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## Research article


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# The genus *Phantolabis* (Diptera: Limoniidae) new to the Palearctic: description of a new species and re-definition of the genus

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**Abstract.** A new crane fly species from the genus *Phantolabis* Alexander, 1956, active in the cold season and previously known by a single, eastern Nearctic species, is described from Primorsky Krai of the Russian Far East. A revised definition of the genus is given.

**Keywords.** Crane flies, Limoniidae, new species, Palearctic, Russian Far East.

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## Introduction

The diverse and widespread crane fly family Limoniidae Speiser, 1909 includes more than 11 000 species in the world fauna. In the Palearctic, the family is represented by 78 genera and more than 1700 species, including 1130 in the eastern Palearctic (Oosterbroek 2020). Recently, the fauna of the eastern Palaearctic Limoniidae has been intensively studied in Korea (Podenas 2013, 2015, 2016a, 2016b, 2016c; Podenas & Byun 2013, 2014a, 2014b, 2016, 2018; Podenas *et al.* 2015a, 2015b, 2016, 2017, 2019a, 2019b), China (Mao & Yang 2009, 2010; Men 2015a, 2015b; Men & Yu 2015; Zhang *et al.* 2012, 2014, 2015a, 2015b, 2016, 2019), Mongolia (Podeniene & Gelhaus 2010, 2015, 2017; Podenas & Gelhaus 2011; Podenas *et al.* 2013; Yadamsuren *et al.* 2015 ) and Japan (Kato *et al.* 2018).

The fauna of Limoniidae of the Russian Far East has been well studied (Savchenko 1983, 1989; Savchenko & Krivolutskaya 1976; Pilipenko & Sidorenko 2006a, 2006b; Pilipenko 2009) and currently includes 56 genera and 415 species (Oosterbroek 2020). Nevertheless, in 2006, a peculiar crane fly species was noticed among the material collected earlier by Evgeniy A. Makarchenko (Russian Academy of Sciences, Far East Branch, Federal Scientific Center of the East Asia Terrestrial Biodiversity). In the early spring of 2015, Dmitry E. Shcherbakov (Borissiak Paleontological Institute, Russian Academy of Sciences) obtained another male of this species from a Malaise trap in the Sikhote-Alin Nature Reserve (Fig. 4), which indicated a wider distribution of this species in Primorsky Krai (Fig. 5). Due to its unusual morphology, which precluded its placement into any known Palearctic limoniid genus, its description was postponed.

A recent publication by Bouchard & Gelhaus (2019) provided a redescription and biological data for the little-known Nearctic genus *Phantolabis* Alexander, 1956 with a single species, *Phantolabis lacustris* Alexander, 1938, and made it clear that the Russian specimens represented a new species of the same genus.

## Material and methods

The examined material is deposited at the following collections:

- JSOC = Jaroslav Starý collection, Olomouc, Czech Republic
- VPMC = private collection of Valentin E. Pilipenko, Moscow, Russia
- ZISP = Zoological Institute Russian Academy of Sciences, St. Petersburg, Russia
- ZMUM = Zoological Museum of Moscow State University, Moscow, Russia

The holotype and other specimens are preserved in plastic tubes in 70% ethanol. Two males from the type series were dried and mounted in the course of the study. Colors are described from the dry-mounted specimens. Genitalia of two males and one female were macerated in warm 10% KOH for about one hour to remove soft tissues, then rinsed in distilled water. Cleared parts are preserved in glycerol-filled microvials together with the rest of the specimen, in ethanol-filled tubes or pinned below the specimen. The material was studied with an Olympus SZ61 stereo microscope. A Nikon d7000 digital camera, equipped with a Tamron 70-300/4-5,6 and an EL-Nikkor 50/2,8 lenses or a Mitutoyo M Plan Apo 10X and an Olympus ULWD MS Plan 20X microscope objective lenses and controlled by the Helicon Remote ver. 2.6.5.w (<https://www.photo-soft.ru/>) software, were used to capture stacked images, which were then combined using the Helicon Focus ver. 6.7.1.Pro software (Kozub *et al.* 2000–2013). The resulting images were processed in Adobe Photoshop CS2. Morphological terminology generally follows McAlpine *et al.* (1981), except that the notation of wing veins follows *The Manual of Afrotropical Diptera* (Cumming & Wood 2017) and the terminology of male terminalia is changed according to Ribeiro (2006, 2008): lobe of gonostylus = inner gonostylus, clasper of gonostylus = outer gonostylus. The general distribution of species is given according to Oosterbroek (2020).

