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SHORT COMMUNICATION

Caddis-fly (Insecta: Trichoptera) from the Badenian volcano-sedimentary succession (Western Carpathians, Slovakia)

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Abstract: *Vodnik prapovodnik* Sukatcheva et Vršanský, gen. et sp. nov. is described from the Badenian volcano-sedimentary succession of the Plášťovce Member, Sebechleby Formation in southern Slovakia. It represents a taxon closely related to the common European caddis-flies *Chaetopterix* Stephens, 1829 and *Chaetopterna* Martynov, 1913 of the family Limnephilidae Kolenati, 1848. In a seasonal climate, these partially psychrophilic insects emerge in masses during the autumn. Larvae are fixed to water and thus the seasonality in otherwise warm Badenian climate, with characteristic mangroves, might have been caused by temperature changes in streams and/or rivers coming from adjacent steep elevations.

Key words: Tertiary, Miocene, Langhian, Slovakia, fossil insects, caddis-fly.

Introduction

Insects with over 20,000 described fossil species form one of the most complex fossil records, which recently revealed generally important evolutionary patterns such as decreasing variability of species over time, and evidence for mass mutations (Vršanský 2000, 2004, 2005). Fossil insects are reported from over 50 countries, now including Slovakia. Prior to this, only sub-fossil insect capsules were extracted from contemporary tarn sediments in Vysoké Tatry Mts (Bitušík & Kubovčík 1999, 2002; Catalan et al. 2002; Šporka et al. 2002; Kubovčík et al. 2003). Within adjacent regions, generally important fossil insects are known from the Permian sediments of the Bohemian Massif near Obora in Moravia (Kukalová 1963, 1965, 1969; Kukalová-Peck 1974), Eocene "Rovno amber" from Ukraine (Perkovsky et al. 2003a,b; Gumovsky & Perkovsky 2005) and Paleogene "Moravian amber" from the Czech Republic (Prokop & Nel 2005; Nel & Prokop 2004, 2005). Mississippian finds, including the oldest winged insects, and also some Oligocene dragonflies come from the Silesian Basin (Prokop 2003; Prokop & Nel 2004; Prokop et al. 2005, in print). Fossil insect assemblages of the Early Miocene age are known from western Hungary (Pongrácz 1921–23, 1928) and there are geographically adjacent finds from the Pliocene sediments of northern Hungary (Krzeminski et al. 1997). Insect trace fossils come from the Lower Miocene strata of the Bílina Mine in the northern part of the Czech Republic (Prokop 2004) and from Lower Miocene Prešov clay-pit sediments of Prešov Formation in eastern Slovakia (P. Vršanský, V. Šimo & P. Ledvák, pers. com.). Taphonomically interesting is a find of a beetle from deep marine Paleocene deposits near Uzgruň village on the Slovak/Czech boundary (Prokop et al. 2004). An additional find of *Bojophlebia prokopi* comes from the Pennsylvanian sediments of the Czech Republic (Kukalová-Peck 1985). Caddis-flies (butterfly and moth ancestors) are known from the Lower Permian sediments, with the oldest larval cases known from the Middle Jurassic sediments of Siberia (Sukatcheva 1999).

Material, methods and geological settings

The paleontological material is represented by a positive and negative of a single caddis-fly specimen, collected by Mr. Jozef Szalma, deposited in the Slovak National Museum of Natural History (specimen number SNMZ 24300). The sample originates from the Plášťovce village, locality at a road cut nearby Šípka State Nature Reserve (Fig. 1.1A–C: P2).

The locality is situated in the Ipeľ Depression of the Novohrad–Nógrád Basin of southern Slovak–northern Hungary sedimentary area (Vass et al. 1979; Vass 1995), extending along the northern margin of the Pannonian Basin System (Konečný et al. 2002). Sediments containing fossils were deposited on the Central Paratethys Sea shore, between shoreface and offshore zones (Kováč et al. 1999). The volcano-sedimentary complexes composed mainly of

