

CONTRIBUTION TO THE KNOWLEDGE OF THE CADDISFLY FAUNA (INSECTA: TRICHOPTERA) OF LEQINAT LAKES AND ADJACENT STREAMS IN BJESHKËT E NEMUNA (KOSOVO)

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Adult caddisflies were collected with entomological nets and ultraviolet light traps during August and September 2018 in Leqinat Lake, Drelaj Lake and five adjacent streams in Bjeshkët e Nemuna in Kosovo. Within the current study we found three first records for the caddisfly fauna of Kosovo: *Limnephilus flavospinosus*, *Limnephilus flavicornis* and *Oligotricha striata*. The genus *Oligotricha* is reported for the first time from Kosovo. We also found few rare species which have been reported only from few localities in the Balkan Peninsula such as: *Plectrocnemia mojkovacensis*, *Rhyacophila balcanica* and *Drusus tenellus*.

Key words: aquatic insects, rare species, first records, Balkans, *Oligotricha*

Ibrahimi, H., Grapci-Kotori, L., Bilalli, A., Qamili, A. & Schabetsberger, R.: Doprinos poznavanju faune tulara (Insecta: Trichoptera) jezera Leqinat i obližnjih potoka na području Bjeshkët e Nemuna (Kosovo). *Nat. Croat. Vol. 28, No. 1, 35-44, Zagreb, 2019.*

Odrasli tulari prikupljani su pomoću entomološke mrežice i UV svjetlosnih zamki tijekom kolovoza i rujna 2018. na jezerima Leqinat i Drelaj te pet obližnjih potoka, na području Bjeshkët e Nemuna na Kosovu. Tijekom istraživanja zabilježili smo tri prva nalaza za faunu tulara Kosova: *Limnephilus flavospinosus*, *Limnephilus flavicornis* i *Oligotricha striata*. Po prvi puta za Kosovo je zabilježen rod *Oligotricha*. Također smo našli neke rijetke vrste zabilježenih na samo nekoliko lokaliteta na Balkanu, npr.: *Plectrocnemia mojkovacensis*, *Rhyacophila balcanica* i *Drusus tenellus*.

Ključne riječi: vodeni kukci, rijetke vrste, prvi nalazi, Balkan, *Oligotricha*

INTRODUCTION

Freshwater ecosystems of high altitude areas in Kosovo still remain insufficiently investigated in terms of aquatic insects and especially caddisflies, although several records are reported during the last years from these areas (e.g. GASHI *et al.*, 2015; IBRAHIMI *et al.*, 2012a, 2012b, 2013, 2014a, 2014b, 2015; OLÁH, 2010; OLÁH *et al.*, 2013a, 2013b).

One of such areas are the mountains in the southeastern part of Dinarides, Bjeshkët e Nemuna, comprising an area of about 3600 km² and stretching in the

transboundary area of Kosovo, Albania and Montenegro. This area has wide range of elevations up to 2694 m and a great diversity of habitats, including many high altitude lakes, springs and streams, forested and pasture areas, offering favorable and diverse conditions for aquatic insects. A part of this area is legally protected as national park, both in Kosovo and Montenegro.

The caddisfly fauna of the Bjeshkët e Nemuna Mountains is still poorly known. The earliest known records of caddisflies from this area are summarized by PONGRACZ (1923) based on material collected by Hungarian entomologist Erno Csiki. Unfortunately, this material was destroyed in the fire which occurred in the Hungarian Natural History Museum in Budapest during the 1950ies. Many records given in that study are dubious considering current knowledge on distribution of caddisflies in the Balkan Peninsula. However, this study remains important in terms of being the first study on caddisflies of Kosovo and adjacent countries, including data about other aquatic insect orders as well. Few other records of caddisflies of Bjeshkët e Nemuna are further provided by MARINKOVIĆ GOSPODNETIĆ (1975, 1980) and MALICKY (1986) who described a new species from this area, *Ernodes skipetarum* Malicky, 1986.

