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NEW AND INTERESTING RECORDS OF PLECOPTERA (INSECTA) FROM SLOVAKIA AND SEVERAL AUTECOLOGY NOTES

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ABSTRACT

During the last five years several important discoveries of stoneflies from Slovakia were recorded, including *Leuctra dalmoni* Vincon & Murányi 2007, a recently described species and *Rhabdiopteryx hamulata* (Klapálek 1902), an uncommon Balkan species. We also recorded a curious find of the imago of the endangered species, *Capnopsis schilleri* (Rostock 1892), after 60 years.

Keywords: distribution, new species, *Leuctra, Rhabdiopteryx, Capnopsis*

INTRODUCTION

This work summarizes important finds of stoneflies from Slovakia, recorded over the course of five years. During this investigation of the entire Slovakian territory, we found two uncommon species, *Leuctra dalmoni* Vinçon & Murányi 2007 and *Rhabdiopteryx hamulata* (Klapálek 1902) which we confirm for the Slovak Republic, and an additional record representing a rare, postglacial relict species. The latter species, *Capnopsis schilleri* (Rostock 1892) is classified as an endangered species in the red list of threatened species in the Slovak Republic (Krno 2001).

MATERIAL AND METHODS

Samples of stoneflies were collected during the years 2008-2011 from more than 20 Slovakian streams with good or very good ecological water quality. The material from selected sites was taken in spring (March), summer (May, July or August) and autumn (October or November). Qualitative larval samples were collected with a circular net (0.3 mesh size) by disturbing the substrate by kicking for about five minutes. Adults were collected with a standard circular entomological net. Identification of larva and adults was made according to works by Krno (1998, 2004a), Illies (1957), Theischinger (1974), Ikonomov (1983), Kis (1974), Vinçon & Ravizza (1999), and Vinçon & Murányi (2007). All specimens are deposited in the Department of Ecology, Faculty of Natural Science, Comenius University, Bratislava, Slovakia.