## Morphological abbreviations

- aed = aedeagus
- aed apod = aedeagal apodeme
- ce = cercus
- cgonst = clasper of gonostylus
- gonx = gonocoxite
- hvp = hypogynial valve
- interb = interbase
- ip = interbasal plate
- lap = lateral apodeme of vesica
- lgonst = lobe of gonostylus
- pm = paramere
- st = sternite
- tg = tergite
- vap = ventral protrusion at the apex
- vmp = ventro-mesal protrusion
- vs = vesica

## Results

Class Insecta Linnaeus, 1758  
Order Diptera Linnaeus, 1758  
Family Limoniidae Speiser, 1909  
Subfamily Chioneinae Rondani, 1841

Genus *Phantolabis* Alexander, 1956

### Type species

*Erioptera lacustris* Alexander, 1938.

### Diagnosis

Small (wing length not exceeding 5.0 mm), greyish dark brown species; antenna short, with 11–12 segments, apical flagellomere elongate, formed by fused distal segments. All legs with a short third tarsomere and tarsal claws inserted subapically. Mid and hind tarsi with shortened first and second segments, third tarsomere modified, with keel-like edge. Wings wide with wide anal angle, veins almost without microtrichia, veins *R*, *CuA* and *A*<sub>1</sub> thickened, arculus poorly visible, cell *R*<sub>3</sub> long, with short *R*<sub>2+3+4</sub>, discal cell open, crossvein *m-m* absent. Hypopygium not inverted, gonocoxites massive, lobe of gonostylus well developed, with short flat teeth, clasper of gonostylus rod-like, short and inconspicuous. Interbase slender, curved, and needle-like, lateral processes of aedeagal sheath (= parameres) absent. Aedeagus long, straight, thin, divided apically into two or three rods.

*Phantolabis glacialis* sp. nov.

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Figs 1–5

### Diagnosis

Differs from *P. lacustris* by wing venation, structure of male genitalia and ovipositor. Wings entirely brownish, crossvein *r-m* connecting to *Rs* near wing midlength, apex of *R*<sub>3</sub> bent to costal margin, apical part of vein *CuP* strongly curving toward wing margin, *A*<sub>1</sub> straight, noticeably thickened basally. Gonocoxites massive, with large ventromesal protrusion basally and ventral protrusion apically; lobe of gonostylus well developed, apically with 4–5 small teeth on inner surface; clasper of gonostylus small, situated at base of lobe of gonostylus, plate-like, each with thin apical process; aedeagus relatively thin, long and straight, apically bent upward and divided into two short rods.

### Etymology

The specific Latin epithet ‘*glacialis*’ refers to the discovery of this species on ice.

### Type material

#### Holotype

RUSSIA • ♂; Primorsky Krai, Khasan district, Narva River; 43°04′18.7″ N, 131°22′20.3″ E; 25 m a.s.l.; 30 Mar. 2001; E.A. Makarchenko leg.; ZISP.

#### Paratypes

RUSSIA • 5 ♂♂, 1 ♀; same collection data as for holotype; ZISP • 6 ♂♂, 1 ♀; same collection data as for holotype; ZMUM.

### Other material

RUSSIA • 1 ♂; Primorsky Krai, Khasan district, Narva River; 43°04'18.7" N, 131°22'20.3" E; 25 m a.s.l.; 27 Mar. 2005; E.A. Makarchenko leg.; ZMUM • 1 ♂; same collection data as for preceding; JSOC • 1 ♂; Sikhote-Alin Reserve, Kabaniy Klyuch River; 44°53'31.0" N, 135°28'20.0" E; 580 m a.s.l.; 24 Mar.–7 Apr. 2015; D.E. Shcherbakov leg.; Malaise trap; VPMC.

### Type locality

RUSSIA: Primorsky Krai, Khasan district.

### Description

#### Male (Figs 1–2)

MEASUREMENTS. Body length 3.5–4.0 mm, wing length 4.5–5.0 mm, length of antennae 0.8–0.9 mm.

HEAD (Fig. 1A–C). Greyish brown; rostrum short, greyish brown, mouth parts yellow; palpi yellow, with 3 oval segments. Antenna yellowish brown. Scape short, widening distally, pedicel oval. Flagellum 9–10-segmented. Basal flagellar segments subcylindrical, more apical ones shorter, ovoid. Distal flagellomere (Fig. 1C) elongate, formed by fused 4–5 distal segments. Verticils short, yellow, approximately half as long as respective segments. Segments covered with short, yellow pubescence.

