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Pagastia (P.) donoliveri sp. nov.—a new Nearctic alpine stream chironomid species (Diptera: Chironomidae: Diamesinae) from the Beartooth Mountains, Wyoming, U.S.A.

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Abstract

An illustrated description of the adult male of *Pagastia* (*P.*) *donoliveri* **sp. nov.** from the Beartooth Mountains, Wyoming, of North America is provided. An updated key to the determination of all known Holarctic species of *Pagastia* Oliver for males is also provided.

Key words: Diptera, Chironomidae, Diamesinae, *Pagastia,* new species, key, Nearctic

Introduction

After the publication of the review of the chironomid genus *Pagastia* Oliver of North America (Makarchenko 2019), Dean Hansen found two adult males of an undescribed species of this genus in material from an alpine stream in the Beartooth Mountains (Wyoming, U.S.A.); an illustrated description is presented below. Also, we considered it worthwhile to update the key to the determination of all known Holarctic species of *Pagastia*.

Material and methods

The morphological terminology and abbreviations used below generally follow Sæther (1980). For some structures of the hypopygium, however, the terminology of Hansen & Cook (1976) and Oliver (1989) is used. The material was slide-mounted in Euparal®. The photographs were taken using an Axio Lab.A1 (Karl Zeiss) microscope.

The holotype of the new species is deposited at the Department of Entomology, University of Minnesota, St. Paul, MN, U.S.A. (DEUM), and the paratype is placed in the collection of the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Vladivostok (FSCEATB FEB RAS).

Description

***Pagastia* (*P.*) *donoliveri* Makarchenko et Hansen, sp. nov.**
(Figs. 1–9)

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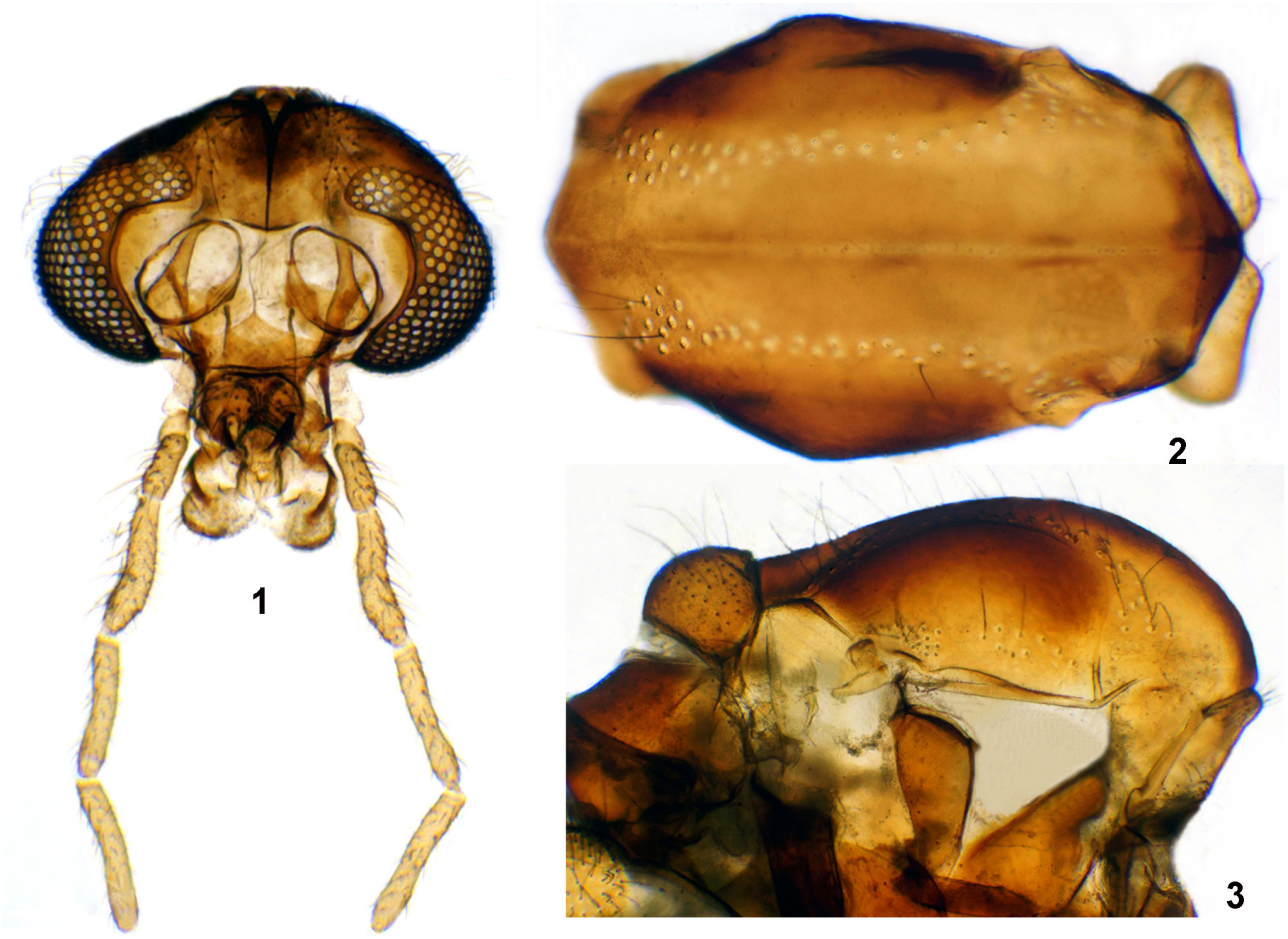
Material. Holotype: adult male, U.S.A.: Wyoming, Park County, Beartooth Pass region, Malaise trap over small stream feeding Frozen Lake, alt. 3127 m above sea level, N 44°57'42.12", W 109°29'08.12", 30–31.VIII.2017, leg. Dean C. Hansen. Paratype: 1 adult male, same data as holotype.

