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## *Epidendrum alejandrinae* (Orchidaceae: Laeliinae), a new species from the high Andean forests of central Peru

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### Abstract

The high Andean forests harbor great and unique biodiversity. Here, we report a new species of *Epidendrum* from Peru. *Epidendrum alejandrinae* is described, illustrated and compared with the morphologically similar *Epidendrum ochoae*, *Epidendrum pachydiscum* and *Epidendrum aida-alvareziae*. We performed a systematic review of herbarium information on the species reported for the Region of Huancavelica and compared the morphological features of the closest species to rule out possible matches. The new species is characterized by a short, foliate aggregate stems, an apical pendulous inflorescence formed from the stem, green resupinate flowers opening in succession, the petals and sepals semi-extended, a 3-lobed lip, lateral lobes obliquely ovoid, median lobe broadly cuneate, bicallous, and four, obovoid, laterally compressed pollinia. The novelty represents an important record for the flora associated with the high Andean forest dominated by *Polylepis* and *Gynoxys* in central Peru.

### Resumen

Los bosques altoandinos albergan una gran y única diversidad biológica. Aquí reportamos una nueva especie de *Epidendrum* del Perú. *Epidendrum alejandrinae*, es descrita, ilustrada y comparada con las morfológicamente similares *Epidendrum ochoae*, *Epidendrum pachydiscum* y *E. aida-alvareziae*. Realizamos una revisión sistemática de la información de herbarios de las especies reportadas para el departamento de Huancavelica y comparamos las características morfológicas de las especies más cercanas para descartar posibles coincidencias. La nueva especie se caracteriza por los tallos agregados cortos foliados, inflorescencia apical péndula formada del tallo, flores verdes resupinadas que se abren en sucesión, los pétalos y sépalos semi extendidos, labelo 3-lobado, lóbulos laterales oblicuamente ovoides, lóbulo medio anchamente cuneado, bicalloso; polinios 4, obovoides, lateralmente comprimidos. La novedad representa un importante registro para la flora asociada a los bosques altoandinos dominados por *Polylepis* y *Gynoxys* del centro del Perú.

**Keywords:** Andean orchids, central Peru, *Gynoxys*, Huancavelica, *Polylepis*

### Introduction

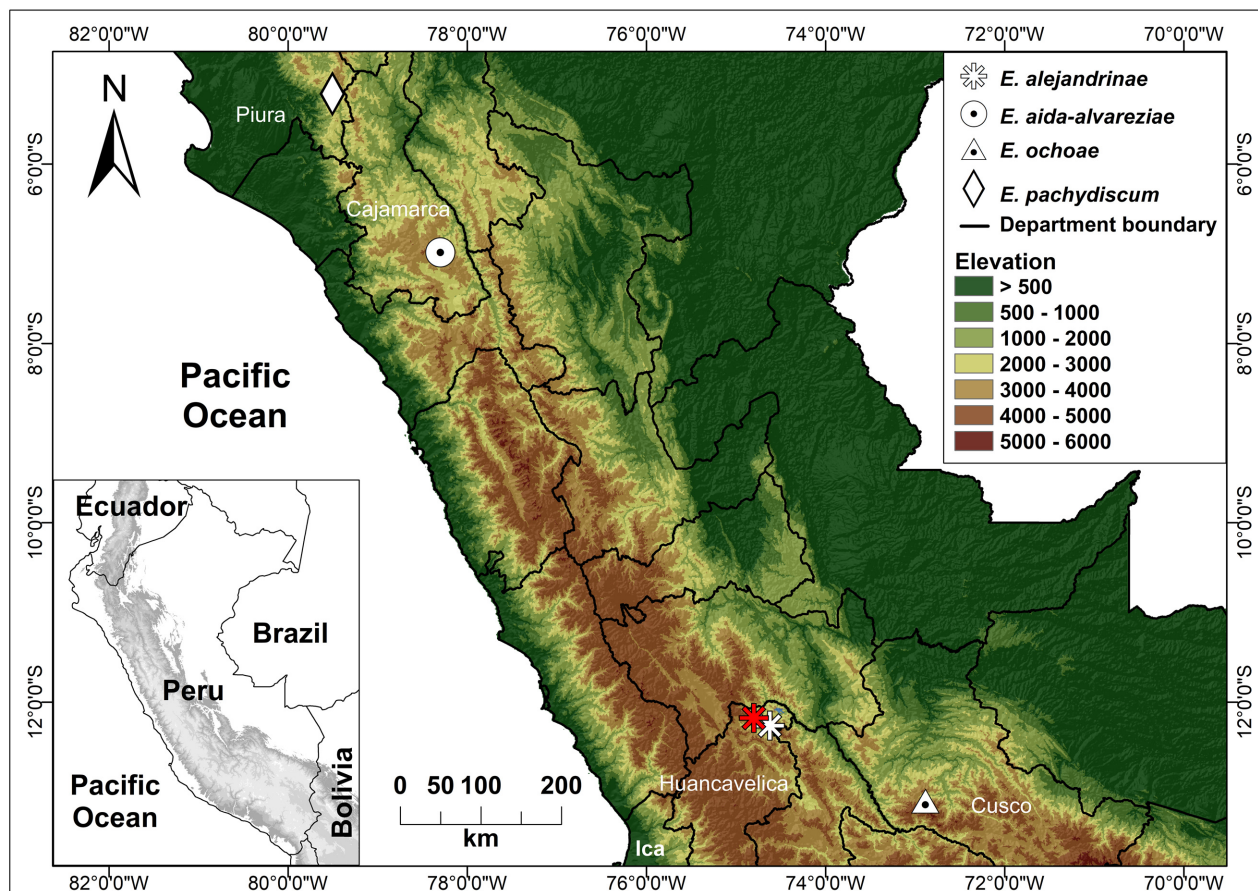
The Tropical Andes is one of the main biodiversity hotspots worldwide (Myers *et al.* 2000). Within this hotspot,