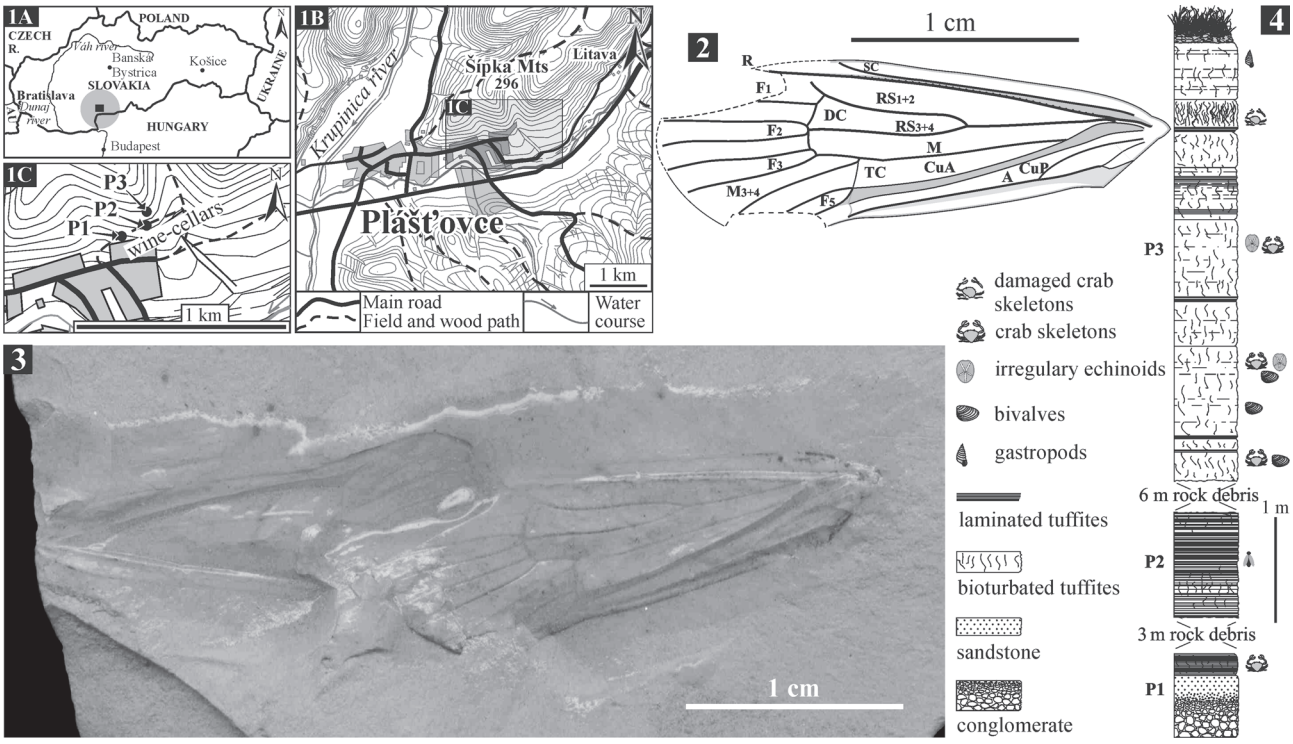

Fig. 1. **1A** — Geographical situation of the Plášťovce village in southern Slovakia; **1B** — Situation of the locality near State Nature Reserve Šípka and **1C** — situation of sampling (P2), with position of adjacent profiles (P1, P3). **2–3** — *Vodnik prapovodnik* Sukatcheva et Vršanský sp. nov. **4** — Geological profiles.

facies of epiclastic sandstones and slamp bodies of conglomerates were specified as the "Plášťovce Beds" (Vass 1971), situated on the periphery of the Central Slovakia Neovolcanics and the Danube Basin eastern margin. The Early Badenian age is documented by foraminiferal associations described from the Príbelce Member of the same age (Vass 1965; Zlinská & Šutovská 1991; Kováč et al. 1999), as well as by rich marine fauna of crabs, irregular echinoids, small infaunal, semi-infaunal and epifaunal bivalves observed in tuffitic sediments of the studied outcrops (Vass 1971). The Plášťovce Member sedimentary environment refers to the former paleogeography and geodynamical processes that controlled deposition (Kováč et al. 1993; Konečný et al. 2002). The basin was filled predominantly by material derived from active andesite stratovolcano situated on the basin's northern margin. Volcanic material of lahars and other types of debris and grain flows entered the basin littoral zone forming bodies of overlying andesite epiclastic conglomerates, breccias and sandstones of the Sebechleby Formation (Konečný et al. 1983). Later, the volcanic activity in the Šahy-Lysec volcano-tectonic zone had risen (Vass et al. 1979; Vass 1995). The Lower Badenian (Langhian; 15.97–13.59 Ma sensu Gradstein et al. 2004) Sebechleby Formation, formed exclusively by volcaniclastics deposited by gravitational flows descending from the slopes of the Štiavnica stratovolcano, additionally contains subaquatic volcaniclastic sediments, predominantly tuffites. The Plášťovce tuffites are various, including rhythmic alternation of tuffitic sandstone and siltstone beds (Vass 1971; Vass et al. 1995). The finding of a fossil caddisfly comes from the fine-grained, laminated tuffite beds which pass toward overlaying strata to massive, intensive bioturbated tuffitic siltstones of light grey–greenish colour with occurrence of benthic macrofauna (Fig. 1.4).