Derivatio nominis. The species is named in honour of the Canadian chironomid taxonomist Donald Raymond Oliver.



FIGURES 1–3. *Pagastia* (*P.*) *donoliveri* **sp. nov.**, male. **1,** head in frontal view; **2,** pronotum and mesonotum in dorsal view; **3,** part of thorax in lateral view.

Adult male (n = 2).

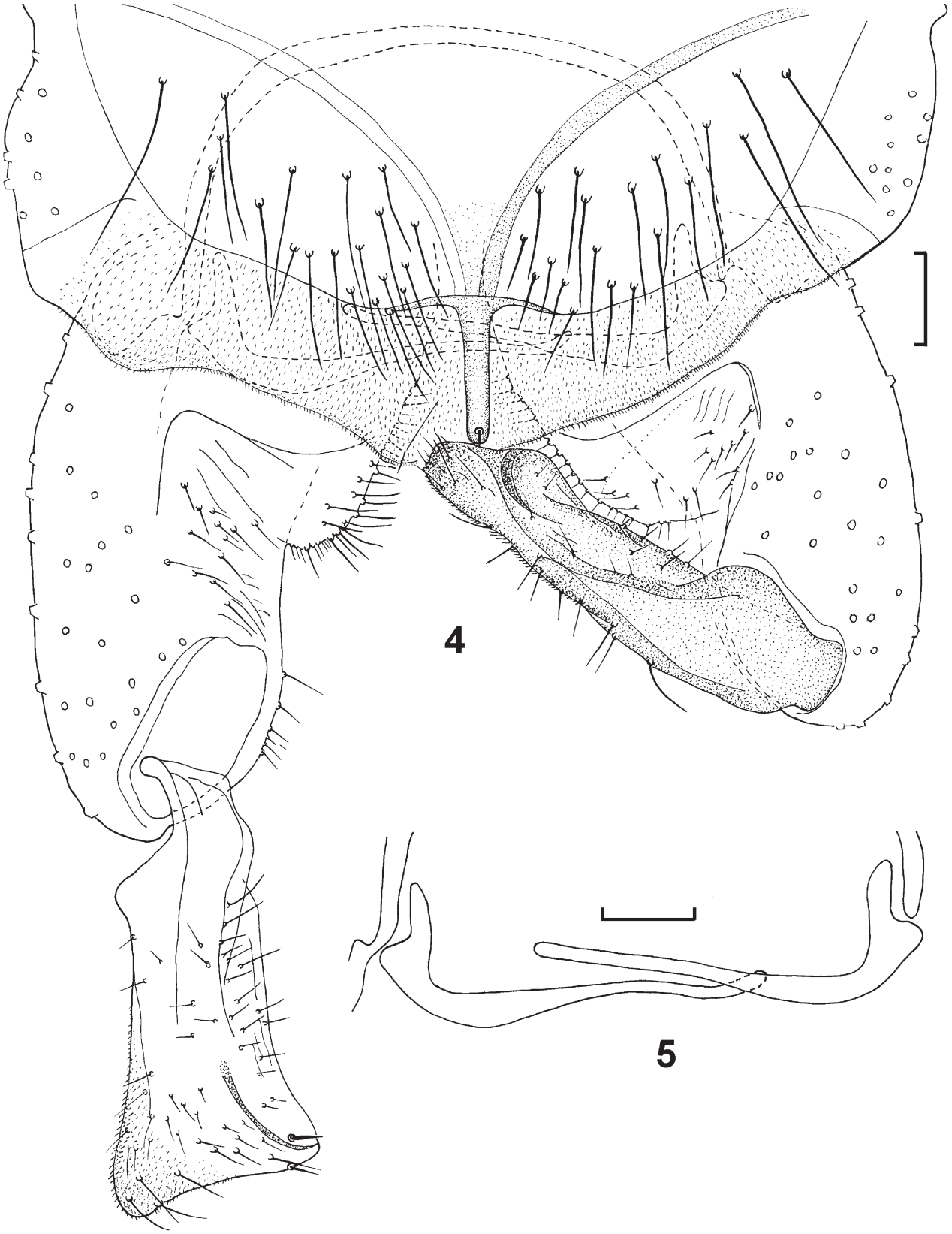
Total length *ca* 5.4–5.6 mm.

