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Original Paper

The genus *Justicia* (Acanthaceae) in the state of Pará, Amazon, Brazil

Fabio Araújo da Silva[1,5], *Cintia Kameyama*[2], *Daniela C. Zappi*[1,3] & *André dos Santos Bragança Gil*[1,4]

Abstract

The taxonomic knowledge for genus *Justicia* in the Amazonian state of Pará, Brazil, is updated. The study was based on material from important national and international herbaria, as well as specimens collected in different vegetation types within the state, some of them kept under cultivation by the first author. Twenty five species of *Justicia* were recorded for Pará: *J. asclepiadea, J. birae, J. calycina, J. carajensis, J. cayennensis, J. comata, J. distichophylla, J. divergens, J. gendarussa, J. laevilinguis, J. mcdadeana, J. montealegrensis, J. multiglandulosa, J. oldemanii, J. oriximinensis, J. paraensis, J. pectoralis, J. polystachya, J. potamogeton, J. pseudoamazonica, J. riedeliana, J. secunda, J. sphaerosperma, J. sprucei, J. yurimaguensis*. Among these, five are new records for the state of Pará (*J. asclepiadea*, *J. cayennensis*, *J. gendarussa*, *J. oldemanii*, and *J. yurimaguensis*). Moreover, seven of the accepted names are lectotypified and a new name (*J. oriximinensis*) is proposed. A species identification key is presented alongside detailed morphological descriptions (including seed analysis), distribution and habitat information, taxonomic comments and illustrations.

Key words: Amazon flora, flora of Pará, Justicieae, seed morphology, taxonomy.

Resumo

Este trabalho tem como objetivo contribuir para o conhecimento taxonômico do gênero *Justicia* no estado do Pará, Amazônia, Brasil. O estudo foi baseado em material de importantes herbários nacionais e internacionais, além daqueles provenientes de expedições de coleta em diferentes tipos de vegetação encontrados no estado e do cultivo de espécimes coletados pelo primeiro autor. Foram registradas 25 espécies de *Justicia* para o estado do Pará: *J. asclepiadea, J. birae, J. calycina, J. carajensis, J. cayennensis, J. comata, J. distichophylla, J. divergens, J. gendarussa, J. laevilinguis, J. mcdadeana, J. montealegrensis, J. multiglandulosa, J. oldemanii, J. oriximinensis, J. paraensis, J. pectoralis, J. polystachya, J. potamogeton, J. pseudoamazonica, J. riedeliana, J. secunda, J. sphaerosperma, J. sprucei, J. yurimaguensis*. Destas cinco são novos registros para o estado do Pará (*J. asclepiadea*, *J. cayennensis*, *J. gendarussa*, *J. oldemanii* e *J. yurimaguensis*), além disso, estão sendo lectotipificados sete nomes aceitos de *Justicia* e um nome novo é proposto: *J. oriximinensis.* São apresentadas chave de identificação das espécies, descrições morfológicas detalhadas (incluindo análise das sementes), informações sobre distribuição geográfica e habitat, comentários taxonômicos e ilustrações.

Palavras-chave: flora Amazônica, flora do Pará, Justicieae, morfologia de sementes, taxonomia.

Introduction

The Amazonian state of Pará, in northern Brazil, has a very complex landscape and beta diversity, being home to over six thousand different species of Angiosperms (BFG 2018; Viana *et al.* 2016). Considering the knowledge regarding the plant diversity in the Amazon rainforest in Brazil, it is still being assembled (Morim & Lughadha 2015; Cardoso *et al.* 2017); Pará is no exception and many new species have

[1] Universidade Federal Rural da Amazônia/Museu Paraense Emílio Goeldi, Prog. Pós-graduação em Ciências Biológicas - Botânica Tropical, Terra Firme, Belém, PA, Brasil. ORCID: <https://orcid.org/0000-0002-1944-7246>.

[2] Instituto de Botânica de São Paulo, Água Funda, São Paulo, SP, Brasil. ORCID: <https://orcid.org/0000-0001-6624-1884>.

[3] Universidade de Brasília, Prog. Pós-graduação em Botânica, Inst. Ciências Biológicas, Campus Darcy Ribeiro, Brasília, DF, Brasil. ORCID: <https://orcid.org/0000-0001-6755-2238>.

[4] Museu Paraense Emílio Goeldi - MPEG, Campus de Pesquisa, Coordenação de Botânica - COBOT, Terra Firme, Belém, PA, Brasil. ORCID: <https://orcid.org/0000-0002-0833-9856>.

[5] Author for correspondence: fabioaraujo.bio@gmail.com

been described recently for this state (*e.g.*, Salas *et al.* 2015; Rocha *et al.* 2017; Reis *et al.* 2017b; Silva *et al.* 2019a,b, 2021).

According to Scotland & Vollesen (2000), Acanthaceae Juss. comprises over 220 genera and over four thousand species and is the second largest family within Lamiales. Its distribution is mainly pantropical, with few representatives in temperate areas (Ezcurra 1999). The genus *Justicia* belongs to one of the largest tribes of the Acanthaceae, the Justicieae Dumort., with around two thousand species seggregated into 100 genera with outstanding morphological diversity (McDade *et al.* 2000; Kiel *et al.* 2017). Pioneering phylogenetic studies of this tribe revealed its monophyletic origin and four main lineages, suggesting the tricolporate, hexapseudocolpate pollen grain as a synapomorphy for the group (Mcdade & Moody 1999; McDade *et al.* 2000). According to McDade *et al.* (2000) the "justicioid" lineage is strongly supported and includes at least 12 genera from the old and new world. Amongst these, genus *Justicia* is the most speciose, with about 700 species (Daniel 2016).

McDade *et al.* (2000) and Kiel *et al.* (2017) have concluded that *Justicia sensu lato*, however, is polyphyletic, with new world species all nested together with other small genera, such as *Cephalacanthus* Lindau, *Clistax* Mart., *Harpochilus* Nees, *Megaskepasma* Lindau and *Poikilacanthus* Lindau. With a more expressive sampling, Kiel *et al.* (2018) reaffirmed the monophyly of the lineages of New World *Justicia*, and concluded that the majority of sections proposed by Graham (1988), Hilsenbeck (1990) and Daniel (2003, 2004) were paraphyletic.

Even considering the advances in the understanding of the taxa comprised by this large genus, the majority of authors continues to adopt the circumscription of *Justicia s.l.* from Graham (1988) (*e.g.*, Ezcurra 2002; Wasshausen & Wood 2004; Côrtes & Rapini 2011; Wasshausen 2013). Graham (1988) proposed an infrageneric classification for *Justicia s.l.*, considering 16 sections and 7 subsections accommodating 295 accepted species based in inflorescence, androecium, pollen and seed characters.

Currently in Brazil there are 131 accepted species occurring in all six biomes, of which 75 are endemic (BFG 2018). In northern Brazil there are records of 40 species, however only 12 were recorded for the state of Pará (BFG 2018) prior to this work.

Justicia is characterized by tubular, bilabiate corolla with stylar groove on the upper lip, that is usually bilobed while the lower lip is trilobed, and frequently has a striate palate, two stamens and anthers with two unequal thecae and staminode absence. Pollen-grains are extremely relevant for the genus, varying from 2 to 4 porate or colporate, subprolate to perprolate (Graham 1988; Ezcurra 2002).

Taxonomic studies of Acanthaceae in northern South America include: Acanthaceae of the Venezuelan Guiana (Wasshausen 1995); Acanthaceae of Bolivia (Wasshausen & Wood 2004); Acanthaceae of the Guianas (Wasshausen 2006); and Acanthaceae of Ecuador (Wasshausen 2013). In northern Brazil these studies are scarce, with the Flora of Acanthaceae from the Reserva Ducke, Amazonas, Brasil (Kameyama 2006), recording only two species of *Justicia*; and Acanthaceae of the canga of the Serra dos Carajás (Reis *et al.* 2017a), treating 9 species of *Justicia*; and Silva & Bonadeu (2019), with the Flora of the Acanthaceae in Colorado do Oeste, Rondônia, Brasil, listing four *Justicia* species.

The objective of this work is to clarify the taxonomy and distribution of *Justicia* in the state of Pará in order to review the knowledge of the genus for the state and for the Amazon biome, also contributing to the understanding of the Brazilian Flora.

Material and Methods

Pará is the second largest state of Brazil, with an area of 1,248,000 km² and is divided in 144 municipalities (IBGE 2008). There is a predominance of low, flat lands, with more than 80% of the territory under 300 m a.s.l., with half of them below 200 m (Lima 2013). According to the Instituto Nacional de Meteorologia (1992), the temperatures in the state have little seasonal variation, with mean temperatures of 25 ºC in all months, constant rains and a mild dry season in most of its territory, that can be more severe and reach more than four months in some areas (southeast of the state, higher areas). February has the lowest temperatures while October has the highest, and the maximum temperature increases continuously from February to October, decreasing in November, when the rainy season begins. Air humidity is high, with values above 80% throughout the year. According to IBGE (2004), dominant climate is equatorial, with rains varying between 1,000 and 4,500 mm.

The dominant vegetation type is ombrophilous forest (*terra firme*, *várzea*, and *igapó* forests) that covers the majority of the state (lower Amazonas, Marajó, Belém Metropolitan Region, northeastern, southeastern and southwestern Pará) (IBGE 2008). There are also stretches of open vegetation, namely *campinarana*, *canga*, Amazonian savanna, and Cerrado where the floristic composition and ecology differ markedly (IBGE 2008; Lima Filho *et al.* 2004; Mota *et al.* 2018).

The present study was based on the analysis of herbarium material housed at BHCB, HBRA, HCJS, HSTM, IAN, INPA, MFS, MG, R, RB, SP, and SPF (acronyms according to Thiers, continuously updated). Additionally, high definition images from K, MO, NY, and US were also examined, either through the JSTOR Global Plants (2019) portal or through the individual herbarium websites, complemented by fieldwork carried out in different vegetation types of the state during 2017 and 2019. Whenever possible, collected specimens were also grown at the Research Campus of the Museu Paraense Emílio Goeldi, Pará, Brazil, in order to complement the knowledge and documentation, and to help preparing drawings and photo plates.

All material was determined using specialized literature for Acanthaceae (*e.g.*, Nees 1847; Lindau 1895; Wasshausen 1995, 2006, 2013; Graham 1988; Wasshausen & Wood 2003, 2004; Ezcurra 2002), consultation to original descriptions and nomenclatural types available in image databases (Biodiversity Heritage Library 2018; Botanicus Digital Library 2018; JSTOR's Global Plants 2019; Open Library 2018 and/or individual herbarium repositories when available).

Species were circumscribed and analysed, described and illustrated using stereomicroscope Leica M165 C, at the Taxonomy Laboratory (Labtax) at Museu Paraense Emílio Goeldi (MPEG). Structures that were lacking in specimens from Pará were described from aditional material and/or literature cited in each of the species treatments. Scientific names, original publication and author abbreviations follow Tropicos (2019) and IPNI (2019). The present work was based on the framework and the genus circumscription proposed by Graham (1988), and considerations regarding the sections proposed in his work are provided. The genus description presented is based on the species recorded from Pará, and information regarding habit, habitat, flowering and fruiting was derived from herbarium labels and field observations.

Morphological terms of vegetative and reproductive structures followed Radford *et al.* (1974), Harris & Harris (2001), and Graham (1988), while indumentum descriptions are based on Ahmad (1978) and Payne (1978). However, specific characters of the group, important for distinguishing the species are outlined in a plate (Fig. 1), where we display characters such as different inflorescence types and bract shapes (lax and congested inflorescence, with alternate flowers opposite to sterile bracts, inflorescence with decussate flowers and sterile bracts absent, panicles of verticillate spikes, panicles of non verticillate spikes), calyx types (calyx with 5 calyx-lobes of equal length, with 4 calyx-lobes of equal length and 1 calyx-lobe reduced), corolla features and measurements (corolla not personate, personate), thecae (appendiculated or not appendiculated) and capsules (glabrous or pubescent).

Results and Discussion

The analysis of 395 herbarium sheets of *Justicia* from Pará resulted in the identification of 25 species. According to BFG (2018), until the present publication there were only 12 species of *Justicia* for the state and *J. angustifolia* (Nees) Lindau was treated as not confirmed for the state. We observed that the majority of examined specimens of *J. laevilinguis* (Nees) Lindau were annotated as *J. angustifolia* and we were not able to locate the voucher used for BFG (2018) that justifies the occurrence of the latter species in Pará. We hereby propose a new name: *J. oriximinensis* (Nees) F.A. Silva & Kameyama, and lectotypify seven names in *Justicia*. The following species are newly recorded for the state: *Justicia asclepiadea* (Nees) Wassh. & C. Ezcurra, *J. cayennensis* (Nees) Lindau, *J. gendarussa* Burm. f., *J. oldemanii* Wassh., and *J. yurimaguensis* Lindau.

Justicia L., Sp. Pl. 1: 15. 1753.
Type-species: *Justicia hyssopifolia* L. (Lectotype designated by Hitchcock in Hitchcock & Green 1930).

Herbs, subshrubs or shrubs. Branches erect, scandent, semidecumbent or decumbent, cylindric to quadrangular, sulcate or not, dilatate or not with or without constrictions above the node, glabrous or with indument. Opposite leaves sessile to petiolate, decussate or rarely sub-distichous to distichous; leaf-blade lanceolate, elliptic to narrowly-elliptic or ovate, margin entire to repandous or ocasionally subcrenate, frequently ciliate. Axillary or terminal

simple spikes to panicles of spikes, flowers alternate or decussate, lax or congested; bracts imbricate or not, sessile or rarely petiolate, bract-blades variable, narrowly-triangular, lanceolate or ovate; bracteoles 2, sessile, narrowly-triangular, lanceolate, subulate or linear; calyx 4–5-lobed (when 5-lobed, all lobes equal or one reduced), lobes frequently linear, lanceolate, narrowly-elliptic or subulate; corolla bilabiate, personate or not, lilac, lavender, white, red or rarely pink-vinaceous, frequently with

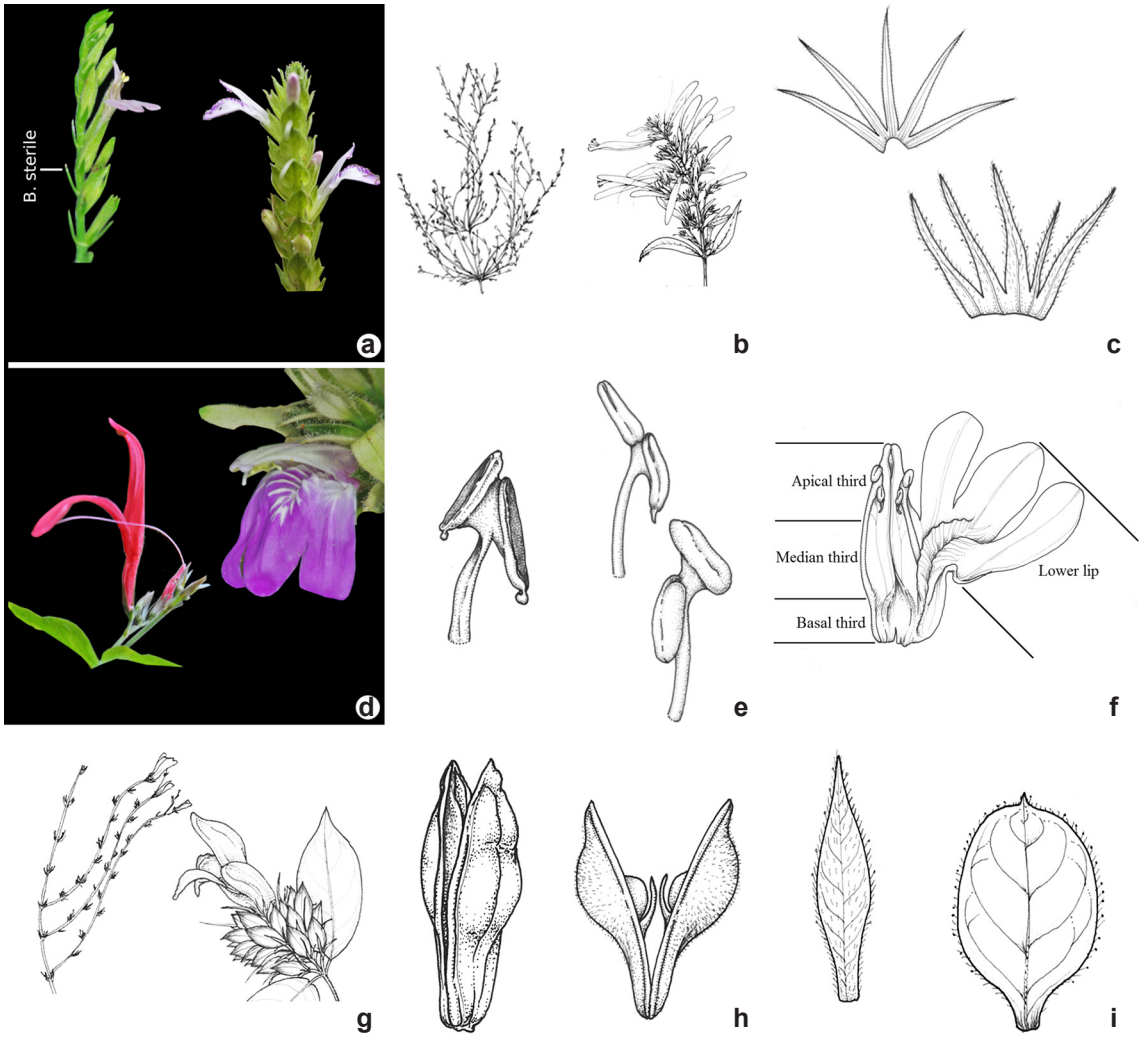

Figure 1 – a-i. Main morphological characters used in the Identification key – a. to the left: inflorescence with alternate flowers, opposite to sterile bracts in *J. carajensis*, to the right: inflorescence with decussate flowers, sterile bracts absent in *J. potamogeton*; b. to the left: panicles composed of verticillate spikes in *J. comata*, to the right: panicles composed of non verticillate spikes in *J. secunda*; c. to the left: calyx with 5 calyx-lobes of equal length in *J. sphaerosperma*, to the right: calyx with 4 calyx-lobes of equal length and 1 calyx-lobe reduced [4+1] in *J. oriximinensis*; d. to the left: corolla not personate in *J. calycina*, to the right: personate corolla in *J. distichophylla*; e. to the left: anther with both thecae appendiculated in *J. mcdadeana*, to the right: anther with thecae not appendiculated, or only the lower thecae appendiculated; f. guide for corolla measurements in *J. distichophylla*; g. to the left: inflorescence with lax flowers in *J. pectoralis*, to the right: inflorescence with congested flowers in *J. asclepiadea*; h. to the left: glabrous capsules in *J. asclepiadea*, to the right: pubescent capsules in *J. distichophylla*; i. to the left: fertile bracts lanceolate to narrowly-triangular in *J. oriximinensis*, to the right: fertile oblong to eliptical bracts in *J. potamogeton*.

stripes or spots at the base of palate, with stylar groove (rugula) always present on the upper lip, which may be entire or bilobed, lower lip trilobed; stamens 2, generally inserted in the median third of the corolla-tube, anthers bi-thecae, dorsifixed, thecae inserted in different heights, not parallel to each other, appendiculate or not; ovary generally glabrous or rarely puberulous or pubescent, with simple glandular or eglandular trichomes; style glabrous, puberulous or pubescent, wrapped by the stylar groove, stigma capitate, subcapitate or bilobed. Capsules clavate to panduriform; seeds 4, compressed to spheroid, smooth to tuberculate, glabrous.

Identification key for *Justicia* species in Pará state

1. Inflorescence with alternate flowers, opposed to the sterile bracts (rarely, few opposite flowers in the apical portion of mature inflorescences).
    2. Leaves sessile; inflorescence in panicles composed of verticillated spikes.....6. *Justicia comata*
    2'. Leaves petiolate; inflorescence in simple spikes or panicles of spikes, never verticillated.
        3. Bracts imbricate.
            4. Branches pilose to sericeous; sterile bracts subulate, pilose; fertile bracts short-petiolate; corolla upper lip entire .....14. *Justicia oldemanii*
            4'. Branches pubescent-adpressed; sterile bracts oval-asymmetric, glabrous; fertile bracts sessile; corolla upper lip bilobed.....18. *Justicia polystachya*
        3'. Bracts not imbricate.
            5. Calyx 4-lobed.....4. *Justicia carajensis*
            5'. Calyx 5-lobed equal or 4 lobes equal length and 1 reduced lobe (4+1).
                6. Corolla 33–67 mm long, predominantly red, not personate.
                    7. Main axis of the inflorescence glabrous to sparsely puberulous; anthers with both thecae appendiculated (Fig. 1e left) ..... 11. *Justicia mcdadeana*
                    7'. Main axis of inflorescence pubescent; anthers with non-appendiculated thecae, or just the lower thecae appendiculated (Fig. 1e right).
                        8. Branches subquadrangular; lower thecae appendiculated; ovary glabrous .....23. *Justicia sphaerosperma*
                        8'. Branches subcylindrical; both thecae not appendiculated; ovary pubescent or puberulous.
                            9. Branches pubescent to puberulous-strigose in two longitudinal bands; corolla 55–67 mm long, upper lip entire; stamens inserted in the median third of the corolla-tube .....3. *Justicia calycina*
                            9'. Branches glabrous to sparsely puberulous throughout the surface; corolla 40–45 mm long, bilobed upper lip; stamens inserted in the basal third of the corolla-tube..... 22. *Justicia secunda*
                6'. Corolla 6–26 mm long, predominantly white, lilac to lavender, personate.
                    10. Sterile bracts 9–16 mm long; fertile bracts 11–16 mm long; flowers congested; stamens inserted in the basal third of the corolla-tube.
                        11. Sterile bracts narrowly-linear; bracteoles narrowly-lanceolate to narrowly-linear; calyx-lobes obovated to oblong; capsules glabrous..... ..... 1. *Justicia asclepiadea*
                        11'. Sterile bracts elliptic to oblong; bracteoles oblanceolate; calyx-lobes oblanceolate; capsules pubescent .....7. *Justicia distichophylla*
                    10'. Sterile bracts 1.5–2.5 mm long; fertile bracts 1–3 mm long; flowers lax; stamens inserted in the median third or apical third of the corolla-tube.
                        12. Subshrubs; stamens inserted in the apical third of the corolla-tube; anthers with just the lower thecae appendiculated; style pubescent..... .....13. *Justicia multiglandulosa*

12’. Herbs; stamens inserted in the median third of the corolla-tube; anthers with both non-appendiculated thecae; style glabrous.
13. Main inflorescence axis with eglandular trichomes; calyx with 5 equal length lobes; seed cordate ..... 10. *Justicia laevilinguis*
13’. Main inflorescence axis with glandular trichomes; calyx with 4 equal length lobes and 1 reduced lobe (4+1), seed oblong ..... 17. *Justicia pectoralis*

1’. Inflorescence with decussate flowers, sterile bracts absent.
14. Calyx 5-lobed, lobes unequal length (4+1).
15. Bracts not imbricate; flowers lax..... 8. *Justicia divergens*
15’. Bracts imbricate; flowers congested.
16. Leaf-blades variegated; main inflorescence axis sericeous..... ..... 25. *Justicia yurimaguensis*
16’. Leaf-blades not variegated; main inflorescence axis pubescent, pubescent-adpressed, hirsute.
17. Leaf-margin entire; capsules clavate..... 5. *Justicia cayennensis*
17’. Leaf-margin subrepandous; capsules panduriform.
18. Main axis of inflorescence pubescent-adpressed, with eglandular trichomes only; fertile bracts lanceolate to narrowly-triangular..... ..... 15. *Justicia oriximinensis*
18’. Main axis of inflorescence pubescent-erect, with eglandular and glandular trichomes; fertile bracts oblong to elliptic, rarely rhomboid..... ..... 19. *Justicia potamogeton*
14’. Calyx 5 or 4 lobed, all lobes of equal length.
19. Corolla predominantly white or lilac; stamens inserted at the base or apical third of the corolla-tube.
20. Calyx 4-lobed; main axis of inflorescence puberulous in two longitudinal bands; corolla personate, upper lip entire ..... 20. *Justicia pseudoamazonica*
20’. Calyx 5-lobed; main axis of the inflorescence glabrous or pubescent; corolla not personate, upper lip bilobed.
21. Leaf-blades narrowly-elliptic, leaf-margin subcrenate, not ciliate; inflorescences in terminal simple spikes..... 9. *Justicia gendarussa*
21’. Leaf-blades lanceolate to oblong, leaf-margin entire to subrepandous, sparsely ciliate; inflorescences in axillary and terminal panicles of spikes .... 24. *Justicia sprucei*
19’. Corolla predominantly red, pink-vinaceous; stamens inserted in the median third of the corolla-tube.
22. Fertile bracts 3–6 mm long; corolla upper lip bilobed; thecae not appendiculated .... 2. *Justicia birae*
22’. Fertile bracts 15–38 mm long; corolla upper lip entire; only the lower thecae appendiculated.
23. Bracts not imbricate; leaf-margin subrepandous, not ciliate; corolla predominantly pink-vinaceous ..... 21. *Justicia riedeliana*
23’. Bracts imbricate; leaf-margin entire and ciliate; corolla predominantly red.
24. Branches quadrangular; inflorescence in terminal panicles of spikes; fertile bracts oblanceolate to obovate, adaxially glabrous, abaxially puberulous; style sparsely-puberulous..... 12. *Justicia montealegrensis*
24’. Branches cylindrical; inflorescence in simple axillary and terminal spikes; fertile bracts ovate to elliptic, pubescent to tomentose on both sides; style glabrous ..... 16. *Justicia paraensis*

1. *Justicia asclepiadea* (Nees) Wassh. & C. Ezcurra, Candollea 52(1): 172. 1997. *Simonisia asclepiadea* Nees in Mart., *Fl. bras.* 9: 145. 1847. LECTOTYPE: Brazil, "Serra da Chapada (cir. Matto Grosso)", *L. Riedel 1063* (Wasshausen & Ezcurra 1997 - first step). Second step: Brazil, "Serra da Chapada (cir. Matto Grosso)", *L. Riedel 1063* (Lectotype LE00007847 image!, designated here; Isolectotypes LE00007846 image!; LE00007845 image!; GZU000250366 image!). Figs. 2a-i; 3a-b; 4a

Subshrubs, 60–120 cm tall. Branches decumbent, cylindrical, not sulcate, slightly dilated, and not constricted above the nodes, glabrescent, sometimes with the presence of two longitudinal bands of pubescent indument along the branch. Leaves petiolate, petiole 4–10 mm long, blades 6–8 × 2.3–4.2 cm, ovate to oblong, apex acuminate, base rounded, sparsely puberulous on both sides, margin entire, sparingly ciliate. Axillary and terminal inflorescences in panicles of spikes, branching once; flowers alternate, congested; peduncles 0.5–1 cm long; main axis of inflorescence 2–3 cm long, puberulous, eglandular trichomes; bracts not imbricate; sterile bract 9–12 × 0.6–1 mm, narrowly-linear, sessile, apex attenuate, glabrous adaxially, puberulous to pubescent abaxially, eglandular trichomes, margin ciliate; fertile bract 12–16 × 1.3–1.5(–2.5) mm, narrowly-lanceolate to narrow-linear, sessile, apex attenuate, glabrous adaxially, puberulous to pubescent abaxially, eglandular trichomes, margin ciliate; bracteoles 12–15 × 0.6–1 mm, narrowly-lanceolate to narrowly-linear, apex attenuate, glabrous adaxially, puberulous to pubescent abaxially, eglandular trichomes, margin ciliate; calyx 5-lobed, all lobes equal, fused before anthesis, 13–16 × 5–7 mm, obovate to oblong, apex acuminate, glabrous on both sides, eglandular trichomes at margin, sparsely ciliate; corolla 21–26 mm long, personate, tube white, lilac lower lip with white stripes on the palate, tube base 4–5 mm long, median third 8–10 mm long, upper lip 11–16 mm long., bilobed, lobes c. 1 × 2 mm, lower lip 13–15 mm long, central lobe 5–7 × 5–9 mm, lateral lobes 5–5.5 × 9–6 mm; stamens inserted in the basal third of the corolla-tube, free portion of the filaments 10–15 mm long, connective short, upper thecae 2–3 mm long, not appendiculated, lower thecae 2–3 mm long, appendiculated at base; ovary glabrous; style 9–14 mm long, sparsely pubescent, stigma subcapitate. Capsules 13–14 × c. 4 mm, clavate, glabrous; seeds c. 1 mm diam., subspheroid, smooth, glabrous.

