

# Three new species of *Psychocampa* Grote and Robinson (Mimallonidae, Cicinninae, Psychocampini) and the description of the female of *P. kohlli* Herbin

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**Abstract:** Three new species of *Psychocampa* Grote and Robinson, 1867 are described from Central and South America: one from Costa Rica and Panama: *P. ursa* n. sp.; and two from Peru: *P. antonkozlovi* n. sp. and *P. yuliyakovalevae* n. sp.. The female of the somewhat rarely reported *P. kohlli* Herbin, 2012 is figured and described, along with its genitalia, for the first time. Four new country records are also provided for *P. kohlli*.

**Keywords:** Andes Mountains, Costa Rica, Mimallonoidea, Neotropical, Panama, Peru

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## INTRODUCTION

Recent phylogenetic studies have started to define the various clades of Mimallonidae (St Laurent *et al.*, 2018). Cicinninae Schaus, 1912 is the most diverse subfamily of mimallonids, and contains three tribes. The cicinnines are among the largest Mimallonidae, and are found throughout the New World, from Canada to Argentina (St Laurent & Kawahara, 2019). The taxonomic histories of two of the cicinnine genera, *Cicinnus* Blanchard, 1852 and *Psychocampa* Grote and Robinson, 1867, have been particularly confusing, and it was not until the molecular phylogeny of St Laurent *et al.* (2018), which clarified the boundaries of these otherwise externally similar genera, that *Cicinnus* and *Psychocampa* were determined to be sufficiently phylogenetically distinct to warrant placement in separate tribes: Cicinnini Schaus, 1912 and Psychocampini St Laurent and Kawahara, 2018, respectively. Psychocampini can be easily separated from Cicinnini by the genitalia that are relatively simple for Mimallonidae, with males having broad rectangular valvae and massive gnathos arms that often rival the remainder of the genitalia in size. The genitalia of Cicinnini are often complex, with variable valvae and gnathos structures, dense patches of diaphragmal setae, tusk-like arms that originate from the vinculum, and juxtal configurations that are intricate in structure and attachment to various other regions of the genitalia. In fact, the genitalia within Psychocampini are among the most homogenous of any mimallonid tribe, and thus permit the simple generic determination and placement of species.

The combined works of St Laurent *et al.* (2018) and St Laurent and Kawahara (2019) transferred 18 species

to *Psychocampa* from *Cicinnus*, and several others from *Psychocampa* to *Cicinnus* and to other genera, illustrating that many species had historically been incorrectly placed in these genera based on external morphology alone. The diagnostic structures of *Psychocampa* genitalia always allow for unambiguous placement of species into this genus, and more broadly within Psychocampini when considering the minor, albeit consistent, differences between *Psychocampa* and its sister genus *Biterolfa* Schaus, 1928. The present article describes three new species of *Psychocampa* based on morphological examination, further expanding our knowledge of this diverse genus and providing additional evidence to support the previously stated consistency of genitalia characters that define *Psychocampa*. Additionally, I describe and figure the female of *P. kohlli* Herbin, 2012 for the first time.

## MATERIALS AND METHODS

Dissection methodology follows Lafontaine (2004), using standard techniques. Specifically, I macerated soft tissue of entire abdomens in 10% potassium hydroxide (KOH), heated to 80° C for 15 minutes. Genitalia preparations were not stained nor slide mounted due to the extremely robustly sclerotized and three-dimensional morphology in *Psychocampa* genitalia. Genitalia are stored in glycerol in microcentrifuge tubes. Morphological terminology follows Kristensen (2003) with additional supplemental definitions and terminology as provided by St Laurent *et al.* (2018) and St Laurent and Kawahara (2019). These latter two works are also the sources of the classification scheme followed here, including the generic concept of *Psychocampa*. Several of the taxa mentioned herein,

that were once formally placed in *Cicinnus*, were recently placed in *Psychocampa*.

All adult specimens figured in this study were photographed with a Panasonic Lumix DMC-FZ50 and a DMW-LC55 macro lens. Genitalia were photographed with a Canon EOS 6D with an Infinity Long-Distance Microscope with a CF-4 objective. Thirty images of the genitalia, taken at differing focal planes, were produced on an automated macro rail for focus stacking in StackShot, and subsequently stacked using Helicon Focus software. All figures were edited with Adobe Photoshop CS4 (Adobe, 2008) and/or Photoshop as part of the Adobe Creative Cloud (Adobe, 2018). The map was initially constructed using the online mapping software SimpleMapp (Shorthouse, 2010). The geographic coordinates and elevations (when not provided on specimen labels) were determined using Google Earth, and are provided in brackets when applicable.

The material examined in this study was derived from the following institutions, with the following abbreviations used throughout the text: **CUIC**: Cornell University Insect Collection, Ithaca, New York, USA; **MGCL**: McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida Gainesville, Florida, USA; **MNHN**: Muséum nationale d'Histoire naturelle de Paris, France; **MWM**: Museum Witt, Munich, Germany; **NHMUK**: Natural History Museum, London, U.K.; **TAMUIC**: Texas A & M University Insect Collection, College Station, Texas, USA; **VOB**: Becker Collection, Camacã, Bahia, Brazil.

## RESULTS AND DISCUSSION

### Mimallonidae: Cicinninae: Psychocampini *Psychocampa Grote and Robinson, 1867*

**Type species.** *Psychocampa concolor* Grote and Robinson, 1867

### *Psychocampa ursa* St Laurent, new species

Figs 1, 2, 9, 15

**Description. Male. Head:** Coloration dark brown. Antennae bipectinate to tip, distal third of pectinations dramatically shorter than basal pectinations. Eyes very large, comprising more than two thirds area of head. Labial palpus extending nearly to edge of frons, coloration as for head though with darker gray scales dorsally; labial palpus three-segmented. **Thorax:** Dark grayish brown, ventrally as above. **Legs:** Coloration as for thorax, vestiture very thick, long. Tibial spurs very small, almost indiscernible in spread specimens. **Forewing dorsum:** Forewing length: 27.0–28.0 mm, avg.: 27.3 mm; wingspan: 58.0–59.0 mm, avg.: 58.3 mm, n = 3. Broadly triangular, apex falcate, outer margin mostly convex except for concavity below apex. Ground color same dark brown coloration as thorax, fading to lighter brown in old specimens. Antemedial line as very faint, wavy brown line. Postmedial line fine, straight, well-defined, dark brown, angled toward costa at intersection with Rs4, after which line curves inward before sharply angling again toward costa. Entire wing nearly concolorous except for darker antemedial line, postmedial line, and discal spot; however, darker brown shading present along outer margin of postmedial line, dark brown shading outwardly dentate nearly to wing margin where shading intersects veins. Discal spot as dark-brown oval. Fringe lighter brown than ground color of wing. **Forewing ventrum:** Similar to dorsum but more uniformly lighter brown. Antemedial line absent, postmedial line weakly defined, consisting of dentate, convex line angled toward costa at intersection with Rs4. Discal spot larger and more well-defined. **Hindwing dorsum:** Rounded, coloration and patterning as for forewing dorsum, but antemedial line absent, postmedial shading relatively wider, shading does not follow wing veins to form dentate pattern as on forewing, coloration basally lighter brown.

