, WAG [1]).

Ule, *E. 8469* (K, MG [5]).

Vargas, *L. 830* (WAG [1]). *Vásquez*, *R. 19847* (MO [7]), *20312* (MO, WAG [7]), *23812* (G, HUT, MO [7]), *24694* (DLF, F, G, HUT, MO, USM [7]). *Vieira*, *G. 149* (K, NY, US, WAG [1]).

Wallnöfer, *B. 14-41088** (K, W [7]), *V62-121088* (K, W [7]). *Wurdack*, *J. J. 42814* (COL, F, NY, S, US, WAG [2]), *43261* (NY, WAG [2]).