



FIRST RECORDS OF THE CADDISFLY FAUNA (INSECTA: TRICHOPTERA) FROM THE KARADAK MOUNTAINS, WESTERN BALKANS

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The caddisfly fauna of the Karadak Mountains in the border area between Kosovo and Macedonia was previously completely unknown. We collected adult caddisfly specimens occasionally, from September 2016 to June 2017, in sixteen localities in this area. During this investigation we found 18 species belonging to the following families: Limnephilidae, Rhyacophilidae, Philopotamidae, Uenoidae and Leptoceridae. The autumnal Limnephilid species *Chaetopteryx gonospina* was found in one locality only, in Dëbëlldeh village in southern Kosovo, representing the first record for Kosovo. *Rhyacophila fischeri*, Rhyacophilidae, was found in Tanushë village in northeastern Macedonia, the first record from Macedonia. This paper is a contribution to knowledge of the distribution of Trichoptera from Kosovo and Macedonia.

Keywords: Trichoptera, Kosovo, Macedonia, *Chaetopteryx gonospina*, *Rhyacophila fischeri*

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Fauna tulara planina Karadak s graničnog područja između Kosova i Makedonije bila je prethodno potpuno nepoznata. Nasumično smo prikupljali odrasle jedinke od rujna 2016. do lipnja 2017. na 16 lokaliteta na tom području. Tijekom ovog istraživanja pronašli smo 18 vrsta iz sljedećih porodica: Limnephilidae, Rhyacophilidae, Philopotamidae, Uenoidae i Leptoceridae. Jesenska vrsta iz porodice Limnephilidae, *Chaetopteryx gonospina* pronađena je samo na jednom lokalitetu, u selu Dëbëlldeh u južnom Kosovu, i to je njen prvi nalaz za Kosovo. *Rhyacophila fischeri*, porodica Rhyacophilidae, pronađena je u selu Tanushë u sjeveroistočnoj Makedoniji i to je njen prvi nalaz za Makedoniju. Ovaj rad je doprinos poznavanju rasprostranjenosti tulara na Kosovu i Makedoniji.

Ključne riječi: Trichoptera, Kosovo, Makedonija, *Chaetopteryx gonospina*, *Rhyacophila fischeri*

INTRODUCTION

According to current knowledge there are more than 15 000 species of the aquatic insect order Trichoptera worldwide (MORSE, 2017). In Europe, more than 1 100 species have

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been recorded (e.g. MALICKY, 2004; OLÁH, 2010; WIBERG-LARSEN, 2008). Within Europe, the Balkan Peninsula is one of the most important biodiversity hotspots for caddisflies with a high rate of endemism due to the geological, hydrological and climatic features of the area (e.g. PREVIŠIĆ *et al.*, 2013; SCHMIDT-KLOIBER *et al.*, 2017). However data for many areas in the Balkans are still lacking. During the past decade, this order of aquatic insects has taken more attention in studies related to taxonomy, ecology and biogeography (e.g. GRAF *et al.*, 2008; IBRAHIMI *et al.*, 2012A, b, 2013, 2014a, b; KUČINIĆ *et al.*, 2013; MALICKY, 2005; OLÁH, 2010; OLÁH *et al.*, 2011; OLÁH *et al.*, 2013a, b, c; PREVIŠIĆ *et al.*, 2014; VUČKOVIĆ *et al.*, 2011; WARINGER *et al.*, 2009; ŽIVIĆ *et al.*, 2006). Several areas in Kosovo have been intensively investigated during the past years for Trichoptera (GASHI *et al.*, 2015; IBRAHIMI *et al.*, 2012a, b, 2013, 2014a, b; OLÁH *et al.*, 2010, 2013a, b) while in Macedonia this order of aquatic insects was investigated only sporadically (OLÁH, 2010, 2011; OLÁH & KOVÁCS, 2013, 2014; RIMC-HESKA *et al.*, 2015; SLAVEVSKA-STAMENKOVIĆ *et al.*, 2016). Several new species were described recently, from both countries, such as *Annitella jabllanicensis* Oláh, 2014, *Chaetopteroidea kosovarorum* Ibrahimović & Oláh, 2013, *Drusus dardanicus* Ibrahimović, Viteček & Kučinić, 2015, *Drusus krpachi* Kučinić, Graf & Viteček, 2015, *Drusus sharrensis* Ibrahimović, Previšić & Viteček, 2015, *Potamophylax alsos* Oláh, 2014, *Potamophylax fules* Oláh & Ibrahimović 2013, *Potamophylax lemezes* Oláh & Graf, 2013, *Rhyacophila liutica* Oláh, 2010, (IBRAHIMI *et al.*, 2015a, 2016; OLÁH *et al.*, 2013a, 2013b; OLÁH & KOVÁCS, 2014; OLÁH, 2010; VITEČEK *et al.*, 2015).

