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Taxonomy of *Sinningia* Nees (Gesneriaceae) in Rio Grande do Sul, southern Brazil

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ABSTRACT

The genus *Sinningia* belongs to the Neotropical tribe Gesnerieae, subtribe Ligeriinae, presently consisting of only three genera, *Paliavana*, *Sinnigia* and *Vanhouttea*. These genera were separated from a larger concept of tribe Gloxinieae based on phylogenetic studies with molecular data. In Rio Grande do Sul, southern Brazil, 12 species and one natural hybrid of *Sinningia* have been recorded. Species of *Sinningia* in this area are erect or ascending herbs or subshrubs arising from underground or partially exposed tubers. They grow in very distinct ecological conditions, from water-saturated marshes to dry grasslands or shrublands, but most often in rupicolous or epiphytic habitats commonly associated with forest environments. In this review we provide an identification key to the species level and morphological descriptions and illustrations, comments on taxonomic aspects, distributional maps and IUCN Red List Categories and Criteria for all twelve species. Additionally, we designate lectotypes for *S. allagophylla* and *S. sellovii* and consider the recently described *S. lutea* as a synonym of the highly variable *S. allagophylla*.

Keywords: epiphytes, geophytes, Gesnerioideae, Lamiales, Ligeriinae, lithophytes

Introduction

The genus *Sinnigia* includes ca. 70 species of shrubs, subshrubs or tuberous herbs occurring in a wide range of geographic regions and growing under distinct ecological conditions (Skog & Boggan 2007; Chautems *et al.* 2010). The genus is presently placed in the tribe Gesnerieae, subtribe Ligeriinae, together with the genera *Paliavana* and *Vanhouttea* (Weber *et al.* 2013). Perret *et al.* (2003) demonstrated that *Sinningia* is paraphyletic. A new generic circumscription combining the three genera into a monophyletic taxon is in preparation (A. Chautems unpubl. res.).

The species of *Sinningia* are widely distributed from southern Mexico to northern Argentina. An evident center of diversity lies within the Brazilian Atlantic Forest, where ca. 60 endemic species occur. The genera *Vanhouttea* (nine species) and *Paliavana* (six species) are also endemic to this mainly tropical formation, especially in southeast Brazil, so this region is the center of diversity for both the genus *Sinningia* and the entire subtribe Ligeriinae (Perret *et al.* 2007; Araújo *et al.* 2014). A relatively low number of *Sinningia* species occur in seasonal vegetation types, such as the semi-deciduous forests of the Paraná-Paraguay river basin, the *cerrados* of central Brazil, and the *caatingas* of northeastern Brazil (Chautems 2008; Perret *et al.* 2013).

Most species of *Sinningia* have well-developed tubers, allowing them to grow in relatively dry habitats, such as rocky outcrops and coastal dunes. In contrast, a few species occur in permanently water-logged marshes and peat-bogs, and so the entire genus can be regarded as occupying environments with very diverse water availability (Perret *et al.* 2006; Chautems 2008). The flowers of *Sinningia*, like those of *Vanhouttea*, mostly display long and narrow corolla tubes that are adapted for hummingbird pollination (SanMartin-Gajardo & Sazima 2005a). In the closely related genus *Paliavana* the flowers have broader and darker corolla tubes which are more similar to a bat pollination syndrome (Perret *et al.* 2001; SanMartin-Gajardo & Sazima 2005b).

There are no previous taxonomic treatments of *Sinningia* or the Gesneriaceae for the state of Rio Grande do Sul. In early papers, mostly floristic surveys of particular areas or regions, the species of *Sinningia* were cited as *Corytholoma* or *Rechsteineria* (e.g. Rambo 1961). Subsequently a few publications reported new occurrences for the state (Silveira 1992; Ferreira & Chautems 2012; Ferreira *et al.* 2013; Ferreira *et al.* 2014b) and proposed three new species with restricted geographic ranges (Chautems 1991; Buzatto & Singer 2012; Ferreira *et al.* 2014a). The first natural hybrid in the genus was also described from Rio Grande do Sul (Ferreira *et al.* 2014b).

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The objective of this paper is to present a taxonomic study of the species of *Sinningia* occurring in Rio Grande do Sul, including an identification key, morphological descriptions, diagnostic illustrations and distribution maps of all native species.

Material and Methods

Rio Grande do Sul, with ca. 282,000 km², is located in the extreme south of Brazil. Elevation varies from sea level to 1,400 m, causing striking differences in climate and vegetation. Climate, according to the Köppen-Geiger system is moist subtropical, (*Cfa*) in the lower areas, and mild temperate (*Cfb*) in the higher areas. The average temperatures vary between 15° and 18°C, with minima around -10°C and maxima around 40°C (Moreno 2014; Peel *et al.* 2007). The northern half is generally associated to the Atlantic biogeographic province, mostly covered with seasonal and araucaria forests, while the southern half is included in the Pampean province, mostly formed by grasslands, gallery forests and small patches of thorn savanas (Rambo 1961; Cabrera & Willink 1980; Overbeck *et al.* 2007).

Specimens were collected during fieldwork carried out in Rio Grande do Sul, Brazil, from September 2010 to November 2013. All pressed collected material was deposited in the ICN and G herbaria. Morphological data were gathered from living specimens during fieldwork and from specimens on loan and/or electronic images from the following herbaria: B, G, G-DC, HAS, HBR, HPL, HUCS, ICN, K, LE, MBM, PACA, US and R. Among the examined material, we selected only one specimen as representative for each municipality. Some flowers were preserved in 70% ethanol and used to draw floral features. Morphological terminology follows Harris & Harris (2001). Mapping of geographic distributions employed Quantum GIS software. Geographical coordinates are given for all collected specimens. Coordinates not available on the original labels were assigned to the middle point of the municipality of occurrence. The IUCN criteria are provided for species that are Threatened (CR, EN, or VU) or least concern (LC).

Results and Discussion

The genus *Sinningia* is represented in the study area by 12 species and one natural hybrid. In earlier works, we identified a new species, described as *S. ramboi* by Ferreira *et al.* (2014a), the first natural hybrid for the genus *Sinningia*, described as *S.* × *vacariensis* by Ferreira *et al.* (2013), and found a new occurrence for *S. bullata* in Rio Grande do Sul, reported by Ferreira *et al.* (2014b).

Among the 12 species, six are endemic to the southern states of Brazil, circumscribing a secondary center of diversity. Most species occur in the northeastern part of the state, especially in the northeastern highlands referred to locally as the *Campos de Cima da Serra* (montane grasslands), and in the northernmost part of the coastal lowlands around the southern limit of the Atlantic rain forest. Local radiations seem to have occurred especially around the steep escarpments of the canyons in southern Santa Catarina and northeastern Rio Grande do Sul.

*Key to the species of **Sinningia** in Rio Grande do Sul*

1. Leaves decussate 2
    2. Leaves inserted along 4–7 nodes ..... *S. macrostachya*
    2. Leaves inserted along 1–2 nodes 3
        3. Leaf-blades green to purplish, abaxial surface vinaceous ..... *S. ramboi*
        3. Leaf-blades green, abaxial surface always green 4
            4. Leaves 9.5–15 × 7–14 cm, not bullate, abaxial surface pale green, tomentose ..... *S. lineata*
            4. Leaves 4–6 × 3–4.5 cm, bullate, abaxial surface white, dense woolly ..... *S. bullata*
1. Leaves whorled 5
    5. Inflorescence a raceme or spiciform 6
        6. Flowers with pedicel 0.6-2.3 cm long 7
            7. Corolla with two erect upper lobes, distinctly larger than the lower ones ..... *S. elatior*
            7. Corolla without two erect upper lobes, all lobes approximately of the same size 8
                8. Flowers pendulous, sepals green, stamens with exserted anthers ..... *S. sellovii*
                8. Flowers horizontal, sepals reddish, stamens with included anthers ..... *S. warmingii*
        6. Flowers apparently sessile or pedicel until 0.2 cm long 9
            9. Stems 40–200 cm long; petiole 8–30 mm long; corolla 0.7–1 cm, magenta to red ..... *S. curtiflora*
            9. Stems 40–80 cm long; petiole 1–2 mm long or sessile leaves; corolla 0.9–1.5 cm long, yellow to orange-reddish ..... *S. allagophylla*
    5. Inflorescence a pseudo-umbella, composed of paired-flower cymes 10
        10. Plants mostly terrestrial in coastal sand dunes; leaves arranged along 3–4 nodes, clearly separated along the erect stems ..... *S. polyantha*

10. Plants mostly rupicolous or epiphytic in forests; leaves arranged along 1–2 nodes, closely grouped at the apex of the erect stems 11
11. Petioles 0.3–2.5 cm long; pedicels tomentose; calyx lobes 5-7 mm long ..... *S. nivalis*
11. Petioles 2.5–6 cm long; pedicels puberulent; calyx lobes 2–3 mm long ..... *S. douglasii*

1. *Sinningia allagophylla* (Mart.) Wiehler, Selbyana 1(1): 32. 1975. *Gesnera allagophylla* Mart., Nov. Gen. Sp. Pl. 3: 36. 1829. Lectotype designated here:—BRAZIL. [Minas Gerais]: *C.F. von Martius 1056* (lectotype P! ID P00587370, isolectotypes P! P00587369, G!, K! K000509959, LE!, NY! NY00312947, BM! BM000992260).

=*Sinningia lutea* Buzatto & Singer, Brittonia 64(2): 109–113. 2012. Type:—BRAZIL. Rio Grande do Sul: Porto Alegre, Morro Tapera, 15 December 2009, *C.R. Buzatto 588* (holotype ICN!, isotypes PACA!, RSPF).

Figs. 1A–B, 5D.

Terrestrial herbs with erect stems arising from tubers. Stems 40–80 cm long, villous, unbranched, green to reddish. Leaves 3-whorled, rarely opposite or 4-whorled, inserted along 4–7 nodes, sessile or with petiole to 0.1–0.2 cm long, tomentose; blade lanceolate to elliptic or rarely obovate, 3.2–12.7 × 1.5–4.3 cm, acute or rounded at the apex, cordiform to rounded or attenuate at the base, margin crenate, adaxial surface green, pubescent, abaxial surface green to reddish-brown, pubescent between the veins and in the veins densely tomentose, with trichomes capitate. Inflorescences terminal, raceme, with 16–50 flowers, 3 flowers per node, borne in whorls along the inflorescence axis; flowers subsessile or pedicel until 0.2 cm long., yellow-greenish to orange, pubescent. Calyx subcampanulate, tube 2–5 mm long, puberulent, lobes lanceolate, 4–8 mm long, acuminate, margin entire, green to orange, puberulent. Corolla erect in calyx, tubular, 0.9–1.5 cm long, yellow to orange-reddish, pubescent, base with 2 dorsal gibbosities somewhat united covering the calyx lobes, tube constricted above base, 3–5 mm wide, then expanding gradually to 4–6 mm at throat, limb spreading, lobes 5, yellow to orange, unequal, 2–3 × **2** mm. Stamens 4, included, filaments 0.6–0.8 cm long, glabrous, anthers coherent, rectangular, pollen white, nectary consisting of five glands, two connate, two separate lateral and one isolated gland. Ovary 3 mm long, 1 mm wide, hispid, style 0.6–0.9 cm long, green, pubescent. Fruit a dry two-valved capsule, 0.5–0.9 × 0.4–0.5 cm, acuminate, reddish brown, pubescent.

