



# INSECT FAUNA OF THE LATE MIOCENE LOCALITY OF ÖHNINGEN (GERMANY) LESS DIVERSE THAN REPORTED: AN EXAMPLE OF THE HYDROPHILID BEETLES (COLEOPTERA)

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**ABSTRACT**—The fossils originally assigned to the family Hydrophilidae (Coleoptera, Polyphaga) from the late Miocene locality of Öhningen (southern Germany) are revised. Nine hydrophilid species are recognized, most of them representing the tribe Hydrophilini. Five species are reliably assigned to genera: *Hydrochara noachica* (Heer, 1847), n. comb. (= *Hydrophilus rehmanni* Heer, 1847, n. syn.), *Hydrobiomorpha braunii* (Heer, 1847), n. comb. (= *Hydrous escheri* Heer, 1862, n. syn.), *Hydrobiomorpha heeri* n. sp., *Hydrophilus spectabilis* Heer, 1847 (= *Hydrophilus knorrii* Heer, 1847, n. syn., = *Hydrophilus giganteus* Heer, 1862, n. syn.), and *Hydrophilus vexatorius* Heer, 1847. Two taxa are treated as Hydrophilini *incertae sedis*: *Hydrophilopsis elongata* Heer, 1862, and *Hydrous ovalis* Heer, 1862. Two species represent Hydrophilidae *incertae sedis*: *Escheria ovalis* Heer, 1847 and *E. bella* Heer, 1862. The fossil genus *Hydrophilopsis* Heer, 1862 likely represents the modern genera *Sternolophus* Solier, 1834 or *Hydrobiomorpha* Blackburn, 1888, the fossil genus *Escheria* Heer, 1847 likely represents some modern genus within the Hydrophilini or Hydrobiusini. Six taxa are excluded from the Hydrophiloidea: *Helophorus magnus* Heer, 1862, *H. exilis* Heer, 1862 (possibly belonging to Curculionidae), *Hydrobius couloni* Heer, 1862 and *H. godeti* Heer, 1862 (both possibly belonging to Curculionidae: Zygopinae), *Hydrophilus braunii* var. *minor* Heer, 1862, and *Hydrophilus stenopterus* Heer, 1862 (likely a leaf fossil). Our revision revealed a rather high amount of inaccurate family and genus assignments and a moderate amount of species-level synonymy in the original treatment of Öhningen fauna by O. Heer. The diversity of the hydrophilid beetles in Öhningen is thus lower than previously reported, but still being slightly higher compared to other European Paleogene and Neogene localities.

## INTRODUCTION

THE BEETLES of the superfamily Hydrophiloidea are a well-known component of the modern aquatic habitats. Among more than 3300 described species (Short and Fikáček, 2011), especially the large- and medium-sized species of the tribes Hydrophilini and Hydrobiusini are well known representatives of aquatic beetles, although the vast majority of the superfamily is represented by rather small species, part of which is even terrestrial. Due to their aquatic habits, hydrophiloid beetles are frequently found also in the fossil taphocenoses, even though the ongoing revision of the fossil record of the group (Fikáček et al., 2010a, 2010b, 2010c, 2011a, 2012a) suggests that they are less common than originally supposed due to frequent misidentifications.

The late Miocene deposits of Öhningen are well known due to the comprehensive treatment of the fossil insects and plants from this locality by the Swiss geologist and naturalist Oswald Heer. The immense diversity of extinct insects reported from Öhningen by Heer (1847, 1849, 1853, 1862, 1865a, 1865b, 1867) undoubtedly co-formed the first ideas on extinct insects and insect evolution (Grimaldi and Engel, 2005). Even today, Öhningen is considered as one of the richest Cenozoic insect deposits in Europe (Rasnitsyn and Zherikhin, 2002; Grimaldi and Engel, 2005) and is also exceptional as it concerns the diversity of particular insect groups. For example, 17 species of the hydrophiloid beetles and 33 species of scarabaeoid beetles were described by Heer (1847, 1862), which made Öhningen a locality with the most diverse local fossil fauna of the Hydrophiloidea and Scarabaeoidea ever recorded (Hansen,

1999; Ponomarenko and Kirejtshuk, 2002; Krell, 2006). The data on the number of species of Öhningen insects and their taxonomic assignments are, however, still based on the original taxonomic treatment by Heer (1847, 1849, 1853, 1862, 1865a, 1865b, 1867). Even though it is obvious that a modern taxonomic revision of the Öhningen insect fauna is necessary (e.g., Rasnitsyn and Zherikhin, 2002; Grimaldi and Engel, 2005; Krell, 2006), such revisions are absent until now.

In this paper we revise the Öhningen fossils originally assigned to the beetle superfamily Hydrophiloidea in order to put the Öhningen fauna into the context with other European Cenozoic localities (e.g., Fikáček et al., 2008, 2010a, 2010b, 2010c, 2011a, 2011b) and to test the accuracy of the historical treatments by Heer (1847, 1862).

## GEOLOGY, STRATIGRAPHY, AND PALAEOENVIRONMENT

The Miocene locality of Öhningen (sometimes mentioned as “Oeningen” in the literature) was located in Southern Germany near the Lake Constance (Bodensee) north of the cities of Öhningen (N 47°40', E 8°53') and Wangen (N 47°40', E 8°56') where two limestone quarries (Ziegelhof and Obersalen) were the source of the fossils. Today these two outcrops no longer exist but a total of over 1,400 fossil species (922 animal species, mainly insects, and over 475 plant species) have been collected there since the eighteenth century (Selmeier, 1990).

The sediments of Öhningen belong to the Upper Freshwater Molasse (Selmeier, 1990) of the Jura Mountains originated during the formation of the Upper Rhine Graben (URG) and the Swiss Molasse Basin (SMB) (Berger et al., 2005b). An overview