



Two new species of *Parameletus* Bengtsson, 1908 (Ephemeroptera: Siphonuridae), and notes on other species from the Far East of Russia

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Abstract

Two new species of *Parameletus* are described, increasing the number of species known from Far East of Russia to four: *P. chelififer* Bengtsson 1908, *P. minor* (Bengtsson 1909), and the new species *P. ensiformis* and *P. arcuatus*. Both new species are known from male imagines. *P. minor* is first recorded for the Southern Far East. Illustrations and a key for the male imagines of the known species of *Parameletus* from Russian Far East are provided. Distributional data are presented.

Key words: Ephemeroptera, Siphonuridae, *Parameletus*, systematics, Far East, Russia, taxonomy

Introduction

Parameletus Bengtsson is a small Holarctic genus with five described species (McCafferty 1996). Three of them, *Parameletus columbiae* McDunnough 1938, *P. croesus* (McDunnough 1923) and *P. midas* (McDunnough 1923), inhabit North America. *Parameletus minor* (Bengtsson 1909) occupies water-currents in North Europe (Söderström & Nilsson 1986, Tshernova *et al.* 1986, Kluge 1997). *Parameletus chelififer* Bengtsson 1908 has the most extensive trans-Holarctic distributional covering Europe, Siberia, Russian Far East and North America (McCafferty 1996, Söderström & Nilsson 1986, Tiunova, 1986, Tshernova *et al.* 1986, Kluge 1997).

Until now, understanding of the distribution of *Parameletus minor* on the Far East of Russia was not clear. So in works by Tshernova *et al.* (1986) and Tiunova (1986) this species was reported questionably for the territory of Kamchatka peninsula. At the same time in Kluge's work (1997) on distribution of *P. minor*, only north of Europe is indicated. Our investigations on the mayfly fauna have shown that *P. minor* is widely distributed on the Far East of Russia (Tiunova 2007).

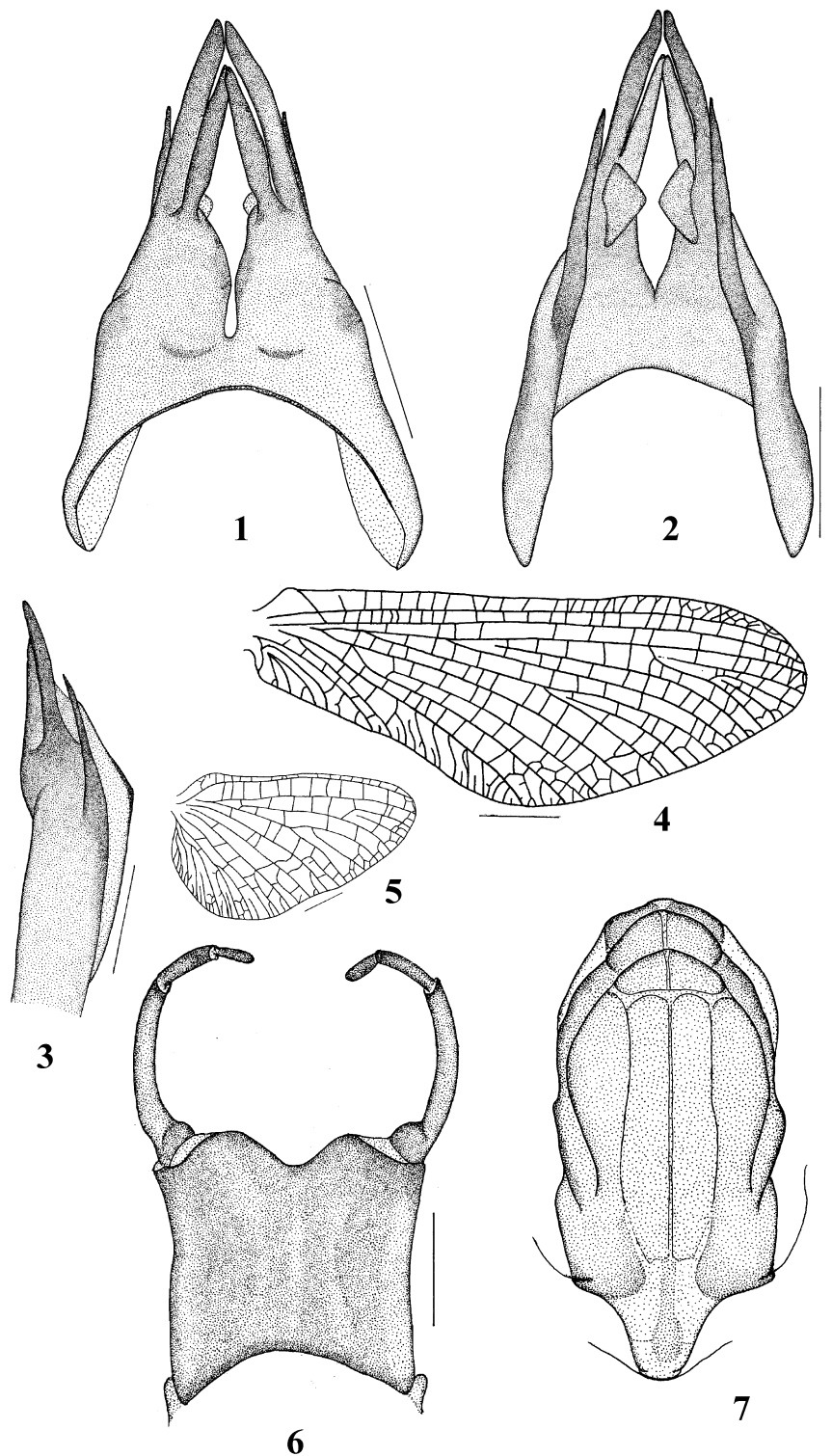
Two new species, *Parameletus ensiformis* **sp. n.** and *Parameletus arcuatus* **sp. n.**, are described based on male imagines. Specimens are preserved in 75% ethanol. The holotypes are deposited in the collection of the Institute of Biology and Soil Sciences, Far Eastern Branch, Russian Academy of Sciences, Vladivostok.

