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**Article**

# Expanding the range: First record and redescription of the male of *Limnephilus petri* Marinković Gospodnetić, 1966 in R. North Macedonia

JELENA HINIĆ-JORDANOVSKA[1], VALENTINA SLAVEVSKA-STAMENKOVIĆ[1], HALIL IBRAHIMI[2], MLADEN KUČINIĆ[3], ASTRIT BILALLI[4], MAJA JORDANOVA[1] & AJTEN RUSHITI-DAUTI[5]

[1] *Institute of Biology, Faculty of Natural Sciences and Mathematics, "Ss. Cyril and Methodius University in Skopje" Arhimedova 3, 1000 Skopje, Republic of North Macedonia.*
*E-mails: jelenahinikj@gmail.com; vale@pmf.ukim.mk; majaj@pmf.ukim.mk*
*https://orcid.org/0000-0002-6194-614; https://orcid.org/0000-0001-9031-5249;*
*https://orcid.org/0000-0002-6272-0738*
[2] *Department of Biology, Faculty of Mathematical and Natural Sciences, University of Prishtina, Mother Theresa Street p.n.,10000 Prishtina, Republic of Kosovo.*
*E-mail: halil.ibrahimi@uni-pr.edu; https://orcid.org/0000-0002-4301-4387*
[3] *Department of Biology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, 10000 Zagreb, Croatia.*
*E-mail: kucinic@biol.pmf.hr; https://orcid.org/0000-0003-2756-2305*
[4] *Faculty of Agribusiness, Haxhi Zeka University of Peja, UÇK Street, 30000 Pejë, Republic of Kosovo.*
*E-mail: astritbilalli@yahoo.com; https://orcid.org/0000-0003-2820-8009*
[5] *Department of Biology, Faculty of Mathematics and Natural Sciences, University of Tetovo, R. North Macedonia. E-mail: ajten.rushiti@unite.edu.mk; https://orcid.org/0009-0000-7142-4087*
**Corresponding author. E-mail: jelenahinikj@gmail.com*

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**Abstract**
*Limnephilus petri*, an endemic caddisfly species, is reported for the first time from the Republic of North Macedonia. This discovery expands the known distribution of the species, which has previously been observed in limited geographic areas. In this study, the redescription of the male of *L. petri* is provided, including detailed morphological features that aid in the species' identification. The findings contribute significantly to the understanding of the aquatic biodiversity of the region, emphasizing the ecological importance of the species. This study also underscores the importance of continued monitoring and conservation efforts to protect such rare and specialized species.

**Key words** caddisflies, new records, rare species, distribution, taxonomy, Balkan Peninsula.

## Introduction

The genus *Limnephilus* Leach, 1815 is the most species-rich group within the family Limnephilidae, comprising 223 living and 15 fossil species (Morse, 2025). Many species of this genus are known to

have very restricted distribution, while some of them even represent regional endemics (Balibrea *et al.* 2017). Due to the wide spawn of different ecological demands, species from genus *Limnephilus* remain one of the most challenging and interesting groups of trichopterans, consistently drawing the attention of caddisfly researchers (Waringer *et al.* 2012; Oláh *et al.* 2019; Zang *et al.* 2022; Spahler 2024). Species of genus *Limnephilus* count for approximately 4% of the total caddisfly species in the West Palearctic region, where Republic of North Macedonia belongs (Ibrahimi, 2024).

Detailed literature review showed that today, the genus *Limnephilus* in R. North Macedonia is represented with 11 species (Radovanović 1935; 1942; 1953; Botosaneanui 1960; Arsov 1991; Kovachev *et al*. 1999; Oláh, 2010; Oláh & Kovács, 2013; 2014; Bilalli *et al.* 2019; Slavevska-Stamenković *et al.* 2021; Musliu *et al.* 2024). Due to the unique geomorphological features and climate elements (Milevski 2015), R. North Macedonia has a distinct blend of habitats offering a variety of environmental conditions able to meet the different ecological demands of many limnephilids (Zang *et al.* 2022). This part of the Balkan Peninsula probably hides even more *Limnephilus* species, yet to be found.

The results presented in this paper aim to contribute to the knowledge of the caddisfly diversity in Republic of North Macedonia by presenting the first record of the rare endemic caddisfly species *Limnephilus petri* Marinković Gospodnetić, 1966. Considering that the original description of the species by Marinković Gospodnetić (1966) contains only the drawing of the lateral view of the genitalia that could easily lead to misidentifications, we redescribe the species offering a detailed description of the genital segments and providing non-genital characters for its identification.

## Material and methods

*Study area*

The Shar Mountain spans from southern Kosovo to northwestern R. North Macedonia and northeastern Albania and is characterized by rugged terrain and sparse vegetation. This mountain is known to be among the highest in the Balkans, with 30 peaks exceeding 2,500 meters above sea level (Jovanovska *et al.* 2020). The areas of the mountain within Kosovo and R. North Macedonia are designated national parks (Ibrahimi *et al.* 2023; Hinić - Jordanovska *et al.* 2024). The sampling site is located at a small mountain stream above the forest zone adjacent to Karanikolicko Lake (42.074913°N, 20.820664°E, 1798 m above sea level, Figure 1). The locality belongs to the 6$^{th}$ ecoregion (Hellenic Western Balkan) according to Illies (1978).

