



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

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### ABSTRACT

*Passiflora ketura*, a new species of *Passiflora* (Passifloraceae) endemic to the mountain forests in Amazonas Department, Northern Peru, is described and illustrated from herbarium material. It is compared to similar species and placed in subgenus *Decaloba* section *Decaloba*.

**Keywords:** Chachapoyas, IUCN Red List, *Passiflora* subgenus *Decaloba*

### RESUMEN

*Passiflora ketura*, una nueva especie de *Passiflora* (Passifloraceae), endémica de los bosques de montaña en el Departamento Amazonas, Norte del Perú, se describe e ilustra de material de herbario. 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

The genus *Passiflora* Linnaeus (1753: 955) comprises more than 625 species of herbaceous climbers, vines, woody lianas, and trees. Four subgenera were recognized by Feuillet & MacDougal (2003, 2007) and Ulmer & MacDougal (2004) but recent phylogenetic studies have now resulted in the widespread acceptance of six subgenera (Muschner *et al.* 2012; Krosnick *et al.* 2013; Ocampo & Coppens d'Eeckenbrugge 2017; Buitrago *et al.* 2018; Restrepo *et al.* 2019). One of these, *Passiflora* subgenus *Decaloba* (de Candolle 1822: 435) Reichenbach (1828: 132), has more than 260 species of mostly small-flowered and small-fruited climbers and vines (Krosnick *et al.* 2013). The subgenus was divided into seven supersections by Feuillet & MacDougal (2003), with nearly all of the passionflowers with bilobed leaves assigned to supersection *Decaloba* (de Candolle 1822: 435) J.M. MacDougal & Feuillet in Feuillet & MacDougal (2003: 37). The supersection is comprised of two monophyletic sections (clades S and W of Krosnick *et al.* 2013), one of which contains the species lacking extrafloral nectaries, *P.* section *Xerogona* (Rafinesque 1836: 103) Killip (1938: 26) *sensu lato* (32 spp.), and the other with the species possessing laminar extrafloral nectaries, *P.* section *Decaloba* de Candolle (1822: 435) (more than 120 spp.). The section with laminar nectaries is especially well represented in middle-elevation humid montane environments from Central America to the northern and central Andes (Ocampo *et al.* 2010; Acha *et al.* 2021).

A total of 90 species of *Passiflora* were reported in Peru by Brako & Zarucchi (1993) and Ulloa *et al.* (2004), of which 24 species are endemic (León & Jørgensen 2006). Eight new species have been described in recent years (Boza 2014; Esquerre-Ibañez 2015a, 2015b, 2017, 2019a, 2019b; Leiva & Tantalean 2016, 2019; MacDougal & Esquerre-Ibañez 2020).

Through herbarium studies of loaned material for a taxonomic revision of the Passifloraceae of Venezuela and South America, Tillett recognized an undescribed Peruvian species of *P.* section *Decaloba* and in 2009 prepared a description based on two specimens. MacDougal independently recognized the novelty and in 2013 prepared a separate description from additional herbarium specimens studied during a taxonomic revision of *P.* subgenus *Decaloba* (Krosnick *et al.* 2013). Through correspondence the two present authors of this paper realized that they were working on the same taxon, so they merged their data and descriptions.