Selected material: Altamira [Itaituba], estrada Santarém-Cuiabá, BR-163, km 859 to 870, 08°45'S, 54°55'W, 6.V.1983, *I.L. Amaral et al. 1196* (INPA, RB). Jacareacanga, Alto do Tapajós, Rio Cururú, 07°35'S, 57°31'W, 8.II.1974, *W.R. Anderson 10659* (IAN).

Additional material examined: BRAZIL. MATO GROSSO: Itaúba, flora rescue of the Colíder UHE transmission line, Planalto dos Parecís Forest, 12.VII.2017, *M.E. Engels & J.A.O. Freitas 5796* (RB). Tapurah, beira do Córrego Falcão, 12°17'S, 56°06'W, 9.VI.1997, *V.C. Souza et al. 17495* (SPF).

Justicia asclepiadea occurs in Bolivia associated with rock outcrops in San Miguel de Velasco, prov. Santa Cruz (Wasshausen & Wood 2004) and in Brazil, in the states of Bahia, Piauí, Minas Gerais, Goiás, Mato Grosso do Sul and Mato Grosso (BFG 2018). In this study it emerges as a new record for the state of Pará. It is not a common species in the study area, listed only in the municipalities of Altamira and Jacareacanga, located in the southern region of the state. It naturally occurs in forest edges or in rock outcrops formations close to rivers and streams. It flowers and fruits from February to May.

Justicia asclepiadea was lectotypified by Wasshausen & Ezcurra (1997), however these authors did not specify which of the herbarium sheets of *L. Riedel 1063* would be the the lectotype, therefore a second step typification of *L. Riedel 1063* (LE) (See Art. 9.17 by Turland *et al.* 2018) is being proposed here. We have chosen the material LE00007847 as the lectotype of *J. asclepiadea* as it is better preserved and clearly displays the diagnostic characters of the protologue for the identification of the species.

Justicia asclepiadea is characterised mainly by lanceolate or narrowly-linear bracts and bracteoles, a calyx with obovate to oblong lobes (Fig. 2g), personate and large corolla (21–26 mm long). Morphologically, it resembles *J. distichophylla* due to the inflorescence characteristics and the corolla colour, being easily differentiated by the narrowly-lanceolate to narrowly-linear, green bracts *in vivo*, with eglandular trichomes (*vs.* elliptic to oblong white bracts, with *in vivo* eglandular trichomes and glandular trichomes in *J. distichophylla*), calyx with obovate to oblong lobes (*vs.* calyx with oblanceolate lobes in *J. distichophylla*) (Silva *et al.* 2019b).

Justicia asclepiadea was not included in the *Justicia* revision by Graham (1988), however it presents morphological characteristics that resemble the species of *J.* section *Simonisia* (Nees) V.A.W. Graham: the 5-lobed calyx, with lobes of

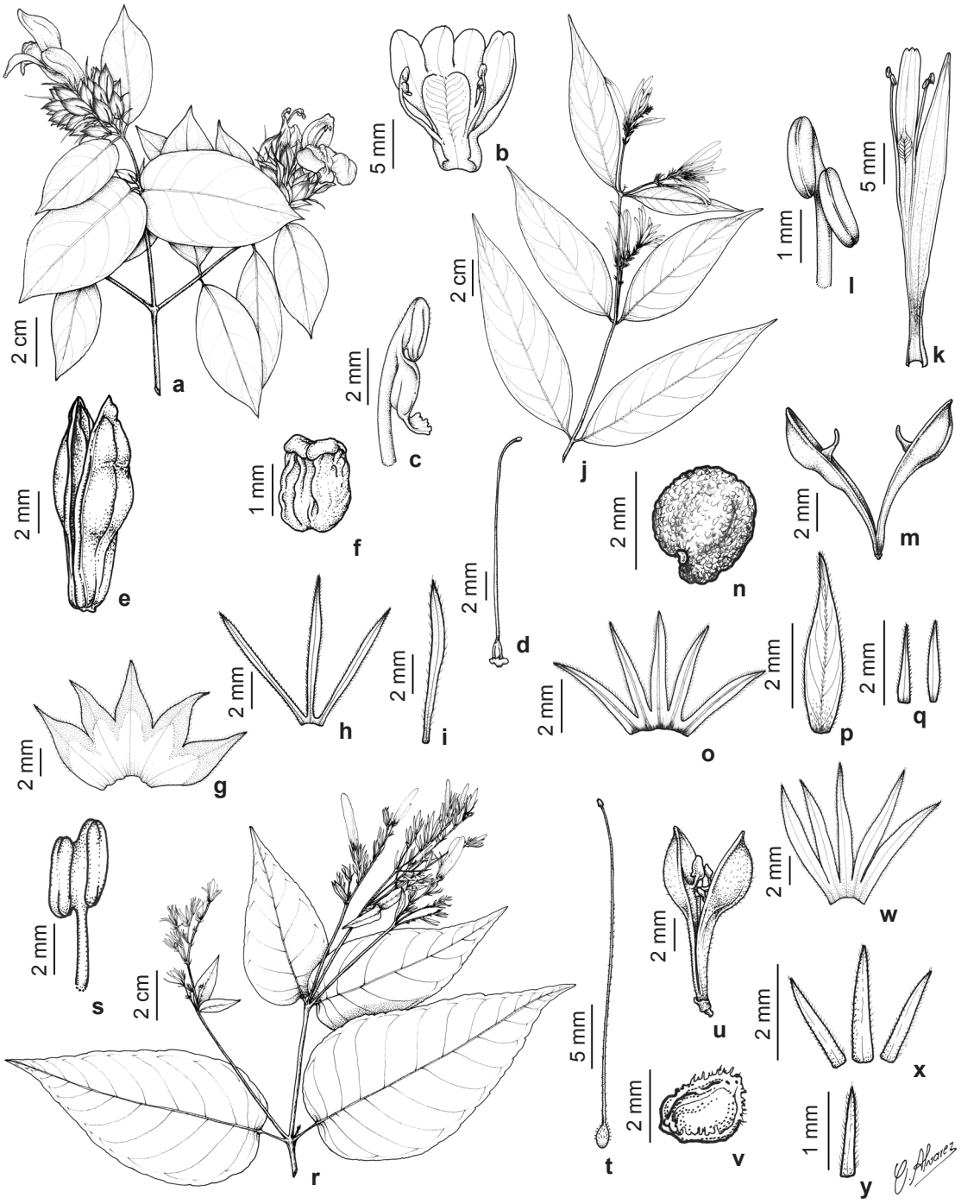

Figure 2 – a-i. *Justicia asclepiadea* – a. branch with inflorescence; b. open corolla; c. anther; d. gynoecium; e. capsule; f. seed; g. open calyx; h. bract and bracteoles; i. sterile bract. j-q. *Justicia birae* – j. branch with inflorescence; k. open corolla; l. anther; m. capsule; n. seed; o. open calyx; p. fertile bract; q. bracteoles. r-y. *Justicia calycina* – r. branch with inflorescence; s. anther; t. gynoecium; u. capsule; v. seed; w. open calyx; x. bracts and bracteoles; y. sterile bract. (a-i. *M.E. Engels & J.A.O. Freitas 5796*, RB; j-q. *C.A.S. da Silva et al. 590*, MG; r-y. *G.T. Prance et al. 13411*, MG).

equal length, appendiculate lower anther thecae, and spherical seeds. According to Kiel *et al.* (2018), *J. asclepiadea* belongs to the "Core *Simonisia*" clade, characterised mainly by pubescent capsules and spherical seeds.

2. *Justicia birae* A.S. Reis, F.A. Silva, A. Gil & Kameyama, Syst. Bot. 44(3): 697-707. 2019. TYPE: "Brazil, Pará, Canaã dos Carajás, FLONA Carajás (Floresta Nacional de Carajás), Serra dos Carajás, Serra do Tarzan-Serra Sul, mata baixa, canga, 06°19'44"S, 50°08'20"W, 763 m, 1.V.2015", *N.F.O. Mota*, *P.L. Viana*, *A. Gil*, *A.L. Ilkiu-Borges*, *C.S. Nunes 3008* (Holotype: MG214465!; Isotype: RB01421437!).

Figs. 2j-q; 3c-d; 4b

Subshrubs, 100–150 cm tall. Branches scandent, cylindric, sulcate, slightly dilated and sometimes constricted above the nodes, glabrescent to puberulous. Leaves dystichous to sub-dystichous, petiolate, petiole 5–20 mm long, blades 9.5–18.5 × 2.8–5 cm, lanceolate, elliptic to oblong, apex acuminate, base acute to cuneate, sometimes due, glabrescent on both sides, entire margin, not ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, congested; peduncles 1.5–3 cm long, main axis of inflorescence 4–7 cm long, puberulous, eglandular trichomes; bracts not imbricate; sterile bract absent; fertile bract 3–6 × 1–1.3 mm, lanceolate to narrowly-triangular, sessile, apex acute, glabrescent to pubescent adaxially, puberulous to pubescent abaxially, eglandular trichomes, margin ciliate; bracteoles 1–2.5 × 0.2–0.3 mm, subulate, apex acute, glabrous adaxially, puberulous to pubescent abaxially, with eglandular trichomes, margin ciliate; calyx 5-lobed, lobes of equal length, 4–5 × 0.7–1 mm, linear to lanceolate, apex acute, puberulous adaxially, glabrescent to puberulous abaxially, with eglandular trichomes, margin sparsely ciliate; corolla 40–55 mm long, not personate, red with white stripes on the palate, tube base 4.5–5 mm long, median third 25–28 mm long, upper lip 12–18 mm long, bilobed, lobes c. 1 × 1 mm, lower lip 14–19 mm long, central lobe 2.5–4.5 × 1.5–2.5 mm, lateral lobes 2.5–4.5 × 1.5–2.4 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 13–15 mm long, connective short, upper thecae 1–1.3 mm long, lower thecae 1–1.3 mm long, both not appendiculate at base; ovary glabrous; style 45–47 mm long, glabrous, stigma bilobed. Capsules 15–17 × c. 5 mm, panduriform, glabrous; seeds c. 2.5 mm diam., subspheroid, tuberculated, glabrous.

Selected material: Altamira, 08°44'10"S, 54°57'47"W, 20.VI.1997, *T.B. Cavalcanti et al. 2362* (SPF). Canaã dos Carajás, Serra do Tarzan, 06°19'56"S, 50°08'57"W, 750 m, 24.V.2010, *M.O.D. Pivari 1592 et al.* (BHCB, HCJS, RB). Itaituba, Alto do Tapajós, River Cururú, 17.VII.1959, *W.A. Egler 928* (MG). Jacareacanga, region around the village of Pratatí, 08°S, 57°05'W, 11.II.1974, *W.R. Anderson 10757* (IAN, RB). Marabá, 6 km northeast of AMZA, 05°47'S, 50°34'W, 200–250 m, 9.VI.1982, *C.R. Sperling 6026* (MG). Novo Progresso [Itaituba], estrada Santarém-Cuiabá, BR-163, km 877, Serra do Cachimbo, 2.V.1983, *I.L. Amaral et al. 1093* (MG, RB). Parauapebas, FLONA de Carajás, access road to the Canga of Serra Sul, 06°17'16"S, 50°20'46"W, 27.VI.2009, *R.D. Ribeiro 1242* (HCJS, RB). Santa Maria das Barreiras, Sul do Pará, 09°04'S, 50°30'W, 24.VI.1978, *Lima 73* (RB). Santana do Araguaia, Rio Inajá, 08°45'S, 50°25'W, 18.II.1980, *T. Plowman et al. 8864* (MG). São Félix do Xingu, Serra dos Carajás, 06°24'03"S, 51°52'06"W, 623 m, 9.IV.2017, *M. Pastore et al. 600* (MG).

Additional material examined: BRAZIL. MATO GROSSO: Juara, River Juruena, margem direita da Cachoeira Misericórdia, 23.V.1977, *N.A. Rosa & M.R. Santos 1996* (MG). Vila Rica, Fazenda Ipê, 09°55'55"S, 51°14'01"W, 5.VI.1997, *F.R. Dário et al. 1220* (SPF). Nova Bandeirantes, 09°50'18"S, 57°48'97"W, 30.V.1997, *G.F. Árbocz et al. 3860* (SPF).

Justicia birae is only known for the states of Pará and Mato Grosso in Brazil, and is found in *campo rupestre* and forest formations, close to streams and rivers, in partially shaded locations (Silva *et al.* 2019b). It is found in flowers and fruits from January to October.

Justicia birae can be recognised by its scandent habit, leaves with sub-distichous to distichous, simple axillary and terminal inflorescence in spikes, with decussate flowers and red corollas with white stripes on the palate (Silva *et al.* 2019b). Morphologically, it resembles *J. calycina* and *J. secunda*, mainly in the form and length of the bracts and similar bracteoles, besides the non personate red corolla, however it differs from these species in its opposite sub-distichous to distichous (*vs.* opposite decussate leaves); inflorescences on simple spikes of decussate flowers (*vs.* inflorescences in panicles, usually flowers alternate, never decussate), and calyx-lobes 4–5 mm long (*vs.* calyx-lobes 7–10 mm long in *J. calycina* and 6–7 mm long in *J. secunda*) (Silva *et al.* 2019b).

The set of characters found in *Justicia birae* is not found in any of the sections proposed by Graham (1988), however it does morphologically resemble the *J.* section *Plagiacanthus* (Nees)

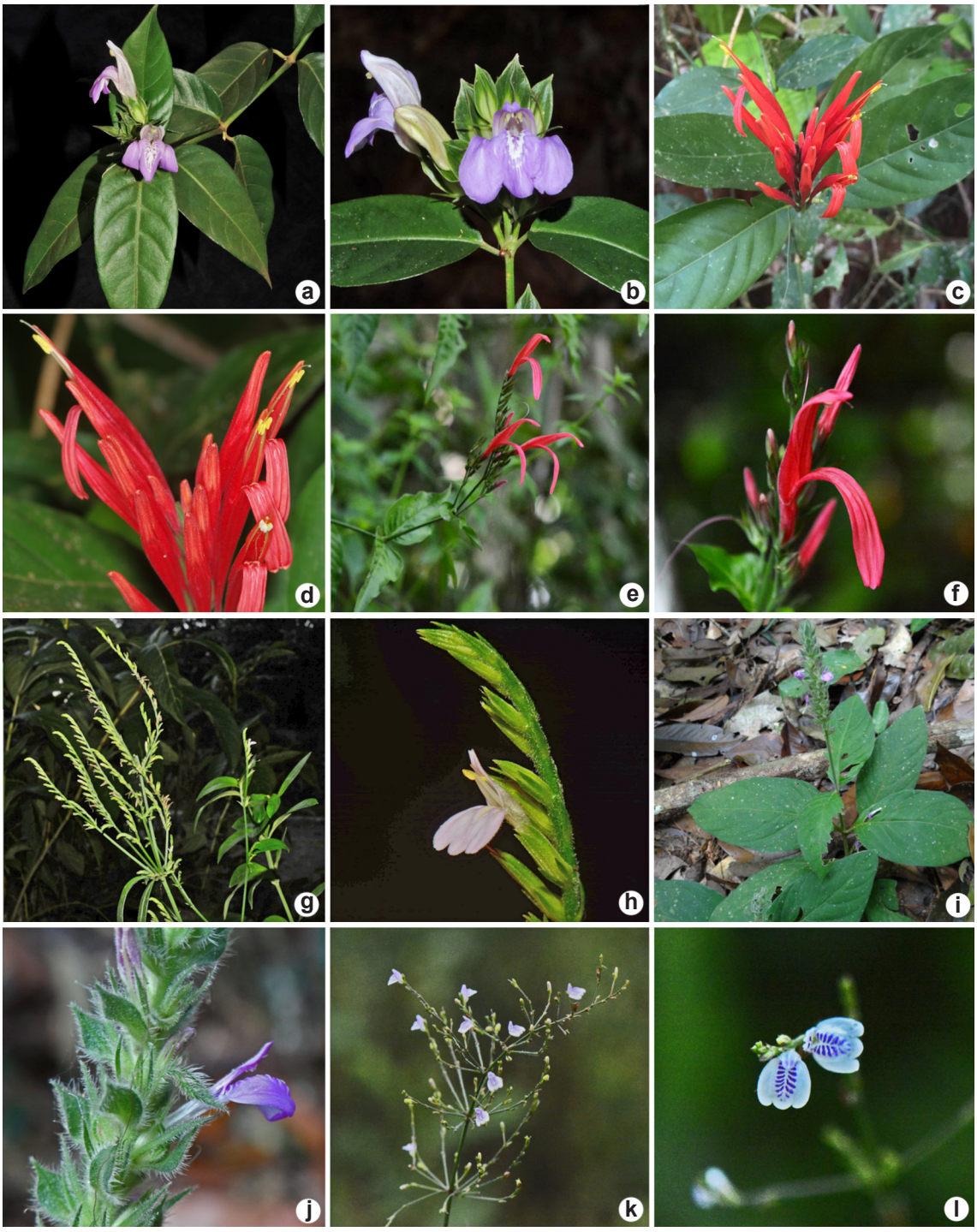

Figure 3 – a-b. *Justicia asclepiadea* – a. frontal view of inflorescence; b. frontal view of corolla exhibiting white stripes on the palate. c-d. *Justicia birae* – c. frontal view of the inflorescence; d. frontal view of corollas. e-f. *Justicia calycina* – e. lateral view of the inflorescence, exhibiting part of the branch; f. lateral view of the corolla. g-h. *Justicia carajensis* – g. lateral view of inflorescence; h. lateral view of corolla. i-j. *Justicia cayennensis* – i. natural habitat; j. lateral view of the inflorescence. k-l. *Justicia comata* – k. lateral view of inflorescence; l. frontal view of the corolla exhibiting purple stripes on the palate. Photos: a-b. M. Engels; c. A. Gil; d. C. Hall; e-h, k-l. F.A. Silva; i-j. E. Menezes.

V.A.W. Graham, with the 5-lobed calyx, with lobes of equal length and red corolla. According to Kiel *et al.* (2018), *J.* section *Plagiacanthus sensu* Graham (1988) species are part of a large clade named "*Dianthera*/*Sarotheca*/*Plagiacanthus*", or "DSP". The subspherical tuberculate seeds (Fig. 4b) of *J. birae* are found in species placed in the "Core *Simonisia*" clade by Kiel *et al.* (2018).

3. *Justicia calycina* (Nees) V.A.W. Graham, Kew Bull. 43(4): 610. 1988. *Beloperone calycina* Nees, London J. Bot. 4: 637. 1845. *Dianthera calycina* (Nees) Benth. *ex* B.D. Jacks., Index Kewensis, 1(1): 290. 1893. *Rhacodiscus calycinus* (Nees) Bremek., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Sect. 2. 45(2): 53. 1948. TYPE: "British Guyana", *Schomburgk* (Holotype: K000529211 image!).

Figs. 2r-y; 3e-f; 4c

Shrubs, 100–200 cm tall. Branches erect to scandent, subcylindrical sulcate, dilated and sometimes constricted above the nodes, presence of two longitudinal bands of puberulous-strigose to pubescent throughout the branch. Leaves petiolate, petiole 15–80 mm long, blades 11–22 × 4–10 cm, lanceolate, elliptic to ovate, apex attenuate to acuminate, base rounded, cordate to subcordate or attenuate, glabrous to slightly pubescent on the veins, subrepandous margin the slightly subcrenate, sparsely ciliate. Terminal inflorescences in panicles of spikes, branching twice; flowers alternate, lax; peduncles 4–28 cm long, main axis of inflorescence 5–15 cm long, pubescent, eglandular trichomes; bracts not imbricate; sterile bract 1.6–2 × 0.3–0.5 mm, subulate, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; fertile bract 2–3.5 × 0.3–0.5 mm, subulate, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; bracteoles 2.5–3 × 0.3–0.5 mm, narrowly-triangular, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; calyx 5-lobed, lobes of equal length, 7–10 × 1–1.5 mm, linear, apex attenuate, glabrous adaxially, slightly puberulous abaxially, eglandular trichomes, margin ciliate; corolla 55–67 mm long, not personate, red, tube base 4–6 mm long, median third 25–35 mm long, upper lip 20–25 mm long, entire, lower lip 14–18 mm long, central lobe 1.5–2 × 1.8–2 mm, lateral lobes 1.5–2 × 1.8–2 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 18–20 mm long, connective short, upper thecae 1.5–2.5 mm long, lower thecae 1.5–2 mm long, both not appendiculate at base; ovary pubescent with sparse glandular trichomes; style 20–33 mm long, puberulous, stigma capitate. Capsules 13–15 × c. 3 mm, clavate, puberule with sparse glandular trichomes; seeds 1–1.2 × 1.2–1.4 mm, compressed, orbicular, smooth with involute and jagged margin, glabrous.

Selected material: Afuá, Reserva Charapucu, veg. de várzea, 5.VII.2011, *L.C.B. Lobato & L. Ferreira 4032* (MG). Barcarena, shore of the Rio Bacuri, flooded floodplain, 24.XII.1983, *N.A. Rosa et al. 4549* (MG). Belém, UFRA, Murucutu trail, 01°27'14.84"S, 48°25'51.80"W, 11.IV.2018, *F.A. Silva & M.L.G. Conde 309* (MG, SP). Gurupá, shore of the Jacopy, 01.III.1923, *A. Ducke* (RB18428). Jacunda, Rio Tocantins, river Cajazeiras, 16.V.1978, *M.G. Silva & R. Bahia 3587* (IAN, MG). Marabá, Serra dos Carajás, 3 alfa road, 26.I.1985, *O.C. Nascimento & R.P. Bahia 1000* (MG). Moju, Rio Moju, between the mouth and the city, 3.VI.1969, *P. Cavalcante & D. Austin 2266* (MG). Monte Alegre, Macau airstrip, on river Maicuru, 00°55'S, 54°26'W, 25.VII.1981, *J.J. Strudwick et al. 3575* (MG). Novo Progresso [Itaituba], Santarém-Cuiabá road, BR-163, 23.IV.1983, *I.L. Amaral et al. 900* (MG). Óbidos, Rio Parú de Oeste, Tiriós, 26.VI.1960, *P. Cavalcante 862* (MG). Parauapebas, Serra dos Carajás, 05°47'00"S, 50°34'00"W, 200–250 m, 9.VI.1982, *C.R. Sperling et al. 6027* (MG). Tucuruí, right shore of the Rio Tocantins, 8.XI.1980, *P. Lisboa et al. 1489* (MG). Vitória do Xingu, Sítio Bela Vista, 25.VI.2012, *L.C. Antonio 462* (IAN, MG, RB, SP).

Justicia calycina occurs in the Venezuela, Guyana, Suriname, French Guiana and Bolivia (Wasshausen 2006). In Brazil, it is recorded in Acre, Amazonas, Amapá, Pará, Rondônia and Mato Grosso states (BFG 2018). In Pará, the species is found in the edges of lowland forests and also along rivers, mainly in areas that are periodically flooded. It is found in flower and fruit from May to November.

Justicia calycina is characterised by grooved subcylindrical branches, the presence of two longitudinal bands of puberulous-strigose to pubescent longitudinal bands, the largest corolla amongst the studied species (55–67 mm long), and compressed, orbicular, smooth seeds, with involute and jagged margins (Figs. 2v; 4c). Morphologically, it resembles *J. secunda* due to the red corolla and the measurements of bract and bracteoles, but it is differentiated by the stamens inserted in the median third of the corolla-tube (*vs.* insertion in the basal third of the corolla-tube), and the entire upper lip (*vs.* bilobed upper lip). In several collections consulted *J. calycina* was determined as *J. secunda*. It also resembles *J. sphaerosperma* (see comments under the latter species).

