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The caddisfly fauna (Insecta: Trichoptera) of the Bajgorë area in Kosovo with the first country record of *Hydroptila occulta* (Eaton, 1873)

Halil IBRAHIMI[1] Astrit BILALLI[2]* Milaim MUSLIU[3] Donard GECI[4]

[1,4]University of Prishtina "Hasan Prishtina", Faculty of Mathematics and Natural Sciences, Department of Biology, 10000 Prishtina, KOSOVO

[2,3]University of Peja "Haxhi Zeka", Faculty of Agribusiness, 30000 Pejë, KOSOVO [ROR ID: https://ror.org/01jrt3n05]

e-mails: [1]halil.ibrahimi@uni-pr.edu, [2]astrit.bilalli@unhz.eu, [3]milaim.musliu@unhz.eu, [4]donard.geci@uni-pr.edu

ORCID IDs: [1]0000-0002-4301-4387, [2]0000-0003-2820-8009, [3]0000-0001-9835-6934, [4]0000-0002-6587-3414

*Corresponding Author

ABSTRACT

In this study we report the first systematic investigation of the caddisfly fauna from the Bajgorë area in northern part of Kosovo. Specimens were collected from four stations during July 2024 using ultraviolet light traps. A total of 316 adult specimens were identified belonging to 19 species and 8 families. The most species-rich family was Rhyacophilidae, while *Philopotamus montanus* (Donovan, 1813) and *Psychomyia pusilla* (Fabricius, 1781) were the most abundant species. The presence of *Hydroptila occulta* (Eaton, 1873) is here reported for the first time from Kosovo. This species was found at all three studied sites which represent upstream areas of relatively undisturbed freshwater habitats located between 566m and 677 m asl altitudes. This represents a significant contribution for the knowledge of distribution of this species, representing one of the few records for the Balkan Peninsula and Ecoregion 5, Dinaric Western Balkans. These findings contribute to the knowledge of the insufficiently known caddisfly species of the region in function of the conservation of freshwater habitats in the Balkans.

Keywords: aquatic insects, Balkans, faunistics, species richness, Hydroptilidae, new record.

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INTRODUCTION

Trichoptera (caddisflies) are an ecologically diverse order of aquatic insects, comprising more than 17,000 extant species globally and over approximately 2000 species in the Western Palearctic (Ibrahimi, 2024; Morse, 2025). Their larval stages play essential roles in organic matter processing, while the adult stages are key components of riparian food webs. Due to their sensitivity to changes in water and habitat quality, caddisflies are frequently used as bioindicators in freshwater monitoring programs.

The Balkan Peninsula is a hotspot of aquatic insect diversity, characterized by complex hydrography, karstic systems, and varied microclimates (Griffiths, Krystufek, & Reed, 2004; Ibrahimi, 2024). Despite growing taxonomic efforts in the region (Bozdoğan, Bilalli, & Ibrahimi, 2025; Bilalli, Ibrahimi, & Musliu, 2018; Bilalli et al, 2019; Cerjanec et al, 2020; Ibrahimi & Bilalli, 2021; Ibrahimi & Kučinić, 2018; Ibrahimi et al, 2017; 2022; Hinić et al, 2020; Hinić-Jordanovska, 2024; 2025; Karaouzas, Ibrahimi, & Waringer, 2018; Kucinic et al, 2015; Musliu et al, 2020; Oláh, 2010; 2011; Oláh & Kovács, 2013; 2014; Oláh et al, 2013a; 2018; 2019; Slavevska-Stamenković et al, 2020, 2021; Vitecek et al, 2015, 2017), underexplored areas still remain. Although recent works have expanded knowledge of Kosovo's caddisfly fauna, they have focused primarily on central and western areas with only few studies conducted in the northern part of the country (Ibrahimi & Sejdiu, 2018; Ibrahimi, Bilalli, Geci, & Grapci-Kotori, 2024a; Ibrahimi, Bilalli, Geci, & Musliu, 2024b; Ibrahimi, Bilalli, Musliu, & Geci, 2025; Ibrahimi et al, 2012, 2015a, 2016b; Musliu et al, 2024; Oláh et al, 2013b).

The Black Sea Basin in Kosovo is hydrologically and ecologically diverse, ranging from upland tributaries to moderately modified midland streams. This study represents the first systematic documentation of adult Trichoptera from Bajgorë area belonging to this basin. Our objectives were: (1) to provide an initial inventory of caddisfly species in the area and (2) to examine spatial patterns in species occurrence, including potential new faunistic records.

