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### A new species of *Amphinemura* (Plecoptera: Nemouridae) from the South of the Russian Far East

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#### Abstract

A new species of Plecoptera, *Amphinemura zwicki* sp. n. from the Primorsky Region south of the Russian Far East, is described and illustrated. Relationships with its close relatives are discussed.

**Key words:** Plecoptera, *Amphinemura*, Primorsky Region, Russia

#### Introduction

*Amphinemura* is the largest genus of the subfamily Amphinemurinae with at least 179 species recognized from the Oriental and Holarctic regions (DeWalt *et al.* 2013, Li *et al.* 2013, Ji *et al.* 2014, Vinçon *et al.* 2014). *Amphinemura* is represented by eight species in the Russian Far East (RFE). Two species, *A. borealis* (Morton, 1894) and *A. standfussi* Ris, 1902 are Transpalearctic; *A. steinmanni* Zwick, 1973, *A. verrucosa* Zwick, 1973, and *A. coreana* Zwick, 1973 occur on the East Asian mainland, whereas *A. decemseta* Okamoto, 1922, *A. dentifera* Zhiltzova, 1979, and *A. flavostigma* Okamoto, 1922 are East Asian insular species, known from the southern Kuril Islands, Sakhalin Island, and Japan.

This paper provides descriptions and illustrations of the adult stage of a new species of *Amphinemura*, *A. zwicki* sp. n., collected from a small foothill stream, the Tamga River that flows from the West Sikhote-Alin Range into the Ussuri River of the Amur River Basin.

#### Material and methods

Specimens were examined with the aid of a MBS-10 binocular and Labor microscope, the color illustrations were produced using digital cameras Nikon Coolpix 995 and Toup View 3.7. Abdomens were removed and soaked in 10% NaOH overnight and rinsed with distilled water. The morphological terminology follows that of Baumann (1975) and Zwick (2010).

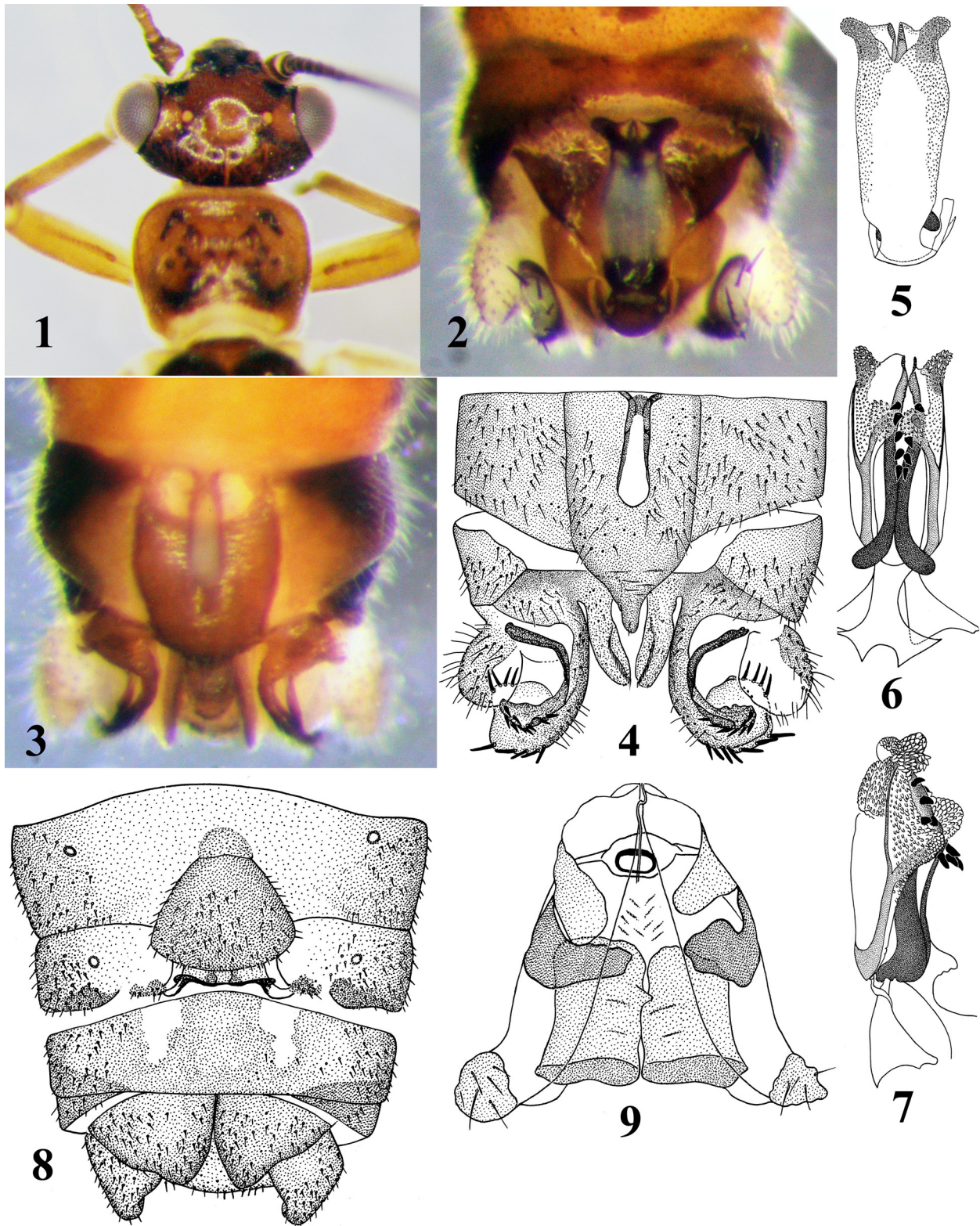
The Holotype and all paratypes are deposited in the Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia.

