Phytotaxa 579 (1): 047–053
https://www.mapress.com/pt/

Article

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

https://doi.org/10.11646/phytotaxa.579.1.5

Three new species of *Valeriana* (Valerianoideae, Caprifoliaceae) from southern Ecuador

CLAES PERSSON[1,6]*, BENTE ERIKSEN[2,7], ÁLVARO J. PÉREZ[3,8], J. NICOLÁS ZAPATA[3,4,9], THOMAS L.P. COUVREUR[3,4,10] & PETR SKLENÁŘ[5,11]

[1] *Department of Biological and Environmental Sciences, University of Gothenburg, P. O. Box 461, 40530 Göteborg, Sweden.*
[2] *Botanical Garden, Lund University, Östra Vallgatan 20, 223 61 Lund, Sweden.*
[3] *Herbario QCA, Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Apartado 17-01-2184, Quito, Ecuador.*
[4] *DIADE, Univ Montpellier, CIRAD, IRD, Montpellier, France.*
[5] *Department of Botany, Faculty of Science, Charles University in Prague, Benátská 2, CZ-128 01 Prague, Czech Republic.*
[6] *claes.persson@bioenv.gu.se; https://orcid.org/0000-0003-3499-3373*
[7] *bente.eriksen@botan.lu.se; https://orcid.org/0000-0002-6797-5262*
[8] *alvaro.perez.castaneda@gmail.com; https://orcid.org/0000-0002-0644-9111*
[9] *josenicozb@gmail.com; https://orcid.org/0000-0002-2863-6524*
[10] *thomas.couvreur@ird.fr; https://orcid.org/0000-0002-8509-6587*
[11] *petr.sklenar@natur.cuni.cz; https://orcid.org/0000-0003-0429-2621*
**Corresponding author*

Abstract

Three new species of *Valeriana* from southern Ecuador are described and illustrated. *Valeriana plateadensis* is found near the highest peak of Cerro Plateado in Cordillera del Cóndor at 2900 m a.s.l. and is recognized by the shrubby habit and sessile, densely imbricate, spatulate leaves and 3-lobed corollas. *V. yacuriensis* is found near Lagunas Negras de Jimbura in the Parque Nacional Yacurí at 3500 m a.s.l. and is recognized by the shrubby habit, petiolate leaves and 3-lobed corollas. *V. xenophylloides* is found in the Páramo de Patococha at 3400 m a.s.l. and is recognized by its cushion growth form, the crown of trichomes at the leaf apex and 3-lobed corollas.

Resumen

Tres nuevas especies de *Valeriana* del sur del Ecuador son descritas e ilustradas. *Valeriana plateadensis* se la encuentra cerca de la cima del Cerro Plateado en la Cordillera del Cóndor a 2900 m y se la reconoce por su hábito arbustivo hojas espatuladas, sésiles, densamente imbricadas, y la corola 3-lobada. *V. yacuriensis* se la encuentra cerca a la Lagunas Negras de Jimbura en el Parque Nacional Yacuri a 3500 m y se la reconoce por su hábito arbustivo, hojas pecioladas, y la corola 3-lobada. *V. xenophylloides* se la encuentra en el Páramo de Patacocha a 3400 m y se la reconoce por su crecimiento en forma de almohadilla, el ápice la hoja con una corona de tricomas, y la corola 3-lobada.

Keywords: Azuay, Loja, Paramo flora, Reserva Biológica Cerro Plateado, Yacurí National Park, Zamora-Chinchipe

Introduction

Valeriana Linnaeus (1753: 31) is a widespread genus of 200–300 species that are distributed in Eurasia, Southern Africa, and all over the American continents (Rabuske-Silva *et al.* 2018, 2020). The Andean region is particularly species-rich and harbor about two-thirds of the species. *Valeriana* is characterized by being rhizomatous, often rosulate herbs, or subshrubs, shrubs, small trees, or lianas. The flowers are unisexual or hermaphroditic and often arranged in thyrse-like inflorescences or dense clusters. The corollas are white, yellow, or of various reddish colours, infundibuliform, salverform, or tubular with (3–)5 usually unequal lobes and 3(–4) stamens. The calyx is vestigial but may develop an initially involute plumose pappus in fruit. *Valeriana* was previously a member of Valerianaceae Batsch, a family which was traditionally included in Dipsacales (Bittrich & Kadereit 2016, Weberling & Bittrich 2016). Phylogenetic

Accepted by Robert Philipp Wagensommer: 21 Dec. 2022; published: 13 Jan. 2023

analyses, however, show that Valerianaceae and other Dipsacales families are nested within Caprifoliaceae (Donoghue *et al.* 2001). To avoid paraphyly of Caprifoliaceae, most of the families in Dipsacales (incl. Valerianaceae) must be included in Caprifoliaceae; another option is to raise several tribes of Caprifoliaceae s.s. to family rank. Here we follow the first, widely accepted option (APG III 2009).

