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Passiflora cana, a New Species of *Passiflora* Section *Decaloba* (Passifloraceae) from Peru

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Abstract

Passiflora cana, a new species of *Passiflora* (Passifloraceae) endemic to the mountain forests in Amazonas and Cajamarca Departments, Northern Peru, is described and illustrated from herbarium and living material. The species has bilobed leaves and is notable for its dense white pubescence throughout and green-centered white flowers. It is compared to similar species and placed in subgenus *Decaloba* section *Decaloba*.

Key words: Chachapoyas, IUCN Red List, *Passiflora* subgenus *Decaloba*

Resumen

Passiflora cana, una nueva especie de *Passiflora* (Passifloraceae), endémica de los bosques de montaña en los Departamentos Amazonas y Cajamarca, Norte del Perú, se describe e ilustra de material de herbario y viviendo en el campo. La especie tiene hojas bilobuladas y se destaca por su densa pubescencia blanca y sus flores blancas con el centro verde. Se compara con especies similares y se propone ubicarla en el subgénero *Decaloba* sección *Decaloba.*

Palabras clave: Chachapoyas, Lista Roja de la IUCN, *Passiflora* subgénero *Decaloba*

Introduction

There are about 650 recognized species in the genus *Passiflora* Linnaeus (1753: 955) but recently published accounts range from 625 (MacDougal & Tillett 2022) to nearly 700 species (Kuethe *et al.* 2024). Systematic studies of *Passiflora* subgenus *Decaloba* (de Candolle 1822: 435) Reichenbach (1828: 132) underway at the MO herbarium revealed an undescribed species with bilobed leaves notable for its dense white pubescence and green-centered white flowers. Subgenus *Decaloba* is one of six subgenera now widely accepted in the genus (Muschner *et al.* 2012; Buitrago *et al.* 2018; Restrepo *et al.* 2019; MacDougal & Tillett 2022) and contains more than 280 mostly small-flowered species divided into various infrageneric categories (Feuillet & MacDougal 2003; Krosnick *et al.* 2013). The subgenus *Decaloba*, widely distributed in the Neotropics, is characterized by flowers with a plicate membranous innermost coronal series ("operculum," Killip 1938). The new species described here clearly belongs to subgenus *Decaloba* supersection *Decaloba* (de Candolle 1822: 435) J. MacDougal & Feuillet (Feuillet & MacDougal 2003: 37) based on the cernuous shoot tip and transverse ridges on the seeds and is furthermore assigned to section *Decaloba* de Candolle (1822: 435) because of the presence of laminar extrafloral nectaries in rows between the main veins (Krosnick *et al.* 2013).

A total of 95 species of *Passiflora* were reported in Peru by Brako & Zarucchi (1993), Ulloa *et al.* (2004), and León & Jørgensen (2006). Several new species have been described since then (see review in Esquerre-Ibañez 2019). These additions have brought the total number of recognized species of *Passiflora* in Peru to at least 102 (36 in subgenus *Decaloba*).

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Materials & Methods

The morphological description was compiled from both dried material and living plants. The authors received loans from or personally visited 76 herbaria for this study: A, AAU, AMAZ, ARIZ, AS, B, BAB, BH, BM, BR, BRH, C, CAS, CHAPA, CR, CTES, CU, CUZ, DLY, DUKE, E, EAP, ENCB, F, FCQ, G, GB, GH, HBG, HSB, HULE, HUT, IAC, K, L, LAGU, LIL, LL, LPB, M, MA, MEXU, MICH, MIN, MO, MYF, NA, NY, P, PH, PMA, PRG, PY, QCA, QCNE, RPSC, RSA, S, SCZ, SEL, SI, SLPM, SPF, TEFH, TEX, TTC, U, UC, UPS, US, USJ, USM, USZ, W, WIS, and XAL. Material of the new species described here was found in the six herbaria mentioned in the specimen citations and Acknowledgments.

The earliest collection seen in herbaria is from 1978, with photos and measurements of living material taken in 2008, 2012, and 2013 (see additional specimens cited). Conservation status was assessed according to IUCN Standards and Petitions Committee (2024) categories based on field data supported with geographic range mapping through the Tropicos (tropicos.org) and GBIF databases (GBIF 2024) with analysis using GeoCat (GeoCat 2024).