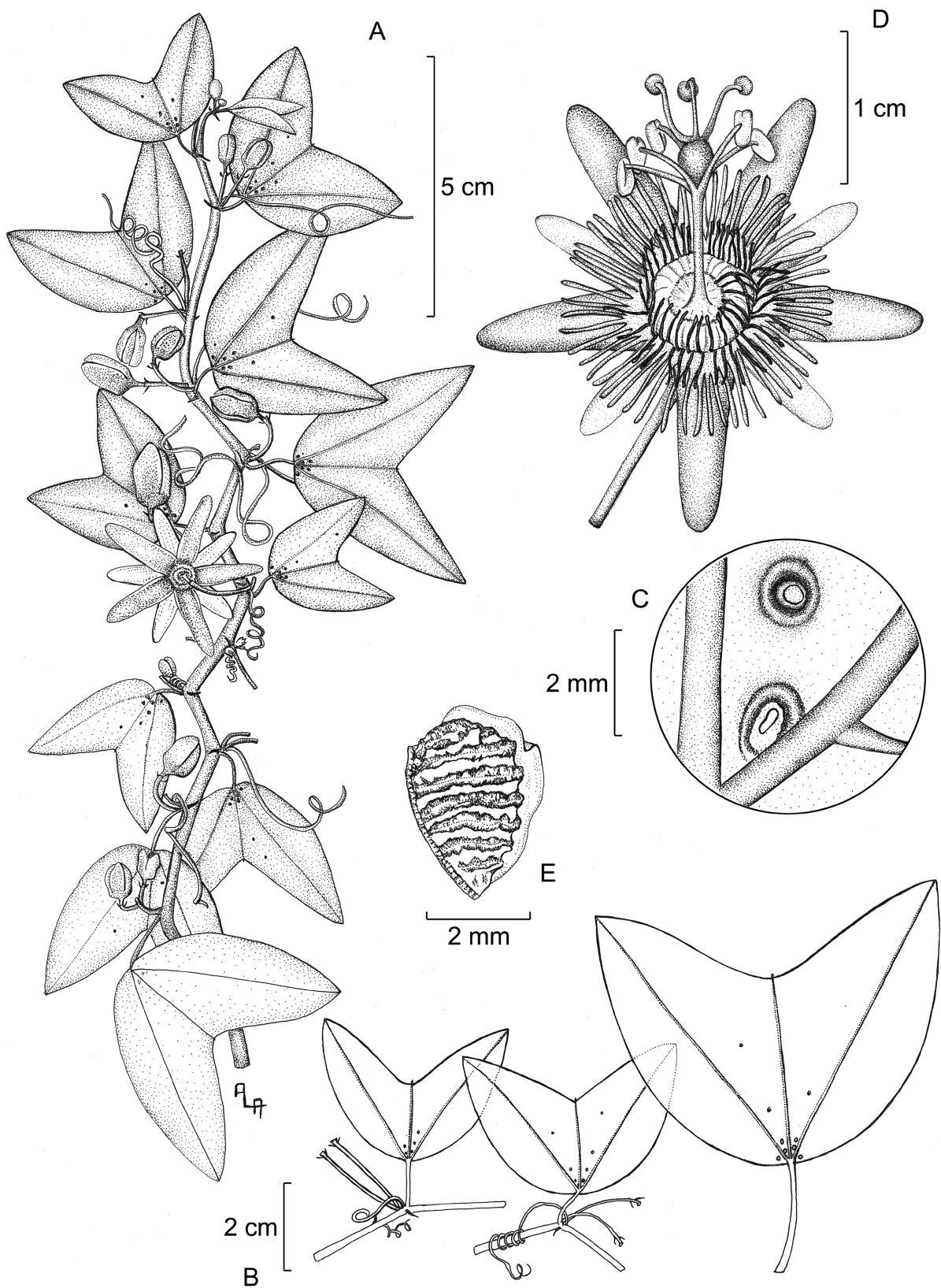
We report here a previously undescribed endemic species from the northern Peruvian Andes belonging to *P.* section *Decaloba*, bringing the reported total species of *Passiflora* in Peru to 99 species, with 32 endemics. Of this total, 16 belong to *P.* section *Decaloba*, with six of those endemic to the same country. Conservation status was assessed according to IUCN (2019) categories and supported with geographic range mapping through the Tropicos.org database using the ruler and area measurement tools in Google Earth Pro.

***Passiflora ketura*** S.S. Tillett & J.M. MacDougal, *sp. nov.* TYPE:—PERU. Amazonas: Prov. Luya: Distr. Santa Catalina: Qunnor [Quinoa, 06°05'5.5"S, 078°06'44.8"W, 2433 m], selva tropical húmeda, December 1943 (bud, fl., imm. fr.), *H. de Cevalco s.n.* (holotype, USM-13172!; isotype, MO 2620322!, GenBank SAMN16951026). Figures 1, 2.

*Passiflora ketura* is a small vine with bilobed leaves. It belongs to *P.* subgenus *Decaloba* supersection *Decaloba* based on the plicate operculum, transversely grooved seeds, variegated leaves, and to section *Decaloba* based on the presence of laminar extrafloral nectaries in rows between the main veins and by the verrucose or rugulose ridges on the seeds. It differs from the similar *P. indecora* by its narrow bracts (0.3–0.7 vs. 2–8 mm wide), and from the similar *P. santos-llatasii* by its smaller flowers (sepals 11–14 vs. 18–20 mm long) and smaller fruits (ca. 10 mm vs. ca. 40 mm long).