The goal of this paper is to contribute to the faunistic list of caddisflies of Kosovo and Macedonia and in particular to provide the first insights into the caddisfly fauna of the Karadak Mountains, which have hitherto provided no records of caddisflies.

MATERIAL AND METHODS

Data sampling and processing

Adult caddisfly specimens were collected with entomological nets, handpicking and ultraviolet light traps. Ultraviolet light was placed above a white pan of 60 cm in diameter, filled with water and a few drops of detergent. The sampling was carried out occasionally between September 2016 and June 2017. Collected samples were preserved in 80 % ethanol. The specimens were identified under a stereomicroscope with determination keys from MALICKY (2004) and KUMANSKI (1985, 1988).

Female specimens of the genus *Hydropsyche* Pictet, 1834 were identified only up to generic level due to the difficulties in identifying the species accurately. During our investigation we found a single male specimen of the genus *Chaetopteroidea* Kumanski, 1987 most probably belonging to *Chaetopteroidea kosovarorum* described recently from Kosovo (OLÁH *et al.*, 2013b). However more specimens are needed in order to compare it with species of this genus. A single male specimen belonging to the genus *Micropterna* Stein, 1873 was found during this investigation at Station S1, which is a tributary of Morava River in Binçe village in Kosovo, and it was identified only up to the generic level. The aedeagus and parameres of this specimen are slightly damaged while all other characteristics are mostly similar to those of *Micropterna testacea* (Gmelin, 1789), and clearly different from those of *Micropterna nycterobia* McLachlan, 1875. More specimens from this locality are needed in order to identify its taxonomic status precisely.

The collection is deposited at the Laboratory of Zoology of the Faculty of Natural and Mathematics Sciences, University of Prishtina, Republic of Kosovo. Systematic presentation was done according to MORSE (2017).



Fig. 1. Map of the sampling stations in the Karadak Mountains. Detailed data are presented in Tab. 1.

Study area

Sampling was carried out in 16 localities in the Karadak Mts. (Fig. 1 and Tab. 1). This mountainous area is shared between Kosovo and Macedonia and it is known for numerous watercourses, springs, rivulets and rivers. Freshwater ecosystems of this area belong to the Black Sea Basin and the Aegean Sea Basin. Eleven of the sampling stations are located in Kosovo in the municipalities of Gjilan, Viti, Kaçanik and Hani i Elezit and five in Macedonia in the municipalities of Čučer-Sandevo and Kumanovë (Tab. 1).

The highest peaks in the Karadak Mts. are Maja e Kopilaqës (1.490m), Maja e Zezë (1.219m) and Maja Topan (1.178m). The area of the Karadak Mts. is bordered by the Sharr Mts. in the north while in the south they border with the Jakupica Mts.

Tab. 1. Locality data for the 16 sampling stations of caddisflies at the Karadak Mountains in Kosovo and Macedonia.

