

Research article

Checklist and a new species of *Lippia* (Verbenaceae) from the Diamantina Plateau, Minas Gerais, Brazil

Pedro Henrique CARDOSO^{1,*}, Luiz MENINI NETO²,
Marcelo TROVÓ³ & Fátima Regina Gonçalves SALIMENA⁴

¹ Universidade Federal do Rio de Janeiro, Museu Nacional, Departamento de Botânica,
Quinta da Boa Vista, CEP 20940-040, Rio de Janeiro, RJ, Brazil.

^{2,4} Universidade Federal de Juiz de Fora, Instituto de Ciências Biológicas, Departamento de Botânica,
Herbário Leopoldo Krieger, CEP 36036-900, Juiz de Fora, MG, Brazil.

³ Universidade Federal do Rio de Janeiro, Instituto de Biologia, Departamento de Botânica,
Av. Carlos Chagas Filho 373, CEP 21941-590, Rio de Janeiro, RJ, Brazil.

*Corresponding author: pedrocardoso@ufrj.br

² Email: menini.neto@gmail.com

³ Email: martrovo@gmail.com

⁴ Email: frsalimena@gmail.com

¹  <https://orcid.org/0000-0002-6198-6729>

²  <https://orcid.org/0000-0001-8750-2422>

³  <https://orcid.org/0000-0002-0478-2332>

⁴  <https://orcid.org/0000-0002-9000-4683>

Abstract. The Diamantina Plateau is located in the central region of the Espinhaço Range, in the State of Minas Gerais, which is dominated by campo rupestre formations. We describe a new species of *Lippia* L., endemic to the Diamantina Plateau, and provide an annotated checklist and identification key for the 17 species of the genus occurring in the area. *Lippia raoniana* P.H.Cardoso & Salimena sp. nov. is mainly distinguished by its ovate leaves with adaxial and abaxial surfaces densely covered by sessile glandular trichomes, and drupaceous fruits with two pyrenes. It is known only from two populations, and thus can be provisionally considered as Critically Endangered. Details on the species' ecology, as well as a comparison with morphologically similar species, a distribution map, and field photographs, are provided. In this work, we also present pictures of the 17 species in their habitats, and we hope that these illustrations will help in the identification and conservation of these taxa.

Keywords. Endangered species, endemism, Espinhaço Range, Lamiales, Lantaneae.

Cardoso P.H., Menini Neto L., Trovó M. & Salimena F.R.G. 2021. Checklist and a new species of *Lippia* (Verbenaceae) from the Diamantina Plateau, Minas Gerais, Brazil. *European Journal of Taxonomy* 733: 42–55. <https://doi.org/10.5852/ejt.2021.733.1219>

Introduction

The flowering plant genus *Lippia* L. is a member of the tribe Lantaneae Endl. in the vervain family (Verbenaceae J.St.-Hil.). It contains approximately 120 species of perennial herbs, shrubs and subshrubs, often aromatic, native to tropical regions of the Americas and Africa (Atkins 2004; Marx *et al.* 2010). The genus is difficult to distinguish from *Lantana* L., given that the two genera are segregated by the fruit morphology only. Chamisso (1832) characterized *Lippia* by the presence of schizocarpic fruits bearing two cluses or drupaceous fruits with two pyrenes. Schauer (1847) assigned species with drupes to *Lantana* and species with schizocarps to *Lippia*. Finally, Silva & Salimena (2002) redelimited *Lantana* and reestablished the circumscription proposed by Chamisso (1832) to include only species with monoplyrenous drupes.

The relationship between *Lippia* and *Lantana* is subject to a continuous taxonomic discussion and several delimitations have previously been proposed (Chamisso 1832; Schauer 1847; Troncoso 1974; Silva 1999; Sanders 2001; Silva & Salimena 2002; Atkins 2004). Phylogenetic analyses indicate that neither genus is monophyletic and both must be recircumscribed (Lu-Irving & Olmstead 2013), but an updated classification is yet to be published.

The highest species richness in *Lippia* is concentrated in Brazil, with ca 90 species (Salimena & Cardoso 2020; Cardoso *et al.* 2019b, 2019c, 2020b). The majority of these occur in the Espinhaço Range (Salimena *et al.* 2009), which extends for over 1000 km, north to south, from the State of Bahia to the State of Minas Gerais. The region is characterized primarily by its quartzite rocky outcrops (i.e., campos rupestres), with elevations reaching 2000 m (Almeida-Abreu 1995; Giuletta *et al.* 1997; Gontijo 2008).

The Diamantina Plateau, located in the mid-southern region of the Espinhaço Range, Minas Gerais State, is bounded north from the Serra do Cipó and south from Grão Mogol (Gonçalves *et al.* 2017). It represents the highest plane surface (King 1956), and the watershed between the São Francisco and Jequitinhonha River basins along the N/S axis. The Diamantina Plateau is considered one of the most important centres of plant diversity and endemism in the Espinhaço Range (Giuletta *et al.* 1997; Echternacht *et al.* 2011). It is included in the Espinhaço Range Biosphere Reserve (UNESCO 2005), situated between the Cerrado and the Atlantic Forest domains, two global hotspots of biodiversity and conservation priorities (Myers *et al.* 2000).

Ongoing taxonomic studies on Verbenaceae for the “Flora do Brasil 2020” project (<http://floradobrasil.jbrj.gov.br/>), with extensive analyses of herbarium specimens and fieldwork, allowed the recognition of a new species of *Lippia*. This new species appears endemic to the Diamantina Plateau in the Espinhaço Range, State of Minas Gerais, and is described and illustrated in the present study. Furthermore, we provide an annotated checklist, identification key, and pictures of the species of *Lippia* in the Diamantina Plateau, with the aim of increasing our knowledge of the local flora, which is essential for conservation purposes.

