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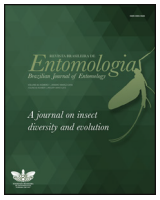

Three new species of *Pseudosympycnus* (Diptera, Dolichopodidae) from Peru and an updated key to the species

Matheus Mickael Mota Soares[1]*, Rosaly Ale-Rocha[2]

[1]*Instituto Nacional de Pesquisas da Amazônia (INPA), Programa de Pós-Graduação em Entomologia (PPG-Ent), Manaus, AM, Brasil.*
[2]*Instituto Nacional de Pesquisas da Amazônia – (INPA), Coordenação de Biodiversidade, Manaus, AM, Brasil.*

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ABSTRACT

Three new species of *Pseudosympycnus* Robinson are described and illustrated from Peru: *P. pennipes* **sp. nov.**, *P. latitarsus* **sp. nov.** and *P. rafaeli* **sp. nov.** In addition, *Pseudosympycnus latipes* (Parent) is recorded for the first time from the country and the male terminalia are illustrated. The first photographs of the holotype of *P. bicolor* Robinson and an updated key to species of the genus are provided.

Introduction

Pseudosympycnus Robinson, 1967 (Dolichopodidae: Stolidosomatinae) comprises 12 described species distributed from South Mexico (17ºN) to Southeast Brazil (22ºS) (Soares and Capellari, 2020). Species of the genus are relatively uncommon in collection, although the genus is widespread in the Neotropical region, and seem to prefer moist rocks near streams and waterfalls (Soares and Capellari, 2020). The genus was erected by Robinson (1967) to allocate three species previously described as *Sympycnus* Loew: *P. albipalpus* (Parent), *P. latipes* (Parent) and *P. palpiger* (Van Duzee) and two new species: *P. bicolor* Robinson and *P. perornatus* Robinson. Later, Robinson (1970) transferred *Sympycnus singularis* Parent to the genus. The genus remained without the inclusion of new species until the revisionary work conducted by Soares and Capellari (2020) where six new species were described from Brazil and Peru.

In this paper, three new sympatric species are described and illustrated from Peru. In addition, *P. latipes* (Parent) is recorded for the first time from the country and the male terminalia are illustrated. The first digital photographs of the holotype of *P. bicolor* Robinson and an updated key to the species of the genus are provided.

Material and methods

Specimens included in the present paper belong to the following collections: Instituto Nacional de Pesquisas da Amazônia (INPA, Manaus, Brazil) and Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos (MUSM, Lima, Peru). Photographs of the holotype of *P. bicolor* Robinson, housed in the National Museum of Natural History (NMNH, Washington D.C., USA), were studied. After the review of the genus conducted by Soares and Capellari (2020) more specimens were found in the INPA Invertebrate Collection, stored in CD holders with a thin layer of cotton, a storage method used for many years at the institution (see Rafael et al., 2003). The morphological nomenclature follows mainly Cumming and Wood (2017).

The following abbreviations are used: I, II, III: pro-, meso-, metathoracic legs; MSSC: male secondary sexual character(s) (some features are assumed to be so by comparison with other species in the genus, even when females are unknown at present); t_{1-5}: tarsomeres 1

* Corresponding author
E-mail: matheusmmsoares@gmail.com (M.M.M. Soares)

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to 5. Measurements of the leg segments are representative ratios and given according to the following formula: trochanter+femur, tibia, tarsomeres 1/2/3/4/5. Measurements of eyes were taken from the top to the bottom of the eye in lateral view. The position of setae on leg podomeres is given as a fraction of the total length, starting from the base.

Terminalia were removed from the abdomen, treated with hot 85% lactic acid and kept in a microvial with glycerin after drawing and subsequently pinned together with their respective specimens. Label data for the holotypes are cited verbatim in quotation marks (each line separated by a slash "/"), and annotations in square brackets. Specimens were photographed with a Leica MC170 HD camera, attached on a Leica M165C stereomicroscope. The multiple images were stacked and combined using Leica Application Suite V4.11.

Taxonomy

Dolichopodidae Latreille, 1809
Stolidosomatinae Robinson, 1967
Pseudosympycnus Robinson, 1967

Pseudosympycnus Robinson, 1967: 901. Type-species: *Sympycnus palpiger* Van Duzee (1931: 177), by original designation.

Diagnosis (males). Species of the genus are easily recognized (and distinguished by the closely related genus *Sympycnus* Loew) by the males with palpus covered with silvery pruinosity (Figs. 2A–F), often enlarged, rounded, covered with scale-like setae (MSSC). Tarsus I and distal segments of tarsus III modified in shape and/or setae, noticeably It_2 (shortened, distorted and/or ornamented with modified setae (MSSC) (Figs. 3A–F) [see Soares and Capellari (2020) for a complete diagnosis].

Key to species of *Pseudosympycnus* from Peru (males) (modified from Soares and Capellari, 2020)

1 Palpus as long as eye height (Soares and Capellari, 2020, Figs. 26–27); tibia I compressed, white, except ventral surface yellow (Soares and Capellari, 2020, Fig. 70) [Brazil: Minas Gerais, Rio de Janeiro and São Paulo] ..... *P. latitibia* Soares & Capellari

- Palpus shorter than eye height, about 1/3 to 2/3 as eye height (Figs. 2A–F); tibia I not compressed (or only thicker than tibiae II and III), mostly yellow or brown, never white (Figs. 1A–D) 2

2 It_1 compressed and trapezoidal, with dorsal crest bearing fringe of setae increasing in size towards apex (Soares and Capellari, 2020, Figs. 41, 58); It_2 with dorsal projection, and apical crest bearing long setae (Soares and Capellari, 2020, Figs. 41, 58); tibia II with anteroventral row of erect short setae (as long as diameter of tibia) extending to IIt_1 (Soares and Capellari, 2020, Fig. 69) [Dominica] ..... *P. perornatus* Robinson

- It_1 cylindrical or nearly so (Figs. 3A, C, E), sometimes with dorsal row of setae, but never with crest bearing fringe of setae; It_2 without dorsal projection or apical crest bearing long setae (Figs. 3A, C, E); tibia II without anteroventral row of erect short setae …..... 3

3 $IIIt_3$ with dorsal projection overlapping the base of $IIIt_4$ and with cluster of apical curved setae (Fig. 3D) …..... 4

- $IIIt_3$ cylindrical or nearly so, without apical cluster of curved setae (Figs. 3B, F) 5

4 Metepimeron and coxa III brown (Fig. 1A); It_3 laterally compressed with dorsal rows of slender setae (Robinson, 1967, Fig. 10); femur III brown, except basal 1/3 yellow, with few slender ventral setae at basal 1/3 and 3–4 ventral strong setae near middle (Figs. 1A, 4A); tibia III slightly thicker than tibiae I and II, with ventral row of short, curved setae from base to apical 4/6 (Fig. 1A) [Mexico: Oaxaca and Chiapas] ..... *P. bicolor* Robinson

- Metepimeron and coxa III yellow (Fig. 1B); It_3 slightly laterally flattened and with anterior to anterodorsal rows of long setae (Fig. 3C); femur III yellow, except apex brown, with ventral row of long and strong setae from base to apical 5/8 (Fig. 4C); tibia III not ticker than tibiae I and II (Fig. 1B) [Peru: Department of Cusco] … ..... *P. latitarsus* **sp. nov.**

