

NORDIC JOURNAL OF BOTANY

Research article

Passiflora quimiana, a new species from the Cordillera del Cóndor: Ecuador's far-flung frontier

J. R. Kuethe¹✉, Henry Garzón-Suárez², Marco M. Jiménez³, Danilo A. Zavatin⁴ and
Dave Randall Goucher⁵

¹School of Environment, University of Auckland, Auckland, New Zealand

²Herbario HUTPL, Departamento de Ciencias Biológicas, Universidad Técnica Particular de Loja, Loja, Ecuador

³Grupo de Investigación en Biodiversidad, Medio Ambiente y Salud BIOMAS, Carrera de Ingeniería Agroindustrial, Facultad de Ingeniería y Ciencias Aplicadas, Universidad de Las Américas, UDLA, Vía a Nayón, Quito, Ecuador

⁴Department of Botany, Institute of Biosciences, University of São Paulo, Edifício Aylthon Brandão Joly (Herbário SPF), São Paulo, SP, Brazil

⁵Jungle Dave's Science Foundation, San Juan Bosco, Ecuador

Correspondence: J. R. Kuethe (jay.kuethe@auckland.ac.nz)

Nordic Journal of Botany

2025: e04854

doi: [10.1002/njb.04854](https://doi.org/10.1002/njb.04854)

Subject Editor: Isa Lucia de Moraes

Editor-in-Chief: Torbjörn Tyler

Accepted 7 May 2025

Published 3 June 2025

A new species of *Passiflora* subgenus *Decaloba*, supersect. *Decaloba*, from the Cordillera del Cóndor in Ecuador, is described and illustrated, with its morphological similarities to other species being discussed in this paper. *Passiflora quimiana* exhibits the unique combination of narrow ovate to long-oval leaves and small foliaceous bracts. Morphologically it is the most similar to *Passiflora quadriflora* from Peru, from which it differs by the size of the floral organs, the foliaceous bracts, the structure of the corona, with the inner series slightly swollen at the apices, and the raised limen. It is currently known from a single locality only, occurring as a vine in submontane vegetation of sandstone plateaus.

Keywords: *condorita*, *Decaloba*, El Quimi Biological Reserve, Granadilla, Maracuja, Passionflower



Introduction

With nearing a total of 700 species of *Passiflora* Linnaeus (Passifloraceae), this variable genus of plants, vines, lianas and trees, is represented across a wide range of habitats and environments. The number of known species is rapidly growing, with since the start of the 21st century around 3–8 new species being described on a yearly basis (Kuethe 2020, SpeciesLink 2024, TROPICOS 2024). Many of the newly described species come from large, previously unresolved species groups, where the original reference specimens (types) were collected before the year 2000. Other species are distinguished based on clear physical features or visual traits that relate to their specific environment or habitat (Daston 2004, Ulmer and MacDougal 2004). A smaller number of species, however, are discovered through focused fieldwork in remote areas where previous plant collecting and biodiversity surveys have been a lot more scarce. These surveys



www.nordicjbotany.org

© 2025 The Author(s). Nordic Journal of Botany published by John Wiley & Sons Ltd on behalf of Nordic Society Oikos.

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

often lead to the discovery of a higher number of new species across several genera, as the complex interactions between plants, pollinators and predators in these isolated regions create distinct and unique ecological communities (Knapp and Mallet 1984, Kuethe 2020).

