

ARTICLE



Rediscovery of *Ruellia reitzii* (Acanthaceae), a narrowly endemic critically endangered species from Santa Catarina, southern Brazil, and notes on *R. squarrosa*

Luís A. Funez^a, Gustavo Hassemer^b, Eduardo A. Lunkes^c and Elisandro R. Drechsler-Santos^a

^aLaboratory of Micology, Federal University of Santa Catarina, Florianópolis, Brazil; ^bLaboratory of Plant Systematics, Federal University of Santa Catarina, Florianópolis, Brazil; ^cUndergraduate student, Regional University of Blumenau, Blumenau, Brazil

ABSTRACT

Ruellia reitzii was first collected in 1948 by the prominent botanist Raulino Reitz in Santa Catarina state, southern Brazil, and the species was only known from two gatherings. Because its most recent collection was in 1953, the species was considered possibly extinct. In this work we present the rediscovery of this species, 65 years after its last collection. Here we complement and rectify the morphologic knowledge of the species, present the first photographs of living specimens and assess its conservation status. We also present notes on the authorship of the name *R. squarrosa*, and provide an identification key to the species of *Ruellia* that occur in Santa Catarina.

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Introduction

Ruellia L. is a genus widely distributed in tropical, subtropical and temperate regions, having in the neotropics its most important centre of distribution (Ezcurra 1993; Daniel 1999; Tripp 2010; Tripp and Darbyshire 2017). With c. 350 species, the genus is the second largest in the Acanthaceae (Tripp 2007; Tripp and McDade 2013; Tripp and Darbyshire 2017), after *Justicia* L., with c. 600 species (Ezcurra 2002). *Ruellia* belongs to the tribe Ruellinae (Tripp et al. 2013) and has as a generic morphologic synapomorphy the triporate, rarely pantoporate pollen, with a coarsely reticulate exine (Tripp 2007; Tripp and Manos 2008; Tripp et al. 2013).

In Brazil, there are 80 recorded species of *Ruellia*, of which 44 are endemic to the country (Profice et al. 2015). One of these species, *R. reitzii* Wash. & L.B. Sm. is an extremely narrowly endemic species only known from the type material collected in Luiz Alves municipality, Santa Catarina state (SC), southern Brazil. This species was described in 1969 based on two specimens collect by the prominent botanist Raulino Reitz in 1948 and 1953 (Wasshausen and Smith 1969).

In this work we present the rediscovery of *R. reitzii*, 65 years after its last collection. Here we complement and rectify the morphologic knowledge of the species, present the first photographs of living specimens and assess its conservation status. We also present notes on the authorship of the name '*R. squarrosa*', and provide an identification key to the species of *Ruellia* that occur in SC.

Material and methods

We conducted field work in SC and neighbouring areas in southern Brazil from 2008 to 2019. We studied *Ruellia* specimens from the following herbaria: ECF, FLOR, FURB, HBR JOI, MBM and UPCB, and images of specimens kept at A, ASE, BHCB, BM, BOTU, BR, C, CEN, CESJ, DAO, E, EAC, ENCB, ESA, F, FI, FR, G, GENT, GH, GOET, GZU, HBG, HOH, HUEFS, HVASF, INPA, K, LD, LINN, M, MA, MO, MPU, NY, P, PH, PORT, R, RB, S, SBT, SING, TCD, TUB, UC, UEC, UFG, US, VIC and W. The conservation status assessment followed the IUCN (2012, 2017) criteria. The nomenclature presented here follows the Shenzhen Code (Turland et al. 2018).

Results and discussion

Ruellia reitzii Wash. & L.B. Sm., Fl. Il. Catarin. ACAN: 60–62, t. 6(f). 1969.