Material and methods

Collections of the new species deposited in the herbaria CESJ, ICN, RB and SPF (acronyms of herbaria follow Index Herbariorum (Thiers, continuously updated)) were examined and field expeditions were conducted to observe individuals in their natural habitat. Morphological terminology follows Radford *et al.* (1974), Harris & Harris (2003), and Gonçalves & Lorenzi (2007). Conservation status is in accordance with the IUCN (2019) criteria; the area of occupancy (AOO) is based on 2 × 2 km grids. The geographical distribution map was prepared using QGIS ver. 3.8 (QGIS Development Team 2018). An identification key to the species of *Lippia* from the Diamantina Plateau was elaborated by consulting the type specimen images available at Global Plants on JSTOR (<https://plants.jstor.org/>) and collections

available from BR, CESJ, F, G, HAL, K, M, MBML, P, R, RB, SP, SPF, VIC and W as well as several herbaria at Herbario Virtual Refflora (reflora.jbrj.gov.br/). Species' distribution records were obtained from the herbaria consulted and followed the delimitation of the Diamantina Plateau proposed by Gonçalves *et al.* (2017). This delimitation differs from the one proposed by Rapini *et al.* (2002) since it excludes the Serra do Cabral. This location is separated from the remaining Espinhaço Range by the geological depression, which is drained by the Jequitai and Curimatai Rivers (Saadi 1995).

Results

Taxonomic treatment

Class Magnoliopsida Brongn.
Order Lamiales Bromhead
Family Verbenaceae J.St.-Hil.
Genus *Lippia* L.

Lippia raoniana P.H.Cardoso & Salimena sp. nov.

urn:lsid:ipni.org:names:77214745-1

Figs 1, 4 B–C

Diagnosis

The new species is similar to *Lippia spiraeastrum* (Mart. & Schauer) T.R.S.Silva, but differs by ovate leaves (vs oblong or oblong-elliptic), slightly discoloured (vs strongly discoloured), matte adaxial surface (vs shiny), glandular abaxial surface (vs tomentose-glandular), shorter peduncle (0.8–1.3 vs 3.2–10.5 cm long) and slender (vs thick), ovate bracts (vs lanceolate).

Etymology

The specific epithet is in homage to Raoni Metuktire, an important indigenous leader of Brazil, internationally known as a symbol of environmental preservation. Raoni is dedicated to the fight for the rights of native indigenous people and conservation of the tropical forest, mainly Amazonia. His legacy is a symbol of the daily struggle for Brazilian biodiversity, constantly threatened.

Material examined

Type

BRAZIL – Minas Gerais • Serro, “próximo ao Km 1 do distrito de Milho Verde” [near to Km 1 of the Milho Verde district]; 18°27'35.1" S, 43°29'24.4" W; 13 Feb. 2020; fl/fr; F.R.G. Salimena & P.H. Nobre 4057; holotype: CESJ; isotypes: HUEFS, RB, SPF.

Paratypes

BRAZIL – Minas Gerais • Felício dos Santos, “APA Municipal Felício” [Municipal Environmental Protection Area Felício]; 10 Jun. 2006; fl/fr; F.R.G. Salimena *et al.* 1382; CESJ • Serro, “estrada Diamantina para o distrito de Milho Verde” [road from Diamantina to the Milho Verde district]; 16 Nov. 2010; fl/fr; V. Thode, P. Lu-Irving, N. Mota, M. Toledo 386; CESJ, ICN.

Description

Shrub 1.5 m tall, aromatic, branched, branches erect, tetragonal, sulcate, glabrescent to strigose, with sessile glandular trichomes, nodes conspicuous. Leaves decussate, patent, congested at the stem apices, petioles 2.2–6 mm long, cylindrical, strigose, with abundant sessile glandular trichomes; blades 1.5–3 × 0.8–1.5 cm, chartaceous, ovate, slightly discoloured, apex acute to obtuse, base cuneate, decurrent into the petiole, margin basally entire, crenate to serrate toward the apex, ciliate, slightly revolute, adaxial

surface matte, sparsely strigose, densely covered by sessile glandular trichomes, abaxial surface densely covered by sessile glandular trichomes, strigose along the veins. Inflorescence one per axil, 0.5–1 cm long, capituliform, hemispherical, rachis not elongated in the infructescence, peduncle 0.8–1.3 cm long, cylindrical, slender, strigose, with abundant sessile glandular trichomes; bracts 3–5 mm long, green, spirally arranged, ovate, apex acute to obtuse, margin ciliate, adaxial surface strigose, covered by sessile



Fig. 1. *Lippia raoniana* P.H.Cardoso & Salimena sp. nov. **A.** Habit. **B–C.** Branch with inflorescence. **D.** Inflorescence frontal view. **E–G.** Drupaceous fruit. **E.** Overview. **F.** Longitudinal section showing two pyrenes. **G.** Cross section showing two pyrenes and seeds. Scale bars: E–G = 1 mm. Photos: A–D by Pedro Henrique Nobre; E–G by Nádia Silvia Somavilla.

glandular trichomes, abaxial surface densely covered by sessile glandular trichomes; calyx 1–2 mm long, tubular, 2-lobed, apex 4-toothed, externally hirsute, ciliate, with abundant glandular sessile trichomes; corolla tube 6–8 mm long, limb 2-labiate, lilac, hypocrateriform, externally pubescent, with abundant glandular sessile trichomes, throat yellow, pubescent, 4 didynamous stamens, inserted at the middle of the corolla tube, included, thecae parallel; ovary 1 mm long, ovoid, glabrous, 2-locular, 1 ovule per locule, stigma oblique, lateral. Fruit drupaceous, mesocarp dry, 2-pyrenate, 2 mm long, spherical, light-brown, dorsal surface smooth to slightly striated, surrounded by the persistent calyx.

