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of the Empidoidea (Diptera)**

BRADLEY J. SINCLAIR & JEFFREY M. CUMMING



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The morphology, higher-level phylogeny and classification of the Empidoidea (Diptera)

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Abstract

A cladistic analysis of the Empidoidea and basal lineages of the Cyclorrhapha, based on morphological characters, confirms the monophyly of both groups as well as that of the Eremoneura. The resulting final trees are used to revise the classification of the Empidoidea to include the following five families: Empididae, Hybotidae, Atelestidae (including Nemedinae **n. subfam.**), Brachystomatidae **rev. stat.** (comprising the subfamilies Brachystomatinae, Ceratomerinae and Trichopezinae), and Dolichopodidae *s.lat.* The family Microphoridae is not recognized, and the Microphorinae and Parathalassiinae are assigned to the Dolichopodidae *s.lat.* The Dolichopodidae *s.str.* includes 15 subfamilies that were previously recognized within the family. Within the Empidoidea we found support for Atelestidae as the sister group to the Hybotidae and for the monophyly of Parathalassiinae + Dolichopodidae *s.str.* The Empididae remains poorly defined and the genera *Homalocnemis* Philippi, *Iteaphila* Zetterstedt, *Anthepiscopus* Becker, and *Oreogeton* Schiner are classified as *incertae sedis* within the Empidoidea. In addition, the following higher taxa are proposed: Symballophthalmini **n. tribe**, Bicellariini **n. tribe**, Oedaleinae **rev. stat.**, and Trichininae **rev. stat.**, which are all assigned to the Hybotidae. The genus *Sematopoda* Collin is tentatively assigned to Trichopezinae, and *Xanthodromia* Saigusa is transferred from Hemerodromiinae to Brachystomatinae.

All morphological characters are extensively discussed and illustrated, including details of the antennae, mouthparts, internal thoracic structures, wings, and male and female terminalia. In addition, a key to families and unplaced genus groups of the Empidoidea is provided. Feeding habits are also discussed in terms of the empidoid ground plan condition.

Key words: dance flies, long-legged flies, Empidoidea, Empididae, Hybotidae, Atelestidae, Brachystomatidae, Dolichopodidae, phylogeny, cladistics, morphology, genitalia, mouthparts, new subfamily, new tribes

Introduction

An estimated 11,400 species are described in the Empidoidea, making it among the largest of higher categories of Diptera (Thompson 2005). Fossils with empidoid-like venation are known from the upper Jurassic (Mostovski 1999), with the empidoid subfamilies present by the early Cretaceous (Grimaldi 1999; Grimaldi & Cumming 1999). In fact, the Empidoidea are among the best known lineages from the Cretaceous (Grimaldi 1999). Divergence time estimates for the Empidoidea range between 144–163 MYA (Wiegmann *et al.* 2003). They occur worldwide (except Antarctica), with certain lineages being particularly abundant or more diverse in temperate latitudes. For example, we have identified several “empidoid hotspots” (exclusive of Dolichopodidae *s.str.*) based on total number of described endemic genera, among which are included, New Zealand (13 endemic genera), South Africa (9), southern South America (11) and western North America (9).

The tremendous species diversity of the Empidoidea corresponds to an enormous morphological or structural diversity (Figs. 417–424), especially in the male genitalia. The