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A description of *Parameletus ensiformis* Tiunova, 2008 larva (Ephemeroptera: Siphlonuridae) from the Russian Far East

Описание личинки *Parameletus ensiformis* Tiunova, 2008 (Ephemeroptera: Siphlonuridae) с Дальнего Востока России

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Ключевые слова: Ephemeroptera, подёнки, личинка, *Parameletus*, Дальний Восток, Россия.

Abstract. The larva of *Parameletus ensiformis* Tiunova, 2008 from the Russian Far East is described and illustrated for the first time. The larva is similar to larvae of *P. chelifer* Bengtsson, 1908 and *P. minor* (Bengtsson, 1909) and differs from larva of *P. chelifer* by shape and length/width ratio of gills I, VI and VII, and from larva of *P. minor* by the absence of maculation on the abdominal terga and by the length of posterolateral spines of tergum IX.

Резюме. Приводится описание личинки *Parameletus ensiformis* Tiunova, 2008 с Дальнего Востока России. Личинка *P. ensiformis* наиболее близка к *P. chelifer* Bengtsson, 1908 и *P. minor* (Bengtsson, 1909). Личинки *P. ensiformis* отличаются от личинок *P. chelifer* формой и соотношением длины/ширины I, VI и VII жабр, а от личинок *P. minor* отсутствием пятен на тергитах брюшка и длиной заднебоковых шипов на IX тергите.

At present time, seven mayfly species of the genus *Parameletus* Bengtsson, 1908 are known in the world fauna, four of which inhabit the watercourses of the Russian Far East. These are the East Palaearctic *P. arcuatus* Tiunova, 2008 and *P. ensiformis* Tiunova, 2008, the Palaearctic *P. minor* (Bengtsson, 1909), and the Holarctic *P. chelifer* Bengtsson, 1908 [Tiunova, 2007, 2008, 2009; Kluge 2021]. The other three species *P. columbiae* McDunnough, 1938, *P. croesus* McDunnough, 1923, and *P. midas* McDunnough, 1923 were recorded in the Nearctic watercourses. Of the four Far Eastern species, both larval and imaginal stages of development were known only for *P. chelifer* and *P. minor* [Bengtsson, 1930; Söderström, Nilsson, 1986; Tshernova et al., 1986; Tiunova, 2008]. In 2021, N. Yavorskaya (Institute of Water and Ecological Problems Feb RAS, Khabarovsk) collected a mature larva of *P. ensiformis*, which made it possible to describe the larval stage of development of this species. The association of mature larvae with adults was established by the simultaneous collection of mature larvae and imaginal stages of males and females.

The material is deposited in the collection of the Laboratory of Freshwater Hydrobiology of the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch, Russian Academy of Sciences, Vladivostok.

Parameletus ensiformis Tiunova, 2008

Figs 1–13.

Material. **Russian Federation,** ***Khabarovskii Krai:*** Komsomolskii Nature Reserve, Amur River basin, Gorin River, puddles near the cordon, 1.VII.2021, N. Yavorskaya, 1 larva, 3♂♂, 9♀♀ adults.