Type: BRAZIL, Santa Catarina, Luiz Alves, Rio Canoas, roadside, 50 m, 18 January 1953, *R. Reitz 5154* (holotype US-2580639 barcode 00136624!; isotypes HBR (not seen), US-2550702 barcode 02861979!). **Figure 1.**

Description

Herbs 0.5–2.0 m long, stems erect to scandent, sparsely branched, younger stems quadrangular and densely pilose. Indumentum composed of three types of trichomes: dense short pubescent trichomes c. 0.1 mm long; sparse and longer hispid trichomes c. 3.5 mm and glandular trichomes c. 0.5 mm long, basal portions of stems terete, woody, less densely pilose and inflated



Figure 1. Holotype of *Ruellia reitzii* (R. Reitz 5154, US-2580639 barcode 00136624). Copyright: Smithsonian Institution.

at nodes. Petioles 25–48 mm long, with the same indumentum as the stems; leaf blades elliptic, 6.5–13.8 × 2.0–6.9 cm, apex acute to acuminate, base cuneate to decurrent on the petiole, margins entire to shallowly crenate, abaxial surface pale green, sparsely pubescent, mostly along veins, adaxial surfaces green, sparsely pubescent, cystoliths visible on both surfaces but more obvious adaxially. Inflorescences of few flowered cymes in axils of distal nodes, peduncles 30–111 mm long. Bracteoles elliptic to lanceolate, apex acute, 10–40 × 1–22 mm, trichomes like those of leaf blades. Flowers pedicellate, pedicels 10–15 mm. Calyx lobes 10–11 × 1.0–1.2 mm, oblanceolate, pubescent

and densely covered by glandular trichomes to 0.5 mm long, lobes fused less than 1 mm basally. Corolla purple, outer surface sparsely glandular, inner surface glabrous, tube 44–46 mm long, throat c. 11 mm diameter, lobes 9–13 × 8–11 mm, rounded, erect to suberect, emarginate. Stamens exserted, anthers 4 mm; styles 5.0–5.3 mm long, stigma unequally bifid, one lobe very reduced. Fruits broad oblanceolate, pubescent, 13–19 × 3–5 mm, stipe 5–8 mm long, seed-bearing portion 12–14 mm long, pubescent with short trichomes. Seeds to 6–8, orbicular, flat, 2–3 mm in diameter, covered by small whitish trichomes. See [Figures 1 and 2](#).