The goal of this paper is to contribute to the knowledge of the caddisfly fauna of the Bjeshkët e Nemuna Mountains, more precisely from Leqinat lakes and adjacent streams and rivers.

MATERIAL AND METHODS

Study area

Sampling was carried out at seven localities in the Bjeshkët e Nemuna Mountains (Fig. 1). The first sampling station was located at the Leqinat Lake, inside the national park area, in western Kosovo nearby the Kuqishte village, and shared between Kosovo and Montenegro. The second sampling station was located at the Drelaj Lake, only few kilometers far away from the first lake. This lake almost always dries during the summer. Both lakes are sometimes referred as Leqinat lakes. The other sampling stations were located in the nearby streams in Bjeshkët e Nemuna (Tab. 1).

Tab. 1. Locality data for the seven sampling stations of caddisflies at the Bjeshkët e Nemuna Mountains, Kosovo.

Code	Sampling Stations	Latitude °N	Longitude °E	Altitude m
S1	Leqinat Lake	42.668608	20.090833	1861
S2	Drelaj Lake	42.667651	20.099384	1800
S3	Restaurant "Te Liqeni"	42.681374	20.082918	1500
S4	Kuqishte	42.688568	20.079524	1220
S5	Çakorr	42.686841	20.065488	1242
S6	Haxhaj	42.708348	20.042476	1254
S7	Boge	42.763243	20.057842	1598

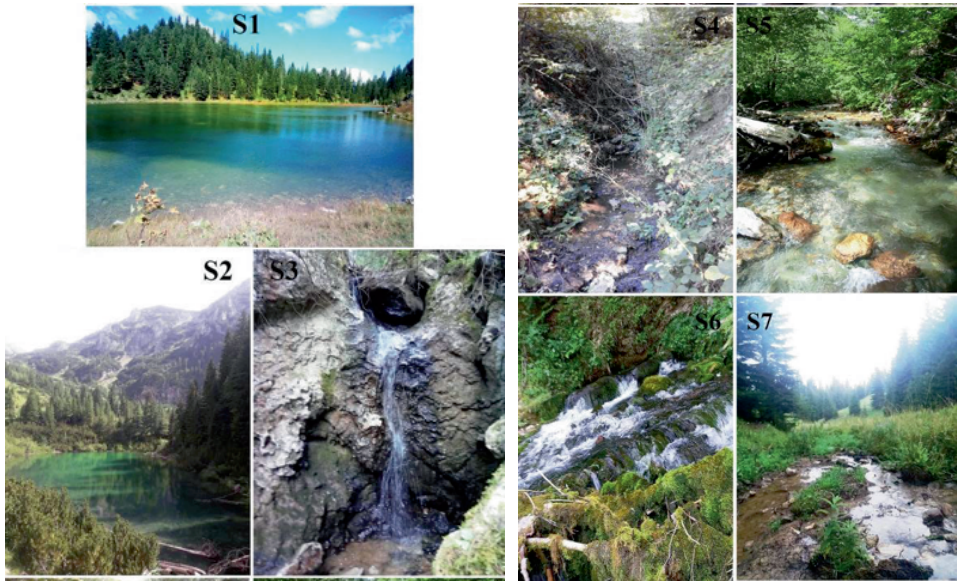


Fig. 1. Seven sampling stations of caddisflies in Bjeshkët e Nemuna: S1 Leqinat, S2 Drelaj, S3 Restaurant "Te Liqeni", S4 Kuqishte, S5 Çakorr, S6 Haxhaj and S7 Boge.

Data sampling and processing

Adult caddisfly specimens were collected during August and September 2018. Different sampling efforts have been applied for different stations with most of the sampling carried out during the August. Sampling was conducted using entomological nets during the day and UV pyramid type light traps during the night. The pyramid light traps were placed on stream banks and operated for one hour and fifteen minutes immediately after the dusk. Collected samples were preserved in 80 % ethanol. The specimens were identified with a stereomicroscope using identification keys of MALICKY (2004) and KUMANSKI (1985, 1988).

