

A new species of *Adenocalymma* (Bignoniaceae, Bignoniaceae) from Minas Gerais, Brazil

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Abstract. *Adenocalymma* includes approximately 76 species of lianas, shrubs and treelets, representing the largest genus from the Neotropical tribe Bignoniaceae (Bignoniaceae). As part of ongoing taxonomic studies within the “*Adenocalymma-Neojobertia*” clade, we found a new species endemic to the Brazilian Atlantic forest, ***Adenocalymma fistulosum***. The new taxon resembles *A. apetiolum*, *A. sessile*, *A. subsessilifolium*, and *A. tephrocalyx* on the sessile leaf insertion and shrubby habit, but differs by the indument type, branch and branchlet pith, prophyll shape, inflorescence trichomes, bract and bracteole shape and size, corolla shape and color, presence of cupular trichomes in the corolla, and position of the anthers and stigma. The new taxon is described and illustrated. In addition, a distribution map, notes on the geographic distribution, habitat and morphological variation are provided.

Keywords: Atlantic Forest, endangered species, taxonomy.

Adenocalymma Mart. ex Meisn. is a Neotropical genus of lianas, shrubs and treelets with approximately 76 species (Fonseca & Lohmann, in prep.). It belongs to tribe Bignoniaceae, the most speciose tribe of the Bignoniaceae. The genus is centered in Amazonia and the Atlantic Forest, with most species being found at low to mid-elevations (up to 2000 m). The remaining species occur in the South American dry diagonal, wet and dry forests of Central America, Colombia, Ecuador and the Guiana Shield (Lohmann & Taylor, 2014).

The current circumscription of *Adenocalymma* (Lohmann & Taylor, 2014) is based on a molecular phylogeny of the whole tribe Bignoniaceae inferred using DNA sequences from the plastidial gene *ndhF* and the nuclear intron *pepC* (Lohmann, 2006). Under the new circumscription, *Memora* is synonymized under *Adenocalymma*, which is broadly circumscribed and characterized by cupular glandular trichomes on the prophylls of the axillary buds, floral bracts, bracteoles, calyces, and fruits, all of which are morphological synapomorphies of the genus (Lohmann, 2006, Lohmann & Taylor, 2014). More recently, a phylogeny of the “*Adenocalymma-Neojobertia*” clade was inferred based on a combination of nearly-complete plastome sequences and the nuclear *pepC*, and

sampling 90% of all known species in the genus (Fonseca & Lohmann, 2018). This phylogenetic framework provided additional support for the broader circumscription of *Adenocalymma* adopted by Lohmann & Taylor (2014), and further indicated that *Neojobertia* Baill. and *Pleonotoma albiflora* (Salzm. ex DC.) A.H. Gentry are nested within the genus and best treated as part of *Adenocalymma*. The new findings are leading to an updated classification for the whole clade that recognizes a broad *Adenocalymma* (Fonseca & Lohmann, in prep.).

During morphological studies of the “*Adenocalymma-Neojobertia*” clade (Fonseca & Lohmann, in prep.), a new species from the Atlantic Forest was discovered. This is still a poorly known group, with nine new species being described for this clade only in the last decade (Udulutsch et al., 2009; Udulutsch et al., 2013; Fonseca et al., 2016; Faria et al., 2016; Fonseca & Lohmann, 2017). Two of the newly described species are endemic to the Rio Doce State Park and surroundings (Udulutsch et al., 2013), where the species described here is also found. The new taxon was sampled in the molecular phylogeny of the “*Adenocalymma-Neojobertia*” clade (Fonseca & Lohmann, 2018; Fig. 1), confirming its placement within the genus. The newly described

