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Original Paper

Malpighiaceae in southern Brazil: Identification keys for genera and updates on species richness

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Abstract

Recent studies have contributed to a better understanding of the circumscription of some genera of Malpighiaceae and the overall diversity of the family in Brazilian tropical ecosystems. In southern Brazil, however, this important group of lianas and shrubs still has not been fully categorized. The present study provides identification keys based on floral and fruit morphology for the 23 genera reported from southern Brazil. The importance of the number of styles and the position and shape of the stigmas for the recognition of genera was confirmed. Illustrations of morphological characteristics used in the keys and notes about taxonomy, species richness and distribution are provided. It should be noted that the occurrence of some Malpighiaceae genera that are represented by only one species in the southern region, such as *Bronwenia*, *Camarea* and *Heladena*, are not yet cited in the Flora do Brasil 2020 database. A total of 95 species were confirmed and documented by voucher specimens. *Banisteriopsis pseudojanusia*, *Heteropterys dusenii* and *Peixotoa catarinensis*, occur exclusively in southern Brazil and are classified as "Critically Endangered", "Vulnerable" and "Endangered" in the Brazilian Red List, respectively.

Key words: Atlantic Forest, Cerrado, lianas, Malpighiales, Pampa.

Resumo

Embora recentes estudos tenham contribuído para uma melhor compreensão da circunscrição de gêneros e da diversidade da família Malpighiaceae em ecossistemas tropicais brasileiros, na Região Sul, esse importante grupo de lianas e arbustos ainda apresenta dificuldades para a sua identificação. O presente estudo traz chaves de identificação baseadas na morfologia de flores e frutos para 23 gêneros de Malpighiaceae registrados no sul do Brasil. A importância do número de estiletes e da posição e forma dos estigmas para o reconhecimento de gêneros foi confirmada. Adicionalmente, são apresentadas ilustrações relativas às características morfológicas incluídas nas chaves, além de observações sobre a taxonomia, riqueza de espécies e distribuição dos gêneros abordados. Cabe destacar que a ocorrência de alguns gêneros representados na Região Sul por apenas uma espécie, como é o caso de *Bronwenia*, *Camarea* e *Heladena,* não é mencionada na Flora do Brasil 2020, em construção. Ao total, 95 espécies de Malpighiaceae foram confirmadas para a região e documentadas por materiais testemunho. *Banisteriopsis pseudojanusia*, *Heteropterys dusenii* e *Peixotoa catarinensis* ocorrem exclusivamente no sul do Brasil e são classificadas como "Criticamente em Perigo", "Vulner*ável"* e "Em Perigo", respectivamente, no Livro Vermelho da Flora do Brasil.

Palavras-chave: Mata Altântica, Cerrado, lianas, Malpighiales, Pampa.

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Introduction

Malpighiaceae is composed of approximately 75 genera and 1300 species, including a great diversity of neotropical lianas, shrubs and trees (Anderson *et al.* 2006). Most of this species richness is found in Brazil and is frequently associated with more-open vegetation types, such as Cerrado and Campos Rupestres (Anderson 2004; Mamede *et al.* 2015), or rain forests (Almeida *et al.* 2016). Despite being more diverse in tropical ecosystems, some species of Malpighiaceae reach extratropical latitudes. In southern Brazil, Malpighiaceae occur in both forested and non-forested ecosystems (Amorim *et al.* 2013). Nonetheless, as mentioned, the family includes a great diversity of lianas which have not been fully studied in extratropical regions, despite their great floristic and ecological importance (Durigon *et al.* 2019).

The south of Brazil (*i.e.*, states of Paraná, Santa Catarina, and Rio Grande do Sul) has been recognized for its flora, which includes species of tropical and temperate origins (Durigon & Waechter 2011). It is a convergence area of different floristic elements and, notably, the southern distribution limit of several tropical species (Rambo 1961). Three biomes can be identified, with different extents over the area (IBGE 2004): the Atlantic Rainforest, distributed across the three states; the Cerrado (Brazilian savannah), represented by only a small area in northeastern Paraná; and the Pampa, which in Brazil is restricted to Rio Grande do Sul, covering the state's southern half. The Atlantic Forest and Cerrado are widely recognized as biodiversity conservation hotspots (Mittermeier *et al.* 2005), and several efforts have been employed to understand the diversity of Malpighiaceae in these biomes (Francener *et al.* 2015, 2017; Almeida *et al.* 2016). On the other hand, little is known about the Malpighiaceae species richness in the Pampa, which is still considered a neglected biome (Overbeck *et al.* 2007), despite having several endemic species and, in some places, a highly species-rich flora (Boldrini 2009).

Malpighiaceae is one of the ten most threatened botanical families of the Brazilian flora (Martinelli *et al.* 2013; Martins *et al.* 2018) and, in the Rio Grande do Sul Endangered Plant Species List (Rio Grande do Sul 2014), eight species of the family are cited as threatened. The rapid advance of monocultures is accelerating the loss of habitats and species in southern Brazil (Overbeck *et al.* 2007). Rio Grande do Sul has been considered a new frontier of mineral exploration, and most of the projects are focused on the most conserved areas of the Pampa Biome, with great potential impact on biodiversity (Durigon & Seifert Jr. 2018).

Despite recent taxonomic and phylogenetic studies concerning the family Malpighiaceae (Almeida *et al.* 2016, 2017; Almeida 2018), in the South Region of Brazil, floristic studies of the family are still lacking. Monographs of Malpighiaceae genera and extensive taxonomic revisions generally do not account for specimens that are in border areas between biogeographical regions and do not cover particular morphological data in addition to not providing taxonomic tools applicable at a regional scale. These gaps in the taxonomy of Malpighiaceae weaken the circumscription of taxa, making it difficult to recognize the group in southern Brazil and, ultimately, prevent the measurement of regional species diversity. The objective of the present study is to provide identification keys for Malpighiaceae genera in southern Brazil, along with notes on its current taxonomy, as well as updates on the species richness and their distribution in these three southern states.

Materials and Methods

The study area included the states of Paraná, Santa Catarina, and Rio Grande do Sul, encompassing the three different biomes, Atlantic Forest, Cerrado, and Pampa (Fig. 1).

The list of genera of Malpighiaceae occurring in the study area and their morphological characteristics were obtained from the analysis of specimens collected from 13 field expeditions conducted between December 2011 and January 2014 as well as specimens found in the largest herbarium collections in southern Brazil, as well as, other important collections of Brazilian flora (CRI, FLOR, FUEL, HAS, HBR, HUCS, ICN, MBM, PACA, PEL, R, RB, SMDB, UPCB). The terminology used in the keys follow Anderson (1981), and the character states were determined only from the species found in southern Brazil. The notes about genera taxonomy are based on specialized literature on the family (see Supplementary Material), the distribution of confirmed species was determined based on the collected material, the occurrence data obtained from the databases (CRIA 2020; REFLORA, 2020), and from the consulted herbarium collections.

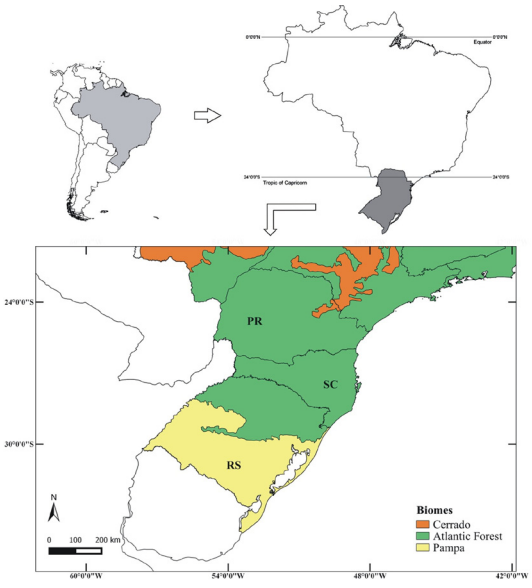

Figure 1 – Location of study area and the three biomes sampled in southern Brazil – a. map of South America, with emphasis on Brazil; b. map of the southern region of Brazil; c. geopolitical division of southern Brazil and the distribution of the three biomes. RS: Rio Grande do Sul; SC: Santa Catarina and PR: Paraná.

Results and Discussion

In our extensive survey on southern Brazilian Malpighiaceae, 23 of the 45 genera recognized for Brazil were recorded (Flora do Brasil 2020, under construction), which represents 52.3% of the family diversity at the generic level. The placement of the genera into clades according to Anderson *et al.* (2006) and the relevant references about the genera can be found in the Supplementary Material (Tab. S1, available on <https://doi.org/10.6084/m9.figshare.16876165.v1>).

The importance of the number of styles and the position and shape of the stigmas for the recognition of genera was confirmed, in addition to several characteristics of dried or fleshy fruits. Two identification keys for Malpighiaceae genera, based on floral and fruit morphology, respectively, are presented as follows. These also include some vegetative characters, especially related to the indument, leaves and stipules.

