



Universidade Federal de Minas Gerais  
Instituto de Ciências Biológicas  
Departamento de Botânica  
Programa de Pós-Graduação em Biologia Vegetal



**YURI FERNANDES GOUVÊA**

**PLASTOME PHYLOGENOMICS AND TAXONOMY OF THE  
PRICKLY CLIMBING, HAIRY- AND LARGE-FRUITED  
SPECIES OF *SOLANUM* L.**

Tese apresentada ao Programa de Pós-Graduação em Biologia Vegetal do Departamento de Botânica do Instituto de Ciências Biológicas da Universidade Federal de Minas Gerais, como requisito parcial à obtenção do título de Doutor em Biologia Vegetal.

Área de Concentração: Morfologia,  
Sistemática e Diversidade Vegetal.

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Orientador: Prof. Dr. João Renato Stehmann

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Giacomin

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## **PLASTOME PHYLOGENOMICS AND TAXONOMY OF THE PRICKLY CLIMBING, HAIRY- AND LARGE-FRUITED SPECIES OF *SOLANUM* L.**

Yuri Fernandes Gouvêa

### **Abstract**

*Solanum* L. is a hyperdiverse (ca. 1400 spp.) and almost ubiquitous worldwide genus of the flowering plants belonging to the family Solanaceae Juss., which comprises important crop species. The Leptostemonum clade or the ‘prickly solanums’ is the most species-rich ( $\geq 550$  spp.) amongst the major lineages of the genus, with primary diversity centers in the Andes and Brazilian Atlantic Forest. Brazilian endemic taxa, however, have been poorly represented in previous phylogenetic analyses, like the Thomasiifolium clade. On the opposite way, recent revisionary work, examination of herbaria collections and extensive field work efforts focused on these Brazilian endemic taxa have unveiled a hitherto overlooked diversity. We used full chloroplast genomes to infer phylogenetic relationships among the Brazilian endemic taxa, emphasis on the poorly known morphological group of climbing species with hairy and large fruits. Our results revealed five sectional-level clades, here informally named; Jussiaei, Oocarpum and Schizandrum clades comprised exclusively of hairy- and large-fruited climbing species; the clades Cordifolium and Hexandrum comprise only shrubs; and *S. robustum* remains unassigned to a clade. Additionally, we provide a taxonomic treatment for the clades grouping climbing species including 15 species, eight of which are new and presented here.

**Keywords:** climbing plants, full chloroplast genomes, large fruits, Neotropics, phylogenomics, Solanaceae, ‘spiny’ solanums, systematics.

## Resumo

*Solanum* L. é um gênero hiperdiverso (ca. 1400 spp.) presente em quase todo o mundo que pertence à família Solanaceae Juss., e que compreende espécies com grande importância econômica. O clado Leptostemonum agrupa espécies aculeadas e é o mais diversificado ( $\geq 550$  spp.) dentre as principais linhagens do gênero, com centros primários de diversidade nos Andes e na Mata Atlântica brasileira. Seus táxons endêmicos do Brasil, entretanto, ainda são mal representados em análises filogenéticas, como é o caso do clado *Thomasiifolium*. Por outro lado, trabalhos de revisão recentes, bem como a análise de coleções de herbário e coletas *in situ* focados nesses táxons endêmicos brasileiros revelaram uma diversidade compreendida por estes grupos até então negligenciada. Nós usamos sequências de genomas plastidiais completos para inferir relações filogenéticas entre os taxa endêmicos brasileiros, com ênfase no grupo morfológico pouco conhecido formado espécies trepadeiras com frutos peludos e grandes. Nossos resultados revelam cinco clados a nível de seção, os quais são denominados informalmente no presente trabalho: os clados *Jussiaei*, *Oocarpum* e *Schizandrum* clades, compostos exclusivamente por espécies de trepadeiras com frutos densamente pubescentes e grandes; os clados *Cordifolium* e *Hexandrum* compreendendo apenas arbustos; e *S. robustum*, que permanece sem ser atribuído a um clado. Além disso, apresentamos um tratamento taxonômico para os clados que agrupam espécies trepadeiras, incluindo 15 espécies, oito das quais são novas para a ciência.

**Palavras-chave:** plantas escandentes, genomas plastidiais completos, frutos grandes, Neotrópico, filogenômica, Solanaceae, solanums espinhosos, sistemática.

## Introduction

*Solanum* L. is a hyperdiverse (ca. 1400 spp.; Frodin 2004) and almost ubiquitous worldwide genus of flowering plants belonging family Solanaceae Juss. (D'Arcy 1991; Bohs 2005; Särkinen et al. 2013), which includes important crop species (e.g. potato, tomato and berinjal eggplant). Pentamerous, often star-shaped flowers bearing yellow, connivent, poricidal anthers at its center, in general terms (see D'Arcy 1986 and Olmstead et al. 1999), morphologically characterize *Solanum* and compose its 'common-sense image' (i.e. the '*Solanum*-type' or 'solanoid' flower, see Voguel 1978; Faegri 1986; Mast et al 2004; Barrett 2010). Its conservative overall flower morphology, which can be also observed in unrelated plant groups (e.g. the genus *Ramonda* Rich., Gesneriaceae; *Dodecatheon*, Primulaceae; and *Ouratea* Aubl., Ochnaceae), is attributed to a successful interaction and coevolution with buzzing bees (i.e. buzz-pollination, Buchmann 1983; De Luca and Villejo-Marín 2013; Mesquita-Neto et al. 2018). Conversely, the extreme morphological polymorphism found in vegetive parts of *Solanum* species seems to be a result of their great and relatively recent diversification (Särkinen et al. 2013), and colonization of highly heterogeneous environments. Like, for example, the Andes range and Brazilian Atlantic Forest, the major diversity centers of *Solanum* (D'Arcy 1991; Knapp 2002; Carnaval et al. 2014).

This morphological, or "taxonomic paradox", as it was considered by Roe (1972), has challenged generations of taxonomists and lead to the proposition of various different classification schemes (Linnaeus 1753; Dunal 1813, 1852; Bitter 1919; Seithe 1962; Danert 1970; D'Arcy 1972; Nee 1999; Child and Lester 2001; Hunziker 2001; for more details see Weese and Bohs 2007). Bohs (2005), based

on molecular phylogenetic analysis based on chloroplast *ndhF* marker, identified and informally named 12 subgenus-level clades within *Solanum*. However, compared to the latest widely accepted morphology-based schemes (D'Arcy 1972; Nee 1999), only *Solanum* subgenus *Leptostemonum* (Dunal) Bitter, group composed of prickly species with stellate trichomes, remained largely cohesive. It was thus named Leptostemonum clade (popularly called 'spiny solanums'; Whalen 1984; Bohs 2005). The Leptostemonum clade is the most species-rich amongst the major lineages of the genus, also being pointed as the most complex one (Bohs 2005). Its greatest species richness is found in the Neotropics (ca. 450 spp.; Bohs 2005), particularly in the regions of the Andes and Brazilian Atlantic Forest (Whalen 1984), although a considerable richness is also found in the Old World (ca. 240 native species; see Aubriot et al. 2016).

Aiming to test the monophyly of the subgenus *Leptostemonum* and examine relationships within it, Levin et al. (2006) sampled 112 taxa in their phylogenetic analysis based on chloroplast (i.e. *trnS-G*), nuclear (*waxy* or *GBSSI*) and ribosomal (ITS) markers. As result, the subgenus *Leptostemonum* emerged as monophyletic, considering the exclusion of two clades composed by prickly species lacking stellate trichomes (i.e. *Nemorensis* and *Wendlandii* clades), and 10 higher-level clades were recovered. Stern et al. (2011), aiming to increase representativeness of neotropical prickly *Solanum* groups underrepresented or not included in Levin et al. (2006), focused sampling on *Torva* and *Micracantha* clades, and on sects. *Erythrotrichum* (Whalen) Child and *Polytrichum* (Whalen) Child. To increase the dataset informativeness, the relatively more polymorphic chloroplast marker *trnT-F*, in place of *trnS-G*, was also used. A particularly interesting result from their analyses is the division of the *Robustum* clade (Levin et al. 2006), which was

mostly composed by Brazilian endemic species, into *Erythrotrichum*, *Thomasiifolium* and *Gardneri* clades. Amongst these three clades, the exclusively Brazilian *Thomasiifolium* clade presented the most intriguing species composition. It was recovered as sister of the *Erythrotrichum* clade, and comprised two morpho- and ecologically contrasting subclades. One subclade grouping the medium-heighted, self-sustaining small-fruited shrubs *S. buddleiifolium* Sendtn. and *S. thomasiifolium* Sendtn., which grows in high-elevated, seasonally dry and extreme environments related to the campo rupestre vegetation (Giulietti et al. 1997; Rapini et al. 2008; Stern et al. 2011; Gouvêa and Stehmann 2019). With the other subclade grouping the high-climbing large-fruited lianas *S. rupicola* Sendtn. and *S. paraibanum* Agra, which inhabit low Brazilian Atlantic rainforests. Moreover, the inclusion of *S. hexandrum* Vell. and the close well-supported relationship recovered between it and *S. stagnale* Moric., both previously assigned to the section *Polytrichum* (Whalen) Child, suggested the existence of an also Brazilian Atlantic Forest endemic lineage comprising these two species (Whalen 1984; Child 1998; Nee 1999; Stern et al. 2011). However, although *S. hexandrum* and *S. stagnale*, along with other Brazilian species, also form an morpho-, geographic- and ecologically coherent group, they were not recognized as a separate clade (Gouvêa et al. 2018, 2020). Recent revisionary work, examination of herbaria collections and extensive field work efforts focused in Brazilian endemic taxa have unveiled a hitherto overlooked diversity (Agra and Stehmann 2016; Gouvêa and Stehmann 2016; Gouvêa et al. 2018, Gouvêa and Stehmann 2019; Gouvêa et al. 2019; Sampaio et al. 2019; Gouvêa et al. 2020). What made even more evident the imperative need to increase sampling of these groups in molecular phylogenetic studies, and to taxonomically treat them, since both

actions are fundamental for conservational, economical and general scientific purposes.

Therefore, in order to address this situation, we infer phylogenetic relationships among the neotropical prickly *Solanum* species, with focus in the Brazilian endemic taxa, using full chloroplast genomes. Our sampling was especially planned to assess relationships among the largely unknown prickly climbing hairy- and large-fruited species, and provide insights on: (1) the number of sectional-level clades within the *Leptostemonum* clade; (2) the composition of the *Erythrotrichum* clade s.s.; (3) the number of Brazilian endemic sectional-level clades; and the (4) phylogenetic relationships among climbing species with hairy and large fruits. We also provide a taxonomic treatment including all clades comprised of climbing species recognized here.

## **Material and Methods**

### **Taxon sampling for phylogenetic analysis**

We generated full plastome sequences for 74 taxa from 10 of the 14 major clades in the *Leptostemonum* clade (i.e. except the Bahamense, Carolinense and *Elaeagnifolium* clades; clades sensu Stern et al. 2011). Sampling was focused on the *Thomasiifolium* clade and its sister group, the *Erythrotrichum* clade, and includes 47 taxa morpho- and ecologically related to the species recovered as part of these clades in Stern et al. 2011 (Gouvêa et al. 2018, 2019; Sampaio et al. 2019; Gouvêa et al. 2020). Especially to the prickly climbing, large- and hairy-fruited species, of which we failed to obtain DNA samples of the *S. nuricum* M. Nee, *S. orientale* Benítez and *S. schuechii* Sendtn., as well as of part of the new species

described here. We also failed to include specimens of *S. nuricum*, *S. orientale* and *S. schuechii* in our sampling for morphological studies. Twelve recently described (Sampaio et al. 2016; Gouvêa and Stehmann 2016; Agra and Stehmann 2016; Gouvêa et al. 2019) or poorly-known species representing the Crinitum (Stern et al. 2010), Asterophorum (Stern et al. 2011), Gardneri and Torva clades (Stern et al. 2011) that have not previously been included in a phylogenetic study were also sampled. In addition, we included 14 species previously assigned to nine different clades: the Lasiocarpa clade (Bohs 2004), the Acantophora clade (Levin et al. 2005), the Crinitum clade (Stern et al. 2010), the Asterophorum clade, the Gardneri clade, the Micracantha clade, the Sisymbriifolium clade, the Torva clade, and the Wendlandii clade as outgroup (Stern et al. 2011). These were included aiming to increase the comparability of our results with previous phylogenies based on plastid and nuclear markers and to provide a plastome-based phylogenetic backbone for the New World spiny *Solanum* groups. Old-World solanums are represented in our analysis by a full-plastome sequence of *S. melongena* L. (eggplant clade) downloaded from GenBank (<https://www.ncbi.nlm.nih.gov/>; KU682719). Likewise, sequences of the spiny species *S. pachyandrum* Bitter (Wendlandii clade; Stern et al. 2011) and the non-spiny *S. clivorum* S.Knapp (Geminata clade), *S. anomalostemon* S.Knapp & M.Nee (Maripiense clade relative; Särkinen et al. 2015), *S. dulcamara* L. (Dulcamaroid clade; Bohs 2005), *S. nigrum* L. (Morelloid clade; Särkinen et al. 2015), and species in the Potato clade (Bohs 2005; Tepe et al. 2016; Spooner et al. 2019) were obtained and included as outgroups. The tree was rooted using *S. laciniatum* Aiton (Archaeosolanum clade; Poczai et al. 2011).

## **DNA extraction and sequencing**



DNA extractions and electrophoresis were carried out at the Biosistemática Vegetal laboratory of the Universidade Federal de Minas Gerais (UFMG); Libraries assembly were performed at the Ecologia Molecular e Genômica Evolutiva de Plantas laboratory of the Universidade de Campinas (UNICAMP).

Total genomic DNA was extracted from 20–40 mg of silica gel-dried or herborized leaf fragments using the DNeasy Plant Mini Kit (Qiagen, Valencia, CA, USA), following its standard protocol. Starting DNA concentration of each sample was quantified using microspectrophotometer (Nanodrop 200c, Thermo Scientific Inc.) and adjusted to 30–38 ng/ul in a total volume of 26 ul. Then, the samples were subjected to mechanical shearing using the Bioruptor ultrasonicator (Diagenode Inc.), aiming to obtain DNA fragments from 200 to 500 bp on average. Sheared samples were assessed by electrophoresis in agarose gel 0.8%. Libraries were prepared following Meyer and Kircher (2010) and double indexed as suggested in Kircher et al. 2012. Sequencing service was performed by Novogene Co. (Sacramento, CA, USA) using two lanes of Illumina HiSeq 4000 platform (2 x 150 paired-end reads), and included prior mass quantification (Qubit 2.0 Fluorometer, Invitrogen Inc.), quality control (BioAnalyzer, Agilent Technologies Inc. and qPCR) and pooling. Generated sequences will be deposited in GenBank during the publishing process of the present study.

### **Plastome assembly and annotation**

Raw data were imported into Geneious R9 (Biomatters Ltd, Auckland, New Zealand) and the adapter, contaminant and low-quality sequences were removed using the BBDuk plugin (part of BBMap package;

<https://sourceforge.net/projects/bbmap/>) with the following parameters: `mink = 30`, `minlength = 150`, `ftm`, `ktrim`, `k`, `hdist`, `tbo` and `tpe = standard value`. Resulting higher-quality reads, including both inverted repeats, were mapped to the *Solanum melongena* plastid reference sequence downloaded from GenBank (ref. KU682719). Regions with error probability higher than 5% were removed prior to assembly. Consensus sequences of aligned reads were matched to a minimum coincidence of 50% with the aligned reads. Regions with coverage lower than 3x were trimmed. The plastid genome was integrally assembled, since no consensus sequence had ambiguous regions of more than 500 bp. Maximum and minimum coverage of each sample, as well as the number of ambiguous base pairs for each assembly are provided in (Appendix 1). Assembled plastomes were annotated using the Geneious “transfer annotations” tool by aligning to the previously annotated and published of *S. melongena* available on GenBank (ref. KU682719), with a similarity threshold of 70%.

### **Alignment and phylogenetic analyses**

All consensus sequences were aligned through Fast Fourier Transformation in MAFFT 7.402 (Kato and Sandley 2013), with a partition size of 1000 and three interactive refinements, ran on CIPRES Science Gateway ([www.phylo.org](http://www.phylo.org); Miller et al., 2010) as well as the succeeding analyses described below. Coding regions were identified from the *S. melongena* annotation. The best partition scheme was determined with the GTRGAMMA model in Partitionfinder2 (Lanfear et al. 2012) using the heuristic search algorithm ‘rcluster’ for both Maximum Likelihood (ML) and Bayesian inference (BI) analyses of the 120 taxa. The ML was conducted in RAxML version 8.2.4 (Stamatakis 2014) by using an exhaustive search (-f a), and then the rapid bootstrap algorithm with 1000 pseudoreplications. The BA was

implemented in PhyloBayes MPI 1.7 (Lartillot et al. 2013) using the best nucleotide substitution model selected separately for each partition through jModelTest (Darriba et al. 2012). We also performed a search using the CAT-GTR model (see Lartillot and Philippe 2004). Each concatenated nucleotide matrix was subjected to two independent Markov chain Monte Carlo (MCMC) analyses, with the stationarity from both MCMC analyses determined in Tracer 1.7 (Rambaut et al. 2018). The MCMC analyses were ran until the *effective sampling size* reach 200 for all parameters in each chain. Chains convergence was examined when discrepancies between bipartitions had values lower than 0.1. Majority consensus trees and parameter estimates were summarized using a burn-in of 25%.

## **Taxonomy**

Morphological descriptions, and thus all taxonomic decisions and notes, were based on specimen collections and observations made during extensive field work and on physical or virtual (online databases) examination of specimens housed in the following herbaria (acronyms follow Index Herbariorum; <http://sweetgum.nybg.org/science/ih/>): ALCB, ASE, BHCB, BM, BR, CEPEC, CESJ, CVRD, ESA, G, HUEFS, IPA, JPB, K, M, MO, MAC, MBM, MBML, P, R, RFFP, RB, UEC, and UFP. Type specimens with sheet numbers are cited with the herbarium acronym, a dash and the sheet number respectively (i.e. BHCB-195566); barcodes are written between brackets, as a continuous string (i.e. [W0022647]).

For species delimitation we have essentially followed the “morphological cluster” concept (Mallet 1995), or simply morphological species concept: i.e., “assemblages of individuals with morphological features in common and separate from other

such assemblages by correlated morphological discontinuities in a number of features” (Davis and Heywood 1963).

Descriptions were based on dried herbarium material supplemented by measurements from living and rehydrated material. Colors of flowers, fruits and other structures were described from living material and from herbarium label data. Measurements of reproductive characters comprise the dimensions of both fresh or rehydrated and dried materials. Terms used to describe the overall morphology and indumentum are mostly based on Radford et al. (1974), and terminology used to describe trichome types follows Roe (1971), Mentz et al. (2000) and the current literature about *Solanum*. Specimens records used in georeferencing were downloaded from disponible online sources (e.g. speciesLink and Reflora platforms; <http://www.splink.org.br/>; <http://floradobrasil.jbrj.gov.br/>) and checked one-by-one; specimens lacking geographic coordinates were estimated using Google earth and label data.

Species conservation status was assessed using IUCN Red List Categories and Criteria (IUCN 2019) with extent of occurrence (EOO) and area of occupancy (AOO) measured using GeoCat (Bachman et al. 2011; <http://geocat.kew.org/>). Cell size of 2 km<sup>2</sup> was used for the AOO estimation.

## RESULTS

**Plastome phylogenomic analyses.**—We generated full plastome sequences for 73 taxa within the *Leptostemonum* clade, including 40 taxa that have not been included in molecular phylogenetic studies (see Fig. 1), and *S. alternatopinnatum* Steud. (*Wendlandii* clade; Stern. et al 2011). Plastome lengths ranged from

154464 to 155080 bp, with an average read coverage depth of 34 to 867 and an average GC content of 37.6% to 38% (see Appendix 1 for details on plastomes).

There were no supported topological conflicts between the phylogenetic trees obtained from BI and ML analyses, although the former has a greater number of strongly supported nodes. Thus, the results of both analyses are presented in a single tree (Fig. 1). The BI tree is fully resolved with maximum support (PP = 1.0) on all nodes, with the exception of a polytomy involving *S. valdiviense* Dunal and *S. laciniatum* at the base of the tree. Similarly, the ML tree is fully resolved with most

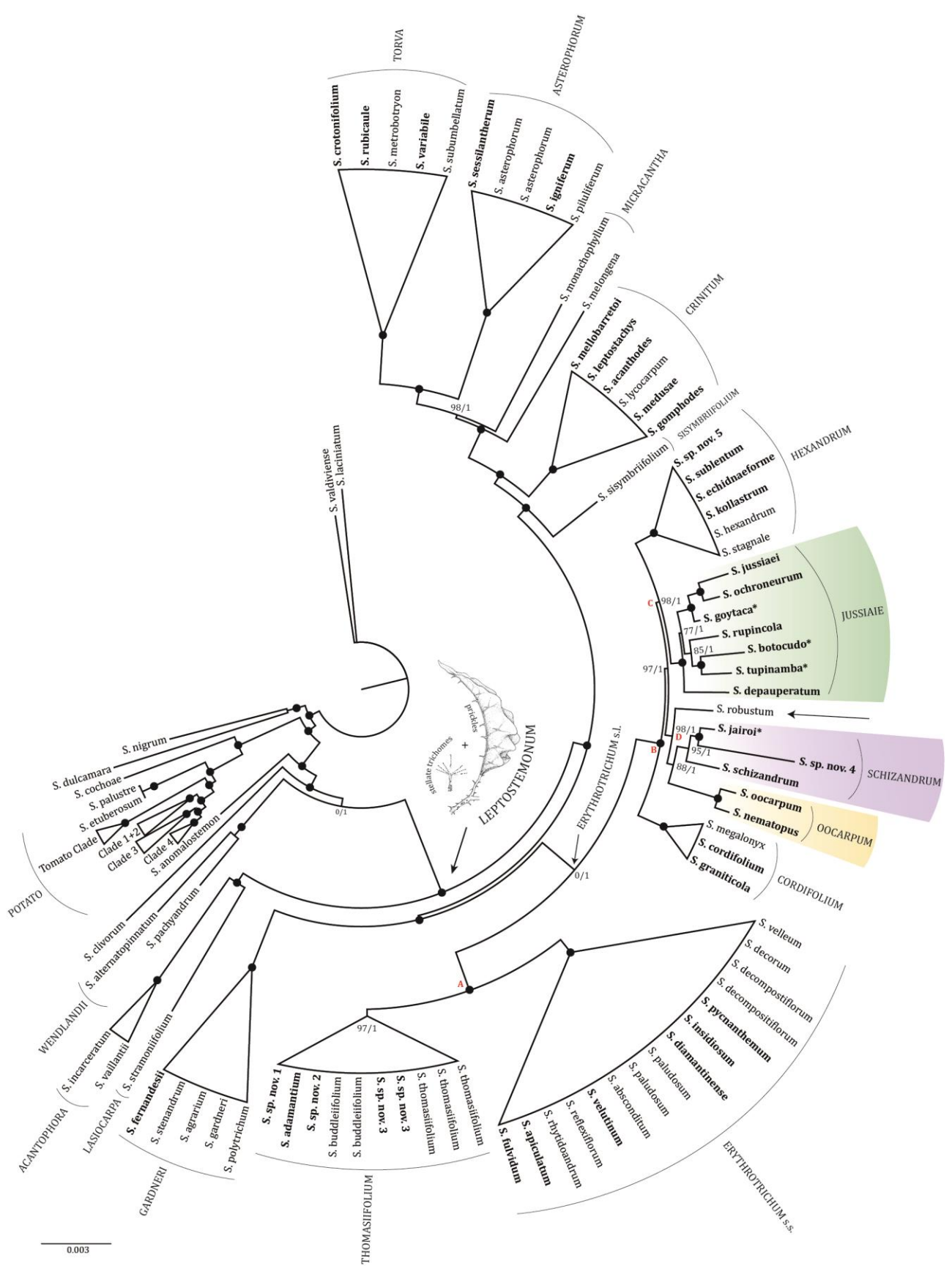


Fig. 1. Phylogenetic relationship of the Leptostemonum clade inferred from whole chloroplast sequences with focus in Brazilian taxa. Fully supported nodes in both BI and ML are indicated with black dots, the others are represented numerically (BS/PP). Clades designated A–D are used to guide discussion, and those including climbing species with hairy and large fruits are highlighted with colors. The arrow indicates an unplaced species.

nodes strongly supported (BS  $\geq$  95%), three moderately supported nodes (BS = 77–94%) and two nodes with no bootstrap support (BS = 0%). In both BI and ML trees, the *Leptostemonum* clade (Bohs 2005; Levin et al. 2006; Weese and Bohs 2007; Stern et al. 2011; Särkinen et al. 2013) is strongly supported as monophyletic (BS = 100%, PP = 1.0). Considering our limited sampling for the clade as a whole, the major lineages recovered within it in both trees are very similar to those presented in previous phylogenetic studies based on traditional molecular markers (Levin et al. 2006; Stern et al. 2011; Särkinen et al. 2013; Fig. 1). Analysis of our plastid genome dataset, however, fully resolved the relationships among the internal lineages represented in the analysis, with all but one node strongly supported (BS  $\geq$  97%, PP = 1.0) in both BI and ML trees. The only exception is the *Erythrotrichum* clade sensu Stern et al. (2011; here referred as *Erythrotrichum* clade *sensu lato* [s.l.]; see Fig. 1), which has maximum support in the BI tree (PP = 1.0) despite the lack of support in the ML tree (BS = 0%). Our increased sampling of poorly-known Brazilian endemic species related to those of the *Erythrotrichum* and *Thomasiifolium* clades (Stern et al. 2011) revealed a strongly supported lineage as sister to that formed by these two former clades. These lineages are here referred as ‘clade A’ (*Erythrotrichum* plus *Thomasiifolium* clade; BS = 100%, PP = 1.0) and ‘clade B’ (*Cordifolium*, *Hexandrum*, *Jussiaei*, *Oocarpum* and *Schizandrum* clades plus *S. robustum* H.Wendl.; BS = 100%, PP = 1.0; Fig. 1). Internally to the clade B, the first-branching clade (BS = 100%, PP = 1.0) groups *S. cordifolium* Dunal, *S. graniticola* V.Samp. & Gouvêa and *S. Megalonyx* Sendtn. The next clade (BS  $\geq$  97%; PP = 1.0) comprise two strongly supported major lineages (BS  $\geq$  98%; PP = 1.0), one formed by the clades *Hexandrum* and *Jussiaei* (‘clade C’) and other by the clades *Oocarpum* and *Schizandrum* plus *S. robustum* (‘clade D’). Species with climbing habit and hairy large fruits were not

recovered as a monophyletic group, although all of them fall within the clade B. Our results indicate that species possessing these features form two distinct strongly supported lineages (BS  $\geq$  98%; PP = 1.0). Within the clade D, *S. robustum* branches first, emerging as sister of a lineage (BS  $\geq$  88%; PP = 1.0) composed exclusively by climbing hairy- and large-fruited species. This lineage in turn branches into two well supported clades: Oocarpum clade (BS = 100%, PP = 1.0) and Schizandrum clade (BS = 95%; PP = 1.0). Clade C includes two strongly supported lineages (BS = 100%, PP = 1.0), the Hexandrum and Jussiaei clades. The Jussiaei clade comprises all remaining prickly climbing species with hairy and large fruits included in our analyses.

**Sectional level clades.**—We recognize five sectional-level clades within the Leptostemonum clade in addition to the 14 delimited in Stern et al. (2011). These are: the Cordifolium clade, the Hexandrum clade, the Jussiaei clade, the Oocarpum clade, and the Schizandrum clade (see clade B; Fig. 1). Most species placed within these clades have not been included in phylogenetic studies thus far, which greatly limits comparison with preceding molecular phylogenetic studies. The Jussiaei, Oocarpum and Schizandrum clades groups prickly climbing *Solanum* species with hairy and large fruits they are discussed below. Relationships among clades within clade B, as well as the clades Cordifolium and Hexandrum will be discussed separately in future papers.

**Taxonomic and nomenclatural changings.**—Eight new species morphologically related to those nested in the clades Jussiaei and Schizandrum were recognized during the execution of the present study and are present below (Figs. 1, 2). We also elaborated an artificial key to the identification of the prickly climbing, hairy- and large-fruited *Solanum* species (15 spp.; see Fig. 2) treated in the Taxonomy



section, which showed not form a monophyletic group. The history of the species-level circumscription and classification of the species included in the taxonomic treatment (see below) are summarized in Figure 2. Additionally, were made eight nomenclatural changings, amongst which one synonymization, one neotypification, four lectotypifications and two second-step lectotypifications.

**Preliminary conservation status (IUCN).**—Based on our refined geographical distribution database, we assessed the preliminary conservations status for the 15 prickly climbing, hairy- and large-fruited *Solanum* species treated below using GeoCat (Bachman et al. 2011; <http://geocat.kew.org/>). Assessment results are presented in Table 1.

## **DISCUSSION**

Whalen (1984) and Nee (1999) provided the more recent morphology-based classification scheme including prickly climbing species of *Solanum* possessing hairy and large fruits (for details on the history of species-level circumscription, see Fig. 2). In Whalen's (1984) conspectus, he treated only two species with these features, *S. oocarpum* Sendtn. and *S. rupicola*, placing them into Unusual Species (z.) and *S. polytrichum* Moric. species group, respectively. Likewise, Nee (1999) also included

Species	Preliminary Conservation Assessment				Life form
	E00	status	A00	status	
<i>S. botocouda</i>	6,541 km <sup>2</sup>	VU	24 km <sup>2</sup>	EN	High-climbing liana to robust scrambling shrub
<i>S. caipora</i>	11,341 km <sup>2</sup>	VU	64 km <sup>2</sup>	EN	High-climbing liana
<i>S. chirocalyx</i>	35,042 km <sup>2</sup>	NT	68 km <sup>2</sup>	EN	High-climbing liana
<i>S. depauperatum</i>	21,545 km <sup>2</sup>	NT	32km <sup>2</sup>	EN	Scrambling shrub
<i>S. goytaca</i>	547 km <sup>2</sup>	EN	24 km <sup>2</sup>	EN	High-climbing liana
<i>S. gymnum</i>	4,319 km <sup>2</sup>	EN	28 km <sup>2</sup>	EN	High-climbing liana
<i>S. jairoi</i>	3,536 km <sup>2</sup>	EN	16 km <sup>2</sup>	EN	High-climbing liana to robust scrambling shrub
<i>S. jussiaei</i>	999,656 km <sup>2</sup>	LC	108 km <sup>2</sup>	EN	Medium-height climbing liana to scrambling shrub
<i>S. nematopus</i>	27,901 km <sup>2</sup>	NT	28 km <sup>2</sup>	EN	Slender scrambling shrub
<i>S. ochroneurum</i>	147,178 km <sup>2</sup>	LC	256 km <sup>2</sup>	EN	High-climbing liana to scrambling shrub
<i>S. oocarpum</i>	531,268 km <sup>2</sup>	LC	200 km <sup>2</sup>	EN	Scrambling shrub
<i>S. puri</i>	9,961 km <sup>2</sup>	VU	16 km <sup>2</sup>	EN	High-climbing liana
<i>S. rupicola</i>	272,846 km <sup>2</sup>	LC	324 km <sup>2</sup>	EN	High-climbing liana
<i>S. schizandrum</i>	14,377 km <sup>2</sup>	VU	52 km <sup>2</sup>	EN	High-climbing liana
<i>S. tupinamba</i>	16,955 km <sup>2</sup>	VU	76 km <sup>2</sup>	EN	High-climbing liana

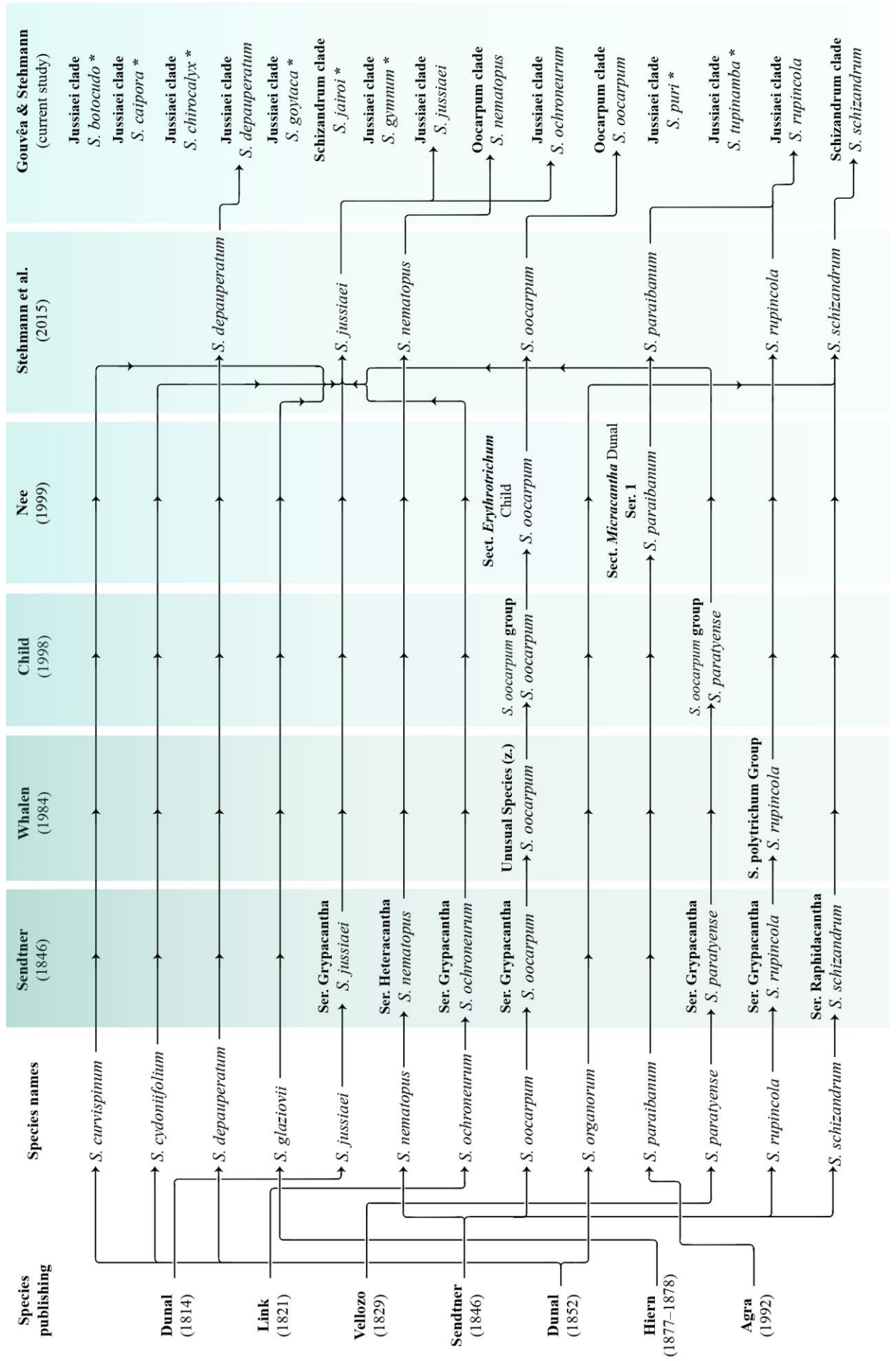
Table 1. Preliminary conservation status assessment for the species treated here; DD (Data Deficient); LC (Least Concern); EN (Endangered); VU (Vulnerable); NT (Near Threatened); CR (Critically Endangered).

only two species morphologically related to these in his synopsis, with *S. oocarpum* placed in the sect. *Erythrotrichum* (Whalen) Child and *S. paraibanum*

(here treated as synonym of *S. rupincola*) in the sect. *Micracantha* Dunal. More recently, Stern et al. (2011) presented a molecular phylogenetic hypothesis, based on the nuclear markers ITS and *waxy* (GBSSI) and the plastidial *trnT-F*, which included *S. rupincola* and *S. paraibanum* (= *S. rupincola*). Analyses performed in that study resolved both species as forming one of the two subclades within the moderately supported (i.e. BS = 1.0, PP = 73) Thomasiifolium clade (Stern. 2011), with its sister subclade formed by *S. buddleiifolium* and *S. thomasiifolium*. These results, however, already indicated the possibility of the Thomasiifolium clade be divided into more clades, as it was comprised of two poorly sampled and morpho- and ecologically contrasting groups (Whalen 1984; Agra 1992; Stern et al. 2011; Gouvêa and Stehmann 2019). With both *S. buddleiifolium* and *S. thomasiifolium* being small to medium-height shrubs with inconspicuously pubescent and small fruits growing almost exclusively in high elevation mostly quartzite rocky fields (i.e. campo rupestre vegetation) in Brazil (Gouvêa & Stehmann 2019). Otherwise, *S. rupincola* is a high-climbing liana with markedly pubescent to hirsute and large fruits inhabiting wet coastal forests of the country.

Our increased sampling focused on species morphologically related to those of the Thomasiifolium clade, allied to the use of a full plastid genome dataset, allowed us to produce a better resolved phylogenetic tree than that of Stern et al (2011). As main result of the present study, we highlight the division of the Erythrotrichum clade sensu Stern et al. (2011) into two sister clades, here called clades 'A' and 'B' (see Fig.

Fig. 2. Flow chart summarizing the species-level circumscription and infrageneric classification of the prickly climbing, hairy- and large-fruited



1). The clade A groups together the *Erythrotrichum* clade (here referred as *Erythrotrichum sensu strictu* [s.s.]), composed by species previously assigned to the *Erythrotrichum* clade or sect. *Erythrotrichum* (Child 1998; Nee 1999; Stern. et al. 2011); and the *Thomasiifolium* clade, which includes the shrubby species *S. buddleiifolium*, *S. thomasiifolium*, the recently described *S. adamantium* Gouvêa and other three morphologically similar undescribed species. The clade B, however, is recovered for the first time. It is comprised of five clades: *Cordifolium*, *Hexandrum*, *Jussiaei*, *Oocarpum* and *Schizandrum*. The prickly climbing species with hairy and large fruits included in our phylogenetic hypothesis not form a monophyletic group. Differently, our plastome data strongly support the existence of two independent lineages with species sharing these features; one denoted here as *Jussie* clade, and other, within which are recognized the clades *Oocarpum* and *Schizandrum*. All species contained within these three clades are endemic to Brazil, most of which are rare and/or poorly collected.

**Jussiaei clade.**— The *Jussiaei* clade comprises seven species inhabiting mostly low, wet or seasonal semi-deciduous, Atlantic forests in northeastern and southeaster Brazil. Other four new species morphologically related to its members, which we failed to include in our phylogenetic analysis are presented below. Members of the *Jussiaei* clade are mostly high-climbing lianas with the exception of *S. depauperatum*, a scrambling shrub with up to 4 m height, and *S. jussiaei*, a medium-height climbing liana to scrambling shrub reaching up to 6 m. *Solanum depauperatum* and *S. jussiaei* Dunal, along with *S. botocudo* sp. nov., also share rigid, sclerified pericarps. *Solanum rupicola* has the most dissimilar trichome morphology when compared to the other members of the clade. Trichomes of fruits and aerial vegetative portions in this species are mostly sessile

with short rays and midpoint of two to three cells long, markedly longer and more robust than the rays. This trichome type is also found in fruits of *S. caipora* sp. nov., *S. chirocalyx* sp. nov. and *S. gymnum* sp. nov.. *Solanum ochroneurum* Link differs from all above-mentioned species in having a variously dense, always present, coverage of stellate trichomes on the apical half of the abaxial anthers surface. This characteristic, which to date was documented only for species belonging to the Crinitum clade (Levin et al. 2006; Stern et al. 2011; Farruggia and Bohs 2011; Gouvêa et al. 2019), is also present in *S. puri* sp. nov..

This clade is difficult to define morphologically due the inconsistent distribution of morphological characters amongst the subclades recovered with moderate support (BS = 77–85%) in the ML tree. Recent discovery of species sharing morphological features with those included in the Jussiaei clade suggests that it have not yet fully sampled. Thus, the inclusion of these species in the plastome dataset may improve the clade resolution and evidence at least three minor clades.

**Oocarpum clade.**—The Oocarpum clade groups two species (*S. nematopus* Sendtn. and *S. oocarpum*) growing in the seasonally dry forest environments of the Southeastern and Mideastern Brazil. Besides being strongly supported in both BI and ML trees, this clade in also supported by morphological (i.e. [1] the scrambling-shrubby habit reaching up to 4.5 m height; [2] the variously ovoid fruits, which are small in *S. nematopus*; [3] the leaf bases decurrent onto the petiole) and ecological ([1] the shared preference for seasonally dry, high-elevation environments; and [2] the predilection for limestone-rich soils) evidences.

**Schizandrum clade.**— The Schizandrum clade is composed by three species: *S. jairoi* sp. nov., *S. schizandrum*, and *Solanum* sp. nov. 4, of which we failed to gather

enough material for the elaboration and presentation of a reliable description here. Species belonging to this clade are characterized and differ from those of its sister group, the *Oocarpum* clade, in (1) being high-climbing lianas reaching high altitudes into the forest canopy; (2) in having globose to depressed globose fruits; (3) in its globose to obovoid younger buds with completely closed calyces. Additionally, species of these two clades differ also in relation to ecological aspects. Although they share the preference for high elevated environments, the species of *Schizandrum* occur exclusively in wet, montane to high montane, Atlantic forests.

