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Taxonomic revisions in *Fridericia* (*Bignonieae*, *Bignoniaceae*) I: the "Acrodromous venation" and "Piriadacus" clades

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Abstract: *Fridericia* is a conspicuous genus of neotropical lianas, with 60 species distributed among seven lineages that are broadly distributed through the neotropics in both dry and wet environments. As part of ongoing taxonomic studies of the genus, we provide taxonomic revisions of two clades: (1) the "Acrodromous venation" clade and (2) the "Piriadacus" clade. The former is characterized by 1- or 2-foliolate leaves with acrodromous venation, tubular calyces and coriaceous fruits with slightly raised edges. The latter is recognized by the red, pink-reddish or orange, tubular corolla and exserted or sub-exserted anthers. We recognize two species in each lineage and provide identification keys, morphological descriptions, illustrations, distribution maps and comments on the distribution, phenology, conservation status and taxonomy. We propose the lectotypification of 13 names: *Arrabidaea brachypoda* var. *acuminata*, *A. brachypoda* var. *attenuata*, *A. brachypoda* var. *firma*, *A. brachypoda* var. *induta*, *A. brachypoda* var. *rigida*, *A. platyphylla* var. *lasiorrhachis*, *A. platyphylla* var. *puberula*, *Bignonia brachypoda* var. *firmula*, *B. erubescens* var. *breviflora*, *B. erubescens* var. *subtruncata*, *B. regnelliana*, *Cuspidaria erubescens* var. *glabrescens* and *Petastoma simplicifolium*. We further correct the typification of *B. erubescens* var. *breviflora* and *B. erubescens* var. *subtruncata* and propose two new synonyms for *F. platyphylla* (i.e. *A. celastroides* and *B. violacea*).

Key words: *Arrabidaea*, *Bignoniaceae*, *Bignonieae*, *Fridericia*, nomenclature, taxonomy, typification

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Introduction

Fridericia Mart. emend. L. G. Lohmann is one of the largest and most complex genera in the plant family *Bignoniaceae* (Kaehler & al. 2019). This genus belongs to tribe *Bignonieae*, which includes lianas and is broadly distributed throughout the neotropics, where they occur in both wet and dry habitats (Lohmann & Taylor 2014). The generic classification of *Bignonieae* remained problematic for more than a century due to overlapping patterns of morphological variation and a lack of diagnostic generic characters. Molecular phylogenetic data (Lohmann 2006) allowed for a re-circumscription of monophyletic genera diagnosed by morphological synapomorphies (Lohmann & Taylor 2014). Under this new generic classification system, *Fridericia* is much more broadly circumscribed, including many species of the previously recognized *Arrabidaea* DC.

Arrabidaea originally included four Brazilian species (Candolle 1838). Its circumscription was later expanded to accommodate 21 species (Candolle 1845). By the time the monumental treatment of *Flora brasiliensis* was published, *Arrabidaea* included 70 species and an incredible range of morphological variation (Bureau &

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Schumann 1896). The *Flora brasiliensis* remains the most comprehensive treatment of *Arrabidaea* to date. To help organize the broad range of morphological features included in the genus, three sections distinguished by the number and arrangement of ovules per locule were proposed (Bureau & Schumann 1896), as follows: (1) *A.* sect. *Microcarpaea* K. Schum., with fewer than five ovules in each of the two locule rows; (2) *A.* sect. *Macrocarpaea* K. Schum., with more than five ovules in each of the locule rows; and (3) *A.* sect. *Paracarpaea* K. Schum., with ovules affixed in four rows (Bureau & Schumann 1896). This infrageneric system was followed by subsequent authors who described new species within the genus (e.g. Kränzlin, Pittier, Rusby and Sprague). The circumscription of *Arrabidaea* continued to grow in subsequent years, especially due to the inclusion of the species-rich genera *Cremastus* Miers, *Panterpa* Miers, *Paramansoa* Baill. and *Petastoma* Miers (Sandwith 1968). The most-comprehensive treatment of the *Bignoniaceae* prior to the availability of phylogenetic data recognized an *Arrabidaea* with c. 100 species (Fisher & al. 2004). Despite a large number of species in the genus, the infrageneric classification system proposed by Bureau & Schumann (1896) was subsequently refuted by morphology (Sandwith 1968) and molecular characters (Lohmann 2006; Kaehler & al. 2019).

The first molecular phylogeny that sampled multiple members of *Arrabidaea* (Lohmann 2006) indicated that the genus was polyphyletic, leading to a revised circumscription (Lohmann & Taylor 2014). Namely, *A. rego* (Vell.) DC. [= *Fridericia rego* (Vell.) L. G. Lohmann], the type of *Arrabidaea*, was placed within the same clade as *F. speciosa* Mart., the type of the monotypic *Fridericia*, indicating that these taxa were best treated within a single genus (Lohmann 2006). Because *Fridericia* is the older name, 66 species of *Arrabidaea* were transferred into *Fridericia*, leading to a broadly circumscribed *Fridericia* with 67 species (Lohmann & Taylor 2014). The remaining species of *Arrabidaea* were shown to be more closely related to *Cuspidaria* DC., *Tanaecium* Sw. and *Xylophragma* Sprague and were transferred into those genera instead. While *Fridericia* is clearly monophyletic, the genus remained morphologically variable (Lohmann & Taylor 2014; Kaehler & al. 2019). The 60 species currently recognized in *Fridericia* are distributed in seven lineages characterized by morphological traits in an informal classification system (Kaehler & al. 2019).

Most species of *Fridericia* are lianas, although some are shrubs or treelets; the prophylls of the axillary buds are minute, triangular and distichous, sometimes concentrically disposed or foliaceous; the leaves are usually ternate with the terminal leaflet often replaced by a simple tendril, although 1-foliolate leaves are also found; the corolla is usually in shades of pink, less commonly white, red, orange or yellow; the ovary is lepidote, with two lines of ovules per locule; the fruits are linear, usually coriaceous, rarely woody, bearing winged seeds, with two hyaline or papyraceous wings (Lohmann & Taylor 2014; Kaehler & al. 2019).

As part of ongoing taxonomic studies of *Fridericia*, we provide taxonomic revisions of the "Acrodromous venation" and "Piriadacus" clades, both of which are exclusively South American and centred in Brazil. The "Acrodromous venation" clade is the first diverging lineage in *Fridericia*, whereas the "Piriadacus" clade is a small lineage within the following polytomy. Due to their small size, these two clades are treated together in this study. We provide an identification key, typifications, morphological descriptions, illustrations, distribution maps and comments on the geographical distribution, phenology, conservation and taxonomy for each clade.

Material and methods

Almost 700 gatherings and several duplicates, including all nomenclatural types deposited in HAL, K, M, MBM, MO, NY, P, R, RB, S, SPF, TEPB, UB and UPCB were analysed (acronyms following Thiers 2021+). Additionally, we consulted images in electronic repositories such as Global Plants (https://plants.jstor.org/), JACQ (https://www.jacq.org/), Reflora (http://reflora.jbrj.gov.br/) and Species Link (http://splink.org.br/) as well as photographs from C and LE provided by the staff of these two herbaria. The complete list of specimens examined is provided in Appendix 1, sorted by collector.

Types are listed alphabetically and herbarium accession numbers are provided when available. Whenever herbarium accession numbers were lacking, specimen barcodes were provided instead. Taxonomic headings include type information provided in the labels of each specimen and the phenological condition of each specimen. Whenever the data provided in the label differed from those included in the protologue, the additional information provided in the protologue was added between square brackets.

The terminology of leaf venation follows Ellis & al. (2009), trichome types follow Nogueira & al. (2013) and inflorescence morphology follows Weberling (1981). All other terms follow Lohmann & Taylor (2014).

Distribution maps were prepared using QGis 3.14.1 Pi (QGis Development Team 2020) using the Americas Base Map (Bletter & al. 2004). The conservation status of each species was estimated using the GeoCAT (Bachman & al. 2011). Because all species treated here have wide Extent of Occurrence (more than one million km^2), we opted to estimate the Area of Occupancy using the auto-value option for the cell width (50 km of cell width for all species). The 2 km cell width recommended by the IUCN (2019) is too small for broadly distributed species with relatively small density of collections within this large area (Lughadha & al. 2018).

