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SEVEN NEW SPECIES OF *PERLOMYIA* (PLECOPTERA: LEUCTRIDAE) FROM JAPAN

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ABSTRACT

Seven new species of *Perlomyia* are described from specimens collected in Iwate Prefecture and Nara Prefecture, Honshu, Japan. A key to the Japanese male *Perlomyia* (*P. gifuensis* [Kohno] excluded), and a checklist for 18 currently recognized species are presented. *Perlomyia nipponica* (Okamoto) is placed as a nomen dubium.

Keywords: *Perlomyia*, Leuctridae, Plecoptera, Japan, New species

INTRODUCTION

Genus *Perlomyia*, proposed by Banks (1906) for his newly described Canadian species, *P. collaris* Banks, remained monotypic until *P. utahensis* Needham & Claassen was added (Needham & Claassen 1925). Nelson & Hanson (1973) proposed the first Asian member of the genus from China, and Zhiltzova (1974) named the first Russian species. Zhiltzova (1976, 2003) and Zwick (1977) subsequently transferred seven species named in other genera to *Perlomyia* and the genus currently includes 10 species, with two, *P. gifuensis* (Kohno 1965) and *P. parva* (Kawai 1967) recognized from Japan (Zwick 1977; Shimizu 2000). Shimizu (2000) indicated *Leuctra nipponica* Okamoto (Okamoto 1922) is a probable member of *Perlomyia* based on the figure of a female subgenital plate in Okamoto (1922), but type material for this species is missing and we regard it as a nomen dubium.

North American workers have usually recognized the genus on the basis of modified male cerci, a poorly developed female subgenital plate and divided sclerites on the female eighth sternum (Baumann et al. 1977), but Nelson & Hanson (1973) proposed two apomorphies for the group, (1) a common origin for Rs and M veins in the forewing, and (2) a complete 10th female abdominal sternum. The first character is found in most current species placed in the genus, but not, at least, in *P. kiritshenkoi* Zhiltzova, 1974 and *P. secunda* (Zapekina-Dulkeit 1955) (Zhiltzova 1976), however, the second character is valid for all known *Perlomyia.* Asian *Perlomyia* have often been confused with *Rhopalopsole* Klapálek, but males of that genus often have elongate spines arising on the posterolateral margins of tergum 10 and tergum 10 is usually divided with a relatively large (sometimes trilobed) central sclerite and a transverse pair of sclerites located along the posterior margin of the segment (Sivec et al. 2008). In contrast, *Perlomyia* males usually have a pair of small posterolateral projections on tergum 10 and the segment is often narrowly divided and lacks a large mesal sclerite.

In this study seven new species of *Perlomyia* are described from material provided by Professor Y. Isobe, Nara Bunka Women's College, Nara, Japan,

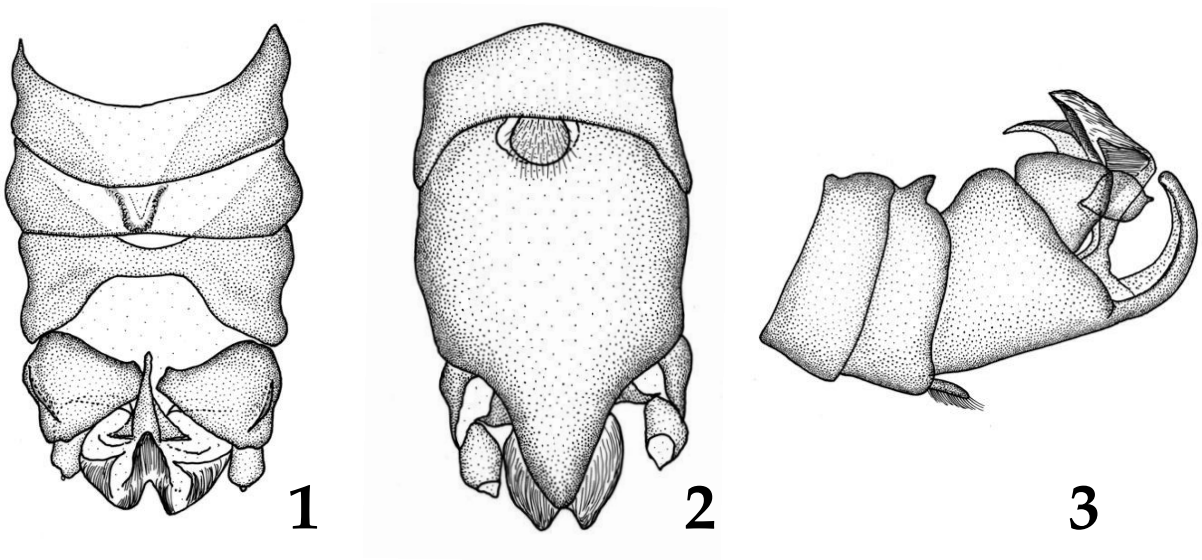
and from C.D. Kerst, Eugene, Oregon. Specimens are deposited in the Slovenian Museum of Natural History, Ljubljana, Slovenia (PMSL).

