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Original Paper

Nomenclatural, taxonomic, and distribution novelties concerning *Evolvulus chrysotrichos* (Convolvulaceae): a rare and endangered species from Brazil

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Abstract

Nomenclatural, taxonomic, and distribution novelties concerning *Evolvulus chrysotrichos* (Convolvulaceae): a rare and endangered species from Brazil. *Evolvulus chrysotrichos* is a rare and threatened species, known from its type collection and a few old specimens. New records closer to the type locality are reported 150 years after its first collection reported by literature. We present here a complete description of this species, its first illustration and photographs in the field, distribution and phenological data, and a reassessment of its conservation status. We also designate a second-step lectotype of the name *E. chrysotrichos* and the lectotypification of its synonym, *E. guaraniticus*.

Key words: conservation status, disjunct geographical distribution, first illustration, lectotype.

Resumo

Evolvulus chrysotrichos é uma espécie rara e ameaçada, conhecida a partir de sua coleção tipo e poucos espécimes antigos. Novos registros próximo a sua localidade tipo foram reportados 150 anos após sua primeira coleta relatada na literatura. Apresentamos aqui uma descrição completa para essa espécie, sua primeira ilustração e fotografias em campo, distribuição, dados fenológicos e a reavaliação de seu status de conservação. Também designamos um lectótipo de segundo-passo para *E. chrysotrichos* e a lectotipificação de seu sinônimo, *E. guaraniticus*.

Palavras-chave: status de conservação, distribuição geográfica disjunta, primeira ilustração, lectótipo.

Introduction

Evolvulus L. comprises approximately 100 species distributed throughout the tropical Americas, with two pantropical species, *E. alsinoides* (L.) L. and *E. nummularius* (L.) L. (Ooststroom 1934). Seventy-three species have been reported for Brazil, distributed in all regions and phytogeographic domains. The genus is characterized by having two free styles, or styles partially fused at the base, each one with two filiform or clavate stigmas (Ooststroom 1934).

Studies assessing the conservation status of *Evolvulus* species has generally been restricted to the recent publications of new taxa (Silva & Bianchini 2014; Santos *et al.* 2020), taxonomic studies (Silva 2013), and listings in the Red List of Endangered Species (IUCN 2019). The revision of *E.* sect. *Phyllostachyi* (Silva 2013) and the Red List of Threatened Species of the Brazilian Flora (Simão-Bianchini *et al.* 2013) evaluated 16 and five species respectively. Additionally, four newly described species had their conservation status assessed (Silva & Bianchini 2014; Santos *et al.* 2020). In this way, the genus has 21 species (28% of the Brazilian species) evaluated, of which 18 are threatened.

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Among these, we highlight *E. chrysotrichos* that was described by Meisner (1869) for the Serra da Caraça, Minas Gerais state, southeastern Brazil. After its description, this species had no more records for the Minas Gerais state. However, in 1888 (19 years later), this species was recorded in São Paulo state, Brazil, in the municipality of Araraquara (Loefgren, ACG 932 [SP]), and was last reported in 1990 at the Santa Bárbara Ecological Station, also in São Paulo (Meira Neto *et al.* 681 [UEC]). In 2018, we were inquired concerning the identity of a small unidentified population of *Evolvulus* found during a field expedition in the municipality of Ouro Preto, Minas Gerais state. After morphological analysis and consulting specialized literature (Ooststroom 1934), type collections, and protologue, we confirmed that it belongs to *E. chrysotrichos* - and this collection represents the second record for that state after 150 years.

According to the Brazilian Flora database (BFG 2018), *E. chrysotrichos* is endemic to Brazil, however, Ooststroom (1934) synonymized *E. guaraniticus* Chodat & Hassl., which was described for Paraguay (Chaco), under *E. chrysotrichos*. After morphological analysis and consulting type collections and protologue, we agree with Ooststroom's taxonomic decision, since there is no morphological discontinuity between both entities. The recognition of that taxonomic decision represents a first step towards better characterizing *E. chrysotrichos,* providing data on its distribution, and promoting a reassessment of its conservation status, since it was previously assessed based only on records from Brazil (Simão-Bianchini *et al*. 2013).

During our investigations, we realized that the species had never been illustrated or photographed in the field, in addition, we realized the need to proceed with a second-step lectotypification for the name *E. chrysotrichos* and designate a lectotype for its synonym. We provided a complete morphological description, comments on geographic distribution, reassessment of conservation status, the first illustration and field photographs of this species.

