Zootaxa 2693: 49–59 (2010)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Redescription of *Filchneria mongolica* (Klapálek, 1901) (Plecoptera, Perlodidae) based on type eggs and fresh material from the Selenga and Amur River Basins of Russia and Mongolia

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Abstract

Filchneria mongolica (Klapálek, 1901) is redescribed and reillustrated from the female holotype and fresh material collected in the Selenga and Amur River Basins of Russia and Mongolia. Its relationship with close relatives is discussed.

Key words: Plecoptera, Perlodidae, *Filchneria mongolica*, eggs, eversible paraproct lobes, Selenga River, Amur River, Russia, Mongolia

Introduction

The genus *Filchneria* Klapálek (1908) belongs to the *Perlodes* group which is characterized by the combination of secondary loss of the epiproct, an entire tergum 10 and triangular eggs (Zwick 1997). Abdominal segments 1–3 are divided into terga and sterna by hairless pleural membranes in adults as well as in larvae. Larvae have a small protrusion with a group of short setae arising basally from the apical lacinial tooth (Zwick 2004). Presently, twelve species of *Filchneria* are recognized: the type species *F. mongolica* (Klapálek, 1901), *F. amabilis* (Jewett, 1958), *F. balcarica* Balinsky, 1950, *F. furcifera* Navás, 1936 [species inquirenda], *F. heteroptera* (Wu, 1938), *F. irani* (Aubert, 1964), *F. kuenluensis* (Šamal, 1935), *F. mesasiatica* Zhiltzova, 1971, *F. nuristica* (Brinck, 1954), *F. olgae* (McLachlan, 1875), *F. shobhaae* (Singh & Ghosh, 1969), *F. tau* (Klapálek, 1908). The above species inhabit the Palaearctic from Afghanistan to India and China to Mongolia, including boundary areas of the Oriental Region (Zwick 1973).

As currently understood, *Filchneria* seems to be paraphyletic, and may include members of other genera because most descriptions in the group do not consider all of the relevant characters, for example, egg morphology, the eversible male paraproct lobes, and details of chaetotaxy. Conversely, some species presently assigned to other genera may in fact belong to *Filchneria.*

Filchneria mongolica was described after a female from northern Mongolia. The description of the male (Klapálek 1908) was based subsequently on material collected in China (Tsinling), and was inaccurate in some details (Zhiltzova 1971). Better figures of both sexes from the Chinese material were provided by Klapálek (1912), but unfortunately these do not include some needed specific characters. Raušer (1968) and Zhiltzova (1971) attempted to redescribe adults of *F. mongolica*, but both used misidentified specimens.

The female holotype of *F. mongolica*, a recently collected female and a presumably conspecific male from Mongolia were studied by Zwick (1997). He illustrated the female subgenital plate, the characteristic egg, and the everted male paraproct lobe. However, a complete redescription was not provided. Zwick (1997)

Accepted by E. DeWalt: 28 Oct. 2010; published: 1 Dec. 2010

emphasized that the identity of material used in the earlier redescriptions (Raušer 1968, Zhiltzova 1971) required confirmation.

Recently, we collected adequate new material associating the male, female, eggs, and larvae. The identity of our material was confirmed by comparison with slide-mounted eggs from the holotype. Herein, we redescribe *F. mongolica*, presenting new illustrations, and confirming that the Mongolian male illustrated by Zwick (1997) is *F. mongolica*.

Results and discussion

Filchneria mongolica (Klapálek, 1901)

(Figs. 1–19)

Dictyogenus mongolica Klapálek, 1901: 13, Fig. 10.

Diagnosis. The narrow medially interrupted strip of short, blunt thick spines on the posterior margin of tergum 10 distinguishes the male of *F. mongolica* (Fig. 7). The female is distinguished by a deep notch between the lobes of the subgenital plate (Fig. 9). The egg of *F. mongolica* is triangular in cross section (Fig. 10, 12). In addition to longitudinal ridges, a transverse ridge is found near the posterior pole (Fig. 11, 12). The collar is formed by projections of the three longitudinal ridges, which are flat and triangular in lateral view (Fig. 14). The surface of the chorion is granular (Fig. 13, 15).

Adult habitus. Males are brachypterous, while females are macropterous. Wings have a brownish tint and brown veins (Fig. 1). The general body colour is dark, males are mostly black. The head is dark, wider than the pronotum. In front of the black, distinct M-line a yellow spot projects onto the clypeus; in females this spot includes a dark centre (Figs. 2, 3). The interocellar area carries a small tear-shaped yellow spot which is widest anteriorly. The anterolateral margins of the head are dark from the compound eyes to across the clypeus. A yellow U-shaped band extends across the occiput and forms a triangular medial projection along the epicranial stem (Figs. 2, 3). Behind each compound eye is a dark posterolateral spot. Submental gills are lacking. Antennae are brown and palpi pale.

The pronotum is brown with a broad, yellow median band that is widest in its basal third (Fig. 2). The pronotal rugosites are dark brown, meso- and metascuta are dark brown. The mesosternal Y-arms reach the posterior corners of the furcal pits.

The abdomen is covered by short colourless clothing hairs. Abdominal segments 1–3 are divided laterally by hairless pleural membranes, the remaining segments are undivided. Legs are brown, with a basal dark brown spot on the tibia. Cerci pale, each cercal segment darker in its distal half.