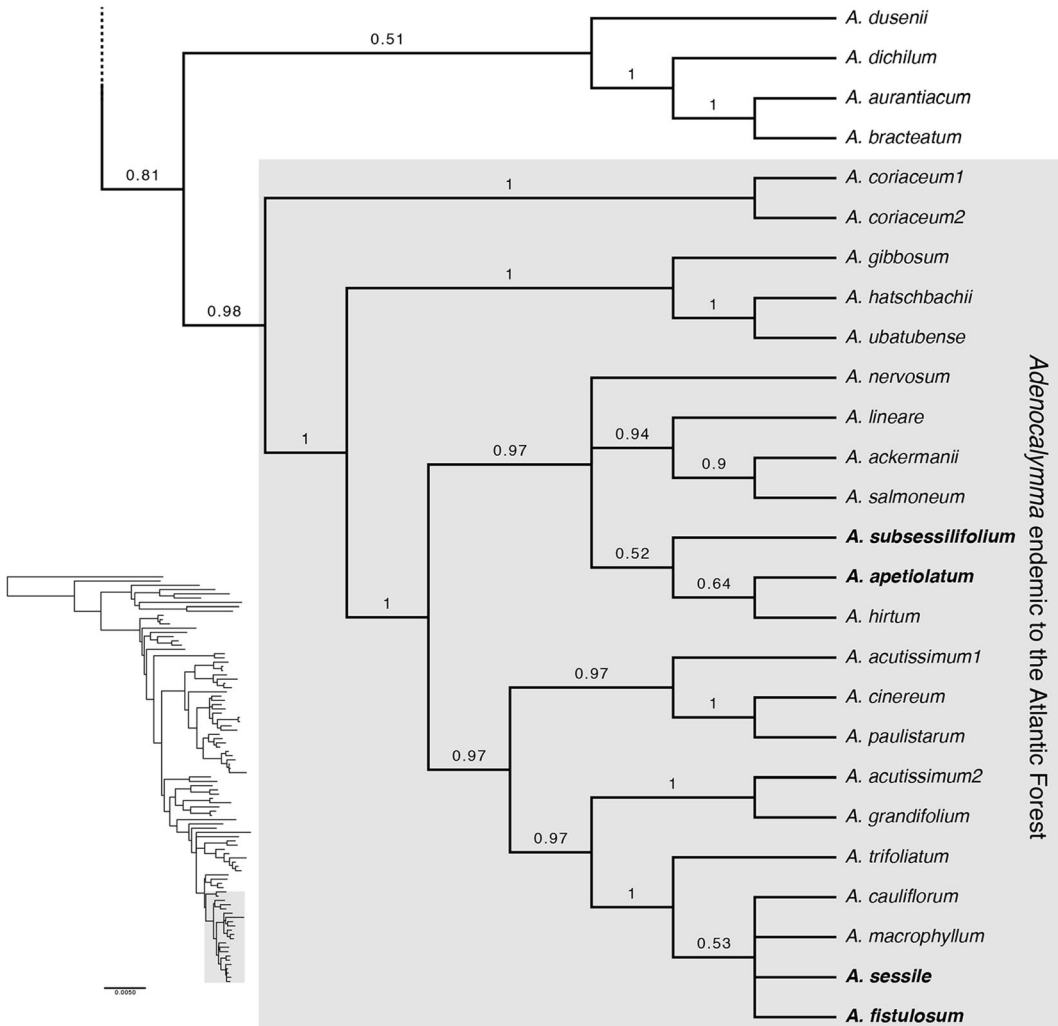


FIG. 1. Bayesian majority rule consensus tree derived of the analysis of the combined plastome and nuclear (*pepC*) datasets. Bayesian posterior probabilities are shown above branches. In bold are the new species, *Adenocalymma fistulosum*, and morphologically similar species (adapted from Fonseca & Lohmann, 2018).

species, *Adenocalymma fistulosum* L.H. Fonseca & L.G. Lohmann, is morphologically similar to *A. apetiolum* L.H. Fonseca & L.G. Lohmann, *A. sessile* Udulutsch & Assis, *A. subsessilifolium* DC., and *A. tephriocalyx* Bureau ex K. Schum., but differs in a suite of morphological characters.

Material and methods

For this study, we examined the botanical collections deposited at the BHCN, MBML, SPF and VIC Herbaria (acronyms follow Index Herbariorum). The botanical terminology

adopted here follows Hickey (1973) for leaf characters, and Weberling (1989) for inflorescence terminology. Other morphological structures follow Harris and Harris (2001) and Lohmann and Taylor (2014). Species delimitation is based on the concept proposed by Queiroz (2007), which recognizes species as independent evolutionary lineages. We are here recognizing species as independent evolutionary units that share a unique combination of features. Maps were prepared using the packages *maptools* (Bivand et al., unpubl.; available from <http://cran.r-project.org/web/packages/maptools/index.html>) and *Raster* (Hijmans et al., unpubl.;

