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New Oriental tribe Iscini, new non-dilatognathan species of *Notophlebia* Peters & Edmunds 1970 and independent origin of *Dilatognathus*-type mouth apparatus in Atalophlebiinae (Ephemeroptera: Leptophlebiidae)

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Abstract

A new tribe, Iscini **tr. n.**, comprising the Oriental genera *Isca* Gillies 1951 and *Notophlebia* Peters & Edmunds 1970, is established. A new species, *Notophlebia ganeshi* **sp. n.**, is described based on male and female imagos reared from larvae. The new species markedly differs from *N. jobi* Sivaramakrishnan & Peters 1984 by its non-specialized larval mouth apparatus. The larva of *N. jobi* has a highly specialized mouth apparatus of the «*Dilatognathus*-type»; this type of mouth apparatus has evolved independently in several non-related leptophlebiid taxa.

Key words: Oriental Region, mayflies, Ephemeroptera, Leptophlebiidae, systematics, new tribe, new species

Introduction

Peters & Edmunds (1970) described the genus *Notophlebia* Peters & Edmunds 1970 based on a single male imago of *N. hyalina* Peters & Edmunds 1970 from the Western Ghats in India. They assumed that this genus had relationship with the genera *Nathanella* Peters & Edmunds 1970 and *Isca* Gillies 1951. However, the larva ascribed by Peters & Edmunds (1970) to *Nathanella*, was later recognized as belonging to *Notophlebia* (Sivaramakrishnan & Peters 1984). Sivaramakrishnan & Peters (1984) described a second species of *Notophlebia—N. jobi* Sivaramakrishnan & Peters 1984 as imagos and larvae (associated by rearing), and gave the first diagnosis of *Notophlebia* based on the larval stage. Later, Sivaramakrishnan et al. (1996) described true larva of *Nathanella*, which appeared to be quite different from the larva of *Notophlebia*.

My investigation of *Notophlebia* (two species described below) and *Nathanella* (male and female imagos reared from larvae of *N. saraswathiae* Sivaramakrishnan, Venkataraman & Balasubramanian 1996) has not revealed shared apomorphies of *Notophlebia* and *Nathanella* other than the loss of hind wings. Thus, the assumption about their relationship, which was expressed by Peters & Edmunds (1970), has not been supported yet (nor has it been disproven, because the relationships of *Nathanella* remain unknown). On the other hand, comparison of new material of *Notophlebia* with available material of *Isca* (male and female imagos reared from larvae of several species) allows discovery of their shared apomorphies and allows confirmation of the idea of their relationship. Based on this, a new tribe Iscini **tr. n.** is established. In the present paper, diagnoses of Iscini and *Notophlebia* are given, and a new species, *N. ganeshi*, is described.

Material and methods

All material, including the holotype and paratypes of the new species, will be permanently deposited in the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia), but is temporarily located in the Department of Entomology of Saint Petersburg State University. In the list of material examined, the following

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& Murphy 1924 s.l., or «*Hermanella*-complex») belongs to the holophylum Hermanellonota Kluge 2008 (or Hermanella/fg2) (Kluge 2008, 2012). Larvae of all species of Hermanellognatha have «*Dilatognathus*-type» mouth apparatus. Larvae of all other taxa belonging to Hermanellonota (*Farrodes* Peters 1971, *Simothraulopsis* Demoulin 1966) have non-dilatognathan mouth apparatuses.

(4) The Cuban taxon Hagenulus/fg3 (subgenus or genus *Hagenulus* Eaton 1882 s.str.) belongs to the holophylum Hagenulus/fg2 (or genus *Hagenulus* s.l.) (Kluge 1994, 2012). Larvae of both species of Hagenulus/fg3 have «*Dilatognathus*-type» mouth apparatus. Larvae of all other taxa belonging to Hagenulus/fg2 (*Borinquena* Traver 1938, *Turquinophlebia* Kluge 1994, *Poecilophlebia* Kluge 1994, *Traverina* Peters 1971, *Careospina* Peters 1971, *Neohagenulus* Traver 1938, *Hagenulopsis* Ulmer 1920) have non-dilatognathan mouth apparatuses.

(5) The Neotropical taxon Ulmeritus/g2 (subgenus or genus *Ulmeritus* Traver 1956 s.str.) belongs to the holophylum Ulmeritus/g1 (or genus *Ulmeritus* s.l.). Known larvae of Ulmeritus/g2 have «*Dilatognathus*-type» mouth apparatus. Larvae of another taxon belonging to Ulmeritus/g1, *Ulmeritoides* Traver 1959, have non-dilatognathan mouth apparatuses.

These facts confirm the earlier conclusion that the same «*Dilatognathus*-type» mouth apparatus repeatedly appeared in course of evolution five times, and its presence can't be regarded as a proof of relationship between taxa (Peters & Edmunds 1970: 235; Sivaramakrishnan & Peters 1984: 121; Kluge 2012: 303–305).

Among taxa with the «*Dilatognathus*-type» mouth apparatus, Hermanellognatha and *Notophlebia jobi* have filtering setae on 3rd segment of maxillary palp arranged to transverse rows (Kluge 2012: Table 1). For Hermanellognatha, this character have been illustrated earlier (Kluge 2008: Fig. 40) and for *N. jobi* it is illustrated here (Figs 46–49). This common characteristic, as well as other characteristics of the «*Dilatognathus*-type» mouth apparatus, appeared in these two taxa independently. Besides transverse rows of filtering setae on 3rd segment of maxillary palp, *N. jobi* has transverse rows of filtering setae on 3rd segment of labial palp (Sivaramakrishnan & Peters 1984: Fig. 17); unlike maxillary palp, on labial palp setal rows are situated only on outer side of the segment, while its dorsal side bears irregularly situated setae (Figs 50, 51).

Among taxa with the «*Dilatognathus*-type» mouth apparatus, some have long and heavily sclerotized maxillary tusk, and some have only a short tusk (Kluge 2012: Table 1). Formerly, the long tusk was regarded to be an autapomorphy and had been used for diagnoses of *Hydrosmilodon* Flowers & Dominguez 1992 and *Hydromastodon* Polegatto & Batista 2007, which belong to Hermanellognatha. As shown earlier, length of this tusk varies among species within two taxa of Hermanellognatha—*Needhamella* Dominguez & Flowers 1989 and *Hylister* Dominguez & Flowers 1989, and because of this cannot be used for generic diagnosis (Kluge 2008, 2012). Recently, it has been discovered, that length of maxillary tusk varies in the same way among species of one more taxon within Hermanellognatha—*Traverella* Edmunds 1948 (Nascimento & Salles 2013).

Thus, besides independent origin of the «*Dilatognathus*-type» mouth apparatus as a whole, we have to assume independent origin of its particular characteristics, such as arrangement of filtering setae and length of maxillary tusk.

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