Taxonomy

Passiflora cana J. M. MacDougal, *sp. nov.* TYPE: Peru: Amazonas: Chachapoyas: road Leymebamba to Chachapoyas, river valley at uniformly 1900–2100 m, areas over sand stone, 06°50’31”S, 077°57’12”W, 5 June 1998 (bud, fl.), *Max Weigend, Thassilo Franke, Jürgen Skrabal, & M. A. Gonzales 98/374a* (holotype: USM-173499!; isotypes: F-2211144!, M-[barcode] 0007956!). Figures 1, 2, 3, 4.

Diagnosis:—*Passiflora cana* is a conspicuously white-hirsute small climber with bilobed leaves with laminar nectary glands borne on the proximal half of the blades. The flowers are white with a green center, with filamentous corona in two series and a pilose ovary. It differs from the similar *P. ketura* Tillett & J. MacDougal by its conspicuous pubescence and pilose ovary. It belongs to subgenus *Decaloba* based on the plicate operculum, and assigned to section *Decaloba* based on the presence of laminar extrafloral nectaries in rows between the main veins, the cernuous shoot tip, and by the transverse verrucose or rugulose ridges on the seeds.

Small **herbaceous vine** ca. 2–3 m long, conspicuously hirsute and pilose throughout with trichomes usually of mixed sizes 0.15–1.6(–2.2) mm long, the trichomes straight, slender, erect, white-translucent. **Stems** up to 4 mm diam. at flowering nodes, subterete, obscurely striate, green often flushing purple, drying striate, subangulate; shoot tip cernuous; prophyll of the vegetative bud 1, (2–)3.5–5.5 × 0.5–1.0 mm, lanceolate to obtrullate, long acuminate, with a slender long tooth on each side above the middle (rarely untoothed, entire). **Stipules** (3.5–)5–10 × 0.5–1.3 mm, linear-narrowly triangular, subfalcate, long acuminate. **Leaves** with petioles 0.8–2.5 cm long, eglandular; laminas 2.5–9.1 (central vein length) × 2.3–9.5 cm wide, not variegated, in outline truncate-elliptic to widely elliptic to truncate-widely obovate; the ratio of laminar width to (central vein) length 0.79–1.3, rounded at the base, shallowly 2-lobed 1/10 to 2/5 (0.1–0.4) the distance to the base, the margin entire and hispidulous with trichomes 0.15–0.5 mm long, lateral lobe veins 3.0–10.3 cm, ratio of lateral/central vein length 1.2–1.7, the apices of the lateral lobes acute to sometimes obtuse or rounded on larger leaves, the angle between the lateral lobes 30°–43°(–47)°, the central lobe absent, obsolete, or present as an obtuse cusp; lamina hispidulous adaxially with erect trichomes 0.2–0.4(–0.5) mm long, abaxially more densely hispidulous or pilose on the raised pale primary and secondary veins with trichomes 0.3–0.8 mm; **laminar nectaries** 2 to 10 per leaf, borne in the proximal ¼–1/3 (–1/2) of the blade, (2–)3–6(–9) borne between the main veins, 0–2 borne outside the main veins at their base, nectaries 0.5–1.5 mm diam., yellow or yellowish, not edged in purple, surrounded by a pale zone up to 2.0 mm diam. **Peduncles** (1)2 per node, 19–62 mm long not including floral stipe (pedicel), uniflorous; **bracts** 3, (3.0–)4.0–6.5 × 0.2–0.5 mm, filiform to linear, often slightly narrower at base than middle, scattered near middle or basal half of peduncle (rarely more distal), pubescent. **Flowers** 3.5–4 cm diameter, oriented (horizontally to) ca. 45° above the horizontal plane at anthesis, overall white with a greenish center, the corona white to cream and with or without one obscure purplish zone near middle; floral stipe (pedicel) 1–2 mm (to 2 mm in fruit); hypanthium 10–14 mm diam., **sepals** 13–17 × 5–6.5 mm, oblong-ovate to triangular-ovate, apically rounded or rounded obtuse with no subapical projection, light green to pale yellow-green abaxially, nearly white adaxially, reflexing at anthesis; **petals** 9–10.5 × 2.5–3 mm, narrowly ovate to oblong-ovate, white, the apex rounded or subacute; **coronal filaments** in 2(–3) series, the outer 44–55 in number (N=5 clones, 7 flowers), 8.5–13(–14) mm long, widely spreading, the lower half white or whitish and forming a very shallow bowl or saucer shape, upper half cream or whitish, geniculate and spreading horizontally ca. 180° or slightly reflexed distally, usually lightly or