*Data sampling and processing*

Adult caddisfly specimens were collected with entomological nets. A single specimen of *Limnephilus petri* was collected on 01.08.2016. The collected material was preserved in 96% ethanol. Adult specimens were identified under a stereomicroscope using the identification keys of Kumanski (1988) and Malicky (2004). To provide photographs of the male genitalia, *Limnephilus petri* specimens were cleared using 10% KOH solution. The material is deposited at the Laboratory of Zoology of the Faculty of Natural and Mathematical Sciences, University of Prishtina, Kosovo. Drawings and microscopic photographs were completed by Prof. Halil Ibrahimi, PhD.

## Results

The findings outlined in this paper provide a summary of the recent discovery of the rare endemic *Limnephilus petri*, noted in R. North Macedonia for the first time. Detailed redescription of the species is provided. Drawings of lateral, dorsal and caudal view of male genitalia of *Limnephilus petri* are given in Figure 2. Additionally, photo of male genitalia in lateral view is given in Figure 3.

**Material examined.** Lectotype: R. North Macedonia, Shar Mountains, Karanikolicko Lake, 01. VIII. 2016, 1 male, leg. H. Ibrahimi.

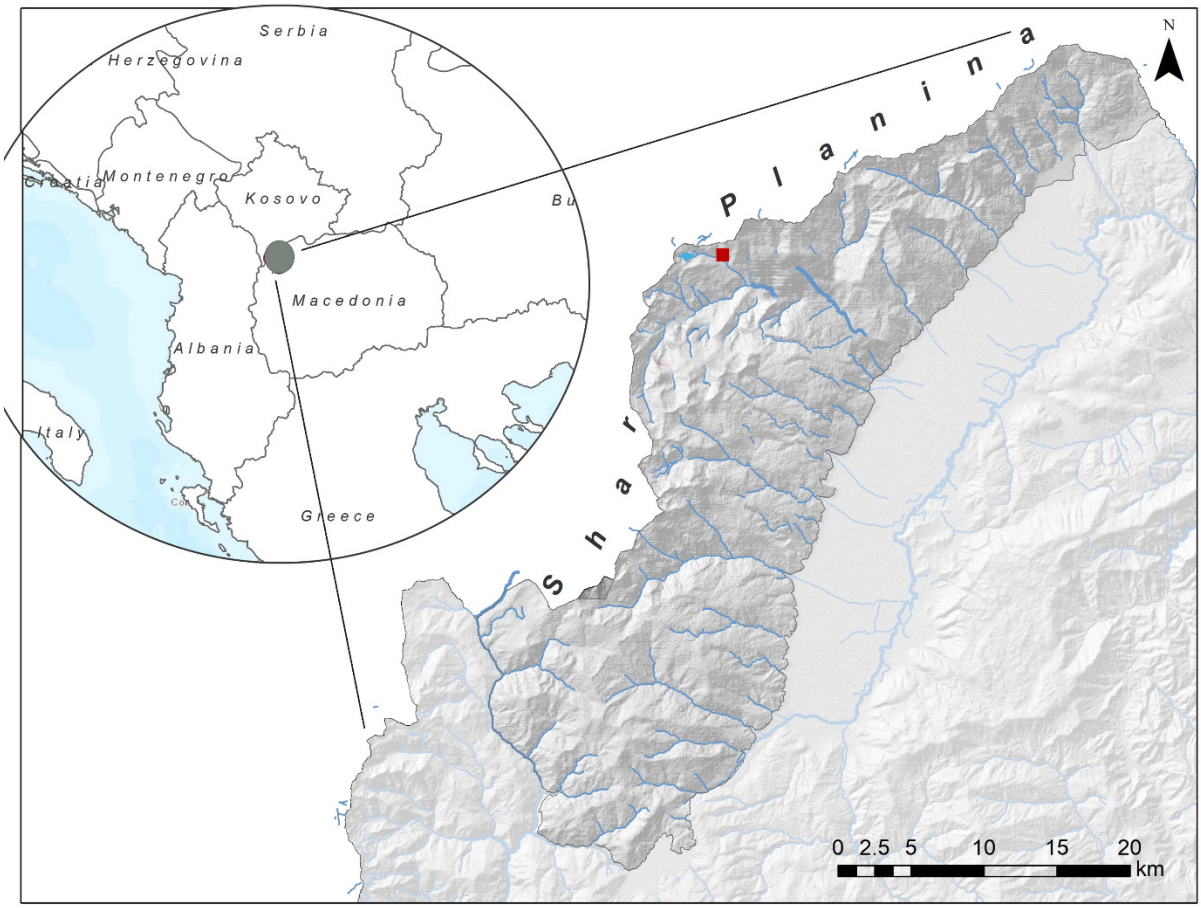


**Figure 1.** Map of the sampling locality of *Limnephilus petri* in R. North Macedonia (red square represents the small mountain stream above the forest zone adjacent to Karanikolicko Lake).

**Male general description.** After preserving the specimen in ethanol, antennae, maxillary palps, and legs are light brown in color, while the wings are whitish grey. Forewings without any spots; spur formula 1.3.4; maxillary palps 3-segmented; labial palps 5-segmented; three ocelli, one located between scapi, two of which located dorsally near each compound eye; head and thorax dorsal warts with dark brown setae; dorsally three dark brown setae near each ocellus; above both side two dark brown setae on wart; near scapi seven setae on each side; posterior warts of head with four setae each; paranotal warts with ten dark brown setae and seven pale brown setae on anterior and posterior edges each; left and right warts of mesonotum with twenty dark brown setae each. Forewing length 11–12.5 mm.

**Male genitalia**. In lateral view, segment IX widest (longest) in the middle with narrow (short) dorsal and ventral portions.

Preanal appendages (pa) 4/5 (3/4) as long as intermediate appendages (ia), oval, two times as long as tall (1/2 as tall as long), with apex pointed and directed caudad (Figure 2a).