5 It_{4-5} entirely white or covered by dense whitish pubescence on anterior surface (Fig. 3A; Soares and Capellari, 2020, Figs. 55, 56) 6

- It_{4-5} entirely brown, without whitish pubescence on anterior surface (Figs. 3C, E) 10

6 Palpus largely transparent (Soares and Capellari, 2020, Figs. 28, 29); metepimeron brown; tarsus I cylindrical or nearly so, It_2 with 1 long dorsal seta at apex, longer than segment (Soares and Capellari, 2020, Fig. 53); femur III mostly yellow, but apical 1/5 brown (Soares and Capellari, 2020, Fig. 6) [Brazil: Amazonas] .... *P. maroaga* Soares & Capellari

- Palpus opaque (Figs. 2A–F); metepimeron yellow; tarsus I with flattened segments or overlapping projections (Figs. 3A, C, E) ... 7

7 It_{4-5} (sometimes also It_3) laterally flattened, brown, and covered by dense whitish pubescence on anterior surface (Soares and Capellari, 2020, Figs. 55, 56); It_3 as long as It_1, without projection overlapping base of It_4 (Soares and Capellari, 2020, Fig. 7); $IIIt_{3-4}$ with row of setae decreasing in size towards apex (Soares and Capellari, 2020, Fig. 57) [Panama; Brazil: Acre and Amazonas] .... *P. palpiger* (Van Duzee)

- It_{4-5} not entirely flattened as above, white, but never covered by dense whitish pubescence on anterior surface (Fig. 3A); It_3 2–3 times shorter than It_1, with projection overlapping base of It_4 (Fig. 3A); $IIIt_3$ with 3–4 posterior setae longer than tarsomere (Figs. 3B, F) … 8

8 Femur I yellow, with 1 conspicuous ventral seta near basal fourth, almost as long as half of femur length (Soares and Capellari, 2020, Fig. 66); It_3 dark brown, with dorsal row of curved setae (Soares and Capellari, 2020, Fig. 44); IIt_5 white (Soares and Capellari, 2020, Fig. 45) [Peru: Department of Cusco] ..... *P. araza* Soares & Capellari

- Femur I brownish (at least dorsal surface), without conspicuous, long ventral seta at basal fourth (Figs. 1A–D); It_3 white, without dorsal row of curved setae (Fig. 3A); IIt_5 dark brown 9

9 Tibia I with anterodorsal row of setae as long as diameter of tibia; $IIIt_5$ without modified setation (Soares and Capellari, 2020, Fig. 50); ventral lobe of surstylus wide, with ventral margin projected ventrally (Figs. 6A–B) [Peru: department of Cusco; Brazil: Acre, Amapá and Pará] ..... *P. latipes* (Parent)

- Tibia I without row of setae as long as diameter of tibia; $IIIt_5$ with anterodorsal to posterodorsal rows of long and slender setae (Fig. 3B); ventral lobe of surstylus long and narrow, with ventral margin nearly straight, dorsal margin weakly sclerotized (Figs. 5A–B) [Peru: department of Cusco] ..... *P. pennipes* **sp. nov.**

10 Femur I brown; It_2 without long dorsal bristle at apex (Soares and Capellari, 2020, Fig. 64); It_3 subtriangular, projecting dorsally and overlapping base of It_4 (Soares and Capellari, 2020, Fig. 64); It_4 2

times as long as It_5 and cylindrical (Soares and Capellari, 2020, Fig. 64) [Colombia: Gorgona Island; Belize] ..... *P. singularis* (Parent)

- Femur I yellow; It_2 with 1–2 long dorsal bristles at apex, as long as tarsomere (Soares and Capellari, 2020, Figs. 40, 47, 51); It_3 not subtriangular and not projecting dorsally over base of It_4 (Figs. 3C, E); It_4 usually as long as It_5 (if It_4 longer than It_5, then It_4 laterally flattened) 11

11 Femur I with ventral row of subequally long and slender setae; femur III with ventral row of strong setae abruptly decreasing in length from base to apical 5/8 (Fig. 4D); $IIIt_3$ with 3 posterior curved setae, as long as tarsomere (Fig. 3F) [Peru: department of Cusco] ... *P. rafaeli* **sp. nov.**

- Femur I with or without ventral row of setae (if ventral row of setae present, decreasing in length towards apex); femur III without ventral row of strong setae; $IIIt_3$ without posterior curved setae as long as tarsomere 12

12 Metepimeron yellow; femur I without row of conspicuous ventral setae; It_2 with 2 dorsal bristles at apex (Soares and Capellari, 2020, Figs. 42, 51); It_{3-4} or It_{4-5} conspicuously flattened (Soares and Capellari, 2020, Figs. 42, 60); $IIIt_{3-5}$ with posterior and posteroventral rows of short, slightly curved setae (Soares and Capellari, 2020, Figs. 43, 61) 13

- Metepimeron light brown to brown; femur I with row of conspicuous ventral setae (Soares and Capellari, 2020, Figs. 40, 68); It_2 with 1 dorsal bristle at apex (Soares and Capellari, 2020, Figs. 47, 62); It_{3-5} cylindrical or nearly so; $IIIt_{3-5}$ without posterior and posteroventral rows of setae (Soares and Capellari, 2020, Figs. 48, 63) 14

13 It_3 twice length of It_4 (Soares and Capellari, 2020, Fig. 42); It_3 cylindrical; femur III without ventral row of long setae [Brazil: Amapá and Pará] ..... *P. albipalpus* (Parent)

- It_3 shorter than It_4; It_3 laterally flattened (Soares and Capellari, 2020, Fig. 60); femur III with 3 ventral setae on basal half, basal two short and curved at apex, apical one longer, twice diameter of femur at broadest point (Soares and Capellari, 2020, Fig. 71) [Brazil: Acre] ..... *P. robinsoni* Soares & Capellari

14 It_1 without row of anterior setae; It_2 with 1 sinuous bristle at apex (Soares and Capellari, 2020, Fig. 62); It_3 with anterior surface mostly bare, with anterior comb of short setae at apex; distal half of femur III darkened (Soares and Capellari, 2020, Fig. 10); tibiae II and III brown (Soares and Capellari, 2020, Fig. 10); $IIIt_4$ unmodified [Brazil: Amazonas] ..... *P. sehnali* Soares & Capellari

- It_1 with one anterior row of slightly curved setae, which extends to It_2; It_2 with 1 hook-like bristle at apex; It_3 with anterior surface setose and without comb of short setae at apex (Fig. 47); femur III darkened only at apex (Soares and Capellari, 2020, Fig. 3); tibiae II and III dark yellow (Soares and Capellari, 2020, Fig. 3); $IIIt_4$ slightly excavated at ventral surface (Soares and Capellari, 2020, Fig. 48) [Brazil: Roraima and Pará] ..... *P. bickeli* Soares & Capellari

Figure 1 *Pseudosympycnus* Robinson. Habitus lateral. **A.** *P. bicolor* Robinson, holotype ♂; **B.** *P. latitarsus* **sp. nov.**, holotype ♂ (pre-dissection); **C.** *P. pennipes* **sp. nov.**, holotype ♂; **D.** *P. rafaeli* **sp. nov.**, holotype ♂. Scale bars = 2 mm.