During a scouting expedition in April 2018, Andreas Kay ventured to the remote El Quimi Biological Reserve within the Cordillera del Cóndor, located in the far south-east of Ecuador. This largely uninhabited Cordillera, partially shared with bordering Peru, consist of several flat-topped, sandstone mountains reaching elevations of up to 2900 m (Jørgensen 2003, Beck et al. 2008, Chicaiza and Rodríguez-Labajos 2012). The fact that these mountains are largely composed of sandstone delivers an interesting geochemical contrast to the rest of the Andean country, which is mostly comprised of volcanic rock, limestone basins or metamorphic complexes (Duchelle 2007, Almendáriz et al. 2014). The lateritic breakdown of sandstone tends to produce iron-rich clays and quartz-rich sands, which have a circumneutral pH or are slightly alkaline (Chicaiza and Rodríguez-Labajos 2012, Rizwan et al. 2016), rendering much of its native flora [and fauna] unique to this restricted area of the country. Kay photographed a flower, loosely identified as *Passiflora* cf. *quadriflora* Killip on his Flickr account, though did not collect any herbarium (nor living material) to allow study of the plant *ex situ*. *Passiflora quadriflora*, being native to south-central Peru and having setaceous (instead of foliaceous) bracts, makes direct relation between the two species unlikely. Instead, it was abundantly evident that this regarded a new species, with a potential affinity to the vegetatively similar *Passiflora parvipetala* Jørgensen rediscovered by the authorial team in 2022.

In the absence of a type specimen, it is not possible to scientifically define a new species, hence not much could be done with the photographs provided by the late Andreas Kay. The remoteness and inaccessibility of the Cordillera del Cóndor meant that little to no other specimens corresponding with this species could be found in any of the major, nor local herbaria. In December 2022, the authorial team ventured an expedition deep into the Cordillera del Cóndor in the hope to find this interesting species, along with other hereto elusive taxa such as *Passiflora condorita* Jørg., *Passiflora telesiphe* Knapp and Mallet and *Passiflora tessmannii* Harms, and collect the necessary herbarium material. Three subsequent expeditions into the El Quimi reserve were organized in April 2023 and June 2023, and later in May 2024. The second expedition, which focused on surveying the higher subpáramo habitats of the tepuis-like mountains proven successful, and three plants were seen of which herbarium specimens were collected. The 2024 expedition found the species with flower buds and fruit, allowing for the full description of the species based on *in situ* material. Sadly, Andreas Kay passed away long before 'his' species was recognized as being new to science. We hope his early expedition into the El Quimi, his story, and discovery of rare and narrow endemic species remains alive in the new *Passiflora quimiana* sp. nov.: a new species of *Passiflora* subg. *Decaloba* from Ecuador's far-flung frontier.

Material and methods

Targeted field studies to the El Quimi Biological reserve in south-east Ecuador were carried out by the authorial team during December 2022, April 2023, June 2023 and May 2024, which helped to establish ecological and distributional information, as well as an in-depth morphological analysis to determine their taxonomic association with the other species of the genus. All the relevant herbarium databases, including LOJA, CPUN, HUTPL, K, GUAY, CUENC, QCA, QCNE, US, NY and MO have been assessed and studied where possible in support of this manuscript, however. The limited availability of photographs and total absence of relevant specimens from previous collections have made this study almost exclusively reliant on the field observations. Literature studies including the Flora of Ecuador (Holm-Nielsen et al. 1988), previous writings concerning the biodiversity of the Cordillera del Cóndor (e.g. MBG report – www.mobot.org/mobot/research/ecuador/cordillera/introduccion.shtml; EcoMinga report: <http://www.loujost.com/Condor%20Report/CondorReport.htm>; Jørgensen 2003, Neil 2005), and any previous botanical chronicles have been acquired to assess the hereto identified species and any other species that were of interest for this study. The species distribution map was elaborated using the ESRI software, based on field collections, herbaria collections and georeferenced photographic material provided.

Taxonomy

***Passiflora quimiana* Kuethe & H.Garzón sp. nov.**
(Fig. 1–3)

Diagnosis

A species similar to *Passiflora quadriflora*, but differing in the larger flower (>4 cm versus <4 cm), the foliaceous bracts (opposed to setaceous), the vegetative pubescence on both stems and leaves (versus glabrous throughout), the slightly laterally compressed outer corona series (versus filiform), and the capitate structure of the inner corona (versus capillary).