Distribution, habitat and phenology

Lippia raoniana P.H.Cardoso & Salimena sp. nov. is known only from two localities in the Diamantina Plateau (Felício dos Santos and Serro), on the Espinhaço Range, Minas Gerais, Brazil, where it seems to be endemic (Fig. 2). The populations are quite small and grow on quartzitic rock outcrops (campos rupestres), at an elevation of 1200–1400 m. Plants were collected with flowers and fruits in January, June, and November.

Preliminary conservation status

Lippia raoniana P.H.Cardoso & Salimena sp. nov. is only known from two localities, presenting an estimated Area of Occupation (AOO) smaller than 10 km². The first known population is small and located in the municipality of Serro, along an unpaved road, near to a residential area under urban pressure. The other population is recorded from the municipality of Felício dos Santos, inside a conservation unit. The Diamantina Plateau is now witnessing increasing, uncontrolled tourism, exposing the vulnerability of

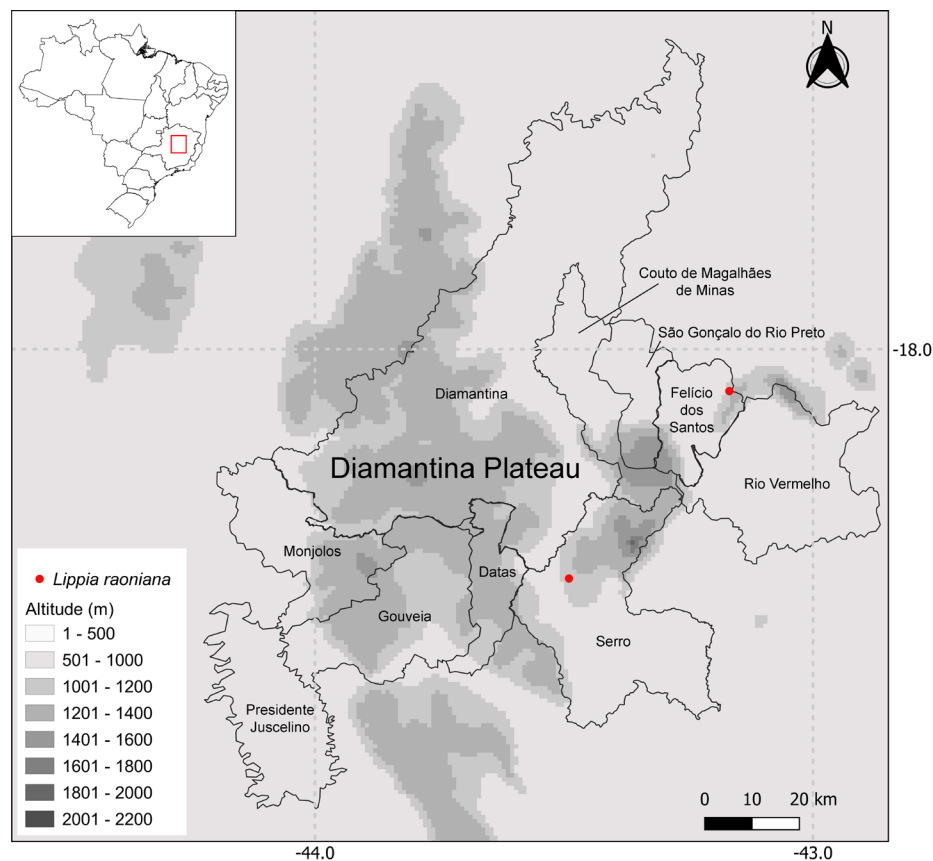


Fig. 2. Map of the Diamantina Plateau, Minas Gerais, Brazil, showing the known distribution of *Lippia raoniana* P.H.Cardoso & Salimena sp. nov.

its soils and vegetation (Schaefer *et al.* 2002). Thus, *L. raoniana* sp. nov. may be considered Critically Endangered (CR) based on criteria and sub-criteria B2ab(ii, iii, iv) of IUCN (2019), due to its restricted AOO, number of known locations, and the continuous decline in the quality of its habitat.

Notes

Lippia raoniana P.H.Cardoso & Salimena sp. nov. most closely resembles *L. spiraeastrum*, which is also endemic to the Espinhaço Range, occurring in Grão Mogol, Minas Gerais State (Salimena & Cardoso 2020), due to the shrubby habit, conspicuous nodes, leaves concentrated in the upper portion of the stem, adaxial surface glandular, axillary inflorescences, capituliform, hemispherical, corolla lilac, and fruit with dry mesocarp, 2-pyrenate. However, several characters of the leaves, peduncles and bracts can be used to distinguish them. The new species is mainly characterized by the combination of ovate leaves with adaxial and abaxial surfaces densely covered by sessile glandular trichomes, peduncles 0.8–1.3 cm long, and ovate bracts with adaxial and abaxial surfaces densely covered by sessile glandular trichomes.