Materials and Methods

The morphological analyzes were performed by examining specimens housed in the BHCB and OUPR. We analyzed high resolution images of specimens deposited in the virtual herbaria of G, GH, K, MPU, NY, P, SPF, SP, UEC, and U (acronyms according to Thiers, continuously updated) available on the JSTOR and Species Link platforms. The identifications were made based on the specialized bibliography (Ooststroom 1934), and confirmed through the analysis of protologues, and images of the type collections available at JSTOR (<https://plants.jstor.org/>). Typification decisions were made according to the International Code of Nomenclature (ICN) adopted in Shenzhen (Turland *et al*. 2018). The morphological terminology follows Harris & Harris (2001). The collected samples were processed according to the usual taxonomic techniques (Mori *et al.* 1989), and incorporated into the OUPR herbaria. The data referring to the flowering and fruiting period were obtained from exsiccate labels and/or field observations. The main diagnostic characters were illustrated (Fig. 1).

The species distribution map was prepared using QGIS v. 1.4 software, based mainly on records with original geographical coordinates. To assess the conservation status of *E. chrysotrichos*, its area of occupation (AOO) and extent of occurrence (EOO) were calculated using the Geospatial Conservation Assessment Tool (<http://geocat.kew.org>) (Bachman *et al*. 2011), based on geographic occurrences provided by the online database available by CRIA (2016). The conservation assessment follows the IUCN Red List Categories, and Criteria (IUCN, 2019).

Results and Discussion

Taxonomic treatment

Evolvulus chrysotrichos Meisner, *Fl. bra.* 7: 351. 1869. Figs. 1-2

Type: BRAZIL. MINAS GERAIS: Serra da Caraça, I.1825, *Riedel 1464* [first-step lectotype designated by Ooststroom (1934); second-step lectotype in LE (photo!), without barcode (annotation "typus"), here designated; isolectotypes LE [without barcode] (photo!), LE [without barcode] (photo!), NY [NY00319004] (photo!), NY [NY00319005] (photo!), U [U0003134] (photo!). Fig. 3

= *Evolvulus guaraniticus* Chodat & Hassl. Bull. Herb. Boissier, 2: 685. 1905.

Type: Paraguay. Bellavista, Upper Rio Apa, XI.1901, Hassler 7936 [lectotype in G [G00174463] (photo!), here designated;