Results and Discussion

Key for the identification of the "Acrodromous venation" and "Piriadacus" clades and included species

1. Leaves 1- or 2(or 3)-foliolate, venation acrodromous; corolla pink or white . . . . . "Acrodromous venation" clade: **2**
– Leaves (2 or)3-foliolate, venation pinnate; corolla red, pinkish red or orange . . . . . "Piriadacus" clade: **3**
2. Inflorescence branches pubescent to velutinous; calyx cupular, costate, pubescent, chartaceous; corolla infundibuliform; stamens inserted. Broadly distributed through South America (Amazonian and Atlantic rainforests, Caatinga, Chaco and savannahs) . . . . . **1. *Fridericia platyphylla***
– Inflorescence branches lepidote; calyx tubular, not costate, lepidote, coriaceous; corolla narrowly infundibuliform; stamens at same height as tube mouth. Restricted to lowland Amazonian rainforests . . . . . **2. *Fridericia prancei***
3. Prophylls of axillary buds broadly triangular, arranged as a bromeliad, 1.8–2.1 mm long; blade of lateral leaflets 2.4–5.8(–10.6) × 1.2–5.7 cm; corolla zygomorphic. Caatinga, Cerrado and ecotone areas of Atlantic rainforest . . . . . **3. *Fridericia erubescens***
– Prophylls of axillary buds triangular, arranged in 2 rows (sometimes concentrically disposed at inflorescence peduncles), c. 1 mm long; blade of lateral leaflets 9.1–15.2 × 4.5–11 cm; corolla actinomorphic. Lowland oriental Amazonian rainforests . . . . . **4. *Fridericia ornithophila***

Taxonomic treatments

The "Acrodromous venation" clade

The species of the "Acrodromous venation" clade are characterized by 1- or 2-foliolate leaves with acrodromous venation, tubular calyces and smooth, coriaceous fruits, without prominent midrib and with edges slightly raised. These morphological features are consistent between the two species of this group and are not found concomitantly in any other species of *Fridericia*. The morphological complexity of this clade is mainly due to the wide morphological variation of *F. platyphylla* (Cham.) L. G. Lohmann.

1. *Fridericia platyphylla* (Cham.) L. G. Lohmann in Ann. Missouri Bot. Gard. 99: 442. 2014 ≡ *Bignonia platyphylla* Cham. in Linnaea 7: 679. 1832 ≡ *Bignonia brachypoda* var. *platyphylla* (Cham.) DC. in Candolle, Prodr. 9: 146. 1845 ≡ *Arrabidaea brachypoda* var. *platyphylla* (Cham.) Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894 ≡ *Arrabidaea platyphylla* (Cham.) Bureau & K. Schum., Fl. Bras. 8(2): 38. 1896, nom. illeg. [non *Arrabidaea platyphylla* DC. in Candolle, Prodr. 9: 186. 1845] ≡ *Arrabidaea platyphylla* var. *stricta* Bureau & K. Schum., Fl. Bras. 8(2): 41. 1896. – Holotype: Brazil, fl., s.d., *F. Sellow* Herb. Reg. Berolinense 1841 [s.n.] (LE [image!]; isotypes: B destroyed [image negative 18452 at F!], HAL barcode HAL098686!, K barcode K000449124!, US barcode US282538 [image!]). – Fig. 1, 2.

≡ *Bignonia brachypoda* DC. in Candolle, Prodr. 9: 145. 1845, nom. illeg. (Art. 52.1) ≡ *Arrabidaea brachypoda* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894. – **Lectotype (designated here):** Brazil, fl., s.d., *F. Sellow* Herb. Reg. Berolinense 1841 [s.n.] (LE [image!]; isolectotypes: B destroyed [image negative 18452 at F!], HAL barcode HAL098686!, K barcode K000449124!, US barcode US282538 [image!]).

Note — *Bignonia brachypoda* DC. is illegitimate under Art. 52.1 of the *International Code of Nomenclature for algae, fungi, and plants* (Turland & al. 2018, hereafter called "*Code*") because Candolle (1845) included under the simultaneously published *B. brachypoda* var. *platyphylla* (Cham.) DC. the earlier species name *B. platyphylla* Cham. Because var. *platyphylla* is a subordinate taxon that did not include the intended type of *B. brachypoda*, the type of the latter name is not automatically that of *B. platyphylla* (Art. 7.6). *Arrabidaea brachypoda* Bureau (1894) is a legitimate replacement name based on the illegitimate *B. brachypoda* (Art. 6.12 and 58.1). Bureau's name is not likewise illegitimate under Art. 52.1 because in 1894 the epithet *platyphylla* was not available for a new combination in *Arrabidaea*, having already been used in the heterotypic *A. platyphylla* DC. in 1845 (Art. 58 Note 1). We have selected as the lectotype of *B. brachypoda* the specimen *Sellow s.n.* deposited in LE, which is also the holotype of *B. platyphylla*, the two names thereby becoming homotypic synonyms.

= *Bignonia brachypoda* var. *acutifolia* DC. in Candolle, Prodr. 9: 145. 1845. – Holotype: Brazil, Mato Grosso, Cuiabá, fl., 1832, *da Silva Manso 70A* [*s.n.*] (G-DC barcode G00133313 [image!]).

= *Bignonia brachypoda* var. *cuneata* DC. in Candolle, Prodr. 9: 145. 1845 ≡ *Arrabidaea brachypoda* var. *cuneata* (DC.) Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894 ≡ *Arrabidaea platyphylla* var. *cuneata* (DC.) Bureau & K. Schum., Fl. Bras. 8(2): 40. 1896. – Holotype: Brazil, Mato Grosso, Cuiabá, fl., 1832, *da Silva Manso s.n.* (G-DC barcode G00133320 [image!]).

= *Bignonia brachypoda* var. *elliptica* DC. in Candolle, Prodr. 9: 145. 1845 ≡ *Arrabidaea platyphylla* var. *elliptica* (DC.) Bureau & K. Schum., Fl. Bras. 8(2): 40. 1896. – Holotype: Brazil, Mato Grosso, Cuiabá, fl., 1832, *da Silva Manso s.n.* (G-DC barcode G00133316 [image!]).

= *Bignonia brachypoda* var. *firmula* DC. in Candolle, Prodr. 9: 146. 1845 ≡ *Arrabidaea platyphylla* var. *fir-*

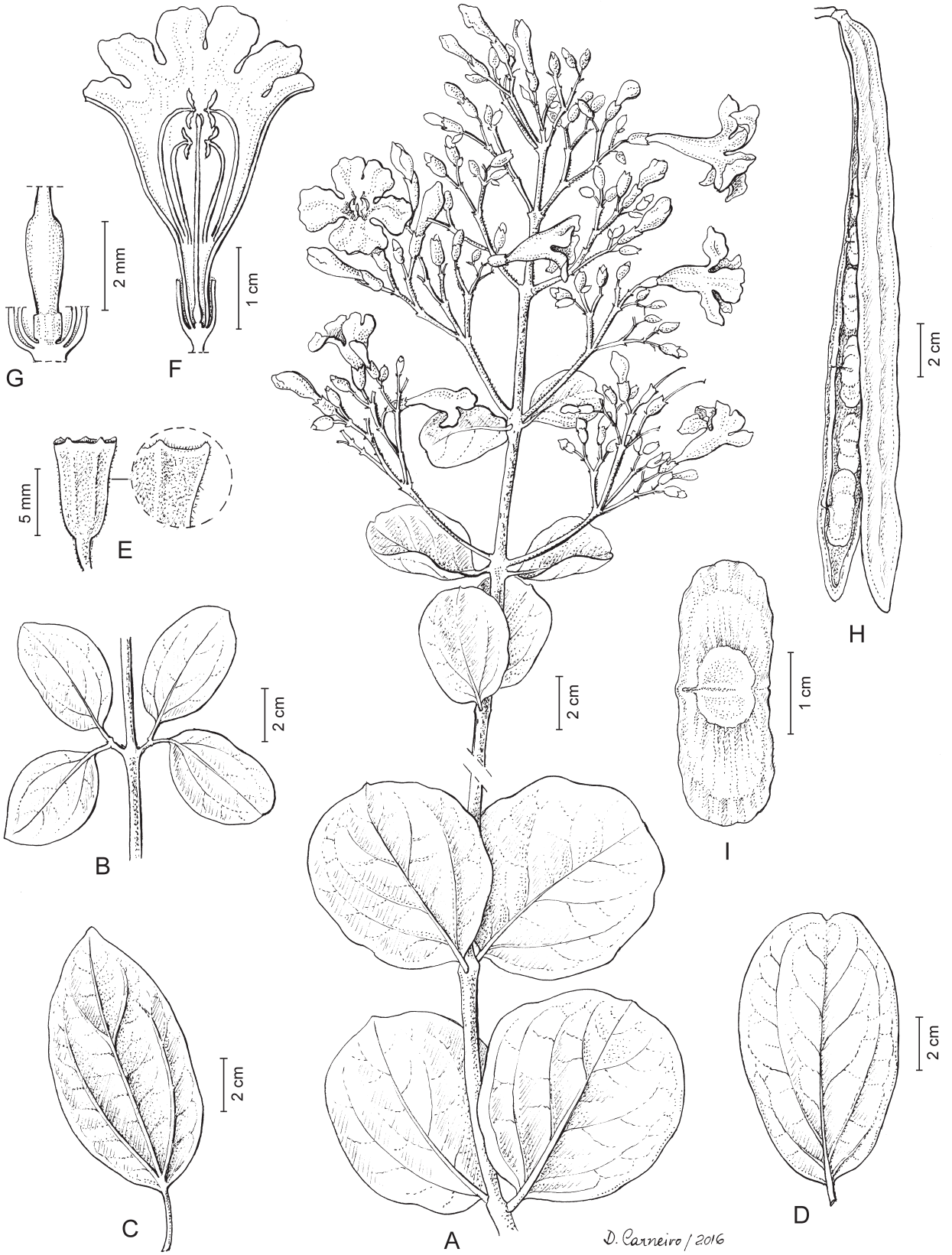

Fig. 1. *Fridericia platyphylla* – A: habit of a sclerophyllous plant with 1-foliolate leaves with orbicular leaflets; B: branch of sclerophyllous plant with 2-foliolate leaves and elliptic leaflets; C: leaflet of a mesophyllous plant showing elliptic shape and shortly acuminate apex; D: leaflet of a sclerophyllous plant showing elliptic shape and retuse apex; E: calyx cupular, costate near rim; detail showing 5-acuminate calyx rim; F: open flower in longitudinal section (staminode is omitted for clarity); G: ovary and disk; H: mature fruit; I: seed. – A, E, F, G from *Hatschbach & Koczicki 33052* (MBM); B from *Irwin & al. 23926* (UB); C from *Hage & al. 2284* (MBM); D, H, I from *Queiroz & al. 4712* (MBM). – Drawn by Diana Carneiro.

mula (DC.) Bureau & K. Schum., Fl. Bras. 8(2): 40. 1896. – **Lectotype (designated here):** Brazil, Minas Gerais, Serro Frio, fl., 1833, *M. Vauthier 250* (G-DC barcode G00133322 [image!]; isolectotypes: G-DC barcode G00008804 [image!], P barcode P03586005!, W herbarium accession number W-0057543!).