| Code | Sampling Stations | Latitude °N | Longitude °E | Altitude m |
|------|---|----------------|-----------------|---------------|
| S1 | Tributary of Morava River in Binçë village, Kosovo | 42.29476 | 21.37150 | 570 |
| S2 | Tributary of Morava River in Shushtë village, Kosovo | 42.28113 | 21.35911 | 573 |
| S3 | Morava River in Viti town, Kosovo | 42.30628 | 21.36202 | 520 |
| S4 | Tributary of Morava River in Letnicë village, Kosovo | 42.28727 | 21.45736 | 625 |
| S5 | Tributary of Vardar River in Brodec Village, Macedonia | 42.14192 | 21.4403 | 912 |
| S6 | Tributary of Zhegër stream in Zhegër village, Kosovo | 42.31572 | 21.53148 | 640 |
| S7 | River in Dëbëlldeh village, Kosovo | 42.25454 | 21.40008 | 982 |
| S8 | Llapushnicë River in Pogradjë village, Kosovo | 42.42533 | 21.55426 | 483 |
| S9 | Lugu i Kopilaqës streamlet in Dëbëlldeh village, Kosovo | 42.24605 | 21.43110 | 1160 |
| S10 | Streamlet before Brodec village, Macedonia | 42.130803 | 21.429318 | 652 |
| S11 | Morava River in Korbliq village, Kosovo | 42.229795 | 21.336078 | 730 |
| S12 | Zhegër stream in Stanqiq village, Kosovo | 42.25506 | 21.55029 | 836 |
| S13 | Stream in Dërmjak village, Kosovo | 42.17264 | 21.31582 | 625 |
| S14 | Stream above Brodec village, Macedonia | 42.160165 | 21.448974 | 1350 |
| S15 | Streamlet before Tanushë village, Macedonia | 42.23356 | 21.42733 | 1358 |
| S16 | Stream in Tabanovc village, Macedonia | 42.219713 | 21.697831 | 380 |

RESULTS

During this investigation we found 18 species belonging to 5 families and 13 genera of Trichoptera. The distribution of species within families is as follows: Limnephilidae (10), Rhyacophilidae (4), Philopotamidae (2), Uenoidae (1) and Leptoceridae (1).

The highest number of specimens comes from three species of the Rhyacophilidae family: *Rhyacophila fasciata* Hagen, 1859 (39 specimens), *R. fischeri* Botosaneanu 1957 (14 specimens) and *R. obliterata* McLachlan, 1863 (12 specimens) while all other species were collected with fewer than ten specimens. The following five species were found with one specimen only each during the whole investigation period: *Chaetopteryx bosniaca* Marinkovic-Gospodnetic, 1959, *Chaetopteryx gonospina* Marinkovic-Gospodnetic, 1966, *Drusus botosaneanui* Kumanski, 1968, *Micropterna* sp., *Mystacides azurea* (Linnaeus, 1761) and *Stenophylax meridiorientalis* Malicky, 1982. Three species (*Halesus digitatus* (Schrank, 1781), *Rhyacophila fasciata* and *R. obliterata*) were the most widespread and were collected at five localities each, while the rest of the species were found in fewer localities. Nine species were recorded in only one locality each (*Chaetopteryx bosniaca*, *Chaetopteryx gonospina*, *Drusus botosaneanui*, *Micropterna* sp., *Mystacides azurea*, *Potamophylax pallidus* (Klapalek, 1899), *Rhyacophila nubila* Zetterstedt, 1840, *Stenophylax meridiorientalis* and *Thremma anomalum* McLachlan, 1876).

Systematic list of caddisflies collected at sixteen stations in the Karadak Mountains (Kosovo and Macedonia) during the period September 2016 – June 2017. Details about sampling stations are given in Tab. 1.

Family Rhyacophilidae*Rhyacophila fischeri* Botosaneanu 1957

S5 Tributary of Vardar River in Brodec Village, Macedonia: 23.06.2017. 2 ♂♂, 2 ♀♀; S14 Stream above Brodec village, Macedonia: 23.06.2017. 1 ♂; S15 Streamlet before Tanushë village, Macedonia: 03.06.2017. 2 ♀♀; 04.06.2017. 3 ♂♂, 1 ♀; 23.06.2017. 3 ♂♂.

Rhyacophila obliterated McLachlan, 1863

S1 Tributary of Morava River in Binçë village, Kosovo: 27.11.2016. 1 ♂. S9 Lugu i Kopilaqës streamlet in Dëbelldeh village, Kosovo: 27.11.2016. 2 ♂♂. S4 Tributary of Morava River in Letnicë village, Kosovo: 04.11.2016. 3 ♂♂. S11 Morava River in Korbliq village, Kosovo: 30.10.2016. 3 ♂♂. S14 Stream in Dërmjak village, Kosovo: 02.10.2016. 1 ♂ 2 ♀♀.