Parameletus ensiformis **sp. nov.**

(Figs. 1–7)

= *Parameletus*/fg2 sp.S3: Kluge 2004: 79

Material examined. Holotype. RUSSIA. Khabarovskiy Kray: Bikin River, 50 m lower motor-car bridge, line Vladivostok-Khabarovsk, 16.VI 2005, T Tiunova, 1 male imago.



FIGURES 1–7. *Parameletus ensiformis*: 1. Penis, ventral. 2. Penis, dorsal. 3. Penis, lateral. 4. Fore wing. 5. Hind wing. 6. Styli and gonostyli. 7. Mesonotum, dorsal. Scale (mm): 1–3, 6=0.05; 5, 7=0.1; 4=0.2.

Paratypes. Together with holotype, 12 male imagines.

Description. Male imago (in alcohol). **Dimensions:** length (mm): body 15.1–16.8; fore wings 13.0–14.3; cerci 19.8–22.0. Total color of living imago brown tinged with goldish. **Head:** upper portion of eyes light brown, lower portion black. **Thorax:** medioscutum and submedioscutum grayish; sublateroscutum brown

(Fig. 7). Mesosternum dark brown. Femur and tibia of foreleg brown, tarsal segments light brown. Claw, joints of tibia and tarsus and joints of tarsal segments tinged with brown. Short stout spines located on tibia and first tarsal segment dark brown. General color of middle and hind legs yellowish, joints of tarsal segments and claw brown. Length (mm) of foreleg segments: femora 3.0–3.2; tibiae 2.3–2.4; tarsal segments 1.3–1.6, 1.7–2.0, 1.8–2.0, 1.5–1.7, 1.0–1.2. Wings hyaline, with all veins brown (Figs. 4–5); pterostigma whitish. The ratio of length to the maximal width for fore wing—2.64, hind wing—1.64.

Abdomen: terga 2–7 hyaline tinged with grayish; terga 1 dark brown; terga 8–9 white; terga 2–9 with dark band on posterior margins; lateral part of all terga tinged brown or dark gray. Sterna hyaline tinged with brownish in 2/3 of posterior part; sterna 5–7 or 4–7 with a pair of small round spots in middle part; sterna 9 opaque, brown in posterior and lateral parts. Gonostyli and penis brown and well contrasted with styliger. Styliger with deep posteromedian emargination (Fig. 6). (Figs. 1–2). External lobes of penis dark brown, inner lobes lighter. Both external and inner lobes of penis narrow and long, with pointed apices; inner lobes reach 3/4 lengths of external lobes. Ventral processes dark brown, pointed, reaching middle part of external lobes of penis (Figs. 2–3). Cerci light yellow, base light brown.

Female imago and nymph: Unknown.

Etymology. The epithet *ensiformis* is connected with form of penis lobes.

Distribution and biology. Known from Russian Far East (Fig. 8). The imagines were collected in grass and on leaves of trees which grow near the water.

Discussion. Male imago of the new species differs from all known species by narrow and long inner and external penis lobes with pointed apices (Figs. 1–3).

Parameletus arcuatus sp. nov.

