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New *Leptotarsus* from the Early Cretaceous of Brazil and Spain: the oldest members of the family Tipulidae (Diptera)

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Abstract

New species of *Leptotarsus* (Tipulidae *s.str.*) are described from the Early Cretaceous beds of Brazil (Santana Fm. Aptian/Albian, ca. 112 Mya) and Spain (La Huérguina Fm., Late Barremian, ca. 126 Mya), viz. *L. grimaldii* sp. nov., *L. cretaceus* sp. nov., *L. martinsnetoi* sp. nov., *L. buscalioniae* sp. nov., *L. ibericus* sp. nov. and *L. contractus* sp. nov. Males of three species possess extremely long antennae. The fossils are the oldest representatives of the genus *Leptotarsus*, and the oldest known members of the family Tipulidae.

Key words: *Leptotarsus*, Early Cretaceous, new species, Santana, Las Hoyas

Introduction

The Tipulomorpha—crane flies—is one of the largest groups of the order Diptera. The group has a worldwide distribution, and includes over 15000 extant species (Oosterbroek 2013). Only one tipulomorphan family, the Limoniidae, is well represented in the fossil record since the early Middle Triassic (ca. 240 million years in age, Mya), being the most ancient living family of the order Diptera (Shcherbakov *et al.* 1995; Krzemiński & Evenhuis 2000; Krzemiński & Krzemińska 2003; Blagoderov *et al.* 2007). The family Tipulidae, however, does not appear in the geologic record until the mid-Cretaceous: *Tipula eva* Krzemiński, 1992 (Krzemiński 1992), described on the basis of a single wing fragment, stands alone as the oldest known representative of the family and the only species so far described for the Mesozoic. The fossil came from the Upper Bureya depression, Khabarovsk Krai, Russia, Kyndaly Formation, which age has been referred to as Albian–Cenomanian (Stratigraphic Dictionary of the USSR 1979). However, based on plant megafossils and palynomorphs, this formation has been dated as Albian (ca. 105 Mya; Krassilov 1973; Markevich & Bugdaeva 2009).

Leptotarsus is a large genus of the family Tipulidae, comprising over 300 extant species in 20 subgenera (Oosterbroek 2013). Though *Leptotarsus* species occur in all the world's biogeographic regions, it is in the Southern Hemisphere that the bulk of the diversity of the genus is found, with only seven species of subgenus *Longurio* Loew occurring in the Northern Hemisphere. No extant species of the genus are known to occur in West Palearctic, and only three East Palearctic species are known (from China and Japan) (Oosterbroek 2013). The most species-rich regions are the Neotropical and Australian. The fossil record of the genus *Leptotarsus* is much reduced, and extinct species were recorded only from Europe and only from the Cenozoic: two species placed in the subgenus *Macromastix* (*bornhardti* Meunier, 1917 and *cladoptera* Cockerell et Haines, 1921) were described respectively from the Eocene Baltic amber and Eocene/Oligocene of England (Tertiary of France was stated erroneously for the former in Evenhuis 1994).

In this paper, six new fossil species of the genus *Leptotarsus* are described from two Early Cretaceous outcrops: Santana (Crato) Formation of Brazil and Las Hoyas (La Huérguina Formation) of Spain. These are the oldest records of the genus, and also the oldest occurrences of the family Tipulidae.

The laminated limestone of the Santana (Crato) Formation in Northeastern Brazil, considered to be of Aptian/

widened, m-cu long and almost parallel to the wing margin) are known in Early Cretaceous and extant members of *Leptotarsus*. The long Sc vein typical of most Limoniidae, but also found in basal Tipulidae lineages such as *Leptotarsus* and *Brachypremna* Osten-Sacken, is clearly a plesiomorphic feature (see ground-plan reconstruction of Tipulomorpha in Ribeiro 2008: 661), and therefore should not be used for the establishing of family-level relationships. However, the “tipulid-like” shape of the medial veins of *Tipunia*, which includes a long vein m-cu, may well be a synapomorphy of the Tipulidae, and this genus may represent, in fact, the earliest lineage of the family. Nevertheless, until further morphological evidence is discovered, we prefer to maintain *Tipunia* within the Limoniidae.

Although the wing venation of the new *Leptotarsus* species described here resemble that of *Tipunia*, there are important differences. In *Tipunia*, the stem of vein Rs is longer than (and plesiomorphic relative to) the condition found in *Leptotarsus*, in which the stem of Rs is subequal in length with R_{2+3} . Also, in *Tipunia* species (e.g., *Tipunia undata* Lukashevich and *Tipunia jorgi* Lukashevich), the vein R_2 is not so much inclined as in *Leptotarsus* species. The veins R_2 and R_3 in *Tipunia* run more or less parallel to each other, and are only slightly divergent towards the wing margin. This is a plesiomorphic feature for Tipulomorpha, and the very inclined vein R_2 , typical of most *Leptotarsus* and present in the Cretaceous species of the genus is more apomorphic (Ribeiro 2008).

In conclusion, until additional light is shed on the family-level relationships of *Tipunia*, the Early Cretaceous *Leptotarsus* species described here are not only the oldest representatives of the genus, but also the oldest undisputed members of the family Tipulidae.

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