MATERIALS AND METHODS

Adult caddisfly specimens were collected from four sampling stations in the Bajgorë area: L1 (Selac 1), L2 (Bistricë), L3 (Selac II), and L4 (Selac III) (Table 1, Figure 1 and Figure 2 A-D). The first sampling site (L1, Selac I) is located upstream of the Bistrica e Shalës River near Selac village. It is characterized by a narrow stream with rocky substrate and shows visible signs of anthropogenic activity. The second site (L2, Bistricë) lies along the main stream of the Bistrica e Shalës River in the village of Bistricë. This section has a wider channel with moderate flow and is surrounded by dense riparian vegetation. The third site (L3, Selac II) represents a tributary of the Bistrica e Shalës River. The habitat consists of fast-flowing water over boulders and stones, with minimal direct anthropogenic impact, making it relatively pristine. The fourth site (L4, Selac III) is also located on the main stream of the Bistrica e Shalës River (Table 1, Figs. 1 and 2). It lies in a more open mountainous landscape, influenced by nearby hydropower plants and associated modifications of the river course. Sampling was conducted during the summer period.

Table 1. Sampling sites in the Bajgorë area, Kosovo.

Code	Site name	Longitude & Latitude	Altitude (a.s.l.)
L1	Selac I	43.018102, 20.910783	677m
L2	Bistricë	43.008958, 20.867247	566m
L3	Selac II	43.028474, 20.896511	634m
L4	Selac III	43.030221, 20.889587	610m

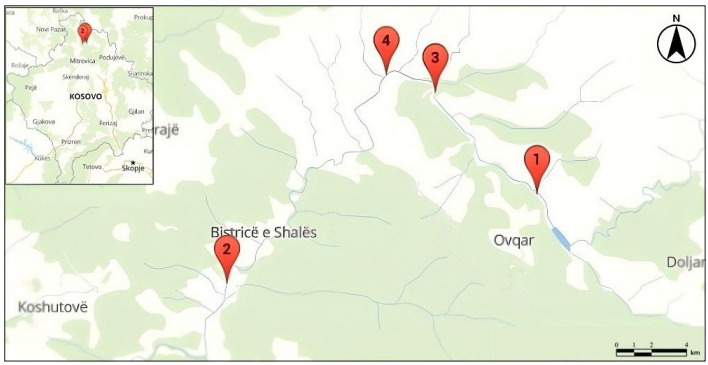

Figure 1. Map of sampling sites in the Bajgorë area, Kosovo.

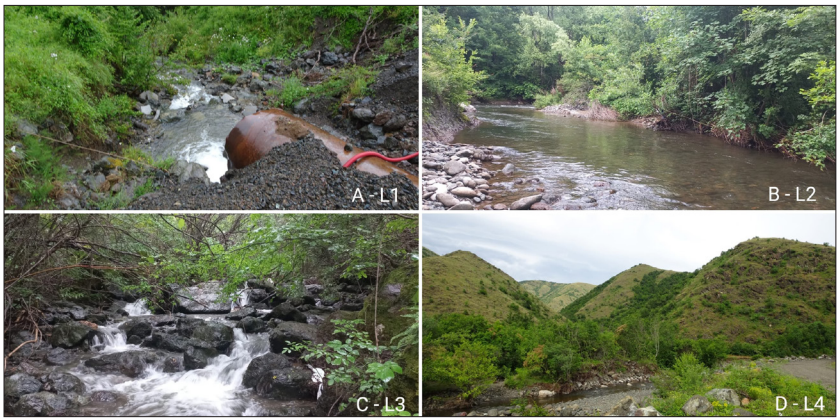

Figure 2. Four sampling stations of caddisflies in the Bajgorë area, Kosovo: A. L1 Selac I, B. L2 Bistricë, C. L3 Selac II and D. L4 Selac III.

At each site, ultraviolet (UV) light traps were used to sample caddisflies. Each trap consisted of a 15-watt UV light source placed over a white pan, powered by portable batteries, and operated for approximately 8 hours after dusk. Specimens attracted to the light were collected manually and preserved in 80% ethanol for subsequent identification.

In the laboratory, specimens were identified to the species level using standard taxonomic key by Malicky (2004) and Valladolid et al, (2022). Morphological characteristics, particularly male and female genitalia, were examined under a stereomicroscope to confirm species identifications. Voucher specimens are deposited in the entomological collection of the Department of Biology at the University of Prishtina.

