Phytotaxa 684 (2): 139–146
https://www.mapress.com/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.684.2.1

Gynoxys yasgolgensis (Asteraceae, Senecioneae): A new species from northern Peru

ITALO REVILLA[1,2*], ELVER CORONEL-CASTRO[3,4], GERSON MEZA-MORI[3] & CARLOS A. AMASIFUEN GUERRA[3,4*]

[1]*Instituto Científico Michael Owen Dillon, Arequipa, Perú*
italorevilla@gmail.com; https://orcid.org/0000-0002-5596-1234
[2]*Herbario Sur Peruano (HSP), Arequipa, Perú*
[3]*Instituto de Investigación para el Desarrollo Sustentable de Ceja de Selva, Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Calle Higos Urco N° 342-350-356 - Calle Universitaria N° 304: - Chachapoyas: - Amazonas, Perú*
elver.coronel@untrm.edu.pe; https://orcid.org/0000-0002-6260-6580
gmeza@indes-ces.edu.pe; https://orcid.org/0000-0002-9754-6725
carlos.amasifuen@untrm.edu.pe; https://orcid.org/0000-0001-9752-8618
[4]*Herbario KUELAP, Escuela Profesional de Ingeniería Forestal, Facultad de Ingeniería y Ciencias Agrarias, Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Calle Higos Urco N° 342-350-356 - Calle Universitaria N° 304: - Chachapoyas: - Amazonas, Perú*
**Correspondence authors: italorevilla@gmail.com, carlos.amasifuen@untrm.edu.pe*

Abstract

Gynoxys (Asteraceae) includes a great diversity of species inhabiting the South American Andes, from Venezuela to northern Argentina. This genus currently comprises 130 species, from which 65 have been recorded in Peru. In this study, we describe a new species, *G. yasgolgensis* from northern Peru. This species was found in the Yasgolga mountain range at 3,300–3,500 meters above sea level, in the *jalcas* and altimontane (Pluvial) *yunga* forest of the Yasgolca-Santa Lucía Private Conservation Area from the Montevideo district, at the Amazonas department. It seems to have a restricted distribution nearby this area. *Gynoxys yasgolgensis* is a shrub or tree, differentiated from other related species, such as *G. oleifolia*, *G. revolutifolia* and *G. ferreyrae,* by the presence of coriaceous leaves with revolute margins and the indumentum composed of simple trichomes. In addition, it has a densely corymbose synflorescence and capitula with 6–8 ray florets and 21 disc florets. Data concerning its distribution, ecology and conservation status are provided.

Key words: Asteraceae, Department of Amazonas, Jalca, Peru, Senecioneae, Yasgolga mountain

Introduction

The genus *Gynoxys* Cass. (Asteraceae, Senecioneae, Tussilagininae) is a member of the Gynoxyoid clade (Escobari *et al*. 2021). This genus was considered closely related to *Aequatorium* B.Nord., *Nordenstamia* Lundin, *Paracalia* Cuatrec., and *Paragynoxys* Cuatrec. (Pelser *et al*. 2007). Recently, Escobari *et al*. (2023) included the genus *Nordenstamia* within *Gynoxys*. Species of this genus are shrubs, treelets, and trees with alternate or opposite, coriaceous or papyraceous leaves; with simple, substellate or T-shaped trichomes on the stems and the abaxial leaf surface; corymbiform or paniculiform synflorescences; homogamous or heterogamous capitula; yellow flowers; sagittate, auriculate, or obtuse anther bases; and apically obtuse, truncate, or acute style branches (Escobari *et al*. 2023). Weddell (1855) and Correa (2003) subdivided this genus into two sections: one group with radiate capitula, and another group with discoid capitula.