RESULTS AND DISCUSSION

Perlomyia ainu sp. n.
(Figs. 1-3)

Material examined. Holotype ♂, **Japan**, Iwate Prefecture, Hienuki River, 16 km above Hayachine Dam, 3 May 2002, C.D. Kerst (PMSL).

Male. Forewing length 5 mm. General color dark brown to black. Epiproct long and slender, forming a narrow triangular structure in dorsal aspect (Fig. 1), and shaped like a raptorial beak in lateral aspect (Fig. 3). Tergum 9 broadly excavated on posterior margin; small knobs absent from tergum 10, but posterolateral margins developed into low wide mounds. Tergum 8 with small, erect median lobe truncate on posterior margin and tergum 6 with a minute posteromedian lobe. Cerci bear a small posteromedian spine in lateral aspect (Fig. 3). Paraprocts fused into a broad, thick process; lateral aspect of paraprocts wide at base and tapered to form a sagittate structure in ventral aspect (Fig. 2). Apex of sternum 9 curved strongly dorsad (Fig. 3); vesicle wide apically and tapered to base (Fig. 2).



Figs. 1-3. *Perlomyia ainu* terminalia. 1. Male dorsal. 2. Male ventral. 3. Male lateral.

Female. Unknown.

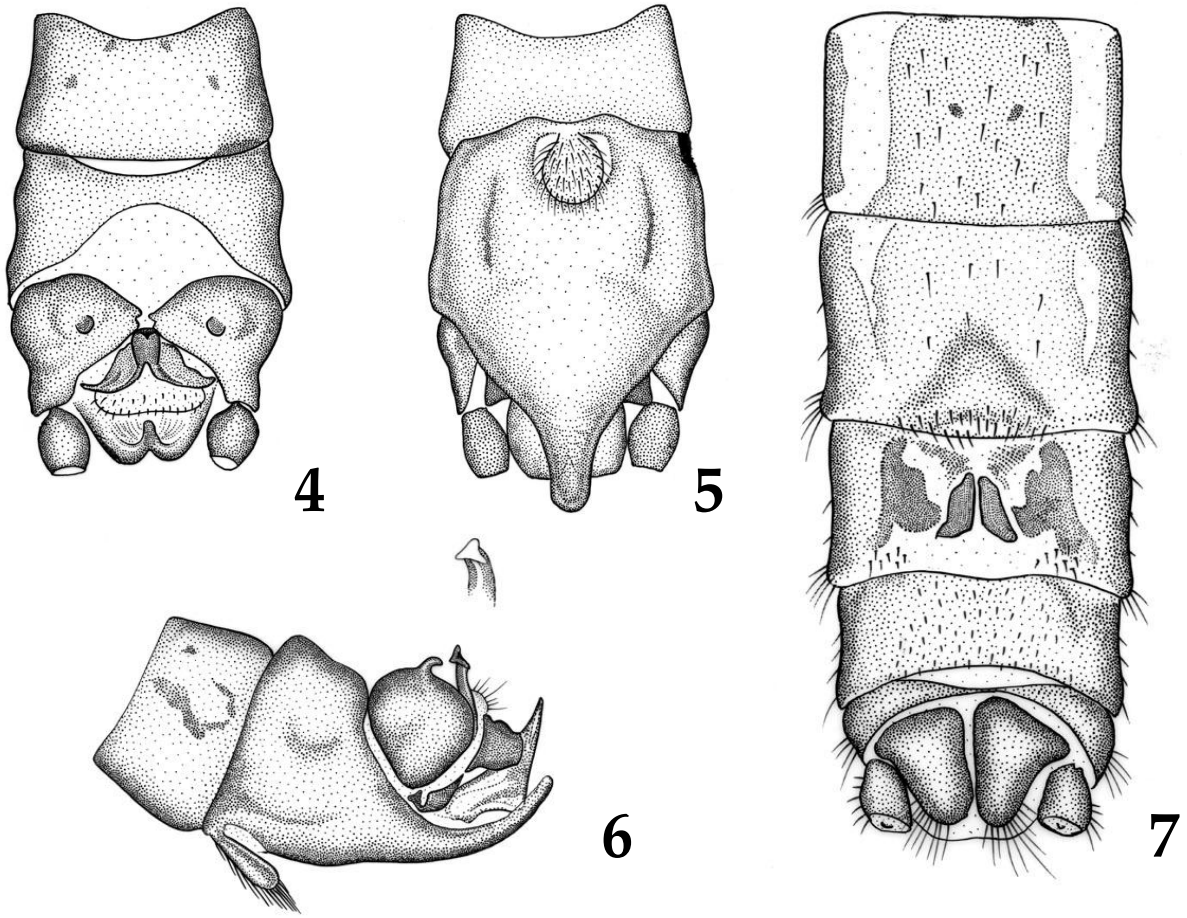
Larva. Unknown.

Etymology. The species name, used as a noun in apposition, honors the early Ainu culture once known from the area of the type locality.