obscurely 1-banded with violet or light purple just below the middle, sometimes without a colored band, the filaments slender and laterally compressed, drying subfiliform, slightly thicker near middle, more or less geniculate, gradually attenuate to a fine apex, roughened-papillate adaxially on upper half distal to bend in the coronal filament; filaments of the inner series (1.5)3–4(–5) mm long, capillary, clavate to widely lobulate apically, erect, borne at base of operculum, as long as or only slightly longer than operculum, pale yellow-green basally with white apex; **operculum** 2.5–3.0 mm long, 9 mm outside diam., membranous, plicate, green or bright yellow-green except the apex white-fimbriate, and sometimes slightly purplish just beneath apex; **nectary** trough yellow, raised nectary annulus absent; **limen** floor flat, pale yellow-green, sometimes purplish red near base of androgynophore, the raised edge fleshy and apically incurved; **androgynophore** 5.5–7.0 mm, greenish or sometimes lightly flushed with purplish red, the color sometimes extending basally a few mm onto the limen floor; **staminal filaments** 6–8 mm long, greenish or lightly flushed with purplish red; **anthers** 4.3–5.2 mm long; **ovary** 1.8–2.9 × 1.5–2.8 mm, ellipsoid, conspicuously densely white pilose with trichomes (0.5–)1.5–2.0 mm long; styles 6–8 mm long including stigmas, flushed red-purple, stigmas bright green. **Fruit** a berry, 2.0 × 1.3–1.7 cm, widely ellipsoid to slightly obovoid, estipitate, dark purple at maturity; arils unknown; **seeds** 3.3–3.9 × 2.2–2.8 mm, widely obovate in outline, chalazal end widely obtuse, micropylar end subacute, dark brown to nearly black, transversely sulcate with 6–8 sulci, the intervening ridges verrucose or rugulose.

Distribution and Ecology:—*Passiflora cana* is a Peruvian endemic species found at 1870–2100 m elev. mainly in the Utcabamba river valley (Fig. 3E) in Amazonas state between Chachapoyas and Leymebamba, and also on other side of the mountain ridge in the Marañon river valley both as road the descends down towards Celendín and across the river at Chota in Cajamarca state (Fig. 4). It is found at temperate forest edges, "dry shrubby vegetation dominated e.g. by *Furcraea*" (*Weigend 98/392*), and moist areas in valleys. In the Leymebamba area it is common to see them climbing branches of nearby trees or bushes on the slopes, dropping their long branches up to 2 m (Fig. 3D). The proportions and color of the parts of the flower suggests that the species is adapted to insect-pollination (Ocampo & Coppens d'Eeckenbrugge 2017), and honey bees and wasps (Fig. 3C) have been observed *in situ* on the open flowers and are potential pollinators in the area. Herbivores are unknown, but the laminar nectaries are often bright yellow, suggesting heliconiine butterfly egg-mimicry (Gilbert 1982).

Preliminary Conservation status:*—Passiflora cana* is known from seven collection localities, with an Extent of Occurrence (EOO) of 3340 km^2 and an Area of Occupancy (AOO) of 25 km^2. The species can be assigned the conservation status of Endangered (EN) according to criteria B1a,b(iii) and B2a,b(iii) of the IUCN (2024). The area is under pressure from conversion of forest remnants to agriculture, especially the location in Chota with intensive livestock farming and disturbed areas with *Pinus* spp.

Phenology:—According to herbarium records and field observations, it has been observed with flowers in March to July and November to December, with fruits in June and November to December.

Etymology:—The name refers to the conspicuous white indumentum on the plant body especially obvious on the stems and buds.

Discussion:—This species of passionflower was first collected by Klaas Kingma and Henk Wouters in 2008 in Peru beside the river at the ruins of Kuelap south of Chachapoyas. It was illustrated in September 2008 in the hobbyist horticultural publication *PCN - Passiflora Club Nederland* magazine. The species has been cultivated in the Netherlands and Europe since 2008 (Kingma 2008) and photographs of it are available on the internet.