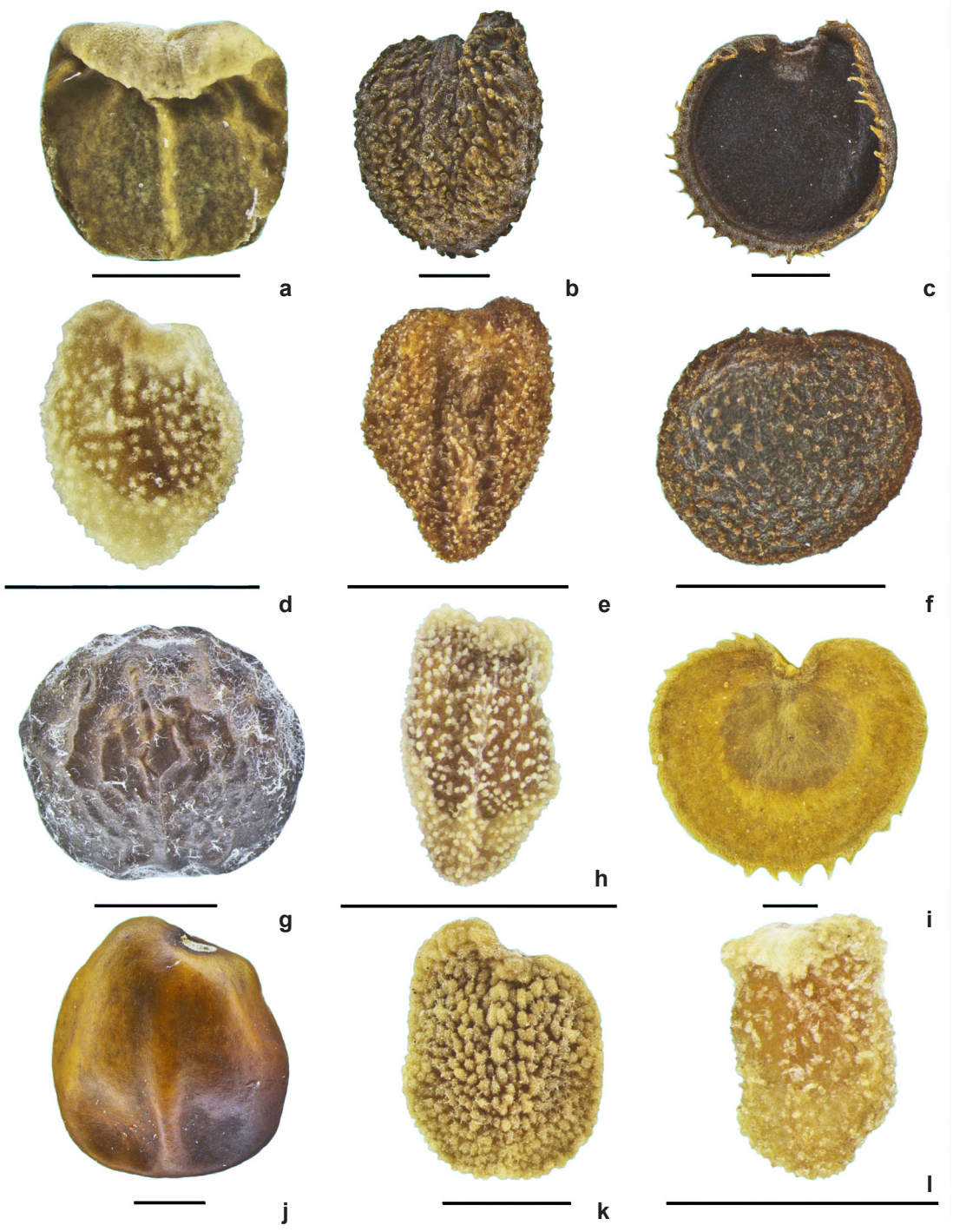

Figure 4 – a-l. Morphology of *Justicia* seeds in the state of Pará – a. *Justicia asclepiadea*; b. *Justicia birae*; c. *Justicia calycina*; d. *Justicia carajensis*; e. *Justicia cayennensis*; f. *Justicia comata*; g. *Justicia distichophylla*; h. *Justicia divergens*; i. *Justicia laevilinguis*; j. *Justicia mcdadeana*; k. *Justicia oldemanii*; l. *Justicia oriximinensis*. (a. *M.E. Engels & J.A.O. Freitas 5796*, RB; b. *C.A.S. da Silva et al. 590*, MG; c. *J. Jangoux & B.G.S. Ribeiro 1498*, MG; d. *Harley et al. 57319*, MG; e. *L.L. Giacomim et al. 2881*, HSTM; f. *F.A. Silva & A. Gil 222*, MG; g. *A. Gil et al. 482*, MG; h. *M.F.F. da Silva et al. 307*, MG; i. *L. Carreira et al. 1845*, MG; j. *R.M. Harley et al. 57487*, MG; k. *H.S. Irwin et al. 47284*, MG; l. *G. Martinelli et al. 7296*, MG). Scale bars = 0,5 mm.

According to Graham (1988), *Justicia calycina* belongs to *J.* section *Plagiacanthus*, characterized mainly by inflorescences in panicles of spikes, 5-lobed calyx with lobes of equal length, broad red corolla, and strongly compressed seeds. This species was also sampled by Kiel *et al.* (2018), assigned to the "DSP2" clade, which contains four subclades, with *J. calycina* belonging to the "DSP2A: *Justicia comata*" clade.

4. *Justicia carajensis* F.A. Silva, A. Gil & Kameyama, Phytotaxa 388(4): 266-274. 2019. TYPE: "Brazil, Pará, Canaã dos Carajás, FLONA Carajás (Floresta Nacional de Carajás), Subida para a FLONA Carajás, Serra do Tarzan, floresta, 06°25'19"S, 50°05'48"W, 1.IX.2015", *R.M. Harley*, *P.L. Viana*, *A. Gil*, *A.L. Ilkiu-Borges 57319* (Holotype: MG!; Isotypes: IAN197801!, SP502047!). Figs. 3g-h; 4d; 5a-h

Subshrubs, 40–50 cm tall. Branches erect, cylindrical, sulcate, dilated and not constricted above the nodes, glabrous, sometimes with the presence of two longitudinal bands along the branch. Leaves petiolate, petiole 5–13 mm long, blades 6.5–8 × 1.5–3.5 cm, slightly anisophyllous, lanceolate, elliptic to rarely oblanceolate, apex acute, base attenuate to decurrent, glabrous in both sides, margin entire, not ciliate. Axillary and terminal inflorescences in simple spikes or in panicles of spikes, branching twice; flowers alternate, lax; peduncles 0.3–0.5 cm long, main axis of inflorescence 3.5–5 cm long, presence of longitudinal bands of pubescent indument, eglandular trichomes; bracts not imbricate; sterile bract 3.5–4 × 0.3–0.5 mm, narrow-triangular, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; fertile bract 3.5–4.5 × 0.3–0.5 mm, narrowly-triangular, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; bracteoles 2.5–3 × 0.2–0.3 mm, subulate, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; calyx 4-lobed, lobes of the same length, 4.5–6 × 0.3–0.5 mm, linear, apex acute, glabrous adaxially, puberulous abaxially, eglandular and glandular trichomes, margin ciliate; corolla 8–9.5 mm long, not personate, white with light lilac shades, white macula on the palate, tube base 5–5.5 mm long, median third 4–5 mm long, upper lip 2.7–3 mm long, bilobed, lobes c. 0.3 × 0.3 mm, lower lip 3.5–4 mm long, central lobe 1–1.2 × 0.8–0.9 mm, lateral lobes 0.8–0.9 × 0.8–0.9 mm; stamens inseted in the apical part of the corolla, free portion of filaments 2–2.5 mm long, elongated connective, upper thecae 0.3–0.5 mm long, not appendiculate, lower thecae 0.2–0.3 mm long, appendiculate at base; ovary puberulous, with glandular trichomes; style 6–8 mm long, sparsely puberulous, stigma subcapitate. Capsules 6–6.5 × c. 1.5 mm, clavate, puberule with eglandular and glandular trichomes; seeds c. 1 mm diam., suborbiculoid, tuberculated, glabrous.

Selected material: Canaã dos Carajás, FLONA de Carajás, estrada da S11 para a Serra Norte, 06°12'53"S, 50°18'58"W, 12.VIII.2016, *R.M. Harley et al. 57928* (MG); FLONA de Carajás, Serra do Tarzan, 06°25'19"S, 50°05'48"W, 1.IX.2015, *R.M. Harley et al. 57319* (MG); corpo C, 06°21'35"S, 50°22'35"W, 1.IX.2010, *T.E. Almeida et al. 2527* (BHCB).

Justicia carajensis is known only from the state of Pará, in the municipality of Canaã dos Carajás, found in Serra Sul range at FLONA de Carajás, and at Serra do Tarzan, in Parque Nacional dos Campos Ferruginosos. It grows in tall forests, opened edges, partially shaded areas and in *campo rupestre* on *canga* (Silva *et al.* 2019a). It flowers and fruits between August and September.

Justicia carajensis is characterised mainly by the stamens inserted in the apical third of the corolla-tube (Fig. 5b) and by the 4-lobed calyx (Fig. 5f), glabrous adaxially, puberulous abaxially, with both eglandular, and glandular trichomes. Morphologically, it resembles *J. laevilinguis* (Nees) Lindau, due to its alternate flowers, lax and narrowly-triangular bracts and bracteoles. The primary differences are the presence of a 4-lobed calyx (*vs.* 5-lobed calyx in *J. laevilinguis*), stamens with appendiculated lower thecae (Fig. 5c) (*vs.* non-appendiculated thecae in *J. laevilinguis*), and elongated connective (*vs.* connective short in *J. laevilinguis*).

Justicia carajensis could be placed in *J.* section *Chaetothylax* (Nees) V.A.W. Graham (1988), characterised by inflorescences in simple spikes, bracts and bracteoles of shorter length than the 4-lobed calyx, the thecae of the anthers totally overlapping, and with lower thecae appendiculated. Eight species treated by Graham (1988) in the *J.* section *Chaetothylax* were nested in the clade with the same name in Kiel *et al.* (2018) and it is likely that *J. carajensis* would be placed in the same clade due to the morphological ressemblance it bears with these species.

5. *Justicia cayennensis* (Nees) Lindau, Engl. & Prantl, Nat. Pflanzenfam. Abt. 3b: 350. 1895. *Rhytiglossa cayennensis* Nees in A. DC., Prodr. 11:

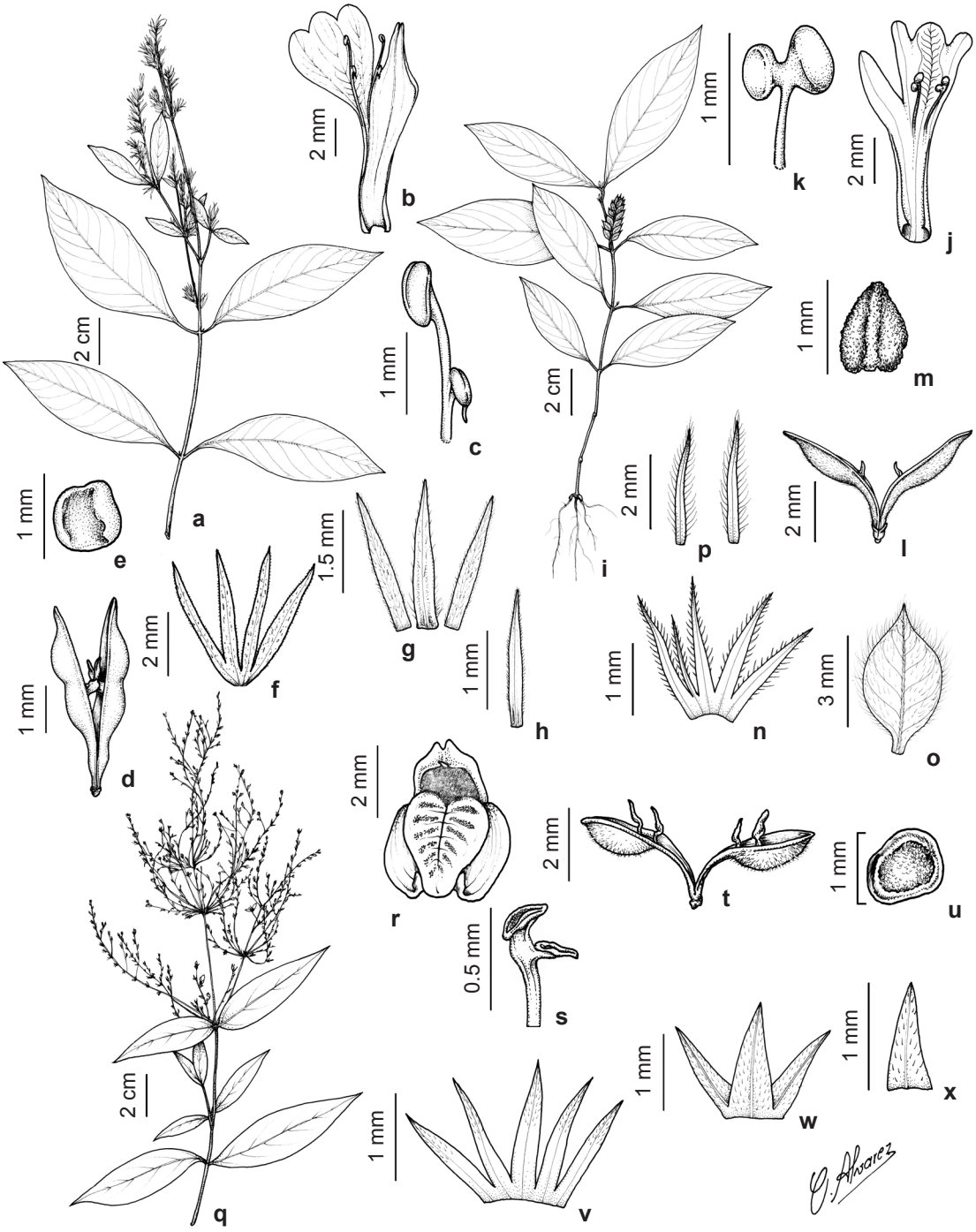

Figure 5 – a-h. *Justicia carajensis* – a. branch with inflorescence; b. open corolla; c. anther; d. capsule; e. seed; f. open calyx; g. bract and bracteoles; h. sterile bract. i-p. *Justicia cayennensis* – i. branch with inflorescence; j. open corolla; k. anther; l. capsule; m. seed. n. open calyx; o. fertile bract; p. bracteoles. q-x. *Justicia comata* – q. branch with inflorescence; r. frontal view of corolla; s. anther; t. capsule; u. seed; v. open calyx; w. bract and bracteoles; x. sterile bract. (a-h. *R.M. Harley et al. 57928*, MG; i-p. *L.L. Giacomim et al. 2881*, HSTM; q-x. *F.A. Silva & A. Gil 222*, MG).

346. 1847. *Dianthera cayennensis* (Nees) Griseb., in Cat. Pl. Cub. 197. 1866. *Dyspemptemorion cayennense* (Nees) Bremek., in Bull. Torrey Bot. Club 75: 670. 1948. TYPE: "Surinam", *Hostmann 1122* (Lectotype, K000529200 image! designated here; Isolectotype BM000992616 image!).

Figs. 3i-j; 4e; 5i-p

Subshrubs, 30–60 cm tall. Branches semi-decumbent, sub-cylindrical, not sulcate, undilated, and sometimes constricted above the nodes, glabrescent to hirsute. Leaves petiolate, petiole 3–8 mm long, blades 8–11.5 × 2.5–5 cm, slightly anisophyllous, elliptic to narrowly-elliptic, sometimes lanceolate, apex attenuate, base cuneate to obtuse, glabrescent to strigose, on both sides, margin entire, sparsely ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, congested; peduncles 0.3–0.6 cm long, main axis of inflorescence 2–4 cm long, pubescent to hirsute, eglandular trichomes; imbricate bracts; sterile bract absent; fertile bract 6–10 × 3–6 mm, ovate to elliptic, sessile, apex cuspidate, glabrous adaxially, pubescent abaxially, eglandular trichomes, margin long-ciliate, cilia c. 1.2 mm long; 3.5–5 × 0.3–1 mm bracteoles, narrowly-elliptic to subulate, apex attenuate, more rarely acuminate, glabrous adaxially, pubescent abaxially, eglandular trichomes, trichomes, margin ciliate; calyx 5-lobed, 4 lobes of the same length and 1 reduced (4 + 1), the largest 2.5–3 × c. 0.3 mm, the smallest 1.8–2 × c. 0.3 mm, subulate lobes, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; corolla 11–12 mm long, personate, purple, tube base 1–2 mm long, median third 7–8 mm long, upper lip 4–4.5 mm long, entire, lower lobe 4.5–5 mm long, central lobe 1.4–1.5 × 1.3–1.8 mm, lateral lobes 0.8–1 × 0.8–1 mm; stamens inserted in the apical third of the corolla-tube, free portion of the filaments 3.5–4 mm long, connective short, upper thecae 0.5–0.6 mm long, lower thecae 0.4–0.5 mm long, both not appendiculated to the base; ovary glabrous; style 7–9 mm long, sparsely pubescent, stigma subcapitate. Capsules 7–8 × c. 1.5 mm, clavate, pubescent with eglandular trichomes. Seeds 0.5–0.6 × c. 0.4 mm, compressed, oblong, tuberculated, glabrous.

Selected material: Belterra, km 67, trail to Igarapé, FLONA do Tapajós, 4.XI.2015, *V.F. Mansano et al. 1041* (RB). Itaituba, Parque Nacional da Amazônia, trilha do Tracoá, 04°28'28"S, 56°16'46"W, 38 m, 11.VII.2016, *L.L. Giacomim et al. 2836* (HSTM, RB). Vitória do Xingu, 03°12'05"S, 51°47'01"W, 17.IX.2014, *M.L.C. de Faria* (RB614843). Santarém, I.1878, *Schwacke 613* (RB).

Justicia cayennensis occurs in the Guianas and in the brazilian Amazon (Wasshausen 2006). During the analysis of herbarium collections only one record was verified for the state of Amapá (K001033127 image!), and the species is also highlighted here as a new occurrence for Pará. In the study area it is found in *terra firme* forest, on trails, in partially shaded places. It flowers and fruits from January to November, with greater intensity in August.

Justicia cayennensis was originally described as *Rhytiglossa cayennensis* by Nees (1847), who based his new species on multiple collections, namely *Hostmann 1122* and *M. Leprieur 23*, *163*, and *265* (syntypes, see Art. 40, Note 1 of Turland *et al.* 2018). Of the various syntypes, *Hostmann 1122* (K000529200) is in total agreement with the protologue and was selected as the lectotype for this name. (See Art. 9.5 and 9.11 of Turland *et al.* 2018).

Justicia cayennensis is mainly characterized by its branches with hirsute indumentum, slightly anisophyllous blades (Fig. 5i), the main axis of the inflorescence pubescent to hirsute, a 5-lobed calyx, with one of the lobes reduced (Fig. 5n), and all the lobes subulate. *Justicia cayennensis* resembles *J. potamogeton* as both have subshrubs habit, inflorescence in simple spikes with decussate flowers and 5-lobed calyx, with 1 reduced lobe (4 + 1). It differs mainly by the anisophyllous leaf-blades (*vs.* non-anisophyllous leaf-blades in *J. potamogeton*), stamens inserted in the apical third of the corolla-tube (*vs.* stamens inserted in the median third of the corolla-tube in *J. potamogeton*), and clavate capsules with eglandular trichomes (*vs.* panduriform capsules with glandular and eglandular trichomes in *J. potamogeton*).

According to Graham (1988) *Justicia cayennensis* belongs to *J.* section *Dianthera* (L.) V.A.W. Graham, probably the largest and most variable section of the genus, characterized mainly by its inflorescences of decussate flowers in simple spikes. *Justicia cayennensis* also resembles the species of *J.* subsection *Strobiloglossa* (Oersted) V.A.W. Graham, as it presents ovate bracts (6–10 mm long) which exceed the length of the 5-lobed calyx with one of its lobes quite reduced, as well as compressed seeds. *Justicia cayennensis* was not sampled by Kiel *et al.* (2018), however it resembles the species that belong to the informal lineage called "DSP2", that includes four subclades, as *J. cayennensis* resembles more closely the species

of the subclade "DSP2C: *J.* section *Dianthera* subsection *Strobiloglossa*", characterised as being perennial herbs with small corollas (7–11 mm long), with inflorescences in simple spikes with ovate bracts, usually exceeding the length of the calyx-lobes, and compressed seeds (Kiel *et al.* 2018).

6. *Justicia comata* (L.) Lam., Encycl. 1: 632. 1785. *Dianthera comata* L., Syst. Nat. ed. 10. 850. 1759. *Leptostachya comata* (L.) Nees, in A. DC. Prodr. 11: 381. 1847. *Ecbolium comatum* (L.) Kuntze, Revis. Gen. Pl. 2: 487. 1891. *Stethoma comata* (L.) Britton, Bot. Porto Rico 6: 218. 1925. *Psacadocalymma comatum* (L.) Bremek., Verhand. Konin. Nederl. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 45: 55. 1948. TYPE: "Jamaica" *P. Browne* (Lectotype: LINN 29:2 image!; desginated by Graham 1988). Figs. 3k-l; 4f; 5q-x

Herbs perennial, 30–60 cm tall. Branches erect to decumbent, subquadrangular, sulcate, dilated and sometimes constricted above the nodes, glabrous to slightly puberulous. Leaves sessile, blades 4–11(–20) × 1–3.5 cm, narrowly-elliptic, elliptic, linear to lanceolate, apex acuminate to acute, base cuneate to acute, glabrous on both sides or rarely puberulous, entire margin, not ciliate. Axillary and terminal inflorescences in panicles of spikes, branching twice, up to 12-verticillate along the main axis of the inflorescence; flowers alternate or rarely, few opposite flowers in the apical portion of mature inflorescences, lax; peduncles 1.5–6.5 cm long; main axis of inflorescence 2.5–10 cm long, sparsely puberulous, glandular trichomes; bracts not imbricate; sterile bract 1–1.2 × 0.3–0.4 mm, narrowly-triangular, sessile, apex acute, glabrous on both sides, margin not ciliate; fertile bract 1.2–1.4 × 0.3–0.4 mm, narrowly-lanceolate, sessile, apex acute, glabrous on both sides, margin not ciliate; bracteoles 0.8–1 × 0.1–0.2 mm, narrowly-lanceolate, apex acute, glabrous on both sides, margin not ciliate; calyx 5-lobed, lobes of equal length, 2.5–4 × 0.3–0.5 mm, lanceolate, apex acuminate, glabrous on both sides, margin not ciliate; corolla 5–7 mm long, personate, white with purple stripes on the palate, tube base 0.4–0.5 mm long, median third 1.3–1.5 mm long., upper lip 1.5–2 mm long, bilobed, lobes c. 0.3 × 0.2 mm, lower lip 2–3 mm long, central lobe 1.1–1.2 × 2.1–2.2 mm, lateral lobes 1–1.1 × 1.2–1.3 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 2–2.5 mm long, little elongated connective, upper thecae 0.3–0.4 mm long., lower thecae 0.2–0.3 mm long, both not appendiculated to the base; ovary sparsely puberulous; style 2–2.3 mm long, sparsely puberulous, stigma subcapitate. Capsules 3.5–4.5 × c. 1 mm, clavate, puberulous with sparse glandular trichomes; seeds 0.5–0.6 × c. 0.5 mm, compressed, orbicular, smooth, glabrous.

Selected material: Almeirim, Monte Dourado, near the SION ferry navy in Munguba, 28.X.1985, *M.J.P. Pires et al. 711* (INPA, MG). Belém, UFRA, access road to the várzea, 01°27'42.07"S, 48°26'11.09"W, 11.VIII.2017, *F.A. Silva & A. Gil 222* (MG, SP). Gurupá, várzea, 01º18'44"S, 51º30'54"W, XI.2014, *F.C.A. Lucas 1666* (MFS). Jacundá, Rio Jacundá, capueira em cacaual, 5.XI.1950, *G.A. Black & P. Ledoux 50-10545* (IAN). Muaná, Rio Anabiju, Monte Alegre farm, 23.IV.1982, *M. Dantas & S. Nivaldo 1132* (IAN). Novo Progresso [Itaituba], Santarém-Cuiabá road, 19.V.1983, *M.N. Silva 364* (INPA, MG, RB, SPF). Oriximiná, Trombetas, Rio Cuminá-miri, 9.VI.1957, *P. Cavalcante 181* (MG). Santarém, 16.IX.1999, *M.R. Cordeiro 4105* (IAN). Soure, between Desterro and Laranjeira farms, 15.III.1950, *G.A. Black & J. Lobato 50-9169* (IAN).

Justicia comata is widely distributed in tropical America, from southern Mexico to Bolivia, Paraguay and northern Argentina (Ezcurra 2002). In Brazil, it occurs in most of the states and is listed for all political regions (BFG 2018). In Pará, it is found on forest margins, especially in humid soil and flood-prone areas, and is common in *várzea* vegetation, in partially shaded areas. It flowers and fruits from January to November.

Justicia comata is easily recognised by the panicles formed by verticillated spikes (Fig. 5q), small flowers (5–7 mm long), and white corolla with purple stripes on the palate (Fig. 3l). It is similar to *J. pectoralis* in habit, corola size, bract measurements and shape and by the lax inflorescences, however it is distinct due to its sessile leaves (*vs.* petiolate leaves in *J. pectoralis*), absence of buds in the sterile bract (*vs.* presence of buds, not developed at the base of the sterile bract in *J. pectoralis*), and by the 5-lobed calyx with lobes of the same length (*vs.* 5-lobed calyx, with one reduced lobe in *J. pectoralis*).

Graham (1988) did not place *Justicia comata* in any of his sections due to the complexity of the inflorescence, often cleistogamic flowers and 2-aperturate pollen with large irregular bodies flanking the openings. Graham (1988) suggested affinities to the *J.* section *Dianthera*, particularly from the subsection *Dianthera* (L.) V.A.W. Graham, but the structure of the *J. comata* inflorescence suggests its placement in *J.* section *Plagiacanthus*

or *J.* section *Sarotheca* (Nees) Benth. According to Kiel *et al.* (2018), *J. comata* belongs to the *Justicia comata* clade (included in the informal lineage "DSP2A"), which also includes two more species from the *J.* section *Plagiacanthus*, as suggested by Graham (1988) (*J. calycina* and *J. filiobracteolata* Lindau).