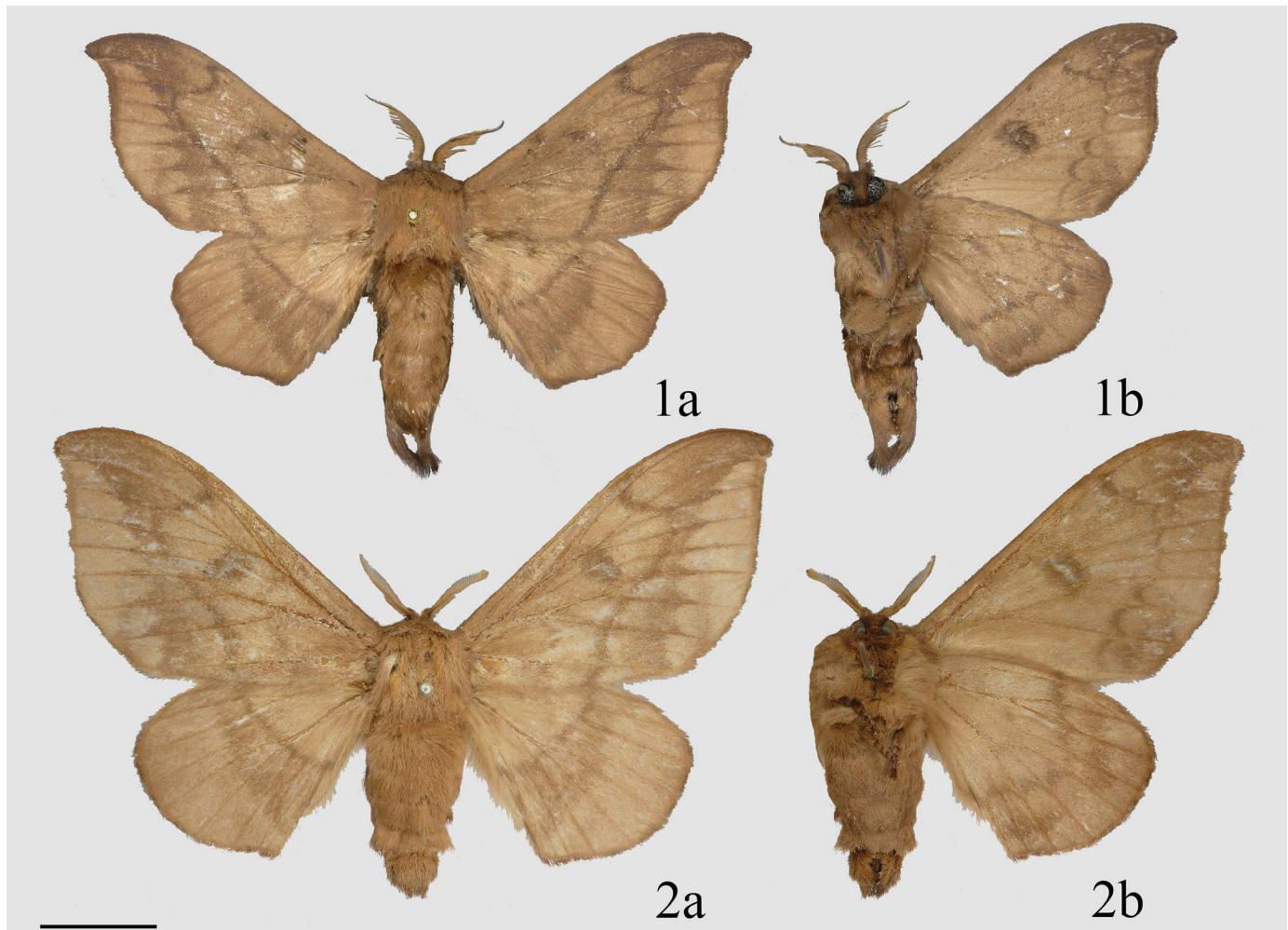
**Hindwing ventrum:** Follows similar pattern as forewing ventrum, postmedial line convex, discal spot as oval, colored darker brown than surrounding medial area. **Abdomen:** Robust, extending beyond anal angle of hindwing, coloration mostly as for thorax but darker brown terminally due to darker colored, more elongated scales extending from each valva. Sternite of VIII anteriorly and posteriorly concave, with pair of short protuberances, one on either side of posterior concavity. **Genitalia:** (Fig. 9) n = 2. Typical of *Psychocampa*. Vinculum rectangular. Tegumen quadrate, short, stout, robustly sclerotized and equal in length to that of uncus. Uncus broadly triangular basally, distally very narrow, digitiform. Gnathos extends downward from heavily sclerotized ventral margins of tegumen, distally gnathos as pair of flattened arms, basally arms wrinkled, termini of arms truncated, arms extend beyond saccular margin of valvae. Valva vaguely triangular, longer than tegumen + uncus. Juxta fused to phallus with paired flattened knob-like lateral components. Phallus cylindrical, dorsoventrally flattened, distally widened. Vesica thick, bag-like, spiculate. **Female. Head:** As for male but antenna smaller overall. **Thorax:** As for male. **Legs:** As for male, but coloration slightly deeper brown. **Forewing dorsum:** Forewing length: 34 mm; wingspan: 62.5 mm, n = 1. Patterning as for male, wing shape slightly broader, not falcate, coloration barely lighter. **Forewing ventrum:** Similar to dorsum but more uniformly lighter brown. Antemedial line absent, postmedial line weakly defined, consisting of dentate, convex line angled toward costa at intersection with Rs4. Discal spot larger and more well-defined. **Hindwing dorsum:** As for male, coloration barely lighter brown. **Hindwing ventrum:** Follows similar pattern as forewing ventrum, postmedial line convex, discal spot nearly absent. **Abdomen:** As for male, but thicker, coloration mostly as for thorax, terminus lacks elongated scale tufts. **Genitalia:** Not examined.

**Types. Holotype, ♂. PANAMA: Chiriqui:** PANAMA: Chiriqui, Mt. Totumas Lodge, nr. Volcan [8.88283°, -82.683643°], 24-30 May 2014 1900 m, J. B. Heppner [leg.]/ St Laurent dissection: 8-23-18:4 *ursa* HT/ HOLOTYPE ♂ *Psychocampa ursa* St Laurent, 2019/ (MGCL).

**Paratypes.** (2 ♂, 1 ♀) **COSTA RICA: Puntarenas:** 1 ♂, Monteverde area, Hotel de Montaña [10.311838°, -84.815861°, 1395 m]: 22.VII.1987, D. L. Eiler leg., D. L. Eiler colln. MGCL Accession #2008-9, MGCL 1031828, "lighted veranda, early morning" (MGCL). 1 ♀, Monteverde [10.269014°, -84.822015°], 1500 m: 1-4.IX.1999, V. O. Becker col., Col. Becker 119269 (VOB). **PANAMA: Chiriqui:** 1 ♂, No additional locality data, Rothschild Bequest BM 1939-1, NHMUK 010895681, genitalia vial NHMUK 010402295 (NHMUK). Paratypes with the following yellow label reading: "PARATYPE ♂/♀ *Psychocampa ursa* St Laurent, 2019".