Fieldwork in the Andes of southern Ecuador has revealed three new species of *Valeriana*, one cushion-forming species from the province of Azuay, and two small shrubs from the provinces of Loja and Zamora-Chinchipe. All three species have 3-merous corollas, rudimentary calyces, and fused involucral bracts, features that were used for segregating the high Andean genera *Phyllactis* Persoon (1805: 39) and *Belonanthus* Graebner (1906a: 447) (see e.g. Eriksen 1989, Weberling & Bittrich 2016). Molecular phylogenetic analyses based on the ITS region and several plastid loci show, however, that *Phyllactis* and *Belonanthus* are nested in *Valeriana* (Bell & Donoghue 2005, Bell *et al.* 2012), where they form a clade together with *Valeriana* Sect. *aretiastrum* Candolle (1830: 633). This clade is in turn part of a greater clade comprising nearly all the species inhabiting the paramo of the tropical high Andes. Although not confirmed by molecular data, morphological characters of the three species described here relate them closely to the former clade.

Taxonomic treatment

1. *Valeriana plateadensis* Á.J. Pérez, C. Persson & J.N. Zapata, *sp. nov.*—Figures 1 A–C, 2 A–E

Type: ECUADOR. Zamora-Chinchipe: Cantón Nangaritza, Parroquia Nuevo Paraíso. Reserva Biológica Cerro Plateado, [la cima de la meseta], -4.6194445, -78.7830556, 2900 m, 8 August 2021 (fl), *A.J. Pérez, N. Zapata, T.L.P. Couvreur, C. Persson, R. Paqui, R. Cabrera & W. Santillán 11704* (holotype QCA-244410; isotypes GB-0210405, PRC).

Shrub 20–25 cm tall with ± erect branches. Stem and branches terete covered with dead leaves basally, 0.5 to 1 cm wide (incl. leaves), slightly wider at the head-like top, branching rhythmic with 3–7 branches at each node. Leaves seemingly spirally arranged (but actually positioned in multiple ranks) and overlapping, sessile, glabrous, coriaceous, spatulate and sharply bent, proximal portion canaliculate, 5 × 1 mm, adpressed tightly to the shoot, distal portion widely oblong 2.1–2.3 × 2–2.2 mm, with rounded apex, above slightly concave with thickened margin, below sometimes with a raised narrowly triangular portion, fresh leaves generally spreading (forming an angle of 90° to the shoot), or in the uppermost portion of the shoots ascending to erect, dried and dead leaves the outer portion generally facing downwards. Inflorescence a loose cluster of up to 12 flowers at the top/end of the shoots, partial inflorescences of 2–3 flowers subtended by an opposite pair of involucral bracts that are entirely or fused in for 2/3. Flowers hermaphrodite? (neither pollen nor ovules seen); calyx vestigial; corolla funnelform, white, 3-lobed, the tube obconical, 3–3.5 mm long, 0.2 to 1.5 mm wide, the lobes widely ovate, ca 1.5 × 1 mm, apex obtuse; stamens 3, exserted, the filaments white, flattened, 2.5 mm long, inserted in the upper portion of the tube, anthers 0.2 × 0.1 mm; style slightly exserted, the stigma capitate, the ovary cylindrical 0.7 × 0.3 mm, glabrous with 1 pendent ovule. Fruits unknown.

Additional specimens examined: ECUADOR. Zamora-Chinchipe, Nangaritza, Cordillera del Cóndor, Reserva Biológica Cerro Plateado, gently sloping summit area of Cerro Plateado, 4°37’10”S, 78°46’59”W, 2915 m, 24 August 2012 (fl), *D. Neill, M. Asanza & E. Cueva 17494* (ECUAMZ); en la cima de la meseta, -4.6194445, -78.7830556, 2900 m, 23 September 2016 (fl), *Á.J. Pérez, N. Zapata & W. Santillán 10175* (QCA-244424); 2850–2900 m, 27 September 2016 (fl), *Á.J. Pérez, N. Zapata & W. Santillán 10329* (QCA-244532).

Valeriana plateadensis is distinguished from other *Valeriana* species of the high Andes with 3-lobed corollas by being small sparsely branched shrubs with small spatulate and sharply bent densely set leaves in multiple ranks.