Key to the genera of Malpighiaceae from southern Brazil based on floral characters

1. Styles with terminal stigmas (Figs. 2e, 2g-i, 2l, 3d, 3j, 4i, 5f, 5k) 2
1'. Styles with stigmas on ventral surface (Figs. 3g, 4e-f, 5h) 14
2. Styles slender and subulate, tapering to minute stigmas (Figs. 2l, 3j); inflorescence terminal .. 3
2'. Styles slender to stout, of uniform diameter along their length or enlarged at apex; stigmas capitate, truncate or subpeltate; inflorescence terminal or axillary 4
3. Leaves eglandular; pedicels sessile (Fig. 2k); petals posterior (Fig. 5a) with erect claw (Fig. 2k); calyx bearing a pair of oblong large glands on each sepal ..... *Byrsonima*
3'. Leaves bearing marginal glands on base of lamina; pedicels pedunculate; all petals with patent claw; calyx eglandular or with rounded glands on base of the sinus between adjacent sepals (Fig. 3i) ..... *Galphimia*
4. Stigmas capitate with any sort of dorsal extension (Fig. 5k) or stigmas subpeltate (Fig. 2i) 5
4'. Stigmas capitate or truncate without dorsal extension 7
5. Calyx with 4 pairs of stalked peltate glands (Fig. 3k) ..... *Heladena*
5'. Calyx eglandular or with 4 or 5 pairs of sessile glands 6
6. Plants with stellate hairs; calyx eglandular; inflorescence a thyrse; bracts and bracteoles eglandular; sepals completely concealing the petals at pre-anthesis stages (Fig. 5j); scandent shrubs to lianas ..... *Thryallis*
6'. Plants with T-shaped hairs; calyx bearing 4 or 5 pairs of glands; inflorescence an axillary pseudoraceme, unbranched or sometimes ternate at base; bracts and bracteoles bearing glands; sepals leaving petals exposed at pre-anthesis stages; shrubs to small tree ..... *Bunchosia*
7. Gynoecium with 2 or 3 styles (Figs. 2g, 5f) 8

7. Gynoecium with only 1 style (Figs. 2e, 3d) 12
   8. Pedicels pedunculate (peduncle ≥ 4 mm long) ..... *Tetrapterys*
   8'. Pedicels sessile or rarely short pedunculate (peduncle 0.5–3.0 mm long) 9
      9. Androecium with 5 stamens and 5 staminodia (Fig. 5e); pair of stipules from opposite leaves connate to form a large cordate structure (Fig. 5d) ..... *Peixotoa*
      9'. Androecium with 9 or 10 stamens; stipules absent or if present, triangular 10
         10. Styles densely hairy for up to half their length; all stamens with glandular connective; calyx eglandular or calyx glands attached below the free part of the sepals on receptacle ..... *Diplopterys*
         10'. Styles glabrate or with strigose indument in the base; some stamens with glandular connective or all stamens with connectives not glandular; calyx eglandular or calyx glands attached on or below the free part of sepals on receptacle 11
            11. Calyx eglandular or bearing pairs of glands on the free part of the sepals; some stamens with glandular connective; solitary umbel or ultimate unit of inflorescence an umbel; petals white, yellow or pink ..... *Banisteriopsis*
            11'. Calyx glands attached below the free part of the sepals on receptacle; all stamens with connectives not glandular; panicles (ultimate unit of inflorescence a pseudoraceme); petals yellow ..... *Bronwenia*
               12. Androecium with 5 or 6 stamens, without staminodia (Fig. 4h); climbers, rarely shrubs ..... *Janusia*
               12'. Androecium with 3 or 4 stamens, staminodia present; subshrubs or shrubs .. 13
                  13. Three stamens and 2 staminodia (Fig. 2d); lamina with sericeous indument ..... *Aspicarpa*
                  13'. Four stamens and 2 staminodia (Fig. 3c); lamina with hirsute indument..... *Camarea*
                     14. Styles bearing lateral appendages in their apices (Fig. 5h); petiole biglandular at apex (Fig. 5g) or eglandular with glands on abaxial base of lamina; stamens strongly unequal; stipules epipetiolar, triangular ..... *Stigmaphyllon*
                     14'. Styles without lateral appendages in their apices; petiole eglandular or bearing glands between base and middle of its length; stipules triangular, filiform or subulate or stipules absent 15
                        15. Stigmatic surface transversely expanded (Fig. 3a); three posterior anthers smaller than the other seven ..... *Callaeum*
                        15'. Stigmatic cavity; subequal anthers 16
                           16. Styles 2 (Fig. 3g), rarely 3, the third (anterior position) style rudimentary or absent; styles with two ventral protuberances; bracts concave (Fig. 3f); petals abaxially densely sericeous ..... *Dicella*
                           16'. Styles 3; styles without ventral protuberance; bracts flat; petals abaxially tomentose or sericeous 17
                              17. Stipules epipetiolar, subulate between middle and apex of petiole (Fig. 4d); epipetiolar stipules; flowers sessile; inflorescence a solitary umbel ..... *Hiraea*
                              17'. Stipules epipetiolar or not, triangular, very small, at base, middle or apex of petiole; stipules interpetiolar or absent; flowers sessile or pedunculated; pseudoraceme, corymb, panicle or another type of compound inflorescence, never solitary umbel 18
                                 18. Sepals strongly revolute in anthesis (Fig. 5c) .. .. *Niedenzuella*
                                 18'. Sepals appressed, recurved or slightly revolute at apex in anthesis 19

19. Lamina abaxially densely and persistently golden, silvery or metallic-sericeous .... *Heteropterys* [in part]
19'. Lamina glabrate or abaxially glabrate, pubescent, tomentose or very thinly sericeous 20
20. Petals abaxially carinate (Fig. 4B); flowers pink or white, rarely yellow .... *Heteropterys* [in part]
20'. Petals abaxially not carinate; flowers yellow, rarely lilacs or pink 21
21. Bracteoles subopposite inserted just below the apex of peduncle ..... *Heteropterys* [in part]
21'. Bracteoles opposite or subopposite inserted at apex of peduncle 22
22. Petiole bearing a pair of glands at base; bracteoles eglandular; leafy-bracteous, paniculiform sinflorescence ..... *Heteropterys* [in part]
22'. Petiole eglandular or bearing glands slightly above of its base; bracteoles eglandular or bearing glands; ultimate units of inflorescence a pseudoraceme (Fig. 4l) or a corymb 23
23. Leaves abaxially eglandular or bearing glands on margin; petals abaxially densely sericeous ..... *Carolus*
23'. Leaves abaxially bearing glands between midrib and margin; petals abaxially glabrous, tomentose or sericeous 24
24. Stipules epipetiolar or absent; bracteoles slightly concave ..... *Alicia*
24'. Stipules interpetiolar (Fig. 4k); bracteoles flat 25
25. Bracts sessile, linear or triangular, eglandular; petals yellow, pink or lilac ..... *Mascagnia*
25'. Bracts short-petiolate, lanceolate, bearing marginal glands on each side near base (Fig. 2c); petals yellow ..... *Amorimia*

Key to the genera of Malpighiaceae from southern Brazil based on fruit caracters

1. Fruit fleshy at maturity (Figs. 2j, 2m) 2
1'. Fruit dry at maturity (Figs. 2f, 3b, 3h, 4c, 4g, 4j, 5b, 5i, 5l) 3
2. Leaves and bracteoles eglandular; calyx bearing 5 pairs of glands; inflorescence a terminal pseudoraceme ..... *Byrsonima*
2'. Leaves bearing glands impressed in abaxial surface of blade; some bracteoles bearing abaxial glands; calyx bearing 4 pairs of glands; inflorescence an axillary pseudoraceme, unbranched or sometimes ternate at base ..... *Bunchosia*
3. Fruit syncarpic, densely sericeous when immature (Fig. 3h) ..... *Dicella*
3'. Fruit schizocarpic, sericeous when immature 4
4. Mericarps with winged pericarp 5
4'. Mericarps with unwinged pericarp 20
5. Mericarps with dorsal wing dominant (Figs. 2f, 3e, 4c, 4j); nut smooth or bearing winglets or crests on each side 6
5'. Mericarps with lateral wings dominant (Figs. 3b, 4g, 5b, 5i) 13
6. Wing of mericarp with the abaxial edge thickened (Fig. 4c) ... *Heteropterys*
6'. Wing of mericarp with the adaxial edge thickened (Figs. 2f, 3e, 4j) 7
7. Pedicels pedunculate (peduncle ≥ 4 mm long) 8
7'. Pedicels sessile or rarely short pedunculate (peduncle 0.5–3.0 mm long) 9
8. Mericarp with dorsal wing well developed (Fig. 4j) ..... *Janusia*
8'. Mericarp with dorsal ridge or rudimentary dorsal wing (Fig. 5f) .. .. *Aspicarpa*
9. Stem with a pair of stipules from opposite leaves connate to form a large cordate structure (Fig. 5d) ..... *Peixotoa*
9'. Stem with triangular and minute stipules or stipules absent .. 10
10. Nut with winglets and with or without an appendage at base of adaxial edge of dorsal wing 11

