

***Ruellia eriocalyx* (Acanthaceae, Ruellieae), a Pyrophytic Species from Central Brazil**

Thomas F. Daniel ¹, Erin A. Manzitto-Tripp ², and Cecilia Ezcurra ³

¹* *Department of Botany, California Academy of Sciences, 55 Music Concourse Drive, San Francisco, California 94118, U.S.A.*; ² *Department of Ecology & Evolutionary Biology, UCB 334, University of Colorado, Boulder, Colorado 80309; U.S.A.*; ³ *Departamento de Botánica, Universidad Nacional del Comahue, INIBIOMA, CONICET, Quintral 1250, 8400 Bariloche, Río Negro, ARGENTINA.*

*Corresponding author: E-mail: tdaniel@calacademy.org

***Ruellia eriocalyx*, a name in use for a species in central Brazil was never validly published. We publish this name and provide a morphological description, photographs of specimens, ecological data, a preliminary conservation assessment, discussion of its putative relatives, and a list of materials studied.**

KEYWORDS: Valid publication, morphological description, conservation

With more than 350 species and a worldwide distribution, monophyletic *Ruellia* L. is one of the largest and most widely distributed genera of Acanthaceae (Tripp and Darbyshire 2017; Manzitto-Tripp et al. 2022). In the New World, species range from the north-central United States to Uruguay and central Argentina. During research for a sectional classification of the ca. 275 species of *Ruellia* in the New World (Manzitto-Tripp and Daniel, in prep.) numerous taxonomic and nomenclatural issues became evident; most of these are to be discussed and/or resolved in that study. Here, we effect publication of a name, *Ruellia eriocalyx*, which has been in wide usage for a Brazilian species but never validly published.

Glaziou (1911) published a new species of *Ruellia* from Brazil and provided a name, an indication of its status (“n. sp. ?”), a very brief description, a locality, a single collection (with collector and number), list of herbaria, months (presumably referring to collection and flowering time), and a common name. Unfortunately, his “protologue” does not effect valid publication of the name, “*R. eriocalyx*,” that he used according to Article 38.2 (Ex. 3) of the International Code of Nomenclature for Algae, Fungi, and Plants (Turland et al. 2018). Glaziou’s (1911) indication of “Herbacé, fl. bleues” does not qualify as a validating description or diagnosis because he employed this same brief description to multiple species of *Ruellia* (both new and previously described ones) in his account of plants from central Brazil. Nevertheless, this “name” has been used for a distinctive Brazilian species on both herbarium specimens and in scientific documents (e.g., Vilar 2009). Most attributions of the name have been cited as “*Ruellia eriocalyx* Glaziou ex Wasshausen.” Wasshausen was aware that the name had not been validly published by Glaziou, and he annotated numerous specimens with this authorship; however, he did not publish the name (Dieter Wasshausen, pers. comm.).

Ruellia eriocalyx Glaziou ex T.F. Daniel, E. Tripp & C. Ezcurra

BRAZIL. Goiás: “Entre As Antas et Pedro Gardinha” (fide protologue), “dans les campos queimados” (fide holotype), 30 VIII 1894 (flr), *A. Glaziou 21877a* (holotype: P-image!; isotype: K!). Figure 1.

Perennial herbs to 10 cm tall from a stout vertical caudex, sometimes appearing subcaulescent; roots thick (but not fusiform-tuberos), numerous. Young stems $\pm$ densely pubescent with whitish trichomes. Leaves $\pm$ congested, green, sessile to subsessile, blades ovate-elliptic to elliptic to linear-elliptic to oblanceolate to obovate, 6–50 mm long, 1.5–13 mm wide, 1.8–11.6 (–17) times longer than wide, surfaces $\pm$ densely pubescent with whitish trichomes. Reduced dichasia (1-flowered), borne in axils of leaves, 1 per axil. Bracteoles absent or inconspicuous (if present, not observed). Flowers pedicellate, pedicels (2.5–) 7–42 mm long, pubescent like stems; calyces deeply 5-lobed, 11–23 mm long, externally pubescent like leaves, lobes subulate to lance-subulate, subequal in length; corolla purplish, infundibuliform, (30–) 40–56 mm long, externally pubescent, tube 23–36 mm long, narrow proximal portion subcylindric and $\pm$ abruptly expanded at apex into a $\pm$ broadly conical throat, 7–16 mm long, throat 14–27 mm long, longer than narrow proximal portion of tube, widest at mouth, limb 26–39 mm in diameter, lobes of limb 7–15 mm long, 7–16 mm wide; stamens included in corolla throat, longer pair 10–14 mm long, shorter pair 6.5–8.5 mm long; style 18–26 mm long, stigma lobes unequal, 1 lobe 1.5–2.6 mm long, other lobe 0.4–0.8 mm long. Capsules elliptic, 9–11 mm long.