Diagnosis. This species is one of at least four Japanese species without the distinctive pair of small knobs found on *P. parva* and several other members of the genus (Kawai 1967; Nelson & Hanson 1973); we are uncertain about the presence of these structures on *P. gifuensis*. This new species is easily distinguished from other Japanese species by the presence of a truncate lobe on male tergum 8 and by the small apical spine on the male cerci. *Perlomyia kersti*, described below, is the only other Japanese species known to have a male tergal lobe and in that species the dorsal lobe is located on tergum 9. At least two other Asian *Perlomyia*, *P. levanidovae* (Zhiltzova 1975) and *P. smithae* Nelson & Hanson 1973, lack knobs on male tergum 10, but these species also lack dorsal lobes on segment 8.

***Perlomyia honshu* sp. n.**
(Figs. 4-7)

Material examined. Holotype ♂, **Japan**, Nara Prefecture, Takami River, Aritoshi, 15 April 1995, Y. Isobe (PMSL). Paratypes: 1♂, 3♀, same data (PMSL).
Male. Forewing length 7-7.5 mm. General color dark brown to black. Epiproct almost straight in lateral aspect, but with small tab-like triangular tip (Fig. 6). Tergum 9 broadly excavated posteromesally; tergum 10 with small rounded knobs placed near center of sclerites (Figs. 4, 6). Cerci somewhat globular in dorsal aspect, apex truncate or slightly rounded in lateral aspect and without conspicuous dorsobasal lobe or apical spine. Paraprocts fused into a broad, thick process (Figs. 4, 6). Sternum 9 prolonged beyond paraprocts and curved gently upward (Figs. 5-6). Vesicle almost circular in outline.
Female. Forewing length 8-8.5 mm. Posterior margin of sternum 7 slightly produced over base of sternum 8, projecting portion relatively well sclerotized (Fig. 7). Sternum 8 with a narrow, mesal membranous strip which separates dark median sclerites; lateral wing-like sclerites narrowly separated from median sclerites.



Figs. 4-7. *Perlomyia honshu* terminalia. 4. Male dorsal. 5. Male ventral. 6. Male lateral, epiproct tip inset. 7. Female ventral.

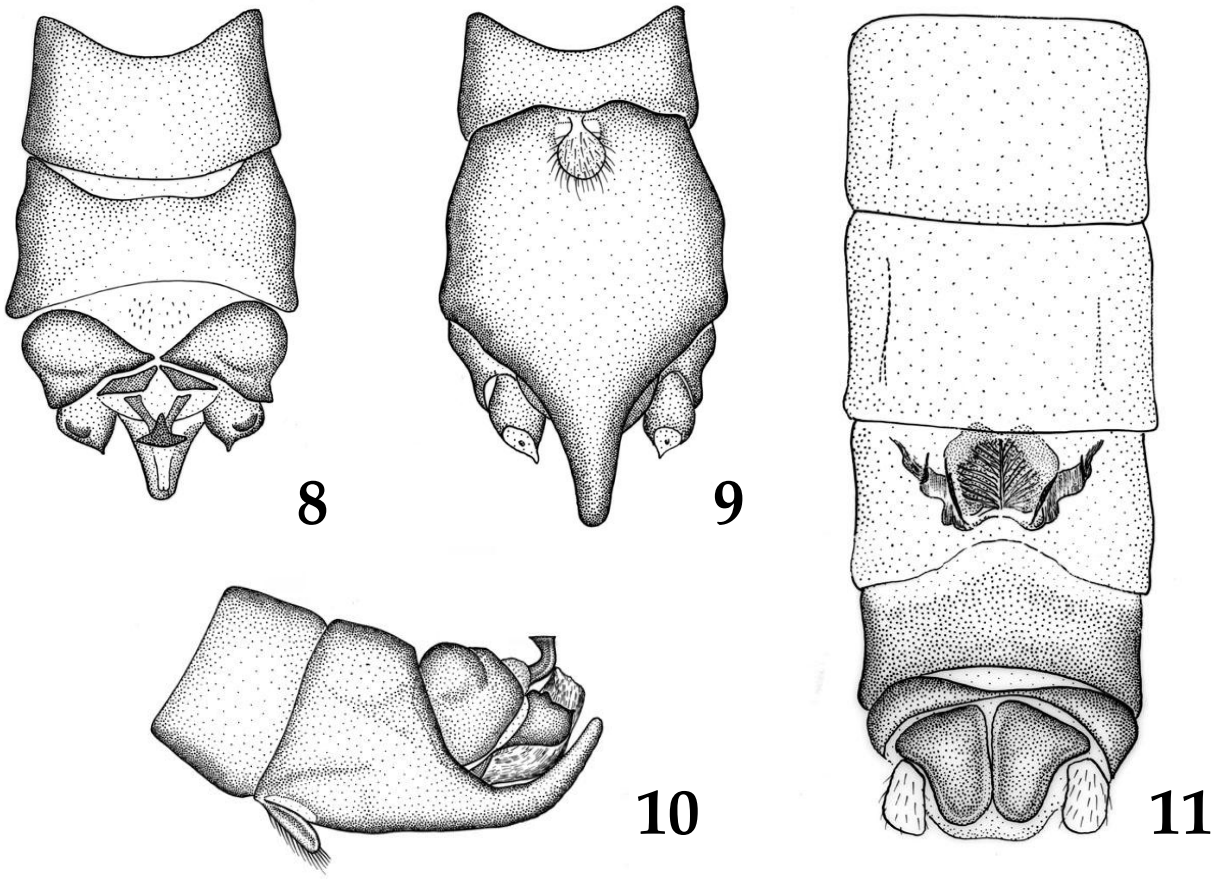
Larva. Unknown.
Etymology. The species name, used as a noun in apposition, is based on Honshu Province where it was first collected.
Diagnosis. *Perlomyia honshu* is one of four Japanese species with small knobs on male tergum 10. Two of

these, *P. kappa* and *P. parva*, have an apical spine visible in lateral aspect on the male cerci, and in *P. iwate*, the epiproct tip is not enlarged.