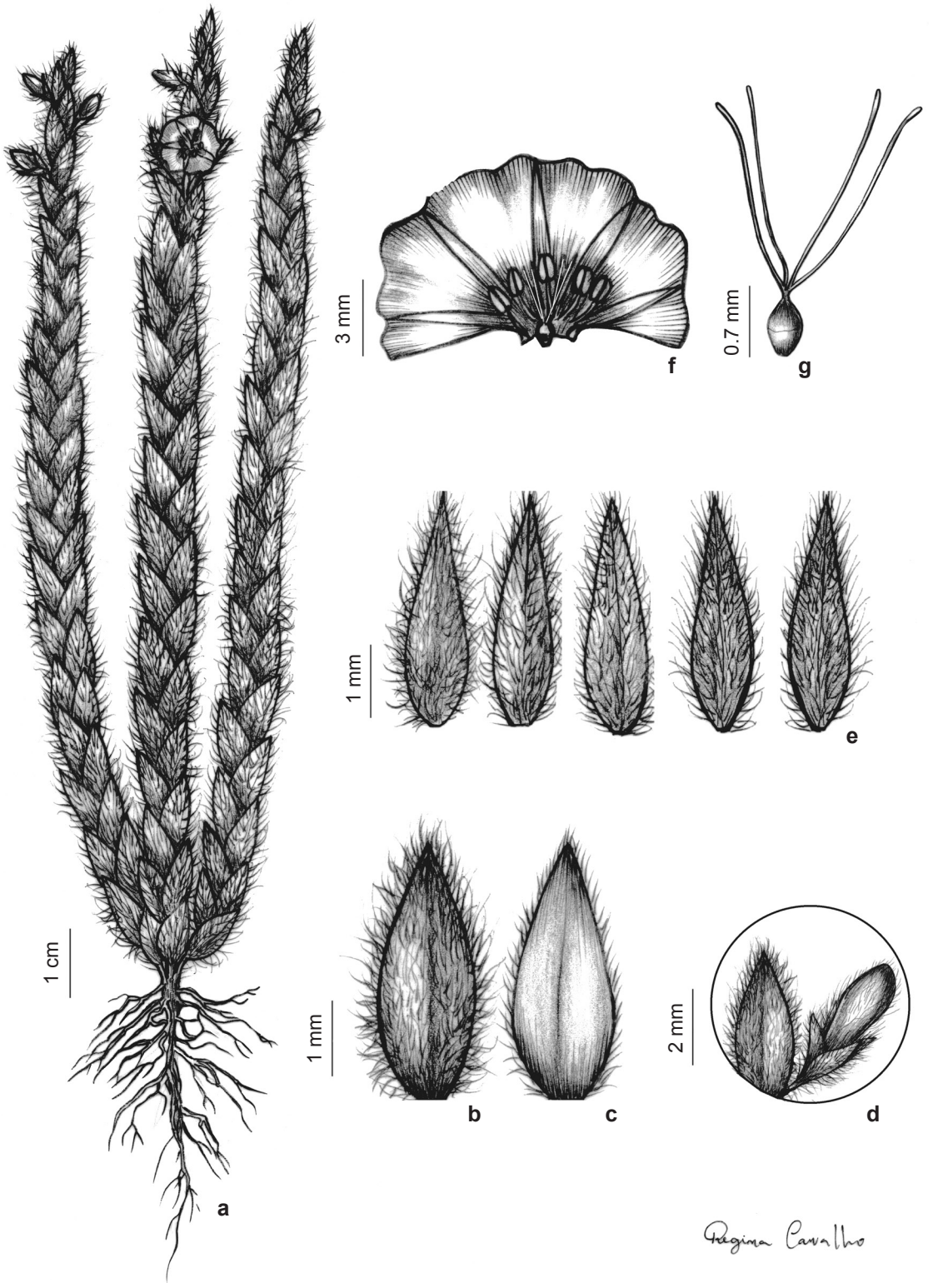

Figure 1 – a-g. *Evolvulus chrysotrichos* – a. habit; b. leaf blade with abaxial surface villous with long hairs; c. leaf blade with adaxial surface glabrous; d. detail of floral bud; e. sepals lanceolate and acute; f. corolla rotate; g. gynoecium. Drawn by Regina Carvalho.

isolectotype in G [G00228041] (photo!), G [G00174462] (photo!), GH [GH00054439] (photo!), K [K000613204] (photo!), MO [MO100716163] (photo!), MPU [MPU012086] (photo!), P [P03546827] (photo!). Fig. 4

Herb, stem erect, branches villous with long hairs. Leaves simple, alternate, helicoidal, sessile, leaf blade 0.8–2.2 × 0.5–1 cm, elliptic, base cuneate, apex acute, adaxial surface glabrous, abaxial surface villous with long

Figure 2 – a-e. *Evolvulus chrysotrichos* – a. habit with details of the corolla; b-c. details of the floral buds, frontal view; d. detals of the hairs on floral buds, side views; e. flowers usually concentrated at the distal regions of the branches, side views. Photos: Pedrosa L.

trichomes, erect, papyraceous, margins entire, flat. Flowers 1–3 axillary usually concentrated at the distal regions of the branches; peduncle ca. 0.1 cm long; bracteole ca. 0.3 cm long, lanceolate, villous; pedicel 2–5 mm long, villous. Calyx dialisepalous with sepals 5, equal, 5–6 mm long, lanceolate, base cuneate, apex acute, villous, margins hyaline inside. Corolla gamopetalous ca. 0.1 cm diam., rotate, blue or white. Filaments ca. 0.2 cm long, anther ca. 0.1 cm long, oblong, epidermal vesicle absent. Ovary upper, glabrous; styles 2, ca. 0.2 cm long, stigmas filiform ca. 0.3 cm long. Capsule 4-valvar, ca. 3–3.5 mm long, ovoid. Seeds 4, ca. 1 mm long.

Evolvulus chrysotrichos is similar to *E. sericeus* Sw. by sharing leaf blades with glabrous adaxial surfaces, although differing from it by having a villous indument, with long hairs (*vs.* sericeous in *E. sericeus*), leaves helicoidal (*vs.* distich), and flowers usually concentrated at the distal regions of the branches (*vs.* along the branches).