Type: Ecuador, Morona-Santiago province: cantón Gualaquiza, Tepuy de Reserva Biológica El Quimi, parroquia Bomboiza, on top of the sandstone plateau, 03°30'58.0"S, 78°24'31.3"W, 1989 m a.s.l., 16 June 2023, H.Garzón-Suárez, M. Jiménez, L. Vélez, C. Villalta & D. Medina 203 (holotype: HUTPL14834 isotypes: HUTPL).

Etymology

The species is named after the Reserva Biológica El Quimi, one of the biological reserves within the Cordillera del Cóndor and the location of its discovery.

Description

Plant a tendrillate vine; branches (2–)3–4 m, pubescent throughout except for the flowers. Stems striate to

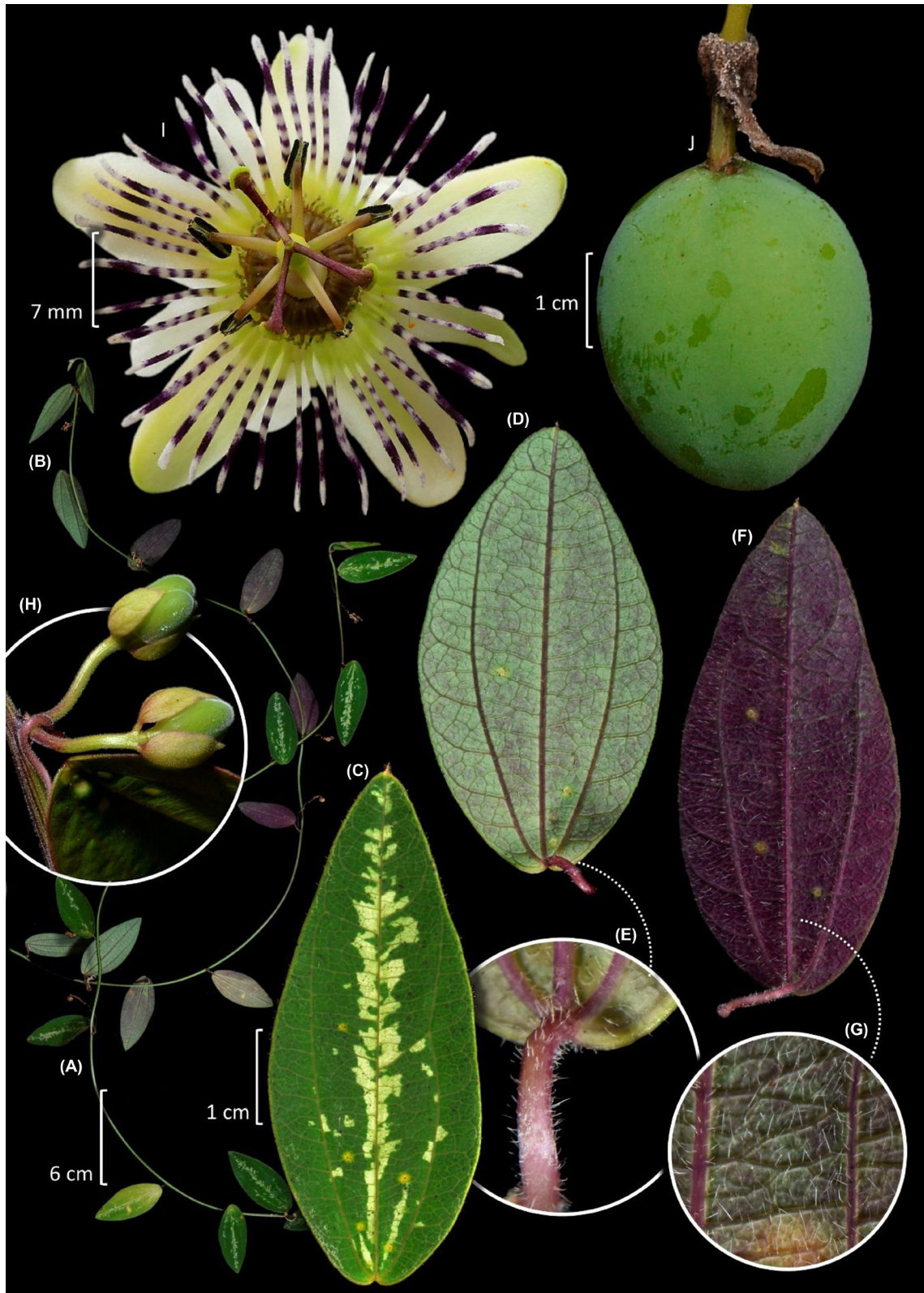