the forests located in the eastern cordillera of the Peruvian Andes have a very high rate of endemism for different taxa (Swenson *et al.* 2012) and, particularly, the high Andean forests are home to a great diversity of flora and fauna species that are unique worldwide (Fjeldså & Kessler 1996; Herzog *et al.* 2012). These ecosystems are one of the most threatened due to the pressure of human activities and their vulnerability to climate change (Fjeldså & Kessler 1996; Kessler 2002; Tejedor 2014; Herzog *et al.* 2012; Tejedor *et al.* 2015). Forests dominated by plants of the genera *Polylepis* Ruiz & Pavón (1794: 80), *Gynoxys* Cassini (1827: 455) and *Escallonia* Mutis (1821: 532) are considered islands of diversity in continental areas due to the characteristic of being fragmented in formation and the great biodiversity they can harbor, even in relatively small spaces (Fjeldså & Kessler 1996).

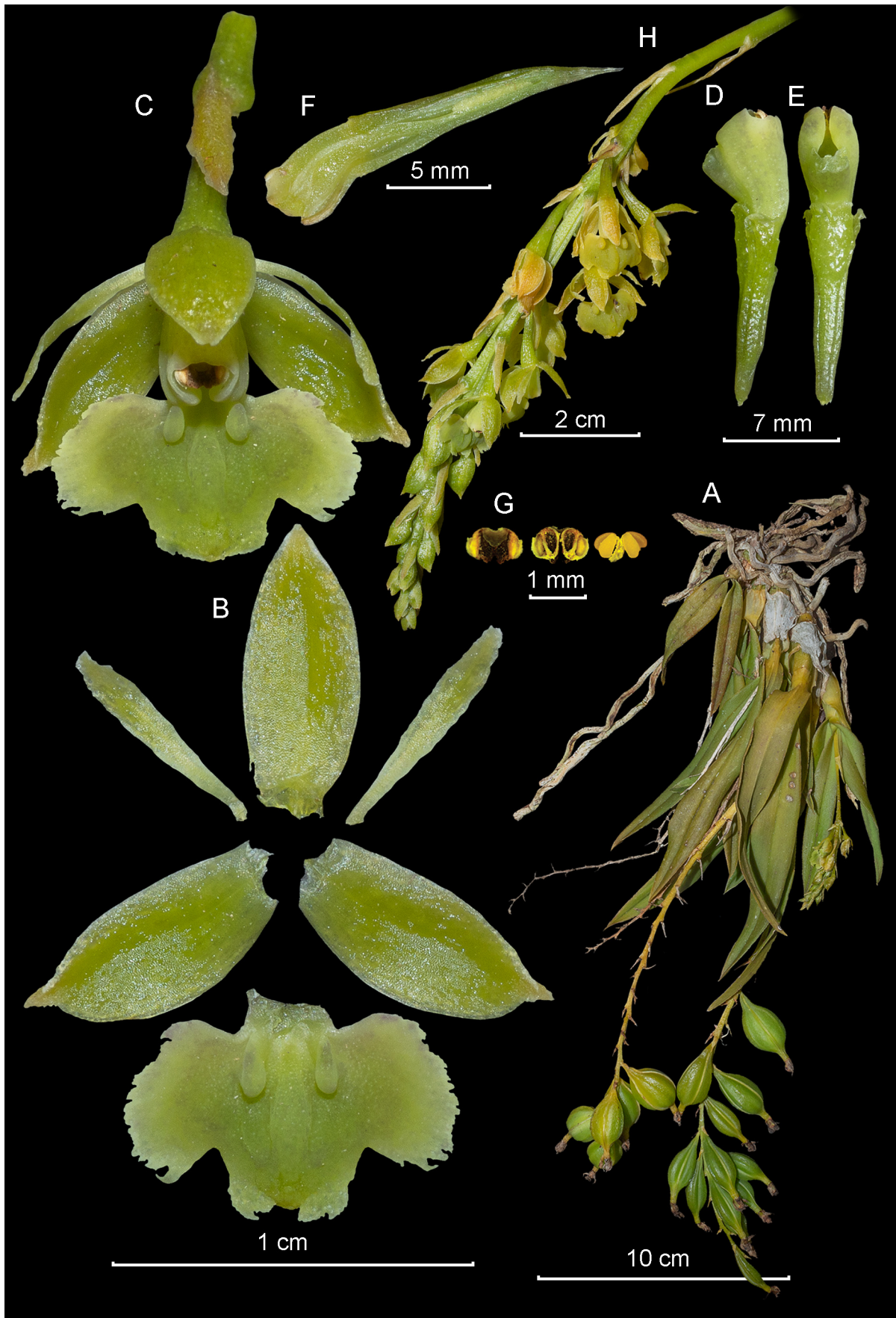
Huancavelica is one of the least explored regions in the central Peruvian Andes, despite the high diversity of orchids. Areas such as the Amaru-Huachocolpa-Chihuana Cloud Forest Regional Conservation Area (RCA) register an estimated 200 different species in an area of only 5024 ha (Collantes 2014; Gobierno Regional de Huancavelica 2016; MINAM 2021), and additional research projects are currently being proposed to explore the area in greater detail. The areas surrounding the RCA and others throughout the region have not received the same attention; having high potential in terms of unexplored biodiversity.