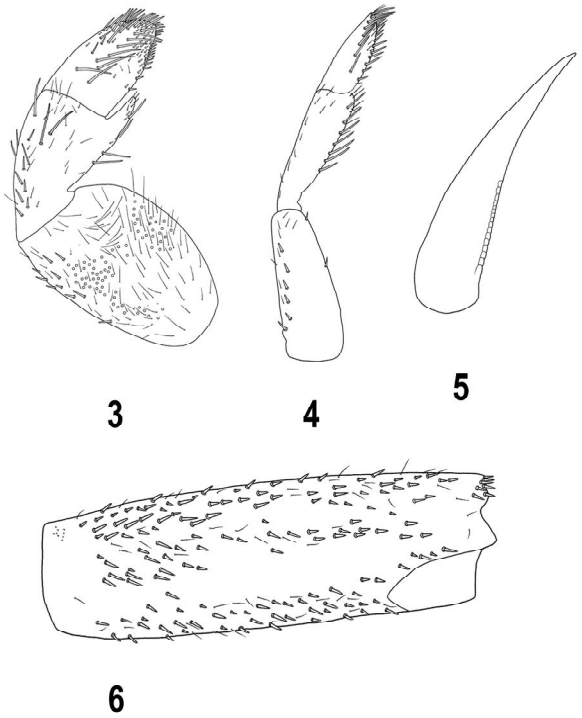
Description. Mature larvae (in alcohol). Since larva is strongly matured, the color and maculation are not described in detail. Body length 9.7 mm, cerci 5.0 mm. General body color dark brown (Figs 1, 2). *Head*: antennae brown, antennal pedicel darker; head dark yellowish-brown with a narrow lighter area around the eyes; the eyes are dark grayish black. Labrum brown with darker lateral margins, 1.9 times wider than its length; anteriorly densely setose. Glossae and paraglossae densely setose. First segment of the labial palp wide, dorsal surface with long and thin hairs like-setae and strong pointed setae on the outer margin (Fig. 3); second segment with inner apical process apex of which covered small pointed setae; inner margin with four long stout setae; outer margin with irregular row of short stout setae and with three elongated setae in distal area; third segment in the middle area with a row of long setae along all length of segment and with stout setae different size in 1/2 distal area; its apex pointed (Fig. 3). Maxillary palp three-segmented; the first segment the longest, longer than second in 1.2 times and in 1.7 times than third segment, with a row of short stout setae located along the outer margin; second segment widens towards the apex, with a row of long stout setae along the inner margin and fine hair-like setae along the outer margin; third segment sharply tapering towards apex, one third shorter than the second segment, with a row of stout setae along the inner margin and a regular row of long setae located in the

Figs 1–2. Color pattern of *Parameletus ensiformis* Tiunova, larvae. 1 — dorsal view; 2 — ventral view.
Рис. 1–2. Окраска личинки *Parameletus ensiformis* Tiunova. 1 — вид сверху; 2 — вид снизу.

middle area along all length of segment (Fig. 4). Mandibles dark brown. The structure of the mandibles is characteristic of the genus: incisor of left mandible with outer incisor terminated by four denticles and inner incisors terminated by three denticles; right mandible with outer incisor terminated by four denticles and inner terminated by two denticles. *Thorax*: Pronotum brown with light longitudinal stripe at the base; mesonotum dark brown with lights maculation. Femora of all legs light brown with a darker inner part. Tibia and tarsi of fore leg brown, middle and hind legs yellowish or whitish; joints of legs dark brown or black; tarsal claws brow, with serration reaches middle or slightly less than middle of inner margin (Fig. 5). Legs with numerous stout spines (Fig. 6). Lengths (mm) of the leg segments as follows: Foreleg: femur 1.1; tibia 0.8; and tarsus 1.2. Middle leg: femur 1.1; tibia 0.8; and tarsus 0.8. Hind leg: femur 1.2; tibia 0.8; and tarsus 0.9. *Abdomen*: Terga brown with dark brown large spots near lateral margins and dark brown stripe at the base. (Fig. 1). Posterior corners of terga V–IX with spines, length of which increase in size from minimum on tergum V to maximum on tergum IX; length of last spine reaches ½ length of tergum X (Figs 1, 2). Sterna generally dirty brownish with white lateral margins; sternum IX brown and well contrasted with other light sterna. Seven single asymmetrical pairs of gills present on abdominal segments I–VII; all gills matt, with dark tracheation; tracheae with numerous small branches; tips all gills rounded (Figs 7–13). Gill I is elongated, more narrow than the other gills and its length 1.54 times exceeds it is width (Fig. 7; Table 1); gills II and III the largest, gill II only slightly smaller than gill III, lengths of gill II–III 1.45 and 1.41 times exceed their width, respectively (Figs 8, 9); gills IV and V almost equal in size and slightly smaller than gills II–III and its length 1.35–1.37 times exceeds its width (Figs 10, 11); gill VI shorter than gills I–V, and its length 1.37 times exceeds its width (Fig. 12); gill VII the smallest, 1.36 times longer than width (Fig.13). Cerci brown at base and brownish or yellowish on tips.

Diagnosis. Terga brown with dark brown large spots near lateral margins and dark brown stripe at the base. Length of posterolateral spines of segment IX more than 1/2 of length of segment X. Claw with serration reaches middle or slightly less than middle of inner margin. Gill I is elongated, narrower than the other gills and its length 1.54 times exceeds it is width (Table 1). Gills VI and VII with rounded tips.