Figure 1. Lankester composite dissection plate (LCDP) of *Passiflora quimiana* sp. nov., showing the morphological anatomy of the species. LCDP constructed by Danilo A. Zavatin and composed of pictures taken by Henry Garzón-Suárez and Andreas Kay.



Figure 2. (A–C) Comparative plate between *Passiflora quimiana* sp. nov. and (D–F) *Passiflora quadriflora* . Note the differences in floral coloration, vegetative vestiture and variegation. Photos taken in situ. Photo courtesy by Henry Garzón-Suárez (B–C); Jhon Yuca (D–F). The late Andreas Kay took photo A.

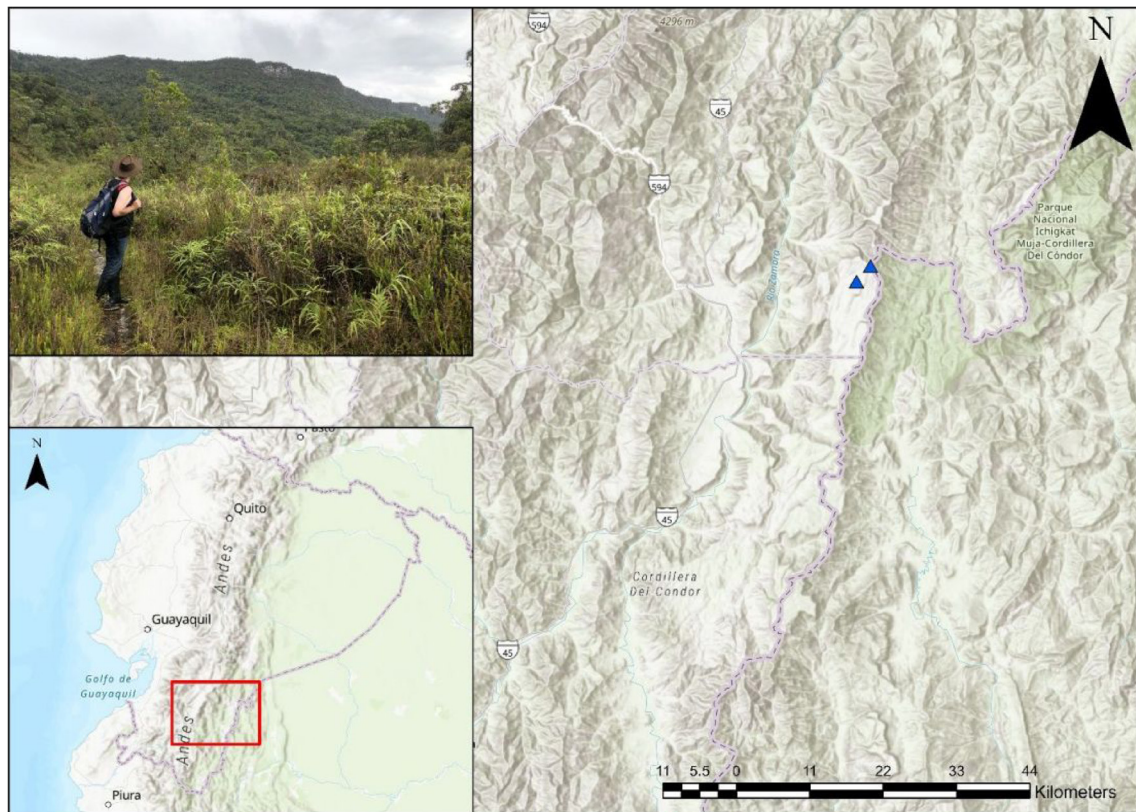


Figure 3. Location of where *Passiflora quimiana* was found. This location is within the El Quimi biological reserve that is part of the greater Cordillera del Cóndor (pictured). Photo courtesy of J.R. Kuethe.