Passiflora cana clearly belongs to subgenus *Decaloba* supersection *Decaloba* based on the transverse ridges on the seeds and by the cernuous growing shoot tip (Krosnick *et al.* 2013) and is furthermore assigned to section *Decaloba* because of the presence of laminar extrafloral nectaries in rows between the main veins and the verrucose or rugulose ridges on the seeds. This placement was recently confirmed in more detail by Acha *et al.* (2021) in their phylogenomic study of *Passiflora* section *Decaloba*. Samples from the isotype specimen at F (*Weigend et al. 98/374a)* and from the paratypes *Gentry et al. 23238* and *Vanderplank 2449/18* were genotyped using 2b-RAD sequencing, and they fell together into the southern Andean "South American Clade 7" of 20–25 species of this section, including *P. indecora* Kunth (1817: 134) and *P. telesiphe* S. Knapp & Mallet (1998: 162).

There is a mistake on the label of the type collection (*Weigend et al. 98/374a;* M. Weigend, pers. comm.). The collector's note "flowers purplish blue and yellow... herb in moist open areas… " refers not to this collection but rather to the plant, *Burmannia stuebelii* Hieron. & Schltr. (Schlechter 1916: 15), collected immediately before it (*Weigend et al. 98/374*). The flower of the type was "whitish."

Other bilobed species of *Passiflora* native near Chachapoyas include *P. ketura*, *P. callacallensis* Skrabal & Weigend in Skrabal *et al.* (2001: 316), and *P. cisnana* Harms (1894: 5). *Passiflora cana* is easily distinguished from these because of its canescent stems, conspicuously white-pilose leaves with nectary glands, and pilose ovary. *Passiflora ketura* is merely sparsely to lightly puberulent, or even glabrescent, and the ovary is glabrous. *Passiflora callacallensis*

has glabrous leaves adaxially, a glabrous ovary, and has petiolar nectaries which *P. cana* lacks. *Passiflora cisnana* has no extrafloral nectaries of any kind.

