

First record of the rare orchid *Bipinnula polysyka* (Orchidaceae: Chloraeinae) for Brazil

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ABSTRACT – *Bipinnula polysyka* is herein reported for the first time for the Brazilian Flora. This rare and inconspicuous terrestrial orchid species was previously known from Uruguay and Buenos Aires Province, in Argentina. In the Brazilian State of Rio Grande do Sul, it grows in the open grasslands of the Pampa Biome, which are normally used for cattle grazing. Here, we describe and illustrate the found specimen and provide an extension of its known distribution range. Additionally, we offer a brief discussion on the morphological diagnosis and ecological aspects of this species.

Keywords: Pampa Biome, Southern Brazil, terrestrial orchid.

RESUMO – Primeiro registro da rara orquídea *Bipinnula polysyka* (Orchidaceae: Chloraeinae) para o Brasil. *Bipinnula polysyka* é reportada pela primeira vez para a Flora do Brasil. Esta rara e inconspícua espécie de orquídea terrestre era anteriormente conhecida apenas no Uruguai e na Província de Buenos Aires, Argentina. No Estado do Rio Grande do Sul, Brasil cresce nos campos abertos do Bioma Pampa, que normalmente são utilizados para o pastoreio de gado. Aqui, descrevemos e ilustramos o espécime encontrado e fornecemos uma ampliação de sua área de distribuição conhecida. Além disso, oferecemos uma breve discussão sobre a diagnose morfológica e os aspectos ecológicos desta espécie.

Palavras-chave: Bioma Pampa, orquídea terrestre, Sul do Brasil.

INTRODUCTION

Bipinnula Comm. ex Juss is a small orchid genus comprising ten species within the subtribe Chloraeinae Pflff. (as Chloraeaceae) (Buzatto *et al.* 2014, Sanguinetti *et al.* 2015, Ulloa Ulloa *et al.* 2017). All the species in the genus are terrestrial. Leaves are variable in shape but normally are disposed in a rosette (Sanguinetti *et al.* 2015). Most species present characteristic fimbriae at the edges of the lateral sepals (Izaguirre 1973, Cisternas *et al.* 2012a, Sanguinetti *et al.* 2015). In addition, the column in *Bipinnula* species lacks the “nectariferous” cavities which are present in the other Chloraeinae (Cisternas *et al.* 2012a). The genus presents a disjunct geographical distribution. A subset of Andean species are confined to Chile and are characterized by multi-flowered inflorescences. In contrast, the non-Andean species, found in Argentina, Brazil, and

Uruguay, typically have uniflorous inflorescences, although they may occasionally bear two flowers (Izaguirre 1973, Cisternas *et al.* 2012a, Sanguinetti *et al.* 2015). Recent phylogenetic analyses have confirmed the monophyly of the genus, in spite of its geographical disjunction and contrasting inflorescence characteristics (Cisternas *et al.* 2012b). In Brazil, Buzatto *et al.* (2014) recorded four species, all located in Paraná and Rio Grande do Sul States, within the Mata Atlântica and Pampa Biomes of Southern Brazil.

Brazilian *Bipinnula* species are exclusively terrestrial orchids. Their roots are fascicled and cylindrical, bearing basal annular thickenings typical of contractile roots (Buzatto *et al.* 2014, Sanguinetti *et al.* 2015). The leaves are oblong to linear-lanceolate, and may sometimes be absent or considerably deteriorated during anthesis. Inflorescences are terminal and usually bear a single flower, though

occasionally two. The flowers predominantly exhibit a translucent greenish hue, characterized by a reticulate pattern of green veins. Lateral petals are light-green colored. The labellum is distinctly colored, providing a contrast with the other segments of the perianth. The dorsal sepal, which has an entire margin, is typically wider than the lateral sepals. The lateral sepals, which are connate at the base, extend longer than the dorsal sepal and display a fimbriate to pectinate structure in their apical third or fourth portion (Sanguinetti *et al.* 2015). Yet, the sepals are entire and devoid of fimbriae in *B. penicillata* (Rchb.f.) Cisternas & Salazar (Buzatto *et al.* 2014).