Small vine to 3 m long, minutely and sparsely to lightly puberulent or pilosulose throughout, sometimes densely appressed puberulent near shoot tip, the trichomes 0.1–0.2 mm long, except the laminas adaxially sparsely puberulent and glabrescent with age, the stem sometimes glabrescent below, the stipules glabrous to slightly puberulent, and the ovary glabrous; stems drying subangulate or subtriangular and often conspicuously striate, sometimes glabrescent below, flowering internodes (1.0–)2–4(–4.6) cm long, green, flushed purplish at the node complex; prophyll of the vegetative bud single, 1.3–3.0 × 0.7–1.5 mm, ovate to widely ovate, the apex acuminate to long-acuminate, the margin with (1–) 2–3 (–4) conspicuous teeth per side. Stipules 2.0–3.5 × 0.3–0.7 mm, narrowly lanceolate, long-acuminate, subfalcate, glabrous to slightly puberulent, purple with stramineous tip; petioles 0.7–2(–2.8) cm long, eglandular; laminas wider than long, in outline (very widely obovate to) depressed obovate, widest near the apex, (1.3–)2–4.2 cm long along central vein, (3.5–)4.5–7.5(–9.2) cm wide, the ratio of laminar width to central vein length 2–3(–3.5), adaxial surface sublustrous and less puberulent, glabrescent with age, sometimes variegated whitish adaxially along the lateral veins and rarely with a pale trace on the center vein, the laminar base rounded, obscurely to slightly cordate, 2-lobed (1/8 to) 1/4 to 1/3 (to 1/2) the distance to the base, the sinus of the bilobed leaf often obtusely subangular and sometimes slightly emarginate at central vein, sinus rarely abruptly rounded or crescent shaped, laminar margin entire, lateral lobe veins (1.8–)2.5–4.8(–5.0) cm long, ratio of lateral/central vein length (1.0–)1.6–2.3(–2.7), the angle between the lateral lobes (58°–)68°–85°(–95)°, the lateral lobes ovate to ovate-lanceolate, the apices obtuse to acute and rounded at very tip, the central lobe absent; laminar nectaries (3 to) 4 to 9 (to 11) per leaf, with 3 to 9 borne between the main veins, and sometimes (0 or) 1 or 2 nectaries borne outside (exmedial) the main lateral veins near the junction of main veins, the glands 0.5–1.0 mm diam., patelliform or shallowly crateriform, their edges sometimes purplish and the whole gland ringed by a pale zone or halo. Peduncles (1)2 per node, (1.0–)1.2–2.2 cm long not including pedicel (floral stipe), uniflorous; bracts 3, 1.3–2.7 × 0.3–0.7 mm, at or within 3 mm of the apex of the peduncle, narrowly obtrullate, cuneate, tridentate (subentire or obscurely toothed to 5-toothed). Buds (ovate-) oblong, bluntly rounded, yellow (*Wurdack 485*); flowers white, pedicel 1.5–3.5(–4.5) in both flower and fruit, hypanthium 7–12 mm diam., concave at point of attachment; sepals 11–14 × 4–5 mm, ovate-triangular to broadly lanceolate, apically rounded with no subapical projection, color white adaxially; petals 6.5–8 × 2.1–2.9 mm, narrowly ovate or lanceolate, the apex rounded or praemorse, white; coronal filaments in 2 series, the outer ca. 50 in number (N=1), 4.5–6 mm long, filiform but slightly laterally compressed basally and slightly tapering to the apex, adnate to base of sepals ca. 1 mm, whitish with dark purplish color at base; the inner series 2.2–3 mm long, capillary, purplish, capitellate or slightly lobulate at tips; operculum ca. 2 mm long, membranous, plicate, pale or whitish with slight purplish flush at base, the margin fimbriate; nectary annulus not seen; limen ca. 3.5 mm diam.; androgynophore 8–9 mm long, color unknown, dark; staminal filaments 5.5–6 mm long, purplish, anthers 3 mm long; ovary 1.8–2.5 × 1.8–2.5 mm, subglobose, glabrous, drying dark; styles 6–7 mm long including capitate stigmas. Fruit a berry, 9–10 mm long, subglobose, stipitate, purplish black; arils unknown; seeds 3.2–3.5 × 2.3–2.7 mm, widely obovate in outline, symmetric around

long axis, often somewhat prismatic in cross-section, dark brown to nearly black, transversely sulcate with (6 to) 7 to 8 sulci, the intervening ridges verrucose or rugulose.



