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The genus *Lepechinia* Willd. (Lamiaceae – Salviinae) in Brazil

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ABSTRACT

Lepechinia is a New World genus of Lamiaceae with ca. 45 species. There is ongoing controversy regarding the recognition and delimitation of *Lepechinia* that occur in Brazil. After fieldwork and herbaria consultation we recognize two species of *Lepechinia* in Brazil: *Lepechinia speciosa*, distributed within the Mantiqueira region, and *Lepechinia annae*, endemic to Serra do Caparaó. A taxonomic revision of the genus *Lepechinia* in Brazil is provided including descriptions, lectotypifications, a distribution map, a photographic plate, an identification key, a conservation assessment and comments on both the taxonomy and ecology of the two species.

Keywords: *campo de altitude*, Lamiaceae, *Lepechinia*, Mentheae, Neotropical Flora, Nepetoideae, taxonomic revision

Introduction

Lepechinia is a New World genus of the Lamiaceae, subfamily Nepetoideae, tribe Mentheae, subtribe Salviinae, with ca. 45 species distributed from California in the western United States to central Argentina and Chile. Within South America, *Lepechinia* has a disjunct distribution in Brazil, as the occurrences in the country are very distant from the nearest other occurrence of the genus (Epling 1948; Hart 1983; Drew & Sytsma 2013; Drew *et al.* 2014). The species of the genus can be recognized as (generally) aromatic shrubs or perennial herbs, with paniculate, racemose or spiciform inflorescences, flowers sessile to short pedicellate, calyces actinomorphic to weakly 2-lipped, corollas annulate and weakly 2-lipped, stamens 4, didynamous, included to exserted, stigmatic branches short and subequal, and nutlets non-mucilaginous when wetted. *Lepechinia* differs from the closest related genera in subtribe Salviinae – *Melissa* and *Salvia* (Harley *et al.* 2004; Drew & Systma 2013; Drew *et al.* 2017) – by straight upper corolla lips (non-galeate), actinomorphic to weakly 2-lipped calyces, an unenlarged connective separating the two thecae of the stamens, non-mucilaginous seeds, and a distinctive leaf odor.

The genus was first revised by Epling (1926; 1937; 1948), who proposed the subsumation of *Sphacele* into *Lepechinia*, and was later updated in the unpublished dissertation of Hart (1983). Subsequently, several new species have been described or rediscovered (Wood 1988; Boyd & Mistretta 2006; Martinez-Gordillo & Lazoda-Pérez 2009; Henrickson *et al.* 2011; Gonzáles-Gallegos *et al.* 2015; Wood *et al.* 2015), but no comprehensive monographic treatment has been conducted. Recently, the genus has been the subject of evolutionary and biogeographical studies (Drew 2011; Drew & Sytsma 2011; 2013; Drew *et al.* 2014), resulting in the inclusion of the monotypic genera *Chaunostoma* and *Neoeplingia* into *Lepechinia* (Moon 2012; Drew *et al.* 2014).

Although in some Brazilian floras and checklists the genus has been represented by two species, *Lepechinia speciosa* and *Lepechinia annae* (*e.g.* Brade 1943; Romão *et al.* 2010; Harley 2012; BFG 2015; Antar 2019), a recent paper describing the biogeography of the genus (Drew & Sytsma 2013) accounts for only *L. speciosa* from Brazil, treating *L. annae* as a synonym; this treatment followed

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previous broad taxonomic studies within the genus (Epling 1937; 1948; Hart 1983) and the WCSP (2019). A third species, *Lepechinia anomala*, was erroneously described as a species of *Lepechinia* by Epling (1960), but this species is now treated in the genus *Condea* as *Condea undulata* (Harley & Pastore 2012). Harley (2010) concluded that two species of *Lepechinia* occur in Brazil, but there has not been any formal published examination of relationships among *Lepechinia* within Brazil, and an account of *Lepechinia* in Brazil remains a priority.

In view of the above, the objective of this paper is to make a revision of *Lepechinia* in Brazil clarifying the circumscription of both species and contributing to the knowledge of the systematics of the genus.

Materials and methods

Digital images of the types were obtained on-line on institutional databases (JSTOR Global Plants - https://plants.jstor.org/, Virtual Herbarium Reflora -http://reflora.jbrj.gov.br/reflora/herbarioVirtual/ and Museum National d'Histoire Naturelle, Paris Website http://coldb.mnhn.fr/catalognumber/mnhn/p). The morphological descriptions were based on the specimens seen in the following herbaria: ALCB, BHCB, BHZB, BRBA, CEN, CESJ, CGMS, COR, CTBS, DIAM, ESA, ESAL, FLOR, HDJF, HEPH, HRB, HRCB, HUEFS, HUFSJ, HXBH, IBGE, ICN, MBM, MBML, NEBK, NX, NY, PAMG, R, RB, SP, SPF, SPFR, SPSC, SPSF, UB, UEC, UFMT, UFOP, UPCB, US, VIES (acronyms according to Thiers 2019). Fieldwork was carried out in the Serra do Caparaó and Serra do Itatiaia in order to collect and observe the species in their natural habitat. A 10–60 × magnification stereomicroscope was used to analyze morphological features of the specimens. Terminology follows Harris & Harris (2001) for general morphology and Hickey (1973) for leaf shape, as well as Epling (1948) and Hart (1983) for specific terms.

The Geospatial Conservation Assessment (GeoCAT) tool (Bachman *et al.* 2011), in concert with IUCN criteria (2012; 2017), was used to infer conservation status. GeoCAT was applied with the IUCN default values for Extent of Occurrence (EOO) and Area of Occupancy (AOO) analysis. The distribution map was produced in QGIS version 2.18.15 (QGIS Development Team 2018). In cases where herbarium specimens were not geo-referenced, the geographic coordinates were approximated using the locality description from the specimen label.