#### TAXONOMIC TREATMENT

##### ARTIFICIAL KEY TO THE PRICKLY CLIMBING *SOLANUM* SPECIES WITH HAIRY AND LARGE FRUITS

**1'** Midpoints of stem stellate trichomes 2–3(–7)-celled (cells long), or stems glabrous except for minute, simple, sessile to subsessile, glandular trichomes to 0.05 mm long (not visible to the naked eye); midpoints of ovary stellate trichomes 2–3-celled (cells long); fruits distinctly densely long-pubescent to hirsute, midpoints of stellate trichomes 2–3-celled, mostly longer than 1.5 mm long, markedly more robust than the rays, thick-walled, stiff, straight                    **2**

**2'** Stems, leaves, inflorescence axis, pedicels and calyx glabrous

***Solanum***

***gymnum***

2" Stems, leaves, inflorescence axis, pedicels and calyx sparsely to densely pubescent to  
hirsute 3

3' Trichomes of stems, petioles, inflorescence axes and calyces sessile to long-stalked  
(occurring together) with midpoints of various lengths *Solanum*  
*caipora*

3" Trichomes of stems, petioles, inflorescence axes and calyces all sessile to subsessile  
with midpoints of similar length 4

4' Calyx lobes linear-filiform; trichomes of stems, leaves, inflorescence axes and calyces  
with curved midpoints; abaxial leaf surface drying golden to greenish golden, with  
stramineous, pale yellow or ochraceous trichomes *Solanum*  
*chirocalyx*

4" Calyx lobes lanceolate to narrowly triangular or ovate-lanceolate; trichomes of stems,  
leaves, inflorescence axes and calyces with straight midpoints; abaxial leaf surface drying  
of various shades of brown, with ferruginous, vinaceous, castaneous or atropurpureous  
trichomes *Solanum rupincola*

1" Midpoints of stem stellate trichomes strictly 1-celled (cells long) or obsolete  
(apparently absent), stems never glabrous; midpoints of ovary stellate trichomes strictly  
1-celled (cell long); fruits short-pubescent to tomentose, midpoints of stellate trichomes



1-celled, mostly shorter than 1 mm long, similar to the rays, straight to oblique

5

5' Leaves very sparsely pubescent to glabrous (sometimes trichomes restrict to the veins) and shine adaxially, densely pubescent abaxially, strongly discolorous, leaf bases never attenuate or decurrent onto the petiole 6

6' leaves ovate, cordate, rombooid or trullate; anthers with stellate trichomes on the upper half of the abaxial surface *Solanum puri*

6" leaves lanceolate, elliptic or oblanceolate; anthers glabrous 7

7' Buds with calyces closed, completely enclosing the corollas, calyx lobes completely fused to just before anthesis, irregularly splitting at anthesis, 6–7.7 mm long after anthesis; corolla 3–4 cm in diameter, light blue to lavender, lobed for ca. 1/2–2/3 of the way to the base; corolla lobes 1–1.6 cm long, 8.3–11 mm wide; anthers 8–10.8 mm long, 1.8–2.4 mm wide, the epidermis of the abaxial surface strongly warty  
*Solanum goytaca*

7" Buds with calyces open, soon covering only the corolla base, calyx lobes soon and regularly splitting, sometimes apparently absent, 0.3–1.4 mm long after anthesis; corolla (1)1.6–2 cm in diameter, white, lobed for 5/6–5/7 of the way to the base; corolla lobes (0.5)0.7–0.85 cm long, (1.8)3–3.8 mm wide; anthers (4.2)5–6.5 mm long, 0.8–1.4 mm wide, the epidermis of the abaxial surface minutely papillose  
*Solanum tupinamba*

5" Leaves densely to sparsely pubescent and matte adaxially, variously dense abaxially, discolourous or concolourous, if sparsely pubescent adaxially, then the leaf bases decurrent onto the petiole, or the leaves concolourous to slightly discolourous, sparsely to moderately pubescent abaxially

7

7' Leaves concolourous drying slightly discolourous, sparsely to moderately pubescent adaxially and abaxially, leaf bases acute to slightly attenuate, not decurrent onto the petiole, leaf apices cuspidate; buds turbinate with pointed apices, calyx closed, completely enclosing the corolla to just before anthesis; calyx lobes completely fused to just before anthesis

### *Solanum*

#### *botocudo*

7" Leaves discolourous covered with dense indumentum at least in one of the surfaces, with variously shaped bases, if the leaves slightly discolourous with both surfaces sparsely to moderately pubescent, then the leaf bases long-decurrent onto the petiole; buds lanceoloid, ellipsoid, ovoid, globose or obovoid, always with rounded apices; calyx soon open, covering only the corolla base to initially closed, completely enclosing the corolla only to an intermediate stage of bud development; calyx lobes apparently absent, soon splitting at least apically or completely fused to an intermediate stage of bud development

8

8' Buds with calyx tubes soon covering only the corolla base; leaf bases never decurrent onto the petiole; calyx lobes (after anthesis) apparently absent or mere apiculae on the rim to 2.5 mm long

9

9' Anthers glabrous; pericarp sclerified and thickened when mature; inflorescence once to 3 times forked (occasionally unbranched)

*Solanum*

*jussiaei*

9" Anthers with stellate trichomes on the upper half of the abaxial surface; pericarp not sclerified or thickened when mature; inflorescences strictly unbranched

*Solanum*

*ochroneurum*

8" Buds with calyx tubes completely covering the corolla or covering all but the corolla's apical portion to an intermediate stage of bud development, if soon completely splitting and covering only the corolla base, then the leaf bases decurrent onto the petiole reaching or nearly reaching the stem; calyx lobes 3–12.7 mm long

11

11' Pericarp sclerified, thickened and rigid when mature

*Solanum*

*depauperatum*

11" Pericarp not sclerified, thickened or rigid when mature

12

12" Young buds ovoid with open calyces, bud calyx lobes soon splitting at least apically, the splitted portion never adhered to the corolla, bud calyx tube soon covering only the corolla base, or all but the corolla's apical portion; stellate trichomes of adaxial leaf surfaces strictly or mostly sessile to subsessile, never long-stalked; stellate trichomes of stems with stalks to 0.4 mm long, if longer, then scattered

13

**13'** Inflorescence axis filiform; buds with calyx lobes soon completely splitting, the tube soon covering only the corolla base; stellate trichomes of stems strictly uniradiate

***Solanum***

***nematopus***

**13"** Inflorescence not filiform (normal), calyx tubes covering all but the corolla's apical portion to an advanced stage of bud development; stellate trichomes of stems uni- and biradiate

***Solanum oocarpum***

**12"** Young buds globose to obovoid with closed calyces, bud calyces completely enclosing the corollas with calyx lobes completely fused and tightly adhered to the corolla to an intermediate stage of bud development; stellate trichomes of adaxial leaf surfaces mostly short- to long-stalked, or sessile to long-stalked equally abundant; stellate trichomes of stems with stalks longer than 0.5 mm abundant

**14**

**14'** Leaf base obtuse to rounded, less often rounded, abruptly and shortly attenuate onto the petiole's apical fifth to fourth, truncate or sagittate; the fruiting pedicel straight to basally curved in mature fruits; corollas purple to lilac

***Solanum***

***schizandrum***

**14"** Leaf base attenuate, long-decurrent onto the petiole reaching to the stem or very nearly; the fruiting pedicel curled in mature fruits; corollas white

***Solanum***

***jairoi***

## **Species descriptions**

## JUSSIAEI CLADE

1. *Solanum botocudo* Gouvêa, sp. nov.—TYPE: **BRAZIL**. Espírito Santo: Mun. Nova Venécia, Área de Proteção Ambiental da Pedra do Elefante, crescendo em fragmento de Floresta Estacional Semidecidual de encosta na base de afloramento granítico (inselberg), 18°46'37"S, 40°27'05"W, 366 m elev., 1 Apr 2019 (fl,fr), *Y.F. Gouvêa & G.V.A. Santos 327* (holotype: BHC[B] [BHC[B]194942]; isotypes: to be distributed).

**Diagnosis.** Differs from *S. depauperatum* Dunal., *S. jussiaei* Dunal, *S. goytaca* sp. nov. and *S. oocarpum* Sendtn. in having inflate, turbinate and apically-pointed flower buds with calyces completely enclosing the corollas to just before anthesis, and concolorous to slightly discoloured leaves with both surfaces sparsely to moderately pubescent.

**High-climbing liana to robust scrambling shrub** reaching more than 7 m height, armed. **Young stems** terete, densely stellate-tomentose on and near the meristems, gradually sparser downward, the trichomes ochraceous to ferruginous, sessile to short-stalked or also with less abundant long-stalked, glandular or eglandular, porrect to biradiate or multiradiate stellate trichomes mixed with inconspicuous, small, more or less abundant, simple, uniseriate, glandular trichomes; the larger, more abundant and conspicuous stellate trichomes with stalks to 0.45 mm long, multiseriate, 2–4 cells wide, the rays of the only/upper whorl 4–8, 0.15–0.55 mm long, usually eglandular, 1-celled, the rays of the lower whorl(s), if present, 1–8(<), usually gland-tipped, but occasionally with one to all rays eglandular, the gland-tipped rays less conspicuous and markedly shorter than the eglandular rays of the upper whorl, with up to 0.06 mm

long, 2–3-celled, the midpoint obsolete to 0.2 mm long, always shorter than the eglandular rays, 1-celled, rarely gland-tipped, if so 2–3-celled; the smaller stellate trichomes like the larger ones, but when porrect, usually 4-rayed, with all rays gland-tipped; the simple glandular trichomes sessile to 0.1 mm long, uniseriate; sparsely to moderately prickly, the prickles 0.9–3.7 mm long, strongly recurved to nearly retrorse, the base elongate, golden to ferruginous. Bark of older stems brown, glabrescent, lenticeled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, sometimes deeply lobed in young plants, the blades of fully developed leaves (6.4–)8–14 cm long, (3–)4.2–6.3 cm wide, elliptic, less often somewhat lanceolate or oblanceolate, chartaceous, concolorous when fresh, drying slightly discolorous; the adaxial surface matte, green when fresh, drying green to brown or dark brown, sparsely stellate-pubescent with sessile to short-stalked, eglandular, porrect stellate trichomes, the stalks to 0.1 mm, multiseriate, 2–3 cells wide, the rays 4–8, 0.1–0.5 mm long, 1-celled, the midpoint obsolete to 0.2 mm long, shorter to nearly the same length as the rays, the midrib and primary veins more densely pubescent, usually with trichomes like those of the young stems, the epidermis always visible, unarmed or with nearly obsolete prickles (<0.4 mm long) on the midrib; the abaxial surface green when fresh, drying green to brown, the same color as or slightly paler than the adaxial surface, sparsely to moderately stellate-pubescent with porrect to biradiate, less often multiradiate stellate trichomes like more abundant on the young stems, the rays of the lower whorl all eglandular to gland-tipped (varying in proportion between specimens), the epidermis always visible, armed only along the midrib or unarmed, the prickles like those of the stems but smaller, to 2 mm; primary veins 6–8 pairs; base acute to slightly attenuate, symmetric, not decurrent onto the petiole; margins with 0–2 lobes on each side, these up to 2.5 cm long, 1.8 cm wide,

triangular to nearly oblong, apically acute; apex cuspidate to acute; petiole 0.7–2.5 cm long, the indumentum similar to that of the stems, the epidermis always visible, usually armed, the prickles like those of the abaxial midrib. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) densely stellate-tomentose strictly with trichomes like those of the stems, or also with glandular or eglandular, dendritic-echinoid trichomes, these to 0.7 mm long, many-rayed, the rays of the upper whorl eglandular, those of the lower whorls all eglandular to all gland-tipped, the eglandular rays 1-celled, the gland-tipped ones 2–3-celled, usually shorter than the eglandular rays, the epidermis visible or not, unarmed; the peduncles 0.9–2.8 cm long, the rachis 0.4–4.4 cm long, with 4–18 flowers; pedicel insertion points evenly and very closely spaced, these to 5.2 mm apart, more congested distally, sometimes clustered at the inflorescence tip; pedicels 4–8 mm long in open flowers, not geniculate, articulated at base, the indumentum like that of the inflorescence axis, but usually denser, unarmed. **Buds** turbinate, 5-rounded-plicate (less evident when dry) and inflated, the apex pointed, the calyx closed, completely enclosing the corolla, the calyx lobes completely fused to just before anthesis. **Flowers** 5-merous, occasionally 6-merous, robust, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** nearly flat, 0.7–5.6 mm long, often incompletely or irregularly splitting with 1–2 lobe pairs remaining fused, if so, with an irregular, inflated, somewhat rounded-plicate appearance, the lobes 7–17.2 mm long, 3.8–8.7 mm wide, lanceolate to triangular, acute to nearly cirrhose apically, densely stellate-tomentose with stellate trichomes like those of the

inflorescence axis, unarmed. **Corolla** 3–4 cm in diameter, white to lilac or pale pink, stellate, lobed for ca. 3/4–7/8 of the way to the base, interpetalar tissue little developed, 0.5–1 mm wide at the widest point, the lobes 1–1.9 cm long, 6.9–9.1 mm wide at the widest point, widest in the middle to the basal third, lanceolate to nearly elliptic, usually reflexed at anthesis, the apex acute, not or slightly cucullate, the adaxial surface moderately to densely stellate-pubescent for the whole length with sessile to short-stalked, porrect to biradiate, eglandular or glandular stellate trichomes, the stalks to 0.25 mm long, multiseriate, 2–4 cells wide, the rays 4–14, 0.1–0.5 mm long, the rays of the upper whorl eglandular, the rays of the lower one, if present, eglandular or gland-tipped, the midpoint shorter to the same length as the rays, eglandular, 1-celled, the trichomes somewhat misshapen; the abaxial surface densely stellate-tomentose for the whole length with trichomes like those of the adaxial surface. **Stamens** equal; the filament tube 1–1.6 mm long; the free portion of the filaments 1.6–2.4 mm long, glabrous; anthers 7–9 mm long, 2.7–3.7 mm wide at the widest point, 2.3–2.9 mm thick at the thickest point, widest and thickest in the basal third, broadly lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with small, elliptic pores, the epidermis of the abaxial surface strongly papillose, tightly connivent. **Ovary** cupuliform, 4-locular, densely pubescent with trichomes like to those of stems, but the stellate trichomes shorter and thinner stalked with longer midpoints, the stalks to 0.2 mm long, 2 cells wide, the midpoint to the same length as the rays; style 12–13 mm long in long-styled flowers, 1–3.2 mm long in short-styled flowers, cylindrical, straight, moderately to densely stellate-pubescent in the basal half with trichomes like those of the ovary; stigma bilobed, the surface papillose. **Immature fruit** a globose to somewhat pyriform berry to 4.3 cm in diameter, green, densely stellate-tomentose to -pubescent with stramineous to ochraceo-



ferruginous, sessile to short- or long-stalked, porrect stellate to echinoid and dendritic-echinoid trichomes, the stalks to 0.5 mm long, multiseriate, 3–6 cells wide, the rays 6–20(<), 0.05–0.5(–0.7) mm long, 1-celled, occasionally glandular, if so, 2–3-celled, the midpoint 0.1–0.4 mm long, shorter to longer than the rays, 1-celled, the pericarp thick and sclerified when nearly mature; fruiting pedicels short, 0.4–1.3 cm long, woody, straight to slightly curved, articulated at the base, enlarged towards the calyx, unarmed; fruiting calyx not accrescent, the tube flat or nearly so, 11.3–16.6 mm in diameter; mature fruit not known. **Seeds** ca. 200 per berry, immature seeds to 3.8 mm long, 4.2 mm wide and 0.5 mm thick when dry, flattened, reniform, drying brown to dark brown; mature seeds not known.

**Chromosome number:** not known. Figure 3.



Fig. 3. *Solanum botocudo* (A, C-F: Y.F. Gouvêa and G.V.A. Santos 327, BHCB; B: V. Demuner 645, RB; G: A.M. Amorim et al. 7541, RB). A. Flowering branch. B. Lobed leaves. C. Young Inflorescence. D(a-c). Calyx. E. Dissected flower F. Stamens. G. Fruit. Scale bars: A = 5.5cm; B = 2.5cm; C-Dc = 1.5cm; E = 1cm.

**Distribution**—Along western Espírito Santo State (ES) to northeaster Minas Gerais State (MG), in the watershed between the Mucuri and Paraíba do Sul rivers (Fig. 4).

**Ecology and Habitat**—*Solanum botocudo* grows in seasonal semi-deciduous to wet forests associated to large granitic or gneissic rock outcrops (inselbergs); from 300 to 800 m elevation.

**Etymology**— The specific epithet honours the ethno-linguistic group known as “Botocudos” (also known as Krenák or Borúm), which is considered as belonging to the predominantly Brazilian linguistic stock, Macro-jê. The Botocudos are historically known to inhabit the lands of the continental eastern-southeastern Brazil, including the regions of Nova Venécia, the municipality comprising the type locality of *S. botocudo* (for details on the distribution of Brazilian ethno-linguistic indigenous groups, see Nimuendajú’s 2017 map: <http://portal.iphan.gov.br/indl/pagina/detalhes/1574/>).

**Preliminary conservations status**—See Table 1.

**Notes**— *Solanum botocudo* belongs to the Jussiaei clade. It is unique among the prickly climbing, hairy- and large-fruited species of *Solanum* in having well-developed, inflated, 5-rounded-plicate (especially in fresh material), turbinate and apically-pointed flower buds with closed calyces that completely enclose the corollas to just before anthesis (Fig. 3C). Bud calyces of *Solanum goytaca* sp. nov. (see below)

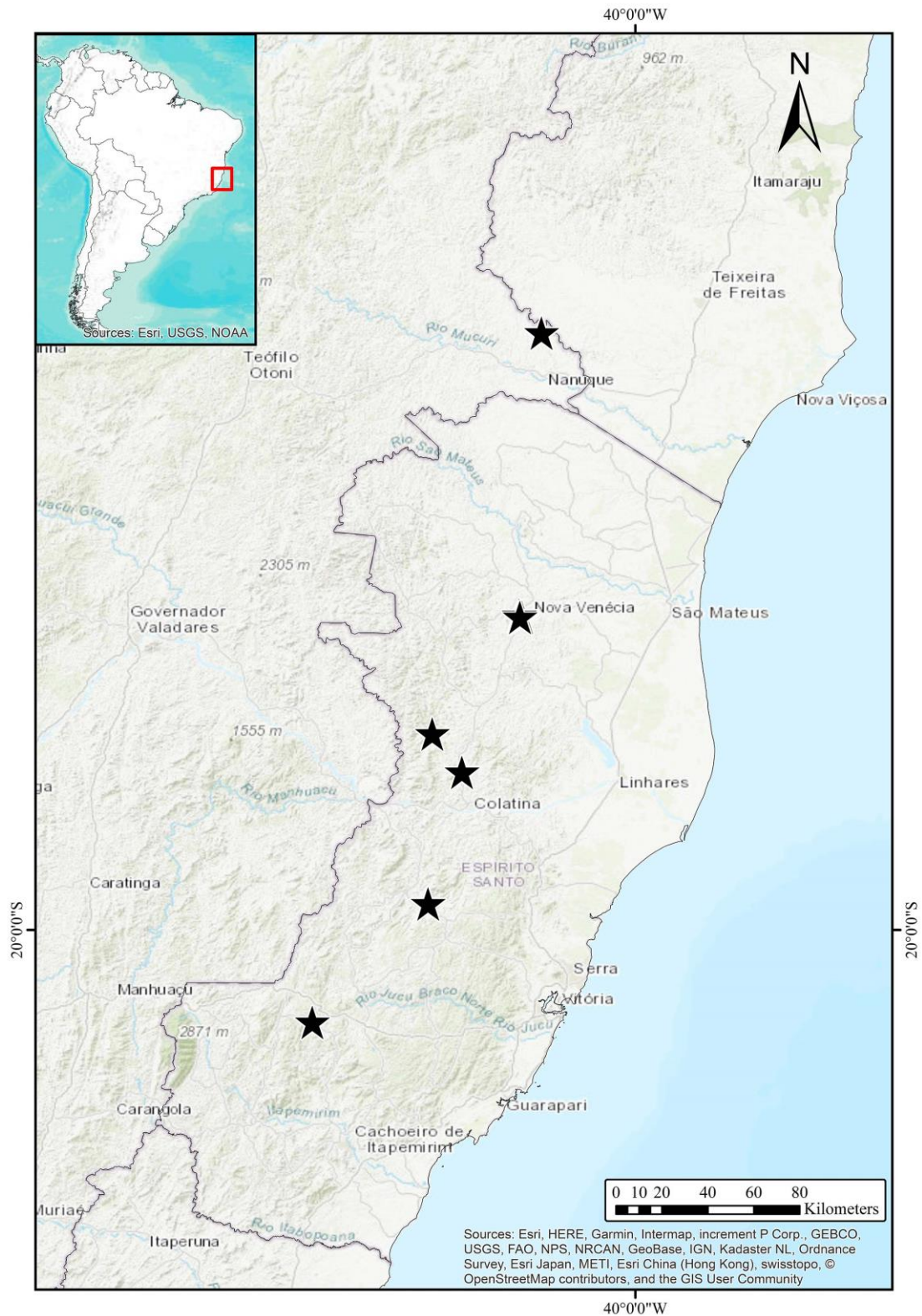


Fig. 4. Distribution of *Solanum botocudo*.

also completely enclose the corollas to an advanced developmental stage, but *S. botocudo* greatly differs from it in its overall morphology. *Solanum botocudo* can be easily distinguished from *S. goytaca* by its turbinate apically-pointed buds,

rather than ellipsoid to oblong, apically-rounded buds; and its concolorous to slightly discolorous leaves (Fig. 3A) with both surfaces sparsely to moderately pubescent, rather than leaves strongly discolorous, sparsely pubescent adaxially and very densely pubescent abaxially. Calyces of *S. oocarpum* are also well-developed in bud. Its lobes, however, splits early in bud development and the lobe apices are not tightly adhered to the corolla. These species can also be differentiated by the mature fruits, which are globose to somewhat piriform with rigid, sclerified pericarps in *Solanum botocudo* (Fig. 3G), whereas in *S. oocarpum* they are variously ovoid with soft, not sclerified pericarp. Mature fruit pericarps are also rigid and sclerified in *S. depauperatum* and *S. jussiaei*. But the turbinate apically-pointed buds and leaves with both surfaces sparsely to moderately pubescent of *S. botocudo* (Fig. 3A, C) easily differentiates it from these species, which have leaves with abaxial surfaces densely pubescent and soon-opening bud calyces.

**Additional Specimens Examined (paratypes)—Brazil.**—MINAS GERAIS: Próximo a Nanuque, 12 Nov 1953, *A.P. Duarte & E.C. Gomes 4043* (RB).—ESPÍRITO SANTO: Mun. Colatina, estrada do Pancas, Rio Doce, 23 Mar 1934, *J.G. Kuhlmann 18* (RB); Mun. Conceição do Castelo, Alto Bananal, 18 Oct 1985, *G. Hatschbach & J.M. Silva 49947* (MBM, NY); Mun. Nova Venécia, área de Proteção Ambiental da Pedra do Elefante, 18°46'37"S, 40°26'38"W, 400 m elev., 17 Jul 2008, *A.M.A. Amorim et al. 7541* (MBML, RB, UPCB); 18°46'S, 40°27'W, 653 m elev., 10 May 2008, *C.N. Fraga et al. 2093* (BHCB, CEPEC, MBML, RB, UPCB); Mun. Pancas (?), Rio Pancas, 30 Nov 1943, *J.G. Kuhlmann 6573* (RB); Mun. Santa Teresa, Pedra da Onça, 1 Feb 2000, *V. Demuner & E. Bausen 645* (MBML, RB).

**2. *Solanum caipora*** Gouvêa, sp. nov. —TYPE: **BRAZIL**. Bahia: Mun. Itacaré, Fazenda da Boa Paz, Trilha da Boa Paz, 14°20'05"S, 39°01'04"W, 105 m elev., 5 Dec 2006 (fl, fr), *E.J. Lucas, D. Sampaio, N.A. Brummitt, O.R. Campos, T. B. Flores & L.V.S. Jennings 1044* (holotype: BHC [BHC-117028]; isotype: RB [RB- RB00938370])

**Diagnosis.** Differs from *S. rupicola* Sendtn., *S. chirocalyx* sp. nov. and *S. gymnum* sp. nov. in having stem, petiole, inflorescence axis and calyx indumentum of sessile to long-stalked (stalks to 1 mm long), uni- to biradiate stellate trichomes; additionally differs from *S. chirocalyx* in having lanceolate to triangular calyx lobes; and from *S. gymnum* in having pubescent stems, petioles, inflorescence axes and calyces.

**High-climbing liana** reaching more than 8 m height, armed. **Young stems** terete, densely stellate-tomentose with ferruginous to castaneo-ferruginous, sessile to long-stalked, porrect to biradiate, eglandular stellate trichomes and tiny, sessile to subsessile simple glandular trichomes to 0.2 mm long, not visible to the naked eye or in densely indumented plants; the stellate trichomes with stalks to 1 mm long, multiseriate, often broader at base, 4–15 cells wide, the rays of the only/upper whorl (4–)5–8(–11), 0.2–1 mm long, 1-celled, patent to antrorse, the rays of the lower whorl, if present, 1–5(–9), usually shorter than those of the upper whorl, 0.1–0.6(–0.9) mm long, 1-celled, patent to retrorse, the trichomes with up to 15 rays, the midpoint 0.25–1.4 mm, 2–3-celled, many times longer to shorter than the rays, straight to oblique, the epidermis not to barely visible; moderately armed, the prickles 1.2–2.9 mm long, recurved, broad-based, laterally compressed or not, ferruginous to dark brown, sometimes golden at base. Bark of older not known. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire to

sinuate, less often rarely shallowly lobed, the blades of fully developed leaves 8.3–17.5 cm long, 3.8–8.7 cm wide, lanceolate to elliptic, chartaceous to coriaceous, discolorous to markedly discolorous; the adaxial surface green when fresh, drying green, brown or grey, moderately stellate-pubescent with stramineous, ochraceous or ferruginous, sessile to short-stalked, porrect, distinctly long-midpointed, eglandular stellate trichomes and tiny simple glandular trichomes like those of the stems; the stellate trichomes with enlarged stalks to 0.2 mm long, multiseriate, many cells wide, the rays 4–8, 0.05–0.65 mm long, 1-celled, patent to retrorse, the midpoint 0.45–1.2 mm long, longer to many times longer and more robust than the rays, 2–3-celled, straight, sometimes with the distal-most cell oblique, the epidermis always visible; unarmed or armed (especially in young plants) along the midrib and primary veins, the prickles 0.5–2.5 mm long, straight, broad-based, ferruginous to dark brown, sometimes golden at base; the abaxial surface green when fresh, drying greenish, ochrish or greyish pale brown, moderately to densely stellate-pubescent with ochraceous to ferruginous, sessile to short-stalked, strictly biradiate, or biradiate to porrect, eglandular stellate trichomes and tiny simple glandular trichomes like those of the stems; the stellate trichomes with robust stalks to 0.45 mm long with a and many cells wide, broad base, narrower apically, ca. 6–8 cells wide, the upper/only whorl of rays patent to antrorse, the rays (4–)6–8(–10), 0.2–0.75 mm long, 1-celled, the lower whorl of rays sometimes less conspicuous, retrorse to patent, the rays (4–)6–12(–18), 0.05–0.55 mm long, these usually smaller than those of the upper whorl, 1-celled, the midpoint 0.25–1.2 mm long, longer to shorter than the rays, straight, sometimes with the distal-most cell oblique, the epidermis visible; sparsely to moderately armed on the midrib and primary veins or only along the midrib, the prickles like those of the stems, but with up to 3.2 mm long; primary veins 5–7

pairs; base obtuse to rounded, less often acute, symmetric or asymmetric, not decurrent onto the petiole; margins with 0–3 lobes on each side, with up to 0.4 cm long and 1.8 cm wide, apically obtuse; apex acute, obtuse, rounded or cuspidate, if obtuse to rounded, usually apiculate; petiole 0.6–2.2 cm long, the indumentum like that of the young stems, usually armed, the prickles like those of the abaxial leaf surface. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) by the subsequent sympodial unit's development; the axis (peduncle plus rachis) indumentum similar to that of the young stems, but also with some longer stalked trichomes, the stalks to 1.6 mm long, armed or not, the prickles like those of the stems but usually smaller, to 2.3 mm long, the epidermis not to barely visible; the peduncles (0.3–)0.8–1.5 cm long, the rachis (1.3–)2.8–9.2 cm long, with 6–23 flowers; the two basal-most pedicel insertion points spaced 1.8–8 mm apart, the others gradually less spaced towards the apex; pedicels 5.8–10 mm long in open flowers, straight, articulated at base, the indumentum like that of the young stems, unarmed or armed with prickles like those of the inflorescence axis. **Buds** ovoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, calyx lobes soon apparent, not adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped, 0.3–2 mm long, the external surface smooth, the lobes 6.7–12.2 mm long, 2–3.8 mm wide, widest in the basal third, lanceolate to triangular, the apex acuminate to acute, often unequally sized, regularly splitting, densely stellate-tomentose with trichomes like those of inflorescence axis, unarmed or armed, the prickles like those of the inflorescence axis. **Corolla** 2.4–4 cm in diameter, white, drying dark



brown with black midveins adaxially, stellate, lobed for 5/6–8/9 of the way to the base, the interpetalar tissue very little developed with up to 0.4 mm wide at the widest point, the lobes 1.1–1.75 cm long, 3.2–6.5 mm wide, widest in the basal third to near the middle, lanceolate, the apex acute to acuminate, often apiculate, cucullate, adaxial surface moderately to densely stellate-pubescent in the apical 2/3 with stellate trichomes like those of the adaxial leaf surface, but usually misshapen; the abaxial surface densely stellate-tomentose for the whole length with trichomes like those of the abaxial leaf surface, but sometimes somewhat misshapen. **Stamens** equal; the filament tube 0.9–1.3 mm long; the free portion of the filaments 0.9–1.2 mm long, glabrous; anthers 8.2–12 mm long, 1.9–3 mm wide at the widest point, 1.7–2.3 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis of the abaxial surface minutely papillose, connivent. **Ovary** cupuliform, 4-locular, densely stellate pubescent with hyaline to hyaline ferruginous, sessile to short-stalked, porrect, distinctly long-midpointed, eglandular stellate trichomes and simple glandular trichomes like those of the stems; the stellate trichomes thin-walled with stalks to 0.25 mm long, multiseriate, relatively thin, 2 cells wide, the rays 4–8, 0.05–0.75(–1.15) mm long, 1-celled, usually misshapen, the midpoint 0.7–3 mm long, 2–3-celled, markedly more robust than the rays, straight; style 10–14 mm long in long-styled flowers, 2.2–4.6 mm long in short-styled flowers, cylindrical, straight, glabrous or with scattered trichomes like those of the ovary at base; stigma capitate, the surface minutely papillose. **Fruit** a globose berry, 2.7–3.8 cm in diameter, orange when mature, densely and remarkably pubescent to hirsute, with trichomes like those of the ovary, but the stellate trichomes with midpoints on average longer than 1.5 mm long, thick-walled, straight, stiff, yellow to

ferruginous; the pericarp soft and not sclerified at maturity, orange; fruiting pedicels 1.8–2.5 cm long, woody, curved downwards, articulated at the base, usually gradually enlarged towards the calyx, densely stellate-tomentose with trichomes like those of the inflorescence axis, usually unarmed; fruiting calyx slightly accrescent, the tube flat or nearly so, 8–15 mm in diameter, the lobes 0.7–1.8 mm long, 3–7 mm wide, often reflexed. **Seeds** 40–60 per berry, 4.2–5 mm long, 4.4–6 mm wide, 0.9–1.4 mm thick when dry, flattened, reniform to nearly discoid, dark brown when fresh, drying brown to greyish or dark brown. **Chromosome number:** not known. Figure 5.



Fig. 5. *Solanum caipora* (A, D–H: E.J. Lucas et al. 1044, BHCB; B: A.M. Amorim et al. 3922, BHCB; C: Y.F. Gouvêa & M.U. Guerrero 296, BHCB). A. Flowering branch. B–C Leaves. D. Calyxes. E. Dissected flower. F. Anther. G. Young fruit covered by the calyx. H. Young fruit. Scale bars: A = 4.5cm; B, C = 2.5cm; D, E, G = 0.5cm; F = 0.25cm; H = 1cm.

**Distribution**—Endemic to southern coastal Bahia State (Fig. 6).

**Ecology and Habitat**—*Solanum caipora* inhabits low to montane, Atlantic rainforests; from 100 to 900 m elevation.

**Etymology**— The word ‘Caipora’ derives from the indigenous Tupi language (‘*kaa*’ = forest + ‘*pora*’ = inhabitant; Navarro 2013). Caipora is the name of a Brazilian folkloric forest entity that, according to the popular legend, protect native forests and animals from hunters and other malicious people by tricking them.

**Preliminary conservations status**—See Table 1.

**Notes**—Specimens of *Solanum caipora* have been identified as *S. rupicola* (Jussiaei clade), with which has a similar overall appearance and seems to be closely related. *Solanum caipora*, however, can be readily distinguished by its stems, petioles, inflorescence axes and calyx indumentum of sessile to long-stalked (stalks to 1 mm long), uni- to biradiate stellate trichomes (Fig. 5), rather than the sessile to subsessile, uniradiate, porrect or rarely multiangulate stellate trichomes found in *S. rupicola*. *Solanum caipora* also resembles *S. chirocalyx* sp. nov. from which it also differs in its stems, petioles, inflorescence axes and calyx indumentum of sessile to long-stalked, uni- to biradiate trichomes (Fig. 5), rather than sessile to subsessile, uniradiate stellate trichomes; and in having lanceolate to triangular calyx lobes, rather than the linear-filiform calyces.

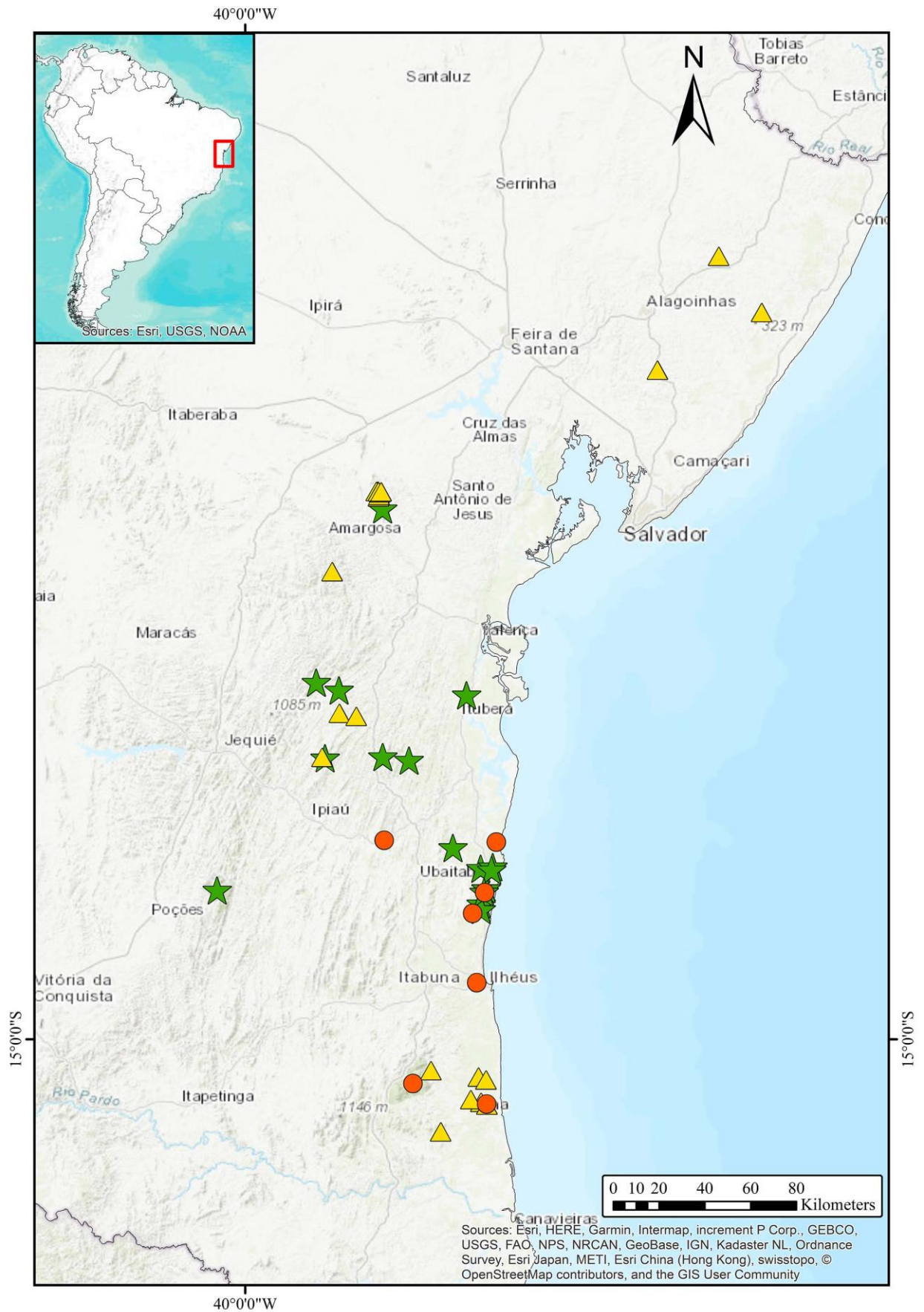


Fig. 6. Distribution of *Solanum caipora* (stars), *S. chirocalyx* (triangles), *S. gymnum* (circles).

**Additional Specimens Examined (paratypes)—Brazil.**—Bahia: Mun. Amargosa, Serra do Timbó, Área de estudos do Projeto Timbó/Centro Sapucaia, 12°52'S, 39°28'W, 750–900 m elev., 24 Jan 2007, *D. Cardoso et al.* 1528 (CEPEC, HUEFS); Mun. Apuarema, concessão da Rio Tinto, 13°53'46"S, 39°41'10"W, 680 m elev., 20 Nov 2013, *L.Y.S. Aona et al.* 3262 (HURB, RB); Mun. Boa Nova, Parque Nacional de Boa Nova, 12°29'33"S, 39°00'11"W, 1 Mar 2013, *L.Y.S. Aona et al.* 2062 (HURB, RB); Mun. Ibirapitinga, Reserva Municipal Cachoeira do Pau, 13°53'27"S, 39°27'33"W, 690 m elev., *W.W. Thomas et al.* 13423 (CEPEC, MO, NY); Igrapiúna, Assentamento Mirante, 13°54'20"S, 39°20'59"W, 18 Dec 2001, *D.M Loureiro et al.* 398 (ALCB, CEPEC); Mun. Itacaré, Estrada Itacaré/Taboquinhas, ca. 6 km de Itacaré, Loteamento Marambaia, 14 Dec 1992, *A.M. Amorim et al.* 946 (NY, RB); estrada que liga Serra Grande à Uruçuca, 5 km da Rodovia Ilhéus/Itacaré, entorno do Parque Estadual da Serra do Condurú, 14°28'09"S, 39°04'24"W, 380 m elev., 5 Apr 2004, *A.M. Amorim et al.* 3922 (BHCB, CEPEC, MO); Fazenda da Boa Paz, Trilha Boa Paz, 14°19'26"S, 39°01'39"W, 106 m elev., *Y.F. Gouvêa & M.U. Guerrero* 296 (BHCB); Mun. Ituberá, km 11 da estrada Ituberá/Valença, ramal de acesso à estação da Telebahia, km 1 a 2, 5 Feb 1983, *A.M. Carvalho & T. Plowman* 1473 (CEPEC, NY); Mun. Uruçuca, antiga estrada que liga Ubaitaba à Maraú, Fazenda Água Boa, 14°10'40"S, 39°01'(?)W, 11 Jun 2006, *A.M. Amorim et al.* 6040 (CEPEC, NY); Distrito de Serra Grande, 7.3 km na estrada Serra Grande/Itacaré, Fazenda Lagoa do Conjunto Fazenda Santa Cruz, 14°25'S, 39°01'W, 7 Sep 1991, *A.M. Carvalho et al.* 3623 (CEPEC, NY); 7.3 km north of Serra Grande on road to Itacaré, Fazenda Lagoa do Conjunto Fazenda Santa Cruz, transect study site, 14°25'S, 39°01'W, 6 May 1993, *W. Thomas et al.* 9809 (CEPEC, NY, RB); Mun. Wenceslau Guimarães, Reserva Estadual de Wenceslau Guimarães, 380–600 m elev., 1 Apr 1993, *S.C. Sant'Ana & L.A.M. Silva* 309 (CEPEC, MO, NY, RB); Assentamento Oziel

Alves, 13°37'08"S, 39°37'57"W, 18 Aug 2001, *D.M. Loureiro et al.* 602 (ALCB, CEPEC).

**3. *Solanum chirocalyx*** Gouvêa, sp. nov. —TYPE: **BRAZIL**. Bahia: Mun. Santa Teresinha, Serra da Jiboia, topo da serra, próximo às antenas de transmissão, borda de Floresta Ombrófila Densa, 12°50'50"S, 39°28'47"W, 686 m elev., Dec 2018 (fl, fr), *Y.F. Gouvêa, A.M. Amorim, R. Asprino & S.K.V. Bonifácio* 345 (holotype: BHCB [BHCB-195566]; isotypes: to be distributed).

**Diagnosis.** Differs from *S. rupincola* Sendtn., *S. caipora* sp. nov. and *S. gymnum* sp. nov. in its linear-filiform calyx lobes, its trichomes of the adaxial leaf surfaces all or mostly erayed, trichomes bearing midpoints gently curved above the basal-most cell, its golden to greenish golden abaxial leaf surfaces; also differing from *S. gymnum* in its pubescent stems, petioles, inflorescence axes and calyces; from *S. caipora* in its stem, petiole, inflorescence axis and calyx indumentum of strictly sessile to subsessile trichomes.