Phenology. Flowering: June–November; fruiting: September.

Distribution and habitat. Central Brazil in the Distrito Federal and the state of Goiás. Plants occur in recently burned cerrado, campo sujo, campo limpo, and campo rupestre at elevations from 975 to 1110 meters.

Local name. “Flor do fogo” (*Glaziou 21887a*; Vilar 2009).

Uses. Vilar (2009) noted that plants are used locally for medicinal purposes.

Conservation. Based on the collections cited below, the species has an Extent of Occurrence (EOO) of 3,475 sq. km and an Area of Occupancy (AOO; 2 km cell width) of 36 sq. km (IUCN 2022). Within the EOO plants are known from three areas (i.e., three subpopulations): a nickel-mining region 8 to 15 km NNE of the city of Niquelandia in north-central Goiás, a region ca. 165 km to the south in the Distrito Federal (just south of Brasília), and a locale ca. 23 km west of Brasília in the western Distrito Federal. Plants in Goiás would appear to be threatened by the severe habitat destruction resulting from extensive mining activities there. Plants occurring south of Brasília in the Distrito Federal are known from three contiguous protected areas (Reserva Ecológica do IBGE, Fazenda Água Limpa [FAL], and Estação Ecológica do Jardim Botânico de Brasília). Most collections of the species have been made in these protected areas, and plants there would not appear to be under threat. The single collection (*Irwin & Soderstrom 5984*) made ca. 25 km west of these preserves is from along a major highway in a region comprising a mixture of native vegetation, agricultural lands, and housing/businesses. Natural areas in this region would appear to be threatened by anthropogenic development. Thus, there appear to be two locations (in Goiás and in the western portion of the Distrito Federal), each constituting a threatened subpopulation. The degree of isolation of the subpopulations is not known, but the population is potentially severely fragmented (condition a) because no collections have been made between them. Using IUCN (2022) criteria for Geographic Range (B), a preliminary conservation assessment of Endangered (EN) is proposed, based on either the EOO or the AOO, the number of locations (2), and observed/inferred/projected population decline based on the threats noted (B1a,b or B2a,b). A more thorough study of this species in the field and in Brazilian herbaria would likely increase both