Results

Taxonomic treatment

***Lepechinia* Willd., Hort.** Berol. 1(2): ad t.21. 1804. Type: *Horminum caulescens* Ortega [=*Lepechinia caulescens* (Ortega) Epling].

= *Alguelaguen* Feuill. ex Adans. Fam. Pl. 2: 505. 1763. Type: *Algue Laguen (Nomen vernaculum), based on Feuillée, Hist. Pl. Medic. 4. 4. 1725.*

= *Alguelagum* Kuntze, Revis. Gen. Plantarum 2: 511. 1891. Nom. rej. vs. Sphacele Benth. 1829 (nom. cons.).

= *Phytoxis* Molina, Sagga Sulla Storia Nat. del Chili, ed. II, 145, 290.1610. Type: *Phytoxis sideritifolia* Molina [=*Lepechinia chamaedryoides* (Balb.) Epling], nom. rej. vs. *Sphacele* Benth. 1829 (nom. cons.).

= *Ulricia* Jacq. ex. Steud., Nom. ed. 1, 862. 1821. Type: *Ulricia pyramidata* Jacq. [=*Lepechinia caulescens* (Ortega) Ep1ing].

= *Sphacele Benth., Edwards Bot. Reg. 15: sub. t. 1289. 1829.(nom. cons.). Type: Sphacele lindleyi Benth., nom.* illeg. [*Stachys salviae* Lindl., *Sphacele salviae* (Lindl.) Briq.] (typ. cons.).

= *Astemon* Regel, Ind. Sem. Hort. Petrop. 38. 1860. Type: *Astemon graveolens* Regel [=*Lepechinia graveolens* (Regel) Epling].

= *Mahya* Cord. Fl. Ile Réunion, 490. 1895. Type: *Mahya stellata* Cord. [= *Lepechinia chamaedryoides* (Balb.) Epling].

= *Chaunostoma* Donn.Sm. in Bot. Gaz. 20: 9. 1895, Type: *Chaunostoma mecistandrum* Donn.Sm. [= *Lepechinia mecistandra* (Donn.Sm.) H.K.Moon].

= *Neoeplingia* Ramamoorthy, Hiriart & Medrano in Bol. Soc. Bot. México 43: 61. 1982, Type: *Neoeplingia leucophylloides* Ramamoorthy, Hiriart & Medrano [= *Lepechinia leucophylloides* (Ramamoorthy, Hiriart & Medrano) B.T.Drew, Cacho & Sytsma].

Aromatic perennial herbs, shrubs or subshrubs; hermaphroditic, dioecious or gynodioecious; glabrous, villose or tomentose, indument frequently composed of dendroid trichomes and often glandular. Stems erect or creeping, quadrangular, frequently canaliculate. Leaves simple, opposite, petiolate or rarely sessile, commonly decussate, serrate, crenate, dentate or rarely entire, adaxial surface bullate. Inflorescence paniculate, spicate, racemose, or with individual flowers in leaf axils; bracts reduced, usually leaf-like; bracteoles inconspicuous or absent. Flowers conspicuous to reduced; calyx 5–merous, 5–lobed, slightly bilabiate, actinomorphic to rarely zygomorphic, usually accrescent, tube campanulate, costate, 10–15–nerved, lobes subulate to deltoid; corolla slightly bilabiate, 5–lobed, blue, red, orange, pink, purple or white, tube cylindrical to campanulate, generally (ex)annulate, lobes subequal or the anterior larger; stamens 4, didynamous, paired, included to exserted, anthers 2–thecous, connective not enlarged; ovary with nectariferous disc, style exserted, stigma bifid, lobes subequal. Fruit a nutlet, brown or black, smooth, shiny, not mucilaginous.

Lepechinia is represented in Brazil by two species, *Lepechinia annae* and *Lepechinia speciosa* (Fig. 1). The two species in Brazil are disjunctly distributed, well separated

from the +/- continuous distribution of *Lepechinia* that ranges from the western United States to central Argentina and Chile (Drew & Sytsma 2013).

Both species occur in *Campo de Altitude* (a high elevation vegetation type overlaying a granitic/gneiss formation) in the Atlantic Rainforest biome.

Key to the species of ***Lepechinia*** *in Brazil*

1. Leaf base cuneate; leaf margin entire near the base of the leaf; petiole winged; lamina elliptic or rarely ovate; bracteoles present; calyx teeth at anthesis 6.5–11 mm long ..... *L. annae*
1'. Leaf base truncate, cordate or sagittate; leaf margin entirely crenate or crenulate; petiole not winged, lamina ovate, rarely oblong or narrowly elliptic, bracteoles absent; calyx teeth at anthesis 4–6 mm long……..... *L. speciosa*

Lepechinia annae (Taub. ex Schwacke) Brade, Rodriguésia 16: 23. 1980. *Sphacele annae* Taub. ex Schwacke, Pl. Nov. Mineir. 2: 4. 1900—Lectotype, designated here: BRAZIL. Minas Gerais. Serra do Caparaó, 8 Fev 1890, *Schwacke 6778* (P [barcode] P02903809 [scan seen]; isolectotypes RB [barcode] RB00539126!; R [catalogue number] 34829!).