Male. Mean body length 13.5±1.0 (sd) mm (n=15). Wings short, not reaching the posterior margin of tergum 2. Mean forewing length is 3.5±0.3 mm, wingspan 9.6±0.8 mm.

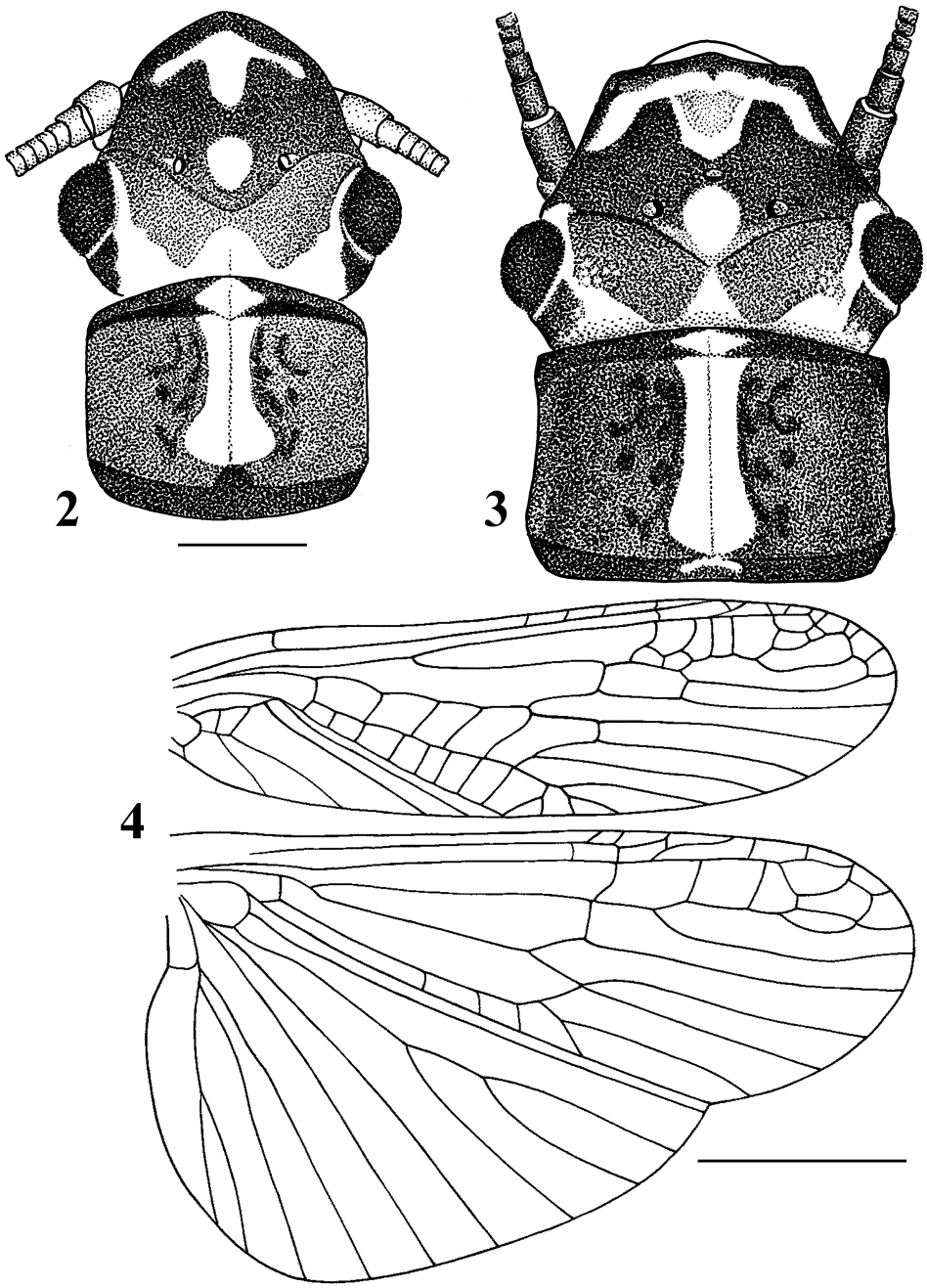
Abdominal tergum 8 with a butterfly-shaped brownish spot which is caudally expanded and divided by a longitudinal, pale, median line; two submedial swellings densely covered by sensillae basiconica and colourless hairs close to the posterior margin, especially obvious in lateral view (Figs. 5, 6). Abdominal tergum 9 with two similar but smaller posterior swellings which are covered by acute sensilla basiconica and short fine conspicuous colourless hairs posterolaterally (Fig. 6); anterior tergal margin medially with a membranous, triangular light spot which is almost hidden under tergum 8 (Fig. 5). Sternum 9 light brown medially, posterior margin tongue-shaped, extended backward and upcurved, corresponding to 2/3rd length of sternum 10 (Fig. 6). Tergum 10 in lateral view, arcuate and upcurved (Fig. 6), its posterior margin obtusely angled with a narrow medially interrupted strip of short, blunt, thick spines (Figs. 5–7). Paraproct lobes in repose are dorsally pale, dorsomedially touching each other and pressed against the inner surface of tergum 10. Laterally, lobes are slightly angular and project under abdominal tergum 10 (Fig. 5). The paraproct sclerite is wide and well sclerotized basally, distally it narrows rapidly, the thin apex resembling a slightly rounded claw (Fig. 8). In caudal view each paraproctal sclerite surrounds a pale oval spot (Fig. 7). The eversible paraproct lobe (EPL) emerges from a fold near the thin apex of the sclerite. The everted lobe is bell-shaped,

unpigmented, soft, and is covered by many fine sensory scales and small thin spinules, especially dorsally (Fig. 8).