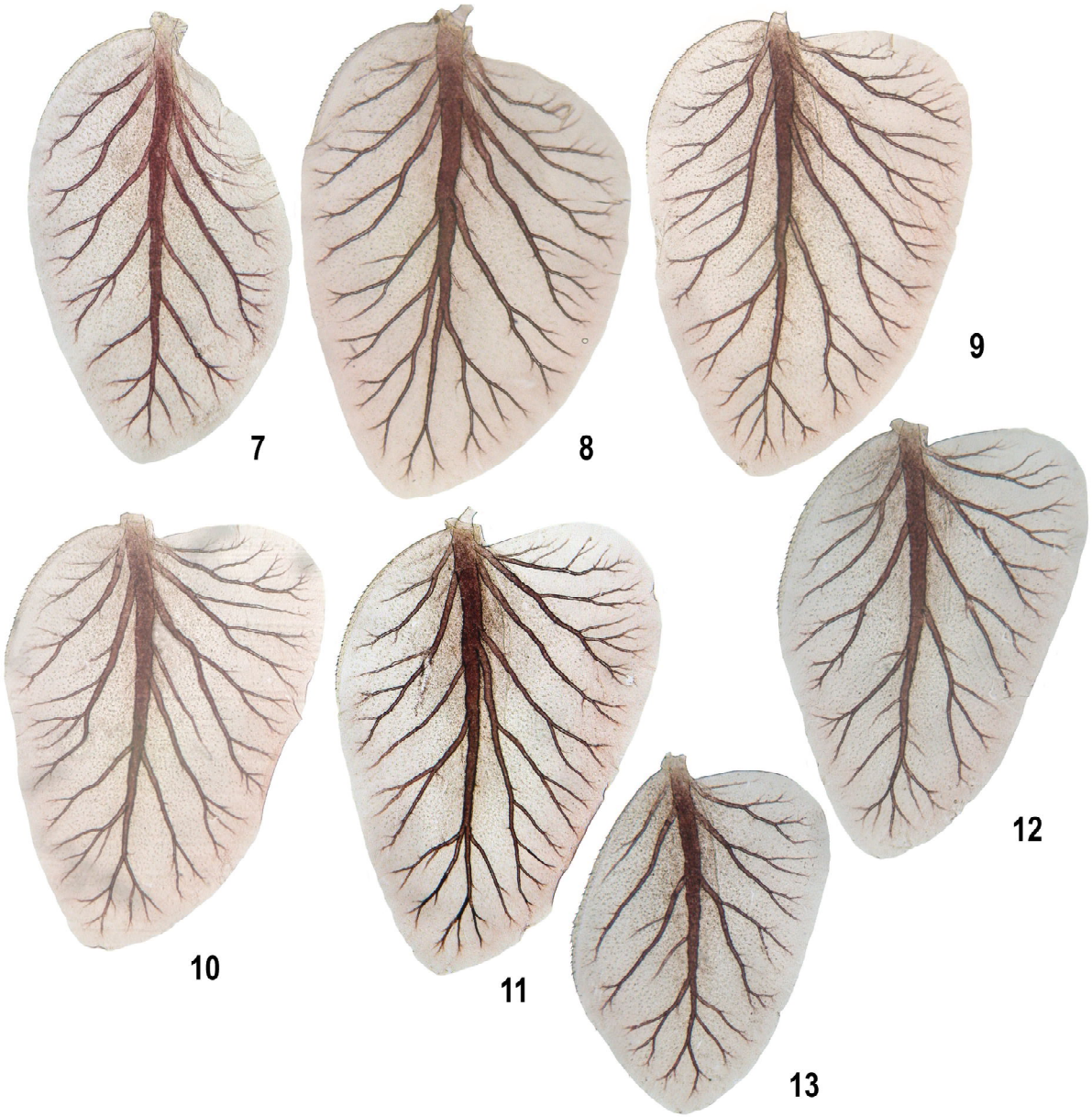
Distribution and ecology. Khabarovskii Krai of Russia. Mature larvae, which were ready to emerge, were collected in permanent puddles together with the larvae of *Siphlonurus* sp. According our observation, the period of emergence of the adults from June to the middle August.



Figs 3–6. *Parameletus ensiformis* Tiunova, larva. 3 — labial palp, ventral view; 4 — maxillar palp, ventral view; 5 — tarsal claw, dorsal view; 6 — foreleg femora, dorsal view.
Рис. 3–6. *Parameletus ensiformis* Tiunova, личинка. 3 — губной щупик, вид снизу; максиллярный щупик, вид снизу; 5 — коготок, вид сверху; 6 — бедро передней ноги, вид сверху.