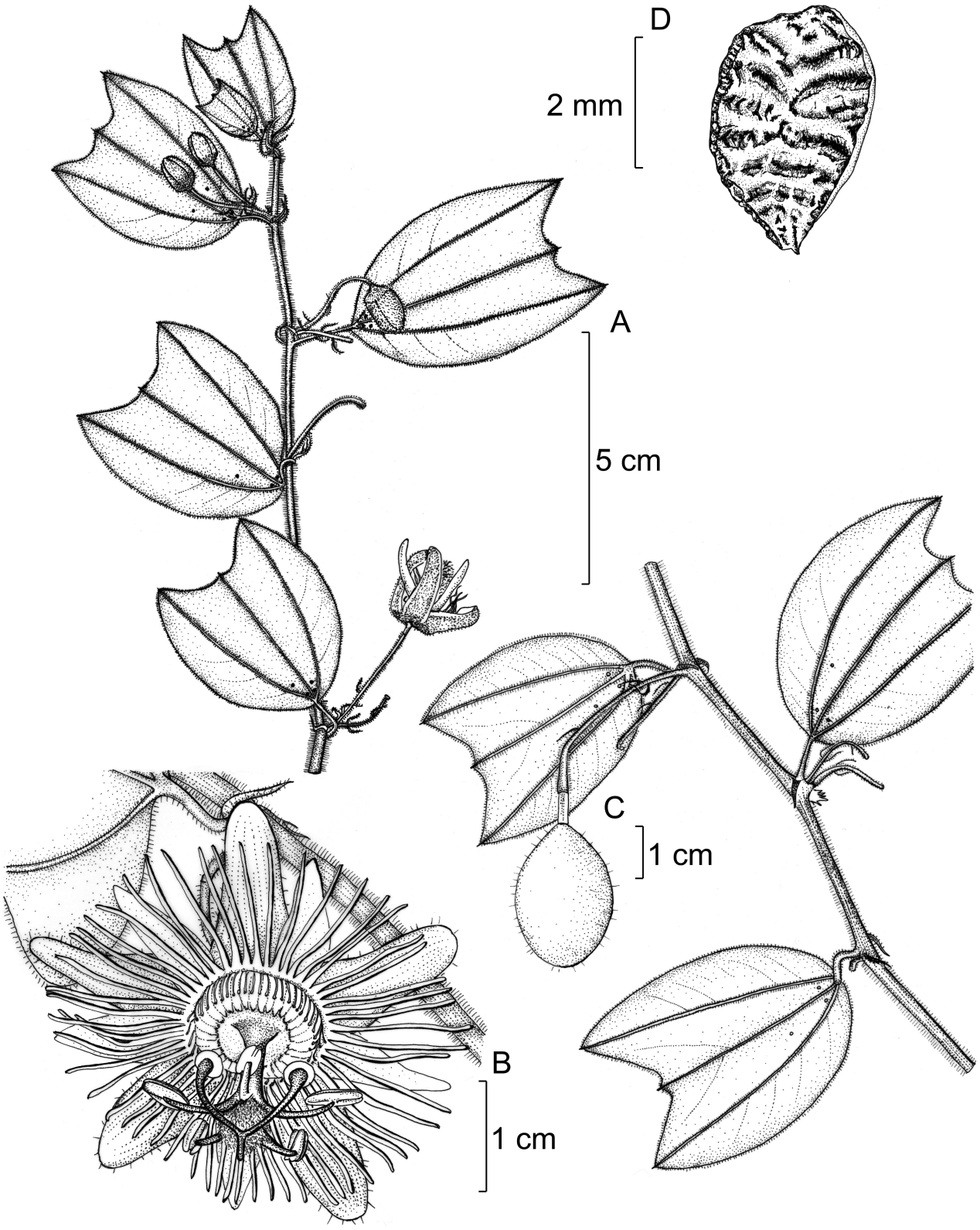

FIGURE 1. *Passiflora cana.* A. Habit of flowering branch. B. Flower at node with stipule. C. Leafy branch with immature fruit. D. Seed, with remnant of raphe at right side. A. from *Weigend et al. 374a*; B–C. from photos taken in field of *Boza &Valdez 2125*; D. from *Gentry et al. 23238*. Illustration by Alba Arbelaez.

FIGURE 2. *Passiflora cana*. A. Habit, leaves with flower, near Chachapoyas. B. Flower, oblique view. C. Flower with transverse section of base. D. Node with leaf removed showing stipule, prophyll of vegetative bud, and base of tendril. E. portion of flower showing outer coronal filaments with papillate distal surface and purple band below middle, with shorter inner corona and operculum near base. F. flower, transverse section showing (from left to right) base of androgynophore, raised edge of limen at nectary margin, yellowish nectary trough, operculum (green with white margin) touching edge of limen, inner coronal filaments, outer coronal filaments with purple band, sepal. G. Flower from population near Chota. H. Leaves with yellow extrafloral nectaries.
Photo credits: A, D (*Esquerre & Rojas s.n.*), E–G (*Esquerre s.n.*), Boris Esquerre. B–C (*Boza & Valdez 2125*), Tatiana Boza. H, Ruth Ripley.