Erect shrub 0.3–2 m tall, weakly aromatic, hermaphroditic, branched; stems woody, 3–5 mm in diameter, quadrangular, canaliculate (more visible in the younger stems), the younger stems tomentose with entangled dendroid trichomes and sessile yellow glands, the older stems with less dendroid trichomes making it possible to see small stipitate glandular trichomes, internodes 0.5–4.9 cm long. Leaves opposite, decussate, longer than internodes, diminishing in size towards stem apex, lamina (4,5–)6–14.5 × (2.6–)3–5.5 cm, chartaceous or rarely membranous, elliptic, rarely ovate, discolorous, adaxial surface dark brown, abaxial surface light grey, base cuneate, often slightly unequal, apex acute to acuminate, margin crenulate with the exception of the base (up to 1/5 of the leaf) which is entire, (22–)29–48 teeth

Figure 1. A-B. *Lepechinia annae* (Taub. ex Schwacke) Brade. **A**. Branch bearing leaves and inflorescense. **B**. Habit, Habitat and branch bearing leaves and inflorescence. **C-E.** *Lepechinia speciosa* (A.St-Hil. ex Benth.) Epling **C**. Habitat and Habit. **D**. Branch bearing leaves and inflorescence **E**. Adaxial surface highlighting leaf base. A, B and E. Photos by G.M. Antar. C-D. Photos by Lucas N. Gonçalves.

on each side of leaf, the tooth apex rounded, rarely slightly acute, glabrous with the exception of sessile glands, adaxial surface bullate (mostly in younger leaves), glabrescent with orange, red or yellow sessile glands dispersed in the lamina and non-glandular trichomes in the midvein and lateral veins, abaxial surface tomentose, with white dendroid non-glandular trichomes and yellow sessile glands, the older leaves with much fewer trichomes, venation adaxially with the midvein deeply sulcate or sulcate mostly near the base, near the apex almost plain, other veins are slightly impressed, venation abaxially reticulate, midrib and secondary veins elevated; petiole (0.3–)0.8–1.5 cm long, deeply canaliculate, winged, tomentose with dendroid trichomes. Inflorescence paniculate, terminal, axis covered with tiny stipitate glandular trichomes, yellow glands and rare uniseriate trichomes, each bract subtending (1–)2–4 flowers; bracts leaf–like, decreasing towards the apex, 0.7–6.7(–7.7) × 0.3–2.8 cm, sessile to subsessile, the older bracts very similar to the cauline leaves, the younger ones with the adaxial surface glabrescent and the abaxial surface densely covered with entangled dendroid trichomes, sessile glands and stipitate glandular small trichomes; bracteoles linear, ca. 1 mm long, covered with small brown stipitate glandular trichomes. Flowers conspicuous, monoclinous, pedicels 4–10 mm long, covered with small brown stipitate glandular trichomes; calyx at anthesis 1–1.5 cm long, externally densely covered with small stipitate glandular trichomes, rare sessile glands and rarely longer stipitate glandular trichomes uniseriated with base dilated, internally glabrous to glabrescent with rare tiny stipitate glandular trichomes near the apex of the teeth, campanulate, tube 5–7.5 mm long, straight, ribbed, 10–13 veined, lobes subequal, 6.5–11 mm long, straight or slightly curved, triangular, apex acuminate, calyx in fruit 2–2.2 cm long, tube accrescent, 9.5–11 mm long, campanulate, ribbed, lobes 1–1.1cm long, straight; corolla purple, 25–35 mm long, straight, tubular, externally glabrescent to pubescent with tiny stipitate glandular trichomes concentrated in the lobes and rare sessile glands, internally glabrous with the exception of an annulus of trichomes near the base of the tube, veins conspicuous, somewhat prominent, tube 17–28 mm long, lobes obtuse to rounded, unequal, anterior lobe 3.5–5.7 mm long, other lobes (1.5–)3–3.3 mm long; stamens 4, didynamous, anterior pair glabrous 5–8.9 mm long, slightly exerted, posterior pair glabrous, 3–5 mm long, inserted; gynoecium slightly exerted, glabrous, style 2–3.1 mm long, stigma bifid. Nutlets 2.6–3.5 × 1.8–2.6 mm, obovoid, castaneous to dark castaneous, smooth, shining, glabrous, not mucilaginous when wetted.

Common name: Orelha-de-Burro.

Conservation Status: Although all the specimens collected are located inside the protected area of Parque Nacional do Caparaó, the AOO and EOO are both small, just 36 km². The principal threats to this species are from tourism and global warming (Scarano *et al*. 2016). *Lepechinia annae* should be considered endangered according to IUCN criteria B1ab(iii)+2ab(iii) (IUCN 2017).

Distribution and Habitat: *Lepechinia annae* is endemic to the Caparaó region, a mountain complex between the states of Minas Gerais and Espirito Santo, southeast Brazil. It occurs in the municipalities of Alto Caparaó and Ibitirama. It can be found growing in open natural granitic grasslands (*campo de altitude*) in wet soils from 1850 to 2800 meters (Fig 2).

Phenology: *Lepechinia annae* was found in flower in February, March, April, July and October, mostly in February and March, and in fruit in March and October (Fig. 3).