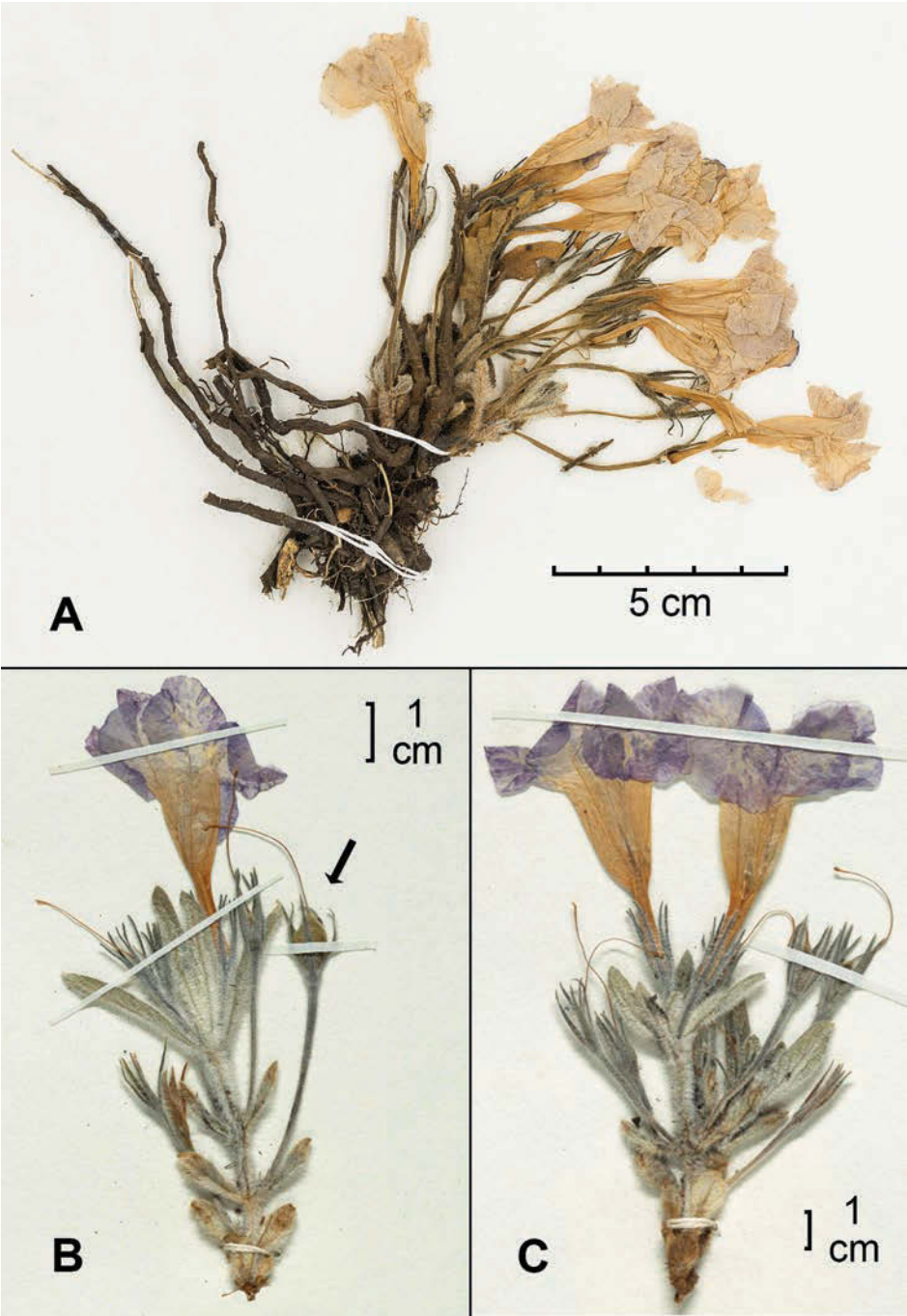


FIGURE 1. Plants of *Ruellia eriocalyx* from herbarium specimens. A. Nearly leafless flowering plant (post-fire), showing woody caudex, thick (but not tuberous) roots, and elongate pedicels, *Irwin et al. 8164* (NY), image courtesy of the C.V. Starr Virtual Herbarium (<http://sweetgum.nybg.org/science/vh/>), used with permission. B, C. Leafy plants (32 days following fire), showing pubescence, flowers, and capsule (at arrow), *Fonseca & Alvarenga 2054*, Catalog number 3398390, United States National Herbarium (US), Smithsonian Institution, used with permission.

the EOO and AOO, identify other threats, and provide additional data (e.g., declines/fluctuations of subpopulations) for advancing a more conclusive conservation assessment of this species.