**High-climbing liana** reaching more than 10 m height, armed. **Young stems** terete, moderately to densely stellate-pubescent with yellowish-ochraceous to ochraceo-ferruginous, sessile to subsessile, porrect to retrose, distinctly long-midpointed, eglandular stellate trichomes and tiny, sessile to short simple glandular trichomes to 0.2 mm long, not visible to the naked eye or in densely indumented plants; the stellate trichomes the stalks to 0.15, multiseriate, many cells wide, the rays 4–7(–10), 0.05–0.35 mm long, 1-celled, the midpoints 0.7–2.3 mm long, 3(–4)-celled, markedly longer and more robust than the rays, curved above the basal-most cell, the epidermis always visible; sparsely to moderately

armed, the prickles 0.8–2.5 mm long, recurved, broad-based, laterally compressed, ferruginous, often gold at base. Bark of older stems glabrescent, grey to greyish brown. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, sometimes with to 1 lobe on each side in young plants, the blades of fully developed leaves (7.5–)11.4–20.5 cm long, (3.8–)5.2–9(–12) cm wide, elliptic to lanceolate or ovate-lanceolate, chartaceous to coriaceous, slightly discoloured when fresh, drying discoloured; the adaxial surface shiny green when fresh, drying dark greenish or greyish brown to black, very sparsely to moderately stellate-pubescent with stramineous to ochraceous, sessile stellate trichomes, all or most erayed (i.e. the rays obsolete, thus the trichome apparently simple), the rayed ones, if present, porrect, with tiny, nearly obsolete rays (with no or few exceptions in a given leaf), the rays 1–6, 1-celled, the midpoints 0.5–2.3 mm long, (2–)3(–4)-celled, usually curved above the basal-most cell, occasionally gland-tipped, usually unarmed, the epidermis always visible; the abaxial surface slightly paler than the adaxial one when fresh, drying golden to greenish golden, moderately to densely stellate-pubescent with stramineous to ochraceous, sessile, porrect stellate trichomes, the rays 4–8, 1-celled, the midpoints 0.7–1.8 mm long, 2–4-celled, markedly longer and more robust than the rays, curved above the basal-most cell, occasionally gland-tipped, the epidermis always visible; armed only along the midrib, the prickles like those of the stems, but with up to 3.2 mm long; primary veins 5–7 pairs; base acute to obtuse or rounded, symmetric to slightly asymmetric, not decurrent onto the petiole; apex acute to cuspidate, rarely rounded; petiole 0.5–1.7 cm long, the indumentum like that of the young stems, unarmed or armed, the prickles like those of the stems. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis's (peduncle plus rachis)



indumentum like that of the young stems, unarmed, less often armed with prickles like those of the stems, but usually smaller, the epidermis always visible; the peduncles (0.4–)0.7–2.3 cm long, the rachis 1.7–5.6 cm long, with (2–)7–14 flowers; the two basal-most pedicel insertion points spaced 1.2–8.9 mm apart, the others gradually more closely spaced towards the apex; pedicels 0.9–1.6 cm long in open flowers, straight to slightly curved, articulated at base, the indumentum like that of the stems, usually unarmed. **Buds** ovoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes soon apparent, not adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped, 1.4–1.8 mm long, the external surface usually slightly 5-knobbed basally (more easily seen in fresh material), the lobes 2.6–10 mm long, 0.4–1 mm wide, linear-filiform, with the same width in the whole length or nearly so, terete to flat, often unequal in length, moderately stellate-pubescent with trichomes like those of the young stems, unarmed or armed, the prickles to 1.2 mm long, usually slightly curved. **Corolla** 2.6–3.8 cm in diameter, pale lilac to white, drying dark brown with black midveins adaxially, stellate, lobed for 3/4–4/5 of its length, interpetalar tissue little developed, the lobes 0.9–1.6 cm long, 5.6–9.3 mm wide, widest in the basal third, lanceolate, slightly reflexed at anthesis, the apex acute, usually cucullate, the adaxial surface usually glabrous; the abaxial surface sparsely to moderately stellate-pubescent with trichomes like those of the stems but usually smaller and somewhat misshapen. **Stamens** equal; the filament tube 1.3–2.1 mm long; the free portion of the filaments 0.7–1.4 mm long, glabrous; anthers 8.2–11.2 mm long, 2–3.2 mm

wide at the widest point, 1.6–2.3 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, usually slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, glabrous, the epidermis of the abaxial surface minutely papillose, connivent. **Ovary** cupuliform, 4-locular, densely pubescent with stramineous to ochraceous, sessile to short-stalked, porrect, distinctly long-midpointed, eglandular stellate trichomes and simple glandular trichomes like those of the stems; the stellate trichomes thin-walled with stalks to 0.2 mm long, multiseriate, 2–3 cells wide, the rays 4–8(–10), 1-celled, often misshapen, the midpoint 0.7–1.6 mm long, 2–3-celled, markedly more robust than the rays, straight; style ca. 15 mm long in long-styled flowers, 2.5–3 mm long in short-styled flowers, cylindrical, straight, glabrous to moderately stellate-pubescent in the basal 1/4; stigma capitate, the surface minutely papillose. **Fruit** a globose berry, ca. 2.5–4 cm in diameter, yellowish orange to brown when mature, densely and remarkably pubescent to hirsute with stellate trichomes like those of the ovary, but the stellate trichomes with midpoints 0.8–2.4 mm long, on average longer than 1.5 mm long, thick-walled, straight, stiff, stramineous to ochraceo-ferruginous; the pericarp soft and not sclerified at maturity; fruiting pedicels 2–3.2 cm long, woody, curved downwards, articulated at the base, usually enlarged towards the calyx, moderately to densely stellate-tomentose with trichomes like those of the inflorescence axis, armed or not; fruiting calyx not accrescent, the tube flat, 0.6–1.1 cm in diameter. **Seeds** ca. 60 per berry, 4–5.2 mm long, 4.1–6.4 mm wide, 0.9–1.3 mm thick when dry, flattened, reniform, black to dark brown when fresh, drying grey to black. **Chromosome number**: not known. Figure 7.

**Distribution**— Endemic to the Bahia State (Fig. 6).

**Ecology and Habitat**—*Solanum chirocalyx* occurs in Atlantic rainforests; from 50 to 800 m elevation.

**Etymology**—The epithet *chirocalyx* is derived from Greek words for hand (*'chiro'* or *'kheirós'* [χειρός]) and calyx (κάλυξ) referring to the distinct spreading linear calyx lobes of *S. chirocalyx*, which give to the calyces of most specimens, an open-hand appearance (especially when fresh).

**Preliminary conservations status**—See Table 1.

**Notes**—Overall morphology of *Solanum chirocalyx* relates it to the Jussiaei clade's member *S. rupicola*, whose identity has been attributed to most of *S. chirocalyx* specimens housed in the examined herbaria collections. Nevertheless, the calyx lobes



Fig. 7. *Solanum chirocalyx* (A– Bb, Ca, D, E: Y.F. Gouvêa et al 345, BHCB; Bc, Cd: L.P. de Queiroz et al. 6389; Bd, Cc: G.C.P. Pinto et al. 116/86, HUEFS; Cb: L.L. Giacomini et al. 1998, BHCB). A. Flowering branch. B(a–d). Calyces. C(a–d). Dissected flowers. D. Young fruit. E. Dissected fruit. Scale bars: A = 5cm; Ba, D = 0.4; Bb = 0.3cm; Bc, Bd = 0.5cm; Ca = 1cm; Cb, Cc, Cd = 1.5cm; E = 2cm.

of *S. chirocalyx* are linear-filiform (Fig. 7B, D), while those of *S. rupicola* vary from lanceolate to narrowly triangular or ovate-lanceolate. *Solanum chirocalyx* also

differs from *S. rupincola* in its golden abaxial leaf surfaces (Fig. 7A), rather than variously brown and often with the more strongly tinged trichomes forming tiny dots to the naked eye; its trichomes of the adaxial leaf surfaces all or mostly erayed, rather than all to mostly rayed; and its trichomes bearing midpoints gently curved above the basal-most cell (Fig. 7B), rather than trichomes with straight to oblique midpoints. Moreover, *Solanum chirocalyx* also can be distinguished from *S. caipora* by its linear-filiform calyx lobes, not lanceolate or triangular. Finally, *S. chirocalyx* also exhibit some resemblance to *S. gymnum* sp. nov, but differs from it in have pubescent young stems, petioles, inflorescence axis and calyces, while vegetative parts of *S. gymnum* are glabrous.

**Additional Specimens Examined (paratypes)—Brazil.** —Bahia: Mun. Amargosa, Serra do Timbó, 29 Apr 2007, *J.L. Paixão et al.* 1200 (HUEFS); Mun. Apuarema, Concessão do Rio Tinto, 7 Mar 2013, *L.Y.S. Aona et al.* 2293 (RB); Mun. Catu, Mata do Cassarangongo, 17 Dec 1986, *G.C.P. Pinto et al.* 116/86 (HUEFS, RB); Mun. Entre Rios, Algodão, 12°10'S, 37°58'W, 150 m elev., 6 May 2014, *A.V. Popovkin & J.C. Mendes* 1703 (ALCB, HUEFS); Fazenda Experimental da Escola de Medicina Veterinária (UFBA), Reserva florestal do povoado de Águazinha, 28 Aug 2009, *N. Roque et al.* 2204 (UFBA); Mun. Esplanada, Algodão, 12°10'S, 37°58'W, 6 Feb 2013, *A.V. Popovkin & J.C. Mendes* 1345 (HUEFS); 30 Oct 2013, *A.V. Popovkin & J.C. Mendes* 1571 (HUEFS); Mun. Itamari, Fazenda Mesquita, 13°00'S, 40°36'W, 7 Oct 2011, *M.N. Oliveira et al.* 134 (HUESB, JPB); Mun. Nova Ibiá, Fazenda Dois Irmãos, 13°43'54"S, 39°33'50"W, 8 Oct 2014, *R.S. Souza et al.* 698 (HUESB, JPB); Mun. Santa Teresinha, Serra da Jibóia, 12°51'11"S, 39°28'19"W, 18 Mar 1995, *F. França et al.* 1097 (CEN, HUEFS, SPF); 12°50'52"S, 39°28'50"W, 700 m elev., 6 Nov 2013, *L.L. Giacomini et al.* 1998 (BHCB); 12°50'55"S, 39°29'08"W, 800 m elev. 14

Apr 1999, *E. Melo et al.* 2617 (HUEFS, HUESB); 12°52'11"S, 39°28'37"W, *M.L.C. Neves* 36 (CEN, HUEFS); 12°51'10"S, 39°28'32"W, 27 Sep 2000, *L.P. Queiroz et al.* 8389 (ALCB, FUEL, HUEFS, RB); 12°15'11"S, 39°28'31"W, 700–800 m elev., *L.P. Queiroz et al.* 6298 (HUEFS, JPB); 12°51'S, 39°28'W, 650–700 m elev., 17 Mar 2001, *J.G.C. Sobrinho* 59 (HUEFS); Serra da Pioneira, 12°45'S, 39°32'W, 750–800 m elev., 21 May 1985, *L.R. Noblick & Lemos* 3736 (CEN, HUEFS, JPB); 12°51'11"S, 39°28'21"W, 14 Nov 1986, *L.P. Queiroz et al.* 1072 (IAC, HUEFS, HST); Mun. Una, rodovia Una/Ilhéus (BA-001), 3 Oct 2017, *Y.F. Gouvêa & R.G. Barbosa-Silva* 234 (BHCB); km 35 da Rod. Olivença/Una, 2 Jun 1981, *L. Hage & E.B. Santos* 823 (CEPEC, RB); rodovia BA-262, a 22 km de Una, 50–75 m elev., 25 Feb 1978, *A.S. Mori et al.* 9276 (CEPEC, MO, NY, RB); Ribeirão das Palmeiras, Serra Javi, 15°09.5'S, 38°18.5'W, 600–760 m elev., 6 Mar 1986, *T.S. Santos et al.* 4195 (CEPEC, NY, RB); REBIO de Una, trilha da bromélia, 15°09'35"S, 39°03'17"W, 1 Mar 2012, *M. Melito et al.* 71 (CEPEC, RB); Reserva Biológica de Una (IBAMA), estrada do Zé Zóinho, 10 May 1998, *A. Martini & G. Santos* 9 (CEPEC); Reserva Biológica do Mico-leão (IBAMA), 15°09'S, 39°05'W, 28 Nov 1993, *A.M.A. Amorim et al.* 1575 (CEPEC, NY); 8–12 Mar 1993, *A.M. Amorim et al.* 1088 (CEPEC, NY, RB); 12 Dec 1995, *A.M. Carvalho et al.* 6184 (CEPEC, MO, NY, RB)

**4. *Solanum depauperatum*** Dunal in A. DC., Prodr. 13(1): 227. 1852.—TYPE: BRAZIL. Bahia: sin. loc., 1840, *J.S. Blanchet* s.n. (lectotype designated here: G! 2 sheets [G00343419; second sheet a duplicate without barcode or accession number, prob. held together with the former]).

**Scrambling shrub** to 4 m height, armed. **Young stems** terete, densely pubescent to tomentose with stramineous or greyish stramineous to ochraceo-ferruginous,

sessile to long-stalked, porrect stellate trichomes and tiny, more or less conspicuous and abundant, simple glandular trichomes; the stellate trichomes with stalks to 0.4(-0.6) mm long, multiseriate, 2-4 cells wide, the rays (4-)8(-9), 0.02-0.75 mm long, 1-celled, occasionally gland-tipped, if so, 2-celled, the midpoint nearly obsolete to the same length as the rays, rarely longer, 1-celled, straight; the simple glandular trichomes subsessile to 0.35 mm long, uniseriate; the epidermis visible to barely visible, sparsely to moderately armed, the prickles 0.6-4 mm long, recurved, broad-based, more or less laterally compressed, golden to ferruginous. Bark of older stems dark brown to greyish dark brown, glabrescent, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire to sinuate, the blades of fully developed leaves 5-12.3 cm long, 2.3-6.1 cm wide, elliptic to lanceolate, rarely obovate or oblanceolate, membranaceous to chartaceous, strongly discoloured; the adaxial surface green when fresh, drying green to brown or dark brown, less often yellowish ochraceous, moderately to densely stellate-pubescent with trichomes similar to those of the stems, but these all sessile to subsessile, or also with less abundant short-stalked trichomes, the stalks to 0.1 mm long, the rays (0-)4-8, to 0.3 mm long but often smaller, the midpoint shorter to longer than the rays, the epidermis always visible, usually unarmed, less often sparsely armed, the prickles ca. 2 mm long, straight, golden to ferruginous; the abaxial surface pale green when fresh, drying beige or grey to greenish or brownish grey, less often pale ochraceo-ferruginous, densely stellate-pubescent to -tomentose with trichomes similar to those of the adaxial surface, but sometimes biradiate, usually with longer rays, all sessile to subsessile, or also with short- rarely long-stalked trichomes, the stalks to 0.3 mm long, the rays (4-)8-18, to 0.5 mm long, the epidermis not to barely visible, unarmed or armed only along the midrib with prickles like those of the

stems, but usually smaller, to 2.7 mm long; primary veins 5–7 pairs; base acute to obtuse, symmetric or asymmetric, not decurrent onto the petiole; apex acute to cuspidate or obtuse-apiculate; petiole 0.6–1.4 cm long, the indumentum like that of the young stems, the epidermis visible or not. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) indumentum similar that of the young stems, but sometimes with longer-stalked trichomes, these less often multiangulate or multiradiate, the stalks 0.4–0.8 mm long, the rays (4–)8–16, the epidermis visible or not; unarmed; the peduncles 0.45–1.7 cm long, the rachis (0.33–)1–5.4 cm long, with 6–20 flowers; pedicel insertion points evenly spaced, to 5 mm apart, gradually more congested towards the apex; pedicels 6–10 mm long in open flowers, straight to slightly geniculate, articulated at base, the indumentum like that of the inflorescence axis, unarmed. **Buds** ovoid, the apex rounded, the calyx open, the tube soon covering all but the corolla apical portion to an intermediate stage of bud development, tightly adhered to the corolla, the calyx lobes soon splitting apically, then gradually splitting to anthesis, tightly adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped, (1.3–)1.7–3.6(–4.1) mm long, the external surface smooth, often irregularly splitting, the lobes 1.6–3.3(–4.9) mm long, (1.8–)2.2–3.3 mm wide, nearly rounded to deltate or shortly oblong with the apex rounded to deltate, apiculate, the apiculae 0.1–0.4 mm long, densely stellate-tomentose with stellate trichomes like those of inflorescence axis, but these denser with shorter stalks to 0.35, unarmed. **Corolla** 2–3.3 cm in diameter, white with purple midveins



adaxially to lilac, stellate, lobed for  $2/3$ – $3/4$  of the way to the base, interpetalar tissue moderately developed 0.9–1.6 mm wide at the widest point, the lobes 0.7–1.4 cm long, 5.7–7.5 mm wide at the widest point, widest in the basal third, lanceolate to triangular, the apex acute, slightly cucullate, the adaxial surface moderately to densely stellate-pubescent for the whole length but along the basal portion of the midvein, the trichomes sessile, porrect to multiradiate, somewhat misshapen; the abaxial surface densely stellate-tomentose for the whole length with sessile to short-stalked, porrect to multiradiate, somewhat misshapen trichomes. **Stamens** equal; the filament tube 1.2–1.7 mm long; the free portion of the filaments 1.2–2 mm long, glabrous; anthers 5.1–9 mm long, 1.4–1.9 mm wide at the widest point, 1.2–1.7 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis of the abaxial minutely papillose, connivent. **Ovary** cupuliform to nearly conical, 4-locular, densely pubescent with delicate, sessile to short-stalked, porrect to biradiate or multiradiate, often somewhat misshapen stellate trichomes and simple, uniseriate, glandular trichomes, the stalks to 0.25 mm long, 2 cells wide, the rays (4–)6–16, 0.05–0.3 mm long, 1-celled, the midpoint 0.1–0.4 mm long, longer than the rays, 1-celled, straight; style 8.9–10.1 mm long in long-styled flowers, 1.9–3.7 mm long in short-styled flowers, cylindrical, straight, sparsely to densely stellate-pubescent in the basal  $3/4$ , gradually sparser upwards, the trichomes like those of the ovary, but less misshapen; stigma bilobed, the surface minutely papillose. **Fruit** a globose berry, sometimes drying piriform when immature, 3–3.5 cm in diameter, orange when mature, densely tomentose with stramineous to ochraceo-ferruginous, sessile to long-stalked, porrect stellate to echinoid and dendritic-echinoid trichomes, the stalks to 0.35 mm long, multiseriate, relatively slender, 2–

3 cells wide, the rays (4-)8-20(<), 0.05-0.4 mm long, 1-celled, the midpoint usually as long as the rays, 1 celled, the pericarp thick and sclerified when mature; fruiting pedicels 1.5-2.5 cm long, woody, curved downwards, articulated at the base, enlarged towards the calyx, unarmed; fruiting calyx not accrescent, often slightly swollen, the tube flat or nearly so, 10-14.7 mm in diameter, the lobes 2-4.1 mm long, sometimes breaking off eventually. **Seeds** ca. 180 per berry, 2.2-3 mm long, 3-4.1 mm wide, 0.7-0.9 mm thick when dry, flattened, reniform, black when fresh, drying grey. **Chromosome number**: not known. Figure 8.

**Distribution**—Endemic to the Bahia State (Fig. 9).

**Ecology and Habitat**—*Solanum depauperatum* inhabits seasonal semi-deciduous tropical forests lying in the semi-arid matrix of continental Bahia state; from 220 to 980 m elevation.

**Etymology**—The epithet *depauperatum* is formed by the union of the Latin prefix 'de-' (in) and the word 'pauper' (poor), meaning impoverished. It probably refers to the incompleteness of *S. depauperatum* type material.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum depauperatum* is a member of the Jussiaei clade. It has the most continental distribution amongst species of the same clade, occurring in seasonal semi-deciduous forests lying in the semi-arid matrix of the Bahia State interior. *Solanum depauperatum* resembles the other Jussiaei clade species, *S. botocudo* and *S. jussiaei*, in having fruits with rigid, sclerified pericarps (Fig. 8E), being, however,

more similar to *S. jussiaei* in general aspects. Both *S. depauperatum* and *S. jussiaei* have discoloured leaves (more markedly in *S. depauperatum*; Fig. 8A) with abaxial surfaces densely stellate pubescent and flower buds with at least the corolla apex soon

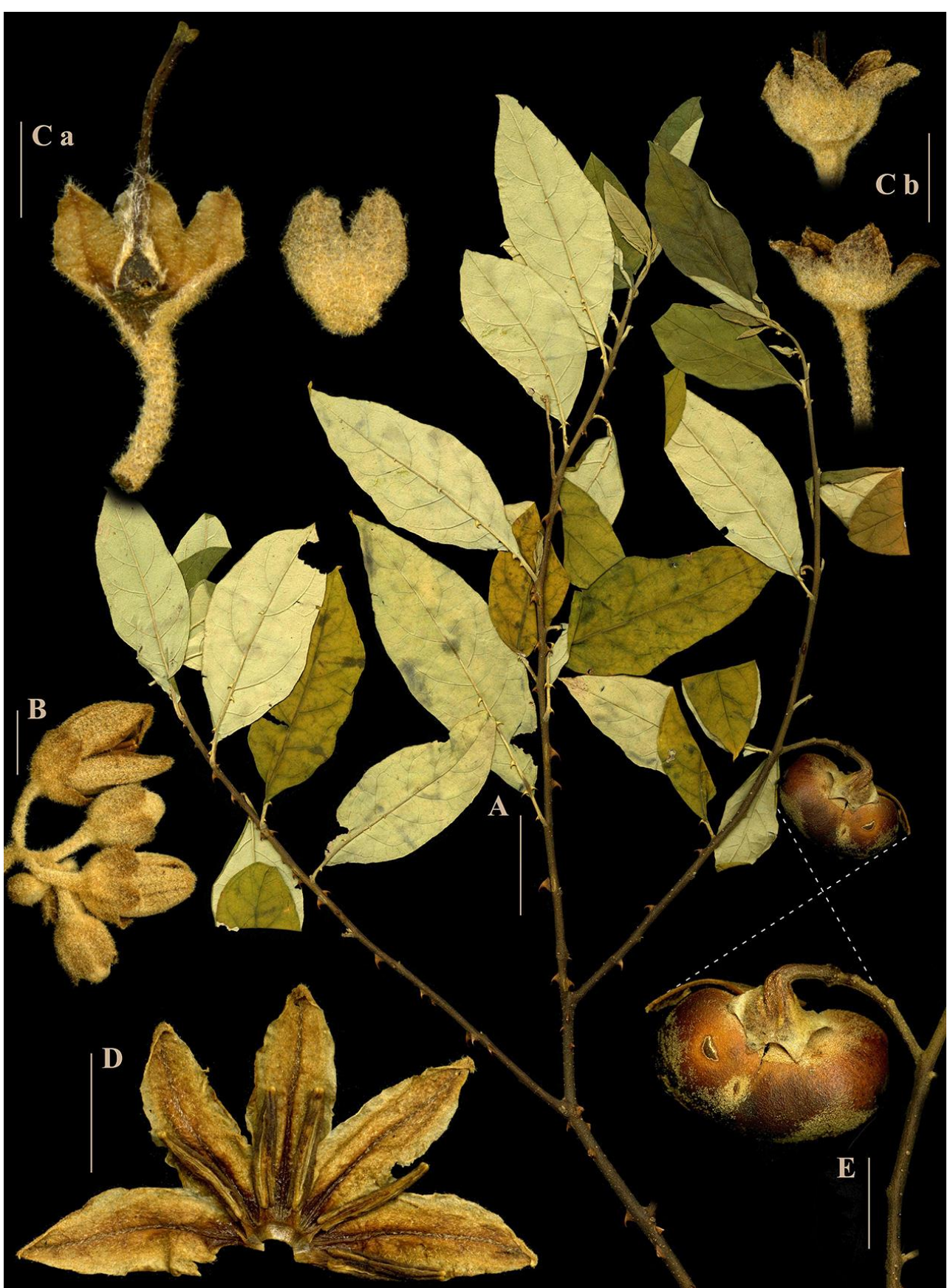


Fig. 8. *Solanum depauperatum* (A, E: Y.F. Gouvêa et al. 343, BHCB; B, Ca, D: L.P. de Queiroz 16337; Cb: C.T. Lima et al. 37, HUEFS). A. Fruiting branch. B. Flower buds. C(a-b). Dissected calyx, calyx lobes and gynoecium. D. Dissected flower. E. Fruit. Scale bars: A = 3 cm; B = 0.5 cm; Ca = 0.5cm, Cb = 0.4cm; D = 0.85 cm; E = 1.5cm.

exposed. Differently, *S. botocudo* has concolorous or slightly discolorous leaves with both surfaces sparsely to moderately pubescent, and flower buds with

corollas completely enclosed by long calyx lobes, which remains fused to anthesis. Flower buds also distinguish *S. depauperatum* from *S. jussiaei*. Those of *S. depauperatum* are ovoid, with the calyx tube covering all but the corolla's apical portion to an intermediate stage of bud development (Fig. 8B), while in *S. jussiaei* buds are lanceoloid to oblong with the calyx tube soon covering only the corolla base. Moreover, leaves of *S. depauperatum* are strictly elliptic to lanceolate (Fig. 8A), whereas those of *S. jussiaei* are usually ovate or somewhat cordiform (less often elliptic). Finally, *S. jussiaei* has a predominantly coastal distribution and has not been recorded to the Bahia State.

***Additional Specimens Examined—Brazil.***—Bahia: Mun. Anguera, morro da Fazenda Retiro, 12°10'01"S, 39°11'16"W, 380 m elev., 21 Nov 2006, *D. Cardoso & F. França 1434* (HUEFS); Mun. Feira de Santana, a oeste pela rod. BA-052, entrada em estrada de terra à direita a aprox. 20 km antes do mun. de Anguera, 12°13'56"S, 39°04'33"W, 235 m elev., Dec 2018, *Y.F. Gouvêa et al. 343* (BHCB); Distrito de Ipuacú, Monte Alto, 14°13'55"S, 39°04'34"W, 220 m elev., 8 Jul 2006, *C.T. Lima et al. 37* (HUEFS); 12°13'45"S, 39°04'33"W, 260 m elev., 25 Nov 2005, *C.T. Lima et al. 4* (HUEFS); 12°13'56"S, 39°04'33"W, 253 m elev., 11 Feb 2003, *A.O. Moraes et al. 139* (HUEFS, ESA); Mun. Itaberaba, Serra 1, Faz. Gameleira, 12°24'44"S, 40°32'12"W, 783 m elev., *L.P. Queiroz et al. 10801* (HUEFS); Mun. Itaeté, próximo ao Rio Una, sentido Cachoeira do Roncador, 13°04'29"S, 41°08'03"W, 332 m elev., *L.P. Queiroz et al. 16337* (HUEFS);

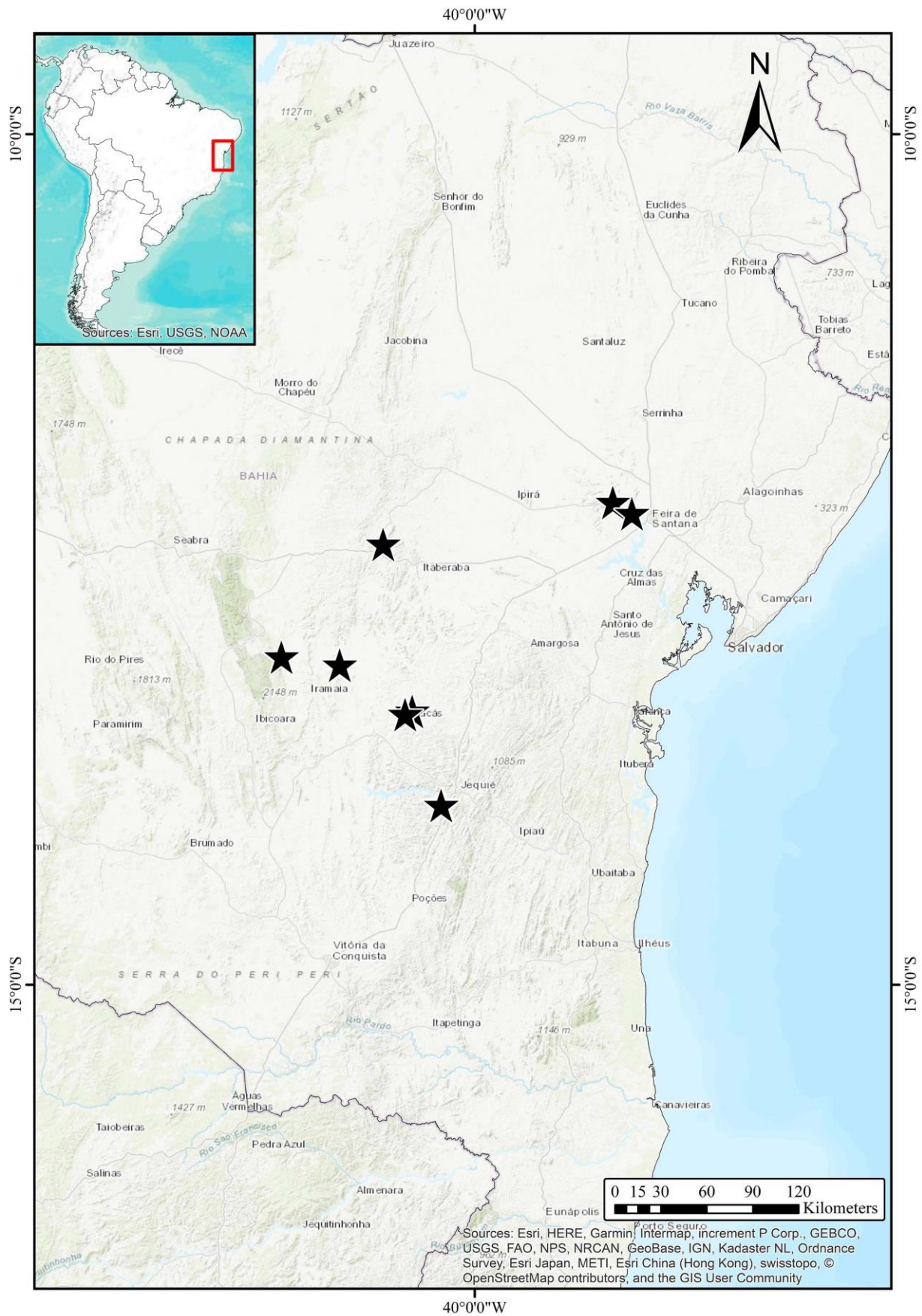


Fig. 9. Distribution of *Solanum depauperatum*.

Mun. Jequié, Serra do Castanhão, 14.5 km S of Jequié on BR-116, then 7.5 km W (at Pousada Corujão) to Embratel tower, 13°56'22"S, 40°11'27"W, 835 m elev., 25 Jul 2003, *W.W. Thomas et al. 13556* (CEPEC, HUESB, JPB, NY); 13°56'52"S, 40°11'46"W, 775 m elev., 23 Oct 2001, *W.W. Thomas et al. 12535* (CEPEC, MO, NY); Mun. Maracás, estrada para cruzeirinho, 13°23'39"S, 40°21'57"W, 392 m elev., *G.E.L. Macedo et al. 34* (HUEFS, HUESB); ca. 1.5 km após Cruzeiro, 13°24'47"S, 40°24'27"W, 982 m elev., *E. Melo et al. 11327* (HUEFS); Mun. Machado Portello, vicinity of Machado Portello, 19–23 Jun 1915, *J.N. Rose & P.G. Russel 19911* (NY, US).

**5. *Solanum goytaca*** Gouvêa, sp. nov. —TYPE: **BRAZIL**. Espírito Santo: Mun. Jaguaré, Barra Seca, crescendo em borda de mata, ao sol, 18°56'47"S, 40°08'47"W, 82 m elev., 31 Mar 2019 (fl, fr), *Y.F. Gouvêa & G.V.A. Santos 324* (holotype: BHCBC [BHCBC194939]; isotypes: to be distributed).

**Diagnosis.** Differs from *S. depauperatum* Dunal, *S. jussiaei* Dunal, *S. ochroneurum* Link, *S. puri* sp. nov., and *S. tupinamba* sp. nov. in having flower buds with calyces completely enclosing the corolla to anthesis, anthers with the abaxial surface markedly warty; also differ from *S. depauperatum*, *S. jussiaei* and *S. ochroneurum* in its very sparsely to glabrous adaxial leaf surfaces; differs from *S. botocudo* in its very densely adaxial leaf surfaces.

**High-climbing liana** reaching more than 7 m height, armed. **Young stems** terete, densely and compactly stellate-tomentose with small, pale castaneous to greyish or ochraceo-castaneous, sessile to subsessile, eglandular porrect stellate trichomes, the stalks < 0.02 mm long, multiseriate, 2–3 cells wide, the rays (7–)8(–

9), 0.05–0.2 mm long, 1-celled, the midpoint obsolete or nearly so, always shorter than the rays, 1-celled, straight; the epidermis not or barely visible, drying wrinkled on younger portions, sparsely to moderately prickly, the prickles 0.5–2 mm long, strongly recurved, the base slightly elongate, castaneous. Bark of older stems glabrescent, lenticled, greyish brown. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, the blades of fully developed leaves 7–12.3 cm long, 3–6.2 cm wide, elliptic to oblanceolate, less often nearly obovate, chartaceous, strongly discolourous; the adaxial surface shiny green to dark green when fresh, drying greenish brown or brown to black, very sparsely stellate-pubescent to glabrous, the stellate trichomes like those of the stems, but sometimes hyaline, the epidermis always visible with prominent veins, unarmed; the abaxial surface greenish or greyish beige when fresh, drying grey or greyish beige to pale castaneous or ochraceous, densely stellate-pubescent with trichomes like those of the stems, the most abundant trichomes hyaline to stramineous, the less abundant and slightly larger ones ochraceous, the epidermis barely or not visible, armed only along the midrib or unarmed, the prickles like those of the stems; primary veins 5–7 pairs; base acute to obtuse, symmetric or asymmetric, not decurrent onto the petiole; apex cuspidate to rounded-apiculate, less often acute; petiole 0.9–3.3 cm long, the indumentum like that of the young stems, the epidermis drying wrinkled, usually armed, the prickles like those of the stems. **Inflorescence** an unbranched cyme, rarely forked, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) indumentum like that of the stems, the epidermis not or barely visible; usually unarmed, less often with few prickles along the peduncle (especially in older inflorescences), the prickles like those of the stems but smaller, to 0.8 mm long; the peduncles (0.1)0.7–3 cm long, the rachis



1.5–6.5 cm long, with 7–28 flowers; pedicel insertion points evenly and closely spaced, to 2.1 mm apart, more congested distally, sometimes nearly paired; pedicels 5–9 mm long in open flowers, not geniculate, articulated at base, the indumentum like that of the young stems, unarmed. **Buds** ovoid to lanceoloid when young, then ellipsoid to oblong, the apex rounded, the calyx closed, completely enclosing and tightly adhered to the corolla, the calyx lobes completely fused to just before anthesis. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped, 2.6–3 mm long, the base more or less swollen, the external surface smooth, slightly and somewhat irregularly undulate or shallowly 5-knobbed when fresh, drying markedly wrinkled, often slightly constricted distally, the lobes 6–7.7 mm long, 3.6–4.4 mm wide, triangular to nearly lanceolate with acute apices, usually irregularly splitting with lobe pairs remaining completely fused, densely stellate-tomentose with stellate trichomes like those of stems, unarmed. **Corolla** 3–4 cm in diameter, light blue to lavender, the midveins drying black adaxially, stellate, lobed for ca. 1/2–2/3 of the way to the base, interpetalar tissue moderately developed 1.6–3 mm wide at the widest point, the lobes 1–1.6 cm long, 8.3–11 mm wide at the widest point, widest in the middle to the basal third, lanceolate, strongly reflexed at anthesis, the apex acute, cucullate, both the adaxial and abaxial surfaces densely stellate-pubescent for the whole length with trichomes like those of the stems, but slightly to strongly misshapen, the abaxial surface always denser than the adaxial one. **Stamens** equal or slightly unequal; the filament tube 1.2–1.6 mm long; the free portion of the filaments 2.6–3.8 mm long, glabrous; anthers 8–10.8 mm long, 1.8–2.4 mm wide at the widest point, 1.7–

2.2 mm thick at the thickest point, widest and thickest in the basal third, narrowly lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis of the abaxial surface strongly warty and papillose, tightly connivent. **Ovary** cupuliform, 4-locular, densely pubescent with trichomes similar to those of the stems, but usually misshapen, hyaline to ochraceous, and small simple glandular trichomes to 0.15 mm long; style ca. 11–16 mm long in long-styled flowers, 5.2–5.4 mm long in short-styled flowers, cylindrical, straight, moderately to densely stellate-pubescent in the basal fifth to the middle, sparser towards the apex, the trichomes like those of the stems, but more delicate and somewhat misshapen; stigma clavate to bilobed, the surface papillose. **Fruit** a globose berry 3–4.5 cm in diameter, yellowish-orange to orange when mature, densely stellate-tomentose to -pubescent with stramineous to ochraceo-ferruginous, sessile to long-stalked, porrect to multiangulate or multiradiate trichomes, the stalks to 0.35 mm long, multiseriate, relatively slender, 2–3 cells wide, the rays (6)8–18, 0.08–0.3 mm long, 1-celled, occasionally gland-tipped, if so 2-celled, the midpoint shorter to slightly longer than the rays, 1-celled; the pericarp soft and not sclerified at maturity; fruiting pedicels 1–2 cm long, woody, strongly curved, articulated at the base, gradually enlarged towards the calyx, unarmed; fruiting calyx not accrescent, often slightly expanded with 5 more or less prominent, longitudinal, swelled rounded ridges, these sometimes absent, less conspicuous or with a wrinkled appearance after drying, the tube flat or nearly so, 9–12.2 mm in diameter. **Seeds** ca. 100 per berry, immature seeds to 5.2 mm long, 5.6 mm wide and 1 mm thick when dry, flattened, reniform, drying red; mature seeds not observed. **Chromosome number:** not known. Figure 10.

***Distribution***—Endemic to the Espírito Santo State (Fig. 11).

***Ecology and Habitat***—*Solanum goytaca* grows in low Atlantic rainforests; from 50 to 120 m elevation.

***Etymology***—This specific epithet honors the extinct indigenous ethno-linguistic group called as *Goytaca* or *Waiataká*. Their tribes were distributed along coastal lands between the states of Espírito Santo and Rio de Janeiro, and partially coincides with the distribution of *S. goytaca* (for details on the distribution of Brazilian ethno-linguistic indigenous groups, see Nimuendajú's 2017 map: <http://portal.iphan.gov.br/indl/pagina/detalhes/1574/>).

***Preliminary conservations status***—See Table 1.



Fig. 10. *Solanum goytaca* (Y.F. Gouvêa and G.V.A. Santos 324, BHCB). **A(a-b)**. Flowering branch. **B**. Young inflorescence and flower buds. **C(a-b)**. Dissected calyx, calyx lobes and gynoecium. **D**. Dissected flower. **E**. Stamens. **F**. Fruiting calyx. Scale bars: **A** = 4.5cm; **B** = 2cm; **Ca**, **Cb**, **E** = 0.5cm; **D** = 0.9cm; **F** = 2 cm.

**Notes**—*Solanum goytaca* has the narrower known range amongst the members of the Jussiaei clade, and is unique in having anthers with the abaxial surface

markedly warty (Fig. 10E). Vegetatively, it mostly resembles *S. tupinamba* sp. nov., with which it shares elliptic to oblanceolate leaf blades (although also lanceolate in *S. tupinamba*; see Fig. 10A); shiny, very sparsely pubescent or glabrous adaxial leaf surfaces (Fig. 10A); stems and petioles covered by a dense and compact indumentum of small, sessile to subsessile stellate trichomes (sometimes also short-stalked in *S. tupinamba*), which give to them a ‘ceramic’ appearance and range from ochraceo-castaneous to orange-ferruginous; and strongly curved to curled pedicels. These set of characters distinguish *S. goytaca* and *S. tupinamba* from all other prickly climbing, hairy- and large-fruited species of *Solanum*. In spite of its great vegetative similarity, the calyces and other floral parts of the species are quite distinct (Fig. 10B, C, D), which makes the differentiation of reproductive specimens relatively easy. Calyx buds of *S. goytaca* are completely enclosed with long calyx lobes (i.e. 6–7.7 mm long, 3.6–4.4 mm wide) that remains fused to anthesis (Fig. 10B, C), while those of *S. tupinamba* soon covers only the corolla base with much smaller lobes (i.e. 0.3–1.4 mm long, 0.85–1.8 mm wide).

**Additional Specimens Examined (paratypes)**—*Brazil*.—ESPÍRITO SANTO: Mun. Governador Lindeberg, Morelo, 19°08’54”S, 40°27’27”W, 110–150 m elev., 24 Aug 2006, *V. Demuner et al.* 2794 (MBML); Mun. Jaguaré, Barra Seca, 18 Jan 1996, *G. Hupp* 2 (MBML); *G. Hupp* 11 (MBML); 15 Apr 1996, *G. Hupp* 29 (MBML); Mun. Linhares, Reserva de Florestas Rio Doce, Mar 1986, *M. Sobral* 4657 (CVRD, ICN); *M. Sobral & D.A.*

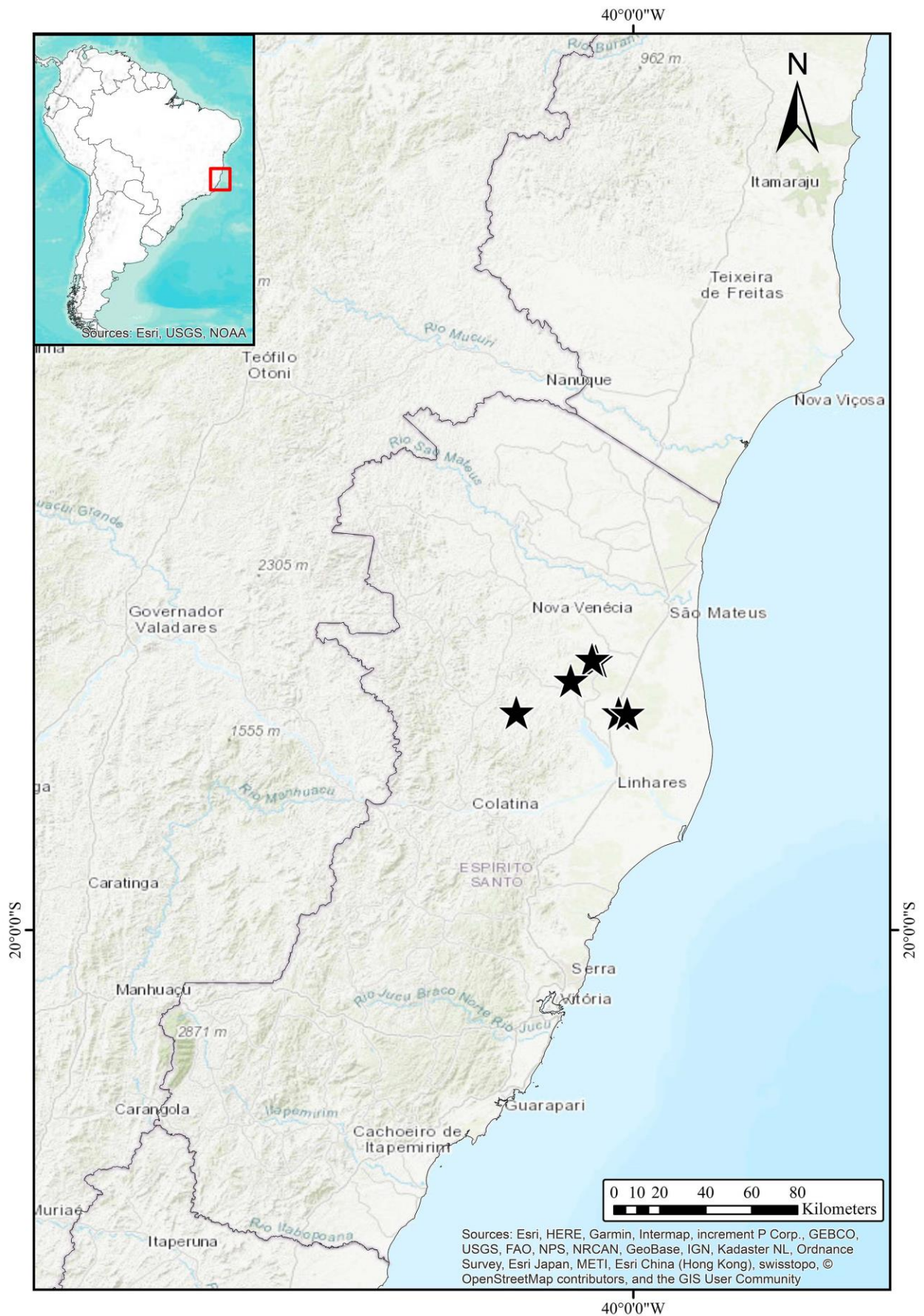


Fig. 11. Distribution of *Solanum goytaca*.

