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Rediscovery of *Rubus pendulus* Rusby (Rosaceae) and a new record for the flora of Ecuador

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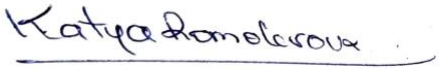

Katya Romoleroux, Ph.D.
Directora de la disertación

Quito, 23 de enero de 2023

A mamá y hermana, custodias de "La Zona de Promesas"

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Abstract

A new record of *Rubus* for Ecuador is described. *Rubus pendulus* Rusby is a climbing shrub or vine originally described from Huila in Colombia 90 years ago. Here, we report seven new localities in Ecuador where this species grows. *Rubus pendulus* is morphologically differentiated from all the Ecuadorian *Rubus* species and a detailed botanical description, illustrations and photographs are provided. This is the first time that *R. pendulus*' stipules and flowers are described, as they were unavailable in the original description. We also report possible hybridization between *R. urticifolius* Poir. and *R. pendulus*, as the samples reviewed showed mixed characteristics from both species.

Keywords: Andes, Ecuadorian, Rubeae, taxonomy.

Introduction

Rubus L. presents more than 500 species classified in 14 subgenera; thus, being one of the most diverse genera of the Rosaceae family (Focke 1910, 1911, 1914; Kalkman 1987; Jarvis 1992; Bean 1997). Despite the genus being cosmopolitan, it is more abundant in Asia, where at least 208 species (139 endemic) classified in nine subgenera were reported only in China (Lingdi and Boufford 2003). South America contains a low *Rubus* diversity with less than 50 species and four subgenera (Macbride 1938; Romoleroux 1996; Forzza et al. 2010; Romoleroux 2014; Espinel-Ortiz and Romoleroux 2020, 2021). Thus, more focalized taxonomic studies will help to uncover more species.

Originally, Romoleroux (1996) reported 21 *Rubus* species for Ecuador, but recently two new endemic species (*Rubus longistipularis* Espinel-Ortiz & Romol. and *R. maquipucunensis* Espinel-Ortiz & Romol.) and an introduced species (*R. rosifolius* Sm.) were recorded (Espinel-Ortiz and Romoleroux 2020, 2021). In the present work, we register *Rubus pendulus* Rusby in Ecuador for the first time after 90 years of its original description in Colombia (Rusby, 1933). It is a native species that belongs to the subgenus *Rubus* and is distributed along the Ecuadorian Andes and in the Huila Department in Colombia. Herbarium specimens representing this species showed low sample numbers and were often annotated as *Rubus urticifolius* Poir. because of the resemblance to this species or were unidentified. However, *R. pendulus* vegetative and reproductive characters differ greatly from those of the species reported for Ecuador (Romoleroux 1996; Espinel-Ortiz and Romoleroux 2020, 2021).

Methodology

The *Rubus* collections of the Herbaria HA, HUTI, LOJA, NY, Q, QAP, QCA, QCNE were revised, and samples not fitting with the species reported for Ecuador were studied. Additional samples from AAU and MO were revised from online images.

The botanical terms used in the descriptions followed those used by Stearn (1986), and the pubescence types were based on the terminology of Hickey and King (2000), and Wilhelm

and Rericha (2020). Some specimens examined for the descriptions (e.g. D. Espinel-Ortiz & H.G. Abad 300) were mounted in more than one herbarium sheet, and/or have additional dry or alcohol material; therefore, each part had its own herbarium barcode (QAP and QCA). For these samples, we wrote all the herbarium barcodes for each part in examined specimens when available.

The geographic coordinate from sample M. Moreano 3 (QCA-92363) was misplaced, since the sample was collected near Floristic Reserve Río Guajalito and the coordinates of the label were from approximately 40 km Northwest, near Rancho San Clemente. Therefore, the coordinate was eliminated in the examined specimens.

Taxonomic treatment

***Rubus pendulus* Rusby, Torreya 33:41. 1933.**

Figs 1–3

Type. COLOMBIA. Huila: Balsillas, at Balsillas river, edge of forest, 2000–2100 m, 03–05 Aug 1917, *H.H. Rusby & F.W. Pennell 719* (isotype: NY (NY-424649)).