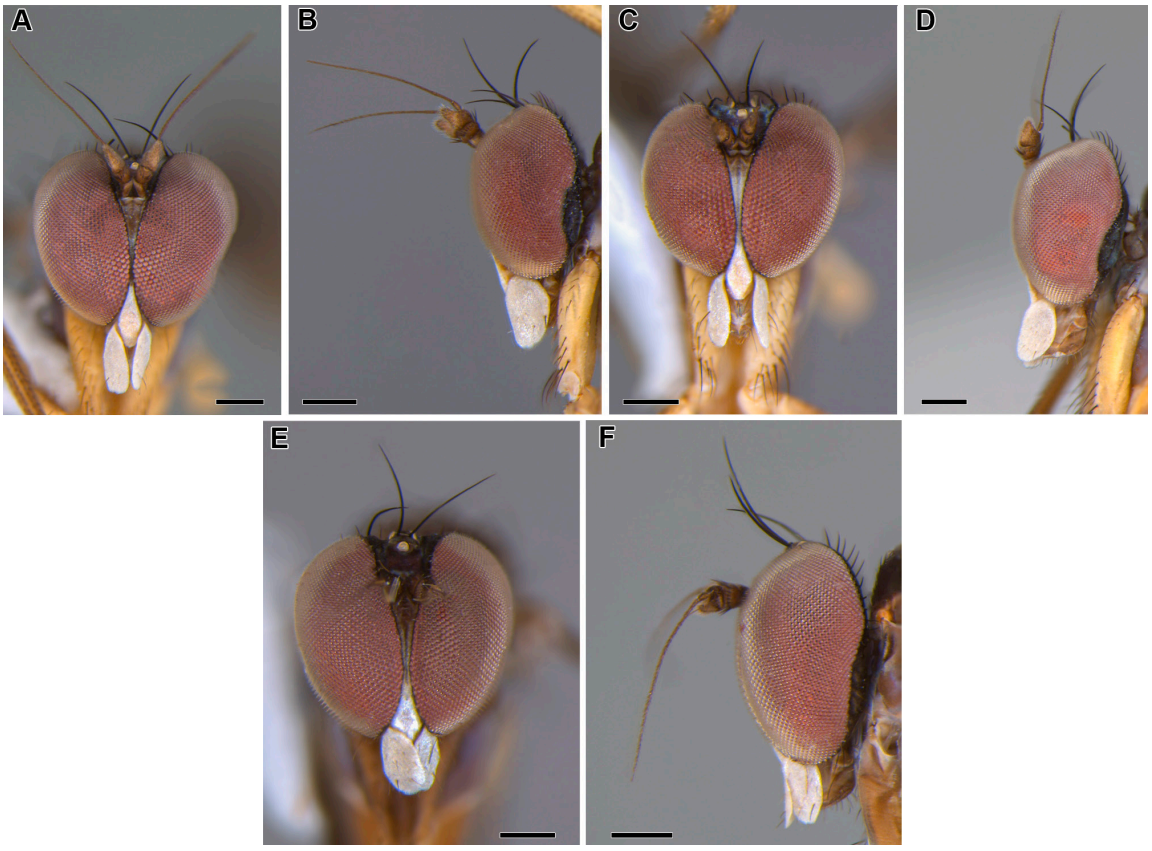

Figure 2 *Pseudosympycnus* Robinson. Head in anterior and lateral views respectively. **A–B.** *P. pennipes* **sp. nov.**, holotype ♂. **A.** Head, anterior view. **B.** Head, lateral view; **C–D.** *P. latitarsus* **sp. nov.**, holotype ♂. **C.** Head, anterior view. **D.** Head, lateral view; **E–F.** *P. rafaeli* **sp. nov.**, holotype ♂ **E.** Head, anterior view. **F.** Head, lateral view. Scale bars = 0.2 mm.

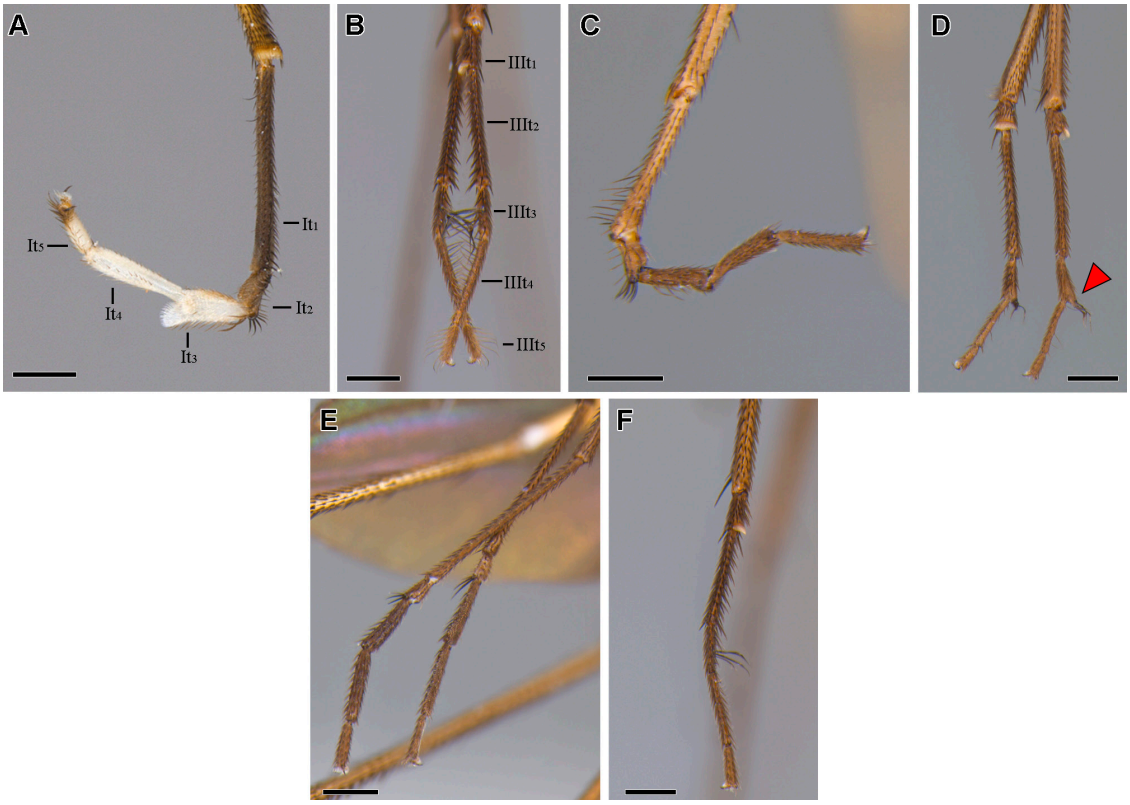

Figure 3 *Pseudosympycnus* Robinson. Male tarsus I and III respectively. **A–B.** *P. pennipes* **sp. nov.**, holotype ♂. **A.** Tarsus I. **B.** Tarsus III; **C–D.** *P. latitarsus* **sp. nov.**, holotype ♂. **C.** Tarsus I. **D.** Tarsus III, short dorsal projection on $IIIt_3$ highlighted; **E–F.** *P. rafaeli* **sp. nov.**, holotype ♂. **E.** Tarsus I. **F.** Tarsus III. Scale bars = 0.2 mm. Abbreviations: It_{1-5} = fore tarsomeres 1 to 5; $IIIt_{1-5}$: hind tarsomeres 1 to 5

