Analysis of the Taxonomic Structure of the Crane Fly Family Limoniidae (Diptera) Based on the Larval Characters

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Abstract—A morphological study of the larval characters in the genera Elephantomyia, Helius, Microlimonia, Lipsothrix, and Teucholabis was conducted. Significant differences between Elephantomyia and Helius were discovered; Elephantomyia should be placed in the subfamily Hexatominae, while Helius cannot be assigned to any known subfamily. The genus Microlimonia has nothing in common with other representatives of the tribe Limoniini, and the genera Lipsothrix and Teucholabis, with those of Gonomyini; these genera cannot be included in any of the existing tribes. The presently accepted subdivision of the Limoniidae into 4 subfamilies does not reflect its actual diversity.

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The family of short-palped crane flies (Limoniidae, Pediiciidae) is one of the few dipteran groups whose taxonomy is based on extensive use of characters pertaining to all the developmental stages, not only the adults (Wood and Borkent, 1989; Oosterbroek and Theowald, 1991). The significance of larval characters in the taxonomy of Diptera was considered in a number of works by the Russian authors (N. Krivosheina, 1969, 1979, 1982, 1988; Krivosheina and Zaitsev, 1989). The studies of preimaginal stages of Limoniidae (Oosterbroek and Theowald, 1991; M. Krivosheina, 2008, 2009a, 2009b, 2009c; N. Krivosheina, 2009, 2010, etc.) have shown that the presently accepted composition of the subfamilies and tribes of this family needs to be emended based on analysis of the larval characters together with the imaginal ones.

A comparative study of the larvae aimed at finding diagnostic characters of high-rank taxa has shown that some subfamilies and tribes include genera clearly deviating in their morphological features. There are many such genera among crane flies but data on morphology of the preimaginal stages are available only for some of them, for example, Elephantomyia Osten Sacken, 1860, Helius Lepeletier et Serville, 1828, Lipsothrix Loew, 1873, Teucholabis Osten Sacken, 1860, Gnophomyia Osten Sacken, 1860, and Microlimonia Savchenko, 1976. The composition of the tribe Elephantomyiini and its position within the family Limoniidae is the most dubious.

The family Limoniidae includes 4 subfamilies: Dactylolabinae, Eriopterinae, Hexatominae, and Limoniinae (Starý, 1992). The most recent classification (Oosterbroek, 2010) uses the name Chioneinae for the subfamily Eriopterinae and the name Limnophilinae, for Hexatominae; however, in this communication I use the traditional names under which these subfamilies are known in the literature.

In this paper I question the position of the genus Helius in the tribe Elephantomyiini, the position of the genera Elephantomyia and Helius in the subfamily Limoniinae (Oosterbroek and Theowald, 1991; Savchenko et al., 1992; Starý, 1992; Oosterbroek, 2010), the position of the genus Microlimonia in the tribe Limoniini, and the position of the genera Lipsothrix and Teucholabis in the tribe Gonomyiini within the subfamily Eriopterinae.

Genus ELEPHANTOMYIA Osten Sacken, 1860

Based on analysis of the imaginal characters, this genus was placed either in the tribe Antochini (Alexander, 1919) or in the tribes Limnophilini (Savchenko and Krivolutskaya, 1976) or Elephantomyiini (Savchenko, 1983, 1986, 1989) of the subfamily Hexatominae. In the modern classification, based on both imaginal (Lackschewitz, 1932; Savchenko et al., 1992; Starý, 1992) and larval characters (Oosterbroek and Theowald, 1991), the tribe Elephantomyiini is included in the subfamily Limoniinae. Unfortunately, the characteristic of the genus proposed by Ooster-
broek and Theowald (1991) includes data on the Afrotropical species *E. aurantiaca* Alexander, 1917, whose larvae differ strongly from those of the Palaearctic species of *Elephantomyia*. The larvae of *E. aurantiaca* are characterized by a massive head capsule, a complete absence of spiracular lobes, and the presence of an anterior row of 5 large denticles on the hypostomium, i.e., the features typical of the subfamily Limoniinae.

The tribe Elephantomyiini includes 3 genera: *Elephantomyia*, *Helius*, and *Protohelius* Alexander, 1928 (Savchenko et al., 1992). In the opinion of Savchenko (1983), the placement of the first two genera in one tribe should be regarded as an arbitrary decision which can only be justified by a certain similarity of the imaginal characters: an elongate rostrum (usually clearly longer than the head), the presence of only 2 apical branches in the radial sector, and underdevelopment of the tibial spurs. In addition, members of these genera lack the cross vein *rq* connecting *r*₁ and *r*₂ (Figs. 2, 3); however, vein *rm* is well developed in *Elephantomyia* whereas in *Helius* it is

**Table 1.** Comparison of larval characters of the genera *Elephantomyia* and *Helius* (Limoniidae)

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<tr>
<td>1. Head capsule reduced to narrow longitudinal rods (Fig. 12)</td>
<td>1. Head capsule with well-developed, entire frontal and lateral plates; the latter with small incision in posterior third (Fig. 17)</td>
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<tr>
<td>2. Denticles on anterior margin of hypopharynx, labium, and hypostomium absent</td>
<td>2. Hypopharynx, labium, and hypostomium each with a row of large denticles on anterior margin (Figs. 29, 38)</td>
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<td>3. Spiracular area with 4 lobes (Fig. 45)</td>
<td>3. Spiracular area with 5 well-developed lobes (Fig. 49)</td>
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<td>4. Row of long hairs positioned in front of anal opening (Fig. 52)</td>
<td>4. Row of long hairs positioned in front of anal opening (Podenienė, 2002: Fig. 14)</td>
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