All specimens were identified to the species level with the exception of females of two genera (*Hydropsyche* Pictet, 1834 and *Tinodes* Leach, 1815) which were identified only to the generic level. The collection is deposited at the Laboratory of Zoology of the Faculty of Mathematics and Natural Sciences, University of Prishtina, Republic of Kosovo. Systematic classification follows MORSE (2019).

For estimation of similarity and differences of caddisfly composition among the sampling stations, the NMDS analysis was used. Similarity among the sampling stations was determined using the Bray-Curtis similarity index (BRAY & CURTIS, 1957) through the PRIMER 6 software package (CLARKE & WARWICK, 2001).

RESULTS

During this investigation we found 27 species belonging to 18 genera and 12 families of Trichoptera. The distribution of species within families was as follows: Limnephilidae (13), Rhyacophilidae (3), Phrygaenidae (2), Glossosomatidae (1),

Philopotamidae (1), Hydropsychidae (1), Polycentropodidae (1), Psychomyiidae (1), Uenoidae (1), Goeridae (1), Lepidostomatidae (1) and Sericostomatidae (1).

The following species were collected in high numbers of specimens: *Drusus tenellus* (Klapalek, 1898) (121 specimens), *Rhyacophila loxias* Schmid, 1970 (46 specimens), *Plectrocnemia mojkovacensis* Malicky, 1982 (25 specimens), *Rhyacophila balcanica* Radovanovič, 1953 (22 specimens) and *Agrypnia varia* (Fabricius, 1793) (14 specimens). All other species were found with less than 10 specimens. The following taxa were found with single specimen each: *Tinodes* sp., *Limnephilus flavicornis* (Fabricius, 1787), *Limnephilus stigma* Curtis, 1834, *Thremma anomalum* McLachlan, 1876, *Lepidostoma basale* (Kolenati, 1848) and *Oligotricha striata* (Linnaeus, 1758).

Non-metric multidimensional scaling (NMDS) analysis (Fig. 2) revealed similarities and differences in the caddisfly fauna composition between the study sites: sampling stations S4 and S5 are clustered together with the highest similarity and then altogether with stations S6 and S7. The remaining three sampling stations (S1, S2 and S3) are singled out as the most dissimilar stations based on their caddisfly fauna.

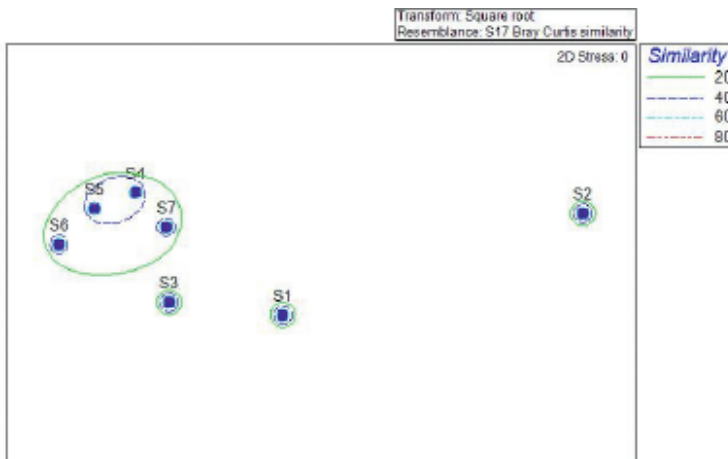


Fig. 2. NMDS analysis of the seven sampling stations based on the caddisfly fauna composition. Abbreviations of the sampling sites are given in Tab. 1.

Systematic list of caddisflies collected at seven sampling stations in the Bjeshkët e Nemuna Mountains during August and September 2018. Details about sampling stations are given in Tab. 1. Species new for the caddisfly fauna of Kosovo are indicated with an asterisk.

Family Rhyacophilidae Stephens, 1836
Genus: *Rhyacophila* Pictet, 1834

Rhyacophila balcanica Radovanovič, 1953

S6 Haxhaj: 03.08.2018. 13 ♂♂ 9 ♀♀.