Intermediate appendages apically sclerotized, in lateral view long with distal part and apex curved caudad under obtuse angle (Figure 2a).

Inferior appendages (inf) broad in lateral view with apex pointed and directed caudad (Figure 2a).

In dorsal view, transverse posteromesal spinulose zone (sz) of tergite VIII 1/3 as long as broad, posterior edge sinuous, dorsomesally convex and laterally well rounded (Figure 2b).

Phallic parameres (par) extending as long as phallicata apex, each with subapicodorsal row of spines and apicodorsal and ventral tuft of setae (Figure 2d).

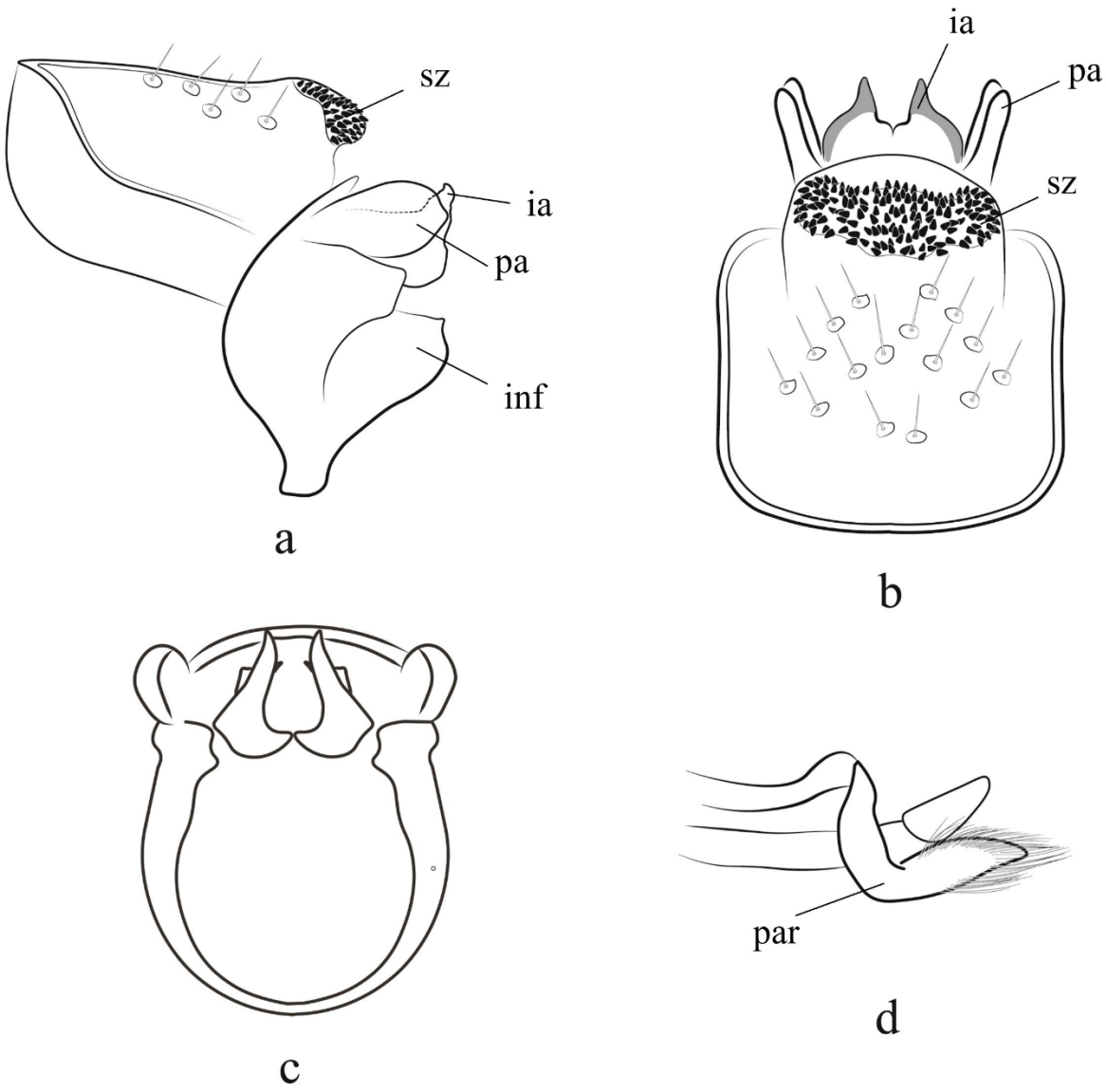


**Figure 2**. Drawings of male genitalia of *Limnephilus petri* a) lateral view; b) dorsal view; c) caudal view; d) parameres. (Abbreviations: sz - spinulose zone; ia - intermediate appendages; pa - preanal appendages; inf - inferior appendages; par - parameres).