Rhyacophila fasciata Hagen, 1859

S2 Tributary of Morava River in Shushtë village, Kosovo: 30.10.2016. 1 ♀. S3 Morava River in Viti town, Kosovo: 30.10.2016. 13 ♂♂; 02.10.2016. 6 ♂♂ 3 ♀♀. S4 Tributary of Morava River in Letnicë village, Kosovo: 9 ♂♂ 2 ♀♀. S9 Lugu i Kopilaqës streamlet in Dëbelldeh village, Kosovo: 27.11.2016. 4 ♂♂. S12 Zhegër stream in Stanqiq village, Kosovo: 09.10.2016. 1 ♂.

Rhyacophila nubila Zetterstedt, 1840

S11 Morava River in Korbliq village, Kosovo: 30.10.2016. 2 ♂♂.

Family Philopotamidae*Philopotamus montanus* (Donovan, 1813)

S5 Tributary of Vardar River in Brodec Village, Macedonia: 25.09.2016. 5 ♂♂ 1 ♀. S13 Stream in Dërmjak village, Kosovo: 02.10.2016. 2 ♂♂. S15 Streamlet before Tanushë village, Macedonia: 25.09.2016. 1 ♂.

Wormaldia occipitalis (Pictet, 1834)

S12 Zhegër stream in Stanqiq village, Kosovo: 09.10.2016. 1 ♂. S15 Streamlet before Tanushë village, Macedonia: 25.09.2016. 1 ♂. S14 Stream above Brodec village, Macedonia: 25.09.2016. 4 ♂♂ 2 ♀♀.

Family Limnephilidae*Micropterna nycterobia* McLachlan, 1875

S1 Tributary of Morava River in Binçë village, Kosovo: 27.11.2016. 2 ♂♂. S7 River in Dëbelldeh village, Kosovo: 27.11.2016. 2 ♂♂. S9 Lugu i Kopilaqës streamlet in Dëbelldeh village, Kosovo: 27.11.2016. 1 ♂.

Micropterna sp.

S1 Tributary of Morava River in Binçë village, Kosovo: 27.11.2016. 1 ♂

Limnephilus lunatus Curtis, 1834

S2 Tributary of Morava River in Shushtë village, Kosovo: 30.10.2016. 1 ♀. S4 Tributary of Morava River in Letnicë village, Kosovo: 04.11.2016. 1 ♀.

Stenophylax meridionalis Malicky, 1982

S1 Tributary of Morava River in Binçë village, Kosovo: 27.11.2016. 1 ♂.

Halesus digitatus (Schrank, 1781)

S1 Tributary of Morava River in Binçë village, Kosovo: 27.11.2016. 1 ♂. S3 Morava River in Viti town, Kosovo: 30.10.2016. 1 ♂. S6 Tributary of Zhegër stream in Zhegër village, Kosovo: 30.10.2016. 3 ♂♂. S8 Llapushnicë River in Pogradjë village, Kosovo: 27.11.2016. 1 ♂. S11 Morava River in Korbliq village, Kosovo: 30.10.2016. 1 ♂.

Potamophylax pallidus (Klapálek, 1899)

S5 Tributary of Vardar River in Brodec Village, Macedonia: 25.09.2016. 2 ♀♀.

Drusus botosaneanui Kumanski, 1968

S10 Streamlet before Brodec village, Macedonia: 25.09.2016. 1 ♂.

Chaetopteroidea sp.

S15 Streamlet before Tanushë village, Macedonia: 21.09.2016 1 ♀; 25.09.2016 2 ♀♀. S9 Lugu i Kopilaqës streamlet in Dëbelldeh village, Kosovo: 27.11.2016. 1 ♂.

Chaetopteryx bosniaca Marinkovic-Gospodnetic, 1959

S9 Lugu i Kopilaqës streamlet in Dëbelldeh village, Kosovo: 27.11.2016. 1 ♂ 1 ♀.

Chaetopteryx gonospina Marinkovic-Gospodnetic, 1966

S7 River in Dëbelldeh village, Kosovo: 27.11.2016. 1 ♂.

Family Uenoidae

Thremma anomalum McLachlan, 1876

S14 Stream above Brodec village, Macedonia: 25.09.2016. 3 ♂♂.