*Epidendrum* Linnaeus (1763:952) is one of the most diverse genera within the Orchidaceae family, widely distributed on a continental scale and with an elevation range that goes from sea level to 4200 meters (Hågsater & Soto 2005). Many new species have been discovered in Peru in recent years (Damian & Hågsater 2016; Hågsater & Santiago 2018a, b, 2019, 2020a, b, 2021; Acuña-Tarazona *et al.* 2019; Navarro *et al.* 2020) and further explorations are carried out, new records and species are being found. Demonstrating that the diversity of *Epidendrum* is higher than initially estimated, as has been shown in other regions (Karremans 2021). An updated list of species of the Orchidaceae of Peru has been recently published by Goicochea *et al.* (2019) and which together with the new discoveries elevates the total of *Epidendrum* species in the country to 480.

A new *Epidendrum* species from the region of Huancavelica, Peru, in a high Andean forest dominated by the *Polylepis* genus, is described and illustrated here.



**FIGURE 1.** Distribution map of *Epidendrum alejandrinae* and the most similar species in Peru. The red asterisk indicates a record that needs to be corroborated.



**FIGURE 2.** LCDP of *Epidendrum alejandrinae*. **A.** Habit, inflorescence and fruit. **B.** Dissected perianth. **C.** Flower, front view. **D.** Column, lateral view. **E.** Column, ventral view. **F.** Column and ovary, dissected view. **G.** Anther, front and back view, and Pollinarium. **H.** Inflorescence. Photographs by Harold Rusbelth Quispe-Melgar from the type, H.R. Quispe 125.

## Materials and methods

The plant material was collected in Sune, Andaymarca district, Tayacaja province, Huancavelica region (Fig. 1) in fieldwork that sought to register *Polylepis* forests in the Peruvian central Andes. Photographs were taken in the field and laboratory for preparing and diagramming a Lankester Composite Dissection Plate (LCDP) (Fig. 2).

Only 118 of the 10,165 *Epidendrum* records from Peru in the AMO-DATA (2021) are from Huancavelica. The herbaria searched include AMES, AMO, B (photographs lodged at F), CAS, COL, F, G, GH, HB, HBG, HOXA, K, LE, LL, M, MA, MO, MOL, NY, OXF, P, PR, RENZ, S, SEL, TNS, UC, US, USM & WIS. These records are based on images taken at these herbaria by the staff of AMO through the years and do not necessarily include recent collections. Records of specimens and illustrations from David E. Bennet Jr. (at MOL and AMO) were also searched (Bennett & Christenson 1993, 1995a, b, 1998, 2001). The issues, of *Icones Plantarum Tropicarum* by Dodson & Bennett (1989a, b) were also searched. The records for Huancavelica were studied for possible matches. There is no published key to this group of species, and no recent comprehensive key to the species of *Epidendrum* for Peru, or neighboring countries.

Distinctive features were reviewed and taken into account for the Rupestre group and comparisons were made with *Epidendrum ochoae* Collantes & Hágsater (2015: pl. 1546), *Epidendrum aida-alvareziae* Hágsater (2016: pl. 1570) and *Epidendrum pachydiscum* Hágsater (2004: pl. 773) (images of type and live material at MO and USM, as well as descriptions); being species most similar to the new species. The pressed material was deposited in the HOXA herbarium.

## Taxonomy

*Epidendrum alejandrinae* Hágsater & H.R. Quispe, *sp. nov.* (Figs. 2, 3)

TYPE: Peru. Huancavelica Region: Tayacaja Province, Andaymarca District; Sune locality, 3900 m, semi humid high Andean Forest, epiphyte on *Gynoxys* sp., 29 August 2021, H.R. Quispe 125 (holotype HOXA).