7. *Justicia distichophylla* F.A. Silva, A. Gil & Kameyama, Syst. Bot. 44(3): 697-707. 2019. TYPE: "Brazil, Pará, Canaã dos Carajás, FLONA Carajás (Floresta Nacional de Carajás), Serra dos Carajás, Serra Sul, Corpo B, lagoa das macrófitas, 06°21'20"S, 50°23'26"W, 751 m, 29 Apr. 2015", *A. Gil*, *P.L. Viana*, *C.S. Nunes*, *N.F.O. Mota*, *A.L. Ilkiu-Borges 482* (Holotype: MG215982!; Isotype: SP!). Figs. 4g; 6a-j; 7a-b

Subshrubs, 40–100 cm tall. Branches erect to scandent, cylindrical, not sulcate, slightly dilated and not constricted above the nodes, glabrescent to puberulous. Leaves dystichous, petiolate, petiole 2–4 mm long, blades 3–11 × 1–3.5 cm, ovate to lanceolate, apex acuminate, base rounded to obtuse, glabrous on both sides, veins puberulous, margin entire, sparsely ciliate. Axillary and terminal inflorescences in panicles of spikes, sollitary or geminate, branching once; flowers alternate, congested; peduncles 0.8–1 cm long; main axis of inflorescence 1.5–2 cm long, puberulous, eglandular trichomes; bracts not imbricate; sterile bract 11–16 × 3–6 mm, elliptic to oblong, sessile, apex rounded, glabrous adaxially, puberulous to pubescent abaxially, eglandular and sparsely glandular trichomes, margin ciliate; fertile bract 11–15 × 4–5 mm, elliptic to oblong, sessile, apex rounded, glabrous adaxially, puberulous to pubescent abaxially, eglandular and sparsely glandular trichomes, margin ciliate; bracteoles 9.5–12 × 1.5–2 mm, oblanceolate, apex rounded, glabrous adaxially, puberulous to pubescent abaxially, eglandular and glandular trichomes, margin ciliate; calyx 5-lobed, calyx-lobes of equal length, fused before anthesis, 7–9 × 1.8–2 mm, oblanceolate, apex attenuate, glabrous adaxially, sparsely puberculous abaxially, eglandular trichomes, margin sparsely ciliate; corolla 14–18 mm long, personate, lavender with white stripes on the palate, tube base 2–2.5 mm long, median third 3–3.7 mm long, upper lip 6–8 mm long, bilobed, lobes c. 1 × 1 mm, lower lip 8–10 mm long, central lobe 4.5–5.5 × 4–4.5 mm, lateral lobes 4–5 × 3.5–4 mm; stamens inserted in the basal third of the corolla-tube, free portion of the filaments 6–9 mm long, little elongated connective, upper thecae 1.8–2 mm long, not appendiculated, lower thecae 1.8–2 mm long, appendiculated at base; ovary glabrous; style 10–12 mm long, sparsely puberulous, stigma bilobed. Capsules 9.5–12 × c. 4 mm, clavate, pubescent with eglandular trichomes; seeds c. 3.5 mm diam., spheroid, smooth, glabrous.

Selected material: Canaã dos Carajás, Serra dos Carajás, S11-A, 06°20'46"S, 50°24'54"W, 745 m, 23.III.2016, *R.M. Harley et al. 57454* (MG). Parauapebas, N1. 06°01'52"S, 50°17'23"W, 655 m, 12.III.2009, *P.L. Viana et al. 4028* (HCJS).

Additional material examined: BRASIL. MARANHÃO: Carolina, BR-010, Transamazônica, Pedra Caída village, 15.IV.1983, *M.F.F. Silva 1098* (IAN). CEARÁ: Aratuba, Sítio Jacarandá, 15.V.1980, *P. Martins & E. Nunes* (SPF71152). Tianguá, 9.V.2008, *M.A. Neto* (SP405536).

Justicia distichophylla is recorded so far for Pará in the region of Serra dos Carajás and more towards the south of the state, in Maranhão state, in Parque Nacional da Chapada das Mesas and in mountainous areas in Ceará state. It is observed that the species distribution is associated with elevations above 400 m (Silva *et al.* 2019b). It occurs in *campo rupestre* and margins of low forests, in partially shaded areas. It flowers and fruits from February to June, with a peak during March.

Justicia distichophylla is characterised mainly by its distichous leaves, elliptic to oblong bracts and oblanceolate white bracteoles, with eglandular and glandular trichomes, and by the lavender corolla with white stripes on the palate (Fig. 7b) (Silva *et al.* 2019b). Morphologically, it resembles *J. asclepiadea*, and the characters for their differentiation are expanded under for that species.

The *Justicia distichophylla* set of morphological characters does not allow it to be categorised in the sections proposed by Graham (1988). However, its pollen-type and smooth spherical seeds (Fig. 4g) are found in species of the "Core *Simonisia*" clade (Kiel *et al.* 2018).

8. *Justicia divergens* (Nees) A.S. Reis, A. Gil & C. Kameyama, Rodriguésia 68(3): 887-903. 2017. *Rhytiglossa divergens* Nees in Mart. *Fl. bras.* 9: 128. 1847. TYPE: Brazil, "Provinciae Paraensis, in sylvis ad Para, Apr." *Martius* (Holotype: M0113214 image!). Figs. 4h; 6k-q

Subshrubs, 30–70 cm tall. Branches erect, subcylindrical, sulcate, slightly dilated and not constricted above the nodes, presence of two longitudinal bands of pubescent indument along

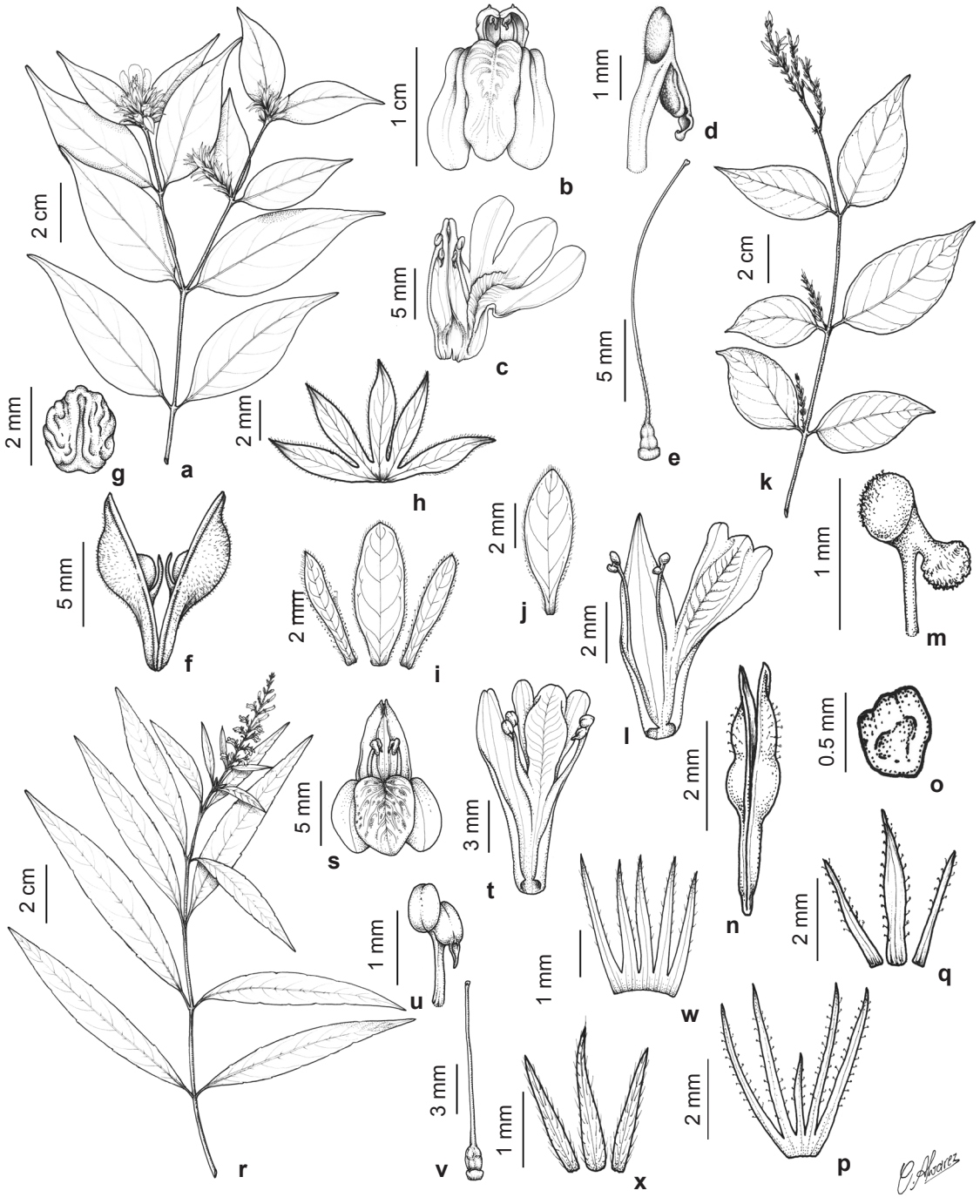

Figure 6 – a-j. *Justicia distichophylla* – a. branch with inflorescence; b. frontal view of corolla; c. open corolla; d. anther; e. gynoecium; f. capsule; g. seed; h. open calyx; i. bract and bracteoles; j. sterile bract. k-q. *Justicia divergens* – k. branch with inflorescence; l. open corolla; m. anther; n. capsule; o. seed; p. open calyx; q. bract and bracteoles. r-x. *Justicia gendarussa* – r. branch with inflorescence; s. frontal view of corolla; t. open corolla; u. anther; v. gynoecium; w. open calyx; x. bract and bracteoles. (a-j. *M.O.D. Pivari et al. 1536*, MG; *A. Gil et al. 482*, MG; k-q. *M.F.F. da Silva et al. 307*, MG; r-x. *M.J.P. Pires et al. 876*, MG).

the branch. Leaves petiolate, petiole 2–3.5 mm long, blades 3.5–9.5 × 2.5–3.5 cm, elliptic to ovate, apex acuminate, base cuneate to rounded, glabrous on both sides, margin entire, sparsely ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, lax; peduncles 1.5–4 cm long; main axis of inflorescence 2.5–5 cm long, glabrescent to puberulous, eglandular and sparsely glandular trichomes; bracts not imbricate; sterile bract absent; fertile bract 4–4.5 × 0.5–1 mm, lanceolate, sessile, apex acute, sparsely pubescent on both sides, glandular trichomes, margin ciliate; bracteoles 3–4 × 0.2–0.4 mm, subulate, apex acute, sparsely pubescent on both sides, with glandular trichomes, margin ciliate; calyx 5-lobed, 4 lobes of equal length and 1 reduced lobe (4 + 1), the largest 3–5 × c. 0.3 mm, the smallest 2–2.5 × c. 0.1 mm, lobes subulate, apex acute, glabrous adaxially, puberulous abaxially, trichomes glandular, margin ciliate; corolla 10–12 mm long, personate, lilac with with purple stripes on the palate, tube base 1–1.5 mm long, median third 4.5–5 mm long, upper lip 5–5.5 mm long, entire, lower lip 5–5.5 mm long., central lobe 1–1.2 × 1–1.5 mm, lateral lobes 1–1.2 × 0.8–1 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 4–4.5 mm long, connective short, upper thecae 0.5–0.6 mm long, lower thecae 0.3 mm long, both not appendiculated at the base; ovary glabrous; style 7.5–9 mm long, sparsely puberulous, stigma subcapitate. Capsules 7–8 × c. 1 mm, panduriform, pubescent with eglandular and glandular trichomes; seeds 0.5–0.6 × c. 0.4 mm, compressed, oblong, tuberculated, glabrous.

Selected material: Ananindeua, Águas Lindas, area of 15, 01°29'45"S, 48°42'41"W, 14.X.2011, *K.S.S. Sato & A.S.S. Pereira 22* (MFS). Belterra, comunidade de São Domingos, Várzea da FLONA do Tapajós, 26.IX.2004, *C.M.N. Nascimento & C. Suemitsu 182* (HSTM). Almeirim, matta, 11.XII.1902, *A. Ducke* (MG3041). Belém, IPEAN: Mocambo, 7.IX.1966, *J.M. Pires & N.T. Silva 10208* (IAN). Canaã dos Carajás, Serra do Tarzan, 06°19'29"S, 50°07'10"W, 760 m, 9.II.2012, *L.V.C. Silva et al. 1208* (BHCB). Jacundá, Rio Tocantins, Jatobal, station of the old railroad of Tucurui, 16.V.1977, *M.G. Silva & R.Bahia 3091* (MG). Parauapebas, N1, forest, 05°00'00"S, 50°00'00"W, 245 m, 21.VI.2012, *L.V.C. Silva et al. 1255* (BHCB, MG, HCJS). Santarém, Sertão do Planalto, XI.1954, *R.L. Fróes* (IAN86698). São Domingos do Capim, Rio Capim, 02°20'S, 47°45'W, 2.VII.1974, *P. Cavalcante 2942* (MG).

Additional material examined: BRAZIL. MARANHÃO: Nova Olinda do Maranhão, Rio Alto Turiaçu, Nova esperança, 02°55'S, 45°45'W, 5.XII.1978, *J. Jangoux & R.P. Bahia 253* (MG).

According to Reis *et al.* (2017a) *Justicia divergens* is a species endemic to Brazil, recorded in Pará and Maranhão. In the study area, it occurs in *campo rupestre* vegetation and forest formations in partially shaded locations, river margins and in areas of disturbed ground (*capoeira*). It flowers and fruits throughout the year, with a flowering peak during November and December.

Justicia divergens can be recognised by the two longitudinal bands of pubescent indument along the entire branch, glabrous blades on both sides, minute subulate bracteoles (3–4 × 0.2–0.4 mm) and compressed, oblong and tuberculated seeds (Fig. 4h). It morphologically resembles *J. pseudoamazonica* Lindau, with its axillary and terminal inflorescences of simple spikes, decussate flowers, and elliptic to ovate blades. It can be distinguished from *J. pseudoamazonica* by its 5-lobed calyx (*vs.* the 4-lobed calyx in *J. pseudoamazonica*), by the pubescent the main axis of inflorescence with glandular trichomes (*vs.* puberulous main axis of the inflorescence, with eglandular trichomes in *J. pseudoamazonica*), stamens inserted in the median third of the corolla-tube (*vs.* stamens inserted in the apical third of the corolla-tube in *J. pseudoamazonica*), and anthers with both thecae not appendiculated (*vs.* lower thecae of the anthers apendiculated in *J. pseudoamazonica*).

Justicia divergens was not treated by Graham (1988), and neither was it sampled in Kiel *et al.* (2018). However, it resembles *J.* section *Dianthera* subsection *Strobiloglossa* of Graham (1988), presenting a 5-lobed calyx, with one of the lobes significantly reduced and compressed seeds, therefore probably related to the species of the "DSP2C: *J.* section *Dianthera* subsection *Strobiloglossa*" clade by Kiel *et al.* (2018).

9. *Justicia gendarussa* Burm. f., Fl. Indica: 10. 1768. TYPE: "Crescit in Malabara, Amboina & Java, unde specimina saepius missa", [without collector, or herbarium]. Fig. 6r-x

Shrubs, 50–100 cm tall. Branches erect, cylindrical, slightly sulcate, dilated to slightly constricted above the nodes, with the presence of two longitudinal bands of puberulous indument along the branch. Leaves petiolate, petiole 3–6 mm long, blades 8.2–12.3 × 1.5–2.3 cm, narrowly-elliptic, apex acute, base acute, glabrous on both sides, subcrenate margin, not ciliate. Terminal inflorescences in simple spikes; flowers decussate, lax; peduncles 0.4–0.7 cm long; main axis of

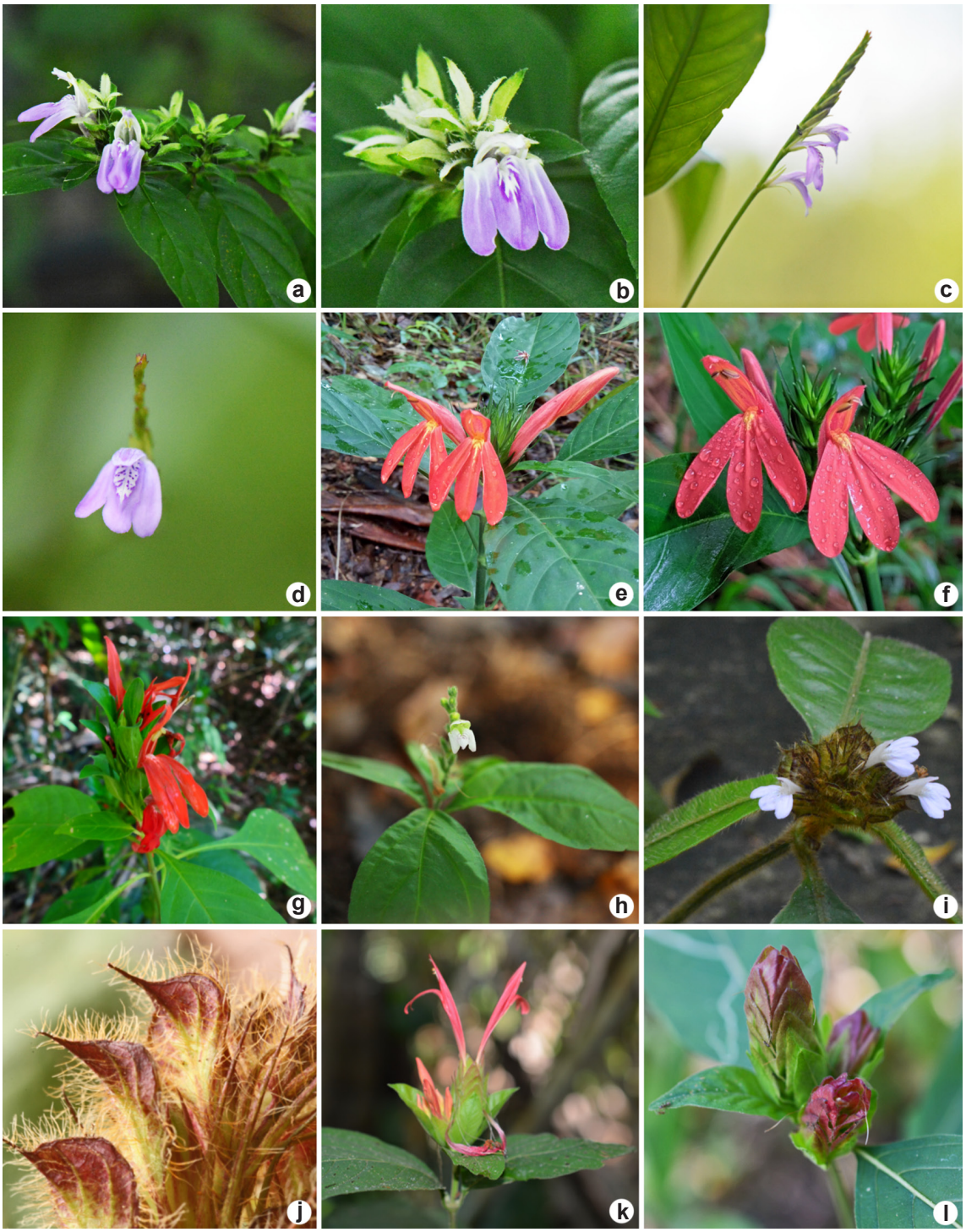

Figure 7 – a-b. *Justicia distichophylla* – a. lateral view of inflorescence; b. frontal view of corolla. c-d. *Justicia laevilinguis* – c. lateral view of inflorescence; d. frontal view of corolla exhibiting white stripes on the palate. e–f. *Justicia mcdadeana* – e. lateral view of inflorescence; f. frontal view of corollas exhibiting yellow marks on the palate. g. *Justicia montealegrensis* – lateral view of inflorescence. h. *Justicia multiglandulosa* – lateral view of inflorescence. i–j. *Justicia oldemanii* – i. lateral view of inflorescence; j. detail on the bracts brownish apex. k–l. *Justicia paraensis* – k. lateral view of inflorescence; l. young inflorescence. Photos: a–f, i: F.A. Silva. g: M. Devecchi. h: E. Menezes. j: J. Batista. k–l: J. Maciel.

inflorescence 2–5 cm long, glabrous; bracts not imbricate; sterile bract absent; fertile bract 2–2.5 × 0.4–0.5 mm, narrowly-triangular, sessile, apex acute, puberulous-adpressed on both sides, eglandular trichomes, margin ciliate; bracteoles 1.8–2 × 0.3–0.4 mm, subulate, apex acute, puberulous-adpressed on both sides, eglandular trichomes, margin ciliate; calyx 5-lobed, lobes of equal length, 4.5–5 × 0.3–0.6 mm, subulate, apex attenuate, glabrous adaxially, sparsely puberulous-adpressed on both side, with eglandular trichomes, margin ciliate; corolla 15–16 mm long, not personate, lilac with white stripes on the palate, tube base 4–5 mm long, median third 6–6.5 mm long, upper lip 5.5–6.5 mm long, bilobed, lobes c. 0.3 × 0.3 mm, lower lobe 8–9 mm long., central lobe 1.8–2 × 1.6–1.8 mm, lateral lobes 1.8–2 × 1.6–1.8 mm; stamens inserted in the apical third of the corolla-tube, free portion of the filaments 4.3–5 mm long, connective short, upper thecae 0.7–0.9 mm long, not appendiculate, lower thecae 0.7–0.9 mm long, appendiculated at base; ovary glabrous; style 10–11 mm long, glabrous, stigma subcapitate. Capsule and seeds not seen.

Complementar description: Capsules 1.2–3 mm long, clavate; seeds 1.2–1.4 mm long, compressed (Adapted from Oliveira & Andrade 2000).

Selected material: Almeirim, Mt. Dourado, Mt. Oeste road, 00°57'S, 52°45'W, 16.IV.1986, *M.J.P. Pires et al. 876* (INPA, MG). Oriximiná, Comunidade São Joaquim, 02°06'43"S, 56°03'11"W, 20.VIII.2008, *D.R. Oliveira & M.S. Almeida 165* (INPA).

Justicia gendarussa is originally from South East Asia and is cultivated and subspontaneous in Africa (Darbyshire *et al.* 2010). In Brazil, it is listed for the Northeast region (Oliveira & Andrade 2000) and is highlighted here as a new record for Pará, seemingly rare considering the herbaria consulted, with few sheets that were not from cultivated origin, for example *Pires et al. 876* (MG), collected in a disturbed area (*capoeira*) in the municipality of Almeirim. Almost all other collections analysed are likely cultivated for ornamental and medicinal purposes, as cited by Oliveira & Andrade (2000). Collected with flowers in April.

The protologue of *Justicia gendarussa*, despite presenting a detailed description, does not include precise data about a type-specimen, thus we were not able to proceed to its typification. It should be emphasised that all the published work subsequent to the publication of *J. gendarussa* did not provide new information besides those appeared in the original work (De Candolle 1901; Benoist 1939, 1947; Oliveira & Andrade 2000). No original material of this species contemporaneous with Burman f. was located and it would be necessary to study Asian collections in order to clarify its typification.

Justicia gendarussa is characterised by the shrubby habit, leaves glabrous on both sides, subcrenate margin, subulate bracteoles, puberulous-adpressed on both sides, short in length (1.8–2 mm long), and stamens inserted in the apical third of the corolla-tube (Fig. 6t). *Justicia gendarussa* is very distinct to the other species occuring in Pará. Within the species known to Brazil, it is vaguely similar to a species endemic to Minas Gerais, *Justicia warmingii* Hiern, by the narrowly-elliptic leaf blades and its inflorescences in simple spikes; flowers decussate. *Justicia gendarussa* can be easily differentiated from *J. warmingii* by the cylindrical branches (*vs.* subquadrangular in *J. warmingii*), 5-lobed calyx, lobes of equal length, with eglandular trichomes [*vs.* 5-lobed calyx, with 1 reduced lobe (4 + 1), and glandular trichomes in *J. warmingii*].

According to Graham (1988) *Justicia gendarussa* belongs to *J.* section *Rhaphidospora* (Nees) T. Anders., characterised mainly by the totally overlapped thecae of the anthers, both of the same width or with the lower ones wider and appendiculated. Kiel *et al.* (2018) did not sample species of *J.* section *Rhaphidospora*.