Most *Bipinnula* species are poorly represented in herbarium collections due to their rareness, inconspicuous vegetative features, and short flowering periods (Sanguinetti *et al.* 2015). Consequently, it is often challenging to delineate their geographical distribution and understand their ecological aspects. In the present study, we report the rare orchid *Bipinnula polysyka* Kraenzl. in the Brazilian Flora for the first time.

MATERIAL AND METHODS

Plant material was collected in September 2022, from the border region between Brazil and Uruguay, specifically in Santana do Livramento (30° 53' 23" S; 55° 31' 56" W), in the southern Brazilian state of Rio Grande do Sul. Vouchering and illustration methodologies follow Singer *et al.* (2024). Taxonomic identification and morphological terminology were based on Sanguinetti *et al.* (2015) and the type description by Kraenzlin (1888). Morphological differences with *Bipinnula gibertii* Rchb.f. were based on Buzatto *et al.* (2014), Izaguirre (1973), and the type description by Reichenbach (1876). Additionally, comparisons were made with herbarium specimens deposited in ZT, AMES, F, GH, ICN, RSPF, US, SI, LP, BAA, MVFA, HBG, and P herbaria (following Thiers 2024). The geographical distribution and number of specimens deposited in the Herbarium collection of the species were determined using coordinates from herbarium specimens, additional material examined cited in Sanguinetti *et al.* (2015) for Argentina, and Pérez *et al.* (2020) for Uruguay. We also obtained records from the iNaturalist website (www.inaturalist.org) (Appendix 1). The voucher specimen was deposited in the Herbário Alarich Rudolf Holger Schultz (HAS 1098190). In addition, we estimated the extent of occurrence (EOO) and area of occupancy (AOO) using previous herbarium specimens, iNaturalist records, and the new locality reported here. These data were analyzed using the GeoCAT platform to conduct a preliminary conservation assessment in accordance with the IUCN Red List Criterion B, specifically B1 (Extent of Occurrence, EOO) and B2 (Area of Occupancy, AOO) (IUCN 2024). For herbarium specimens lacking geographic coordinates, coordinates were inferred from the nearest locality described in the exsiccata.

RESULTS AND DISCUSSION

Bipinnula polysyka Kraenzl., Bot. Jahrb. Syst. 9:317. 1887

Type: URUGUAY, Montevideo, Cerro de Montevideo, ladera oeste, XI.1875, Arechavaleta 2627. (Lectotype ZT-14858, ZT!)

Figs. 1A–2

Description: Herb, 15 cm high. Leaves rosulate (Fig. 2A). Scape erect, uniflorous (Fig. 2C), covered by apiculate invaginant sheaths about 2.43–2.53 cm long, lightly reticulate-veined. Floral bract 2.60 cm long, subequal than scape sheaths, not covering the ovary. Flower terminal (Fig. 2D), characterized by a black, shiny, labellum (Fig. 2F–J). Dorsal sepal 1.51 cm long, and 0.27 cm wide, ovate, green, with crenate margin and acute apex. Lateral sepals 19.5 mm long, and 2.83 mm wide, basally white, linear, involute, and recurved, apex fimbriate 1.46 cm long, green with simple to trifid laciniae 2.4 mm long (Fig. 2E). Petals ovate, 11.1 mm long, and 3.5 mm wide, entire margin, and condilomatose apex (Fig. 2D). Labellum 14.3 mm long, and 5.2 mm wide, black, lustrous, shortly unguiculate, near to the apex with foveolate surface, apical margin 2.1 mm long with dense fascicle black projections (Fig. 2F–J). Column arched (Fig. 2J–K), 6.8 mm long. Ovary obconic (Fig. 2K) 7.3 mm long. Stigmatic surface in ventral position of the labellum (Fig. 2L). Pollinarium yellow of 4 mm long (Fig. 2M). Fruits not found.