Identification key to the species of *Lippia* L. from the Diamantina Plateau, Minas Gerais, Brazil

1. Inflorescences more than 2 per leaf axil; bracts tetrastichous, the basal ones connate 2
 - Inflorescence 1 per leaf axil; bracts spiraled, all free 3
2. Plants with frondose-bracteose inflorescences *L. stachyoides* Cham.
 - Plants with frondose inflorescences *L. origanoides* Kunth
3. Calyx laterally flattened, 2-winged. *L. rubella* (Moldenke) T.R.S.Silva & Salimena
 - Calyx tubular-cylindric, not winged. 4
4. Leaves with hypodromous venation; corolla yellow *L. filifolia* Mart. & Schauer
 - Leaves with pinnate venation; corolla pink, lilac, rarely white 5
5. Bracts membranous, pink to magenta, rarely green at base and vinaceous at apex, longer than the corolla tube 6
 - Bracts foliaceous, green, rarely vinaceous at apex, shorter than the corolla tube 10
6. Leaf-blades abaxially densely pubescent with pedunculate glandular trichomes; bracts green at base, vinaceous at apex *L. pseudothea* (A.St.-Hil.) Schauer
 - Leaf-blades abaxially lacking pedunculate glandular trichomes; bracts pink to magenta 7
7. Leaves ovate-deltoid to suborbicular, margin dentate-lobate *L. hederifolia* Mart. & Schauer
 - Leaves ovate, broadly ovate or elliptic, margin crenate 8
8. Branches densely velutinous, pedunculate glandular trichomes present; leaves ovate-elliptic to oblong-elliptic *L. rhodocnemis* Mart. & Schauer
 - Branches hirsute or pubescent, pedunculate glandular trichomes absent; leaves ovate to broadly ovate 9
9. Branches and peduncles pubescent; inflorescences hemispheric or cylindric
 - *L. diamantinensis* Glaz. ex Moldenke
 - Branches and peduncles hirsute; inflorescences globose *L. lupulina* Cham.
10. Corymbs axillary, densely congested at the apex of the branches 11
 - Spikes axillary, not congested at the apex of the branches 13

11. Leaf-blades abaxially hirsute, adaxially bullate; bracts elliptic, apex reflexed
.....*L. corymbosa* Cham.
– Leaf-blades abaxially tomentose, adaxially slightly bullate; bracts ovate-lanceolate, apex straight .
..... 12
12. Leaves ovate, base cordate *L. lacunosa* Mart. & Schauer
– Leaves ovate-orbicular or orbicular, base obtuse to cuneate *L. rotundifolia* Cham.
13. Leaves congested at the apex of the branch, with few tector trichomes; drupe with 2 pyrenes
..... *L. raoniana* P.H.Cardoso & Salimena sp. nov.
– Leaves evenly distributed along the branch, with several tector trichomes; schizocarp with 2
cluses 14
14. Leaves obovate to suborbicular; inflorescences few-flowered *L. hermannioides* Cham.
– Leaves ovate to ovate-elliptic; inflorescences many-flowered 15
15. Branches sulcate, nodes conspicuous; bracts elliptic *L. subracemosa* Mansf.
– Branches not sulcate, nodes inconspicuous; bracts ovate or lanceolate 16
16. Branches villous-sericeous; leaves ovate-deltate, abaxially villous-sericeous; bracts lanceolate
..... *L. krenakiana* P.H.Cardoso, V.I.R.Valério & Salimena
– Branches strigose; leaves elliptic to ovate-elliptic, adaxially strigose; bracts broadly ovate
..... *L. rosella* Moldenke

Discussion

Our floristic knowledge of *Lippia* in the State of Minas Gerais has gradually increased in recent years thanks to studies focusing on the Verbenaceae of small areas in the state (e.g., Salimena-Pires & Giuliatti 1998; Salimena & Silva 2009; Cruz & Salimena 2017; Cardoso *et al.* 2018, 2019a, 2019d, 2020a; Santiago *et al.* 2020). These studies have revealed new distribution records (Cardoso *et al.* 2019a), and in some cases, new species (Cardoso *et al.* 2019c, 2020b). It is not surprising that the Diamantina Plateau harbors some yet undescribed species of *Lippia*, since the region is ultimately considered one of the main diversity and endemism centres in the Espinhaço Range (Giuliatti *et al.* 1997; Echternacht *et al.* 2011). The recent discovery of *Lippia raoniana* P.H.Cardoso & Salimena sp. nov. and *L. krenakiana* P.H.Cardoso, V.I.R.Valério & Salimena in the Diamantina Plateau (Cardoso *et al.* 2020b) added to the understanding of ongoing threats to which the flora of the Espinhaço Range is subjected (Martinelli & Moraes 2013; Martinelli *et al.* 2014), emphasizing the need of further taxonomic studies in *Lippia*. Thus, we present an annotated checklist of the species of *Lippia* from the area (Table 1). It is important to emphasize that all are found in campos rupestres. In addition, we also provide photographs and an identification key for the 17 species currently recognized in the region (Figs 3–4). This study improves our understanding of species diversity and distributions, and will aid the proposal of new conservation measures for the Espinhaço Range.