Female. Mean body length 17.0±4.6 mm (n=15). Forewing length is 16.7±0.9 mm, wingspan 36.7±2.0 mm. Front wing tinted, fumose, hind wing paler. The venation includes an irregular net near the apex sometimes consisting of three rows of cells. Four cross veins between *C* and *Sc*; five apical veins between *Sc* and R_1 (Fig. 4). *Rs* with five apical branches. Eight veins between *M* and Cu_2; three anal veins. Hind wing anal area large, A_2 and A_5 forked.

Abdominal terga brown, with three pairs of small, black spots in a row; tergum 10 is pale brown with a small dark brown medial spot. Abdominal sterna yellowish-brown, anterior margin of abdominal sterna 2–7 with medially interrupted dark brown stripe, and one median and three lateral pairs of dark spots, the median pair smallest. Sternum 8 with a large subgenital plate extending half the length of sternum 9 (Fig. 9), posterior margin of the plate with a parabolic notch separating two large, rounded lateral lobes covered by red spinules. An arched transverse fold separates the lobes from two broad angled dark bands (Fig. 9) on the anterior part of the sternum. Abdominal sternum 9 is medially pale, with a pair of large, dark, rounded spots posterolaterally. Abdominal sternum 10 yellow anteriorly, dark posteriorly.

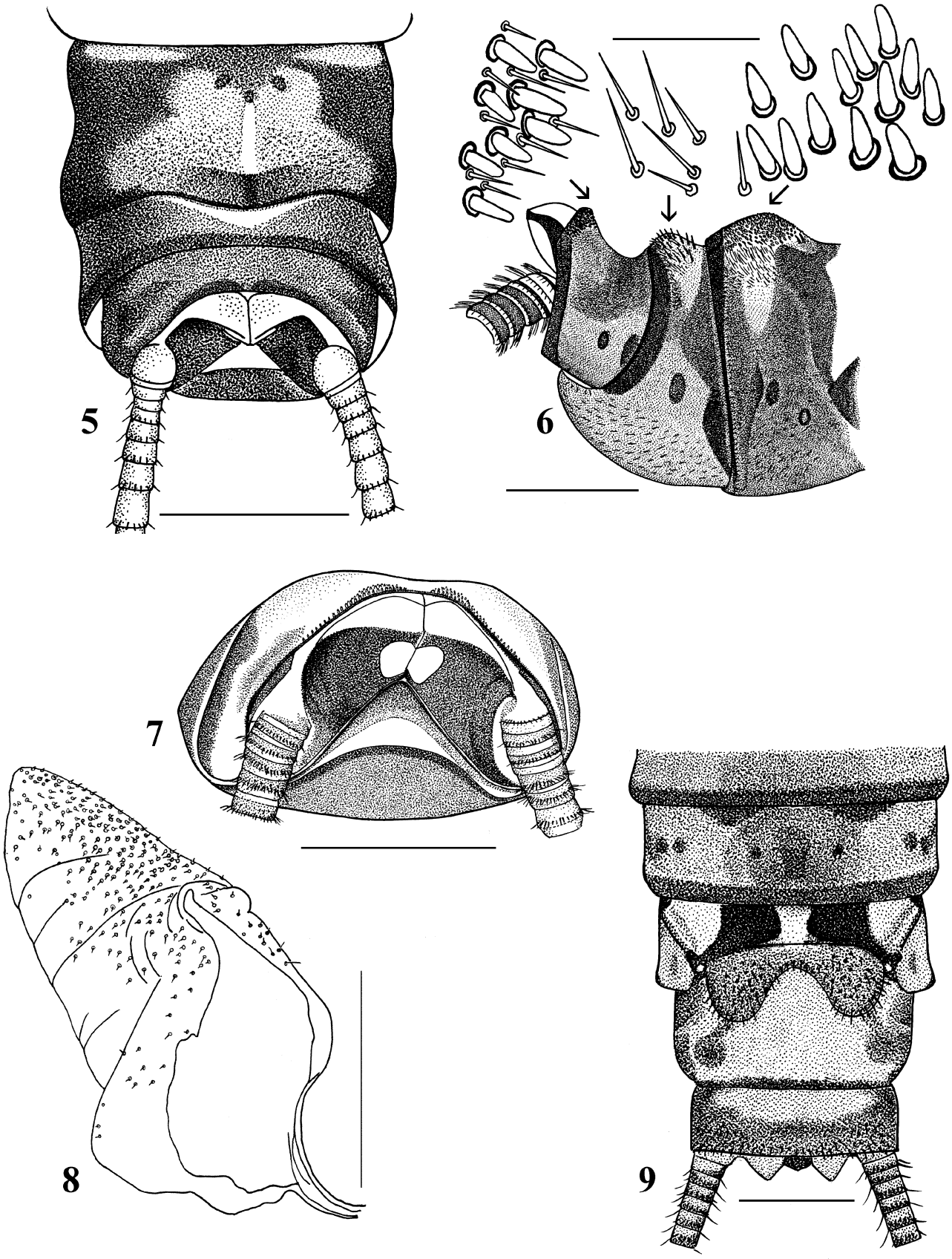
FIGURE 1. *Filchneria mongolica*, female, habitus (Photograph by M.P. Tiunov).