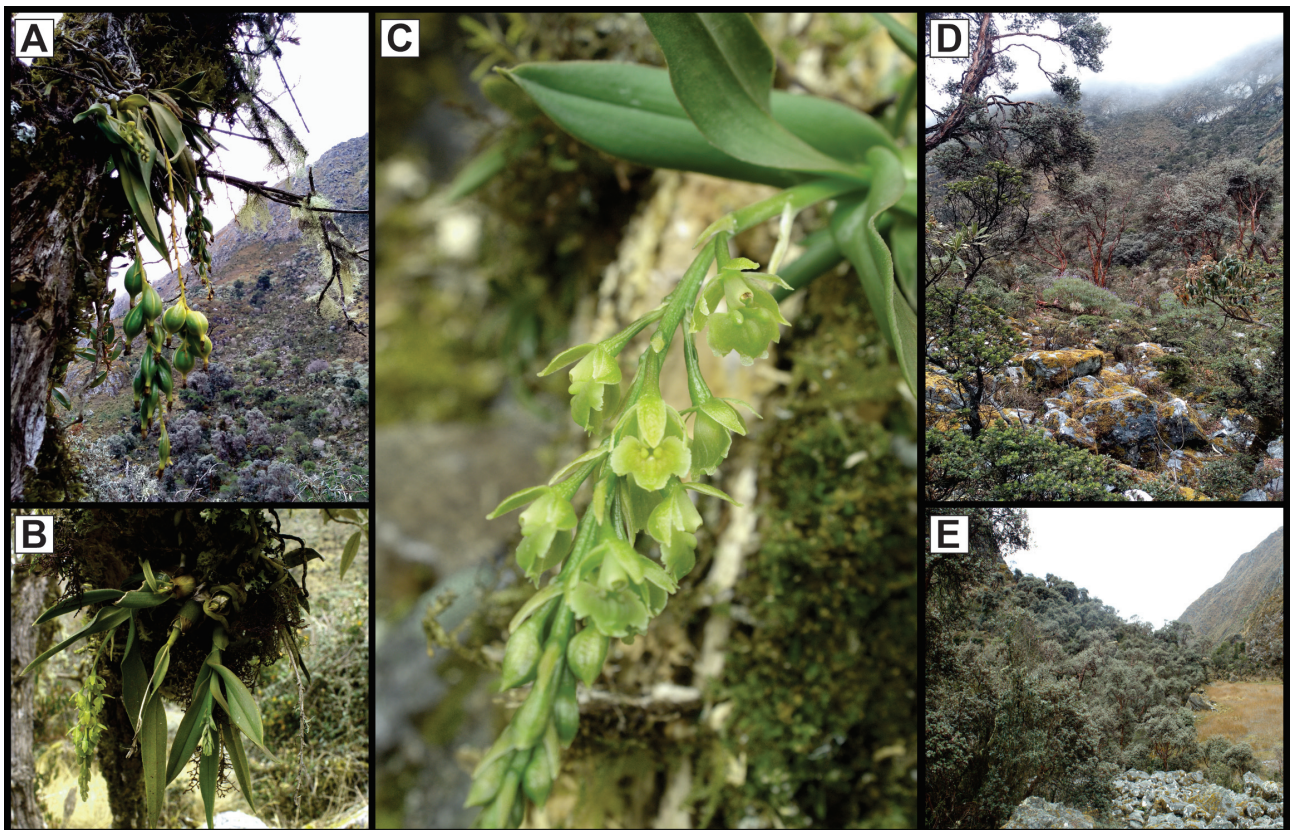
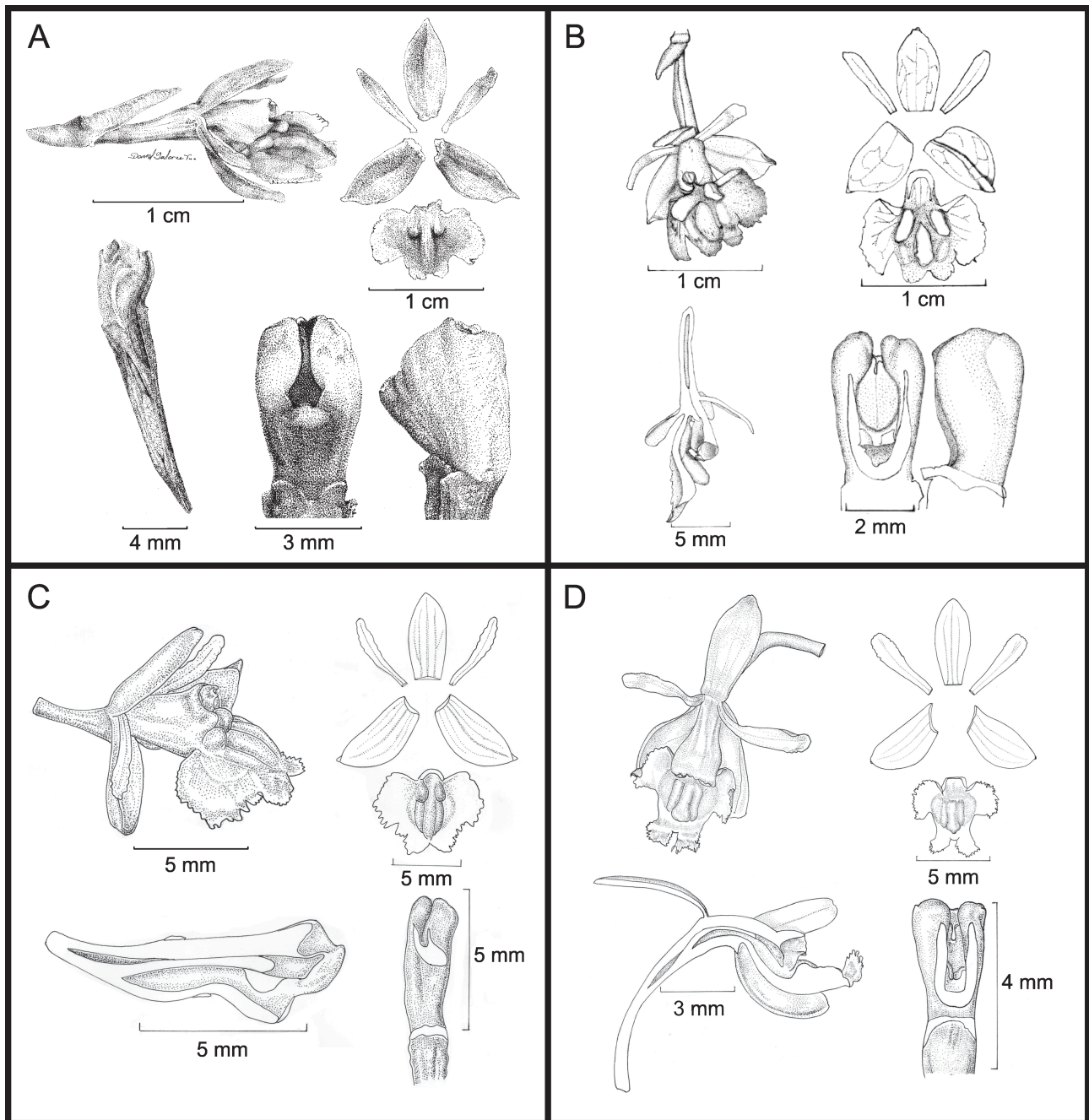