**Etymology.** The specific epithet for *P. ursa* n. sp. is derived from the Latin noun *ursus*, meaning bear. This name refers to the large size of this *Psychocampa*, as well as its thick brown vestiture, both of which are characteristic of a Brown Bear (*Ursus arctos* Linnaeus, 1758).

**Diagnosis.** This species is similar in maculation to a complex of species including *Psychocampa bactriana* (Butler, 1878), *P. callipius* (Schaus, 1928), *P. gaujoni* (Dognin, 1922) (Figs 6, 12), *P. magnapuncta* (Kaye, 1901), and *P. narseres* (Schaus, 1928) (Figs 7, 13). *Psychocampa ursa* n. sp. is much darker in coloration than any of these, has unique postmedial patterning, and distinct genitalia. *Psychocampa ursa* is deep brown, with obscured patterning due to weak contrast between the dark ground color and discal spot and postmedial line. The only other comparatively darkly colored *Psychocampa* are *P. concolor* Grote and Robinson, 1867 and *P. funebris* (Schaus, 1896). *Psychocampa concolor* has very narrow, elongated forewings and *P. funebris* almost entirely lacks discernable maculation and has more deeply falcate forewings and almost black coloration. One particularly noteworthy external feature of *P. ursa* is the shading along the outer margin of the postmedial line, which appears sharply dentate where the shading intersects the veins, such that this darker coloration follows the vein toward the



**Figs 1, 2.** Adult *Psychocampa ursa* n. sp., a = dorsal, b = ventral. **1.** Male, holotype, Panama, Chiriquí, Mt. Totumas Lodge, nr. Volcán (MGCL). **2.** Female, paratype, Costa Rica, Puntarenas, Monteverde, 1500 m (VOB). Scale bar: 1 cm.

wing margin, sharply narrowing along the veins' length forming five to six sharp points along the submarginal area. The male genitalia of *P. ursa* are typical of *Psychocampa* (for example, see Figs 9, 11–13), although the quadrate, abruptly truncated termini of the gnathos arms are so far apparently unique to this species, particularly in combination with the presence of only weakly developed VIII sternite projections. Other *Psychocampa* with truncated gnathos arms, such as *P. gaujoni* (Fig. 12) and *P. narseres* (Fig. 13) do not have such abruptly squared termini of the gnathos arms and also have comparatively more elongated projections of the VIII sternite.

**Distribution.** (Fig. 15). This new species of *Psychocampa* is quite rare in collections and is only known from four specimens from mountainous regions of Costa Rica and Panama.

**Remarks.** As mentioned in the diagnosis, *P. ursa* n. sp. belongs to a species complex of *Psychocampa* that is found throughout South America, but this taxon is so far the only member of the complex known from Central America, and is externally rather distinct from any other *Psychocampa*, particularly those from Central America. The life history is completely unknown, although based on the notes on the labels of one of the

paratypes, this species is attracted to lights. Other darkly colored *Psychocampa* that are rare in collections are purported to be at least partially diurnal despite coming to lights occasionally, and this could also be the case with the rarely collected, darkly colored *P. ursa* (St Laurent *et al.*, 2019).

#### *Psychocampa antonkozlovi* St Laurent, new species

Figs 3, 4, 10, 15

**Description. Male. Head:** Coloration light brown. Antennae bipectinate to tip, distal pectinations dramatically shorter than basal pectinations. Eyes very large, comprising more than two thirds area of head. Labial palpus extending to edge of frons, coloration as for head though with darker gray scales dorsally; labial palpus apparently three-segmented but second segment very short. **Thorax:** Coloration light brown interspersed with bicolored basally off-white distally darker brown petiolate scales, ventrally as above. **Legs:** Coloration as for thorax. Tibial spurs shorter than shortest (the distalmost) tarsomere, covered in scales. **Forewing dorsum:** Forewing length: 22.0 – 27.0 mm, avg.: 24.5 mm; wingspan: 46.0 – 52.5 mm, avg.: 48.9 mm, n = 5. Acutely triangular, falcate. Ground color light grayish brown. Antemedial line as very faint, wavy brown line. Postmedial line well-defined, dark brown, angled toward costa after passing Rs<sub>4</sub>; outwardly suffused with darker brown and denser speckling of bicolored petiolate scales. Antemedial and medial areas concolorous, coloration somewhat darker brown submarginally due to postmedial shading and denser covering of dark petiolate scales. Discal spot variable, from faint to well-defined gray-brown oval. Fringe darker brown than ground color of wing. **Forewing ventrum:** Similar to dorsum



but more uniformly lighter brown, bicolored petiolate scales more concentrated mesally, ternal region somewhat darker brown. Antemedial line absent, postmedial line weakly defined, consisting of weakly dentate line angled toward costa at Rs4. *Hindwing dorsum*: Rounded, coloration and patterning as for forewing dorsum, but antemedial line absent, basally lighter. *Hindwing ventrum*: Follows similar pattern as forewing ventrum, postmedial line convex, discal spot not well defined. *Abdomen*: Robust, extending well beyond anal angle of hindwing, coloration mostly as for thorax albeit slightly darker brown. Terminally with elongated scales extending from each valva. Sternite of VIII broadly rectangular with mesal concavity, laterally with two pairs of small teeth formed by smaller secondary concavities. *Genitalia*: (Fig. 10) n = 2. Somewhat atypical of *Psychocampa*: vinculum narrow, rectangular. Tegumen short, stout, robustly sclerotized and shorter than uncus. Uncus broadly triangular basally, distally narrowly rectangular with truncated terminus. Gnathos extends downward from heavily sclerotized, somewhat rounded ventral margins of tegumen, distally gnathos as robust, flattened inwardly arched wide band-like arms which reach saccular edge of valvae, distally arms with blunt dorsal apex and elongated digitiform disto-ventral projections that curve inward, arms weakly wrinkled baseo-latitudinally. Valva rounded, saccular edge more thickly sclerotized and mesally projected with flattened protuberance; with moderately sclerotized baseo-costal outwardly projected lobe. Juxta fused to phallus with paired flattened knob-like lateral components. Phallus flattened, curved, otherwise simple. Vesica thick, bag-like, spiculate. **Female**. Unknown.

**Types. Holotype**, ♂. **PERU: Junín**: PERU: Junín reg.: Satipo prov., San Martín de Pangoa distr., 960 m, 11.7047°S, 74.3016°W, 22.I.2017, A. Kozlov & Yu. Kovaleva leg./ St Laurent dissection: 7-20-18:3/ HOLOTYPE ♂ *Psychocampa antonkozlovi* St Laurent, 2019/ (MGCL).

**Paratypes**. (4 ♂): **PERU: Junín**: [Chanchamayo], La Merced, 3000–4500 ft [-11.061932°, -75.331595°], genitalia vial NHMUK 010402296 associated with specimen NHMUK 010895684 (NHMUK). Paratypes with the following yellow label reading: “PARATYPE ♂ *Psychocampa antonkozlovi* St Laurent, 2019”.

**Additional specimens examined** [not included in type series, 2 ♂]: **ECUADOR: Orellana**: 1 ♂, Estación Científica Yasuní, 00°40'28"S, 76°38'50"W [recte -0.674358°, 76.397365°] 215 m: 5–10.IX.1999, E. G. Riley leg., UV light (TAMUIC). **PERU: Amazonas**: 1 ♂, Amazonas, Bagua-Chica, 1000 m: X–XII.1998, via R. Marx, ex. coll. Schintlmeister (MWM).