(Figs. 9–15)

Holotype. RUSSIA. Khabarovskiy Kray: Bikin River, 50 m lower motor-car bridge, line Vladivostok-Khabarovsk, 16.VI 2005, T Tiunova, 1 male imago.

Paratypes. Together with holotype, 26 male imagines. Primorskiy Kray, Bolshaya Ussurka River, 2 km lower Zvenigorodka village, 8.VI 2004, T Tiunova, 1 male imago.

Description. Male imago (in alcohol). **Dimensions:** length (mm): body 13.0 – 15.7; fore wings 11.8 – 13.3; cerci 20.5 – 22.5. Total color of living imago dark brown. **Head:** upper portion of eyes light brown, lower portion black. **Thorax:** Mesonotum light brown tinged with grayish; dorsal arc of prealar bridge dark brown, posterior scutal protuberance brown (Fig. 15); mesosternum from dark brown to black. Fore legs brown; middle and hind legs light brown, tinged with grayish. Length (mm) of foreleg segments: femora 2.8–3.5; tibiae 2.3–2.5; tarsal segments 1.5–1.7, 1.6–1.8, 1.7–1.9, 0.9–1.2. Wings hyaline, tinged with brownish; all veins brown (Figs. 12–13); pterostigma dead. The relation of length to the maximal width makes for fore wing—2.53, hind wing—1.60. **Abdomen:** terga 2–7 translucent, brown; terga 1 from dark brown to black; terga 4–7 with pair of dark brown spots like stroke in anterior margin; terga 7–8 opaque; lateral part of all terga darkened with brown. Sterna 2–6 translucent, brown or dark brown with pair of small light spots in middle part; sterna 7–9 from dark brown to black. Gonostyli and penis brown or dark brown. Posterior margin of styliger with a broad rectangular projection in middle part (Fig. 14). External penis lobes wide with rounded apices; inner penis lobes narrow, curved in base, with furcated apices, reaching apices of external lobes (Figs. 9–10). Ventral processes dark brown, pointed, reach to 2/3 of length of external lobes (Figs. 10–11). Cerci brown, base dark brown.

Female imago and nymph: Unknown.

Etymology. The epithet *arcuatus* is connected with form of inner penis lobes (Fig. 9).

Distribution and biology. Sought of Russian Far East: Khabarovskiy Kray and Primorskiy Kray (Fig. 8). The imagines were collected in grass and on leaves of trees which grow near the water together with *Parameletus ensiformis* sp. nov.