Description. Woody vine growing up to 10 m long**, or scandent or climbing shrub,** with all prickles from the base *1⁄3–2⁄3* sparsely villous-hirsute with red setose hairs, glabrous towards the apex, eglandular or with subsessile glands. **Branches** obtuse-angled, red to slightly brownish, with red setose hairs, and hirsute, 3.4–9.4 mm diam., eglandular or with some setose hairs ending in a gland, unarmed or with up to 5 prickles (per total area of 5 cm long of the branch), gradually narrowed from a broad base, curved at the apex, 1.1–4.1 × 1.2–7.4 mm. **Stipules** asymmetrically narrow, subulate, 4.7–9.7 × 0.4–1.8 mm, margin entire, chartaceous; adaxial surface sparsely hirsute on veins, with red subsessile glands on margin; abaxial surface with red setose hairs on veins and towards the margin, and hirsute, with red sessile and subsessile glands. **Petioles** 4.8–10.6 (–15.2) cm long, with red setose hairs, and hirsute, with 17–35 prickles, gradually narrowed from a broad base, curved at the apex, 0.9–2.8 × 0.6–2.8 mm; basal petiolules 3.0–6.5 mm long, unarmed or with up to 5 prickles, gradually narrowed from a broad base, curved at the apex, 0.7–1.1 × 0.3–1.1 mm, lateral petiolules 7.0–29.7 (–45.5) mm long, with 3–17 (–34) prickles, gradually narrowed from a broad base, curved at the apex, 0.6–2.0 × 0.4–1.6 mm, terminal petiolules 2.8–5.1 (–9.0) cm long, with 8–27 (–42) prickles, gradually narrowed from a broad base, curved at the apex, 0.6–2.8 × 0.4–3.1 mm. **Leaves** trifoliate to 5-foliate; leaflets ovate to elliptic, base subcordate or asymmetrically subcordate, apex acuminate, margin serrate or bidentate towards the apex, basal leaflets (2.6–) 5.3–7.7 × (1.1–) 2.5–4.0 cm, lateral leaflets 7.1–14.3 × 3.7–7.0 cm, terminal leaflet (6.7–) 10.4–15.1 × (3.8–) 4.8–7.3 cm, chartaceous, with 10–19 secondary veins; adaxial surface bullate, sparsely villous-hirsute on each bubble, and densely villous hirsute on the midvein and secondary veins, with red subsessile glands, unarmed; abaxial surface glabrous with red setose hairs, and villous only on the veins, with red subsessile glands on the veins, rarely unarmed or with 8–18 (32) prickles on the primary vein, gradually narrowed from a broad base, curved at the apex, 0.2–1.8 × 0.3–2.1 mm. **Inflorescences** compact, compound, terminal and axillary cymes, 6–53-flowered, 8.2–15.3 cm long, with simple or trifoliate leaves below; peduncles terete, red to slightly brownish, (5.7–) 8.1–20.3 (–48.7) mm long, villous with abundant red setose hairs, eglandular, unarmed or with up to 14 prickles, gradually narrowed from a broad base, curved at the apex, 1.4–2.2 × 0.4–1.6 mm; pedicels terete, red to slightly brownish, 2.4–7.5 (–9.1) mm long, villous with abundant red setose hairs, eglandular, with 6–20 prickles, gradually narrowed

from a broad base or triangular, curved at the apex, 0.8–2.4 × 0.1–1.4 mm. **Flowers** 8.21–15.25 mm diam.; sepals 5, obovate to elliptic or slightly lanceolate, apex mucronulate, margin entire, 5.1–7.9 × 2.5–4.6 mm, greenish-red to red; adaxial surface villous-sericeous, and tomentose towards the apex and the margin, with sessile and subsessile glands, unarmed; abaxial surface tomentose, with subsessile glandular, unarmed; petals 5, obovate-lanceolate to elliptic, margin entire, 9.0–13.9 × 6.1–7.8 mm, fuchsia to pink, glabrous, eglandular, adaxial surface deeply concave, abaxial surface deeply convex; stamens with anthers glabrous, filaments pale pink, glabrous; pistils, stigmas glabrous, styles slightly hirtellous, ovaries densely villous. **Fruits** green to red when immature, and black at maturity, ovoid to globose, 7.8–15.4 × 6.6–11.0 mm (when dry); drupelets 66–115 per receptacle, 2.1–4.3 × 1.1–2.8 mm (when dry), sparsely villous.