Specimens Examined: BRAZIL. Espirito Santo: Alto Caparaó [Ibitirama], Parque Nacional do Caparaó, Trilha entre o Terreirão e o Pico da Bandeira., 27 Aug 2001, *V.C. Souza et al. 26979* (ESA); Alto Caparaó [Ibitirama], Parque Nacional do Caparaó, Trilha Pico da Bandeira - Terreirão, 20°26'05"S 41°47'45"W., 9 March 2010, *M.O. Bünger et al. 465* (BHCB); Dores do Rio Preto [Ibitirama], Parque Nacional do Caparaó, Campo - Pedra Gêmeas [Pedra das Duas Irmãs], July 2005, *L.S. Leoni 6237* (GFJP, RB). Minas Gerais: Alto Caparaó, Parque Nacional do Caparaó, Arredores do Terreirão, 20°25'"S 41°49'"W, 17 Feb 2000, *V.C. Souza et al. 23263* (ESA, RB, SPF); Alto Caparaó, Parque Nacional do Caparaó, Estrada para a Tronqueira, 20 March 2012, *J. Kuntz et al. 522* (ESA, SPF); Alto Caparaó, Parque Nacional do Caparaó, Próximo a trilha., 27 March 1996, *L.S. Leoni 3246* (ESA, GFJP, HUEFS, RB); Alto Caparaó, Parque Nacional do Caparaó, Terreirão., 11 Feb 2001, *L.S. Leoni 4607* (GFJP, RB); Alto Caparaó, Parque Nacional do Caparaó, Trilha entre o Terreirão e o Pico da Bandeira., 18 March 2014, *V.C. Souza et al. 38094* (ESA); Alto Caparaó, Parque Nacional do Caparaó, Trilha para o Pico da Bandeira, 20°25'5"S 41°49'2"W, 30 March 2017, *G.M. Antar & M.F. Santos* 1454 (NEBK, SPF); Alto Caparaó, Parque Nacional do Caparaó, Trilha para o Pico da Bandeira., 21 March 2012, *J. Kuntz et al. 555* (ESA, SPF), *J. Kuntz et al. 558* (ESA, SPF); Campos de Caparaó, 12 March 1917, *A. Lutz 1224* (R); Campos de Caparaó., 22 Feb 1915, *Zikan 18* (R); Caparaó [Alto Caparaó], Parque Nacional do Caparaó, Próximo ao Terreirão., 3 March 1991, *L.S. Leoni 1451* (GFJP, RB); Caparaó [Alto Caparaó], Parque Nacional do Caparaó, Chegando ao Terreirão., 12 Dec 1995, *L.S. Leoni 3139* (GFJP, RB); Parque Nacional do Caparaó, 15 Oct 1988, *S.M.S. Verardo & M. Brugger 25211* (CESJ, RB); Parque Nacional do Caparaó., 19 Apr 1988, *R.F. Novelino et al. 25210* (CESJ, RB); Serra do Caparaó, Oct 1941, *A.C. Brade 17083* (RB); Serra do Caparaó, caminho para o Campo., 29 Feb 1960, *M.R. Rodrigues s.n.* (R).

Affinities and morphological notes: *Lepechinia annae* differs from *L. speciosa* as the former has a cuneate leaf base (vs. truncate, cordate or sagittate), the leaf margin is entire near the base (vs. entirely crenulate or crenate), the petiole is winged (vs. not winged), the laminas are elliptic or rarely ovate (vs. ovate, rarely oblong or narrowly elliptic), the bracteoles are present (vs. bracteoles absent) and the

calyx teeth at anthesis are slightly longer 6.5–11 mm long (vs. 4–6 mm long).

Lectypification: Carl August Wilhelm Schwacke, a German botanist, when publishing the species *Sphacele annae*, only indicated in the protologue "Schwacke 6778", and did not mention in which herbarium it was deposited. The species was first recognized as novel by Paul Taubert, a German botanist from the Berlin herbarium (B). Taubert suggested that the original material examined would be stored in the Berlin herbarium. However, these samples were destroyed during the Second World War (R Vogt unpubl. res.). Although Schwacke worked at the OUPR herbarium, no collections could be found there (VR Scalon unpubl. res.). There are three duplicates of Schwacke 6778 stored at P, R and RB. The one from P is more complete. Epling (1935) did not propose a lectotypification as he wrote that the type was probably in P. When combining *Sphacele* in *Lepechinia annae*, Brade (1943) used a question mark to express that the possible type would be at RB, but did not propose a formal lectotypification. Thus, lectotypification is needed and provided here (Fig. 4).

Lepechinia speciosa (A.St.-Hil. ex Benth.) Epling, Repert. Spec. Nov. Regni Veg., Beih. 85: 22. 1935. *Sphacele speciosa* A.St.-Hil. in Benth., Lab. Gen. Sp. 570. 1834; *Alguelagum speciosum* (A.St.-Hil. ex Benth.) Kuntze, Rev. Gen. 1: 511. 1891.— Lectotype, designated here: BRAZIL. Provinciae Minas Geraes [Minas Gerais]. In umbrosis rupestribus in Serra do Papagaio, *A. Saint-Hilaire 528* (P [barcode]

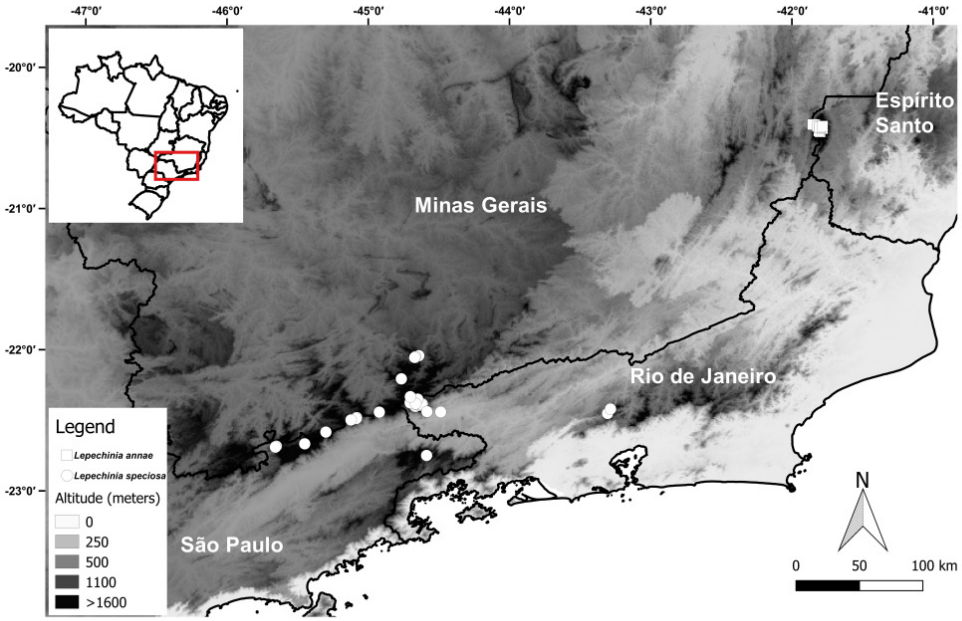

Figure 2. Geographic distribution of *Lepechinia annae* (white squares) and *Lepechinia speciosa* (white circles).