Phenology: Flowers from September to April, fruits from November to March.

Distribution and habitat: The species occurs in fields and stony fields with high solar radiation in Brazil, from Goiás to Rio Grande do Sul, Paraguay, Argentina and Uruguay (Chautems 2008). In Rio Grande do Sul, it occurs in all regions of the state (Fig. 7A).

Conservation status: Least concern (IUCN 2013).

Notes: *S. allagophylla* is here treated as a variable species that occurs from central Brazil to northern Argentina. We do not agree with Buzatto & Singer (2012) who described *S. lutea* based on a difference in size and colour of the corolla and restricted this species to a narrow area of the Rio Grande do Sul state. In addition, they claim that there is geographic isolation between *S. lutea* and *S. allagophylla*. Our field observations do not confirm any isolation, as in several localities we observed individuals bearing corollas varying in size and colour within the same population, with intermediates between the two morphologies. A rather broad introgression zone seems to occur between the two kinds of morphologies at the contact zone of the Pampa and Atlantic Forest Domain: short yellow corollas occur mostly in the southern and western part of the Rio Grande do Sul as well as in northern Argentina, eastern Paraguay, and Uruguay; longer orange corollas occur mostly in the northeastern Rio Grande do Sul and Santa Catarina on the higher plateau relief. A detailed study of all the morphological variants so far included within a broadly defined circumscription of *S. allagophylla* is underway; it involves floral biology and population genetics aspects in order to better understand the radiation that took place in southern Brazil within this taxon (CR Buzatto unpubl. res.).

Selected Material: **BRAZIL. Rio Grande do Sul:** Alegrete, XII/1994, A.Nilson 386 (HAS), Augusto Pestana, II/1955, Pivetta 818 (PACA), Barracão, II/1988, N. Silveira & D. Faria-Filho 5423 (HAS), Bom Jesus, 13/XI/2012, G.E. Ferreira & C. Vogel-Ely s.n. (ICN), Caçapava do Sul, XII/1978, A.Krapovickas & C.L.Cristobal 34176 (MBM), Cambará do Sul, 20/XII/1969, A.Ferreira & B. Irgang s.n. (ICN), Canela, XII/1986, J.Mattos & N.Silveira 30583 (HAS), Canguçu, I/1995, Haussen & Nilson 17 (HAS), Canoas, XII/1966, J.Lindeman & H.Haas 3912 (MBM), Carazinho, 27/I/1951, Irmão Januario s.n. (ICN), Caxias do Sul, 10/XII/2005, M.Machado & L.Y.S.Aona 733, (G), Cruz Alta, XII/1986, G.L.Webster 25939 (ICN), Ipiranga do Sul, 27/XII/1993, R.Wasum s.n. (HUCS, M, MO), Jarí, I/1942, B.Rambo 9507 (PACA), Júlio de Castilhos, I/1978, J.Mattos & N.Mattos 18144 (HAS), Lagoa Vermelha, 06/I/1978, M.Fleig 936 (ICN), Manuel Viana, 23/IV/2011, E.Pasini 892 (ICN), Montenegro, 22/XI/1950, A.Sehnem 5036 (PACA), Nova Prata, XII/1983, J.Mattos 25429 (HAS), Panambí, 30/I/1973, B.Irgang & J.Valls s.n. (ICN), Pinheiro Machado, XII 1983, J.Mattos & N.Silveira 25343 (HAS), Porto Alegre, XI/1945, B.Rambo 29391 (ICN), Santa Margarida do Sul, 3/XII/2005, M.Machado & L.Y.S.Aona 671 (G), Santa Maria, XI/1988, N.Silveira 6049 (HAS), Santana do Livramento, II/1980, J.Mattos & N.Model 20948 (HAS), Santo Ângelo, 15/XI/1977, J.Waechter 664 (ICN), São Borja, 13/XI/2009, E.Barbosa *et al.* 2590 (MBM), São Francisco de Paula, 15/I/2009, C.R.Buzatto

473 (ICN), São José dos Ausentes, 22/XI/1997, R. Wasum *et al.* s.n. (MBM), São Leopoldo, XI/1934, B.Rambo 594 (PACA), São Lourenço do Sul, XI/1978, J.Mattos *et al.* s.n. (HAS), São Pedro do Sul, 6/XII/1986, G.L.Webster *et al.* 25979 (ICN), São Tomé, 10/XII/1976, S.Miotto *et al.* 348 (ICN), Sarandí, XII/1986, J.Mattos & N.Silveira 30223 (HAS), Tapes, 05/XII/1988, J.A.Jarenkow 1078 (MBM), Torres, 12/XI/1965, A.Schultz 3968 (ICN), Vacaria, 21/XI/2012, G.E. Ferreira & C. Vogel-Ely s.n. (ICN).

2. *Sinningia bullata* Chautems & M. Peixoto, Candollea 65(2): 242–244, 2010. Type:—BRAZIL. Santa Catarina: Município de Florianópolis, Ilha de Santa Catarina, Alto Ribeirão, Testa do Macaco, ca 315 m, 6.III.2006, *A. Reis et al. 5040* (holotype: HBR!; isotypes: G!, HUMC!, US!).
Figs. 1C–E, 6B.
Rupicolous herbs, arising from tubers. Stems 10–15 cm long, usually unbranched, covered by a dense woolly indumentum. Leaves decussate, inserted along 2 nodes closely grouped at the apex of the erect stems, equal within pairs, petiole 0.5–1 cm long, light green; blade elliptic to obovate, 4–6 × 3–4.5 cm, chartaceous, apex obtuse to rounded, base acute to cuneate, margin irregularly crenate, vivid green, adaxial surface bullate and glabrous, specially when young, abaxial surface white, covered by a dense woolly indumentum beneath when young, becoming looser and light brownish on older leaves, 5–7 pairs of veins. Inflorescence a frondose florescence with paired-flower cymes with 1–8 flowers, borne on pedicels, 3–4.5 cm long, reddish, woolly. Calyx narrowly campanulate, fused at base for ca. 0.3 cm, lobes 0.5 cm long, narrowly lanceolate, apex acute, base truncate, margin entire, pale green, pubescent. Corolla tubular, erect within the calyx, 3–4 cm long, ca. 4 mm in diam. at base, tube 2.5–3 cm long, 4–6 mm wide, orange, pubescent, base with 5 gibbosities between the calyx lobes, lobes 8–10 × 10–12 mm, spreading and forming a right angle with the tube, the 2 dorsal ones narrower, up to 7–8 mm wide, tube inside light orange with darker lines, extending over the lateral and ventral lobes. Stamens 4, included, filaments ca. 2 cm, white, glabrous, anthers coherent, star–shaped, pollen cream; nectary formed by two completely separate glands. Ovary 6–8 mm long, glabrous, greenish, style ca. 2.5 cm, white, glabrous. Fruit not seen.
Phenology: Flowers from October to November, fruits from November to December.
Distribution and habitat: The species occurs in South Brazil; in the states of Santa Catarina (Araújo *et al.* 2014) and Rio Grande do Sul (Fig. 7A). In this state, the populations inhabit rocky outcrops (probably rhyolites and rhyodacites) at the edges of the escarpment southeast of the Fortaleza canyon.
Conservation status: Endangered (EN) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 5,000 km in only two locations (IUCN 2013).
Specimens examined: **BRAZIL. Rio Grande do Sul:** Cambará do Sul, 15/X/2013, G.E.Ferreira *et al*. 238 (ICN, G).

3. *Sinningia curtiflora* (Malme) Chautems, Candollea 45: 382. 1990. *Corytholoma curtiflorum* Malme, Ark. Bot. 29A(3): 5. 1937. Type:—BRAZIL. Paraná: Jacarehy, locis arenosis graminosis, 19 March 1916, *P.K.H.Dusén 18096* (holotype S-image!, isotypes F-image!, GH!, MO!).
Figs. 1F–G, 5C.
Terrestrial herbs with erect stems arising from tubers. Stems 40–200 cm, unbranched, green with streaks reddish, villous to woolly. Leaves 3-whorled, inserted along 4–7 nodes, petiole to 0.8–3.0 cm long; blade ellipitic-lanceolate 5.2–12.5 × 3.0–6.5 cm, acute at the apex, obtuse to attenuated at the base, margin irregularly crenate, adaxial surface green, pubescent, abaxial surface light green, pubescent. Inflorescence terminal, spiciform, with 30–70 flowers, one flower per bract, bract liner; flowers subsessile or pedicel until 0.2 cm long, green, pubescent. Calyx subcampanulate, tube 2–3 mm long, puberulent, lobes triangular, 4–5 mm long, acuminate, margin entire, green to reddish, puberulent. Corolla erect within calyx, tubular, 0.7–1.0 cm long, magenta to red, pubescent, base with 2 dorsal gibbosities somewhat united covering the calyx lobes, tube constricted above base, 2–3 mm wide, then expanding gradually to 4–5 mm at throat, lobes 5, magenta, equal, ca. 1 × 1.5 mm. Stamens 4, included, filaments 0.5–0.7 cm long, glabrous, anthers coherent, rectangular, pollen white, nectary consisting of two dorsal glands, connate. Ovary 4–5 mm long, hispid, style 0.6–0.9 cm long, beige, pubescent. Fruit a dry two-valved capsule.
Phenology: Flowers from November to March, fruits from December to July.
Distribution and habitat: The species occurs in Brazil, in the states of São Paulo, Paraná, Santa Catarina (Araújo *et al.* 2014) and Rio Grande do Sul (Fig. 7B), growing in marshes and wet grasslands near [in?] the coastal plain.
Conservation status: Endangered (EN) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 5,000 km^2 so far only in 4–5 localities or municipalities where the species is threatened by habitat drainage and urban development along the beaches (IUCN 2013).
Selected Material: **BRAZIL. Rio Grande do Sul:** Arroio do Sal, 19/I/2002, *C.Mondin s.n.* (ICN), Torres, 19/I/1990, *N.Silveira 9127* (HAS).