Perlomyia isobeae sp. n.
(Figs. 8-11)

Material examined. Holotype ♂, **Japan**, Nara Prefecture, Takami River, Aritoshi, 11 April 1995, Y. Hajashi (PMSL). Paratypes: 2♂, 3♀, same data (PMSL).

Male. Forewing length 5.5 mm. General color dark brown to black. Epiproct slightly curved in lateral aspect with apex appearing flat on dorsum and slightly expanded (Fig. 10); dorsal aspect of tip saggitate (Fig. 8). Tergum 9 not constricted mesally, but sclerotized area of segment narrowed near anterior margin (Fig. 8); tergum 10 without small knobs. Cerci rounded with low dorsal lobe and small spine-like apex (Figs. 8, 10); basal knob small, rounded and inconspicuous. Paraprocts fused into a broad, curved process. Sternum 9 projecting beyond paraprocts and curved gradually upwards in lateral aspect (Figs. 9-10).



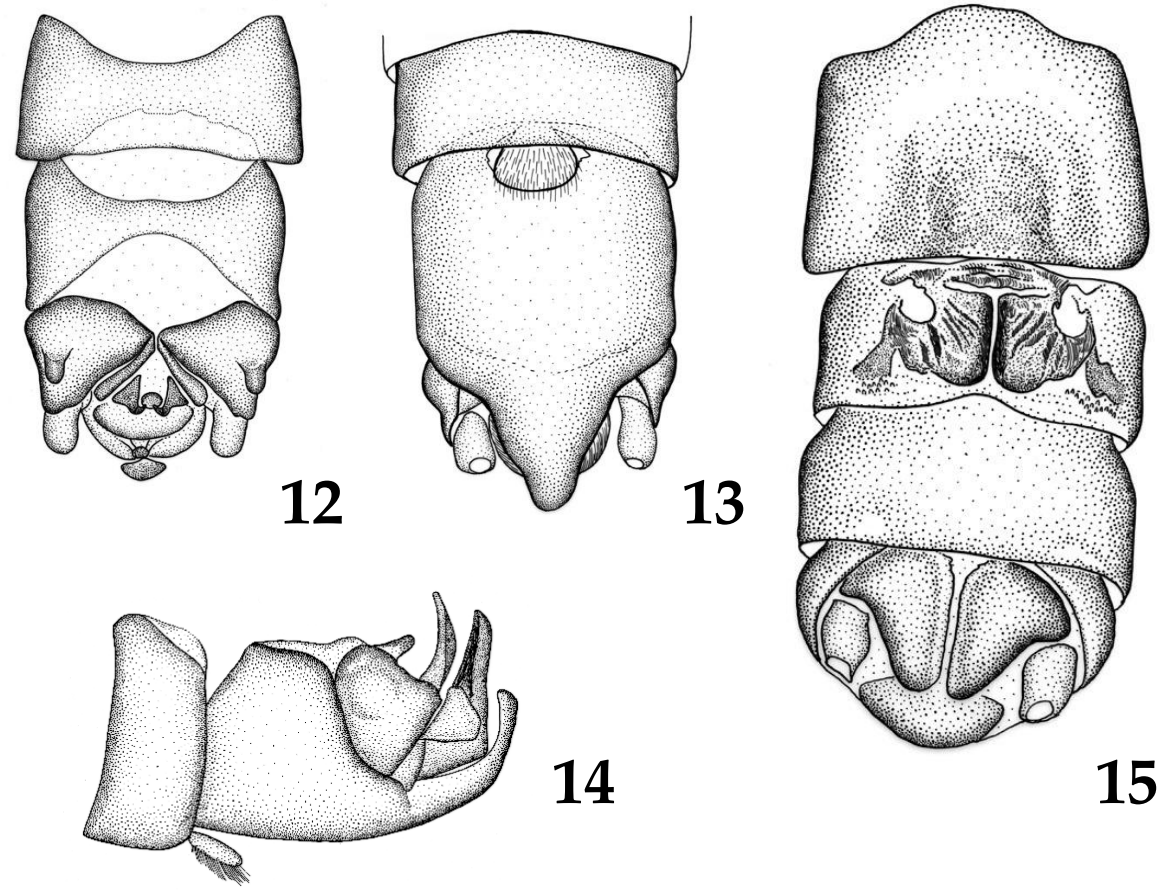
Figs. 8-11. *Perlomyia isobeae* terminalia. 8. Male dorsal. 9. Male ventral. 10. Male lateral. 11. Female ventral.