Coloration (specimens in Euparal). Head, thorax, legs, and abdomen brown to dark brown; antennae light brown; wings greyish.

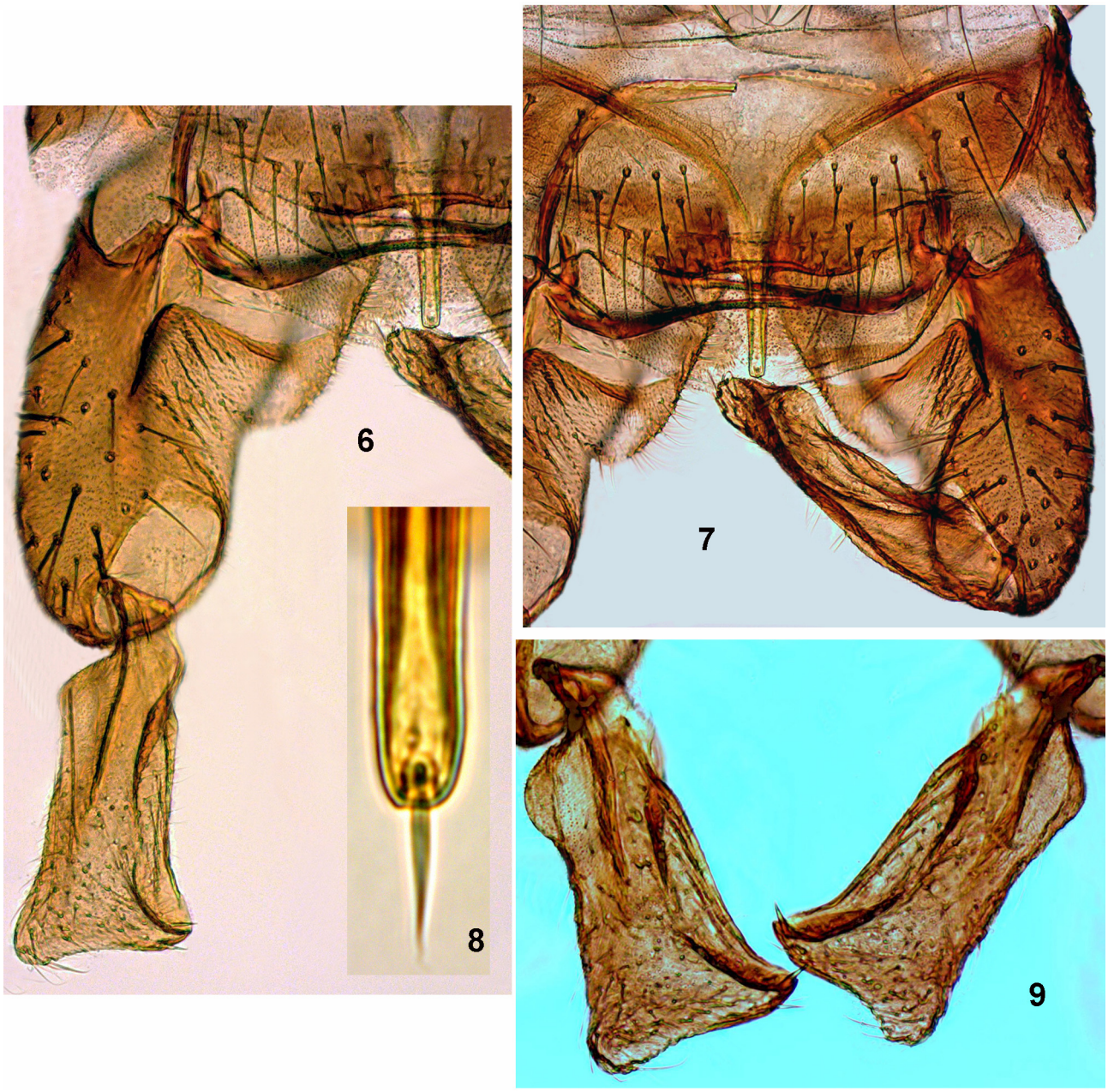
Head. Eyes bare and strongly extended dorsomedially (Fig.1). Temporal setae 33–52, including 4 coronals, 8–14 preoculars, 14–22 verticals, and 7–11 postorbitals. Clypeus with 23–24 setae. Antenna with 13 flagellomeres and developed plume, these setae 328–590 µm long; pedicel with 3 setae 56–64 µm long; terminal flagellomere with 1 subapical setae 50–52 µm long; flagellomeres lengths (in µm): 72–76; 28; 24–28; 32; 36–40; 36–40; 40–44; 40–42; 42–44; 44; 44–52; 44–48; 592–636; AR 1.22–1.26. Palpomere lengths (in µm): 60–68; 96–100; 192–196; 168–208; 260. Palpomere 3 distally with sensilla capitata (diameter 12 µm). Palpomeres 1–5 length/head width 0.95–1.24.