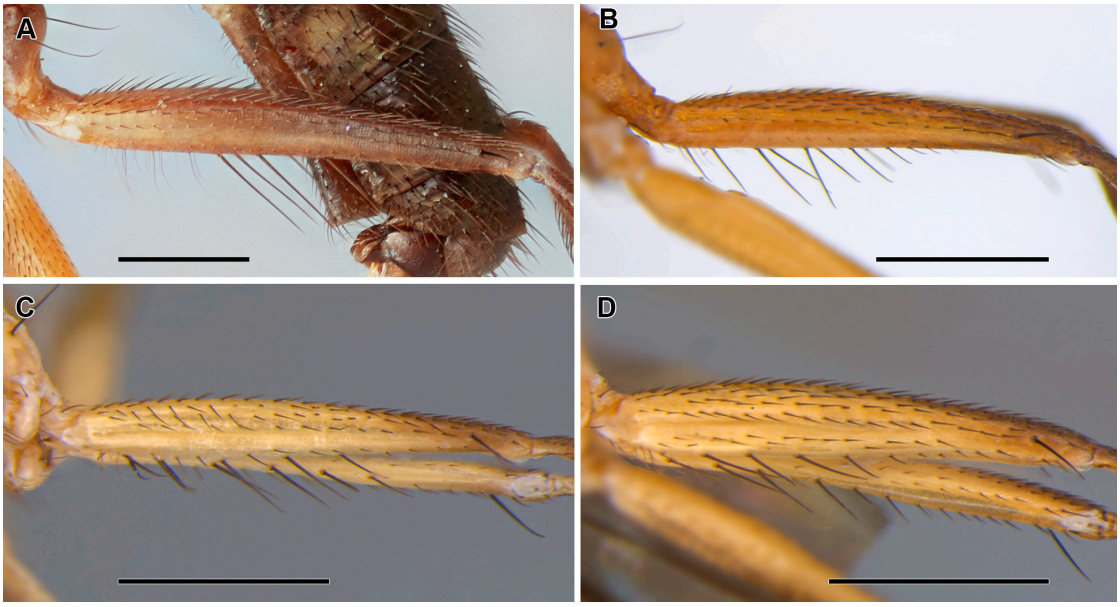

Figure 4 *Pseudosympycnus* Robinson. Male femur III, anterior view. **A.** *P. bicolor* Robinson, holotype ♂; **B.** *P. pennipes* **sp. nov.**, holotype ♂; **C.** *P. latitarsus* **sp. nov.**, holotype ♂; **D.** *P. rafaeli* **sp. nov.**, holotype ♂. Scale bars = 0.5 mm.

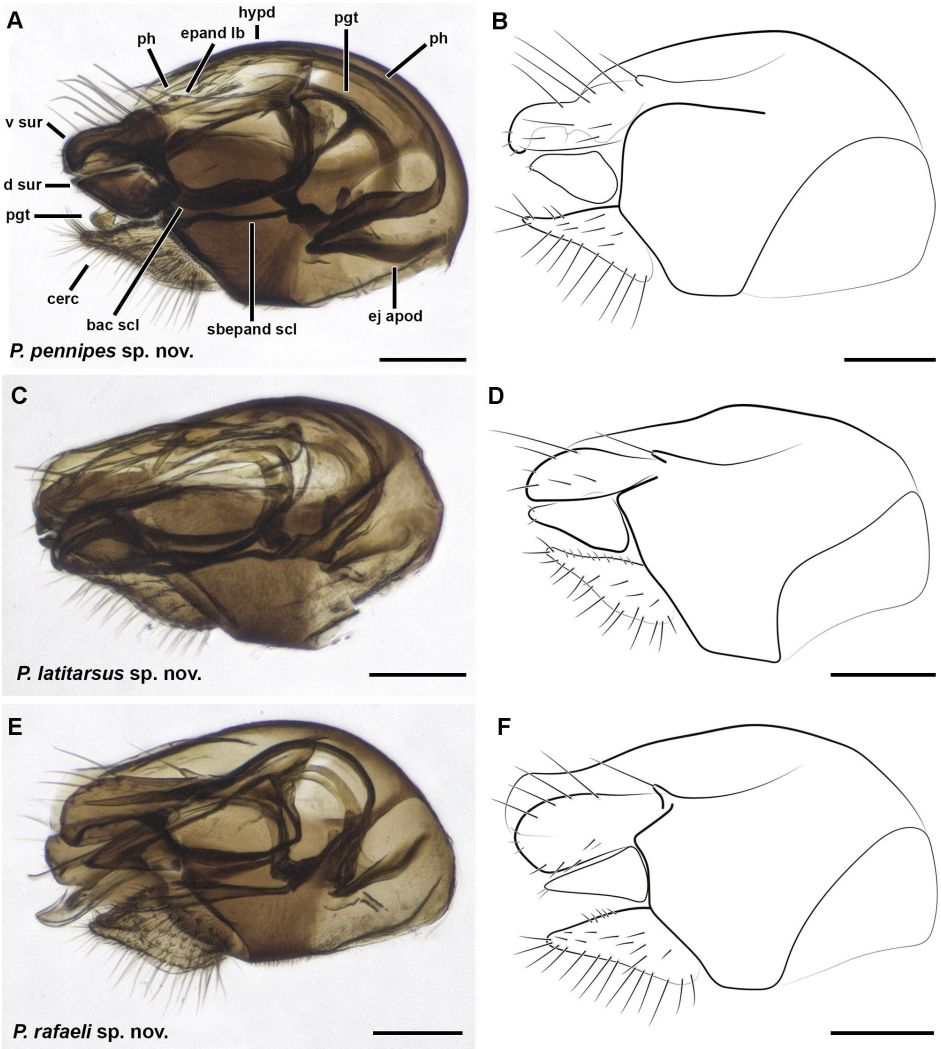

Figure 5 *Pseudosympycnus* Robinson. Hypopygia, left lateral view. **A–B.** *P. pennipes* **sp. nov.**, paratype ♂; **C–D.** *P. latitarsus* **sp. nov.**, holotype ♂; **E–F.** *P. rafaeli* **sp. nov.**, paratype ♂. Scale bars = 0.1 mm. Abbreviations: bac scl = bacilliform sclerite; cerc = cercus; d sur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand lb = epandrial lobe; hypd = hypandrium; pgt = postgonite; sbepand scl = subepandrial sclerite; v sur = ventral lobe of surstylus.