10'. Nut smooth or with discontinuous winglets and without appendages at base of adaxial edge of dorsal wing 12
11. Nut bearing a winglet on each side; a pair of basal glands on each side of the midrib; inflorescence paniculate; dorsal wing without appendage ..... *Bronwenia*
11'. Nut bearing 2–3 winglets on each side (Fig. 3e); lamina bearing minute and numerous glands on margin; petiole bearing glands in its apex; umbel or pseudoraceme; dorsal wing with appendage ..... *Diplopterys*
12. Petiole eglandular or rarely with a pair of glands near the apex, whose diameter is less than 0.5 mm ..... *Banisteriopsis*
12'. Petiole with a pair of prominent glands at its apex (Fig. 5g), whose diameter is equal to or greater than 0.8 mm ..... *Stigmaphyllon*
13. Mericarps with 4 lateral wings or with 2 lateral wings and one dorsal wing, both well developed 14
13'. Mericarps with two lateral wings, free or continuous at base and dorsal wing much reduced (winglet or dorsal crest) or absent 15
14. Sepals strongly revolute in anthesis (Fig. 5c); stigma ventral ..... *Niedenzuella*
14'. Sepals erect or recurved in anthesis; stigma terminal ..... *Tetrapterys*
15. Pedicels sessile; stipules subulate, epipetiolar (Fig. 4d) ..... *Hiraea*
15'. Pedicels pedunculate; stipules interpetiolar, triangular or filiform 16
16. Mericarps bearing two lateral wings with free margins at the base and apex (Figs. 3b, 4g) 17
16'. Mericarps bearing two lateral wings with confluent margins at the base (Fig. 5b) 19
17. Bracts with 1 or 2 basal glands (Fig. 2c); bracteoles eglandular, rarely with 1 pair of glands ..... *Amorimia*
17'. Bracts and bracteoles eglandular 18
18. Bracteoles flat; glands on or embedded in margin; elongated pseudoracemes; stipules interpetiolar ..... *Carolus*
18'. Bracteoles concave; glands at or on margin of lamina; umbels, corymbs or short pseudoracemes; stipules epipetiolar .... *Callaeum*
19. Stipules interpetiolar; membranous wings (Fig. 5b); bracts and bracteoles flat ..... *Mascagnia*
19'. Stipules epipetiolar; chartaceous or papyraceous wings; bracts flat, lanceolate and bracteoles concave (Fig. 2a) . ..... *Alicia*
20. Mericarps equinate; lamina bearing a pair of pedunculate glands at base, near the margin .... *Camarea*
20'. Mericarps smooth or slightly rugose; lamina eglandular or with sessile glands 21
21. Fruit with enlarged winglike sepals (Fig. 5l); sepals eglandular; plants with stellate hairs .... *Thryallis*
21'. Fruit without winglike sepals; sepals bearing pairs of glands; plants with a T-shaped hairs 22
22. Calyx with 4 pairs of stalked peltate glands (Fig. 3k) ..... *Heladena*
22'. Calyx eglandular or with rounded glands in base of each sinus between adjacent sepals (Fig. 3i) ..... *Galphimia*

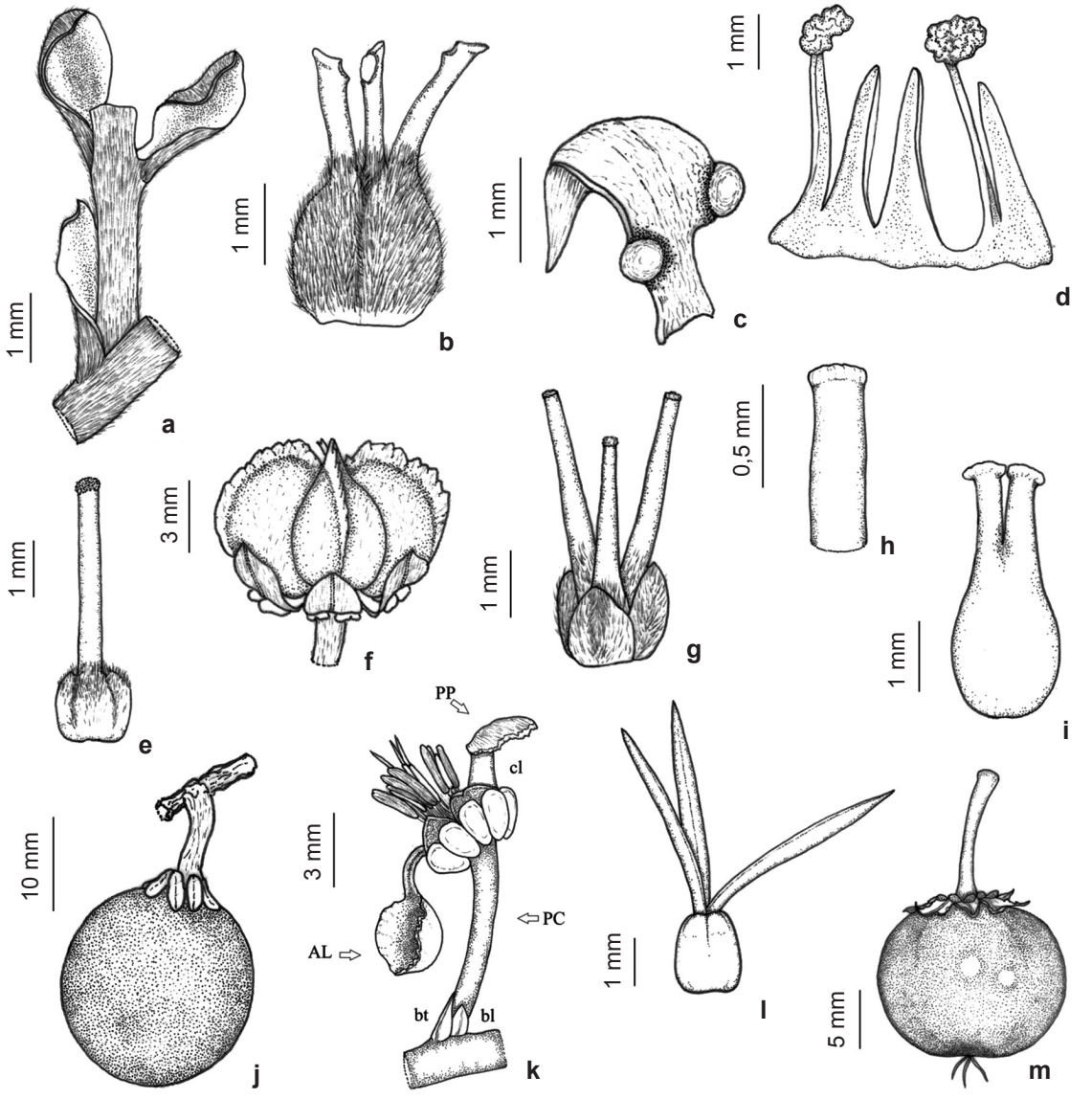

Figure 2 – Morphological details of selected genera of Malpighiaceae found in southern Brazil – a–b. *Alicia* – a. bracts and bracteoles, b. gynoecium; c. *Amorimia* –bract; d-f. *Aspicarpa* – d. androecium, e. gynoecium, f. fruit with three mericarps; g-j. *Banisteriopsis* – g. gynoecium, g. detail of apex of the style; i-j. *Bunchosia* – i. gynoecium, j. fruit; k-m. *Byrsonima* – k. sessile flower (lateral view), showing posterior petal with erect claw (PC: pedicel; PP: posterior petal; AL: antero-lateral petal; bt: bract; bl: bracteole; cl: claw), l. gynoecium, m. fruit. (a-b. *E.L.C. Soares 307*; c. *E.L.C. Soares 319*; d-f *E.L.C. Soares 380*; g-h *E.L.C. Soares 453*; i-j *E.L.C. Soares 355*; k-m *E.L.C. Soares 481*).

Species richness and occurrence

The 23 genera of Malpighiaceae found in southern Brazil comprise 95 species, among them, trees, shrubs, subshrubs (upright, rhizomatous or xylopodiferous), and climbers. Almost all species (92) were recorded in the Atlantic Forest, in the state of Paraná. More than a third of the 95 species were found in the states of Santa Catarina (35) and Rio Grande do Sul (31). The complete list of species, occurrence data and voucher specimens can be found in the Table 1. Notes about genera taxonomy, species richness by genera, and distribution data are presented in the following.