## Discussion

*Separating Limnephilus petri from other species of the Limnephilus bipunctatus species group*

While thoroughly analyzing the *Limnephilus bipunctatus* species group in Turkey, Sipahiler (2024) provided detailed insights into the distinctive morphological characters between the species included. According to the structure of preanal and inferior appendages, it seems that *Limnephilus petri* is mostly similar to *Limnephilus malickyi* Sipahiler 1992. At the same time, according to the form of the spinulose zone on the eight abdominal segment, as well as the intermediate appendages, *L. petri* resembles *Limnephilus bipunctatus* Curtis 1834. Misidentification issues with *L. malickyi* cannot occur as it is a stenoendemic species found only on the highest part of the Taurus Mountains (Sipahiler 1992). *Limnephilus petri* can easily be distinguished from *L. malickyi* primarily by the shape of intermediate appendages, being more bulbous and with dorsal hump in lateral view in the later species. In addition to this, intermediate appendages in *L. petri* in dorsal view are broader on their basal half ending basally acuminate in ventral view, whereas in *L. malicky* they end broadly rounded basally in ventral view. On the other hand, *Limnephilus bipunctatus* is a part of the Macedonian caddisfly fauna (Radovanović 1953;

Oláh & Kovács 2013; Slavevska-Stamenković *et al.* 2021) and inhabits a wide range of habitats from small springs to large streams and lakes (Sipahiler 2024). Since it has already been reported from Shar Mountain (Radovanović 1953; Oláh & Kovács 2013) it is not excluded that its distribution patterns could overlap with those of *L. petri*. *Limnephilus bipunctatus* is also reported frequently from areas close to Republic of North Macedonia (Olah & Kovacs, 2013; Ibrahimi & Sejdiu, 2018; Ibrahimi *et al*. 2014, 2017, 2019). As there are significant similarities in the morphological structure of their male genitalia, the main diagnosable characters of these two species are the following:

(1) In dorsal view, the transverse spinulose zone of the eight abdominal segment in both species is narrow (longitudinally short) and the posterior margin has a noticeable median lobe. However, the lateral lobes along the margin are noticeably rounder and more prominent in *L. petri* than in *L. bipunctatus*;

(2) In lateral view, the apices of the preanal appendages are pointed caudad in *L. petri*, while in *L. bipunctatus* these appendages finish with a dull distal margin;

(3) In dorsal view the intermediate appendages of *L. bipunctatus* contain darkly sclerotized inner edges. In lateral view, the inferior appendages of this species are evenly curved caudodorsad to acute apices. The intermediate appendages of *L. petri* are apically sclerotized, with distal part and apex curved caudad under obtuse angle.

(4) In lateral view, the apices of the inferior appendages of *L. petri* are pointed caudad, while the inferior appendages of *L. bipunctatus* end with two rounded lobes posterodorsally.

(5) Forewings of *L. petri* whitish grey, without any spots. Forewings of *L. bipunctatus* spotted and dark brown.

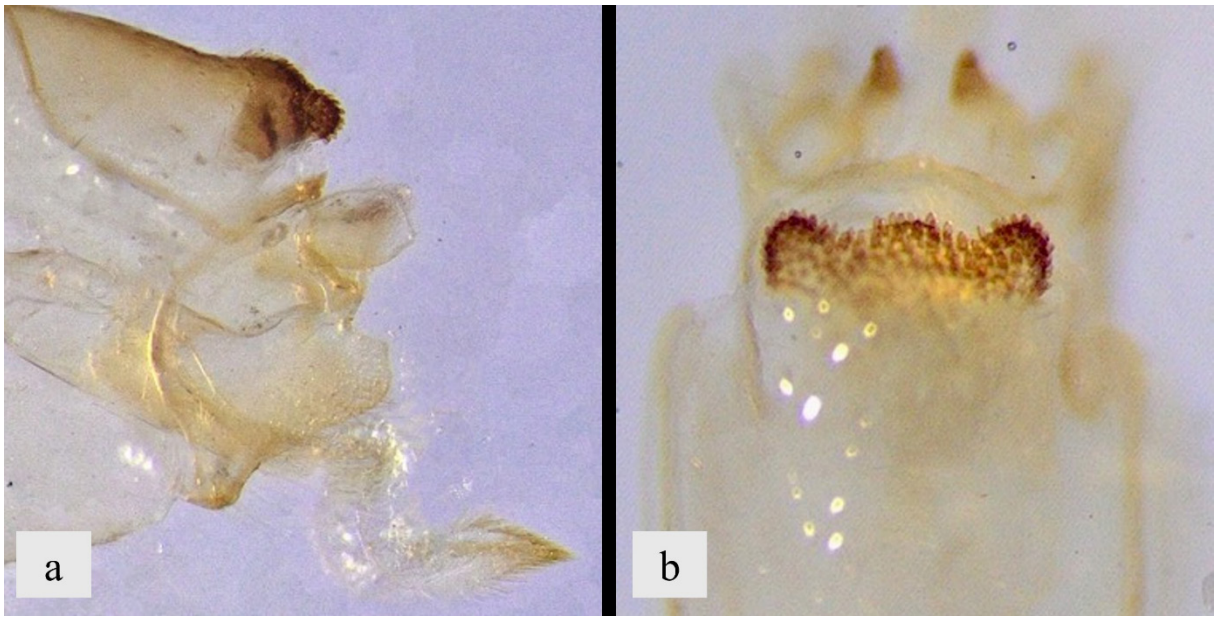


**Figure 3**. a) Lateral view and b) dorsal view of male genitalia of *Limnephilus petri.*

*Ecological and distributional notes*

*Limnephilus petri* was originally described by Marinković Gospodnetić (1966; 1975) on specimens collected in 1954 from Brodska Reka River in Dragash Municipality (today in Kosovo). The entomological study conducted by Ibrahimi et al. (2015) resulted in recording *L. petri* near the type locality again more than a half century later. In the meantime, Kumanski (1988) identified some *Limnephilus* specimens from Rila Mountains in Bulgaria, Kopaonik Mountain in Serbia and Shar Mountain in R. North Macedonia only as *Limnephilus* cf. *petri*. Therefore, the presence of this species in Kopaonik, Rila and Shar mountains (R. North Macedonia) remained debatable. Bearing all this in mind, up until now, the only valid location of *L. petri* occurrence was its type locality.