Distribution and habitat:—*Valeriana plateadensis* is an endemic species to Cerro Plateado, Cordillera del Cóndor in southeast Ecuador where it has been collected on sandstone soil between rocks on the top of the Andean tepui at 2900 m (Figure 3A). Associated plants include *Symplocos neillii* Ståhl (2010: 86), *Diplostephium* sp. nov, *Chusquea nana* (Clark) Clark (2009: 681) and *Drosera peruensis* Silva & Correa (2002: 543) (Figure 3A).

Conservation status: Only one population with ca. 40 mature individuals of this species were discovered at the type locality at the summit of the Cerro Plateado. It is an isolated area and difficult to access; nevertheless, climate change effects could affect the distribution and population size of this species negatively. According to the IUCN Red List criteria (IUCN 2022) this species is therefore assessed as Vulnerable (VU, Criterion D2).

Phenology: Flowers were collected in August and September.

Etymology: The specific epithet of this species refers to Cerro Plateado in the Cordillera del Cóndor in southeastern Ecuador which is the only known locality for this species.

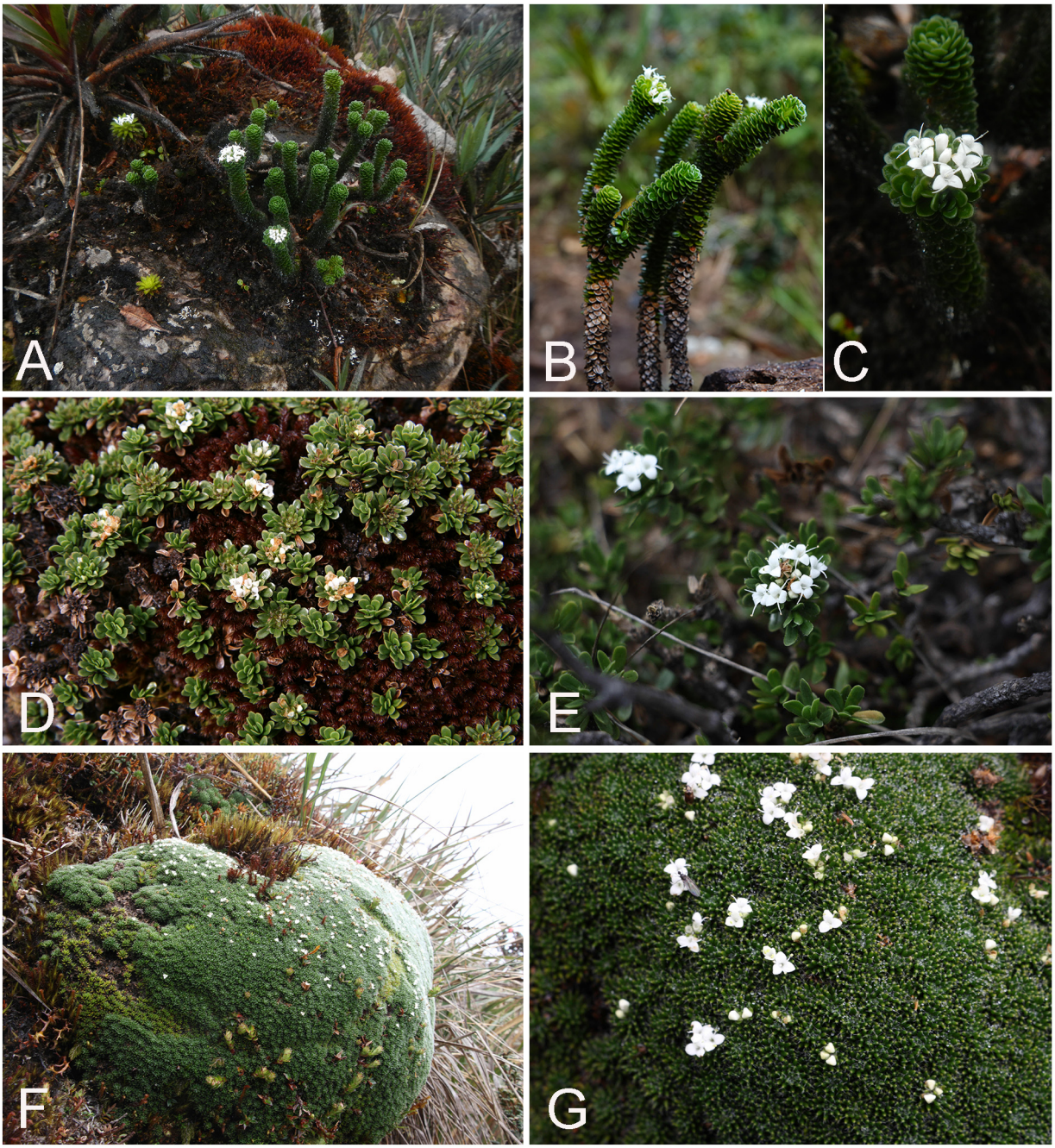

FIGURE 1. A–C. *Valeriana plateadensis*. D–E. *V. yacuriensis*. F–G. *V. xenophylloides*. A, D, F. Habit. B. Close up of branches. C, E, G. Close up of inflorescence, showing 3-merous flowers. Photographs by Álvaro J. Pérez (A, C), Claes Persson (B), Petr Sklenář (D–G).