Note — Four syntypes were listed in the protologue of *Bignonia brachypoda* var. *firmula* DC. Two of these are gatherings from Minas Gerais (*Vauthier 250* [*s.n.*] and *Martius s.n.*), one is a gathering from Bahia (*Martius s.n.*) and the other is another gathering by *Martius s.n.* with fruits deposited in Munich. We have selected one of the two specimens of Vauthier's gathering deposited in G-DC (G00133322) as the lectotype because it is well preserved and was identified by Candolle.

= *Bignonia brachypoda* var. *heterophylla* DC. in Candolle, Prodr. 9: 146. 1845 ≡ *Arrabidaea platyphylla* var. *heterophylla* (DC.) Bureau & K. Schum., Fl. Bras. 8(2): 40. 1896. – Holotype: Brazil, São Paulo, São Carlos, fl., 1834, *P. W. Lund* 1879 (G-DC barcode G00133364 [image!]).

= *Bignonia violacea* DC. in Candolle, Prodr. 9: 156. 1845, **syn. nov.** – Holotype: Bolivia, Santa Cruz, Concepción, fl., Jul, *A. C. V. D. d'Orbigny 669* [*s.n.*] (P barcode P03586052!).

Note — We synonymize the previously unplaced name *Bignonia violacea* DC. under *Fridericia platyphylla*. We agree with Bureau (in sched.), who identified the holotype in Paris (P03586052) as *Bignonia brachypoda* var. *elliptica*, here considered as a synonym of *F. platyphylla*.

= *Bignonia regnelliana* Sond. in Linnaea 22: 558. 1849. – **Lectotype (designated here):** Brazil, Minas Gerais, fl., s.d., *A. F. Regnell I-295* (S herbarium accession number S04-3501!; isolectotypes: BM barcode 000848555 [image!], P barcode P03585983!).

Note — The protologue of *Bignonia regnelliana* Sond. does not provide any information about where the type was deposited, nor about where the holotype was collected. Four specimens of *Regnel I-295* were located, three of which do not contain any evidence that Sonder studied them. The first specimen is deposited in P and includes Regnell's handwritten note "Ad Caldas in Provincié Mina Ger. Brasl [sic]" in the label. The second is deposited in BM and includes the same locality of the specimen deposited in P and the species name handwritten by Regnell. The third is deposited in MO (MO-083287) and includes two labels. One of those labels includes two notes handwritten by Regnell using two different pen colours as follows: (1) "Entre M C Lopes e a Capella – illegible – Sta Rita" and (2) "Ad Beau 1867 I.295." The second label was typed within a printed label from the Uppsala herbarium that describes the collection locality as "entre Lopes Jaguary e St. Rita" and the collection date as "24 Apr 1862". The fourth specimen held at S includes an identification label handwritten by Regnell and a handwritten note by Sonder indicating the collection locality as "Provincia Minas Geraes [sic] Am. [America] Regnell". Because the latter specimen is well preserved and is the only one that clearly indicates that it was analysed by Sonder, we have selected it (S04-3501) as the lectotype. Following Art. 9.4(a) of the *Code*, the specimen deposited in MO (MO-083287) does not represent an isolectotype because the collection date handwritten by Regnell is subsequent to the publication of *B. regnelliana*, indicating that this specimen does not represent original material.

= *Petastoma simplicifolium* Miers in Proc. Roy. Hort. Soc. London 3: 194. 1863. – **Lectotype (designated here):** Brazil, São Paulo and Rio [São Paulo], fl., 1861-2 [s.d.], *J. Weir 204* (K barcode K000990553!; isolectotype: K barcode K000990524! [i.e. only the branch on the left of the sheet]).

Note — The protologue of *Petastoma simplicifolium* Miers does not indicate the herbarium where the type material was deposited. Two specimens of *Weir 204* were found at K. Because one of them (K000990524) is mounted on the same sheet as a specimen from different gathering, *Correa de Mello 2* (K000990533), we have selected the other specimen (K000990553) as the lectotype. The selected material is well conserved allowing for accurate species identification.

= *Arrabidaea brachypoda* var. *acuminata* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894 ≡ *Arrabidaea platyphylla* var. *acuminata* (Bureau) Bureau & K. Schum., Fl. Bras. 8(2): 39. 1896. – **Lectotype (designated here):** Brazil, Minas Gerais, Lagoa Santa, fl., 16 Feb ["floret Februario ad Aprilem"], *E. Warming s.n.* (C barcode C10021771 [image!]; isolectotype: C barcode C10021772 [image!]).

Note — Bureau (1894) indicated two syntypes for *Arrabidaea brachypoda* var. *acuminata* Bureau in the protologue: *Warming s.n.*, collected at Lagoa Santa in Minas Gerais, and *Glaziou 7775*, collected in Rio de Janeiro. We have selected the specimen *Warming s.n.* (C10021771) as the lectotype because the description of the flowers in the label matches perfectly the description provided in the protologue.

= *Arrabidaea brachypoda* var. *attenuata* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894. – **Lectotype (designated here):** Brazil, Minas Gerais, Lagoa Santa, fl., s.d., *E. Warming 1961/3* [*s.n.*] (C barcode C10021767 [image!]).

Note — Bureau (1894) did not indicate where the type of *Arrabidaea brachypoda* var. *attenuata* Bureau was deposited. We found three gatherings of Warming with this determination made by Bureau deposited in C. We have selected the specimen *Warming 1961/3* (C10021767) as the lectotype because the habitat and plant description match the protologue. This

gathering has a collecting number very similar to the number of the lectotype of *A. brachypoda* var. *rigida* Bureau (*Warming 1961/2*, C10021764). Because the specimen C10021764 includes a distinct collection date, this material is not a duplicate. Among the two remaining specimens identified by Bureau as *A. brachypoda* var. *attenuata*, C10031766 does not include the collecting number and C10021765 has a different number (*Warming 1965*). Therefore, these specimens are also not isolectotypes.

= *Arrabidaea brachypoda* var. *firma* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894. – **Lectotype (designated here):** s. loc. [Lagoa Santa], fl., s.d., *A. Glaziou 12970* (C barcode C10021773 [image!]; isolectotypes: P barcodes P03586027!, P03586028!).

= *Note* — Bureau (1894) listed *Arrabidaea brachypoda* var. *firmula* DC. "(partim)" as a synonym of *A. brachypoda* var. *firma* Bureau. In the protologue, he cited two syntypes, the gatherings *Warming s.n.* and *Glaziou 12970*; neither was cited by Candolle (1845). Following Art. 52.1 of the *Code*, because Bureau indicated "partim", the type of *A. brachypoda* var. *firmula* was not definitely included in *A. brachypoda* var. *firma*, resulting in his varietal name being legitimate. Among the two gatherings mentioned by Bureau (1894), we found only three specimens of *Glaziou 12970*, one in C without locality and date, and two in P, one of them with Glaziou's handwritten indication that the gathering was made in Ipanema on 23 April 1881. The specimens in P were donated to the herbarium after Glazious's death in 1907 (Bureau 1908) and, therefore, after the publication of the new varietal name. Despite lacking detailed gathering information, we have selected C10021773 as the lectotype because it is a well-preserved specimen and was annotated by Bureau.

= *Arrabidaea brachypoda* var. *induta* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894 ≡ *Arrabidaea platyphylla* var. *induta* (Bureau) Bureau & K. Schum., Fl. Bras. 8(2): 39. 1896. – **Lectotype (designated here):** s. loc. ["Brasilia australiore"], fl., Feb 1882 [s.d.], *A. Glaziou 12992* (C barcode C10021775 [image!]; isolectotypes: BR barcode 880546 [image!], C barcode C10021774 [image!], K [barcode K000449128!], MO herbarium accession numbers MO-083153!, MO-083247!, P barcodes P03586029!, P03586030!).

Note — Bureau (1894) did not mention where the type of *Arrabidaea brachypoda* var. *induta* Bureau was deposited. We were able to locate eight specimens of *Glaziou 12992*, one deposited in each of BR and K and two deposited in each of C, MO and P. The specimens deposited in BR and K do not have Bureau's handwriting, while the two deposited in MO are sterile. The two deposited in P have the varietal name annotated by Bureau in a label that indicates that these specimens were donated to P by Glaziou's daughter in 1907, after Glaziou's death (Bureau 1908), subsequent to the publication of *A. brachypoda* var. *induta*. We opted to select as the lectotype the only specimen from Warming's herbarium held in C (C10021775), which has Bureau's handwriting and is very well preserved.