*Folli 4767* (CVRD, ICN, INPA); Reserva de Linhares, estrada X-1, 30 Jan 1972, *D. Sucre 8305* (RB); Mun. Sooretama, Reserva Biológica de Sooretama, porção oeste, estrada do Picadão, 20 Jan 2010, *M. Ribeiro et al. 77* (BHCB, SAMES).

**6. *Solanum gymnum*** Gouvêa, sp. nov.—TYPE: **BRAZIL**. Bahia: Mun. Uruçuca, Dist. Serra Grande, Parque Estadual da Serra do Condurú, Fazenda Óregon, escandente na orla da mata, 14°30'19"S, 39°06'26"W, 29 Sep 1999 (fl), *A.M. Amorim, W.W. Thomas, K. Everhart & E. Whitfield 3126* (holotype: CEPEC [CEPEC-83715]; isotypes: BHCB [BHCB-102582]; JPB [JPB-33602], RB [RB00526713]).

**Diagnosis.** Differs from *S. rupicola* Sendtn., *S. caipora* sp. nov. and *S. chirocalyx* sp. nov. in having stems, petioles, leaves, inflorescence axes and calyces glabrous.

**High-climbing liana** reaching more than 10 m height, armed. **Young stems** terete, glabrous except for minute, simple, sessile to subsessile, glandular trichomes to 0.05 mm long (not visible to the naked eye), these denser on the younger parts, the younger portions drying dark brown to black, the older more lignified ones stramineous to golden, obviously or inconspicuously armed, the prickles 0.5–2.2 mm long, recurved, laterally compressed, the base elongate. Bark of older stems drying greyish brown. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, the blades of fully developed leaves (7–)11.1–15 cm long, (2.2–)3.8–7.1 cm wide, elliptic, less often oblanceolate, chartaceous, concolorous to slightly discoloured when fresh, drying slightly discoloured, always paler abaxially; both surfaces completely glabrous except for minute papillae like those of the young stems or their scars in older leaves, the epidermis always visible; the adaxial surface shiny green when fresh, drying dark brown to black,

unarmed or less often armed along the midrib with tiny prickles; the abaxial surface green when fresh, drying brown, greyish or greenish brown armed only along the abaxial midrib or unarmed, the prickles to 2.5 mm long, strongly recurved, broad-based, laterally compressed; primary veins 5–7(–8) pairs; base acute, occasionally nearly oblique and asymmetric, not decurrent onto the petiole; apex acute, cuspidate, rounded-apiculate or rounded; petiole 1–2.4 cm long, glabrous, drying black, unarmed or armed, the prickles like those of the stems, these up to 2.5 mm high, 4.1 mm long, 1.6 mm wide. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) by the subsequent sympodial unit's development; the axis (peduncle plus rachis) glabrous, unarmed to sparsely armed, the prickles to 2 mm long, straight to recurved; the peduncles obsolete to 1 cm long, the rachis 1.7–4.5 cm long, with (2–)6–12 flowers, sometimes with a nearly obsolete axis giving the inflorescence a few-flowered (2–4 flowers) fasciculate appearance; the two most proximal pedicel insertion points distinctly more spaced, 0.6–2.2 cm apart, the others usually gradually less spaced from each other towards the apex; pedicels 1.7–2.3 cm long in open flowers, straight, articulated at base, glabrous except for minute simple glandular trichomes like those of the young stems, unarmed or sparsely armed with tiny prickles. **Buds** ovoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes soon apparent, not adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped, 1.7–2.2 mm long, slightly 5-knobbed externally at base (more easily seen in fresh or rehydrated material), the lobes 16–23 mm long, 2.7–5 mm wide, widest



in the upper basal third to the middle, lanceolate to narrowly elliptic, nearly oblong, with a distinct petiole-like narrowing at base, the apex acuminate to acute, the lobes usually unequal in size, glabrous except for minute simple glandular trichomes like those of the young stems, armed or not. **Corolla** ca. 3.5 cm in diameter, pale lilac to nearly white, drying dark brown with black midveins adaxially, stellate, lobed ca. 5/6 of the way to the base, interpetalar tissue little developed, the lobes 1.5–1.8 cm long, 6.5–7.6 mm wide, widest in the basal third, lanceolate, planar to slightly reflexed at anthesis, the apex acute to acuminate, the tips cucullate, the adaxial and abaxial surfaces glabrous or with few sessile stellate trichomes at the apex, these usually with a robust midpoint many times longer than the rays, the margins covered by tiny, contrasting yellow, misshapen, branched trichomes. **Stamens** equal; the filament tube ca. 2 mm long; the free portion of the filaments ca. 0.6 mm long, glabrous; anthers 7.8–11 mm long, 2.2–3 mm wide at the widest point, ca. 2.8 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis of the abaxial surface glabrous and minutely papillose, connivent. **Ovary** cupuliform, 4-locular, densely pubescent with hyaline, stramineous or pale yellow, sessile to subsessile, porrect to retrorse, distinctly long-midpointed stellate trichomes and minute simple glandular trichomes like those of the stems; the stellate trichomes thin-walled with stalks to 0.1 mm long, multiseriate, 2–3 cells wide, the rays (4–)6–8, 0.05–0.3 mm long, usually eglandular, 1-celled, the midpoint 0.8–1.6 mm long, 2–3(–6) celled, markedly more robust than the rays, straight, both rays and midpoint occasionally glandular; style ca. 1.5 cm long in long-styled flowers, ca. 3 mm long in short-styled flowers, cylindrical, straight, glabrous; stigma capitate, the surface papillose. **Fruit** a globose berry, 3–4 cm in diameter when mature, orange, densely

and remarkably pubescent to hirsute with trichomes like those of the ovary, but the stellate, distinctly long-midpointed trichomes thick-walled and stiff, yellow, ochraceous or ferruginous, usually more rayed with longer midpoints, the rays 8–12, usually eglandular, 1-celled, the midpoint 2.6–4.8 mm long, 2–3-celled, straight, the pericarp soft, not sclerified when mature; fruiting pedicels 2.9–4 cm long, woody, curved downwards, articulated at the base, usually gradually enlarged towards the calyx, glabrous, usually armed; fruiting calyx not accrescent, the tube flat, ca. 8.5 mm in diameter, the lobes longer than those of the flowering calyx, to 2.9 cm long and to 5.8 mm wide at the widest point. **Seeds** ca. 70 per berry, 4.3–5.5 mm long, 4.3–5.4 mm wide, 0.6–1 mm thick when dry, flattened, reniform to nearly discoid, dark brown to black when fresh, drying grey to black.

**Chromosome number:** not known. Figure 12.

***Distribution***—Endemic to the Bahia State (Fig. 6).

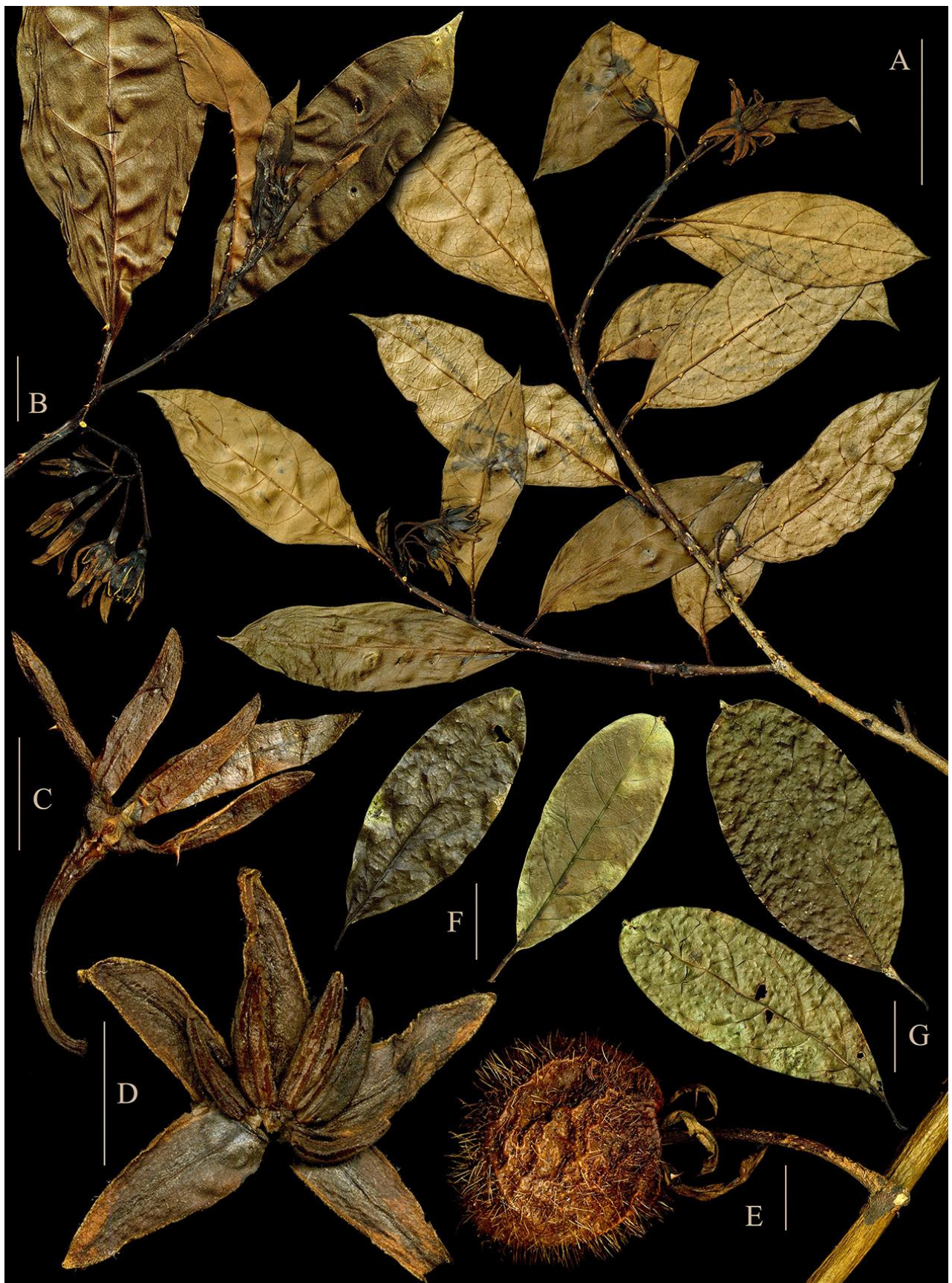


Fig. 12. *Solanum gymnum* (A–D: A.M. Amorim et al. 3126, BHCB, CEPEC and JPB; E: A.M. Amorim et al. 6727, BHCB; F: S.F. Conceição et al. 452, BHCB). A. Flowering branch. B. Young inflorescence and flower buds. C. Calyx. D. Dissected flower. E. Fruit. F–G. Leaves. Scale bars: A = 5cm; B = 1.5cm; C, D, E = 1 cm; F, G = 3cm.

**Ecology and Habitat**—*Solanum gymnum* grows low Atlantic rainforests; from sea level to 520 m elevation.

**Etymology**—The specific epithet comes from the Greek word “*gymnos*” (γυμνός), meaning naked, referring to the distinctly glabrous vegetative parts of this species.

**Preliminary conservation status**—See Table 1.

**Notes**—*Solanum gymnum* is morphologically related to *S. caipora*, *S. chirocalyx* and the already known *S. rupicola*. All these four species have peculiarly pubescent to hirsute fruits with trichomes bearing long, straight and stiff midpoints of two or three cells long, usually far exceeding the length of the rays (Fig. 12E). *Solanum gymnum* differs from them in having the epidermis of all its vegetative parts completely glabrous, with the exception of minute, sessile to subsessile, uniseriate glandular trichomes (not visible to the naked eye; Fig. 12A, B, F, G). Differently, in *S. caipora*, *S. chirocalyx* and *S. rupicola* the epidermis of these organs has always a conspicuous, sparse to dense, stellate trichome coverage. It is worth mentioning that few poorly developed and early deciduous stellate trichomes were noted on the youngest portions of some specimens. Furthermore, *S. gymnum* can also be distinguished from those species by the shape of its calyx lobes. Its calyx lobes have a distinct petiole-like narrowing at base, which gives it a leaf-shaped appearance (Fig. 12C). In *S. caipora*, *S. chirocalyx* and *S. rupicola* the calyx lobes have not that distinct basal narrowing.

**Additional Specimens Examined (paratypes)**—Brazil.—Bahia: Mun. Arataca, Serra do Peito-de Moça, RPPN Caminho das Pedras, 15°10'25"S, 39°20'30"W, 1000

m elev., 20 Jan 2007, *A.M. Amorim et al.* 6727 (CEPEC); Mun. Ilhéus, 2 km NNE of Banco da Vitória on road leading to west edge of Mata da Esperança, 14°46'38"S, 39°05'28"W, 28 Sep 1994, *W.W. Thomas et al.* 10713 (CEPEC, MO, NY); Mun. Ipiaú, between Ipiaú and Ibirapitanga, cocoa plantation (old forest), aprox. 14°10'S, 39°50'W, ca. 100 m elev., 26 Jan 1980, *R.A. Harley et al.* 20681 (CEPEC); Mun. Maraú, antiga Estrada Maraú-Itacaré, 14°13'31"S, 39°00'51"W, 14 Feb (?), *M.F. Fernandes et al.* 375 (HUEFS); Mun. Una, beira da estrada próximo a um lixão, 15°15'16"S, 39°03'08"W, 45 m elev., 28 Dec 2005, *S.F. Conceição et al.* 452 (BHCB, HUEFS); Mun. Uruçuca, 7.4 km north of Serra Grande on road to Itacaré, Fazenda Lagoa do Conjunto Fazenda Santa Cruz, 14°25'24"S, 39°03'38"W, 12 May 1995, *W.W. Thomas et al.* 10904 (CEPEC, NY).

**7. *Solanum jussiaei*** Dunal in Poir., *Encycl., Suppl.* 3: 767. 1814.—TYPE: **BRAZIL**. Rio de Janeiro: sin. loc., Jul–Jun 1767 (fl), *P. Commerson* 165 (lectotype designated here: P! [P00578360]; the lectotype and the paratype *P. Commerson* 166 [P00578361] mounted in the same sheet).

*Solanum curvispinum* Dunal in DC., *Prodr.* 13(1): 265. 1852.—TYPE: **BRAZIL**. Rio de Janeiro: sin. loc., 1833, *C. Gaudichaud* 526 (holotype: P! [P00083354]; isotype: G [G00227715]).

*Solanum cydoniifolium* Dunal in DC., *Prodr.* 13(1): 209. 1852.—TYPE: sin. loc., prob. Brazil, 1830, *C. Gaudichaud* s.n. (holotype: G! [G00145831]).

*Solanum glaziovii* Hiern, Vidensk. Meddel. Dansk Naturhist. Føren. Kjøbenhavn 47. 1877–78.—TYPE: BRAZIL. Rio de Janeiro: sin. loc., *A.F.M. Glaziou 6059* (lectotype designated here: C! [LNR-13059]; isolectotype: P! [P00335474]).

*Solanum paratyense* Vell., Fl. Flumin., 90. 1829 (“1825”); Fl. Flumin. Icon. 2: t. 130. 1831 (“1827”).—TYPE: **BRAZIL**. Rio de Janeiro: “Offendi ad littoral Pitaguaba dicta, trans cautes Cairusú tractu Pharmaco-politano” (lectotype, designed by Knapp et al. 2015, pg. 832 [illustration] Original parchment plate of Flora Fluminensis at the Manuscript Section of the Biblioteca Nacional, Rio de Janeiro [cat. no.: mss1198651\_133], later published in Vellozo, Fl. Flumin. Icon. 2: t. 130. 1831).

*Solanum ovalifolium* var. *campylacanthum* Dunal in DC., Prodr. 13(1): 270. 1852.—TYPE: **BRAZIL**. Rio de Janeiro: sin. loc., 1834, *C. Gaudichaud 526* (holotype: G! [G00130262]).

**Medium-height climbing liana to scrambling shrub** reaching ca. 6 m, armed. **Young stems** terete, densely stellate-tomentose with stramineous to ochraceo-ferruginous, sessile to short- or long-stalked, glandular and eglandular, erayed (i.e. the rays obsolete, thus the trichome apparently simple) to porrect, multiangulate or multiradiate stellate to dendritic-echinoid trichomes, the stalks to 0.25 mm long, multiseriate, 3–4 cells wide, the rays obsolete in some less conspicuous smaller trichomes to >20 in the larger ones, 0.02–0.35 mm long, the more robust trichomes (i.e. the longer stalked and rayed and/or more branched ones) with the rays of the upper most whorl usually eglandular, and those of the lower whorls eglandular or gland-tipped, the less robust and smaller trichomes (i.e. shorter stalked and rayed ones) completely eglandular, or with one to all rays gland-

tipped, the eglandular rays 1-celled, the gland-tipped ones 2–3-celled, usually smaller and less conspicuous than the eglandular rays, the midpoint obsolete to 0.15(–0.2) mm long, eglandular, 1-celled, straight to oblique, the epidermis barely visible to visible; sparsely to moderately prickly, the prickles 0.8–3.1 mm long, recurved, broad-based, laterally compressed, golden to ferruginous. Bark of older stems brown to dark brown, glabrescent, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire to lobed, the blades of fully developed leaves 3.4–11.2 cm long, 1.8–6.8 cm wide, ovate to somewhat cordiform, less often elliptic, trullate or rhombic, membranaceous, slightly discoloured when fresh, drying more markedly discoloured; the adaxial surface green when fresh, drying greenish brown, brown, greenish dark brown to black, moderately to densely stellate-pubescent with stramineous to ferruginous, sessile to short-stalked, erayed and porrect, usually eglandular stellate trichomes mixed with small, more or less conspicuous simple, uniseriate, glandular trichomes; the stellate trichomes with stalks to 0.2 mm long, multiseriate, 3–4 cells wide, the rays obsolete to 8(–10), with up to 0.3 mm long, 1-celled, occasionally gland-tipped, if so, 2–3-celled, the midpoint nearly obsolete to 0.15 mm long, 1-celled, always shorter than the rays in the rayed stellate trichomes, straight to oblique; the simple glandular trichomes subsessile to 0.08 mm long, uniseriate, the epidermis always visible, unarmed; the abaxial surface green when fresh, drying greyish or ochrish beige, brown or brownish dark grey, always paler than the adaxial surface, densely stellate-tomentose with stellate trichomes like those of the adaxial surface, but usually denser with longer stalks and slightly longer rays, both the stalks and rays to 0.4 mm long, the stellate trichomes with less than 4 rays, if present, usually much less abundant, the epidermis barely visible; unarmed or armed only along the midrib, the prickles like those of the stems but smaller, to 2

mm long; primary veins (3–)4–5 pairs; base truncate, shallowly cordate or obtuse, less often acute, symmetric or asymmetric, not decurrent onto the petiole; margins with 0–3 lobes on each side, these with up to 1.5 cm long, shallowly deltate to nearly oblong, apically rounded to obtuse; apex acute to obtuse or rounded, apiculate or not; petiole 1.2–2.7 cm long, the indumentum like that of the young stems, unarmed or armed, the prickles like those of the abaxial leaf surface.

**Inflorescence** an 1 to 3 times forked, occasionally unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) densely stellate-tomentose with trichomes like those of the young stems, but usually with a higher proportion of multialgulate- or multiradiate-stellate to dendritic-echinoid trichomes, these often longer stalked, the stalks to 0.6 mm long, usually unarmed; the peduncles 0.3–2 cm long, the rachis (0.6–)1.8–4.2 cm long, with (4–)12–58 flowers; pedicel insertion points closely, evenly or unevenly spaced, nearly paired to 3.5 mm apart, gradually more congested towards the apex; pedicels 7–9 mm long in open flowers, straight to slightly geniculate distally, articulated at base, the indumentum like that of the inflorescence axis, usually unarmed. **Buds** ovoid when young, then lanceoloid to oblong, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes nearly absent to soon splitting and tightly adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped, 1.4–2.2 mm long, truncate, the lobes mere apiculae on the rim or clearly lobed, if lobed, the lobes to 1.3 mm long, 1.2–2 mm wide, rounded, obtuse, deltate, or somewhat quadrate,



apiculate, the apiculae 0.1–0.4 mm long, sometimes irregularly splitting, densely stellate-tomentose with stellate trichomes like those of the inflorescence axis, but with slightly shorter stalks, unarmed. **Corolla** 1.9–3.5 cm in diameter, lilac to white, stellate, lobed for 3/4–4/5 of its length, interpetalar tissue moderately to little developed, (0.6–)1.1–1.7 mm wide at the widest point, the lobes 0.8–1.5 cm long, 3.9–7 mm wide at base, lanceolate to triangular, planar to reflexed at anthesis, the apex acute, usually cucullate, the adaxial surface sparsely stellate-pubescent in the apical third or only along the midvein apically, the trichomes sessile, porrect to erayed, these sometimes extending toward the base along the margins; the abaxial surface densely stellate-tomentose for the whole length with sessile to short-stalked, porrect to multiangulate, usually misshapen trichomes. **Stamens** equal; the filament tube (0.9–)1.2–1.6 mm long; the free portion of the filaments (1.3–)2–2.4 mm long, glabrous; anthers (5.9–)7.2–8.7 mm long, 1.2–1.5 mm wide at the widest point, 0.9–1.3 mm thick at the thickest point, widest and thickest in the basal third, narrowly lanceolate, usually slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, glabrous, usually loosely connivent, the epidermis of the abaxial surface minutely papillose. **Ovary** conical, 4-locular, densely pubescent with stramineous, tiny, sessile to short-stalked, porrect to multiangulate and multiradiate, somewhat misshapen stellate trichomes, the stalks to 0.2 mm long, multiseriate, 2–3 cells wide, the rays 4–18(<), 0.05–0.3 mm long, 1-celled, the midpoint shorter to slightly longer than the rays, rays and/or midpoints sometimes gland-tipped; style 10–13.6 mm long in long-styled flowers, 1.8–4.8 mm long in short-styled flowers, cylindrical, straight, moderately to densely stellate-pubescent at base, gradually denser distally to 6/7 of the way to the apex with trichomes like those of the ovary, stigma minutely bilobed to clavate, the surface papillose. **Fruit** a globose berry ca. 2.5–4

cm in diameter, orange when mature, densely pubescent with hyaline pale yellow to ochraceo-ferruginous, sessile to short-stalked, porrect to multiangulate and/or multiradiate stellate trichomes, the stalks to 0.15(-0.2) mm long, multiseriate, 2-3 cells wide, the rays 4-18(-20), 1-celled, occasionally gland-tipped, if so 2-3-celled, the midpoint shorter to slightly longer than the rays, 1-celled, straight to oblique; the pericarp thick and sclerified when mature; fruiting pedicels 1.5-1.8 cm long, woody, curved, articulated at the base, gradually enlarging toward the calyx, usually with more or less prominent longitudinal ridges distally, unarmed; fruiting calyx not accrescent, the tube flat, 8-11.9 mm in diameter. **Seeds** 100-200 per berry, 2.8-3.7 mm long, (3-)3.8-4.9 mm wide, 0.7-0.9 mm thick when dry, flattened, reniform, black to castaneous when fresh, drying black or grey. **Chromosome number:** not known. Figure 13.

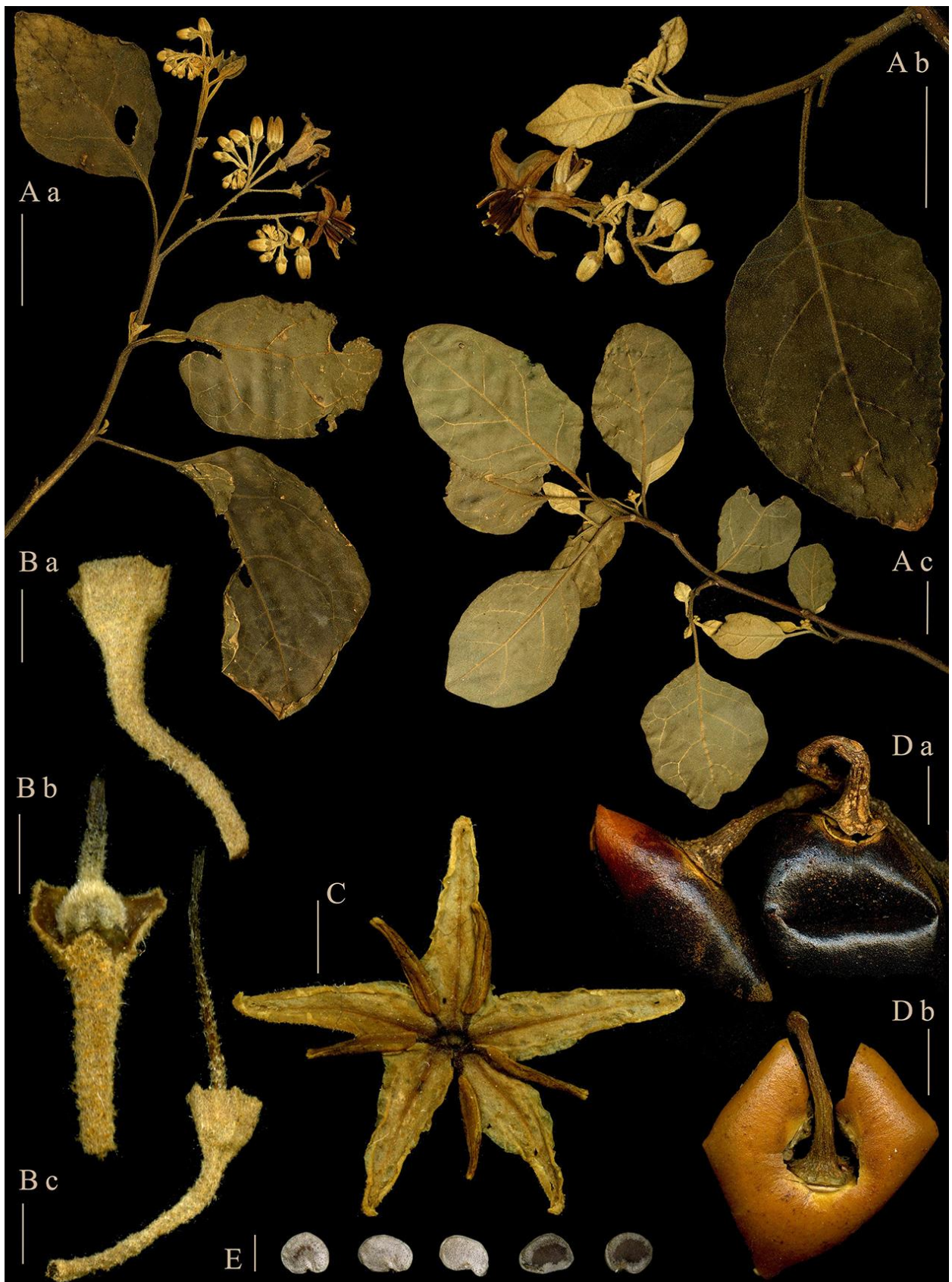


Fig. 13. *Solanum jussiaei* (Aa–Ac, Bb, C–E: Y.F. Gouvêa et al. 250, BHCB; Ba: I.G. Costa 638, RB; Bc: M.G. Bovini et al. 4016, BHCB). A(a–c). Flowering branches. B(a–c). Dissected calyx and gynoecium. C. Dissected flower. D(a–b). Fruits. E. Seeds. Scale bars: Aa = 2.5cm; Ab = 2cm; Ac = 1.5cm; Ba, Bb, Bc = 0.25cm; C = 0.5cm; D = 1cm; E = 0.3 cm.

**Distribution**—Disjunct between the coastal southeaster and northern northeastern Brazil (Fig. 14).

**Ecology and Habitat**—*Solanum jussiaei* inhabits vegetation of the sandy coastal lowlands (i.e. restinga; Araújo 1992) usually usually associated to large granitic or gneissic rock outcrops (inselbergs); from sea level to 160 m elevation.

**Etymology**—This species was named after the French botanist Antoine Laurent de Jussieu.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum jussiaei* (Jussiaei clade) has a relatively uniform morphology considering its widely disjunct distribution in eastern Brazil. Its mature fruits are similar to those of *S. botocudum* and *S. depauperatum* in having rigid sclerified pericarp (Fig. 13D). However, it can be easily distinguished from them by its bud calyces soon covering only the corolla base (Fig. 13A), rather than covering at least the corolla half to an intermediary developmental stage. *Solanum jussiaei* also share morphological similarities with *S. ochroneurum* and *S. puri* sp. nov., from which it differs in having fruits with rigid, sclerified pericarp at maturity rather than soft, not sclerified; and anthers glabrous rather than pubescent on the apical half abaxially (i.e. dorsally; see Fig. 13C). The tree species share bud calyces that soon cover only the corolla base. Species of some populations of both *S. ochroneurum* and *S. jussiaei* have

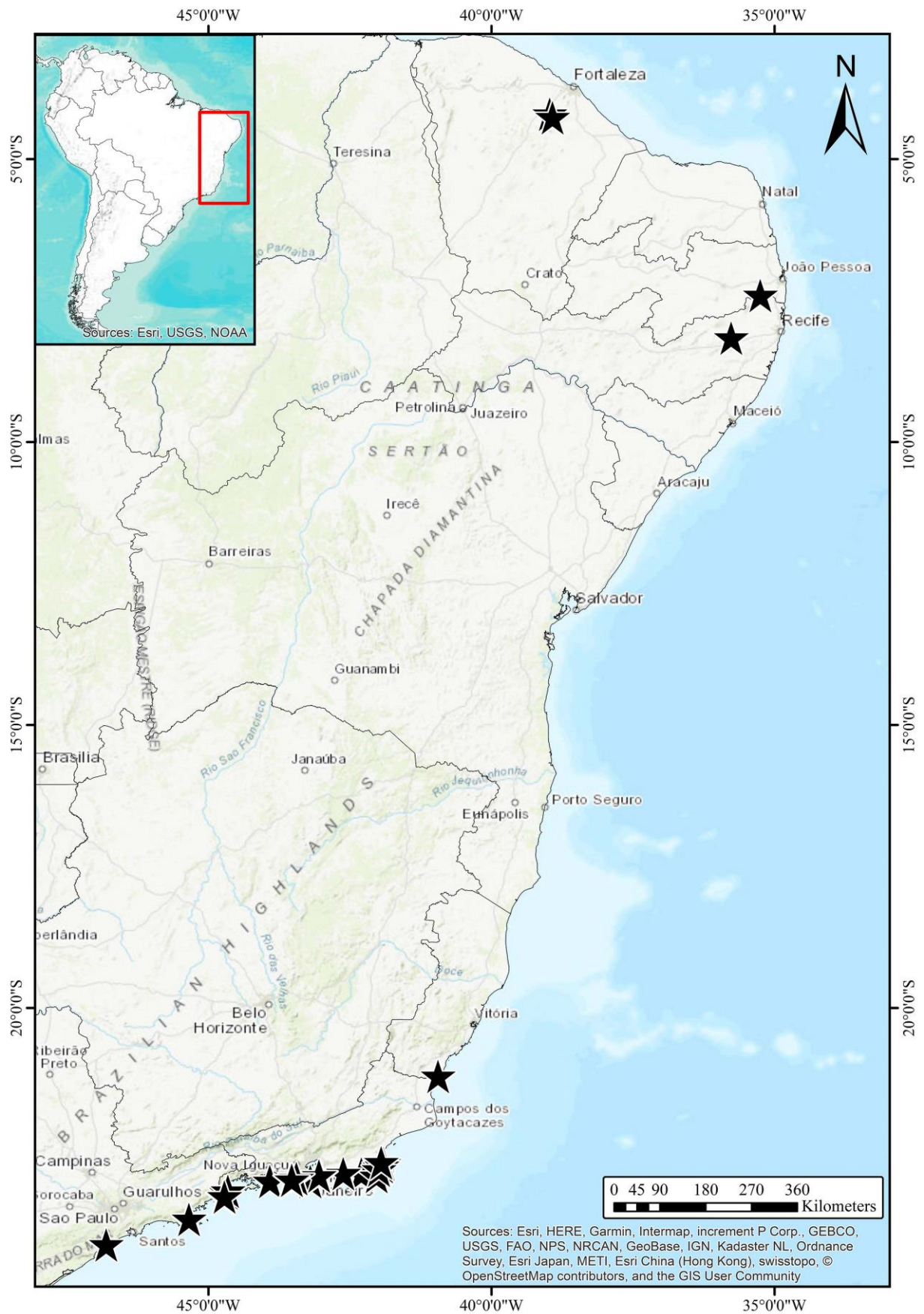


Fig. 14. Distribution of *Solanum jussiaei*.

truncate calyces (Fig. 13B). This feature is more frequent in *S. jussiaei*; in *S. ochroneurum* it seems to be restricted to populations from Espírito Santo State, especially those from the region of Santa Teresa municipality. Moreover, *S. jussiaei* and *S. puri* share ovate to cordiform (somewhat cordiform in *S. jussiaei*) leaf blades (Fig. 13A), however the adaxial leaf surface of *S. jussiaei* is moderately to densely pubescent, while that of *S. puri* is very sparsely pubescent, sometimes with trichomes restricted to veins.

**Additional Specimens Examined—Brazil.**—“Iter Brasiliense”, 1824–29, *L. Riedel s.n.* (NY [NY00770926]); “Brasilia”, 1855, *Sellow s.n.* (P [P00367383]); “Brasilia”, Dec 1831, *L. Riedel 391* (NY, US).—CEARÁ: Serra do Baturité, Sep 1910, *E. Ule 9100* (US); Mun. Guaramiranga, subida do Pico Alto, 23 Aug 2008, *E. Silveira & O. Deusdênia s.n.* (RB [RB00597241], EAC [EAC-41797]).—ESPÍRITO SANTO: Mun. Presidente Kennedy, Praia das Neves, 21°13'17"S, 40°56'45"W, ca. 6 m elev., *I.G. Costa 638* (ALCB, RB); Restinga de Marobá, 18 May 1994, *C. Farney et al. 3365* (BHCB, JPB, RB); Praia de Marobá, área de restinga baixa próximo à estrada, 40°56'28"S, 21°12'52"W, 25 Sep 2016, *K.S. Valdemarin et al. 87* (ESA, RB).—PERNAMBUCO: Tapera, 29 Sep 1931, *B.J. Pickel 2775* (US); 27 Jul 1934, *B.J. Pickel 3676* (US); Mun. Bezerros, Serra Negra, 18 Mar 1995, *L.P. Félix & M. de Paula 7040* (EAN, HST, SPF); Mun. Itambé, Usina Central Olho D'água, Fazenda Guararema, margem do rio Água Torta, 1 Mar 2001, *I.A. Bayma & M.N.R. Staviski 623* (HUEFS).—RIO DE JANEIRO: sin. loc., Jul 1767, *P. Commerson 166* (P; paratype, mounted in the same sheet as the lectotype); sin. loc., 12 Oct 1899, *E. Ule s.n.* (US [US01931611]); Mun. Araruama, Praia Seca, 22°56'16"S, 42°17'37"W, 20 Apr 2008, *A.C.S. Cavalcanti et al. 122* (RB, SPF, NY); 8 Nov 2008, *A.C.S. Cavalcanti & V. Amorim 311* (RB, SPF); Mun. Armação de Búzios, restinga da Praia da Tartaruga, 12 Nov 1998, *D.*

*Fernandes et al.* 177 (RB); 23 Jun 1999, *D. Fernandes* 223 (NY, RB); Praia de Tucuns, 16 Feb 2000, *D. Fernandes & A. Oliveira* 434 (RB); 7 Sep 2000, *D. Fernandes et al.* 559 (RB); Ilha Rasa, terreno escarpado, 6 Jul 2008, *R.D. Ribeiro et al.* 998 (RB); Mun. Arraial do Cano, Morro do Miranda, 10 Jul 2014, *M.G. Bovini et al.* 4016 (RB); Pontal do Atalaia, vertente Sul, 22°58'53"S, 42°01'41W, 27 m elev., 6 Aug 2007, *C. Farney* 4785 (RB); Mun. Cabo Frio, APA Pau-Brasil, Praia do Perú, 16 Sep 2006, *C. Farney et al.* 4544 (RB); Cabo Frio, Sep 2013, *D. Hottz et al.* 222 (RB); Armação dos Búzios, 11 Jan 1979, *G. Martinelli* 5582 (RB); Dunas do Perú, 25 May 2006, *R.D. Ribeiro et al.* 663 (RB); 1821–24, *L. Riedel s.n.* (NY [NY00770920]); *L. Riedel* 35 (NY); 19 Sep 1968, *D. Sucre* 3718 (RB); Mun. Niterói, Restinga de Itacoatiara, 18 Mar 1996, *M.G. Santos* 791 (RB); Mun. Paraty, Apa-cairuçu, Cond. Laranjeiras, caminho p/ Praia Vermelha, 23°10'S, 44°30'W, 8 Aug 1994, *M.D. Campos* 28 (CEPEC, MBM, RB); Restinga de Trindade, 12 Apr 1991, *L.C. Giordano & L.S. Sarahyba* 1065 (RB); Trindade, Praia de Fora, 7 Nov 1991, *V.L.G. Klein et al.* 1138 (RB); Condomínio Parati-Mirim, APA-Cairuçu, 22 Oct 1990, *V.L.G. Klein et al.* 1040 (RB); Mun. Rio de Janeiro, Restinga de Grumari, 30 May 1972, *J. Almeida* 1594 (RB); 24 May 1982, *D. Araujo et al.* 5077 (RB); Praia do Recreio dos Bandeirantes, 14 Jun 1938, *A.C. Brade* 16097 (RB); Monumento Natural das Ilhas Cagarras, cume da Ilha Redonda, 23°04'15"S, 43°11'43"W, 159 m elev., 6 Mar 2012, *M.G. Bovini et al.* 3668 (RB); Restinga de Grumari, 6 May 1992, *J.M.A. Braga & E.F. Amado* 13 (RB); 28 Mar 1979, *L.A.F. Carvalho s.n.* (RB [RB00466247; RB00705366; RB00705272], BHCB [BHCB-199838]); Jardim Botânico, 8 May 1916, *Dionísio Constantino s.n.* (RB [RB00465896]); 13 May 1916, *Dionísio Constantino s.n.* (RB [RB00466249]); Estrada da Restinga da Marambaia km 17, 20 Oct 1966, *E. Gumarães & D. Sucre* 50 (RB); Fazenda Sta. Cruz, 9 Dec 1875, *A. Glaziou* 9552 (P); 17 Oct 1872, *A. Glaziou* 11364 (P); Restinga da Praia de Grumari, à margem da Av. Estado da Guanabara,

lado oposto ao da praia, 23°02'51"S, 43°31'07"W, 4 m elev., 9 Nov 2017, *Y.F. Gouvêa et al.* 249 (BHCB); *Y.F. Gouvêa et al.* 250 (BHCB); Praia de Grumari, 22 Feb 1960, *H.F. Martins* 161 (RB); Restinga da Praia de Grumari, 21 May 2000, *A. Oliveira & D. Fernandes* 125 (MBM, NY, RB); Restinga da Praia de Itaipú, 27 May 1969, *D. Sucre & T. Plowmann* 5094 (RB); Praia de Grumari, 11 Jul 1973, *M.R.R. Vidal & W.N. Vidal* 358 (RB, VIC); Mun. Saquarema, Praia de Jaconé, 30 May 1978, *L. Montone et al.* 534 (RB).—SÃO PAULO: Ilhabela, Norte da ilha, perto da armação, 29 Aug 2013, *G.D. Colletta et al.* 1297 (UEC, RB); Mun. Santa Branca, *A. Loefgren s.n.* (US [US01931610]); Mun. Santos, Conceição de Itanhaém, *A. Loefgren et al.* 2614 (SP, US); Mun. Ubatuba, 2018, *J.P. Lemos-Filho s.n.* (BHCB).

**8. *Solanum ochroneurum*** Link, Enum. Hort. Berol. Alt. 1: 186. 1821.— TYPE: **BRAZIL.** Sin. loc., *Anon.* (holotype: B? prob. from Link's herbarium, later incorporated into B herbarium, then destroyed). **Brazil.** Rio de Janeiro: Mun. Saquarema, borda de restinga florestal anterior ao cordão arenoso e à praia, 22°55'31"S, 42°26'39"W, 84 m elev., 10 Nov 2019 (fl, fr), *Y.F. Gouvêa & M.U. Guerrero* 365 (neotype designated here: BHCB [BHCB204221]; isoneotypes: to be distributed).