2. *Valeriana yacuriensis* Sklenář & B.Eriksen, *sp. nov.*—Figures 1 D–E, 2 F–J

Type: ECUADOR. Loja: Cordillera las Lagunillas (de Sabanilla), paramo de las Lagunas Negras [Parque Nacional Yacurí], S4° 42' 36'', W79° 25' 44'', 3500 m, 16 June 2009 (fl), *P. Sklenar, J. Mackova, & P. Macek 12053* (holotype PRC; isotypes GB-0210434, QCA-188696).

Shrubs to 40 cm tall, branched stems ascending to erect, terete, to 4.1 mm in diameter. Leaves numerous, well-spaced basally but becoming densely clustered in the upper part of the branches; the petiole persistent, triangular, flat, sheathing, 1.6–1.7 mm broad basally, ca 2.2 mm long, green distally, whitish-brown with violet streaks basally when young, sparsely ciliate along the margins; the lamina spreading, glossy-green, tubercled, glabrous, flat to shallowly canaliculate towards the petiole, grooved adaxially, ca 0.3 mm thick, oblong to obovate, 4.6–6.3 × 1.7–2.1 mm, the apex obtuse, the margin entire, rarely with a few cilia basally. Inflorescence capitoid, 6–20-flowered, sessile, the bracts leaf-like, ovate, 0.8–1.6 x 2.8–3.8 mm, acute. Flowers gynodioecious; calyx vestigial; corolla white, 3-lobed, narrowly

funnelform, the tube to 4.2 mm long, the lobes triangular, 1.3–1.7 × 0.9–1.4 mm, spreading and recurved, the apex obtuse; stamens exserted to 2.1 mm, spreading, the thecae 0.35–0.46 mm long; pistil with the style exserted to 2.7 mm, 3-parted, the branches ca 0.15 mm long. Fruits unknown.