Rhyacophila loxias Schmid, 1970

S7 Boge: 01.08.2018. 4 ♂♂; S4 Kuqishte: 05.08.2018. 15 ♂♂ 9 ♀♀; S5 Çakorr: 05.08.2018. 6 ♂♂ 5 ♀♀; S6 Haxhaj: 03.08.2018. 4 ♂♂ 3 ♀♀.

Rhyacophila polonica McLachlan 1879

S4 Kuqishte: 05.08.2018. 5 ♂♂.

Family Glossosomatidae Wallengren, 1891

Genus: *Glossosoma* Curtis, 1834

Glossosoma conformis Neboiss, 1963

S5 Çakorr: 05.08.2018. 2 ♂♂.

Family Philopotamidae

Genus: *Wormaldia* McLachlan, 1865

Wormaldia occipitalis (Pictet, 1834)

S7 Boge: 01.08.2018. 3 ♂♂.

Family Hydropsychidae

Genus: *Hydropsyche* Pictet, 1834

Hydropsyche spp. females

S7 Boge: 01.08.2018. 2 ♀♀; S4 Kuqishte: 05.08.2018. 2 ♀♀; S3 Restaurant "Te Liqeni": 07.08.2018. 1 ♀; S6 Haxhaj: 03.08.2018. 3 ♀♀.

Family Polycentropodidae Ulmer, 1903

Genus: *Plectrocnemia* Stephens, 1836

Plectrocnemia mojkovacensis Malicky, 1982

S4 Kuqishte: 05.08.2018. 10 ♂♂ 3 ♀♀; S5 Çakorr: 05.08.2018. 4 ♂♂ 8 ♀♀.

Family Psychomyiidae

Genus: *Tinodes* Curtis, 1834

Tinodes sp. female

S7 Boge: 01.08.2018. 1 ♀.

Family Limnephilidae

Genus: *Allogamus*, Schmid, 1955

Allogamus uncatatus (Brauer, 1857)

S2 Drelaj lake: 04.08.2018. 1 ♂, 26.09.2018. 3 ♂♂.

Genus: *Drusus* Stephens, 1837

Drusus tenellus (Klapalek, 1898)

S5 Çakorr: 05.08.2018. 10 ♂♂ 10 ♀♀; S4 Haxhaj: 03.08.2018. 52 ♂♂ 49 ♀♀.

Genus: *Potamophylax* Wallengren, 1891

Potamophylax cingulatus (Stephens, 1837)

S7 Boge: 01.08.2018. 2 ♀♀; S4 Kuqishte: 05.08.2018. 2 ♀♀; S3 Restaurant "Te Liqeni": 07.08.2018. 3 ♀♀; S5 Çakorr: 05.08.2018. 1 ♀.

Potamophylax goulandrionum Malicky, 1974

S7 Boge: 01.08.2018. 1 ♂ 1 ♀; S4 Kuqishte: 05.08.2018. 1 ♀; S5 Çakorr: 05.08.2018. 3 ♂♂.

Potamophylax pallidus (Klapalek, 1899)

S7 Boge: 01.08.2018. 1 ♂ 1 ♀.

Genus: *Micropterna* Stein, 1874

Micropterna sequax McLachlan, 1875

S7 Boge: 01.08.2018. 1 ♂ 1 ♀.

Genus: *Limnephilus* Leach, 1815

Limnephilus bipunctatus Curtis, 1834

S2 Drelaj lake: 04.08.2018. 2 ♂♂ 6 ♀♀.

Limnephilus centralis Curtis, 1834

S1 Leqinat lake: 04.08.2018. 1 ♂ 4 ♀♀.

Limnephilus flavospinosus (Stein, 1874)*

S1 Leqinat lake: 04.08.2018. 1 ♂ 2 ♀♀.

Limnephilus flavicornis (Fabricius, 1787)*

S7 Boge: 01.08.2018. 1 ♂.