Family Leptoceridae

Mystacides azurea (Linnaeus, 1761)

S16 Stream in Tabanovc village, Macedonia: 21.09.2016. 1 ♂.

DISCUSSION

During this investigation we found two species which are quite rare in the Balkan Peninsula: *Chaetopteryx gonospina* and *Rhyacophila fischeri*.

Chaetopteryx gonospina was described from Bosnia and Herzegovina and is reported for the first time from Kosovo. It was found at Station S7 in Dëbelldeh village close to the border with Macedonia. This species has a disjunct distribution and is currently known only from Ecoregions 2 and 5 according to Illies (ILLIES, 1978), i.e. from the Iberian Peninsula, Croatia, Bosnia and Herzegovina and recently Montenegro (GONZÁLEZ & MARTÍNEZ, 2011; KUČINIĆ *et al.*, 2013; MALICKY, 2017; OLÁH & KOVÁCS, 2012). Our finding in Kosovo is the first record for Ecoregion 6. Like other species of the genus *Chaetopteryx* Stephens, 1837, this species is also associated with the upper courses of small streams. *Chaetopteryx gonospina* was previously found at different altitudes, from 500 m a.s.l. up to the alpine area. During our investigation it was found at 982 m a.s.l. Very close to the locality where *C. gonospina* was found, we sampled another species of the genus *Chaetopteryx*, *Chaetopteryx bosniaca*. This species is also rare in Kosovo and is known from 5 localities at different altitudes (IBRAHIMI *et al.*, 2012a, 2014a, 2015a, b). This is the first time that two species of the genus *Chaetopteryx* are recorded at such

close proximity in Kosovo. One male and one female specimen belonging to the genus *Chaetopteroidea* were also collected in the same area but at the Macedonian side of the Karadak Mts. Species of these two genera prefer spring areas or the upper reaches of small to medium streams, without pollution, which are well shaded by riparian and nearby vegetation.

Rhyacophila fischeri was originally described from Romania and is currently known from Ecoregions 5, 7 and 10 (GRAF *et al.*, 2008). During this investigation we report it for the first time from Ecoregion 6; it is also the first record for the Republic of Macedonia based on reliable adult specimens. Although reported from Fauna Europaea as present in Macedonia, we could not trace any record in published literature about caddisflies of Macedonia based on adult specimens. This species is reported from a variety of altitudes, from 500 m up to 1900 m a.s.l. and is mainly associated with upper reaches of mountainous streams (GRAF *et al.*, 2008). During our investigation we found it in three localities: S5, S14 and S15 in altitudes from 950 m up to 1358 m a.s.l.. All localities are situated in beech forests. In Kosovo more than 10 localities of this species are currently known (IBRAHIMI *et al.*, 2012b).

This investigation contributes to the knowledge on the faunistics and distribution of several other rare, endangered and endemic species such as: *Chaetopteryx bosniaca*, *Drusus botosaneanui*, *Rhyacophila nubila*, *R. obliterated*, and *Stenophylax meridionalis*. Based on our preliminary results, the Karadak Mts. are home to an interesting caddisfly community. This investigation adds to the distributional patterns and ecological information regarding caddisflies of a rarely studied area in the Balkans, namely Kosovo and Macedonia (e.g. IBRAHIMI *et al.*, 2012a, b, 2014a, b; RIMCHESKA *et al.*, 2015; SLAVEVSKA-STAMENKOVIĆ *et al.*, 2016).

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SUMMARY

First records of the caddisfly fauna (Insecta: Trichoptera) from the Karadak Mountains, Western Balkans

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In this study we present the first data about the caddisflies of the Karadak Mountains (Kosovo and Macedonia). Caddisfly specimens were collected from September 2016 to June 2017 at sixteen localities. In total, 18 species belonging to five families were found. During this investigation we found two new records for the caddisfly fauna, one for Kosovo and one for Macedonia. *Chaetopteryx gonospina* is recorded for the first time from Kosovo and *Rhyacophila fischeri* is recorded for the first time from Macedonia. Several other species found during this investigation are rare, with a limited distribution in the Balkan Peninsula.

This investigation contributes to the knowledge on the distribution of caddisflies in Kosovo and Macedonia and highlights the Karadak Mountains as an important hotspot of caddisfly diversity, which was almost completely unknown until now.

