



Rehabilitation of *Grindelia argentina* (Asteraceae: Astereae) and updates on its geographic range

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Abstract. Rehabilitation of *Grindelia argentina* (Asteraceae: Astereae) and updates on its geographic range. *Grindelia argentina* is rehabilitated from the synonymy of *G. buphthalmoides* and comments about morphology and related taxa are mentioned. Further, the existence of *G. argentina* in the orographic Tandilia System is confirmed, which increase the geographic distribution of this species.

Key words: Argentina, Buenos Aires, endemism, Tandilia, taxonomy, Ventana.

Resumen. Rehabilitación de *Grindelia argentina* (Asteraceae: Astereae) y actualización sobre su distribución geográfica

Grindelia argentina es rehabilitada de la sinonimia de *G. buphthalmoides* y se mencionan comentarios sobre morfología y taxones relacionados. Además, se confirma la existencia de *G. argentina* en el Sistema orográfico de Tandilia, lo que aumenta la distribución geográfica de dicha especie.

Palabras-clave: Argentina, Buenos Aires, endemismo, Tandilia, taxonomía, Ventana.

Grindelia Willdenow (1807: 259) includes ca. 70 species, mainly represented in xerophytic and halophytic environments in North America and center-south South America (Bartoli & Tortosa 1999, Bartoli & Tortosa 2011). The genus was revised in two occasions for South America (Cabrera 1931, Bartoli & Tortosa 1999) and considering the description of new species and taxonomic adjustments subsequent to these wide-ranging revisions, a total of 29 species and five varieties are recognized for the genus (Bartoli *et al.* 2012, Bartoli & Tortosa 2014, Sabatino & Deble 2022).

Grindelia argentina was originally described for Ventana orographic system, southern Buenos Aires Province, and two doubtful specimens are mentioned for Tandilian orographic system, eastern Buenos Aires Province (Deble & Oliveira 2010). Later, Bartoli & Tortosa (2014) merged *G. argentina* under *G. buphthalmoides* De Candolle (1836: 316). However, the authors have not indicated the reasons for this subordination, and the status and geographic range of *G. argentina* and *Grindelia buphthalmoides* remain still uncertain.

During botanical collections carried out in

Argentina, it was possible to analyze populations of *Grindelia argentina* in their natural environments in Sierra La Chata, Sierra La Vigilancia, and Sierra Amarante, regions belong to Tandilia orographic system, eastern Buenos Aires Province. With the new records it possible to carry out more detailed morphological comparisons of this taxon and *G. buphthalmoides*, and it was evident that the subordination of *Grindelia argentina* under *G. buphthalmoides* is weakly consistent. Thus, the two species are described below and, subsequently, the morphological characteristics, geographic distribution, conservation and status of each one of them are discussed.

Results

Grindelia argentina Deble & A.S. Oliveira, Bonplandia (Corrientes) 19 (1): 48. 2010. Typus:—ARGENTINA. Buenos Aires: Part. Tornquist, Sierra de la Ventana, 9 November 1907, *M. Hicken 614* (holotypus SI015060!). Figure 1. **Description**— Shrub 80–200 cm high, at base ramified; stems several, erect ascendant or erect, 28–56 cm long with scattered sessile glandular hairs, and often ramified in distal portion,