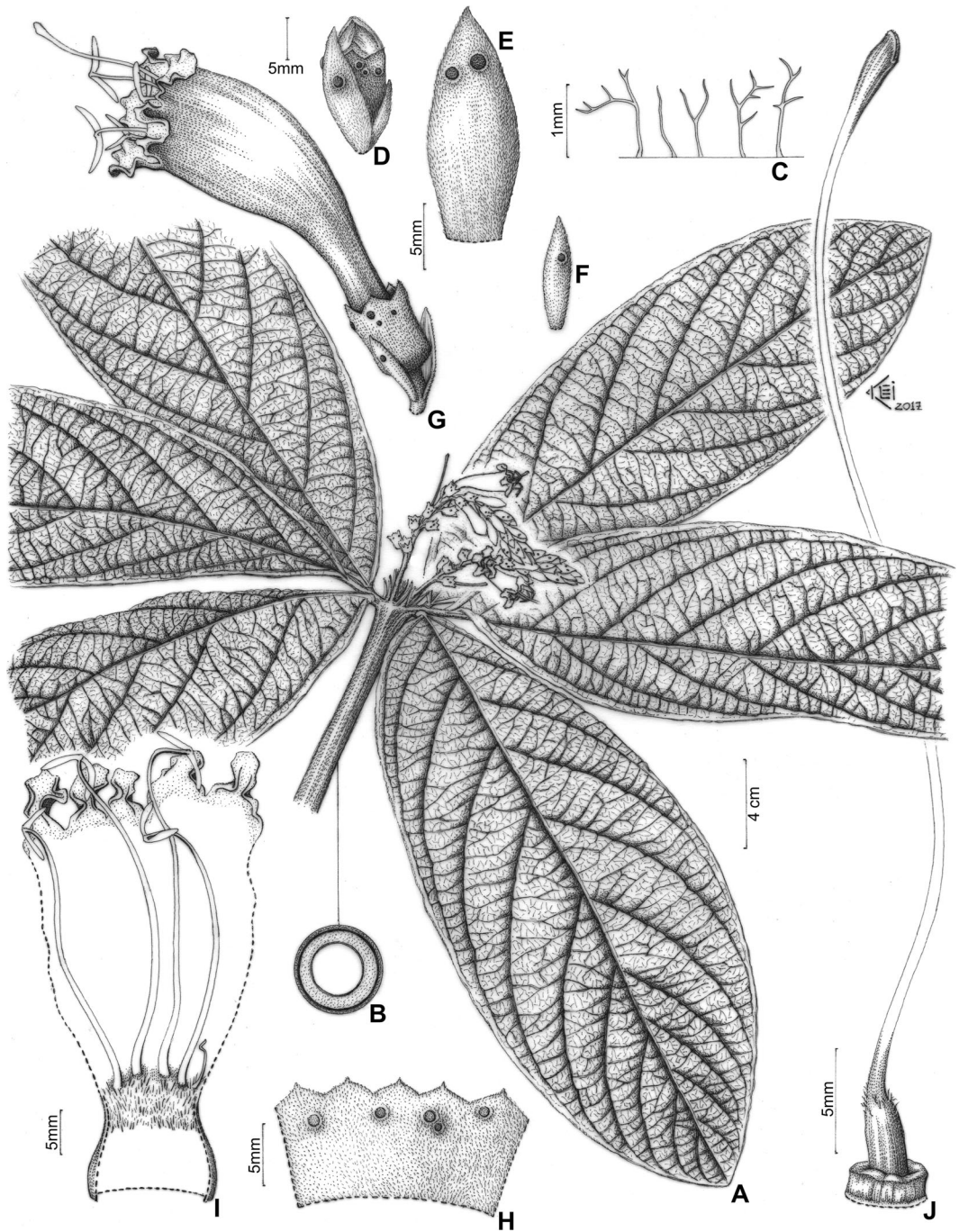


FIG. 2. *Adenocalymma fistulosum*. **A.** Flowering branch. **B.** Detail of the hollow pith. **C.** Detail of inflorescence trichomes. **D.** Detail of young bud. **E.** Bract. **F.** Bracteole. **G.** Open flower. **H.** Detail of calyx. **I.** Detail of corolla showing stamen insertion. **J.** Nectar disk, ovary, style, and stigma. (Illustrated from the holotype).

available from <http://cran.r-project.org/web/packages/raster/index.html>), both implemented in R environment (R Development core team, 2018).