Table. 1. The length/width ratio of gills I–VII
Таблица. 1. Соотношение длины к ширине жабр I–VII

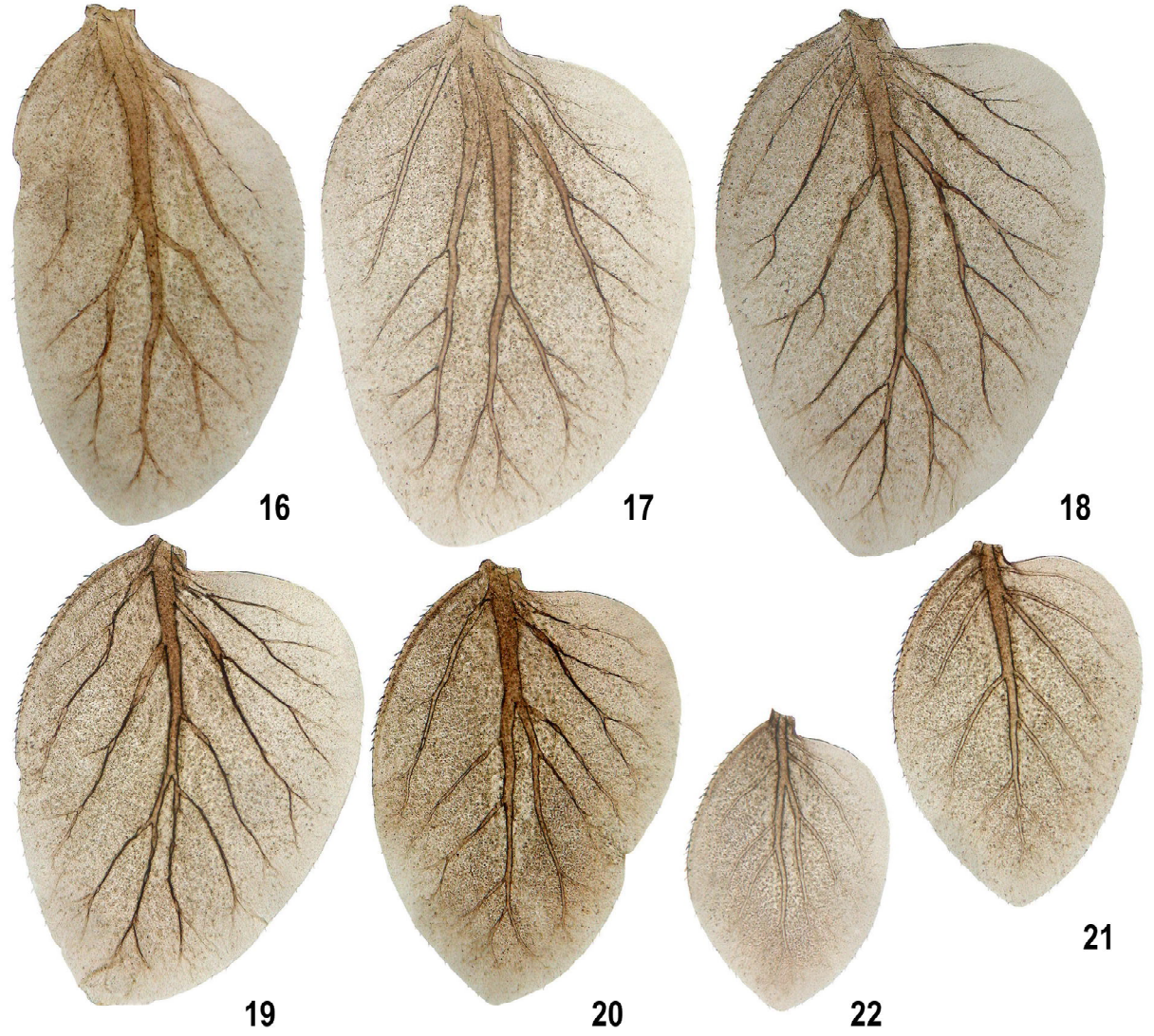
Species	Numbers of gills						
	I	II	III	IV	V	VI	VII
P. ensiformis	1.54	1.45	1.41	1.35	1.37	1.37	1.36
P. chelifer	1.38	1.30	1.24	1.31	1.42	1.43	1.44
P. minor	1.74	1.42	1.36	1.33	1.36	1.39	1.36



Figs 7–13. *Parameletus ensiformis* Tiunova, gills of larva. 7 — gills of I pair; 8 — gills of II pair; 9 — gills of III pair; 10 — gills of IV pair; 11 — gills of V pair; 12 — gills of VI pair; 13 — gills of VII pair.