RESULTS AND DISCUSSION

Leuctra dalmoni Vinçon & Murányi 2007

In the spring of 2008 we collected several larvae

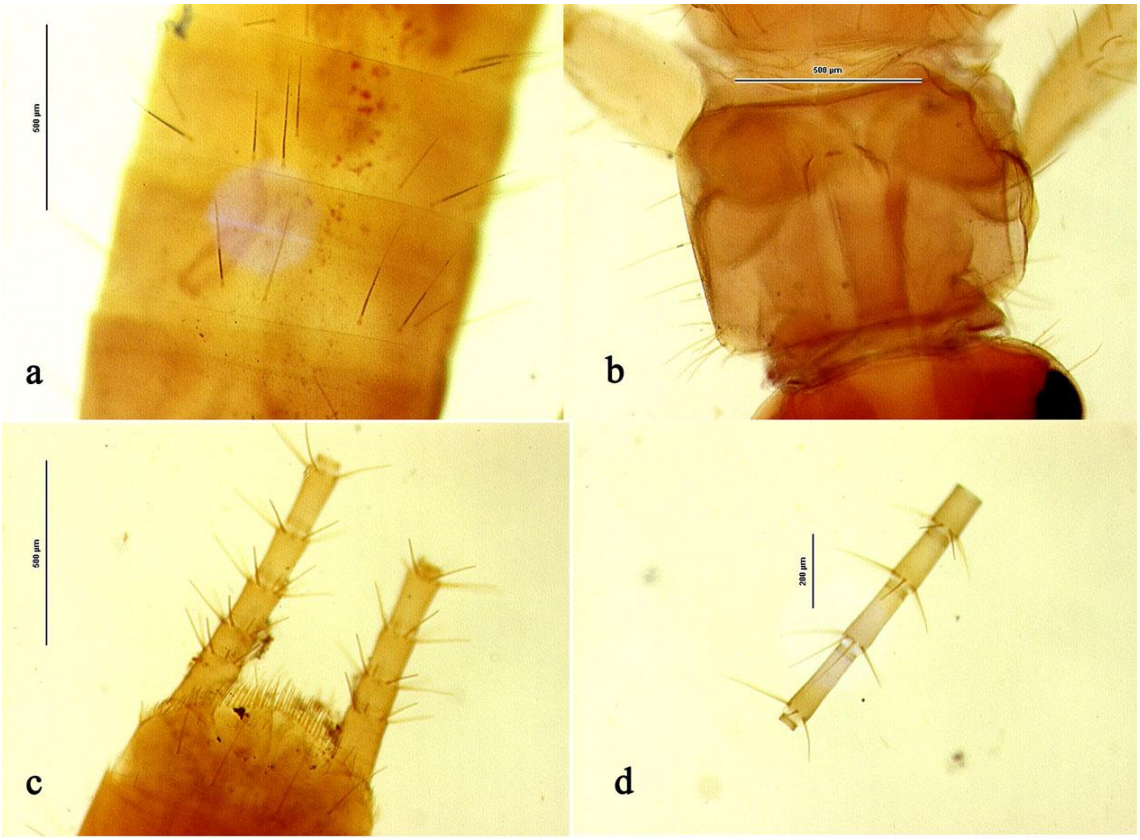

Fig. 1. Larva of *Leuctra dalmoni*: pilose medial tergites of larva in dorsal view (a), prothorax in dorsal view (b), cercal segment with setae in dorsal view (c, d) : Slovakia

and adults of *Leuctra dalmoni*, a species recently described from France and seven other European nations, including two sites in Slovakia (Vinçon & Murányi 2007). Our first Slovakian records are from Suchý potok basin in the western High Tatra Mountains. We found dark brown to black adults with short, thin pilosity and larvae with long setae on the mid-abdominal tergites; long larval abdominal setae were at least ¾ of the segment length and often longer than the segments which were otherwise bare (Fig. 1). Before the description of *L. dalmoni*, the species was confused with *L. pseudosignifera* Aubert, 1954 and *L. prima* Kempny, 1899 (Vinçon & Murányi 2007), but in comparison to larvae of these species, the larvae of *L. dalmoni* have shorter pilosity on the cerci. Larval cercal setae on segments 3-10 do not reach the base of the next cercal segment in *L. dalmoni*, whereas in larvae of *L. prima* and *L. pseudosignifera* these setae reach, or exceed, the length of the next segment. During the faunistic research in Slovakia over the years 2008-2010, we thought the center of occurrence for this species is in the High Tatra Mountains. Exceptionally, it was recorded from Slovak Paradise and Vepor's Hills, and at present, it appears not only as an ordinary Tatra species, but also Slovak. In more recent data (yet unpublished) it is clear, that it commonly occurs in the upper Váh, Poprad and Dunajec, Ipel', Hornád and Hnilec basins (Fig. 2), but its distribution does not extend to the Pannonian ecoregion. Distribution of *L. dalmoni* is closely related to the occurrence of mountain hypsometric degree. It is a rheophilic species which strongly dominates in epirithral zones and partially in springs, and it seems to prefer second and third order streams. The species occurs in streams with cristallic and carbonate geological basins.