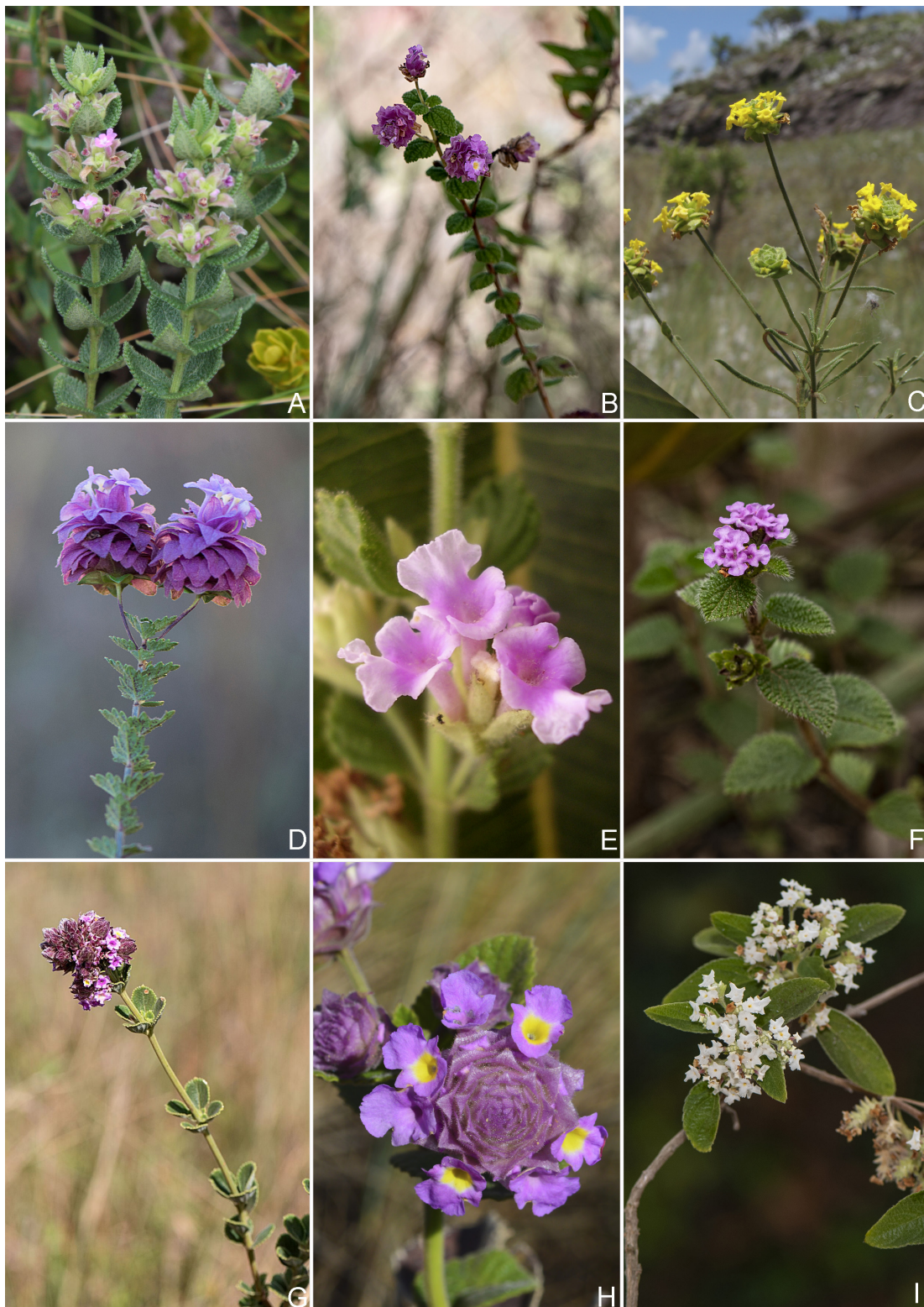


Fig. 3. A. *Lippia corymbosa* Cham. B. *L. diamantinensis* Glaz. ex Moldenke. C. *L. filifolia* Mart. & Schauer. D. *L. hederifolia* Mart. & Schauer. E. *L. hermannioides* Cham. F. *L. krenakiana* P.H.Cardoso, V.I.R.Valério & Salimena. G. *L. lacunosa* Mart. & Schauer. H. *L. lupulina* Cham. I. *L. organoides* Kunth. Photos: A by Daniela Zappi; B, D, F–G, I by Pedro Henrique Nobre; C, E by Luiz Menini Neto; H by Vinicius Dittrich.



Fig. 4. A. *Lippia pseudothea* (A.St.-Hil.) Schauer. B–C. *L. raoniana* P.H.Cardoso & Salimena sp. nov. D. *L. rhodocnemis* Mart. & Schauer. E. *L. rosella* Moldenke. F. *L. rotundifolia* Cham. G. *L. rubella* (Moldenke) T.R.S.Silva & Salimena. H. *L. stachyoides* Cham. I. *L. subracemosa* Mansf. Photos: A–C, E, G–H by Pedro Henrique Nobre; D by Luiz Menini Neto; F by Maurício Mercadante; I by Lucas Marinho.

Table 1 (continued on the next page). List of species of *Lippia* L. from the Diamantina Plateau. † = endemic to Minas Gerais State (BFG 2018); * = Endemic to the Diamantina Plateau.