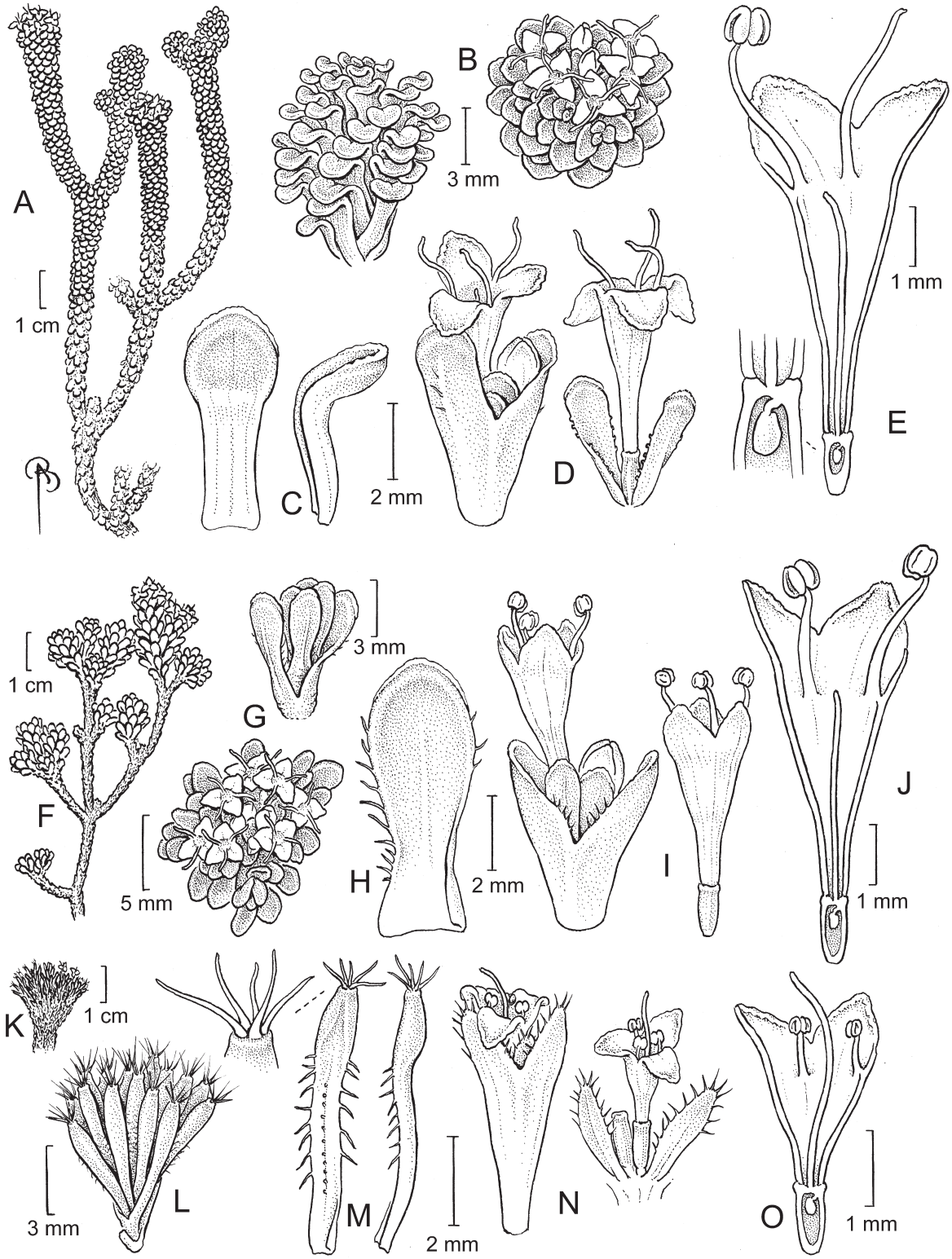

FIGURE 2. A–E. *Valeriana plateadensis*. A. Habit. B. Side view of shoot (left), top view with flowers (right). C. Leaves in top view (left) and side view (right). D. Flower and bracts. E. Longitudinal section of ovary with hanging ovule (left) and of flower (right). F–J. *V. yacuriensis*. F. Habit. G. Side view of shoot (up), top view with flowers (down). H. Leaves in top view. I. Flower and bracts (left), front view of flower (right). J. Longitudinal section of flower. K–O. *V. xenophylloides*. K. Habit. L. Side view of shoot. M. Leaves in top view (left), side view (right) and the crown of trichomes at the leaf apex (up left). N. Flower and bracts (left), front view of flower (right). O. Longitudinal section of flower. Line drawings by Bobbi Angell.

Additional specimens examined: ECUADOR. Loja: Parque Nacional Yacurí, around the upper Laguna Negra, W79°25'27", S04°42'51", 3325 m, 7 November 2018, *Sklenar P., Ptacek J., Klimesova J., Klimes A. 15684* (PRC, QCA-241671).

Valeriana yacuriensis is distinguished from the other 3-lobed species of *Valeriana* in Ecuador and northern Peru by the shrubby habit and petiolate leaves which are distinctly clustered apically. *Valeriana imbricata* Killip (1928: 501) and *V. plateadensis* are shrubs but have (sub)sessile, closely imbricate leaves which are persistent throughout the stem, whereas *V. xenophylloides* (described below) is cushion-forming.

Distribution and habitat:—*Valeriana yacuriensis* was collected twice at the type locality, i.e., in humid paramo grasslands with scattered shrubs around the Laguna Negra in the Parque Nacional Yacurí (Figure 3B). Since the locality occurs at the Ecuador-Peruvian border, the occurrence of the species in the latter country is likely.

Conservation status: Data deficient (DD); as *Valeriana yacuriensis* has only been collected twice from the type locality it is obvious that more field work is needed in order to assess the conservation status according to the IUCN criteria properly (IUCN 2022).

Phenology: Flowers were observed in July and November which indicates that the population of the species has a very extended (perhaps continuous) period of flowering.

Etymology: The epithet refers to the name of the Parque Nacional Yacurí where the species was found.