semi-striate, pubescent to tomentose with whitish trichomes 0.5 mm long, especially on the younger stems, green to dark green or purple. Stipules setaceous, blackish to brownish, 3.5–5.0 mm long, often deciduous in older stems. Petiole short, 4–6 mm long, dark purple to dark green, eglandular, pubescent. Leaves simple, long-elliptic to ovate, unlobed or occasionally obscurely 3-lobed at apex, $5.1\text{--}6.7 \times 2.1\text{--}3.0$ cm, partially glabrous to glabrescent on upper surface, pubescent on lower surface, shallowly cordate to rounded at base, rounded to obtuse at apex (if lobation present the lobes are very shallow, obtuse); upper surface occasionally variegated with whitish markings along the median vein; lower surface green, greenish purple or deep purple; margin entire, smooth; venation arcuate, purple on the underside; ocellated with 5–10 (–12) yellow extrafloral glands arranged disorderly between the two lateral veins, sometimes with three glands present at the base of the blade. Inflorescence axillary, showy, single or in pairs. Peduncle terete, greenish to greenish-yellow, 1.5–2.2 cm long, pubescent. Bracts foliaceous, ovate, mucronulate, 3–4 mm long, 1.5–2.5 mm wide, positioned 1.0–1.5 mm below the base of the flower, yellowish green to yellow with a reddish vein terminating into a small mucro ca 0.7 mm long; margins entire. Flowers white with blue-purple, 4.0–4.2 cm in diameter; hypanthium disc-shaped, about 2 mm tall, about 8 mm wide measured at the sepal base, pale green, tomentose; sepals oblong, slightly concave, 14–16 mm long, 6–7 mm wide, pale green and tomentose on the

outside, white on the inside, rounded at apex, ecoriunculate. Petals much smaller than sepals, linear-oblong, 8–10 mm long, 4.0–4.5 mm wide, white, rounded at apex, membranous. Corona in 2 series, blue to purple with 4–5 white to pale purple bands, becoming yellowish-green at base; outer series radiate, slightly laterally compressed, 10–12 mm long, banded in upper 3/4th, yellowish green in lower 1/4th; inner series capitate, with the apices slightly swollen, 2–3 mm long, green to greenish, erect. Operculum deeply plicate, incurved around the base of the androgynophore, 3.5–4.2 mm long, with slightly denticulate margin, brownish-green with slightly purple apices. Androgynophore 8–10 mm tall, whitish-green; limen a large disk, white. Ovary pubescent, $2.0\text{--}3.0 \times 2.0\text{--}2.5$ mm, ellipsoid, green; staminal filament green 4–5 mm long, pollen dark yellow; styles purple, 5 mm long; stigmas green. (Immature) fruit subglobose to ovoid, glabrous except for few isolated trichomes, green.

Phenology

Passiflora quimiana has been observed with flowers and immature fruit in April and June, which in its native Ecuador corresponds with the end of the wet-season.

Distribution and habitat

Passiflora quimiana is endemic to a very small regional distribution restricted to the high, sandstone plateaus of the Cordillera del Cóndor in Morona-Santiago province,

Ecuador. It was seen only on the top of the plateaus of the Reserva Biológica El Quimi due east of Gualaquiza, where the vegetation becomes lower and more stunted giving it the appearance of a sub-páramo habitat. Three plants were seen growing at elevations between 1850 and 2100 m a.s.l., where it appears next to small streams and waterways on partially stoney and clayish soils. Plants were seen only at the summit plateaus of the sandstone tepuis of the Cordillera.