Currently, the genus *Gynoxys* comprises around 130 species (Escobari *et al.* 2023), distributed along the South American Andean mountains (Chiquín Baños & Velecela Caiza 2015), from northern Venezuela to northern Argentina (Nordenstam *et al*. 2007, Escobari *et al*. 2021). Most species are found in paramos and montane forests (Beltrán & Baldeón 2009, Tinoco *et al*. 2013, Coronel-Castro *et al*. 2023, Arias *et al*. 2024), between 1600 and 4700 meters above sea level (Herrera 1980, Beck & Ibañez 2014, Escobari *et al*. 2023).

The first taxonomic study of the genus *Gynoxys* in Peru was conducted by Herrera (1980), who described 30 species.

Accepted by Alexander Sennikov: 14 Jan. 2025; published: 11 Feb. 2025

Later, Brako & Zarucchi (1993) listed 52 species, 42 of which are endemic to this country (Beltrán *et al*. 2006). In the most recent study of the group, Escobari *et al*. (2023) included the genus *Nordestamia* within *Gynoxys*, considering *G. cajamarcense*, *G. juninensis*, *G. magnifolia*, *G. pascoensis*, *G. stellatopilosa*, *G. tovarii*, and *G. valuanzelae* as records new to Peru. Thus, a total of 65 *Gynoxys* species are currently recorded from Peru (Escobari *et al*. 2023, Coronel-Castro *et al*. 2023). From these species, 42 are mainly distributed in northern Peru (Brako & Zarucchi 1993, Beltrán *et al*. 2006, Beltrán & Baldeón 2009, Rodríguez *et al*. 2016, Escobari *et al*. 2023, Coronel-Castro *et al*. 2023).

The discovery of new species of *Gynoxys* and the Gynoxyoid group has been continuous (Cuatrecasas 1951, 1960, 1990, Robinson & Cuatrecasas 1992, Beltrán & Baldeón 2009, Beltrán & Calvo 2020, Arias *et al*. 2024). It has contributed significantly to the high species diversity and endemism levels in the Andean landscape (Myers *et al*. 2000; Padilla-González *et al*. 2021). Considering that previous studies have been primarily conducted in restricted geographical areas, this genus has a great potential for the discovery of new species (Escobari *et al*. 2023).

In this study, we present a description and illustration for *Gynoxys yasgolgensis*, a new species from the department of Amazonas, northern Peru.

Materials and methods

The revision of *Gynoxys* collections was carried out in the main herbaria of Peru: CPUN, CUZ, HAO, HOXA, HSP, HUSA, HUT, KUELAP, MOL, USM (the abbreviations follow Thiers 2023). Additionally, we inspected high-resolution images of herbarium specimens of *Gynoxys* species available online (B, F, GH, K, MO, NY, P, US). Measurements of leaves, phyllaries, and bracts were made from herbarium specimens and holotype material available at Global Plants on JSTOR (https://plants.jstor.org/).

A map of geographical distribution of the recorded specimens was performed using the software QGIS version 3.12 (QGIS.org 2024). Then, we revised the habitats where the specimens were collected, according to the Peruvian ecosystem types defined by the Ministry of Environment (MINAM 2019). Additionally, the conservation status of the new species was assessed using IUCN's B and C criteria. The B1 (Extent of Occurrence (EOO)) and B2 (Area of Occupancy (AOO)) criteria were calculated using the GeoCAT tool (Bachman & Moat 2012), wherein the coordinates of collected specimens and field presence data were overlaid, applying a buffer zone of 2 km^2. The C criteria were identified through evaluation of the threats affecting or potentially affecting the population (IUCN 2022) in the collected area.

Taxonomy

Gynoxys yasgolgensis Revilla & Coronel-Castro, ***sp. nov.*** (Figure 1)
urn:lsid:ipni.org:names:77355476-1

Type:—PERU. Provincia de Chachapoyas: Cordillera Yasgolga, road to Chilchos, 6°40'03"S 77°42'52"W, 2800 m, 18 May 2023 (fl.), *E. Coronel ECC-194* (holotype: KUELAP!; isotype: HSP!).