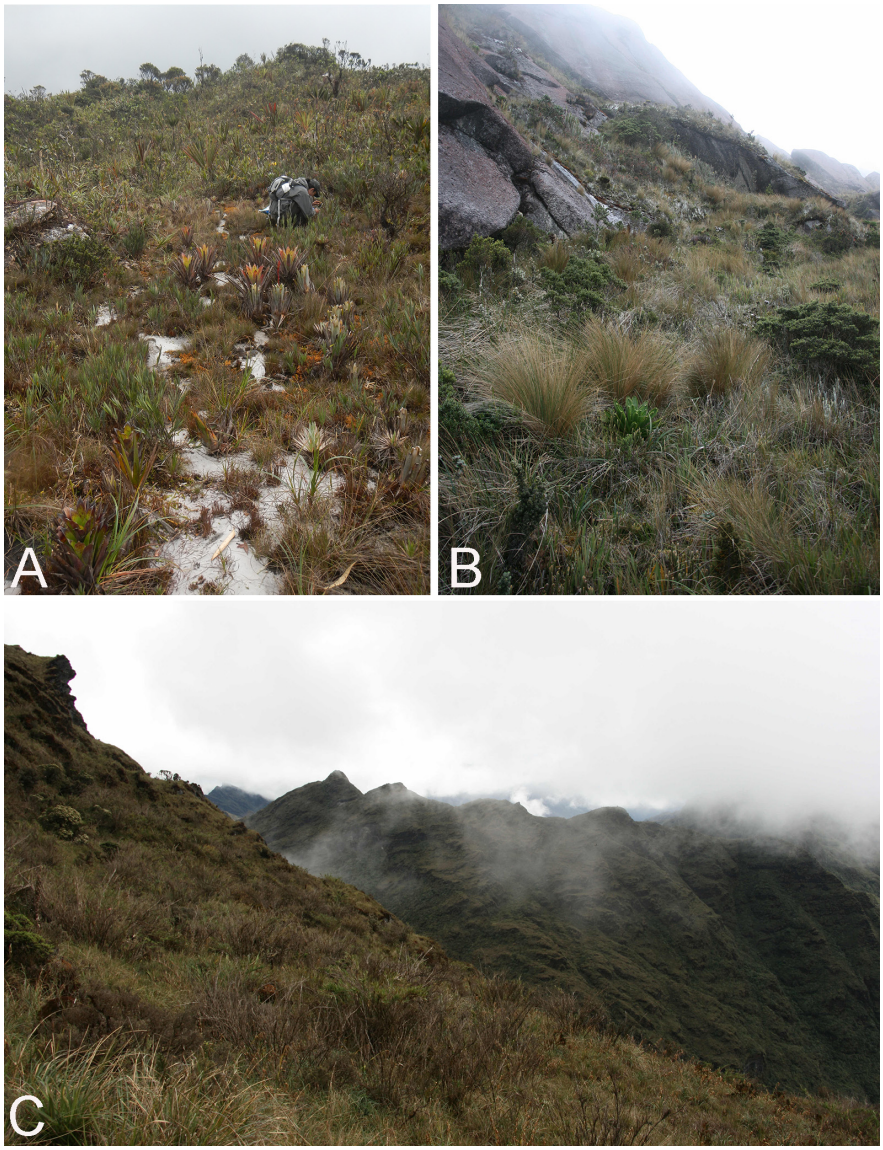

FIGURE 3. A. Habitat of *Valeriana plateadensis* at the summit of the Cerro Plateado Biological Reserve. Photograph by Álvaro J. Pérez. B. Habitat of *Valeriana yacuriensis* at the Lagunas Negras in the Páramo de Jimbura, Yacuri National Park. Photograph by Petr Sklenář. C. Habitat of *Valeriana xenophylloides* in the Páramo de Patococha. Photograph by Petr Sklenář.

3. *Valeriana xenophylloides* Sklenář & B.Eriksen, *sp. nov.*—Figures 1 F–G, 2 K–O

Type: ECUADOR. Azuay: Páramo de Patococha, road Gualaceo-Limón, to the south of the military antennas, W78°40'09'', S03°02' 02'', 3400 m, 1 November 2018 (fl), *P. Sklenar, Klimes A. 15580* (holotype PRC; isotype QCA-242019).