Female. Forewing length 6 mm. Posterior margin of sternum 7 straight and unproduced over sternum 8 (Fig. 11). Sternum 8 with a broad mesal sclerite narrowly divided on meson and excavated on posterior margin; wing-like lateral areas of sclerite ribbon-shaped and attached to posterolateral margins of median sclerite.

Larva. Unknown.

Etymology. The matronym honors Professor Yu Isobe for her outstanding contributions to the study of Japanese Plecoptera and for her contribution of specimens to this study.

Diagnosis. This species is another of the four Japanese *Perlomyia* whose males lack small knobs on abdominal tergum 10 (see *P. ainu* above). It is distinguished from these similar species by the truncate epiproct tip in lateral aspect and by the presence of a low rounded lobe and small spine in dorsal aspect of the cerci.



Figs. 12-15. *Perlomyia iwate* terminalia. 12. Male dorsal. 13. Male ventral. 14. Male lateral. 15. Female ventral.

***Perlomyia iwate* sp. n.**
(Figs. 12-15)

Material examined. Holotype ♂, **Japan**, Iwate Prefecture, Hienuki River, Oinokubo Riverside Park, 12 km above Hayachine Dam, 4 May 2002, C.D. Kerst (PMSL). Paratypes: 4♂, 3♀; 3 May 2002, same locality; 2♂, 7♀, 4 May 2002, same locality (PMSL).

Male. Forewing length 6 mm. General color dark brown to black. Epiproct curved slightly forward in lateral aspect, long, slender and pointed or slightly rounded at tip (Fig. 14). Tergum 9 narrowed posteromesally; tergum 10 with a pair of small mesolateral knobs (Fig. 12). Cerci apically rounded in dorsal aspect, broad, more or less trapezoidal in lateral aspect and without apical spine. Paraprocts fused into a broad, thick process, angulate near midlength and tapered to a narrow apex in lateral aspect (Fig. 14). Sternum 9 curved upward in lateral aspect and broadly triangular in apical half in ventral

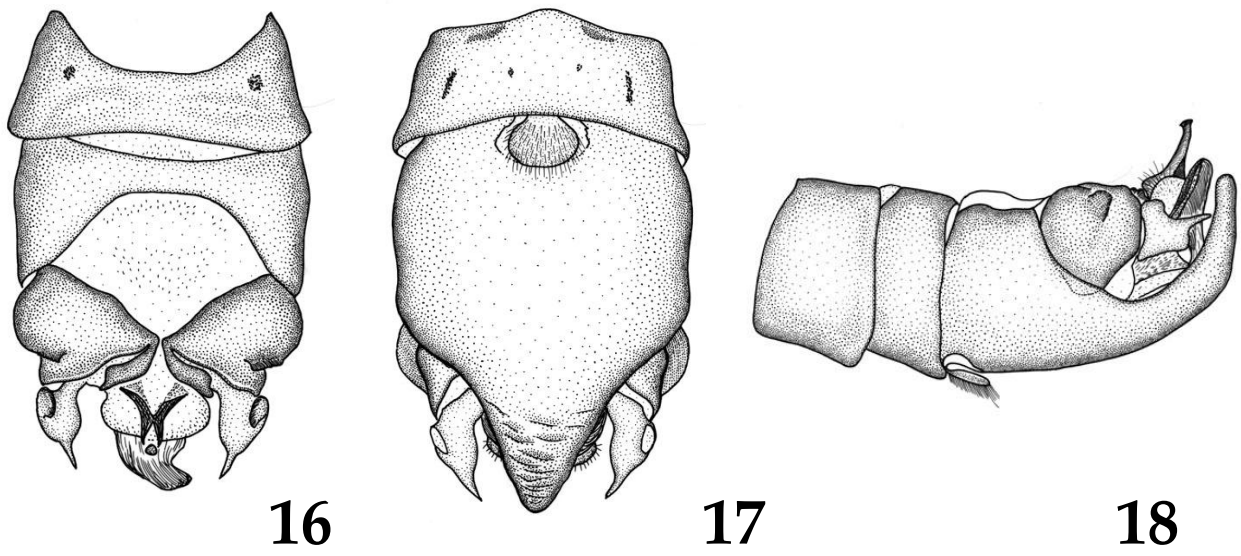
aspect and extending beyond base of paraprocts. Vesicle broadly rounded at apex, much wider apically than at base (Fig. 13).

Female. Forewing length 7 mm. Posterior margin of sternum 7 straight, but slightly swollen (Fig. 15). Sternum 8 bearing a conspicuous pair of large dark median sclerites, narrowly separated on meson; lateral wing-like sclerites directed posterolaterally, wider at apex than at base.

Larva. Unknown.

Etymology. The species name, used as a noun in apposition, is based on the type locality in Iwate Prefecture.

Diagnosis. Among the four species of Japanese *Perlomyia* which share small knobs on tergum 10 (see *P. honshu* above) only *P. parva* and *P. iwate* lack an expanded apex to the epiproct. In *P. parva* the epiproct apex is acute and the cerci bear a small apical spine, whereas in *P. iwate* the epiproct apex is narrowly rounded and the cerci lack the apical spine.



Figs. 16-18. *Perlomyia kappa* terminalia. 16. Male dorsal. 17. Male ventral. 18. Male lateral.