Notes: The type material of *B. polysyka* remained unrecognized for a long time until Steudel *et al.* (2012) discovered the type herbarium specimen collected by Arechavaleta in 1867 in the Z+ZT herbarium collection (barcode: ZT-000140858). Sanguinetti *et al.* (2015) later officially designated this specimen as the lectotype. *Bipinnula polysyka* is similar to *B. gibertii* but can be distinguished by several characteristics: it has a dorsal sepal with crenate margins (*vs.* a dorsal sepal with non-crenate margins), lateral sepals that are whitish below the fimbriate apex (*vs.* lateral sepals that are greenish), petals that are green with whitish external margins (*vs.* petals that are completely greenish), and a blackish, shiny, more than 1 cm long labellum that darkens towards the apex, acquiring a lustrous and foveolate surface with shortly condylomatous wings bearing clavate, flat to geniculate projections (*vs.* a grayish, less than 1 cm long labellum with no lustrous and foveolate surface and clavate to pilate appendices gradually protruding from base to apex). Based on the character of the dorsal sepal, Williams (1938) suggested that *B. polysyka* should be considered a variety of *B. gibertii*, as he found individuals of *B. polysyka* in Uruguay exhibiting an entire margin of the dorsal sepal. However, Buzatto *et al.* (2014) and Sanguinetti *et al.* (2015) demonstrated there are additional characteristics that distinguish these species.