Conservation

Passiflora quimiana is restricted to the remote, higher elevations and subpáramo vegetation of the Cordillera del Cóndor, which form small 'islands habitats' with little to no lateral distribution possible. With only three individual plants seen, the very limited extent of occurrence (EOO) of 7.5 km² and an area of occupancy (AOO) of less than 20 km² easily scale *P. quimiana* as 'Critically Endangered' (CR) in accordance with the IUCN criteria B1a and C2a (IUCN 2024). However, the El Quimi region is classified as a Biological Reserve, meaning it is protected under the Sistema Nacional de Áreas Protegidas del Ecuador (SNAP), and mining or milling of any kind is outlawed (<http://areasprotegidas.ambiente.gob.ec/>). Conservation efforts (through local reproduction [cuttings]). Monitoring efforts have been initiated by the authorial team to help protect the longevity of this population.

Similar species

According to the current taxonomic treatment (Feuillet and MacDougal 2003), the new *Passiflora quimiana* belongs to *P.* subgen. *Decaloba*, supersect. *Decaloba*, sect. *Decaloba* (DC.) J.M.MacDougal and Feuillet since it has relatively small flowers, small setaceous stipules, and eglandular petioles. Within this taxonomic alliance, *P. quimiana* belongs to a small group of six species that have foliaceous bracts, four of those found within central and eastern Ecuador to northern Peru (*i.e.* *Passiflora hirtiflora* Jørg. and Holm-Niels, *Passiflora telesiphe* Knapp and Mallet, *Passiflora carnosiseipala* Jørg. and *Passiflora subpurpurea* Jørg. and Holm-Niels). Unlike those aforementioned species, the bracts in this new species do not fully envelop the bud or base of the flower at any stage.

Passiflora quimiana displays a unique combination of traits that are not seen in any other member of this taxonomic lineage. The ovate, solely unlobed leaves are unusual within *P.* subgen. *Decaloba*, with all other bracteate species having 2–3-lobed to transverse foliar shapes maintaining distinct apical lobation. The structure of the flower and the presence of the small but foliaceous bracts suggest a close relationship to *Passiflora parvipetala*. However, the two species can easily be identified by the shape and texture of their vegetative anatomy, which extends to the degree of vestiture (noticeably more tomentose in *Passiflora parvipetala* opposed to the partially pubescent indument of *Passiflora quimiana*); colour of the foliage (dark green with purple variegation versus reddish green with red and purple variegation to green throughout [as seen in leaves lower to the stem]), and by the apical lobation which is obscurely 3-lobed in *P. parvipetala*, but unlobed in *P. quimiana*. The flowers differ significantly in size (> 4

cm in *P. quimiana* opposed to < 3 cm in *P. parvipetala*); and petal-sepal ratio, where in *P. quimiana* the ratio is around 1:2 while in *P. parvipetala* the ratio is 1:5th.

Comparing *Passiflora quimiana* to *Passiflora quadriflora* shows a closer vegetative similarity, but is distinct by the difference in vestiture with *P. quimiana* being vegetatively pubescent while *P. quadriflora* is glabrous throughout. In flower, *P. quimiana* is very easily distinguishable from *P. quadriflora* by almost all its floral traits: including size (>4 cm for *P. quimiana* opposed to <4 cm for *P. quadriflora*), bracts (foliaceous versus setaceous), limen structure (raised disk and white versus shallowly campanulate and deep purple), and the texture of the coronal structure (the outer series being laterally compressed versus very finely filiform throughout; and the inner series being capitate versus filiform). Furthermore, *Passiflora quadriflora* is endemic to the premontane dry forests of southern and central Peru, whereas *Passiflora quimiana* is endemic to the montane sandstone plateaus of the Ecuadorean Cordillera del Cóndor. This disjunct distribution would not permit direct genetic interchange between the two species, but the vague floral- and vegetative similarity may be the result of having a common species-interaction.