Diagnosis:—The new species is characterized by a woolly simple tomentum on the leaf underside with 6–8 mm trichomes. Secondary veins are partially inconspicuous, and a reticulated tertiary venation becomes conspicuous when the leaf is dried. Synflorescences have a yellowish ferruginous pubescence, with linear bracts of the calyculus (3–5 mm) that can be half the length of the phyllaries (4.5–6 mm).

Description:—Treelets or shrubs ca. 2–3 meters tall. Main stem with fissured bark, terminal twigs with yellow-rusty indumentum, composed of simple woolly trichomes. *Leaves* opposite, simple, petioles 1.5–2 cm long, lamina entire, coriaceous, oblong to ovate, with revolute margins, 4–5 × 1.4–1.8 cm long, base rounded, apex acute. Adaxial surface glabrescent, with scattered trichomes, midvein with trichomes. Abaxial surface with woolly pubescence, consisting of two layers of trichomes, upper layer with long yellowish coiled and simple trichomes, 6–8 mm long, inner adpressed layer composed of short simple trichomes 1–2 mm long. Venation pinnate, with 12–14 pairs of slightly visible secondary veins, prominent reticulate tertiary venation upon drying. *Synflorescences* thyrsoid, terminal with 2–3 branches. *Capitula* radiate, 8–10 mm long and 7–10 mm wide; pedicels 0.5–1 cm long, with 2–3 linear bracts 3.7–5 mm long, densely woolly pubescent with simple yellow-rusty trichomes, 0.6–1 mm long. Involucre cylindrical, with

a calyculus generally of 2 linear bracts 3–5 mm long, densely ferruginous tomentose; phyllaries 8(–10), uniseriate and membranous, outer phyllaries lanceolate, 4.5–6 × 1.5 mm, apex acute, inner phyllaries oblong-lanceolate, 4.5–6 × 2 mm, margins glabrous, apex acute. *Ray florets* 6–8, without staminodes; corolla yellow, glabrous, tube 4–4.2 mm long; limb oblong-elliptic, 6–7 × 2–2.5 mm, nerves 3 to 4, apex 2–3-dentate; style 4–5.2 mm long, style branches 0.8–1.3 mm long with acute, glabrous apex. *Disc florets* 21, corolla yellow, glabrous, 6–7 mm long, tube 5–5.5 mm long, with 5 lobes, 1–1.4 × 0.4–0.5 mm; anthers 2 mm long, apical appendage lanceolate, 0.70–0.72 × 0.2–0.25 mm, pollen sacs 1.2–1.3 mm long, anther bases sagittate, 0.1 mm long, linear, filaments 0.4–0.5 mm long with distal thickening 0.5 mm long; style 8–8.8 mm long, style branches 1.3–1.8 mm long, apex of style branches with lateral and distal hairs. *Achene* glabrous, 1 mm long (immature). *Pappus* straw-colored, barbellate, 6–7.2 mm long, apex slightly thickened, reddish at anthesis.

FIGURE 1. *Gynoxys yasgolgensis* Revilla & E. Coronel-Castro. **A**. Flowering branch. **B**. Inflorescence. **C**. Capitulum. **D**. Ray floret (ligule). **E**. Disc floret (with pappus). **F**. Detail of leaf indumentum: adaxial surface (up), abaxial surface (down). Drawn by Maricruz Bedoya Cuno, based on *E. Coronel ECC-194* (KUELAP).

Etymology:—The epithet refers to the Cordillera Yasgolga where the type was collected. This mountain extends from the north of the Department of San Martín to the east of La Jalca Grande, located in the Amazonas department. Elevations vary between 2900 and 3300 meters above sea level. Hydrographically, this morphostructural feature

constitutes the *divortium acuarium* of the Utcubamba River (to the west) and Shocol River (to the east) watersheds, an important source of water for the Amazonas department (Rodríguez *et al*. 2012).