Thorax. Antepronotum with 6–7 dorsal and 13–18 lateral setae. Acrostichals 19–26 (60–92 µm long), dorsocentrals 41–43 (in 1–2 rows in anterior 2/3 and in 3 rows in posterior 1/3), prealars 22–24, scutellars *ca* 55 (Figs. 2–3).

Wing. Length 4.28–4.36 mm; width 1.16 mm. Membrane with setae 20–24 µm long on wing apex. R and R_1 with 59–64 setae in 1–2 rows; R_{4+5} with 34–35 setae. Setae on R, R_1, R_{4+5} 40–52 µm long. Costa extension 49–66 µm long. RM length/MCu length 2.5–3.3. Anal lobe developed, outline rounded. Squama with 40–46 setae 48–152 µm long, in 1–2 rows. VR 0.84–0.93.



FIGURES 4–5. *Pagastia* (*P.*) *donoliveri* **sp. nov.**, male. **4,** hypopygium in dorsal view; **5,** lateral aedeagal lobes. Scale bars: 50 µm.



FIGURES 6–9. *Pagastia* (*P.*) *donoliveri* **sp. nov.**, male. **6–7,** parts of hypopygium in dorsal view; **8,** apex of anal point with peg; **9,** gonostylus.

Legs. Spur of fore tibia 88–92 µm long; spurs of mid tibia 68–72 µm and 72–76 µm; of hind tibia 112–116 µm and 72 µm long. Hind tibial comb with 10 setae. Lengths and proportions of leg segments as in Table 1.

TABLE 1. Lengths (in µm) and proportions of leg segments of *Pagastia* (*P.*) *donoliveri* **sp. nov.**, male (n=2).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
P_1	1246-1361	1607-1673	1197-1214	590-615	394	213	197-213	0.72-0.76	2.88-2.98	2.35-2.53	2.6-2.9
P_2	1509-1607	1591	738-754	443-451	296-303	180	197	0.46-0.47	3.14-3.52	4.20-4.24	1.0-1.7
P_3	1607-1680	1860-1886	1080-1132	560-590	360-377	200-2113	220-230	0.58-0.60	3.28-3.45	3.0-3.28	3.0-3.2

Hypopygium (Figs. 4–9). Tergite IX with 20–25 setae on each side 64–120 µm long. Anal point almost parallel-sided in dorsal view, 72–88 µm long, with narrow seta-like apical peg 28 µm long (Fig. 8). Laterosternite IX with 7–

11 setae. Transverse sternapodeme narrow, anterior margin nearly straight. Phallapodeme with lateral aedeagal lobe only (Fig. 5), these 172–196 μm long, elongate and tapering to thin rounded apex. Gonocoxite 320–328 μm long, with basal plate and lobe-like median field. Gonostylus 196–224 μm long, narrow and ribbed, with rounded basal lobe in outer side and with lobe-like "heel" apically; megaseta 16–20 μm long (Figs. 4, 6–7, 9). HR 1.46–1.63.
Pupa and ***larva*** unknown.

