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Discovery of the most ancient member of family Tanyderidae (Diptera) from the Lower Jurassic (Sinemurian) of England

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Abstract

Nannotanyderus oliviae sp. nov. from the Lower Jurassic (Sinemurian) of England, the oldest representative of family Tanyderidae, is described and illustrated.

Key words: new species, oldest specimen, Psychodidae, dipteran, Lias Group

Introduction

Due to their high number of plesiomorphic features, Tanyderidae (primitive crane flies) are an important family for elucidation of the evolution of the order Diptera (true flies) (Krzemiński, 1992; Krzemiński & Krzemińska, 2003, Bertone *et al.*, 2008). This small family is represented by 37 extant species in 10 genera with a mostly temperate or subtropical distribution; however, the family is absent from Europe. They are narrow-bodied, long-legged flies, superficially resembling Tipulidae (crane flies), and their biology is poorly known. The adults are usually found near streams while the larvae are either aquatic or develop in wet habitats such as rotting wood or sandy stream margins (Krzemiński & Judd, 1997).

Currently, 22 fossil species in six genera have been described, all from Eurasia (including Europe). Hitherto, the oldest described tanyderids are from Lower Jurassic (Toarcian: Falciferum zone) deposits in Germany (Ansorge, 1994). Krzemiński *et al.* (2010) reported (but did not describe or figure) tanyderid wings from the Lower Jurassic (Sinemurian: Turneri zone) of southern England. These specimens are described here. With an estimated age of between 195 and 197 Ma (Cohen *et al.*, 2013), they are in excess of 12 Ma older than the German material. In addition to improving our knowledge of the basal Jurassic dipteran fauna and the timing of familial diversification, the new taxon belongs to an extant family and therefore provides an important calibration point for molecular clock studies (Bertone *et al.*, 2008).

Material and methods

Specimens examined include two well-preserved wings referable to *Nannotanyderus* Ansorge, 1994, collected by R. A. Coram from fine-grained, laminated limestone nodules in a Lower Sinemurian marine mudstone sequence exposed on the Dorset coast, southern England. They are deposited in the Institute of Systematics and Evolution of Animals, PAN, Kraków, Poland.

The specimens were examined with a Leica (MZFLII) stereomicroscope equipped with a Leica (DFC295) digital camera and a camera lucida for producing line drawings. For this study, drawings were rendered based on the photographs and subsequently digitally processed. Vein nomenclature follows that of Byers (1989).

2009). However, Ansoerge (1994), Krzemiński & Evenhuis (2000) and Krzemiński & Krzemińska (2003) hypothesized on the basis of the venation of fossil material that Tanyderidae and Psychodidae are sister families within the suborder Diarchineura, proposed by Krzemiński (1992). According to Krzemiński and Krzemińska (2003), they arose from the paraphyletic Triassic/Lower Jurassic family Nadipteridae Lukashevich (in Shcherbakov *et al.*, 1995). The sister relationship of Tanyderidae and Psychodidae was accepted by Grimaldi & Engel (2005) and has recently been confirmed by molecular studies (Bertone *et al.*, 2008; Wiegmann *et al.*, 2011).

The oldest definitive examples of Psychodidae are known from the Toarcian of Germany (Ansoerge, 1994), and these species have a wing venation that is quite similar to the contemporaneous tanyderids, supporting their close phylogenetic relationship (for example, five radial and four medial veins ending on the edge of the wing, sometimes also the presence of a closed d-cell). On the other hand, there are significant differences that demonstrate the two families already represented two separate evolutionary lines. In particular, the Tanyderidae have a well-developed anal lobe with a long vein A_1 that extends beyond the origin of R_s and an anal loop is present. In the Psychodidae the anal lobe is almost absent, vein A_1 is strongly reduced and an anal loop is not observed. The presence of similarly well-differentiated Tanyderidae in the older Sinemurian suggests that the Psychodidae could have been present as well; in fact, a putative psychodid from the Late Triassic (Carnian) of the USA, described by Blagoderov *et al.* (2007), hints at a possibly much earlier separation of the two families.

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