

New fossil record Gerridae (Heteroptera: Gerromorpha) from the Early Oligocene diatomite in the Czech Republic

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Received May 17, 2006; accepted October 1, 2006
Published June 6, 2007

Abstract. New record of aquatic water striders (Heteroptera: Gerromorpha) is reported from the laminated beds of lacustrine diatomite in Holý Kluk hill site near Proboštov from Early Oligocene of České středohoří Mts (Czech Republic). Furthermore, the present occurrence is significant for palaeoecology. It represents an important element for reconstruction of aquatic insect palaeocommunities.

Taxonomy, fossil, Gerromorpha, Gerridae, lacustrine sediments, palaeoecology, Tertiary, Early Oligocene, Czech Republic

INTRODUCTION

Gerromorpha comprises 145 genera with about 1600 extant species worldwide classified in eight families, commonly called semiaquatic bugs (Andersen 1995). Most of them live on surface film of freshwater or in the near surroundings of aquatic or humid terrestrial habitats (Andersen 1982). Family Halobatidae is also well known by insects inhabiting seashore tidal zone counting more than 100 species (Andersen 1995). Fossil record of Gerromorpha is rather poor comprising so far six families of mostly Cenozoic and several Mesozoic taxa recently reviewed (see Andersen 1998, and complete list of fossil Gerromorpha listed by Wappler & Andersen 2004).

Only few fossil gerrid species have been described, viz. in the north-eastern Italian Eocene (Andersen et al. 1994), the Late Eocene Baltic amber (Andersen 2000, Weitschat et al. 2002), the Eocene and Oligocene-Miocene of North America and Paleocene-Eocene of Denmark (Andersen 1982), and in the Miocene Dominican amber (Andersen & Poinar 1992, Andersen 2001). The oldest accurate records of the family are the two genera *Palaeogerris* Andersen, 1998 (Paleocene-Eocene boundary, Fur and Ølst formations, Denmark) (Andersen 1998), and *Cretogerris albianus* Perrichot, Nel et Néraudeau, 2005 from the late Albian (early Cretaceous) of France (Perrichot et al. 2005), suggesting that their sister group, the Veliidae evolved even more than 120 Ma ago (Wappler & Andersen 2004). Several Cenozoic lacustrine outcrops have never furnished any Gerridae (viz. the very rich insect layers of the Paleocene of Menat (Puy-de-Dôme, France) late Eocene of Alès-Monteils (Gard, France) or of the Oligocene of Bes-Konak (Turkey), or Céreste (France). The absences of these semi-aquatic bugs in several paleolakes are very surprising. These insects are not dependent on the quality of the water for breath and food as they live at the surface water and eat insects and small animals that are falling in the water. Possibly, their rarity is related to the fact that they live and die at the water surface, so that their dead bodies rarely reach the bottom of the water body where they could be fossilized in the sediment (Wappler & Andersen 2004).

The Early Oligocene locality Holý Kluk hill site near Proboštov in the České středohoří Mts belongs lithostratigraphically to the Ústí Formation (Radoň et al. 2006). The site represented by palaeoenvironment of the small lake filled with volcanogenic deposits during calm period of the volcanic activity. The composition of the rich flora support the subtropical climate of this time interval with frostless winters and the vegetation corresponds to the mixed mesophytic forest with a considerable representation of thermophilic elements surviving from the latest Eocene (Radoň et al. 2006). Sparse and fragmentary record of entomofauna encountered several specimens of the family Curculionidae (Coleoptera) besides numerous not identifiable (Prokop 2003).

MATERIAL AND METHODS

The locality of Holý Kluk hill is situated about 0.5 km NE from village Proboštov and about 7 km SE from Ústí nad Labem (N 50°37'54", E 14°09'21"). All material was gathered by M. Radoň (curator of the Teplice Regional Museum) during his field prospecting of old known Tertiary palaeontological localities in České středohoří Mts. The specimens are housed in the collection of the Teplice Regional Museum in northern Bohemia. Specimens were observed in dry state or under ethyl-alcohol by stereomicroscope Olympus SZX9. We follow the terminology of external morphology as proposed by Andersen (1998).

SYSTEMATIC PALAEONTOLOGY

Gerromorpha Popov, 1971

Family Gerridae Leach, 1815

Subfamily Gerrinae Bianchi, 1896 (genus and species undetermined)

(Figs 1–3)

DESCRIPTION. **Specimen HK01:** print and counterprint of a specimen in lateral position. Head dark, 1.1 mm long, 0.8 mm high, diameter of eye 0.5 mm, no visible ocelli, rostrum long, 1.9 mm long, its apex surpassing prosternal hind margin for 1.2 mm; first antennomere visible, about 1.1 mm long; ventral lobes of head reduced. Thorax 2.4 mm long, 2.3 mm high; lateral intersegmental suture between meso- and metathorax not visible; mesothorax prolonged; mesoscutellum reduced; wings not visible, apparently absent or very reduced; legs long and slender, prothoracic femur 2.2 mm long, 0.5 mm wide, tibia 1.2 mm long, 0.3 mm wide; meso- and metathoracic coxae horizontal, mesothoracic femur 6.1 mm long and 0.4 mm wide, metathoracic femur 6.0 mm long, 0.4 mm wide; tibia and tarsi not preserved. Abdomen 4.5 mm long, 1.7 mm high, external genitalia not visible.