**Etymology.** *Psychocampa antonkozlovi* n. sp. is named for one of the collectors of the holotype, Anton Olegovich Kozlov (Moscow, Russia).

**Diagnosis.** *Psychocampa antonkozlovi* n. sp. is unique among *Psychocampa* in the combination of the following characters: pale gray-brown coloration, a straight dark brown postmedial line which is outwardly suffused with dark brown scales, and greatly reduced discal markings. Other Andean *Psychocampa* species such as *P. gaujoni* (Fig. 6) and *P. narseres* (Fig. 7) have broader wings, are lighter in color, have (usually) distinct discal spots, and lack well-defined outward suffusions along the postmedial lines. The genitalia of *P. antonkozlovi* (Fig. 10) are the only known within *Psychocampa* to have inwardly arched, flattened, band-like gnathos arms with elongated ventral projections and distinctly sclerotized extensions reaching outward from the saccular edge of the valvae; all other *Psychocampa*, including other Andean species (for some, see Figs 11–13), do not possess these structures in this unique configuration.

**Distribution.** (Fig. 15). This new species is definitively known from two locations separated by about 130 km in Junín, central Peru. Of these two locations, elevational data is only specific for the holotype which was collected at 960 m, though the paratypes were collected in a range from about 900–1370 m, which is consistent with the elevation of the type locality. One

specimen in the MWM from a third locality, farther north in Amazonas, Peru, is also known, but see remarks. A single specimen is known from a lower elevation in Orellana, Ecuador.

**Remarks.** Despite extensive holdings of Peruvian Mimallonidae in collections that I have visited, *P. antonkozlovi* n. sp. is seemingly rarely collected. The genitalia morphology of *P. antonkozlovi* are perhaps the most divergent of all examined *Psychocampa* species (I have examined male genitalia from most *Psychocampa* species, and all putative species-groups), and *P. antonkozlovi* is the only species so far seen to possess deeply curved, bifurcating gnathos arms and well-defined, more heavily sclerotized saccular projections of the valvae. Hopefully future inclusion of this species in molecular phylogenetics will help elucidate the placement of this taxon within *Psychocampa*.

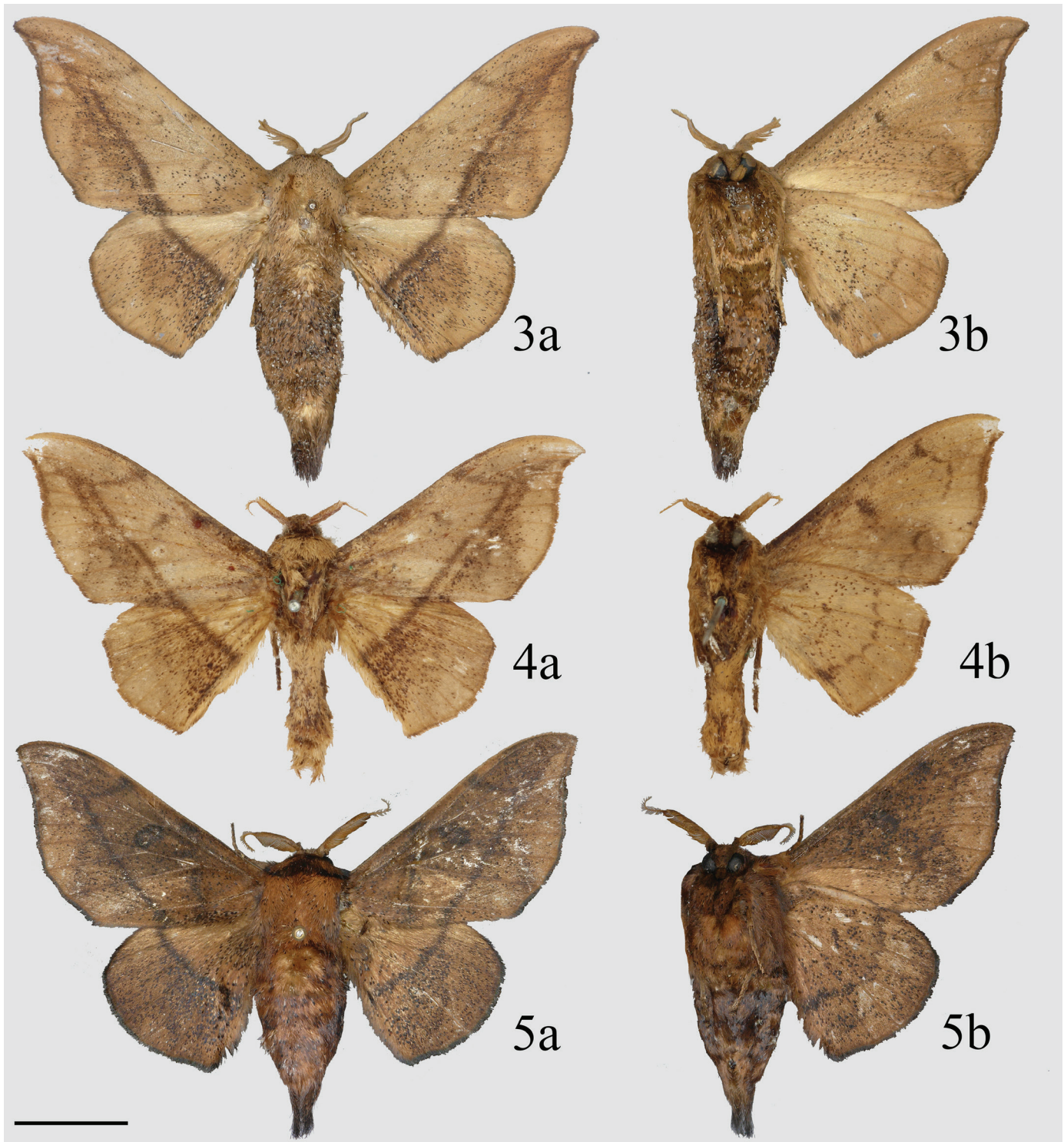
The single specimen from the MWM that was not included in the type series displays coloration consistent with *P. antonkozlovi*, but has slightly broader wings than those of the holotype. It is worth noting that some of the NHMUK paratypes, all of which come from the same location near the type locality, also display some variability in relative wing width. The specimen from the MWM was not dissected and considering this and the fact that the imprecise collecting location of this specimen is quite distant from the other localities where this species is found, it was not included in the type series, but is still currently regarded as *P. antonkozlovi*. The single Ecuadorian specimen is a very close match to the type series, and almost certainly belongs to this species. However, I excluded it from the type series in order to maintain a more conservative type series from near the type locality in central Peru, with the Ecuadorian specimen being the one most distant from the type locality. This specimen was also collected at a much lower elevation than any of the other *P. antonkozlovi* specimens that I have examined.