DISCUSSION

Leaves of plants occur at or near ground level and show considerable variation in the size and shape. Most collections cited below note that the plants appeared on burned ground following a recent fire (regrowing/flowering as soon as 10 days post-fire fide *Heringer et al. 5044*), sometimes become locally common, and usually occur in full sun. Thus, the plants appear to be pyrophytes. Whether they are passive or active pyrophytes or pyrophiles remains undetermined. Vilar (2009) noted that the species is sometimes confused with *R. brevicaulis* (Nees) Lindau. This name is illegitimate, being a later homonym of *R. brevicaulis* Baker (1885), a Malagasy species, now treated as a synonym of *Radamaea montana* Benth. in the Orobanchaceae. Plants identified as *R. brevicaulis* (Nees) Lindau are potentially conspecific with *R. dissitifolia* (Nees) Hiern. Indeed, in the protologue Nees (1847, and on his annotation of the type specimen of the basionym, *Dipteracanthus brevicaulis* Nees) indicated that *R. brevicaulis* was perhaps a variety of *R. dissitifolia*. Also, Ezcurra (1993) treated *Ruellia dissitifolia* Nees var. *humilior* Nees as synonym of *R. brevicaulis*. South American plants often identified as *R. brevicaulis* tend to be shorter in stature and more densely pubescent (hirsute) than those of *R. dissitifolia*. Variation in plant height and pubescence are somewhat variable throughout their respective geographic ranges, and at least some plants referred to *R. brevicaulis* are also pyrophytic and sympatric with *R. eriocalyx*. Additional morphological and molecular studies of plants treated as *R. brevicaulis* and *R. dissitifolia* should be helpful to determine if and how they differ, and at what taxonomic rank, if any, *R. brevicaulis* should be treated. The following key distinguishes *Ruellia eriocalyx* from its morphologically similar congener(s):

- 1a. Roots with fusiform-tuberous swellings; plants subcaulescent to caulescent, to 30 cm high; bracteoles present and conspicuous (more than 10 mm long); dichasia mostly 1-flowered, sessile (or borne on peduncles less than 5 mm long), flowers sessile; corollas pale blue, (35–) 50–70 mm long; capsules 12–15 mm long; central to southern Brazil, eastern Paraguay, and eastern Argentina *R. dissitifolia*/*R. brevicaulis* (Nees) Lindau
- 1b. Roots thickened but not with fusiform-tuberous swellings; plants subcaulescent, to 10 cm high; bracteoles absent (or inconspicuous; if present, not seen); flowers borne on pedicels (2.5–) 7–42 mm long; corollas purplish, (30–) 40–56 mm long; capsules 9–11 mm long; central Brazil (Distrito Federal, Goiás) *R. eriocalyx*

ADDITIONAL SPECIMENS EXAMINED

BRAZIL. Distrito Federal: Brasília, Reserva Ecológica do IBGE, 15°46'41"S, 047°53' 07"W, *M. Aparecida da Silva* 6023 (IBGE-image); Brasília, Reserva Ecológica do IBGE, 15°57'03"S, 047°52'18"W, *M. Aparecida da Silva* 5363-A (IBGE-image), 5373 (IBGE-image); Brasília, Jardim Botânico de Brasília, área do Cristo Redentor, entre o córrego Tapera e Taperinha, ca. 15°22'S, 047°51'W, *M. Aparecida da Silva* & *D. Alvarenga* 7383 (RB-image); área da UNE (FAL), *M. Azevedo* & *D. Alvarenga* 936 (IBGE-image, US-image); Reserva Ecológica do IBGE, área de campo sujo próximo ao Córrego Taquara, 15°55'55"S, 047°53'51"W, *M. Fonseca* & *D. Alvarenga* 2054 (IBGE-image, SPF-image, US-image); Fundação Zoobotânica, Brasília, *E. Heringer* 8704 (NY-image, US-image); Bacia do Rio São Bartolomeu, *E. Heringer et al. 5044* (IBGE-image, K, MO-image); ca. 23 km SW of Brasília on road to Anápolis, [ca. 15°55'12.32"S,