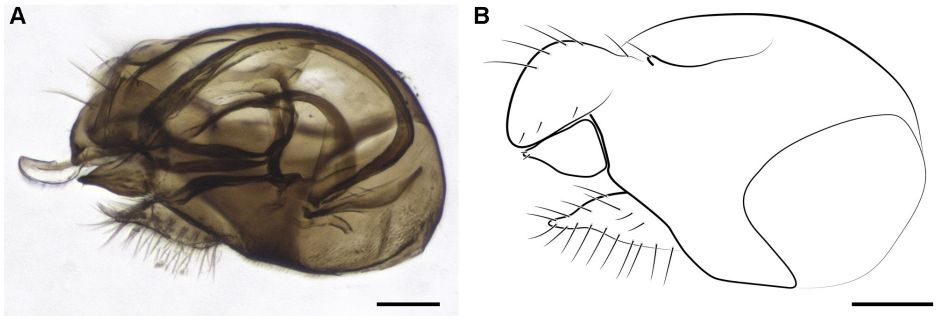

Figure 6 *Pseudosympycnus latipes* (Parent), identified specimen from Peru. Hypopygium, left lateral view. Scale bars = 0.1 mm.

***Pseudosympycnus bicolor* Robinson**

(Figs. 1A, 4A)

Pseudosympycnus bicolor Robinson, 1967: 902, Figs. 10–11. Type locality: Rio Valle Nacional, Oaxaca, Mexico.

Diagnosis. As in Soares and Capellari (2020) plus the femur III brown, except basal 1/3 yellow, with few slender ventral setae at basal 1/3 and 3–4 ventral strong setae near middle (Fig. 4A); tibia III slightly thicker than tibiae I and II, with ventral row of short, curved setae from base to apical 4/6 (Fig. 1A)

Distribution. Mexico (Chiapas and Oaxaca).

Remarks. *Pseudosympycnus bicolor* is similar to *P. latitarsus* **sp. nov.** by the $IIIt_3$ modified (mostly triangular and overlapping the base of $IIIt_4$ and with apical cluster of setae). But *P. bicolor* can be differentiated by the metepimeron and coxa III brown (metepimeron and coxa III yellow in *P. latitarsus* **sp. nov.**) and tibia III slightly thicker than tibiae I and II, with ventral row of short, curved setae from base to apical 4/6 (tibia III unmodified in *P. latitarsus* **sp. nov.**).

***Pseudosympycnus pennipes* sp. nov.**

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(Figs. 1C, 2A–B, 3A–B, 4B, 5A–B, 7)

Diagnosis (male). Metepimeron yellow (Fig. 1C). Femora yellow, except dorsal surface of femur I and apex of femur III brownish (Figs. 1C, 4B). Femur III with ventral row of strong setae decreasing in length from base to apical 5/8 of femur (Fig. 4B). Tarsus I (Fig. 3A): brown, except It_3–It_4 and basal 2/3 of It_5 white: It_2 with brush of compacted stout dorsal setae directed forward at base, followed by 3 stout curved setae, apex with dorsal and anterodorsal stout setae; It_3 laterally flattened with dorsal small projection overlapping base of It_4, with dorsal row of setae, 2–3 basal longer and curved. Tarsus II unmodified. Tarsus III (Fig. 3B): $IIIt_3$ with posterodorsal row of curved and strong setae, as long as segment, and 1 slender dorsal seta at apex; $IIIt_4$ with dorsal to posteroventral rows of slender and long setae, decreasing in length towards apex; $IIIt_5$ with anterodorsal to posterodorsal rows of long, slender and curved setae.

Description. Male (Fig. 1C). Body length [holotype]: 3.1 mm. Wing length: 3.3 mm, width: 1.0 mm. **Head** (Figs. 2A–B). Vertex slightly excavated. Face ground color dark yellow but obscured by dense silvery pruinosity, narrowing at middle (narrower than anterior ocellus at narrowest point). Clypeus covered by dense silvery pruinosity, ending below eye level, lower margin rounded. Frons dark blue purple, covered by weak silvery pruinosity. Occiput dark brown, except upper part posterior to ocellar triangle with weak bluish-purple reflections, covered by weak silvery pruinosity; one row of black postocular setae, increasing in length at lower 1/2; paravertical setae as long as postoculars; vertical setae proclinate and convergent, slightly shorter than ocellars; ocellar setae divergent, one pair of minute postocellar. Palpus thin, ovoid, 2 times longer than wide, 1/3 as long as eye height, ground color yellow, obscured by dense silvery pruinosity and covered with few pale short hairs and 1 black seta near apex. Proboscis pale brown. Antenna entirely brown. Pedicel with crown of setae at apex, dorsalmost slightly longer. Postpedicel triangular, with short pubescence, arista-like stylus arising at upper edge, dorsally, at middle. **Thorax.** Mesonotum and scutellum mostly metallic dark green, with strong bluish-purple reflections; notopleuron obscured by weak silvery pruinosity; pleura dark brown with some green to bluish reflections and weak silvery pruinosity, but metepimeron and dorsal part of metepisternum (around posterior spiracle) yellow. *Chaetotaxy*. Lower surface of proepisternum with 1 conspicuous black seta and 4–5 pale hairs. Acrostichals in two regular rows, 5 pairs of large dorsocentrals, increasing in size posteriorly, fourth pair slightly offset laterally; 1 large (slightly shorter than notopleural setae) and 2 very small postpronotal setae; 1 pre-sutural, 1 sutural and 1 post-sutural slightly offset laterally intra-alar setae, 1 pre- and 1 postsutural supra-alars, 2 notopleurals, 1 postalar; 1 pair of scutellars as long as postalar setae. **Legs** (Figs. 1C, 3A–B, 4B). Mostly yellow, but trochanter I, dorsal surface of femur I, It_{1-2} and apex of It_5, lateral surface of coxa II, leg II from apical 1/3 of tibia, leg III from apex of femur brownish; It_{3-5} white, except apex of It_5 brown. **Leg I.** Podomere ratios: 35/32/21/5/7/10/6. Anterior surface of coxa I covered by short black setae, outer edge with 3 pre-apical long black setae, apicalmost stronger, apical edge with 3–4 longer black setae. Femur I covered by short vestiture of black setae, with 4–5 slender setae on basal 1/3, almost as long as diameter of femur (MSSC), 1 short posteroventral seta near apex. Tibia I relatively thicker than II and III. Tarsus I (Fig. 3A): It_1 with ventral row of short setae, 2 basalmost longer than width of segment, with anterior to anterodorsal rows of setae on apical 1/3. It_2 with brush of compacted stout dorsal setae directed forward at base, followed by 3 stout curved setae, apex with dorsal and anterodorsal stout setae; It_3 laterally flattened with dorsal small projection overlapping base of It_4, with dorsal row of setae, 2–3 basal longer and curved, anterior and posterior surfaces mostly bare (all MSSC). **Leg II.** Podomere ratios: 39/55/41/15/13/7/4. Anterior surface of coxa II mostly bare, except apical edge with fringe of long setae, and with 2 setae at middle-length of outer edge, apicalmost twice longer than basal seta. Femur II covered with short black setae vestiture, but ventral surface mostly bare, 1 short and slender anteroventral seta at base, 1 anteroventral row of short hairs decreasing in length from basal 2/8 to apical 5/8 (MSSC), 2 posteroventral rows of short pale hairs from base to apical 5/8 (MSSC), 1 conspicuous anterior and 1 posterior preapical seta. Tibia II with 1 anterior seta at 6.5/8, 4 anterodorsal setae at 1/8, 3/8, 5.5/8 and 8/8, 3 posterodorsal at 1/8, 3.5/8 and 8/8, 1 ventral at 6.5/8 and 1 antero- and 1 posteroventral at apex. IIt_1 with anterior row of setae as long as width of segment from base to apical 6/8. **Leg III.** Podomere ratios: 42/51/6/17/7/12/5. Coxa III with 1 strong seta near base and 1 smaller