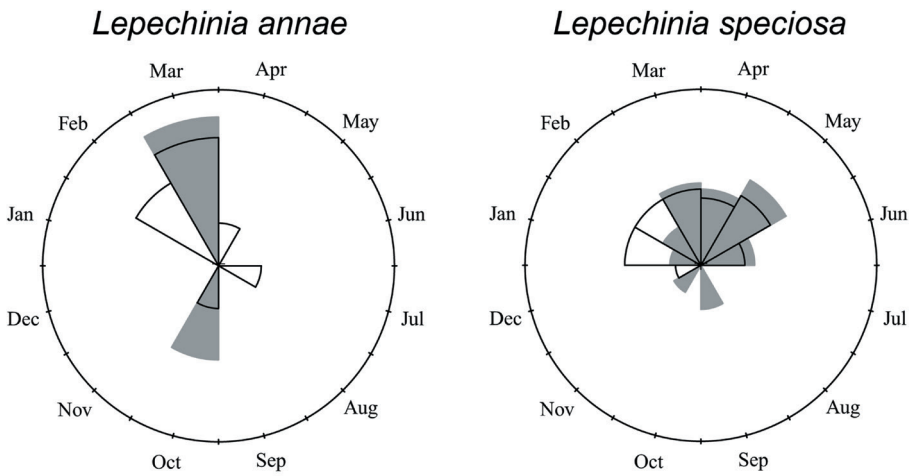

Figure 3. Phenology in *Lepechinia speciosa* and *Lepechinia annae*. White slices denote flowering specimens and gray slices fruiting specimens. The size of the slice represents the relative amount of specimens from the total which was blooming or fruiting in that month. For *Lepechinia speciosa* a total of 57 specimens were observed, for *Lepechinia annae* a total of 18 specimens were observed.

P00714644 [scan seen]; isolectotypes F [barcode] 998944 [scan seen]; P [barcode] P00714645 [scan seen]; P [barcode] P00714646 [scan seen]; US [barcode] 00121711!)

Hyptis itatiaiae Wawra, Oesterr. Bot. Z.31: 70. 1881. *Mesosphaerum itatiaiae* (Wawra) Kuntze, Revis. Gen. Pl. 2: 526. 1891.—Type: BRAZIL. Prov. Rio Janeiro in Serra Itatiaia prope Resende in collibus sterilibus, Wawra 493 (holotype W).

Erect shrub 0.6–2 m tall, discreetly aromatic, hermaphroditic, branched; stems woody, 3–6 mm in diameter, quadrangular, canaliculate (more visible in the younger stems), the younger stems tomentose with brown dendroid non-glandular trichomes and orange/yellow sessile glands, internodes 5–45 mm long. Leaves opposite, decussate, longer than internodes, diminishing in size towards stem apex, lamina 6–14 × (2.3–)2.7–5.5(–7.5) cm, chartaceous or membranous, ovate, rarely oblong or narrowly elliptic, discolorous, adaxial surface dark brown or green, abaxial surface light grey or light brown, base truncate, sagittate, or cordate, rarely slightly unequal, apex acute, margin entirely crenulate or crenate, 38–65 teeth on each side of leaf, the tooth apex rounded or acute, glabrous except for sessile glands, adaxial surface bullate (mostly in younger leaves), glabrous except for orange, red or yellow sessile glands dispersed in the lamina and non–glandular trichomes in the midvein and lateral veins, abaxial surface densely tomentose with white dendroid uniseriate non-glandular trichomes and yellow/orange sessile glands, venation adaxially with the midvein sulcate mostly near the base, near the apex almost plain, other veins slightly impressed, venation abaxially reticulate, midrib and secondary veins elevated; petiole 7–23(–32) mm long, canaliculate, not winged, tomentose with long dendroid non-glandular trichomes and yellow sessile glands. Inflorescence paniculate, terminal, axis covered with tiny stipitate glandular trichomes alongside sessile yellow glands and dendroid or simple uniseriate trichomes, each bract holding 1(–2) flowers; bracts leaf–like decreasing in size towards the apex, 4–59 × 3–24mm, sessile to subsessile, the older ones similar to the cauline leaves, the younger ones with the adaxial surface glabrescent and the abaxial surface densely covered with entangled dendroid trichomes, sessile glands and small stipitate glandular trichomes; bracteoles absent. Flowers conspicuous, monoclinous, on pedicels 4–7 mm long, covered in stipitate uniseriate glandular trichomes; calyx at anthesis 0.9–1.3 cm long, externally tomentose with rare long uniseriate and common short non–uniseriate glandular capitate trichomes mostly concentrated in the margins and veins, with sessile glandular trichomes between veins, internally glabrescent with small glandular trichomes stipitated mostly near the teeth, campanulate, tube 4–6.5 mm long, straight, ribbed, 10–14 veined, calyx lobes subequal, 4–6 mm long, straight or slightly curved, triangular, apex acuminate, calyx in fruit 1.6–2.1 cm long, tube accrescent, 0.95–1.1 mm long, campanulate, costate, calyx lobes 7–10 mm long, straight; corolla purple, 20–32 mm long, straight, tubular, externally glabrescent with short uniseriate non-glandular trichomes concentrate in the veins and scattered sessile glandular trichomes, internally glabrous with the exception of the base with an annulus of trichomes near the base of the tube, veins conspicuous, somehow prominent, tube 18–30 mm long, lobes obtuse to rounded, unequal, anterior lobe 3.5–5.0 mm long, other lobes 2–3.1 mm long; stamens 4, didynamous, anterior pair glabrous to glabrescent with few uniseriate trichomes near the base, 7.0–9.0 mm long, slightly exerted, posterior pair glabrous to glabrescent with few uniseriate trichomes near the base, 4–5 mm long, inserted; gynoecium exerted, glabrous, style 2.5–3.2 mm long, stigma bifid. Nutlets 2.6–3.1 × 1.9–2.6 mm, obovoid or ellipsoid, dark castaneous, smooth, shining, glabrous, not mucilaginous when wetted.