Limnephilus stigma Curtis, 1834

S1 Leqinat lake: 04.08.2018. 1 ♀.

Limnephilus sparsus Curtis, 1834

S7 Boge: 01.08.2018. 1 ♀; S1 Leqinat lake: 04.08.2018. 3 ♂♂.

Genus: *Stenophylax* Kolenati, 1848

Stenophylax meridiorientalis Malicky, 1982

S3 Restaurant "Te Liqeni": 07.08.2018. 1 ♂ 1 ♀.

Family Uenoidae

Genus: *Thremma* McLachlan, 1876

Thremma anomalum McLachlan, 1876

S7 Boge: 01.08.2018. 1 ♂.

Family Goeridae Ulmer, 1903

Genus: *Silo* Curtis, 1830

Silo pallipes Fabricius, 1781.

S4 Kuqishte: 05.08.2018. 5 ♂♂.

Family Lepidostomatidae Ulmer, 1903

Genus: *Lepidostoma* Rambur, 1842

Lepidostoma basale (Kolenati, 1848)

S5 Çakorr: 05.08.2018. 1 ♂.

Family Sericostomatidae Stephens, 1876

Genus: *Oecismus* McLachlan, 1876

Oecismus monedula (Hagen, 1859)

S4 Kuqishte: 05.08.2018. 2 ♂♂.

Family Phryganeidae Leach, 1815

Genus: *Agrypnia* Curtis, 1835

Agrypnia varia (Fabricius, 1793)

S3 Restaurant "Te Liqeni": 07.08.2018. 1 ♀; S1 Leqinat Lake: 04.08.2015. 5 ♂♂ 8 ♀♀.

Genus: *Oligotricha* Rambur, 1842*Oligotricha striata* (Linnaeus, 1758)*

S1 Leqinat Lake: 04.08.2015. 1 ♀.

DISCUSSION

Within the current study we found three first records for the caddisfly fauna of Kosovo: *Limnephilus flavospinosus*, *Limnephilus flavicornis* and *Oligotricha striata*. *Limnephilus flavospinosus* is mostly distributed in Central, Southern and South-eastern Europe, but records from the Balkan Peninsula are still very few. It has not been recorded yet from neighboring countries of Kosovo such as Albania, Serbia and Macedonia (MALICKY, 2019). *Limnephilus flavicornis* is a widespread species in Europe, which is up to now known only from some areas in western Balkans (e.g. KUČINIĆ *et al.*, 2017; OLÁH & BESHKOV, 2016; PREVIŠIĆ *et al.*, 2014). It has not been recorded from Macedonia and Albania yet (MALICKY, 2019). According to GRAF *et al.* (2019) both species are typical for planar and collin areas, and at a lesser degree submontane areas. However, during this study we found them at considerably higher altitudes. *Limnephilus flavicornis* was found at 1598 m asl and *L. flavospinosus* at 1861 m asl. During the past years there are several records of these two species from the Balkan Peninsula at altitudes above submontane area. For example, *Limnephilus flavicornis* has been found in Zlatibor Mountain in Serbia few years ago at an altitude of 1160 m (OLÁH & KOVACS, 2013), and also in mountain ranges between Kosovo and Macedonia up to 1400 m asl (Bilalli, unpublished results). To the best of our knowledge, our finding during this study is the highest altitude where this species is registered. Within this study adults of this species (but larvae as well) were observed within the epirhithral and hypocrenal zones of the Boge stream, unlike data from the other parts of Europe where the species was only found in epipotamal, metapotamal and littoral zones (GRAF *et al.* 2019). Similarly, *Limnephilus flavospinosus* was found in the Pirin Mountains in Bulgaria at 1928 m asl (OLÁH & BESHKOV, 2016), which is approximately the same altitude we have found it during this study. It is apparent that both species inhabit altitudes higher than submontane area as well, at least in the Balkan Peninsula where ecological and habitat preferences of both species are not very well studied.