near apex. Femur III (Fig. 4B) with ventral row of strong setae decreasing in length from base to apical 5/8 (MSSC), 1 anterior strong preapical seta. Tibia III with 3 anterior setae at 1/8, 3/8 and 5/8, 1 anterodorsal seta at apex, with dorsal row of more conspicuous setae from basal 2/8 to apex, and with group of ventral fine pale hairs at apex (MSSC). Tarsus III (Fig. 3B): $IIIt_3$ with posterodorsal row of curved and wide setae, as long as segment, and 1 slender dorsal seta at apex (MSSC); $IIIt_4$ with dorsal to posteroventral rows of slender and long setae, decreasing in length towards apex (MSSC); $IIIt_5$ with anterodorsal to posterodorsal rows of long, slender and curved setae (MSSC). **Wing.** Membrane brownish smoky, veins brown. Costal vein ending in wing apex. Posterior margin with conspicuous fringe of setae. Veins R_{4+5} and M_1 subparallel near apex. CuA+CuP as indistinct fold. Length of crossvein dm-m/last part of M_4 ("CuAx ratio"): 1. Halter yellow. **Abdomen** (Fig. 1C). Entire tergite 1 except for a narrow patch dorsally and tergites 2 and 3 laterally yellow, sternites 1 and 2 yellow, abdomen otherwise dark brown with weak greenish reflections. Tergites 1–6 covered with short vestiture of black setae, but posterior margin of tergites with longer setae (those on tergite 1 1.5 times longer than tergite length). **Hypopygium** (Figs. 5A–B). Capsule brown, cercus yellow; ventral lobe of surstylus long and narrow, with dorsal edge weakly sclerotized, ventral edge with 4 long setae and few short setae at apex; dorsal lobe of surstylus short, subtriangular, with pointed apex; cercus as long as ventral lobe of surstylus, with pointed apex and covered with long setae; epandrial lobe short, with 1 short seta at apex; hypandrium: distal part covering phallus-postgonite apparatus, fused with genital capsule at base; basal part prolonged into genital capsule as two hypandrial arms, forming distinct hypandrial apodemes; phallus: basal part wide and parallel to ejaculatory apodeme, widening ventrally, parallel to hypandrium and strong narrowing at apex; postgonites extending from base of phallus to form two-branched structured, directed anteriorly, before fusing with each other in association with distal part of phallus.

Female. Unknown.

Type material. HOLOTYPE ♂, labelled: "Peru, Cusco, Quincemil / 13º13′03.4″S 70º43′40″W / 633 m, 23–31.viii.2012" "Sweep, J.A. Rafael / R.R. Cavichioli, D.M. Takiya" "HOLOTYPE / *Pseudosympycnus pennipes* / Soares & Ale-Rocha [red label]" (MUSM). Holotype in good condition (terminalia not dissected). **PARATYPES:** same data as holotype (1 ♂, MUSM; 2 ♂, INPA, one specimen with detached genitalia stored in microvial with glycerin).

Etymology. From Latin *penna* = feather and *pes* = foot, referring to the $IIIt_5$ with remarkable rows of long, slender and curved setae.

Remarks. *Pseudosympycnus pennipes* **sp. nov.** is similar to *P. araza* and *P. latipes* by having the It_{3-5} mostly white, and to *P. araza*, *P. latipes* and *P. singularis* due to It_2 with brush of compacted stout dorsal setae directed forward and It_3 overlapping the base of It_4 in males. Nevertheless, the new species is distinct in having the tibia I without conspicuous setae, femur III with ventral row of strong setae decreasing in length from base to apical 5/8, $IIIt_5$ with rows of long, slender, and curved setae, and the ventral lobe of surstylus with dorsal edge weakly sclerotized.

Distribution. Peru (Department of Cusco) (Fig. 7).

Pseudosympycnus latitarsus sp. nov.

urn:lsid:zoobank.org:act:B24DA205-9E52-432C-8D64-75A764331938
(Figs. 1B, 2C–D, 3C–D, 4C, 5C–D, 7)

Diagnosis (male). Metepimeron yellow (Fig. 1B). Femora yellow, except dorsal surface of femur I and apex of femur III brown (Figs. 1B, 4C). Femur III with anteroventral row of slender setae decreasing in length towards apex, and ventral row of long and strong setae from base to apical 5/8 (Fig. 4C). Tarsus I (Fig. 3C): brown, except basal 2/3 of It_1 yellow: It_1 4 times longer than It_2 and with anterior rows of long setae at apical 1/2. It_2 with brush of compacted stout dorsal setae directed forward at base, followed by 3 stout curved setae, and with dorsal row of long setae, apex of It_2 slightly overlapping the base of It_3 and with group of dorsal long setae. It_3 slightly laterally flattened and with anterior to anterodorsal rows of long setae. Tarsus II unmodified. Tarsus III (Fig. 3D): $IIIt_3$ with short dorsal projection overlapping base of $IIIt_4$ and with group of 4 apical curved setae. $IIIt_4$ with 2 posterior slender and curved setae at apical 1/2.