Taxon; collection number (herbarium)	Distinguishing morphological characters	Distribution in the Diamantina Plateau and official conservation status (if available)
<i>Lippia corymbosa</i> Cham.; <i>W.R. Anderson 8843</i> (NY)	Branches and leaves hirsute, leaves ternate, subsessile, ovate, margin revolute, adaxially bullate, inflorescences corymbose, short-pedunculate, corolla pink	Diamantina, Gouveia, Presidente Juscelino
<i>Lippia diamantinensis</i> Glaz. ex Moldenke†; <i>T.B. Cavalcanti 2294</i> (CEN)	Branches pubescent, leaves patent, ovate to orbicular, apex round, base truncate to cordate, inflorescences hemispheric to cylindrical, bracts membranous, pink, corolla pink	Couto de Magalhães de Minas, Diamantina, Gouveia
<i>Lippia filifolia</i> Mart. & Schauer; <i>J.R. Pirani 5279</i> (SPF)	Branches viscous, leaves sessile, filiform, margin entire, hyphodromous venation, corolla yellow	Diamantina, Presidente Juscelino
<i>Lippia hederifolia</i> Mart. & Schauer; <i>Hatschbach et al. 64657</i> (MBM)	Leaves subsessile, congested at the apex of the branches, ovate-deltoid to suborbicular, margin dentate-lobate, adaxially nitid, bracts and corolla pink to magenta	Diamantina, Felício dos Santos, São Gonçalo do Rio Preto, Serro
<i>Lippia hermannioides</i> Cham.; <i>I. Cordeiro CFCR 9395</i> (SPF)	Leaves obovate to suborbicular, margin entire up to mid-length, crenate-dentate at apex, adaxially scabrid, bullate, inflorescences few-flowered, corolla white turning pink	Diamantina, Felício dos Santos, Gouveia, Rio Vermelho, São Gonçalo do Rio Preto, Serro
<i>Lippia krenakiana</i> P.H.Cardoso, V.I.R.Valério & Salimena†,*; <i>J.R. Pirani 5673</i> (SPF)	Leaves ovate-deltoid, sericeous-lanate with dense sessile and pedunculate glandular trichomes, inflorescences short-pedunculate, bracts lanceolate, corolla pink	Diamantina
<i>Lippia lacunosa</i> Mart. & Schauer; <i>P.T. Sano 1015</i> (SPF)	Leaves patent, subsessile, coriaceous, ovate, abaxially foveolate, inflorescences corymbose-paniculate, at the apex of the branches, bracts sericeous, corolla pink or lilac	Datas, Diamantina, Gouveia, São Gonçalo do Rio Preto, Serro
<i>Lippia lupulina</i> Cham.; <i>J.R. Pirani 6309</i> (SPF)	Branches and peduncles hirsute, leaves ovate to orbicular, apex obtuse, base obtuse to cordate, inflorescences globose, bracts membranous, pink, corolla pink	Couto de Magalhães de Minas, Diamantina, Gouveia, Presidente Juscelino, Serro
<i>Lippia organoides</i> Kunth; <i>V.C. Souza CFCT 8783</i> (SPF)	Leaves opposite, inflorescence frondose, many per leaf axil, bracts tetrastichous, imbricate, the basal ones connate, the apical ones free, corolla white	Couto de Magalhães de Minas, Diamantina, Gouveia, Monjolos, Serro
<i>Lippia pseudothea</i> (A.St.-Hil.) Schauer†; <i>V.C. Souza 20998</i> (HUEFS)	Leaves sessile, spatulate, adaxially with dense pedunculate glandular trichomes, bracts membranous, greenish-pink with vinaceous apex, corolla pink	Datas, Diamantina, Felício dos Santos, Gouveia, Presidente Juscelino, São Gonçalo do Rio Preto, Serro

Table 1 (continued). List of species of *Lippia* L. from the Diamantina Plateau. † = endemic to Minas Gerais State (BFG 2018); * = Endemic to the Diamantina Plateau.

Taxon; collection number (herbarium)	Distinguishing morphological characters	Distribution in the Diamantina Plateau and official conservation status (if available)
<i>Lippia raoniana</i> P.H.Cardoso & Salimena sp. nov.†*; <i>Salimena et al. 1382</i> (CESJ)	Leaves congested at the apex of the branches, ovate, densely covered by sessile glandular trichomes, bracts ovate, corolla lilac, drupe with 2 pyrenes	Felício dos Santos, Serro
<i>Lippia rhodocnemis</i> Mart. & Schauer †*; <i>N.L. Menezes CFCR 7703</i> (SPF)	Branches velutine, leaves petiolate, ovate-elliptic to oblong-elliptic, adaxially velutine, bracts membranous, pink to magenta, corolla pink	Felício dos Santos, Rio Vermelho, São Gonçalo do Rio Preto, Serro EN B1ab(i, iii, iv) (Salimena <i>et al.</i> 2013)
<i>Lippia rosella</i> Moldenke †*; <i>J.R. Pirani CFCR 8707</i> (NY)	Branches strigose, leaves opposite or ternate, adaxially scabrid, abaxially glandular-strigose, bracts broadly ovate, green, vinaceous at apex, corolla pink	Diamantina
<i>Lippia rotundifolia</i> Cham.; <i>N. Roque 226</i> (SPF)	Branches tomentose-velutine, leaves ovate-orbicular to orbicular, coriaceous, base obtuse to cuneate, inflorescences consisting of many-flowered corymbs, bracts hirsute, corolla lilac or magenta	Datas, Diamantina, Gouveia, Rio Vermelho, São Gonçalo do Rio Preto, Serro
<i>Lippia rubella</i> (Moldenke) T.R.S.Silva & Salimena †*; <i>F.R.G. Salimena 3684</i> (CESJ)	Leaves elliptic, margin entire up to mid-length, serrate towards the apex, inflorescences lax, calyx laterally compressed, 2-winged, corolla pink	Diamantina EN B2ab(i, ii, iii) (Salimena <i>et al.</i> 2014)
<i>Lippia stachyoides</i> Cham.; <i>P.T. Sano 754</i> (SPF)	Leaves opposite, inflorescences frondose-bracteose, many per leaf axil, bracts tetrastichous, imbricate, corolla white or magenta	Datas, Diamantina, Gouveia, Rio Vermelho, São Gonçalo do Rio Preto
<i>Lippia subracemosa</i> Mansf.; <i>J.R. Pirani 4416</i> (SPF)	Internodes long, nodes conspicuous, inflorescences capituliform, long-pedunculate, bracts elliptic, congested, apex acute to obtuse, corolla pink	Monjolos

Acknowledgments

We thank Prof. Dr Pedro Henrique Nobre for facilitating the expedition to collect *Lippia raoniana* sp. nov. and Dr Nádia Silvia Somavilla for sectioning the fruits. We also thank Daniela Zappi, Lucas Marinho, Maurício Mercadante, Pedro Henrique Nobre and Vinicius Dittrich for the photos of the species. The first author also thanks CNPq, Conselho Nacional de Desenvolvimento Científico e Tecnológico – Brasil, for the doctoral grant (process 141837/2020-9). Marcelo Trovó thanks the Alexander von Humboldt Foundation (BRA/1139098), FAPERJ (E26/203.269/2016 and E-26/202.708/2019—JCNE), and CNPq (470349/2013-1—Universal, 306758/2019-9—Pq2) for financial support. The last author thanks the CNPq (REFLORA/563560/2010-0) for the financial support to review the Verbenaceae types in Europe.