Diagnosis. The male of the new species is most closely related to the Japanese species *P*. (*P*.) *hidakamontana* Endo, but it may be clearly distinguished from later by the shape of the gonostylus and some other features, namely the gonostylus with a rounded basal lobe in its outer side and a lobe-like "heel" apically; anal point of tergite IX 72–88 μm long, with narrow seta-like apical peg 28 μm long (Figs. 4, 6, 7, 9); AR 1,22–1,26. Gonostylus of *P*. (*P*.) *hidakamontana* with small basal lobe in outer side, apically rounded, without "heel"; anal point 100–116 μm long and apical peg broad, 24–33 μm long (Endo 2004, Figs. 1–6); AR 1.56–1.75. See also key below.

Key to the known species of *Pagastia* Oliver of Holarctic region

Males

1. Eyes hairy. Aedeagal lobes reduced (subgenus *Hesperodiamesa* Sublette). Basal lobe of gonocoxite small . . . . . *P.*(*H.*) *sequax* (Garrett, 1925) (Makarchenko 2019, Fig. 18)
– Eyes bare or pubescent. One or two aedeagal lobes present (subgenus *Pagastia* Oliver). Basal lobe of gonocoxite large 2
2. Both median and lateral aedeagal lobes present. AR 2.5-4.2 3
– Only lateral aedeagal lobe present. AR 1.0–2.42 6
3. Antepronotum with dorsal and lateral setae in widely separated groups. Median aedeagal lobe digitated and widest distally . 4
– Antepronotum completely covered with setae. Median aedeagal lobe widest medially, then tapering abruptly and with the apex forming a sharp hook. . . . . *P*. (*Pagastia*) *partica* (Roback, 1957) (Makarchenko 2019, Figs.16–17)
4. Gonostylus subapically with "heel" . . . . . *P*. (*P*.) *nivis* (Tokunaga, 1936) (Makarchenko 2006, Fig. 180, 5–10)
– Gonostylus subapically without "heel" 5
5. Apex of the gonostylus angled. . . . . *P.* (*P*.) *orientalis* (Tshernovskij, 1949) (Makarchenko 2006, Fig. 181, 1–5)
– Apex of the gonostylus broadly rounded. . . . . *P*. (*P*.) *altaica* Makarchenko, Kerkis et Ivanchenko, 1997 (Makarchenko *et al.* 1997, Fig. 1)
6. Anal point absent. Alula as well as M_{1+2}, M_{3+4}, and Cu_1 of wing with setae . . . . . *P*. (*P*.) *subletteorum* Makarchenko (Makarchenko 2019, Figs. 1–6, 19–20)
– Anal point present. Alula and M_{1+2}, M_{3+4}, Cu_1 without setae 7
7. Anal point almost parallel-sided in dorsal view; lateral aedeagal lobe tapering to thin apex 8
– Anal point tapering to apex; lateral aedeagal lobe broad in distal part 10
8. Anal point with rounded apex and without apical peg . . *P*. (*P*.) *orthogonia* Oliver, 1959 (Makarchenko 2019, Figs. 7–13, 21)
– Anal point with pointed apical peg. 9
9. Gonostylus with small basal lobe in outer side; apically rounded, without "heel". AR 1.56–1.75 . . . . . *P.* (*P*.) *hidakamontana* Endo, 2004 (Endo 2004, Figs. 1–6)
– Gonostylus with rounded basal lobe in outer side and with lobe like "heel" apically. AR 1.22–1.26 . . . . . *P.* (*P*.) *donoliveri* **sp. nov.** (Figs. 4, 6, 7, 9)
10. Anal point narrow, tapering to pointed apex, without apical peg; gonostylus in basal part with outer angle-shaped projection. AR 2.18–2.42 . . . . . *P.* (*P*.) *tianmumontana* Makarchenko *et* Wang, 2017 (Makarchenko &Wang 2017, Fig. 17)
– Anal point widest in basal part and thin apically, pointed and sometimes with apical peg; gonostylus without outer basal projection and with rounded apex. AR 1.81–2.10 . . . . . *P*. (*P*.) *lanceolata* (Tokunaga, 1936) (Makarchenko 2006, Fig. 180, 1–4)

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