Common name: Orelha-de-Burro; Salvia-roxa

Conservation Status: *Lepechinia speciosa* has an AOO of 112 km² and an EOO of 9943 km². This species is restricted to high elevation *Campos de altitude* in the Atlantic rainforest biome. Although this species has a broad representation in herbarium collections, it is currently known from just nine localities. It is protected in Parque Nacional do Itatiaia, Parque Estadual da Serra do Papagaio and Parque Estadual de Campos do Jordão. The main threats to *L. speciosa* are from tourism and global warming (Scarano *et al*. 2016). According to criteria B1ab(iii)+2ab(iii) (IUCN 2017), the conservation status of *L. speciosa* is assessed as Vulnerable.

Distribution and Habitat: *Lepechinia speciosa* occurs in São Paulo, Rio de Janeiro and Minas Gerais states, mostly in the Mantiqueira mountain complex. It can be found growing in open natural granitic grasslands (*campo de altitude*) in wet or dry soils, sometimes forming wide clusters, from 1500 to 2650 meters. (Fig. 2).

Phenology: *Lepechinia speciosa* was found in flower in December to June, mostly from January to May, and in fruit in January, February, March, April, May, June, September and November, mostly from March to May (Fig. 3).

Specimens Examined: BRAZIL. Minas Gerais: Aiuruoca, Pico do Papagaio, 9 June 1999, *M.F. de Vasconcelos s.n.* (BHCB); Aiuruoca, Serra do Papagaio., Alto da serra. Gruta próxima ao Retiro do Pedros, 22°03'18"S 44°40'17"W, 18 Feb 2005, *R. Mello-Silva & F.M. Ferreira 2853* (CESJ, HUEFS, K, SPF); Aiuruoca, Parque Estadual da Serra do Papagaio, 22°02'32.5"S 44°38'32.1"W, 18 May 2005, *L. Echternacht & R.C. Mota 992* (BHCB); Aiuruoca, Parque Estadual da Serra do Papagaio, Retiro dos Pedros, 22°03'"S 44°40'"W, 11 March 2008, *P.L. Viana et al. 3836* (BHCB, HUEFS); Alagoa, ao longo de toda a subida da Pedra do Garrafão, 22°12'23"S 44°45'56"W, 10 Nov 2007, *N.F.O. Mota et al. 1049* (BHCB, HUEFS); Delfim Moreira, São Francisco dos Campos, 07 June 1950, *M. Kuhlmann 2433* (SP, SPF); Itamonte, road from Garganta do Registro to Abrigo Rebouças and Parque

Figure 4. Lectotype of *Lepechinia annae* (Taub. ex Schwacke) Brade (P-02903809). Image by courtesy of Muséum National d'Histoire Naturelle, Paris; reproduced with permission.