10. *Justicia laevilinguis* (Nees) Lindau, Bot. Jahrb. Syst. 19, Beibl. 48: 20. 1894. *Rhytiglossa laevilinguis* Nees, in Mart., *Fl. bras.* 9(7): 120. 1847. *Dianthera laevilinguis* (Nees) Durand & Jackson, Ind. Kew. Suppl. 1: 132. 1902. TYPE: Argentina "Rio Segundo in prov. Cordubensi", *Tweedie 1837* (Lectotype, K000529453 image! designated here). Figs. 4i; 7c-d; 8a-i

Herbs perennial, semi-aquatic, 40–80 cm tall. Branches decumbent, cylindrical to quadrangular, sometimes sulcate, dilated and not constricted above the nodes, glabrescent to pubescent. Leaves petiolate, petiole 1.5–3 mm long, blades 4–8.5(–18.5) × 0.7–3 cm, lanceolate, linear to narrowly-elliptic, apex attenuate to acute, base attenuate to obtuse, glabrous on both sides, subrepandous margin, ciliate. Axillary and terminal inflorescences in simple spikes, or in panicles of spikes, branching twice; flowers alternate, lax; peduncles 5–7 cm long; main axis of inflorescence 3.5–5.5 cm long, pubescent, eglandular trichomes;

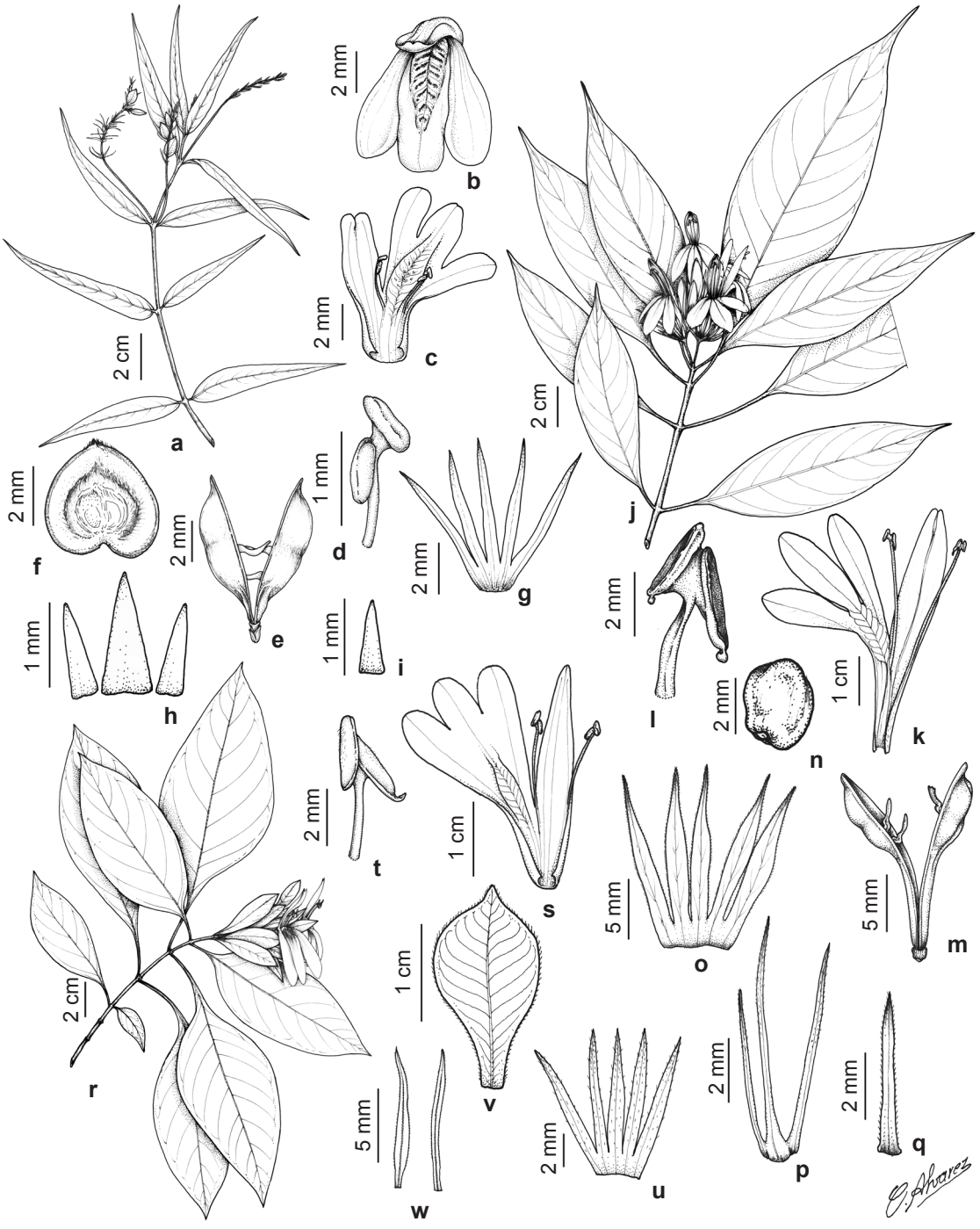

Figure 8 – a-i. *Justicia laevilinguis* – a. branch with inflorescence; b. frontal view of the corolla; c. open corolla; d. anther; e. capsule; f. seed; g. open calyx; h. bract and bracteoles; i. sterile bract. j-q. *Justicia mcdadeana* – j. branch with inflorescence; k. open corolla; l. anther; m. capsule; n. seed; o. open calyx; p. bract and bracteoles; q. sterile bract. r-w. *Justicia montealegrensis* – r. branch with inflorescence; s. open corolla; t. anther; u. open calyx; v. fertile bract; w. bracteoles. (a-i. L. Carreira *et al*. 1845, MG; j-q. R.M. Harley *et al*. 57487, MG; r-x. D.C. Zappi *et al.* 4239, MG).

bracts not imbricate; sterile bract 1.5–2 × 0.8–1 mm, narrowly-triangular, sessile, apex acute, glabrous on both sides, margin not ciliate; fertile bract 1–1.5 × 0.5–0.6 mm, narrowly-triangular, sessile, apex acute, glabrous on both sides, margin not ciliate; bracteoles 1.5–2 × 0.8–1 mm, narrowly-triangular, apex acute, glabrous on both sides, margin not ciliate; calyx 5-lobed, calyx-lobes of equal length, 7–9 × 0.8–1 mm, narrowly-elliptic, apex acute, glabrous on both sides, margin not ciliate; corolla 8–11 mm long, personate, lilac, with white stripes on the palate, tube base 2–3 mm long, median third 2–4 mm long, upper lip 4–6 mm long, bilobed, lobes c. 0.5 × 0.5 mm, lower lip 5–7 mm long, central lobe 0.7–0.9 × 0.6–0.8 mm, lateral lobes 0.7–0.9 × 0.6–0.8 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 3–4 mm long, connective short, superior thecae 0.6–0.7 mm long., inferior thecae 0.5–0.7 mm long, both not appendiculated at the base; ovary glabrous; style 9–11 mm long, glabrous, stigma subcapitate. Capsules 10–12 × 5–6 mm, clavate, glabrous; seeds 2–2.5 × 2.5–3 mm, compressed, cordate, smooth, glabrous.

Selected material: Almeirim, path to the Serra de Almeirim, 27.III.1963, *E. Oliveira 2386* (IAN). Belterra, FLONA do Tapajós: Itapuama, 10.V.2011, *M. Braga & V.F. Mansano* 59 (MG). Belém, UFRA, access road to the várzea, 01°27'42.07"S, 48°26'11.09"W, 11.VIII.2017, *F.A. Silva & A. Gil 226* (MG, SP). Benevides, Área da Natura Ecopark, aprox. 4.2 km to the north of the city of Benevides, 18.X.2014, *J.C.N. Dergan 65* (HBRA). Cametá, Rio Itaituba, 8.II.1961, *E. Oliveira 1323* (IAN). Capanema, Rio Quatipuru, 01°04'S, 46°59'W, 50 m, 9.IV.1980, *G. Davidse et al. 18131* (MG). Curuçá, Rio Cupari, 2.I.1948, *G.A. Black 48-2259* (IAN). Faro, campos do Macuarany, 31.I.1910, *A. Ducke* (MG10603). Óbidos, Lago do Mariapixy, 18.VII.1912, *A. Ducke* (MG11996). Monte Alegre, Rio Maicurú, mouth of the Paituna, 9.X.1984, *I.A. Rodrigues et al. 1264* (IAN). Muaná, Faz. S. João, Rio Anabijú, Marajó, 27.VI.1962, *E. Oliveira 2057* (IAN). Oriximiná, Lago Uraría, next to the Rio Trombetas, 11.VI.1980, *C. Davidson & G. Martinelli 10247* (INPA, MG, RB). Peixe Boi, vila do Ananim, alto Rio Peixe Boi, 6.X.1999, *L. Carreira et al. 1845* (MG). Santarém, Lago Grande do Curuai, 02°16'19"S, 55°28'33"W, 5.IV.2011, *C. Suemitsu 1051* (HSTM).

Justicia laevilinguis has wide distribution in the swampy areas of South America (Wasshausen & Wood 2004). Ezcurra (2002) confirmed its occurrence in Colombia, Venezuela, Peru, Bolivia, southern Brazil, Uruguay, northeastern Argentina and Paraguay. In Brazil, it is cited for most of the Brazilian states, occuring in all regions (BFG 2018). In the state of Pará, it is widely distributed in flooded fields, near rivers and streams, in open or partially shaded areas. It flowers and fruits throughout the year.

In the original work of *Rhytiglossa laevilinguis*, Nees (1847) cites five specimens from different localities and two collectors. We choose a lectotype for the taxon from among collections housed at B (*Sellow*) and K (*Tweedie*) following Stafleu & Cowan (1977–88). It was verified that all three *Sellow* specimens cited by Nees (1847) were destroyed during the Second World War, and the *Tweedie* specimen collected in "Isla Santa Catarina" was not located at K. Therefore, the only extant original material of *R. laevilinguis* is the collection made in Argentina, "Rio Segundo in prov. Cordubensi", *Tweedie 1837*, and is lectotypified here (See Art. 9.5 e 9.11 by Turland *et al.* 2018).

Justicia laevilinguis is characterized by herbaceous habit, inflorescences with flowers alternate, lax and compressed, cordate seeds (Figs. 4i; 8f), being morphologically close to *Justicia carajensis* due to the inflorescence characteristics. They are, however, easily distinguished by the 4-lobed calyx (*vs.* 5-lobed calyx in *J. laevilinguis*) (further comments found under *J. carajensis*). There are also similarities between *J. laevilinguis* and *J. multiglandulosa* (see comments under *J. multiglandulosa*).

According to Graham (1988), *Justicia laevilinguis* belongs to *J.* section *Dianthera* subsection *Dianthera*, characterised by the 5-lobed calyx, with calyx-lobes of equal length, triangular bracts and compressed, smooth seeds. Graham (1988) comments that *J.* section *Dianthera* subsection *Dianthera* is one of the few in which the majority of species occur in semi-aquatic habitats and have a strong relation with species of North American *Justicia*. Kiel *et al.* (2018) did not sample *J. laevilinguis*, however it is likely that it would appear as related to the North American *Justicia* semi-aquatic species clade, called "DSP1B: *J.* section *Dianthera* subsection *Dianthera*", within the lineage known informally as "DSP1". This lineage is characterized mainly by the 5-lobed calyx, all lobes of equal length and by discoid, tuberculated seeds (Kiel *et al.* 2018).

11. *Justicia mcdadeana* A.S. Reis, A. Gil & Kameyama, Syst. Bot. 44(3): 607-707. 2019. TYPE: "Brazil, Pará, Parauapebas, Floresta Nacional de Carajás, trilha peito de aço. Às

margens da cachoeira no interior da mata, 06°10'04.3"S, 50°21'06"W, 6.XII.2017", *F.A. Silva*, *L. Schneider*, *J. Maciel-Silva*, *M. Conde 291* (Holotype: MG229210!; Isotype: RB!).

Figs. 4j; 7e-f; 8j-q

Subshrubs, 30–150 cm tall. Branches erect, cylindrical sulcate, dilated and not constricted above the nodes, puberulous. Leaves petiolate, petiole 10–60 mm long, blades 7.5–24 × 2.5–9.5 cm, lanceolate to elliptic, apex acuminate, base attenuate, glabrous on both sides, puberulous along the veins, margin subrepand, sparsely ciliate. Axillary and terminal inflorescences in panicles of spikes, branching twice, spikes with 3 rows of fertile bracts and 1 row of sterile bracts; flowers alternate, congested; peduncles 1.2–1.8 cm long; main axis of inflorescence 2–2.8 cm long, glabrous to sparsely puberulous, eglandular trichomes; bracts not imbricate; sterile bract 4–10 × 0.8–1 mm, subulate, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; fertile bract 13.5–25 × 1–1.5 mm, subulate, sessile, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; bracteoles 13–20 × 0.7–1 mm, subulate, apex acute, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin sparsely ciliate; calyx 5-lobed, lobes of equal length, 16–19 × 1.5–2 mm, subulate to narrowly-elliptic, apex acute, glabrous adaxially, glabrescent to puberulous abaxially, eglandular trichomes, margin sparsely ciliate; corolla 60–65 mm long, not personate, red with yellow spots on the palate, tube base 5–6 mm long, median third 30–33 mm long, upper lip 28–33 mm long, bilobed, lobes c. 1 × 1 mm, lower lip 25–30 mm long, central lobe 20–24 × 5.5–8 mm, lateral lobes 18–22 × 5–7.5 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 22–25 mm long, connective short, upper thecae 3–3.5 mm long, lower thecae 4–4.5 mm long, both appendiculated to the base; ovary glabrous; style 60–65 mm long, sparsely puberulous, stigma capitated. Capsules 14–22 × c. 6 mm, clavate, puberulous, eglandular trichomes; seeds c. 4 mm diam., spheroid, smooth, glabrous.

Selected material: Altamira, Rio Xingu, Forte Ambé, 29.VI.1909, *E. Snethlage* (MG10415). Canaã dos Carajás, Serra Sul, area of forest with rocky soils, 06°19'43"S, 50°07'57"W, 763 m, 6.VI.2016, *C.A.S. da Silva et al. 611* (MG). Eldorado dos Carajás, Rio Vermelho, Tocantins region, 1.I.1951, *R.L. Fróes 27027* (IAN). Jacareacanga, border between MT and PA. Property of Sr. Nilo Weber, 09°19'54"S, 56°46'01"W, 28.V.2008, *R. Dias-Melo et al. 336* (RB). Jacundá, Rio Tocantins, Jatobal, station on the old railroad of Tucurui, 16.V.1977, *M.G. Silva & R. Bahia 3090* (MG). Marabá, serra norte, road N3, 25.III.1985, *R. Secco et al. 563* (MG, RB). Novo Progresso [Itaituba], Santarém-Cuiabá road, BR-163, km 1011, 07°40'S, 55°15"W, 11.VI.1983, *I.L. Amaral et al. 1215* (INPA, RB). Parauapebas, Parque Zoobotânico, 4.II.2018, *F.A. Silva et al. 297* (MG, SP). Vitória do Xingu, Belo Monte Hydroelectic Dam, 19.VI.2012, *L.P. Santos 416* (MG).

Additional material examined: BRAZIL. MARANHÃO: Carolina, Chapada das Mesas, 07°03'00"S, 47°28'36"W, 17.VI.2017, *A. Gil & M.M.M. Andrade 756* (MG); Rod. Transamazônica, BR-230 e BR-010, Pedra Caída, 07°08'S, 47°25'W, 16.IV.1983, *E.L. Taylor et al. 1300* (MG, SPF). MATO GROSSO: Novo Mundo, RPPN Lote Cristalino, 09°37'24.6"S, 55°55'42.1"W, 18.III.2009, *D. Sasaki & J.H. Piva 2514* (SPF). Nova Bandeirantes, 09°48'40"S, 57°48'40"W, 29.V.1997, *N.M. Ivanauskas et al. 1999* (SPF).

Justicia mcdadeana is known for the state of Pará, with many records in the region of Carajás, extending to the north of Mato Grosso and into Maranhão, where it has been recorded only in the Parque Nacional da Chapada das Mesas. It is commonly found in *campo rupestre*, ombrophylous forest or near waterfalls and rivers, in partially or totally shaded areas, and also in disturbed areas (Silva *et al.* 2019b). It flowers and fruits throughout the year, with a peak observed between May and July.

Justicia mcdadeana is characterised by the inflorescence spikes with three rows of fertile bracts and one row of sterile bracts, the subulate bracts, bracteoles and lobes of the calyx, wide red corolla (60–65 mm long), with yellow spots on the palate (Fig. 7f), and all the thecae being appendiculated (Fig. 8l). It resembles *J. calycina* due to its subulate bracts and bracteoles, red corolla and puberulous clavate capsules, and also *J. riedeliana* with lanceolate leaf-blades of similar size (7.5–24 mm long), and glabrous on both sides, ovary glabrous, clavate capsules, spheroid, smooth seeds (Silva *et al.* 2019b). It can be distinguished from *J. calycina* through the calyx-lobes length of 16–19 mm (*vs.* 7–10 mm long em *J. calycina*), upper lip of the corolla bilobed (*vs.* upper entire lip in *J. calycina*), and all the thecae appendiculated at base (*vs.* both thecae not appendiculated at base in *J. calycina*) (Silva *et al.* 2019b). It differs from *J. riedeliana* by presenting flowers alternate (*vs.* decussate flowers in *J. riedeliana*), subulate bracts, short-ciliate leaf margin (c. 0.5 mm long) [*vs.* generally narrowly-elliptic bracts with long-ciliate margin (c. 1–2 mm long) in *J. riedeliana*]

subulate calyx-lobes (*vs.* linear calyx-lobes in *J. riedeliana*), and 2-lobed upper lip of the corolla (*vs.* entire upper lip of the corolla in *J. riedeliana*) (Silva *et al.* 2019b).

Justicia mcdadeana, like *J. birae*, presents a combination of characters that do not allow its categorisation in any of the sections proposed by Graham (1988), or the set of characteristics used in the informal clades of Kiel *et al.* (2018).

12. *Justicia montealegrensis* F.A. Silva & Kameyama, Syst. Bot. 46(2): 433-445. 2021. TYPE: "Brasil, Pará, Monte Alegre, Parque Estadual de Monte Alegre, Estrada para Parque Estadual de Monte Alegre, Mata baixa, perto do Buriti, 2º2'42"S, 54º11'26"W, 20 Jun 2018", *D.C. Zappi, M.F.Devecchi, M. Pastore 4239* (Holotype:MG!; Isotype: RB!). Figs. 7g; 8r-w

Subshrubs, 38–140 cm tall. Branches erect to semidecumbent, quadrangular, sulcate, not dilated and sometimes constricted above the nodes, glabrescent to puberulous-strigose. Leaves petiolate, petiole 7–25 mm long, blades 5.5–15 × 3–7 cm, elliptic to ovate, apex cuspidate to acuminate, base decurrent to attenuate, glabrous adaxially, sparsely puberulous on the abaxial midrib, margin entire, sparsely ciliate. Terminal inflorescences panicles of spikes, branching once; flowers decussate, congested; peduncles 0.3–0.5 cm long; main axis of inflorescence 3–6.5 cm long, puberulous-strigose, eglandular trichomes; imbricate bracts; sterile bract absent ; fertile bract 26–38 × 8–16 mm, oblanceolate to obovate, sessile, apex cuspidate, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; bracteoles 3–3.5 × 0.5–0.8 mm, narrowly-triangular to narrowly-lanceolate, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin ciliate; calyx 5-lobed, lobes of equal length, fused before anthesis, 9–21 × 1–2.2 mm, narrowly-triagular to linear, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular trichomes, margin sparsely ciliate; corolla 47–53 mm long, not personate, red with white stripes on the palate, base of the tube 4.5–5 mm long, median third 20–30 mm long, upper lip 20–23 mm long, entire, lower lip 22–27 mm long, central lobe 10–13 × 5–7.5 mm, lateral lobes 10–13 × 5–6.5 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 18–21 mm long, connective short, upper thecae 2.7–3 mm long, not appendiculated, lower thecae 3.5–4 mm long, appendiculated at the base; ovary glabrous; style 29–38 mm long, sparsely puberulous, stigma subcapitate. Capsules and seeds unknown.

Selected material: Monte Alegre, Parque Estadual de Monte Alegre, 02°02'42"S, 54°11'26"W, 20.VI.2018, *D.C. Zappi et al. 4239* (MG); trilha para o Morro do Pilão, 02°00'29"S, 54°04'09"W, 12.V.2009, *C. Suemitsu 911* (HSTM).

Justicia montealegrensis is recorded until now only for the state of Pará, with two records for the municipality of Monte Alegre. It is a species from terra firme forest, with an affinity for shady areas and wet soils (Silva *et al*. 2021). Recorded with flowers in May and June.

It is characterized by quadrangular branches, the main axis of inflorescence puberulous-strigose, oblanceolate to obovate bracts (Fig. 8v), narrowly-triangular to narrowly-lanceolate bracteoles, and calyx-lobes fused before anthesis (Silva *et al*. 2021). It resembles *J. paraensis* due to aspects of the inflorescences and the red corolla, the characters for differentiation mentioned under *J. paraensis*.

Justicia montealegrensis morphologically resembles *J.* section *Orthotactus* sensu Graham (1988) and clade "*Orthotactus*" of Kiel *et al.* (2018) presenting some striking characteristics, such as the red corolla and wide bracts (26–38 mm compr.).

13. *Justicia multiglandulosa* F.A. Silva & Kameyama, Syst. Bot. 46(2): 433-445. 2021. TYPE: "Brasil, Pará, Oriximiná, Rio Trombetas, margem esquerda, mata adjacente ao lago Ajudante, 25 Aug 1980", *C.A. Cid, J. Ramos, C.D. Mota, N. Rosas 1841* (Holotype: RB00036250!; Isotypes: INPA96009!, MG77428!, MO3072477 image!, NY2482138 image!, US2950872 image!).

Figs. 7h; 9a-e

Subshrubs, 20–35 cm tall. Branches erect, subquadrangular, sulcate, dilated and not constricted above the nodes, pubescent. Leaves petiolate, petiole 2–4 mm long, blades 4,5–6,5 × 2–2,8 cm, lanceolate to elliptic, apex acute to cuneate, base cuneate to asymmetrical, glabrescent to pubescent-adpressed in the veins, eglandular and glandular trichomes, margin entire to subrepandous, margin ciliate. Terminal inflorescences in simple spikes; flowers alternate, lax; peduncles 0.3–0.6 cm long; main axis of inflorescence 1–2 cm long, pubescent, glandular trichomes; bracts not imbricate; sterile bract 1.8–2 × 0.5–0.6 mm, lanceolate to narrowly-triangular,

Figure 9 – a-e. *Justicia multiglandulosa* – a. branch with inflorescence; b. open corolla; c. anther; d. open calyx; e. part of branch, with bracts, bracteoles and calyx. f-n. *Justicia oldemanii* – f. branch with inflorescence; g. open corolla; h. anther; i. gynoecium; j. capsule; k. seed; l. open calyx; m. bract and bracteoles; n. sterile bract. o-u. *Justicia oriximinensis* – o. branch with inflorescence; p. open corolla; q. anther; r. capsule; s. seed; t. open calyx; u. bract and bracteoles. v-bb. *Justicia paraensis* – v. fertile branch; w. open corolla; x. anther; y. capsule; z. seed; aa. open calyx; bb. bract, bracteoles and young calyx. (a-e. A. Ducke s.n., MG11000; f-n. H.S. Irwin *et al*. 47284, MG; o-u. G. Martinelli *et al*. 7296, MG; v-bb. D.F. Silva 851, MG).

sessile, apex acute, pubescent on both sides, glandular trchomes on the abaxial, margin ciliate face; fertile bract 2.5–3 × 0.5–0.6 mm, lanceolate to narrowly-triangular, sessile, apex acute, pubescent on both sides, glandular trichomes on the abaxial face, margin ciliate; bracteoles 1.8–2 × 0.4–0.5 mm, lanceolate, apex acute, pubescent on both sides, glandular trichomes on the abaxial face, margin ciliate; calyx 5-lobed, lobes of equal length, free before anthesis, 3–5 × 0.5–0.6 mm, linear to lanceolate, apex acute, pubescent adaxially, glandular trichomes, margin ciliate; corolla 12–15 mm long, personate, white, base of the tube 1.6–2 mm long, median third 6–8 mm long, upper lip 3–3.5 mm long, entire, lower lip 4.5–5 mm long, central lobe 2.7–3 × 3.5–4 mm, lateral lobes 3–3.5 × 1.8–2 mm; stamens inserted in the apical third of the corolla-tube, free portion of the filaments 2.7–3 mm long, connective short, upper thecae 1–1.2 mm long, not appendiculated, lower thecae 1–1.2 mm long, appendiculated at the base; ovary glabrous; style 8–10 mm long, pubescent, stigma capitated. Capsules and seeds unknown.

Selected material: Faro, beira do Rio Jamundá, 12.XI.1950, *G.A. Black & P. Ledoux 50-10711* (IAN). Oriximiná, Rio Trombetas, margem esquerda, 25.VIII.1980, *C.A. Cid et al. 1841* (INPA, MG, RB).

Additional material examined: BRAZIL. AMAZONAS: Maués, 9.X.2000, *M.A.D. Souza 1529* (IAN). Borba, Rio Abacaxis, 58º40'W, 04º22'S, 5.VII.1983, *C.A. Cid 4068* (MG). Rio Urubú, Pedra Branca, 17.IX.1949, *R.L. Fróes 25282* (IAN).

Justicia multiglandulosa, until now, is known only for the states of Pará and Amazonas. In the study area it is not a very common species, with only three collections, occuring in *terra firme* forest and swampy fields, always being associated with the margins of rivers (Silva *et al*. 2021). It flowers from August to November.

It is characteristed by its subshruby habit (20–35 cm tall), with the main axis of the inflorescence with a large ammount of glandular trichomes, bracts, bracteoles and pubescent calyx on both sides, with glandular trichomes on the abaxial side, and white corolla, with stamens inserted in the apical third of the corolla-tube (Fig. 9b) (Silva *et al.* 2021). *Justicia multiglandulosa* morphologically resembles *J. laevilinguis*, for its alternate, and similar corolla, differing mainly by the subshruby habit (*vs.* herbaceous habit in *J. laevilinguis*), glabrescent to pubescent-adpressed leaf-blades (*vs.* glabrous leaf-blades in *J. laevilinguis*), pubescent calyx with glandular trichomes (*vs.* glabrous calyx in *J. laevilinguis*).

Justicia multiglandulosa resembles the species of *J.* section *Dianthera* subsection *Dianthera sensu* Graham (1988) presenting mainly inflorescences with lax, alternate flowers, narrowly-triangular bracts and smooth compressed seeds. *Justicia multiglandulosa* may be placed in the clade "DSP1B: *J.* section *Dianthera* subsection *Dianthera*" of Kiel *et al.* (2018) because of the above mentioned character set (Silva *et al*. 2021).

14. *Justicia oldemanii* Wassh., Brittonia 54(4): 286-297. 2002. TYPE: Guiana Francesa, "Trois Sauts: Haut Oyapock, old clearing for about 3 km, 9.IX.1973" *R.A.A. Oldeman T-992* (Holotype: P00719867 image!; Isotype: US00730847 image!). Figs. 4k; 7i-j; 9f-n

Shrubs, 35–60 cm tall. Branches decumbent, subquadrangular, not sulcate, dilated and sometimes constricted above the nodes, pilose to sericeous. Leaves petiolate, petiole 4–7 mm long, blades 6.5–11.5 × 2–4.5 cm, elliptic to oblong, apex cuspidate to acute, base cuneate, pubescent-adpressed on both sides, dense indumentum in the midrib, entire margin to sub-repanda, ciliate. Axillary and terminal inflorescences in panicles of spikes, branching twice; flowers alternate, congested; peduncles 3–5 cm long; main axis of inflorescence 4–7.5 cm long, sparsely pubescent, eglandular trichomes; imbricate bracts; sterile bract 10–13 × 0.3–0.6 mm, subulate, sessile, apex narrowly attenuate, pilose on both sides, including veins, eglandular trcihomes, margin long-ciliate, cilia c. 1.6 mm long; fertile bract 9–13 × 4.5–7 mm, obovate to orbicular, short-petiolate 1–3 mm long, apex apiculate, pilose on both sides, eglandular trichomes, margin long-ciliate, cilia c. 1.6 mm long; bracteoles 9–12 × 0.8–1 mm, subulate, apex narrowly attenuate, pilose on both sides, eglandular trichomes, margin long-ciliate, c. 1.6 mm long; calyx 5-lobed, calyx-lobes of equal length, 6–7.5 × 0.7–1 mm, linear to lanceolate, apex narrowly attenuate, glabrous adaxially, sparsely pubescent abaxially, eglandular trichomes, ciliate; corolla 12–15 mm long, personate, white externally, internally lilac with white stripes on the palate, tube base 1–1.5 mm long, median third 7.5–8 mm long, upper lip 3.6–4 mm long, entire, lower lip 3.8–4 mm long, central lobe 2–2.2 × 2–2.2 mm, lateral lobes 2–2.2 × 2–2.2 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 5–5.5 mm long, elongated connective, upper thecae 0.9–1 mm long, not appendiculated, lower thecae 1–1.2 mm long, appendiculated

at base; ovary glabrous; style 11–12 mm long, sparsely pubescent, stigma capitated. Capsules 9–10 × c. 2 mm, clavate, glabrous; seeds 1–1.2 × 0.6–0.7 mm, compressed, oblong, tuberculated, glabrous.