Final remarks

As accessibility is slowly improving across the Ecuadorean south-east, more and more new species from various genera and families are being added to the endemic flora of the Cordillera del Cóndor (Clark and Neill 2023, Jaramillo 2023, Jimenez et al. 2024, Molino et al. 2025). *Passiflora quimiana* is the second species (after *P. condorita*) restricted to the Cordillera, and it is likely more species will be uncovered in the future and we hope continual expeditions to this region will include Passifloraceae during their surveys. The habitats of the Cordillera are vastly diverse and cover a wide range of valleys, elevations, summits and ecosystems.

As with many remote and biodiverse habitats in Ecuador, mining and the prospective trove of natural resources within the bedrock of the Cordillera presents an enormous concern to the preservation and conservation of its unique biodiversity. Already, large mining corporations have been seen operating within the Cordillera del Cóndor, many of which not applying sustainable practices and cause significant damage to the fragile ecosystem and ecosystems downstream. For example, during the short period between our initial visit to the Cordillera in December 2022, and the writing of this manuscript in July 2024, the location of the first sighting for *Passiflora tessmannii* within Ecuador, which was in the Cordillera del Cóndor nearby San Juan Bosco, has been destroyed by the expansion of a gold mine, rendering this species possibly removed from Ecuador before its actual recognition as such within the Ecuadorean Flora (Kuethe et al. pers. obs.). This really amplifies the importance of our work and that of similar researchers, to document, preserve and publish about the biodiversity of these remote, yet so ecologically important regions in these far-flung frontiers.

Acknowledgements – We would like to thank Francisco Tobar, Hernan Dario Bernal, Miguel Molinari and Martin Wettges for joining us in Ecuador, where we collected this species within its native habitat. We thank the curators from the HUTPL, GUAY, QCA and QCNE herbaria for sharing their databases during our searches for representative specimens. We would also like to thank the other curators of the herbaria listed for providing access to the collections by digitizing the vouchers so we could study the material remotely. We thank the Universidad Técnica Particular de Loja herbarium (HUTPL) for their support in the development of this research. The Ministerio del Ambiente, Agua y Transición Ecológica (MAATE) of Ecuador is acknowledged for granting the research permit MAATEDBI-CM-2022-0248. We thank Christian Villalta, Digner Medina and Leisberth Vélez-Abarca for their support and help in the field. We acknowledge Patricio Páucar, administrator of the El Quimi Biological Reserve, for allowing entry to the reserve. Park rangers Ámbar Cárdenas and Juan Carlos Fernández are thanked for guiding in the field. Open access publishing facilitated by The University of Auckland, as part of the Wiley – The University of Auckland agreement via the Council of Australian University Librarians.

Funding – MMJ thanks Universidad de Las Américas (UDLA) for funding orchid research in Ecuador, grant no. AGR.GID.22.01, part of which allowing visitation to the site.

Author contributions

J. R. Kuethe: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Supervision (equal); Validation (equal); Writing—original draft (equal); Writing—review and editing (equal). **Henry Garzón-Suárez:** Conceptualization (equal); Data curation (equal); Investigation (equal); Methodology (equal); Resources (equal); Visualization (equal). **Marco M. Jiménez:** Conceptualization (equal); Data curation (equal); Funding acquisition (equal); Investigation (equal); Methodology (equal); Resources (equal); Visualization (equal). **Danilo A. Zavatin:** Conceptualization (equal); Investigation (equal); Software (equal); Visualization (equal). **David Randall Goucher:** Funding acquisition (equal); Project administration (equal); Resources (equal); Visualization (equal); Writing—review and editing (equal).

Data availability statement

This article has no additional data.