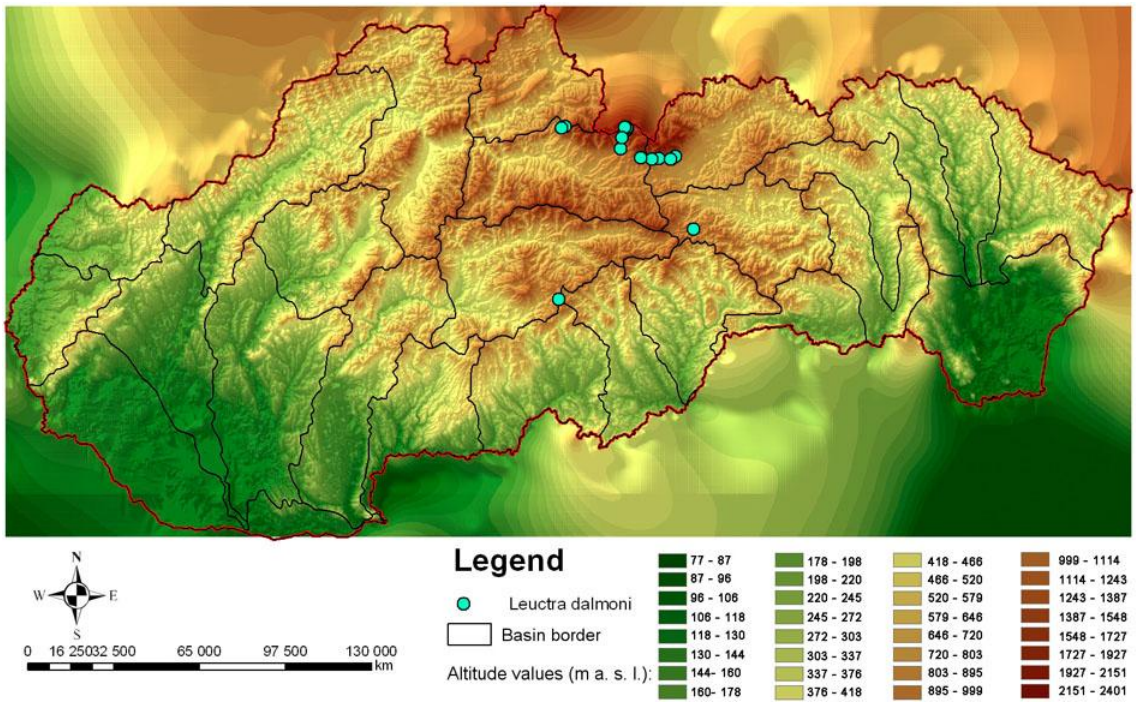

Fig. 2. Distribution of *Leuctra dalmoni* in Slovakia.

Material examined. Slovakia, High Tatra Mts, Suchý brook: 1. (N49°12′36.1′′ E019°36′50.7′′), 1117 m a.s.l., 15.V.2008, 18L, coll., leg. et det.M. Žiak; 2. (N49°12′21.7′′ E019°35′46.4′′), 983 m a.s.l., 15.V.2008, 23L, 1♂, coll. leg et det. M. Žiak; Slovakia, High Tatra Mts, Tichý brook: 1. (N49°12′34.6′′ E019°55′55.6′′), 1115 m a.s.l., 15.V.2008, 2 ♀,coll. I. Krno, leg et det. M. Žiak; 2. (N49°12′35.3′′ E19°55′54.4′′), 1150 ma.s.l., 13.V.2009, 10L, coll., leg. et det. I. Krno; 3. (N49°11′17.9′′ E19°54′82.3′′), 1037 m a.s.l., 13.V.2009, 1L, coll., leg. et det. I. Krno; Slovakia, Higt Tatra Mts, Tomanov brook: 1. (N49°13′28.1′′ E19°55′55.2′′), 1336m a.s.l., 10.V.2009, 2 L, coll., leg. et det. I. Krno; 2. (N49°13′15.7′′ E19°56′04.9′′), 1290m a.s.l., 10.V.2009, 5L, coll., leg. et det. I. Krno; 3. (N49°13′17.5′′ E19°56′28.9′′), 1151m a.s.l., 10.V.2009, 12L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Javorov brook: (N49°13′15.8′′E19°56′07.7′′), 1290m a.s.l., 11.V.2009, 6L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Veľký Šum: (N49°07′44′′ E20°06′62. 6′′), 1165m a.s.l., 11.V.2009, 3L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Poprad river, (N49°07′21.8′′ E20°04′53.3′′), 1220m a.s.l., 09.V.2010, 12L, coll., leg. et det.I. Krno; Slovakia, High Tatra Mts, Belá river: (N49°08′81.7′′ E19°54′65.8′′), 963m a.s.l., 18.III.2009, 1L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Biely Váh river, N49°07′30.1′′ E20°00′93.2′), 1198 m a.s.l., 7L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Velický brook: (N49°07′35.5′′ E20°10′44.3′′), 984 m a.s.l., 14.V.2009, 1L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Slavkovský brook: (N49°07′96.4′′ E20°11′71.1′′), 1047m a.s.l., 2L, coll., leg. et det. I. Krno; Slovakia, High Tatra Mts, Hromadná voda: (N49°07′36.5′′ E20°10′27.1′′), 1002m a.s.l., 14.V.2009, 4L, coll., leg. et det. I. Krno; Slovakia, Slovenský raj, Kopanec: (N48°53′24.5′′ E20°18′47.0′′), 851m a.s.l., 22.V.2008, 1♀, coll. I. Krno, leg. et det. M. Žiak; Slovakia, Ipeľ river: (48°36'14.74" 19°41'19.28"), 848m a.s.l., 14.IV.2008, 5L, coll et leg. M. Očadlík, det. M. Žiak.
L = larva