#### Results and discussion

##### *Amphinemura zwicki* Teslenko sp. n.

(Figs. 1–9)

**Description.** Adult habitus. Body length from tip of the head to the apex of abdomen, males, 4.2–6.0 mm; females 5.3–7.1 mm. Forewing length, males, 5.5–6.2 mm; females, 6.8–7.0 mm; wingspan, males, 11.8–13.1 mm; females 11.5–15.5 mm.



**FIGURES 1–9.** *Amphinemura zwicki* sp. n.: 1. Head, male pronotum and mesonotum, dorsal. 2. Male abdominal tip, dorsal. 3. Male abdominal tip, ventral. 4. Male abdominal tip, cleared, ventral. 5. Epiproct, dorsal. 6. Epiproct, ventral. 7. Epiproct, lateral. 8. Female, subgenital plate, cleared, ventral. 9. Vaginal complex, cleared, dorsal. Not to scale.

Head brown with V-shaped black spot anterior of the anterior ocellus extending onto clypeus; M-line black and distinct (Fig. 1). A small rectangular black spot present on each inner side at the top of the epicranial suture in the antennal area. Interocellar area with a large rounded light brown spot (Fig. 1). A small semi-oval light brown spot present

medially between posterior ocellus and the compound eye. Occiput covered by small black spots along the epicranial stem and behind each eye extending to posterior ocelli. Pronotum light brown with rounded anterior angles and X-shaped pattern consisting of small black spots which form a figure with sharp anterior angles and right posterior angles, posterior part of the pattern is diffuse (Fig. 1). The head and pronotum patterns are more pronounced in males, than females.

**Male.** Posterior margin of tergum 9 with a shallow notch and interrupted medially by a fringe of strong inwardly curved setae (Fig. 2). Subgenital plate of sternum 9 elongate, barrel-shaped, narrowed distally and terminates in a short rounded tongue-shaped-like extension, delimited basally by transverse folds; vesicle long, extending  $\frac{1}{2}$  length of the subgenital plate, widened and apically pale, narrowed, and basally sclerotized (Figs. 3, 4). Tergum 10 laterally short, medially forming a triangular sclerite plate with pointed angles; two paramedial elongated leaf-shaped sclerites extend from the base of the epiproct to the triangular sclerite plate (Fig. 2). Sternum 10 occupied by the broad base of the paraprocts. Cerci membranous, oval, covered by hairs, without hairs on medial face (Figs. 2-4). Paraprocts complex, in ventral view, the inner paraproctal lobe conical, more strongly sclerotized and blade-like along its medial edge (Figs. 3, 4). The middle lobe is large, elongate, transverse at the base, sclerotized mostly at the inner edge, extending first backward and then forward and up, curved dorsally, similar to a letter "J"; basally and along the inner edge with hairs (Figs. 3, 4). Along its upper and rear face, the apex of the lobe with a fringe of 5-7 long blunt black bristles. Dorsal face of the middle lobe apex a large membranous knob with almost a straight lateral margin; along its upper face, the apex of the lobe has 4 long blunt black spines (Fig. 4). Outer lobe a narrow sclerite that appears as a strip that bends outward at obtuse angle at its base and curved medially. Posterior branch of the outer lobe scoop shaped and widened, its tip lies in the loop of the sclerite of the middle lobe, outer margin with 9 small pointed bristles (Fig. 4).