According to the investigations conducted on Shar Mountain in Kosovo (Ibrahimi *et al*. 2016a, 2016b; Ibrahimi & Vehapi, 2017; Ibrahimi *et al*. 2019; 2023; Karaouzas *et al.* 2018), this area is recognized for hosting a significant diversity of rare caddisfly species. However, these aquatic insects

within the Macedonian part of this mountain remain insufficiently explored. Trichopterological research on the Macedonian territory of Shar Mountain has been inconsistent, with significant gap years between studies (Radovanović 1953; Kumanski, 1997; Kovachev *et al.* 1999; Mementi and Janeva 1999; Oláh and Kovác 2013; 2014; Oláh *et al*. 2017; 2022). Luckily, the entomological investigations on the caddisfly fauna on Shar Mountain were intensified over the last six years when caddisflies were sampled from mountainous streams, springs, rivers, wetlands and glacial lakes on different altitudes situated within and above the forest zone all over the mountain (Hinić - Jordanovska *et al*. 2024). Yet, *L. petri* was not recorded in any of these investigations, meaning that although it is present in Shar Mountain (R. North Macedonia) after all, its distribution area is restricted only to the vicinity of Karanikolicko Lake. The species is characterized by very limited flight period as the adult stage of its life cycle can be encountered only during the summer months July – August (Kumanski 1988). This observation perfectly corresponds to the time of the first finding of the species in the spring region of Brodska Reka river in July 1954 (Marinković Gospodnetić 1966; 1975) as well as to the results presented in Ibrahimi et al. (2015) when the species was recorded again around the type locality in July 2010. The collection of the species in August 2016 presented in this paper confirms the flight period of the species. Moreover, the fact that all three recorded occurrences of *L. petri* (Marinković-Gospodnetić 1966, 1975; Ibrahimi *et al*. 2015), including the one documented in this study, are from Shar Mountain, establishes this rare caddisfly as a steno-endemic species with a distribution restricted only to Shar Mountain. Based on the observations in this study, the species favors cold, slow-flowing mountain streams at high altitudes.

A noteworthy detail is that since the entomological collection of Marinković-Gospodnetić containing all *L. petri* specimens including the holotype (Marinković-Gospodnetić 1966, 1975,) is no longer available, the newly collected specimen from Shar Mountain becomes the lectotype. Along with the specimens collected from Shar Mountain in Kosovo (Ibrahimi *et al.* 2015), this lectotype becomes the only available material of this species deposited in the Laboratory of Zoology of the Faculty of Natural and Mathematical Sciences, University of Prishtina, Kosovo. Bearing in mind that only pencil drawing illustrations of the lateral view of the genitalia were available (Marinković-Gospodnetić 1966), this paper provides the complete description of the species including photographs of lateral and dorsal view of male genitalia (Figure 3). Also, it employes the morphological characters of the forewings for separating *L. petri* from the *Limnpehilus bipunctatus* species group, since the use of non-genital morphological characters in evaluation of species delimitation was proven to be inevitable element when it comes to this group of aquatic insects (Sganga *et al.* 2022).

Considering all aspects, uncovering new insights into rare species such as *L. petri* highlights the importance of aquatic biodiversity and entomological studies, particularly in regions that have not been extensively explored. Such efforts enhance conservation initiatives and management strategies, ensuring the protection of these crucial species. Specifically, in R. North Macedonia, there are ongoing efforts to compile updated National lists of strictly protected and protected wild species. While *L. petri* was already listed as a protected wild species (Official Gazette of the Republic of Macedonia no. 139/2011) although its presence in the country in the past was debatable, the scientific evidence presented in this paper represents the first reliable data supporting its inclusion on the list. Therefore, the first two authors of this paper incorporated *L. petri* in the updated version of the National Lists of Protected and Strictly protected wild species in R. North Macedonia.

In summary, this record serves as an additional contribution to the catalog of caddisfly species in the Republic of North Macedonia, a region that still remains among the least studied in Europe (Radovanović 1935, 1943; Bilalli *et al.* 2018; Botosaneanu 1960; Pavlovski 1984, 1991; Rimcheska *et al.* 2015; Arsov 1991; Kumanski 1997; Kumanski & Malicky 1999; Vitecek *et al.* 20215; Kučinić *et al*. 2016; Oláh *et al.* 2018; Hinić *et al*. 2020; Slavevska-Stamenković *et al*. 2020; 2021; Hinić *et al*. 2024; Valladolid *et al.* 2021; 2022). The species redescription presented in this paper is a valuable contribution that simplifies the identification of this stenoendemic species while emphasizing the conservation significance of the area where it is found.

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## References


Arsov, G. (1991) Taxonomical and biocenological analyses and altitude distribution of the larval caddisfly fauna of Zrnovska Reka river. Master thesis. Skopje, 1–148. (In Macedonian)

Balibrea, A., Ferreira, V., Gonçalves, V. & Raposeiro, P. M. (2017) Consumption, growth and survival of the endemic stream shredder Limnephilus atlanticus (Trichoptera, Limnephilidae) fed with distinct leaf species. *Limnologica*, 64, 31–37. https://doi.org/10.1016/j.limno.2017.04.002

Bilalli, A., Ibrahimi, H. & Musliu, M. (2018) First records of the caddisfly fauna (Insecta: Trichoptera) from the Karadak Mountains, Western Balkans. *Natura Croatica: Periodicum Musei Historiae Naturalis Croatici*, 27(1), 143–151. https://doi.org/10.20302/NC.2018.27.7

Bilalli, A., Ibrahimi, H., Musliu, M., Gashi, A., Grapci-Kotori, L., Slavevska-Stamenkovič, V., Hinić, J. & Geci, D. (2019) First record of *Chaetopteroides kosovarorum* Ibrahimi & Oláh, 2013 (Insecta: Trichoptera) from the Republic of North Macedonia. *Ecologica Montenegrina*, 23, 34–39. https://doi.org/10.37828/em.2019.23.5

Botosaneanu, L. (1960) Trichoptères de Yougoslavie recueillis en 1955 par le Dr. F. Schmid. *Deutsche Entomologische Zeitschrift*, 7(3), 261–293.