Material examined: Vigia, I.1950, *G.A. Black 50-9770* (MG).

Additional material examined: BRAZIL. AMAZONAS: Itapiranga, Rio Uatumã, right margin of the Igarapé Catitu, 21.VIII.1979, *C.A. Cid et al. 602* (MG). AMAPÁ: [Unloc], Rio Jari, Cachoeiras das Guaribas, 00°24'S, 53°07'W, 110 m, 16.VIII.1961, *A. Engler & H.S. Irwin 46459* (MG); Rio Oiapoque, Rio Pontanari, 03°45'S, 51°52'W, 31.VII.1960, *H.S. Irwin et al. 47284* (IAN, MG).

Justicia oldemanii is widely distributed in French Guiana and Brazil, where it is recorded in Amazonas and Amapá states (Wasshausen 2002), however it was not cited in BFG (2018). The present study highlights it as a new record for the state of Pará, where it is not commonly collected, with only a single record for the municipality of Vigia. According to Wasshausen (2002) it is common in upland forests, in wet and sandy soils, close to rivers and waterfalls and upon rocks, in shady locations. Recorded with flowers in January.

Justicia oldemanii can be easily recognised by its by densely pilose to sericeous branches and fertile petiolate bracts (1–3 mm long), obovate to orbicular, with acuminate apex (Fig. 9m). The apex of the bracts is brown in living specimens (Fig. 7j), a unique character among species of *Justicia* found in Pará. It slightly resembles *J. polystachya*, differentiated by pubescent-adpressed leaves on both sides (*vs.* glabrous to sparsely pubescent leaves on both sides in *J. polystachya*), inflorescence in panicles of spikes (*vs.* inflorescences in simple spikes in *J. polystachya*), and by subulate, pilose sterile bracts (*vs.* glabrous sterile oval-asymmetric bracts in *J. polystachya*).

The morphology of *Justicia oldemanii* partly suggests that the species could be placed in *J.* section *Orthotactus* (Nees) V.A.W. Graham, which, according to Graham (1988), is characterised by inflorescences in simple spikes, bracts more or less ovate, exceeding the size of the calyx, this one 5-lobed, with calyx-lobes of equal length, white or red corolla, pubescent capsules, and compressed, tuberculated seeds. However *J. oldemanii* has densely congested panicles of twice branching spikes, and glabrous capsules. According to Kiel *et al.* (2018) *J. oldemanii* belongs to the clade "*Orthotactus*", which in turn is within the clade "*Simonisia*", consisting mainly of sampled members from *J.* section *Simonisia*, and some species of *J.* section *Orthotactus sensu* Graham (1988) as well as other taxa from Guyana and Costa Rica. The species of this clade are distributed throughout the Neotropics, presenting inflorescences in spikes, with linear to ovate bracts, glabrous or pubescent capsules, and smooth seeds (Kiel *et al.* 2018).

15. *Justicia oriximinensis* (Nees) F.A. Silva & Kameyama, nom. nov. *Rhytiglossa poeppigiana* Nees in Martius, *Fl. bras.* 9: 123. 1847. TYPE: Brasil "ad flumen Amazonum", *Poeppig 2157* (Holotype: GZU000251218 image!).

Figs. 4l; 9o-u

Subshrub, c. 18 cm tall. Branches erect, cylindrical, sulcate, dilated and not constricted above us, glabrescent to sericeous. Leaves petiolate, petiole 3–5 mm long, blades 5–7.5 × 1.8–3 cm, oblong to elliptic, sometimes obovate, apex acuminate, base rounded to cuneate, glabrescent to puberulous on the veins on both sides, margin subrepandous, sparsely ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, congested; peduncles 0.5–1.5 cm long; main axis of inflorescence 4.5–6 cm long, pubescent-adpressed, eglandular tricomes; imbricaded bracts; sterile bract absent; fertile bract 4–5 × 0.5–1 mm, lanceolate to narrowly-triangular, sessile, apex acute, glabrous adaxially, sericeous to pubescent-adpressed abaxially, eglandular and glandular trichomes, margin short-ciliate c. 0.5 mm long; bracts 3–4.5 × 0.4–0.5 mm, subulate, apex attenuate, glabrous adaxially, sericeous to pubescent-adpressed abaxially, glandular trichomes, margin ciliate; calyx 5-lobed, 4 lobes of equal length and 1 reduced lobe (4 + 1), the largest 4–5 × c. 0.3 mm, the smallest 2–3 × c. 0.2 mm, narrowly-triangular larger lobes, subulate smaller lobes, apex attenuate, glabrous adaxially, pubescent abaxially, glandular trichomes, margin ciliate; corolla 10–12 mm long, personate, white, with lilac stripes on the palate, tube base 1–1.5 mm long, median third 5–5.5 mm long, upper lip 3–4 mm long, entire, lower lip 3.5–4 mm long, central lobe 1–1.2 × 1.4–1.5 mm, lateral lobes 1–1.2 × 1–1.2 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 3–3.5 mm long, connective short, upper thecae 0.6–0.7 mm long, lower thecae 0.5–0.6 mm long, both not appendiciated; ovary glabrous; style 9–10 mm long, puberulous, stigma subcapitate. Capsule

7.5–8 × c. 1.5 mm, panduriform, puberulous with eglandular and glandular trichomes; seeds 0.3–0.5 × c. 0.25 mm, compressed, oblong, tuberculated, glabrous.

Material examined: Oriximiná, Rio Trombetas, mine at Sta. Patrícia-Jari, 7.VII.1980, *G. Martinelli et al. 7296* (MG, RB).

The type of *Justicia oriximinensis* was collected in Amazonas river, without an exact locality, but the analysis of the various collections consulted has revealed only records from the state of Pará for this taxon thus far. These collections are from the municipality of Oriximiná, close to Trombetas river, in ombrophyllous forests, where plants are reported to shaded environments. Collected with flowers and fruits in July.

Rhytiglossa Nees *ex* Lindl. was described by Nees (1847) in *Flora brasiliensis*, and subsequently had many of its species transferred by Bentham (1876) to *Dianthera* L. It was finally synonymised in *Justicia* by Lindau (1895), that did the new combinations of the species of the genus, however he did not combined *Rhytiglossa poeppigiana* Nees. With the epithet already occupied by *Justicia poeppigiana* (Nees) Lindau (basionym *Leptostachya poeppigiana* Nees), a new name in *Justicia* for *R. poeppigiana* is proposed (See Art. 6.10 e 7.3 by Turland *et al.* 2018).

The species is characterised mainly by being tiny subshrubs (c. 18 cm tall), sericeous branches, and the 5-lobed calyx, with a very small lobe (2–3 mm compr.) with glandular trichomes (Fig. 9t). Due to the corolla and inflorescence morphology, it is similar to *J. potamogeton*, differentiated by the sericeous branches (*vs.* densely pubescent branches in *J. potamogeton*), leaf-blades of 5–7.5 mm long. (*vs.* leaf-blades 13–17.5 mm long in *J. potamogeton*), main inflorescence axis pubescent-adpressed with eglandular trichomes (*vs.* pubescent main axis of the inflorescence with glandular trichomes in *J. potamogeton*), and by the bracts and bracteoles glabrous adaxially, sericeous to pubescent-adpressed abaxially (*vs.* bracts and bracteoles pubescent on both sides in *J. potamogeton*).

Due to the bracts that exceed the calyx lobes, which is 5-lobed, and its compressed seeds, *Justicia oriximinensis* morphologically resembles species of *J.* section *Dianthera* subsection *Strobiloglossa sensu* Graham (1988) and the species of the clade "DSP2C: *J.* section *Dianthera* subsection Strobiloglossa" *sensu* Kiel *et al.* (2018) (more comments in *J. cayennensis*).

16. *Justicia paraensis* F.A. Silva, A. Gil & Kameyama, Syst. Bot. 46(2): 433-445. 2021. TYPE: "Brasil, Pará, Parauapebas, estrada interna do Loteamento Chico Oliveira, -6.127817º, -49.867992º, 25 July 2013", *D.F. Silva 851* (Holotype: MG!; Isotype: HCJS!).

Figs. 7k-l; 9v-bb; 10a

Subshrubs, 50–100 cm tall. Branches erect, cylindrical, sulcate, slightly dilated and sometimes constricted above the nodes, glabrescent at the base and densely pubescent at the apex. Leaves petiolate, petiole 6–15 mm long, blades 5.5–14.5 × 3.5–7 cm, ovate to elliptic, rarely obovate, apex cuspidate, base attenuate, pubescent on both sides, margin entire, ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, congested; peduncles 0.3–0.5 cm long; main axis of the inflorescence 3–5.5 cm long, pubescent, eglandular trichomes; imbricate bracts; sterile bract absent; fertile bract 15–25 × 6–10 mm, oval to eliptical, sessile, apex cuspidate, pubescent to tomentose on both sides, eglandular trichomes, margin ciliate; bracteoles 8–11 × 1.5–3 mm, eliptical to oblanceolate, apex acute, pubescent to pilose on both sides, eglandular trichomes, margin ciliate; calyx 5-lobed, lobes of equal length, 5–6 × 0.8–1.3 mm, linear, apex acute, strigose-pubescent adaxially, pubescent abaxially, with eglandular and glandular trichomes, margin ciliate; corolla 40–45 mm long, not personate, red, base of tube 4–4.2 mm long, median third 23–25 mm long, upper lip 16–18 mm long, entire, lower lip 16–18 mm long, central lobe 7–8 × 1.7–1.8 mm, lateral lobes 7–8 × 1.5–1.8 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 13–16 mm long, little elongated connective, upper thecae 1.8–2.2 mm long, not appendiculated, lower thecae 1.6–1.8 mm long, appendiculated at the base; ovary glabrous; style 34.5–37 mm long, glabrous, stigma subcapitated. Capsules 13–14.5 × c. 2.5 mm, panduriform, pubescent with eglandular trichomes; seeds 0.8–0.9 × 0.9–1 mm, compressed, orbicular, tuberculated, glabrous.

Selected material: Canaã dos Carajás, Morro da torre Sossego, 14.IV.2010, *D.F. Silva & L. Tyski 615* (HCJS, MG). Parauapebas, Loteamento Chico Oliveira, 06°07'40"S, 49°52'05"W, 25.VII.2013, *D.F. Silva 851* (HCJS, MG). Santa Cruz dos Martírios, Região do Araguaia, 12.VI.1953, *R.L. Fróes 30037* (IAN).

Justicia paraensis is known until now only for the state of Pará, occuring in the Serra dos Carajás and in the region of the Araguaia

Figure 10 – a-i. Morphology of seed of *Justicia* in Pará state – a. *Justicia paraensis* (D.F. Silva 851, MG). b. *Justicia pectoralis* (L.C. Branch 14, INPA). c. *Justicia polystachya* (M.T. Benjamin *et al*. 1751, RB). d. *Justicia potamogeton* (L.C.B. Lobato & L. Ferreira 4223, MG). e. *Justicia pseudoamazonica* (Ule 5853, MG). f. *Justicia riedeliana* (L. Tyski 412, MG). g. *Justicia sphaerosperma* (R.L. Fróes & G.A. Black 24668, IAN). h. *Justicia sprucei* (A. Ducke s.n., MG2891). i. *Justicia yurimaguensis* (H.T. Beck *et al*. 123, MG). (Scale bars = 0.5 mm).

river. It grows in the margins and within forest environments, in partially shaded areas (Silva *et al*. 2021). It fruits and flowers from April to July.

Justicia paraensis is characterised by its subshruby habit, with densely pubescent branches at the apex, oval to broad elliptic bracts (15–25 × 6–10 mm), pubescent to tomentose, strigose-pubescent adaxially, pubescent abaxially, with eglandular and glandular trichomes, and the inflorescences with a quadrangular disposition *in vivo* (Fig. 7l) (Silva *et al*. 2021). Due to the aspect of the inflorescence, bract size and red corolla it resembles *Justicia montealegrensis*, differing in that they have cylindrical branches (*vs.* quadrangular in *J. montealegrensis*), oval to elliptic bracts, pubescent to tomentose on both sides (*vs.* oblanceolate to obovate bracts, glabrous adaxially, puberulous abaxially in *Justicia*

montealegrensis), and calyx (5–6 mm long) [*vs.* calyx (9–21 mm long) in *J. montealegrensis*].

Because *J. paraensis* presents inflorescences in simple spikes, red corolla and broad oval bracts (15–25 mm long) it resembles morphologically the species of *J.* section *Orthotactus* of Graham (1988). Apart from the characteristics mentioned, it resembles the species of the clade "*Orthotactus*" of Kiel *et al.* (2018), due to the pubescent capsules (Silva *et al*. 2021).

17. *Justicia pectoralis* Jacq., Enum. Syst. Pl. 11: 1760. *Dianthera pectoralis* (Jacq.) Murr., Syst. Veg. Ed. 14, 64. 1784. *Stethoma pectoralis* (Jacq.) Raf., F1. Tellur. 4: 61. 1838 (1836). *Rhytiglossa pectoralis* (Jacq.) Nees in Bentham, London J. Bot. 4: 637. 1845. *Ecbolium pectorale* (Jacq.) Kuntze, Verh. Gen. P1. 2: 487. 1891. *Psacadovalymma pectorale* (Jacq.) Bremek., Verh. Koll. Ned. Akad. Wetensch., Afd. Natuurk. Tweede Sect. 45: 55. 1948. (TYPE: Illustration in Jacquin, Selec. Stirp. Amer. Hist., t. 3. 1763; lectotype designated by Ezcurra 2002). Figs. 10b; 11a-h; 12a-b

Herbs perennial, 30–60 cm tall. Branches erect and semi-decumbent, subquadrangular, sulcate, undilated, constricted above the nodes, glabrous, sometimes with the presence of two longitudinal sparsely pubescent bands along the branch. Leaves petiolate, petiole 1.5–4 mm long, blades 6.5–11 × 1.5–2.2 cm, lanceolate to rarely ovate and oblong, apex acute to attenuate, base acute, rarely rounded, sometimes asymmetrical, glabrous adaxially, sparsely puberulous in the abaxial veins, margin entire, sparsely ciliate. Axillary or terminal inflorescences in simple spikes or in panicles of spikes, branching thrice, flowers alternate, lax; axis of inflorescence with buds in the hollow of sterile bracts opposed to flowers, rarely developing and then two flowers occuring in the same node; peduncles 7.5–8.5 cm long; main axis of inflorescence 6–15 cm long, slightly pubescent, glandular trichomes; bracts not imbricate; sterile bract 2–2.5 × 0.4–0.5 mm, narrowly-triangular, sessile, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular and glandular trichomes, margin ciliate; fertile bract 1.5–2 × 0.4–0.5 mm, narrowly-triangular, sessile, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular and glandular trichomes, margin ciliate; bracteoles 1–1.5 × 0.3 mm, narrowly-triangular, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular and glandular trichomes, margin ciliate; calyx 5-lobed, 4 lobes of equal length and 1 reduced lobe (4 + 1), the largest 2–3 × c. 0.3 mm, the smallest 1.5–1.8 × c. 0.3 mm, narrowly-elliptic lobes, apex attenuate, glabrous adaxially, puberulous abaxially, eglandular and glandular trichomes, margin ciliate; corolla 6–8 mm long, personate, lilac, with white stripes on the palate, tube base 1.5–2 mm long, median third 1.5–2 mm long, upper lip 3.5–4 mm long, entire, lower lip 3.5–4 mm long, central lobe 1–1.4 × 1.5–1.7 mm, lateral lobes 1–1.2 × 1.1–1.2 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 2–2.5 mm long, connective short, upper thecae 0.5–0.7 mm long, lower thecae 0.5–0.6 mm long, both are not appendiculate at base; ovary glabrous; style 5–7 mm long, glabrous, stigma subcapitate. Capsules 8–10 × c. 1.5 mm, clavate, sparsely pubescent with eglandular trichomes; seeds 0.4–0.5 × c. 0.5 mm, compressed, oblong, tuberculated, glabrous. **Selected material**: Ananindeua, Aurá, 11.I.1980, *M.G. Silva 5148* (MG). Altamira, km 180, serraria BANACH, 29.VIII.1986, *R.T.P. Vasconcelos et al. 152* (MG). Barcarena, Itupanema, 7.VI.1986, *A. Gély & M.C. Amorozo 686* (MG). Belém, 5 km from Inst. Agro. do Norte, 13.VII.1942, *M.B. da Silva 68* (IAN); 29.XI.1945, *J.M. Pires & G.A. Black 728* (IAN). Itaituba, Capueira, 25.VIII.1902, *A. Ducke* (MG2951). Marapanim, casa do Sr. Anacleto, 11.VIII.1998, *I.A. Rodrigues* (IAN182710). Parauapebas, Parque Zoobotânico, plant cultivated in MPEG, 20.VIII.2018, *F.A. Silva 314* (MG, SP). Santarém, Rio Tapajós, Bururé, 29.IX.1977, *M.F. Silva & Coêlho 2199* (INPA).

Justicia pectoralis is widely distributed in tropical South America, and recorded in Paraguay, Argentina (Ezcurra 2002) and Bolivia (Wasshausen & Wood 2004). In Brazil, the species is distributed in the entire North region and some of the northeastern states (Ceará, Maranhão) and the Central-West (Goiás, Mato Grosso) (BFG 2018). In the state of Pará, it is not very common in natural environments, with one record for the municipality of Santarém, close to the Tapajós river, and another for the municipality Itaituba, in a disturbed area (*capoeira*). The other records are of cultivated individuals, normally used for medicinal purposes (anti-inflammatory properties) (Oliveira & Andrade 2000). Found with flowers in January, July and August and fruits in September.

Justicia pectoralis is characterised by the inflorescences with alternate, lax flowers (Fig. 12a), branching thrice, with undeveloped buds at the base of the sterile bract, and by the 5-lobed

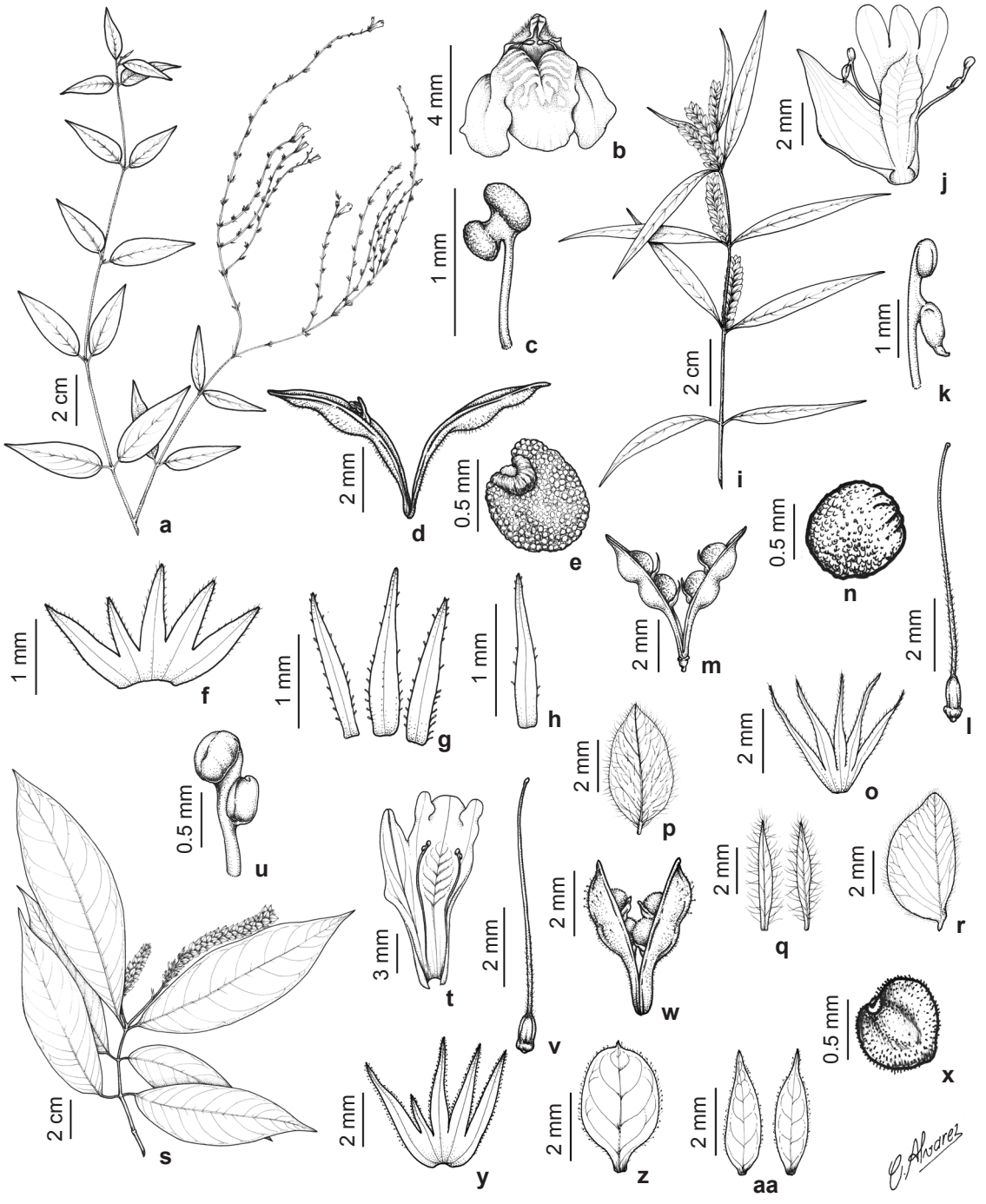

Figure 11 – a-h. *Justicia pectoralis* – a. branch with inflorescence; b. frontal view of the corolla; c. anther; d. capsule; e. seed; f. open calyx; g. bract and bracteoles; h. sterile bract. i-r. *Justicia polystachya* – i. branch with inflorescence; j. open corolla; k. anther; l. gynoecium; m. capsule; n. seed; o. open calyx; p. fertile bract; q. bracteoles; r. sterile bract. s-aa. *Justicia potamogeton* – s. brach with inflorescence; t. open corolla; u. anther; v. gynoecium; w. capsule; x. seed; y. open calyx; z. fertile bract; aa. bracteoles. (a-h. L.C. Branch 14, INPA; i-r. M.T. Benjamin *et al*. 1751, RB; s-aa. L.C.B. Lobato & L. Ferreira 4223, MG).

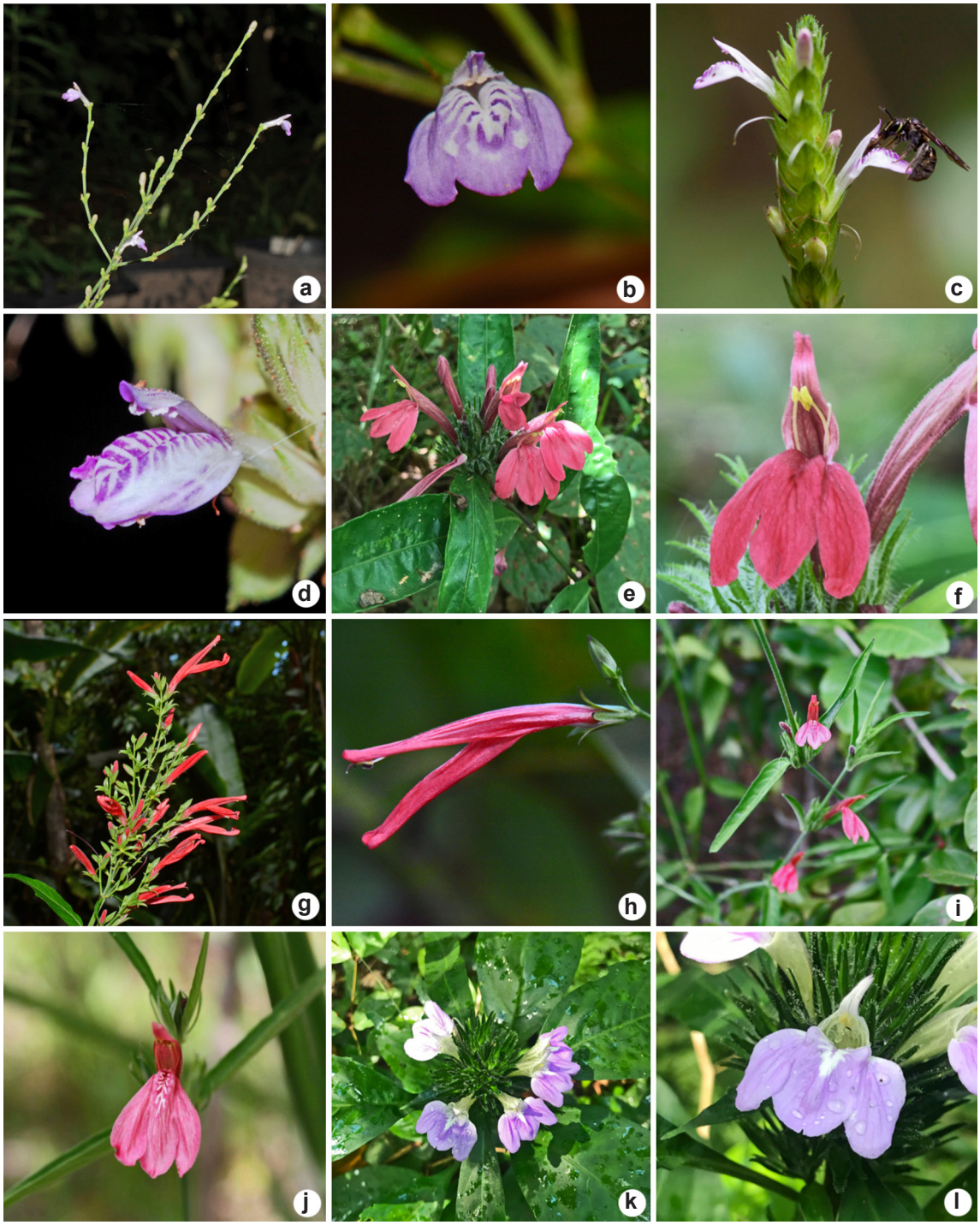

Figure 12 – a–b. *Justicia pectoralis* – a. lateral view of inflorescence; b. frontal view of corolla, exhibiting stripes on the palate. c–d. *Justicia potamogeton* – c. lateral view of inflorescence, with wasp of genera *Ceratina* pollinating the flower; d. lateral view of corolla exhibiting white stripes on the palate. e–f. *Justicia riedeliana* – e. lateral view of inflorescence. f. frontal view of corolla. g–h. *Justicia secunda* – g. lateral view of inflorescence; h. lateral view of corolla. i–j. *Justicia sphaerosperma* – i. lateral view of inflorescence; j. frontal view of corolla. k–l. *Justicia sprucei* – k. frontal view of inflorescence; l. frontal view of the corolla exhibiting white blemish on palate. Photos: a-b; g-h: F.A. Silva. c: P. Viana. d: C. Hall. e, k-l: A. Gil. f: M. Pastore. i-j: A. Cardoso.

calyx, with one of the calyx-lobes reduced (Fig. 11f). It is distinct from *J. comata*, which also has lax inflorescences with alternate flowers, and 5-lobed calyx with lobes of equal length (Fig. 5v) (*vs.* 5-lobed calyx, with one reduced lobe in *J. pectoralis*) (more comments can be found under *J. comata*).