FIGURE 3. *Epidendrum alejandrinae*. A, B. Habit and complete plant. C. Flowers. D, E. Habitat. Photographs by Katherine Lucero Lagones Poma (A and D) and Harold Rusbelth Quispe-Melgar (B, C and E).



**FIGURE 4.** Comparison of species similar to *E. alejandrinae*. Plates **B–D** were adapted from *Icones Orchidacearum* (Hágsater 2004; Collantes & Hágsater 2015; Hágsater 2016). **A.** *E. alejandrinae*. **B.** *E. ochoae*. **C.** *E. aida-alvareziae*. **D.** *E. pachydiscum*. Illustrators: **A:** Daniel Galarza. **B:** Benjamín Collantes. **C–D:** Rolando Jiménez.

*Similar to Epidendrum ochoae* but the flowers green, concolor (vs. flowers yellow-green, irregularly tinged with purple dots), sepals 8.7–9.0 mm long (vs. 6.5 mm long), and the lip with elongate calli, thick (vs. ellipsoid, laterally compressed), parallel (somewhat divergent), relatively small, 1.7 × 0.7 mm (vs. calli prominent).

Epiphytic, sympodial, caespitose, pendent herb, ca. 30 cm long. Roots 3 mm in diameter. Rhizome short, 1 cm long. Stems 2.0–3.2 × 1.0 cm, aggregate, short, green, thickened into an ovoid pseudobulb. Leaves 3, articulate; 2 produced from basal and middle internodes and one from the apex of pseudobulb; blade 8.0–12.0 × 1.0–1.6 cm, lanceolate, coriaceous, green, margin entire, crenate towards the apex. Spathe lacking. Inflorescence 8.0–12.5 × 0.1–0.3 cm, apical, from mature stem, pendulous, flowers successive, ca. 10 flowers open at a time, pendent; peduncle 3.5–4.5 cm long, laterally compressed, ancipitose, straight, with nodes at base and 1 bract 1.5 cm long; rachis terete, straight and sulcate. Floral bracts 8–10 mm long, 1/2 the length of the ovary, triangular, long-acuminate, dorsally granulose, yellow with irregular lighter yellow dots. Ovary clavate 13.0 × 0.6–3.0 mm, furrowed, with a small ventral swollen vesicle at