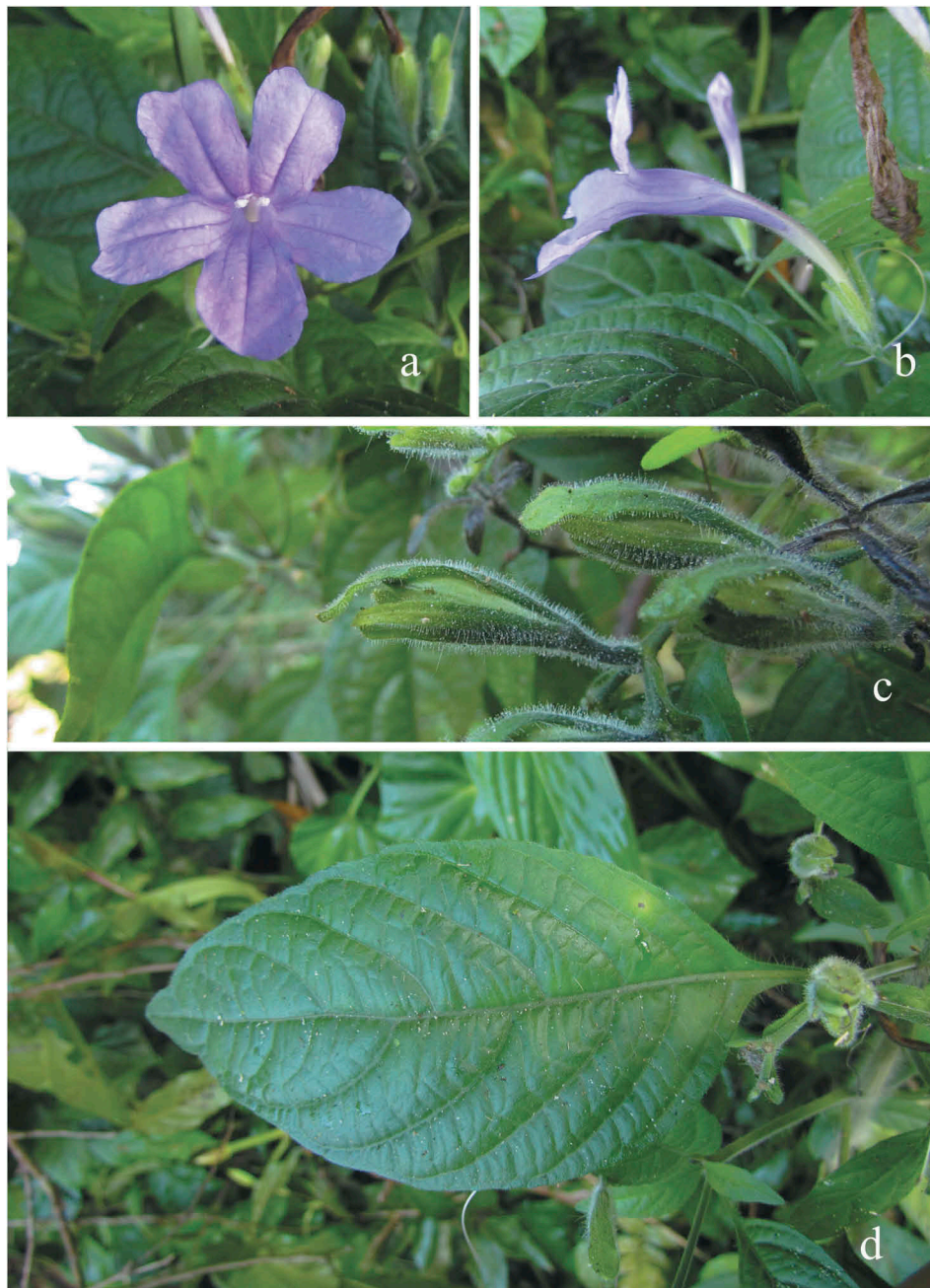


Figure 2. Field photographs of *Ruellia reitzii*. (a) Flower in frontal view. (b) Flower in lateral view. (c) Calyx lobes and fruits. (d) Leaf blade.

Distribution and habitat

Ruellia reitzii was hitherto only known from the type locality, in Luiz Alves municipality, SC, southern Brazil, on the banks of the Canoas River. We discovered a new, small population on a roadside, near the Luiz Alves River (Figure 3). The plants at this highly disturbed locality are restricted to a small area between the road and the edge of a secondary native forest (Figure 4).

Conservation status

Critically Endangered (CR-B1,2:a,b[iii,v]). *Ruellia reitzii* inhabits a very small area of occurrence of less than 150 m² between a road and a small forest fragment (Figure 4(a)). The count of mature

individuals is imprecise, but there are less than 30 individuals of this species in the studied locality. In addition, the surrounding areas are largely being converted into monocultures of *Eucalyptus* L'Hér. and *Pinus* L. (Figure 4(b)). In addition, herbaceous plants that grow close to roadsides are subject to the application of herbicides, which have been indiscriminately used to carry out the 'cleaning' of rural roads. This activity is certainly a great threat to this and many other species that inhabit roadsides. Both threats are extremely dangerous to biodiversity conservation, and, if not checked, will most probably lead to the extinction of *R. reitzii* and other narrowly endemic species in SC (see Hassemer et al. 2015; Funez and Hassemer 2016, 2017).

