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An immature stonefly from Lower Miocene of the Bílina mine in northern Bohemia (Plecoptera: Perlidae)

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Abstract. The first record of an immature stonefly (*Perla* cf. *burmeisteriana* Claassen, 1936) from the Lower Miocene of the Bílina mine in northern Bohemia (Czech Republic) is described and illustrated. Its occurrence with supposed palaeoenvironmental aspect of fossilization is outlined.

Taxonomy, fossil, description, Insecta, Plecoptera, Perlidae, Tertiary, Lower Miocene, Czech Republic, Central Europe

INTRODUCTION

Fossil stoneflies are extremely rare in Cenozoic fossil record and have not been found in Tertiary of the Czech Republic until present. The oldest stoneflies are known from Early Permian. The family diversity culminated in Jurassic and declined in Early Cretaceous. The general lack of fossil representatives especially in Tertiary deposits is probably due to different living conditions preferring running waters throughout their history. However, it is in contrary to a number of supposed lentic taxa in Mesozoic (Sinitshenkova 1997). During Tertiary period, the palaeolakes were mainly oligotrophic or stagnant waters. In these lakes, the running water elements were drifted by water current, e. g., streams.

Only a few specimens of family Perlidae were found in fossil record. The oldest taxon is *Sinoperla abdominalis* Ping, 1928 from the Early Cretaceous of China. Several larvae and adults are described from Baltic amber (Eocene) and attributed to the recent genus *Perla* Geoffroy, 1762 (Carpenter 1992). A larva from the Oligocene of Southwestern Montana (USA) is attributed to the genus ?*Acroneuria* Pictet, 1841.

The classical locality of Bílina mine (50° 34' N, 13° 45' E) is geographically situated in northwestern Bohemia of the Czech Republic (see Fig. 1). From stratigraphical point of view it belongs to the Lower Miocene (Eggenburgian/Ottnangian) of the Most Formation. The insect fauna is preserved in the three fossiliferous horizons above coal seam (Clayey Superseam Horizon, Delta Sandy Horizon, Lake Clayey Horizon) reflecting different sedimentary and palaeoenvironmental conditions (Rajchl & Uličný 1999, Prokop 2002). The paleobotanical record and possible reconstruction of vegetation on Clayey Superseam Horizon was previously outlined (Kvaček 1998, Sakala 2000).

The nomenclature of larvae structures followed Theischinger (1991), Baumann (1987) and Raušer (1980).

SYSTEMATIC PALAEONTOLOGY

Perlidae Latreille, 1802

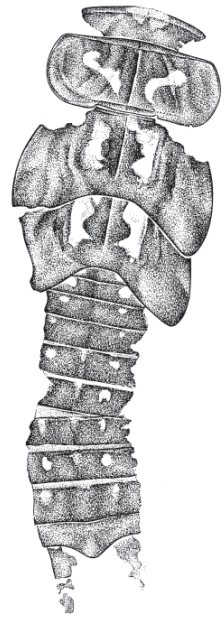
***Perla* cf. *burmeisteriana* Claassen, 1936**
(Figs 2, 3)

Description. Larval body flattened, overall length about 16.6 mm. Head with distinctly transverse posterior occipital ridge. Pronotum rectangular (5.3 mm long and 2.1 mm wide) with clear marginal groove separating marginal flanges; mesonotum (2.8 mm long and 6.2 mm wide) and metanotum (2.6 mm long and 6.0 mm wide) of about same size with well-developed wing pads. Medial dorsal suture distinctly present on all thoracic segments. Abdomen elongate, (9.2 mm long and 3.8 mm wide) with ten visible dorsal segments; tenth segment shorter than ninth with medial apical tip between basally thick cerci. A visible pattern of dark and light spot coloration.
Discussion. The general habitus of large, dorsoventrally flattened body and dorsal color spot pattern resembles family Perlidae, especially genus *Perla*. The shape of the pronotum is similar to the recent abundant palaearctic species *P. burmeisteriana* Claassen, 1936. Nevertheless, a precise classification is not possible because of the lack of the head and of the ventral branched gills on thoracic segments.

Fig. 1. Geographical position of northwestern Bohemia within Europe (A), detailed map of the Most Basin (B), 1 – Bílina mine.

Lewis & Gundersen (1987) described ?*Acroneura* sp., an immature stonefly from Ruby River Basin (Oligocene) of Southwestern Montana, USA. The specimen is very incomplete, smaller in size and differs mainly from our specimen in the absence of the wing pads and a different abdominal coloration. The nymphs of Perlidae described from the Baltic amber as *Perla* sp. have different structure and shape of pronotum. They show thoracic gills that are not preserved in specimen described here. The other fossil record of Perlidae is generally based on adult wing venation. There is adult of *Dominiperla antigua* Stark et Lentz, 1992 from Dominican amber and *Eoperlites paradoxus* Haupt, 1956, which is probably a fragment of wing of a Fulgoromorpha from the Eocene of Geiseltales in Germany (Haupt 1956, Stark & Lentz 1992).

It is extremely difficult to determine Cenozoic fossils relative to modern taxa after the immature stages. Thus, this specimen is left in open nomenclature.



Figs 2–3. *Perla* cf. *burmeisteriana* Claassen, specimen ZD0185 – photo and line drawing. Scale 3 mm.

Material examined. Specimen No. ZD0185 (Doly Bílina coll., Bílina, Czech Republic), a nearly complete larvae (imprint) in dorsal view, posterior part of head, thorax, fragments of prothoracic and mesothoracic femora present, abdomen with distinct segmentation and basal part of cerci preserved, the coloration pattern is also preserved.

Locality. Bílina mine near Bílina, Czech Republic.
Age and Layer. Lower Miocene (Eggenburgian/Ottnangian), Most Formation, Clayey Superseam Horizon.

CONCLUSIONS

The presence of this specimen indicates an aquatic environment. Stonefly nymphs are predators that occur mainly in running water. The recent species preferably inhabit of small streams to large rivers but they are found also in cold ponds and lakes. The family Perlidae comprises about 400 recent species that are widely distributed in the northern hemisphere with a few genera extending into the southern hemisphere in Africa and South America. The major part of the genera is restricted in the East Palaearctic (Baumann 1987, Nelson 1996). The history and living conditions of modern Plecoptera started with the break up of Pangaea (Zwick 2000).

This fossil is the unique record of a stonefly in the Bilina paleolake. We can suspect that this element is allochthonous and was probably transported into basin by an occasional flooding from early uplands. This is supported by the fish fauna (M. Böhme pers. comm.), plant megafossils (*Pinus ornata* Stemberk) and pollen analysis significantly confirmed from Lake Clayey Horizon. The evidence of facultative foothills elements in Clayey Superseam Horizon is not clearly documented, e. g., pollen analysis (Pinaceae). However, a stonefly is probably indicative of life apart from back swamp or lake.

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