**FIGURE 1.** *Passiflora ketura*. A. Habit of flowering branch. B. Variations in leaf shape and two nodes with peduncles and stipules. C. Detail of laminar extrafloral nectary glands on abaxial surface of leaf at axil of central and a lateral vein. D. Flower. E. Seed, with remnant of raphe at right side. A, C–D from *Cevasco s.n.*; B from *Woytkowski 7804* (left) and *Cevasco s.n.* (middle and right); E from *Woytkowski 7804*. Illustration by Alba Arbelaez.





MUSEO DE HISTORIA NATURAL  
HERBARIO  
SAN MARCOS  
U.S.M.  
No. 13172  
LIMA-PERU  
UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS

Limbo absent. 13172  
SCR: S. Tillett 1966  
1/2 mm apart at base  
5-6 mm ± 3 mm Some appearing = 2-2.5 mm  
Pinnate auriculate  
outer radii slightly flattened tangentially  
inner " rounded  
operculum plicate, fimbriate margin  
annulus of 2-3 ridges

Holotype of: *Passiflora ketura*  
S. Tillett & J. M. MacDougal  
Ref. ined.  
Missouri Botanical Garden (MO)

USM : 13172 PLANTAS DEL PERU  
Depto. AMAZONAS Prov. Luya  
*Passiflora punctata* L.  
Localidad: Qunnuor  
Flores: ..... Frutos redondos  
Habitat: S.T. húmedo  
Fecha: Dic. de 1943. Altitud  
N. v. Det.  
Colector: ~~Chamorro~~ H. de Cevasco s.n.  
-70

Leaf tissue removed for DNA sequencing.  
Cited in "Phylogenomics of *Passiflora* sect.  
*Decaloba*". Serena Achá (MO), 2019.

FIGURE 2. *Passiflora ketura*. Holotype specimen at USM. Scan courtesy of the Missouri Botanical Garden.

*Distribution and Ecology.* Endemic to northern Peru, this species is only known from a small area roughly bound by the settlements of Luya, Chachapoyas, and Leimebamba (Amazonas Department). *Passiflora ketura* is recorded from forest and forest edge at 2100–2433 m elevation. The collector of the type, Hortencia de Cevalco, recorded “S. T. húmedo” on the sample. The “ceja de selva” forest in that general area is characterized as Holdridge life zones bh-MBT (bosque húmedo Montano Bajo Tropical) and bmh-MT (bosque muy húmedo Montano Tropical) (SINIA 2009).

*Conservation status.* With an extent of occurrence (EOO) of ca. 725 km<sup>2</sup>, and an area of occupancy (AOO) surely much less than that, and only three known localities, *P. ketura* can be assigned the conservation status of Endangered (EN) according to criteria B1a,b and B2a,b of the IUCN (2019). The area is under pressure from conversion of forest and forest remnants to agriculture.

*Phenology.* Buds, flowers, and immature fruits are known in May and buds, flowers, and fruits are known in December.

*Etymology.* The name is derived from the Greek *ketos*, whale, and *ura*, tail, referring to the distinctive bilobed shape of the leaf that resembles the tail fluke of a cetacean.

*Discussion.* First collected in 1846 by Mathews and still known only from herbarium specimens, the vine is relatively small judging from the short internodes and the collector’s notes “vine in shrubs” (Wurdack 485), and “forest, liana 3 m high” (Woytkowski 7804). Flowers are known from only one very well-preserved dried flower and a couple older shriveled ones. Notes on labels indicate the buds to be “yellow” (Wurdack 485) and flowers “white” (Woytkowski 7804) and the petals and inner surface of the sepals appear to be white in the herbarium. The three-dimensional shape of the open corona in living flowers is unknown but the outer corona is adnate for a short distance to the base of the sepals, forming pale pads that are very similar to flowers of other species of *P.* section *Decaloba* with very widely spreading coronas.