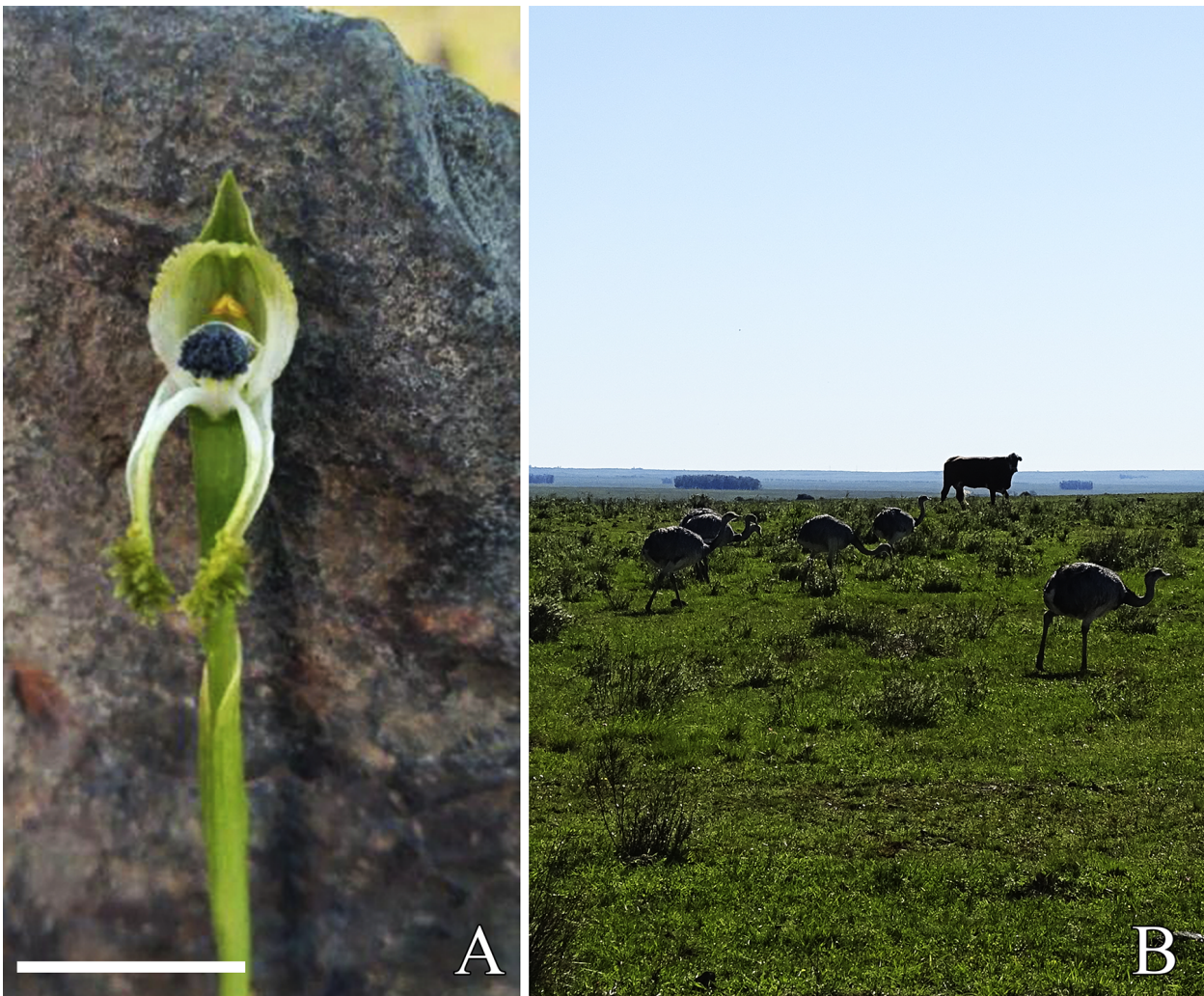


Figure 1. *Bipinnula polsyka* in situ. **A.** Flowering individual observed; **B.** Panoramic view of the grassland habitat with the presence of cattle and *Rhea americana* (Rheidae). Scale bar = 2 cm.

Phenology: Flowering individuals in Brazil have been recorded between September (2019) and October (2023). In Argentina, flowering occurs from late October to November, with fruiting from November to early December (Sanguinetti *et al.* 2015). In Uruguay, flowering has been documented between September to November based on herbarium collections and Izaguirre (1973). Although the pollination biology of this species remains unexplored, it is suggested to involve a sexual deceptive mechanism, as reported in *B. penicillata* (Ciotek *et al.* 2006, Buzatto *et al.* 2014, Bohman *et al.* 2016).

Distribution and ecology: This species has been previously recorded in Argentina (Sanguinetti *et al.* 2015, POWO 2024) and Uruguay (Izaguirre 1973, Pérez *et al.* 2020, POWO 2024). In Argentina, its distribution is confined to a narrow strip of plain grasslands adjacent to the Río de la Plata in the Buenos Aires Province (Sanguinetti *et al.* 2015) (Fig. 3). In Uruguay, the species is more widely distributed, found throughout the country from Paysandú to Rocha departments (Izaguirre 1973, Pérez *et al.* 2020) (Fig. 3 and Appendix 1), spanning low altitudes to

mountain summits, typically in lowland areas near humid soils (Izaguirre 1973).

In Brazil, the species is only found, so far, in the Municipality of Santana do Livramento in the Rio Grande do Sul state (Figs. 3-4), growing in open areas with humid, clay soils within the Pampa Biome. Here, it coexists with *Oxalis articulata* Lam., *Nassella* (Trin.) É.Desv. spp, *Herbertia pulchella* Sweet, *Gymnocalycium uruguayense* Britton & Rose, and other typical species of the Pampa biome. Similar to observations in Argentina and Uruguay, the species is present in habitats with grazed livestock and native species such as *Rhea americana* Linnaeus, 1758 (Rheidae) (Fig. 1B). In 2019, we recorded only two flowering individuals, and in 2023, only a single individual was found. These observations highlight the inconspicuous nature of the species. Most collections and observations of *Bipinnula polsyka* in Uruguay are concentrated in the departments adjacent to the Uruguay River and the Río de la Plata, possibly due to sampling bias/effort. This may also explain the few specimens sampled near the border with Brazil (e.g., Cerro Largo and Rocha departments) (Fig. 3).