Description. Male (Fig. 1B). Body length [holotype]: 2.5 mm. Wing length: 2.6 mm, width: 0.7 mm. **Head** (Figs. 2C–D). Similar to *P. pennipes* **sp. nov.**, except for: face ground color brown; palpus thin, ovoid, 1.5 times longer than wide, about 1/3 as long as eye height, with few pale hairs and 1 black seta at posterior margin. **Thorax.** Similar to *P. pennipes* **sp. nov.**, except for: mesonotum and scutellum mostly brown, with greenish and bluish reflections. **Legs** (Figs. 1B, 3C–D, 4C). Mostly yellow, but coxa II, dorsal surface of femur I, tarsus I from apex of It_1, leg II from apex of tibia and leg III from apex of femur brownish. **Leg I.** Podomere ratios: 28/23/12/3/6/7/8. Anterior surface of coxa I covered by short black setae, outer edge with 3 pre-apical long black setae, apicalmost stronger, apical edge with 3–4 longer black setae. Femur I with short vestiture of black setae, ventral surface mostly bare, with anteroventral row of short setae and 3–4 posteroventral slender pale setae at basal 1/3 (MSSC). Tibia I relatively thicker than II and III, with anterodorsal row of short setae from basal 2/6 to apex (MSSC), 2 posterior setae at 4/6 and 5.5/6. Tarsus I (Fig. 3C): It_1 4 times longer than It_2 and with anterior rows of long setae at apical 1/2. It_2 with anterior brush of compacted stout dorsal setae directed forward at base, followed by 3 stout curved setae, and with dorsal row of long setae, apex of It_2 slightly overlapping the base of It_3 and with group of dorsal long setae. It_3 slightly laterally flattened and with anterior to anterodorsal rows of long setae (all MSSC). **Leg II.** Podomere ratios 30/44/39/10/10/5/3. Coxa II with row of short pale setae on outer margin of anterior surface, ending in 1 much longer black seta near apex. Femur II covered with vestiture of short black setae, except basal part of posterior surface and entire ventral surface mostly bare, with antero- and posteroventral rows of fine setae from base to basal 4/8 (MSSC), with 1 anterior and 1 posterior preapical setae. Tibia II with 1 anterior seta at 7/8, 5 anteroventral setae at 1/8, 2.5/8, 3.5/8, 5.5/8 and 8/8, 4 posterodorsal setae at 1/8, 2.5/8, 4.5/8 and 8/8, 1 antero- and 1 posteroventral apical setae and with ventral rows of short and slender setae. IIt_1 with 6 more conspicuous ventral setae at 1/8, 2/8, 3/8, 5/8, 6.5/8 and 8/8. **Leg III.** Podomere ratios: 37/43/3/15/6/6/3. Coxa III with 1 large seta, as long as coxa, at basal 1/3 and 1 smaller seta near apex. Femur III (Fig. 4C) with anteroventral row of slender setae decreasing in length towards apex, and ventral row of long and strong setae from base to apical 5/8 (MSSC) and with 1 long anterior preapical seta. Tibia III with 4 anterior setae at 1/8, 3/8, 5.5/8 and 8/8, and with dorsal row of more conspicuous setae from 1/8 to apex and with group of short ventral fine pale hairs at apex. Tarsus III (Fig. 3D): $IIIt_1$ with 1 long posteroventral seta at apex, as long as segment. $IIIt_2$ with posteroventral row of more erected setae. $IIIt_3$ with short dorsal projection overlapping the base of $IIIt_4$ and with group of 4 apical curved setae. $IIIt_4$ with 2 posterior slender and curved setae at apical 1/2. $IIIt_5$ unmodified (all MSSC). **Wing.** Similar to *P. pennipes* **sp. nov.** (see above) including the "CuAx ratio". **Abdomen** (Fig. 1B). Setation and general color pattern similar to *P. pennipes* **sp. nov.**, except for tergite 1 entirely yellow. **Hypopygium** (Figs. 5C–D). Similar to *P. pennipes* **sp. nov.** except as noted: ventral lobe of surstylus narrow, rounded at apex, with 2 long setae at ventral edge and few short setae at apex; dorsal lobe of surstylus long, triangular, wider than ventral lobe; cercus as long as ventral lobe of surstylus, narrowing at apex; epandrial lobe

short, with 1 long seta at apex; phallus: basal part narrow and shorter than ejaculatory apodeme, slightly arched ventrally.

Female. Unknown.

Type material. HOLOTYPE ♂, labelled: "Peru: Cusco, Quincemil / 13º13′03.4″S 70º43′40″W / 633m, 23–31.viii.2012" "Sweep, J.A. Rafael / R.R. Cavichioli & D.M. Takiya" "HOLOTYPE / *Pseudosympycnus latitarsus* / Soares & Ale-Rocha [red label]" (MUSM). Holotype condition: left leg I, left leg II and right wing mounted between cover slides, genitalia dissected and stored in microvial with glycerin on the same pin of the specimen.

Etymology. From the Latin *lato* = broad and *tarsus*, referring to the remarkable $IIIt_3$ with dorsal projection overlapping the base of $IIIt_4$.

Remarks. *Pseudosympycnus latitarsus* **sp. nov.** is similar to *Pseudosympycnus bicolor* Robinson by sharing the It_2 slightly overlapping the apex of It_3, It_3 laterally flattened, $IIIt_3$ with dorsal projection overlapping the base of $IIIt_4$ and with cluster of apical setae. The new species can be differentiated by the It_1 with dorsal rows of long setae at apical 1/2 (only short setae in *P. bicolor*), femur III yellow with apex brown and with ventral row of strong setae from base to apical 5/8 (femur III with apical 1/2 brown and with only 2–3 ventral setae near middle in *P. bicolor*) and tibia III not compressed (tibia III slightly compressed than tibiae I and II in *P. bicolor*).

Distribution. Peru (Department of Cusco) (Fig. 7).

Pseudosympycnus rafaeli sp. nov.

urn:lsid:zoobank.org:act:14051400-C30E-4912-B909-2B001341AE01
(Figs. 1D, 2E–F, 3E–F, 4D, 5E–F)

Diagnosis (male). Metepimeron yellow (Fig. 1D). Femora yellow, except apex of femur III brown (Figs. 1D, 4D). Femur III with ventral row of strong setae abruptly decreasing in length from base to apical 5/8 (Fig. 4D). Tarsus I (Fig. 3E): brown, It_1 7 times longer than It_2, without modified setation; It_2 with 3 long setae at apex, the 2 posteriormost as long as segment, and with anterior row of curved setae; $It_{3–4}$ laterally flattened with anterior surface mostly bare. Tarsus II unmodified. Tarsus III (Fig. 3F): $IIIt_3$ with 3 curved setae, as long as segment. $IIIt_{4–5}$ unmodified.

Description. Male (Fig. 1D). Body length [holotype]: 2.7 mm. Wing length: 3.1 mm, width: 1 mm. **Head** (Figs. 2E–F). Similar to *P. pennipes* **sp. nov.**, except for: face ground color brown; frons dark green, with weak blue-purple reflections. Palpus thin, ovoid, 1.6 times longer than wide, 1/3 as long as eye height, ground color yellow, with dense silvery pruinosity, covered with few pale setae and 1 black seta near apex at posterior margin. **Thorax.** Similar to *P. pennipes* **sp. nov.**, except for: scutellum mostly metallic green with weak bluish reflections; fifth pair of dorsocentrals slightly offset laterally; pleura pale brown, with weak greenish reflections. **Legs** (Figs. 1D, 3E–F, 4D). Mostly yellow, except coxae I and II, tibia I and tarsus I, leg II from apex of tibia, leg III from apex of femur brownish. **Leg I.** Podomere ratios: 30/30/21/3/7/8/5. Anterior surface of coxa I covered by short black setae, with 3–4 long black setae on anterior apical edge, outer edge with 1 long black seta at apex. Femur I with short vestiture oft black setae, ventral surface mostly bare, with row of ventral subequally long and slender setae (MSSC). Tibia I not thickened, with 2 posterior setae at 4.5/8 and 6/8. Tarsus I (Fig. 3E): It_1 7 times longer than It_2, without modified setae; It_2 with 3 long setae at apex, the 2 posteriormost setae as long as segment, and with anterior row of curved setae; $It_{3–4}$ laterally flattened with anterior surface mostly bare (all MSSC). **Leg II.** Podomere ratios: 34/47/30/10/10/6/3. Coxa II with row of short pale setae on outer margin of anterior surface, ending in 1 much longer black seta near apex. Femur II covered with vestiture of short black setae, except basal part of posterior surface and entire ventral surface mostly bare, with anteroventral row of slender pale setae decreasing in length from basal 1/8 to basal 3/8, with 1 anterior and 1 posterior pre-apical setae. Tibia II with 1 anterior seta at 6.5/8, 4 anterodorsal setae at 1/8, 2.5/8, 5/8 and 8/8, 3 posterodorsal setae at 1/8, 3.5/8 and 8/8, 3 ventral setae at 3/8, 5/8 and 6/8, 1 antero- and 1 posteroventral setae at apex. IIt_1 with 4 ventral short setae at 2/8, 4.5/8, 6/8 and 8/8. **Leg III.** Podomere ratios: 40/54/5/12/5/9/4. Coxa III with 1 large seta, as long as coxa, at basal 1/3 and 1 smaller seta near apex. Femur III (Fig. 4D) with ventral row of strong setae abruptly decreasing in length from base to apical 5/8, with 1 anterior preapical seta. Tibia III with 5 anterior setae at 1/8, 2/8, 3/8, 5/8 and 8/8, with dorsal row