the apex. *Flowers* 15–25, successive, opening from base towards apex of inflorescence, resupinate, green, concolor; fragrance not registered. *Sepals* partly spreading, free, margin entire; dorsal sepal  $9.0 \times 3.6$  mm, oblong-elliptic, minutely mucronate; lateral sepals  $8.7 \times 3.3$  mm, elliptic-oblong, acute, with a prominent dorsal keel, 3-veined. *Petals*  $7.0 \times 1.1$  mm, partly spreading, arching forward in natural position, linear-oblongate, sub-obtuse, 1-veined, margin entire, spreading. *Lip*  $6.7 \times 10$  mm, adnate to column, 3-lobed, transversely cordiform-elliptic in outline, convex, base somewhat cordate, distal margins erose-denticulate; bicallose, calli elongate, parallel,  $1.7 \times 0.7$  mm, separated by a thick mid-rib, disc with 3 parallel, broad and very low ribs, mid-rib reaching apical sinus, lateral ribs in front of calli ending at base of mid-lobe; lateral lobes  $3.0 \times 4.8$  mm, widely dolabriform; mid-lobe  $2.0 \times 4.4$  mm, widely cuneate, apex emarginate. *Column*  $5.6 \times 3.4 \times 3.2$  mm, short, thick, obtuse, apex forming an obtuse angle with lateral wings. *Clinandrium-hood* short, margin entire. *Rostellum* apical, slit. Lateral lobes of *stigma* small, in a small stigmatic cavity. *Nectary* penetrating 1/4 of pedicellate ovary, unornamented, forming a somewhat widened vesicle behind perianth. *Anther* transversely ellipsoid, apex emarginate, front papillose, brown with sides cream-colored, 4-celled. *Pollinia* 4, obovoid, laterally compressed; caudicles soft and granulose, as long as pollinia; viscarium semi-liquid. *Capsule*  $39 \times 17$  mm; pedicel  $7 \times 1.5$ –5 mm, conical; body  $27 \times 17$  mm, ellipsoid; apical neck  $5 \times 3.5$  mm, thin.

## Etymology

Honoring the memory of Mrs. Alejandrina Melgar Sotomayor (1957-2020), mother of the first author, who was born in the Region of Huancavelica in life had a great passion for plants and their flowers, always inspiring a deep respect for nature.

## Distribution and ecology

Known presently only from the Region of Huancavelica, in central Peru. The plant that served as type was collected in the upper part of the locality of Sune, near the Judas lagoon, in the middle Mantaro river basin, approximately 20 km from the Amaru-Huachocolpa-Chihuana Cloud Forest RCA. It was found growing in a semi-humid forest dominated by *Polylepis albicans* Pilger (1906:535) (Boza *et al.* 2019), epiphytic on a specimen of *Gynoxys*, an environment that is typical of the high Andean ecosystem surrounded by a matrix of grassland, with the presence of other genera such as *Escallonia* and *Lupinus* Linnaeus (1753:721), at 3900 m in elevation. Flowering was recorded in August (Fig. 3).

## Conservation Status

DD. Data deficient. Known presently only from the type.

## Comments

*Epidendrum alejandrinae* belongs to the *Epidendrum* ‘Rupestre’ group (Hágsater 2004), which is characterized by the caespitose, sympodial plant, the pseudobulbous stems with 1-4 fully developed leaves toward the apex, the lack of spathes at the base of an erect, racemose or paniculate inflorescence, the lip ecallose or bicallose and with several fleshy thickened keels on the disc. The group presently consists of 13 localized species found at very high elevations between 3000-3900 m, and widely distributed from northern Colombia to southern Peru. They are very similar both vegetatively and florally, with variation in the length and width of the leaves, size of the flowers and shape of the lip, with or without calli, and always with a thickened disc with 3-5 thickened and varying ribs. The highest diversity is found in Peru with nine recorded species, followed by Ecuador (2 spp.), Bolivia (1 spp.) and Colombia (1 spp.).

The new species is similar to *E. ochoae* from Machu Picchu, Cusco, which has yellow-green flowers irregularly tinged with purple dots, especially on sepals and lip, sepals  $6.5 \times 3.5$ –4.0 mm, and the lip convex, bicallose, the calli prominent, ellipsoid, laterally somewhat compressed, somewhat divergent, disc 3-carinate, the lateral ribs low, the mid-rib prominent, forming a fleshy, irregular, obovoid protuberance which nearly reaches the apical sinus. *Epidendrum aida-alvareziae*, from Cajamarca in northern Peru, has shorter, narrower leaves,  $0.6$ – $5.0 \times 0.5$ – $1.0$  cm, sepals  $5.0$ – $7.3$

× 2.8–3.3 mm, and a shallow 3-lobed lip, the apical half looks more like a truncate pyramid in general outline, with the mid-lobe emarginate, bicallose, the calli prominent, ellipsoid, parallel, laterally somewhat compressed, disc 3-ribbed, the ribs low, parallel. *Epidendrum pachydiscum*, from Huancabamba, Piura, also has smaller leaves, 1.3–4.1 × 0.7–1.2 cm, sepals 5.3–5.8 × 2.4–2.5 mm, and the lip deeply 3-lobed, with the mid-lobe deeply bifid, the lobes somewhat divergent, sub-rectangular, oblique, the outer margin curved and entire, the inner margin dentate to short-fimbriate, sinus widely mucronate, and ecallose, with 3 well-defined, central ribs, the lateral pair somewhat shorter than the mid-rib (Fig. 4).

Species in the *Epidendrum rupestre* Lindley (1841:84) complex are associated with high Andean ecosystems such as forests and Paramo grasslands and are epiphytes of tree genera such as *Polylepis*, *Escallonia*, *Gynoxys* and *Buddleia* Linnaeus (1753:112). This type of ecosystem is important for their conservation.