According to Graham (1988), *Justicia pectoralis* is placed in *J.* section *Sarotheca*, characterised mainly by the inflorescences in panicles, the main axis of the inflorescences with glandular trichomes and the 5-lobed calyx, with one of the calyx-lobes reduced. Kiel *et al.* (2018) positions *J. pectoralis* in the clade "DSP1C: Tuberculate seeds + reduced calyx lobe", within the lineage known informally as "DSP1". This clade is characterised by the terminal and axillary inflorescences in panicles, 5-lobed calyx, with one lobe significantly reduced, compressed, and tuberculated seeds.

18. *Justicia polystachya* Lam., Tabl. Encycl. 1: 40. 1791. *Amphiscopia polystachya* (Lam.) Nees in A. DC., Prodr. 11: 356. 1847. *Ecbolium polystachyum* (Lam.) Kuntze in Revis. Gen. Pl. 2: 981. 1891. TYPE: "Cayena", *D. Leblond* (Holotype: MPU019860 image!).

Figs. 10c; 11i-r

Subshrubs, 35–75 cm tall. Branches erect, cylindrical to quadrangular, sulcate, slightly dilated and not constricted above the nodes, with of two longitudinal bands of pubescent-adpressed indument along the branches. Leaves petiolate, petiole 5–10 mm long, blades 6.5–12 × 0.8–4 cm, lanceolate to narrowly-elliptic, apex attenuate, base rounded or attenuate, glabrous on both sides, sparsely pubescent on the veins, entire margin, sparsely ciliate. Axillary and terminal inflorescences in simple spikes; flowers alternate, congested; peduncles 0.5–2 cm long; main axis of inflorescence 3–5.5 cm long, pubescent, eglandular trichomes; imbricate bracts; sterile bract 6–8 × 3–4 mm, oval-asymmetrical, sessile, apex rounded, glabrous on both sides, sparsely pubescent on the veins, eglandular trichomes, margin long-ciliate, cilia c. 1 mm long; fertile bract 6–10 × 4–7 mm, ovate to rarely oblong, sessile, apex obtuse to cuneate, glabrous on both sides, sparsely pubescent on the veins, eglandular trichomes, margin long-ciliate, cilia c. 1 mm long; bracteoles 5–10 × 1–2 mm, lanceolate-asymmetrical, apex acute, glabrous on both sides, sparsely pubescent in the veins, eglandular trichomes, margin long-ciliate, cilia c. 1 mm long; calyx 5-lobed, calyx-lobes of equal length, 4–5.5 × 0.5–1 mm, linear to lanceolate, apex attenuate, glabrous on both sides, sparsely pubescent on the veins of the abaxial face, eglandular trichomes, margin sparsely ciliate; corolla 11–13 mm long, personate, lilac, tube base 1.5–2 mm long, median third 4–4.3 mm long, upper lip 5–6 mm long, bilobed, lobes c. 0.4 × 0.4 mm, lower lip 5–6.5 mm long, central lobe 2–2.2 × 2.2–2.8 mm, lateral lobes 2.5–3 × 1.2–1.6 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 3–3.5 mm long, elongated connective, upper thecae 1–1.2 mm long, not appendiculated, lower thecae 0.6–0.8 mm long, appendiculated at the base; ovary glabrous; style 1–1.3 mm long, glabrous, stigma capitated. Capsules 7–8 × c. 2 mm, panduriform, glabrous; seeds 0.5–0.7 × 0.5–0.6 mm, compressed, orbicular, tuberculated, glabrous.

Selected material: Itaituba, Parque Nacional da Amazônia, 04°30'37"S, 56°15'34"W, 35 m, 13.VII.2016, *M.T. Benjamin et al. 1751* (IAN, RB). Monte Alegre, Sete varas airstrip on Rio Curua, 54º92'W, 00º95'S, 10.VIII.1981, *J.J. Strudwick et al. 4473* (MG). Santarém, Cacaual Grande, Maria Francisca, campo baixo, 9.VII.1952, *G.A. Black 52-15585* (IAN).

Justicia polystachya is recorded for Venezuela, Suriname, French Guiana, northern Brazil and Bolivia (Wasshausen 2006). According to BFG (2018), the species occurs in the states of Acre, Rondônia, Roraima, Pará and Mato Grosso. In the study area, it is rare, with only three records found in lowland vegetation and in dense rain forest. It flowers and fruits from July to September.

Justicia polystachya can be recognised by its inflorescences in simple spikes; flowers alternate, congested, and sterile bracts oval-asymmetrical (Fig. 11r), a characteristic exclusive to this species in this study area. *Justicia polystachya* resembles *J. potamogeton* due to their subshrubs habit, corolla measurements, and strongly imbricate bracts. It differs mainly by alternate flowers (*vs.* flowers decussate in *J. potamogeton*), calyx-lobes of equal length [*vs.* calyx with lobes of differing lengths (4 + 1) in *J. potamogeton*]. It also resembles *J. pycnophylla* Lindau, because of its inflorescences, bracts and bracteoles, however it can be distinguished by the lanceolate to narrowly-elliptic leaf-blades (*vs.* oval to oblong leaf-blades in *J. pycnophylla*), and densely ciliate bracts margin, with cilia of c. 1 mm long (*vs.* glabrous bracts, cilia rare in *J. pycnophylla*). It is worth noticing that *J. pycnophylla* has a restricted distribution to central Brazil, ocurring in Goiás, Federal District,

and Minas Gerais, growing in Cerrado and open fields (BFG 2018). It is often confused in herbaria with *J. dubiosa* Lindau, although they are easily differentiated by the 5-lobed calyx with calyx-lobes of equal length [*vs.* 5-lobed, with 1 reduced lobe (4 + 1) in *J. dubiosa*], and by the spikes with alternate flowers (*vs.* spikes with decussate flowers in *J. dubiosa*).

Justicia polystachya was not treated by Graham (1988), however it shares similarities with species of *J.* section *Orthotactus*, with ovate bracts exceeding the size of the 5-lobed calyx with lobes of equal length. In Kiel *et al.* (2018) *J. polystachya* was placed in the clade "*Orthotactus*" within the clade "*Simonisia*".

19. *Justicia potamogeton* Lindau, Bull. Herb. Boissier, sér. 2, 4: 412. 1904. TYPE: Brasil, Amazonas, "Bl. weisslich mit purpurem flechen, Juruá Miri. Rio Juruá, Mai 1901", *Ule 5502* (Holotype: B, destr.; Lectotype: MG005448! designated here; Isolectotype: HBG522723 image!). Figs. 10d; 11s-aa; 12c-d

Subshrubs, 30–120 cm tall. Branches decumbent, cylindrical, lightly sulcate, dilated and sometimes constricted above the nodes, glabrescent to sparsely puberulous. Leaves petiolate, petiole 5–15 mm long, blades 8–23 × 3.5–6.3 cm, lanceolate to elliptic, sometimes ovate, apex acuminate, base attenuate to cuneate, glabrous on both sides to rarely puberulous on the veins, with glandular trichomes, subrepandous margin, sparsely ciliate. Terminal inflorescences in simple spikes; flowers decussate, congested; peduncles 3.5–10 cm long; main axis of inflorescence 2.5–10 cm long, pubescent, eglandular and glandular trichomes; imbricate bracts; sterile bract absent; fertile bract 5.5–9 × 3.5–5 mm, oblong to elliptic, rarely rhomboid, sessile, apex apiculate, puberulous on both sides, glandular trichomes, short ciliate margin, cilia c. 0.5 mm long; bracteoles 6–8 × 1–2 mm, narrowly-elliptic to lanceolate, apex attenuate, puberulous on both sides, margin ciliate with sparse glandular trichomes; calyx 5-lobed, 4 lobes of equal length and 1 reduced lobe (4 + 1), the largest 4–6 × c. 0.5 mm, the smallest 3–3.5 × c. 0.3 mm, lobes lanceolate, apex attenuate, glabrous adaxially, pubescent abaxially, sparse glandular trichomes, margin ciliate; corolla 9–14 mm long, personate, white externally, lilac internally, with white stripes on the palate, tube base 2–3 mm long, median third 5–6 mm long, upper lip 5–6 mm long, entire, lower lip 5.5–6 mm long, central lobe 1.2–1.3 × 1.7–2 mm, lateral lobes 1.2–1.3 × 1.1–1.2 mm; stamens inserted in the median third of the corolla-tube, free portion of filaments 4–4.5 mm long, connective short, upper thecae 0.6–0.7 mm long, lower thecae 0.5–0.6 mm long, both are not appendiculate at base; ovary glabrous; style 10–11.5 mm long, sparsely puberulous, stigma subcapitate. Capsules 7–7.5 × c. 1.8 mm, panduriform, pubescent with eglandular and glandular trichomes; seeds 0.5–0.6 × c. 0.6 mm, compressed, suborbicular, tuberculated, glabrous.

Selected material: Canaã dos Carajás, Vila Planalto, 06°26'45"S, 49°41'03"W, 608 m, 11.VIII.2016, *R.M. Harley et al. 57919* (MG). Marabá, right margin of N5-N1 road, next to the road entrance H7, 18.VIII.1984, *N.A. Rosa et al. 4630* (MG, SPF). Parauapebas, Parque Zoobotânico, 30.VI.2014, *D.F. Silva 912* (HCJS, MG); Entrada do Parque Zoobotânico Vale, 06°03'52.2"S, 50°03'32.5"W, 11.V.2010, *L. Tyski 634* (HCJS).

Justicia potamogeton is endemic to Brazil occuring only in Acre, Amazonas and Pará (BFG 2018). In the state of Pará, it occurs in *campo rupestre* and in forest formations near waterfalls (Reis *et al.* 2017a). It flowers and fruits from May to November.

Justicia potamogeton was described by Lindau in 1904, based on material collected by *Ule 5502* at Juruá Miri [Juruá Mirim], Rio Juruá, in 1901, however, according to the curator of B herbarium, the holotype was destroyed in in the Second World War. Duplicates were located at the MG and HBG herbarium, and we chose the MG material as the lectotype, as it complies with all the diagnostic characteristics mentioned in the protologue (see Art. 9.11 by Turland *et al.* 2018).

Justicia potamogeton is characterised by its 5-lobed calyx, with one of the lobes very small (3–3.5 × c. 0.3 mm), corolla externally white, lilac within, with white stripes on the palate (Fig. 12d), and panduriform, pubescent capsules with glandular trichomes. It resembles superficially *J. yurimaguensis*, mainly by the inflorescence in simple spikes, flowers decussate, calyx with one reduced lobe, and the tuberculated seeds (Fig. 10d). These species can be differentiated by the non-variegated leaf-blades (*vs.* variegated leaf-blades in *J. yurimaguensis*), glabrescent to sparsely puberulous branches (*vs.* sericeous branches in *J. yurimaguensis*), main axis of inflorescence pubescent with glandular trichomes (*vs.* main axis of inflorescence sericeous with eglandular trichomes in *J. yurimaguensis*), bracts oblong to eliptical (*vs.* ovate bracts in *J. yurimaguensis*),

connective short (*vs*. connective little elongated *J. yurimaguensis*), and capsules with eglandular and glandular trichomes (*vs*. capsules solely with eglandular trichomes in *J. yurimaguensis*). Morphologically, *J. potamogeton* also resembles *J. cayennensis* (comments under this taxon), and bears some similarity with *J. oriximinensis* (see comments for *J. oriximinensis*).

Justicia potamogeton was not treated in Graham study (1988), however it is morphologically similar to the species of *J.* section *Dianthera* subsection *Strobiloglossa*, presenting inflorescences in simple spikes with decussate flowers, bracts exceeding the length of the calyx, which is 5-lobed with one of the calyx-lobes very reduced. It was also not sampled by Kiel *et al.* (2018), however, it is believed that this set of characteristics would place it within the informal lineage called "DSP2", specifically in the "DSP2C: *J.* section *Dianthera* subsection *Strobiloglossa*", mainly due to its panduriform capsules, and compressed tuberculated seeds.

20. *Justicia pseudoamazonica* Lindau, Bull. Herb. Boissier, sér. 2, 4: 415. 1904. TYPE: Brasil, Amazonas, "Bl. weiss mit violett. Rio Juruá, Fortaleza", *Ule 5929* (Holotype: B, destr.; Lectotype MG005826! designated here; Isolectotypes: G00236355 image!, HBG522718 image!, K000529299 image!). Figs. 10e; 13a-h

Subshrubs, 50–100 cm tall. Branches erect, subquadrangular, sulcate, undilated and not constricted above the nodes, with two longitudinal bands of puberulous indument along the branch. Leaves petiolate, petiole 5–10 mm long, blades 6–8 × 2.4–3.4 cm, ovate to elliptic, apex acuminate, base decurrent asymmetrical, glabrous on both sides, margin entire, not ciliate. Axillary and terminal inflorescences in simple spikes; flowers decussate, lax; peduncles 1–1.2 cm long; main axis of inflorescence 3.5–5 cm long, presence of two longitudinal bands of puberulous, eglandular trichomes; bracts not imbricate; sterile bract absent; fertile bract 2–2.5 × 0.6–0.8 mm, narrowly-triangular to subulate, sessile, apex acute, slightly puberulous on both sides, eglandular trichomes, margin ciliate; bracteoles 1.8–2 × 0.4–0.6 mm, subulate, apex acute, slightly puberulous on both sides, eglandular trichomes, margin ciliate; calyx 4-lobed, lobes of equal length, 4–6 × 0.8–1 mm, lanceolate, apex attenuate, puberulous on both sides, eglandular trichomes, margin ciliate; corolla 7.5–10 mm long, personated, white, with purple stripes on the palate, tube base 1–1.2 mm long, median third 4–4.2 mm long, upper lip 4–4.2 mm long, entire, lower lip 3–3.5 mm long, central lobe 1–1.2 × 1–1.3 mm, lateral lobes 0.8–1 × 0.8–1 mm; stamens inserted in the apical third of the corolla-tube, free portion of the filaments 3–3.3 mm long, connective short, upper thecae 0.4–0.5 mm long, not appendiculated, inferior thecae 0.4–0.5 mm long., appendiculated at the base; ovary glabrous; style 9–11 mm long, glabrous, stigma subcapitated. Capsules 9–11 × c. 1 mm, clavate, glabrous; seeds 0.6–0.7 × c. 0.4 mm, compressed, oblong, tuberculated, glabrous.

Selected material: Benevides, Reserva da Pirelli, left shore of Rio Uriboca, 23.VII.1997, *S.V. da Costa Neto et al. 57* (MG). Jacundá, PA-150, km 97, N.S. Fátima comunity, Faz. do Sr. Passarinho, 15.XI.1995, *I.P. Miranda et al 559* (INPA). Oriximiná, Rio Parú do Oeste, Pancada waterfall, 5.IX.1980, *C.A. Cid et al. 2125* (INPA, MG, RB).

Additional material examined: BRAZIL. AMAZONAS: Rio Juruá, IX.1901, *Ule 5853* (MG).

Justicia pseudoamazonica is endemic to Brazil, being listed only for Amazonas and Pará (BFG 2018). It is a species that is seldom collected in Pará state, where is found in forest margins and areas surrounding waterfalls, in shady locations. Flowers from July to October.

Justicia pseudoamazonica was described by Lindau in 1904, based on the material of *Ule 5929* from Rio Juruá, Fortaleza, but the holotype, deposited in herbarium B, was destroyed in the Second World War. Three duplicates of *Ule 5929* were found (G, HBG, MG, K), and we selected the specimem from MG as the lectotype, as it is in good state of preservation and clearly displays the diagnostic characters of this species (See Art. 9.11 by Turland *et al.* 2018).

Justicia pseudoamazonica can be recognised by the subquadrangular branches, with two longitudinal bands of puberulous indument, decussate flowers, 4-lobed calyx, puberulous on both sides (Fig. 13g), and by the appendiculated lower thecae (Fig. 13c). It resembles *J. divergens* in the inflorescences in simple spikes, flowers decussate, lax, however they are markedly different because of the 4-lobed calyx [*vs*. 5-lobed, with one calyx-lobe reduced (4 + 1) in *J. divergens*] (see more comments in *J. divergens*). Lindau (1904), did not described the fruits of *J. pseudoamazonica*, wich is presently described for the first time (Figs. 13e-f; 10e).

Justicia pseudoamazonica was not treated by Graham (1988), however it presents characteris

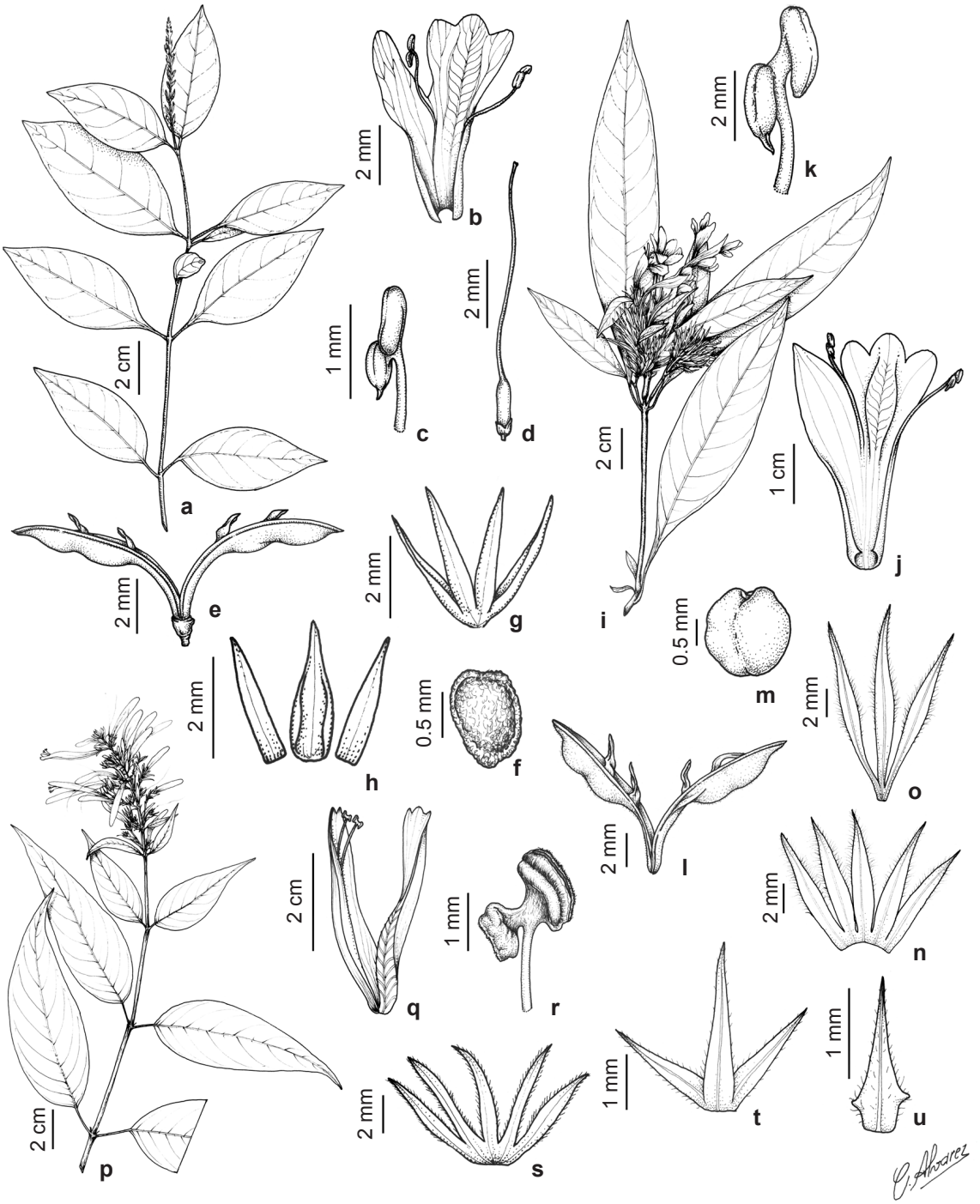

Figure 13 – a-h. *Justicia pseudoamazonica* – a. branch with inflorescence; b. open corolla; c. anther; d. gynoecium; e. capsule; f. seed; g. open calyx; h. bract and bracteoles. i-o. *Justicia riedeliana* – i. branch with inflorescence; j. open corolla; k. anther; l. capsule; m. seeds; n. open calyx; o. bract and bracteoles. p-u. *Justicia secunda* – p. branch with inflorescence; q. open corolla; r. anther; s. open calyx; t. bract and bracteoles; u. sterile bract. (a-h. C.A. Cid *et al*. 2125, MG e Ule 5853, MG; i-o. M.G. Silva & C. Rosário 5381, MG; p-u. F.A. Silva & A. Gil 223, MG).

resembling the species of *J.* section *Dianthera* subsection *Saglorithys* (Rizzini) V.A.W. Graham, with narrowly-triangular bracts, 4-lobed calyx, white corolla, glabrous capsules and compressed, tuberculated seeds. The combination of characters found in *J. pseudoamazonica* were not found in any of the informal clades proposed by Kiel *et al.* (2018).

21. *Justicia riedeliana* (Nees) V.A.W. Graham, Kew Bull. 43(4): 605. 1988. *Simonisia riedeliana* Nees in Mart., *Fl. bras*. 9(7): 145, t. 23. 1847. TYPE: Brazil, "Ribeirão, Rio Madeira", *Riedel 1332* (Lectotype NY00278265 image! designated here; Isolectotypes GZU000250368 image!; US02880507 image!). Figs. 10f; 12e-f; 13i-o

Subshrubs, 50–80 cm tall. Branches erect, cylindrical, slightly sulcate, undilated and sometimes constricted above the nodes, glabrescent to slightly pubescent-strigose. Leaves petiolate, petiole 15–35 mm long, blades 11–18 × 3.5–4.5 cm, lanceolate, oblong, more rarely oblanceolate, apex attenuate, base acute, glabrous on both sides, subrepand margin, not ciliate. Axillary and terminal inflorescences in panicles of spikes, branching twice; flowers decussate, congested; peduncles 0.5–2 cm long; main axis of inflorescence 3–4 cm long, pubescent, eglandular trichomes; bracts not imbricate; sterile bract absent; fertile bract 18–22 × 3–6 mm, eliptical, narrowly-elliptic to lanceolate, sessile, apex acute, glabrous on both sides, sparsely pubescent in the veins, hirsute indument on the margin, long-ciliate, cilia 1–2 mm long; bracteoles 18–20 × 2.7–3.3 mm, linear to narrowly-elliptic, apex acute, glabrous on both sides, sparingly puberulous on the nervuras, hirsute indument on the margin, long-ciliate, cilia 1–2 mm long; calyx 5-lobed, lobes of the same length, 13–15 × 2.8–3 mm, linear to lanceolate, apex attenuate, glabrous on both sides to sparsely puberulous in the veins, pubescent indument on the margin, long-ciliate, cilia c. 1.5 mm long; corolla 45–57 mm long, not personate, wine-pink, tube base 4.5–5 mm long, median third 30–38 mm long, upper lip 11–13 mm long, entire, lower lip 12–15 mm long, central lobe 10–12 × 9–10 mm, lateral lobes 10–12.5 × 5–6 mm; stamens inserted in the apical third of the corolla-tube, free portion of the filaments 17–20 mm long, connective short, upper thecae 1.8–2 mm long, not appendiculated, lower thecae 1.8–2.2 mm long, appendiculated at the base; ovary glabrous; style 33–36 mm long, pubescent, stigma capitated. Capsules 12–15 × c. 5 mm, clavate, adpressed-puberulous with eglandular trichomes; seeds c. 2.5 mm diam., spheroid, smooth, glabrous.

Selected material: Canaã dos Carajás, S11-D, floresta ombrófila densa, 06°23'31"S, 50°19'9"W, 604 m, 23.V.2012, *A.J. Arruda et al. 1177* (BHCB, HCJS, RB). Jacundá, roadside, 5.VII.1949, *G.A. Black 49-7979* (IAN). Marabá, Carajás Serra Norte, 31.V.1983, *M.F.F. Silva et al. 1393* (IAN, INPA, MG). Parauapebas, Sítio of Sr. Juarês, road to VS10, 6.VIII.2013, *L. Tyski 412* (HCJS, MG). São Geraldo do Araguaia, Campo cerrado, morro 3, 15.VI.1995, *M.N. Bastos & M.R. Cordeiro 2141* (IAN, MFS, MG). Tucuruí, road to repartimento, km 25, 5.VI.1980, *M.G. Silva & C. Rosário 5381* (MG, RB).

Occuring in the tropical rainforest plains of the southwestern Amazon basin of Peru, Brazil and extending along the Andes and south to the Amboro National Park in Bolivia (Wasshausen & Wood 2004). In Brazil, it is cited for Amazonas, Pará and Maranhão (BFG 2018). In the study area, the species has been recorded in *terra firme* forest, growing in total shade. It flowers from May to August.