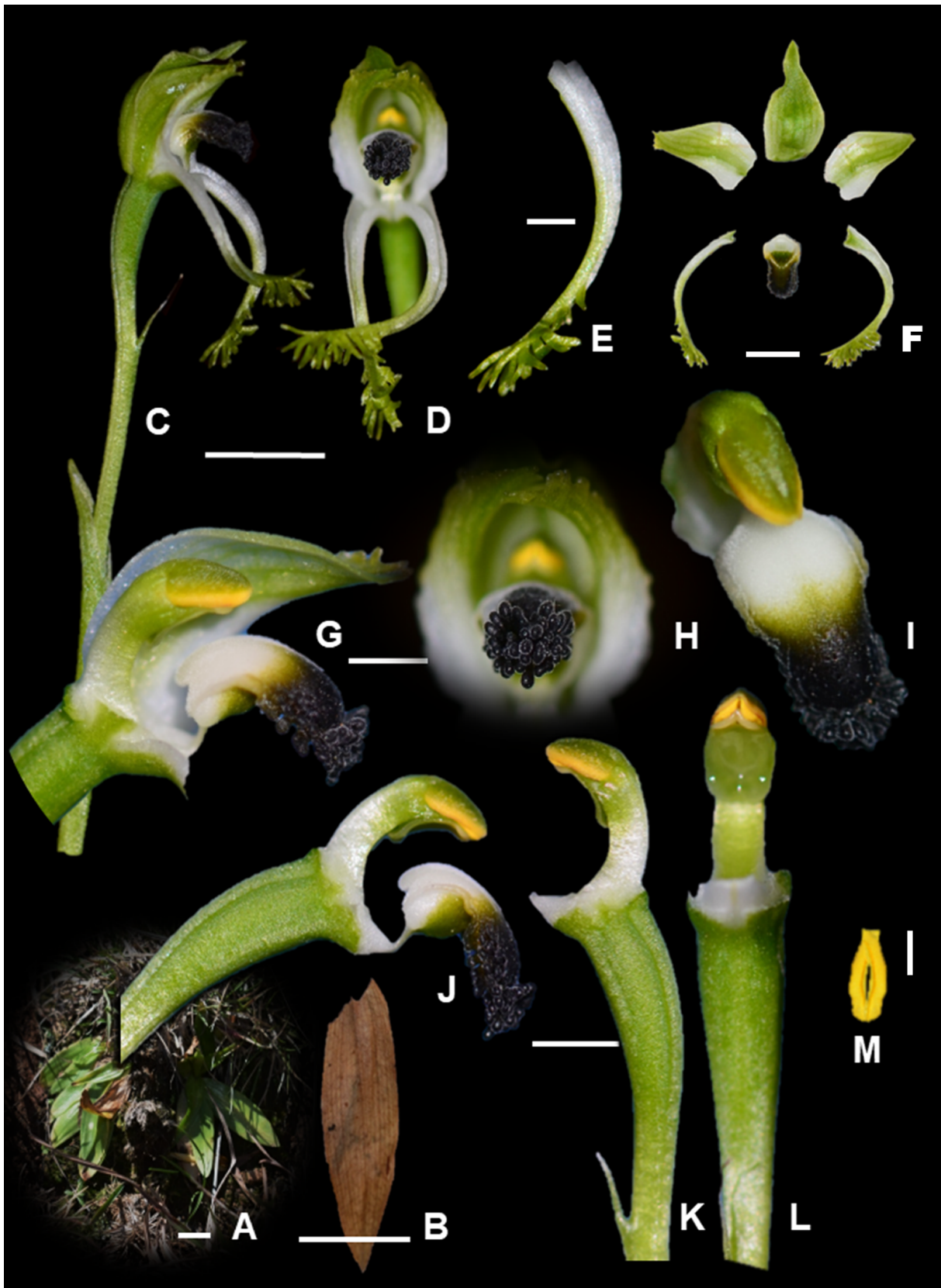


Figure 2. Lankester composite dissection plate (LCDP) of *Bipinnula polysyka*. **A.** Leaves; **B.** Floral bract; **C.** Uniflorous scape; **D.** Frontal view of the flower; **E.** Detail of the fimbriate lateral sepal; **F.** Dissection of the perianth; **G.** Lateral view of the flower showing the column, labellum, and dorsal sepal; **H.** Detail of the labellum apex; **I.** Dorsal view of the labellum and column; **J.** lateral dissection of the column and labellum; **K.** lateral view of the column; **L.** ventral view of the labellum showing the stigmatic surface; **M.** detail of the pollinarium. Scale bars: A-B = 1 cm; C-D, F = 5 mm; E = 1 mm; G-I, J-L = 3 mm; M = 2 mm.