Specimens examined. ECUADOR. — Pichincha: San José de Mindo, Nono-Tandayapa road, route of the OCP Heavy Crude Oil Pipeline, Cerro Castillo and La Bola, 00º01.750'S, 78º40.984'W, 2600 m, 05 Oct 2001 (fl, fr), *D. Fernández, E. Toapanta, M. Mites & C. Morales 606* (MO, QCNE (QCNE-159936)); Quito, Nanegalito, vía a San Tadeo, Área Protegida Privada Bellavista, 00º02.170'S, 78º42.067'W, 2297 m, 03 Dec 2021, *D.A Espinel-Ortiz & H.G. Abad 300* (QCA (QCA-244065, QCA-7010819 to QCA-7010822 and QCA-7010828)); same locality as for preceding, 00º02.178'N, 78º42.227'W, 2297 m, 03 Dec 2021, *D.A Espinel-Ortiz & H.G. Abad 301* (QCA (QCA-244068 and QCA-7010829 to QCA-7010831)); Quito, Nanegalito, vía al Área Protegida Privada Bellavista desde carretera E26, 00º00.077'N, 78º41.356'W, 2281 m, 07 Dec 2021, *D.A Espinel-Ortiz & H.G. Abad 303* (QCA (QCA-244067 and QCA-7010825 to QCA-7010827)); same locality as for preceding, 00º02.178'S, 78º42.227'W, 2315 m, 20 Apr 2022, *D.A Espinel-Ortiz & H.G. Abad 327* (QCA); same locality as for preceding, 00º02.274'S, 78º42.275'W, 2303 m, 20 Apr 2022, *D.A Espinel-Ortiz & H.G. Abad 328* (QCA); same locality as for preceding, 00º02.281'S, 78º42.316'W, 2 m, 16 May 2022, *D.A Espinel-Ortiz & H.G. Abad 382* (QCA); Quito, Nanegalito, El Golán, between El Alí and El Porvenir, 00º06.570'N, 78º35.150'W, 2444 m, 25 May 2021 (fl), *C.E. Cerón & C.I. Reyes-Tello 88459* (QAP (QAP-106468 and QAP-106757)); Quito, Nanegalito, El Golán, between Edén Mágico and El Porvenir, 00º05.270'N, 78º33.230'W, 2402 m, 10 Jul 2021, *C.E. Cerón, C.I. Reyes-Tello, D. Bacuilima & A. Acosta* 88667 (QAP (QAP-106886)); Quito, Yunguilla, pasando la entrada a la comunidad El Golán, 00º06.485'N, 78º33.207'W, 2641 m, 08 Dec 2021, *D. Espinel-Ortiz & H.G. Abad* 304 (QCA (QCA-244066 and QCA-7010824). **— Napo:** National Park Los Llanganates, Salcedo-Tena road, km 60, "La Poderosa" ranch, descending to Mulatos river, 4 km, 00º57.000'S, 78º14.000'W, 2500–2870 m, 16 Mar 1995 (fl, fr), *H. Vargas & D. Sandoval 451* (MO (MO-1610744), NY). **— Loja:** Ca. 5 km of Paso de Sabanilla, on road Yangana-Valladolid, 04º27.00'S, 79º10.000'W, 2500 m, 03 Sep 1985, *S. Lægaard 55178* (AAU). **— Morona Santiago:** Sangay National Park, Guamote-Macas road, near Purshi-Zuña, 02º11.000'S, 78º20.000'W, 2400–2700 m, 07 Jun 1998, *C.E. Cerón 36281* (QAP (QAP-91)). **— Zamora Chinchipe:** Nanguipa Cordillera, Cerro Colorado, about 8 km by air SSE of Nambija, 20 km ESE of Zamora, montane cloud forest, 04º07.483'S, 78º46.417'W, 2500 m, 18 Feb 2002 (fr), *D. Neill, W. Quizhpe, J. Manzanares, A. Hirtz, T. DeLinks & C. Cole 13778* (MO, QCNE (QCNE-162651)); Yacuri National Park, San Andrés, collections on Jimbura-Zumba road, ca. 500 m from Isimanchi river bridge, high montane evergreen forest from the south of the Ecuadorian Andes eastern cordillera, 04º47.100'S, 79º22.668'W, 2653 m, 29 Apr 2015, *A.J. Pérez, N. Zapata, W. Santillán & R. Jiménez 8997* (QCA (QCA-233885)).