Distribution and habitat:—*Gynoxys yasgolgensis* grows in the transitional formation between the shrubby vegetation of the 'jalcas' and the montane cloud forest, recorded at an elevation range between 2800 and 3500 meters above sea level (Figure 2). The species is distributed in northeastern Peru, Amazonas region, south of the Huancabamba depression. The recorded populations are in the private conservation area "Yasgolga – Santa Lucia" (Figure 3). This area of Amazonas is known for its high diversity of *Gynoxys*, *Clusia, Weinmannia* and *Cinchona* populations (Beltrán *et al*. 2006, Coronel-Castro *et al*. 2023).

TABLE 1. Morphological differences between *Gynoxys yasgolgensis* and related species. The data was taken from Muschler (1913), Herrera (1980), Rodríguez *et al*. (2016), Coronel-Castro *et al*. (2023), Escobari *et al*. (2023), Arias *et al*. (2024). *Authors observation based on type material.

Species	*G. yasgolgensis*	*G. oleifolia*	*G. revolutifolia*	*G. ferreyrae*
Trichome type	simple	simple	simple and T-shaped	simple
Texture leaves	coriaceous	coriaceous	coriaceous	coriaceous
Lamina shape	ovate-lanceolate	lanceolate to ovate-lanceolate	oblong to ovate	oblong-lanceolate to lanceolate-ovate
Leaf margin	entire, revolute	entire, revolute	entire, strongly revolute	entire, revolute
Leaf length (cm)	4–5	6–12	4–7.2(–8.6)	4.5–5.5
Abaxial leaf surface	tomentose, yellowish	tomentose subferruginous—grey-ferruginous	densely ferruginous tomentose	tomentose-yellowish-grey
Inflorescence	densely corymbose	terminal corymbose branch	corymbiform, erect and terminal	terminal corymbose racemes
Bracteole form	linear	linear-oblong	triangular	oblong-spatulate*
Bracteole length (mm)	4–5	8–12*	0.2–0.3	12–13
Phyllary number	8 (10)	11–12	8	12–13
# Ray florets (RF)	6–8	6	4–5	8–10*
Ligule dimensions (mm)	6–7 × 2–2.5	4.5–5.6 × 1.3–1.5	10–11 × 2–3	7–8 × 2.8–3
# Disc florets (DF)	21	13–19	8–9(–12)	12–14
Pappus length (mm)	6–7.2	7–8	7–8	5–5.5
Distribution	Peru: Amazonas	Peru: Ancash, Cajamarca, Lima	Ecuador: Loja, Zamora, Chinchipe	Peru: Amazonas, Ancash, Cajamarca, Lambayeque and La Libertad
	Southern Huancabamba Depression, Oriental Cordillera	Southern Huancabamba, West, center and north of the Andes Cordillera	Northern Huancabamba Depression, Oriental Cordillera	North and South of the Huancabamba depression, Western Cordillera