References

- Almeida-Abreu P.A. 1995. O supergrupo Espinhaço da Serra do Espinhaço Meridional (Minas Gerais): o rifte, a bacia e o orógeno. *Geonomos* 3: 1–18. <https://doi.org/10.18285/geonomos.v3i1.211>
- Atkins S. 2004. Verbenaceae. In: Kubitzki K. & Kadereit J.W. (eds) *The Families and Genera of Vascular Plants*: 449–468. Springer-Verlag, Berlin. https://doi.org/10.1007/978-3-642-18617-2_25
- Cardoso P.H., Cabral A., Valério V.I.R. & Salimena F.R.G. 2018. Verbenaceae na Serra Negra, Minas Gerais, Brasil. *Rodriguésia* 69: 777–786. <https://doi.org/10.1590/2175-7860201869235>
- Cardoso P.H., Cabral A., Santos-Silva F. & Salimena F.R.G. 2019a. Verbenaceae no Parque Estadual da Serra do Papagaio, Minas Gerais, Brasil. *Rodriguésia* 70: e02932017. <https://doi.org/10.1590/2175-7860201970056>
- Cardoso P.H., Menini Neto L. & Salimena F.R.G. 2019b. A new species of *Lippia* (Verbenaceae) from the inselbergs of Brazilian Atlantic Forest. *Phytotaxa* 406: 243–249. <https://doi.org/10.11646/phytotaxa.406.4.3>
- Cardoso P.H., Menini Neto L. & Salimena F.R.G. 2019c. *Lippia mantiqueirae* (Verbenaceae), a new species from Minas Gerais, Brazil. *Phytotaxa* 420: 249–254. <https://doi.org/10.11646/phytotaxa.420.3.5>
- Cardoso P.H., Santos-Silva F., Menini Neto L. & Salimena F.R.G. 2019d. Verbenaceae no Parque Nacional do Caparaó, Serra da Mantiqueira, Brasil. *Hoehnea* 46: e652019. <https://doi.org/10.1590/2236-8906-65/2019>
- Cardoso P.H., Cabral A., Santos-Silva F. & Salimena F.R.G. 2020a. Verbenaceae no Parque Nacional da Serra da Canastra, Minas Gerais, Brasil. *Rodriguésia* 71: e03072018. <https://doi.org/10.1590/2175-7860202071032>
- Cardoso P.H., Valério V.I.R., Menini Neto L., Trovó M. & Salimena F.R.G. 2020b. Novelties in *Lippia* (Verbenaceae) from Minas Gerais State, Brazil. *Phytotaxa* 455: 47–52. <https://doi.org/10.11646/phytotaxa.455.1.6>
- Chamisso L.K.A. 1832. Verbenaceae. *Linnaea* 7: 105–723.
- Cruz L.V.V. & Salimena F.R.G. 2017. Verbenaceae J.St.-Hil. do Parque Estadual do Ibitipoca, Minas Gerais, Brasil. *Boletim de Botânica da Universidade de São Paulo* 35: 65–74. <https://doi.org/10.11606/issn.2316-9052.v35i0p65-74>
- Echternacht L., Trovó M., Oliveira C.T. & Pirani J.R. 2011. Areas of endemism in the Espinhaço Range in Minas Gerais, Brazil. *Flora – Morphology, Distribution, Functional Ecology of Plants* 206: 782–791. <https://doi.org/10.1016/j.flora.2011.04.003>
- Giulietti A.M., Pirani J.R. & Harley R. 1997. Espinhaço Range region, eastern Brazil. In: Davis S.D., Heywood V.H., Herrera-MacBryde O., Villa-Lobos J. & Hamilton A.C. (eds) *Centres of Plant Diversity*: 397–404. IUCN publications, Cambridge.