Distribution. *Rubus pendulus* is distributed in Colombia and Ecuador. In Colombia, it is known from its type collection at Balsillas river in Huila department. In Ecuador, this species

is distributed along the Andes cordillera, from 2280 to 2900 m a.s.l., in the provinces of Pichincha, Napo, Loja, Morona Santiago and Zamora Chinchipe (Fig 4).

Ecology. This species occurs in montane cloud forests dominated by trees and shrubs and in nearby disturbed areas. *Rubus pendulus* can be found living in sympatry with *Rubus adenotrichos* Schltdl., *R. boliviensis* Focke, *R. longistipularis* and *R. urticifolius*. Flowering and fruiting collections dated from February, March, May and October.

Conservation status. *Rubus pendulus* is known from eight localities, impacted by human activities, including regression to agriculture and road openings. Following the IUCN (2019) guidelines, based on the geographic distribution and altered land use at the localities, this species should be categorized as least concern (LC).

Discussion

Rubus pendulus was described by Rusby (1933) with a sample collected at Balsilla's river, Balsillas, Huila Department in Colombia. Since then, no other records of this species were reported until Romoleroux (1996) suggested that sample Lægaard 55178 (AAU) may belong to this species. However, the available material could not be properly identified as it lacked flowers and fruits. The revised material agrees with the original description of Rusby (1933) by its setose pubescence (ferrugineous-tomentose), bullate leaves with subcordate base, compact (crowded) and subsessile fruits.

This species may resemble *R. urticifolius* by its red setose hairs, mostly eglandular trifoliate to 5-foliate leaves, and ovate to elliptic leaflets, but it differs from the latter by its bullate leaves, few flowered inflorescences (up to 50 flowers), and mucronulate sepals in contrast with the non-bullate leaves, many flowered inflorescences (50–150 flowers), and apiculate or acuminate sepals of *R. urticifolius*. Furthermore, *R. pendulus* has bigger fruits (7.8–15.4 × 6.6–11 mm) with more (66–115) and bigger drupelets (2.1–4.3 × 1.1–2.8 mm), whereas *R. urticifolius* has smaller fruits (7–10 × 6–9 mm) with fewer (30–50) and smaller drupelets (1.5–3 × 1–2 mm).

Possible hybrids

Rubus urticifolius Poir. × *Rubus pendulus* Rusby

Specimens examined. ECUADOR. Carchi: approx. 6 km above Maldonado, just below Puente de Palo, 2275 m, 23 May 1993 (fl), *B. Boyle & J. Bradford 1866* (MO (MO-1604629), QCNE (QCNE-137663)). **Pichincha:** Floristic Reserve Río Gujalito, km 19 from the old road Quito-Santo Domingo, transition zone, 1800 m, 16 Jun 2001 (fr), *M. Moreano 3* (QCA (QCA-92363)).

None of the reviewed samples were found in the field, but they may be hybrids between *Rubus urticifolius* and *R. pendulus*. Both samples were collected where both species coexist and showed mixed characteristics from them both. For instance, the leaf abaxial surface of both samples showed pannose pubescence with villous-hirsute hairs on the veins and leaf-blade, whereas *R. pendulus* has a glabrous leaf abaxial surface with villous-hirsute hairs only

on the veins, and *R. urticifolius* has a pannose leaf abaxial surface. Sample Moreano 3 showed subsessile, big fruits similar to those from *R. pendulus*, compared to the smaller fruits of *R. urticifolius*. Finally, both samples showed slightly bullate leaves, while *R. pendulus* has strongly bullate leaves, and *R. urticifolius* has non bullate leaves.