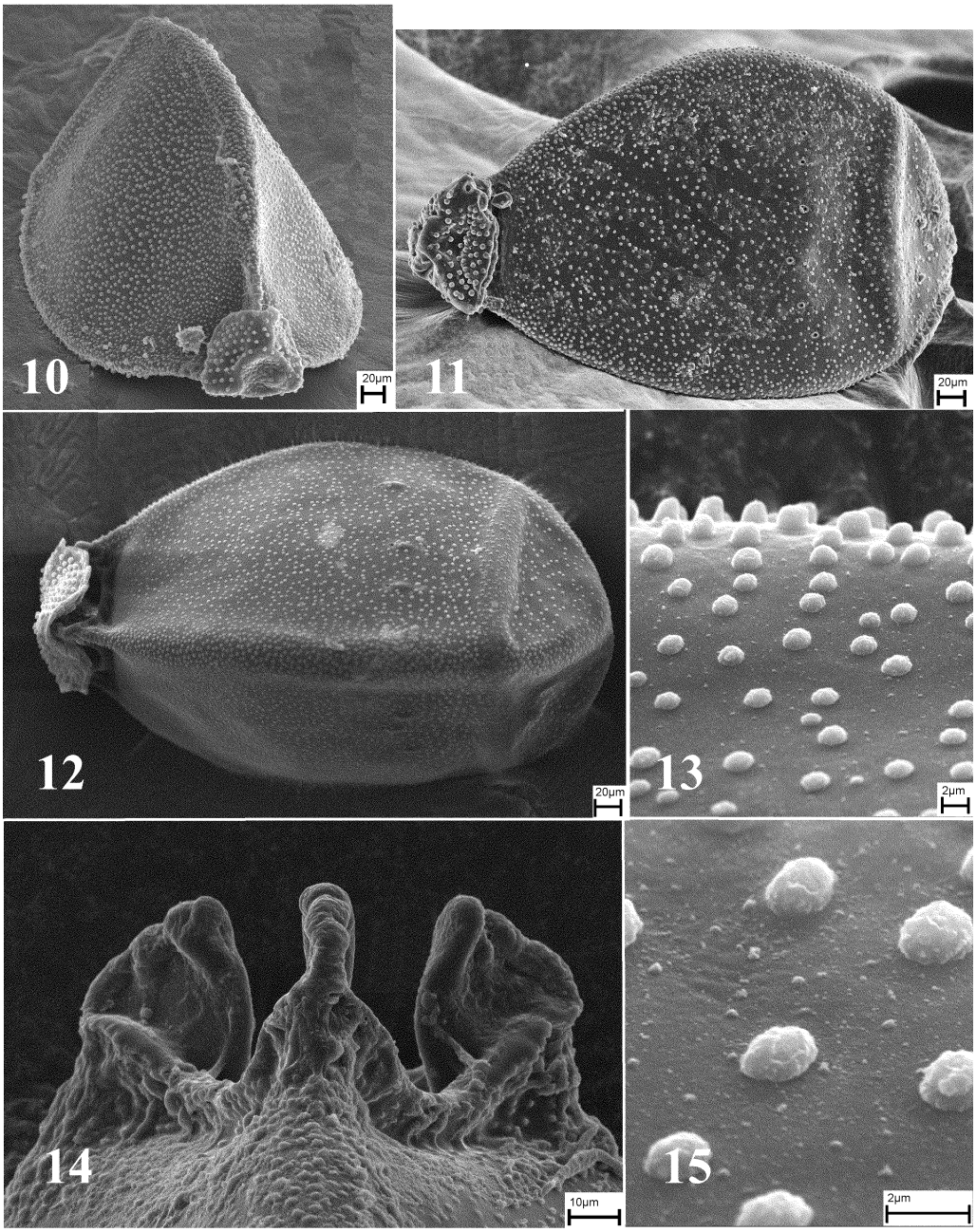
FIGURES 2–4. *Filchneria mongolica*: 2. Head and pronotum of male. 3. Same of female. 4. Wings of female. Scale (mm): 2, 3 = 2.0; 4 = 5.0.

Egg. Trilateral (Figs. 10–12), 462 X 295 µm, depth 302 µm. Longitudinal ridges delimit the three sides of the egg. Each side has additionally a transverse ridge close to the posterior pole (Figs. 11, 12). Collar long, formed by medially projecting extensions of the three longitudinal ridges, each flat and triangular laterally, crest-like, inner edges slightly curved (Fig. 14). A row of 3–6 micropyles is found near the transverse ridge (Fig. 12) on each of the three sides. Anchor mushroom-shaped with short pedicel (Fig. 11) with single globular bodies on the whole anchor plate. The margin of the anchor covers the collar completely (Figs. 11, 12). The structure of the chorion surface is rough with small light tubercles (Figs. 13, 15).