Plants forming semi-globose cushions to 30 cm large. Stems terete, woody, 1.5–1.9 mm in diameter near the base, the upper branches 1.6–2.1 mm in diameter including leaves. Leaves numerous, persistent, only the terminal ones green; petiole white to pale brown with violet streaks, flat, appressed, to 3.7 mm long and 0.5 mm broad, ciliate along the margins; lamina erect to spreading, glossy-green, tubercled, flat to semi-terete, to 0.5 mm thick, narrowly ovate, 1.5–1.9 × 0.6–0.9 mm, the apex obtuse, crowned with (4–)6–8(–11) spreading to erect pellucid trichomes to 0.8 mm long. Inflorescences capitoid, 1–3-flowered, (sub)sessile with the peduncles to 0.5 mm long, the outer bracts leaf-like, ovate, 1.4–1.9 × 0.8–1.2 mm, the inner bracts oblong, 1.2–1.7 × 0.5–0.8 mm, both type of bracts ciliate along the margins and with a few pellucid trichomes at the apex. Flowers gynodioecious; calyx vestigial; corolla white, 3-lobed, funnelform, the tube 1.4–1.8 mm long, the lobes spreading, triangular to ovate, obtuse, 0.9–1.3 × 0.7–1 mm; stamens exserted and spreading, the thecae oblong, 0.16–0.24 mm long; pistil with the style exserted to 1.5 mm, 2-parted, the branches to 0.13 mm long. Fruits unknown.

Among the high-elevation species of *Valeriana* from the tropical Andes, the cushion habit is also present in *V. aschersoniana* Graebner (1945: 37) from Peru and *V. aretioides* Kunth (1819: 324) from Ecuador–Colombia (Weberling & Uhlarz 1977, Eriksen 1989). However, both species have typically 5-lobed corollas, although flowers are occasionally 3–4-lobed in *V. aschersoniana* (Weberling & Stützel 2006) and 4-lobed in *V. aretioides* (Eriksen 1989), and leaf laminas lack the distinct crown of trichomes at the apex (Weberling & Uhlarz 1977), which provides the cushions of *V. xenophylloides* a slightly silvery-white appearance. Moreover, the flowers of *V. aretioides* are yellow. Confusion with other species of *Valeriana* is unlikely.

Distribution and habitat:—*Valeriana xenophylloides* was collected only once in a very humid bamboo-shrub páramo of southern Ecuador. It grew in patches of open vegetation on wet slopes with a rich cover of bryophytes and lichens (Figure 3C). Only a few individual cushions were observed but more plants can be expected to occur at higher elevations.

Conservation status: Data deficient (DD); as only a few individuals have been observed from one locality more field work is needed to assess the conservation status according to the IUCN criteria properly (IUCN 2022).

Phenology: Flowers were collected in November.

Etymology: The habit of *Valeriana xenophylloides* resembles *Xenophyllum humile* (Kunth) (1820: 150) Funk (1997: 239), a distinct cushion-forming Asteraceae species which is commonly found in the paramos of Ecuador and the epithet of the new species refers to this resemblance.

Acknowledgements

The fieldwork was supported by the permits issued by the Ministerio del Ambiente, Agua y Transición Ecológica del Ecuador (No. 09-IC-FLO-DNB/MAE, MAE-DNB-CM-2015-0031, MAE-ARSFC-2020-0473). The research of PS in Ecuador was funded by the Grant Agency of the Czech Republic (project no. 17-12420S). The expedition to Cerro Plateado in 2016 was supported by Secretaría de Educación Superior, Ciencia, Tecnología e Innovación de la República del Ecuador (SENESCYT, Arca de Noé Initiative; S. R. Ron and O.Torres–Carvajal, Principal Investigators) and in 2021 by the International Palm Society (IPS) Endowment Fund and the University of Gothenburg, the expedition also received partial funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement No. 865787, GLOBAL project). The Pontificia Universidad Católica del Ecuador and Herbario QCA provided logistic and technical facilities after the trips.

References

APG III (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of Linnean Society* 161: 105–121. https://doi.org/10.1111/j.1095-8339.2009.00996.x

Bell, C.D. (2004) Preliminary phylogeny of Valerianaceae (Dipsacales) inferred from nuclear and chloroplast DNA sequence data.

Molecular Phylogenetics and Evolution 31 (1): 340–350.
https://doi.org/10.1016/j.ympev.2003.07.006

Bell, C.D. & Donoghue, M.J. (2005) Phylogeny and biogeography of Valerianaceae (Dipsacales) with special reference to the South American valerians. *Organisms Diversity & Evolution* 5 (2): 147–159.
https://doi.org/10.1016/j.ode.2004.10.014

Bittrich, V. & Kadereit, J.W. (2016) Introduction to the orders and families of uncertain placement of this volume. *In: Flowering Plants. Eudicots.* Springer, Cham, pp. 1–18.
https://doi.org/10.1007/978-3-319-28534-4_1

Candolle, A.P. de. (1830) *Prodromus systematis naturalis regni vegetabilis.* Vol. 4. Sumptibus Sociorum Treuttel et Würtz, Paris, pp. 624–642.