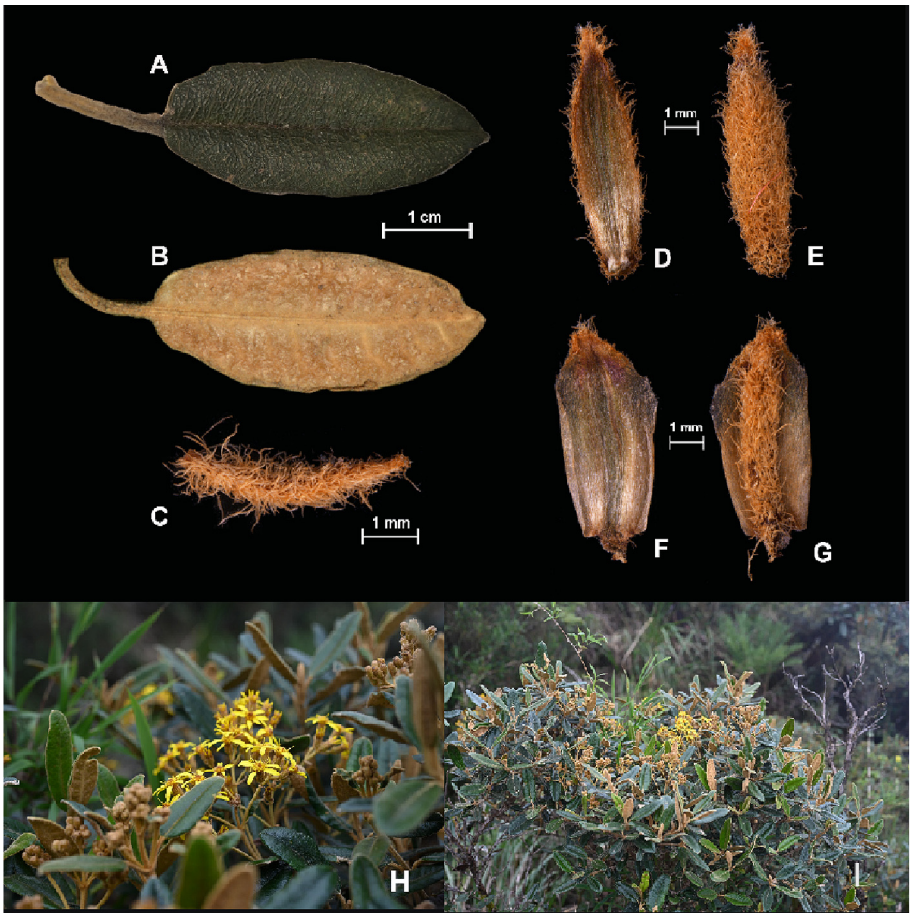

FIGURE 2. *Gynoxys yasgolgensis*. **A**. Adaxial leaf surface. **B**. Adaxial leaf surface. **C**. Inflorescence bract. **D**. External phyllaries, ventral shape. **E**. External phyllaries, dorsal shape. **F**. Internal phyllaries, ventral shape **G**. Internal phyllaries, dorsal shape. **H**. Synflorescence. **I**. Habit. Source: *E. Coronel ECC-194* (KUELAP, HSP).

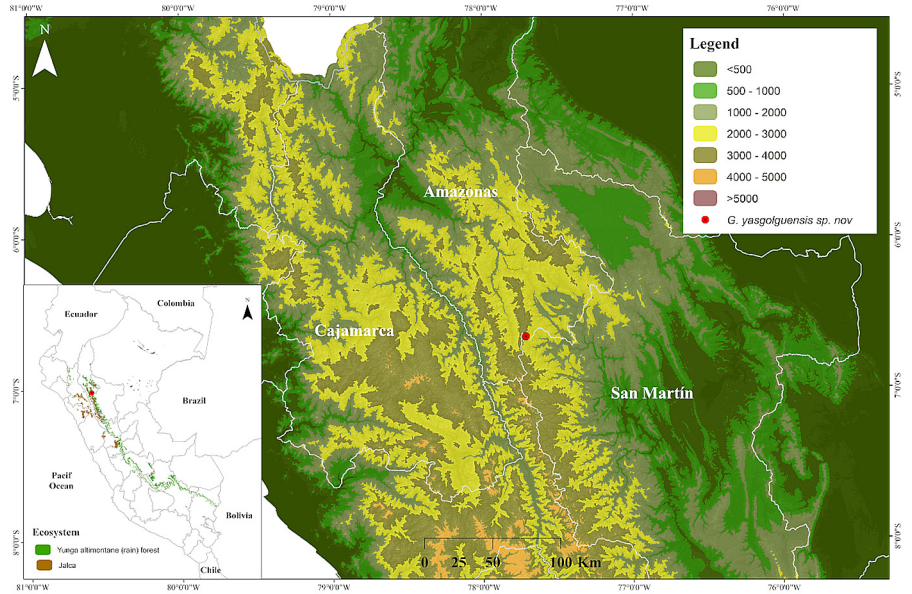

FIGURE 3. Distribution of *Gynoxys yasgolgensis*.

Phenology:—Immature flowers of *G. yasgolgensis* were observed from February to April, and mature flowers (full bloom) between late March and June.