HK02: print of a specimen in dorsal view; head dark, 1.0 mm long, 1.0 mm wide, diameter of eye 0.5 mm, no visible ocelli, rostrum and antennae not visible. Thorax 2.3 mm long, 1.9 mm wide; lateral intersegmental suture between meso- and metathorax not visible; mesoscutellum reduced; wing visible, reduced, 2.8 mm long (brachypterous); legs long and slender, prothoracic femur 1.3 mm long, 0.5 mm wide, tibia 3.0 mm long, 0.2 mm wide; meso- and metathoracic coxae horizontal, mesothoracic femur 6.1 mm long and 0.4 mm wide, metathoracic femur 6.0 mm long, 0.4 mm wide; tibia and tarsi not preserved. Abdomen 5.1 mm long, 0.9 mm wide, external genitalia not visible.

HK03: print of a specimen in dorsal view; head very poorly preserved, useless. Thorax 2.3 mm long, 2.5 mm wide; dark with two lateral brown stripes; lateral intersegmental suture between meso- and metathorax not visible; mesothorax prolonged; mesoscutellum reduced; wing not visible; legs long and slender; prothoracic femur very poorly preserved; mesothoracic femur 6.2 mm long and 0.4 mm wide, tibia shorter than femur, without rows of spinous hairs; metathoracic femur 6.2 mm long, 0.4 mm wide; tibia and tarsi not preserved. Abdomen 4.8 mm long, 2.0 mm wide, external genitalia not visible.



Figs 1–4. Gerrinae genus and species undetermined. 1,2 – photographs of specimen HK01, 3 – photograph of specimen HK02, 4 – photograph of specimen HK03. Scale 5 mm.

MATERIAL EXAMINED. Three specimens are almost complete bodies; HK01 is laterally preserved, HK02 and HK03 dorsally preserved; all housed in coll. of Teplice Regional Museum (Czech Republic).

AGE AND LAYER. Early Oligocene, about 29–30 Ma according to the radiometric data, Nové Sedlo Formation, Holý Kluk hill site near Litoměřice, České středohoří Mts (Czech Republic).

DISCUSSION

Following Andersen's (1982) phylogenetic analysis, our specimens fall to family Gerridae because of the prolonged mesothorax and meso- and metathoracic coxae horizontal, and in the subfamily Gerrinae because of combination of the following characters: ventral lobes of head reduced (apomorphy of Gerridae minus Rhagadotarsinae); lateral intersegmental suture between meso- and metathorax not visible, indistinct or lost, apomorphy of ((Gerrinae + Eotrephinae) + (Cylindrostethinae + Ptilomerinae + Halobatinae)); rostrum long and slender, its apex surpassing

the prosternal hind margin, plesiomorphy that would exclude our fossils from the group (Cylindrostethinae + Ptilomerinae + Halobatinae); middle tibia without rows of spinous hairs, plesiomorphy that would exclude them from the Eotrechinae; middle femur slender, longer than middle tibia, plesiomorphy that would exclude them from Trepobatinae. Unfortunately we are unable to examine the structure apomorphic of Gerrinae, i.e. dorsal plate of vesica distinctly sclerotized due to the poor state of preservation. Lastly, the elongate pronotal lobe is a plesiomorphy also present in some Charmatometrinae and Gerrinae (Andersen 1982: 201, 205).

The elongate abdomen of these fossils, longer than meso- and metasternum together is an apomorphic character convergently present in the recent genus *Limnometra* Mayr, 1865 and the clade (*Gigantometra* Hungerford & Matsuda, 1958 + (*Aquarius* Schellenberg, 1800 + (*Limnoporus* Stål, 1868 + (*Geriselloides* Hungerford & Matsuda, 1958 + (*Macrogerris* Andersen, 1994 + *Gerris* Fabricius, 1794)))) (Andersen 1995). Our fossils share with *Gerris* the length of first antennal segment less than 1.3x head length, the median longitudinal carina of pronotal lobe present, and the fore femur thicker than middle femur (Andersen 1998). Nevertheless, after Andersen (1995) phylogenetic analysis and key to gerrine genera, it is not possible to accurately attribute our fossils to a precise gerrine genus because of the lack of information on several crucial structures, viz. structure and position of the metathoracic spiracle, proportion of antennomeres, of tibia and femora. They could belong to the genus *Gerris*, but we prefer to maintain them as Gerrinae of uncertain affinities.

Recently two fossil gerrid genera with uncertain subfamily attribution were described from the Middle Eocene deposits of Germany (Wappler & Andersen 2004). First genus *Lutetiabates* Wappler et Andersen, 2004 differs from our specimens in its shorter abdomen, while the second genus *Cylindrobates* Wappler et Andersen, 2004 has a distinctly more elongate body with a very short pronotum.

The presence of gerrid fossils in the small diatom/tuffite lake could be related to a mechanism of low transport of the dead insect from the surface to the bottom via a diatom mat (Nel 1991). Thus they are of interest for the reconstruction of the physico-chemistry of this paleolake.

The plant/insect assemblage of the Holý Kluk hill in bedded tuffitic claystone with a small proportion of diatoms is preserved in two characteristic facies. First bearing coarser plant fossils is followed by low energy sedimentation fining upwards. A lake with calm waters may be expected as sedimentary environment, which arose during a short period of low volcanic activity (Radoň et al. 2006).

Acknowledgements

The authors are grateful to Miroslav Radoň (Teplice Regional Museum) for recovery of the locality and support of fieldwork by paleobotanists Z. Kvaček and J. Sakala (both from Charles University). We thank to Jitka Vilímová (Charles University in Prague) for her revision and suggestions on earlier version of the manuscript. The research was supported by grants of the Ministry of Schools MSM 0021620828 and the Grant Agency of the Czech Republic Nos. 205/03/D151 and 205/05/0204.

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