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up the apex densely leaf and bearing mostly solitary terminal and sessile capitula, appearing in clusters, a corymbiform capitulescence. Leaves chartaceous, sessile, alternate, internodes 0.3–3.8 cm long; basal leaves obovate-oblong to obovate, $3.6\text{--}9.4 \times 1.6\text{--}4$ cm, blade apex obtuse or rounded, apiculate; margin toothed; teeth recurved, acuminate and spinulose, blades with scarce sessile glandular hairs on both surface, base attenuate, often amplexicaul; the most distal ovate to ovate-lanceolate, $1.3\text{--}2.5 \times 0.7\text{--}1.3$ cm, blade apex obtuse or acute, apiculate; margin toothed; teeth curved, acuminate and spinulose, blades with scarce sessile glandular hairs on both surface, base amplexicaul or cordate, the most distal often involving the heads. Heads radiate, ca. 5–6.5 cm diameter, sessile or shortly pedunculate, peduncles up to 0.8 cm long; involucre hemispheric, resinous, $13\text{--}16.5 \times 18\text{--}33$ mm; phyllaries 6-7-series, subequal, subulate at apex glutinous, herbaceous, pinnately veined, minutely trichomes in margins and sparsely trichomes glandular on dorsum; outer phyllaries triangular or lanceolate, $13\text{--}17 \times 4\text{--}6$ mm, dorsum with 4-10 parallel glutinous and darker veins; inner phyllaries linear-elliptic, elliptic or lanceolate-elliptic, $12\text{--}15 \times 1.5\text{--}3.5$ mm, with irregular veins. Clinanthium convex, alveolate. Ray flowers 28 to 45, pistillate, yellow; corolla 21–28.5 mm long, apically ligulate; tube glabrous, 5.3–7.2 mm long; ligule linear-elliptic, $15\text{--}21 \times 2.5\text{--}3.5$ mm; ray flower cypselae dark-brown, prismatic, $4.1\text{--}5.5 \times 1.5\text{--}2$ mm, slightly compressed, angled, glabrous; pappus composed by 13–14 pectinate awns, 4.5–7 mm long. Disk flowers 244–350, perfect, yellowish; corolla 6–7.3 mm, with an amplified throat, at apex 5-dentate, teeth 0.8–1 mm; disk flower cypselae broadly oblong or elliptic, $6.3\text{--}7.5 \times 2.3\text{--}3.1$ mm, strongly compressed, extend in a narrow marginal wing; pappus composed by 14–18 pectinate awns, 5–7 mm long.

Additional Material Examined— ARGENTINA. Buenos Aires: Balcare, Sierra El Volcan, 5 December 1982, *J.H. Hunziker 10132* (SI!); Sierra La Vigilancia, 23 November 2019, *M. Sabatino s.n.* (MDQ 00453!). Part. Coronel Pringles, pie del cerro Bonete, 05 November 1938, *A. L. Cabrera 4658* (SI!). Part. Saavedra: Pigüé, cerros de Curumalán [Curumalal], 10 November 1932, *A. Burkart 4734* (SI!); Sierra Curumalal, Ea. Las Grutas, 13 October 1979, *O. Boelcke 9120* (SI!).

Part. Tornquist, Sierra de La Ventana, 1881, *C. Spegazzini s.n.* (SI!); Sierra de la Ventana, 10 November 1907, *C. M. Hicken 614b* (SI!).

Distribution and habitat— *Grindelia argentina* was described from Ventana orographic System, in southern Buenos Aires Province, Argentina. With new data, this species is confirmed as occurrence also in Tandilian orographic System, where populations are found in Sierra La Chata, Sierra La Vigilancia and Sierra Amarante. Furthermore, two collections from Sierra El Volcán and Sierra Bachicha mentioned in the protologue by Deble & Oliveira (2010) as doubtful for this species is now confirmed as belonging to *G. argentina*. This species grows exclusively in crevices of rocky outcrops on the slopes and near the tops of hills in Southern of the Pampeana Province (sensu Cabrera & Willink 1973) along the mountainous complexes of Ventana and Tandilia, in southern and eastern of the province of Buenos Aires, which belongs to the Estepa Arbustiva of the Pampa Austral (following Oyarzabal *et al.* 2018). In some places the species can be common, associated with other shrub species, among them *Baccharis articulata* Pers., *Baccharis tandilensis* Speg., *Colletia paradoxa* (Spreng.) Escal. and *Discaria longispina* Miers.

Conservation— *Grindelia argentina* was initially placed as Vulnerable category of the IUCN Red List of endangered plant species. Despite the new records increased the geographic range of this species is prudent to maintain *G. argentina* as threatened, because the specific habitat of occurrence, and frequent human disturbance that sierras suffer, due to cattle grazing and fire, between others (Sabatino *et al.* 2010).

Grindelia buphthalmoides DC., De Candolle, A.P. Prodr. Systematis Naturalis Regni Vegetabilis 5: 316. 1836. Typus: BRAZIL. Rio Grande do Sul: “in Brasiliae prov. Rio-Grande. Species patriâ et formâ distinctissima. Ligulae amplae flavae (v.s. in h. Mus. reg. Par. à Mus. imp. Bras. sub n. 1027 miss.)”, *F. Sellow s.n.* [=2377?] (holotypus P00697580 image seen! isotypi G00455684 image seen! K001107312 image seen! R!). Figure 2.

= *Grindelia rupestris* A. Bartoli, Tortosa & Marchesi, Brittonia 48: 78. 1996. URUGUAY. Treinta y Tres: Quebrada de Los Cuervos, 24 September 1993, *D. Bayce, G. Speroni & I. Grela s.n.* (holotypus MVFA0000017! isotypi BAA00001244! BAA00001245!).