= *Arrabidaea brachypoda* var. *rigida* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 98. 1894. – **Lectotype (designated here):** Brazil, Minas Gerais, Lagoa Santa, fr., 16 Dec 1863 [s.d], *E. Warming 1961/2* [*s.n.*] (C barcode C10021764 [image!]).

Note — Bureau (1894) did not indicate where the type of *Arrabidaea brachypoda* var. *rigida* Bureau was deposited. We were only able to locate one specimen of a Warming gathering determined by Bureau with this name (C10021764). This material is a fruiting specimen collected in December. Even though the protologue describes corolla colour and not the fruit, it indicates "October to February" as the flowering period and "December to January" as the fruiting period. Because this was the only Warming specimen annotated by Bureau as *A. brachypoda* var. *rigida*, we have selected it as the lectotype.

= *Arrabidaea celastroides* Bureau ex K. Schum. in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 213. 1894, **syn. nov.** – Lectotype (designated by Lohmann in Lohmann & Taylor 2014: 434): Brazil, Bahia, Jacobina, fl., 1841 [s.d.], *J. S. Blanchet 3419* (G-DC barcode G00008903 [image!]; isolectotypes: BR barcode BR8805393 [image!], FI barcode FI009859 [image!], G-DC barcode G00133799 [image!], P barcodes P00468568!, P00468569!).

Note — Arrabidaea celastroides Bureau ex K. Schum. is here proposed as a new synonym of *Fridericia platyphylla*. The description provided in the protologue of *A. celastroides* is very concise, mentioning only the glabrous, orbicular or oblong leaflets. The protologue has no mention of any specimen (Schumann, 1894). In the *Flora brasiliensis*, Bureau & Schumann (1896) segregated this species based on the shrubby habit, "herbacea" leaves, flowers smaller than 2 cm and denticulate calyx rim. On the other hand, *A. platyphylla* (Cham.) Bureau & K. Schum. (non *A. platyphylla* DC.) is characterized by the shrubby or scandent habit, coriaceous leaves, flowers larger than 2.5 cm and almost denticulate calyx rim. Even though the type materials of both species represent the extremes of their variation, the pattern of morphological variation is continuous. Molecular phylogenetic data (Kaehler & al. 2019) provide additional support for the recognition of a single taxon.

= *Arrabidaea platyphylla* var. *lasiorrhachis* Bureau & K. Schum., Fl. Bras. 8(2): 40. 1896. – **Lectotype (designated here):** Brazil, São Paulo, Minas Gerais and Goiás ["Brasilia australiore"], fl., Jul–Oct 1877 [s.d.], *Vic. P. Seguro 59* [*s.n.*] (W barcode W0057598!).

Note — Bureau & Schumann (1896) did not specify where the type of *Arrabidaea platyphylla* var. *lasiorrhachis* Bureau & K. Schum. (*Vic. P. Seguro s.n.*) was deposited. We have selected as the lectotype the only specimen located (W0057598) with an identification clearly made by Schumann.

= *Arrabidaea platyphylla* var. *puberula* Bureau & K. Schum., Fl. Bras. 8(2): 41. 1896. – **Lectotype (designated here):** s. loc. ["in Brasilia occidentali"], fl., s.d., *Tamberlik s.n.* (NY barcode NY720025!; isolectotypes: MO herbarium accession number MO-085876!, W herbarium accession number W-57550!).
Note — Four syntypes were listed in the protologue of *Arrabidaea platyphylla* var. *puberula* Bureau & K. Schum. (the gatherings *Pohl 1105*, *Vic. Porto Seguro s.n.*, *Sellow 5511* and *Tamberlik s.n.*). Of these, only three specimens of *Tamberlik s.n.* were located, all of which included Schumann's handwriting in the label. The specimen with the highest quality (NY720025) has been selected as the lectotype.

– "*Fridericia platyphylla*" (Cham.) L. G. Lohmann in Monogr. Syst. Bot. Missouri Bot Gard. 107: 1606. 2008. Designation not validly published (Art. 41.1).

– "*Fridericia platyphylla*" (Cham.) L. G. Lohmann in Forzza & al., Cat. Pl. Fung. Brasil 1: 766. 2010. Designation not validly published (Art. 41.1).

Morphological description — Lianas, shrubs (sometimes small trees), up to 20 m tall. *Branches* terete, lenticellate, grey or brown when dry, glabrescent to velutinous with simple trichomes (sometimes branched) and sparsely lepidote with peltate glandular trichomes, without interpetiolar ridges, with interpetiolar glandular fields; prophylls of axillary buds triangular, arranged in 2 rows, 1–2 mm long. *Leaves* 1- or 2-foliolate; petiole 0.4–2 cm long, glabrescent to velutinous with simple trichomes (rarely branched); petiolules of equal lengths, when 1-foliolate 0.5–1(–1.3) cm, when 2-foliolate 1–2.2 cm, glabrescent to velutinous with simple trichomes (rarely branched); blade chartaceous to coriaceous, margin entire or revolute, central leaflet elliptic, orbicular or obovate (sometimes ovate), lateral leaflets elliptic or orbicular (sometimes ovate), 4–16 × 1.7–13.5 cm, base rounded or cuneate, apex rounded, shortly acuminate, acute or emarginate, surface adaxially lepidote with glandular peltate trichomes, glabrescent to velutinous with simple trichomes, abaxially lepidote with glandular peltate trichomes, glabrescent to velutinous with simple trichomes, venation acrodromous, secondary veins raised, tertiary veins flat or slightly raised, domatia as vestigial pockets and trichome tufts. *Inflorescence* terminal (rarely axillary), a thyrse, with 2 or 3 orders; peduncle of first order 2–8.3 cm long, of second order 1.2–3.4 cm long, of third order 0.3–0.7 cm long, pubescent to velutinous with simple trichomes (sometimes branched); bracts linear, 1–2.5 mm long, caducous; bracteoles linear, 0.6–0.8 mm long, caducous; pedicels 0.3–0.6 cm long. *Calyx* cupular, costate throughout (sometimes only near rim), 5-acuminate (sometimes shortly split), 0.3–0.6 × 0.2–0.5 cm, pubescent with simple trichomes (rarely with branched trichomes), chartaceous, white, pink or purplish, with glands close to rim. *Corolla* infundibuliform, zygomorphic, slightly furrowed, 2.4–5.1 cm long, 0.9–1.3 cm wide at tube mouth, externally pubescent with simple and glandular peltate trichomes, without glands, internally glabrous, villose at base and close to base of stamens, with glandular capitate trichomes, pubescent at lobes with simple and glandular capitate trichomes, lobes 0.7–1 × 0.8–1.2 cm, pink. *Androecium* with stamens included; longer filaments 1–1.3 cm long, shorter filaments 0.8–1 cm long; staminode c. 0.3 cm long; anthers c. 2 mm long, connectives not protruding. *Gynoecium* with ovary cylindric, 1.8–2.7 × 0.7–1 mm, smooth, lepidote; style 1.6–2.3 cm long; stigma elliptic to rhomboid; nectar disk plate-shaped, 0.6 –1 × 1.1–2 mm. *Fruit* linear, flat, margin not raised, with or without a central ridge; valves coriaceous, smooth, 11–33 × 0.8–1.4 cm, lepidote with glandular peltate trichomes; septum coriaceous. *Seeds* oblong or elliptic, 0.7–1.3 × 2–4 cm, body oblong or elliptic, wings hyaline, 0.2–0.4 cm wide, margin entire.

Phenology — Produces flowers and fruits all year long.

Distribution and habitat — *Fridericia platyphylla* is broadly distributed through South America. This species occupies dry and wet Amazonian forests, Atlantic rainforest, savannahs (including Cerrado, Llanos and Guiana Highlands), Chaco and Caatinga. It is distributed through Bolivia (El Beni, La Paz and Santa Cruz), Brazil (Acre, Amazonas, Bahia, Ceará, Distrito Federal, Espírito Santo, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraíba, Paraná, Piauí, Rondônia, Roraima, São Paulo, Rio de Janeiro and Tocantins), Guyana (Upper Takutu-Upper Essequibo), Paraguay (Amambay, Caazapá, Central, Canindeyú and Paraguarí), Peru (Cusco, Huánuco, Junín, Loreto, San Martín and Ucayali) and Venezuela (Amazonas, Bolívar, Guárico and Portuguesa).

Conservation status — *Fridericia platyphylla* is categorized as Least Concern (LC) based on its Extent of Occurrence (29 120 298 km^2) and Area of Occupancy (502 500 km^2).

Remarks — *Fridericia platyphylla* is easily recognized by its 1- or 2-foliolate leaves and cupular calyx, costate when dry. An infraspecific classification was proposed by Candolle (1845) based on leaf morphology. Indeed, the leaves show wide variation, usually being 2-foliolate and chartaceous in moist and forested environments, where the plants are usually lianas, but 1-foliolate and coriaceous in dryer and open vegetation, where the plants are shrubs, scandent shrubs or treelets. Despite the variation found in the leaf morphology, the flower and fruit

morphologies are constant, leading us to disregard the infraspecific classification. Additionally, some specimens (e.g. *Giulietti & al. 1845*, MBM; *Hassler 10576*, NY, P; *Krapovickas & al. 14077*, MBM) were shown to bear sclerophyllous leaves in older branches and mesophyllous leaves in younger branches, indicating that leaf morphology can vary even within the same individual.