**High-climbing liana to scrambling shrub** reaching more than 8 m height, armed. **Young stems** terete, densely stellate-tomentose with ochraceo-ferruginous, ferruginous or stramineous, sessile to short- or long-stalked, porrect stellate trichomes, these sometimes mixed with multiangulate to multiradiate, dendritic-like stellate trichomes; the trichomes with stalks to 2.3 mm long, multiseriate, 2–3 cells wide, sometimes slightly and gradually enlarged towards the base, the rays 4–18(<), 0.05–0.5 mm long, 1-celled, rays of the lower whorls, if present,



occasionally gland-tipped, if so, 2-celled, these often shorter than the eglandular ones, the midpoint obsolete to the same length as the rays, 1-celled, straight, epidermis not to barely visible, sparsely to moderately armed, the prickles 0.4–2.4 mm long, strongly recurved, broad-based, more or less laterally compressed, ferruginous. Bark of older stems, brown to greyish brown, lenticeled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, the blades of fully developed leaves 4–12.7(–17.5) cm long, 1.5–6.8(–7.2) cm wide (to 17.5 cm long and 7.2 cm wide in young plants and resprouted shoots), elliptic to lanceolate, chartaceous, markedly to slightly discoloured; the adaxial surface matte green to dark green when fresh, drying green to ochraceo-ferruginous brown, moderately to densely stellate-pubescent with ochraceous to ferruginous, eglandular stellate trichomes mixed with erayed (i.e. the rays obsolete, thus the trichome apparently simple) and small, simple glandular trichomes; the rayed stellate trichomes sessile to long-stalked, porrect to antrorse, the stalks to 0.45 mm, multiseriate, the rays (1–)4–8(–10), 0.15–0.4(–0.5) mm long, 1-celled, the midpoint 0.05–0.35(–0.5) mm long, 1-celled, shorter to the same length as the rays, straight; the erayed stellate trichomes sessile to short-stalked, the stalks nearly obsolete to 0.05 mm long, multiseriate, the midpoint to 0.3 mm long, 1-celled, straight, the trichomes more or less conspicuous and abundant; the simple glandular trichomes sessile to 0.1 mm long, uniseriate, the epidermis visible; unarmed; the abaxial surface paler than the adaxial one, green to beigeish green when fresh, drying greenish or greyish beige, beige or ochraceo-ferruginous, densely tomentose to pubescent with stramineous to ferruginous, sessile to short- or long-stalked, porrect to multiangulate or multiradiate eglandular stellate trichomes, the two latter types sometimes with solitary rays along the stalk, the stalks to 0.8 mm long, multiseriate, 2–4 cells wide, the rays 4–16(<), 0.15–0.45 mm long, 1-celled, the

midpoint nearly obsolete to 0.4 mm, shorter to the same length as the rays, 1-celled, straight, the epidermis visible or not, unarmed or armed only along the midrib, the prickles like those of the stems; primary veins 5–8 pairs; base obtuse to rounded, less often acute, symmetric to slightly asymmetric, not decurrent onto the petiole; apex acute to somewhat cuspidate or obtuse, rarely rounded; petiole 0.5–2.6(–3.2) cm long, the indumentum like that of the young stems, unarmed or armed, the prickles like those of the stems but usually smaller. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) densely stellate-tomentose strictly with sessile to long-stalked, porrect stellate trichomes, or these mixed with multiangulate to dendritic-like stellate trichomes like those of the young stems, the epidermis visible or not, usually unarmed; the peduncles 0.5–2.3 cm long, the rachis 1.2–11 cm long, with 7–45 flowers; pedicel insertion points usually evenly spaced 0.5–1.7 mm apart, more congested distally; pedicels 0.5–1.1 cm long in open flowers, more or less geniculate at the tip, articulated at base, the indumentum like that of the inflorescence axis, usually unarmed. **Buds** ovoid when young, then lanceoloid to ellipsoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes nearly absent to soon splitting and tightly adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped, 2.4–3.7 mm long, the external surface smooth to slightly 5-angulate, sometimes slightly 5-knobbed basally, gently constricted distally or not, the lobes mere apiculae on the rim or present to 2.5 mm long, 2.3–3.5 mm wide, rounded-deltate to shortly oblong with

the apex rounded-deltate, occasionally quadrate, apiculate, the apiculae 0.3–1.1 mm long, sometimes irregularly splitting, densely stellate-tomentose with stellate trichomes like those of the inflorescence axis, but with slightly shorter stalks, unarmed. **Corolla** 2–4.1 cm in diameter, lilac, the midveins sometimes white, stellate, lobed for  $2/3$ – $3/4$  of the way to the base, interpetalar tissue absent to little developed, the lobes 1–1.8 cm long, 3.5–9.5 mm wide, widest in the basal third, lanceolate, reflexed at anthesis, the apex acute, usually cucullate, the adaxial surface moderately to densely stellate-pubescent in the apical half with sessile, porrect to multiangulate, somewhat misshapen trichomes, these usually extending toward the base along the midveins and margins; the abaxial surface densely stellate-tomentose for the whole length with sessile to short-stalked, porrect to multiradiate, somewhat misshapen trichomes. **Stamens** equal; the filament tube 0.8–1.8 mm long; the free portion of the filaments 1–2.4 mm long, glabrous; anthers 8.5–13.8 mm long, 1.6–2.5 mm wide at the widest point, 1.2–1.9 mm thick at the thickest point, widest and thickest in the basal third, narrowly lanceolate, usually slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, moderately to sparsely stellate-pubescent in the abaxial apical half with trichomes like those of the corolla's adaxial surface, the epidermis of the abaxial surface minutely papillose, tightly connivent. **Ovary** cupuliform to conical, 4-locular, densely pubescent with stramineous to ochraceous, tiny, sessile to subsessile, somewhat misshapen, porrect to multiangulate stellate trichomes, the stalks to 0.05 mm long, the rays 4–12(<), 0.05–0.3 mm long, 1-celled, the midpoint shorter to slightly longer than the rays, sometimes with gland-tipped rays or midpoints; style 10–15 mm long in long-styled flowers, 2.8–4 mm long in short-styled flowers, cylindrical, straight, densely stellate-pubescent for the whole length with trichomes like those of the ovary, but

sometimes short-stalked; stigma bilobed, the surface minutely papillose. **Fruit** a globose berry, sometimes drying piriform (especially when immature), 2.5–4 cm in diameter, orange to yellowish orange when mature, densely pubescent with hyaline pale yellow to ochraceo-ferruginous, sessile to short-stalked, multiangulate stellate to echinoid and dendritic-echinoid trichomes, the trichomes (whole) 0.2–0.7 mm long, many-rayed, the rays 1-celled, the midpoints shorter to slightly longer than the rays, 1 celled, rays and midpoints occasionally gland-tipped; the pericarp soft and not sclerified at maturity; fruiting pedicels 1.4–2.2 cm long, woody, straight to slightly curved basally, articulated at the base, usually enlarged towards the calyx and ridged distally, glabrescent, unarmed; fruiting calyx not accrescent, the tube flat, 7.2–11.3 mm in diameter. **Seeds** ca. 200 per berry, 3–3.4 mm long, 2.9–4.2 mm wide, 0.6–1 mm thick when dry, flattened, reniform, black when fresh, drying black to grey. **Chromosome number**: not known. Figure 15.

**Distribution**—Along the states of Espírito Santo, southern Bahia and eastern Minas Gerais and Rio de Janeiro States (Fig. 16).

**Ecology and Habitat**—*Solanum ochroneurum* grows in different sorts of forest environments, being found from sandy coastal lowlands vegetation (i.e. restinga; Araújo 1992) to montane Atlantic rainforests and the more continental seasonal semi-deciduous tropical forests; from sea level to 900 m elevation.

**Etymology**—This epithet is composed of the Greek words ‘*ochros*’, meaning pale yellow (or sallow), and ‘*neuron*’ meaning nerve. It probably refers to the ochraceous indumentum on the leaf nervures.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum ochroneurum* is member of the Jussiaei clade. It is morphologically related to the extremely poorly known *S. puri* sp. nov., with which it shares abaxially stellate pubescent anthers with trichomes concentrated on their apical half (Fig. 15D). *Solanum ochroneourum*, however, can be easily distinguished from *S. puri* by its elliptic to lanceolate leaves with adaxial surfaces moderately to densely pubescent (Fig. 15A), rather than ovate, cordiform, trullate or rhombic leaves with the abaxial

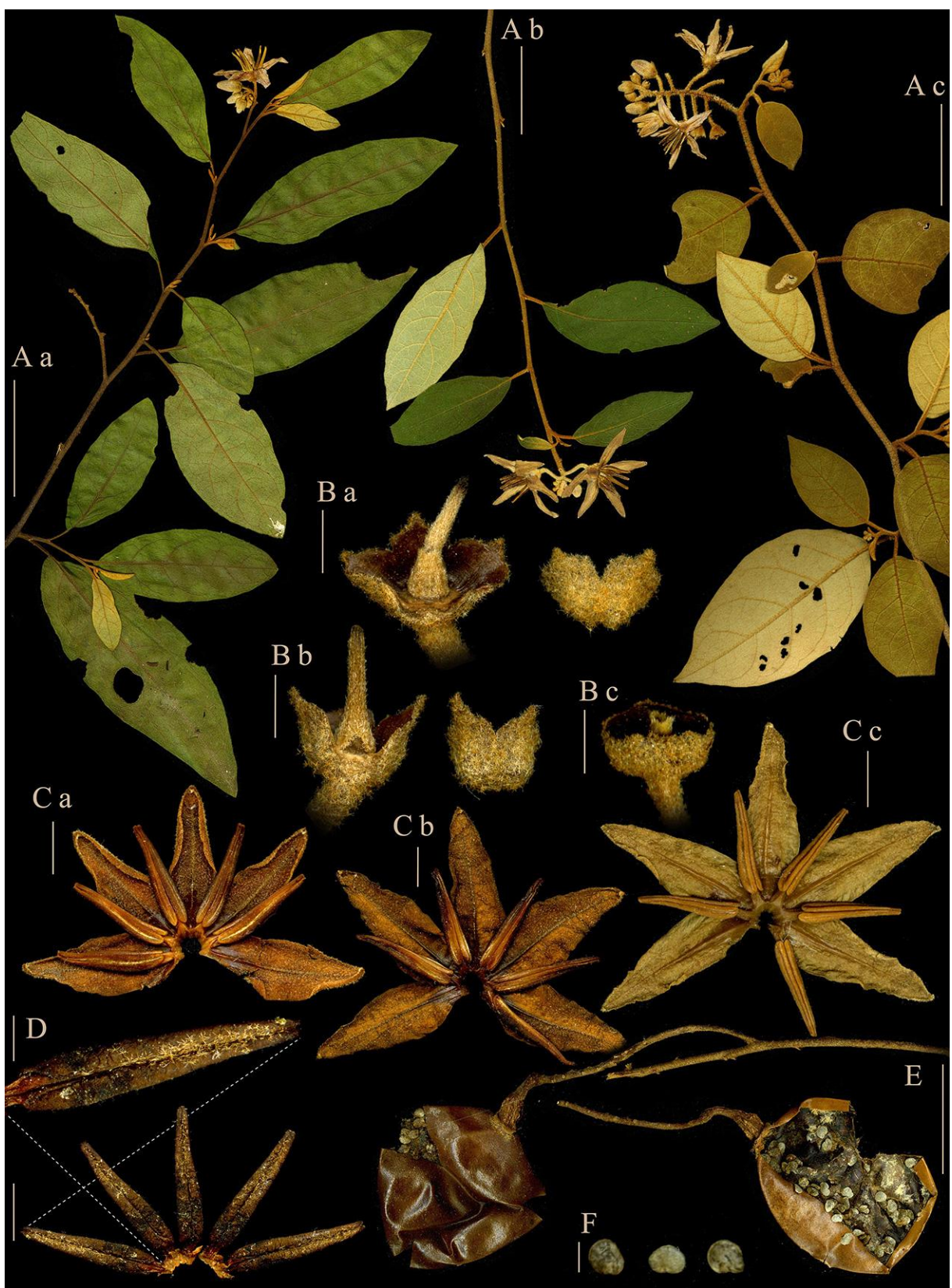


Fig. 15. *Solanum ochroneurum* (Aa, Cc: Y.F. Gouvêa and M.U. Guerrero 364, BHCB; Ab, Ba, Bb, Ca–D: Y.F. Gouvêa and G.V.A. Santos 323, BHCB; Ac: Y.F. Gouvêa et al. 238, BHCB; Bc: R.R. Vervloet 2111, BHCB; E, F: J.A. Lombardi 5197, BHCB). A(a–c). Flowering branches. B(a–c). Dissected calyx, calyx lobes and gynoecium. C(a–c). Dissected flowers. D. Apically pubescent anthers. E. Fruits. F. Seeds. Scale bars: Aa, Ac = 4cm; Ab, E = 3cm; Ba–Bc = 0.3cm; Ca–Cc = 0.5cm; D = 0.5cm(down), 0.2cm(up); F = 0.3cm.

surface very sparsely pubescent (sometimes with the trichomes confined to the veins). Abaxially pubescent anthers, the character morphologically uniting these two species, is very rare within *Solanum* and, to date, has been documented only to species of the Crinitum clade (e.g. *S. lycocarpum* A.St.-Hil; Whalen 1984; Stern et al. 2011; Gouvêa et al. 2018). In Crinitum clade species, however, trichomes are restricted to the connective region, while in *S. ochroneurum* and *S. puri* they extend towards the anther margin. *Solanum ochroneurum* can be similar to *S. jussiaei*, from which it can be distinguished by its pubescent anthers rather than glabrous, and mature fruits with soft, not sclerified pericarps (Fig. 15E).

The collections from Link's herbarium are known to have been acquired by the B herbarium after his death and, eventually to be destroyed during the Second World War. Furthermore, no specimen, locality or collector was provided in the protologue. Therefore, we choose as neotype a flowering, fruiting and georeferenced specimen from the Rio de Janeiro State (mun. Saquarema), as it was one of the first and most collected regions by earlier botanist in Brazil. The specimen designed as the neotype of *S. ochroneurum* is represented in Figure 15Aa.

**Additional Specimens Examined**—Sin. loc., “Jacaré”, Jul 1837, *G. Gardner 801* (K). **Brazil**. Sin. loc., *L. Riedel 1082* (MO, US).—BAHIA: Almadina, Serra do Corcovado, 13,8 km ao SW de Coaraci na estrada para Almadina, Fazenda São José, 14°42'21”S, 39°36'12”W, 650–900 m elev., 10 Apr 2007, *R.A.X. Borges et al. 543* (CEPEC, HUEFS, NY, SPF, UPCB); Rod. Coaraci/Almadina, a cerca de 15km de Coaraci em direção a

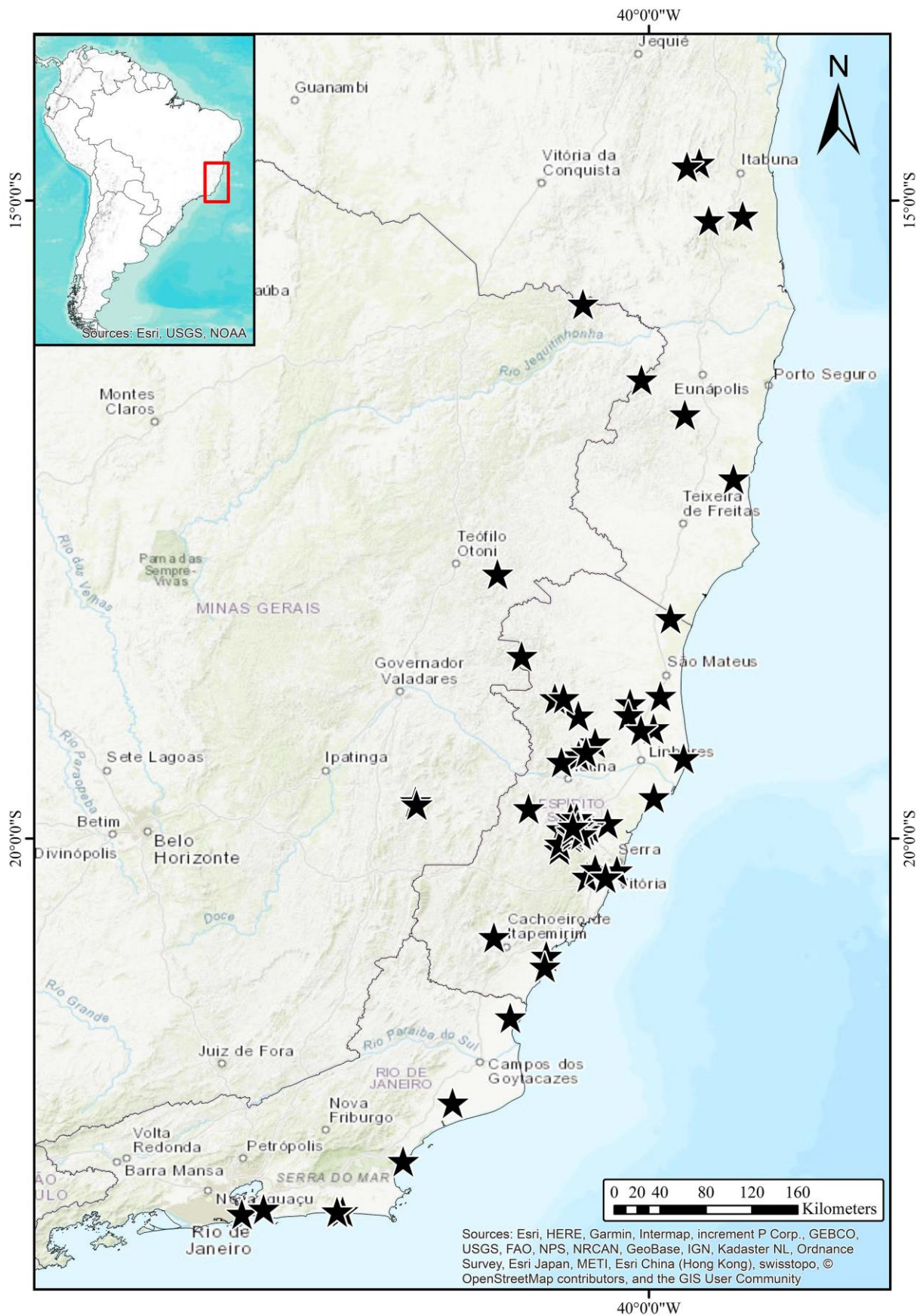


Fig. 16. Distribution of *Solanum ochroneurum*.

Almadina, acesso pela Fazenda São José, 14°42'26"S, 39°36'12"W, 629 m elev., 4 Oct 2017, Y.F. Gouvêa et al. 238 (BHCB); 5.3 km from Almadina on rod to Itabupã,



then left 7.9 km on road to Serra dos Sete Paus, 14°44'11"S, 39°41'57"W, 500–650 m elev., 4 Apr 1997, *W.W. Thomas et al. 11440* (CEPEC, NY, RB); Mun. Guratinga, km 21 do ramal para Cajuíta e São Paulinho, com entrada a 13 km S de Itabela, à direita, 16°41'S, 39°43'W, 29 Oct 1979, *L.A. Mattos Silva & H.S. Brito 627* (RB); Mun. São José da Vitória, estrada que liga São José da Vitória a Una, 15°07'19"S, 39°15'47"W, 150 m elev., 22 Sep 2008, *L.L. Giacomini et al. 198* (BHCB).—ESPÍRITO SANTO: Mun. Linhares, Reserva Florestal da CVRD, estrada 243, 31 Jan 1985, *A.L. Peixoto et al. 3021* (MO); 23 Mar 1986, *M. Sobral 4770* (CVRD, IAC, ICN, NY); Mun. Água Doce do Norte, Pedra da Torre, 27 Feb 2008, *L. Kollmann et al. 10968* (BHCB, MBML); Mun. Água Branca, Assentamento 16 de Abril, 18°54'12.6"S, 40°44'07.8"W, 170–200 m elev., 21 Nov 2007, *V. Demuner et al. 4569* (specimen n° 1; BHCB, MBML); Águas Claras, 18°54'10"S, 40°40'01"W, 300–330 m elev., 27 Jul 2006, *L.F.S. Magnago et al. 1157* (MBML); Mun. Aracruz, Picuã, 30 Apr 2011, *C.L. Dalmonech & T.F. Sagrillo 14* (MBML); *C.L. Dalmonech & T.F. Sagrillo 15* (MBML); Mun. Cachoeiro de Itapemirim, a mais ou menos 10km na estrada de Cachoeiro de Itapemirim para Alegre, ca. 90 m elev., 28 Apr 1972, *D. Sucre & T. Soderston 9008* (RB); Mun. Cariacica, beira de estrada, 11 Jan 2007, *L. Kollmann 9473* (MBML); Reserva Biológica Duas Bocas, 20°18'09"S, 40°28'55"W, 500 m elev., 16 Feb 2008, *C.N. Fraga et al. 1873* (CEPEC, MBML, RB, UPCB); Mun. Colatina, Estrada da Colônia da Água Branca, 8 May 1934, *J.G. Kuhlmann 331* (BHCB, RB); Mun. Fundão, Goiapaba-Açu, cabeceira da Serra Comprida, 700 m elev., 17 Jun 1990, *L. Kollmann & E. Bausen 120* (MBML); Mun. Itaguaçu, Cachoeirão, 27 Feb 2006, *R.C. Britto et al. 29* (MBML); Mun. Itapemirim, Itaoca, 9 May 1990, *M. Gibram 75* (RB, VIES); Estrada para Marataízes, a ca. 3 km N de Marataízes, 22 Feb 1995, *J.R. Pirani et al. 3584* (MBM, NY, SP, SPF); Mun. Jaguaré, Barra Seca, 18°56'37"S, 40°08'42"W, 86 m, 31 Mar 2019, *Y.F. Gouvêa & G.V.A. Santos 323* (BHCB); Mun. Linhares, Reserva

Florestal de Sooretama, 9 Aug 1965, *R.P. Belém 1508* (IAN, US); São Sebastião, 23 May 2006, *V. Demuner et al. 2309* (MBML); Regência, Reserva Biológica de Comboios, 28 Aug 1989, *G.L. Farias 299* (CVRD, UEC, NY); 12 Apr 1991, *V.C. Souza 64* (NY, UEC); 22 Aug 1991, *V.C. Souza 165* (NY, UEC); Degredo, 19°22'21"S, 39°43'32"W, 15 Mar 2007, *C. Farney et al. 4630* (RB); Refúg. Biol. Sooretama., 9–10 Aug 1965, *J.P. Lanna Sobrinho 1036* (RB); Reserva Florestal da Cia. Vale do Rio Doce, 10 May 1977, ca. 50 m elev., *G. Martinelli et al. 1831* (RB); *Martinelli et al. 1839* (RB); *Martinelli et al. 1840* (RB); Mun. Marilândia, Alto Liberdade, Pedra do Cruzeiro, 19°21'05"S, 40°32'53"W, 373 m elev., *R.C. Forzza et al. 7569* (BHCB, RB); Mun. Pedro Canário, Fazenda São Joaquim, 16 Oct 1986, *H.Q. Boudet & W. Boone 2054* (MBML, RB); Mun. Rio Bananal, Comunidade de Alto Bananal, 19°15'01"S, 40°25'09"W, 250 m elev., 10 Jun 2012, *L.L. Giacomini et al. 1873* (BHCB, MBM, RB); Mun. Santa Maria do Jetibá, Caramuru, Sítio Jetibá, 20°05'58" S, 40°42'57"W, 800 m elev., 18 Mar 2003, *H.Q. Boudet et al. 3316* (MBML, RB); Belém, 12 Mar 2002, *L. Kollmann et al. 5820* (MBML, RB); Mun. Santa Teresa, Aparecidinha, 19°58'23"S, 40°35'35"W, 710 m elev., 11 Apr 2003, *I.M. Andrade 775* (HUEFS); Valsugana Velha, 19°58'S, 40°32'24"W, 600 m elev., Sep 1991, *E. Bausen & M.F. Santos 29* (MBML, RB); Penha, 15 May 1984, *W. Boone 150* (RB, MBML); Parque do MBML, 3 Jul 1985, *W. Boone 570* (MBML, RB); Santo Henrique, 12 Jul 2006, *R.C. Britto & S. Krausi 97* (MBML); Aparecidinha, 3 Nov 1999, *V. Demuner et al. 235* (MBML, RB); RPPN Macaco Barbado, final da Trilha Radical, 19°59'27"S, 40°36'34"W, 25 Aug 2018, *A.D. Ferreira 381* (MBML); Bairro do Eco, 22 Jan 1986, *A.B. Fontana s.n.* (MBML, RB); Comunidade de Santo Antônio, 19°54'38"S, 40°35'40"W, 729 m elev., 8 Jun 2012, *L.L. Giacomini et al. 1859* (BHCB); Nova Lombardia, Reserva Biológica Augusto Ruschi, cabeceira Alto Lombardia, 800 m elev., 12 Apr 2001, *L. Kollmann & E. Bausen 5110* (MBML); São Lourenço, Mata Fria, 750 m elev., 7 Aug 1998, *L.*

*Kollmann 185* (RB); Saltinho, 6 Jul 2001, *L. Kollmann et al. 3866* (MBML); cabeceira do Rio Bonito, 6 Dec 2001, *L. Kollmann et al. 3895* (MBML, RB); Nova Lombardia, ao lado da Reserva Augusto Ruschi, 19°50'33"S, 40°33'54"W, 872 m elev., 25 Feb 2003, *J.A. Lombardi et al. 5197* (BHCB, MBM); mata da torre de VHF, 22 May 1984, *J.M. Vimercat 147* (MBML); Santa Lúcia, 12 Jun 1984, *J.M. Vimercat 181* (MBML); Mun. São Gabriel da Palha, Faz. Rondeli, próx. ao Clube Campestre, 31°19'24"S, 40°33'19"W, 26 Apr 2008, *A.M. Assis & V. Demuner 1573* (MBML); Mun. São Mateus, estrada para Lagoa Suruaca. 4km a dentro da entrada no km 86 da BR-101, 18°53'05"S, 39°54'25"W, 26 m elev., 10 Jan 2008, *M.C. Souza et al. 567* (RB); Mun. Vitória, Fradinhos, 7 Mar 1984, *T.M.S. Carmo s.n.* (RB [RB00466229]); Estação Experimental de Carapina, 9 Jul 1969, *D. Sucre 5507* (JPB); Parque Estadual da Fonte Grande, 12 Nov 1991, *P.C. Vinha 1381* (RB).—MINAS GERAIS: Mun. Bandeira, Mata do Boi Rajado, ca. de 14 km da sede de Bandeira, na divisa com a Bahia, 15°48'42"S, 40°30'53"W, 662–777 m elev., 1 Mar 2004, *J.A. Lombardi et al. 5719* (BHCB); Mun. Caratinga, Estação Biológica de Caratinga, 22 Aug 1983, *K.B. Strier 1064* (NY); Mata do Jaó, 12 Oct 2002, *F.R. Couto 103* (BHCB); 14 Jan 2003, *F.R. Couto 185* (BHCB); Mun. Santa Maria do Salto, Fazenda Duas Barras, 16°24'19"S, 40°03'22"W, 765 m elev., 24 Aug 2003, *J.A. Lombardi et al. 5508* (BHCB); Mun. Teófilo Otoni, Pedra da Boca, 17°55'42"S, 41°02'22"W, 950 m elev., 20 Sep 2016, *J.R. Stehmann et al. 6388* (BHCB); *J.R. Stehmann et al. 6390* (BHCB).—RIO DE JANEIRO: Sin. loc., Oct 1832, *L. Riedel 1082* (MO, NY, US); "Environs de Rio de Janeiro", *A. Glaziou 12103* (K); Mun. Niterói, Muriqui Pequeno, Estrada do Chibante, Reserva Ecológica Darcy Ribeiro, Serra Grande, 26 Nov 2001, *A.A.M. Barros & H.P. Moreira 1170* (RB, RFFP); 18 Jun 2003, *A.A.M. Barros et al. 2006* (RB, RFFP); 10 Dec 2003, *L.F. Santos et al. 73* (RB, RFFP); 27 Nov 2002, *P.T. Santos et al. 77* (RB, RFFP); Mun. Quissamã, Mata São Miguel, *V. Maioli 442* (R, RB); Mun. Rio das Ostras, Restinga da

Praia Virgem, 28 Feb 1999, *H.N. Braga 65* (RB); Mun. Rio de Janeiro, Botafogo, Morro Mundo Novo, 8 Mar 1921, *J.G. Kuhlmann s.n.* (RB [RB00465901]); Mun. São Francisco de Itabapoana, Estação Ecológica Estadual de Guaxindiba, Módulo PPBio, 21°26'30"S, 41°04'24"W, 12 m elev., 18 Jul 2018, *H.C. Lima et al. 8690* (BHCB); Mun. Saquarema, 12 Dec 1990, *D. Araujo 9219* (RB); 8 Jul 1992, *C. Farney et al. 3797* (RB); 22°55'30"S, 42°26'35"W, 63 m elev., 10 Nov 2019, *Y.F. Gouvêa & M.U. Guerrero 364* (BHCB); Restinga de Ipitangas, 7 Mar 1989, *C. Farney et al. 2236* (RB); Reserva Ecológica de Jacarepiá, Sep 1992, *C. Farney et al. 3711* (RB); 22 Feb 1999, *D. Fernandes 209* (BHCB, RB); 9 Mar 1993, *V.S. Fonseca et al. 38* (RB).

**9. *Solanum puri*** Gouvêa, sp. nov.—TYPE: BRAZIL. Espírito Santo: Mun. Santa Teresa, Reserva Biológica da Caixa D'Água, Trilha do Caravagem, 750 m elev., 29 Dec 1998 (fl), *L. Kollmann & E. Bausen 1381* (holotype: MBML [MBML-9298]; isotypes: BHCB [BHCB204222], RB [RB00466208]).

**Diagnosis.** Differs from *S. ochroneurum* Link, *S. jussiaei* Dunal and *S. depauperatum* Dunal in its very sparsely pubescent adaxial leaf surfaces; differs from *S. ochroneurum* and *S. depauperatum* in having ovate to cordate leaves; differs from *S. jussiaei* and *S. depauperatum* in its abaxially pubescent anthers, mature fruits with soft pericarp.

**High-climbing liana** reaching more than 8 m height, armed. **Young stems** terete, densely stellate-tomentose with small orangish-ferruginous to stramineous, short-stalked, porrect stellate trichomes, the stalks (0.05–)0.1–0.35 mm long, multiseriate, 2–4 cells wide, the rays (4–)8(–9), 0.15–0.5 mm long, 1-celled, the

midpoint obsolete to 0.1 mm long, always shorter than the rays, 1-celled, occasionally gland-tipped, if so 2–3-celled, straight, the epidermis not to barely visible, sparsely to moderately prickly, the prickles 0.5–2.5 mm long, strongly recurved, broad-based, laterally compressed to slightly compressed, ferruginous. Bark of older stems not observed. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, sinuate or lobed, the blades of fully developed leaves 6.3–10.5 cm long, 3.7–8.7 cm wide, ovate, cordiform, trullate or rhombic, membranaceous to chartaceous, strongly discolorous; the adaxial surface shiny green when fresh, drying greenish brown to dark brown, very sparsely stellate-pubescent to glabrous, with trichomes restrict to the midrib and veins, the trichomes like those of the stems, but usually sessile or subsessile (<0.1 mm long), the epidermis always visible, unarmed or armed along the midrib and primary veins, the prickles 1.5–5.6 mm long, straight to slightly curved; the abaxial surface pale green when fresh, drying pale brown to beige, densely stellate-pubescent with trichomes like those of the stems, but usually stramineous, these mixed with more or less abundant and conspicuous eglandular, erayed stellate trichomes (i.e. the rays obsolete, thus the trichome apparently simple), the stalks to 0.05 mm long, multiseriate, the midpoint to 0.12 mm long, 1-celled, straight, the epidermis visible, armed only along the midrib, the prickles like those of the stems; primary veins 4–5 pairs; base obtuse, rounded or cordate, if cordate the basal lobes obtuse to rounded, symmetric or asymmetric, not decurrent onto the petiole; margins with 0–3 lobes on each side, 0.5–1.4 cm long, 1.5–2.7 cm wide, apically acute to obtuse or rounded; apex acute to cuspidate; petiole 1.9–4.2 cm long, the indumentum like that of the stems, moderately to densely armed, the prickles like those of the stems. **Inflorescence** an unbranched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's

development; the axis (peduncle plus rachis) densely stellate-tomentose with stramineous to orangish ferruginous, sessile to long-stalked, porrect to multiangulate and multiradiate, sometimes to echinoid- or dendritic-like stellate trichomes, the stalks to 0.5 mm long, multiseriate, 2–4 cells wide, the rays 8–18, 1-celled, those of the inferior whorls occasionally gland-tipped, if so, 2-celled, the midpoint shorter to the same length as the rays, 1-celled, straight to oblique, the epidermis not visible; unarmed or sparsely armed with few prickles along the peduncle (especially in older inflorescences), the prickles like those of the stems; the peduncles 0.35–1.4 cm long, the rachis 3.1–6 cm long, with 12–22 flowers; pedicel insertion points evenly spaced to 6.5 mm apart, gradually more congested towards the apex; pedicels 8–10.5 mm long in open flowers, straight to slightly geniculate, articulated at base, the indumentum like that of the inflorescence axis, unarmed. **Buds** ovoid to lanceoloid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes nearly absent to soon splitting and tightly adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped, 1.6–3.8 mm long, the external surface drying 5-angulate with a more or less prominent, narrow, longitudinal ridge along the midvein of each sepal, nearly truncate to lobed, the lobes mere apiculae from the rim (especially before anthesis) to 0.9–2.2 mm long, 2–3.5 mm wide, rounded to rounded-deltate or rounded-quadrangle, apiculate, the apiculae 0.2–0.5 mm long, densely stellate-tomentose with stellate trichomes like those of inflorescence axis, unarmed. **Corolla** 2–2.8 cm in diameter, white to lilac, stellate, lobed for 2/3–3/4 of the way to the base, interpetalar tissue very little

developed 0.15–0.4 mm wide at the widest point, the lobes 0.7–1.3 cm long, 3.2–5.3 mm wide at the widest point, widest in the basal third, lanceolate, the apex acute, cucullate, the adaxial surface moderately to densely stellate-pubescent in the apical half with sessile, porrect to multiangulate, usually misshapen trichomes, these usually extending toward the base along the midveins and lobe margins; the abaxial surface densely stellate-tomentose for the whole length with sessile to short-stalked, porrect to multiradiate, somewhat misshapen trichomes. **Stamens** equal; the filament tube 1.1–1.3 mm long; the free portion of the filaments 0.9–1.3 mm long, glabrous; anthers 7–10.3 mm long, 2–2.8 mm wide at the widest point, 1.5–2.1 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, sparsely to moderately stellate-pubescent in the apical third with trichomes like those of the corolla's adaxial surface, the epidermis of the abaxial surface minutely papillose, connivent. **Ovary** cupuliform to somewhat conical, 4-locular, densely pubescent with delicate, sessile to subsessile, porrect stellate to echinoid trichomes, the rays 8–many(>20), 0.05–0.4 mm long, 1-celled, the midpoint shorter to slightly longer than the rays, rays and midpoint sometimes gland-tipped; style ca. 1.1 mm long in long-styled flowers, 1–1.7 mm long in short-styled flowers, cylindrical, straight, densely stellate-pubescent for the whole length with trichomes like those of the ovary; stigma bilobed, the surface minutely papillose. **Immature fruit** a piriform berry ca. 3 cm in diameter, the pericarp not sclerified; mature fruit not known. **Seeds** not known. **Chromosome number:** not known. Figure 17.

***Distribution***—Disjunct, with the few known records restricted to the municipalities of Rio de Janeiro, Rio de Janeiro State, and Santa Teresa, in the state of Espírito Santo (Fig. 18).

***Ecology and Habitat***—*Solanum puri* inhabits submontane to montane Atlantic rainforests; from 450 to 750 m elevation.

***Etymology***—The specific epithet honours the extinct Brazilian ethno-linguistic group known as ‘Puri’. They lived along the more continental lands between south-central



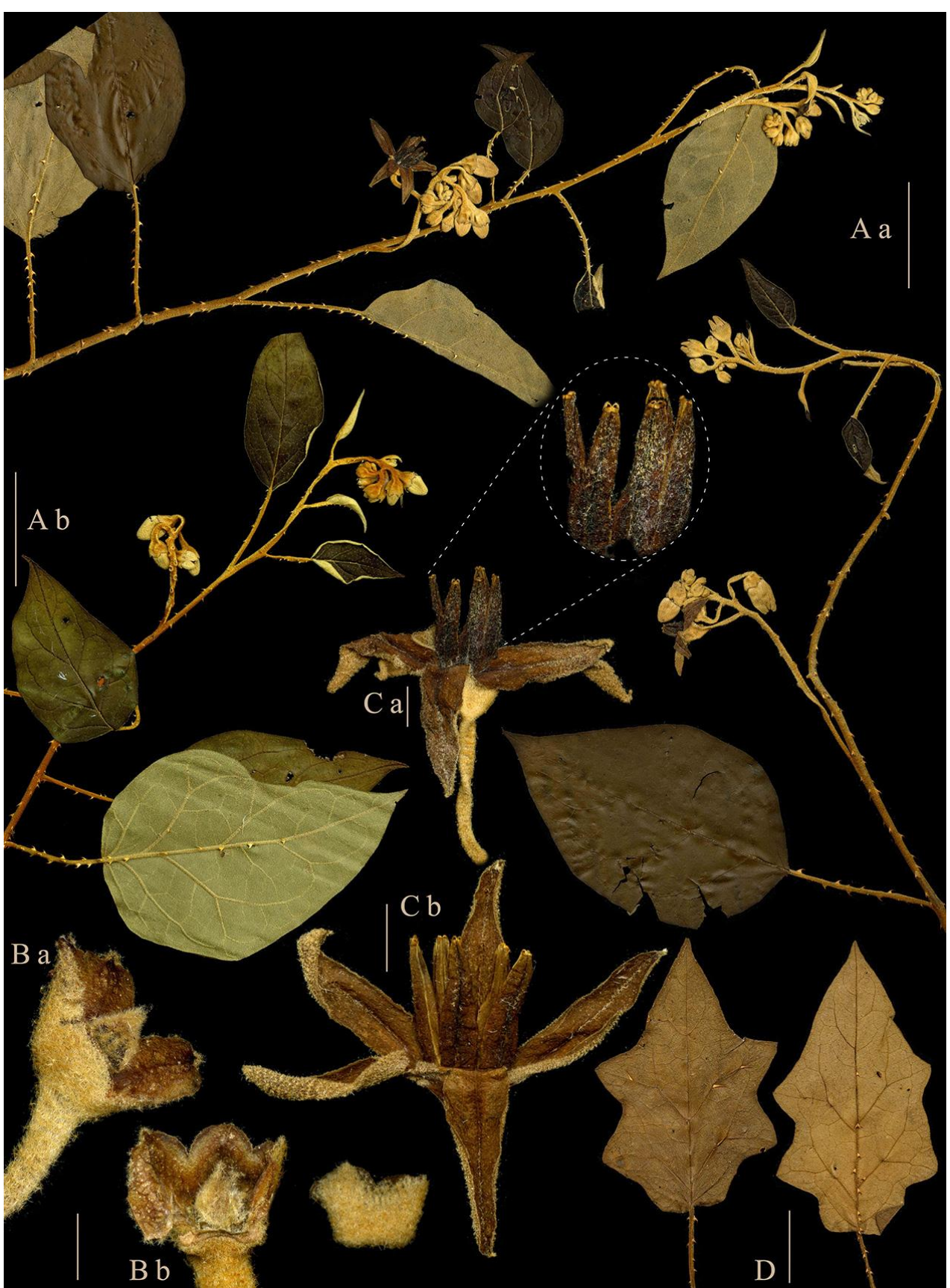


Fig. 17. *Solanum puri* (*spnov1*) (**Aa, Ba, Ca, Cb**: L. Kollmann and E. Bausen 1381, BHCB and MBML; **Ab, Bb**: L. Kollmann and M. Gropo 12225, MBML; **D**: Paulino and Vict3rio s.n., BHCB. **A(a-b)**. Flowering branches. **B(a-b)**. Dissected calyx with ovary. **C(a-b)**. Calyx lobes. **D**. Lobed leaves. Scale bars: **Aa, Ab** = 3 cm; **Ba, Bb** = 2.5mm; **Ca** = 0.35cm; **Cb** = 0.45cm; **D** = 2.5cm.

region of the Espírito Santo State and the north-central region of the Rio de Janeiro State, partially coinciding with the known range of this species (for details on the distribution of Brazilian ethno-linguistic indigenous groups, see Nimuendajú's 2017 map: <http://portal.iphan.gov.br/indl/pagina/detalhes/1574/>).

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum puri* and *S. ochroneurum*, which belongs to the Jussiaei clade, are morphologically united by sharing anthers apically pubescent on their abaxial surfaces (Fig. 17C). This feature allied to the climbing habit, hairy and large fruits, and other overall morphological similarities (see descriptions for more details), as well as their similar environmental preferences and geographic occurrence, are evidences that these species may be closely related. *Solanum puri* can be easily distinguished, however, by its ovate, cordiform, trullate or rhombic leaf blades with the adaxial surfaces very sparsely pubescent (Fig. 17A, D), rather than elliptic to lanceolate and moderately to densely pubescent as those of *S. ochroneurum*. Trichome morphology also provides a useful distinctive character distinguishing these species. Stem and abaxial leaf surface trichomes are mostly and evenly short-stalked in *S. puri*. Distinctly, those of *S. ochroneurum* have various lengths. This feature is better observed in intermediate to fully developed parts of the mentioned organs. *Solanum puri* is also similar to *S. jussiaei*, which it shares ovate to somewhat cordiform leaves. These species also share a close geographical distribution, however, *S. jussiaei*, inhabits herbaceous to arboreal vegetation growing along the Brazilian sandy coastal

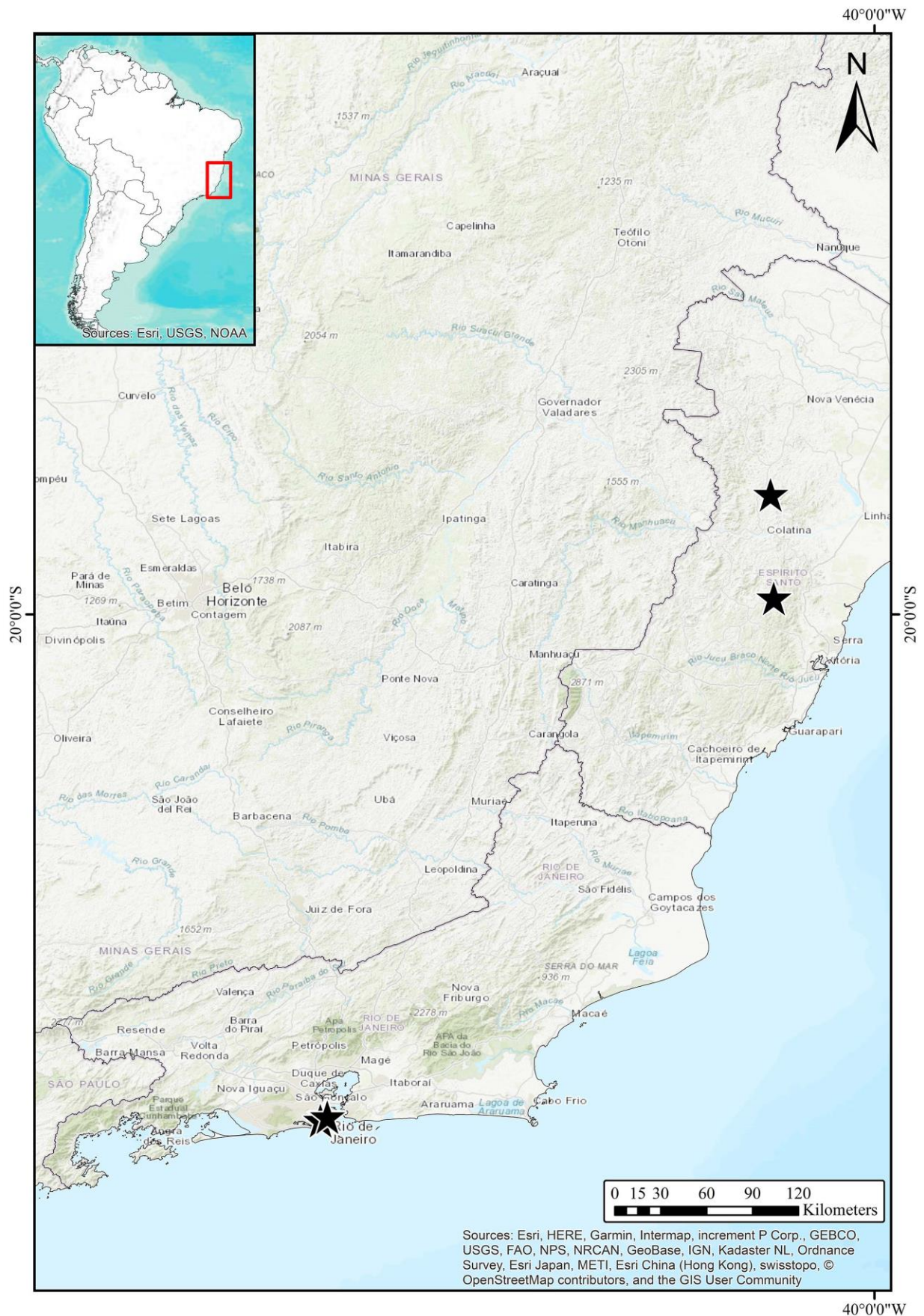


Fig. 18. Distribution of *Solanum puri*.

lowlands, while *S. puri* has been recorded to coastal slope forests above 400 m elevation. *Solanum puri* differs from *S. jussiaei* in its very sparsely pubescent

adaxial leaf surfaces (Fig. 17A, D), rather than moderately to densely pubescent; its anthers apically pubescent on their abaxial surfaces (Fig. 17C), rather than glabrous; and its fruits with soft, not sclerified pericarp, rather with rigid, sclerified pericarps.