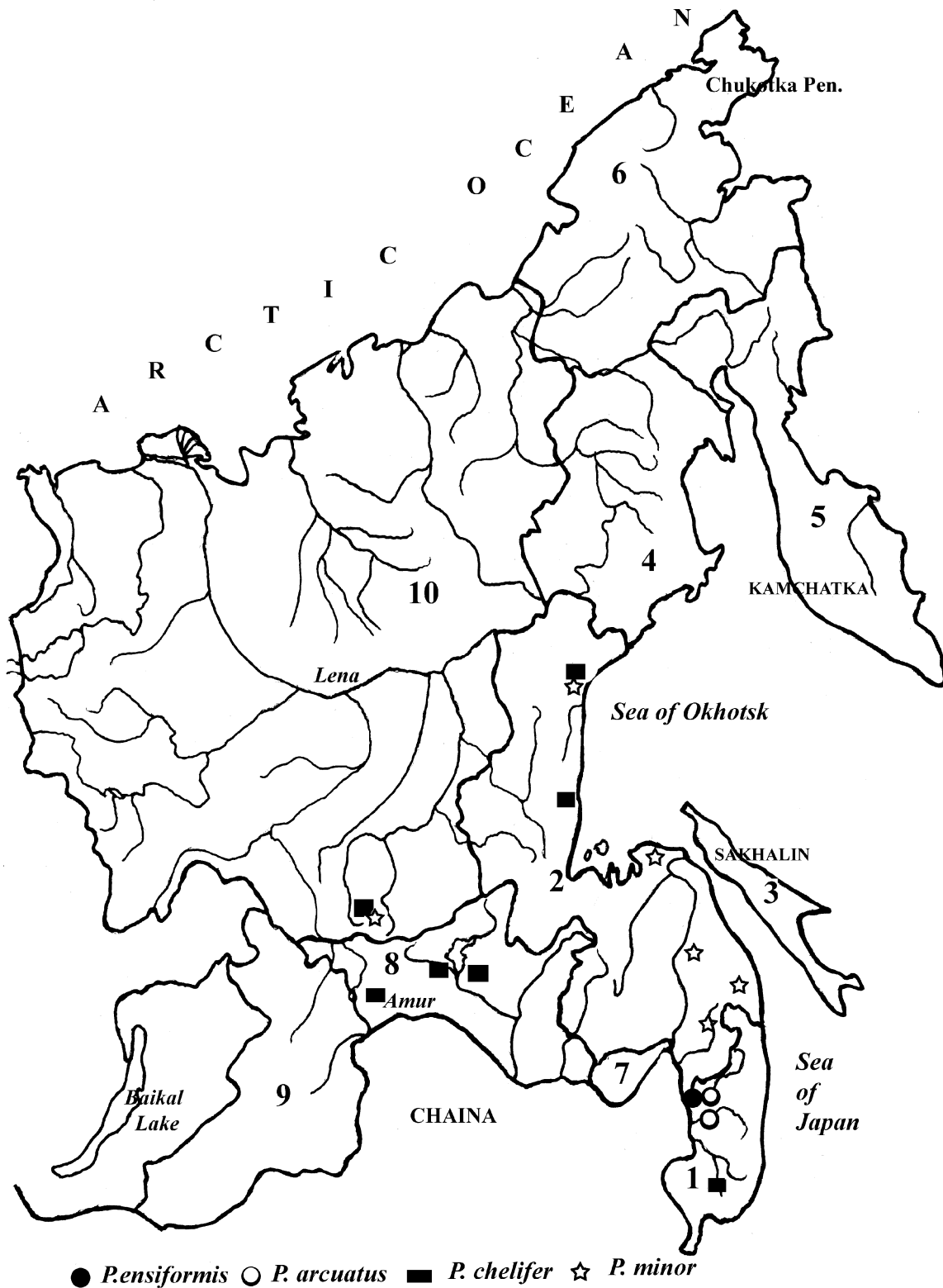
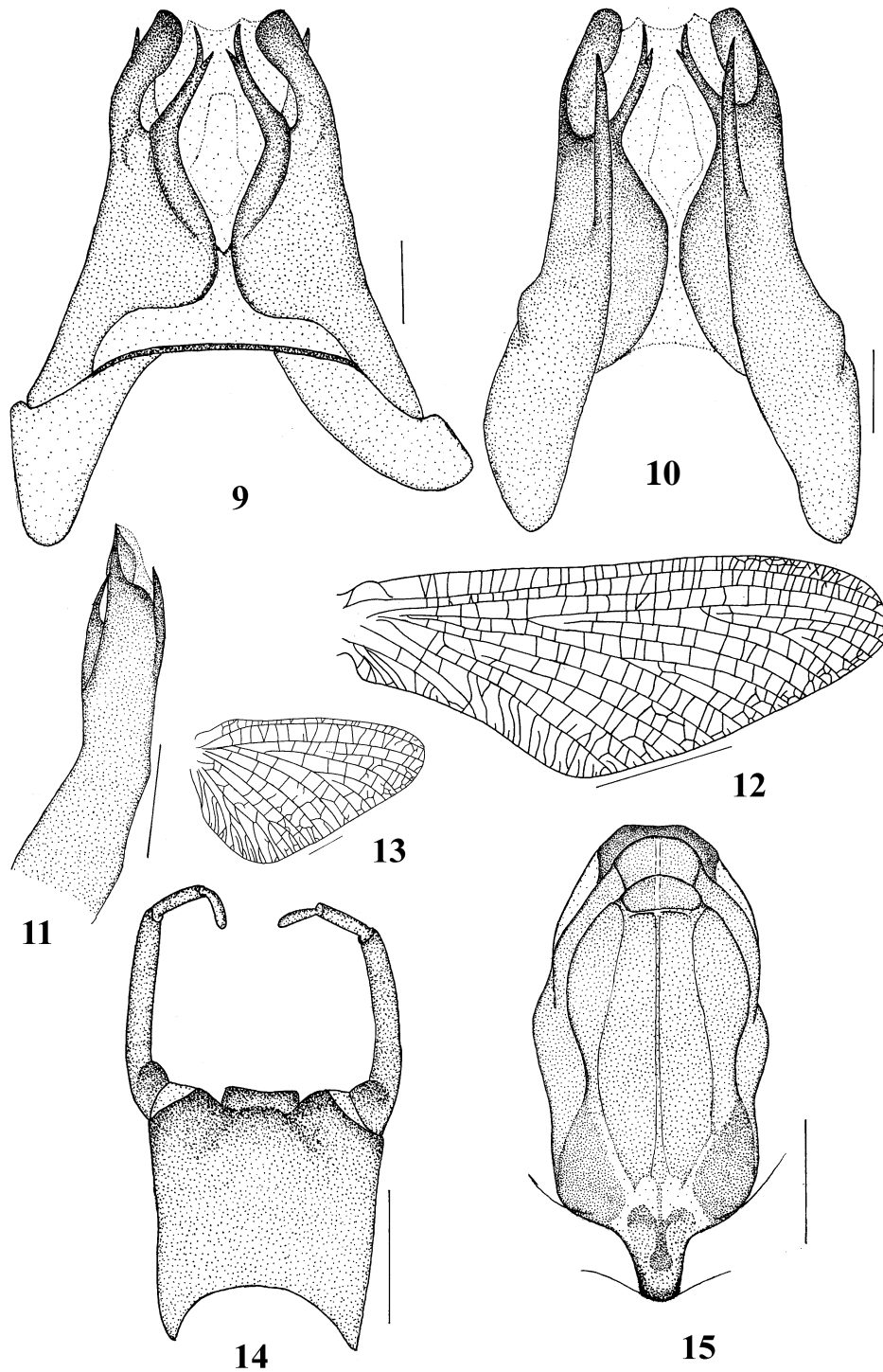