*Passiflora ketura* has strictly and conspicuously bilobed leaves (at least on the mature specimens seen) and a consistent leaf shape (see fig. 1) with no trace of a central lobe, unlike many related “bilobed” species which show evidence of a variable middle lobe that may be variously more or less developed. Morphologically it fits in the large *P.* section *Decaloba* due to its bilobed leaves and plicate operculum, transversely grooved seeds with verrucose or rugulose ridges, variegated leaves, and laminar extrafloral nectaries in rows between the main veins. This placement was recently confirmed in more detail by Acha *et al.* (2021) in their phylogenomic study of *P.* section *Decaloba*. Samples from the isotype specimen and from Woytkowski 7804 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. pascoensis* L.K. Escobar (1989: 880) and *P. indecora* Kunth (1817: 134).

*Passiflora ketura* cannot be confused with *P. pascoensis* of the Peruvian Andes because the latter has very shallowly bilobed or truncate leaves that are much longer than wide and very large flowers (7–8 cm diam. vs. < 3 cm diam.). The leaf shape of the new species is similar to that of *P. indecora* of the Andes of southern Ecuador, but that species has bracts 2–8 mm wide (vs. < 0.8 mm wide). The leaves are also rather similar to those of the recently described *P. santos-llatasii* B. Esquerre (2019a: 4) from Piura in northwest Peru, but that species has a larger flower with sepals 18–20 mm long (vs. 11–14 mm long); corona to ca. 18 mm long (vs. ca. 6 mm long); and oblong-obovoid fruit ca. 40 mm long (vs. subglobose fruit ca. 10 mm long). The recently described *P. andicola* B. Esquerre (2019b: 280), also of northern Peru, has a somewhat similar flower, but the ovary of that species is pubescent (vs. glabrous), and its leaves are not deeply bilobed and have an angle between the lateral lobes of 20°–40° (vs. 58°–95°).

Duplicates of the Mathews paratype (see below) were seen and annotated by the last two monographers of *Passiflora*, Maxwell T. Masters and Ellsworth P. Killip. Masters annotated the specimen at OXF as “*P. sp. n.*” but as “*P. indecora*” at K and in his monograph (1872: 551), while Killip annotated the K specimen as “*Passiflora Candollei*.” In his 1938 monograph, under *P. indecora* (1938: 227), Killip noted that “Masters referred here a specimen of *P. Candollei* collected at Chachapoyas, Peru, by Mathews...” and he cited the Mathews specimen under *P. candollei* Triana & Planchon (1873: 161). Killip cited five duplicates of the Mathews collection (1938: 182); they are included in the paratypes below and we have marked the ones we examined. *Passiflora candollei*, found in the upper reaches of the Amazon basin and its foothills (100–1400 m elevation), is not very closely related to *P. ketura* (in clade SA8 of Acha *et al.* 2021, not clade SA7). It can easily be distinguished because besides its warmer lowland habitat, it has larger leaves with a broadly lunate sinus and lateral leaf lobes 6–14 cm long (vs. up to ca. 5 cm long), and petioles 3–6 cm long (vs. < 3 cm long).

Other species of *Passiflora* growing near Chachapoyas include *P. callacallensis* Skrabal & Weigend in Skrabal *et al.* (2001: 316), a species outside of *P.* section *Decaloba* with petiolar nectaries, and an undescribed species of *P.* section *Decaloba* with canescent stems and very different white-pilose leaves (MacDougal, unpublished data).

*Paratypes:* PERU. **Amazonas:** Chachapoyas: [vic.] Chachapoyas (“Chacapoyas”) [ca. 06°14’S, 077°52’W],



December 1846 (bud, fl.), [*Andrew Mathews s.n.*, (B (destroyed), BM, G-00160061!, G-Bo, K-H2008/01383-220!, NY, OXF-00072243!); Leimebamba, 2100 m, 06°41'S, 077°47'W, December 1962 (bud, fl., fr.), *F. Woytkowski 7804* (MO 1793889, MO-[barcode]1272509, GenBank SAMN16951025, US 2453365); pasture 1.5 km southwest of Chachapoyas, 2320 m, 06°14'55"S, 077°52'31"W, 24 May 1962 (bud, fl., imm. fr.), *J. J. Wurdack 485* (US 2406475, USM 28888).

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