4. *Sinningia douglasii* (Lindl.) Chautems, Candollea 45: 382. 1990. *Gesneria douglasii* Lindl., Trans. Hort. Soc. London 7: 62. 1826. Type:—Cult. Hort. Soc. (holotype CGE!).
Figs. 2A–B, 6D.
Epiphytic or rarely rupicolous herbs with erect stems arising from tubers. Stems 20–60 cm long, pilose, green to reddish. Leaves 3-whorled, arranged in 1–2 nodes closely grouped at the apex of the erect stems, subequal, petiole 2.5–6 cm long, tomentose, concolorous; blade ovate to elliptic, 4–14 × 2.5–10.5 cm, acute at the apex, obtuse or slightly cordate or unequal at the base, margin irregularly serrate, 7–8

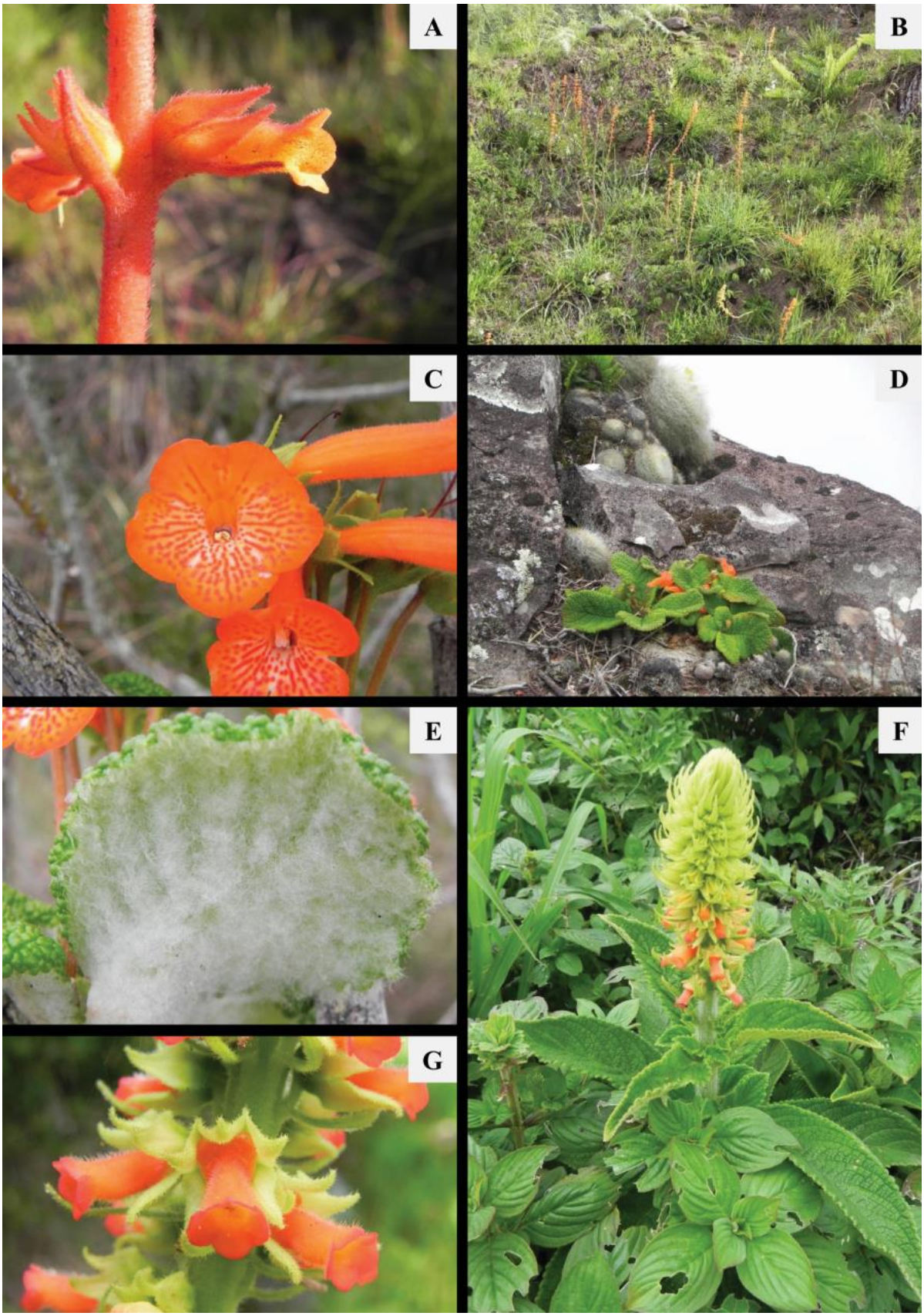

Figure 1. A–B. *Sinningia allagophylla*. A. Corolla in lateral view. B. Habit. C–E. *Sinningia bullata*. C. Corolla in front view. D. General view of the species habitat. E. Detail of below leaf. F–G *Sinningia curtiflora*. F. Habit. G. Corolla in front view.

pairs of veins, adaxial surface green and puberulent, abaxial surface green to pinkish and pubescent, with midrib and major veins green to pinkish. Inflorescences terminal, pseudo-umbellate, composed of paired-flower cymes, arranged in 1–2 whorls; borne on an erect axis of 10–30 cm long peduncles 0.3–2 cm long, green with reddish streaks, puberulent; pedicels ascending 2–5 cm long, green to vinaceous, puberulent. Calyx subcampanulate, tube 1–2 mm long, hoary-tomentose, lobes linear, 2–3 mm long, acuminate, margin entire, green, glabrescent. Corolla erect within calyx, tubular, 3.5–5 cm long, pink, lanulose, base with 5 gibbosities between the calyx lobes, tube constricted above base, 2–4 mm wide, then expanding gradually to 5–8 mm wide at throat, limb spreading, lobes 5, with many dark red dots, unequal, ca. 6–7 mm long. Stamens 4, included, filaments 3.3–4.5 cm long, glabrous, anthers coherent, star-shaped, pollen white, nectary consisting of two separate dorsal glands. Ovary 6–8 mm long, 3 mm wide, hispid, style 4 cm long, reddish, pubescent. Fruit a dry two-valved capsule, 1.3–1.7 cm long, 0.5–0.7 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, 0.7–0.9 long, brown.

Phenology: Flowers from September to November, fruits from October to January.

Distribution and habitat: The species occurs in Argentina (Misiones), Paraguay and Brazil (Chautems 2008), from Minas Gerais to Rio Grande do Sul (Araújo *et al.* 2014). In the latter state, the species is distributed mostly in the northern part, in forested areas, where it grows epiphytically on several species of phorophytes (Fig. 7B).

Local names: batata-de-árvore.

Conservation status: Least concern (IUCN 2013).

Selected Material: **Brazil. Rio Grande do Sul:** Augusto Pestana, X/1955, Pivetta 816 (PACA), Barra do Ribeiro, X/1991, N.Silveira 9669 (HAS), Bom Jesus, 13/X/2013, G.E. Ferreira *et al*. 246 (ICN), Canela, 5/X/2012, G.E. Ferreira 222 (ICN), Caxias do Sul, I/1946, B.Rambo 33200 (PACA), Farroupilha, 22/XI/1957, Camargo 2606 (B, PACA), Montenegro, IX/1949, B.Rambo 43377 (PACA), Maquiné, 31/X/2012, G.E. Ferreira 226 (ICN), Mampituba, 2/XI/2012, G.E. Ferreira 233 (ICN), Morrinhos do Sul, 19/X/1997, J.A.Jarenkow 3207 (MBM), Novo Hamburgo, V/1949, B.Rambo 41728 (PACA), Osório, XI/1989, N.Silveira 8553 (HAS), Salvador do Sul, X/1946, A.Senhem 2205 (PACA, MBM), Santa Maria, XI/1988, N.Silveira 5889 (HAS), São Francisco de Paula, 4/XI/1995, J.Larocca & R.Balbueno 95049 (ICN), Tenente Portela, X/1989, N.Silveira 7304 (HAS), Terra de Areia, Arroio Bonito, 10/X/1999, C.N.Gonçalves & C.F.A.Gonçalves s.n. (ICN), Torres, XI/1989, N.Silveira 8666 (HAS), Vale do Sol, IX/1980, J.Waechter 1771 (ICN).

5. *Sinningia elatior* (Kunth) Chautems, Candollea 45: 383. 1990. *Gesneria elatior* Kunth, Nov. Gen. Sp. 2: 393. 1818. Type:—[VENEZUELA]. Tumiriquiri, Cocollar [Crescit locis umbrosis, temperatis montis Tumiriquiri (Nova Andalusia)], s.d., *A.J.A.Bonpland & F.W.H.A.von Humboldt 191* (holotype P-image!, US!).

Figs. 2C–D, 5B.

Terrestrial herbs with erect stems arising from tubers. Stems 40–100 cm long, tomentose, green to brown. Leaves 3-whorled, inserted along 4–9 nodes, subequal, sessile or petiole 0.2 cm long, tomentose, green-brownish; blade lanceolate to elliptic, 4–7 × 1.1–2.6 cm, acute at the apex, acute to obtuse at the base, margin crenate, 5–9 pairs of veins, adaxial surface green, pubescent, abaxial surface green to brown, tomentose with tector trichomes. Inflorescences terminal, racemous, three flowers per whorl; peduncles absent; pedicels ascending 0.8–2.3 cm long, green, tomentose. Calyx campanulate, tube 4–6 mm long, tomentulose, lobes triangular to lanceolate, 8–10 mm long, acuminate, margin entire, green, tomentose. Corolla erect within calyx, tubular, 3.5–4.3 cm long, orange to red, pilose, base with 2 dorsal gibbosities somewhat united covering the calyx lobes, tube constricted above base, 3–5 mm wide, then expanding gradually to 8–10 mm wide at throat, lobes 5, red, unequal, the two dorsal ca. 4–6 mm long, others 2–3 mm long. Stamens 4, exserted, filaments 3.5–3.7 cm long, glabrous, anthers coherent, globose, pollen white, nectary consisting of 5 glands, two connate glands larger than the others, two separate lateral glands and one isolated. Ovary 10–12 mm long, 4 mm wide, hispid, style 3–3.3 cm long, green, pubescent. Fruit a dry two-valved capsule, 1.5–1.9 cm long, and 0.6–0.7 cm wide, acuminate, reddish brown, pubescent; seeds brown.

Phenology: Flowers from January to March, fruits from February to July.

Distribution and habitat: The species is widespread in South America, occurring in Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru, Uruguay and Venezuela (Skog & Boggan 2007). In Brazil, it occurs in all regions (Araújo *et al.* 2014). In Rio Grande do Sul, this species is found commonly in wetlands, from coastal marshes to montane peat-bogs (Fig. 7C).

Conservation status: Least concern (IUCN 2013).