Simonisia riedeliana was described by Nees (1847) based on two different collections: *Riedel 1332*, from Brazil and *Poeppig*, from Peru (syntypes; see Art. 40, Note 1 of Turland *et al.* 2018). Among these syntypes, we chose *Riedel 1332* (NY00278265) as a lectotype, as it clearly displays the diagnostic characters featured in the protologue (See Art. 9.5 e 9.11 by Turland *et al.* 2018).

Justicia riedeliana is characterised by its bracts and bracteoles longer than the calyx-lobes (Fig. 13o) and the hirsute trichomes of the margins of the lobes reaching 1–2 mm length, the rose-wine corolla (Fig. 12f), and by the appendiculated lower thecae (Fig. 13k). It resembles *J. sprucei* due to the inflorescences in panicles of spikes, branching twice and the absence of sterile bracts. However it can be differentiated from *J. sprucei* by the presence of hirsute indument in bracts and bracteoles (*vs.* pubescent indument in bracts and bracteoles in *J. sprucei*), calyx with a long-ciliate margin, trichomes of 1–2 mm long (*vs.* calyx with a short-ciliate margin, trichomes of c. 0.5 mm long in *J. sprucei*), corolla 45–57 mm long, wine-rose (*vs.* corolla 28–35 mm long, light lilac to purple in *J. sprucei*), upper lip of the corolla entire (*vs.* upper lip of the corolla bilobed in *J. sprucei*), and stamens inserted in the apical third of the corolla-tube (*vs.* stamens inserted in the basal third of the corolla-tube in *J. sprucei*). It also bears some resemblance to *J. mcdadeana* (see comments under this species).

According to Graham (1988) *Justicia riedeliana* belongs to *J.* section *Simonisia* due to the red corolla and 5-lobed calyx, with calyx-lobes of equal length. Despite not being sampled by Kiel *et al.* (2018), *J. riedeliana* resembles species of the clade "Core *Simonisia*" due to adpressed-puberulous capsules and subspherical seeds.

22. *Justicia secunda* Vahl, Symb. Bot. 2: 7. 1791. *Rhytiglossa secunda* (Vahl) Nees in A. DC., Prodr. 11: 340. 1847. *Dianthera secunda* (Vahl) Griseb. in Syst. Veg. Karaiben 98. 1857. *Ecbolium secundum* (Vahl) Kuntze in Revis. Gen. Pl. 2: 488. 1891. *Rhacodiscus secundus* (Vahl) Bremek. in Verh. Kon. Ned. Akad. Wetensch. 45: 53. 1948. TYPE: Trinidad, "Insula Trinitatis", *Von Rohr* (Lectotype BM000992606 image! designated here; Isolectotype C10005003 image!).

Figs. 12g-h; 13p-u

Subshrubs, 40–60 cm tall. Branches erect to semi-decumbent, subcylindrical, sulcate, dilated and sometimes constricted above the nodes, glabrous to sparsely puberulous. Leaves petiolate, petiole 15–30 mm long, blades 9–15 × 3.5–5.5 cm, ovate to ovate-lanceolate, apex acute, base rounded to obtuse, glabrous on both sides, sparsely pubescent on the veins, margin entire to subrepandous, sparsely ciliate. Terminal inflorescences in panicles of spikes; flowers alternate, lax; peduncles 1.5–2.5 cm long; main axis of inflorescence 4–7 cm long, pubescent, eglandular trichomes; bracts not imbricate; sterile bract 1.5–1.8 × 0.3–0.4 mm, narrowly-linear, sessile, apex acute, glabrous adaxially, sparsely puberulous abaxially, eglandular trichomes, margin ciliate; fertile bract 2.5–3 × 0.5–0.8 mm, narrowly-triangular to subulate, sessile, apex acute, glabrous adaxially, sparsely puberulous abaxially, eglandular trichomes, margin ciliate; bracteoles 3–3.5 × 0.5–0.8 mm, subulate, apex acute, glabrous adaxially, sparse puberulous abaxially, eglandular trichomes, margin ciliate; calyx 5-lobed, calyx-lobes of equal length, fused before anthesis, 6–7 × 0.8–1.2 mm, linear to lanceolate, apex attenuate, glabrous adaxially, puberulous abaxially, with eglandular and glandular trichomes, margin ciliate; corolla 40–45 mm long, not personate, red with white stripes on the palate, tube base 2.5–3 mm long, median third 6–8 mm long, upper lip 30–32 mm long, bilobed, lobes c. 1 × 1 mm, lower lip 30–32 mm long, central lobe 2.5–3 × 2.2–2.8 mm, lateral lobes 1.8–2 × 1.8–2 mm; stamens inserted in the basal third of the corolla-tube, free portion of the filaments 26–30 mm long, little elongated connective, upper thecae 0.5–0.6 mm long, lower thecae 0.3–0.5 mm long, both not appendiculated to the base; ovary sparsely puberulous with glandular trichomes; style 30–32 mm long, sparsely puberulous, stigma subcapitate. Capsule and seeds not seen.

Complementar description: Capsules 9–12 × 4–5 mm, puberulous; seeds 2.5–3 mm diam., glabrous, slightly rough (Adapted from Wasshausen 2006).

Selected material: Belém, UFRA, access road to várzea, 01°27'42.07"S, 48°26'11.09"W, 11.VIII.2017, *F.A. Silva & A. Gil 223* (MG, SP). Moju, PA-150, km 15, Vila Ateua Grande, 1.X.2016, *R.H. Souza 12* (IAN). Oriximiná, Mineração Rio Norte-Porto Trombetas, 21.VI.1991, *O.H. Knowles 1720* (INPA). São Miguel do Guamá, comunidade Santa Terezinha, 01°01'35"S, 47°39'22"W, *E.C. de Souza 1* (IAN). Santarém, comunidade Novo Lugar, 4.X.2012, *J. Braga 56* (INPA). Soure, Cumunidade de Cajú-Uma, 00°40'03"S, 48°30'27"W, 10.IX.2013, *T.T. Rocha 270* (MFS). Vigia, bairro Castanheira, 56°42'84"S, 48°06'00"W, 1.II.2018, *U.O. Mesquita 69* (MFS).

Justicia secunda is recorded for the Lesser Antilles, Guyana, Colombia and Venezuela (Wasshausen 2006). In Brazil, it is cited for Acre, Rondônia, Amazonas and Pará (BFG 2018). All the collections consulted are from cultivated material, it grows both in shaded and sunny places. It flowers from February to October.

Justicia secunda was described in 1791 by Vahl based on the collection of *Von Rohr* from Trinidad. Corresponding material was located at the BM and C herbaria. The material of *Von Rohr* (BM000992606) is being designated here as the lectotype of *J. secunda* as it clearly exhibits the diagnostic characters described in the protologue (See Art. 9.5 and 9.11 by Turland *et al.* 2018).

Justicia secunda is characterized mainly by lax terminal inflorescence in panicles of spikes (Fig. 12g), red corollas with white stripes on the palate and by the stamens inserted in the basal third of the corolla-tube. It may be confused with *J. calycina* (see characters for differentiation under the comments for this species). It vaguely resembles *J. sphaerosperma* (see comments under this species). The collections consulted that were named as *J. secunda* were in mainly misidentifications of *J. calycina*.

Justicia secunda, according to Graham (1988), belongs to *J.* section *Plagiacanthus*, mainly due to its 5-lobed calyx, with lobes of the same length and the red corolla. The set of external

morphological characteristics could not place this species in any of the informal clades proposed by Kiel *et al.* (2018).

23. *Justicia sphaerosperma* Vahl, Symb. Bot. 2: 3. 1791. *Adhatoda sphaerosperma* (Vahl) Nees in A. DC., Prodr. 11: 409. 1847. *Beloperone sphaerosperma* (Vahl) B.D. Jacks. in Ind. Kew. 1: 290. 1893. TYPE: "Caribe", *Forsyth* (Holotype C10005005 image!). Figs. 10g; 12i-j; 14a-h

Subshrubs, 50–70 cm tall. Branches semidecumbent, subquadrangular, sulcate, undilated and not constricted above the nodes, glabrescent to sparsely puberulous. Leaves petiolate, petiole 3–6 mm long, blades 7.5–10 × 0.6–1.7 cm, narrowly-lanceolate, narrowly-elliptic to rarely linear, apex acute, base acute to cuneate, glabrous to sparsely puberulous on the margin on both sides, margin entire, sparsely ciliate. Axillary and terminal inflorescences in panicles of spikes, branching once; flowers alternate, congested; peduncles 0.2–0.4 cm long, main axis of the inflorescence 1.5–7 cm long, pubescent, eglandular trichomes; bracts not imbricate; sterile bract 7–9.5 × 0.5–0.7 mm, subulate, sessile, apex acute, pubescent on both sides, eglandular trichomes and glandular trichomes sparse abaxially, margin ciliate; fertile bract 10–15 × 1–1.5 mm, narrowly-elliptic to linear, sessile, apex acute, pubescent on both sides, eglandular trichomes and glandular trichomes sparse abaxially, margin ciliate; bracteoles 7–12 × 1–1.5 mm, narrowly-elliptic to linear, apex acute, pubescent on both sides, with eglandular trichomes and glandular trichomes abaxially sparse, margin ciliate; calyx 5-lobed, calyx-lobes of equal length, 3–12 × 0.5–1 mm, linear to narrowly-triangular, apex acute, glabrous adaxially, sparsely pubescent abaxially, eglandular trichomes, margin ciliate; corolla 33–41 mm long, not personate, red with white spots on the palate, base of the tube 3–3.5 mm long, median third 15–20 mm long, upper lip 13–16 mm long, bilobed, lobes c. 0.5 × 0.5 mm, lower lip 12–18 mm long., central lobe 7–8.5 × 2.5–2.8 mm, lateral lobes 7–8.5 × 2–2.2 mm; stamens inserted in the median third of the corolla-tube, free portion of the filaments 12–14 mm long, connective short, upper thecae 2–2.3 mm long, not appendiculated, lower thecae 2–2.5 mm long, appendiculated at the base; ovary glabrous; style 20–23 mm long, pubescent, stigma subcapitated. Capsules 14–17 × c. 6.5 mm, clavate, puberulous with eglandular trichomes; seeds c. 2.5 mm diam., spheroid, smooth, glabrous.

Selected material: Altamira, Rio Xingu, 17.VIII.1986, *A.T.G. Dias et al. 17* (MG). Itaituba, Alto do Tapajós, Rio Cururú, 16.VII.1959, *W.A. Egler 910* (MG). São Domingos do Capim, Rio capim, 02°20'S, 47°45'W, 3.VII.1974, *P. Cavalcante 2957* (MG). Vitória do Xingu, Sítio Belo Monte, 9.VII.2012, *C. Faveri 538* (MG). Marabá, Rio Tocantins, Ilha de Praia, 26.VI.1949, *R.L. Fróes & G.A. Black 24668* (IAN).

Additional material examined: BRAZIL. MARANHÃO: Rio de Pedreira, Arary, capoeirão, 23.VI.1909, *F.Q. Lima* (MG2289). CEARÁ, Fortaleza, 6.VII.1960, *L. Almeida* (SPF71146).

Justicia sphaerosperma occurs in the Amazonian regions of Colombia, Venezuelan, Guyana, Ecuador, Bolivia and Brazil (Wasshausen 2006). In Brazil, it has been listed for Pará, Amazonas (*P. Acevedo-Rodríguez 8183* NY01060036 image!), Maranhão (*F.Q. Lima* MG2289) and Ceará (*L. Almeida* SPF71146). In the study area it occurs in swampy fields along rivers and in partially shaded areas. It fruits and flowers from March to August.

Traditionally *J. sphaerosperma* had been treated as *Justicia schomburgkiana* (Nees) V.A.W. Graham in various floras (*e.g.*, Wasshausen & Wood 2004; Wasshausen 1995), but recently it was synonymized in *J. sphaerosperma* by Wasshausen (2013), in Flora of Ecuador. In the present study, after a thorough analysis of the nomenclatural types of both names it became evident that Wasshausen (2013) position is correct and that these names are conspecific.

Justicia sphaerosperma is characterized mainly by narrowly-lanceolate to narrowly-elliptic leaf-blades (Fig. 14a), inflorescences in panicles of spikes, branching once, flowers alternate, congested, and corolla red. It resembles *J. calycina* and *J. secunda* because of the red corolla, but these latter species have subcylindrical branches (*vs.* subquadrangular in *J. sphaerosperma*), inflorescences in lax spikes (*vs.* congested spikes in *J. sphaerosperma*) and compressed seeds [*vs.* spheroid seeds (Fig. 10g) in *J. sphaerosperma*].

According to Graham (1988) *Justicia sphaerosperma* belongs to *J.* section *Simonisia*, characterised by the red corolla and by the bracts that exceed the length of the calyx lobes. According to Kiel *et al.* (2018), *J. sphaerosperma* (treated as *Justicia schomburgkiana*) belongs to the clade "Core *Simonisia*", characterised mainly by the clavate puberulous capsules and smooth spherical seeds.

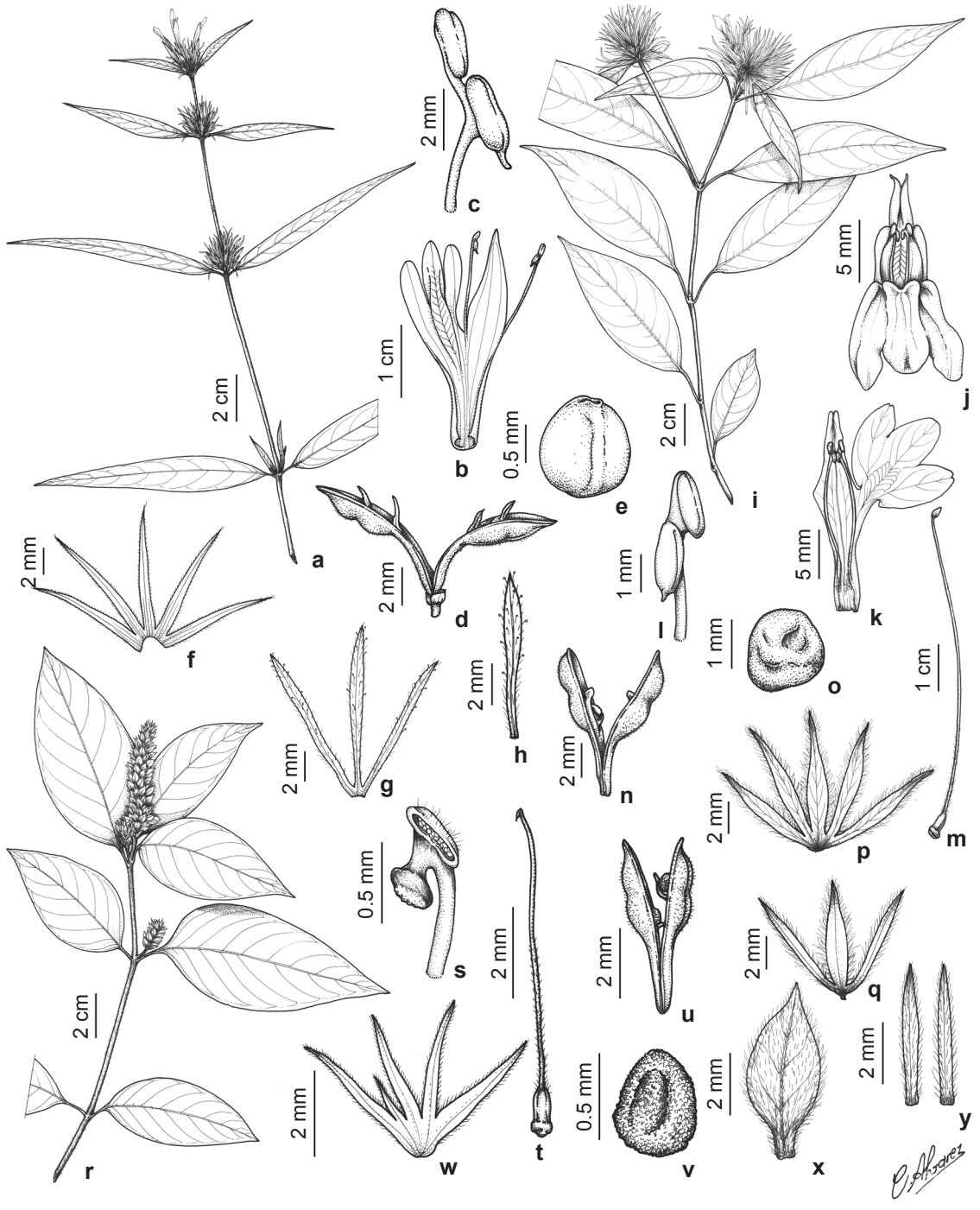

Figure 14 – a-h. *Justicia sphaerosperma* – a. branch with inflorescence; b. open corolla; c. anther; d. capsule; e. seed; f. open calyx; g. bract and bracteoles; h. sterile bract. i-q. *Justicia sprucei* – i. branch with inflorescence; j. frontal view of corolla; k. open corolla; l. anther; m. gynoecium; n. capsule; o. seed; p. Open calyx; q. bract and bracteoles. r-y. *Justicia yurimaguensis* – r. branch with inflorescence; s. anther; t. gynoecium; u. capsule; v. seed; w. open calyx; x. fertile bract; y. bracteoles. (a-h. R.L. Fróes & J.M. Pires 24094, RB e R.L. Fróes & G.A. Black 24668, IAN; i-q. A. Ducke s.n. MG2891; r-y. H.T. Beck *et al*. 123, MG).

24. *Justicia sprucei* V.A.W. Graham, Kew Bull. 43(4): 605. 1988. *Chaetochlamys ciliata* Lindau, Bull. Herb. Boiss., ser. I, 5: 677. 1897. not *Justicia ciliata* Jacq, Hort. Bot. Vindob. 2, 47, t. 104. 1772. TYPE: Brazil "In vicinibus Santarem, Prov. Pará", Aug. 1850, *Spruce* (Holotype B, destr.; Lectotype K000529280 image!; Isolectotypes BM000992629 image!, E00132480 image!, MG! and NY311860 image!; designated by Wasshausen & Wood 2004). Figs. 10h; 12k-l; 14i-q

Subshrubs, 30–90 cm tall. Branches erect to semidecumbent, cylindrical, sulcate, slightly dilated and sometimes constricted above the nodes, glabrescent to pubescent-strigose. Leaves petiolate, petiole 5–13.5 mm long, blades 4.5–11(–18) × 1.5–6 cm, lanceolate to oblong, apex acuminate, base attenuate to current, glabrous on both sides, margin entire to subrepandous, sparsely ciliate. Axillary and terminal inflorescences in panicles of spikes, branching twice; flowers decussate, congested; peduncles 0.3–0.5 cm long; main inflorescence axis 2.5–3 cm long, pubescent, eglandular trichomes; bracts not imbricate; sterile bract absent; fertile bract 10–20 × 2.5–4 mm, lanceolate to narrowly-elliptic, sessile, apex attenuate, glabrous adaxially, pubescent abaxially, margin long-ciliate, cilia 0.5–1 mm long; bracteoles 10–15 × 0.8–1.2 mm, lanceolate to narrowly-elliptic, apex attenuate, glabrous adaxially, pubescent abaxially, margin long-ciliate, cilia 0.5–1 mm long; calyx 5-lobed, lobes of equal length, 12–14 × 1–1.8 mm, lanceolate to linear, apex acute, glabrous adaxially, pubescent abaxially, margin short-ciliate, cilia c. 0.5 mm long; corolla 28–35 mm long, not personate, pale lilac to purple with white spots on the palate, tube base 3.5–4 mm long, median third 11–15 mm long, upper lip 5.5–7 mm long, bilobed, lobes c. 0.3 × 0.4 mm, lower lip 6.5–8 mm long, central lobe 4.5–7 × 3–6 mm, lateral lobes 5–7 × 3–4.5 mm; stamens inserted in the basal third of the corolla-tube, free potion of the filaments 6–13.5 mm long, connective short, upper thecae 2–2.5 mm long, not appendiculated, lower thecae 2.5–2.8 mm long, appendiculated at the base; ovary glabrous; style 27.5–30 mm long, puberulous, stigma subcapited. Capsules 13–15 × c. 4 mm, clavates, puberulous with eglandular trichomes; seeds c. 3 mm diam., spheroid, smooth, glabrous.

Selected material: Belterra, Mata, 25.VII.1947, *G.A. Black 47-1092* (IAN). Juruti, Barroso road, area explored by loggers, 10.VIII.2007, *I.L. Amaral et al. 3105* (INPA). Marabá, comunidade Pau Seco, 05°04'43"S, 49°04'52"W, 24.X.1995, *D. Mitja 2801* (INPA). Óbidos, Curuçambá, próximo ao igarapé, 21.V.1957, *P. Cavalcante 82* (MG). Oriximiná, estrada do BEC, km 70, próximo ao Rio Cuminá-Mirim, 14.IX.1980, *C.A. Cid et al. 2547* (MG). Parauapebas, N3, 06°01'44"S, 50°12'07"W, 656 m, 21.IV.2012, *A.J. Arruda et al. 1012* (BHCB, HCJS, RB). Tucuruí, Porto da fazenda Guaripé, right shore of Rio Caripé, 12.V.1980, *N.A. Rosa 3663* (MG).

Justicia sprucei occurs in French Guiana, Peru and Bolivia (Wasshausen 2006). In Brazil, it is cited for Acre, Rondônia and Pará (BFG 2018). In the study area, it grows in *campo rupestre* and in forest formations near the banks of rivers, in partially shaded places.

Justicia sprucei is characterised by axilary and terminal inflorescences in panicles of spikes, branching twice, bracteoles of similar length of the calyx-lobes, a pale lilac to purple corolla with white spots on the palate (Fig. 12l), clavate puberulous capsules (Fig. 14n), and spheroid glabrous seeds (Fig. 10h). During this taxonomic treatment, some morphological differences were observed between specimens from Serra dos Carajás and collections from other localities in Pará. The specimens from the Carajás have smaller structures (*e.g.*, leaves, bracts, bracteoles, and calyx), however this did not justify their seggregation into a new taxon. *Justicia sprucei* resembles morphologically *J. riedeliana* (see comments under the latter species).

According to Graham (1988) *Justicia sprucei* belongs to *J.* section *Simonisia*, mainly due to the purple corolla, lanceolate bracts that exceed the length of the 5-lobed calyx, and all calyx-lobes of equal length. According to Kiel *et al.* (2018) *J. sprucei* belongs to the clade "Core *Simonisia*", which has clavate, puberulous capsules and spherical seeds as its most noteworthy characteristics.

25. *Justicia yurimaguensis* Lindau, Bull. Herb. Boiss., ser. II, 4: 411. 1904. TYPE: Peru "Loreto prope Yurimaguas in paludibus", Aug 1902, *Ule 6877* (Holotype B, destr.; Lectotype HBG522715 image!; designated by Wasshausen & Wood 2004). Figs. 10i; 14r-y

Subshrubs. Branches erect, subcylindrical, not sulcate, dilated and not constricted above the nodes, sericeous. Leaves variegated, petiolate, petiole 5–10 mm long, blades 8.2–11.5 × 4–5.4 cm, ovate, apex cuspidate, base rounded to subattenuate, pubescent on both sides, margin ciliate. Axillary and terminal inflorescences in simple spikes;

flowers decussate, congested; peduncles 0.3–0.5 cm long; main axis of inflorescence 2–6 cm long, sericeous, eglandular trichomes; imbricate bracts; sterile bract absent; fertile bract 6.5–9 × 3–4 mm, ovate, sessile, apex cuspidated, glabrous adaxially, pubescent abaxially, eglandular trichomes, margin ciliate; bracteoles 5–6.5 × 0.8–1 mm, linear to lanceolate, apex acute, glabrous adaxially, pubescent abaxially, eglandular trichomes, margin ciliate; calyx 5-lobed, 4 lobes of the same lenth and one reduced (4 + 1), the largest 2–3 × c. 0.4 mm, the smallest 0.8–1 × c. 0.1 mm, larger narrowly-triangular lobes, smaller lobe subulate, apex acute, glabrous adaxially, pubescent abaxially, eglandular trichomes, margin ciliate; corolla personate, white with purple stripes on the palate; stamens inserted in the median third of the corolla-tube, free portion of the filaments 2.7–3 mm long, little elongated connective, upper thecae 0.4–0.5 mm long, lower thecae 0.3–0.4 mm long, all not appendiculated at the base; ovary glabrous; style 7–8 mm long, pubescent, stigma subcapitated. Capsules 6–6.3 × c. 1 mm, panduriform, pubescent-strigose, with eglandular trichomes; seeds 0.3–0.4 × c. 0.3 mm, compressed, oblong, tuberculadas, glabrous.

Complementar description: 50–120 cm tall. Corolla with a tube c. 6 mm long, basally c. 2 mm wide, apically c. 3 mm wide, upper lip c. 4 × 3 mm, wrinkled in the inside, lower lip c. 5 × 5 mm, lateral lobes c. 1 × 1 mm, central lobe c. 1 × 2 mm (Adapted from Wasshausen & Wood 2004). **Material examined**: Estação Ecológica de Jari, 14.10.1987, *H.T. Beck et al. 123* (INPA, MG).

Justicia yurimaguensis is an Amazonian species with records in Peru and Bolivia (Wasshausen & Wood 2004). In Brazil, it is cited for Acre and Rondônia (BFG 2018). In the present study, it is highlighted as the first record for the state of Pará, being rare in the region, with a single record at the Estação Ecológica do Jari. It inhabits the margins of terra firme forest trails and was recorded with flowers and fruits in October.

Justicia yurimaguensis can be recognised by its sericeous branches and central axis of the inflorescence, leaf-blades variegated, ovate, pubescent on both sides, a unique feature among the species in the study area. It resembles *J. potamogeton* due to the axillary and terminal inflorescence in simple spikes, congested and with decussate flowers, being easily differentiated by the variegated leaves (*vs*. non-variegated in *J. potamogeton*) (more comments under *J. potamogeton*).

Justicia yurimaguensis was not treated by Graham (1988), however it is morphologically similar to species from *J.* section *Dianthera* subsection *Strobiloglossa* and also species of the clade "DSP2C: *J.* section *Dianthera* subsection *Strobiloglossa*" according to Kiel *et al.* (2018) mainly due to its white corolla and ovate bracts which exceed the length of the 5-lobed calyx, where one calyx-lobe is significantly reduced.

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