Hinić, J., Slavevska-Stamenković, V., Ibrahimi, H., Bilalli, A., Musliu, M., Kučinić, M., Beerman, A. & Lesse, F. (2020) The first record of the Balkan endemic caddisfly *Drusus osogovicus* Kumanski, 1980 (Trichoptera: Limnephilidae) in the Republic of North Macedonia, with DNA barcoding of the species and comments on its ecology and distribution. *Acta Zoologica Bulgarica*, 72(3), 369–379.

Hinić-Jordanovska, J., Slavevska-Stamenković, V., Ibrahimi, H., Kučinić, M., Bilalli, A., Cvetkovska-Gjorgjievska, A. & Rušiti-Dauti, A. (2024) Shar Mountain National Park (R. North Macedonia)-shelter for caddisfly biodiversity in the country. *Ecologica Montenegrina*, 73, 158–167. https://doi.org/10.37828/em.2024.73.16

Ibrahimi, H. (2024) Trichoptera of Europe: Diversity, importance, and conservation. In Insect Diversity and Ecosystem Services (pp. 159-172). Apple Academic Press. https://doi.org/10.1201/9781003467205-7

Ibrahimi, H., Kuçi, R., Bilalli, A. & Gashi, E. (2017) First record of *Triaenodes bicolor* (Curtis, 1834) (Insecta: Trichoptera) from the ecoregion Hellenic Western Balkans. *Natura Croatica*, 26(2), 197–204. https://doi.org/10.20302/NC.2018.27.18

Ibrahimi, H. & Sejdiu, N. (2018) The caddisfly fauna (Insecta: Trichoptera) of the Llap River catchment, Republic of Kosovo. *Natura Croatica*, 27(2), 293–304. https://doi.org/10.20302/NC.2018.27.18

Ibrahimi, H., Gashi, A., Bilalli, A., Musliu, M., Grapci-Kotori, L. & Zhushi-Etemi, F. (2014) Three first records of the genus *Limnephilus* Leach, 1815 (Trichoptera: Limnephilidae) from the Republic of Kosovo. *Biodiversity Data Journal*, 2, e4140. https://doi.org/10.3897/BDJ.2.e4140

Ibrahimi, H., Gashi, A., Grapci-Kotori, L., Zhushi-Etemi, F., Bilalli, A. & Musliu, M. (2015) New Distribution and Species Records of Caddisflies (Insecta: Trichoptera) from the Republic of Kosovo. *Entomological News*, 125(4), 229–238. https://doi.org/10.3157/021.125.0402

Ibrahimi, H., Vitecek, S., Previšić, A., Kučinić, M., Waringer, J., Graf, W., Balint, M., Keresztes, L. & Pauls, S. U. (2016a) *Drusus sharrensis* sp. n. (Trichoptera, Limnephilidae), a new species from Sharr National Park in Kosovo, with molecular and ecological notes. *ZooKeys*, 559, 107–124. https://doi.org/10.3897/zookeys.559.6350

Ibrahimi, H., Gashi, A. & Kotori, L. G. (2016b) First records of three rare species of the genus *Glossossoma* Curtis, 1834 (Insecta: Trichoptera) from the Republic of Kosovo. *Journal of the Entomological Research Society*, 18(2), 79–83.

Ibrahimi, H. & Vehapi, V. (2017) Contribution to the knowledge of the caddisfly fauna (Insecta: Trichoptera) of the Sharr Mountains in Kosovo. *Journal of the Kansas Entomological Society*, 90(4), 283–290. https://doi.org/10.2317/17-4.1

Ibrahimi, H., Kuçi, R., Bilalli, A., Musliu, M., Vehapi, V., Gashi, A., ... & Geci, D. (2019) New additions to the caddisfly fauna (Insecta: Trichoptera) of the Sharr Mountains in Kosovo. *Ecologica Montenegrina*, 23, 40–46. https://doi.org/10.37828/em.2019.23.6

Ibrahimi, H., Grapci-Kotori, L., Bilalli, A., Qamili, A. & Schabetsberger, R. (2019) Contribution to the knowledge of the caddisfly fauna (Insecta: Trichoptera) of Leqinat Lakes and adjacent streams in Bjeshkët e Nemuna (Kosovo). *Natura Croatica*, 28(1), 35–44. https://doi.org/10.20302/NC.2019.28.3

Ibrahimi, H., Bilalli, A., Gashi, A., Kotori, L. G., Stamenkovič, V. S. & Geci, D. (2023) *Potamophylax humoinsapiens* sp. n. (Trichoptera, Limnephilidae), a new species from the Sharr Mountains, Republic of Kosovo. *Biodiversity Data Journal*, 11, e97969. https://doi.org/10.3897/BDJ.11.e97969

Illies, J. (1978) Limnofauna Europaea. A Checklist of the Animals Inhabiting European Inland Waters, with an Account of their Distribution and Ecology. 2nd Edition. Gustav Fischer Verlag, Stuttgart, 552 pp.