Selected Material: **BRAZIL. Rio Grande do Sul:** Alegrete, XII/1994, A.Nilson 387 (HAS), Augusto Pestana, IX/1958, Pivetta 1127 (PACA), Butiá, I/1989, P.Brack 347 (HAS), Cachoeira do Sul, XII/1986, M.Sobral *et al.* 5370 (ICN), Cambará do Sul, 03/II/1948, B.Rambo 36504 (ICN), Caxias do Sul, 8/II/1955, B.Rambo 56662 (B, HBR, PACA), Cruz Alta, 23/I/1964, A.Sehnem 8305 (PACA), Esmeralda, I/1983, J.Waechter 1977 (ICN), Guaíba, 21/XII/1989, N.I.Matzenbacher s.n. (ICN), Montenegro, XI/1949, A.Sehnem 4072 (PACA), Nonoai, III/1945, B.Rambo 28483 (PACA), Osório, 23/II/1989, A.Chautems & J.Waechter 331 (G, ICN), Emboaba, II/ 1983, J.Waechter 1997 (ICN), Parque Mal. Osório, January 1974, A.Allen s.n. (ICN), Passinhos, XII/1945, A.Schultz 459 (ICN), Pelotas, I/1981, J.Mattos *et al.* 22012 (HAS), Rosário do Sul, 8/XII/1986, O.Bueno 4751 (HAS), Santa Maria, I/1956, Camargo 67 (PACA), Santana do Livramento, 15/I/2007, M.Grings 446 (ICN),

São Francisco de Paula, II/1948, B.Rambo 36505 (PACA), Lorenço do Sul, 10/XII/1965, A.Sehnem 8354 (PACA), Tupanciretã, I/1942, B.Rambo 9863 (PACA), Xangri-lá, 29/XI/1991, R.Záchia 543 (HAS).

6. *Sinningia lineata* (Hjelmq.) Chautems, Candollea 45: 385. 1990. *Rechsteineria lineata* Hjelmq. Botaniska Notiser 302–305. 1937. Type:—BRAZIL. Paraná: from cult. *A.Hässler s.n.* (holotype LD!).
Figs. 2E–G, 5F.
Rupicolous herbs with erect stems arising from tubers. Stems 30–60 cm, pilose, green with reddish streaks. Leaves decussate, inserted along 2 nodes, rarely 3, closely grouped at the apex of the erect stems, petiole to 3–4 mm long, subequal, tomentose; blade elliptic to ovate, 9.5–15 × 7–14 cm, obtuse at the apex, cordate or sometimes unequal at the base, margin crenate, 4–8 pairs of veins, adaxial surface green, pubescent, abaxial surface pale green, tomentose. Inflorescence a frondose florescence with paired-flower cymes with 2–18 flowers per peduncle; peduncles erect, 7–15 cm long, green with reddish streaks, pilose. Calyx subcampanulate, tube 1–2 mm long, green-tomentose, lobes triangular to lanceolate, 4–6 mm long, acuminate, margin entire, green, pilose. Corolla erect within calyx, tubular, 2.8–3.5 cm, orange to reddish, pilose, base with 5 gibbosities between the calyx lobes, tube constricted above base, 5–6 mm wide, then expanding gradually to 10–12 mm at throat, limb spreading, lobes 5, orange to red, unequal, ca. 3 × 10 mm, all the lobes with vinose dots. Stamens 4, included, filaments 2.5–3.2 cm long, glabrous, anthers coherent, rectangular, pollen white, nectary consisting of two separate dorsal glands. Ovary 7 mm long, 2 mm wide, hispid, style 2 cm long, green, pubescent. Fruit a dry two-valved capsule, 0.9–1.1 cm long, 0.4–0.6 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, brown.
Phenology: Flowers from September to March, fruits from October to April.
Distribution and habitat: The species occurs in South Brazil, in Santa Catarina and Rio Grande do Sul (Araújo *et al.* 2014). It has a restricted distribution, occurring in shaded rocky outcrops in the forests along steep slopes of the Pelotas, Canoas, and Uruguay rivers in these States (Fig. 7C).
Conservation status: Endangered (EN) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 5,000 km with only 4–5 locations. The species is presently threatened by the construction of hydroelectric dams (IUCN 2013).
Selected Material: **BRAZIL. Rio Grande do Sul:** Barracão, X/1988, N.Silveira & C.J.Manson 6071 (HAS), Erval Seco, 18/I/1970, A. Senhem 10775 (PACA), Pinhal da Serra, 17/III/2005, C.M.Barroso s.n. (ICN), Vacaria, X/2004, G.G.Hatschbach *et al*. 78338 (G, MBM).

7. *Sinningia macrostachya* (Lindl.) Chautems, Candollea 45(1): 386. 1990. *Gesneria macrostachya* Lindl., Bot. Reg. 14, 1828. Type:—Cult. Hort. Soc. (holotype CGE!).
Figs. 3A–B, 5G.
Rupicolous herbs with erect stems arising from tubers. Stems 30–100 cm, pilose, green. Leaves decussate, inserted along 4–7 nodes, petiole 2.5 cm long, subequal, tomentose; blade ovate to elliptic, 8–15 × 5–9.5 cm, acute to obtuse at the apex, cordate or sometimes unequal at the base, margin crenate, 4–7 pairs of veins, adaxial surface green, pubescent, abaxial surface pale green to whitish, tomentose. Inflorescence terminal, racemiform, composed of paired-flower cymes; peduncles up 1 cm long, green with reddish streaks, hirsute; pedicels ascending 0.5–2 cm long, green, hirsute. Calyx subcampanulate, tube 2–3 mm long, hoary-tomentose, lobes linear-lanceolate, 4–6 mm long, acuminate, margin entire, green, pilose. Corolla erect within calyx, tubular, 2.8–3 cm long, orange to red, puberulent, base with 5 gibbosities between the calyx lobes, tube constricted above base, 2–3 mm wide, then expanding gradually to 5–6 mm at throat, limb spreading, lobes 5, with few vinose dots mostly on ventral and lateral lobes, unequal, ca. 2 × 3 mm. Stamens 4, included, filaments 2.6 cm long, glabrous, anthers coherent, rectangular, pollen white, nectary consisting of two separate dorsal glands. Ovary 4 mm long, 1 mm wide, hispid, style 2 cm long, green, pubescent. Fruit a dry two-valved capsule, 0.8–1.0 cm long, 0.3–0.6 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, brown.
Phenology: Flowers from September to December, fruits from October to March.
Distribution and habitat: The species is almost endemic to Rio Grande do Sul, extending into small neighbouring areas in southern Santa Catarina and northern Uruguay (Grela & Brussa 2005). In the state it has a rather wide distribution in the Atlantic (eastern) half (Fig. 7D), where it occurs mostly in sunny and shadowy rocky outcrops, from sea level up to 1000 msm.
Conservation status: Least concern (IUCN 2013).
Notes: The tubers of the species may reach more than 1 m in diameter.
Selected Material: **BRAZIL. Rio Grande do Sul:** Aratinga, 25/XI/1994, G.G.Hatschbach *et al*. 61365 (MBM), Bagé, II/1989, I.Fernandes 683 (ICN), Bom Jesus, 13/X/2013, G.E. Ferreira *et al*. 245 (ICN), Caçapava do Sul, 15/X/1979, J.Mattos *et al*. 19411 (HAS), Canela, 5/X/2012, G.E.Ferreira 223 (ICN), Caxias do Sul, 10/XI/1987, J.Meyer *et al*. 63 (HAS), Dois Irmãos, XI/1989, N.Silveira 10554 (HAS), Dois Irmãos, XI/1989, N.Silveira 10558 (HAS), Farroupilha, X/1957, Camargo 1913 (PACA), Guaíba, 17/IX/2006, C.R.Buzatto 163 (ICN), Jaquirana, 10/XI/2009, C.R.Buzatto & R.B.Singer 580 (ICN), Maquiné, 31/X/2012, G.E. Ferreira 230 (ICN), Mampituba, 2/XI/2012, G.E.Ferreira 234 (ICN), Montenegro, 15/XII/1952, B.Rambo 52906 (B, HBR), Pantano Grande, 3/XI/2008, T.C.L.Silveira & R.T.Mattos s.n. (PACA, ICN), Pelotas, 9/III/2008, R.Tsuji 2495 (HPL), Piratini, 22/X/1997, J.A.Jarenkow 3589 (MBM), Porto Alegre, 25/VIII/2008, R.Setubal & P.Ferreira 655 (ICN), São

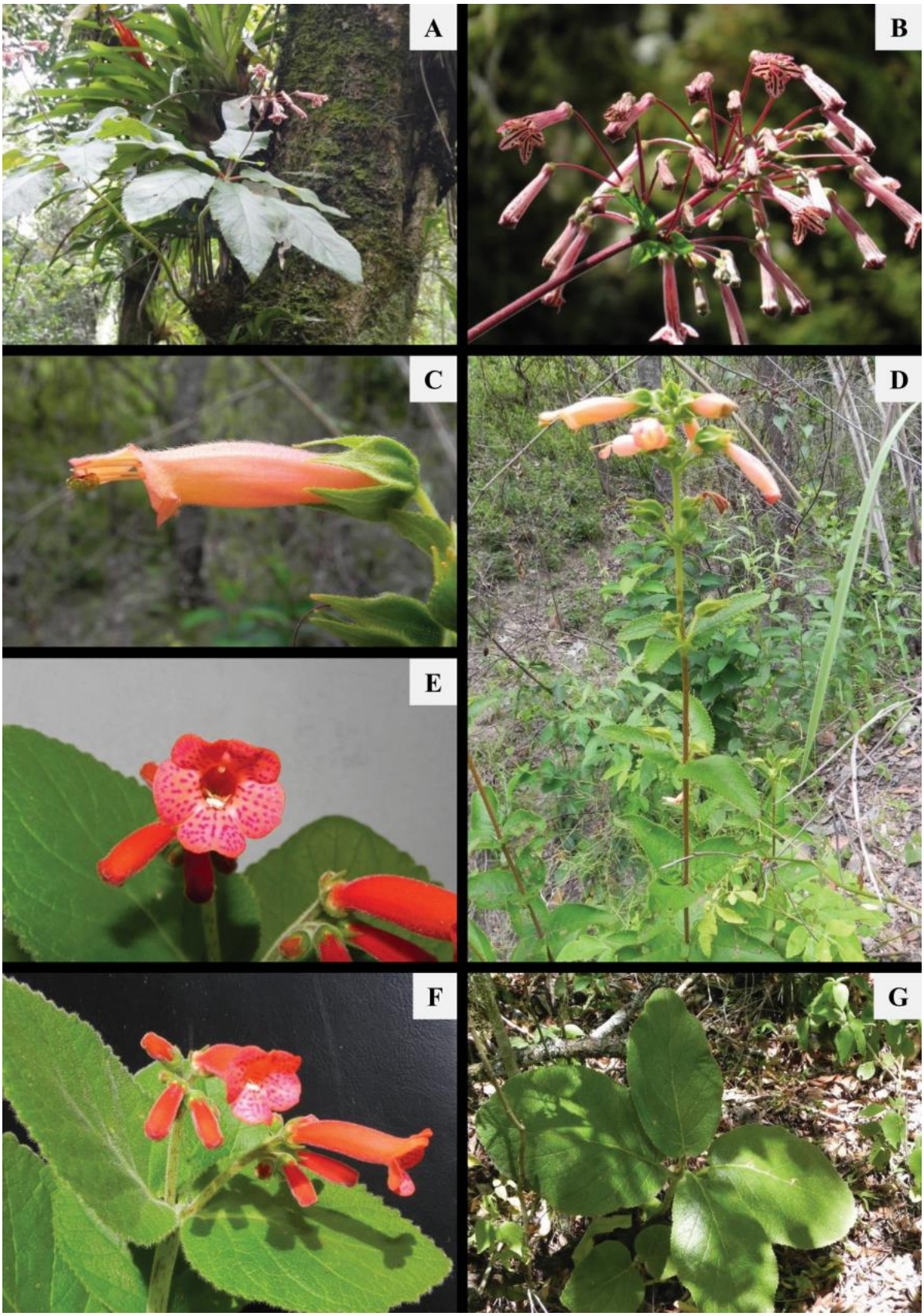

Figure 2. A–B. *Sinningia douglasii*. A. Habit. B. Inflorescence. C–D. *Sinningia elatior*. C. Corolla in lateral view. D. Habit. E–G *Sinningia lineata*. E. Corolla in front view. F. Detail of inflorescence. G. Habit.