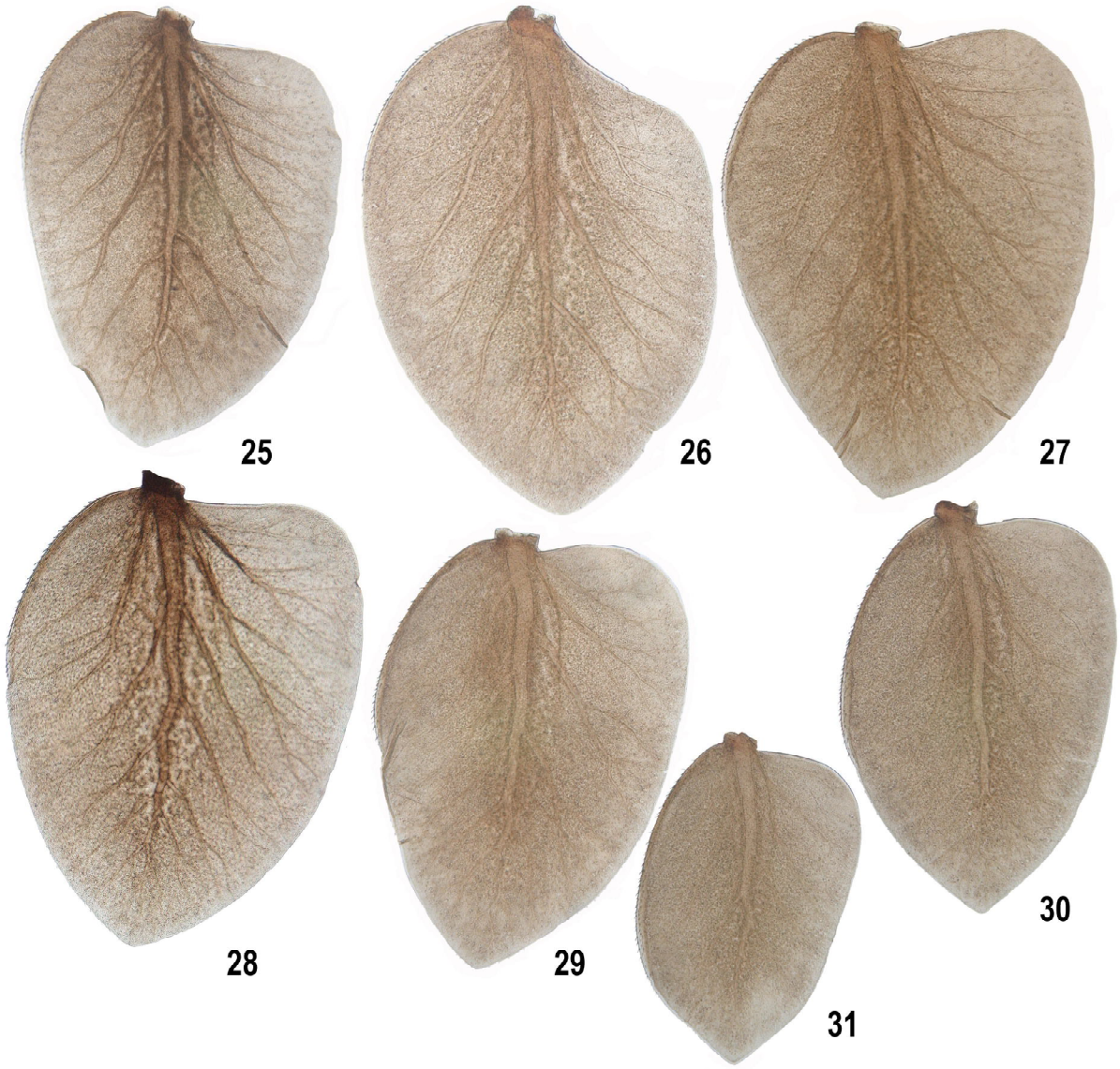
Рис. 7–13. Жабры личинки *Parameletus ensiformis* Tiunova. 7 — жабры I пары; 8 — жабры II пары; 9 — жабры III пары; 10 — жабры IV пары; 11 — жабры V пары; 12 — жабры VI пары; 13 — жабры VII пары.