Two distinct species were described in different genera with the specific epithet "*platyphylla*": *Bignonia platyphylla* DC. and *Arrabidaea platyphylla* Cham. The correct name of the species treated here was carefully explained by Lohmann & Taylor (2014). However, the name *Arrabidaea platyphylla* DC. [= *Xylophragma platyphyllum* (DC.) L. G. Lohmann] is often mistakenly applied to *Fridericia platyphylla* (Cham.) L. G. Lohmann. *Xylophragma platyphyllum* can be easily identified by the leaves with venation darker than the blade when dry (vs. never darker when dry in *F. platyphylla*), corolla tubular (vs. corolla infundibular in *F. platyphylla*), smaller than 1.2 cm (vs. 2.2–5.1 cm in *F. platyphylla*), nectar disk surrounding the ovary (vs. nectar disk under the ovary in *F. platyphylla*) and branched trichomes (vs. simple trichomes in *F. platyphylla*; only the specimen *Irwin 13141* seen in MO, NY, P and UB has branched trichomes on the inflorescence axis).

2. *Fridericia prancei* (A. H. Gentry) L. G. Lohmann in Ann. Missouri Bot. Gard. 99: 443. 2014 ≡ *Arrabidaea prancei* A. H. Gentry in Ann. Missouri Bot. Gard. 63: 50. 1976. – Holotype: Brazil, Amazonas, km 67 E of Manaus–Itacoatiara road, fl., Nov 1974, *A. H. Gentry 12882* (INPA not seen; isotypes: MO herbarium accession number MO-2251712!, RB barcodes RB00536870!, RB00538142!, RB00538143!, TEPB herbarium accession number TEPB-4488!). – Fig. 2, 3A–C.

– "*Fridericia prancei*" (A. H. Gentry) L. G. Lohmann in Forzza & al., Cat. Pl. Fung. Brasil 1: 766. 2010. Designation not validly published (Art. 41.1).

Morphological description — Lianas, up to 25 m tall. *Branches* terete, lenticellate, brown or black when dry, lepidote with glandular peltate trichomes; without interpetiolar ridges, with interpetiolar gland fields; prophylls of axillary buds triangular, arranged in 2 rows, 1–2.3 mm long. *Leaves* 2-foliolate; petiole 1.2–2.7(–3.5) cm long, glabrescent with simple trichomes and lepidote with glandular peltate trichomes; petiolules of equal lengths, (0.8–)2–3.6 cm long, glabrescent with simple trichomes and lepidote with glandular peltate trichomes; blade elliptic, coriaceous, margin revolute, 10.5–19 × 5.5–9 cm, base rounded or cuneate, apex acuminate, surface adaxially glabrous or lepidote with glandular peltate trichomes, abaxially glabrous or pubescent with simple trichomes only on veins and lepidote with glandular peltate trichomes, venation acrodromous, secondary veins raised, tertiary veins slightly raised, domatia as vestigial pockets and trichome tufts. *Inflorescence* axillary or terminal, a thyrse, with 3 or 4 orders; peduncle of first order 0.7–1.1(–4.2) cm long, of second order 0.5–1.4 cm long, of third order 0.4–0.6 cm long, of fourth order 0.3–0.4 cm long, lepidote with glandular peltate trichomes; bracts linear, 1.2–2.5 mm long, persistent; bracteoles linear, 0.9–1.3 mm long, caducous; pedicels 0.6–1.1 cm long. *Calyx* tubular, not costate, truncate to shortly 5-acuminate, 0.8–1.1 × 0.3–0.5 cm, lepidote with glandular peltate trichomes (sometimes pubescent with simple trichomes at rim), coriaceous, white or cream, with glands clustered close to acumens. *Corolla* narrowly infundibuliform, zygomorphic, not or slightly furrowed, 5–6.2 cm long, 0.6–1.2 cm wide at tube mouth, externally pubescent with simple and glandular peltate trichomes, without glands, internally glabrous, villose at base and close to base of stamens with glandular capitate trichomes, pubescent at lobes with simple and glandular capitate trichomes, lobes 1.2–1.6 × 0.8–1.3 cm, white, pinkish white or lavender outside, white inside. *Androecium* with stamens at same height as tube mouth; longer filaments 1.7–1.9 cm long, shorter filaments 1.3–1.6 cm long; staminode 0.7–0.9 cm long; anthers c. 3 mm long, connectives not protruding. *Gynoecium* with ovary cylindric, 3.1–3.5 × c. 1 mm, furrowed, lepidote; style 2.8–3 cm long; stigma elliptic to rhomboid; nectar disk plate-shaped, c. 0.8 × 1.4 mm. *Fruit* linear, flat, margin not raised, without a central ridge; valves leathery, smooth, 34–40 × 1.3–1.7 cm, glabrous and sparsely lepidote with glandular peltate trichomes; septum coriaceous. *Seeds* oblong or elliptic, 1.1–1.5 × 4.2–4.9 cm, body oblong or elliptic, wings hyaline, 0.1–0.2 cm wide, margin entire.

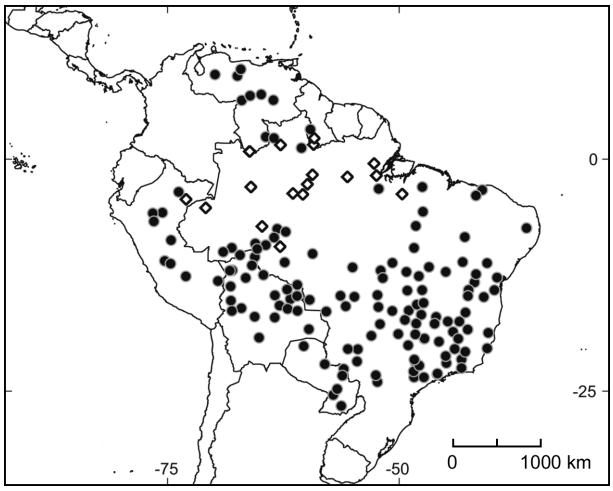

Fig. 2. Distribution of the species of the "Acrodromous venation" clade: *Fridericia platyphylla* (black circles); *F. prancei* (open diamonds).

Phenology — Produces flowers all year long. Fruiting specimens were collected in July, August and November.

Distribution and habitat — *Fridericia prancei* is distributed in lowland Amazonian rainforest in Venezuela (Am-