Larvae. Mature nymphs are 19.0±1.0 mm long (n=15). The general colour is grey-brown with a pale pattern (Fig. 18). Body covered by hardly visible short colourless clothing hairs. Antennae and cerci grey, brownish apically. The ventral body side is grey. The head is slightly wider than the pronotum with a large, triangular, pale spot in front of the anterior ocellus extending onto the clypeus (Fig. 18). M-line brown,



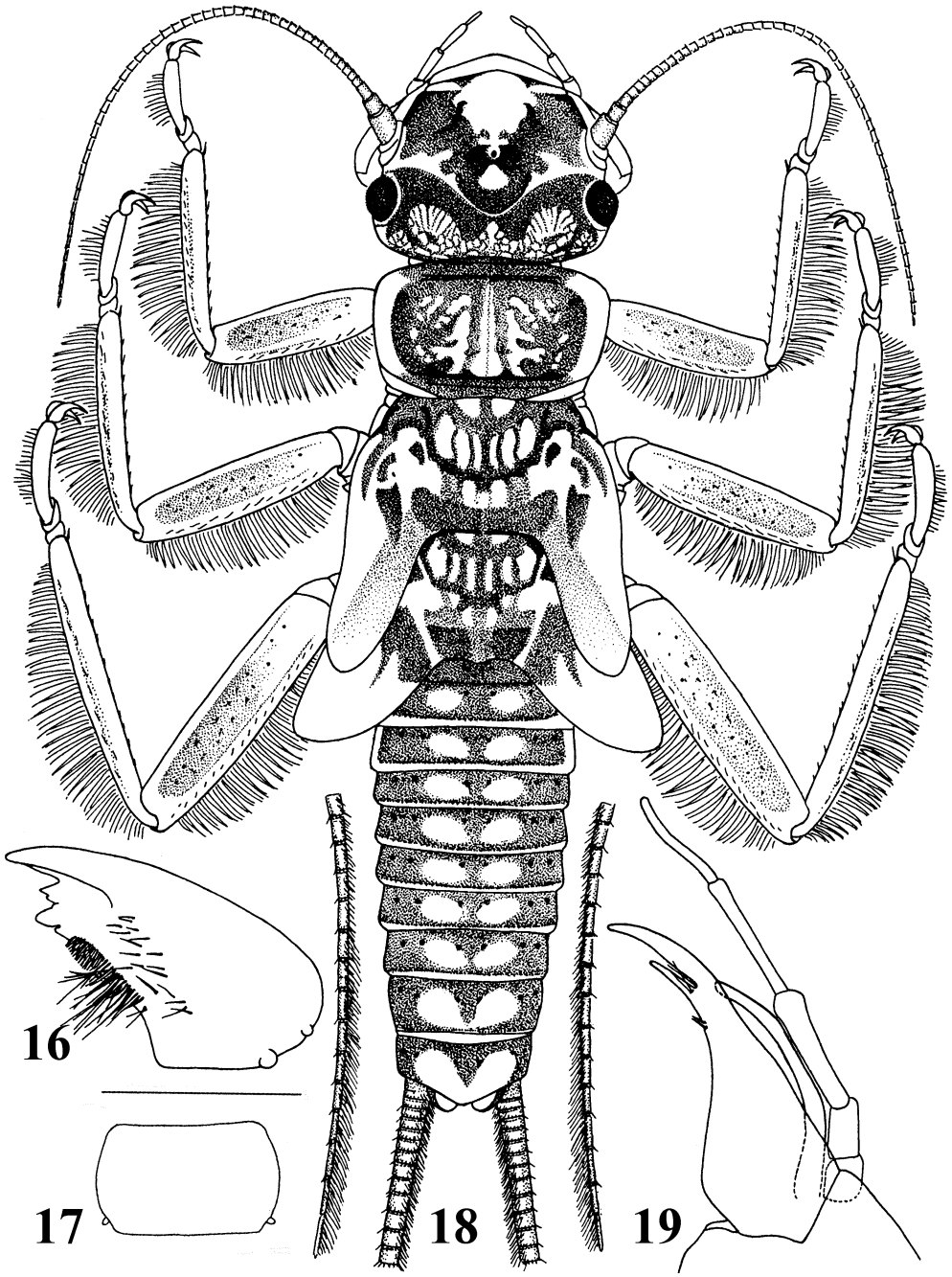
FIGURES 5–9. *Filchneria mongolica*: 5. Male abdominal tip, dorsal. 6. Same, lateral view, with chaetotaxy. 7. Same, posterior view. 8. Right everted male eversible paraproct lobe, posterior view. 9. Female abdominal tip, ventral view. Scale (mm): 5, 6 (bottom), 7, 9 = 1.0; 6 (top) = 0.1; 8 = 0.0625.