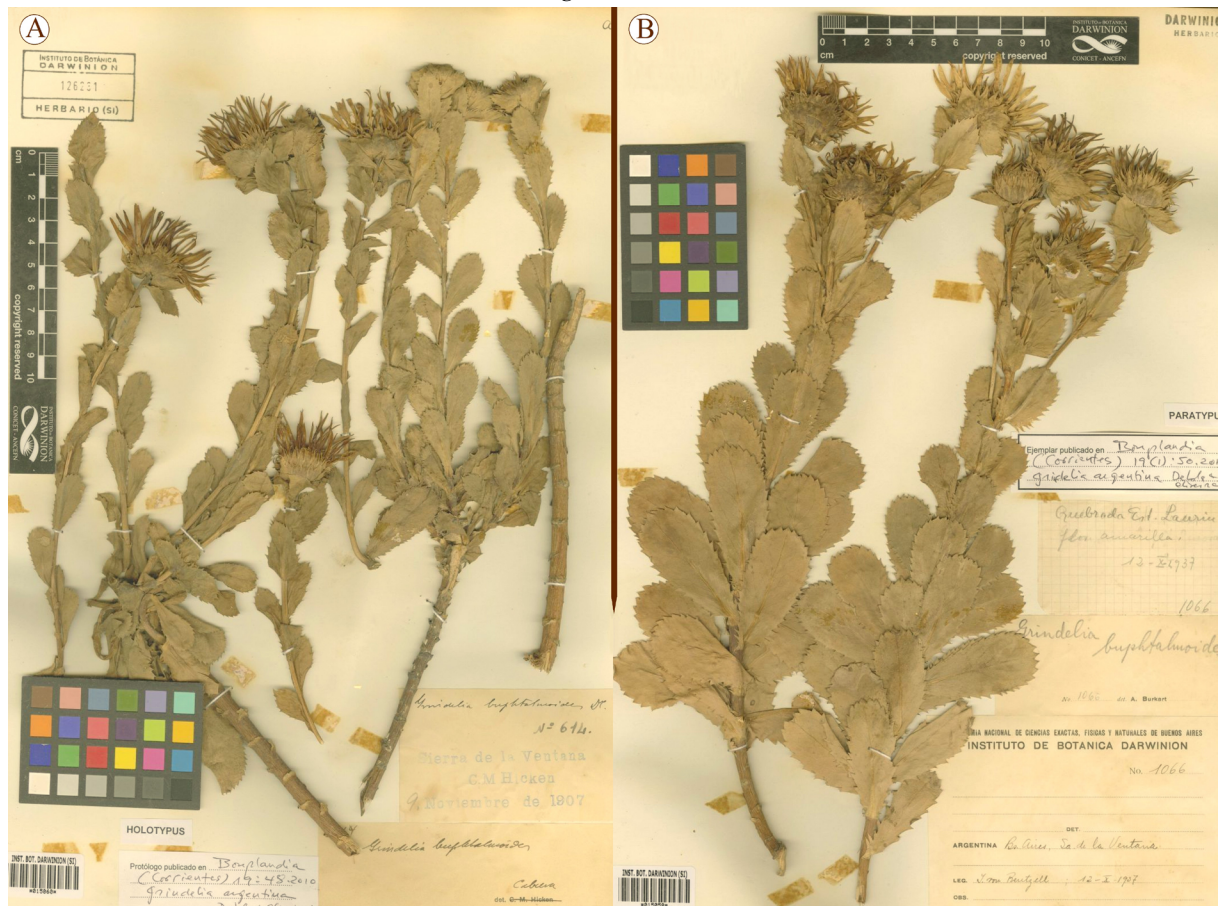


Figure 1. *Grindelia argentina*. **A.** Holotype deposited at SI Herbarium. **B.** Paratype deposited at SI Herbarium. Can be seen in both the obovate or obovate-oblong shape of the leaves, the apical leaves involving the capitula and the outer phyllaries lanceolate or triangular.