Marcos, 13/XI/1978, J.Mattos 20340 (HAS), Sapucaia do Sul, 23/IV/1979, O.Bueno 1323 (HAS), Terra de Areia, XI/1988, N.Silveira 8093 (HAS), Torres, 31 December 1987, N.Silveira 5075 (HAS), Porto Fagundes, 26/VII/1987, N.Silveira 4707 (HAS), Vacaria, 13/IV/1975, A.Sehnem 14635 (PACA), Veranópolis, 30/X/1987, N.Silveira 4858 (HAS), Viamão, X/1981, Nilson 25 (HAS).

8. *Sinningia nivalis* Chautems, Candollea 46: 418. 1991. Type:—BRAZIL. Santa Catarina: Bom Jardim da Serra, topo das Serra dos Aparados, próximo ao monumento rodoviário, 1450 m alt., 2 December 1989, *A.Chautems & R.Reitz 354* (holotype HBR!, isotypes G-image!, US).
Figs. 3C–D, 6E.
Rupicolous or rarely epiphytic herbs with erect stems arising from tubers. Stems 10–15 cm, pilose, green to reddish. Leaves 3–whorled, inserted along 2 nodes closely grouped at the apex of the erect stems, subequal, petiole 0.3–2.5 cm, tomentose, pinkish below; blade elliptic to ovate, 6–15 × 3.5–7 cm wide, obtuse at the apex, cordate or sometimes unequal at the base, margin irregularly crenate to serrate, 7–9 pairs of veins, adaxial surface green, strigillose, abaxial surface whitish-tomentose with midrib and veins pinkish. Inflorescences terminal, pseudo-umbellate, composed of paired-flower cymes, borne on an erect axis of 7–17 cm long, reddish green, hirsute; peduncles 0.1–1 cm long, reddish, hirsute; pedicels ascending 1.5–4 cm long, reddish, tomentose; rarely, a second inflorescence develops above the first. Calyx campanulate, tube 2–3 mm long, hoary-tomentose, lobes linear-lanceolate, 5–7 mm long, acuminate, margin entire, reddish, pilose. Corolla erect within calyx, tubular, 2.5–3 cm long, pink to dark-pink with dark red striations and dots toward the upper half, pilose, base with 5 gibbosities between the calyx lobes, tube constricted above base, 4 mm wide, then expanding gradually to 6–9 mm at throat, limb spreading, lobes 5, unequal, the two dorsal partially connate, 6 × 8 mm wide, others subequal, ca. 6 × 6 mm. Stamens 4, included, filaments 2.73 cm long, glabrous, anthers coherent, star-shaped, pollen white, nectary consisting of two separate dorsal glands. Ovary 8 mm long, 3 mm wide, hispid, style 2 cm long, reddish, pubescent. Fruit a dry two-valved capsule, 1.3–1.7 cm long, 0.5–0.7 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, 0.7–0.9 long, brown.
Phenology: Flowers from September to December, fruits from November to March.
Distribution and habitat: The species occurs in Brazil, in Santa Catarina and Rio Grande do Sul (Araújo *et al.* 2014). In the latter state, it occurs only in a restricted area in the northeastern highlands (Fig. 7D). This species inhabits the abrupt escarpments and the edges of the canyons. It can also occur epiphytically in the forests near the canyons.
Conservation status:—Critically Endangered (CR) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 100 km with two locations known (IUCN 2013).

Selected Material: **BRAZIL. Rio Grande do Sul:** Jaquirana, 14/XI/2013, G.E.Ferreira *et al.* 240 (G, ICN, RB, PACA), São José dos Ausentes, 12/XI/2013, G.E.Ferreira *et al.* (G, ICN).

9. *Sinningia polyantha* (DC.) Wiehler, Selbyana 5(3–4): 383, 1981. *Gesneria polyantha* DC., Prodr. 7(2): 528, 1839. Type:—BRAZIL. Santa Catarina, 1932, *C.Gaudichaud 182* (holotype G-DC! G00133467, isotypes G! G00359977, P! P00587364).
Figs. 3E–F, 6F.
Terrestrial or more rarely rupicolous and epiphytic herbs with erect stems arising from tubers. Stems 30–80 cm long, unbranched, villous, reddish. Leaves 3–whorled, inserted along 3–4 nodes, clearly separated along the erect 1 stems, equal within whorl, petiole 0.2–3 cm long, villous, green; blade ovate, 5–14 × 3–8 cm, acute at the apex, obtuse to truncate or slightly cordiform at the base, adaxial surface green, sericeous, abaxial surface pale green to canescent, tomentose, margin irregularly serrate to serrulate, 5–6 pairs of veins. Inflorescence terminal, pseudo–umbellate, in one or two whorls in the upper stem, peduncle 1–5 mm, bracts 5–15 × 3–5 mm, pedicels 1.5–3 cm long, densely pubescent. Calyx campanulate, fused at base for 2–3 mm, lobes linear–lanceolate, 3–4 mm long, apex acute, margin entire, green to reddish, pubescent. Corolla erect in the calyx, tubular, 3.1–3.4 cm long, tube constricted above base 3–4 mm wide, then expanding gradually to 5–7 mm wide at throat, limb spreading, base with 5 gibbosities between the calyx lobes, bright pink with wine red streaks in the upper half, pubescent, lobes 5, unequal, the two dorsal ones 3–4 × 3–4 mm, the ventral and lateral lobes 3–4 × 4–5 mm, overlapping at the apex, erect to slightly spreading, throat pink with wine red streaks extending on the inner lobes. Stamens 4, included, filaments white, anthers coherent, forming a rectangle, pollen white; nectary consisting of two dorsal glands, ca 3 mm long, separate, only 12 touching in their basal portion. Ovary reddish, style ca. 2.5 cm, pink. Fruit held on erect pedicel, capsules ovoid, apex acute, 12–15 × 4–6 mm; seeds narrowly ellipsoid, ca. 1 mm long.
Phenology: Flowers from October to December, fruits from November to January.
Distribution and habitat: The species occurs in South Brazil, in the States of Santa Catarina and Rio Grande do Sul. In Rio Grande do Sul it only occurs in the northeastern lowlands, growing on coastal dunes or *restingas* (Fig. 7E). Occasionally the species also grows on rocks and trees in the transition zone between beach vegetation and coastal forest. This is the only species in the genus growing on sandy substrate, with tubers that can be totally buried in sand (Chautems *et al.* 2010).
Conservation status: Critically Endangered (CR) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 100 km^2 in a strongly fragmented habitat, due to urban expansion along coastal beaches (IUCN 2013).

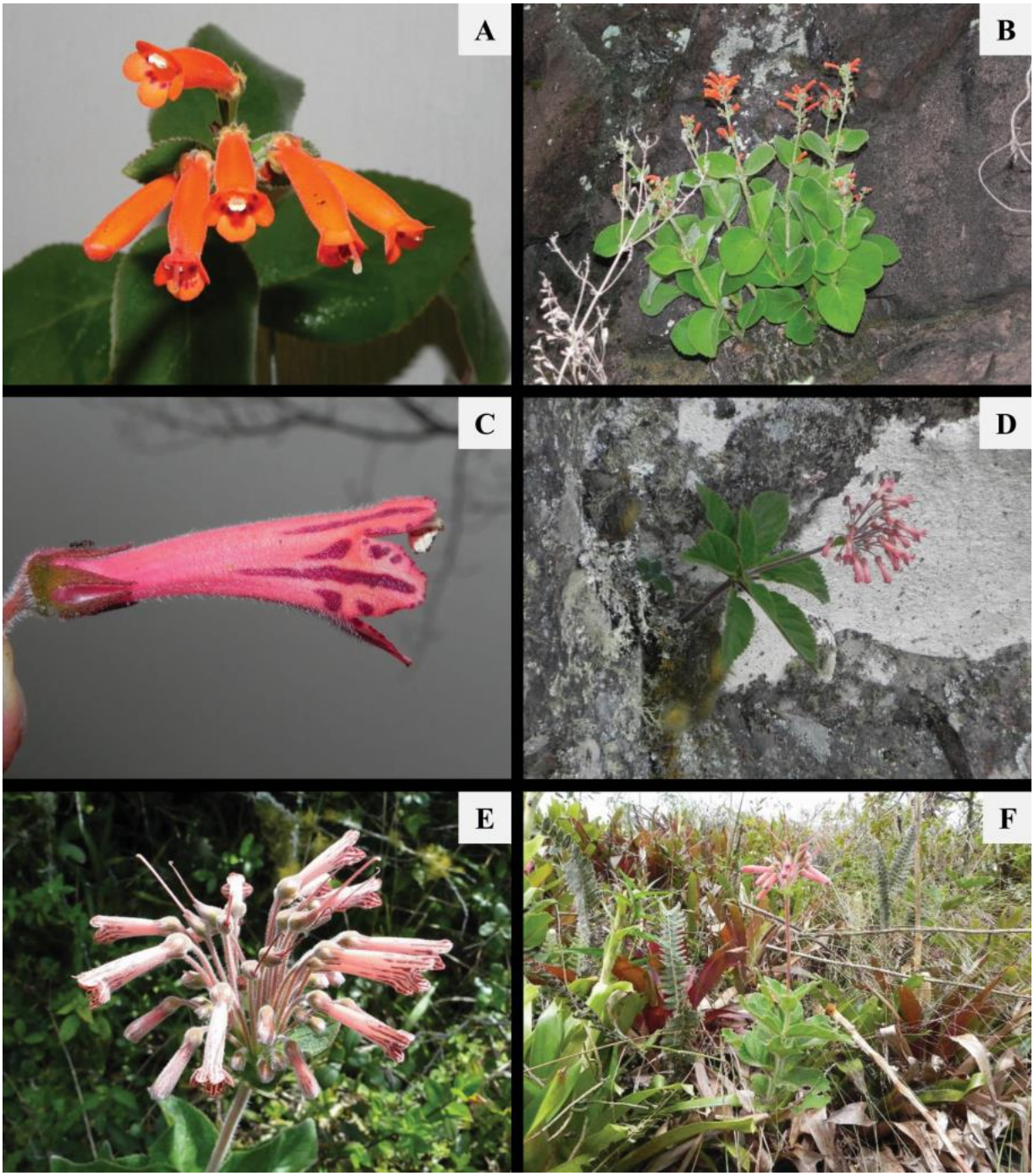

Figure 3. A–B. *Sinningia macrostachya*. A. Detail of inflorescence. B. Habit. C–D. *Sinningia nivalis*. C. Corolla in lateral view. D. Habit. E–F *Sinningia polyantha*. E. Detail of inflorescence. F. Habit

Selected material: **BRAZIL. Rio Grande do Sul:** Arroio do Sal, 11/XI/1990, M.G.Rossoni 570 (ICN), Torres, 1/XI/2012, G.E.Ferreira 231 (ICN).