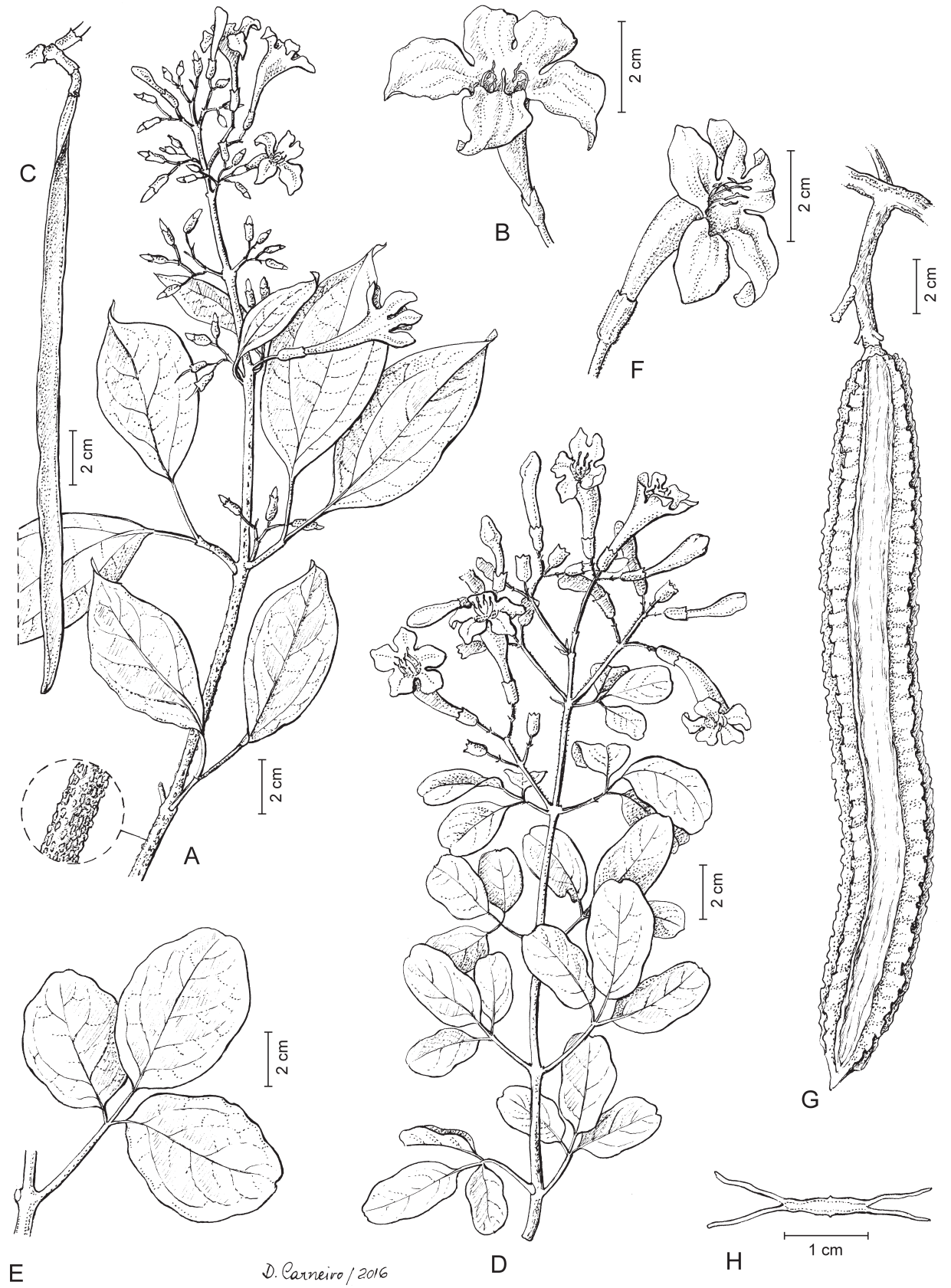

Fig. 3. A–C: *Fridericia prancei*; A: habit; detail showing densely lenticellate stem; B: flower; C: fruit. – D–H: *Fridericia erubescens*; D: habit; E: leaf; F: flower; G: fruit; H: fruit cross-section showing large wings. – A from *Steward & al. 7* (NY); B from *Gentry 13055* (MO); C from *Oliveira 4665* (NY); D–F from *Queiroz & al. 7023* (UPCB); G–H from *Anderson 9151* (MO). – Drawn by Diana Carneiro.

azonas), Guyana (Upper Takutu-Upper Essequibo) and Brazil (Acre, Amazonas, Pará, Rondônia and Roraima).

Conservation status — Fridericia prancei is categorized as Least Concern (LC) based on its Extent of Occurrence (1 876 438 km^2) and Area of Occupancy (47 500 km^2).

Remarks — Fridericia prancei can be easily identified because of the large and coriaceous leaves with marked suprabasal acrodromous venation, tubular, not costate calyx, long and narrowly infundibuliform, white or whitish pink corolla, and stamens at the same height as the tube mouth.

Al Gentry annotated "12822" over his collector's number typed (12882) on the isotype deposited in MO. However, he did not mention the differential notation in the protologue or in any other published work. Lohmann and Taylor (2014) cited the number handwritten by Gentry (in sched.). Since the protologue and all remaining isotypes found have the number 12882, we consider this to represent the correct collecting number.

The "Piriadacus" clade

The "Piriadacus" clade is composed of two species that share axillary buds with concentrically disposed prophylls (seen at the base of the inflorescences in *Fridericia ornithophila* (A. H. Gentry) L. G. Lohmann), inflorescences and calyx with capitate glandular trichomes, tubular, red, pink-reddish or orange corollas and exserted or sub-exserted stamens. The name of the clade is based on the monospecific genus *Piriadacus* Pichon, which has *Bignonia erubescens* DC. (= *F. erubescens* (DC.) L. G. Lohmann) as the type (Kaehler & al. 2019).

3. *Fridericia erubescens* (DC.) L. G. Lohmann in Ann. Missouri Bot. Gard. 99: 437. 2014 ≡ *Bignonia erubescens* DC. in Candolle, Prodr. 9: 157. 1845 ≡ *Cuspidaria erubescens* (DC.) Bureau in Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 1893: 102. 1894 ≡ *Piriadacus erubescens* (DC.) Pichon in Bull. Soc. Bot. France 92: 225. 1945 ≡ *Alsocydia erubescens* (DC.) J. C. Gomes in Revista Brasil. Biol. 11: 49. 1951. – Lectotype (designated by Lohmann in Lohmann & Taylor 2014: 437): Brazil, Minas Gerais, Serro Frio, fl., Jul [s.d.], *C. F. P. von Martius s.n.* [herb. 342] (M barcode M0088919!). – Fig. 3D–H, 4.

= *Bignonia erubescens* var. *breviflora* DC. in Candolle, Prodr. 9: 158. 1845. – **Lectotype (designated here):** Brazil, Minas Gerais [in Sylvis Capoes deserti], fl., Jul 1818 [s.d.], *C. F. P. von Martius s.n.* [herb. 341] (M barcode M0088918!).

= *Bignonia erubescens* var. *subtruncata* DC. in Candolle, Prodr. 9: 157. 1845. – **Lectotype (designated here):** Brazil, Minas Gerais, fl., s.d., *C. F. P. von Martius s.n.* [herb. 343] (M barcode M0088920!).
Note — Bignonia erubescens DC. includes three varieties, but the types of the species and varietal names were not directly designated by Candolle (1845). All three types are Martius's gatherings conserved in Munich. Lohmann (in Lohmann & Taylor 2014) chose the specimen M0088919 as the lectotype of *B. erubescens* with M0088918 and M0088920 as isolectotypes. However, the two varietal names also need lectotypification. The specimen M0088918 has the same locality description provided in the protologue of *B. erubescens* var. *breviflora* DC., as well as a label with a comment from Candolle on the small size of the flowers. Therefore, we have chosen M0088918 as the lectotype of this varietal name. Lastly, the label of M0088920 includes Candolle's handwriting and the specimen matches well the description of *B. erubescens* var. *subtruncata* DC. provided in the protologue. Therefore, we have chosen this specimen as the lectotype of this varietal name. Specimens M0088918 and M0088920 are not isolectotypes of *B. erubescens*, but lectotypes of the two varietal names described in the same treatment.

= *Cuspidaria erubescens* var. *glabrescens* Bureau in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 103. 1894. – **Lectotype (designated here):** Brazil, s. loc. [Minas Gerais], fl., s.d., *A. Glaziou 14106* (C barcode C10021781 [image!]; isolectotypes: K barcode K000449476!, P barcode P02885020!).
Note — Bureau (1894) did not cite where the type of *Cuspidaria erubescens* var. *glabrescens* Bureau was deposited. We were only able to locate three specimens, none of which was collected in the locality provided in the protologue. We have chosen as the lectotype the only specimen annotated by Bureau that does not have a locality description but whose morphology matches the protologue (leaves 1- or 2-foliolate, whereas the specimens K000449476 and P02885020 have leaves 3-foliolate).

– "*Fridericia erubescens*" (DC.) L. G. Lohmann in Forzza & al., Cat. Pl. Fung. Brasil 1: 765. 2010. Designation not validly published (Art. 41.1).

Morphological description — Lianas or scandent shrubs, up to 5 m tall. *Branches* terete, striate and sparsely lenticellate, brown or black when dry, glabrescent to villose with simple and glandular capitate trichomes, with or without inconspicuous interpetiolar ridges, with or without interpetiolar glandular fields; prophylls of axillary buds broadly triangular, arranged as a bromeliad, 1.8–2.1 mm long. *Leaves* 2- or 3-foliolate; petiole 0.8–2.4 cm long, glabrescent to villose with simple trichomes (sometimes glandular capitate); petiolules in two sizes, central ones 0.7–2.2 cm long, lateral ones 0.2–0.5 cm long, glabrescent to villose with simple trichomes (sometimes glandular capitate); blade chartaceous to coriaceous, margin revolute, central leaflet elliptic, (2.1–)3–7.1(–11.5) × 3–6.4 cm, base rounded or cuneate, apex rounded or acuminate, lateral leaflets elliptic or obovate, 2.4–5.8(–10.6)

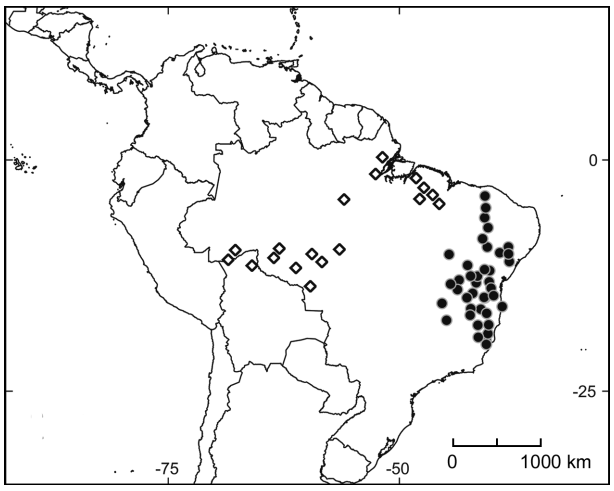

Fig. 4. Distribution of the species of the "Piriadacus" clade. *Fridericia erubescens* (black circles); *F. ornithophila* (open diamonds).