Rhabdiopteryx hamulata (Klapálek 1902)

The genus *Rhabdiopteryx* is currently represented

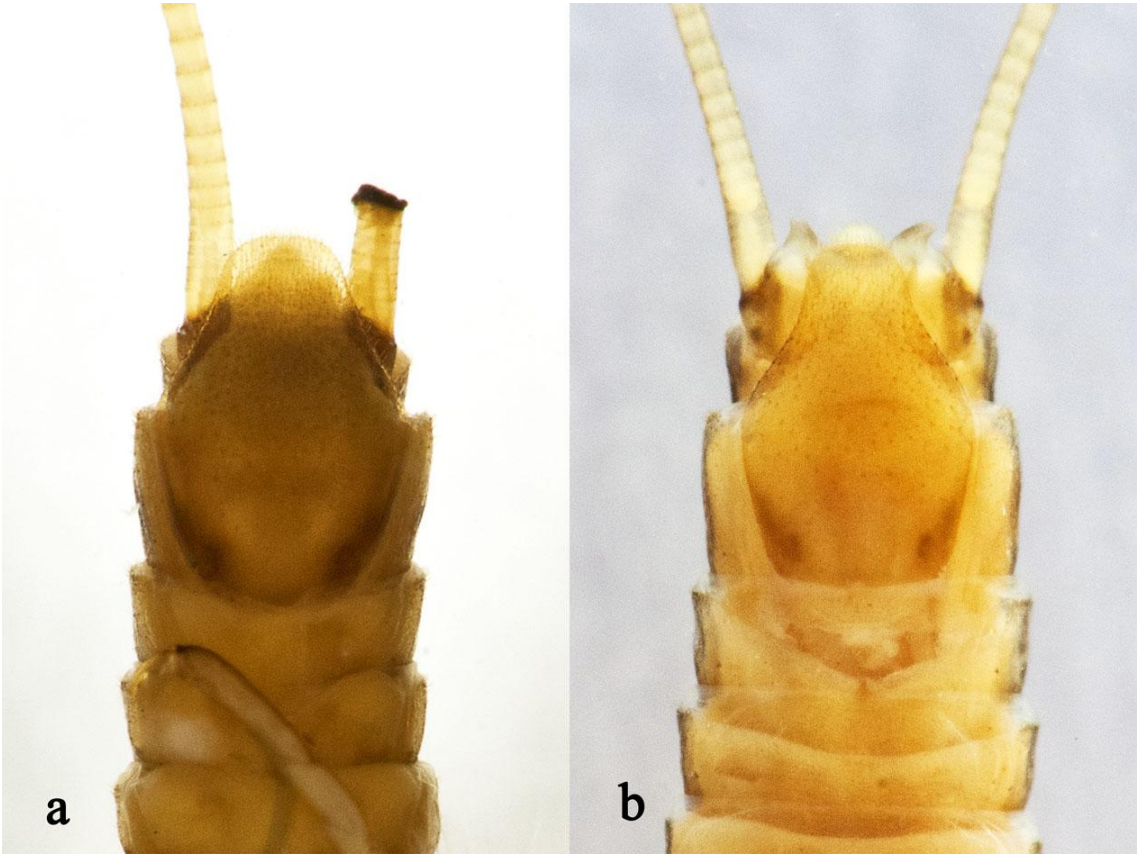

Fig. 3. Larva of *Rhabdiopteryx hamulata*: subgenital plate of female in ventral view (a), subgenital plate of male in ventral view (b): Slovakia.