Jovanovska, D., Swetnam, R. D., Tweed, F. S. & Melovski, L. (2020) Assessing the landscape visual quality of Shar Planina, North Macedonia. *Landscape Ecology*, 35(12), 2805–2823. https://doi.org/10.1007/s10980-020-01122-5

Karaouzas, I., Ibrahimi, H. & Waringer, J. (2018) The larva of *Rhyacophila palmeni* McLachlan, 1879 (Trichoptera: Rhyacophilidae) from Greece and Kosovo with notes on ecology and zoogeography, including a key to the known Greek *Rhyacophila* larvae. *Zootaxa*, 4514(1), 97–106. https://doi.org/ 10.11646/zootaxa.4514.1.8

Kovachev, S., Stoichev, S., Uzonov, Y., Kumanski, K. & Memeti, A. (1999) Hydrofaunistic studdy of the Tetovska River, Macedonia. *Lauterbornia*, 36, 67–70.

Kumanski, K. (1988) *Fauna Bulgarica*. 19. Trichoptera, Integripalpia. Bulg. Acad. Sci. Publ., Sofia.

Kumanski, K. (1997) Contributions to the caddisfly fauna (Trichoptera) of the central-western part of the Balkan Peninsula. *Lauterbornia*, 31, 73–82

Kumanski, K. & Malicky, H. (1999) A survey of the genus *Potamophylax* Wallengren 1891 in the Balkan Peninsula, with description of two new species (Trichoptera: Limnephilidae). *Braueria*, 26, 27–30.

Kučinić, M., Previšić, A., Mihoci, I., Krpač, V., Živić, I., Stojanović, K., ... & Katušić, L. (2016) Morphological features of larvae of *Drusus plicatus* Radovanović (Insecta, Trichoptera) from the Republic of Macedonia with molecular, ecological, ethological, and distributional notes. *ZooKeys*, 598, 75–97. https://doi.org/ 10.3897/zookeys.598.7311

Lists for Designation of Strictly Protected and Protected Wild Species in the Republic of Macedonia, 2011, Official Gazette of the Republic of Macedonia no. 139/2011.

Malicky, H. (2004) Trichoptera. In Atlas of European Trichoptera/Atlas der Europäischen Köcherfliegen/Atlas des Trichoptères d'Europe, Springer Netherlands, pp. 1–341.

Marinkovic-Gospodnetic, M. (1966) New species of Trichoptera from Yugoslavia. *Bulletin Scientifique, Sec. A*, Tome 11, No. 4–6.

Marinković-Gospodnetić M (1975) Fauna Trichoptera SR Srbija. *Zbornik radova o entomofauni Srbije*, 1, 219–236.

Memeti, A. & Janeva, I. (1999) Saprobiological characteristic of Tetovska river (Sharr Mountain, Macedonia). *Acta Zoologica Bulgarica*, 51(1), 69–72.

Milevski, I. (2015) General geomorphological characteristics of the Republic of Macedonia. Geographical Reviews, 48, 5–25.

Morse, J.C. (2025) Trichoptera World Checklist. Available online: http://entweb.Clemson.edu/database/trichopt/Index.htm (accessed on 24 March 2025).

Musliu, M., Bilalli, A., Ibrahimi, H., Slavevska-Stamenković, V., Hinić-Jordanovska, J., Grapci-Kotori, L. & Geci, D. (2024) Two new records for the genus *Limnephilus* Leach, 1815 (Trichoptera: Limnephilidae) from North Macedonia. *Natura Croatica: Periodicum Musei Historiae Naturalis Croatici*, 33(1), 139–148. https://doi.org/10.20302/NC.2024.33.10

Oláh, J. (2010) New species and new records of Palearctic Trichoptera in the material of the Hungarian Natural History Museum. *In Annales historico-naturales Musei nationalis hungarici*, 102, 65–117

Oláh, J. & Kovács, T. (2013) New species and records of Balkan Trichoptera II. *Folia Historico Naturalia Musei Matraensis*, 37, 109–121. https://doi.org/10.18348/opzool.2022.1.67

Oláh, J. & Kovács, T. (2014) New species and records of Balkan Trichoptera III. *Folia Historico Naturalia Musei Matraensis*, 38, 97–131. https://doi.org/10.18348/opzool.2022.1.67

Oláh, J., Beshkov, S., Chvojka, P., Ciubuc, C. & Coppa, G. (2017) Revision of Drusinae subfamily (Trichoptera, Limnephilidae): divergence by paraproct and paramere: speciation in isolation by integration. *Opuscula Zoologica (Budapest)*, 48(Supplementum 1), 3–228. http://dx.doi.org/10.18348/opzool.2017.S1.3

Oláh, J., Kovács, T. & Ibrahimi, H. (2018) Agaphylax, a new limnephilid genus (Trichoptera) from the Balkan: Lineage ranking by adaptive paramere. *Opuscula Zoologica (Budapest)*, 49(1), 77–89. http://dx.doi.org/10./8348/opzool.2018.1.77

Oláh, J., Andersen, T., Beshkov, S., Bilalli, A., Coppa, G., Ibrahimi, H., ... & Ruiz Garcia, A. (2019). Lineage sorting by parameres in Limnephilinae subfamily (Trichoptera): with description of a new tribe, new genera and new species. *Opuscula Zoologica (Budapest)*, 50(Supplementum 1), 3–98. https://doi.org/10.18348/opzool.2019.s1.3

Oláh, J., Beshkov, S., Ibrahimi, H., Kovács, T. & Vinçon, G. (2022) On the Trichoptera of the Balkan: survey on species complexes of Polycentropus ierapetra, Rhyacophila balcanica, R. bosnica and Notidobia nekibe. *Opuscula Zoologica Instituti Zoosystematici et Oecologici Universitatis Budapestinensis*, 53(1). https://doi.org/10.18348/opzool.2022.1.67

Pavlovski, T. (1984) Two new rare species for the caddisfly fauna of R. Macedonia. *Annual of PMF Biology – Skopje*, 37-38, 11–115. (In Macedonian)

Pavlovski, T. (1991) Structure, dynamics and distribution of the caddisfly larval fauna of river Babuna. Special edition of PMF Biology – Skopje, 1–81. (In Macedonian)

Radovanović, M. (1935) Trichoptera Jugoslavije. *Glasnik Zemaljskog muzeja u Bosni i Hercegovini u Sarajevu*, 47, 73–84.