Description— Shrub 60–200 cm high, at base ramified; stems several, erect ascendant, 16–45 cm long with scattered sessile glandular hairs, and often ramified in distal portion, with stems ascendant or patent, 3–12 cm long up the apex densely leaf and bearing mostly solitary terminal and sessile capitula, appearing in clusters, a laxer corymbiform capitulescence. Leaves chartaceous, sessile, alternate, internodes 0.5–2.4 cm long; basal leaves oblong to oblong-spathulate, 3.5–9.5 × 0.8–1.5 cm, blade apex obtuse or rounded, apiculate; margin toothed; teeth appressed, slightly curved, acuminate and spinulose, blades with scarce sessile glandular hairs on both surface, base long-attenuate; the most distal elliptic, oblong or ovate 1.5–2.5 × 0.7–1 cm, blade apex obtuse or acute, apiculate; margin entire or few toothed; teeth appressed, ascendant, acuminate and spinulose, blades with scarce sessile glandular hairs on both surface,

base amplexicaul or cordate. Heads radiate, ca. 5–6 cm diameter, sessile or shortly pedunculate, peduncles up to 0.5 cm long; involucre hemispheric, resinous, 10–12 × 15–26 mm; phyllaries 6–7-series, subequal, subulate at apex glutinous, minutely trichomes in margins and sparsely trichomes glandular on dorsum; outer phyllaries narrowly linear-lanceolate, 10–12 × 1.2–2 mm, apex long subulate, revolute, dorsum covered by glandular trichomes; inner phyllaries linear-lanceolate or linear-elliptic, 9–12 × 1.4–2.5 mm, apex subulate, straight or slight curved, dorsum with glandular trichomes scattered. Clinanthium slightly convex, alveolate. Ray flowers 15 to 25, pistillate, yellow; corolla 17–24.5 mm long, apically ligulate; tube glabrous, 4–5.5 mm long; ligule linear-elliptic, 13–19 × 2–3.5 mm; ray flower cypselae dark brown, prismatic or nearly rectangular 4–5 × 1–1.5 mm, angled, glabrous; pappus composed by 13–16 pectinate awns, 4–6 mm long.



Figure 2. *Grindelia buphthalmoides*. **A.** Holotype deposited at P Herbarium. **B.** A more complete collection, showing several capitula at NY Herbarium. Can be seen in both, the oblong or oblong spatulate shape of the leaves and the outer phyllaries linear-lanceolate and curved at apex.

Disk flowers 100–150, perfect, yellowish; corolla 5–6 mm, with an amplified throat, at apex 5-dentate, teeth 0.7–1 mm; disk flower cypselae prismatic or rectangular, 4.5–5.5 × 1–1.5 mm, angled, glabrous; pappus composed by 14–18 pectinate awns, 4–7 mm long.

Nomenclatural notes— De Candolle (1836) not provided a precise indication of the place of collection and he mentioned in the prologue <in *Brasiliae prov. Rio-Grande. Species patriâ et formâ distinctissima. Ligulae amplae flavae* (v.s. in *h. Mus. reg. Par. à Mus. imp. Bras. sub n. 1027 miss.*)>. The number 1027 represents the collections of *Charles Gaudichaud-Beaupres* acquired for the museum of Paris and Brazilian Imperial, part of these collections are performed by *Friedrich Sellow*, who certainly was the collector of *Grindelia buphthalmoides*.

Deposited at K herbarium has the following information <*Herb. Reg. Berolinensis*>, the number 2377 is handwritten. We assume that this material is a duplicate of the holotype, that is why it is indicated as an isotype, and as it has a collection number it is possible to assign a more precise collection location. According to Urban (1893) in his study of *Sellow's* itineraries in Brazil and Uruguay, the collection *Sellow 2377* was made <*ebenda S. Francisco do Paula und Villa Rio grande do Sul X-XI/1824*>. The indication *S. Francisco do Paula* is currently the municipality of Pelotas, in southern Rio Grande do Sul state, Brazil.

Additional Material Examined—BRAZIL. Rio Grande do Sul: Capão do Leão, Pedreira, s.d., *I. Edésio* (PEL). encosta de cerro pedregoso, 15 October 2009, L.P. Deble & A.S. de Oliveira 11950 (SI!). Pelotas, praia e dunas, próximo a laguna

dos Patos, 15 October 2009, L.P. Deble & A.S. de Oliveira 11951 (SI!). Santana da Boa Vista, Cerro do Diogo, 04 September 1985, Irgang & al. s.n. (ICN 81.191); em vassoural sobre pedras na encosta do cerro, capítulos amarelos, September 1985, Sobral & al. 4276 (ICN K001107311 image seen! NY00797537 image seen!). [without precise place] probably BRAZIL. “Rio Grande do Sul: Encrusilhada nach Caçapava und Rio S. Barbara”, November-December 1825, F. Sellow 3140 (R!).