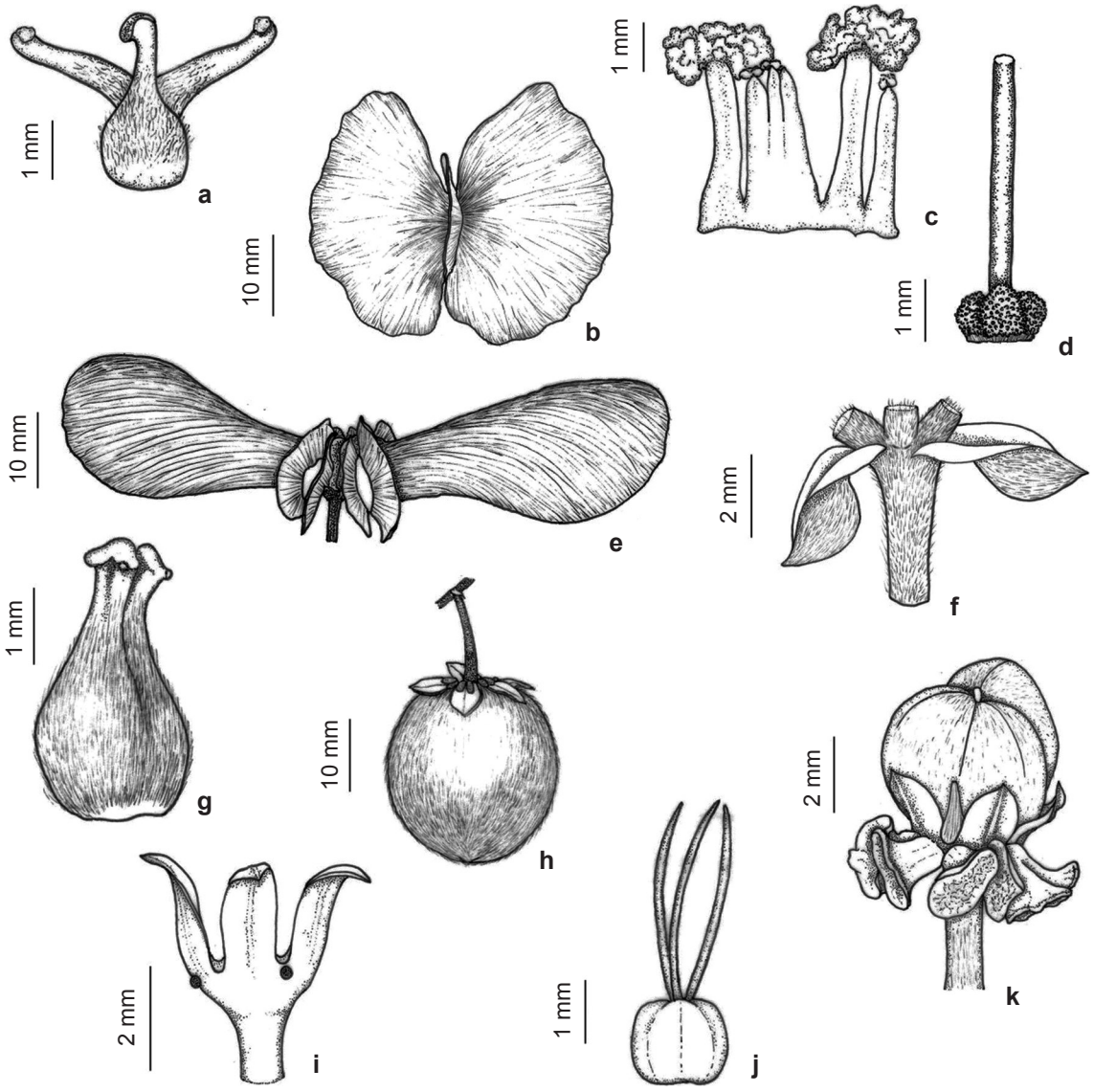

Figure 3 – Morphological details of selected genera of Malpighiaceae found in southern Brazil – a–b. *Callaeum* – a. gynoecium; b. mericarp (ventral view); c–d. *Camarea* – c. Androecium, d. gynoecium; e. *Diplopterys* – fruit with two mericarps; f–h. *Dicella* – f. bracts, g. gynoecium, h. fruit; i–j. *Galphimia* – i. calyx (two sepals were removed), j. fruit; k. *Heladena* – fruit with three mericarps. (a-b. *E.L.C. Soares 336*; c-d. *E.L.C.Soares 448*; e. *E.L.C.Soares 505*; f-h. *E.L.C. Soares 491*; i-j. *E.L.C.Soares 502*; k. *E.L.C.Soares 504*).

1. *Alicia*

This is one of the generic segregates of *Mascagnia s.l.* (Anderson 2006a) and comprises two species, both South American lianas. *Alicia anisopetala* (A.Juss.) W.R.Anderson is the only species of the genus in southern Brazil, occurring in the Atlantic Forest, in the states of Santa Catarina and Paraná.

2. *Amorimia*

This is one of the generic segregates of *Mascagnia s.l.* (Anderson 2006a) and comprises fifteen species of South American lianas. *Amorimia exotropica* (Griseb.) W.R.Anderson is the only species of the genus in southern Brazil, occurring in the Atlantic Forest in Paraná, Santa Catarina and Rio Grande do Sul.

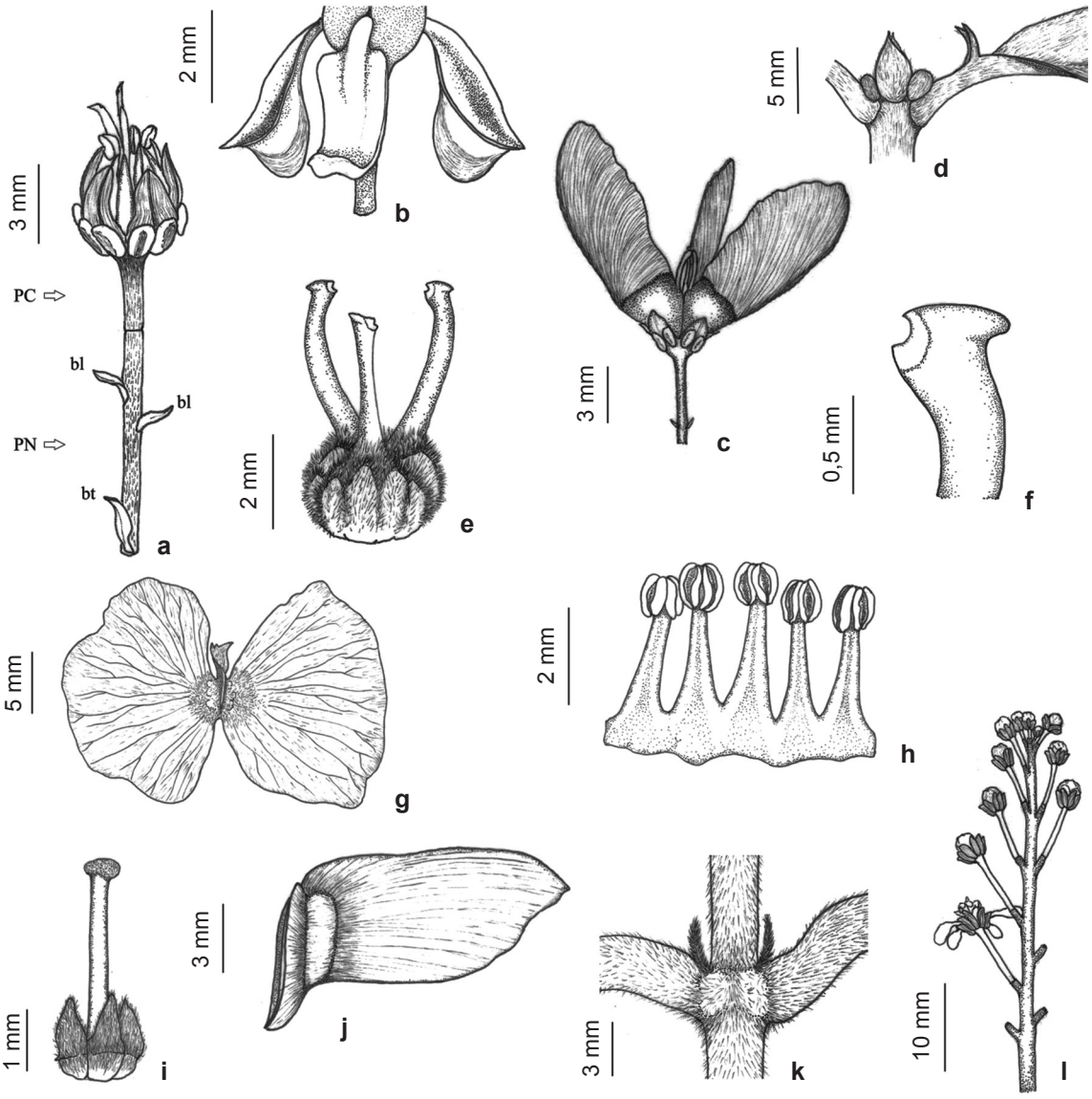

Figure 4 – Morphological details of selected genera of Malpighiaceae found in southern Brazil – a–c. *Heteropterys* – a. flower (lateral view, petals were removed, PN: peduncle, PC: pedicel, bt: bract, bl: bracteole), b. carenate petals, c. fruit with three mericarps; d–g. *Hiraea* – d. epipetiolar stipule, e. gynoecium, f. detail of apex of the style, g. mericarp (ventral view); h–j. *Janusia* – h. gynoecium, i. gynoecium, j. mericarp (lateral view); k–l. *Mascagnia* – k. interpetiolar stipule, l. pseudoraceme. (a. *E.L.C. Soares 500*; b. *E.L.C. Soares 316*; c. *E.L.C. Soares 321*; d-g. *E.L.C. Soares 390*; h-j. *E.L.C. Soares 395*; k. *E.L.C. Soares 423*; l. *E.L.C. Soares 406*).