Epiproct in the dorsal view vase-shaped with two anterolateral heavily sclerotized bulbous projections covered with spicules of various sizes and sclerotization, directed towards each side of the bifurcated tip (Fig. 5); bifurcated tip consists of thin tips of two ventral sclerites rolled up dorsally and covered by fine spicules (Fig. 5). Dorsum of the epiproct densely covered with fine spicules, surface divided by fine suture that anteriorly forms a shallow cleft separating two short membranous rounded lobes (Fig. 5). Lateral arms of the dorsal sclerite are darkly sclerotized, wide basally, each lateral arm folds in the half of length, the dorsal branch of the lateral arm long, narrow and supports the anterolateral lobe on lateral margin; the ventral branch of the lateral arm shorter and wider, supporting the apical rounded membranous lobe, which covers partially the keel-shaped ridge of the ventral sclerite (Figs. 6, 7). In the ventral view, the ventral sclerites heavily sclerotized, broad at the bases; bases project beyond the general contour of the epiproct; the sclerites converge in the first  $\frac{1}{2}$  of their length and branched and narrowed towards the apex (Fig. 6). In lateral view, the ventral sclerites form keel-shaped ridges; each ridge bears 5 pairs of heavily sclerotized stout spines (Figs. 6, 7). The apex of the ventral sclerites not converging anteriorly; partially concealed by the overhanging membrane of the dorsal side; from the lateral view, the tops of the ventral sclerites are rounded membranous knobs covered with fine spicules (Figs. 6, 7). Basal sclerites represented by two broad triangular patches located at the basolateral margins of the epiproct (Figs. 2, 6, 7).

**Female.** Sternum 7 enlarged with sclerotized bell-shaped pregenital plate, extending to  $\frac{2}{3}$  of sternum 8 length (Fig. 8). Sternum 8 forms a subgenital plate that consists of two rectangular rounded sclerites separated by a fine median slot; the posterior edges of the sclerites concave-wavy and appear as a single, narrow and sclerotized longitudinal ridge; the anterior edges of the subgenital sclerites hidden under the pregenital plate (Fig. 9). Paragenital plates unpigmented, slightly sclerotized. On the posterior margin of the sternum 8, on sides of the paragenital plates, two small slightly sclerotized sclerites bearing a few short setae (Figs. 8, 9). In cleared slide mounted female genitalia in the dorsal view, the paragenital plates form the dorsal transparent conical layer opens in front of the top, reaching the large, wide, and heavy sclerotized funnel (Fig. 9). Below the paragenital plates sclerites of the subgenital plate with wide rounded anterior edges; pointed processes along the medial edges near mid-length. A transverse crests present on each sclerite (Fig. 9). Anterolaterally, the subgenital plate sclerite support sclerotized internally roughened pockets (Fig. 9). Bases of roughened pockets support the sclerotized funnel. Between the roughened pockets, a large pouch with numerous inside folds (Fig. 9). From the pouch and funnel passes through a median tube that connect these vaginal structures with membranous hemispherical receptacles surrounding the funnel, anterolaterally (Fig. 9).

**Remarks.** Several Chinese *Amphinemura* species also have a remarkable pair of anterolateral projections directed toward each side of the bifurcated tip of the epiproct. The details of interconnections between these sclerites are undescribed (Zwick 2010). Among those species, *A. zhoui* Li & Yang, 2008 and *A. lingulata* Du & Wang, 2014 appear more closely related to *A. zwicki* are, sharing the keel-shaped ventral sclerite with spines; fingerlike inner paraproctal conical lobes, apex of middle paraproctal lobe with a membranous knob covered by spines, and the outer paraproctal lobe with bristles on the outer margin. However, both the keel-shaped ventral sclerites with five pairs of heavily sclerotized stout spines and the vase-shaped epiproct of *A. zwicki* are distinctive and different from *A. zhoui* and *A.*

*lingulata*. In the dorsal view, the epiproct of *A. zhoui* is quadrangular, with a truncate apex and very small bulbous anterolateral projections; ventral sclerite with gently angulated ridge fringed by a row of tiny spines and erect subapical bar (Li, Yang 2008). The slender epiproct of *A. lingulata* has small triangular tongue-shaped anterolateral projections. The bases of the ventral sclerites do not project beyond the general contour of the epiproct; there are many black spines on the ventral sclerite keel-shaped ridge (Ji *et al.* 2014). The females of Chinese *Amphinemura* are unknown. The pattern of *A. zwicki* female subgenital plate has some similarity to those of the European *A. palmeni* (Koponen, 1917), but the vaginal structures are undescribed for this species (Boumans & Baumann 2012).

**Material examined.** Holotype male. Russian Far East, Primorsky Region, the Tamga River, right tributary of the Ussuri River, near Tamga Settlement, 45.34.30'N 133.37.00'E, 27-29.05.2014, sweeping, coll. Lyubaretz V. Paratypes: 12 males, 16 females, the same locality and data as holotype, coll. Lyubaretz V.; 2 females the same locality, 07.06.2013, coll. Tiunov I.

**Etymology.** The species is named in honor of the outstanding plecopterologist Peter Zwick, who made significant contributions to the knowledge of the stonefly fauna of the Russian Far East.

**Distribution.** The new species is known from the small foothill stream, the Tamga River that flows from the West Sikhote-Alin Range into the Ussuri River near the border with China.

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