FIGURES 10–15. *Filchneria mongolica*, egg: 10. View from the anchor pole. 11. Same, lateral view. 12. Same, dorsal view. 13, 15. Chorion structure. 14. Collar, dorsal view.

indistinct; interocellar area brown with small triangular central pale spot, closed posteriorly. A small triangular pale spot laterally from each posterior ocellus is connected with a narrow pale band extending anterolaterally to the area of the tentorial callosities. Occiput with triangular pale spot around the epicranial stem with two pairs of pale spots bordered by sinuate brownish rows behind each eye. No postocular spinule row. Lacinia (Fig. 19) bidentate, apically narrow, basal half dramatically expanded. No submarginal setae except two small transparent ones below the base of the subapical tooth. There are three setae at the juncture of the apical teeth. Galea reaches the base of the subapical tooth. Mandible (Fig. 16) simple, not deeply cleft, with medial setae; mandibular teeth without serrations; a patch of acanthae basally from the last small tooth. The submental gills are short (Fig. 17). Pronotum rectangular with rounded angles, brownish with wide pale lateral margins; pale, median, dorsal stripe narrow and wider posteriorly, laterally merging with pale reticulate markings inside the brown lateral fields, all margins without fringe of bristles (Fig. 18). The mesosternal Y-

arms meet the posterior corners of the furcal pits. Meso- and metanota anteriorly with six longitudinal narrow short pale stripes in front of an arched brown transverse band. Pale spots at the base of the wingpads extend backward and narrow posteriorly (Fig. 18). Legs grey, femur with a basally incomplete elongate light brown mark that darkens distally. Outer margins of femur, tibia and tarsus with a fringe of colourless silky hairs. The surface of femur and tibia with few scattered brown spinules.



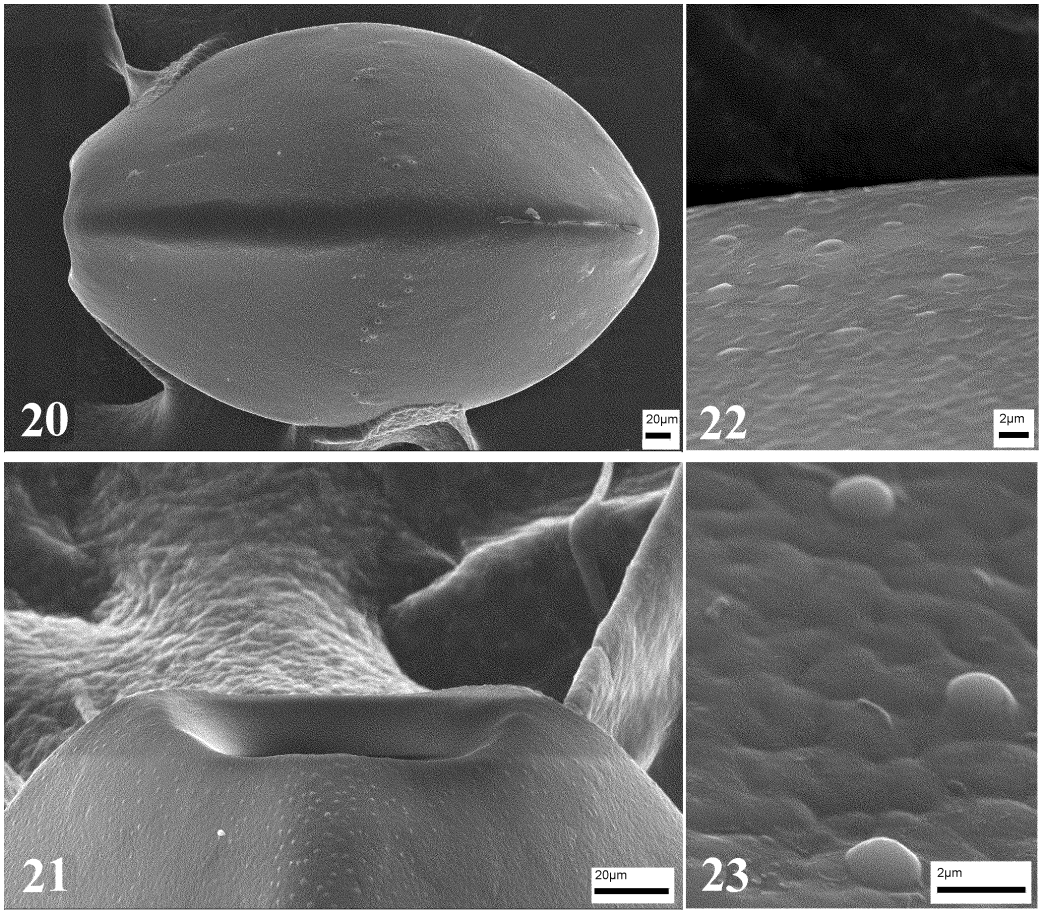
FIGURES 16–19. *Filchneria mongolica*, nymph, female. 16. Right mandible, ventral view. 17. Submentum. 18. Habitus. 19. Right maxilla, ventral view. Scale (mm): 16, 19 = 1.0; 17, 18 no scale.