### *Psychocampa yuliyakovalevae* St Laurent, new species

Figs 5, 11, 15

**Description. Male.** *Head*: Coloration dark chocolate brown. Antennae bipectinate to tip, distal third of pectinations dramatically shorter than basal pectinations. Eyes very large, comprising more than two thirds area of head. Labial palpus extends to edge of frons, coloration as for head; labial palpus apparently three-segmented. *Thorax*: Coloration rich chocolate with bicolored basally off-white distally darker brown, appearing distally black, petiolate scales. Scales of prothorax darker, forming narrow dark brown, almost black collar. *Legs*: Coloration as for thorax but tarsus slightly lighter brown in color. Tibial spurs shorter than shortest (the distalmost) tarsomere, covered in scales. *Forewing dorsum*: Forewing length: 25 mm; wingspan: 50 mm, n = 1. Triangular, apex slightly falcate, mesally wing convex. Ground color dark chocolate brown, similar to thorax but a cooler hue. Antemedial line as very faint, dark brown wavy line. Postmedial line well-defined, dark brown, angled toward costa after passing Rs4, becoming thicker approaching costa. Antemedial and medial areas concolorous, coloration lighter brown submarginally due to weaker suffusion of dark brown that covers most of basal portion of wing. Discal spot ovoid, coloration as for postmedial line. Fringe darker brown than ground color of wing. *Forewing ventrum*: Similar to dorsum, bicolored petiolate scales more concentrated mesally. Antemedial line absent, postmedial line weakly defined, consisting of weakly dentate line angled toward costa at Rs4. *Hindwing dorsum*: Rounded, coloration and patterning as for forewing dorsum, but antemedial line absent, basally lighter. *Hindwing ventrum*: Follows similar pattern as forewing ventrum, postmedial line convex, discal spot not well defined. *Abdomen*: Robust, extending well beyond anal angle of hindwing, coloration mostly as for thorax. Terminally with pair of





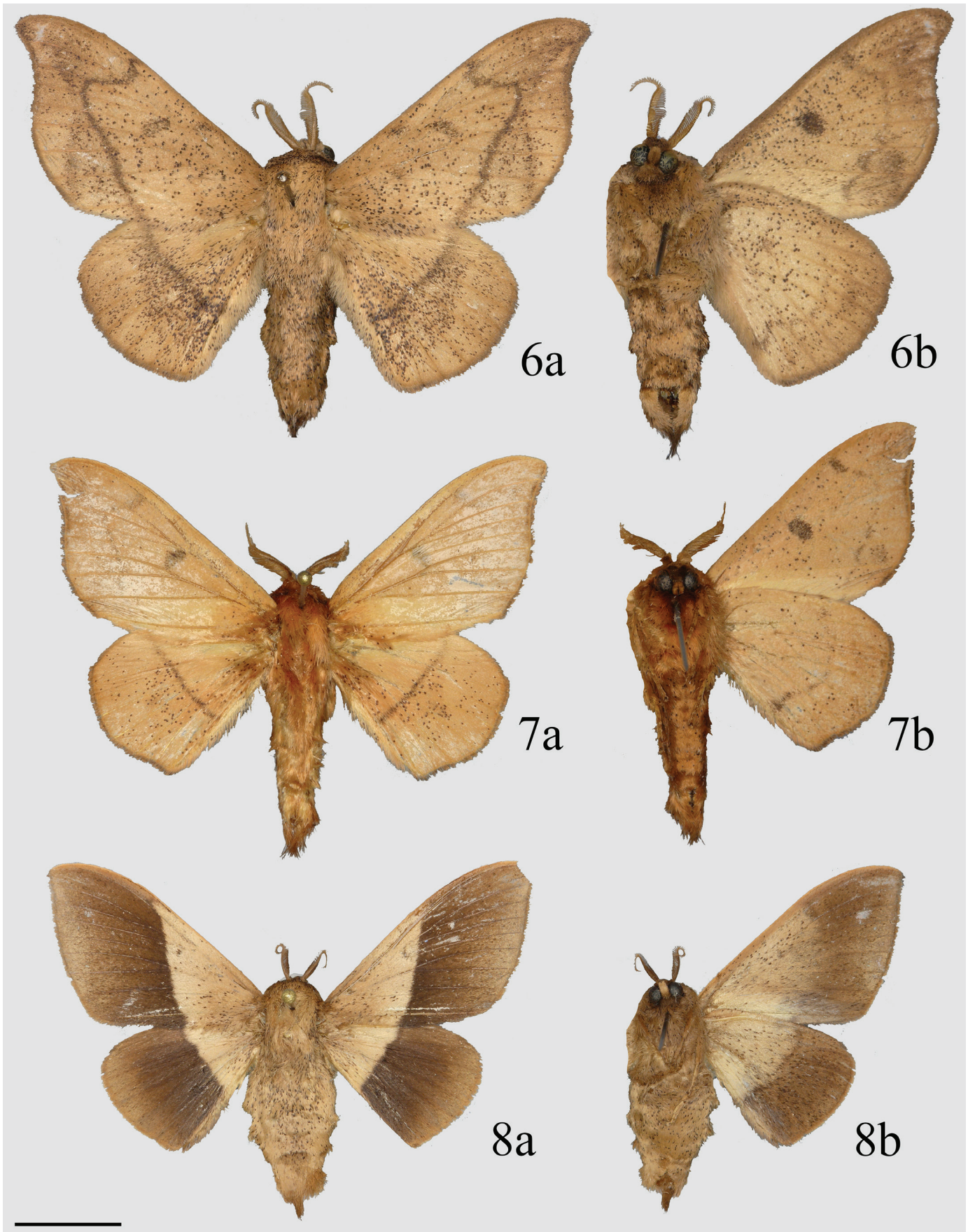
**Figs 3–5.** Adult male *Psychocampa*, a = dorsal, b = ventral. **3.** *P. antonkozlovi* n. sp., holotype, Peru, Junín, Satipo, San Martín de Pangoa, 960 m (MGCL). **4.** *P. antonkozlovi* n. sp., paratype, Peru, Junín, Chanchamayo, La Merced, 3000–4500 ft (NHMUK). **5.** *P. yuliyakovalevae* n. sp., holotype, Peru, Amazonas, Bongará, Yambrasbamba, 2140 m (MGCL). Scale bar: 1 cm.

elongated scale tufts extending from valvae. Sternite of VIII a narrow band with mesal concavity, with pair of tiny nodular projections, one on either side of mesal concavity. *Genitalia:* (Fig. 11) n = 1. Typical of *Psychocampa*. Vinculum narrow, rectangular, tegumen short, stout, robustly sclerotized and shorter than uncus, uncus very narrow distally, digitiform, base widely triangular. Gnathos extends downward from heavily sclerotized, inwardly pinched ventral margin of tegumen, distally gnathos as robust pair of downwardly angled arms which reach saccular edge of valvae, terminus of each arm blunt, arms wrinkled baseo-laterally. Valva rectangular, narrowing apically. Juxta fused to phallus with