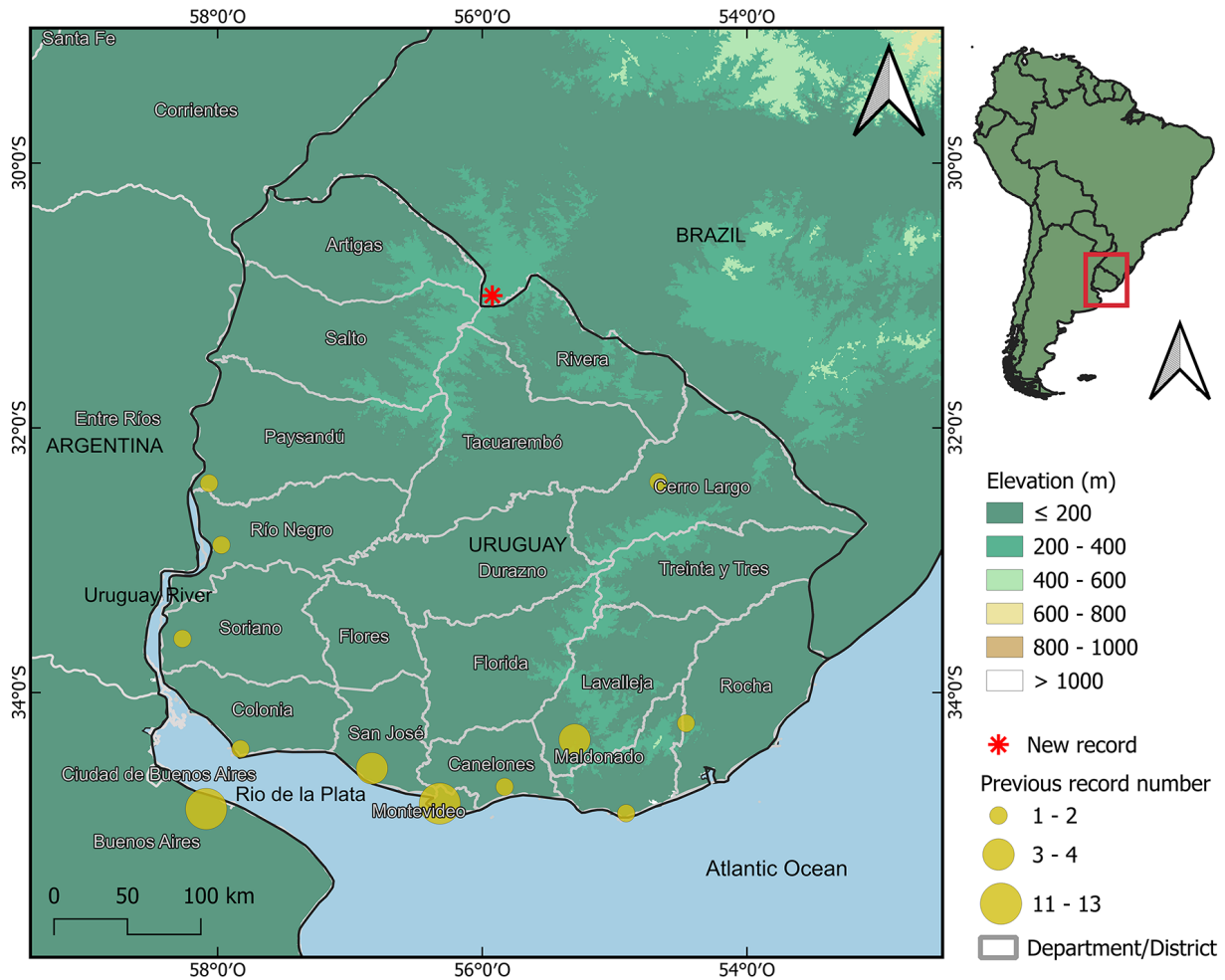


Figure 3. The geographic range of *Bipinnula polysyka*, including the previous records in Argentina and Uruguay, and the first record for Brazil (Red symbol).

Additionally, the lack of previous records in Brazil may be due to the Pampa Biome being an underexplored area, as well as the inconspicuousness of *B. polysyka* individuals when they are not in their flowering period and their short flowering time (Sanguinetti *et al.* 2015).