10. *Sinningia ramboi* G.E. Ferreira, Waechter & Chautems. Syst. Bot. 39(3): 975. 2014. Type:—BRAZIL. Rio Grande do Sul: Cambará do Sul, Cânion Fortaleza, afloramento rochoso próximo a escarpa do cânion, 14 November 2012, *G.E. Ferreira and C. Vogel-Ely 236* (holotype ICN!; isotypes G!). Figs. 4A–B, 6C.

Rupicolous or rarely epiphytic herbs with erect stems arising from tubers. Stems 7–20 cm long, pilose, green to reddish. Leaves decussate, inserted along 2 nodes closely grouped at the apex of the erect stems, subequal, petiole 1.5–3 cm long, pilose, vinaceous; blade ovate–elliptic, 6–11 × 4–8 cm wide, acute at the apex, obtuse or slightly cordate or

unequal at the base, margin irregularly serrate, 6–7 pairs of veins, adaxial surface green and puberulent, abaxial surface green to purplish and puberulent, with midrib and major veins vinaceous. Inflorescences terminal, cymose, with a short main axis 3–6 cm, ramified in 3–5 peduncles bearing pair-flowered cymes; peduncles 1–3 cm long, reddish, pilose; pedicels ascending 1–3 cm long, reddish, pilose. Calyx campanulate, tube 2–4 mm long, lobes 6–8 mm long, truncate at base, subulate at the apex, margin entire, reddish to vinaceous, pilose. Corolla erect in calyx, tubular, 2.2–2.8 cm long, dark pink to crimson with vinaceous streaks and dots toward the upper half, puberulent to pilose, pubescent, 2–3 mm wide at base, base with 5 gibbosities between the calyx lobes, the two dorsal ones larger than the three others that are barely marked, tube constricted above base, then expanding gradually to 4–6 mm wide at throat, limb spreading, lobes 5, unequal, the two dorsal ones 2–3 × 4 mm, ventral and lateral lobes 3–4 × 4 mm, overlapping slightly. Stamens 4, included, filaments 2–2.5 cm long, glabrous, anthers coherent, rectangle, pollen white, nectary consisting of two separate dorsal glands, ca. 2 mm long, whitish. Ovary 8 mm long, 3 mm wide, hispid, style 2.1–2.6 cm long, reddish, puberulent. Fruit a dry two-valved capsule, 1.1–1.5 cm long, 0.5–0.7 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, 0.5–0.6 mm long, brown.
Phenology: Flowers from September to December, fruits from November to March.
Distribution and habitat: *Sinningia ramboi* is known only from Cambará do Sul, a municipalitiy in the northeastern highlands of Rio Grande do Sul (Fig. 7E). The dominant vegetation types in this region are araucaria forests and montane grasslands of the Atlantic Forest Domain. *Sinningia ramboi* occurs predominantly on rocky outcrops near the abrupt escarpments of the canyons, at around 1000 msm, but can also grow epiphytically in the nearby montane forests. The species has a relatively large population around the upper edges of Fortaleza canyon.
Conservation status: Endangered (EN) B1ab, according to the IUCN criteria, based on the extent of occurrence estimated to be less than 5,000 km in only two locations (IUCN 2013).
Selected Material: **BRAZIL. Rio Grande do Sul:** Cambará do Sul, 18/XI/2012, G.E.Ferreira & C.Vogel-Ely 237 (G, ICN).

11. *Sinningia sellovii* (Mart.) Wiehler, Selbyana 5(1): 72. 1978. *Gesneria sellovii* Mart., Nov. Gen. Sp. Pl. 3: 36, 1829. Lectotype designated here:—BRAZIL. Rio Grande do Sul: [Candelária], [Cerro] Botucaraí, 1814, *Sellow s.n.* (lectotype K! ID K000509946).
Figs. 4C–D, 5A.
Rupicolous herbs with erect stems arising from tubers. Stems 30–80 cm, often branched, reddish to vinous, villous. Leaves 3-whorled, inserted along 4–7 nodes, petiole to 0.5–1 cm long; blade elliptic to oval-elliptic 7–12 cm × 2.5–4.0 cm, acute at the apex, obtuse or rounded at the base, margin crenulate, adaxial surface pubescent, abaxial surface green, pubescent, both surfaces with tector trichomes. Inflorescence terminal, racemiform, solitary flower or paired-flower cyme per bract axil, pendulous, borne in whorls along the inflorescence axis; pedicel 0.6–2 cm long, vinaceous, pubescent. Calyx subcampanulate, tube 0.3 × 0.5 mm, pubescent with tector trichomes, lobes triangular, 0.5–0.8 cm long, acuminate, margin entire, green, puberulent. Corolla erect in calyx, tubular, 1.8–2.6 cm long, pink to lilac, rarely white, lanate whit tector trichomes, base glabrous, base with 2 dorsal gibbosities somewhat united covering the calyx lobes, tube constricted above base, 2–4 mm wide, then expanding gradually to 5–7 mm after contracting slightly at throat, limb spreading, lobes 5, pink, red, or greenish, rarely white, equal, ca. 2–3 × 4 mm. Stamens 4, exserted, filaments 2–3.2 cm long, glabrous, staminode present, anthers coherent, rectangular, pollen white, nectary consisting of two connate glands. Ovary 4–5 mm long, 1–2 mm wide, hispid, style 2–3.3 cm long, greenish, pubescent. Fruit a dry two-valved, ball-shaped capsule with a short beak, 1.0–1.1 cm long, and 0.5–0.6 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, brown.
Phenology: Flowers from September to February, fruits from October to March.
Distribution and habitat: The species is widespread in Argentina, Bolivia, Brazil, Paraguay, and Uruguay (Skog & Boggan 2007). In Brazil, it occurs in Mato Grosso do Sul, Paraná, Santa Catarina and Rio Grande do Sul (Araújo *et al*. 2014). In this latter state it occurs in all regions mostly in the northern forested areas, and more rarely in the southern grassland areas (Fig. 7E). The species inhabits rocky outcrops, especially in shady and humid places.
Conservation status: Least concern (IUCN 2013).
Selected material: **BRAZIL**. **Rio Grande do Sul:** Bento Gonçalves, 17/X/1988, N.Silveira & J.Mansan 6065 (HAS), Canela, 5/X/2012, G.E.Ferreira 224 (ICN), Caxias do Sul, 10/XI/1987, J.Meyer *et al*. 61 (HAS), Derrubadas, 22/XI/1975, M.L.Porto 1922 (ICN), Farroupilha, XI/1957, Camargo 2559 (PACA), Maquiné, 20/XII/1989, J.Mattos & N.Silveira 26437a (ICN), Nova Petrópolis, 01/XII/2005, M.Grings 632 (ICN), Nova Prata, 17/XI/1982, J.Mattos & R.Frosi 23743 (HAS), Picada Café, 01/X/2010, M.Grings & S.Bordignon 1134 (ICN), Santa Maria, 9/XI/1988, N.Silveira 6172 (HAS), Santana do Livramento, 15/X/1971, J.C.Lindeman *et al.* 15 (ICN), Taquarí, 2/XI/1989, V.F.Nunes & T.N.Silva 500 (HAS), Terra de Areia, XII/1989, A.Chautems et J.Waechter 373 (G, ICN), Vacaria, 2/XI/1983, J.Mattos & N.Mattos 24680 (HAS), Veranópolis, 29/X/1987, N.Silveira & J.Mattos 5689 (HAS), Vale do Sol, 18/II/1980, J.Waechter 1557 (ICN).

12. *Sinningia warmingii* (Hiern) Chautems, Candollea 45: 386. 1990. *Gesneria warmingii* Hiern, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 90. 1877. Type:—BRAZIL. Minas Gerais: Lagoa Santa, 12 December 1865, *Warming s.n.* (lectotype C!; isolectotype K; P! ID P00587358).
Figs. 4E–F, 6A.

Rupicolous or terrestrial herbs with erect stems arising from tubers. Stems 40–120 cm, often branched, reddish to green, villous. Leaves 3-whorled, inserted along 4–9 nodes, petiole to 0.5–2.0 cm long; blade elliptic or oval-elliptic 3.0–12.0 × 1.6–4.0 cm, acute at the apex, acute or obtuse at the base, margin crenate, adaxial surface pubescent, abaxial green, pubescent, both two surface with tector trichomes. Inflorescence terminal, racemous, 3 flowers per whorl; pedicel 0.6–2 cm long, reddish, pubescent. Calyx subcampanulate, tube 0.8–1.5 mm wide, pubescent with tector trichomes, lobes triangular, 0.9–1.0 cm long, acuminate, margin entire, red to red-greenish, puberulent. Corolla erect in calyx, horizontal, tubular, 3.3–5.0 cm long, salmon to red-yellowish, pubescent with tector trichomes, glabrous at the base, base with 2 dorsal gibbosities somewhat united covering the calyx lobes, tube constricted above base, 2–3 mm wide, then expanding gradually to 5–7 mm at throat, limb spreading, lobes 5, salmon to red, equal, ca. 4 × 5–6 mm. Stamens 4, included, filaments 3.0–4.8 cm long, glabrous, pinkish, staminode present, anthers coherent, rectangular, pollen white, nectary consisting of five glands, two conate glands larger than the others, two separate lateral glands and one isolated. Ovary 8 mm long, 2 mm wide, hispid, style 2.4 cm long, green, pubescent. Fruit a dry two-valved capsule, 1.0–1.1 cm long, 0.5–0.6 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, brown.