Distribution and habitat—*Grindelia buphthalmoides* is a rare species occurring in mountainous places covered by natural grasslands and heliophile shrub associations, known locally as Vassourais (designation according to Marchiori 2004). The species occurs on the slopes and tops of hills and also on rocky outcrops in lower places of eastern and southeastern Rio Grande do Sul state, Brazil in the physiographic regions of Serra do Sudeste and Encosta do Sudeste (Fortes 1959), and extend its occurrence from northeastern Uruguay, in the eco-region of Sierras del Este (Brazeiro *et al.* 2012) The populations are composed by fem individuals, which grow associated with other shrub species, among them *Blepharocalyx salicifolius* (Kunth) O. Berg, *Dodonaea viscosa* Jacq., *Heterothalamus alienus* (Spreng.) Kuntze and *Radlkoferotoma cistifolium* Kuntze.

Conservation— According to Deble & Oliveira (2010: 53) this species can be considered as Critically Endangered category of the IUCN Red List of endangered plant species according to the following criteria: CR A1a,c + B2a, b(i,ii,iv,v) + C2a(ii).

Discussion

Grindelia argentina can be morphologically recognized by its shrub habit, by its basal and cauline leaves obovate-oblong to obovate, 3.6–9.4 × 1.6–4 cm, with length to width ratio 1:2 - 1:3, blade with margin spinulose-denticulate, being the most distal often involving the heads, which are radiate, bigger (5–6.5 cm diameter), sessile or shortly pedunculate, having involucre hemispheric with up to 33 mm diameter. The disk flowers are numerous (244–350), with abundant pappus awns (14–18), and the disk flower cypselae are broadly oblong or broadly elliptic, strongly compressed, extend in a narrow marginal wing. The collections performed in Tandilian orographic

system slightly differs from the type populations from Ventana orographic system by its heads, which are often shortly pedunculate, and the distal leaves not involving completely the involucre. *Grindelia argentina* is undoubtedly segregated of *G. buphthalmoides* in several morphologic aspects, mainly by its herbaceous outermost phyllaries (vs. not herbaceous), with 4–6 mm wide (vs. up to 2 mm wide), outnumber of disk flowers (244–350 vs. 130–150), and dimorphic cypselae, with ray flower cypselae prismatic and disk flower cypselae strongly compressed, extend in a narrow marginal wing (vs. ray and disk flower cypselae prismatic and slightly compressed). Furthermore, *Grindelia argentina* displays basal and cauline leaves obovate-oblong to obovate with length to width ratio 1:2 – 1:3 (vs. oblong to oblong-spathulate, with length to width ratio 1:4 – 1:5).

With the proposed nomenclatural updates, ten species and two varieties are represented in Buenos Aires Province, and this province is relatively rich in species of *Grindelia*, comprising ca. of 1/3 of total South American taxa, four of them are here endemic. *Grindelia aegialitis* Cabrera (1931: 234), which occurs only in sandy soils and rocky places of the coastline of Buenos Aires, in General Alvarado and Chapadmalal region, *G. argentina* Deble & Oliveira (2010: 48), which is exclusive in the mountainous ranges of Ventana and Tandilia, in southern and eastern Buenos Aires province, *G. ventanensis* Bartoli & Tortosa (1994: 143) endemic in the mountainous range of Ventana in southern Buenos Aires province, and *G. peregrinensis* Deble & Sabatino in Sabatino & Deble (2022: 291) endemic in the mountainous range of Tandilia, in eastern Buenos Aires province. The other taxa occurring in the Province of Buenos Aires are the following : *Grindelia brachystephana* Grisebach (1879: 178), *G. cabreriae* Ariza-Espinar (1976: 81), *G. chiloensis* (Cornelissen 1817: 13) Cabrera (1931: 215), *G. patagonica* Bartoli & Tortosa (1994: 143), *G. pulchella* var. *pulchella* Dunal (1819: 51), *G. pulchella* var. *discoidea* (Hooker & Arnott 1836: 45) Bartoli & Tortosa (1999: 352), and *G. scorzonerifolia* Hooker & Arnott (1836: 45).