FIGURE 8. Study area. The thick line indicates the border between administration regions. 1 – Primorskiy Kray, 2 – Khabarovskiy Kray, 3 – Sakhalinskaya Oblast', 4 – Magadanskaya Oblast', 5 – Kamchatskaya Oblast', 6 – Chukotka, 7 – Evreiskaya Autonomous Oblast', 8 – Amurskaya Oblast', 9 – Chitinskaya Oblast', 10 – Republic Sakha Yakutia.

Discussion. *Parametetus arcuatus* is similar to *P. chelifera*; however male imago can be distinguished from that of *P. chelifera* by the structure of penis (Figs. 9–10) and form of posterior margin of styliger (Fig. 14).



FIGURES 9–15. *Parameletus arcuatus*: 9. Penis, ventral. 10. Penis, dorsal. 11. Penis, lateral. 12. Fore wing. 13. Hind wing. 14. Styli and gonostyli. 15. Mesonotum, dorsal. Scale (mm): 9–11=0.02; 12–13, 15=0.1; 14=0.05.

***Parameletus chelifer* Bengtsson 1908**

(Figs. 16–23)

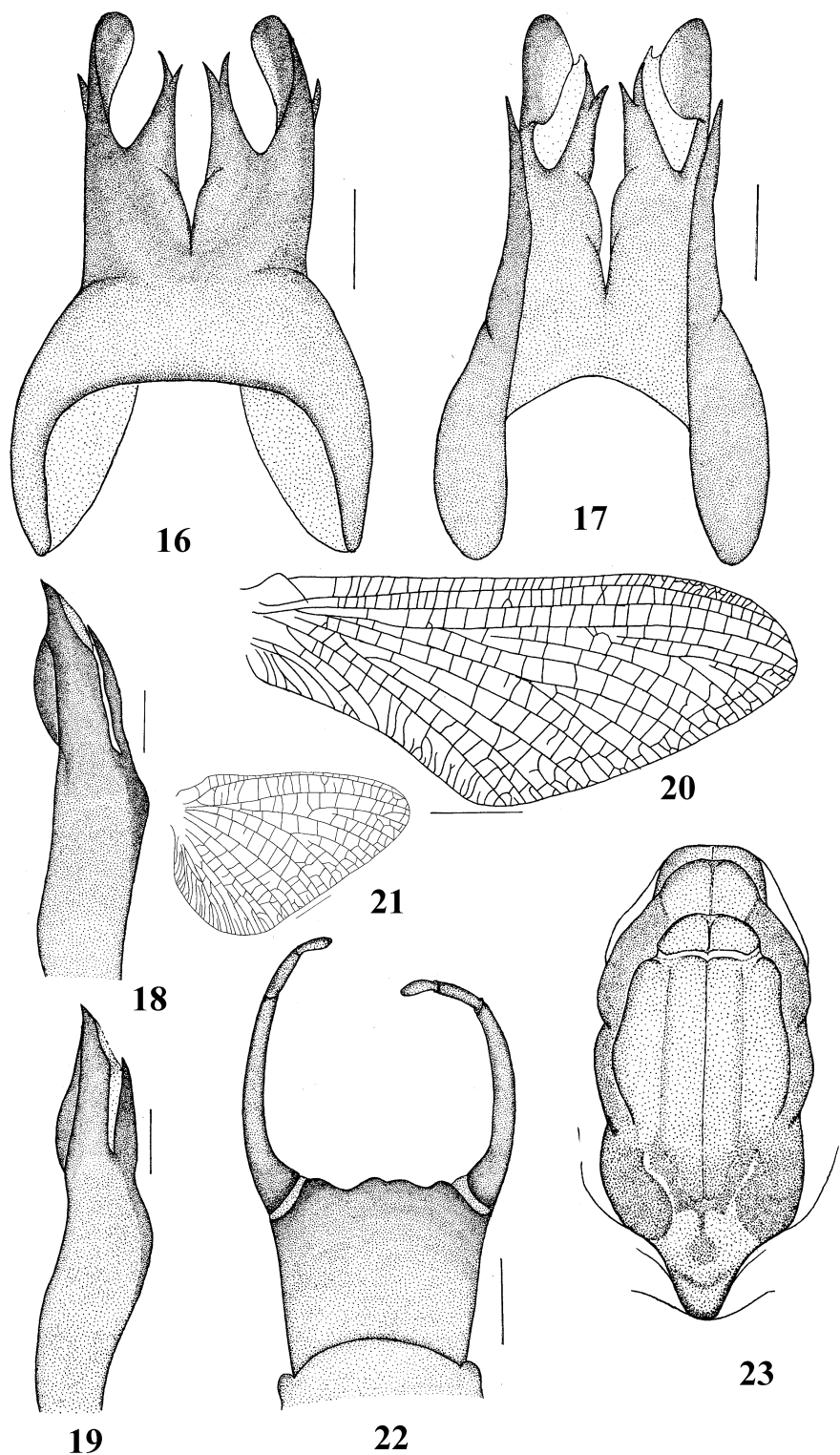
Eatonia borealis Bengtsson, 1904:131, nomen nudum.