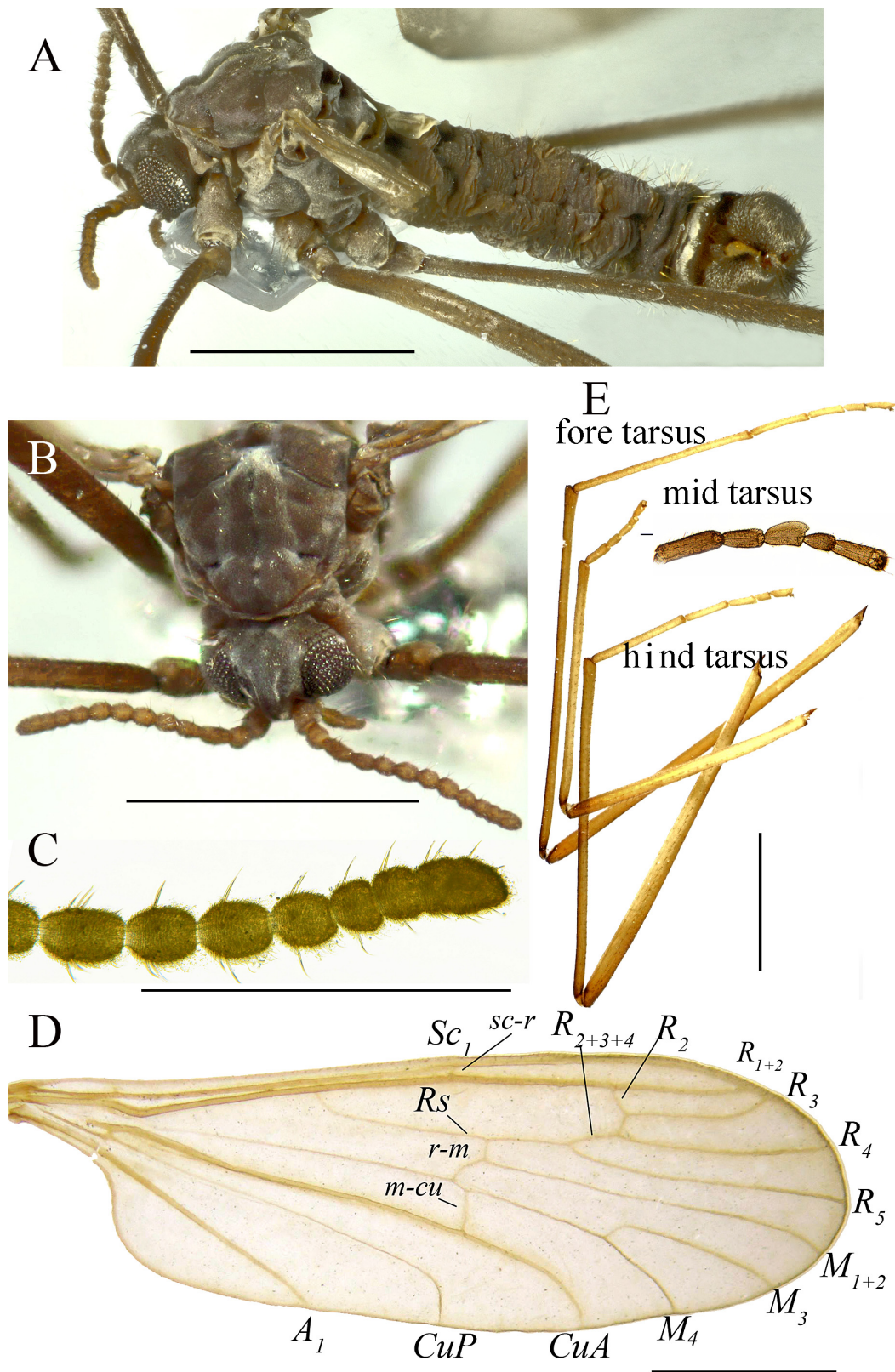
THORAX (Fig. 1A–B). Dark brown with grey pruinose. Pronotum yellowish brown. Mesonotal prescutum dark brown with grey pruinose, longitudinal stripes broad, indistinct, prescutal pits black, tuberculate pits indistinct. Scutal lobes and scutellum same color as prescutum. Mediotergite brownish grey pruinose. Pleuron brownish grey. Meron not separated by a suture from katepimeron, both midleg and hindleg coxae widely separated.