Phenology: Flowers from November to March, fruits from February to May.

Distribution and habitat: The species is widespread occurring in Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru, Uruguay and Venezuela (Skog & Boggan 2007). In Brazil, it occurs in all regions (Araújo *et al.* 2014). In Rio Grande do Sul, the species is more easily observed in the northeastern Atlantic rainforest (Fig. 7F). This species inhabits rocky outcrops or rocky soils, in shady or more or less sun-exposed areas

Conservation status: Least concern (IUCN 2013).

Notes: *Gesneria lindleyi* Hook. is considered a heterotypic synonym of *S. warmingii* by Chautems (1990) although it is an older name than *G. warmingii* Hiern. However, the epithet "*lindleyi*" is already occupied by *Sinningia lindleyi* Schauer; therefore, the epithet "*warmingii*" has been used for this species (Chautems 1990).

Selected Material: **BRAZIL. Rio Grande do Sul:** Bom Jesus, 12/XI/1987, J.Meyer *et al*. 198 (HAS), Cambará do Sul, 23/V/1984, N.Silveira *et al*. 1156 (HAS), Osório, II/1971, L.R.M.Baptista s.n. (ICN), Rolante, XII/1979, O.Bueno 2007 (HAS), São Francisco de Paula, 22/II/1989, A.Chautems et J.Waechter 329 (E, G, ICN, NY, US, WU), Sapiranga, 10/III/2013, G.E.Ferreira 250 (ICN), Terra de Areia, 28/XI/1988, N.Silveira 8091 (HAS), Torres, XII/1977, J.L.Waechter & L.R.M.Baptista 675 (ICN).

13. *Sinningia* × *vacariensis* G.E.Ferreira, Waechter & Chautems, Phytotaxa 119(1): 46. 2013. Type:—BRAZIL. Rio Grande do Sul: Vacaria, Afloramento rochoso no interior da Floresta com Araucária, próximo ao Rio Pelotas, 660 m, 18 November 2012, *G.E. Ferreira and C.Vogel-Ely 235* (holotype ICN!, isotype G!).

Figs. 4G–H, 5E.

Rupicolous herbs with erect stems arising from tubers. Stems 80–100 cm, pilose, green with reddish streaks. Leaves decussate, inserted along 3–5 nodes, subequal, petiole 1.5 cm, tomentose, concolor; blade ovate–elliptic, 8–15 × 7–12 cm, obtuse at the apex, cordate or sometimes unequal at the base, margin irregularly crenate, 4–5 pairs of veins, adaxial surface strigillose, abaxial surface whitish-tomentose. Inflorescence terminal, racemiform, composed of paired-flower cymes, borne in the axils of bracts or upper leaf pairs over the ca. 30 cm long apex of the axis; peduncles 0.5–2 cm long, green with reddish streaks, hirsute; pedicels ascending 0.5–2 cm long, green with reddish streaks, hirsute. Calyx subcampanulate, tube 2–3 mm long, hoary-tomentose, lobes linear-lanceolate, 4–6 mm long, acuminate, margin entire, green, pilose. Corolla erect in calyx, tubular, 2.5–3 cm long, red, pilose, base with 5 gibbosities between the calyx lobes, tube constricted above base, 3–4 mm wide, then expanding gradually to 5–7 mm at throat, limb spreading, lobes 5, with many dark red dots, unequal, ca. 4 × 4 mm. Stamens 4, included, filaments 2.9–3.2 cm long, glabrous, anthers coherent, rectangular, pollen white, nectary consisting of two separate dorsal glands. Ovary 6 mm long, 2 mm wide, hispid, style 2 cm long, green, pubescent. Fruit a dry two-valved capsule, 0.9–1.1 cm long, and 0.4–0.6 cm wide, acuminate, reddish brown, pubescent; seeds narrowly ellipsoid, brown.

Phenology: Flowers from October to December, fruits from December to February.

Distribution and habitat: This hybrid occurs in the Vacaria municipality in Rio Grande do Sul, next to the Pelotas River. We located only one individual, growing on basaltic rocky outcrops within an Araucaria forest, close to streams or in shaded habitats, between 600 and 800 m in elevation (Fig. 7F).

Conservation status: The IUCN indicates that conservation status of the hybrid are not evaluated (IUCN 2013).

Notes: This naturally hybrid between *S. lineata* and *S. macrostachya*, has been found only once on rocky outcrops inside an Araucaria forest in Rio Grande do Sul, Brazil. *S.* × *vacariensis* clearly presents morphological characteristics intermediate between the *S. lineata* and *S. macrostachya*: leaves opposite-decussate, ovate to elliptic, distributed in 3 whorls, petiole 1.5 cm long, frondo-(bracteose) florescence with cymes, peduncle 0.5–2 cm long, corolla 2.5–3 cm long, lobes with vinose dots on ventral and lateral lobes and dark red dots on dorsal lobes. The hybrid was collected where the areas of occurrence of the two species overlap, on a rocky outcrop within a forest, at the mouth of the Socorro River, which flows into the Pelotas River (Ferreira *et al.* 2013).

Specimens examined: **BRAZIL. Rio Grande do Sul**: Vacaria, 18/XI/2012. G.E.Ferreira & C.Vogel-Ely 235 (G, ICN).

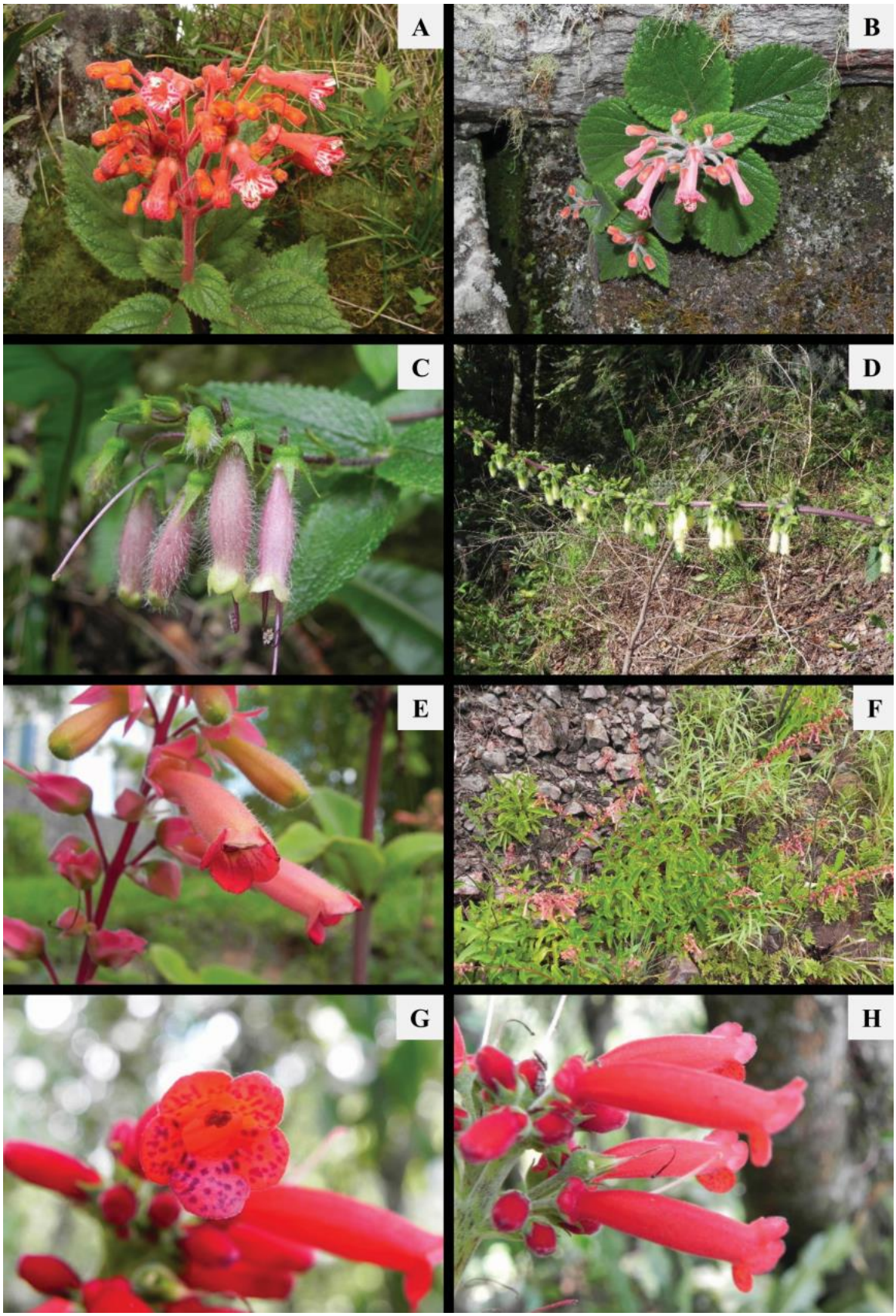

Figure 4. A–B. *Sinningia ramboi.* A. Inflorescente. B. Habit. C–D. *Sinningia sellovii*. C. Flowers in lateral view. D. Inflorescence. E–F. *Sinningia warmingii*. C. Corolla in frontal view. F. Habit. G–H *Sinningia* × *vacariensis*. G. Corolla in frontal view. H. Detail of inflorescence.