Figure 7 Type-locality of *Pseudosympycnus pennipes* **sp. nov.** and *Pseudosympycnus latitarsus* **sp. nov.** (Peru, Cusco, Quincemil). Photograph provided by DM Takiya.

of more conspicuous setae from 2/8 to apex, and with group of short ventral fine pale hairs at apex (MSSC). Tarsus III (Fig. 3F): $IIIt_1$ with 1 anterior strong seta at apex. $IIIt_2$ with 2 posterior setae at apex. $IIIt_3$ with 3 curved setae, as long as segment. $IIIt_{4-5}$ unmodified. **Wing.** Similar to *P. pennipes* **sp. nov.** including the "CuAx ratio" (see above). **Abdomen.** Setation and general color pattern similar to *P. pennipes* **sp. nov.**, except for: mostly brown, except tergites 1 and 2 laterally yellow, sternites 1 and 2 yellow. **Hypopygium** (Figs. 5E–F). Similar to *P. pennipes* **sp. nov.** except as noted: ventral lobe of surstylus wide, rounded at apex, with 4 long setae at ventral edge and few short setae at dorsal edge and apex; dorsal lobe of surstylus long, triangular, slightly narrow than ventral lobe; cercus as long as ventral lobe of surstylus, slightly narrowing at apex; epandrial lobe short, with 1 long seta at apex; phallus: basal part narrow, u-shaped ventrally, with 1 long and strong medial projection; postgonites wide and cap-like at apex.

Female. Unknown.

Type material. HOLOTYPE ♂, labelled: "Peru: Cusco, Quincemil / Rio Araza, 13º21′18″S / 70º53′22″W / 1000 m "22.viii.2012, Malaise / J.A. Rafael, R.R. Cavichioli / & D.M. Takiya" "HOLOTYPE / *Pseudosympycnus rafaeli* / Soares & Ale-Rocha [red label]" (MUSM). Holotype in good condition (terminalia not dissected), left mid leg broken off. **PARATYPES:** same data as holotype (1 ♂, INPA, with detached genitalia stored in microvial with glycerin).

Etymology. Named after José Albertino Rafael, Brazilian dipterologist who contributed substantially to the knowledge of Neotropical Diptera and collected the type material.

Remarks. *Pseudosympycnus rafaeli* **sp. nov.** differs from all species of genus by the simple setae and absence of conspicuous modifications on tarsus I: It_1 long, 7x longer than It_2, It_2 with 3 long dorsal setae at apex and It_{3-4} laterally flattened and the dorsal lobe of surstylus long, triangular, slightly narrow than ventral lobe.

Distribution. Peru (Department of Cusco).

Pseudosympycnus latipes (Parent)

(Figs. 6A–B).

Sympycnus latipes Parent, 1930: 23, Figs. 28–30. Type locality: Taperinha farm, Santarém, Pará, Brazil.

Diagnosis. See Soares and Capellari (2020) for diagnosis and photographs.

Hypopygium (Figs. 6A–B). Similar to *P. pennipes* **sp. nov.** except as noted: ventral lobe of surstylus wide, with 4 long setae at ventral edge and few setae at dorsal edge; dorsal lobe of surstylus short, triangular, narrower than ventral lobe, with pointed apex; cercus short, shorter than ventral lobe of surstylus, with pointed apex and covered with long setae; epandrial lobe short, with 1 short setae at apex; phallus: arched ventrally; postgonites wide and cap-like at apex.

Material examined. "Peru: Cusco, Quincemil / 13º13′03.4″S 70º43′40″W / 633m, 23–31.viii.2012" "Sweep, J.A. Rafael / R.R. Cavichioli & D.M. Takiya" (2 ♂, INPA, one specimen with detached genitalia stored in microvial with glycerin; 1 ♂, MUSM).

Distribution. Brazil (States of Acre, Amapá and Pará) (Soares and Capellari 2020), Peru (Department of Cusco) new record.

Remarks. *Pseudosympycnus latipes* is similar to *P. araza*, differing from it by the femur I without long seta near base (*P. araza* with 1 conspicuous ventral seta near basal 1/4, almost as long as half-length of femur) and IIt_5 unmodified (*P. araza* with IIt_5 conspicuously flattened and white). *Pseudosympycnus latipes* is also similar to *P. pennipes* **sp. nov.**, but can be differentiated by the tibia I with anterodorsal row of setae as long as diameter of tibia (tibia I without anterodorsal row of setae in *P. pennipes* **sp. nov.**) and $IIIt_5$ unmodified (*P. pennipes* **sp. nov.** with anterodorsal to posterodorsal rows of long, slender and curved setae).

Discussion

With the addition of the three new species described above, Peru becomes the country with the secondmost highest species richness of the genus with five species (Brazil with eight known species). However, all the five species from Peru were collected at the same locality in Cusco, Quincemil, at the region of Camanti-Marcapata Biological Corridor of Peru, as defined by Salvador-Montoya et al. (2012), located between 13.2–13.26ºS and 70.77–70.54ºW, and is characterized by extremely high precipitation (up to 7,000 mm per year) and annual mean temperature of 25ºC, with vegetational elements including the upper limits of lowland Amazonian moist forest and Andean submontane and montane cloud forest. The occurrence of five species at the same locality makes the high level of sympatry at one site even more remarkable and suggest that more species await discovery. Except for *P. latipes* which is also widely distributed in the Brazilian Amazon (states of Acre, Amapá and Pará), all the other Peruvian species appear to be endemic to the country.

Species of *Pseudosympycnus* are very similar in overall habitus, differing mostly by features of the tarsus I and III and other MSSC. Although the cladistic relationships among the species of the genus are largely unknown, there is probably a monophyletic group comprising: *P. araza* Soares & Capellari, *P. pennipes* **sp. nov.** and *P. latipes* (Parent), defined on the basis of It_{3-5} mostly white, (Fig. 3A), It_2 with brush of compacted stout dorsal setae directed forward at base, It_3 laterally flattened with dorsal small projection overlapping base of It_4, It_4 slightly constricted and bare at basal 1/3 and $IIIt_3$ with row of posterior curved setae (Fig. 3B). *Pseudosympycnus singularis* (Parent) seems related to this group, however it has tarsus I entirely brown and It_4 cylindrical (Soares and Capellari, 2020, Fig. 64). However, there are undoubtedly many species of *Pseudosympycnus* awaiting discovery and future studies with description of new species are needed to better understand the morphological diversity in this genus before species groups can be defined.

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Author contribution statement

Both authors contributed to the writing, revision and editing of the manuscript.

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