Adenocalymma fistulosum L.H. Fonseca & L.G. Lohmann, *sp. nov.* Type: Brazil. Minas Gerais: Córrego Novo, Lagoa das Piabas, 19°51'26"S, 42°30'29"W, 260 m, 9 May 2003 [fl, fr], *G.S. França 341* (holotype: SPF; isotypes: BHCB [BHCB030312], BHCB [BHCB021971]). (Fig. 2).

Diagnosis: *Adenocalymma fistulosum* resembles *A. apetiolum*, *A. sessile*, *A. subsessilifolium* and *A. tephriocalyx*, with which it shares shrubby habit, sessile leaves, and large leaflets. *Adenocalymma fistulosum* can be differentiated by the hollow branch and branchlet pith, narrow-elliptic prophylls of the axillary buds, villous indumenta throughout, bullate leaflet lamina, branched

trichomes on the inflorescence that become olive-green when dried, small and elliptic bracts (16.4 × 6.5–8.9 mm), small and elliptic bracteoles (7.5–9 × 1.6–1.9 mm), infundibuliform yellow corolla with fields of cupular trichomes, and exerted anthers and stigmas.

Shrub, 3 m tall. Stems terete, brown, with striated bark, with lenticels elliptic; branchlets terete, villous, with eglandular trichomes simple or branched, interpetiolar region without glandular fields; prophylls of the axillary buds narrow-elliptic, 16.1 × 4.3 mm, villous and lepidote, with eglandular trichomes simple or branched, with cupular glandular trichomes ca. 1.2 mm diam. Leaves 3-foliolate, with the terminal leaflet not-modified into a tendril; petioles lacking; petioles terete, with variable lengths, central petioles ca. 16 mm long, lateral petioles ca. 9 mm long, villous; leaflets elliptic or slightly obovate,

