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Confirmation of occurrence of *Trechus* Clairville, 1806 in the Baltic amber forests, with description of a flightless edaphic species, and remarks on *Trechoides* Motschulsky, 1856 (Coleoptera: Carabidae: Trechini)

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Abstract

The first reliably identified Trechini beetle species from Baltic amber, *Trechus balticus* **sp. n.,** is described. This new fossil species is most similar to extant species of the Palaearctic *Trechus* sensu stricto, as well as to the Nearctic *Microtrechus* Jeannel, 1927. Since the fossil specimen is a female and some important character states cannot be investigated, its true systematic position within the genus *Trechus* sensu lato remains open. *Trechoides fasciatus* Motschulsky, 1856 is another fossil species that perhaps belongs to the Trechini clade. However, since the original description does not present any character of systematic value and, because the type is very probably lost, the true systematic position of this taxon remains unknown.

Key words: fossil species, Eocene, new species, ground beetles, Carl Berendt collection, Anton Menge collection

Introduction

Trechini is one of the most diverse tribes of ground beetles, including almost 3000 extant species (Lorenz 2005). Most species are moderately small-sized (3–6 mm) and are adapted to the edaphic way of life. Trechini beetles are sometimes very abundant in the leaf litter and upper soil layers in subtropical and temperate forests, and they are also a very characteristic element of the alpine soil fauna of the mountains all over the world. In the mountains of middle and lower latitudes, a high percentage of the species is flightless. High mountains are usually characterised by swarms of closely related species which have evolved due to vicariance in the course of mountain uplift and Late Cenozoic climate change (e.g., Jeannel 1927, 1960, Barr 1979, Pawlowski 1979, Shilenkov 1992, Gueorguiev *et al.* 1997, Belousov 1998, Schmidt 2009, Faille *et al.* 2013). In addition, Trechini ground beetles are well known due to the adaptations of different lineages to the subterranean environment, which is associated with different degrees of morphological modifications (Jeannel 1926, 1928, Casale *et al.* 1998, Faille *et al.* 2010). For these reasons, Trechini beetles are increasingly included in phylogeographic studies, particularly in last decade (e.g., Contreras-Diaz *et al.* 2007, Faille *et al.* 2010, 2011, 2012, 2013, 2014, Lohse *et al.* 2011).

A crucial point in phylogeographical studies is the calibration of the molecular clock. This is particularly true if Trechini beetles are used as biological proxies to evaluate alternative hypothesis in biogeography (e.g., Lohse *et al.* 2011). Since reliably determined fossils of Trechini are unknown at this stage, at least those whose age exceeds the Quaternary, previous studies dealing with this tribe relied on the standard rate of sequence evolution in arthropods (Contreras-Diaz *et al.* 2007, Faille 2010), or on the rate proposed for *Carabus* Linné, 1758, which is a taxon of the same beetle family (Faille *et al.* 2013, 2014). Contreras-Diaz *et al.* (2007) additionally used the maximum age of the Canary Islands to estimate divergence times of endemic clades of *Trechus* Clairville, 1806. As a result, mitochondrial sequence evolution was estimated to be distinctly faster in *Trechus* (3.04 %) than in arthropods in general (2.3 %, Brower 1994) or in *Carabus* (2.68 %, Andújar *et al.* 2012).

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