Taxonomic Key for Ecuadorian species

1.	Stipules linear-falcate, ovate, or suborbicular; leaves simple or 3-foliolate (subg. *Orobatus*)	**2**
–	Stipules subulate or filiform; leaves 3-foliolate, palmately 5-foliolate, or imparipinnate	**11**
2.	Leaves simple	**3**
–	Leaves 3-foliolate	**7**
3.	Stipules linear-falcate	*R. loxensis*
–	Stipules asymmetrically ovate	**4**
4.	Upper leaf surface bullate	*R. azuayensis*
–	Upper leaf surface not bullate	**5**
5.	Lower leaf surface pannose-tomentose	*R. acanthophyllos*
–	Lower leaf surface glabrous or sparsely pilose on veins	**6**
6.	Flowers solitary or rarely in inflorescences 2–3 cm long, with fewer than four flowers	*R. coriaceus*
–	Inflorescences 5–9 cm long, with more than five flowers	*R. laegaardii*
7.	Flowers solitary or in few-flowered lax inflorescences; sepals as long as or longer than petals	**8**
–	Flowers in simple or compound, compact inflorescences; sepals shorter than petals	**10**

8.	Stipules ovate; flowers usually solitary or sometimes in inflorescences with 2–4 flowers	*R. glabratus*
–	Stipules suborbicular; inflorescences with more than four flowers	**9**
9.	Lower leaflet surface glabrous or sparsely pilose; unarmed sepals	*R. roseus*
–	Lower leaflet surface tomentose or villous; prickly sepals	*R. nubigenus*
10.	Leaves and inflorescences pubescent, prickly sepals	*R. nubigenus*
–	Leaves and inflorescences glabrous, unarmed sepals	*R. compactus*
11.	Drupelets united and falling collectively from dry receptacle (subg. *Idaeobatus*)	**12**
–	Drupelets remaining on the fleshy receptacle and falling together with it (subg. *Rubus*)	**14**
12.	Leaves 3-foliolate; fruit yellow	*R. ellipticus*
–	Leaves imparipinnate, 5- or 7-foliolate; fruit pinkish-purple to black or red	**13**
13.	Lower leaf surface pannose with stipitate glands, whitish; stem pruinose	*R. niveus*
–	Lower leaf surface sparsely pilose with subsessile and sessile glands, greenish; stem not pruinose	*R. rosifolius*
14.	Stems strongly glaucous (whitish); abaxial surface strongly whitish-pannose; fruits with > 70 drupelets	**15**
–	Stems not glaucous (whitish); abaxial surface glabrous, villous, velutinous, tomentose, pilose or greenish-pannose; fruits with < 70 drupelets (except *R. pendulus*)	**16**
15.	Stems pruinose; stipules < 15 mm long; petals white; drupelets > 3 mm long	*R. glaucus*

–	Stems not pruinose; stipules > 20 mm long; petals fuchsia; drupelets < 3 mm long	*R. longistipularis*
16.	Red, yellow or orangish, eglandular setose hairs all over the plant	**17**
–	Setose hairs absent all over the plant	**18**
17.	Upper leaf surface bullate; leaf abaxial surface glabrous with villous-hirsute hairs only on the veins; usually fewer than 50 flowers per inflorescence; sepals mucronulate	*R. pendulus*
–	Upper leaf surface not bullate; leaf abaxial surface pannose; usually more than 50 flowers per inflorescence; sepals apiculate or acuminate	*R. urticifolius*
18.	Basal leaves 3-foliolate; inflorescences few-flowered, usually fewer than 30 flowers per inflorescence (except for *R. maquipucunensis*)	**19**
–	Basal leaves 5-foliolate, rarely 3-foliolate; inflorescences many-flowered, usually more than 40 flowers per inflorescence	**23**
19.	Stems glabrous or puberulent; leaf adaxial surface eglandular	*R. megalococcus*
–	Stems tomentose, velutinous, villous, pilose; leaf adaxial surface with sessile and subsessile glands	**20**
20.	Leaflets with fewer than nine pairs of secondary veins; stems pilose; petals greenish-white	*R. adenothallus*
–	Leaflets with more than 10 pairs of secondary veins; stems tomentose, velutinous, or villous; petals reddish-violet, white, or pink	**21**
21.	Vine or climbing shrub; leaflets broadly elliptic or broadly ovate to elliptic with more than 14 pairs of secondary veins	*R. maquipucunensis*
–	Scandent shrub; leaflets ovate to slightly elliptic with less than 13 pairs of secondary veins	**22**