Fig. 4. Larva of *Rhabdiopteryx hamulata* in its natural habitat in Slovakia.

in Slovakia by three species: *R. acuminata* Klapálek 1905, *R. navicula* Theischinger 1974 and an alpine species, *R. neglecta* (Albarda 1889). Distribution of these species is very well analyzed and documented (Krno 2004b), however, for many years the questions of occurrence of *R. harperi* Vinçon & Murányi, 2009 and *R. hamulata* have remained. The former species is still not confirmed in Slovakia, but we expect it may occur in eastern Slovakia in the Bukovské Mountains. Krno (2000) and Šporka (2003) suggested the latter species occurs in the Dunaj River basin in Slovakia, but this has not been confirmed, and its occurrence in the Danube River was considered doubtful by Ujhelyi (1975). In 2009, we found the first confirmed Slovakian records of larvae and adults of *R. hamulata* in two upland to submontane brooks in the Hron River basin in southern Slovakia (Fig. 5). Globally, this species has a disjunct population in Bulgaria (Braasch & Joost 1975), and is also known from Macedonia (Ikonomov 1986) and Hungary (Kovacs & Murányi 2008). The species is categorized as vulnerable and the Slovakian populations represent the known northern boundary of its distribution in Europe. The species occurs in the Pannonian ecoregion, but borders the Carpathian ecoregion. Larvae have a speckled appearance with spots forming a transverse row on each abdominal segment, and the subgenital plates of larvae are incised inward at the distal end of the body (Fig. 3).