Specimens examined: MINAS GERAIS: Ouro Preto, Lavras Novas, 8.XI.2018, fl. and fr., *L.G. Pedrosa 1002* (OUPR). Sete Lagoas, Embrapa, 26.IX.1996, fl., *J.A. Lombardi 1388* (BHCB). SÃO PAULO: Araraquara, Caminho E., 20.XI.1888, fl., *A.C.G.G. Loefgren 932* (SP). Caieiras, 25.I.1945, fl. and fr., *W. Hoehne* (SPF 12901). São Bernardo do Campo, 18.IX.1902, fl., *A.C.G.G. Puttemans* (SP 11025). Águas de Santa Bárbara, Estação Ecológica de Santa Bárbara, 9.X.1990, fl., *J.A.A. Meira Neto et al. 681* (UEC). PARAGUAY: *B. Balansa 1173* (P); Caaguazú, 14.XI.1874, fl., *B. Balansa 1171* (P).

Typification note

According to the protologue, *E. chrysotrichos* was based on specimens from "Minas Geraes, Serra da Caraça" collected by Ludwig Riedel, but without reference to a collection number and herbarium where the specimens were deposited. When Ooststroom (1934) studied *Evolvulus* for America, he cited that the type collection of *E.*

Figure 3 – First-step lectotype of the name *Evolvulus chrysotrichos* at the LE, Komarov Botanical Institute of RAS (Russia. Saint Petersburg), specimen with Ooststroom' annotation "typus" (without barcode).

Figure 4 – Lectotype of *Evolvulus guaraniticus* at the Conservatoire et the Jardin botaniques de la Ville de Genève, Switzerland (Geneva), specimen G00174463.

chrysotrichos was deposited in the LE. However, we located three specimens of *Riedel 1464*, two in NY and one in U although the collection number was not cited in the protologue, we are confident that these specimens are part of the original material of *E. chrysotrichos* as the collector, type locality on the sheet labels and morphological characters agree with those cited in the protologue. When Van Ooststroom (1934) cited the herbarium LE and the expression "typus" he effected the lectotypification of the name *E. chrysotrichos* - Art. 7.11 and 9.17 of the ICN (Turland *et al.* 2018). However according to the Art. 9.17 Ooststroom's lectotypification must be accepted as the first-step lectotypification since there is more than one specimen in the LE. With that the specimen that has the annotation "type" done by Ooststroom is designated as the second-step lectotype of the name *E. chrysotrichos.* The duplicates present in the LE were not identified by the barcode, so we include here the photograph of that designated.

Evolvulus guaraniticus was proposed by Robert Chodat and Émile Hassler (1905), based on collection *Hassler 7936* collected in Bellavista in Paraguay, and was recognized later as a synonym of *E. chrysotrichos* (Ooststroom 1934). When Chodat and Hassler established this species they did not refer to any specific specimen in the protologue, nor the herbarium where the Hassler' collection was housed. We located eight duplicates of this collection deposited at G, GH, K, MO, MPU, and P. We chose the specimen deposited in G (G00174463) as the lectotype because it has better preserved vegetative and reproductive characters than the other specimens, and it is in the herbarium where Robert Chodat and Émile Hassler deposited their type collections. Besides, the specimen holds the original Hassler's label and annotations.

Distribution and ecological data

Evolvulus chrysotrichos occurs disjunct between Brazil and Paraguay (Ooststroom 1934) (Fig. 5). In Brazil, it was recorded in the states of Minas Gerais and São Paulo (BFG 2018). In Minas Gerais state, *E. chrysotrichos* is known from a small population in the municipality of Ouro Preto, in campos rupestres vegetation in the