Donoghue, M.J., Eriksson, T., Reeves, P.A. & Olmstead, R.G. (2001) Phylogeny and phylogenetic taxonomy of Dipsacales, with special reference to *Sinadoxa* and *Tetradoxa* (Adoxaceae). *Harvard Papers in Botany* 6: 459–479.

Eriksen, B. (1989) Notes on generic and infrageneric delimitation in the Valerianaceae. *Nordic Journal of Botany* 9 (2): 179–187.
https://doi.org/10.1111/j.1756-1051.1989.tb02113.x

Eriksen, B. (1989) 186. Valerianaceae. *Flora of Ecuador* 34: 1–60.

Fisher, A.E., Triplett, J.K., Ho, C., Schiller, A.D., Oltrogge, K.A., Schroder, E.S., Kelchner, S.A. & Clark, L.G. (2009) Paraphyly in the bamboo subtribe Chusqueinae (Poaceae: Bambusoideae) and a revised infrageneric classification for *Chusquea*. *Systematic Botany* 34 (4): 673–683.
https://doi.org/10.1600/036364409790139790

Graebner, P. (1906a) Valerianaceae andinae. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 37: 436–451.

Graebner, P. (1906b) Die Gattungen der natürlichen Familie der Valerianaceae. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 37: 464–480.

IUCN (2022) *Guidelines for using the IUCN Red List categories and criteria. Version 15.1.* Prepared by the Standards and Petitions Committee. Available from: https://www.iucnredlist.org/resources/redlistguidelines (accessed 12 December 2022)

Killip, E.P. (1928) Seven new species of *Valeriana*. *Journal of the Washington Academy of Sciences* 18: 498–501.

Kunth, K.S. (1819) *Nova Genera et Species Plantarum* (quarto ed.) 3: 324.

Larsen, B.B. (1986) A taxonomic revision of *Phyllactis* and *Valeriana* sect. *Bracteata* (Valerianaceae). *Nordic Journal of Botany* 6 (4): 427–446.
https://doi.org/10.1111/j.1756-1051.1986.tb00899.x

Linnaeus, C. von (1753) *Species Plantarum* 1. Stockholm.

Persoon, C.H. (1805) *Synopsis Plantarum: seu Enchiridium botanicum, complectens enumerationem systematicam specierum hucusque cognitarum*. apud CF Cramerum.
https://doi.org/10.5962/bhl.title.638

Rabuske-Silva, C. & Külkamp, J. (2018) *Valeriana iganciana* (Valerianaceae), a new species from the highland grasslands of Serra do Tabuleiro, Santa Catarina, Brazil. *Phytotaxa* 364 (3): 275–282.
https://doi.org/10.11646/phytotaxa.364.3.7

Rabuske-Silva, C., Sobral, M. & Vieira Iganci, J.R. (2020) *Valeriana caparaoensis* (Valerianaceae *nom. conserv.*), a new species from southeastern Brazil. *Systematic Botany* 45 (1): 219–225.
https://doi.org/10.1600/036364420X15801369352496

Silva, T.R.S. & Correa A., M.D. (2002) *Drosera peruensis* (Droseraceae), a new species from Peru. *Novon*, *A Journal for Botanical Nomenclature* 12 (4): 543–545.
https://doi.org/10.2307/3393136

Ståhl, E.B. (2010) Additions to the knowledge of the genus *Symplocos* (Symplocaceae) in Ecuador and Peru. *Novon: A Journal for Botanical Nomenclature* 20 (1): 84–94.
https://doi.org/10.3417/2008079

Weberbauer, A. (1945) *El Mundo Vegetal de los Andes Peruanos*. Minesterio de Agricultura.

Weberling, F. & Bittrich, V. (2016) Valerianaceae. In *Flowering Plants. Eudicots*. Springer, Cham, pp. 385–401.
https://doi.org/10.1007/978-3-319-28534-4_35

Weberling, F. & Stützel, T. (2006) Morphological and anatomical investigations of *Aretiastrum magellanicum* (Hombr. & Jacq.) Skottsb. *Wulfenia* 13: 193–205.

Weberling, F. & Uhlarz, H. (1977) Morphologische, anatomische und palynologische Untersuchungen an der Gattung *Aretiastrum* (Valerianaceae). *Plant Systematics and Evolution* 127: 217–242.
https://doi.org/10.1007/BF00985989