Parameletus chelifer Bengtsson, 1908:242.

Sparrea norvegica Esben-Petersen, 1909:554.

Potameis elegans Bengtsson, 1909:15.

Palmenia fennica Aro, 1910:31.



FIGURES 16–23. *Parametetus chelifera*: 16. Penis, ventral. 17. Penis, dorsal. 18. Penis, lateral (Uika River). 19. Penis, lateral (Khetana River). 20. Fore wing. 21. Hind wing. 22. Styliger and gonostyli. 23. Mesonotum, dorsal. Scale (mm): 16–19=0.02; 21, 23=0.1; 22=0.05.

Material examined. RUSSIA. Southern Yakutia: Ungra River Basin, Yuhktinka stream, mouth, light tributary of Yuhkta River, 30.VII 2006, T. Tiunova, 14 male imagines, 3 female imagines. **Amurskaya Oblast':** Zeya Reservoir's Basin, Artemii River, 50 m lower motor-car bridge, line Zeya-Verhknezeisk Town, 21.VI

2004, T Tiunova, 17 larvae; Zeya Reservoir's Basin, Giluy River, near river crossing, 19.VI 2004, T Tiunova, 1 male imago (reared from nymph); Amur River Basin, upper part of Talali River, 25.VIII 2004, T Tiunova, 20 male imagines, 13 female imagines. **Khabarovskiy Kray:** Priochoť'e, Ul'ya River Basin, Khetana River, 7 km upper mouth, 22.VII 1985, V Zherikhin, 1 male imago; same place, 11–17.VIII 1985. V Zherikhin, 5 male imagines, 6 female imagines; Ayano-Majskiy Region, Ujka River Basin, stream, 300 m upper mouth, left tributary of Uika River, near airport, 23.VII 1989, T Tiunova, 6 male imagines (reared from nymph). **Primorskiy Kray:** Ussuri River Basin, Otkosnaya River, left tributary of Ussuri River, lower motor-car bridge, 16.VI 1998, T Tiunova, 1 male imago.

Male imago. Dimensions: length (mm): body 12.8–15.0; fore wings 12.0–13.1; cerci 17.2–22.4. Total color of living imago dark brown. **Head:** upper portion of eyes light brown or light gray. **Thorax:** medioscutum and submedioscutum brown; sublateroscutum and posterior scutal protuberance dark brown (Fig. 23); mesosternum from dark brown to dark. Fore legs brown, middle and hind legs from light brown to yellowish. Length (mm) of foreleg segments: femora 2.7–3.1; tibia 2.4–2.7; tarsal segments 1.4–1.7, 1.5–1.9, 1.6–1.9, 1.3–1.6, 0.8–1.0. The ratio of length to the maximal width for fore wing—2.40 (Fig. 20), hind wing—1.47 (Fig. 21). **Abdomen:** terga 2–9 opaque with pair of elongated dark brown spots in middle part; lateral part of posterior margins darkened. Sterna brown, sterna 7–9 dark brown, opaque. Forceps brown, styliger plate dark brown. Middle part of posterior margin of styliger protuberant, wavy (Fig. 22). Penis lobes from dark brown up to black. External penis lobes wide with rounded apices; inner lobes straight, narrowed toward apex, with furcated top (Figs. 16–17). Ventral processes dark brown, pointed, reach ½ of length of external lobes (Figs. 17, 19). Cerci brown, with base darker.