Recently, Almeida *et al.* (2017) proposed two new subgenera for *Amorimia*; *A. exotropica* was placed in the subgenus *Amorimia*. As the epithet makes reference to, this species is distributed outside the tropics and, according to Almeida (2018), it should be regarded as Endangered in Brazil. It is easily recognized by the hairy petals on the abaxial surface, bracts with 1–2 basal glands (Fig. 2c) and fruits that split into three lateral-winged mericarps.

3. *Aspicarpa*

The genus currently comprises ten species but does not seem to be monophyletic (Cameron *et al.* 2001; Davis & Anderson 2010). *Aspicarpa pulchella* (Griseb. *ex* Mart.) O'Donell & Lourteig

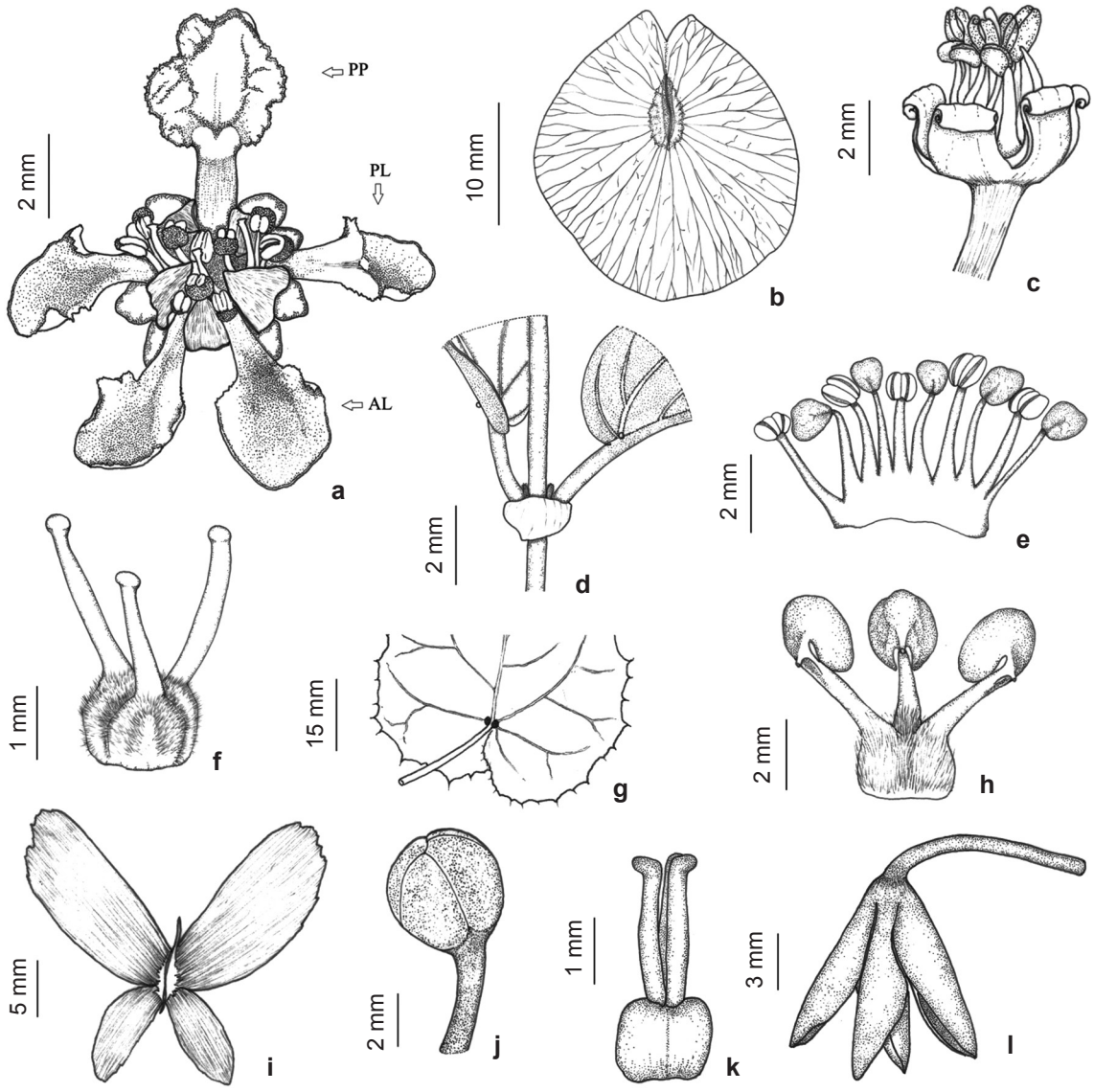

Figure 5 – Morphological details of selected genera of Malpighiaceae found in southern Brazil – a–b. *Mascagnia* – a. flor (frontal view; PP: posterior petal, PL: postero-lateral petal, AL: antero-lateral petal), b. mericarp (ventral view); c. *Niedenzuella* – flower (lateral view, petals were removed); d–f. *Peixotoa* – d. stipule, e. androecium, f. gynoecium; g–h. *Stigmaphyllon* – g. petiole abaxially biglandular near apex, h. gynoecium; i. *Tetrapterys* – mericarp (ventral view); j–l. *Thryallis* – j. bud, k. gynoecium, l. expanded calyx. (a-b. *E.L.C. Soares 406*; c. *E.L.C. Soares 476;* d-f. *E.L.C.Soares 451;* g-h. *E.L.C. Soares 479*; i. *E.L.C. Soares 490*; j-l. *E.L.C. Soares 506*).

is the only species of the genus in southern Brazil, occurring in grasslands of three different biomes (Atlantic Forest, Cerrado and Pampa) and registered in Paraná, Santa Catarina and Rio Grande do Sul. *A. pulchella* is characterized by a herbaceous stem emerging from a perennial base, and the presence of a single style, three stamens, and two staminodia (Figs. 2d, 2e)

4. *Banisteriopsis*

As traditionally defined by Gates (1982), this genus seems to be polyphyletic (Cameron *et al.* 2001; Davis *et al.* 2001). *Banisteriopsis* comprises 57 species, with 47 species recorded in Brazil. In southern Brazil, nine species were registered, including trees, climbers, and subshrubs, which are distributed almost exclusively in the Cerrado, in the

Table 1 – List of Malpighiaceae species in southern Brazil, respective states and biomes of occurrence and vouchers. States: PR: Paraná; SC: Santa Catarina; RS: Rio Grande do Sul. Biomes: ATL: Atlantic Forest; CER: Cerrado; PAM: Pampa.