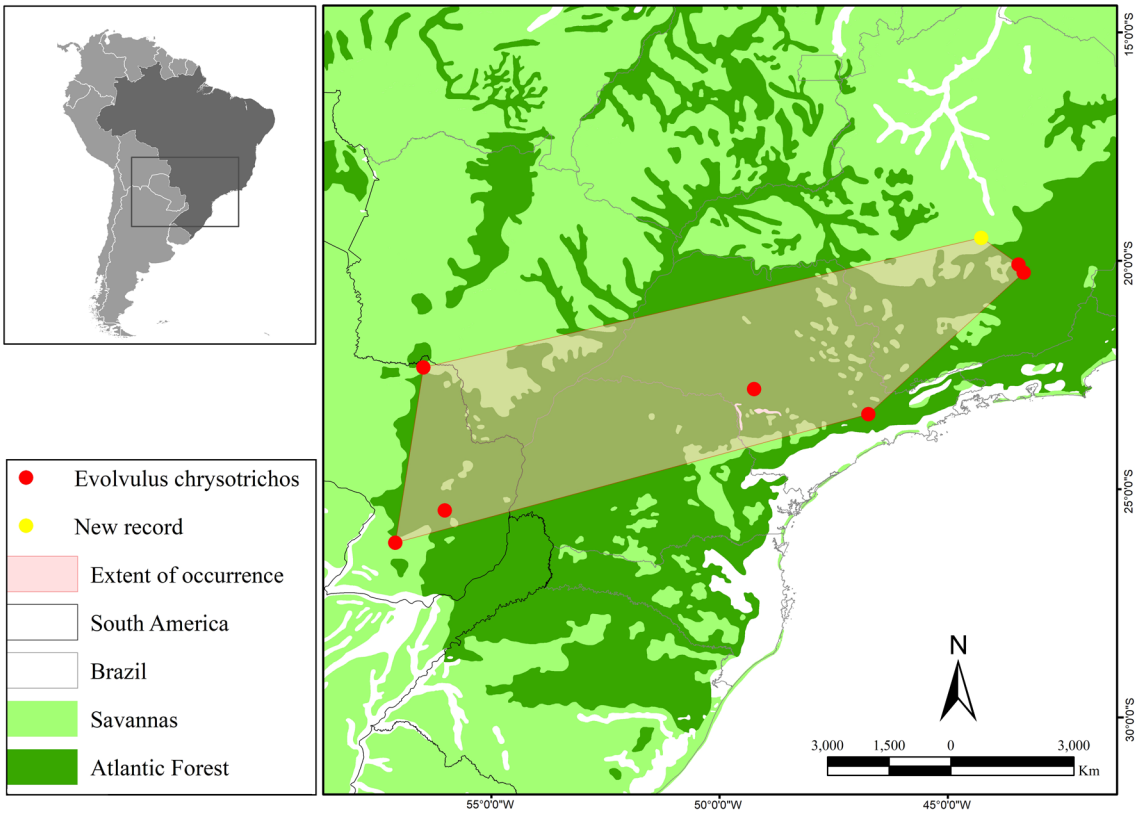

Figure 5 – Updated geographic distribution of *Evolvulus chrysotrichos*.

Cerrado biome, and by its type collection from the Serra da Caraça, in the Atlantic Forest. In São Paulo state, the most recent record of this species dates from 1945, when it was collected in the municipality of Caieiras. In addition, it occurs in the municipalities of Araraquara, São Bernardo do Campo, and Águas de Santa Bárbara, on sandy soils and in open areas of the Atlantic Forest. The populations in the Paraguay occur in the districts of Bellavista and Caaguazú. This species can be found with flowers and fruits populations from September to January.

Conservation implications

Evolvulus chrysotrichos was first classified as Endangered (EN) based only on specimens collected in Brazil (Simão-Bianchini *et al.* 2013). We re-evaluate its conservation status including the specimens from Paraguay. The species should be considered as Least Concern (LC) due to its wide range of occurrences (EOO-B1) is > 20.000 km^2, or as Endangered (EN), according to AOO-B2ab(i) criteria (< 500 km^2). Despite its wide extension of occurrence, that area is widely affected by the demographic, industrial and agricultural expansion (Simão-Bianchini *et al.* 2013). In addition, most of its small populations is not in protected area.

Thus, we consider this species as Endangered (EN), despite having populations recorded in protected areas from Brazil, such as Caraça National Park (Minas Gerais state) and the Santa Barbara Ecological Station (São Paulo state). The rediscovered population in the municipality of Ouro Preto (Minas Gerais state) does not occur in protected area and it was found in campo rupestre ferruginoso (Fig. 3). In Paraguay, there are population within the Bella Vista National Park and Caaguazú National Park, however the size of this population is unknown. Therefore, we alert environmental managers to the importance of conserving areas of occupations of *E. chrysotrichos* to avoid its extinction, mainly in Brazil.

The rediscovery of these species in the state of Minas Gerais reinforces the need to expand floristic studies in that state, and calls attention to the importance of defining environmental policies that can prevent the extinction of rare and endangered species of the Brazilian flora. The degradation of the area of occurrence of this species calls attention to the development of strategic measures to prevent the advance of urbanization in areas still covered by Atlantic Forest - a habitat favorable to the occurrence of this species.

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