References

- Almendáriz, A., Simmons, J. E., Brito, J. and Vaca-Guerrero, J. 2014. Overview of the herpetofauna of the unexplored Cordillera del Cóndor of Ecuador. – *Amphibian Reptile Conserv.* 8: 45–64 (e82).
- Beck, E., Makeschin, F., Haubrich, F., Richter, M., Bendix, J. and Valerezo, C. 2008. The ecosystem (Reserva Biológica San Francisco). – In: *Gradients in a tropical mountain ecosystem of Ecuador*, vol 198. Springer. https://doi.org/10.1007/978-3-540-73526-7_1
- Chicaiza, G. and Rodríguez-Labajos, B. 2012. Cordillera del Cóndor: frontera límite hacia la gran minería. – *Acción Ecológica*.
- Clark, J. L. and Neill, D. A. 2023. *Amanocondorensis* (Phyllanthaceae), a new shrubby species from the Cordillera del Condor in southern Ecuador. – *PhytoKeys* 227: 89.
- Daston, L. 2004. Type specimens and scientific memory. – *Crit. Inq.* 31: 153–182.
- Duchelle, A. E. 2007. Observations on natural resource use and conservation by the Shuar in Ecuador's Cordillera del Condor. – *Ethnobot. Res. Appl.* 5: 5–23.
- Feuillet, C. and MacDougal, J. M. 2003. A new infrageneric classification of *Passiflora* L. (Passifloraceae). *Passiflora*. – *J. Newsl. Passiflora Soc. Int.* 13: 34–38.
- Holm-Nielsen, L. B., Jørgensen, P. M. and Lawesson, J. E. 1988. 126. Passifloraceae. – In: Harling, G. W. and Sparre, B. B. (eds), *Flora Ecuador*. University of Göteborg and Swedish Museum of Natural History, pp. 1–130.
- IUCN 2024. Guidelines for Using the IUCN Red List Categories and Criteria. Version 16. Prepared by the Standards and Petitions Committee. – <https://www.iucnredlist.org/documents/RedListGuidelines.pdf>
- Jaramillo, M. A. 2023. *Piper alwynii* (Piperaceae), a new species from the Cordillera del Cóndor at the border of Peru and Ecuador. – *Novon A J. Bot. Nomenclature* 31: 255–261.
- Jimenez, M. M., Iturralde, G. A., Fierro Minda, A., Ocupa-Horna, L., Mendoza, J. and Garzon-Suarez, H. X. 2024. A new species of *Meriania* (Melastomataceae: Merianieae) with winged hypanthium from the Cordillera del Condor in Ecuador. – *Phytotaxa* 637: 73–86.
- Jørgensen, P. M. 2003. Three new species of *Passiflora* subgenus *Decaloba* (Passifloraceae) from Ecuador. – *Nord. J. Bot.* 23: 11–19.
- Knapp, S. D. and Mallet, J. 1984. Two new species of *Passiflora* (Passifloraceae) from Panama, with comments on their natural history. – *Ann. Mo. Bot. Gard.* 71: 1070–1074, f. 2.
- Knapp, S. and Mallet, J. 1998. A new species of *Passiflora* (Passifloraceae) from Ecuador with notes on the natural history of its herbivore, *Heliconius* (Lepidoptera: Nymphalidae: Heliconiiti). – *Novon* 8: 162–166.
- Kuethe, J. R. 2020. *Passiflora* – list of recognized species – 2020. – ResearchGate.
- Molino, S., Zapata, J. N., Heal, D. and Testo, W. L. 2025. *Parablechnum shuariorum* (Blechnaceae), a new fern species from the Cordillera del Cóndor. – *Brittonia* 2025: 33–39.
- Neill, D. A. 2005. Cordillera del Cóndor. Botanical treasures between the Andes and the Amazon. – *Plant Talk* 41: 17–21.
- Rizwan, M., Ali, S., Qayyum, M. F., Ibrahim, M., Zia-ur-Rehman, M., Abbas, T. and Ok, Y. S. 2016. Mechanisms of biochar-mediated alleviation of toxicity of trace elements in plants: a critical review. – *Environ. Sci. Pollut. Res. Int.* 23: 2230–2248.
- SpeciesLink network 2023-2024. – www.specieslink.net/search.
- TROPICOS 2024. Tropicos.org: Nomenclatural, bibliographic, and specimen data accumulated in MBG's electronic databases. – *Miss. Bot. Gard.*
- Ulmer, T. and MacDougal, J. M. 2004. *Passiflora*: passionflowers of the world. – Timber Press.