***Perlomyia kappa* sp. n.**
(Figs. 16-18)

Material examined. Holotype ♂, **Japan**, Iwate Prefecture, Hienuki River, Oinokubo Riverside Park, 12 km above Hayachine Dam, 3 May 2002, C.D. Kerst (PMSL).

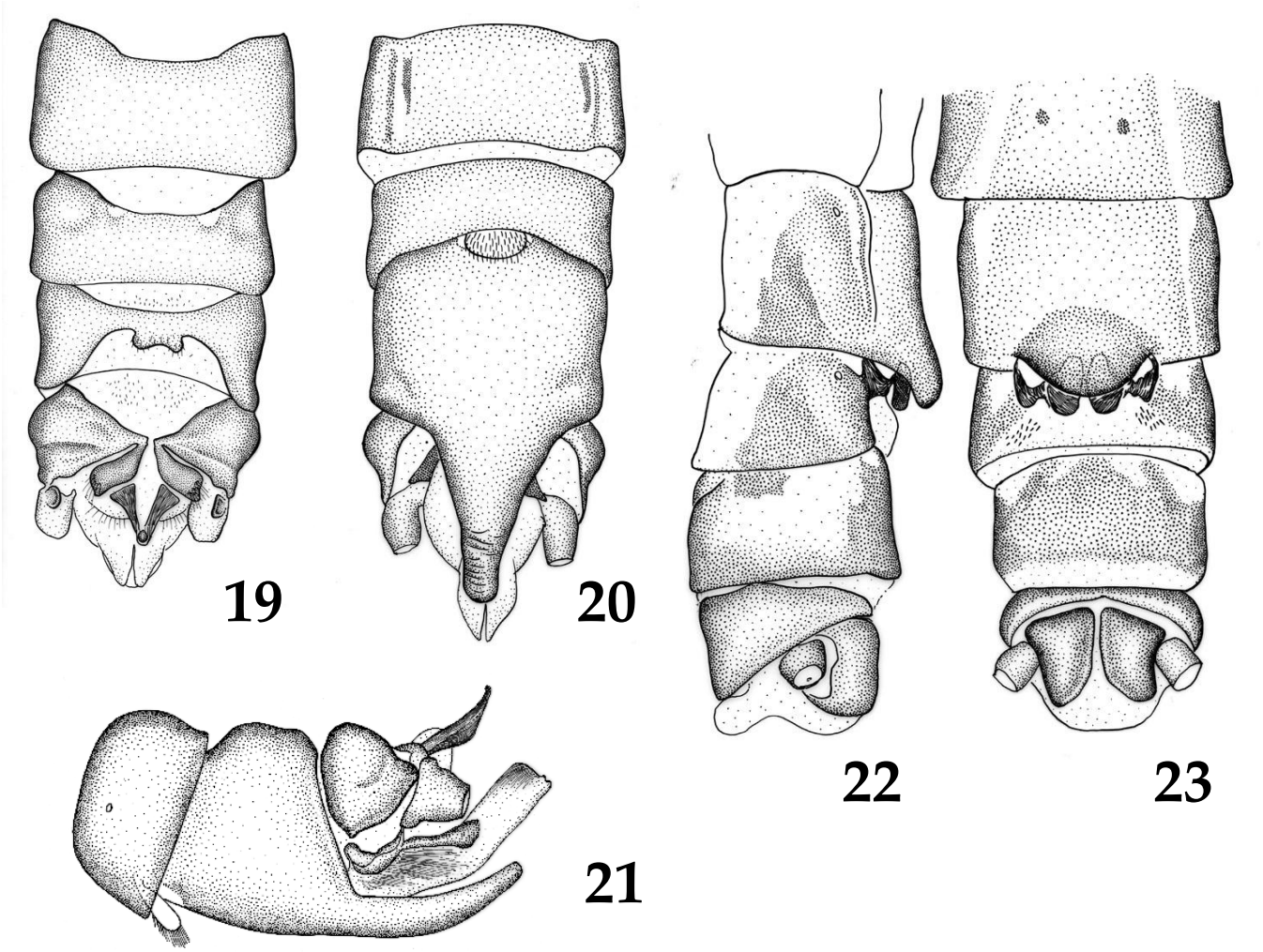
Male. Forewing length 7 mm. General color dark brown to black. Epiproct swollen basally, slender for most of length and expanded apically in lateral aspect (Fig. 18). Tergum 9 broadly excavated posteromesally (Fig. 16); small projections present posterolaterally on tergum 10. Cercal apices with a long terminal spine (Figs. 16-18). Paraprocts fused into a broad, thick process, rounded at the tip in lateral aspect. Sternum 9 apex broadly triangular apically in ventral aspect (Fig. 17), sharply upturned in the apical half in lateral aspect. Vesicle broad near apex, strongly narrowed at base.

Female. Unknown.

Larva. Unknown.

Etymology. The species name, used as a noun in apposition, is based on the Kappa, or river goblins, of Japanese mythology.

Diagnosis. *Perlomyia kappa* has small knobs on tergum 10 and differs from similar Japanese species of the genus in having prominent cercal spines and an apically enlarged epiproct.