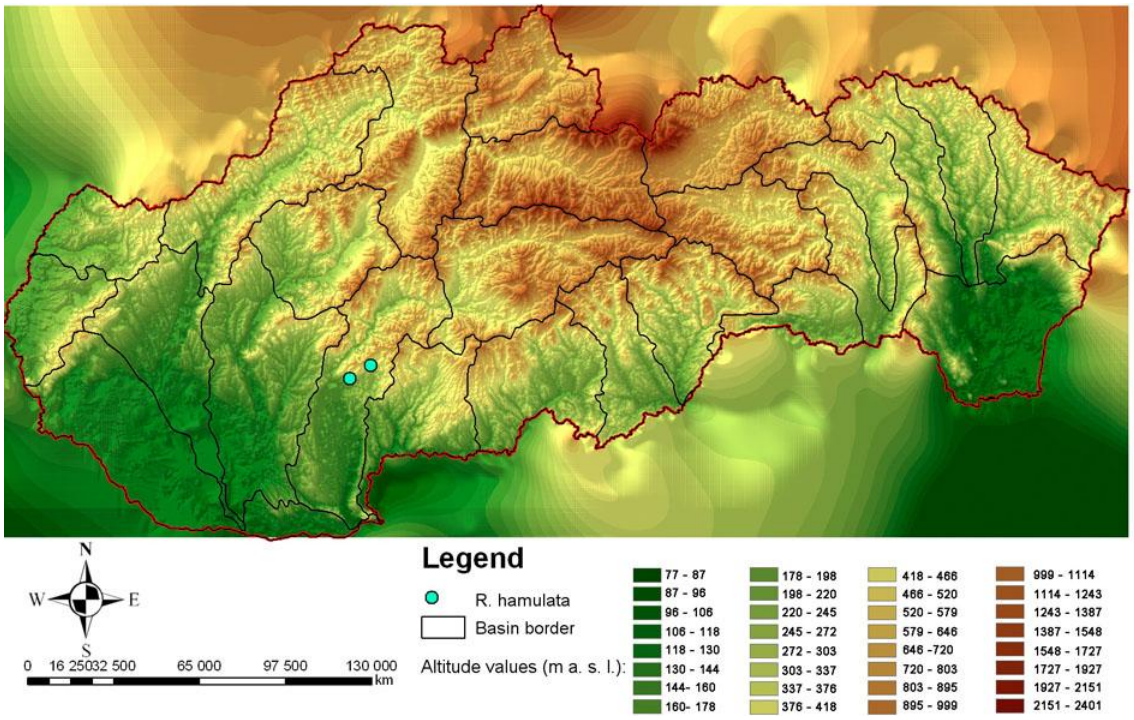

Fig. 5. Distribution of *Rhabdiopteryx hamulata* in Slovakia.

Larval specimens were abundant in Podlužianka brook, but less common in collections from Sikenica brook in the Štiavnica Mountains. These 4th order streams are characterized by neovolcanic basins, high fluctuations of flow in spring and autumn and a summer temperature maximum in excess of 20° C. Both brooks flow through Pannonic oak-hornbeam forest. In this biotope we recorded *Alnus glutinosa, Ulmus minor, Acer campestre, Fraxinus excelsior* and *Rubus fruticosus* among the floral components. Larvae were frequently associated with submerged roots with entrained leaf packs and streaming detritus. During our examination of larvae, the digestive tracts of 26 specimens were analyzed and the species

appears to be a complete detritophage. Larvae were found primarily in the meta and hyporhithral zones, as in Hungary, Bulgaria and Macedonia (Kovacs & Murányi 2008; Tyufekchieva et al. 2013). The species is known from submontane and mountain streams (Újhelyi 1975; Kovacs & Murányi 2008) from localities outside of Slovakia, but in Slovakia the species occurs in upland to submontane streams.

Material examined. Slovakia, Štiavnické vrchy Mts, Podlužianka:1. (N48°18′06.2′′ E18°37′ 32.9′′), 215m a.s.l., 11.3.2009, 25L, 1♀, 2♂, coll. I. Krno, leg. et det. M. Žiak; 2. (N48°18′14.8′′ E18°37′57.4′′), 153m a.s.l., 11.3.2009, 4L, coll. I. Krno, leg. et det. M. Žiak; Slovakia, Štiavnické vrchy Mts, Sikenica: (N48°18′14.8′′ E18°37′57.4′′), 153m a.s.l., 12.3.2009, 1L, coll. leg. et det I. Krno.

Capnopsis schilleri (Rostock 1892)

Capnopsis schilleri is the single known representative of the genus. In Slovakia, the species is rare and endangered, and it is an infrequent and protected glacial relict throughout its range in Europe (Špaček et al. 1999). During the Pleistocene the species apparently spread westward from the Caucasus and Balkans, and from there to other, mainly northern European areas (Zwick 1984). The species is most abundant in Scandinavia where it occurs in a variety of sites from springs to large rivers (Lillehammer 1988; Malmqvist 1999). In 1953, Winkler collected the first two adults in the West Tatras Mountains in the Orava River basin (Winkler 1957), and in 1998 the first two larvae were collected in the Jelešna River, Orava basin (Krno 2002). After more than 50 years we unexpectedly discovered a single female adult and seven larvae in the lower Hron River basin during the spring of 2009 and 2010 (Fig. 6). The dark brown larvae were 4-6 mm in length with dense pilosity and long slender setae surrounding the eyes. The adults are the smallest stoneflies in Slovakia. Previously, *C. schilleri* was thought to be primarily in the Carpathicum ecoregion, but our results show it exceeds the southern Carpathicum border and extends into the Pannonicum ecoregion. The species was collected in small 3rd order neovolcanic streams but older reports