× 1.2–5.7 cm, base rounded or cuneate, apex rounded or shortly acuminate, surface adaxially lepidote with glandular peltate trichomes, glabrescent to velutinous with simple trichomes, abaxially lepidote with glandular peltate trichomes, glabrescent to velutinous with simple trichomes, venation pinnate, secondary veins raised, tertiary veins raised, without domatia (sometimes with trichome tufts). *Inflorescence* terminal or axillary, thyrsoid, with 3 orders; peduncles of first order (1.6–)3–5.9 cm long, of second order 1.8–2.9 cm long, of third order 0.9–1.5 cm long, glabrescent to villose with simple and glandular capitate trichomes; bracts linear, caducous or persistent, 0.5–1 cm long; bracteoles linear, 0.3–0.4 cm long, caducous or persistent; pedicels 0.2–0.8 cm long. *Calyx* tubular, not costate, irregularly split or truncate, 0.6–1.3 × 0.3–0.4 cm, glabrescent to villose with simple and glandular capitate trichomes, membranous or chartaceous, green, pinkish or purplish, without glands. *Corolla* tubular, zygomorphic, not furrowed, (2.4–)3–5(–5.7) cm long, 0.5–0.6 cm wide at tube mouth, externally pubescent with simple and glandular peltate trichomes, without glands, internally glabrous, villose at base and close to base of stamens with glandular capitate long-stalked trichomes, pubescent at lobes with simple and glandular capitate trichomes, lobes 0.4–1.1 × 0.3–0.5 cm, orange, reddish or pinkish. *Androecium* with stamens exserted; longer filaments 2.9–4.3 cm long, shorter filaments 1.7–3.3 cm long; staminode 0.3–0.4 cm long; anthers 3–4 mm long, connectives protruding 0.6–0.9 mm. *Gynoecium* with ovary cylindric, 3–4 × 1–1.2 mm, furrowed, lepidote (sometimes glabrous); style 3.1–4.9 cm long; stigma elliptic to rhomboid; nectar disk plate-shaped, c. 1.2 × 2.6 mm. *Fruit* linear, flat, margin winged, with or without a central ridge; valves woody, smooth, 13–22(–27) × 2.9–3.5(–5.3) cm, glabrous; septum coriaceous. *Seeds* oblong to semicircular, 0.4–1 × 1.9–4 cm, body of seeds semicircular, wings hyaline, 0.3–0.4 cm wide, margin entire.

Phenology — Produces flowers and fruits all year long.

Distribution and habitat — *Fridericia erubescens* occurs in Caatinga, Cerrado and ecotone areas of Atlantic rainforest. It is endemic to Brazil (Bahia, Ceará, Espírito Santo, Minas Gerais, Pernambuco and Piauí).

Conservation status — *Fridericia erubescens* is categorized as Least Concern (LC) based on its Extent of Occurrence (1 206 403 km^2) and Area of Occupancy (307 500 km^2).

Remarks — *Fridericia erubescens* is easily recognized by the tubular calyx, frequently covered by glandular capitate trichomes giving a sticky feel, the tubular and long corolla, usually red, orange or pinkish orange, the exserted stamens and winged fruit. Some species of *Cuspidaria* and *Tynanthus* Miers also have winged fruits, but the mature fruits of *F. erubescens* are longer (reaching 30 cm) and the leaves are often 3-foliolate. On the other hand, *Cuspidaria* and *Tynanthus* have shorter fruits (around 20 cm) and the leaves are usually 2-foliolate.

The placement of this species has long been confusing. Candolle (1845) described it in *Bignonia* based on flower morphology, because the fruit was unknown at that time. Bureau (1894) transferred it into *Cuspidaria* without providing any justification. The species was treated in *Cuspidaria* until Pichon (1945) described the new genus *Piriadacus* Pichon (an anagram of the name *Cuspidaria*), with *Fridericia erubescens* as the type. According to Pichon (1945), the tubular calyx, glabrous anthers, pollen organized in monads with a granulose exine pattern and fruits with large wings were not shared with the remaining species of *Cuspidaria*. Gomes (1951) described the genus *Alsocydia* Mart. ex J. C. Gomes with *B. erubescens* DC. as type, possibly unaware of Pichon's work. His classification was based on "simple pollen" (i.e. in monads), which is distinct from *Cuspidaria* with its pollen organized in tetrads. Finally, molecular evidence led Lohmann (in Lohmann & Taylor 2014) to transfer this species into *Fridericia*.

4. *Fridericia ornithophila* (A. H. Gentry) L. G. Lohmann in Ann. Missouri Bot. Gard. 99: 441. 2014 ≡ *Arrabidaea ornithophila* A. H. Gentry in Ann. Missouri Bot. Gard. 64: 312. 1977 ["1978"]. – Holotype: Brazil, Pará, Tomé Açú, Pão Vermelho, fl.-bud, fl., 3 Aug 1931, *Y. Mexia 6041* (MO herbarium accession number MO-1068874!; isotypes: A barcode 00091926 [image!], GH barcode 00091927 [image!], NY barcode 00346064!, S herbarium accession number S09-21565 [image!], US barcode 00170304 [image!]). Fig. 4, 5.

– "*Fridericia ornithophila*" (A. H. Gentry) L. G. Lohmann in Forzza & al., Cat. Pl. Fung. Brasil 1: 766. 2010. Designation not validly published (Art. 41.1).

Morphological description — Lianas or scandent shrubs, up to 20 m tall. *Branches* terete, striate and sparsely lenti-

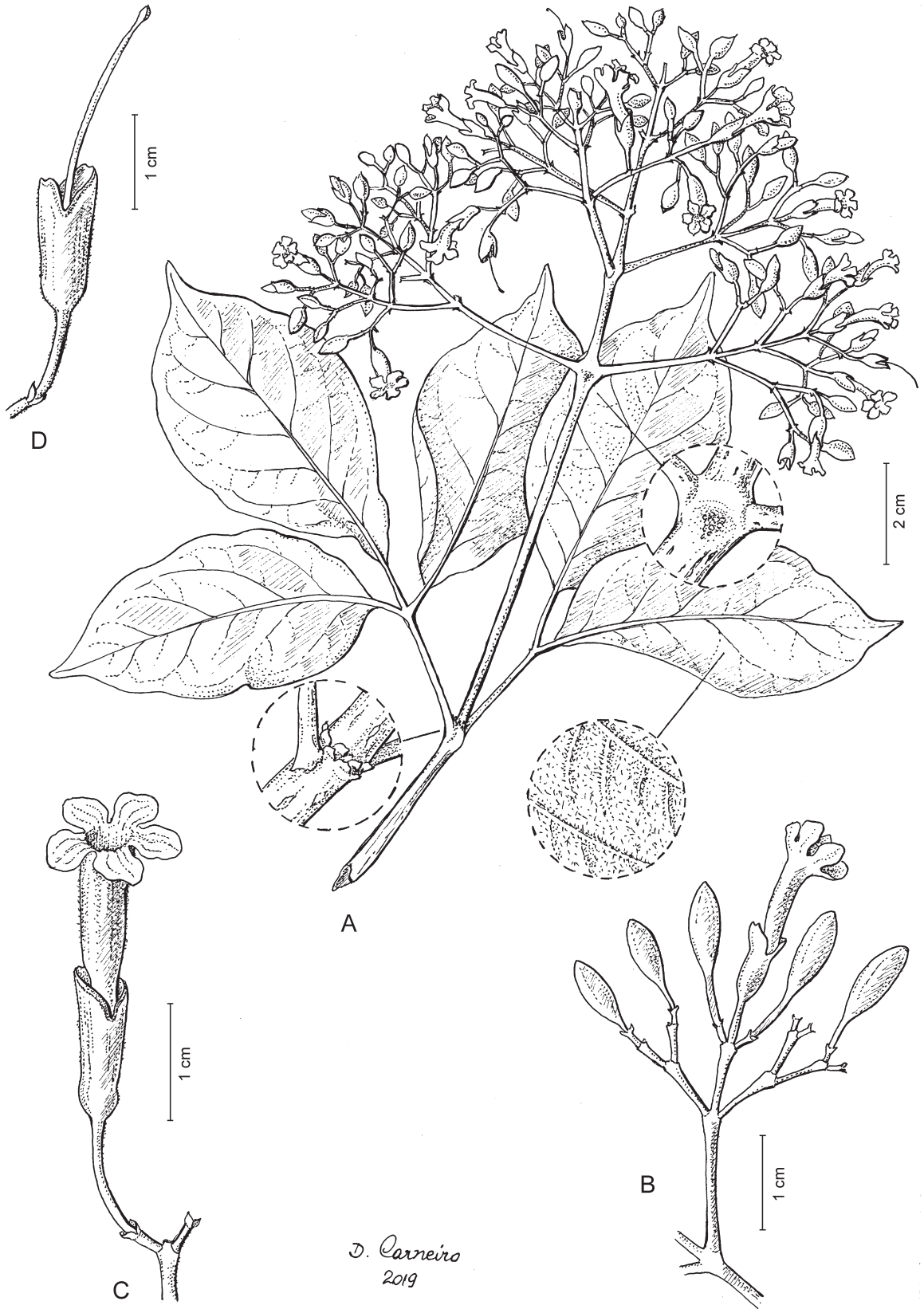

Fig. 5. *Fridericia ornithophila* – A: habit; details showing interpetiolar gland fields (centre right), prophylls concentrically disposed at base of inflorescence (bottom left) and abaxial surface of leaves densely pubescent with protruding secondary venation (bottom right); B: second-order branch of inflorescence; C: flower showing narrowly tubular corolla and actinomorphic disposition of lobes; D: old flower without corolla showing bilabiate calyx and orbicular stigma. – A–D from *Pires 605* (MO). – Drawn by Diana Carneiro.