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References

- Ariza-Espinar, L. 1976. Sobre dos Compuestas nuevas para la flora argentina. *Kurtziana* 9: 81-86.
- Bartoli, A. & Tortosa, R. D. 1994. Tres especies de *Grindelia* (Asteraceae) afines a *G. chilensis* (Corn.) Cabrera. *Kurtziana* 23: 131-150
- Bartoli, A. & Tortosa, R.D. 1999. Revisión de las especies sudamericanas de *Grindelia* (Asteraceae: Astereae). *Kurtziana* 27: 327-359.
- Bartoli, A. & Tortosa, R.D. 2011. Revision of the North American species of *Grindelia* (Asteraceae). *Annals of the Missouri Botanical Garden* 98: 447-513.
- Bartoli, A., Tortosa, R.D., Ratto, F. & D.J. Schiavinato. 2012. Notas taxonómicas em Asteraceae. *Boletín Sociedad Argentina de Botánica* 47(1-2): 145-148.
- Bartoli, A. & Tortosa, R.D. 2014. *Grindelia*. In Freire, S. E., Zuloaga, F. O., Belgrano, M. J., Anton, A. M. (eds.) *Flora Argentina: flora vascular de la Republica Argentina*, v. 7, t. 1, CONICET, Buenos Aires, Argentina. 554 pp.
- Brazeiro A., D. Panario, A. Soutullo, O. Gutierrez, A. Segura & P. Mai. 2012. Clasificación y delimitación de las eco-regiones del Uruguay. Informe Técnico. Convenio MGAP/PPR – Facultad de Ciencias/Vida Silvestre/ Sociedad Zoológica del Uruguay/CIEDUR. 40pp.
- Cabrera, A.L. 1931. Revisión de las especies sudamericanas del género *Grindelia*. *Revista Museu La Plata, Sección Botánica* 33: 207-249.
- Cabrera, A.L. & Willink, A. 1973. *Biogeografía de América Latina*. OEA, Washington DC, USA. 120pp.
- Cornelissen, É.N. 1817. *Hoorebekia chilensis*. In Mussche, J. H. (ed.) *Hortus Gandavensis Tableau general de toutes les Plantes exotiques et indigènes, cultivées dans le Jardin Botanique de la Ville de Gand*. Gand, Lion, France. pp. 12-15.
- De Candolle, A. P. 1836. *Prodromus systematis naturalis regni vegetabilis, sive, Enumeratio contracta ordinum, generum specierumque plantarum huc usque cognitarium, juxta methodi naturalis, normas digesta*, v. 5, Parisii: Sumptibus Sociorum Treuttel et Würtz, pp. 1-706.
- Dunal, M.F. 1819. Sur deux Genres de Plantes de la famille des Composées. *Mémoires du Muséum d'Histoire Naturelle* 5: 45-58.
- Deble, L.P. & Oliveira, A.S. de. 2010. Novelties in *Grindelia* (Asteraceae: Astereae) from South America. *Bonplandia* (Corrientes) 19: 47-57.
- Fortes A.B. 1959. Geografía física do Rio Grande do Sul. Ed. Globo, Porto Alegre. 393p.
- Grisebach, A. 1879. Symbolae ad Floram Argentinam. *Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen* 24: 1-345.
- Hooker, W.J. & Arnott, G.A.W. 1836. Contributions towards a flora of South America and the islands of Pacific. *Companion to the Botanical Magazine* 2: 41-52.
- Marchiori, J.N.C. 2004. Fitogeografía do Rio Grande do Sul: Campos sulinos. Est. Porto Alegre, 110pp.
- Oyarzabal, M., Clavijo, J., Oakley, L., Biganzoli, F., Tognetti, P., Barberis, I., Maturo, H.M., Aragón, R., Campanello, P.I., Prado, D., Oesterheld, M. & León, R.J.C. 2018. Unidades de Vegetación de la Argentina. *Ecologia Austral* 28: 40-63.
- Sabatino, M., Maceira, N. & Aizen, M. 2010. Direct effects of habitat area on interaction diversity in pollination webs. *Ecological Applications* 20 (6): 1491-1497.
- Sabatino, M. & Deble, L.P. 2022. *Grindelia peregrinensis* (Asteraceae: Astereae) a new species from Southern Buenos Aires Province, Argentina. *Brittonia* 74 (3): 290-296.
- Urban, I. 1893. Biographische Skizzen. 1. Friedrich Sellow (1789–1831). *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 17: 177-198.
- Willdenow, C.L. von. 1807. *Grindelia*. *Magazin für die Neuesten Entdeckungen in der Gesammten Naturkunde, Gesellschaft Naturforschender Freunde zu Berlin* 1(4): 259-261.