Nacional do Itatiaia between km 6 and km 13, 22°22'22"S 44°42'14"W, 13 March 2009, *F. Almeda et al. 9818* (SPF, UEC); Itamonte, Parque Nacional do Itatiaia, trilha pelo rio Airuoca, 22°19'57.8"S 44°42'07.2"W, 5 May 2012, *V.Y. Jono et al. 58* (SPF); [Itamonte], Serra do Picú, 11 Apr 1879, *A.F.M. Glaziou 11397* (P, R); Passa Quatro, Itaguaré, 9 May 1948, *A.C. Brade 19030* (RB); Passa Quatro, Subida do campo do muro, perto da antena, 22°26'32"S 44°55'18"W, 4 Apr 1995, *I. Koch & L.S. Kinoshita 436* (UEC). Rio de Janeiro: Itatiaia [Resende], [Parque Nacional do Itatiaia], Abrigo Rebouças., 30 Dec 1966, *H. Strang & A. Castellanos 25725* (NY); Itatiaia [Resende], [Parque Nacional do Itatiaia], no Abrigo Rebouças., 12 March 1960, *C. Angeli 106* (NY); Itatiaia [Resende], [Parque Nacional do Itatiaia], perto abrigo Rebouças., 16 Feb 1958, *M. Emmerich 65* (R); Itatiaia [Resende], [Parque Nacional do Itatiaia], Prateleiras., 8 May 1975, *A.M. Camerik 17* (RB); Itatiaia [Resende], Parque Nacional do Itatiaia, Estrada para a parte alta do Parque., 25 May 2013, *M.L.O. Trovó et al. 596* (RB); Itatiaia [Resende], Parque Nacional do Itatiaia, Parte alta, arredores do abrigo Rebouças., 6 Apr 2014, *M.L.O. Trovó et al. 622* (HUEFS, RB); Itatiaia, Feb 1967, *B. Lutz s.n.* (R); Itatiaia, Planalto., 25 May 1961, *E. Pereira 5675* (RB); Itatiaia, [Parque Nacional do Itatiaia], Estrada para as "Prateleiras", 24 Jan 1987, *R. Mello-Silva et al. 17* (F, K, SPF); Itatiaia, [Parque Nacional do Itatiaia], Planalto de Itatiaia, subida das Agulhas Negras, 6 Feb 1969, *D. Sucre 4667* (RB); Itatiaia, [Parque Nacional do Itatiaia], 14 Apr 1949, *M. Rachid s.n.* (SPF); Itatiaia, [Parque Nacional do Itatiaia]., 24 Feb 1948, *M.G. Ferri s.n.* (SPF); Itatiaia, 20 Apr 1957, *L. Emygdio 1468* (R, US); Itatiaia, Estrada nova - km 9., 21 Feb 1948, *A.C. Brade 8902* (RB); Itatiaia, Itatiaia - Mauá., 16 Jan 1936, *P. Campos-Porto 2875* (RB); Itatiaia, Km 18, 19., 31 Jan 1935, *P. Campos-Porto 2740* (RB); Itatiaia, Parque Nacional do Itatiaia, 1 May 1995, *V.C. Souza et al. 9495* (ESA); Itatiaia, Parque Nacional do Itatiaia, BR 495. BR das Flores. Divisa dos estados de Minas Gerais e Rio de Janeiro. Estrada para o Pico das Agulhas, 18 March 2012, *J. Kuntz et al. 414* (ESA, SPF); Itatiaia, Parque Nacional do Itatiaia, Estrada para o Pico das Agulhas Negras, 13 March 2010, *J.M. Silva & J. Cordeiro 7562* (ALCB, MBM, RB, SPSF); Itatiaia, Parque Nacional do Itatiaia, Planalto de Itatiaia, 13 March 1995, *R. Guedes et al. 2530* (RB); Itatiaia, Parque Nacional do Itatiaia, Planalto de Itatiaia., 13 Sep 1994, *R. Guedes et al. 2413* (RB); Itatiaia, Parque Nacional do Itatiaia, Próximo à base do Maciço das Prateleiras, 2 May 2005, *D. Sasaki & G.C.T. Lira 1070* (SPF); Itatiaia; Parque Nacional do Itatiaia, Trail to Prateleiras, 30 Oct 2017, *B.T. Drew et al. 928* (NEBK, SPF); Itatiaia, Planalto, 22°21'"S 44°39'"W, 1920, *P. Campos-Porto s.n.* (RB); Itatiaia., 23 Jan 1873, *A.F.M. Glaziou 6661* (P, R); Parque Nacional do Itatiaia, 18 Jan 1960, O.*M. Barth 3108* (US); Parque Nacional do Itatiaia., 12 Apr 1977, *G. Martinelli & R.M. Harley 1605* (RB); Itatiaya [Itatiaia], 13 March 1903, *A. Loefgren CGG 5860* (SP); Serra do Itatiaia, 11 July 1872, A, Glaziou 5972 (IAN, P); Serra do Itatiaia, 15 May 1902, *P. Dúsen 229* (US); Sep 1984, D.A. Silva s.n. (HRCB, HUEFS); [Itatiaia], Parque Nacional do Itatiaia, Pico das Agulhas Negras, 1 May 1977, *M.S.F. Silvestre 37* (SP, SPF); [Itatiaia], Pico do Itatiaia, Próximo Prateleiras, 8 May 1997, *M. Sazima et al. 35730* (UEC); Petrópolis, Distrito de Pedro do Rio, Vale das Videiras, Morro do Cuca, 2 June 1984, *R. Guedes et al. 839a* (RB); Petrópolis, Vale das Videiras., 21 Apr 1974, *G. Martinelli 233* (RB); Resende, Parque Nacional do Itatiaia, Nas Prateleiras, crescendo na margem da estrada, em encosta de morro., 17 Jan 1985, *J.F.A. Baumgratz et al. 325* (RB); Resende, Serra do Itatiaia, 1953, *F. Segadas-Vianna et al. SERRA 1202* (R, US); [Resende], Entre Massenas e Rebouças, 21 Jan 1961, *E. Fromm et al. 160* (R); [Resende], Parque Nacional do Itatiaia, Planalto near abrigo Rebouças., 2 Feb 1967, *J.C. Lindeman & J.H. de Haas 4158* (NY); [Resende], Parque Nacional do Itatiaia (Agulhas Negras), no caminho e no planalto do sopé de Agulhas Negras e "Prateleiras", 17 Apr 1971, *I. Gottsberger & G. Gottsberger 22-17471* (UB); [Resende], Parque Nacional do Itatiaia., 25 Feb 2015, *D.Q. Domingos 650* (ESAL, SPF); Caminho para o abrigo Macieira, 6 Dec 1982, *O. Cesar s.n.* (HRCB, UEC). São Paulo: Campos do Jordão, Parque Estadual de Campos do Jordão., 18 March 1975, *L.E. Mello & M. Emmerich 4083* (R); Cruzeiro, Alto do Pico do Itaguaré, Limite entre os Estados de São Paulo e Minas Gerais., 4 June 1995, *L. Parra et al. 40* (SPF); [Piquete], Pico dos Marins, APA Serra da Mantiqueira. Maciço antes da nascente do Ribeirão Passa-Quatro, 22°29'52"S 45°07'21"W, 01 Feb 2014, *L.N. Gonçalves & P. Duffles 305* (RB, SPF); São Bento do Sapucaí, Pedra do Bauzinho, 22°41'1"S 45°39'3"W, 8 March 2012, *I. Cordeiro et al. 3338* (SP, SPF); São Bento do Sapucaí, , Pedra do Bauzinho, 22°41'24"S 45°39'27"W, 13 Apr 1995, *J.Y. Tamashiro 838* (ESA, HRCB, SPF, SPSF, UEC); São Bento do Sapucaí, Proximidades da Pedra do Bauzinho., 24 Jan 2004, *F.A.R.D.P. Arzolla & G.C.R. de Paula 405* (HUEFS, SPSF); São José do Barreiro, Entrada para o Bairro dos Macacos. Fazenda Invernadinha., 20 March 1999, *L. Freitas 636* (UEC); Serra da Mantiqueira, Alto da Pedra., 15 Jan 1987, *A. Loefgren CGG 3497* (SP).