cellate, grey to brown when dry, puberulous to velutinous with simple trichomes, with inconspicuous or without interpetiolar ridges, with interpetiolar glandular fields; prophylls of axillary buds triangular, arranged in 2 rows (sometimes concentrically disposed at inflorescence peduncles), c. 1 mm long. *Leaves* 3-foliolate; petiole (2.5–)4.2–6 cm long, puberulous with simple trichomes; petiolules in two sizes, central ones 1.4–4(–4.9) cm long, lateral ones 0.6–2.8 cm long, puberulous to velutinous with simple trichomes; blade chartaceous, margin entire, central leaflet elliptic, 10.2–16.5(–26) × 4–9.4(–16.9) cm, base rounded or cuneate, apex acuminate (sometimes retuse), lateral leaflets elliptic, oblong to slightly ovate, 9.1–15.2 × 4.5–11 cm, base rounded (sometimes cuneate), apex acuminate, surface adaxially glabrescent to puberulous with simple trichomes (sometimes only at mid vein) and lepidote with peltate trichomes, abaxially puberulous to velutinous throughout with simple trichomes, venation pinnate, secondary veins raised, tertiary veins raised, without domatia. *Inflorescence* terminal or axillary, thyrsoid, with 2–4(or 5) orders; peduncles of first order (3.2–)9–15 cm long, of second order 1.6–3.9 cm long, of third order 0.6–1.8 cm long, of fourth order 0.4–0.8 cm long, of fifth order c. 0.8 cm long, velutinous with simple and glandular capitate trichomes; bracts linear, 1–1.2 mm long, caducous; bracteoles linear, 0.8–1 mm long, caducous; pedicels 0.5–0.9 cm long. *Calyx* tubular, not costate, bilabiate (sometimes irregularly split), 1–1.6 × 0.3–0.5 cm, pubescent with simple and glandular capitate trichomes, thick, red, without glands. *Corolla* tubular, actinomorphic, not furrowed, 2.4–4 cm long, 0.4–0.6 cm wide at tube mouth, externally glabrescent to pubescent with simple and peltate trichomes, without glands, internally glabrescent with glandular capitate long stalked trichomes, villose at base with capitate glandular long-stalked trichomes, villose at lobes with simple trichomes, lobes 0.3–0.7 × 0.3–0.5 cm, red outside and white or yellow inside. *Androecium* with stamens at same height as tube mouth or slightly below; longer filaments c. 2.7 cm long, shorter filaments c. 2.5 cm long; staminode c. 0.4 mm long; anthers 3–4 mm long, connectives protruding 0.4–1 mm. *Gynoecium* with ovary cylindric, c. 2 × 0.8 mm, smooth, lepidote; style 2–2.6 cm long; stigma orbicular; nectar disk plate-shaped, c. 1 × 2–3.2 mm. *Fruit* not seen.

Phenology — Produces flowers from March to November. Fruits unknown.

Distribution and habitat — *Fridericia ornithophila* occupies lowland oriental Amazonian rainforests. A single gathering (*Teixeira & al. 803*, INPA) was collected in ecotone with Cerrado. This species is distributed in Bolivia (El Beni) and Brazil (Acre, Amapá, Maranhão, Mato Grosso, Pará and Rondônia).

Conservation status — *Fridericia ornithophila* is categorized as Least Concern (LC) based on its Extent of Occurrence (1 820 317 km^2) and Area of Occupancy (52 500 km^2).

Remarks — Among the paratypes of *Fridericia ornithophila*, Gentry (1978) listed the sterile gathering *Prance 58902* deposited in MO and NY. We found a fertile specimen of this gathering in UB that allowed us to identify it as *F. trailii* (Sprague) L. G. Lohmann. When sterile, this species is very similar to *F. ornithophila* due to the leaf size, shape and discolorous pattern. However, *F. trailii* has denser inflorescences with 4–6 branching orders without glandular capitate trichomes, the calyx rim is truncate and shortly 5-cuspidate, also lacking the glandular capitate trichomes, and the corolla is slender. On the other hand, *F. ornithophila* has a lax inflorescence with 2–4 branching orders covered with glandular capitate and simple trichomes, the calyx rim is bilabiate (sometimes irregularly split) with glandular capitate trichomes and the corolla is thick.

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References

Bachman S., Moat J., Hill A. W., de la Torre J. & Scott B. 2011: Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. – ZooKeys **150:** 117–126.

Bletter N., Janovec J., Brosi B. & Daly D. C. 2004: A digital base map for studying the neotropical flora. – Taxon **53:** 469–477.

Bureau E. 1894: *Bignoniaceae*. Symbolae ad florum Brasiliae centralis cognoscendam. – Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn. **1893:** 96–118.

Bureau E. 1908: Notice historique sur F.-M. Glaziou. – Bull. Soc. Bot. France **55:** 119–125.

Bureau E. & Schumann K. 1896[–1897]: *Bignoniaceae* II. – Pp. 1–434 in: Martius C. F. P. von (ed.), Flora brasiliensis **8(2).** – Monachii, Lipsiae: apud Frid. Fleischer in comm.

Candolle A. de 1838: Revue sommaire de la famille des Bignoniacées. – Biblioth. Universelle Genève, n.s., **17:** 117–136.

Candolle A. de 1845: *Bignoniaceae*. – Pp. 142–248 in: Candolle A. P. de (ed.), Prodromus systematis naturalis regni vegetabilis **9.** – Paris: Fortin, Masson et Sociorum.

Ellis B., Daly D. C., Hickey L. J., Johnson K. R., Mitchell J. D., Wilf P. & Wing S. L. 2009: Manual of leaf architecture. – Ithaca: Cornell University Press.

Fisher E., Theisen I. & Lohmann L. G. 2004: *Bignoniaceae*. – Pp. 9–38 in: Kadereit J. W. (ed.), The families and genera of vascular plants **VII.** – Heidelberg: Springer-Verlag.

Gomes J. C. 1951: Contribuição ao conhecimento das *Bignoniaceae* Brasileiras, IV. – Revista Brasil. Biol. **11:** 49–52.

IUCN 2019: Guidelines for using the IUCN Red List categories and criteria. Version 14 (August 2019). Prepared by the Standards and Petitions Committee of the IUCN Species Survival Commission. – Published at: http://www.iucnredlist.org/documents/RedList Guidelines.pdf [accessed 20 Apr 2020].

Kaehler M., Michelangeli F. A. & Lohmann L. G. 2019: Fine tuning the circumscription of *Fridericia* (*Bignonieae*, *Bignoniaceae*). – Taxon **68:** 751–770.

Lohmann L. G. 2006: Untangling the phylogeny of neotropical lianas (*Bignonieae*, *Bignoniaceae*). – Amer. J. Bot. **93:** 304–318.

Lohmann L. G. & Taylor C. M. 2014: A new generic classification of tribe *Bignonieae* (*Bignoniaceae*). – Ann. Missouri Bot. Gard. **99:** 348–489.

Lughadha E. N., Walker B. E., Canteiro C., Chadburn H., Davis A. P., Hargreaves S., Lucas E. J., Schuiteman A., Williams E., Bachman S. P., Baines D., Barker A., Budden A. P., Carretero J., Clarkson J. J., Roberts A. & Rivers M. C. 2018: The use and misuse of herbarium specimens in evaluating plant extinction risks. – Philos. Trans. Royal Soc. B **374:** 20170402.

Nogueira A., El Ottra J. H. L., Guimarães E., Machado S. R. & Lohmann L. G. 2013: Trichome structure and evolution in neotropical lianas. – Ann. Bot. (Oxford) **112:** 1331–1350.

Pichon M. 1945: Notes sur les Bignoniacées. – Bull. Soc. Bot. France **92:** 222–229.

QGis Development Team 2020: QGIS — Geographic information system, 3.14.1 Pi. Open source geospatial foundation project. – Published at https://qgis.org/en/site/index.html [accessed 24 Jul 2020].

Sandwith N. Y. 1968: Contributions to the flora of tropical America: LXXVI. Notes on *Bignoniaceae*: XXIX: *Arrabidaea* in Martius's 'Flora brasiliensis' and subsequently. – Kew Bull. **22:** 403–420.

Schumann K. 1894: *Bignoniaceae*. – Pp. 189–252 in: Engler A. & Prantl K. (ed.), Die natürlichen Pflanzenfamilien **IV(3b).** – Leipzig: Wilhelm Engelmann.

Thiers B. 2021+ [continuously updated]: Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. – Published at http://sweetgum.nybg.org/science/ih/ [accessed 25 Jan 2021].

Turland N. J., Wiersema J. H., Barrie F. R., Greuter W., Hawksworth D. L., Herendeen P. S., Knapp S., Kusber W.-H., Li D.-Z., Marhold K., May T. W., McNeill J., Monro A. M., Prado J., Price M. J. & Smith G. F. (ed.) 2018: International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. – Glashütten: Koeltz Botanical Books. – Regnum Veg. **159.**

Weberling F. 1981: Morphology of flowers and inflorescences. – Cambridge: Cambridge University Press.

Supplemental content online

Appendix 1. Specimens examined (see https://doi.org/10.3372/wi.51.51202).

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