- Gonçalves D.J.P., Shimizu G.H., Yamamoto K. & Semir J. 2017. Vochysiaceae na região do Planalto de Diamantina, Minas Gerais, Brasil. *Rodriguésia* 68: 159–193.
<https://doi.org/10.1590/2175-7860201768124>
- Gonçalves E.G. & Lorenzi H. 2007. *Morfologia vegetal: Organografia e Dicionário ilustrado de Morfologia das Plantas vasculares*. Instituto Plantarum, Nova Odessa.
- Gontijo B.M. 2008. Uma geografia para a Cadeia do Espinhaço. *Megadiversidade* 4: 7–14.
- Harris J.G. & Harris M.W. 2003. *Plant Identification Terminology: an Illustrated Glossary*. 2nd Edition. Spring Lake Publ., Spring Lake.
- IUCN Standards and Petitions Committee. 2019. *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 14. Available from <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> [accessed 30 Jun. 2020].
- King L. 1956. Geomorfologia do Brasil Oriental. *Revista Brasileira de Geografia* 18: 1–147.
- Lu-Irving P. & Olmstead R.G. 2013. Investigating the evolution of Lantaneae (Verbenaceae) using multiple loci. *Botanical Journal of the Linnean Society* 171: 103–119.
<https://doi.org/10.1111/j.1095-8339.2012.01305.x>
- Martinelli G. & Moraes M.A. 2013. *Livro vermelho da Flora do Brasil*. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Martinelli G., Messina T. & Santos Filho L. 2014. *Livro vermelho da Flora do Brasil – Plantas raras do Cerrado*. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Marx H.E., O’Leary N., Yuan Y.-W., Lu-Irving P., Tank D.C., Múlgura M.E. & Olmstead R.G. 2010. A molecular phylogeny and classification of Verbenaceae. *American Journal of Botany* 97: 1647–1663.
<https://doi.org/10.3732/ajb.1000144>
- Myers N., Mittermeier R.A., Mittermeier C.G., Fonseca G.A.B. & Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858. <https://doi.org/10.1038/35002501>
- QGIS Development Team. 2018. QGIS Geographic Information System. ver. 3.8. Open Source Geospatial Foundation Project. Available from <https://www.qgis.org> [accessed 14 May 2020].
- Radford A.E., Dickinson W.C., Massey J.R. & Bell C.R. 1974. *Vascular Plant Systematics*. Harper Collins, New York.
- Rapini A., Mello-Silva R. & Kawasaki M.L. 2002. Richness and endemism in Asclepiadoideae (Apocynaceae) from the Espinhaço Range of Minas Gerais, Brazil – a conservationist view. *Biodiversity & Conservation* 11: 1733–1746. <https://doi.org/10.1023/A:1020346616185>
- Saadi A. 1995. A geomorfologia da Serra do Espinhaço em Minas Gerais e de suas Margens. *Geonomos* 3: 41–63. <https://doi.org/10.18285/geonomos.v3i1.215>
- Salimena-Pires F.R.G. & Giuliatti A.M. 1998. Flora da Serra do Cipó, Minas Gerais: Verbenaceae. *Boletim de Botânica da Universidade de São Paulo* 17: 155–186.
<https://doi.org/10.11606/issn.2316-9052.v17i0p155-186>
- Salimena F.R.G. & Cardoso P.H. 2020. *Lippia* in Flora do Brasil 2020 under construction. Jardim Botânico do Rio de Janeiro.
Available from <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB15170> [accessed 25 Jan. 2021].
- Salimena F.R.G. & Silva T.R.S. 2009. Flora de Grão-Mogol, Minas Gerais: Verbenaceae. *Boletim de Botânica da Universidade de São Paulo* 27: 119–126.
<https://doi.org/10.11606/issn.2316-9052.v27i1p119-120>

- Salimena F.R.G., França F. & Silva T.R.S. 2009. Verbenaceae. *In*: Giullietti A.M., Rapini A., Andrade M.J.G., Queiroz L.P. & Silva J.M.C. (eds) *Plantas raras do Brasil*: 399–405. Conservação Internacional, Belo Horizonte.
- Salimena F.R.G., Kutschenko D.C., Monteiro N.P. & Mynssen C. 2013 Verbenaceae. *In*: Martinelli G. & Moraes M.A. (eds) *Livro vermelho da Flora do Brasil*: 1010–1016. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Salimena F.R.G., Moraes L., Kutschenko D.C. & Novaes L. 2014. Verbenaceae. *In*: Martinelli G., Messina T. & Santos-Filho L. (eds) *Livro vermelho da Flora do Brasil – Plantas raras do Cerrado*: 266–273. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Sanders R.W. 2001. The genera of Verbenaceae in the southeastern United States. *Harvard Papers in Botany* 5: 303–358.
- Santiago A.O., Cardoso P.H., Salimena F.R.G. & Trovó M. 2020. Verbenaceae no Parque Nacional do Itatiaia, Brasil. *Rodriguésia* 71: e02462018. <https://doi.org/10.1590/2175-7860202071066>
- Schaefer C.E.R., Ker J.C., Gilkes R.J., Campos J.C., Costa L.M. & Saadi A. 2002. Pedogenesis on the uplands of the Diamantina Plateau, Minas Gerais, Brazil: a chemical and micropedological study. *Geoderma* 107: 243–269. [https://doi.org/10.1016/S0016-7061\(01\)00151-3](https://doi.org/10.1016/S0016-7061(01)00151-3)
- Schauer J.C. 1847. Verbenaceae. *In*: Candolle A.P. de (ed.) *Prodromus Systematis naturalis Regni vegetabilis* 11: 522–700. Treuttel et Würtz, Paris.
- Silva T.R.S. 1999. *Redelimitação e revisão do gênero Lantana L. (Verbenaceae) no Brasil*. PhD thesis, Universidade de São Paulo, São Paulo.
- Silva T.R.S. & Salimena F.R.G. 2002. Novas combinações e novos sinônimos em *Lippia* e *Lantana* (Verbenaceae). *Darwiniana* 40: 57–59.
- Thiers B. continuously updated. Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff. New York Botanical Garden's Virtual Herbarium. Available from <http://sweetgum.nybg.org/science/ih/> [accessed 5 Jun. 2020].
- Troncoso N.S. 1974. Los géneros de verbenáceas de Sudamérica extratropical. *Darwiniana* 18: 295–412.
- UNESCO – United Nations Educational, Scientific and Cultural Organization. 2005. Espinhaço Range Biosphere Reserve, Brazil. Available from: <https://en.unesco.org/biosphere/lac/espinhaco> [accessed 30 Jun. 2020].

Manuscript received: 29 August 2020
Manuscript accepted: 10 November 2020
Published on: 28 January 2021
Topic editor: Frederik Leliaert
Desk editor: Radka Rosenbaumová

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Real Jardín Botánico de Madrid CSIC, Spain; Zoological Research Museum Alexander Koenig, Bonn, Germany; National Museum, Prague, Czech Republic.