Conservation status:—The new species inhabits the eastern slopes of the high Andes, located at the southern end of the Yasgolga mountain range. Its primary threat is population decline, driven by the recent construction of roads to the town of Los Chilchos, which has led to habitat degradation in high-altitude areas. This degradation is caused by the expansion of agricultural activities and the establishment of intensive livestock farming, encouraged by both local populations and migrants (Castañeda *et al.* 2018). Additionally, forest fires in the páramos and excessive logging in the Andean cloud forests of northern Peru—particularly in the Amazonas department—have exacerbated the situation (Global Forest Watch 2022).

The Extent of Occurrence (EOO) and Area of Occupancy (AOO) were analyzed based on known occurrences of *G. yasgolgensis*, as well as nearby localities where it is not present, information gathered during the team's search expeditions in the Yasgolga mountain range. The EOO was calculated to be 85 km², and the AOO 92 km², placing the species between Critically Endangered and Endangered categories. A population study conducted at one of the locations found fewer than 100 mature individuals, with estimates suggesting that no subpopulation contains more than 250 mature individuals. As a result, the species is classified as Endangered (EN B1+C2a(i)) according to the IUCN criteria (2022).

Additional specimens examined (paratypes):—PERU. Provincia de Chachapoyas: Cordillera Yasgolga camino a Valle de los Chilchos en el sector denominado "El Rayo" en el territorio del ACP Yasgolca-Santa Lucía, 6°39'46" S, 77°42'49" W, 3374 m, 21 March 2024, *E. Coronel ECC-220* (KUELAP, HSP).

Discussions:—*Gynoxys yasgolgensis* differs from the other species of the genus by its markedly oblong-obovate coriaceous leaves, with woolly pubescence completely covering the underside of the leaf. However, it has certain similarities with *G. oleifolia*, *G. revolutifolia* and *G. ferreyrae*. It differs from *G. oleifolia* in leaf length (4–5 cm vs. 6–12 cm), shape and length of the synflorescence bracts (linear, 4–5 mm vs. linear-oblong, 6–12 mm), and number of phyllaries (mostly 8 vs. 11–12). It differs from *G. revolutifolia* in leaf margin (revolute vs. strongly revolute), leaf indumentum (simple vs. simple and T-shaped trichomes), and number of radiate and discoid flowers (6–8 and 21 vs. 4–5 and 8–9(–12)). Finally, it differs from *G. ferreyrae* in shape and length of synflorescence bracts (linear, 4–5 cm vs. oblong-spatulate, 6–12 mm), number of phyllaries (mostly 8 vs. 12–13), and number of discoid flowers (21 vs. 12–14). Other differences are detailed in Table 1.

Acknowledgments

We thank the Research Institute for Sustainable Development of the Cloud Forest (Instituto de Investigación para el Desarrollo Sustentable de Ceja de Selva), as the information obtained comes from a study funded by the Project CUI 2261386 'Creation of Laboratory Services for Genetic Resources of Biodiversity and Conservation of Wild Species of the National University Toribio Rodríguez de Mendoza, Amazonas Region.' We also thank the Vice-Rector of Research of the National University Toribio Rodríguez de Mendoza in Amazonas (Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas). In addition, we are grateful to biologist and illustrator Maricruz Bedoya Cuno for the plate of the new species.

References

Arias, R., Espinosa-Ortega, N., Revilla, I., Ansaloni, R. & Tomasello, S. (2024) *Gynoxys revolutifolia* (Senecioneae, Asteraceae): A new species from southern Ecuador. *Phytotaxa* 644 (3): 211–219. https://doi.org/10.11646/phytotaxa.644.3.4

Bachman, S. & Moat, J. (2012) GeoCAT – an open-source tool for rapid Red List assessments. *BGjournal* 9 (1): 11–13. Available from: https://www.jstor.org/stable/24811237 (accessed 10 February 2025)

Beck, S. & Ibáñez, D. (2014) Asteraceae. *In*: Jorgensen, P.M., Nee, N. & Beck, S.G. (Eds.) Catálogo de las plantas vasculares de Bolivia. *Monographs in Systematic Botany from the Missouri Botanical Garden* 127: 290–382.