Affinities and morphological notes: *Lepechinia speciosa* is morphologically most similar to *L. annae,* see comments under this species. Hart (1983) states that the corollas of *Lepechinia speciosa* are red, but they are actually pink-purple. The species is traditionally used to make tea.

Lectotypification: Bentham (1834), when describing *Sphacele speciosa*, cites an unnumbered collection of Saint-Hilaire, who first recognized the new species in Saint-Hilaire's herbarium. Epling (1935) states that the type is numbered 528, but writes "lectum constituta est; typum verum non reperire potui" meaning that he could not find the true type. He doesn't indicate a type, only an isotype at the *P herbarium*. On checking the material stored at P, 3 specimens of Saint-Hilaire 528 were found. The specimen with the barcode P00714644 is the most complete, with handwriting of Saint-Hilaire and also a label from Epling stating that it is the Type. This material is designated here as the Lectotype (Fig. 5).

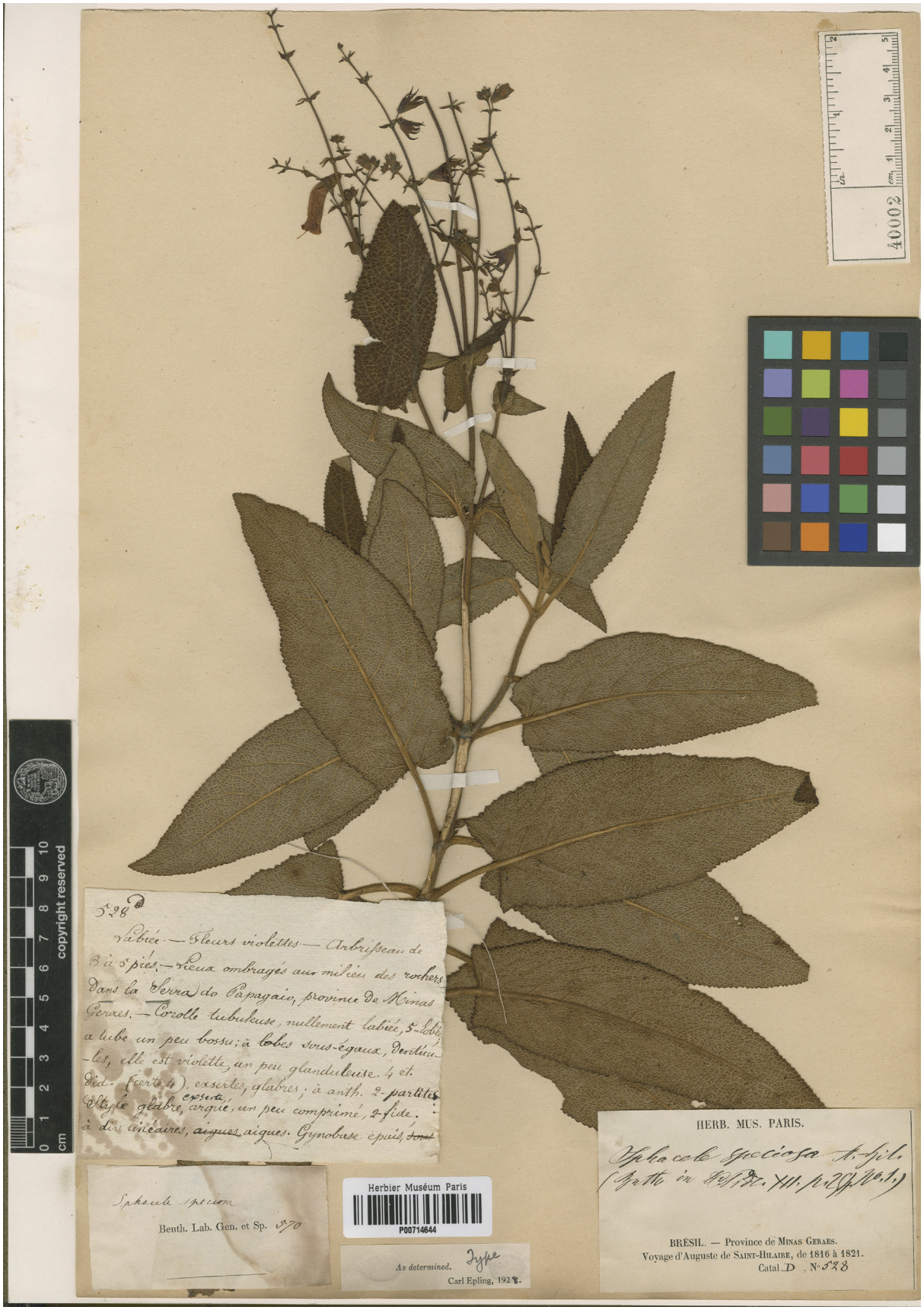

Figure 5. Lectotype of *Lepechinia speciosa* (A.St-Hil. ex Benth.) Epling (P-00714644). Image by courtesy of Muséum National d'Histoire Naturelle, Paris; reproduced with permission.

Final remarks

Carefully conducted taxonomic studies can be useful for delimiting species limits and can inform conservation strategies. After careful examination of morphological characters, it is possible to confirm that there are two species of *Lepechinia* in Brazil. As there are two species recognized in this paper, their conservation status is raised to a level above that when they were treated as one. The administration of the Parque Nacional da Serra do Caparaó urgently needs to monitor *Lepechinia annae*, to ensure its long term survival.

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