LEGS (Fig. 1E). Coxae and trochanters light brown, femora light brown, tibiae brown without spurs, tarsomeres yellowish brown. Legs covered with very short, semi-erect brown setae. Mid tarsus with shortened first and second segments, third tarsomere short with rounded outgrowth on outer lateral side. Tarsal claws inserted subapically, claw simple, without additional spines, arolium absent.

WINGS (Fig. 1D). Wide, brownish, sometimes darkened along *CuA*, veins brownish, almost without macrotrichia. Macrotrichia on wing membrane absent. Venation: arculus absent; *Sc* short, ending about level with midlength of *Rs*, stigma indistinct, but costal margin after *Sc* thickened, *sc-r* indistinct (if present then close to *Sc* tip); origin of *Rs* approximately level with apex of *A*<sub>1</sub>; *R*<sub>1</sub> long, apex of *R*<sub>3</sub> bent to costal margin; bases of cells *r*<sub>1</sub> and *r*<sub>3</sub> at same level. Veins *r-m* and *m-cu* shifted to mid-wing, *r-m* connecting to *Rs* (not to *R*<sub>4+5</sub> as usual) closer to its middle. Discal cell very long and open due to absence of *m-m*. Apical part of *CuP* strongly bent toward wing margin, *A*<sub>1</sub> straight, noticeably thickened basally; anal angle wide, posterior margin widely rounded. Haltere with knob yellowish white.

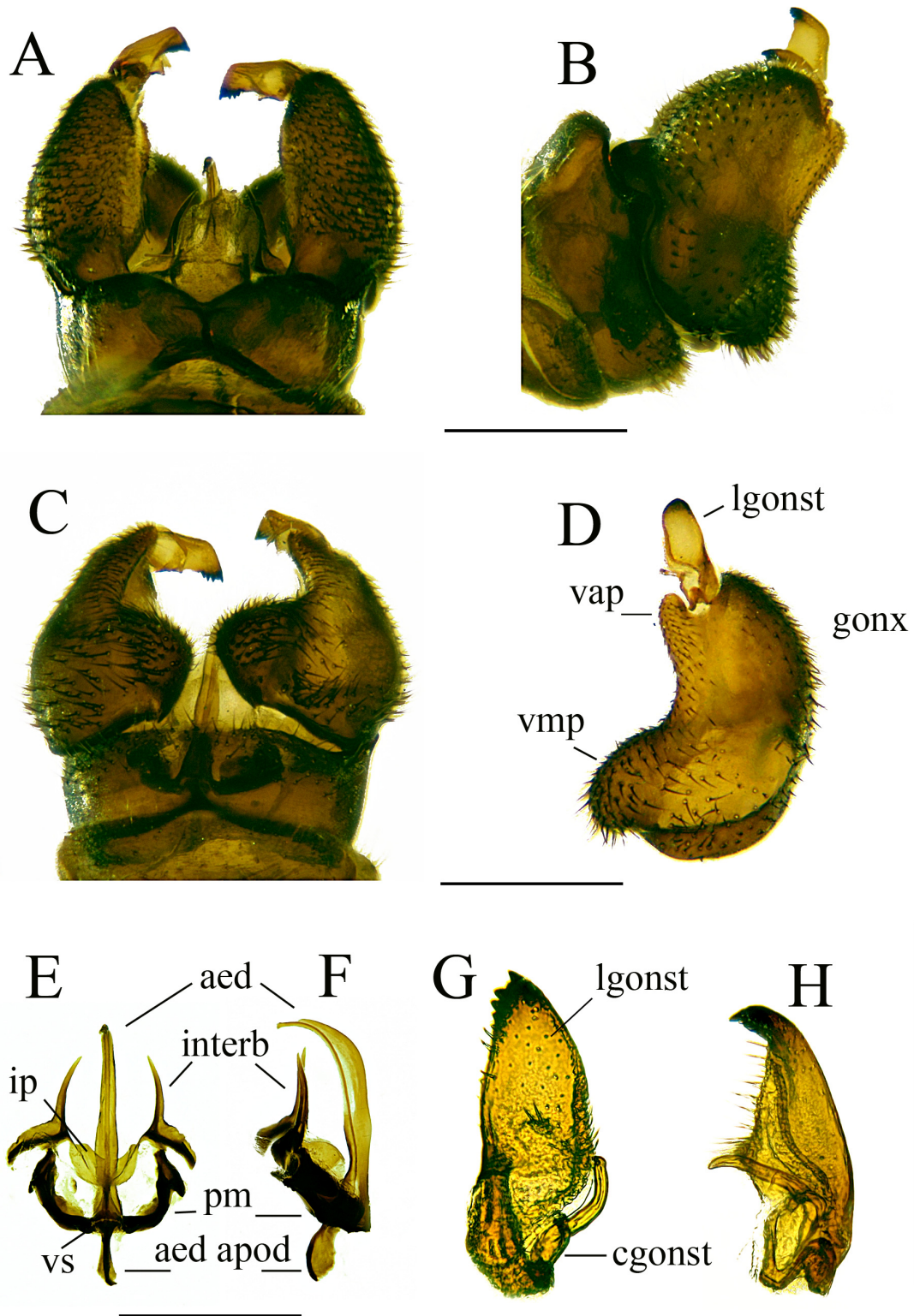
ABDOMEN (Fig. 1A). Generally light brown, grey pruinose, covered with rather long, erect, yellow setae; tergites brownish yellow, grey pruinose, lateral and medial stripes missing, posterior margins of tergites greyish. Sternites yellowish grey.