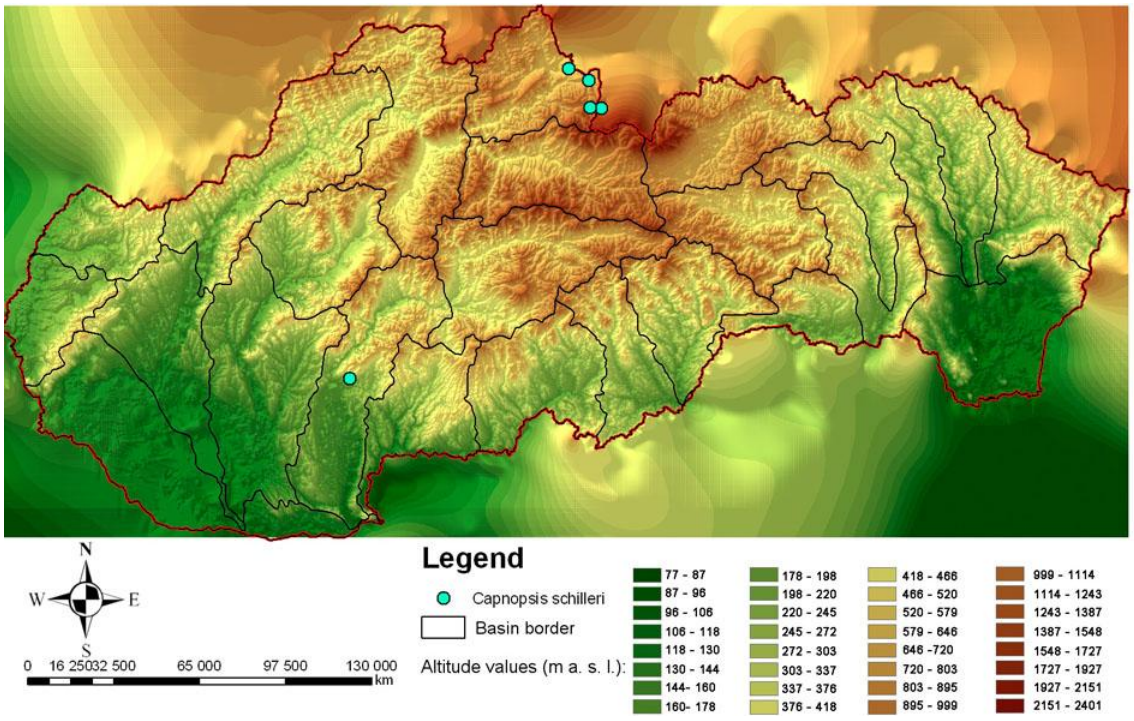

Fig. 6. Distribution of *Capnopsis schilleri* in Slovakia.

indicate the species has been collected in submontane to montane streams (Winkler 1957; Krno 2002). These data suggest the species is rhithral. Larvae have been collected with *Rhabdiopteryx hamulata, Brachyptera risi* (Morton 1896), *B. seticornis* (Klapálek 1902), *Nemoura flexuosa* Aubert 1949, *N. cinerea* (Retzius 1783), *Protonemura praecox* (Morton 1894) and *Isoperla tripartita* Illies 1954 during the spring months. Krno (2002) suggested the species distribution in Slovakia is limited by low water temperature, but our findings show the species also occurs in streams with high temperature regimes. The Podlužianka stream, had a measured summer maximum of 20°C. These observations are consistent with those of Špaček et al. (1999) and indicate the larvae of this species live in streams of different types and different abiotic factors. These factors, such as altitude, stream order, stream size, geological basin and average slope do not play an important role, although they are important in the distribution of other central European stoneflies (Soldán et al. 1998). The distribution of *C. schilleri* is thought to have been influenced by the last glaciation and during the Pleistocene it is thought to have been more widespread in Slovakia (Krno 2002) much as it presently is in Fennoscandinavia (Lillehammer 1988).
Material examined. Slovakia, Štiavnické vrchy Mts, Podlužianka:1. (N48°18′06.2′′ E18°37′ 32.9′′), 215 m a.s.l., 11.3.2009, 6L, coll. I. Krno, leg. et det. M. Žiak; 17.III.2010, 2L, 1♀coll. I. Krno, leg. et det. M. Žiak.

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