Figs. 19-23. *Perlomyia kersti* terminalia. 19. Male dorsal. 20. Male ventral. 21. Male lateral. 22. Female lateral. 23. Female ventral.

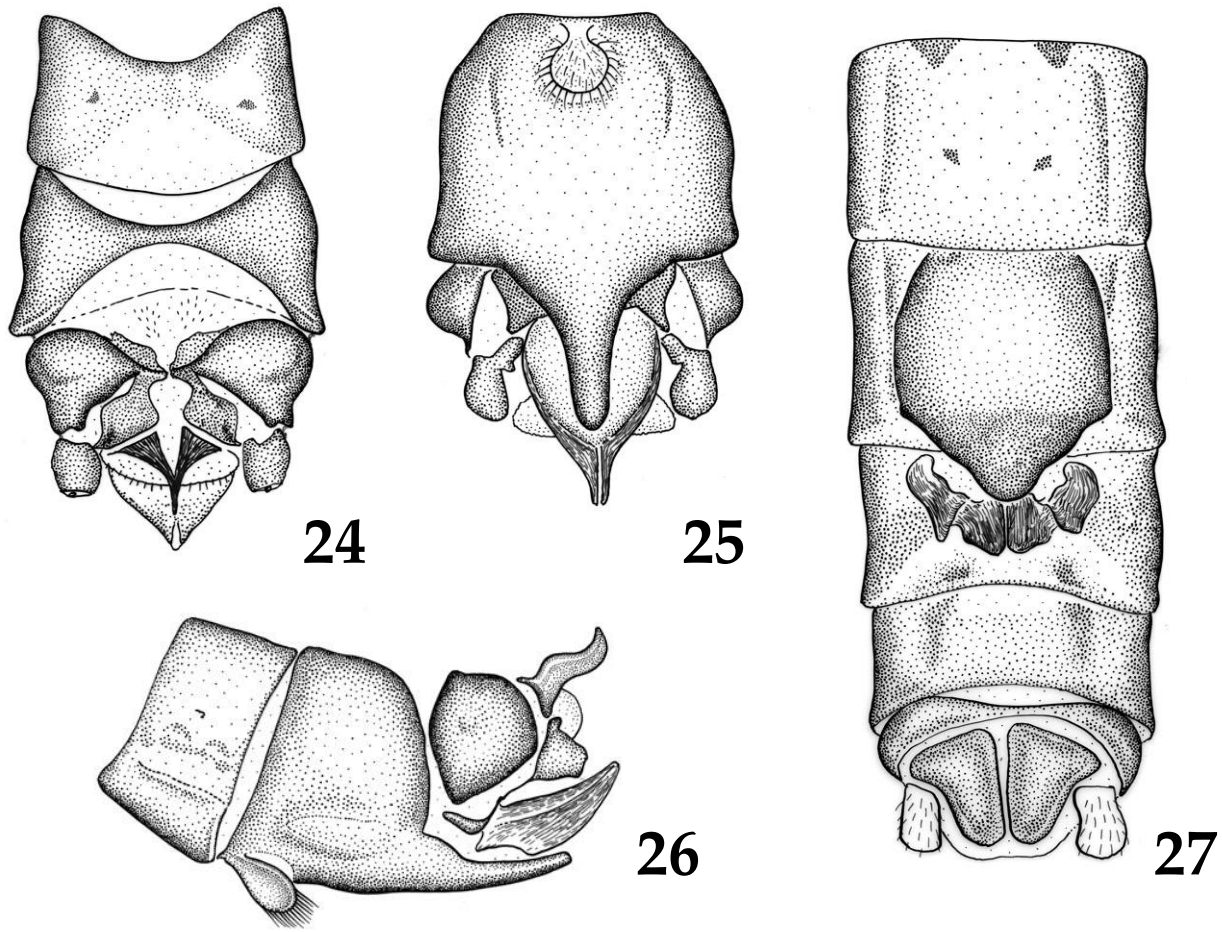
***Perlomyia kersti* sp. n.**
(Figs. 19-23)

Material examined. Holotype ♂, **Japan**, Iwate Prefecture, Hienuki River, headwater area, 22 km above Hayachine Dam, 3 May 2002, C.D. Kerst (PMSL). Paratype: 1♀, same data (PMSL).

Male. Forewing length 6 mm. General color dark brown to black. Epiproct falcate in lateral aspect, curved forward slightly, expanded at midlength and narrowly pointed at tip (Fig. 21). Tergum 9 with mesal lobe set in broad excavation (Fig. 19); small knobs absent from tergum 10 but bearing a shallow transverse groove near tip. Cerci thimble shaped in lateral aspect, but bearing a small dorsobasal knob. Paraprocts fused into a broad, thick process; apex of paraprocts truncate in lateral aspect (Fig. 21), but with a small posteroapical notch. Apex of sternum 9 curved slightly dorsad and strongly narrowed from body of sternum (Figs. 20-21). Vesicle short and broadly rounded at apex.