**Additional Specimens Examined (paratypes)**—*Brazil*.—ESPÍRITO SANTO: Mun. Santa Teresa, Santo Antônio, terreno do Boza, 700 m elev., 29 Mar 2011, *L. Kollmann & M. Gropo 12225* (BHCB, MBML).—RIO DE JANEIRO: Mun. Rio de Janeiro (?), 1841, *A.F. Regnell 343* (US); Mun. Rio de Janeiro, Corcovado, 09 Jan 1880, *A. Glaziou 12106* (P); Paineiras, 20 Jan 1877, *A. Glaziou 8880* (P); estrada da Vista Chinesa, 27 Mar 1932, *Paulino & Victorio s.n.* (BHCB, RB); Sumaré, TVs Tupy e Rio, 16 Mar 1962, *A.P. Duarte 6279* (RB).

**10. *Solanum rupincola*** Sendtn., in Martius, Fl. Bras. 10: 100. Tab. 7, figures 13, 14. 1846.— TYPE: **BRAZIL**. Bahia: Mun. Ilhéus, “Inter dumeta ad rupis fluminis aqua obscuratas, Novembri florens, ad Ilheos” *P. Luschnath & C. Martius s.n.* (holotype: M [?] or lectotypify one of two from BR; isotypes: BR [BR0000008366016; BR0000008366139]).

*Solanum rupincola* var. *piauhense* Dunal, Prodr. [A. P. de Candolle] 13(1): 202. 1852.— TYPE: **BRAZIL**. “in silvis prov. Piauiensis, Majo florens”, *C. Martius s.n.* (holotype: M [M0166111]).

*Solanum paraibanum* Agra, Novon 2: 179. 1992. — TYPE: **BRAZIL**. Paraíba: Mun. João Pessoa, Cidade Universitária, 6 km Sudeste do centro, 7°06'S, 34°53'W, 30–45 m elev., 10 Nov 1989, *M.F. Agra 1101* (lectotype, designated here: JPB! 2 sheets

[JPB1000023, JPB1000034]; isoelectotypes: PEUFR [PEUFR-13724], MO [MO503707]).

**High-climbing liana** reaching more than 10 m height, armed. **Young stems** terete, sparsely to densely stellate-pubescent to -hirsute with ferruginous, castaneous, vinaceous or atropurpureous, sessile, less often subsessile, uniradiate, rarely multiangulate, porrect to retrorse, distinctly long-midpointed, eglandular stellate trichomes and tiny, simple glandular trichomes to 0.2 mm long, not visible to the naked eye or in densely indumented plants; the stellate trichomes with stalks to 0.15 mm long, multiseriate, enlarged, many cells wide, the rays 4–8(–20), 0.05–0.7(–1) mm long, 1-celled, the midpoint 0.5–9.5 mm long, 2–7-celled, markedly longer and more robust than the rays, straight, retrorse or antrorse, the epidermis visible or not, sparsely to densely armed, the prickles 0.5–10 mm long, recurved to retrorse, broad-based, laterally compressed, ferruginous, vinaceous or dark brown, often gold at base. Bark of older stems dark brown to greyish dark brown, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire to lobed, the blades of fully developed leaves 6–21.5 cm long, 3.5–13 cm wide, elliptic to lanceolate, less often oblanceolate, chartaceous to coriaceous, slightly discolorous when fresh, drying discolorous; the adaxial surface shiny green when fresh, drying green to greyish or dark brown, sometimes almost black, sparsely to densely stellate-pubescent with trichomes like those sessile trichomes of the stems, but sometimes with shorter rays and/or midpoints and fewer rays, the rays 4–7, 1-celled, the midpoint 0.3–3.1 mm long, 2–3(–5)-celled, straight to retrorse, sometimes nearly appressed, the epidermis always visible, unarmed or armed along the midrib and primary veins, the prickles 1.2–7 mm long, straight, broad-based, ferruginous to dark brown, often golden at base;

the abaxial surface usually slightly paler green than the adaxial one when fresh, drying green to yellowish, greyish or reddish brown, moderately to densely, less often sparsely stellate-pubescent strictly with trichomes like those of the adaxial surface but usually with longer rays, or these mixed with sessile to subsessile, biradiate, less often multiradiate stellate trichomes, the only/upper whorl of rays porrect to antrorse strictly with eglandular rays, the rays 4–8(–10), to 0.6(0.9) mm long, 1-celled, if gland-tipped 2–3-celled, the lower whorl(–s), if present, patent to retrorse, usually with shorter, eglandular, less often glandular rays, the rays 4–8(–12), the midpoint 0.4–1.4 mm long, many times longer to the same length as the rays, rarely shorter, 2–3-celled, straight, the epidermis always visible, armed only along the midrib or also along the primary veins, the prickles like those of the stems, but with up to 2.5 mm long; primary veins 5–7 pairs; base acute to obtuse, less often narrowly acute, rounded or truncate, symmetric or not, not decurrent onto the petiole; margins with 0–7 lobes on each side, these with up to 1.4 cm long and 3.7 cm wide, apically acute to rounded; apex acute to obtuse- or rounded-apiculate, less often acuminate; petiole 0.5–4 cm long, the indumentum like that of the stems, usually armed, the prickles like those of the stems. **Inflorescence** an usually unbranched, rarely once to twice forked cyme, terminal, becoming internodal (lateral) by the subsequent sympodial unit's development; the axis's (peduncle plus rachis) indumentum like that of the stems, the epidermis visible to barely visible, armed or not, the prickles like those of the stems, but usually smaller; the peduncles 1–4.5 cm long, the rachis 1.6–10 cm long, with 3–20 flowers; the two basal-most pedicel insertion points spaced 7–15 mm apart, the others gradually less spaced towards the apex; pedicels (0.7–)0.9–3.6 cm long in open flowers, straight, articulated at base, the indumentum like that of the stems, armed or not, the prickles to 2.5 mm long, recurved to straight. **Buds** ovoid,

lanceoloid or nearly ellipsoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes soon evident, not adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped, 0.8–3 mm long, the external surface smooth to slightly 5-knobbed basally (more easily seen in fresh material), the lobes 4.2–16 mm long, 1.8–6.7 mm wide, widest at base to nearly the middle, lanceolate to narrowly triangular, less often ovate-lanceolate, the apex acute to acuminate, sparsely to densely pubescent to hirsute with trichomes like those of the stems, unarmed or armed with prickles like those of the stems, but shorter, with up to 2.8 mm long and sometimes straight. **Corolla** (2.6–)3.2–6(–8) cm in diameter, lilac or pale pink to purple, the midvein drying with a colour similar to that of the lamina adaxially, stellate, lobed for 2/3–3/4 of the way to the base, interpetalar tissue moderately to little developed, 0.5–3.4 mm wide at the widest point, the lobes 1.3–2.9 cm long, (2.2–)6–16.7 wide, widest at base, less often near the middle, triangular to nearly oblong or lanceolate, planar to slightly reflexed at anthesis, the apex acute, often apiculate and cucullate, the adaxial surface usually glabrous in its basal 3/4, sparsely to moderately pubescent in its apical 1/4 with trichomes like those of the stems, but smaller and often misshapen; the abaxial surface moderately to densely stellate-pubescent for the whole length with trichomes like those of the stems. **Stamens** equal; the filament tube (0.3–)1–1.4 mm long; the free portion of the filaments 0.4–1.7 mm long, glabrous; anthers 10–13.5 mm long, 2.5–3.5 mm wide at the widest point, 1.8–2.8 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards

the apex, poricidal at the tips with elliptic pores, glabrous, the epidermis of the abaxial surface minutely papillose, tightly to loosely connivent. **Ovary** cupuliform, 4-locular, densely pubescent with stramineous to ferruginous, sessile to short-stalked, porrect, distinctly long-midpointed, eglandular stellate trichomes and simple glandular trichomes like those of the stems; the stellate trichomes thin-walled with stalks to 0.2 mm long, multiseriate, relatively thin, 2 cells wide, the rays 4–8, 0.05–0.45 mm long, 1-celled, usually misshapen, the midpoint 0.9–3.9 mm long, 2(–3)-celled, markedly more robust than the rays, straight; style 8–16.5 mm long in long-styled flowers, 2–3.7 mm long in short-styled flowers, cylindrical, straight, glabrous to moderate stellate-pubescent in the basal 1/3; stigma capitate, the surface minutely papillose. **Fruit** a globose berry, 2.5–4 cm in diameter when mature, yellowish orange to brown when mature, densely pubescent to hirsute, with trichomes like those of the ovary, but the stellate trichomes with longer midpoints, usually more rayed, the rays 4–12, 1-celled, usually eglandular, the midpoints 2.5–5.3 mm long, on average longer than 1.5 mm long, 2–3-celled, thick-walled, straight, stiff, pale yellow, ochraceous or ferruginous; the pericarp soft and not sclerified at maturity; fruiting pedicels 1.6–3.6 cm long, woody, curved downwards, articulated at the base, usually gradually enlarged towards the calyx, sparsely to densely stellate-tomentose with trichomes like those of the inflorescence axis, unarmed or armed; fruiting calyx not accrescent, the tube flat or nearly so, 6–13 mm in diameter. **Seeds** 30–70 per berry, 3.1–5.4 mm long, 3.7–6 mm wide, 0.8–1.4 mm thick when dry, flattened, reniform to nearly discoid, dark brown to black when fresh, drying grey, castaneous or black. **Chromosome number**: not known. Figure 19.



**Distribution**—Widely distributed along the Brazilian coast; from the state of Espírito Santo to the Paraíba State (Fig. 20).

**Ecology and Habitat**—*Solanum rupicola* occurs in wet to seasonal semi-deciduous Atlantic forests; from sea level to 900 m elev.

**Etymology**—The specific epithet *rupicola* probably derives from the Latin word ‘*rupina*’, meaning rock chasm, and probably refers to the large rock outcrops frequent along the Brazilian Atlantic Forest, the habitat of *S. rupicola*.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum rupicola* belongs to the Jussiaei clade. It has the broader geographic distribution and most variable morphology compared to the morphologically similar

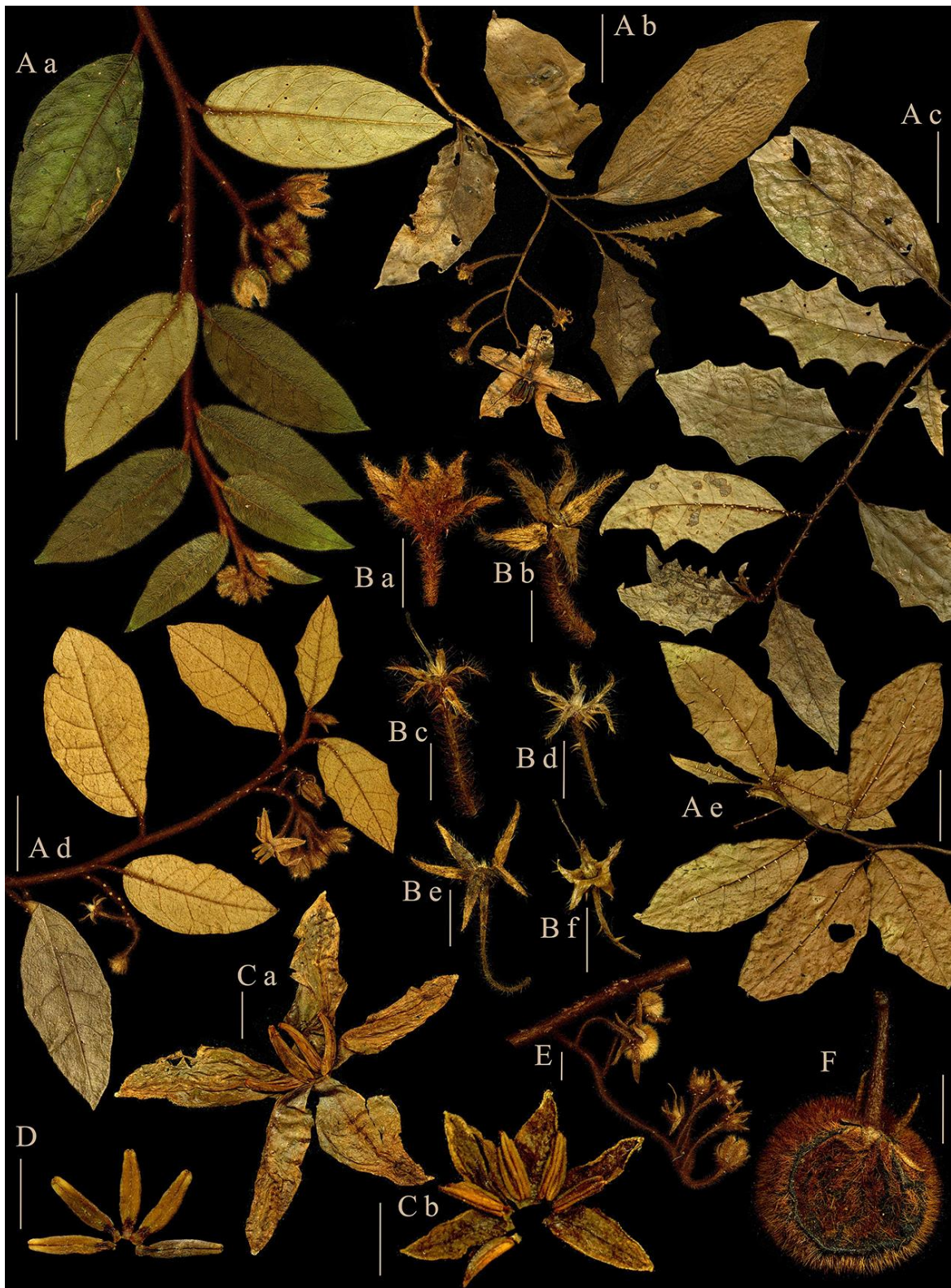


Fig. 19. *Solanum rupicola* (**Aa**, **Ba**: Y.F. Gouvêa et al. 242, BHCB; **Ab**: W.W. Thomas et al. 13649, RB; **Ac**: M.L. Guedes et al. 16470, ALCB; **Ad**, **Cb**, **E**: S.A. Mori et al. 10868, RB; **Ae**, **Bd**: V.S. Sampaio 5, JPB; **Bb**, **Ca**, **D**: J.R. Stehmann et al. 5088, BHCB; **Bc**: L.L. Giacomini et al. 1951, BHCB; **Be**: A.M. Amorim 492, CEPEC; **Bf**: M.L. Guedes et al. 23342, ALCB; **F**: M.L. Guedes et al. 3028, ALCB). **A(a-b-d)**. Flowering branches. **A(c-e)**. Branches. **B(a-f)**. Dissected calyces. **C(a-b)**. Dissected flowers. **D**. Stamens. **E**. Inflorescence with young fruits and flower buds. **F**. Fruit. Scale bars: **Aa** = 7.5cm; **Ab** = 3cm; **Ac** = 6cm; **Ad** = 3.5cm; **Ae** = 4cm; **Ba** = 1.3cm; **Bb**, **Bc**, **Bd**, **Be**, **Bf**, **Ca**, **Cb**, **D**, **E** = 1 cm; **F** = 1.5cm.

species *S. caipora*, *S. chirocalyx*, and *S. gymnum*. Fruits of the four species are distinct in being densely covered by pale yellow, mostly ochraceo-ferruginous stellate trichomes bearing long, straight and stiff midpoints, which are composed by two or three cells (Fig. 19F). *Solanum rupincola* is readily distinguished from *S. gymnum* by its pubescent to hirsute rather than glabrous aerial vegetative parts (Fig. 19A). The indumentum also allows the distinction between *S. rupincola* and *S. caipora*. While the stellate trichomes found on the stems, petioles, inflorescence axes and calyces of *S. rupincola* are all sessile to subsessile and uniradiate, *S. caipora* possess a mixture of sessile to long-stalked (stalks to 1 mm), uni- to biradiate stellate trichomes. *Solanum rupincola* also resembles *S. chirocalyx*, from which it can be differentiated by its lanceolate to narrowly triangular or, less often, ovate-lanceolate rather than linear-filiform calyx lobes (Fig. 19B). These species also differ in the colour of the abaxial leaf surface, which in *S. rupincola* is variously brown, often with darker trichomes forming tiny dots to the naked eye, whereas in golden in *S. chirocalyx* they are golden to greenish (Fig. 19A). Furthermore, although being a more subtle character, the posture of the stellate trichome midpoints (especially those of the plant axes) is a relatively good character in distinguishing these species. Those of *S. rupincola* are straight to oblique (Fig. 19A, B). In *S. chirocalyx*, however, most are gently curved above the basal-most cell.

Here we recognize *S. paraibanum* as synonym of *S. rupincola*. The morphological data gathered during this study indicate that characters used to delimit *S. paraibanum* (i.e. “smaller size of the calyx, corolla, and fruit, the shape of the linear-lanceolate and revolute calyx lobes, and the more scabrous pubescence”; Agra 1992), have, in fact,

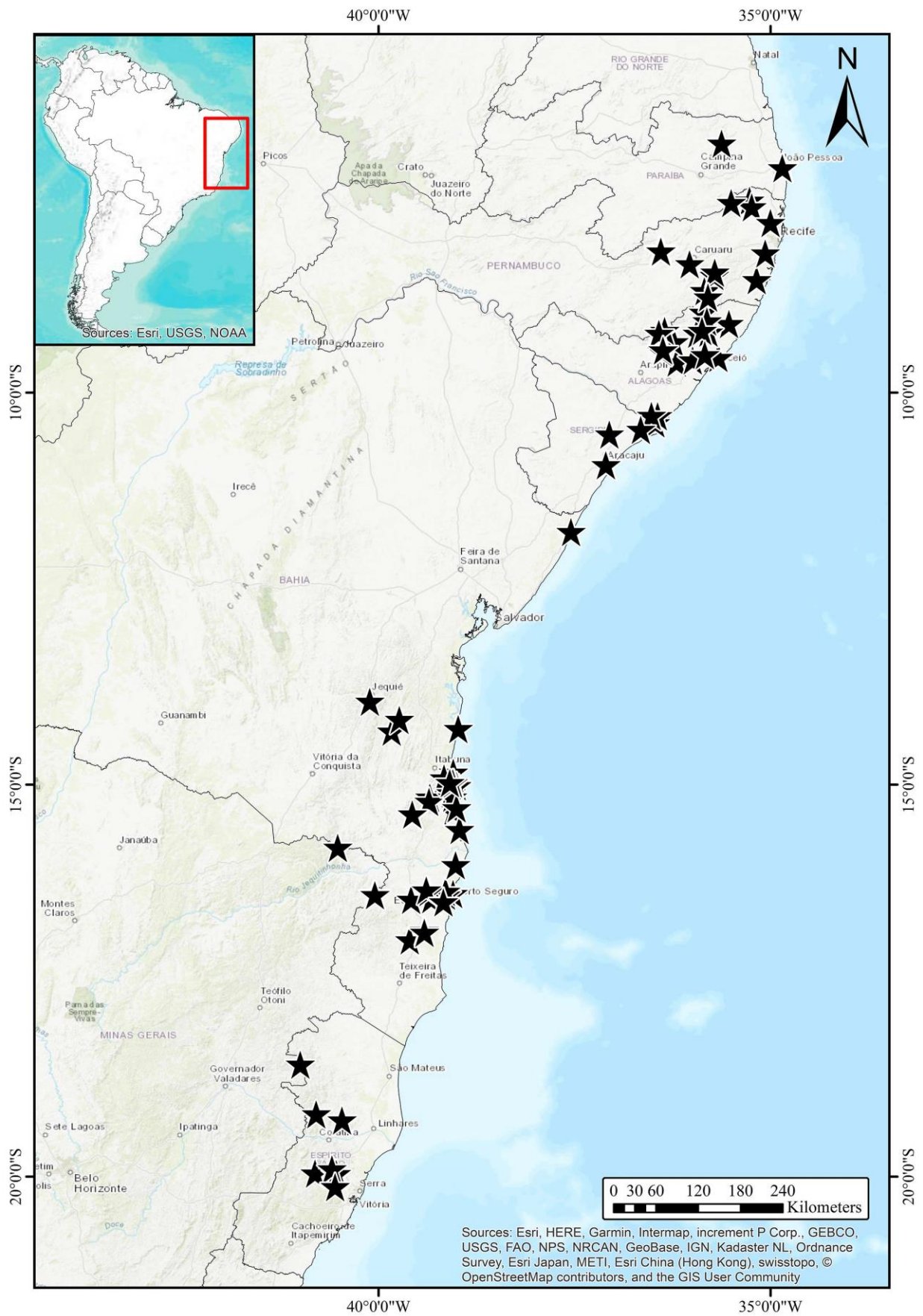


Fig. 20. Distribution of *Solanum rupincola*.

an independent distribution amongst populations of *S. rupincola*. We tentatively illustrate the morphological variation included in *S. rupincola* according to our circumscription in Figure 19.

***Additional Specimens Examined—Brazil.***—ALAGOAS: Mun. Boca da Mata, Serra da Nascéia, 9°14'27"S, 36°17'51"W, 26 Sep 2009, Chagas-Mota et al. 3571 (MAC); Mun. Camaragibe, Usina Camaragibe, 19 Feb 1979, *E.J. de Paula et al.* 1162 (RB); Mun. Chã Preta, Serra Lisa, 6 May 2009, *Chagas-Mota & N. Ramos* 3571 (MAC); Mun. Flexeiras; Estação Ecológica Murici, ca. 500 m elev., 31 Jul 2008, *F.L.R. Filardi et al.* 888 (BHCB, MAC); 9°14'S, 35°48'W, 14 Mar 2001, *R.P. Lyra-Lemos & I.A. Bayma* 5583 (MAC); 31 Jul 2008, *A.I.L. Pinheiro et al.* 432 (MAC); Mun. Ibataguara, Coimbra, Grota do Varjão, 25 Jan 2003, *M. Oliveira & A.A. Grillo* 1269 (UFP); Mun. Joaquim Gomes, Fazenda Boa Vontade, 25 Sep 2009, *A.I.L. Pinheiro et al.* 1022 (MAC); Mun. Maceió, Serra da Saudinha, Fazenda Cela, 18 Apr 2009, *Chagas-Mota* 2804 (MAC); Mun. Mar Vermelho, Fazenda Canadá, 8 May 2009, *Chagas-Mota* 3652 (MAC); *Chagas-Mota* 3694 (MAC); ca. 540 m elev., 29 Mar 2007, *R.P. Lyra-Lemos et al.* 10070 (MAC, TEPB); Mun. Murici, Serra da Águas Belas, 9°15'21"S, 35°56'06"W, 30 Jun 2002, *R.P. Lyra-Lemos et al.* 7046 (MAC, NY); Estação Ecológica de Murici, Fazenda Bananeiras, 14 Sep 2012, *M.C.S. Mota & E.C.O. Chagas* 11774 (MAC); Mun. Penedo, AL-225, a 4km de Piaçabuçu em direção a Penedo, 29 Jul 1981, *G.L. Esteves* 803 (MAC); 11 km de Penedo para Piacabuçu, 10°17'S, 36°26'W, 29 Apr 2017, *M.L. Guedes & L. Cunha* 25634 (ALCB); Mun. Piacabuçu, Mata da Marreca, 8 Aug 1992, *R.P. Lyra-Lemos* 2507 (MAC, JPB); Mun. Pilar, Alagoas, Fazenda Lamarão, BR-101, 6 Apr 2002, *R.P. Lyra-Lemos et al.* 6538 (MAC); Mun. Quebrangulo, REBIO Pedra Talhada, 9°15'04"S, 36°25'41"W, 20 Dec 2012, *B.S. Amorim et al.* 1711 (NY, UFP); Serra das Guaribas, 25 Jun 2009, *Chagas-Mota* 4181 (MAC); Mun. Rio Largo, Usina

Leão, 28 Sep 2006, *P.A.F. Rios et al. 95* (MAC); Mun. Viçosa, Fazenda Jussara, 23 Sep 2010, *Chagas-Mota et al. 8684* (MAC).—BAHIA: Mun. Arataca, RPPN Caminho das Pedras, trilha que leva à Serra do Peito de Moça, 15°10'00"S, 39°20'39"W, 821 m elev., 7 Oct 2017, *Y.F. Gouvêa et al. 242* (BHCB); Estrada de terra saindo da rodovia BA-676, 15°13'12"S, 39°21'13"W, 248 m elev., 8 Oct 2017, *Y.F. Gouvêa et al. 248* (BHCB); Mun. Belmonte, Ramal para Mogiquiçaba, com entrada no km 23 da Rod. Belmonte/Itapebi, 80 m elev., 11 Jul 1980, *L.A. Mattos Silva & H.S. Brito 998* (CEPEC, MO, NY, RB); Mun. Baruaema, Estrada Buerarema/Pontal de Ihéus, 30 Mar 1971, *A.M. Carvalho & G. Bromley 280* (CEPEC, RB); Mun. Camacan, RPPN Serra Bonita, 15°23'30"S, 39°33'55"W, 835 m elev., 28 Oct 2005, *A.M. Amorim et al. 5376* (BHCB, CEPEC); 19 Jun 2009, *L. Daneu & A.M. Amorim 67* (CEPEC); 15°22'51"S, 39°34'06"W, 922 m elev., 26 Sep 2008, *J.R. Stehmann et al. 5088* (BHCB); 6–8km up road to Embratel tower, 8 NW of Camacan on road to Jacareci, above branch road to the Serra Bonita Private Reserve (RPPN) "Caminho da Bapeba", 15°22'51"S, 39°34'04"W, 800–920 m elev., 29 Oct 2014, *W.W. Thomas et al. 16445* (JPB, NY); Mun. Canavieiras, ca. 1km da BA-001, Região do Cotovelo, 15°34'53"S, 38°58'23"W, 97 m elev., 15 Nov 2002, *J.G. Jardim et al. 4072* (CEPEC, HUEFS); Mun. Eunápolis, Km 15 entre Eunápolis e Itabela, *L.E. de Melo Filho 2985* (CEPEC); Mun. Ilhéus, Pontal. Saída p/ Buerarema, 17 May 1968, *R.P. Belém 3588* (CEPEC, IAN); Estrada Olivença para Vila Brasil, 6 km SW de Olivença, 60 m elev., 8 Feb 1982, *G.P. Lewis et al. 1177* (CEPEC, RB); Estrada Olivença/Marium, entre os Kms 7–10, 50 m elev., *G. Martinelli et al. 11103* (BHCB, CEPEC, RB); 7.3 km SW of Olivença on road to Vila Brasil, 14°59'02"S, 39°02'27"W, 21 May 1995, *W.W. Thomas et al. 10947* (CEPEC, NY); road from Olivença to Maruim, 6.1 km W of Olivença, 14°59'S, 39°03'W, *W.W. Thomas et al. 9072* (CEPEC, NY, RB); 14.7 km west of Olivença on road to Vila Brasil, 14°58'55"S, 39°05'18"W, 14 Feb 1994, *W.W. Thomas et al.*

10394 (CEPEC, MO, NY, RB); Cerca de 1km ao S de Itacaré, 7 Jun 1978, *S.A. Mori & T.S. dos Santos* 10151 (CEPEC, MO, NY, K); Mun. Itagibá, 12 Mar 2009, *M.L. Guedes et al.* 16470 (ALCB); Mata do Laterítico, 14°10'35"S, 39°43'55"W, 22 Mar 2008, *C.E. Ramos et al.* 143 (ALCB); Mun. Itamaraju, Morro Pescoço, aprox. 15 km da entrada da cidade, 16°59'13"S, 39°36'03"W, 11 Feb 2007, *A.M. Amorim et al.* 6871 (CEPEC, NY); Mun. Jandaíra, 11°27'S, 37°21'W, 26 Feb 2015, *M.L. Guedes & F. Kelmo* 23342 (ALCB); Mun. Jequié, Fazenda Brejo Novo, a 10,5km da Avenida Otávio Mangabeira, pela Exupério Miranda no Bairro do Mandacaru, 13°56'41"S, 40°06'34"W, 617 m elev., 1 Apr 2004, *G.E.L. Macedo* 675 (HUESB, JPB, PEUFR); 13°56'41"S, 40°06'34"W, 649 m elev., 26 Nov 2004, *G.E.L. Macedo & A.F. Souza* 1311 (JPB); Mun. Porto Seguro, RPPN Manona, 10 Oct 2005, *L.J. Alves* 89 (ALCB); Reserva da Brasil Holanda de Ind. S/A, estrada no km 22 da Rod. Eunápolis/P. Seguro, ca. 9.5 km da entrada, 16°27'45"S, 39°19'31"W, 6 Apr 1994, *A.M. Carvalho et al.* 4441 (CEPEC, MO, NY); Km 9 da Rod. Porto Seguro/Eunápolis, 8 Feb 1972, *A. Eupunino* 216 (CEPEC); Estrada do "Bí", área a ser incorporada à área do PARNA, 16°30'08"S, 39°10'12"W, 18 Jan 2017, *M. Ribeiro & R.T. Valadares* 1300 (RB); Parque Nacional Monte Pascoal, along park road 1–2 km, east of path to peak and visitor center, 16°52'02"S, 39°24'54"W, 17 Jul 1997, *W.W. Thomas et al.* 11571 (CEPEC, MO, NY, SPF); Parque Nacional Monte Pascoal, 15°15'53"S, 40°34'29"W, 250–536 m elev., 14 Nov 1996, *W.W. Thomas et al.* 11269 (CEPEC, MBM, MO, NY, US); Mun. Santa Cruz Cabrália, Reserva de Veracruz, 23 Apr 1994, *M.L. Guedes et al.* 3028 (ALCB); Mata Cara-Branca, 16°16'S, 39°01'W, 20 Jun 1999, *S.S. Lima et al.* 55 (ALCB); torre da EMBRATEL, final do ramal que tem entrada no km 26 da Rod. BR 367 (Eunápolis/Porto Seguro), 220 m elev., *S.A. Mori et al.* 10868 (CEPEC, NY, RB, US); Mun. Una, Fazenda Bolandeira, 6 km ao N da Ilha de Comandatuba, 15°18'20"S, 39°01'18"W, 27 Apr 2004, *A.M. Amorim et al.* 4070 (CEPEC, NY);

Comandatuba, ca. 6 km na estrada de Comandatuba, para praia de Una, *A.M. Amorim et al. 492* (ALCB, CEPEC, MBML, MO, NY); Reserva Biológica do Mico-leão (IBAMA), 15°09'S, 39°05'W, 6 Jun 1996, *A.M. Carvalho et al. 6219* (ALCB, CEPEC, NY); 30 Apr 2000, *S.C. Sant'Ana et al. 800* (CEPEC, JPB, MO, NY); 7 Km ao N Comandatuba, Faz. Bolandeira, c/ entr. na praça da igreja, prox. marg. Rio Doce, 28 May 1998, *L.A.M. Mattos-Silva 3771* (CEPEC).—ESPÍRITO SANTO: Sin. loc., “Norte Rio Doce”, “Mata R.S. Gabriel”, Sep 1950, *J.N. Vieira 107* (RB); Mun. Água Doce do Norte, 27 Apr 2008, *L. Kollmann 10954* (MBML); Mun. Governador Lindemberg, Pedra de Santa Luzia, 19°16'54"S, 40°27'43"W, 650 m elev., 26 Apr 2007, *V. Demuner et al. 3852* (MBML); Mun. Itaguaçu, Jatiboca, 31 May 1946, *A.C. Brade et al. 18498* (RB); Mun. Pancas, 30 Nov 1943, *J.G. Kuhlmann 6565* (RB); Mun. Santa Leopoldina, Bragança, Mata do Tyrol, 20°08'03", 40°33'03", 560–740 m elev., 31 Oct 2006, *L.F.S. Magnago et al. 1531* (MBML); Mun. Santa Teresa, Estação Biológica de Santa Lúcia, Trilha do Sagui, 19°58'18"S, 40°32'05"W, 787 m elev., 5 Feb 2011, *L.L. Giacomini et al. 1205* (BHCB, RB); 19°58'13"S, 40°32'06"W, 755 m elev., 9 Jun 2012, *L.L. Giacomini et al. 1863* (BHCB); 19°58'06"S, 40°32'13"W, 692 m elev., 28 Mar 2019, *Y.F. Gouvêa & G.V.A. Santos 318* (BHCB); Santo Antônio, terreno do Boza, 29 Oct 1998, 750 m elev., *L. Kollmann et al. 883* (MBML); 31 May 2001, *L. Kollmann et al. 3792* (MBML).—MINAS GERAIS: Mun. Almenara, Fazenda Limoeiro, 16°02'59"S, 40°51'03"W, 836 m elev., *J. Lombardi & A. Salino 5634* (BHCB); Mun. Bandeira, Mata do Boi Rajado, ca. 14km da sede de Bandeira, na divisa com a Bahia, 15°48'18"S, 40°30'59"W, 700 m elev., 4 Oct 2003, *A. Salino et al. 9017* (BHCB); Fazenda Boi Rajado, 5.9 km E of Macarani-Bandeiras road on farm road ca. 12 km N of Bandeiras (at Fazenda Canada), 15°48'23"S, 40°31'05"W, 830–850 m elev., 30 Jan 2004, *W.W. Thomas et al. 13649* (CEPEC, JPB, MO, NY, RB); Mun. Santa Maria do Salto, Povoado de Talismã, Fazenda Duas Barras, Reserva Alto Cariri,



16°24'13"S, 40°03'16"W, 950 m elev., 22 Apr 2006, *A.M. Amorim et al. 5927* (CEPEC, NY); RPPN Loredano Aleixo (Fazenda Duas Barras), 16°24'38"S, 40°02'40"W, 813 m elev., 30 Oct 2013, *L.L. Giacomini et al. 1951* (BHCB, NY, RB).—

PARAÍBA: Mun. João Pessoa, Campus I da UFPB, 7°57'S, 34°53'W, 30–45 m elev., 9 Nov 1982, *M.F. Agra 448* (JPB); 7°08'33"S, 34°50'55"W, 60 m elev., 11 Aug 2008, *M.F. Agra et al. 7008* (JPB); 20 Oct 2006, *M.F. Agra & K.N. Nurit 6575* (ICN); 10 Nov 2008, *K. Miranda et al. 18* (UFP); 9 Jun 1980, *O.T. Moura 10* (JPB); 8 Sep 1992, *O.T. Moura 789* (JPB); 5 Nov 1992, *O.T. Moura 863* (IPA, JPB); 7°08'29"S, 34°50'51"W, 49 m elev., 20 Jun 2011, *V.S. Sampaio 5* (JPB, UB, UFP); 27 Jul 2011, *V.S. Sampaio 8* (BHCB, HCF, JPB, UFP); Serraria, Mata do Engenho Matiliano, 8 Jun 2004, *P.C. Gadelha Neto & D.H.M. Dantas 1155* (JPB).—

PERNAMBUCO: Mun. Aliança, 6 Dec 1993, *A.S. Luz s.n.* (HST); Mun. Bonito, Mata da Reserva Ecológica Municipal, 4 Jun 1997, *A.C. Lacerda et al. 4* (HST); Mata de Bonito, 17 Sep 1997, *J.R. Lemos 9* (UEC, PEUFR); Mun. Brejo da Madre de Deus, Mata da Rita, 14 Sep 1999, *C.A.M. Oliveira et al. 23* (PEUFR); Mata do Bituri, 19 Oct 1999, *C.A.M. Oliveira et al. 45* (PEUFR); Mata do Malhada, 565–960 m elev., 10 May 1999, *A.G. Silva & L.M. Nascimento 23* (NY, PEUFR); Fazenda Bituri, Bituri de Baixo, 36°22'15"W, 8°09'00"S, 636 m elev., *M.C. Tschá et al. 678* (PEUFR); Mun. Cabo de Santo Agostinho, Gurjaú, Mata do Cuxiu, 8°13'40"S, 35°03'57"W, 70 m elev., 10 Jun 2003, *J.A. Siqueira-Filho 1396* (HVASF, UFP); Mun. Caruaru, Brejo Dos Cavalos, 30 Jun 1998, *E. Locatelli & P. Medeiros s.n. 1370* (UFP); Mun. Igarassu, Mata da Piedade, 7°50'12"S, 35°00'28"W, 73 m elev., 17 Dec 2009, *J.D. Garcia & D. Cavalcanti 1370* (JPB, UFP); Usina São José, 7°50'15"S, 35° 00'10"W, 95 m elev., 23 Jul 2008, *A.V. Melo et al. 313* (JPB, UFP); Mata da Piedade, 7°50'18"S, 34°59'57"W, 1 Dec 2011, *V.S. Sampaio et al. 48* (BHCB, HCF, HURB, JPB, UFP); Mun. Jaqueira, RPPN Frei Caneca, Mata do Quengo, 8°43'11"S, 35°50'38"W, 31 May 2012, *B.S. Amorim et al. 1604* (JPB, NY); Serra do Urubu, 25

Aug 2015, *M.L. Bazante et al. 107* (JPB); Mun. Maraial, Engenho das Cobras, 16 Jul 1966, *G. Teixeira 2771* (HST); Mun. São Vicente Férrer, Mata do Estado, 7°35'S, 35°30'W, 600 m elev., 31 Jul 1998, *E.M.N. Ferraz & A.G. Bispo 369* (PEUFR); 9 Apr 1999, *E.M.N. Ferraz et al. 662* (PEUFR); Mun. Tapacurá, Mata do Toró, 8°34'04"S, 35°10'34"W, 100 m elev., 10 Aug 2010, *J.D. Garcia et al. 1495* (UFP); Mun. Timbaúba, Engenho Água Azul, propriedade da Usina Cruangi, 6 Mar 1998, *A. Laurênio et al. 780* (PEUFR).—SERGIPE: Mun. Capela, Mata do Junco, 17 Jun 2007, *J.E. Nascimento-Júnior et al. 70* (ASE); 17 Sep 2013, *T.C. Pereira & J.L. Viana 39* (UFP); Mun. Pacatuba, Lagoa do Junco, *G. Viana 1266* (ASE); Mun. São Cristovão, campus UFS, Rio Poxim, 9 Apr 1996, *M. Landim 902* (ASE, MAC).

**11. *Solanum tupinamba*** Gouvêa, sp. nov.—TYPE: **BRAZIL**. Bahia: Mun. Ilhéus, Fazenda Boa Esperança, estrada de terra que liga a Rod. BA-001 à Fazenda Boa Esperança 14°19'44"S, 39°01'46"W, 125 m elev., 6 Oct 2017 (fl), *Y.F. Gouvêa & R.G. Barbosa-Silva 240* (holotype: BHCB [BHCB-189407]).

**Diagnosis.** Differs from *S. goytaca* sp. nov. in having flower bud with calyx soon covering only the corolla base, anthers minutely papillose abaxially, calyx lobes 0.3–1.4 mm long, corollas (1)1.6–2 cm in diameter after anthesis, white corollas (1)1.6–2 cm in diameter, corolla lobes (0.5)0.7–0.85 cm long, (1.8)3–3.8 mm wide, anthers (4.2)5–6.5 mm long, 0.8–1.4 mm wide; also differs from *S. depauperatum* Dunal, *S. jussiaei* Dunal and *S. ochroneurum* Link, in having shine, very sparsely pubescent adaxial leaf surfaces.