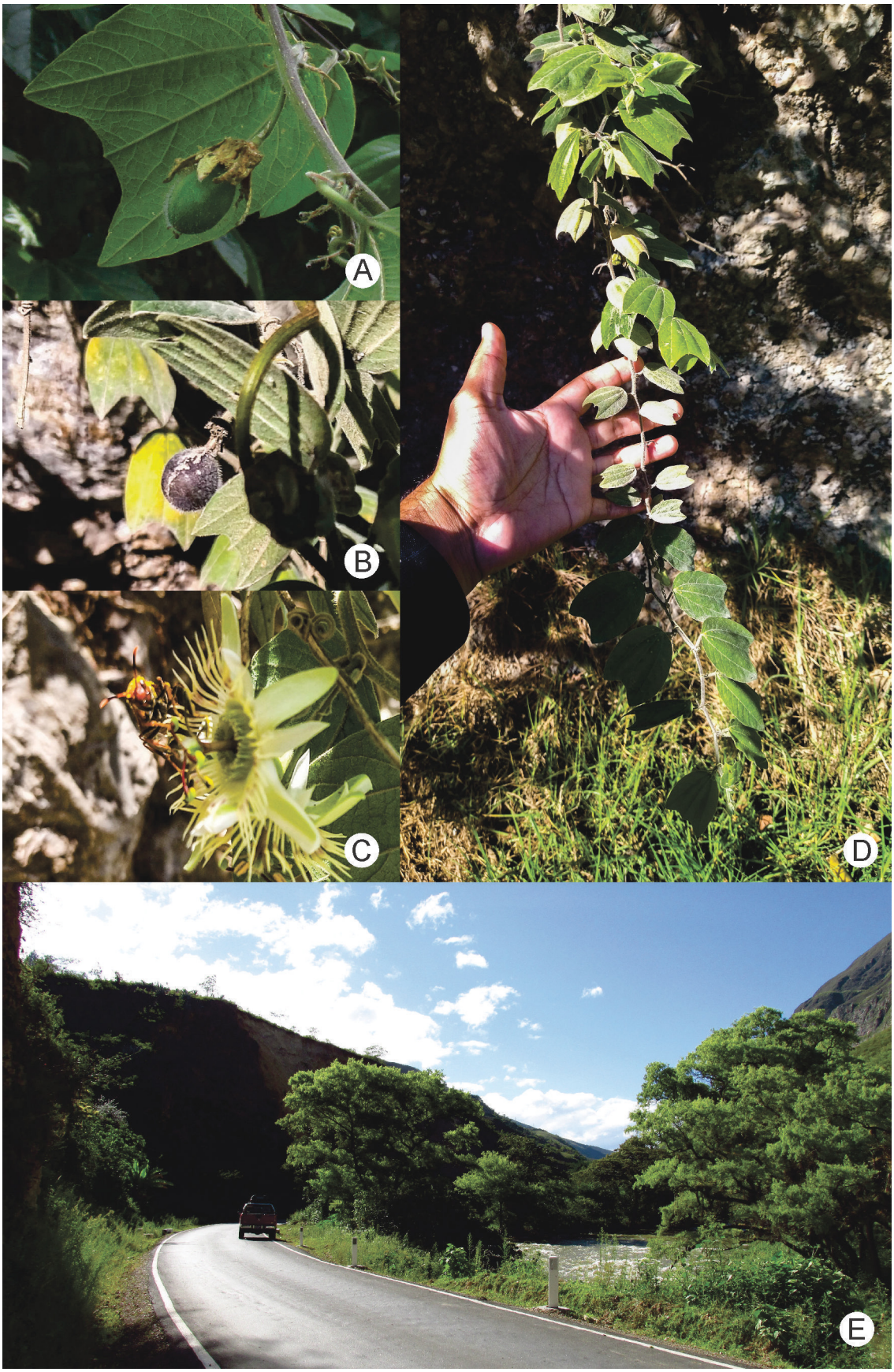

FIGURE 3. *Passiflora cana*. A. Immature fruit. B. Mature purple fruit. C. Wasp on open flower. D. Habit. E. Utcubamba river valley. Photo credits: Boris Esquerre.