***Abbreviations*:** DC — discoidal cell; A — anal vein; CuP — cubitus posterior; CuA — cubitus anterior; R — radius; RS — radius sector; M — media; Sc — subcosta.

Systematic Paleontology

Trichoptera Kirby in Kirby et Spence, 1815
Limnephilidae Kolenati, 1848
Chaetopterygini Hagen, 1858
Vodnik Sukatcheva et Vršanský, gen. nov.

Composition: type species described below.

Diagnosis: Medium-sized, forewings elongate. Costal margin straight, costal area moderately narrow. Discoidal cell with RS1+2 convex inside. Base of F1 wide. RS1 short, meeting R near its apex. All forks except F4 present. Anal veins long.

Remarks: Differ from other Chaetopterygini in RS1 meeting R. New genus is closely related to *Chaetopteryx* and *Chaetopterna* in wide wing with straight fore margin. *Chaetopteryx* is known from Europe and Turkey by 28 species (Morse 1999). Larvae of *Chaetopteryx* develop in mountain and lowland slow creeks, adults usually appear

in masses during late autumn (Martynov 1924). Adults of *Chaetopterna* are known from the Caucasus (Martynov 1913), its larvae are unknown. It is not likely that *Vodnik* was ancestral for the living abovementioned genera because of specialized position of its RS1.

Fusion of R and RS1 occasionally occurs in various unrelated caddis flies, e.g., *Archithremma ulachensis* Martynov, 1935 (Lepidostomatidae) and *Nanoplectrus trachanasi* Neboiss, 1977 (Plectotarsidae) (Martynov 1935; Neboiss 1977). In these cases R and RS1 diverge shortly after fusion resulted in a small terminal fork. Unfortunately imperfect preservation state does not permit us to confirm presence or absence of the terminal fork in the present fossil.

Etymology: after *voda* (Slavic for water) and *potočník* (Slavic for caddis-fly). Vodník means also a water sprite. Gender feminine.

Vodnik prapovodnik Sukatcheva et Vršanský, sp. nov.
Fig. 1.2–3

Holotype: SNM-Z-24300. Positive and negative of both forewings. Plášťovce locality 1C-P2, Slovakia. Plášťovce Member, Sebechleby Formation. Badenian.

Description: Forewing 3.4 times as long as wide (24/7 mm), slightly widened in apical half, widest in the level of R meeting margin. Costal field 3.5 times as wide as subcostal. Sc meeting margin in the apical third. R straight, possibly slightly curved terminally. RS straight, 0.9 times as long as DC cell. F1 wide, with straight base. RS2, RS3 and RS4 long and straight. F2 narrow, long, with widely rounded base. RS1+2 slightly curved inside DC. RS3+4 slightly curved outside DC. F3 long, its base wide, half as wide as base of F1. F4 absent. F5 short, slightly curved towards the posterior margin. Anastomosis of forks F1 and F3 (diagnostic of the Limnephilidae) present. Cross-vein m3+4-cua (connecting M3+4 and F5 base) weak, long, oblique; thyridial cell closed. A2 two times as long as A3. Postanal area narrow.

Remarks: Occurrence of in-mass-flying non-thermophilic caddis-fly in volcaniclastic sediments is surprising because of climatic conditions during the Early Badenian. The Miocene Climatic Optimum was in the Alpine-Carpathian–Pannonian region characterized by a Mediterranean or subtropical type of climate (Böhme 2003; Kvaček et al. 2006), which is documented also by presence of mangrove roots in adjacent localities (Konečný et al. 1997).

Nevertheless, insects from the extinct mangroves from Israel (Vršanský & Anisyutkin, in print) display only partial affinity towards thermophili (Anisyutkin et al. in print), which might indicate their different climatic preferences. Alternatively, also our discovery might indicate partial thermophili of the stem Chaetopterygini.

Occurrence of mangroves in subtropical climatic zone and non-thermophilic caddis-flies living in an environment under seasonal climate changes can be explained as a consequence of vertical zonation and close occurrence of different climatic zones in a relatively small distance due to evolution of steep landscape, associated with rapid uplift of the Western Carpathian mountain chain (including development of over 4 km high stratovolcanoes) during the Badenian (Fordinál et al. 2002; Kováč et al. 2004; Kvaček et al. 2006). The presence of a non-thermophilic adult caddis-fly in a littoral marine deposit is most likely a result of fixation of its larvae in fresh water streams or rivers, coming from inland high elevations and displaying seasonality or permanent cold microclimate.

Etymology: after *pra-* (Slavic for before) and *pôvod* (Slovak for origin). Proposed vernacular Slovak expression for the genus and species is "vodník prapôvodník".

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