Abdominal segments 1–3 divided by hairless pleural membranes, remainder undivided, having a continuous posterior fringe of small brown setae. Terga at posterior margin with a few colourless long hairs medially. Abdominal terga brownish, each with a transverse row of six small, black spots grouped in three pairs; two rows of large, oval, pale paramedial spots separated by a narrow median brown stripe, this stripe being incomplete on terga 9 and 10 so as to form heart-shaped spots (Fig. 18). All abdominal terga have a few

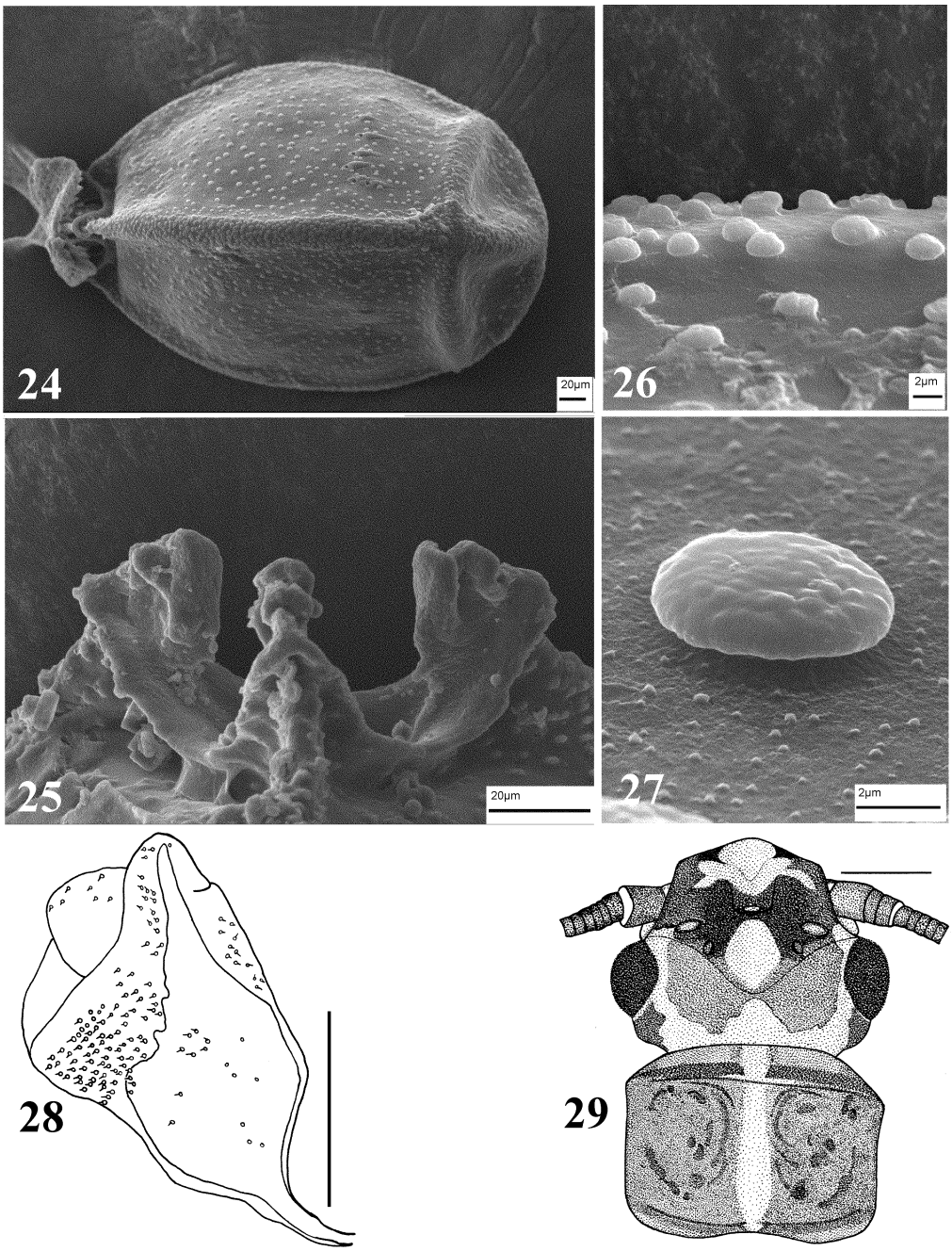
short, stout, brown intercalary spinules that become more numerous on abdominal sterna. Tergum 10 of mature male nymph not modified. Paraprocts long, apex rounded. Cerci grey with dorsal fringe of fine, silky, colourless hairs (Fig. 18), increasing in length towards apical cercal segments. Each cercal segment with an apical whorl of short brown setae.