HYPOPYGIUM (Fig. 2A–H). Dark brown, grey pruinose. Tergite IX transverse with shallow U-shaped notch. Gonocoxites massive, covered with spike-shaped setae directed laterally, with large ventromesal protrusions basally and ventral protrusions at apex (Fig. 2D). One pair of terminal gonostyli well developed, lobes of gonostyli (Fig. 2G–H), each shaped as triangular-rounded plate, apically with 4–5 small teeth on inner surface. Claspers of gonostyli strongly reduced, poorly visible, each situated at base of adjacent lobe of gonostylus, shaped as small plate, tightly attached to the gonostylus with thin process directed inward. Distal portion of interbase (Fig. 2E–F) simple, appearing as slender



**Fig. 1.** *Phantolabis glacialis* sp. nov., paratype, ♂, Khasan district, Narva River (ZMUM). A. General view, the left wing is broken. B. Head and thorax. C. Apex of the antenna. D. Wing. E. Legs. Scale bars: A–B, D = 1.0 mm; C = 0.5 mm; E = 5 mm.





**Fig. 2.** *Phantolabis glacialis* sp. nov., paratype, ♂, Khasan district, Narva River (ZMUM). Terminalia. **A.** General dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Left gonostylus. **E.** Aedeagal complex, dorsal view. **F.** Aedeagal complex, lateral view. **G.** Lobe of gonostylus, lateral view. **H.** Lobe of gonostylus, dorsal view. Abbreviations: see Material and methods. Scale bars = 1 mm.

rod gradually narrowing to acute point, basal portions of interbases merge together medially to form separate crescent-shaped plate above aedeagus, referred to here as interbasal plate (ip). Lateral apodeme of paramere poorly developed. Lateral processes of aedeagal sheath absent. Aedeagus relatively thin, long and straight, protruding beyond apices of interbases and reaching approximately to midlength of gonocoxites, apically bent upward and divided into two short rods.

**Female** (Fig. 3A–F)

Similar to male. Antenna short, with 10 segments.

Female terminalia (Fig. 3B–F) with tergites VIII, IX and X and sternite VIII brown, cerci and hypovalvae brownish yellow. Tergite VIII narrow in lateral aspect, tergite IX triangular, and tergite X relatively small. Cercus elongate, nearly parallel-sided, bent upwards at approximately  $\frac{2}{3}$  of its length, blunt-apexed. Hypo valve long and straight, nearly parallel-sided, setae on dorsal margin long and distinct (Fig. 3E). Tips of hypovalvae reach approximately to  $\frac{2}{3}$  of cercus length. Two pigmented spermathecae (Fig. 3F).

**Elevation**

Specimens were collected at altitudes from approximately 25 to 600 m a.s.l.

**Period of activity**

Adults fly in March–April.