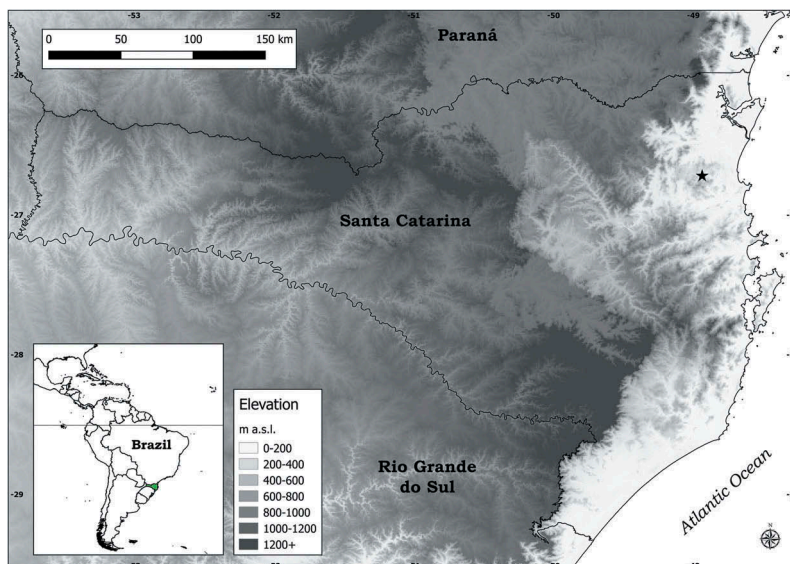


Figure 3. Distribution map of *Ruellia reitzii*.

Notes: Before our rediscovery of the species, the species was only known from the two gatherings mentioned in the protologue, both collected by Raulino Reitz in 1948 and 1953, near ‘Rio Canoas’ riverbanks, in Luiz Alves municipality. The species had not been collected since then, which led it to be considered possibly extinct (see e.g. Hassemmer et al. 2015). Although Wasshausen and Smith (1969) and Ezcurra (1993) described the corolla of the species as being red, in the original labels of the type specimens the colour of the petals is described as purple (Figure 1), which we confirmed with our rediscovery of the species (Figure 2). In addition to rectifying knowledge of the colour of the corolla of the species, in this work we also provide a detailed morphological description including characters unknown to Wasshausen and Smith (1969) and Ezcurra (1993), such as those of the fruits and seeds.

Additional specimens examined

BRAZIL, Santa Catarina, Luiz Alves, Braço Serafim, edges of a waterfall, 100 m, 22 January 1948, *R. Reitz* C2009 (US-1954075 barcode 02861980 (paratype)); Centro, near Rio Luiz Alves, 11 April 2018, *L.A. Funez and E.A. Lunkes* 7686 (FURB-5927).

Notes on the authorship of *Ruellia squarrosa*

Ruellia squarrosa (Fenzl & Benseler) Schaffnit, in Beih. Bot. Centralbl., Abt. 1. 19(3): 455, 486. 1906.

Type: Austria, Vienna, Schönbrunn (cultivated), 30 July 1868, *Anonymous s.n.* (lectotype W-0004526!, designated by Walker 1970, p. 41). Figure 5.

(=) *Dipteracanthus squarrosus* Fenzl & Benseler, Ind. Sem. Hort. Vindob. 1868: 10. 1869.

(=) *Ruellia squarrosa* (Fenzl & Benseler) Cufod. ex E. Walker, in *Baileya* 17: 40. 1970, nom. illeg.

Notes: *Dipteracanthus squarrosus* was described from plants cultivated at the gardens of the Schönbrunn Palace in Vienna, Austria (Fenzl and Benseler 1869). A combination for this name in the genus *Ruellia* published one century later by Walker (1970) is today seemingly ubiquitously used for the species, although with erroneous authorship: ‘*R. squarrosa* (Fenzl) Cufod.’. This authorship is incorrect because (1) it ignores the name of Friedrich Benseler as co-author of *D. squarrosus*, and (2) Georg Cufodontis is not the author of the work in which this new combination was published, which was Egbert Hamilton Walker instead. Nevertheless, a much earlier combination of the basionym *D. squarrosus* in *Ruellia* exists, published by Schaffnit (1906). Therefore, the correct authorship for the name *R. squarrosa*, which is a currently accepted species, is ‘(Fenzl & Benseler) Schaffnit’.