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## Literature cited

- Acuña-Tarazona, M.E., Hágsater, E. & Santiago, E. (2019) *Epidendrum choccei* (Orchidaceae), a new species from Northern Peru. *Phytotaxa* 394 (1): 98–104.  
<https://doi.org/10.11646/phytotaxa.394.1.7>
- AMO-DATA (2021) Digital database of the Herbario AMO, Instituto Chino, Mexico City. [Accessed September 2021]
- Bennett, D.E & Christenson, E.A. (1993) *Icones Orchidacearum Peruvianarum*. pl. 1–200.
- Bennett, D.E & Christenson, E.A. (1995a) *Icones Orchidacearum Peruvianarum*. pl. 201–300.
- Bennett, D.E & Christenson, E.A. (1995b) *Icones Orchidacearum Peruvianarum*. pl. 301–400.
- Bennett, D.E & Christenson, E.A. (1998) *Icones Orchidacearum Peruvianarum*. pl. 401–600.
- Bennett, D.E & Christenson, E.A. (2001) *Icones Orchidacearum Peruvianarum*. pl. 601–800.
- Boza Espinoza, T.E., Quispe-Melgar, H.R. & Kessler, M. (2019) Taxonomic Reevaluation of the *Polylepis sericea* Complex (Rosaceae), with the Description of a New Species. *Systematic Botany* 44 (2): 324–334.  
<https://doi.org/10.1600/036364419x15562052252225>
- Cassini, A.H.G. de (1827) *Gynoxys*. In: *Dictionnaire des Sciences Naturelles, dans lequel on traite méthodiquement des différents êtres de la nature, considérés soit en eux-mêmes, d'après l'état actuel de nos connoissances, soit relativement à l'utilité qu'en peuvent retirer la médecine, l'agriculture, le commerce et les arts*. Edition 2. 48. Strasbourg. pp. 455.
- Collantes Meza, B. (2014) *Huancavelica: Amaru, paraíso de orquídeas*. Lima: Gobierno Regional de Huancavelica, 338 pp.
- Collantes, B. & Hágsater, E. (2015) *Epidendrum ochoae*. In: Hágsater, E. & L. Sánchez, S. (Eds.) The Genus *Epidendrum*, Part 11. *Icones Orchidacearum* 15 (1): pl. 1546.
- Damian, A. & Hágsater, E. (2016) *Epidendrum yanatilense* (Orchidaceae: Laeliinae), a new species from Cusco, Peru. *Phytotaxa* 246 (4): 287–292.
- Dodson, C.H. & Bennett, Jr, D.E. (1989a) Orchids of Peru. In: *Icones Plantarum Tropicarum* series II. pl. 1–100.
- Dodson, C.H. & Bennett, Jr, D.E. (1989b) Orchids of Peru. In: *Icones Plantarum Tropicarum* series II. pl. 101–200.
- Fjeldså, J. & Kessler, M. (1996) *Conserving the biological diversity of Polylepis woodlands of the Highland of Peru and Bolivia. A contribution to sustainable natural resource management in the Andes (Primera)*. Copenhagen, Denmark: NORDECO.
- Gobierno Regional de Huancavelica (2016) *Ordenanza Regional N° 354-GOB.REG-HVCA/CR*.
- Goicochea, A., Gutiérrez, A., Ruiz, A. & Salas, M. (2019) *Orquídeas del Perú: Relacion de especies y sus sinónimos*. Corporación G y G E.I.R.L, Moyobamba, San Martín. pp. 285.
- Hágsater, E. (2004) *Epidendrum pachydiscum*. In: Hágsater, E. & Sánchez S., L. (Eds.) The Genus *Epidendrum*, Part 4. *Icones*

*Orchidacearum* 7: pl. 773.