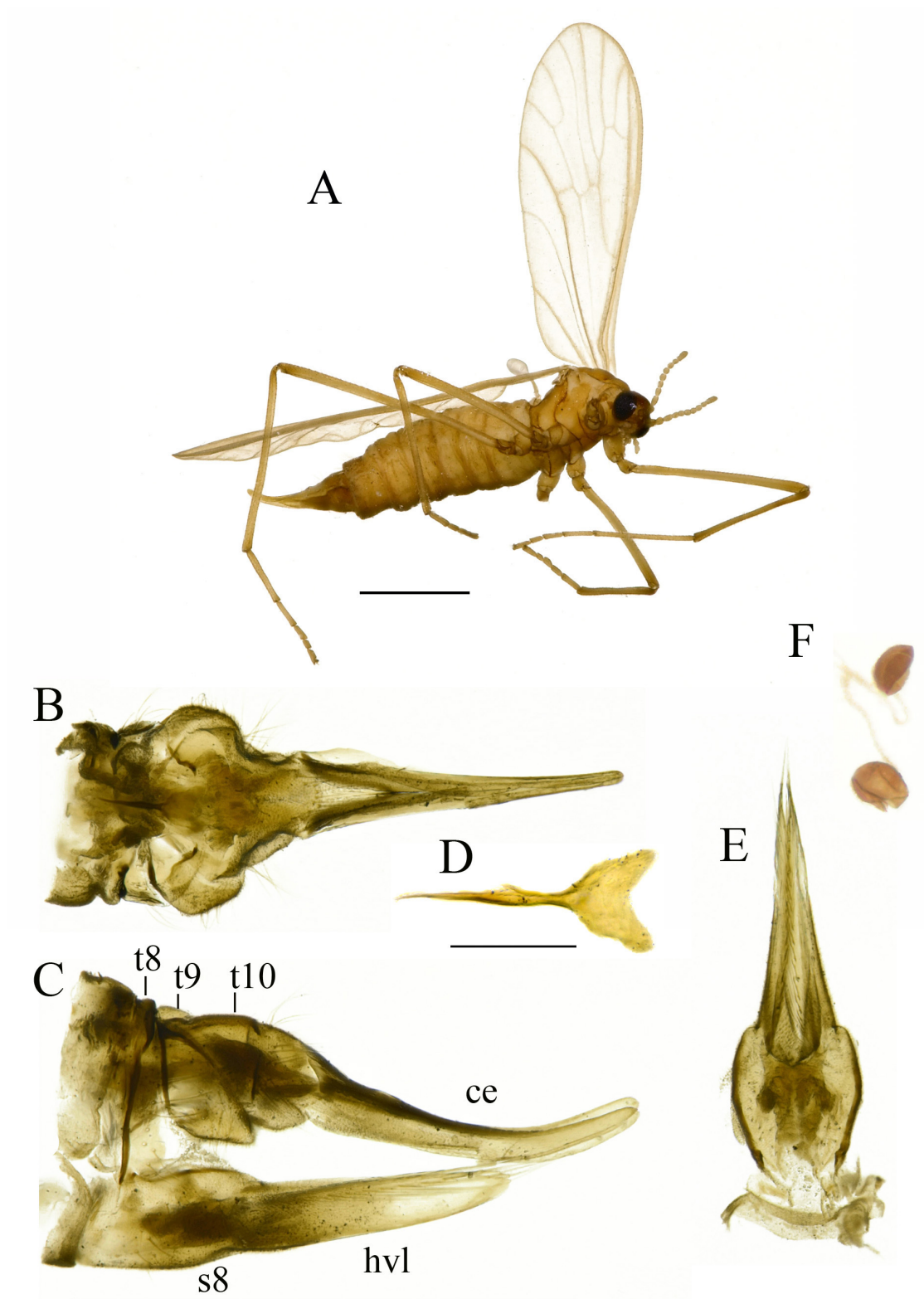
**Distribution**

Russia: Primorsky Krai (Fig. 5).