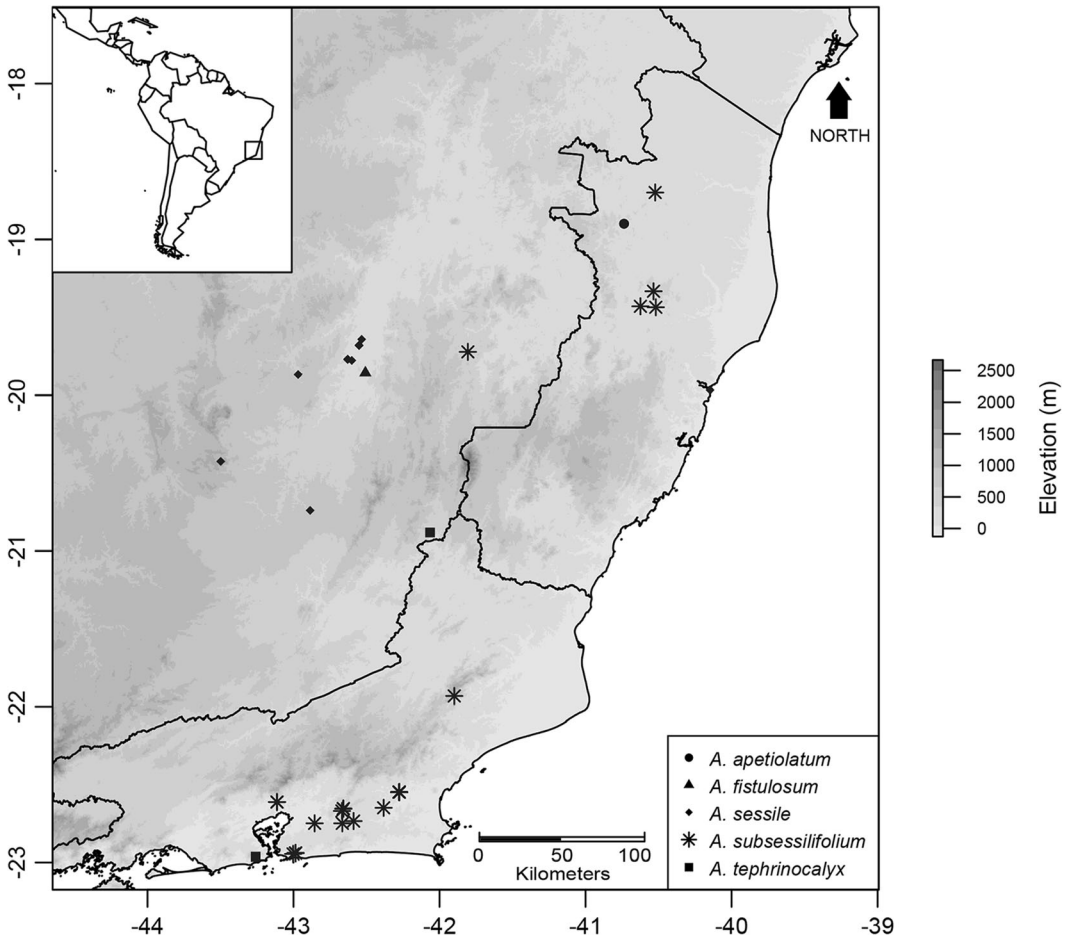


FIG. 3. Distribution of *Adenocalymma fistulosum* and the morphologically similar *A. apetiolum*, *A. sessile*, *A. subsessilifolium*, and *A. tephriocalyx* in the Brazilian Atlantic Forest.

TABLE 1. Morphological comparison between *adenocalymma fistulosum*, *a. apetitatum*, *a. sessile*, *a. subsessilifolium*, and *a. tephriacalyx*

Characters	<i>A. fistulosum</i>	<i>A. apetitatum</i>	<i>A. sessile</i>	<i>A. subsessilifolium</i>	<i>A. tephriacalyx</i>
Indument	Villose	Villose	Pubescent to glabrescent	Pubescent to glabrous	Pubescent to glabrous
Branch and branchlet pith	Hollow	Not-hollow	Hollow	Not-hollow	Filled
Prophyll shape	Narrow-elliptic	Narrow-elliptic	Falcate	Elliptic	Ovate
Leaflet lamina	Bullate	Smooth	Smooth	Smooth	Smooth
Inflorescence indument color	Olive green	Yellowish	Cinereous	Ferruginous	Cinereous
Inflorescence trichomes	Branched	Branched	Simple	Simple	Simple or branched
Bract dimensions	16.4 × 6.5–8.9 mm	8–13.7 × 3.8–5.6 mm	2.6–4 × 1.8–2.5 mm	10.8–12.5 × 4.9–7 mm	6.3 × 3.1 mm
Bract shape	Elliptic	Elliptic	Ovate to obovate	Elliptic	Ovate
Bracteole dimensions	7.5–9 × 1.6–1.9 mm	4.3–9.2 × 2.1–3.1 mm	2–2.6 × 1.1–1.8 mm	9.1–11.1 × 1.5–2.8 mm	4.8–5.2 × 1.2–1.5 mm
Bracteole shape	Elliptic	Elliptic or slight falcate	Ovate to obovate	Elliptic to ovate	Elliptic to ovate
Corolla shape	Infundibuliform	Gibbous	Gibbous	Infundibuliform	Infundibuliform
Corolla color	Yellow	Orange	Yellow	Yellow	Yellow
Corolla cupular trichomes	Absent	Present	Present	Present	Absent
Anther and stigma position	Exserted	At fauceSub-exserted	At fauceSub-exserted	Included	Exserted

Non-overlapping characters between *A. fistulosum* and other species are shown in bold