Conservation status: This species is currently categorized as Data Deficient (DD) according to the IUCN Red List of Threatened Species, as the absence of recent collections hampers the estimation of its extent of occurrence (EOO) and area of occupancy (AOO), as well as the lack of recent records and uncertainty of the species in its historical collection areas due to anthropogenic disturbances (Chadburn & Cockel 2014). Based on the currently available data and our updated analyses (see Materials and Methods), we provide a preliminary conservation assessment, indicating that the species falls within the thresholds for Least Concern (LC) with respect to EOO under criterion B1 (122,948.314 km²), while meeting the criteria for Endangered (EN) based on AOO under criterion B2 (92.000 km²). Furthermore, the population found in southern Brazil is located within the Pampa Biome, to which this species is endemic. This biome

is regarded as highly fragile owing to the ongoing loss of native vegetation driven by land-use change, highlighting the species' vulnerable conservation context and the need for urgent conservation measures (Overbeck *et al.* 2007; Oliveira de Lima *et al.* 2020).

Specimen examined: BRAZIL, RIO GRANDE DO SUL: Santana do Livramento, Parque Eólico Coxilha Negra, em campo pedregoso, 30° 53' 23" S; 55° 31' 56" O, 327 m, 19.IX.2022, J. Pinto Moura, 187 (HAS-1098190) (Fig. 4).

Additional specimen examined: ARGENTINA, BUENOS AIRES, 27.XI.1950, H. Fabris 544 (SI-40241); 27.XI.1950, A. L. Cabrera 10660 (LP-561485); Magdalena, pdo Magdalena, camino de la Costa, 2 Km al S de A.J. Blanco (Ea. Favaloro), 07.XI.1957, Vervoort F Vervoort F 5500 (L! barcode:1487735); 13.XI.1984, R. León 3600 (BAA); 13.XI.2013, A. Sanguinetti 107 (SI-525158); 14.XI.2013, A. Sanguinetti 108 (SI-525161); 23. XI.2012, A. Sanguinetti 64 (SI); 8. XI.2012, A. Sanguinetti 60 (SI); URUGUAY, CANELONES, 19.XI.1911, C. Osten 4702b (US barcode: 00021598); CERRO LARGO: Rio Negro, Estancia Palleros, 12.XII.1937, J. P. Gallinal H., Aragone, Bergalli, Campal & B. Rosengurt 1897 (AMES