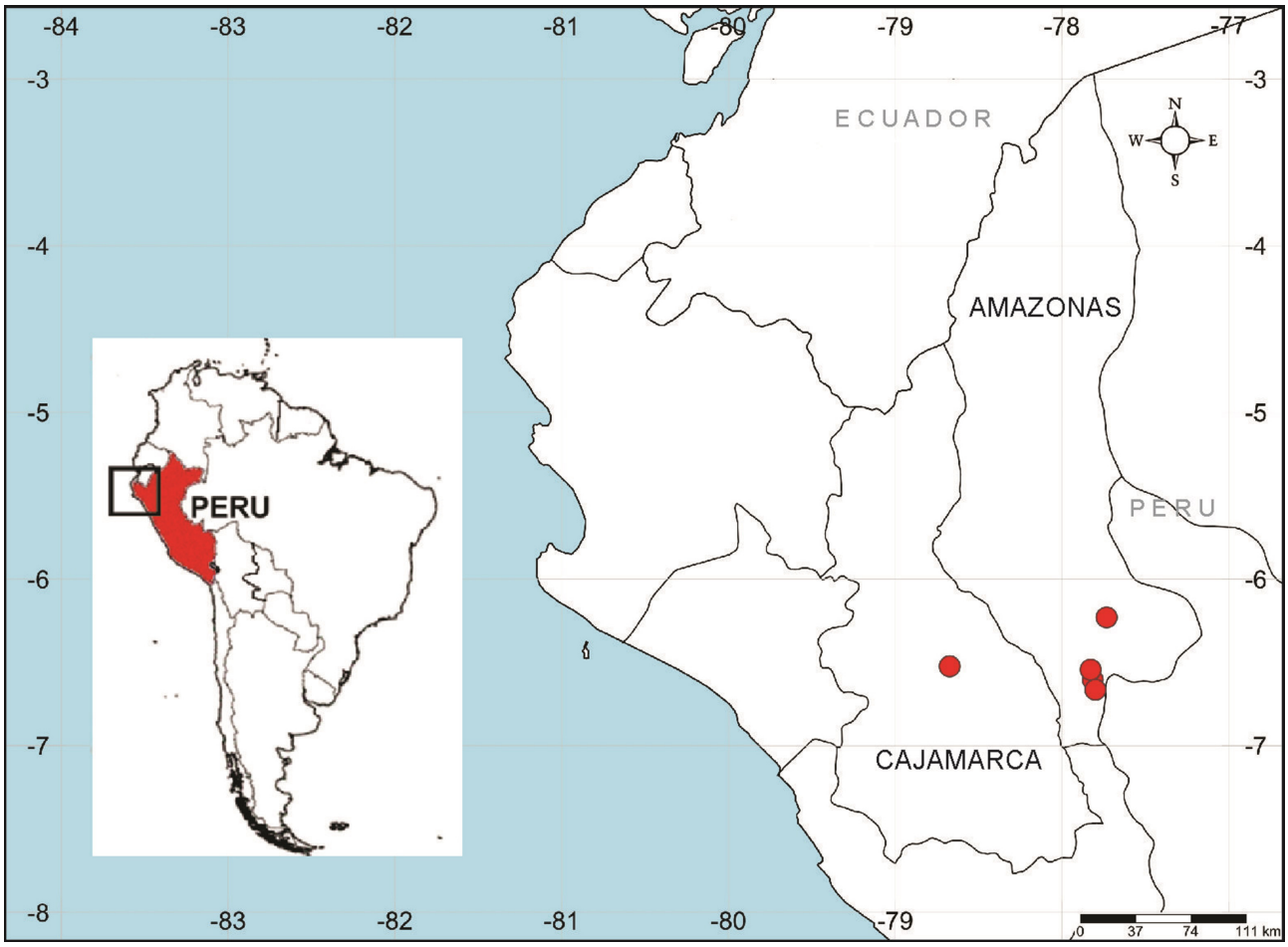

FIGURE 4. Distribution with collection points of *Passiflora cana* in Peru.

Another passionflower with long-pilose bilobed leaves from northern Peru is easily distinguished: *P. nana* J. M. MacDougal (MacDougal & Esquerre 2020: 161) has tiny flowers (1.5 cm diam., not 3.5–4 cm) and widely angled leaf veins (50–75° not 30–47°), and margins of leaves with longer trichomes (mostly 2 mm long, not less than 1 mm long). One other species from northern Peru with similar flowers is *P. santos-llatasii* Esquerre (2019: 4), with white flowers with a white non-banded outer corona and green inner corona, but the plant body is not conspicuously pubescent (trichomes up to 0.3 mm long, not up to 2.2 mm long) and the leaves are often variegated along the veins.

Additional specimens examined (paratypes):—PERU. Amazonas: Chachapoyas: road from Balsas to Leymebamba, Sector Hierba Buena, 1971 m, 06°36’16”S, 077°48’53”W, 24 Mar. 2012 (bud, fl.), *T. Boza E. & Y. Valdez 2125* (CUZ [photos seen]); ruta Yerbabuena a Leymebamba, Región Amazonas, Distrito La Jalca, 2043 m, 29 Dec. 2013 (bud, fl.), *B. Esquerre Ibañez & C. Rojas 001* (PRG-14572!); 24 km N of Leimebamba, valley of Río Utcubamba, 1870 m, 06°32’37”S, 077°49’41”W, 17 June 1978 (fr.), *A. Gentry, M. Dillon, C. Díaz & J. Aronson 23238* (MO (2)!, USM!); road Chachapoyas to Mendoza, 13 km east of Chachapoyas, 2000 m, 06°13’48”S, 077°43’55”W, 4 June 1998 (bud, fl.), *M. Weigend, T. Franke, J. Skrabal, & M.A. Gonzales 98/392* (M [barcode] 007969!, USM-174229!). Cajamarca: near Chota, 06°31’25.29’’S, 078°40’24.15’’W, 9 July 2023 (bud, fl.), *B. Esquerre 231* (PRG!). Cultivated: cultivated in England from cultivated material from Henk Wouters originally collected in Peru near Kuelap in 2008, NCP 2442, Sept. 2018, *J. Vanderplank 2449/18* (MO!).

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