Figs 14–15. Colour pattern of *Parameletus minor* (Bengtsson), larva. 14 — dorsal view; 15 — ventral view.
Рис. 14–15. Окраска личинки *Parameletus minor* (Bengtsson). 1 — вид сверху; 2 — вид снизу.



Figs 16–22. *Parameletus minor* (Bengtsson), gills of larva. 16 — gills of I pair; 17 — gills of II pair; 18 — gills of III pair; 19 — gills of IV pair; 20 — gills of V pair; 21 — gills of VI pair; 22 — gills of VII pair.
Рис. 16–22. Жабры личинки *Parameletus minor* (Bengtsson). 16 — жабры I пары; 17 — жабры II пары; 18 — жабры III пары; 19 — жабры IV пары; 20 — жабры V пары; 21 — жабры VI пары; 22 — жабры VII пары.

Figs 23–24. Colour pattern of *Parameletus chelifer* Bengtsson, larva. 1 — dorsal view; 2 — ventral view.
Рис. 23–24. Окраска личинки *Parameletus chelifer* Bengtsson. 1 — вид сверху; 2 — вид снизу.



Figs 25–31. *Parameletus chelifer* Bengtsson, gills of larva. 25 — gills of I pair; 26 — gills of II pair; 27 — gills of III pair; 28 — gills of IV pair; 29 — gills of V pair; 30 — gills of VI pair; 31 — gills of VII pair.
Рис. 25–31. Жабры личинки *Parameletus chelifer* Bengtsson. 25 — жабры I пары; 26 — жабры II пары; 27 — жабры III пары; 28 — жабры IV пары; 29 — жабры V пары; 30 — жабры VI пары; 31 — жабры VII пары.

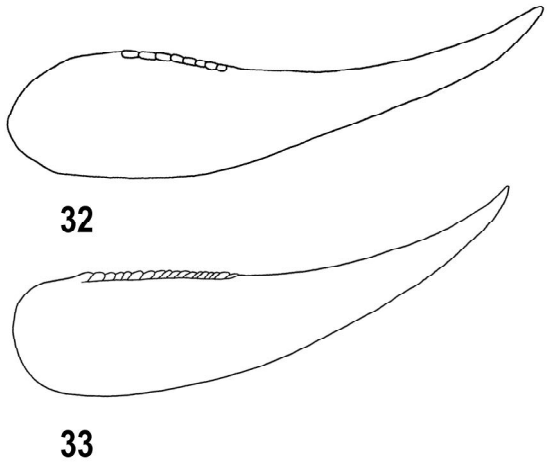
KEY TO MATURE NYMPHS OF THE FAR EASTERN SPECIES OF *PARAMELETUS* BENGTSSON

1. Abdominal terga with a pair of brown drop-shaped submedian spots (Fig. 14); by less than 1/2 of length of segment X (Figs 14, 15); claws with serration in basal 1/3 of inner margin (Fig. 32); gills VI and VII with pointed tips (Figs 21, 22) ..... *P. minor*

— Abdominal terga without submedian spots (Figs 1, 23); length of posterolateral spines of segment IX more than 1/2 of length of segment X (Figs 2, 24); claw with serration reaches middle or slightly less than middle of inner margin (Figs 5, 33) 2

2. Gill I elongated, length is more than 1.5 times exceeds it is width (Fig. 7); gills VI and VII with rounded tips (Figs 12, 13) ..... *P. ensiformis*

— Gill I wide, length is less than 1.5 times exceeds it is width (Fig. 25); gills VI and VII with elongated tips (Figs 30, 31) ..... *P. chelifer*



Figs 32–33. Tarsal claw of larva. 32 — *Parameletus minor* (Bengtsson); 33 — *Parameletus chelifer* Bengtsson.

Рис. 32–33. Коготок личинки. 32 — *Parameletus minor* (Bengtsson); 33 — *Parameletus chelifer* Bengtsson.

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