Species	State	Biome	Vouchers
Alicia anisopetala (A.Juss.) W.R.Anderson	PR	ATL	D.A. Estevan *et al*. 59 (FUEL)
	SC	ATL	R. Reitz 6149 (HBR)
Amorimia exotropica (Griseb.) W.R.Anderson	PR	ATL	R.F. Almeida & A. Francener 549 (FUEL)
	SC	ATL	E.L.C. Soares 319 (ICN)
	RS	ATL	B. Rambo 39952 (PACA)
Aspicarpa pulchella (Griseb. ex Mart.) O'Donell & Lourteig	PR	CER	E.D. Lozano & V. Ariati 1116 (MBM)
	SC	ATL	G. Hashimoto 9272 (SP)
	RS	ATL	E.L.C. Soares 484 (ICN)
		PAM	R.A. Záchia 5982 (SMDB)
Banisteriopsis adenopoda (A.Juss.) B.Gates	PR	ATL	E. Barbosa & E.F. Costa 1268 (MBM)
		CER	J.M. Silva *et al.*1109 (MBM)
Banisteriopsis campestris (A.Juss.) Little	PR	CER	V. Linsingen 72 (MBM)
Banisteriopsis laevifolia (A.Juss.) B.Gates	PR	CER	G. Hatschbach 29232 (MBM)
Banisteriopsis malifolia (Nees & Mart.) B.Gates	PR	CER	R.C. Ferreira 30 (HCF)
Banisteriopsis muricata (Cav.) Cuac.	PR	CER	J. Marques de Lima 308 (MBM)
Banisteriopsis nummifera (A.Juss.) B.Gates	PR	ATL	J. Carneiro 231 (MBM)
Banisteriopsis parviflora (A.Juss.) B.Gates	PR	ATL	E.S. Sekine *et al*. 95 (MBM)
		CER	G. Hatschbach & J.M. Silva 51980 (MBM)
Banisteriopsis pseudojanusia (Nied.) B.Gates	PR	ATL	R.M. Britez *et al*. 279 (MBM)
	SC	ATL	R. Reitz & R.M. Klein 12424 (HBR)
Banisteriopsis variabilis B.Gates	PR	ATL	G. Hatschbach 14247 (MBM)
		CER	R.C. Ferreira 10 (SP)
Bronwenia ferruginea (Cav.) W.R.Anderson & C.C.Davis	PR	ATL	Y. Saito 1069 (P)
Bunchosia maritima (Vell.) J. F. Macbr.	PR	ATL	G. Hatschbach 10971 (FLOR)
	SC	ATL	R. Negrelle& C.A. Fava 646 (SP)
	RS	ATL	M.L. Porto 1914 (ICN)
Bunchosia pallescens Skottsb.	PR	ATL	G. Hatschbach 45575 (NY)
	SC	ATL	R. Reitz & R.M. Klein 5085 (HBR)
	RS	ATL	J. Spanholi s.n. (ICN 120657)
Byrsonima brachybotrya Nied.	PR	CER	E. Barbosa *et al.*1665 (MBM)
Byrsonima clausseniana A.Juss.	PR	CER	M.R.B. Carmo 413 (SP)
Byrsonima coccolobifolia Kunth	PR	CER	A. Uhlmann *et al*. 67 (UPCB)
Byrsonima crassifolia (L.) Kunth	PR	CER	A.C. Cervi 3988 (UPCB)
Byrsonima cydoniifolia A.Juss.	PR	CER	M.R.B. Carmo 414 (SP)
*Byrsonima guilleminiana*A.Juss.	PR	CER	P.K.H. Dusén 10876 (NY)

Species	State	Biome	Vouchers
Byrsonima intermedia A.Juss.	PR	CER	G. Hatschbach 3784 (MBM)
	PR	ATL	G.Hatschbach *et al*. 69830 (MBM)
Byrsonima ligustrifolia A.Juss.	SC	ATL	J.S. Oliveira 45 (ICN)
	RS	ATL	E.L.C. Soares 481 (ICN)
Byrsonima myricifolia Griseb.	PR	ATL	Y.S.Kuniyoshi & Ponciano 4716 (MBM)
	PR	ATL	J.M. Silva 1065 (MBM)
Byrsonima niedenzuiana Skottsb.	SC	ATL	K. Hagelund 9880 (ICN)
	RS	ATL	J.L.Waechter 1564 (ICN)
Byrsonima paulista A.Juss.	PR	CER	G. Hatschbach 18709 (NY)
Byrsonima psilandra Griseb.	PR	CER	G. Hatschbach 5486 (MBM)
Byrsonima sericea DC.	PR	CER	G. Hatschbach & L. Noblick 5709 (MBM)
Byrsonima subterranea Brade & Markgr.	PR	CER	T.H. Aguiar & E.M. Francisco 144 (FUEL)
Byrsonima umbellata A.Juss.	PR	CER	F. Barros 2128 (ESA)
Byrsonima verbascifolia (L.) DC.	PR	CER	L.T. Dombrowski & P. Scherer Neto 12247 (MBM)
	PR	ATL	G. Hatschbach 46242 (MBM)
Callaeum psilophyllum (A.Juss.) D.M.Johnson	SC	ATL	R.L.C. Bortoluzzi & E. Biondo 1220 (ICN)
	RS	ATL	E.L.C. Soares & R. Záchia 503 (ICN)
Camarea affinis A.St.-Hil.	PR	CER	E.L.C. Soares 448 (ICN)
Carolus chlorocarpus (A.Juss) W.R.Anderson	PR	ATL	M.G. Caxambu 3434 (HCF)
	PR	ATL	V. Kinupp 299 (FUEL)
Dicella bracteosa (A.Juss.) Griseb.	SC	ATL	A. Nuernberg 992 (FLOR)
	RS	ATL	E. L. C. Soares 19 (SMDB)
	PR	ATL	M.V. F. Tomé 684 (MBM)
Dicella nucifera Chodat	SC	ATL	B. Rambo 993 (PACA)
	RS	ATL	J. Durigon 967 (ICN)
Diplopterys lutea (Griseb.) W.R.Anderson & C.C.Davis	PR	ATL	J. Carneiro 1143 (MBM)
Diplopterys pubipetala (A.Juss.) W.R.Anderson & C.C.Davis	PR	ATL	R. Lange & R. Braga 12 (MBM)
	PR	ATL	A.C. Cervi 2525 (CGMS)
		CER	J. Durigon & P.P.A. Ferreira 560 (ICN)
Galphimia australis Chodat	SC	ATL	G. Hashimoto 9268 (SP)
	RS	ATL	M. Sobral 5292 (ICN)
		PAM	E.L.C. Soares 374 (ICN)
Heladena multiflora (Hook. & Arn.) Nied.	PR	ATL	M.G. Caxambu 3442 (HCF)
	RS	ATL	E.L.C. Soares 506 (ICN)
	PR	ATL	G. Hatschbach 18097 (MBM)
Heteropterys aenea Griseb.	SC	ATL	R.M. Klein 6945 (FLOR)
	RS	ATL	G.D.S. Seger 350 (ICN)

Species	State	Biome	Vouchers
Heteropterys argyrophaea A.Juss.	PR	ATL	J.S. Carneiro *et al*. 449 (FUEL)
	RS	ATL	E.L.C. Soares 391 (ICN)
Heteropterys banksiifolia Griseb.	PR	ATL	L. T. Dombrowski & Y. Saito 2643 (MBM)
Heteropterys bicolor A.Juss.	PR	ATL	J.M. Silva*et al.* 2215 (MBM)
Heteropterys byrsonimifolia A.Juss.	PR	ATL	G. Hatschbach 7198 (MBM)
		CER	A.C. Cervi 3856 (UPCB)
Heteropterys cochleosperma A.Juss.	PR	ATL	G. Hatschbach & O. Guimarães 19119 (MBM)
Heteropterys coleoptera A.Juss.	PR	ATL	L. Krieger 11087 (MBM)
	SC	ATL	P. Fiaschi 3664 (SPF)
Heteropterys crenulata Mart.	PR	ATL	G. Hatschbach 48109 (MBM)
Heteropterys dumetorum (Griseb.) Nied.	PR	ATL	G. Hatschbach & J.M. Silva 51879 (MBM)
		CER	D.C. Ribeiro *et al*. 37 (FUEL)
Heteropterys dusenii Nied.	PR	ATL	C. Kosera & O.P. Kosera 3018 (MBM)
	SC	ATL	L.B. Smith 11065 (NYBG)
	RS	ATL	M. Sobral & J. Larocca 9260 (ICN)
Heteropterys eglandulosa A.Juss.	PR	ATL	K. Kawakita *et al*. 1309 (HUEM)
Heteropterys glabra Hook. & Arn.	PR	ATL	G. Hatschbach 876 (SP)
	SC	ATL	Pagnussati s.n. (ICN 135451)
	RS	ATL	M. Grings 1298 (ICN)
		PAM	E. Pasini 878 (ICN)
Heteropterys hypericifolia A.Juss.	RS	PAM	E.L.C. Soares 313 (ICN)
Heteropterys intermedia (A.Juss.) Griseb.	PR	ATL	G. Hatschbach 1668 (MBM)
	SC	ATL	A. Krapovickas *et al.* 39396 (MBM)
	RS	ATL	M. Sobral *et al*. 9519 (ICN)
Heteropterys microcarpa Skottsb.	PR	ATL	G. Hatschbach, J.S. *et al*. 64486 (MBM)
	SC	ATL	E.L.C. Soares 321 (ICN)
	RS	ATL	J.R. Pirani *et al*. 483 (SP)
Heteropterys mulgurae W.R.Anderson	PR	ATL	A.C. Svolenski & G. Tiepolo 174 (MBM)
Heteropterys nitida (Lam.) DC.	PR	ATL	C.V. Roderjan & Y.S. Kuniyoshi 656 (MBM)
	SC	ATL	F.C.S. Vieira 1417 (SP)
Heteropterys pauciflora (A.Juss.) A.Juss.	PR	ATL	G. Hatschbach 3131 (MBM)
Heteropterys syringifolia Griseb.	PR	ATL	L.T. Dombrowski & M.J. Sanches 1731 (MBM)
	SC	ATL	O.S. Ribas *et al*. 1131 (MBM)
	RS	ATL	G.D.S. Seger 140 (ICN)
Heteropterys umbellata A.Juss.	PR	ATL	G. Hatschbach 17625 (MBM)