048°09'54.53"W], *H. Irwin & T. Soderstrom* 5984 (NY-image); immediately NW of Brasília, *H. Irwin et al.* 8164 (NY, US-image); Brasília, Estação Ecológica do Jardim Botânico de Brasília, área do Cristo Redentor, 15°52'00"S, 047°51'00"W, *K. Moreira et al.* 126 (HEPH-image); Reserva Ecológica do IBGE, *F. Oliveira & D. Alvarenga* 130 (RB-image, US); Brasília, APA-Gama, Cabeça de Veado, Abrigo Cristo Redentor, 15°52'00"S, 047°51'00"W, *A. Ramos* 902 (HEPH-image); Brasília, Jardim Botânico de Brasília (área de Cristo Redentor), 15°54'50"S, 047°52'52"W, *R. Rodrigues-da-Silva* 652 (HEPH-image); Brasília, Estação Ecológica do Jardim, Botânico de Brasília, centro oeste, 15°54'58"S, 047°54'15"W, *R. Rodrigues-da-Silva* 846 (HEPH-image); Estação Ecológica do Jardim, Botânico de Brasília, área do Cristo Redentor, Lago Sul, *A. Soares et al.* 292 (HEPH-image), *J. Vidal & L. Silva* 169 (HEPH-image). Goiás; Município de Niquelândia, ca. 05 km da Mina de Níquel Tocantins, próximo ao povoado de Macedo, 14°23'32"S, 048°25'10"W, *J. Aparecida da Silva & C. Ferreira* 3096 (RB-image, US); Município de Niquelândia, Macedo, próximo ao Clube dos Engenheiros, 14°21'34"S, 048°26'27"W, *M. Fonseca et al.* 1118 (RB-image); Município de Niquelândia, Companhia de Níquel Tocantins, estrada à esquerda da mina de níquel, ca. 2 km da entrada, 14°20'37"S, 048°23' 57"W, *R. Mendonça et al.* 3103 (IBGE-image).

ACKNOWLEDGMENTS

We are grateful to the following herbaria for permitting access to their collections and/or making images of their specimens available online: K, MO, NY, P, and US. We thank NY and US for permitting reproduction of some of their images, and the Herbário Virtual of Re flora Brasil for making images of collections from several Brazilian herbaria (e.g., HEPH, IBGE, SPF, IBGE) available for study. We are also most grateful for the careful reviews of C. Anderson and D. Wasshausen.

LITERATURE CITED

- BAKER, J.G. 1885. Further contributions to the flora of Madagascar.—Second and final part. *Journal of the Linnean Society, Botany* 21:407–455.
- EZCURRA, C. 1993. Systematics of *Ruellia* (Acanthaceae) in southern South America. *Annals of the Missouri Botanical Garden* 80:787–845.
- *GLAZIOU, A.F.M. 1911. Plantae Brasiliae Centralis a Glaziou Lectae. *Bulletin de la Société Botanique de France* 58, ser. 4, tome 11, *Mémoires* 3f:489–584.
- IUCN STANDARDS AND PETITIONS COMMITTEE. 2022. *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 15.1. <<https://www.iucnredlist.org/documents/RedListGuidelines.pdf>> Accessed August 2022.
- MANZITTO-TRIPP, E.A., I. DARBYSHIRE, T.F. DANIEL, C.A. KIEL, AND L.A. MCDADE. 2022. Revised classification of Acanthaceae and worldwide dichotomous keys. *Taxon* 71:103–153.
- NEES VON ESENBECK, C.G. 1847. Acanthaceae, Pages 5–164 + illustrations in C.F. P. de Martius (ed.), *Flora Brasiliensis* vol. 9.
- TRIPP, E.A. AND I. DARBYSHIRE. 2017. Phylogenetic relationships among Old World *Ruellia* and reinstatement of the genus *Dinteracanthus*. *Systematic Botany* 42:470–483.
- TURLAND, N.J. ET AL. (eds.). 2018. International Code of Nomenclature for Algae, Fungi, and Plants, (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Vegetabile* 159. Glashütten: Koeltz Botanical Books. <<https://doi.org/10.12705/Code.2018>> Accessed August 2022.
- VILAR, T.S. 2009. *Acanthaceae Juss. no Distrito Federal, Brasil*. Dissertação de Mestre, Departamento de Botânica do Instituto de Ciências Biológicas da Universidade de Brasília.

*NOTE: Glaziou's entire publication cited above, published between 1905 and 1913, became listed as a suppressed work under Article 34 (Turland et al. 2018), rendering all new names therein not validly published.