Radovanović, M. (1943) Trichoptera of the Lake Ohrid and surrounding area. SANU, Special edition. Proceedings of Ohrid, 1, 3–46.

Radovanovic, M. (1953) Contribution to the study of Trichoptera in the Balkan Peninsula, primarily in caves and mountain lakes. *Bulletin SANU*, 7, 11–38.

Rimcheska, B., Slavevska-Stamenković, V., Ibrahimi, H., Smiljkov, S., Ristovska, M., & Paunović, M. (2015) First record of the genus *Helicopsyche* von Siebold, 1856 (Trichoptera: Helicopsychidae) from the Republic of Macedonia. *Acta Zoologica Bulgarica*, 67(3), 443–446.

Sganga, J. V., Sganga, D. E. & Iglesias, M. S. (2022) Review and redescription of species in the brasiliana group of Smicridea (*Rhyacophylax*) (Trichoptera, Hydropsychidae, Smicrideinae): exploration of the utility of geometric morphometrics as a method for delimitation and characterization of species in the genus. *ZooKeys*, 1111, 389. https://doi.org/10.3897/zookeys.1111.80961

Sipahiler, F. (1992) Two new species and a new subspecies of Trichoptera from Turkey and Spain (Insecta). *Spixiana, München*,15 (3), 293–297.

Sipahiler, F. (2024) The *Limnephilus bipunctatus* Species Group in Turkey with the descriptions of two new species (Trichoptera, Limnephilidae). *Zootaxa*, 5406(1), 105–122. https://doi.org/10.11646/zootaxa.5406.1.5

Slavevska-Stamenković, V., Hinić, J., Karaouzas, I., Ibrahimi, H., Mitić-Kopanja, D. & Bilalli, A. (2020) First record of Rhyacophila pubescens Pictet, 1834 (Trichoptera: Rhyacophilidae) in the Republic of North Macedonia with notes on its ecology and distribution. *Ecologica Montenegrina*, 31, 28–34. https://doi.org/10.37828/em.2020.31.6

Slavevska-Stamenković, V., Ibrahimi, H., Hinić, J., Mitic-Kopanja, D., Bilalli, A., Musliu, M., ... & Kučinić, M. (2021) Caddisflies (Insecta: Trichoptera) from Kožuf and Baba mountains (Republic of North Macedonia. *Natura Croatica: Periodicum Musei Historiae Naturalis Croatici*, 30(1), 145–160. https://doi.org/10.20302/NC.2021.30.8

Valladolid, M., Arauzo, M., Chertoprud, M. V., Chvojka, P., Czachorowski, S., Dorda, B. A., Rey, I., Sipahiler, F., Previšić, A., Oláh, J., Neu, P. J., Malicky, H., Graf, W. & Robert, B. (2021) The *Rhyacophila fasciata* group in Europe: *Rhyacophila fasciata* Hagen, 1859 and formerly synonymized species (Trichoptera: Rhyacophilidae), with new descriptions of *Rhyacophila fasciata* and *Rhyacophila septentrionis* McLachlan, 1865 (stat. prom.). *Zootaxa*, 4975(1), 1–57. http://doi.org/10.11646/zootaxa.4975.1.1

Valladolid, M., Karaouzas, I., Ibrahimi, H., Arauzo, M., Stamenković, V. S., Dorda, B. A., Hinić, J., Bilalli, A., Musliu, M., & Rey, I. (2022) The *Rhyacophila fasciata* group in Europe: *Rhyacophila macedonica* Karaouzas, Valladolid & Ibrahimi (n. sp.) from Greece, Kosovo,

Republic of North Macedonia, and Serbia (Trichoptera: Rhyacophilidae). *Zootaxa*, 5125(2), 101–130. https://doi.org/10.11646/zootaxa.5125.2.1

Vitecek, S., Kučinić, M., Oláh, J., Previšić, A., Bálint, M., Keresztes, L., Waringer, G., Pauls, S. & Graf, W. (2015) Description of two new filtering carnivore Drusus species (Limnephilidae, Drusinae) from the Western Balkans. *ZooKeys*, (513), 79. https://doi.org/ 10.3897/zookeys.513.9908

Waringer, J., Graf, W. & Malicky, H. (2012) Description of the larvae of *Anabolia lombarda* Ris, 1897 and *Limnephilus sericeus* (Say, 1824), with additional notes on Limnephilus flavospinosus Stein, 1874 (Trichoptera: Limnephilidae). *Aquatic Insects*, 34(2), 93–105.

Zang, H., Ge, X., Peng, L., Sun, C. & Wang, B. (2022) A New Species of Limnephilus (Insecta: Trichoptera: Limnephilidae) from China, with Revision of the Genus Limnephilus on the Chinese Mainland. *Insects*, 13(7), 653. https://doi.org/10.3390/insects13070653