Distribution. *Paramelotus chelififer* has Holarctic distribution, occupying North America (McCafferty 1996), Europe (Söderström & Nilson 1986; Tshernova *et al.* 1986), Siberia, and Russian Far East (Tshernova *et al.* 1986; Kluge 1997; Tiunova 2007) (Fig. 8). Larvae of *P. chelififer* are found in small streams with cool water.

***Paramelotus minor* (Bengtsson 1909)**

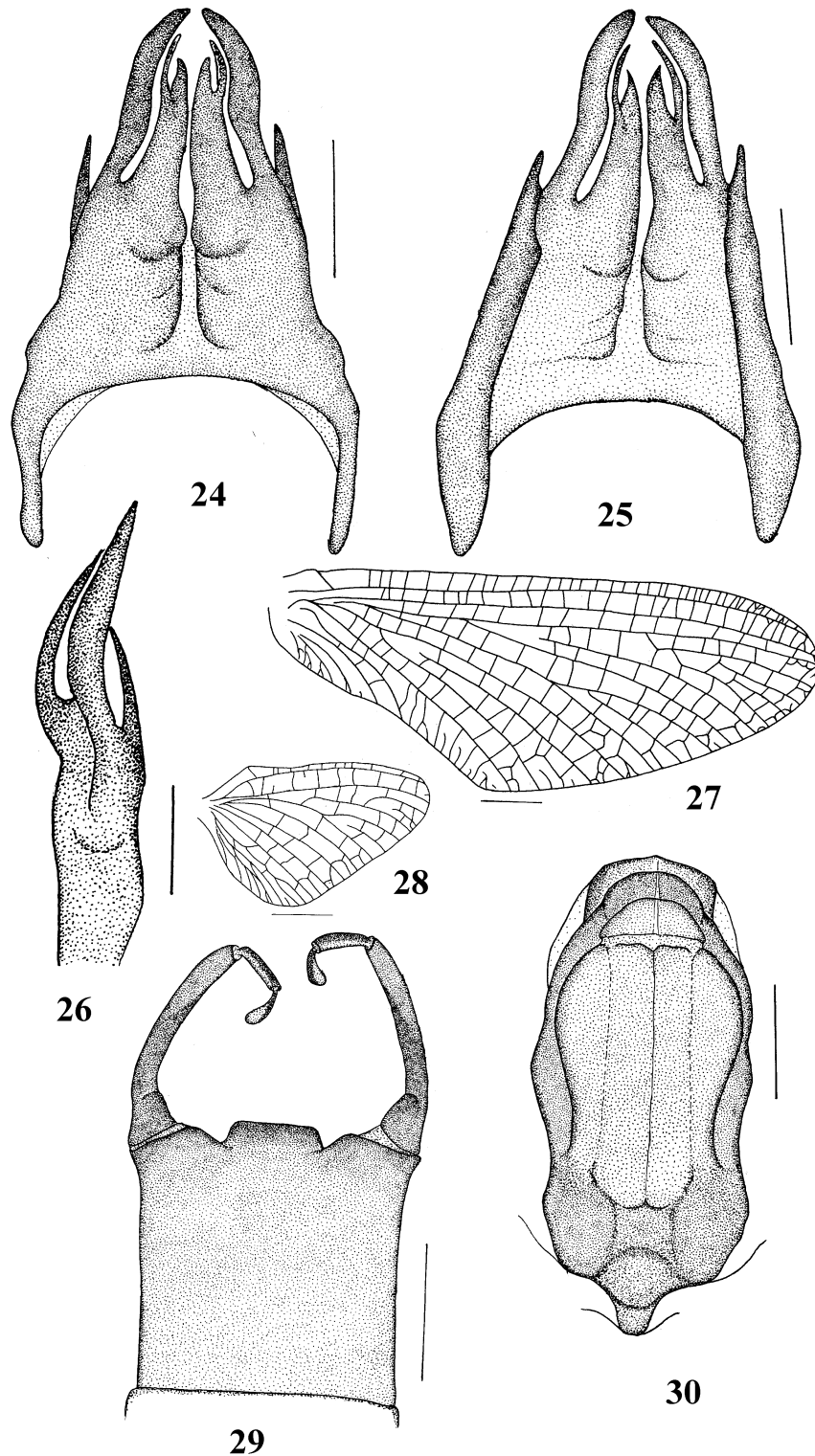
(Figs. 24–30)

Remipalpus minor Bengtsson 1908:242, nomen nudum.