The genus *Oligotricha* is recorded for the first time from Kosovo. It is a small genus with only two known European species. A single female specimen of *Oligotricha striata* was found at the Leqinat Lake. It has been recorded from most of European countries, including neighboring countries of Kosovo, except Macedonia and Albania (MALICKY, 2019). *Oligotricha striata* has been found at the Leqinat Lake together with the other species of the Phryganeidae, *Agrypnia varia*, which is also rare in the Balkan Peninsula and has not yet been recorded from Albania and Serbia (MALICKY, 2019). This is the second finding of *A. varia* from Kosovo. Previously it has been found in the Ibër River, nearby Mitrovicë (IBRAHIMI *et al.*, 2012). Both species are typical for littoral zones (GRAF *et al.*, 2019) and were found during this investigation nearby similar habitats, which are lakes and stream shorelines.

This study contributes to the knowledge on the faunistics and distribution of several other rare species such as: *Plectrocnemia mojkovacensis*, *Rhyacophila balcanica* and *Drusus tenellus*. *Plectrocnemia mojkovacensis*, a rare endemic species of the Balkan Peninsula, was recorded for the second time from Kosovo. Both known localities of this species in Kosovo are in Bjeshkët e Nemuna (IBRAHIMI et al., 2015). Beside Kosovo, the species is only known from few localities in Montenegro and Greece (MALICKY, 2005, 2019). *Drusus tenellus*, which was the most abundant species during this study, is also found for the second time in Kosovo and is found only in few localities in the Balkan Peninsula (NEU et al., 2018). Another Balkan endemic found during this study, *Rhyacophila balcanica*, occurs frequently in mountainous streams and rivers in the Sharr Mountains and Bjeshkët e Nemuna Mountains in Kosovo (IBRAHIMI et al., 2014). The remaining species collected during this investigation are found frequently in the Balkan Peninsula, including Kosovo.

The NMDS analysis singled out both lakes from all other stations, due to the different habitat conditions and consequently caddisfly composition. The reason why both lakes (S1 and S2) are not grouped together, based on these preliminary results, is probably due to the fact that Drelaj Lake is a temporary lake while Leqinat Lake is permanent. In addition to this, Drelaj Lake is located just nearby a permanent stream. This causes different caddisfly composition in both lakes. Sampling station S3 is also separated from all other stations, most probably due to the different conditions at this site. The size of the stream where this station is located is considerably smaller, compared to all other sites and unlike these sites, an important part of the substrate is composed by fallen leaves and tree branches. The impact of pollution from nearby hotels is probably one of the reasons as well, considering the small size of the stream and the nearest vicinity to the inhabited areas amongst the sampling stations.

This study contributes to the knowledge of the caddisfly fauna of the Bjeshkët e Nemuna Mountains in Kosovo. However, this mountain area still remains incompletely investigated in all three countries where it stretches. Therefore, new records can be expected.

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SUMMARY

Contribution to the knowledge of the caddisfly fauna (Insecta: Trichoptera) of Leqinat lakes and adjacent streams in Bjeshkët e Nemuna (Kosovo)

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In this study we present data about the caddisflies of the Leqinat lakes and adjacent streams in Bjeshkët e Nemuna (Kosovo), based on material collected during August and September 2018. In total, 27 species belonging to 12 families were found. During this study we found three first records for the caddisfly fauna of Kosovo: *Limnephilus flavospinosus*, *Limnephilus flavicornis* and *Oligotricha striata*. The genus *Oligotricha* is recorded for the first time from Kosovo. The finding of three other rare species (*Plectrocnemia mojkovacensis*, *Rhyacophila balcanica* and *Drusus tenellus*) contributes to the expansion of their known distribution. Remaining species found during this investigation are recorded frequently in the Balkan Peninsula, including Kosovo.

This study contributes to the knowledge of the caddisfly fauna of Bjeshkët e Nemuna which still remains incompletely investigated in all three countries where it stretches. New records can be expected from this area.