**Discussion**

A male of the Nearctic species *Phantolabis lacustris* was described by Alexander (1938) and assigned to the subgenus *Psiloconopa* Zetterstedt, 1838 of the genus *Erioptera* Meigen, 1803. In 1956, this species was transferred to the genus *Cryptolabis* Osten Sacken, 1860 and a new, monotypic subgenus *Phantolabis* (Alexander 1956) was created. In a generic key (Alexander & Byers 1981) it was listed as the genus *Phantolabis*. In its adult and especially larval (Bouchard & Gelhaus 2019) characters this genus is close to *Hesperoconopa* Alexander, 1948 (Alexander 1948, 1952, 1962, 1967, 1976; Savchenko 1980). The Nearctic species of *Hesperoconopa* have well-developed merons (Bouchard & Gelhaus 2019), while *H. acutistyla* Savchenko, 1980 from South Kurils has a reduced meron and tuberculate pits indistinct (Savchenko 1980). In *Phantolabis* the meron is not separated by a suture from the katepimeron and fuses with the lower portion of the katepimeron to form a composite region referred to by Crampton (1943) as meropleurite or meropleuron. *Phantolabis* differs in some adult features, such as the antenna with 11–12 segments, the veins almost without microtrichia, and the structure of legs. The hypopygium of *Phantolabis* differs in the clasper of the gonostylus being strongly reduced and poorly visible. One pair of well-developed interbases are present. The lateral processes of the aedeagal sheath (inner gonapophyses or apophyses according to Alexander) are absent. Aedeagus divided apically into two or three rods. *Hesperoconopa* (Alexander 1948) has a pair of outer gonostyli (= claspers of gonostyli). It also has well-developed interbases and lateral processes of the aedeagal sheath (or parameres), aedeagus not divided apically. A characteristic biological feature of *Phantolabis* is the appearance of adults at low temperatures at river banks during the early spring (Bouchard & Gelhaus 2019).

*Phantolabis glacialis* sp. nov. is similar to *P. lacustris* in its general appearance but differs by wing color and venation as well as structures of the male and female terminalia. The wings of both sexes of *P. glacialis* sp. nov. are entirely brownish, while the wings of females of *P. lacustris* have lighter areas



**Fig. 3.** *Phantolabis glacialis* sp. nov., paratype, ♀, Khasan district, Narva River (ZMUM). **A.** General view of specimen in 70% ethanol. **B–E.** Terminalia. **B.** Tergites VII–X and cercus, ventral view. **C.** Lateral view. **D.** Genital fork. **E.** Sternite VIII and hypogynial valve, dorsal view. **F.** Spermathecae. Abbreviations: see Material and methods. Scale bars: A–C, E–F = 1.0 mm; D = 0.25 mm.



in cells  $r_p$ ,  $r$ , and  $m$ , and in apical wing cells  $r_3$  to  $m_4$  (Bouchard & Gelhaus 2019). The new species also differs in some venation characters, such as vein  $r-m$  connecting to  $R_s$  some distance before its fork, apex of  $R_3$  bent to the costal margin, and  $CuP$  strongly curving toward the wing margin.

The hypopygium of *P. glacialis* sp. nov. differs by the lobes of the gonostyli apically carrying 4–5 small teeth on the inner surface, in contrast to “single row of 12–17 short flat teeth along dorsal margin” in *P. lacustris*. The aedeagus of *P. glacialis* sp. nov. is simple, relatively thin, long and straight, apically bent upward and divided into two short rods, while in *P. lacustris* it is divided from its midlength into 3 closely appressed rods with separated apices (Bouchard & Gelhaus 2019). The ovipositor of female *P. glacialis* sp. nov. differs from that of *P. lacustris* by the longer cercus, narrow tergite VIII, and two spermathecae (three in *P. lacustris*).

The larvae of the new species most probably develop in sandy to gravelly bottomed streams (Fig. 4), like those of *P. lacustris*. The adults, too, appear at low temperatures at the banks of small rivers during early spring and possibly during winter thaws. According to the collector Evgeniy A. Makarchenko (pers. com.), the males and females formed aggregations on the underside of ice (as reflected in the species name) hanging over the water. The morphological and ecological features of *P. glacialis* sp. nov. are similar to those of *P. lacustris* (Bouchard & Gelhaus 2019), indicating that the new species is probably also capable of skating and does not fly. Nevertheless, its flying and skating capabilities both require confirmation by further studies.



**Fig. 4.** Habitat of *Phantolabis glacialis* sp. nov., Russia, Primorsky Krai, Sikhote-Alin Reserve, Kabaniy Klyuch River in April 2015. Photo: D. Shcherbakov.

*Phantolabis lacustris* is currently known from the central and eastern parts of the United States and Canada (Bouchard & Gelhaus 2019). The discovery of the new species in the East Palearctic suggests that this genus had a wider distribution in the Nearctic in the past and may have crossed Beringia, as also did the genus *Hesperoconopa* (Savchenko 1980).

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Fig. 5. Distribution of *Phantolabis glacialis* sp. nov. Map data ©Google Maps 2020.

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