Beltrán, H. & Baldeón, S. (2009) A new species of *Gynoxys* (Asteraceae: Senecioneae) from Peru. *Compositae Newsletter* 47: 13–18. [https://www.biodiversitylibrary.org/page/15548133]

Beltrán, H. & Calvo, J. (2020) A new species of *Nordenstamia* (Compositae, Senecioneae) from central Peru. *Phytotaxa* 474 (3): 293–297.
https://doi.org/10.11646/phytotaxa.474.3.8

Beltrán, H., Granda, A., León, B., Sagástegui, A., Sánchez, I. & Zapata, M. (2006) Asteraceae endémicas del Perú. *Revista Peruana de Biología* 13 (2): 64–164.
https://doi.org/10.15381/rpb.v13i2.1807

Brako, L. & Zarucchi, J.L. (1993) Catalogue of the flowering plants and gymnosperms of Peru: Catálogo de las angiospermas y gimnospermas del Perú. *Monographs in systematic botany from the Missouri Botanical Garden* 45: 1–1286.

Castañeda, J.H.V., Sabaleta, E.L., Hernández, M.K.B., Meza, S.N.V. & Sánchez, L.M.Q. (2019) Comparación de sustratos en la propagación sexual y asexual del árbol de la quina (*Cinchona officinalis*). *Revista de Investigación en Agroproducción Sustentable* 2 (3): 77–85.
https://doi.org/10.25127/aps.20183.407

Chiquin Baños, M.G. & Velecela Caiza, D.C. (2015) *Estudio de la diversidad florística y características del suelo dentro de un proceso de restauración activa luego de un período de lluvia, en la zona de influencia del" Cerro Puntas" Nororiente de Quito* [Tesis de bachiller]. Universidad Politécnica Salesiana, Quito, Ecuador.

Coronel-Castro, E., Revilla, I., Pariente-Mondragón, E., Torres Guzmán, C., Meza-Mori, G. & Oliva-Cruz, S.M. (2023) Género *Gynoxys* Cass. (Asteraceae) en el departamento de Amazonas, Perú: distribución y nuevos registros. *Folia Amazónica* 32 (2): e32724.
https://doi.org/10.24841/fa.v32i2.724

Correa, A. (2003) Revision of the genus *Paragynoxys* (Asteraceae, Senecioneae-Tussilagininae). *Brittonia* 55 (2): 157–168.
https://doi.org/10.1663/0007-196X(2003)055[0157:ROTGPA]2.0.CO;2

Cuatrecasas, J. (1951) Contributions to the Flora of South America. Studies on Andean Compositae – II. *Fieldiana, Botany* 27 (2): 1–74.
https://doi.org/10.5962/bhl.title.2414

Cuatrecasas, J. (1960) Studies on Andean Compositae – IV. *Brittonia* 12 (3): 182–195.
https://doi.org/10.2307/2805052

Cuatrecasas, J. (1990) Apuntes varios sobre la flora neotropical. XIX. Combinaciones en Senecioneae, Compositae. *Phytología* 69 (5): 313–315.
https://doi.org/10.1002/feder.19530550203

Escobari, B., Borsch, T., Quedensley, T.S. & Gruenstaeudl, M. (2021) Plastid phylogenomics of the Gynoxoid group (Senecioneae, Asteraceae) highlights the importance of motif-based sequence alignment amid low genetic distances. *American Journal of Botany* 108 (11): 2235–2256.
https://doi.org/10.1002/ajb2.1775

Escobari, B., Borsch, T. & Kilian, N. (2023) Generic concepts and species diversity within the Gynoxyoid clade (Senecioneae, Compositae). *PhytoKeys* 234: 61–106.
https://doi.org/10.3897/phytokeys.234.107750

Global Forest Watch (2022) *Peru Deforestation Rates & Statistics*. Available from: https://www.globalforestwatch.org/ (accessed 15 January 2024)

Herrera, B. (1980) Revision de las especies peruanas del género *Gynoxys* (Compositae). *Boletin de la Sociedad Peruana de Botanica* 8 (1): 3–74.