Species	State	Biome	Vouchers
Hiraea fagifolia (DC.) A.Juss.	PR	ATL	G. Hatschbach& A. Manosso 51695 (MBM)
	SC	ATL	E.L.C. Soares 514 (ICN)
	RS	ATL	E.L.C. Soares 407 (ICN)
Hiraea hatschbachii C.E.Anderson	PR	ATL	J.S. Carneiro *et al*. 242 (FUEL)
Hiraea reitzii C.E.Anderson	PR	ATL	G. Hatschbach 39313 (US)
	SC	ATL	D. Falkenberg 4702 (FLOR)
	RS	ATL	J.A. Jarenkow & M. Sobral 8018 (ICN)
Janusia guaranitica (A.St.-Hil.) A.Juss.	PR	ATL	G. Hatschbach 15481 (MBM)
		CER	E.D. Lozano *et al*. 1852 (MBM)
	SC	ATL	G. Hatschbach *et al.*71689 (MBM)
	RS	ATL	G.D.S. Seger 446 (ICN)
		PAM	J.R. Stehmann 536 (ICN)
Janusia linearifolia (A.St.-Hil.) A.Juss.	PR	ATL	G. Hatschbach 45479 (MBM)
Janusia mediterranea (Vell.) W.R.Anderson	PR	ATL	G. Hatschbach *et al*. 60571 (MBM)
		CER	E.L.C. Soares 457 (ICN)
Janusia occhionii W.R.Anderson	PR	ATL	G. Hatschbach 14253 (MBM)
		CER	J.M. Lima 24 (MBM)
Mascagnia australis C.E.Anderson	PR	ATL	J. Lindeman & H. Haas 3141 (MBM)
	SC	ATL	E.L.C. Soares & R. Záchia 495 (ICN)
	RS	ATL	E.L.C. Soares & R. Záchia 497 (ICN)
Mascagnia cordifolia (A.Juss.) Griseb.	PR	ATL	S.R. Ziller 1082 (MBM)
Mascagnia divaricata (Kunth) Nied.	PR	ATL	E.L.C. Soares 357 (ICN)
	SC	ATL	E.L.C. Soares 217 (ICN)
	RS	ATL	M. Sobral *et al*. 6137 (ICN)
		PAM	E. Melo 7797 (HUEFS)
Mascagnia ovatifolia (Kunth) Griseb.	PR	ATL	G. Hatschbach 40555 (UPCB)
Mascagnia sepium (A.Juss.) Griseb.	PR	ATL	S. Ribas *et al.* 5559 (MBM)
Niedenzuella acutifolia (Cav.) W.R.Anderson	PR	ATL	G. Hatschbach 25820 (MBM)
	SC	ATL	R.A. Negrelle 691 (SP)
Niedenzuella lucida (A.Juss.) W.R.Anderson	PR	ATL	G. Hatschbach 45268 (MBM)
	SC	ATL	L.A. Funez 2578 (FURB)
Niedenzuella multiglandulosa (A.Juss.) W.R.Anderson	PR	ATL	J. Carneiro 497 (MBM)
Niedenzuella poeppigiana (A.Juss.) W.R.Anderson	PR	ATL	G. Hatschbach 7922 (MBM)
Niedenzuella sericea (A.Juss.) W.R.Anderson	PR	ATL	S.R. Ziller 1226 (MBM)
Peixotoa catarinensis C.E.Anderson	SC	ATL	D. Falkenberg & M.L. Souza 3218 (FLOR)

Species	State	Biome	Vouchers
Peixotoa jussieuana Mart. ex A.Juss.	PR	ATL	G. Hatschbach 1413 (MBM)
Peixotoa magnifica C.E.Anderson	PR	CER	J.M. Silva *et al.* 5198 (MBM)
Peixotoa parviflora A.Juss.	PR	ATL	G. Hatschbach*et al.* 67158 (MBM)
Peixotoa reticulata Griseb.	PR	ATL	G. Hatschbach 21572 (MBM)
Stigmaphyllon arenicola C.E.Anderson	PR	ATL	R. Kummrow 1334 (MBM)
Stigmaphyllon bonariense (Hook. & Arn.) C.E.Anderson	PR	ATL	G. Hatschbach 39812 (MBM)
	RS	PAM	E.L.C. Soares 304 (ICN)
Stigmaphyllon ciliatum (Lam.) A.Juss.	PR	ATL	J. Carneiro 633 (MBM)
	SC	ATL	E.L.C. Soares 511 (ICN)
	RS	ATL	E.L.C. Soares & R. Záchia 479 (ICN)
		PAM	Ir. Augusto s.n. (ICN 018645)
Stigmaphyllon jatrophifolium A.Juss.	PR	ATL	G. Hatschbach& O. Guimarães 354 (MBM)
	SC	ATL	B. Rambo 60330 (PACA)
	RS	ATL	J. Durigon 978 (ICN)
		PAM	E.L.C. Soares 305 (ICN)
Stigmaphyllon tomentosum A.Juss.	PR	ATL	E.L.C. Soares 530 (ICN)
	SC	ATL	E.L.C. Soares 271 (ICN)
	RS	ATL	E.L.C. Soares & R. Záchia 480 (ICN)
Tetrapterys crispa A.Juss.	PR	ATL	J.S. Carneiro 261 (FUEL)
Tetrapterys jussieuana Nied.	PR	CER	G. Hatschbach 22321 (UEC)
Tetrapterys mollis Griseb.	SC	ATL	A. Rohr s.n (PACA 28883)
	RS	ATL	E.L.C. Soares 490 (ICN)
Tetrapterys mucronata Cav.	PR	ATL	J.G.C.A. Mattos 1033 (CEPEC)
Tetrapterys phlomoides (Spreng.) Nied.	PR	ATL	G. Hatschbach 3048 (MBM)
	SC	ATL	M.L. Souza & D. Falkenberg 738 (FLOR)
	RS	ATL	G.D.S. Seger 351 (ICN)
Tetrapterys salicifolia (A.Juss.) Nied.	PR	CER	J. M. Silva *et al*. 8251 (MBM)
Tetrapterys xylosteifolia A.Juss.	PR	ATL	G. Hatschbach 21298 (MBM)
	SC	ATL	A. Korte& A. Kniess 2957 (FURB)
	RS	ATL	R. Wasum 2580 (BHCB)
		PAM	M. Sobral *et al.* 5305 (FLOR)
Thryallis brachystachys Lindl.	PR	ATL	V. Kinupp *et al*. 1010 (FUEL)
	SC	ATL	A.C. Cervi 2607 (UPCB)

state of Paraná. One exception is *B. pseudojanusia* (Nied.) B.Gates, which occurs in the Atlantic Forest in Paraná and Santa Catarina.

5. *Bronwenia*

This genus comprises ten species: eight of them were previously segregated from *Banisteriopsis* subgenus *Banisteriopsis,* and the other two species have been described as new species (Anderson & Davis 2007). *Bronwenia ferruginea* (Cav.) W.R.Anderson & C.Davis, a liana, is the only species of the genus in southern Brazil, occurring in the Atlantic Forest, in the state of Paraná. The species, and consequently the occurrence of this genus is not yet cited in the Flora do Brasil 2020 database (Flora do Brasil 2020, under construction).

6. *Bunchosia*

This pan-American genus comprises about 75 species of trees or shrubs, with few species reaching the subtropics of Argentina and Brazil (Anderson *et al.* 2006). In southern Brazil, two species were registered from the Atlantic Forest in Paraná, Santa Catarina, and Rio Grande do Sul.

7. *Byrsonima*

This is one of the largest and most taxonomically complex genera of Malpighiaceae, including about 135 pan-American species of tree, shrubs or subshrubs (Anderson *et al.* 2006). In southern Brazil, sixteen species were found: thirteen in the Cerrado and the other three in the Atlantic Forest in Paraná, Santa Catarina, and Rio Grande do Sul.

8. *Callaeum*

A revision of this genus was published by Johnson (1986); Anderson (2006b) proposed one new species, giving a total of 11 pan-American species. *Callaeum psilophyllum* (A.Juss.) D.M.Johnson, a liana, is the only species registered in southern Brazil, occurring in the Atlantic Forest in Paraná, Santa Catarina, and Rio Grande do Sul.