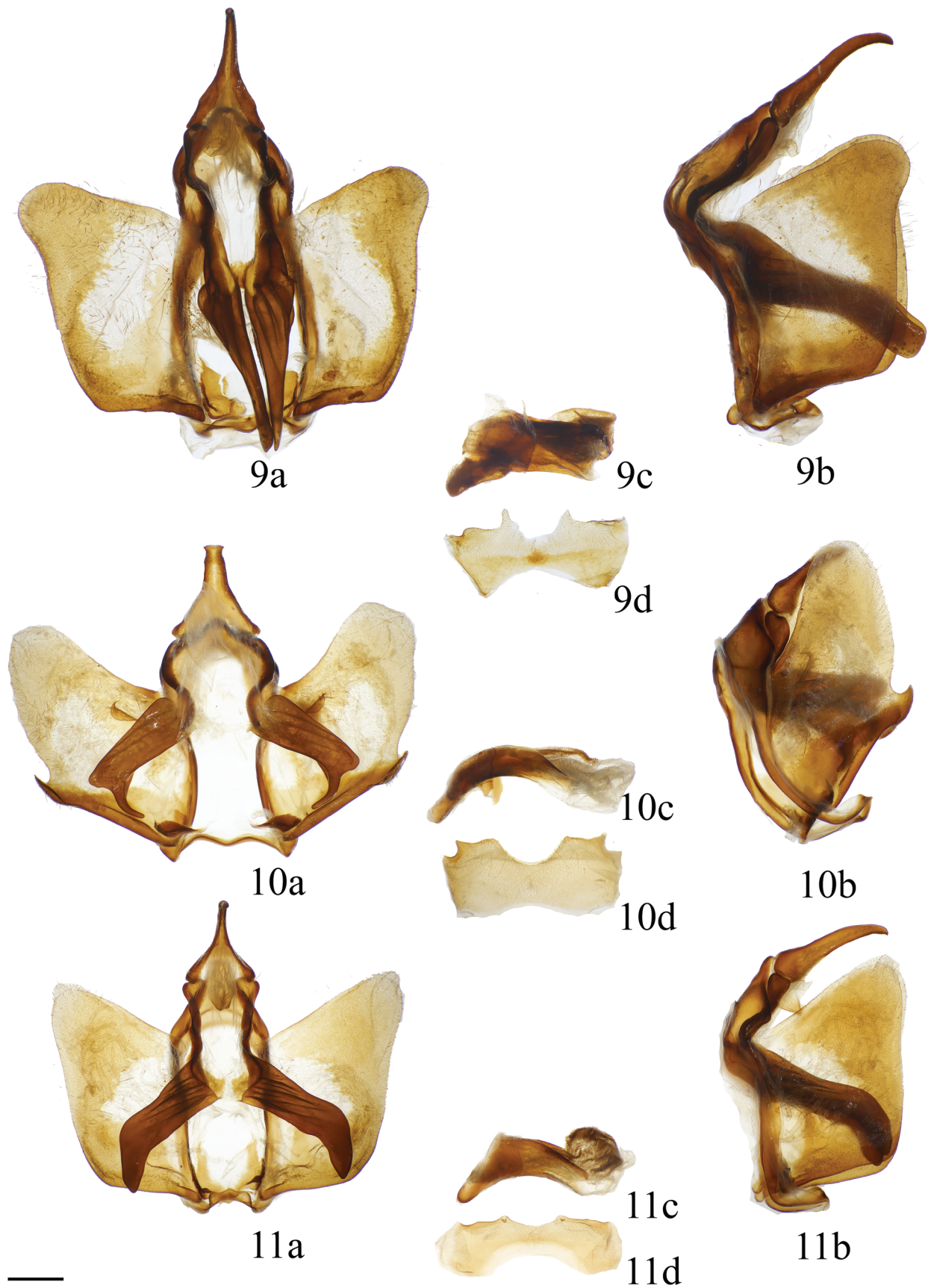
paired flattened knob-like lateral components, phallus weakly flattened, distally down-curved, otherwise simple, cylindrical. Vesica thick, bag-like, spiculate. **Female.** Unknown.

**Type. Holotype, ♂. PERU: Amazonas:** PERU: Amazonas reg.: Bongara Prov., Yambrasbamba distr., 2140 m, 5.6975°S, 77.7955°W, 4.II.2017, A. Kozlov & Yu. Kovaleva leg./ St Laurent dissection: 7-20-18:4/ HOLOTYPE ♂, *Psychocampa yuliyakovalevae* St Laurent, 2019/ (MGCL).