**High-climbing liana** reaching more than 8 m height, armed. **Young stems** terete, densely and compactly stellate-tomentose with small, orangish- or castaneo-

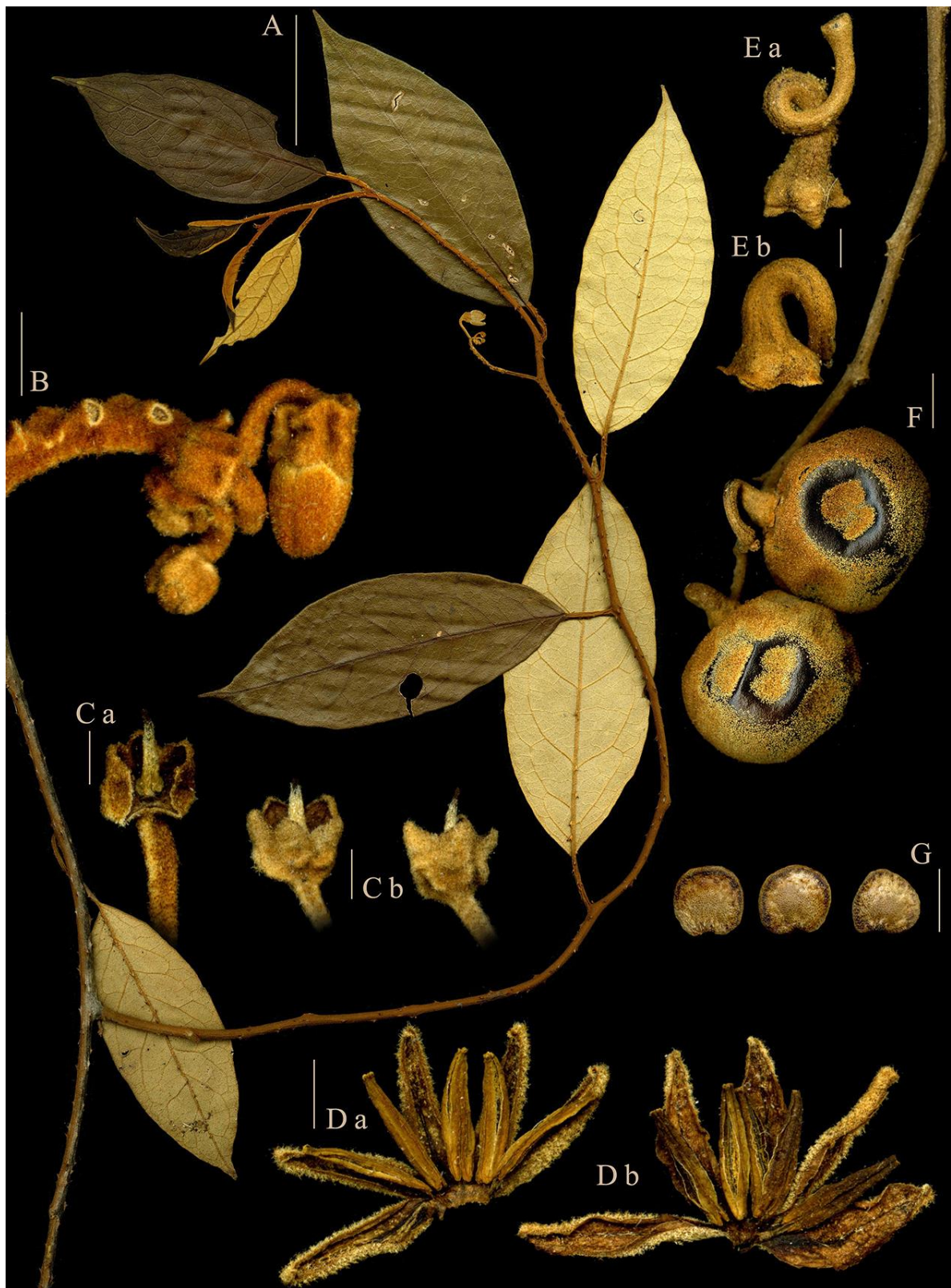
ferruginous to pale ochraceo-ferruginous, sessile to subsessile, or also short-stalked, eglandular, porrect stellate trichomes, the stalks to 0.3 mm long, multiseriate, 3 cells-wide, the rays (7-)8(-9), to 0.3 mm long, 1-celled, the midpoint obsolete to 0.05, always shorter than the rays, 1-celled, straight to oblique; the epidermis not visible, usually sparsely to moderately prickly, the prickles 0.5–2.5 mm long, strongly recurved, broad-based, laterally compressed, ferruginous. Bark of older stems glabrescent, lenticeled, dark grey to greyish brown. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, the blades of fully developed leaves 6.2–15.4 cm long, 2.4–6.3 cm wide (to 17.6 cm long and 7.3 cm wide in young plants and resprouted shoots), lanceolate to oblanceolate, chartaceous to coriaceous, strongly discolorous; the adaxial surface shiny green when fresh, drying greenish brown to dark brown, less often green, very sparsely stellate-pubescent with stellate trichomes like those of the stems, the epidermis always visible, unarmed; the abaxial surface greenish or greyish beige to ochraceo-ferruginous when fresh or dried, densely stellate-pubescent with trichomes like those of the stems, the most numerous and shorter trichomes usually stramineous to ochraceous, the less numerous and slightly longer ones ferruginous, the epidermis barely or not visible, armed only along the midrib, the prickles like those of the stems; primary veins 5–7 pairs; base acute to obtuse, symmetric or asymmetric, not decurrent onto the petiole; apex acute or cuspidate to rounded-apiculate; petiole 0.7–3.3 cm long, the indumentum like that of the young stems. **Inflorescence** an unbranched or once branched cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis's (peduncle plus rachis) indumentum like that of the stems, the epidermis not visible; unarmed or armed with small, retrorse to recurved prickles, these to 1.3 mm long; the peduncles 0.5–3.5 cm long, the

rachis 0.8–5.6 cm long, with (4)23–44 flowers; pedicel insertion points evenly spaced to 2.2 mm apart, sometimes paired or nearly so, more congested distally; pedicels 5.5–8.6 mm long in open flowers, usually geniculate at the tip, articulated at base, the indumentum like that of the stems, unarmed. **Buds** lanceoloid to ellipsoid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes soon splitting and tightly adhered to the corolla, sometimes apparently absent. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped, 0.9–1.6 mm long, the base more or less swollen, the external surface smooth to slightly 5-knobbed when fresh, usually drying wrinkled, often constricted distally, the lobes 0.3–1.4 mm long, 0.85–1.8 mm wide, deltate to rounded-deltate or rounded, usually slightly induplicate and somewhat naviculate, minutely apiculate, the apiculae < 0.3 mm long, densely stellate-tomentose with stellate trichomes like those of stems, unarmed. **Corolla** (1)1.6–2 cm in diameter, white, stellate, lobed for 5/6–5/7 of the way to the base, interpetalar tissue little developed ca. 0.6 mm wide at the widest point, the lobes (0.5)0.7–0.85 cm long, (1.8)3–3.8 mm wide at the widest point, widest in the basal third, lanceolate, reflexed at anthesis, the apex acute, cucullate or not, the adaxial surface stellate-pubescent at the tip and along the midveins apically, with sessile, usually misshapen stellate trichomes; the abaxial surface densely stellate-tomentose for the whole length with trichomes like those of the young stems, these more or less misshapen. **Stamens** equal; the filament tube (0.5)0.9–1.4 mm long; the free portion of the filaments (0.5)0.7–1.4 mm long, glabrous; anthers (4.2)5–6.5 mm long, 0.8–1.4 mm wide at the widest point, 0.7–

1.3 mm thick at the thickest point, widest and thickest in the basal third, narrowly lanceolate, usually slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, glabrous, the epidermis of the abaxial surface minutely papillose, connivent. **Ovary** cupuliform, 4-locular, densely pubescent with hyaline-stramineous, sessile to short-stalked, sometimes somewhat misshapen stellate trichomes like to those of the young stems; style ca. 5.6–7.3 mm long in long-styled flowers, (1)2.5–3.6 mm long in short-styled flowers, cylindrical, straight, densely stellate-pubescent for the whole length to 5/6 of the way to the apex with trichomes like those of the ovary; stigma clavate to bilobed, the surface minutely papillose. **Fruit** a globose berry, 2.8–4 cm in diameter, orange to yellowish-orange when mature, densely stellate-pubescent with stramineous to ochraceo-ferruginous, sessile to long-stalked, porrect stellate to echinoid trichomes, the stalks to 0.7 mm long, multiseriate, relatively slender, 2 cells wide, the rays 8–20(<), 0.1–0.3 mm long, 1-celled, the midpoint shorter to slightly longer than the rays, 1-celled; the pericarp soft and not sclerified at maturity; fruiting pedicels 1.3–2.5 cm long, woody, strongly curved to curled, articulated at the base, gradually enlarged towards the calyx, unarmed; fruiting calyx not accrescent, usually slightly expanded with 5 more or less prominent swellings, the tube flat or nearly so, 5.9–9 mm in diameter. **Seeds** ca. 40–70 per berry, 4.9–6.5 mm long, 5.2–7.2 mm wide, 0.9–1.15 mm thick when dry, flattened, reniform, drying reddish to yellowish brown. **Chromosome number**: not known. Figure 21.

**Distribution**—Endemic to center-southern Bahia State (Fig. 22).

**Ecology and Habitat**—*Solanum tupinamba* inhabits coastal Atlantic rainforests; from 70 to 930 m elevation.



**Etymology**—The specific epithet honours the Brazilian indigenous ethnic group known as “Tupinambá”. Tupinamba Indians occupied the coastal lands between the

Fig. 21. *Solanum tupinamba* (A: Y.F. Gouvêa and R.G. Barbosa-Silva 240, BHCB; B, Ca: G.S. Silva 81, JPB; Cb: L.P. de Queiroz et al.6395, HUEFS; Da, Db: L.P. de Queiroz et al. 6392, JPB; Ea: A.M. Amorim et al. 7042, CEPEC; Eb, G: L.P. de Queiroz et al. 3158, HUEFS; F: M.L. Guedes et al. 20737, ALCB). A. Flowering branch. B. Flower buds. C(a–

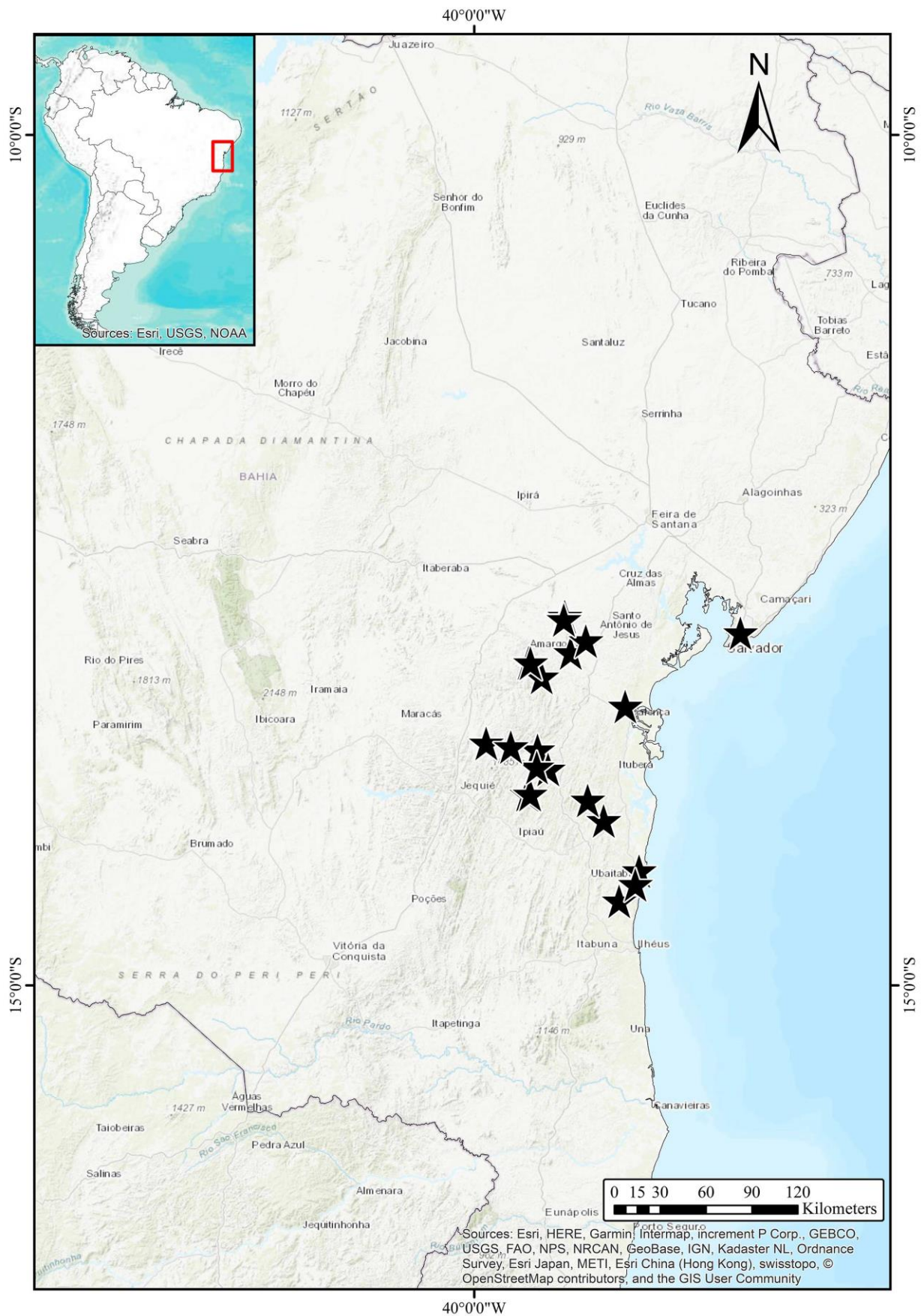
**b).** Dissected calyx with ovary. **D(a–b).** Dissected flowers. **E(a–b).** Fruiting calyces. **F.** Fruits. **G.** Seeds. Scale bars: **A** = 4cm; **B, Da, Db, Ea, Eb** = 0.3cm; **Ca, Cb** = 0.2cm; **F** = 0.8 cm; **G** = 0.5cm.

São Francisco river, in the state of Sergipe, and the municipality of Camamú, Bahia State, region comprising the known distribution of *S. tupinamba* (for details on the distribution of Brazilian ethno-linguistic indigenous groups, see Nimuendajú's 2017 map: <http://portal.iphan.gov.br/indl/pagina/detalhes/1574/>).

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum tupinamba* is a member of the Jussiaei clade. It has, in general, the smallest corollas ( $\leq 2$  mm in diameter) amongst the high-climbing species (see Table 2). Fruiting pedicels of this species are striking curled (Fig. 21E, F), similar to those of *S. jairoi* (Schizandrum clade). These species, however, greatly differs in overall morphology; leaf bases in *S. jairoi* are strongly decurrent onto the petiole, whereas those of *S. tupinamba* are not (Fig. 21A). *Solanum tupinamba* share several vegetative characters with *S. goytaca*, to which it is most similar (see also notes on *S. goytaca*). In contrast, reproductive characters involving their flowers readily distinguish them. Bud calyx in *S. tupinamba* soon covers only the corolla base (Fig. 21B), while in *S. goytaca* it completely encloses the corollas to anthesis. Additionally, *S. tupinamba* has anthers with the abaxial surfaces minutely papillose, rather than warty in *S. goytaca*.

**Additional Specimens Examined (paratypes)**—**Brazil.**—BAHIA: Mun. Amargosa, Serra do Timbó, acesso pelo Morro Pelado, 13°06'09"S, 39°40'39"W, 750–835 m elev., A.M. Amorim et al. 7042 (CEPEC); Faz. do Sr. Arlindo, 16 Nov



2007, F.M. Ferreira et al. 1795 (CEPEC); Fazenda Timbó, Palmeirinha, área 6, Centro Sapucaia, 13°10'S,

Fig. 22. Distribution of *Solanum tupinamba*.



39°09'W, 17 Mar 2007, *J.L. Paixão 1127* (HUEFS); Mun. Apuarema, Concessão do Rio Tinto, 13°52'47"S, 39°41'20"W, 636 m elev., 22 Nov 2013, *L.Y.S. Aona et al. 3341* (HURB, RB); Mun. Camamu, Serra do Cavaco, acesso pela estrada não pavimentada Camamu/Travessão, 14°02'02", 39°14'16", 387 m elev., Dec 2018, *Y.F. Gouvêa et al. 349* (BHCB); Mun. Castro Alves, Serra da Jibóia (= Serra da Pioneira), ca. 10km do povoado de Pedra Branca, 12°51'11"S, 39°28'19"W, 7 May 1993, *L.P. Queiroz et al. 3158* (HUEFS, NY); Mun. Igrapiúna, Pedra Branca, 13°54'50"S, 39°19'53"W, 295 m elev., 23 Jul 2010, *M.L. Guedes et al. 17602* (ALCB);Mun. Itamari, Fazenda Mesquita, 13°00'S, 40°36'W, 7 Oct 2011, *M.N. Oliveira et al. 125* (HUESB, JPB); 25 Sep 2012, *G.S. Silva et al. 81* (HUESB, JPB, NY); 13°37'52"S, 39°37'52"W, 12 Apr 2013, *R.S. Souza et al. 213* (HUESB, NY); Mun. Jaguaquara, Estrada para Apuarema, 5.7 km de Jaguaquara, 13°34'48"S, 39°55'51"W, 808 m elev., 24 Apr 2002, *R.P. Oliveira et al. 784* (HUEFS); Mun. Jequiriçá, Fazenda Araçá, Vale do Jequiriçá, 13°11'26"S, 39°36'10"W, 25 May 2014, *R.S. Moreira et al. 299* (HUESB, JPB); Mun. Nova Ibiá, Fazenda Dois Irmãos, 13°44'06"S, 39°33'59"W, 13 Aug 2014, *G.S. Silva et al. 430* (HUESB, JPB); 13°43'54"S, 39°33'50"W, 7 Oct 2014, *R.S. Souza et al. 674* (HUESB, JPB); Mun. Salvador, Mata dos Oitis, 12°57'S, 38°27'W, 10–30 m elev., *L.R. Noblick & I.C. Britto 4406* (HUEFS); Mun. Santa Teresinha, Serra da Jibóia, 800–850 m elev., 11 Jun 2000, *M. Alves et al. 2003* (CEPEC); estrada de Santa Teresinha para Elísio Medrado, ca. 10.2 km à esq., estrada para o alto da serra, 12°50'S, 39°28'W, 25 Feb 2003, *P. Fiaschi et al. 1378* (CEPEC, NY, SPF); Serra da Jibóia, 12°51'13"S, 39°28'32"W, 822 m elev., 25 Oct 2010, *M.L. Guedes et al. 17820* (ALCB); caminho para a torre, 12°46'S, 39°31'W, 17 Aug 2013, *M.L. Guedes et al. 20737* (ALCB, HURB); 14.5 km na rod. Elísio Medrado/Sta. Teresinha, torre da Embratel, ca. 7km do distr. de Pedra Branca, Serra da Jibóia, 12°51'13"S, 39°28'33"W, 750 m elev., 24

Feb 2000, *J.G. Jardim et al. 2845* (ALCB, BAH, CEPEC, HUEFS, HUNEB, JPB, NY, UESC); Serra da Jibóia, 12°51'16"S, 39°28'33"W, 770–830 m elev., 12 Feb 2011, *E. Melo et al. 9115* (HUEFS); ca. 4km de Pedra Branca, 12°51'10"S, 39°28'32"W, 27 Sep 2000, *L.P. Queiroz et al. 6392* (HST, HUEFS, JPB); *L.P. Queiroz et al. 6395* (HUEFS, JPB); Mun. Santo Antônio de Jesus, rodovia São Miguel das Matas e Amargosa, a 7km do trevo com a BR-101, aprox.. 13°00'S, 39°20'W, 30 Jan 1993, *J.R. Pirani & J.A. Kallunki 2735* (CEPEC, MO, NY, SPF); Mun. São Miguel das Matas, Faz. Engenho da Lama, ca. 4.5 km ao S da cidade, 13°02'49"S, 39°25'56"W, 400 m elev., 24 Feb 200, *J.G. Jardim et al. 2887* (CEPEC, HUEFS, JPB, NY); Mun. Uruçuca, 7.3km N of Serra Grande on rd to Itacaré, 14°25'S, 39°01'W, 6 May 1992, *W.W. Thomas et al. 9155* (MO, NY, RB); Mun. Valença, Estrada para Orobó, entrada no km 3 da rodovia Valença/BR-101, coletas entre os kms 3–10, 7 Feb 1983, *A.M. Carvalho & T. Plowman 1499* (NY, JPB); Mun. Wenceslau Guimarães, Assentamento Oziel Alves, 13°37'08"S, 39°37'57"W, 13 Aug 2001, *D.M. Loureiro et al. 602* (ALCB); Mun. Wenceslau Guimarães, Forest of Fazenda Boa Esperança near Reserva Estadual Wenceslau Guimarães, 8 km above Rio Vermelho, 2km above jct road to Taquara, 13°36'S, 39°47'W, 600–800 m elev., 15 May 1992, *W.W. Thomas et al. 9373* (CEPEC, MO, NY).

#### **OOCARPUM CLADE**

**12. *Solanum nematopus*** Sendtn., in Martius, Fl. Bras. 10: 93. Tab. 6, figures 60–62. 1846.—TYPE: **BRAZIL**. Goiás: “Inter Inhumas & Rio Setuval”, *J. Pohl 3258* (lectotype designated here: W [W0022647]; isoelectotypes: BR [BR0000008380128], M [M0000034], W [W0022647]).

**Slender scrambling shrub** to 4 m height, armed. **Young stems** terete, densely to moderately stellate-tomentose with greyish hyaline or stramineous to ochraceo-ferruginous, sessile to short-stalked, porrect, usually eglandular stellate trichomes, the stalks to 0.2 mm long, multiseriate, 2–3 cells wide, the rays (6–)8(–10), 0.1–0.6 mm long, 1-celled, the midpoint obsolete to 0.1 mm long, always shorter than the rays, 1-celled, straight to oblique, the epidermis visible or not; sparsely to moderately armed, the prickles 1–7.7 mm long, straight to recurved, broad-based, laterally compressed, golden to casteneo-ferruginous. Bark of older brown to dark brown, glabrescent, lenticeled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire to lobed, the blades of fully developed leaves 3.9–20.5 cm long, 1.9–9.5 cm wide, lanceolate to elliptic or somewhat oblanceolate, membranaceous to chartaceous, slightly to markedly discolorous; the adaxial surface green when fresh, drying green to brown or dark brown, sparsely to densely stellate-pubescent with hyaline to ochraceo-ferruginous, sessile to subsessile, porrect, sometimes erayed (i.e. the rays obsolete, thus the trichome apparently simple), eglandular stellate trichomes and small simple glandular trichomes; the stellate trichomes with stalks to 0.1 mm long, multiseriate, 2–3 cells wide, the rays (0–)6–8, 0.1–0.5 mm long, 1-celled, the midpoint 0.03–0.25, shorter to the same length as the rays, straight to oblique; the simple glandular trichomes sessile to subsessile, uniseriate; the epidermis always visible, usually armed along the midrib and primary veins in young plants,

unarmed in older plants, the prickles to 3.5 mm, straight, slightly compressed laterally; the abaxial surface pale green when fresh, drying beigeish or greyish pale green to grey or pale castaneous, densely to moderately pubescent with trichomes like those of the adaxial surface, but the stellate ones denser, strictly pectinate or also biradiate and sometimes slightly longer-stalked, the stalks to 0.3 mm long, if biradiate, the lower whorl of rays usually less conspicuous, with up to 6 rays, these 0.03–0.3 mm long, always shorter than those of the upper whorl, usually eglandular, 1-celled, the epidermis visible to barely visible, unarmed or armed only along the midrib with prickles similar to those of the stems, but usually retrorse to recurved and narrower; primary veins 5–7 pairs; base attenuate, long-decurrent onto the petiole reaching to the stem or nearly, symmetric; margins with 0–6 lobes on each side, sometimes with secondary lobes in young plants, these 0–3 on each lobe side, with up to 2.5 cm long and 3 cm wide, triangular, apically acute; apex acute to somewhat cuspidate; the petiole completely or almost completely winged from the decurrent leaf bases, the wingless portion of the petiole 0–0.7 cm long, the indumentum like that of the stems, unarmed or armed with prickles like those of the adaxial surface, the epidermis visible to barely visible. **Inflorescence** an unbranched to 2 times forked cyme, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) filiform, the indumentum like that of the young stems, epidermis visible or not, unarmed; the peduncles 2.4–5.6 cm long, the rachis nearly obsolete to 7 cm long, with (2–)4–22 flowers, usually zigzagged; pedicel insertion points evenly to unevenly spaced, paired to 24 mm apart, gradually more congested towards the apex; pedicels 8–17 mm long in open flowers, straight, articulated at base, slightly and gradually enlarged distally, the enlarged portion with more or less prominent longitudinal ridges, the

indumentum like that of the inflorescence axis, unarmed. **Buds** ovoid when young, later ovoid to lanceoloid, the apex rounded, the calyx open, the tube soon covering only the corolla base, tightly adhered to the corolla, the calyx lobes soon splitting, not adhered to the corolla. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** shallowly cup-shaped to flat, (0.15–)0.6–2.4 mm long, the surface smooth to slightly knobby, the lobes 3.4–12.7 mm long, 1.8–4.5 mm wide, lanceolate to oblong, apically acute to obtuse, less often nearly rounded, densely stellate-tomentose with stellate trichomes like those of the young stems, unarmed. **Corolla** 1.9–3 cm in diameter, white, stellate, lobed nearly to the base, for 5/6–13/14 of the way to the base, interpetalar tissue absent to 0.2 mm long, the lobes 0.9–1.6 cm long, 2.8–5.2 mm wide at the widest point, usually widest in the basal third, lanceolate, less often oblong or slightly oblanceolate, the apex acute, cucullate, the adaxial surface moderately to densely stellate-pubescent only along the midvein, or also on the apical portion, with sessile stellate trichomes similar to those of the stems, but usually misshapen or erayed, the latter, if present, usually adpressed; the abaxial surface densely stellate-tomentose for the whole length with sessile to short-stalked trichomes like those of the stems, but with longer midpoints to 0.7 mm long, often misshapen. **Stamens** equal; the filament tube 0.6–0.8 mm long; the free portion of the filaments 0.3–1.2 mm long, glabrous; anthers 7–9.8 mm long, 1.5–2 mm wide at the widest point, 1.4–1.6 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis minutely papillose, connivent. **Ovary** conical, 4-locular, densely pubescent with

sessile to short-stalked stellate trichomes like those of the stems, but more delicate with longer rays and midpoints, the rays to 1 mm long, antrorse, the midpoint to 1.3 mm long, 1-celled, straight; style 9–11 mm long in long-styled flowers, 0.8–2.8 mm long in short-styled flowers, cylindrical, straight, densely to moderately stellate-pubescent in the basal 1/3 to 3/4, usually gradually sparser towards the apex, the trichomes like those of the ovary, but usually less misshapen; stigma clavate to truncate, the surface minutely papillose. **Immature fruit** a ovoid berry, ca. 3 cm long and 2 cm in diameter at the widest point, marbled green and dark green, densely pubescent with trichomes like those of the stems, but the more abundant stellate trichomes sessile to subsessile, the stalks to 0.1 mm long, the less abundant with longer midpoints to 0.6 mm, 1-celled, straight; the pericarp soft and not sclerified at maturity; fruiting pedicels 1–1.3 cm long, woody, straight, articulated at the base, gradually enlarged towards the calyx, usually with longitudinal ridges distally, unarmed; fruiting calyx not accrescent, slightly swollen and knobby; mature fruit not known. **Seeds** not known. **Chromosome number:** not known. Figure 23.



Fig. 23. *Solanum nematopus* (Aa: F.R.S Tabosa 60, BHCB; Ab, Ba, Ca, Da, Db: Y.F. Gouvêa et al.359, BHCB; Bb, Cb: Y.F. Gouvêa et al. 360, BHCB). A(a-b). Flowering branches. B(a-b). Calyx and ovary. C(a-b). Dissected flowers. D(a-b). Fruits. Scale bars: Aa, Ab = 2.5cm; B = 0.5cm(both); C = 0.5cm(both); D = 1cm.

**Distribution**—Northern Minas Gerais State, in the watershed between the São Francisco and Jequitinhonha rivers (Fig. 24).

**Ecology and Habitat**—*Solanum nematopus* occurs in seasonally dry deciduous tropical forests associated to limestone outcrops lying on northern Minas Gerais State's highlands; from 530 to 900 m elevation.

**Etymology**—The specific epithet '*nematopus*' is formed by the fusion of the Greek words '*nemato*' and '*podus*', meaning thread and foot, respectively, and refers to the striking filiform inflorescence axes, a distinctive character for *S. nematopus*.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum nematopus* belong to the *Oocarpum* clade. It can be distinguished from all other prickly climbing species in *Solanum* by the combination of delicate scrambling shrubby habit, filiform inflorescence axes (Fig. 23A), and smaller, ovoid fruits (Fig. 23D). *Solanum nematopus* is also distinct from all these species but *S. oocarpum* from an ecological point of view. *Solanum nematopus* share with part of the *S. oocarpum* populations the preference for continental, seasonally dry deciduous forests lying on limestone-rich soils (not evident in *S. oocarpum* populations from São Paulo State). While species belonging to the *Jussiaei* and *Schizandrum* clades, and those morphologically related to them, grow in seasonal semi-deciduous to wet coastal Atlantic forests not associated to limestone. *Solanum nematopus* is more closely





related and morphologically similar to *S. oocarpum*, but a more delicate plant. They can be distinguished, in addition to the morphological characters cited above, by the bud calyces. Despite bud calyces in both species open early in bud development, in *S. nematopus* they soon cover only the corolla base with deeply parted lobes (Fig. 23B), while in *S. oocarpum* they mostly or completely cover the corolla (i.e. exceed in length).

**Additional Specimens Examined—Brazil.**—MINAS GERAIS: sin. loc., *J.B.E. Pohl 2801* (BM); Mun. Francisco Sá, 16°43'S, 43°32'W, 790 m elev., 14 Nov 1981, *F.C.F. Silva 142* (RB); Mun. Januária, arredores do Parque Estadual Cavernas do Peruaçu, 15°06'53"S, 44°14'29"W, 654 m elev., Dec 2018, *Y.F. Gouvêa et al. 359* (BHCB); 15°05'11"S, 44°16'10"W, 612 m elev., Dec 2018, *Y.F. Gouvêa et al. 360* (BHCB); distrito de Fabião, *J.A. Lombardi & A. Salino 1652* (BHCB); Mun. Medina, região do reservatório do córrego Ribeirão (COPASA), 26 May 1999, *A. Salino & P.O. Morais 4661* (BHCB, VIC); Mun. São Pedro do Jequitinhonha, 16°29'46"S, 41°29'09"W, 534 m elev., 17 Dec 2017, *F.R.S. Tabosa et al. 60* (BHCB); Mun. Virgem da Lapa, Companhia Suzano Celulose, Gleba J, 11 Jan 2006, *E. Tameirão Neto 4527* (BHCB).

**13. *Solanum oocarpum*** Sendtn. in Martius, Fl. Bras. 10: 106. Tab. 7, figures 28–30. 1846.— TYPE: BRAZIL. Mato Grosso: Retiro? “Retiro in Mattogrosso. ad viam versus Villa Boa”, *J.B.E Pohl 1003* (lectotype: W! [W-0022652]; isolectotypes: W! [W-0022653; W-0022654], F! [V0073355F], GH! [GH00077729]).

*Solanum oocarpum* var. *cuneatum* Witasek, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Denkschr. 79: 346. 1910.— TYPE: **BRAZIL**. São Paulo: Mun. Campinas, 1900, *J. Campos Novaes 177* (holotype: WU! [WU-069272]).

**Scrambling shrub** to 4.5 m height, armed. **Young stems** terete, densely stellate-tomentose with hyaline, stramineous or grey to ochraceo-ferruginous, sessile to long-stalked, porrect to biradiate, sometimes also multiradiate, eglandular or glandular stellate trichomes mixed with more or less abundant and conspicuous, small, simple glandular trichomes; the stellate trichomes with stalks to 0.4 mm long, multiseriate, slender, 2 cells wide, the rays of the only/upper whorl (4–)8, eglandular, the rays of the lower whorl(-s), if present, 1–8(-12), these less conspicuous than the upper ones, eglandular or gland-tipped, the eglandular rays 0.1–0.5 mm long, 1-celled, the gland-tipped rays 0.02–0.11 mm long, 2–3-celled, markedly shorter than the eglandular ones, the midpoint obsolete to 0.1, always shorter than the rays, 1-celled, oblique; the simple glandular trichomes sessile to 0.08 mm long, uniseriate; the epidermis not to barely visible; sparsely to moderately prickly, the prickles 0.5–6.6 mm long, recurved to straight, broad-based, usually laterally compressed, ferruginous. Bark of older stems brown, glabrescent, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, lobed to sinuate, less often entire, the blades of fully developed leaves 7.5–21.5 cm long, 4.5–14.6 cm wide, ovate to elliptic, rarely somewhat oblanceolate, chartaceous, markedly to slightly discoloured; the adaxial surface green to dark green when fresh, drying green to greenish, yellowish, ochrish or dark brown, sparsely to densely stellate-pubescent with hyaline to ochraceo-ferruginous, sessile to short-stalked, strictly porrect to erayed, or also with less abundant biradiate, usually eglandular stellate trichomes mixed with tiny simple

glandular trichomes like those of the young stems; the stellate trichomes with stalks to 0.15(-0.2) mm long, multiseriate, 2-3 cells wide, the rays of the only/upper whorl 0-8, usually eglandular, the rays of the lower whorl, if present, 1-6, eglandular or gland-tipped, the eglandular rays 0.05-0.6 mm long, 1-celled, the gland-tipped rays to 0.1 mm long, 2-3 celled, usually shorter than the eglandular rays, midpoints obsolete to 0.2 mm long, shorter to the same length as the rays, the trichomes denser or not along the midrib and primary veins, the epidermis always visible, unarmed or armed on the midrib and/or primary veins with prickles to 1.5 mm long, straight, broad-based, laterally compressed, golden to ferruginous; the abaxial surface paler green to beige when fresh, drying green, grey, beige, ochraceous or brown, moderately to densely pubescent to tomentose with hyaline, stramineous, ochraceous or ochraceo-ferruginous, sessile to short-stalked, occasionally long-stalked, porrect to biradiate, less often multiradiate, eglandular or glandular stellate trichomes, and simple glandular trichomes like those of the young stems; the stellate trichomes with stalks to 0.2(-0.3) mm long, multiseriate, 2-3 cells wide, the rays of the only/upper whorl 4-8(-9), (0.05-)0.1-0.55 mm long, usually eglandular, 1-celled, the lower whorl of rays, if present, often less conspicuous, the rays 1-9, all eglandular to all gland-tipped, the eglandular rays like those of the upper whorl, but usually shorter, 1-celled, the gland-tipped ones to 0.15 mm long, 2-3-celled, the midpoints shorter to the same length as the eglandular rays of the upper whorl, usually eglandular, 1-celled, the epidermis visible to not visible, unarmed or armed along the midrib, the prickles like those of the stems but smaller, with up to 3.5 mm; primary veins 5-7 pairs; base attenuate long-decurrent onto the petiole to obtuse or rounded abruptly short-attenuate, not decurrent; margins with 0-5 lobes on each side, these to 3.2 cm long, 4.3 cm wide, triangular, apically acute; apex acute, rarely obtuse; petiole

0.4–3.5 cm long, the indumentum like that of the young stems, but sometimes slightly denser, the epidermis visible or not, armed or unarmed, the prickles like those of the abaxial midrib. **Inflorescence** an unbranched cyme, rarely forked, terminal, becoming internodal (lateral) or leaf-opposed by the subsequent sympodial unit's development; the axis (peduncle plus rachis) densely stellate-tomentose with trichomes like those of the stems, but sometimes with longer stalks to 0.8 mm long, the epidermis visible or not; unarmed; the peduncles 0.4–2.2 cm long, the rachis 1.2–7.7 cm long, with 5–30 flowers; pedicel insertion points more or less evenly spaced 0.5–6 mm apart, gradually more closely spaced toward the apex; pedicels 5–11(–14.5) mm long in open flowers, not geniculate, articulated at base, the indumentum like that of the inflorescence axis, but usually slightly denser, unarmed. **Buds** ovate when young, then ovate to broadly oblong, the apex rounded, the calyx tube open, the tube covering all but the corolla's apical portion to an advanced stage of development, sometimes to anthesis, tightly to loosely adhered to the corolla, the calyx lobes soon splitting apically, not to loosely adhered to the corolla. **Flowers** 5-merous, usually robust, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped to broadly and shallowly cup-shaped or nearly flat, 1.5–3.2 mm long, the external surface smooth, the lobes 3.5–8.3(–11) mm long, 3.2–5.2(–6.6) mm wide, lanceolate to nearly oblong the apex acute to obtuse, less often rounded, occasionally irregularly splitting, densely stellate-tomentose with stellate trichomes like those of the inflorescence axis, but sometimes with shorter stalks, unarmed. **Corolla** 2.2–3.6 cm in diameter, white to cream, stellate, lobed for 2/3–4/5 of the way to the base, interpetalar tissue little

developed, 0.3–0.85 mm wide at the widest point, the lobes 0.8–1.4 cm long, 4–7.2 mm wide at the widest point, widest in the basal third, lanceolate, usually reflexed at anthesis, the apex acute, cucullate, the adaxial surface moderately to densely, less often sparsely stellate-pubescent for the whole length, sometimes becoming sparser or restrict to the midveins towards the base, the trichomes like those of the inflorescence axis, but mostly sessile, the stalks to 0.15 mm long, the trichomes usually misshapen; the abaxial surface densely stellate-tomentose for the whole with trichomes like those of the inflorescence axis. **Stamens** equal; the filament tube 0.6–1.2 mm long; the free portion of the filaments 0.4–1.3 mm long, glabrous; anthers 6.1–9.4 mm long, 2.3–2.8 mm wide at the widest point, 1.7–2.5 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with small, elliptic pores, tightly connivent to divergent, the epidermis of the abaxial surface papillose. **Ovary** cupuliform, 4-locular, densely stellate-tomentose with hyaline to stramineous, sessile to short-stalked trichomes like to those of stems, but these thinner-walled, shorter stalks and rays, and midpoints usually longer than the rays, with up to 0.6 mm long, the trichomes sometimes misshapen; style 11–13 mm long in long-styled flowers, 1.2–4 mm long in short-styled flowers, cylindrical, straight, glabrous to densely stellate-pubescent in the basal fourth with trichomes like those of the ovary; stigma clavate to truncate, sometimes slightly bilobed, the surface minutely papillose. **Fruit** a ovoid to broadly-ovoid berry, 3–4 cm in diameter at the widest point, 3.5–5 cm long, the apex rounded to slightly pointed, yellow to orange when mature, densely pubescent to tomentose with stramineous to ochraceo-ferruginous, sessile to short-stalked, porrect to multiangulate or biradiate, eglandular or glandular stellate trichomes mixed with simple uniseriate, glandular trichomes; the stellate trichomes with stalks to 0.25

mm long, multiseriate, 2–3 cells wide, the rays of the only/upper whorl 4–8(–10), 0.01–0.6 mm long, 1-celled, usually eglandular, the rays of the lower whorl, if present, 1–8(<), all eglandular to gland-tipped, the eglandular rays like those of the only/upper whorl but usually smaller, the gland-tipped rays to 0.15(–0.2) mm long, 2–3-celled, the midpoint 0.25–0.8 mm long, usually longer than the rays (especially in the larger trichomes), 1-celled, straight; the simple glandular trichomes like those of the young stems, but to 0.18 mm long; the pericarp soft and not sclerified at maturity; fruiting pedicels 1.2–2.2 cm long, woody, curved or straight, articulated at the base, gradually enlarged towards the calyx, unarmed; fruiting calyx not accrescent, sometimes swollen, the tube flat or nearly so, 7.8–10.1 mm in diameter. **Seeds** not seen. **Chromosome number**: not known. Figure 25.

***Distribution***—Highlands in São Paulo, Minas Gerais and Goiás States, with one record in the municipality of Divisópolis, Bahia State (Fig. 24).



Fig. 25. *Solanum oocarpum* (**Aa, Bc, Cb**: J.R. Stehmann et al. 6371, BHCB; **Ab**: M.L. Fonseca et al. 5754, RB; **Ac, Ba, Ca**: N.F.O Mota et al. 713, BHCB; **Ad**: J.R. Guillaumon s.n., BHCB [89434]; **D**: J.R. Guillaumon s.n., BHCB [91967]). **A(a-d)**. Flowering branches. **B(1-3)**. Calyces. **C(1-2)**. Dissected flowers. **D**. Fruits. Scale bars: **Aa** = 3.5 cm; **Ab, Ac, D** = 1.5 cm; **Ad** = 4cm; **Ba** = 0.6cm; **Bb** = 0.65cm; **Bc** = 0.55cm; **Ca, Cb** = 0.9cm.



**Ecology and Habitat**—*Solanum oocarpum* grows in seasonally dry deciduous tropical forests lying on limestone-rich soils, to seasonal semi-deciduous Atlantic forests; s highlands; from 400 to 1530 m elevation.

**Etymology**—The specific epithet is composed by the Greek prefix 'oo-', meaning egg, and the word 'Karpos', meaning fruits, which refers to the ovoid fruits of *S. oocarpum*.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum oocarpum* is a member of the Oocarpum clade. Molecular data, as well as morphological and ecological affinities, make clear its close relatedness with *S. nematopus*, which is assigned to the same clade. *Solanum oocarpum* and *S. nematopus* share the scrambling shrubby life form, usually discolourous leaves with bases decurrent onto the petioles (only short-attenuate in some *S. oocarpum* specimens; Fig. 25A), white flowers, and ovoid fruits (Fig. 25A). Further, *S. oocarpum* grows mostly on seasonally deciduous forests on limestone-rich soils, similar to *S. nematopus*, which has been only recorded to this sort of environment. *Solanum oocarpum* can be easily distinguished from *S. nematopus*, however, by its not filiform inflorescence axes, rather than distinctly filiform; its bud calyx tubes covering all but the corolla's apical portion to an advanced stage of development (sometimes to anthesis; Fig. 25A), rather than soon covering only the corolla's base; and its relatively large fruits ( $\geq 3$  cm diam.; Fig. 25D), rather than relatively small fruits ( $\leq 3$  cm diam.).

**Additional Specimens Examined—Brazil.**—DISTRITO FEDERAL: reg. Sobradinho, 10 Nov 1963, *E.P. Heringer* 9329 (UB, US); Bacia do Rio São Bartolomeu, 21 Jul 1981, *E.P. Heringer et al.* 7176 (MO, US); 2 Jul 1979, *E.P. Heringer et al.* 1685 (MO, US); Limestone hills, Córrego Landim, ca. 25 km N of Brasília, 9 Jul 1966, *H.S. Irwin et al.* 18119 (F, IAN, MO, NY, UB, US); adjacências da mata após o córrego Cachoeirinha, afluente margem esquerda rio Paranoá, 26 May 1982, *B.A.S. Pereira* 275 (MO); Terreno do Country Club, mata ciliar limitando com o Catetinho, 30 May 1965, *D. Sucre* 438 (UB, US); Mun. Brasília, mata do Country Club, 8 Jul 1965, *D. Sucre* 676 (IAN, UB, US).—GOIÁS: Serra dos Pirineus, ca. 15 km N of Corumbá de Goiás, north slope of ridge, ca. 1250 m elev., 15 May 1973, *W.R. Anderson* 10327 (MO, NY, US); Mun. Goianápolis, Parque Estadual Altamiro de Moura Pacheco (PEAMP), 16°33'16"S, 49°07'26"W, 900 m elev., May 2005, *M.L. Fonseca et al.* 5754 (JPB, RB, UNB); 16°33'02"S, 49°07'58"W, 855 m elev., 11 Apr 2005, *M.L. Fonseca et al.* 5789 (NY, RB); Mun. Goiânia, 18 Km da cidade para Leopoldo de Bulhões, 16 May 1968, *J.A. Rizzo & A. Barbosa* 759 (UB, UFG); Mun. Goianira, 2 Km da margem esquerda do rio Meia Ponte, 16 May 1970, *J.A. Rizzo & A. Barbosa* 5135 (UB, UFG).—MINAS GERAIS: Mun. Arcos, Fazenda Faroeste, Margem direita do Rio São Miguel, 20°15'05"S, 45°39'46"W, 31 Dec 2002, *P.H.A. Melo & E.A. Melo* 306 (BHCB); 1 Feb 2003, *P.H.A. Melo & J.A. Lombardi* 409 (BHCB, RB); Mun. Divisópolis, divisa Minas com Bahia, Apr 1958, *Mendes Magalhães* 18881 (RB); Mun. Itamarandiba, Parque Estadual da Serra Negra, região conhecida como Buracão, 18°01'05"S, 42°56'55"W, 1020 m elev., 5 Jul 2006, *A. Salino et al.* 11315 (BHCB); Mun. Lagoa Santa, Morro do Baú, 19°32'53"S, 43°59'20"W, 712 m elev., *J.R. Stehmann et al.* 6371 (BHCB, HSTM, RB); *Warming* 496 (P); Mun. Pains, Fazenda amargoso, MG 439 km 16, 20°23'14"S, 45°38'59"W, 15 Apr 2003, *P.H.A. Melo & F.V. Bezerra* 554 (RB); Mun. Paraopeba, 27 Jul 1959, *E.P. Heringer s.n.* (RB [RB00704245]); Mun.