9. *Camarea*

This genus comprises eight species and has its center of diversity in the Central Brazilian Plateau (Mamede 1990).*Camarea affinis* A.St.-Hil, a xylopodiferous subshrub, is the only species registered in southern Brazil, occurring in the Cerrado, in the state of Paraná. The species, and consequently the occurrence of the genus in southern Brazil, are not included in the Flora do Brasil 2020 database (Flora do Brasil 2020, under construction).

10. *Carolus*

This is one of the generic segregates of *Mascagnia s.l.* (Anderson 2006a) and includes six species. *Carolus chlorocarpus* (A.Juss.) W.R.Anderson, a liana, is the only species in southern Brazil, occurring in the Atlantic Forest in Paraná.

11. *Dicella*

This genus comprises seven South American species (Anderson *et al.* 2006). Two species of lianas of the section *Dicella* occur in southern Brazil, in the Atlantic Forest in Paraná, Santa Catarina and Rio Grande do Sul. *Dicella nucifera* Chodat has a subtropical distribution, with populations in the central-western portion of southern Brazil, as well as southern Paraguay and northeastern Argentina (Chase 1981). Most of the Brazilian collections are from the interior of the continent, and the few coastal populations occur in sympatry with *Dicella bracteosa* Griseb.

12. *Diplopterys*

This genus was redefined by Anderson & Davis (2006) to include all species previously positioned in *Banisteriopsis* subgenus *Pleiopterys* (Gates 1982), totaling 31 South American species. In southern Brazil, two species of lianas were found in the Atlantic Forest in Paraná, where the genus reaches the southern limit of its distribution.

13. *Galphimia*

This pan-American genus comprises 26 species. In southern Brazil, *Galphimia australis* Chodat, a shrub or upright subshrub, was the only species registered, occurring manly in more-open areas of the Atlantic Forest in Paraná, Santa Catarina and Rio Grande do Sul, and in the Pampa in Rio Grande do Sul.

14. *Heladena*

Heladena multiflora Nied., a liana or upright subshrub, is the single species described for this genus. In southern Brazil, the species was found in forested ecosystems in the Atlantic Forest, in Paraná and Rio Grande do Sul. Dettke *et al.* (2018) cited the species as a unique record and

a new occurrence for Paraná, and Durigon *et al.* (2019) confirmed its occurrence in Rio Grande do Sul, based on material collected in the present study. These recent records increase the number of subpopulations known in Brazil, which were represented by only four locations (Amorim *et al.* 2013) and contribute to a better understanding of the distribution area of this species, classified as "Endangered" in the Brazilian Red List (Martinelli *et al* 2013). It is important to highlight that this species, and consequently the occurrence of the genus in southern Brazil, is not included in the Flora do Brasil 2020 database (Flora do Brasil 2020, under construction).

15. *Heteropterys*

This is the largest and most taxonomically complex genus of Malpighiaceae. The last taxonomic revision was carried out by Niedenzu (1928). In Brazil, about 97 species are recorded, at least half from the Atlantic Forest. In southern Brazil, 20 species were registered, including climbers, shrubs and subshrubs; it is the genus with the largest number of species in the region, most of them in the Atlantic Forest in Paraná. It should be noted that *Heteropterys dusenii* Nied. occurs exclusively in southern Brazil and is classified as "Vulnerable" in the Brazilian Red List (Martinelli *et al*. 2013). In addition, *H. hypericifolia* A.Juss., which presents a disjunct distribution in the states of Mato Grosso do Sul and Rio Grande do Sul, is mentioned in the Rio Grande do Sul Endangered Plant Species List (Rio Grande do Sul 2014) as having insufficient data, and the few records found in the present study is a strong indication that the species may be under serious threat locally.

16. *Hiraea*

About 60 to more than 70 species are reported to this genus, of which about 20 are listed for Brazil (Anderson *et al.* 2006a, Almeida *et al.* 2016, Flora do Brasil 2020, under construction). In southern Brazil, two species of lianas were recorded in the Atlantic Forest in all the states sampled, and one species (*Hiraea hatschbachii* C.E.Anderson) was only found in Paraná. This species was recognized and described by Anderson (2014) when examining the collections of *H. cuneata* Griseb. *H. hatschbachii* differs from *H. cuneata* by showing adaxially glabrous sepals, eglandulous petioles, and solitary 4-flowering umbels. Although the Flora do Brasil database lists *H. cuneata* for the state of Paraná, this was not confirmed by the present study. Therefore, additional collection efforts are needed to better understand the distribution of this recently revised species. On the other hand, the same database does not cite *H. fagifolia* A.Juss. for the states of Santa Catarina and Rio Grande do Sul, in which the species was found frequently in the Atlantic Forest.

17. *Janusia*

Despite recent taxonomic advances, more studies are necessary to determine the natural delimitation of this genus, which does not seem monophyletic (Anderson & Davis 2007; Davis & Anderson 2010). *Janusia* comprises about 15 South American species (Sebastiani & Mamede 2015). In southern Brazil, four species were registered, including climbers, shrubs and one xylopodiferous subshrub. Most of species occurs in the Cerrado and Atlantic Forest in Paraná. *J. guaranitica* A.Juss. is also found in the Atlantic Forest, in the state of Santa Catarina, and in the Pampa biome, in the Rio Grande do Sul state.

18. *Mascagnia*

This genus had its circumscription drastically reduced (Anderson 2006a; Anderson & Davis 2007, 2013; Anderson & Corso 2007) and currently includes about 45 species (Anderson *et al.* 2006a). In southern Brazil, five species of lianas were registered in the Atlantic Forest, all of which occur in the state of Paraná, and two (*Mascagnia australis* C.E.Anderson and *M. divaricata* (Kunth) Nied.) also present in the states of Santa Catarina and Rio Grande do Sul.

19. *Niedenzuella*

This genus consists of 16 species previously placed in *Mascagnia* and *Tetrapterys* (Anderson 2006a). In southern Brazil, five species of lianas were registered in the Atlantic Forest, most of them in the Paraná state. The occurrence of *Niedenzuella poeppigiana* (A.Juss.) W.R.Anderson in the state of Paraná is not currently cited in the Flora do Brasil 2020 database (Flora do Brasil 2020, under construction), despite having been cited in previous versions.

20. *Peixotoa*

This pan-American genus comprises 29 species, 28 of which were registered in Brazil (Anderson 1982). In southern Brazil, five species were found, including lianas and shrubs. They

occur in the Atlantic Forest and Cerrado, especially in the Paraná state, with the exception of *Peixotoa catarinensis* C.E.Anderson, which is registered only in the coastal zone of Santa Catarina, and is classified as Endangered in the Brazilian Red List (Martinelli *et al*. 2013).

21. *Stigmaphyllon*

The taxonomic revision of this genus was carried out by Anderson (1997) and was then revisited to include species previously placed in *Ryssopterys* (Anderson 2011). *Stigmaphyllon* comprises about 120 species distributed in the tropics worldwide (Anderson 2011); about 49 species are recorded in Brazil (Almeida *et al*. 2016). In southern Brazil, five species of climbers were found in the Atlantic Forest; *S. bonariense* (Hook. & Arn.) C.E.Anderson, *S. ciliatum* (Lam.) A.Juss. and S. *jatrophifolium* A.Juss. also occur in the Pampa biome. It is noteworthy that Pampa biome is not included among the "phytogeographic domains" in which the species occurs in the Flora do Brasil database (Flora do Brasil 2020, under construction), and, consequently, no species of *Stigmaphyllon* are cited for the Pampa biome in this important database.

22. *Tetrapterys*

This genus is not monophyletic, and its delimitation is still unclear (Davis & Anderson 2010). A possible segregation of *Tetrapterys s.l.* to a new genus was mentioned by Almeida *et al.* (2016), however, there is no recent taxonomic review of the genus. *Tetrapterys* comprises approximately 70 species (Anderson 2013). In southern Brazil, seven species were registered, including lianas and upright subshrubs. Most of them occur in the Atlantic Forest, while *T. xylosteifolia* A.Juss. was also present in the Pampa biome, and *T. jussieuana* Nied. and *T. salicifolia* (A.Juss.) Nied. occur exclusively in the Cerrado, in the Paraná state. It should be noted that the occurrence of *T. xylosteifolia* in Paraná is not included in the Flora do Brasil 2020 database (Flora do Brasil 2020, under construction). Nevertheless, the species is cited in the Flora Vascular do Paraná (Kaehler *et al.* 2014), and there are several records identified by specialists in the species link database (CRIA, 2020).

23. *Thryallis*

This pan-American genus comprises five species, all of them are found in Brazil (Anderson 1995). *Thryallis brachystachys* Lindl., a liana or shrub, is the only species registered in southern Brazil, occurring in forest edges of the Atlantic Forest in Paraná and Santa Catarina.

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