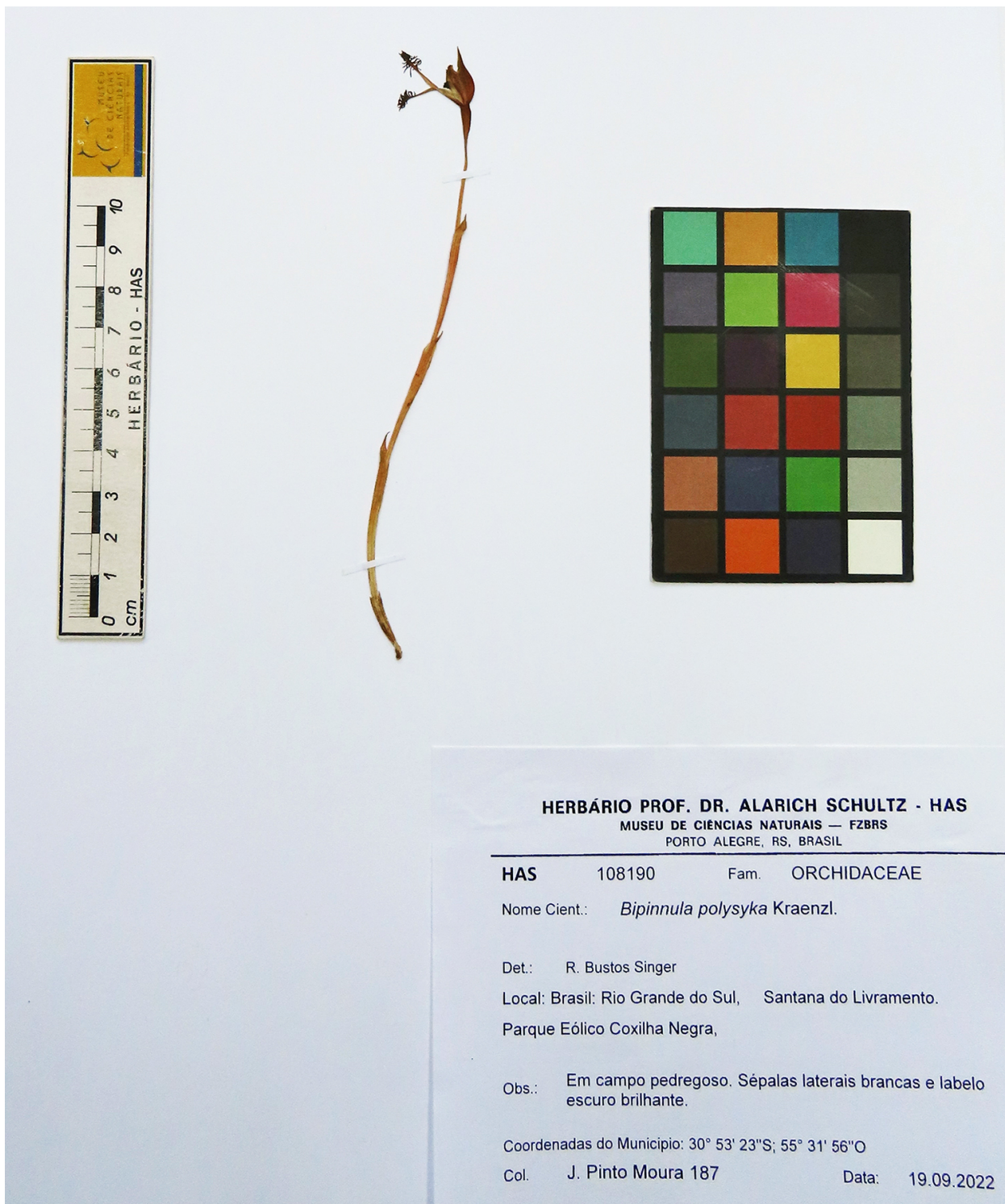


Figure 4. Specimen of *Bipinnula polsyka* deposited in the HAS Herbarium.

barcode: 01941049). COLONIA: 1.XI.1986, Chosa s.n. (MVFA); LAVALLEJA, Minas, Nico Pérez, 120-300 m, 25.XI.1947, W. Herter 61853 (F); MALDONADO, 3.XII.1899, M. B. Berro 2317 (HBG-500918 [imagen!]); 25.XI.1956, Zorrón 1652 (MVFA); MONTEVIDEO, s.d., J. Arechavaleta 310 (MVFA); 1826, A.D. d'Orbigny s.n. (P-372248); 1826, J. Anderson s.n. (Voyage of

H.M.S. Adventure & Beagle 1826 – 1830), (K-364472); 28.IX.1869, J. Arechavaleta 2624 (MVFA); XI-X.1918, Montoro 1062 (MVFA); 19.XI.1911, C. Osten 4702 (SI-40247, HBG-500919, HBG-500920); 29.X.1968, del Puerto *et al.* 7640 (MVFA); 30.XI.1876, C. Fruchard s.n. (P barcode: P00372247); Atahualpa, 25 m, X.1925, Herter, G 79142 (ICN barcode:00039257); Cerro Montevideo,

10-50 m, XI.1925, W. G. F. Herter 442 b (79697) (GH barcode:01941048); RÍO NEGRO, 14.XI.1970, Marchesi *et al.* 20683 (MVFA); SAN JOSÉ, XI.1922, L. Hauman s.n. (BAA-17513); 10.XI.1970, P. Izaguirre *et al.* 9727 (MVFA). SORIANO, Juan Jackson. Estancia: Monsón-Heber, 11.XI.1937, J. P. Gallinal H., Aragone, Bergalli, Campal & B. Rosengurt 779 (AMES barcode: 01941050).

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APPENDIX

Appendix 1. Observations of *Bipinnula polysyka* obtained from Inaturalist website until July 2024.

Country	Department	Link
Uruguay	Paysandú	https://www.inaturalist.org/observations/139324686
	Rocha	https://www.inaturalist.org/observations/100952504
	Canelones	https://www.inaturalist.org/observations/142387577