- Hágsater, E. (2016) *Epidendrum aida-alvarezii*. In: Hágsater, E. & Sánchez S., L. (Eds.) The Genus *Epidendrum*, Part 11. *Icones Orchidacearum* 15 (2): pl. 1570.
- Hágsater, E. & Santiago, E. (Eds.) (2018a) The Genus *Epidendrum*, Part 12. *Icones Orchidacearum* 16 (1): pl. 1601–1667.
- Hágsater, E. & Santiago, E. (Eds.) (2018b) The Genus *Epidendrum*, Part 12. *Icones Orchidacearum* 16 (2): pl. 1668–1700.
- Hágsater, E. & Santiago, E. (Eds.) (2019) The Genus *Epidendrum*, Part 13. *Icones Orchidacearum* 17 (1): pl. 1701–1756.
- Hágsater, E. & Santiago, E. (Eds.) (2020a) The Genus *Epidendrum*, Part 13. *Icones Orchidacearum* 17 (2): pl. 1757–1800.
- Hágsater, E. & Santiago, E. (Eds.) (2020b) The Genus *Epidendrum*, Part 14. *Icones Orchidacearum* 18 (1): pl. 1801–1848.
- Hágsater, E. & Santiago, E. (Eds.) (2021) The Genus *Epidendrum*, Part 14. *Icones Orchidacearum* 18 (2): pl. 1849–1900.
- Hágsater, E. & Soto, M.A. (2005) *Epidendrum*. In: Pridgeon, A.M., Cribb, P.J., Chase, M.W. & Rasmussen, F.N. (Eds.) *Genera Orchidacearum*, Vol. 4. Epidendroideae (Part One). Oxford University Press. pp. 236–251.
- Herzog, S.K., Martínez, R., Jørgensen, P.M. & Tiessen, H. (2012) Cambio climático y biodiversidad en los Andes Tropicales. In *Cambio Climático y Biodiversidad en los Andes Tropicales*. [[https://www.researchgate.net/publication/245023891\\_Cambio\\_Climatico\\_y\\_Biodiversidad\\_en\\_los\\_Andes\\_Tropicales\\_Fenologa\\_y\\_Relaciones\\_Ecolgicas\\_Interespecficas\\_de\\_la\\_Biota\\_Andina\\_Frente\\_al\\_Cambio\\_Climtico?ev=prf\\_pub](https://www.researchgate.net/publication/245023891_Cambio_Climatico_y_Biodiversidad_en_los_Andes_Tropicales_Fenologa_y_Relaciones_Ecolgicas_Interespecficas_de_la_Biota_Andina_Frente_al_Cambio_Climtico?ev=prf_pub)]
- Karremans, A.P. (2021) With great biodiversity comes great responsibility: the underestimated diversity of *Epidendrum* (Orchidaceae). *Harvard Papers in Botany* 26: 299–369.  
<https://doi.org/10.3100/hpib.v26iss2.2021.n1>
- Kessler, M. (2002) The “*Polylepis* problem”: Where do we stand?. *Ecotropica* 8: 97–110.
- Lindley, J. (1841) *Epidendrum rupeste* in Lindley upon the Genus *Epidendrum*, Hooker’s. *Journal of Botany* 3: 84.
- Linnaeus, C. (1753) *Species Plantarum*, vol. 2. Holmiae, Impensis Laurentii Salvii, 1200 pp.
- Linnaeus, C. (1754) *Flora anglica* [dissertation of I. O. Grufberg]. Uppsala.
- Linnaeus, C. (1763) *Species Plantarum*, ed 2. 2: 1347. [<https://biodiversitylibrary.org&page/11834734>]
- MINAM (2021) Decreto Supremo que establece el Área de Conservación Regional Bosque Nublado Amaru-Huachocolpa-Chihuana. Decreto Supremo N° 032-2021-MINAM. El Peruano. Lima. Available from: <https://busquedas.elperuano.pe/normaslegales/decreto-supremo-que-establece-el-area-de-conservacion-region-decreto-supremo-no-032-2021-minam-2008459-2/?fbclid=IwAR2EKIUmw1Sav3U3YhIgAsPRNlixAcvQswz2UGe1whQkQClqb86qpgbt5Jc> (accessed 8 november 2021)
- Mutis, J.C. (1821) *Escallonia*. In: *A selection of the correspondence of Linnaeus, and other naturalists, from the original manuscripts* [J.E. Smith] 2: 532.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858.  
<https://doi.org/10.1038/35002501>
- Navarro Romo, W.C., Quispe-Melgar, H.R. & Hágsater, E. (2020) *Epidendrum curimarcense* (Orchidaceae), a new species from Central Peru. *Lankesteriana* 20: 7–13.  
<https://doi.org/10.15517/lank.v20i1.40781>
- Pilger, R.K.F. (1906) Rosaceae andinae. *Botanische Jahrbucher für Systematik, Pflanzengeschichte und Pflanzengeographie* 37: 534–539.
- Ruiz López, H. & Pavón, J.A. (1794) *Polylepis*. In: *Florae Peruvianae et Chilensis Prodrromus, sive novorum generum plantarum peruvianum et chilensis descriptions et icones*. 80. Madrid. t. 15.
- Swenson, J.J., Young, B.E., Beck, S., Comer, P., Córdova, J.H., Dyson, J., Embert, D., Encarnación, F., Ferreira, W., Franke, I., Grossman, D., Hernandez, P., Herzog, S.K., Josse, C., Navarro, G., Pacheco, V., Stein, B.A., Timaná, M., Tovar, A., Tovar, C., Vargas, J. & Zambrana-Torrel, C.M. (2012) Plant and animal endemism in the eastern Andean slope: Challenges to conservation. *BMC Ecology* 12 (1): 1–18.  
<https://doi.org/10.1186/1472-6785-12-1>
- Tejedor, N.G. (2014) Impact of Climate Change on Extinction Risk of Montane Tree, Bournemouth University. Available from: <http://eprints.bournemouth.ac.uk/21485/> (accessed 8 April 2020)
- Tejedor, N.G., Newton, A.C., Golicher, D. & Oldfield, S. (2015) The relative impact of climate change on the extinction risk of tree species in the montane tropical Andes. *PLoS ONE* 10 (7): 1–19.  
<https://doi.org/10.1371/journal.pone.0131388>