Identification key to the species of *Ruellia* that occur in Santa Catarina

1. Corolla red..... 2
Corolla white, mauve, pink or blue..... 4
2. Calyx segments oblanceolate or spatulate. Corolla lobes 0.5–1.0 cm wide. . *R. elegans* Poir. Calyx segments linear or oblong, acute or obtuse but not spatulate. Corolla lobes less than 0.5 cm wide..... 3
3. Corolla tube throat notably ventricose; basal tube less than 8 mm long.....
..... *R. brevifolia* (Pohl) C.Ezcurra



Figure 4. Habitat of *Ruellia reitzii*. (a) Forest edge with an individual of *R. reitzii* (arrow). (b) Threats to survival of *R. reitzii*: monoculture of *Pinus* (left arrow), monoculture of *Eucalyptus* (right and middle arrows) and road opening (asterisks).

- | | | |
|---|---|---|
| Corolla tube throat not ventricose; basal tube longer than 10 mm..... | Capsules with 6–20 seeds..... | 8 |
| <i>R. angustiflora</i> (Nees) Lindau ex Rambo | 7. Leaves glabrous, coriaceous <i>R. bulbifera</i> Lindau | |
| 4. Erect to scandent herbs up to 2 m tall. Flowers in long-pedunculate cymes..... | Leaves pilose, papyraceous or membranaceous.... | |
| <i>R. reitzii</i> Wassh. & L.B. Sm. | <i>R. geminiflora</i> Kunth | |
| Small herbs up to 0.5 m tall. Flowers sessile..... | 8. Herbs decumbent. Corolla up to 4 cm long. | |
| 5. Corolla white, 1.5–2.0 cm long..... | Capsules with 16–20 seeds..... | |
| <i>R. kleinii</i> C.Ezcurra | <i>R. squarrosa</i> (Fenzl & Bensele) Schaffnit | |
| Corolla blue, mauve, longer than 3 cm..... | Herbs erect. Corolla longer than 4 cm. Capsules with 6–12 seeds..... | 9 |
| 6. Capsules with 2–4 seeds..... | 9. Leaves without glandular hairs. Basal tube of corolla shorter than the throat..... | |
| | | 7 |



Figure 5. Lectotype of *Dipteracanthus squarrosus* (Anonymous s.n., W-0004526). Copyright: Naturhistorisches Museum Wien.

..... *R. brevicaulis* (Nees) Lindau
 Leaves with glandular hairs. Basal tube of corolla
 equalling or longer than the throat.....
 *R. multifolia* (Nees) Lindau

Concluding remarks

In terms of biodiversity conservation, it is noteworthy that a species not recorded for more than 50 years has been found in such a fragile environmental condition. In view of the critical situation of its habitat quality,

in situ and especially *ex situ* conservation efforts are strongly recommended to ensure that the species does not become globally extinct.

We would like to also highlight the importance of botanical training and involvement of students in science, as the rediscovery of *R. reitzii* was only possible because an undergraduate student (E.A. Lunkes) collected it in the first place, and brought the plant to the attention of the other authors.

Considering that *R. reitzii* is restricted to a few metres of forest edge, surrounded by a road and numerous

growing threats, it is our hope that the present study will gather attention to the species and hopefully revert the ongoing trends that will most certainly lead to the extinction of this species, and also many other rare jewels that make SC so beautiful and biodiverse.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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ORCID

Luis A. Funez  <http://orcid.org/0000-0002-0008-1061>
Elisandro R. Drechsler-Santos  <http://orcid.org/0000-0002-3702-8715>

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