IUCN Standards and Petitions Committee (2023) *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 15. Prepared by the Standards and Petitions. Committee. Available from: http://www.iucnredlist.org/documents/redListGuidelines.pdf (accessed 10 February 2025)

Ministerio del Ambiente (2019) *Mapa Nacional de Ecosistemas*. Dirección General de Ordenamiento Territorial Ambiental. Lima, Perú.

Muschler, R. (1913) Compositae perv. et boliv. II. *Botanische Jahrbucher für Systematik, Pflanzengeschichte und Pflanzengeographie* 50 (2/3, Beibl. 111): 76–96.

Myers, N., Mittermeier, R., Mittermeier, C., da Fonseca, G. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403 (6772): 853–858.
https://doi.org/10.1038/35002501

Nordenstam, B. (2007) XII. Tribe Senecioneae Cass. *In:* Kadereit, J.W. & Jeffrey, C. (Eds.) *The Families and Genera of Vascular Plants*, vol. 8. Springer, Berlin, Heidelberg, New York, pp. 208–241.

Padilla-González, G.F., Diazgranados, M. & Da Costa, F.B. (2021) Effect of the Andean Geography and Climate on the Specialized Metabolism of Its Vegetation: The Subtribe Espeletiinae (Asteraceae) as a Case Example. *Metabolites* 11 (4): e220.
https://doi.org/10.3390/metabo11040220

Pelser, P.B., Nordenstam, B., Kadereit, J.W. & Watson, L.E. (2007) An ITS phylogeny of tribe Senecioneae (Asteraceae) and a new delimitation of *Senecio* L. *Taxon* 56 (4): 1077–1104.
https://doi.org/10.2307/25065905

Pelser, P.B., Kennedy, A.H., Tepe, E.J., Shidler, J.B., Nordenstam, B., Kadereit, J.W. & Watson, L.E. (2010) Patterns and causes of incongruence between plastid and nuclear Senecioneae (Asteraceae) phylogenies. *American Journal of Botany* 97 (5): 856–873. https://doi.org/10.3732/ajb.0900287

QGIS.org (2024) *QGIS Geographic Information System*. QGIS Association. [http://www.qgis.org]

Robinson, H. & Cuatrecasas, J. (1992) Additions to *Aequatorium* and *Gynoxys* (Asteraceae: Senecioneae) in Bolivia, Ecuador, and Peru. *Novon* 2 (4): 411–416. https://doi.org/10.2307/3391502

Rodríguez, R., Giraldo, E., Cueva, E., Sánchez, E. & Cornejo, T. (2012) Geología del cuadrángulo de Chachapoyas (13-h). *Boletín Ingemmet, Serie A: Carta Geológica Nacional* 144: 1–7.

Rodríguez, E.F.R., Izquierdo, E.A., Velásquez, L.P., Salas, N.M. & Alva, A.S. (2016) Catálogo de Asteraceae de la Región La Libertad, Perú. *Sagasteguiana* 4 (2): 73–106.

Thiers, B. (2023) *Index Herbarium: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/ih/ (accessed 22 November 2023)

Tinoco, B.A., Astudillo, P.X., Latta, S.C., Strubbe, D. & Graham, C.H. (2013) Influence of Patch Factors and Connectivity on the Avifauna of Fragmented *Polylepis* Forest in the Ecuadorian Andes. *Biotropica* 45 (5): 602–611. https://doi.org/10.1111/btp.12047

Weddell, H.A. (1855) *Chloris andina: essai d'une flore de la région alpine des Cordillères de l'Amérique du Sud*, vol. 1. P.Bertrand. https://doi.org/10.5962/bhl.title.217