Female. Forewing length 7.5 mm. Posterior margin of sternum 7 enlarged, sclerotized and projecting over base of sternum 8 (Figs. 22-23). Sclerites of sternum 8 wide, but restricted to basal half of segment, and notched on meson; apically directed

wing-like sclerites absent, but basally directed ones present.
Larva. Unknown.
Etymology. The patronym honors C.D. Kerst, collector of the type material.
Diagnosis. Among the Japanese *Perlomyia* which lack knobs on tergum 10, *P. kersti* is the only known species with a median lobe on tergum 9.



Figs. 24-27. *Perlomyia sinuata* terminalia. 24. Male dorsal. 25. Male ventral. 26. Male lateral. 27. Female ventral.

***Perlomyia sinuata* sp. n.**
(Fig. 24-27)

Material examined. Holotype ♂, **Japan**, Nara Prefecture, Takami River, Aritoshi, 15 April 1995, Y. Isobe (PMSL). Paratypes: 2♂, 2♀, same data (PMSL).
Male. Forewing length 8 mm. General color dark brown to black. Epiproct sinuate in lateral aspect (Fig. 26). Tergum 9 strongly narrowed mesally (Fig. 24). Tergum 10 without small knobs. Cerci somewhat globular in dorsal aspect, but bearing a small dorsobasal lobe in lateral aspect (Fig. 26); terminal spine absent. Paraprocts fused into a broad, thick process, curved slightly dorsad and narrowly rounded apically (Fig. 26). Sternum 9 apex slender (Fig. 25), not reaching apex of paraprocts and curved only slightly dorsad. Vesicle body almost circular, attached to sternum 9 by a slender stalk (Fig. 25).
Female. Forewing length 9 mm. Posterior margin of sternum 7 enlarged, sclerotized and strongly

produced over base of sternum 8 as a narrowed projection (Fig. 27). Sternum 8 with a short, wide median sclerite, narrowly divided, or notched by membrane; wing-like sclerites slightly longer than, and about as wide as median sclerites (Fig. 27).

Larva. Unknown.

Etymology. The species name refers to the sinuate anterior margin of the epiproct in lateral aspect.

Diagnosis. Among the Japanese *Perlomyia* which lack knobs on male tergum 10, this species is the only one in which the epiproct has a sinuate profile.

Key to Japanese Male *Perlomyia*
(*P. gifuensis* not included)

1 Abdominal terga 8 or 9 with a median lobe (Figs. 1, 19) 2
1′ Abdominal terga 8 or 9 without median lobe (Fig. 4) 3
2 Abdominal tergum 8 with a median lobe (Fig. 1); paraprocts gradually narrowed in lateral aspect from midlength to apex (Fig. 3); cerci with a small terminal spine (Fig. 3) ..... *P. ainu*
2′ Abdominal tergum 9 with a median lobe (Fig. 19); paraprocts apically truncate in lateral aspect (Fig. 21); cerci without terminal spine (Fig. 21) ..... *P. kersti*
3 Tergum 10 bearing a pair of small knobs (Figs. 4, 12, 16) 4
3′ Tergum 10 without small knobs (Figs. 8, 24) 7
4 Cerci bearing a long, slender, terminal spine, prominent in dorsal and lateral aspect (Figs. 16, 18) ..... *P. kappa*
4′ Cerci without terminal spine, or with, at most a minute projection, apices appearing truncate, rounded or notched in dorsal aspect (Figs. 4, 12) 5
5 Apex of epiproct bent forward abruptly as a small triangular tab (Fig. 6); cerci apically truncate (Fig. 4) ..... *P. honshu*
5′ Apex of epiproct gradually narrowed to an acute or rounded tip (Fig. 14); cerci apically rounded or notched (Fig. 12) 6
6 Cercal apices rounded in dorsal aspect (Fig. 12), without terminal notch or minute spine; intersegmental membrane between terga 9-10 without median hairy patch (Fig. 12) ..... *P. iwate*
6′ Cercal apices with a shallow posterolateral notch and small spine; intersegmental membrane between terga 9-10 with a median hairy patch ..... *P. parva*
7 Epiproct apex truncate in lateral aspect (Fig. 10); cerci with a small terminal spine (Figs. 8, 10) ..... *P. isobeae*
7′ Epiproct sinuate in lateral aspect, tip not truncate (Fig. 26); cerci without terminal spine (Figs. 24-26) ..... *P. sinuata*

Checklist of *Perlomyia* Species

P. ainu sp. n.	Japan
P. collaris Banks, 1906	Western North America
P. gifuensis (Kohno, 1965)	Japan
P. honshu sp. n.	Japan
P. insularis (Zhiltzova, 1975)	Russia
P. isobeae sp. n.	Japan
P. iwate sp. n.	Japan
P. kappa sp. n.	Japan
P. kersti sp. n.	Japan
P. kiritshenkoi Zhiltzova, 1974	Russia
P. levanidovae (Zhiltzova, 1975)	Russia
P. mahunkai (Zwick, 1973)	Korea, Russia
P. martynovi (Zhiltzova, 1975)	Russia
P. parva (Kawai, 1967)	Japan

P. secunda (Zapekina-Dulkeit, 1955)	Russia
P. sinuata sp. n.	Japan
P. smithae Nelson & Hanson, 1973	China, Russia
P. utahensis Needham & Claassen, 1925	Western North America

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