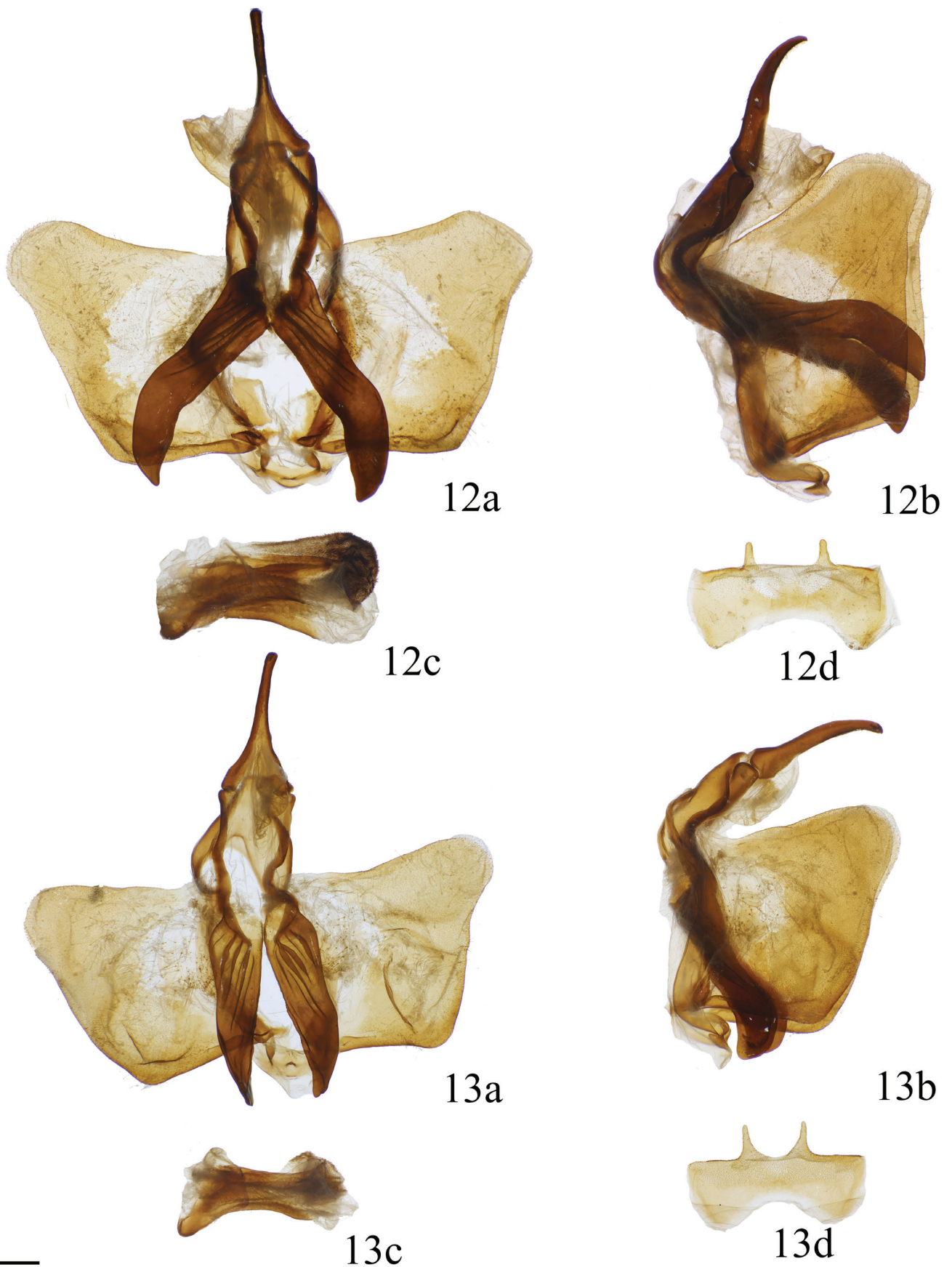


**Figs 6–8.** Adult *Psychocampa*, a = dorsal, b = ventral. **6.** *P. gaujoni*, male, Peru, Amazonas, Huembo Reserve, 8 km W La Florida, 18–20.X.2012, J. B. Heppner & C. Carrera leg. (MGCL). **7.** *P. narseres*, male, Peru, Cuzco, Manu Park, San Pedro, 1800 m, III.1997, local people leg. (MGCL). **8.** *P. kohli*, female, Peru, Madre de Dios, Salvación, Manu Park, Río Alto de Madre de Dios, 500 m (MGCL). Scale bar: 1 cm.

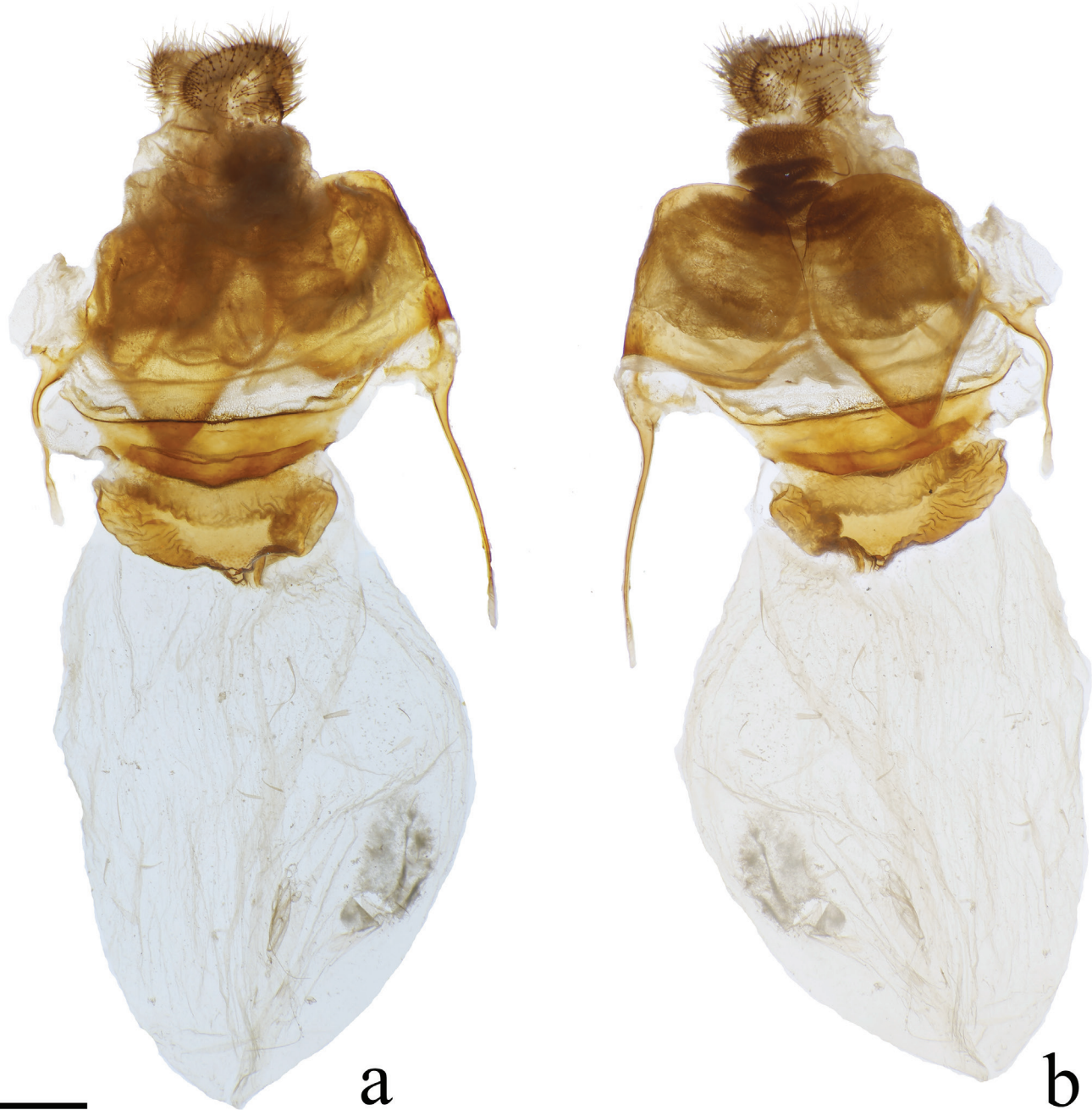


**Figs 9–11.** Male genitalia of the holotypes of new *Psychocampa* described in this work, a = ventral, b = lateral, c = phallus, d = VIII sternite. **9.** *P. ursula* n. sp., Panama, Chiriquí, Mt. Totumas Lodge, nr. Volcán [St Laurent dissection: 8-23-18:4] (MGCL). **10.** *P. antonkozlovi* n. sp., Peru, Junín, Satipo, San Martín de Pangoa, 960 m [St Laurent dissection: 7-20-18:3] (MGCL). **11.** *P. yuliyakovalevae* n. sp., Peru, Amazonas, Bongará, Yambrasbamba, 2140 m [St Laurent dissection: 7-20-18:4] (MGCL). Scale bar: 1 mm.





**Figs 12, 13.** Male genitalia of previously described Andean *Psychocampa* for comparative purposes, a = ventral, b = lateral, c = phallus, d = VIII sternite. **12.** *P. gaujoni*, Peru, Amazonas, Huembo Reserve, 8 km W La Florida [St Laurent dissection: 8-23-18:2] (MGCL). **13.** *P. narseres*, Peru, Cuzco, Manu Park, San Pedro, 1800 m [St Laurent dissection: 8-23-18:3] (MGCL). Scale bar: 1 mm.



**Fig. 14.** Female genitalia of *Psychocampa kohlli*, a = ventral, b = dorsal. Peru, Madre de Dios, Salvación, Manu Park, Río Alto de Madre de Dios, 500 m [St Laurent dissection: 8-23-18:1] (MGCL). Scale bar: 1 mm.

**Etymology.** *Psychocampa yuliyakovalevae* **n. sp.** is named for one of the collectors of the holotype, the only known specimen of this unique species, Yuliya Alexandrovna Kovaleva (Moscow, Russia), at the special request of Anton Olegovich Kozlov.