apex short acuminate to acute, base cuneate, symmetric, membranous, adaxial surface pubescent, with eglandular trichomes simple or branched, abaxial surface pubescent and lepidote, with eglandular trichomes simple or branched, with glandular trichomes cupular sparsely distributed, bullate, first venation order pinnate, second venation order brochidodromous, third venation order reticulate, margins entire, straight, leaflets 0.3–38.5 × 14–16.3 cm. Inflorescence a branched lateral raceme, congested, with eglandular trichomes branched; pedicels 4.8 mm long; floral bracts persistent, covering young buds, elliptic, chartaceous, 16.4 × 6.5–8.9 mm, villous, with glandular trichomes cupular, ca. 0.8 mm diam.; bracteoles persistent, elliptic, membranous, 7.5–9 × 1.6–1.9 mm, with glandular trichomes cupular, ca. 0.3 mm diam. Calyx green, campanulate, 5-lobed, coriaceous, 6.8–8 × 6.6–8.6 mm, villous, with eglandular trichomes simple or branched, with glandular trichomes cupular, 0.6–0.8 mm diam. Corolla yellow, infundibuliform, membranous, with nectar guides, 38–40.8 mm long, tube 32.3–35.7 mm long, 10.6–14.3 mm at the portion with maximum width, 3.5–4.7 mm width at the base, pubescent, with eglandular trichomes simple or branched, without cupular trichomes, lobes orbicular, central inferior 9.6 × 10.7 mm, lateral inferior 9.8 × 8.7 mm. Androecium attached at 12.8 mm long, shorter filaments 35.2 mm long, longer filaments 41 mm long, staminode ca. 4.2 mm long, glabrous, hirsute at insertion, with glandular trichomes stipitate, anthers slightly curved backward, 5 × 0.7 mm, exerted. Gynoecium ca. 46.8 mm long, ovary cylindrical, 2.8 × 1.3 mm, glabrous, style ca. 41.7 mm long, glabrous, stigma lanceolate, 2.3 × 1.5 mm, exerted. Fruit mature, oblong, inflated, rugose, puberulent and lepidote, with eglandular trichomes simple or branched, with glandular trichomes cupular. Seeds not winged, 28–30 × 29–31 × 15–19 mm.

Distribution and ecology.—*Adenocalymma fistulosum* is only known from the type locality in Minas Gerais State, Brazil (Fig. 3). This species is found at 260 m elevation in seasonally semi-deciduous Atlantic forest remnants.

Conservation status.—*Adenocalymma fistulosum* is only known from the type locality. Tentatively, its conservation status is Data Deficient [DD] according to IUCN criteria (IUCN, 2012; IUCN Standards and Petitions Subcommittee, 2017) until more information about this new species is gathered during field

studies. Meanwhile, reduced population size and anthropogenic pressure on the only known locality would very likely push this species towards extinction if conservation measures are not taken seriously. Although it occurs in the surroundings of Rio Doce State Park, no populations within the Park were discovered.

Flowering and fruiting.—*Adenocalymma fistulosum* was collected with flower and fruit in May.

Etymology.—The specific epithet ‘fistulosum’ refers to the hollow pith of the branches and branchlets, an unusual feature within the genus.

Morphological and geographical notes.—*Adenocalymma fistulosum*, *A. apetiolum*, *A. sessile*, *A. subsessilifolium* and *A. tephriacalyx* are understory shrubs from semi-deciduous Atlantic Forest. These five *Adenocalymma* species are the only ones in the genus to bear sessile leaves. Although these species are superficially similar vegetatively, they differ in the type of indument, branch and branchlet pith, prophyll shape, inflorescence indument, bract and bracteole shape and size, corolla shape and color, the presence of cupular trichomes in the corolla, and anther and stigma position (Table 1).

In addition, *A. fistulosum* is also recognized by the bullate leaflets and olive green inflorescence indument when dried (Table 1). The bullate leaflets are shared with *A. bullatum* Bureau ex. K. Schum. and the olive green inflorescence indument when dried is shared, among others, with *A. trifoliatum* (Vell.) R.C. Laroche. As such, the new taxon is here recognized based on a unique combination of features, not found in any other species of the “*Adenocalymma-Neojobertia*” clade. Despite the morphological similarities among these taxa, species with sessile leaves do not form a clade (Fig. 1), indicating that the sessile condition evolved more than once within this lineage. Sessile leaves are not a very common condition within the tribe Bignoniaceae, being only found in a few species of *Amphilophium* and *Anemopaegma*. This condition is common among members of *Crescentieae* (Gentry, 1980).

The geographic distribution of the new taxon coincides with the distribution of two newly described *Adenocalymma* species, all of which occur in the vicinity or within the Rio Doce State Park (Udulutsch et al., 2013). All three species (*A. cinereum* Udulutsch & Assis, *A. sessile*, and *A. fistulosum*) are

understory shrubs that are only known from a few collections around the type locality (Udulutsch et al., 2013). *Adenocalymma fistulosum* and *A. sessile* also share sessile leaves.

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