Perdizes, Mata da Zilda, Unidade de Conservação do Galheiro (CEMIG), 28 Jul 1994, *E. Tameirão Neto & M.S. Werneck* 24857 (UEC); Mata do Joaquim Tobias, Unidade de Conservação do Galheiro (CEMIG), 27 Oct 1994, *E. Tameirão Neto & M.S. Werneck* 25722 (UEC); Mun. Rio Vermelho, Serra da Pedra Menina, Distrito de Pedra Menina, 43°08'16"S, 18°06'57", 1530 m elev., 26 Aug 2008, *N.F.O. Mota et al.* 1382 (UFMG); Mun. São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, subida para a chapada, 20 Mar 2007, *N.F.O. Mota et al.* 713 (BHCB, RB); Mun. Uberlândia, Fazenda Buriti, 25 May 1994, *G.M. Araujo et al.* 1254 (BHCB, CESJ).— SÃO PAULO: Mun. Anhembi, Fazenda Barreiro Rico, Rio Piracicaba, 6 Oct 1956, *M. Kuhlmann* 3982 (SP); Mun. Bauru, Reserva Florestal de Bauru, 11 Oct 1980, *O. Cavassan s.n.* (UEC [UEC-29547]); Mun. Brotas, Rio Jacaré – Pepira, 10 Mar 1986, *S.M. Salis & C.A. Joly* 71 (UEC); Mun. Caconde, 15 Oct 1956, *A.P. Santos-Gonçalves s.n.* (IAC [IAC-18257]); Mun. Cajuru, Fazenda Ytaoca, 30 Apr 2005, *F.T. Farah & D.M. Vieira* 2479 (RB); Mun. Campina do Monte Alegre, Sítio Frutas Raras, 23°32'09"S, 48°30'45"W, 21 Oct 2017, *A.P.A. Pereira* 2 (UEC); Mun. Campinas, Instituto Agrônômico de Campinas - Fazenda Santa Elisa, 47°04'03"S, 22°51'53"W, 670 m elev., *L.L. Giacomini & J.R. Stehmann* 1608 (BHCB); 17 Jan 1944, *E. Kiehl s.n.* (BHCB); bosque da Fazenda Sete Quedas, 20 Nov 1938, *J. Santoro s.n.* (IAC [IAC-4915]); Fazenda Santa Elisa, 27 Mar 1997, *L. Sigrid & Jung-Mendaçolli* 641 (BHCB); Mun. Itu, estrada para Porto Feliz, 20 Apr 1995, *R. Simão-Bianchini et al.* 693 (ESA); Mun. Jundiaí, Serra do Japi, 7 Nov 1981, *H.F. Leitão Filho et al.* 13125 (UEC); 16 May 1988, *E.S.A. Marques* 20301 (UEC); 8 Jan 1979, *W. Uieda & D.M.S. Rocha* 9358 (UEC); 26 Apr 1989, *J. Vesconcellos-Neto* 21583 (UEC); Mun. Pindorama, Estação Experimental de Pindorama, 15 Feb 1987, *A.S. Antônio s.n.* (BHCB [BHCB-77116]); Mun. Piracicaba, Mata da Pedreira, 8 May 1984, *E.L.M. Catharino* 84 (SP); Mun. Piratininga, 19 Jul 1991, *S.C. Chiea et al.* 633 (CPEC, SP);

Mun. Rio Claro, Morro Grande, 21 Jun 1888, *A. Loefgren* 692 (SP, US); Mun. Tietê, Estação Experimental do IAC, 26 Apr 1995, *L.C. Bernacci et al.* 1559 (IAC, SP, SPF, UEC); Mun. Vinhedo, Condomínio Estância Marambaia, 18 Jan 2002, *J.R. Guillaumon s.n.* (BHCB [BHCB-91967], SPSF).

#### SCHIZANDRUM CLADE

**14. *Solanum jairoi*** Gouvêa & Stehmann, sp. nov.—TYPE: BRAZIL. Minas Gerais: Mun. Simonésia, RPPN Mata do Sossego, Trilha das Hortências. clareira antes do mirante, 20°04'05"S, 42°05'19"W, 1550 m alt., 23 Sep 2013(fl), *B.F. Falcão, S.N. Moreira, I.M.C. Rodrigues, Y.F. Gouvêa & J.F. Souza* 4 (holotype: BHCB [BHCB020152]).

**Diagnosis.** Like *S. schizandrum* Sendtn. but differing in having leaf bases long-decurrent onto the petioles, reaching to the stem or very nearly, fruiting pedicels curled in mature fruits and corollas white.

**High-climbing liana** reaching more than 10 m height, armed. **Young stems** terete, densely stellate-tomentose with stramineous, ochraceous, ferruginous or castaneous, short- to long-stalked, less often also sessile, antrorse to porrect, eglandular stellate trichomes and shorter, less conspicuous and abundant simple, glandular trichomes; the stellate trichomes with stalks (0.03–)0.1–1.4 mm long, multiseriate, 2(–6) cells wide, the rays (4–)6–8(–13), 0.15–0.9 mm long, 1-celled, the midpoint nearly obsolete to 0.8 mm long, shorter to longer than the rays, 1-celled, occasionally gland-tipped in smaller stellate trichomes, if so, 3–4-celled,

straight, less often also with trichomes like the latter, but scattered, multiangulate to multiradiate, with up to 20(<) rays; the simple glandular trichomes 0.05–0.2 mm long, uniseriate; the epidermis not or very barely visible; sparsely to moderately armed, the prickles small, 0.5–2.5 mm long, recurved, broad-based, not or slightly laterally compressed, ferruginous to castaneous, sometimes golden at base. Bark of older stems dark brown to nearly black, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, the blades of fully developed leaves 8.5–25.6 cm long, 4.3–10.5 cm wide, lanceolate to elliptic, chartaceous, discolorous; the adaxial surface green when fresh, drying dark green, brown or ochraceo-ferruginous, densely stellate-pubescent with trichomes like those of the stems, but the stellate trichomes with stalks, rays and midpoints on average shorter, the long-stalked ones with stalk bases enlarged, these mixed with similar but less-rayed trichomes (i.e. 0–3 rays; including furcate and erayed trichomes), the latter conspicuously present, the stalks 0.05–0.5 mm long, stalk base enlarged or not, 2–6 cells-wide, more than 3-cells wide in long-styled trichomes, the rays 0–8, 0.1–0.7 mm long, the midpoint 0.2–0.8 mm long, shorter to the same length as the rays, less often longer, the epidermis always visible (except in young leaves), unarmed; the abaxial surface paler, green to greenish or ochrish beige when fresh, drying green, beige, ochraceous, ochraceo-ferruginous or brown, densely stellate-tomentose with trichomes like those of the stems, but these on average shorter stalked, the stalks to 0.8 mm long, 2–6 cells-wide, the long-stalked ones with stalk bases enlarged, more than 3 cells-wide, the 0–3-rayed stellate trichomes less conspicuously present or absent, the epidermis visible to barely visible, armed only along the midrib with prickles like those of the stems; base attenuate, long-decurrent onto the petiole reaching to the stem or very nearly, symmetric; apex cuspidate to acute; petiole completely or almost

completely winged from the decurrent leaf bases, the non-winged portion of the petiole 0–0.2 cm long, the indumentum like that of the young stems, the epidermis visible or not. **Inflorescence** once to twice forked cyme, the less frequent, poorly developed inflorescences unbranched, the branches of a same order diverging at an angle of less than or equal to 90° to each other, and more than 90° to the preceding branch, terminal, becoming internodal (lateral) by the development of the subsequent sympodial; the axis's (peduncle plus rachis) indumentum like that of the young stems, but the multiangulate to multiradiate stellate trichomes more abundant, the epidermis barely or not visible; unarmed; the peduncles 0.5–2.9 cm long, the rachis 1–9.5 cm long, with 5–27 flowers; pedicel insertion points evenly or unevenly spaced, with up to 2.6 mm apart, gradually more congested towards the apex; pedicels 8.8–20 mm long in open flowers, straight to curved, articulated at base, the indumentum like that of the inflorescence axis, unarmed. **Buds** globose, the calyces closed, completely enclosing the corollas to an intermediate stage of bud development, then the bud ovoid with open calyces and exerted corollas, the calyx lobes splitting apically in an intermediate stage of bud development (forming a narrow star-shaped opening at the bud apex), tightly adhered to the corolla to anthesis. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** broadly cup-shaped to obconic, 1.3–3.5 mm long, the external surface smooth, the lobes 5–8 mm long, 4.5–6.9 mm wide, deltate before anthesis, deltate to shortly oblong with the apex rounded-acute, less often ovate after anthesis, the apex acute to rounded, sometimes somewhat naviculate and incurved apically, densely stellate-tomentose with trichomes like those of inflorescence axis, unarmed.

**Corolla** 2.6–4.6 cm in diameter, white, stellate, lobed for  $2/3$ – $4/5$ (– $6/7$ ) of the way to the base, interpetalar tissue moderately developed 1.7–3.5 mm wide at the widest point, the lobes 1.4–1.85 cm long, 8.8–11.8 mm wide at the widest point, widest in the basal third to the middle, lanceolate to tongue-shaped, the apex acute, often apiculate, the apiculae to 2 mm long, cucullate or not; adaxial surface moderately to densely stellate-pubescent for the whole length but on the midvein base with stellate trichomes like those of the stems, but with shorter and more robust stalks to 0.4 mm long, 3–6 cells wide; the abaxial surface densely stellate-tomentose for the whole length with trichomes like those of the stem, but the stalks to 0.7 mm long, with 3–5 cells wide. **Stamens** equal; the filament tube 1.7–2.3 mm long; the free portion of the filaments 0.9–2 mm long, glabrous; anthers 8.5–11 mm long, 2.7–3.4 mm wide at the widest point, 2–2.45 mm thick at the thickest point, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis minutely papillose, loosely connivent to divergent. **Ovary** cupuliform, 4-locular, densely pubescent with delicate, hyaline, sessile to subsessile, antrorse to multiradiate stellate trichomes, the rays 4–15, 0.1–0.8 mm long, 1-celled, the midpoint 0.1–1 mm long, usually longer than the rays, 1-celled, the rays and midpoints sometimes gland-tipped, if so, 2–4 celled, the trichomes often misshapen; style ca. 14 mm long in long-styled flowers, ca. 6 mm long in short-styled flowers, cylindrical, straight, completely glabrous to moderately stellate-pubescent at base with trichomes like those of the ovary; stigma bilobed to truncate, the surface minutely papillose. **Fruit** a depressed-globose berry, ca. 4 cm in diameter, orange to yellowish orange when mature, densely tomentose with stramineous, ochraceous, ferruginous or castaneous, sessile to short-stalked, less often long stalked, multiangulate stellate to echinoid or dendritic-echinoid

eglandular trichomes, the stalks to 0.25(-0.7) mm long, multiseriate, relatively thin, 2-3 cells wide, the rays 12-20(<), 0.05-0.9 mm long, 1-celled, the midpoint 0.1-1.1 mm long, longer to the same length as the rays, 1-celled, the pericarp soft and not sclerified at maturity; fruiting pedicels 1.8-3.8 cm long, woody, curled, articulated at the base, gradually enlarged towards the calyx, unarmed; fruiting calyx not or slightly accrescent, the tube flat or nearly so, 8.1-11.5 mm in diameter, the lobes 3.8-13.3 mm long, 3-10.1 mm wide. **Seeds** 40-60 per berry, 4.4-5.5 mm long, 5.2-6.7 mm wide, 0.9-1.25 mm thick when dry, flattened, reniform to nearly discoid, black when fresh, drying grey or black. **Chromosome number:** not known. Figure 26.

***Distribution***—Espírito Santo and Minas Gerais States (Fig. 27).





Fig. 26. *Solanum jairoi* (A, Bb, C: B.F. Falcão and Y.F. Gouvêa 4, BHCB; Ba, D: Y.F. Gouvêa et al. 317, BHCB; E, F: J.R. Stehmann et al. 6014, BHCB). A. Flowering branches. B. Dissected calyx, calyx lobes and gynoecium. C. Dissected flower. D. Young infructescence E. Infructescence with mature fruits F. Seeds. Scale bars: A = 4cm (both); B, C = 1cm; D, E = 2cm; F = 0.5cm.

**Ecology and Habitat**—*Solanum jairoi* inhabits montane to high montane Atlantic rainforests; from 700 to 1550 m elevation.

**Etymology**—The epithet honors Jairo Joaquim de Andrade, for his efforts to protecting the Mata do Sossego, a high Atlantic rainforest that harbors a rich and distinct flora, which includes the type population of *S. jairoi*.

**Preliminary conservations status**—See Table 1.

**Notes**— *Solanum jairoi* is a member of the Schizandrum clade. It most similar to the also high-climbing liana belonging to the same clade, *S. schizandrum*. Although very similar in general aspects, *S. jairoi* can be distinguished from *S. schizandrum* by its leaf bases markedly decurrent on the petiole reaching to the stem or almost (Fig. 26A), rather than not decurrent; its curled fruiting pedicels (Fig. 26E), rather than straight to basally curved; its inflorescences forked (Fig. 26D), rather than dichotomously branched; and its white corollas, rather than lilac or purple. *Solanum jairoi* also seems to has larger corollas, but the paucity of flowering material precluded us to better assess the consistency of this character. Decurrent leaf bases are also present in *S. nematopus* and *S. oocarpum*, species of the Oocarpum clade, the sister group of the Schizandrum clade. *Solanum jairoi*, however, differs from these species in being a high climbing liana (> 8 m height), rather than scrambling shrub (with up to 4.5 m height). Furthermore, *S. jairoi* have long-stellate and erayed trichomes on the leaf adaxial surface, whereas *S. oocarpum* and *S. nematopus* have not.

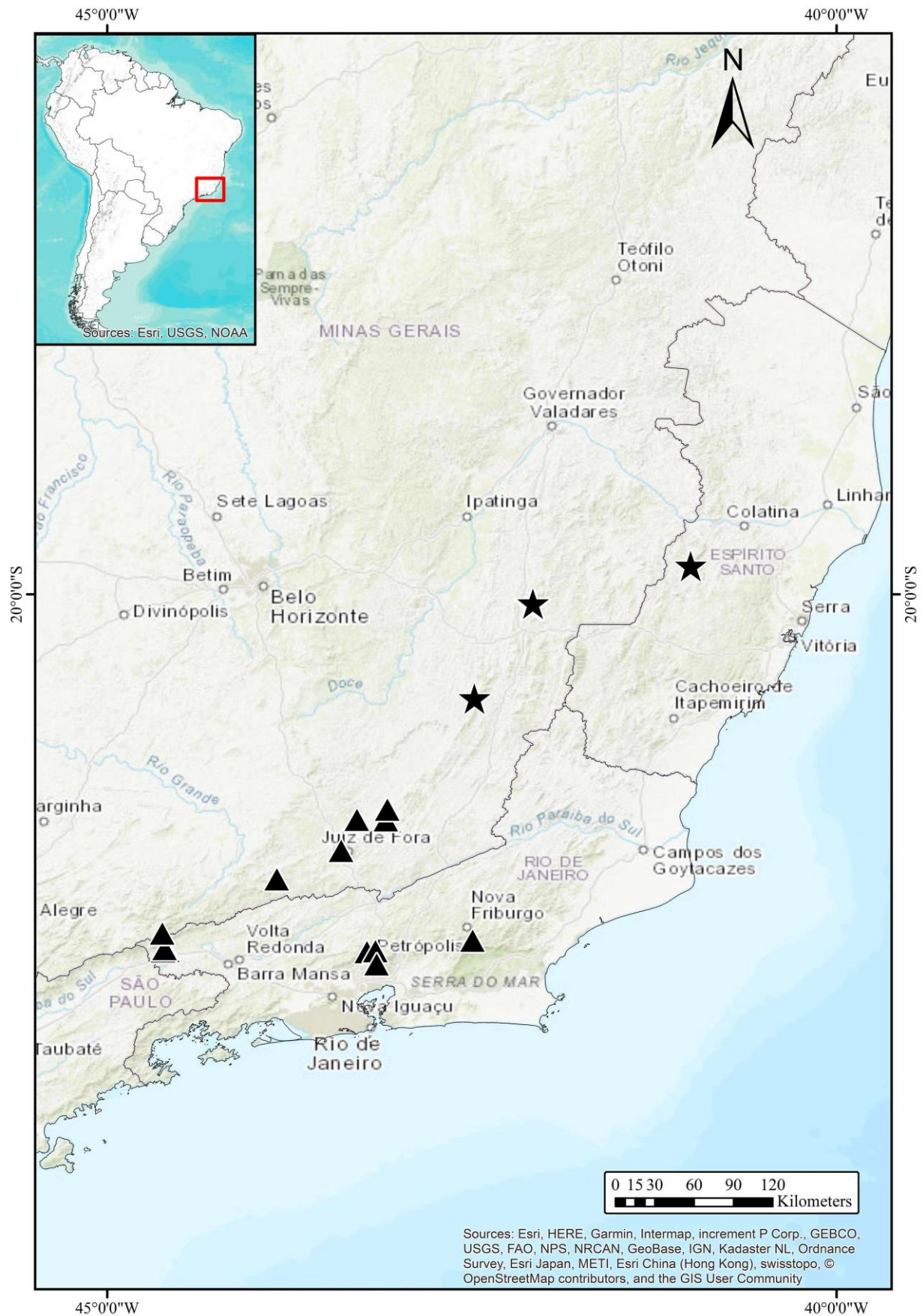


Fig. 27. Distribution of the Schizandrum clade; *S. jairoi* (stars), *S. schizandrum* (triangles).

**Additional Specimens Examined (paratypes)—Brazil.**—ESPÍRITO SANTO: Mun. Itaguaçu (“Itaguassú”), Alto Limoeiro, May 1946, *A.L. Brade et al.* 18552 (RB).—

MINAS GERAIS: Mun. Araponga, Serra da Araponga, Fazenda Neblina, 20°43'S, 42°29'W, 1300 m elev., 1 Feb 1992, *L.S. Leoni s.n.* (RB [RB01339699]); Mun. Simonésia, RPPN Mata do Sossego 20°04'23"S, 42°05'21"W, 1466 m elev., 5 Nov 2012, *Y.F. Gouvêa & J.R. Stehmann 32* (BHCB); 20°04'05"S, 42°05'18"W, 1550 m elev., Oct 2018, *Y.F. Gouvêa et al. 317* (BHCB); 20°04'04"S, 42°04'32"W, 1150–1600 m elev., 23 May 2006, *A. Salino et al. 11170* (BHCB); 20°4'9"S, 45°5'17" W, 1496 m elev., 20 Mar 2009, *J.R. Stehmann et al. 6008* (BHCB); 20°04'07"S, 42°04'51"W, 21 Mar 2009, *J.R. Stehmann et al. 6014* (BHCB, CEPEC).

**15. *Solanum schizandrum*** Sendtn. in Martius, Fl. Bras. 10: 85. Tab. 6, figures 26–29. 1846.— TYPE: BRAZIL. “In Brasilia orientali”, *J. Lhotsky 179* (lectotype designated here: HAL [HAL-0070789]; isolectotype: W! [W-0022469]).

**High-climbing liana** reaching more than 10 m height, armed. **Young stems** terete, densely stellate-tomentose with hyaline, stramineous, ochraceous and ochraceo-ferruginous or ferruginous, less often castaneo-ferruginous, short- to long-stalked, porrect to antrorse, eglandular stellate trichomes and shorter, less conspicuous and abundant simple, glandular trichomes, rarely also with scattered trichomes like the former, but biradiate; the stellate trichomes with stalks 0.15–1 mm long, multiseriate, 2–3 cells wide, the rays of the only/upper whorl 4–8(–10), the lower whorl, if present, with up to 6 rays, 0.2–0.8 mm long, 1-celled, the midpoint nearly obsolete to 0.9 mm long, shorter to longer than the rays, 1-celled, straight; the simple glandular trichomes subsessile to 0.2 mm long, uniseriate; the epidermis not to very barely visible; sparsely to moderately armed, the prickles 0.5–2.3 mm long, strongly recurved, broad-based, not or slightly compressed laterally, ferruginous to castaneous, sometimes golden at base. Bark of older stems

dark brown to greyish dark brown, lenticled. **Sympodial units** plurifoliate, the leaves not geminate. **Leaves** simple, entire, sometimes lobed in young plants, the blades of fully developed leaves 6.5–19 cm long, 3.5–7 cm wide, lanceolate, less often elliptic, chartaceous, discolorous to markedly discolorous; the adaxial surface green when fresh, drying green to pale, dark or ferruginous brown, moderately to densely stellate-pubescent with trichomes like those of the stems, but the stellate ones with shorter stalks, rays and midpoints, the short- to long-stalked trichomes with stalk bases enlarged at least at base, these mixed with similar but less-rayed trichomes (i.e. 0–3 rays; including furcate and erayed trichomes), the latter usually conspicuously present, less often inconspicuous, the stalks 0.05–0.65 mm long, 3–6 cells-wide, stalk base enlarged or not, more than 3-cells wide in long-styled trichomes, the rays 0–8, 0.1–0.7 mm long, the midpoint 0.08–0.6 mm long, shorter to longer than the rays, the epidermis always visible, unarmed; the abaxial surface green, greenish beige or pale ochraceous, drying beige to ochraceous, densely tomentose with trichomes like those of the adaxial leaf surface, but the stellate trichomes also sessile, the 0–3-rayed stellate trichomes less conspicuously present or absent, the epidermis visible to barely visible, unarmed or armed only along the midrib with prickles like those of the stems; base obtuse to rounded, less often rounded abruptly and shortly attenuate onto the petiole's apical fifth to fourth, truncate or sagittate, not decurrent onto the petiole, symmetric or asymmetric; margins with 0–3 lobes on each side, to 1.6 cm long and 2.3 cm wide, apically rounded; apex acute, obtuse; petiole 0.7–3.7 cm long, the indumentum like that of the young stems, unarmed to moderately armed with prickles like those of the stems, the epidermis visible or not. **Inflorescence** a markedly 2–3(<) times dichotomously branched cyme, the less frequent, poorly developed inflorescences unbranched, the inflorescence branches of a same order

diverging at an angle of about 180° to each other and 90° to the preceding branch (easily noticed in live, unpressed material), terminal, becoming internodal (lateral) by the development of the subsequent sympodial; the axis's (peduncle plus rachis) indumentum like that of the young stems, but the stellate trichomes usually porrect to multiradiate, with up to 20(<) rays, the epidermis barely or not visible; unarmed; the peduncles 0.5–2.2 cm long, the rachis 1.1–5.9 cm long, with 10–80 flowers; pedicel insertion points more or less evenly spaced, with up to 7.5 mm apart, gradually more congested towards the apex; pedicels 8–17 mm long in open flowers, straight, articulated at base, the indumentum like that of the inflorescence axis, unarmed. **Buds** obovoid to globose, the calyx closed, completely enclosing the corollas to an intermediate stage of bud development, then the bud ovoid with open calyces and exerted corollas, the calyx lobes splitting apically in an intermediate stage of bud development (initially forming a narrow star-shaped opening at the bud apex), tightly adhered the corolla or not. **Flowers** 5-merous, heterostylous, the plants andromonoecious, usually with the proximal flowers long-styled (hermaphrodite) and the distal flowers short-styled (functionally male), these vary in proportion (number of long- vs short-styled flowers) between inflorescences. **Calyx tube** cup-shaped to obconic, 1.3–5.5(–6) mm long, the external surface smooth, sometimes slightly constricted distally, the lobes 3–8.4 mm long, 2.3–7.1 mm wide, deltate before anthesis, deltate to shortly oblong with the apex deltate to rounded-deltate after anthesis, the apex acute to rounded-acute, sometimes somewhat naviculate and incurved apically, occasionally irregularly splitting, densely stellate-tomentose with trichomes like those of inflorescence axis, unarmed. **Corolla** 2–3.6 cm in diameter, purple to lilac, stellate, lobed for (1/2–)2/3–3/4 of the way to the base, interpetalar tissue little developed 0.6–0.8 mm wide at the widest point, the lobes 0.5–1.65 cm long, (3.2–

)4.5–7.2 mm wide at the widest point, widest in the basal third to nearly the middle, lanceolate to triangular, the apex acute, slightly cucullate, the adaxial surface moderately to densely pubescent for the whole length but the basal portion of the midvein with stellate trichomes like those of the inflorescence axis, but with shorter and more robust stalks to 0.2 mm long, 3–6 cells wide; the abaxial surface densely stellate-tomentose for the whole length with trichomes like those of the adaxial surface. **Stamens** equal; the filament tube 0.8–2 mm long; the free portion of the filaments 1–1.6 mm long, glabrous; anthers 7.3–13 mm long, 1.9–2.6 mm wide, 1.6–2.3 mm thick, widest and thickest in the basal third, lanceolate, straight to slightly curved inwards, narrowed towards the apex, poricidal at the tips with elliptic pores, the epidermis minutely papillose, loosely connivent to divergent. **Ovary** cupuliform, 4-locular, densely pubescent with delicate, hyaline to stramineous, sessile to subsessile, antrorse stellate trichomes, the rays 4–10, 0.15–0.7 mm long, 1-celled, the midpoint 0.5–1.4 mm long, always longer than the rays, 1-celled, the trichomes sometimes misshapen; style 10–12 mm long in long-styled flowers, 1.7–2.8 mm long in short-styled flowers, cylindrical, straight, completely glabrous to sparsely stellate-pubescent at base with trichomes like those of the ovary; stigma bilobed to truncate, the surface minutely papillose. **Fruit** a globose berry, 2.5–4.5 cm in diameter, orange when mature, densely tomentose to pubescent with ochraceous, ferruginous or castaneous, sessile to short-stalked, less often long-stalked, strictly multiangulate, or multiangulate to multiradiate, echinoid or dendritic-echinoid eglandular trichomes, the stalks to 0.3(–0.5) mm long, multiseriate, relatively slender, 2–7 cells wide, often with the upper whorl of rays antrorse and the lower one(s) spreading to retrorse, the rays 8–20(<), 0.05–0.6 mm long, 1-celled, the midpoint 0.05–1.4 mm long, shorter to longer than the rays, 1-celled; the pericarp soft and not sclerified at maturity;

fruiting pedicels 1.7–3.6 cm long, woody, straight to basally curved, articulated at the base, gradually enlarged towards the calyx, unarmed; fruiting calyx not or slightly accrescent, the tube flat or nearly so, 9–22 mm in diameter, the lobes 4.5–12.5 mm long. **Seeds** 40–60 per berry, 4.3–5.7 mm long, 4.7–6 mm wide, 0.7–0.9 mm thick when dry, flattened, reniform to nearly discoid, drying grey or black.

**Chromosome number:** not known. Figure 28.

***Distribution***—Mantiqueira Range region in the states of Minas Gerais and Rio de Janeiro (Fig. 27).

***Ecology and Habitat***—*Solanum schizandrum* inhabits montane to submontane Atlantic rainforests; from 400 to 1400 m elevation.





Fig. 28. *Solanum schizandrum* (**Aa**: E.P. Heringer s.n., RB [RB00467604]; **Ab–C**: J.M.A. Braga et al. 2782, RB; **D**: R. Marquete et al. 3345, RB; **E, F**: L. Menini Neto and N.L. Abreu 571, BHCB). **A(a–b)**. Flowering branches. **B**. Calyx. **C**. Inflorescence flowers and flower buds. **D**. Infructescence with young fruits. **E**. Fruit. **F**. Seeds. Scale bars: **Aa** = 5.5cm; **Ab** = 3 cm; **B** = 0.5cm; **C** = 1.3cm; **D** = 2.5 cm; **E** = 2 cm; **F** = 6 mm.

**Etymology**— The epithet *schizandrum* is formed by the Greek word ‘*schizo*’, that means both cleave and split, and ‘*andros*’, meaning male, a reference to the plant androecium. This epithet probably describes the usually divergent anthers in *S. schizandrum*, which contrasts with the typically connivent anthers of *Solanum*.

**Preliminary conservations status**—See Table 1.

**Notes**—*Solanum schizandrum* is a member of the Schizandrum clade. It is closely related and mostly resembles *S. jairoi*, which is also a high-climbing canopy liana inhabiting wet, montane to high montane, Atlantic forests from east-southeastern Brazil. Stem indumentum in these two species conspicuous presence of long stellate trichomes with stalks longer than 0.5 mm long, differing them from the indumentum of all other morphologically similar species but *S. caipora* (Jussiaei clade). *Solanum caipora*, however, in addition to its occurrence is restrict to the low Atlantic forests in the Bahia State, have striking pubescent to hirsute fruits covered by stellate trichomes bearing distinctly long, stiff midpoints with two or three cells long. While in *S. schizandrum* and *S. jairoi* the fruit indumentum (as a whole) is shorter, pubescent to tomentose, with trichomes bearing one cell long midpoints, which are mostly similarly long as the rays. *Solanum schizandrum* differs from *S. jairoi* in its leaf bases not decurrent into the petiole (Fig. 31A), rather than markedly decurrent onto the petiole; its inflorescences dichotomously branched, rather than up to two time forked; and its lilac to purple flowers, rather than white (see also notes on *S. jairoi*).

**Additional Specimens Examined**—**Brazil**.—MINAS GERAIS: Mun. Coronel Pacheco, Est. Exp. Café, 1 Nov 1941, *E.P. Heringer s.n.* (RB, VIC); Mun. Juiz de Fora,

Reserva Biológica de Santa Cândida, 12 Oct 1996, *R.C. Almeida-Lafetá 206* (CESJ); 14 Jan 1997, *R.C. Almeida-Lafetá 247* (CESJ); 12 Nov 1997, *R.C. Almeida-Lafetá s.n.* (CESJ, RB); Mun. Lima Duarte, Fazenda Serra Negra, 21°56'38,7"S, 43°50'20,3"W, 9 May 2008, *L. Menini Neto & N.L. Abreu 571* (CESJ); Mun. Rio Novo, Ribeirão (“ad Ribeirao prope Rio Novo”), 24 Sep 1894, *C.A.W. Schwacke 10950* (OUPR, P); *F.P.L. Araujo s.n.* (US [US01932443]).—RIO DE JANEIRO: Mun. Itatiaia, lote 17, ca. 850 m elev., *W.D. Barros 457* (RB); Montserrat, Sep 1934, *A.L. Brade 14012* (RB); Parque Nacional de Itatiaia, encosta nas margens do rio Campo Belo, abaixo do Lago Azul, ca. 22°15'S, 44°34'W, 700 m elev., 25 Aug 1995, *J.M.A. Braga et al. 2782* (BHCB, JPB, RB); lote 17, ca. 850 m elev., 15 Jan 1942, *W. Duarte 457* (RB); entre Montserrat e Maromba, 17 Oct 1922, *J.G. Kuhlmann s.n.* (RB [RB00467578]); Maromba, 1922, *Kuhlmann s.n.* (RB [RB00479334]); Mun. Nova Friburgo, Macaé de Cima, estrada para o Sítio Sophronites, 1100 m elev., 3 Aug 1989, *A.L. Almeida et al. 27* (RB); “Novo Fribugo” (Nova Friburgo), Nov 1842, *M. Claussen 25* (P); “dans les bois”, 17 Nov 1890, *A. Glaziou 18406* (P); Macaé de Cima, Sítio Sophronites, nascente do Rio das Flores, *S.V.A. Pessoa et al. s.n.* (RB [RB00467594]); Mun. Petrópolis, “entre la Fazenda Ingleza et le Alto do Imperatriz”, 2 Feb 1880, *A. Glaziou 12104* (K, P); Carangola, 5 Jul 1949, *G.C. Goés & D. Constantino 264* (RB); Morin, subida para a torre, 22°32'14"S 43°09'15"W, 1326 m elev., Nov 2019, *Y.F. Gouvêa & M.U. Guerrero 363* (BHCB); descendo da primeira torre, lado direito da estrada, 22°32'15.4"S, 43°09'13"W, 1379 m elev., 22 Aug 2002, *R. Marquete et al. 3345* (JPB, RB).

### **Doubtful or not validly published names**

*Solanum cladotrichum* Mart. ex Dunal in DC., Prodr. 13(1): 223. 1852. (not *S. cladotrichum* Dunal 1813) Nom. nud. [=*S. jussiaei*]

*Solanum impediens* Weinm. Syll. Pl. Nov. ii. 162. 1828. (no specimen cited but a comparison with the Commerson's collection, which is cited by Roemer & Schultes in Syst. Veg., ed. 15 bis. 1819. 4: pg. 626. ["*Dunal Sol. p. 196.*"; in the paragraph below: "*In Guadeloupe Badier, et Brasilia Commerson.*" {Is the commerson's material referred the type of *S. jussiaei*?}] for *S. micracanthum*.

*Solanum organorum* Dunal in A. DC., Prodr. 13(1): 229. 1852. Nom. nud [=*S. schizandrum*]

*Solanum ochroneurum* var. *armatum* Dunal, in DC., Prodr. 13 (1): 230. 1852.—  
TYPE: **BRAZIL**. "caulis aculeis pluribus majoribus, foliis tenuius tomentosus, nervis supra et infra magis aculeatis", (Link l. c.)

*Solanum ochroneurum* var. *gracile* Dunal f. *graciliore* Dunal, in DC., Prodr. 13 (1): 230. 1852.— TYPE: **BRAZIL**. "In Brasiliâ australiori", (Sellow e Sendtn. l. c.)

*Solanum ochroneurum* var. *micracanthum* Dunal, in DC., Prodr. 13 (1): 230. 1852.— TYPE: **BRAZIL**. "caulis aculeis parvis", (Sendt. l. c.)

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**Appendix 1. List of *Leptostemonum* clade taxa included in the matrix. The plastid genome was accesses for each taxon based on the assembled and annotated plastid genome of *Solanum melongena* L. (KU682719).**

Taxa	Vouchers	Chl. reads	Plastome size (bp)	Mean coverage	GC%	HQ%
<i>S. absconditum</i>	Miranda, A.M. 2956	131,976	154,593	107	37.7	100
<i>S. acanthodes</i>	Giacomin, L.L. 2776	457,830	154,509	379	37.8	100
<i>S. adamantium</i>	Gouvêa, Y.F. 254	236,973	154,505	195	37.8	100
<i>S. agrarium</i>	Gouvêa, Y.F. 342	327,039	154,629	270	37.8	100
<i>S. alternatopinnatum</i>	Giacomin, L.L. 1692	737,982	154,514	605	37.7	100
<i>S. apiculatum</i>	Marques & Ferreira 84	47,033	154,587	36	37.7	99.4
<i>S. asterophorum</i>	Gouvêa, Y.F. 140	139,594	154,670	114	37.7	99.9
<i>S. asterophorum</i>	Gouvêa, Y.F. 192	145,063	154,671	119	37.7	100
<i>S. botocudo</i> sp. nov. ined.	Gouvêa, Y.F. 327	117,379	154,557	96	38	100
<i>S. buddleiifolium</i>	Giacomin, L.L. 1131	147,610	154,530	120	37.8	99.9
<i>S. buddleiifolium</i>	Gouvêa, Y.F. 258	169,176	154,567	137	37.8	100
<i>S. cordifolium</i>	Giacomin, L.L. 1848	336,222	154,465	275	37.8	100
<i>S. crotonifolium</i>	Tovar, J.D. 305	695,163	154,512	574	37.8	100
<i>S. decompositiflorum</i>	Gouvêa, Y.F. 298	286,131	154,513	235	37.9	100
<i>S. decompositiflorum</i>	Gouvêa, Y.F. 121	44,308	154,674	36	37.7	99.6
<i>S. decorum</i>	Agra, M.F. 7263	133,273	154,648	108	37.6	99.8
<i>S. depauperatum</i>	Gouvêa, Y.F. 343	182,857	154,497	148	37.9	100
<i>S. diamantinense</i>	Gouvêa, Y.F. 195	106,324	154,692	85	37.6	99.9
<i>S. echidnaeforme</i>	Gouvêa, Y.F. 158	263,919	154,614	218	37.7	99.9
<i>S. fernandesii</i>	Queiroz, L.P. de 12185	824,073	154,575	681	37.8	100
<i>S. fulvidum</i>	Buitrago, M.A. 480	242,890	154,568	199	37.7	100
<i>S. gardneri</i>	Gouvêa, Y.F. 362	240,571	154,582	199	37.8	100
<i>S. gomphodes</i>	Giacomin, L.L. 1271	142,727	154,670	117	37.8	100
<i>S. goytaca</i> sp. nov. ined.	Gouvêa, Y.F. 324	241,130	155,080	198	37.9	100
<i>S. graniticola</i>	Lima-Verde, L.W. s.n.	309,072	154,510	256	37.8	100
<i>S. hexandrum</i>	Giacomin, L.L. 1689	248,123	154,525	203	37.9	100
<i>S. igniferum</i>	Gouvêa, Y.F. 190	241,694	154,675	198	37.7	100
<i>S. incarceratum</i>	Gouvêa, Y.F. 253	333,638	154,489	276	37.9	100
<i>S. insidiosum</i>	Giacomin, L.L. 1838	224,438	154,641	185	37.6	99.9
<i>S. jairoi</i> sp. nov. ined.	Gouvêa, Y.F. 317	192,412	154,522	157	37.9	100
<i>S. jussiaei</i>	Gouvêa, Y.F. 249	513,796	154,544	424	37.9	100
<i>S. kollastrum</i>	Gouvêa, Y.F. 280	976,602	154,464	811	37.9	100
<i>S. leptostachys</i>	Giacomin, L.L. 1187	544,646	154,638	449	37.9	100
<i>S. lycocarpum</i>	Gouvêa, Y.F. 276	245,148	154,635	198	37.8	100
<i>S. medusae</i>	Gouvêa, Y.F. 259	459,952	154,700	372	37.8	100
<i>S. megalonyx</i>	Gouvêa, Y.F. 339	350,580	154,506	291	37.8	100
<i>S. mellobarretoi</i>	Stehmann, J.R. 6364	532,524	154,513	437	37.8	100
<i>S. metrobotryon</i>	Agra, M.F. 7275	380,165	154,477	313	37.9	100
<i>S. monachophyllum</i>	Giacomin, L.L. 2620	183,153	154,691	149	37.7	100

Appendix 1. Continued.

Taxa	Vouchers	Chl. reads	Plastome size	Mean coverage	GC%	HQ%
<i>S. nematopus</i>	Gouvêa, Y.F. 359	203,787	154,562	167	37.8	99.9
<i>S. ochroneurum</i>	Gouvêa, Y.F. 238	145,593	154,501	120	37.9	100
<i>S. oocarpum</i>	Giacomin, L.L. 1608	169,297	154,520	138	37.8	100
<i>S. paludosum</i>	Santana Júnior, J.A. 89	416,144	154,576	344	37.7	100
<i>S. paludosum</i>	Mota, N.F.O. 2853	243,502	154,572	198	37.7	100
<i>S. piluliferum</i>	Gouvêa, Y.F. 301	215,204	154,590	177	37.8	100
<i>S. polytrichum</i>	Gouvêa, Y.F. 235	255,562	154,682	209	37.8	100
<i>S. pycnanthemum</i>	Giacomin, L.L. 1841	187,492	154,639	152	37.6	100
<i>S. reflexiflorum</i>	Gouvêa, Y.F. 347	122,955	154,505	101	37.7	100
<i>S. rhytidoandrum</i>	Giacomin, L.L. 1603	678,690	154,526	561	37.8	100
<i>S. robustum</i>	Gouvêa, Y.F. 295	225,056	154,600	182	37.6	99.9
<i>S. rubicaule</i>	Särkinen, T. 4601	343,099	154,542	285	37.9	100
<i>S. rupicola</i>	Gouvêa, Y.F. 318	223,842	154,569	185	37.9	100
<i>S. schizandrum</i>	Gouvêa, Y.F. s.n.	663,85	154,579	53	37.9	99.9
<i>S. sessilanthelum</i>	Gouvêa, Y.F. 188	344,390	154,64,7	284	37.7	100
<i>S. sisymbriifolium</i>	Gouvêa, Y.F. 304	210,371	154,492	174	37.8	100
<i>S. sp. nov. 1</i>	Sanín, D. 7260	423,19	154,563	34	37.8	99.5
<i>S. sp. nov. 2</i>	Verdi, M. 7067	110,614	154,489	90	37.8	99.9
<i>S. sp. nov. 3</i>	Giacomin, L.L. 968	63,978	154,520	51	37.8	99.9
<i>S. sp. nov. 3</i>	Couto, A.P.L. 142	155,769	154,520	127	37.8	100
<i>S. sp. nov. 4</i>	Kollmann, L. 906	107,346	154,555	77	37.8	99.8
<i>S. sp. nov. 5</i>	Gouvêa, Y.F. 285	646,867	154,628	538	37.9	100
<i>S. stagnale</i>	Folli, D.A. 7251	76,447	154,516	62	37.9	99.8
<i>S. stenandrum</i>	Gouvêa, Y.F. 257	104,9230	154,54,5	867	37.8	100
<i>S. stramoniiifolium</i>	Gouvêa, Y.F. 292	387,577	154,640	318	37.8	100
<i>S. sublentum</i>	Stehmann, J.R. 6370	310,760	154,527	255	37.9	100
<i>S. subumbellatum</i>	Tabosa, F.R.S. 72	272,562	154,554	225	37.8	100
<i>S. thomasiifolium</i>	Gouvêa, Y.F. 186	267,112	154,567	220	37.7	100
<i>S. thomasiifolium</i>	Gouvêa, Y.F. 287	279,657	154,529	227	37.8	100
<i>S. thomasiifolium</i>	Gouvêa, Y.F. 120	171,623	154,525	140	37.8	100
<i>S. tupinamba</i> sp. nov. ined.	Gouvêa, Y.F. 240	153,852	154,548	126	37.9	99.9
<i>S. vaillantii</i>	Gouvêa, Y.F. 303	338,092	154,505	280	37.9	100
<i>S. variabile</i>	Gouvêa, Y.F. 316	178,585	154,515	147	37.8	100
<i>S. velleum</i>	Stehmann, J.R. 6419	111,604	154,500	92	37.9	99.9
<i>S. vellutinum</i>	Giacomin, L.L. 3131	115,658	154,576	94	37.7	100