**Diagnosis.** This species is externally more similar to *Psychocampa gaujoni* (Fig. 6) than to any other *Psychocampa* species, but apparently also belongs to the same species group which includes the lighter colored *P. narseres* (Fig. 7). Both species are Andean, and display similar patterning and the typical genitalia of *Psychocampa*, but *P. yuliyakovalevae* **n. sp.** is substantially darker than either of these other two species. The wing and body coloration of *P. yuliyakovalevae* is dark chocolate brown, heavily suffused by even darker brown

scales and dense speckling of bicolored off-white and black petiolate scales. No other known Andean *Psychocampa* display such dark brown coloration, with others, including *P. gaujoni*, being light khaki brown in coloration. The genitalia of *P. yuliyakovalevae* was compared to two Peruvian populations of *P. cf gaujoni* (the type locality of *P. gaujoni* is Loja, Ecuador). *Psychocampa yuliyakovalevae* genitalia are distinct from those of both populations of *P. cf gaujoni* (the examined population which originates from a region closer to the type locality of *P. gaujoni* is figured here for comparative purposes in Fig. 12). *Psychocampa yuliyakovalevae* has substantially reduced VIII sternite projections (Fig. 11d). The VIII sternite is mesally concave, but the lateral projections are present as barely projected nodules. The phallus of *P. yuliyakovalevae* is thicker





**Fig. 15.** Map displaying collecting localities of new *Psychocampa* species described in this work. The MWM specimen of *P. antonkozlovi* n. sp. is not shown due to unspecific locality.

and distally downwardly curved, which is not seen in Peruvian *P. cf gaujoni* (compare Figs 11, 12).

**Distribution.** (Fig. 15). *Psychocampa yuliyakovalevae* n. sp. is only known from the holotype, collected at a rather high elevation for Mimallonidae (2140 m) in Amazonas, Peru. The Andes mountains of northern Peru have not been heavily sampled for Mimallonidae.

**Remarks.** *Psychocampa*, particularly the species group containing *P. yuliyakovalevae* n. sp. and *P. gaujoni*, reaches its highest diversity in the Amazon rainforest, and many names have been applied to the taxa within this species group. Fewer species are present in the higher elevations of the Andes, and fewer still have been named, with only *P. gaujoni* and *P. narseres* being formally described. *Psychocampa yuliyakovalevae* belongs to this group of Andean taxa, and is perhaps one of the most externally distinct. Additional taxonomic work will be necessary to unravel the diversity of the more similar species of *Psychocampa* that are found at lower elevations in the Andes and throughout the Amazon.

### *Psychocampa kohlli* Herbin, 2012

Figs 8, 14

**Description. Male.** See Herbin (2012). **Female. Head:** Coloration light brown. Antennae bipectinate to tip, distal third of pectinations dramatically shorter than basal pectinations. Eyes very large, comprising more than two thirds area of head. Labial palpus extending to edge of frons, coloration as for head; labial palpus three-segmented. **Thorax:** Coloration khaki brown, lightly speckled with darker brown petiolate scales. **Legs:** Coloration as for thorax, albeit slightly darker brown overall. Tibial spurs very short, not apparent on spread specimen. **Forewing dorsum:** Forewing length: 24.5 mm; wingspan: ~50 mm, n = 1. Convexly triangular, apex hardly falcate, costa and outer margin weakly convex. Coloration distinctly bicolored, basally light khaki brown as for thorax, light color persists until just past distal margin of discal cell; distally wing dark chocolate brown, dark brown coloration mostly homogenous until wing margin though weak suffusion of lighter gray scales present. Antemedial line absent, postmedial line seemingly the interface between the lighter basal and darker distal regions of the wing. Discal spot a weakly defined speck at distal margin of discal cell. Fringe lighter brown than dark distal portion of wing, strongly contrasting against it. **Forewing ventrum:** Similar to dorsum in patterning, but lighter in color overall, with less pronounced distinction in basal and distal portions of bicolored wings, interface of two colors blurred. Postmedial line more apparent, but still faint, outwardly convex. Discal mark essentially absent. **Hindwing dorsum:** Squared, coloration and patterning as for forewing dorsum in terms of bicolored appearance. Discal mark absent. **Hindwing ventrum:** Follows similar pattern as forewing ventrum, but lighter basal region and darker distal region more distinctly differentiated where they meet. **Abdomen:** Robust, extending well beyond anal angle of hindwing, coloration mostly as for thorax, but with denser speckling of dark brown petiolate scales. **Genitalia:** (Fig. 14) n = 1. Note: Single examined female is apparently deformed with right (viewed dorsally) apophyse anterior and right dorsal tergite malformed. Stout apophyses anteriores longer than apophyses posteriores. Lamella antevaginalis broad, plate-like, internally wrinkled. Lamella postvaginalis a narrow strip of thick sclerotization with mesal bowl-like indentation. Tergite VIII bilobed, broad, spanning entire genitalia structure posterior to lamella antevaginalis. Membranous region of IX dorsally wrinkled, accordion-like and densely covered in minute setae. Papillae anales typical of Mimallonidae in shape, but smaller in width relative to ductus bursae. Ductus bursae broad, well-defined, broadly sclerotized with lamella antevaginalis, nearly as wide as corpus bursae. Corpus bursae bag-like, overall about equal in size to remainder of female genitalia.

**Type. Holotype,** ♂. **FRENCH GUIANA: Cayenne:** Piste de Belizon, Km 20, 28 July 2003, UV light, M. Laguerre *leg.*, genitalia prep. H 645 D. Herbin [*leg.*] (MNHN, examined).

**Additional material examined** (10 ♂, 1 ♀) **ECUADOR: Napo:** 1 ♂, Misahuallí, 450 m: XII.1992, V. O. Becker col., Col. Becker 100900 (VOB). **FRENCH GUIANA: Cayenne:** 1 ♂, Piste de Kaw, km 36 (NHMUK). **GUYANA:** 1 ♂, No additional locality data (NHMUK). **PERU: Ucayali:** 1 ♂, Aguaytía, Huallaga [River], 400 m (NHMUK). **Madre de Dios:** 1 ♂, 1 ♀, Salvación, Manu Park, Río Alto de Madre de Dios, 500 m: XII.1996, Local people *leg.*, St Laurent dissection: 8-23-18:1 [female], UF FLMNH MGCL 1032389 (MGCL). **Puno:** 1 ♂, San Gabán, 2500 ft (NHMUK). 1 ♂, Yahuar Mayo [Yawarmayu], 1200 ft: IV-V.1912 (NHMUK). **BRAZIL: Amazonas:** 3 ♂, Reserva Ducke, km. 26, Manaus-Itacoatiara Highway: E. G., I. & E. A. Munroe [*leg.*] (CUIC).

**Diagnosis.** The recently described *P. kohlli* is easily recognizable in both sexes by the light khaki ground coloration and deep chocolate brown postmedial and submarginal areas of all wings. The genitalia are typical of *Psychocampa*.

**Distribution.** This species is primarily known from lowland Amazon rainforest and up to 760 m along the eastern slopes of the Andes, with records from Ecuador, French Guiana, Guyana, Peru, and Brazil.

**Remarks.** At the time of its original description, *P. kohlli* was known only from males collected in French Guiana. Here I



report several new country records for this widespread, but relatively uncommonly collected Amazonian species, as well as the first known female which is described above.

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