Potameis minor Bengtsson 1909:15.

Paramelotus minor: Bengtsson: 1930:15.

Material examined. RUSSIA. Southern Yakutia: Ungra River Basin, Yuhktinka stream, mouth, light tributary of Yuhkta River, 28.VII – 1.VIII 2006, T. Tiunova, 1 male imago, 2 male and 1 female subimago. **Khabarovskiy Kray:** Priochoť'e, Ul'ya River Basin, Khetana River, 7 km upper mouth, 13.VIII 1985, V Zherikhin, 1 male imago; same place, 23.VIII 1985, V Zherikhin, 1 male imago; Nikolaevskiy Region, Bolshaya Iski River, about 4 km upper mouth, 28.VI – 3.VII 2005, T Tiunova, 5 male imagines, 1 female imago (reared from larvae); Amur River Basin, Mutii River, near motor-car bridge, line Khabarovsk-Nikolaevsk-on-Amur Town, 30.VI 2005, T Tiunova, 9 male imago, 3 female imagines; same place, stream, right tributary of Mutii River, 30.VI 2005, T Tiunova, 1 male imago, 2 larvae; Tumnin River Basin, Stream Asecta, 100 m upper mouth, light tributary of Tumnin River, 29.VI 1997, T Tiunova, 1 male imago; Chor River Basin, stream near Srednechorskiy Village, 50 m upper mouth, right tributary Chor River, 13.VI 1995, T Tiunova, 4 male imagines.



FIGURES 24–30. *Parameletus minor*: 24. Penis, ventral. 25. Penis, dorsal. 26. Penis, lateral. 27. Fore wing. 28. Hind wing. 29. Styliger and gonostyli. 30. Mesonotum, dorsal. Scale (mm): 24–26=0.02; 27–28=0.1; 29=0.05; 30=0.5.

Male imago. Dimensions: length (mm): body 8.0–10.6; fore wings 8.0–10.1; cerci 11.3–16.7. Total color of living imago dark brown. **Head:** upper portion of eyes light gray. **Thorax:** medioscutum and submedioscutum brown; sublateroscutum and posterior scutal protuberance dark brown (Fig. 30); mesosternum from dark brown to black. Fore legs brown, middle and hind legs light brown. Length (mm) of foreleg segments: femora

1.8–2.2; tibiae 1.5–2.0; tarsal segments 0.9–1.0, 1.0–1.3, 1.0–1.3, 0.8–1.0, 0.5–0.7. The relation of length to the maximal width makes for fore wing – 2.53, hind wing – 1.58. **Abdomen:** terga dark brown; terga 2–6 partial translucent with dark band on posterior margins; terga 7–9 opaque, tinged with whitish and with pair of elongated dark brown spots in middle part; lateral part in of posterior margins darkening. Sterna 2–6 brown, translucent; sterna 7–9 dark brown, opaque. Gonostyli pedestal, first and basal part second gonostylus segments and styliger dark brown; other gonostylus segments some lighter; posterior margin of styliger with a broad rectangular projection in middle part (Fig. 29). Penis dark brown, tinged darkish; external lobes at base thinner than at middle part, with apices pointed and curved inside; inner lobes wide and strong, with furcated top (Figs. 24–25). Ventral processes dark brown, short, pointed, reach ¼ of length of external lobes (Fig. 24–25). Cerci brown.

Distribution. *Parameletus minor* is Palaearctic species, distributed from Fennoscandia to Far East of Russia (Fig. 8) (Saaristo & Savolainen 1980; Silfverberg 1984; Söderström & Nilson 1986; Tiunova 2007). Larvae of this species are found in small rivers or streams with cool water only.

Key to species of the genus *Parameletus* from Far East of Russia

Male imagoes

- 1 Both external and inner lobes of penis narrow and long, with pointed apices (Figs. 1–2)..... *P. ensiformis* **sp. nov.**
- Inner lobes of penis with furcated apices (Figs. 9, 16, 24) 2
- 2 External lobes of penis thin and long, with apices pointed and curved inside (Figs. 24, 25) *P. minor*
- External lobes of penis wide, with rounded apices..... 3
- 3 Inner lobes of penis narrow, curved in base, reaching apices of external lobes (Figs. 9–10). Ventral processes reach 2/3 of length of external lobes (Fig. 10)..... *P. arcuatus* **sp. nov.**
- Inner lobes of penis straight, narrowing toward apex, not reaching apices of external lobes (Figs. 16–17). Ventral processes reach ½ of length of external lobes (Fig. 19) *P. chelifera*

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