Material examined: Slide with eggs from the female holotype: N. Mongolei Lederer 92/mongolica Klapálek/Mus. Vienna; pinned, macerated abdomen in microvial. 1 male, 1 female, Mongolei, Central aimak: Songino, 24 km SW von Ulan Bator, 1300 m, 7.VI.1966. Am Ufer des Flusses Tola unter Steinen geeinzelt; Z. Kaszab, No. 502 (Hungarian Natural History Museum, Budapest); Russia: Buryatiya: 1 nymph, Selenga River, set. Kolesovo, 52.0838 N, 106.3885 E, drift, 01.V.2005, coll. N. Bazova; 3 females, the same place, 30.IV.2007, coll. A. Bazov; 7 males, 9 females, 9 eggs masses, the same place, 07–13.V.2009, coll. A. Bazov, N. Bazova; 1 male, Chikoi River, Selenga R. Basin, set. Ust'-Kiran, 50.1951 N, 106.5122 E, 27.V.2008, coll. M. Proshchelykin; 1 nymph, Chikoi R., set. Char'yasta, 50.4317 N, 106.3857 E, drift, 27.XII.2008, coll. A. Bazov; 7 males, 3 females, Chikoi R., Selenga R. Basin, 25 km from the mouth, 05.V.2009, coll. A. Bazov, N. Bazova; Amurskaya oblast': 1 female, Meun R., Nora R. Basin, Selemdzha R. Basin, Zeya R. Basin, Amur R. Basin, 52.5686 N, 130.0737 E, 18.VI.2003, coll. Eu. Dimitruyk; Primorskyi krai: 1 female, Bolshaya Ussurka River, Ussuri R. Basin, Amur R. Basin, set. Zvenigorodka, 45.5859 N, 133.5918 E, 08.VI.2004, coll. V. Teslenko; 1 female, Ussuri River, Amur R. Basin, 4 km from set. Stepanovka, apiary, 44.5619 N, 133.3282 E, 15.VI.2005, coll. T. Tiunova, fot. M. Tiunov.

Distribution. The species inhabits large rivers: the transfrontier Selenga River in Mongolia and Russia (southern Siberia), and the Amur River Basin (Meun River, Bolshaya Ussurka River, Ussuri River) in the south of the Russian Far East.



FIGURES 20–23. Eggs of female used by L.A. Zhiltzova (1971) for the redescription of presumed *Filchneria mongolica*: 20. Lateral view. 21. Anchor pole. 22, 23. Chorion structure.



FIGURES 24–29. *Perlodes stigmata*. 24. Egg, dorsal view. 25. Collar, dorsal view. 26, 27. Chorion structure. 28. Right everted male eversible paraproct lobe, posterior view. 29 Head of male. Scale (mm): 28 = 0.0625.

Remarks. We studied the presumed *F. mongolica* material described by Zhiltzova (1971):

Kyrgyzstan: 4 females, Kurumdu River, Susamyr River Basin, 29.VI.1966, coll. L. Zhiltzova; 3 males, 1 female, 2 nymphs, Karakolka River, Susamyr River Basin, 19.X.1967, coll. L. Zhiltzova. They are distinct from *F. mongolica.* The female subgenital plate is similar but the notches between the lobes are less deep than in *F. mongolica*. Only a female from the Karakolka River contains mature eggs which differ distinctly from eggs of *F. mongolica*. In particular, the transverse ridge close to the posterior egg pole is absent and the micropyles are situated close to the equator (Fig. 20). Instead of a collar there are only very short extensions of the three longitudinal ridges (Fig. 21). The structure of the chorion surface is rough, with low raised tubercles (Figs. 22, 23). The artificial eversion of the EPLs in males from the Karakolka River was unsuccessful but the stripe of short, blunt thick spines on the posterior margin of tergite 10 is different, not narrow and medially interrupted as in true *F. mongolica*.

Males from the Klapálek collection regarded as *F. mongolica* by Raušer (1968) were not available but the very detailed and careful illustrations of the last tergites show no short blunt thick spines on the posterior margin of tergum 10 (Raušer 1968, his figs. 62–66).

The first author studied *P. stigmata* (Ra, Kim, Kang, Ham, 1994): South Korea: 3 males, 1 female, north of Chonchon, 13.IV.1995, coll. V. Kuznetzov. The eggs of *F. mongolica* are similar to eggs of the Korean species (Figs. 24–27), but in *P. stigmata* the collar is wider and its three ridges have almost straight medial edges directed towards the longer anchor pedicle. The edge of the anchor does therefore not cover the collar completely; in *F. mongolica* it does. The paraprocts of male *P. stigmata* are longer than those of *F. mongolica*, and crossed. The paraproct sclerite of *P. stigmata* narrows gradually towards the apex and forms a thin rod rounded at the tip; the EPLs are short, resembling small bulbs situated at an almost right angle to the paraproct sclerite (Fig. 28). The female subgenital plate of *P. stigmata* has a weak, shallow notch and two concave stripes extend from the posterolateral side of the sternum (Ra et al. 1994). There are distinct differences in the shape of spots in front of the M-line and in the interocellar area on the head (Fig. 29). Considering the main specific characters such as egg morphology, male EPLs, and the fact that abdominal segments 1–3 are divided by a membranous pleura, the first author assumes that *P. stigmata* should be removed to the genus *Filchneria*, but study of the holotype is required.

Acknowledgments

We thank D. Muranyi, Hungarian Natural History Museum (Budapest) for photographs of the male *F. mongolica* in the Z. Kaszab collection; T. Eroshenko, Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences (IBSS FEB RAS), Vladivostok is thanked for the illustrations. The authors are very grateful to T. Tiunova, M. Tiunov (both from IBSS FEB RAS) and A. Bazov (Baikal Department of Gosrybcenter, Ulan-Ude, Russia) for material they collected. We thank E. Rosciszewska, Institute of Zoology, Jagiellonian University (Kraków, Poland) and V. Lubini-Ferlin (Zürich, Switzerland) for help with literature, and are grateful to Dr. R. E. DeWalt for helpful critical comments and linguistic help. The present work was supported in part by FEB RAS, Grant No 10–III–D–06–013.

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