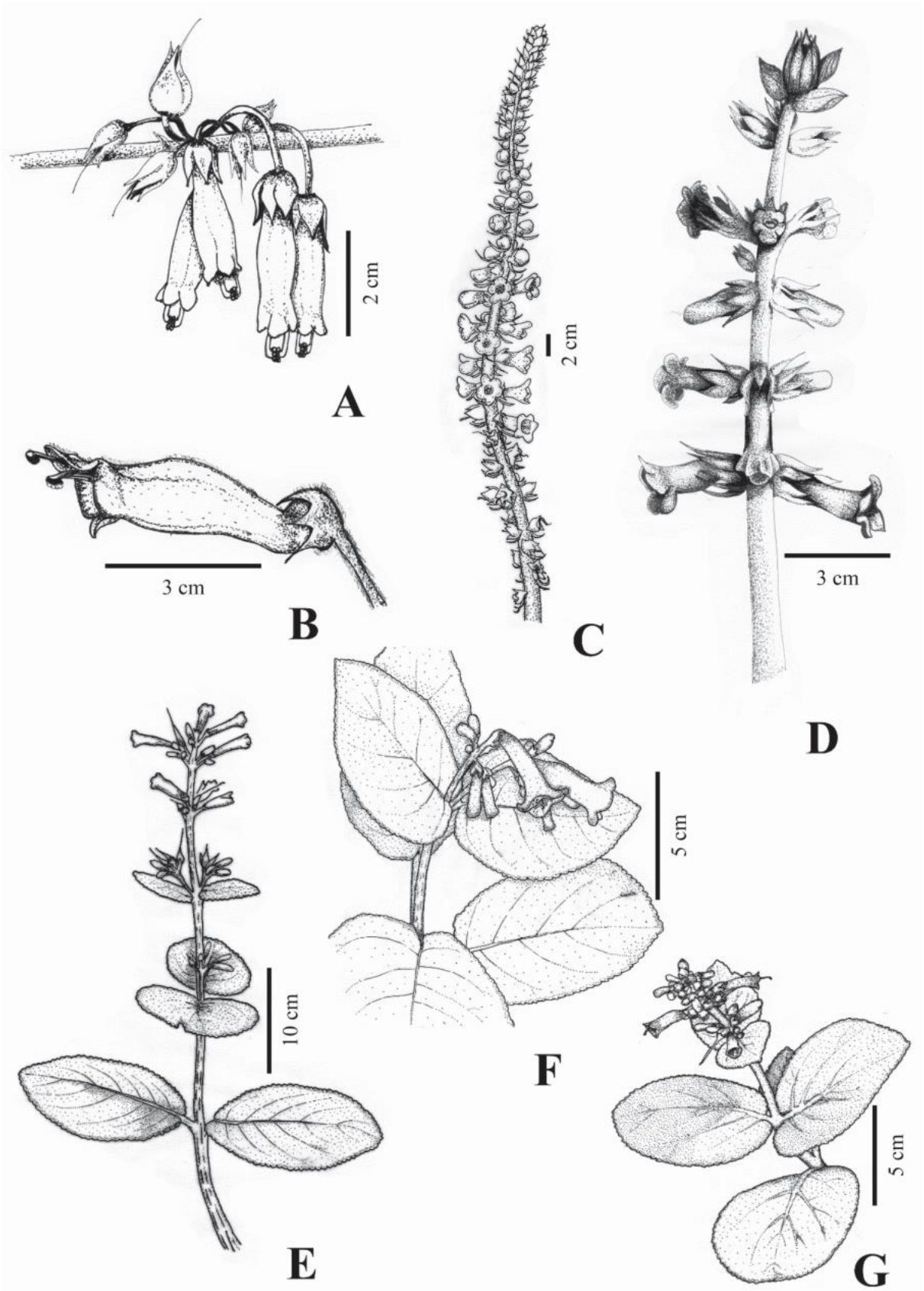

Figure 5. A. *Sinningia sellovii* – Flowers. B. *Sinningia elatior* – Flower. C. *Sinningia curtiflora* – Inflorescence. D. *Sinningia allagophylla* – Inflorescence. E. *Sinningia* × *vacariensis* – Habit. F. *Sinningia lineata* – Flowers and leaves. G. *Sinningia macrostachya* – Habit.

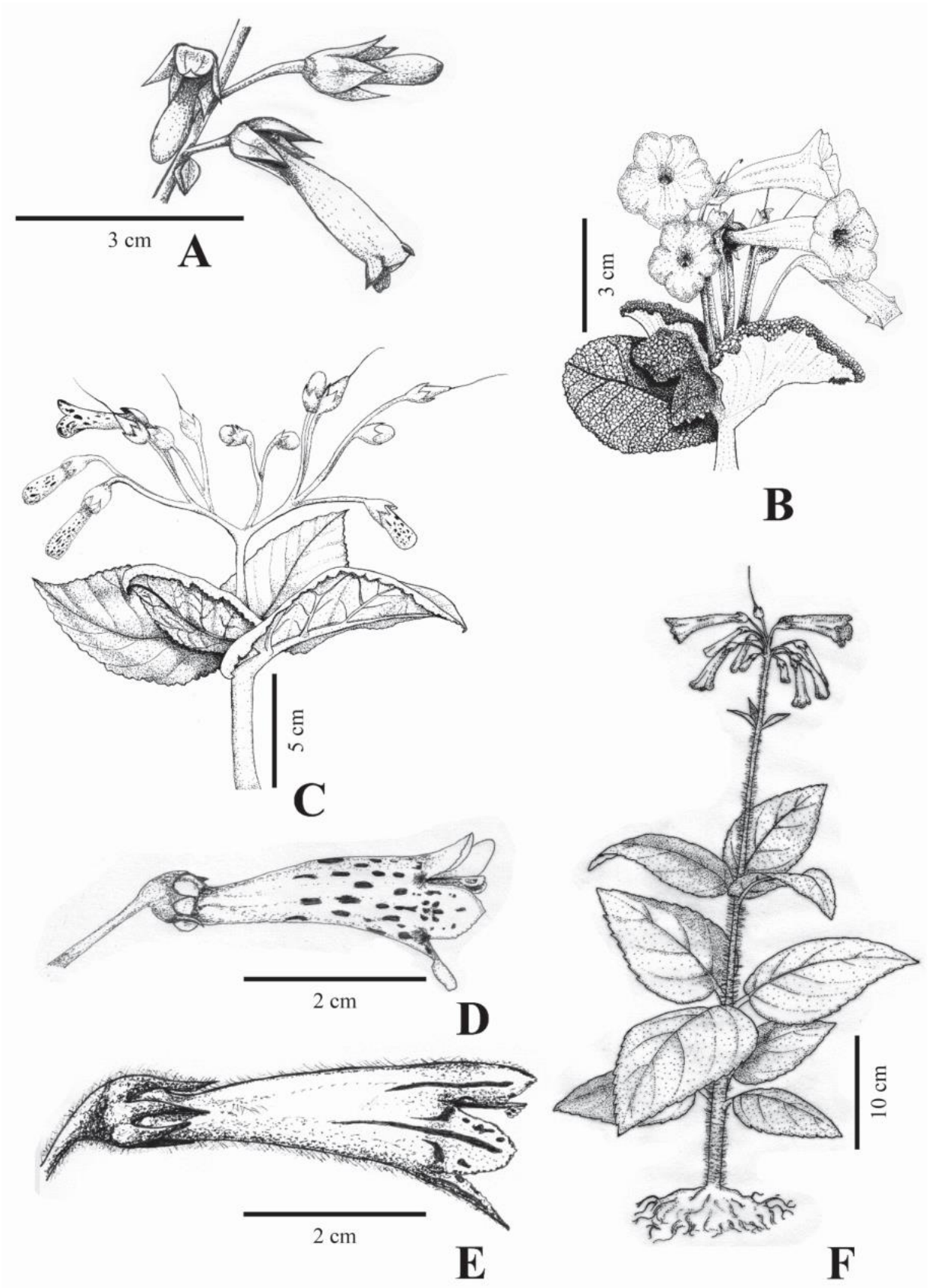

Figure 6. A. *Sinningia warmingii* – Flowers. B. *Sinningia bullata* – Habit. C. *Sinningia ramboi* – Habit. D. *Sinningia douglasii* – Flower. E. *Sinningia nivalis* – Flower. F. *Sinningia polyantha* – Habit.

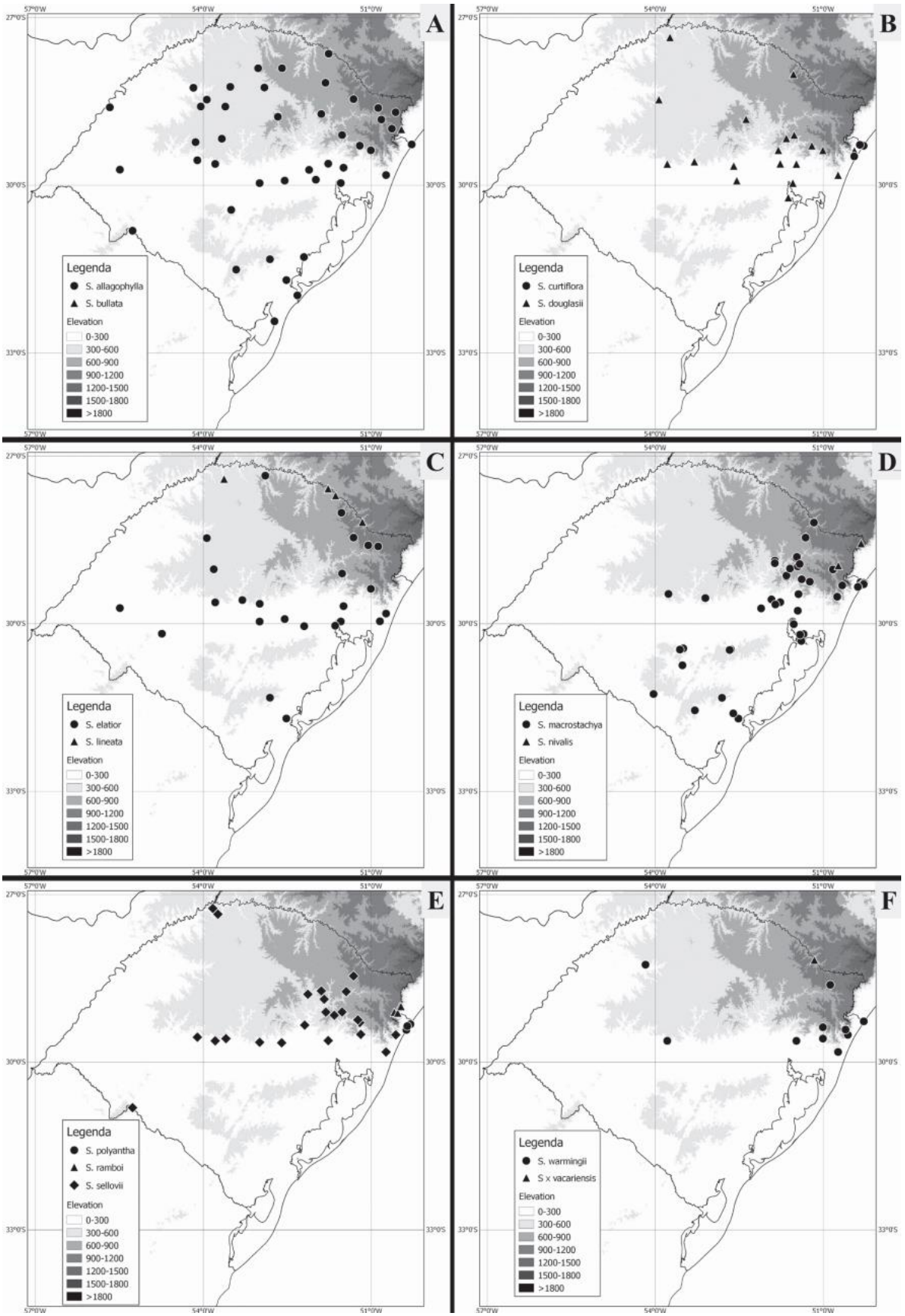

Figure 7. Distribution of *Sinningia* in Rio Grande do Sul.

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