22.	Leaflet surface velutinous or tomentose, with sessile and subsessile glands	*R. bogotensis*
–	Leaflet surface sparsely villous or pilose, eglandular	*R. peruvianus*
23.	Stems and branches glandular	**24**
–	Stems and branches eglandular	**26**
24.	Stems densely covered with long-stipitate glands	*R. adenotrichos*
-–	Stems with scattered, short-stipitate glands	**25**
25.	Petiole pulvinate; base of leaflets asymmetrical	*R. killipii*
–	Petiole not pulvinate; base of leaflets rounded	*R. floribundus*
26.	Lower leaflet surface glabrous; leaflets with 7–10 pairs of secondary veins	*R. killipii*
–	Lower leaflet surface pubescent; leaflets with 10–18 pairs of secondary veins	**27**
27.	Leaflets with 10–12 or rarely 14 pairs of secondary veins, leaf margins serrate	*R. floribundus*
–	Leaflets with 14–18 pairs of secondary veins, leaf margins serrulate	*R. boliviensis*

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FIGURES

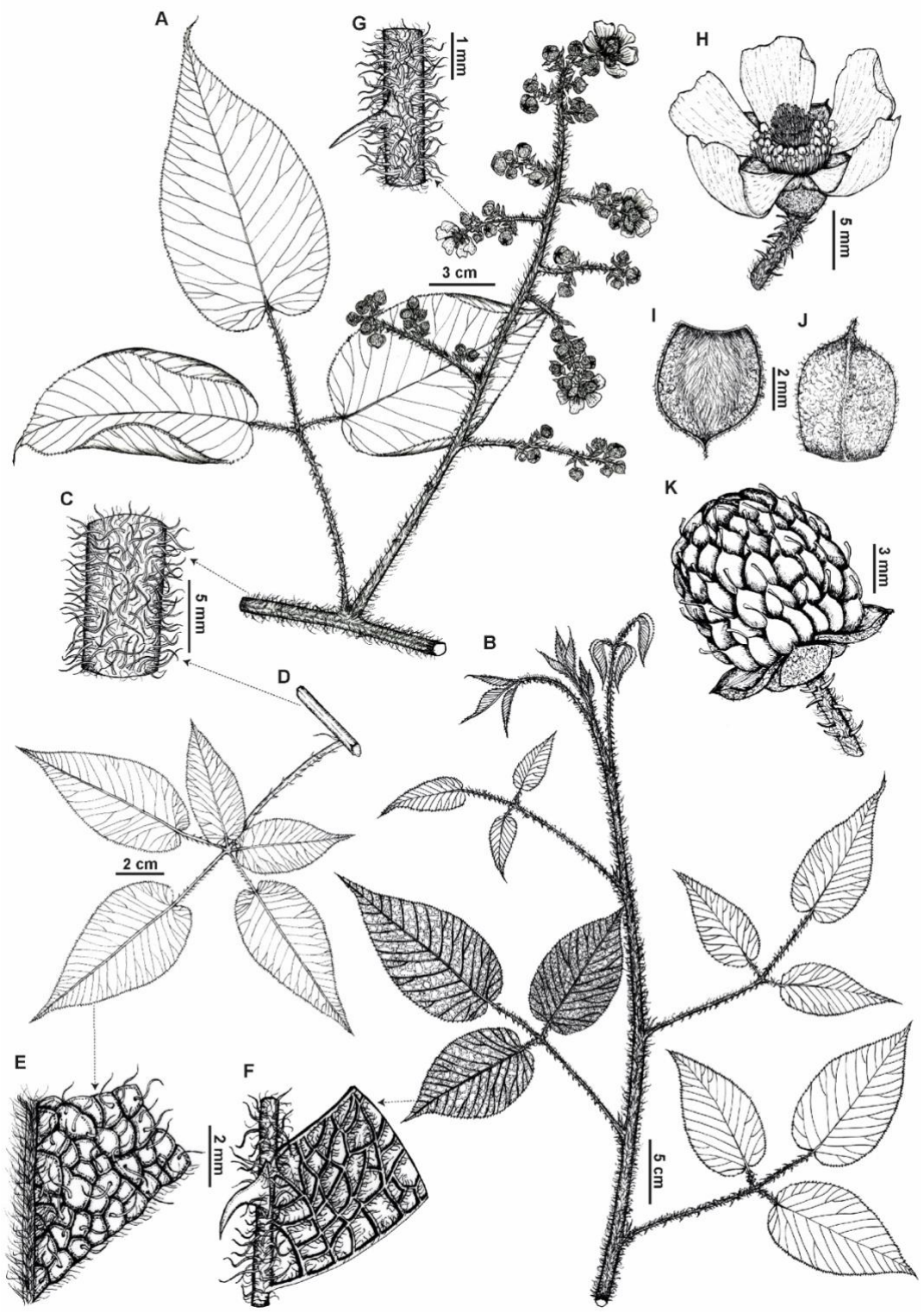

Figure 1. *Rubus pendulus* Rusby. **A** inflorescence **B** habit and leaves **C** branch **D** 5-foliolate leaf **E** leaf adaxial surface **F** leaf abaxial surface **G** pedicel **H** flower **I** sepal adaxial surface **J** sepal abaxial surface **K** fruit. (**K** based on Fernández et al. 606 (QCNE), **B** based on Espinel et al. 301 (QCA), **C–F** based on D. Espinel-Ortiz et al. 304 (QCA), **A, H–J** based on Espinel-Ortiz et al. 382 (QCA)). Illustrations by Carla Rodríguez.

Figure 2. *Rubus pendulus* Rusby. **A** habit QCA **B** trifoliate leaf adaxial surface **C** bullate leaf adaxial surface **D** flowers. Photos by David A. Espinel-Ortiz.

Figure 3. *Rubus pendulus* Rusby. Collection Fernández et al. 606 (QCNE) with flowers and fruits.

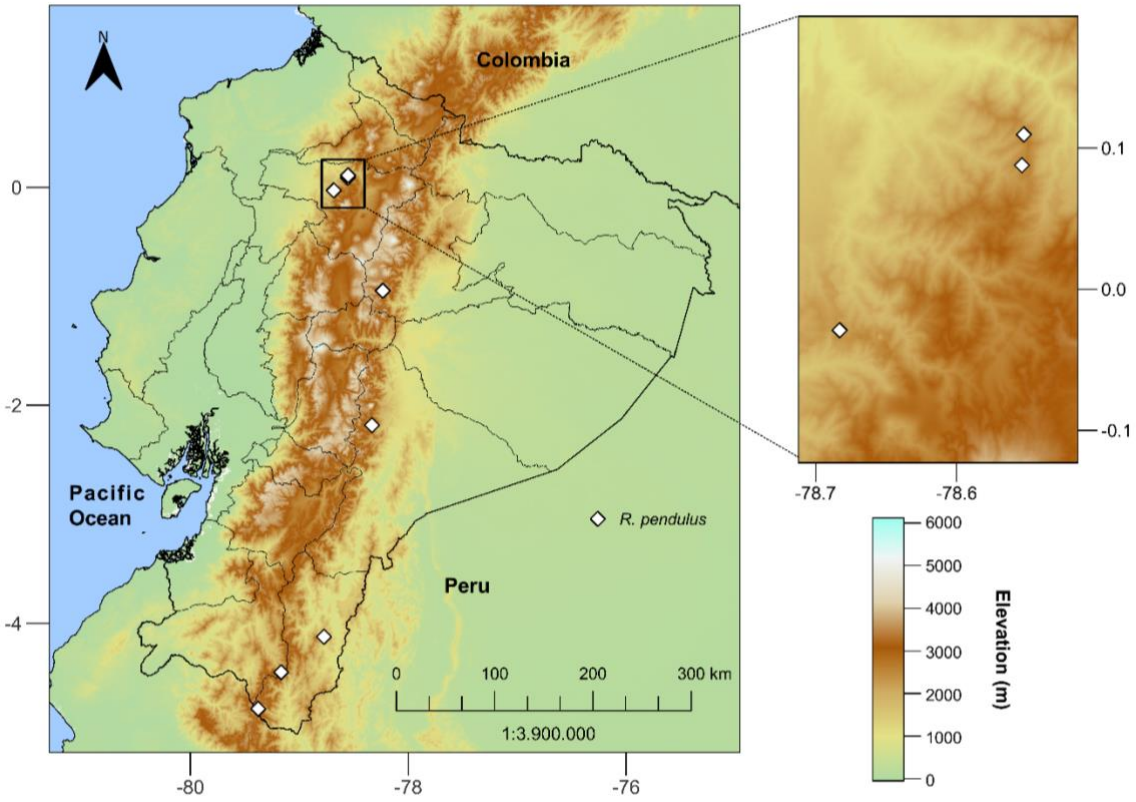

Figure 4. Distribution map of *Rubus pendulus* (white rhombus) in Ecuador.