RESULTS

A total of 316 adult caddisfly specimens representing 19 species and eight families were collected from the four sampling sites in the Bajgorë area. The family Rhyacophilidae was the most species-rich, with five species recorded, followed by Hydropsychidae with four species and Philopotamidae with three species. The remaining six families: Hydroptilidae, Psychomyiidae, Polycentropodidae, Goeridae, and *Limnephilidae*-were each represented by one or two species (Table 2).

Table 2. The composition of the caddisfly fauna in four sampling stations in the Bajgorë area, Kosovo.

Species/Sampling stations		Selac I		Bistricë		Selac II		Selac III	
Rhyacophilidae		♀	♂	♀	♂	♀	♂	♀	♂
1	*Rhyacophila loxias* Schmid, 1970					3	14	5	3
2	*Rhyacophila nubila* Zetterstedt, 1840	1	12			19	21	4	3
3	*Rhyacophila macedonica* Karaouzas, Valladolid & Ibrahimi 2022	2	3				1	4	2
4	*Rhyacophila polonica* McLachlan 1879							12	3
5	*Rhyacophila tristis* Pictet, 1834							3	4
Philopotamidae									
6	*Wormaldia juliani* Kumanski, 1979						2		
7	*Wormaldia subnigra* McLachlan, 1865								3
8	*Philopotamus montanus* (Donovan 1813)	8	7	14	5	2	8		7
Hydroptilidae									
9	*Hydroptila occulta* (Eaton, 1873)		3		2		1		2
10	*Ithytrichia lamellaris* Eaton, 1873				3				
Psychomyiidae									
11	*Psychomyia pusilla* (Fabricius, 1781)	45	29						
Hydropsychidae									
12	*Cheumatopsyche lepida* (Pictet, 1834)				3				
13	*Hydropsyche instabilis* (Curtis, 1834)		2				1		4
14	*Hydropsyche incognita* Pitsch, 1993				5				
15	*Hydropsyche tabacarui* Botosaneanu, 1960				5				
Polycentropodidae									
16	*Polycentropus flavomaculatus* (Pictet, 1834)		2						1
17	*Polycentropus slovenica* Malicky, 1998		3		1		2		1
Goeridae									
18	*Silo piceus* (Brauer, 1857)			9	13				
Limnephilidae									
19	*Potamophylax pallidus* (Klapálek 1899)				4				

Psychomyia pusilla was the most abundant species, with a total of 74 individuals collected, all from the Selac I site. In contrast, *Rhyacophila nubila* Zetterstedt, 1840 and *Philopotamus montanus* were the most widespread species, both occurring at all four stations. *Rhyacophila nubila* was the most numerous taxon overall, with 85 individuals (36 males and 24 females), while *P. montanus* was represented by 51 specimens (27 males and 24 females).

Other species with broad site presence included *Hydropsyche instabilis* (Curtis, 1834) and *Rhyacophila macedonica* Karaouzas, Valladolid & Ibrahimi, 2022, both showing moderate abundance and found across multiple sites. Several taxa were restricted to single locations, suggesting possible microhabitat specialization. For instance,

Rhyacophila polonica McLachlan, 1879 and *R. tristis* Pictet, 1834 were recorded exclusively at Selac III, where they were relatively abundant (15 and 7 individuals, respectively). *Wormaldia subnigra* McLachlan, 1865 was also found only at Selac III, represented by three males. Bistricë showed the highest number of species exclusive to a single site, including *Hydropsyche tabacarui* Botosaneanu, 1960, *Hydropsyche incognita* Pitsch, 1993, and *Cheumatopsyche lepida* (Pictet, 1834) (Table 2).

Overall, site-level species richness varied slightly among stations. Selac III exhibited the highest diversity, with 13 species, followed by Bistricë with 9 species, and Selac I and Selac II with 8 species each. Despite these modest differences, patterns of co-occurrence and species exclusivity suggest underlying ecological gradients influencing local assemblages.

DISCUSSION

This study provides the first detailed faunistic overview of adult Trichoptera in some streams of the Bajgorë area, significantly enhancing the baseline knowledge of caddisfly diversity in northern part of Kosovo. The recorded diversity of 19 species across nine families aligns with expectations for a short-duration sampling in a montane Bajgorë area, and underscores the ecological significance of the region's headwater and mid-order streams.

The dominance of Rhyacophilidae in terms of species richness reflects the favorable conditions of the studies sites for species of this family, particularly Selac III and Bistricë. Members of this family, including *Rhyacophila nubila*, *R. macedonica*, and *R. loxias*, are often associated with higher-altitude streams although they are often found in lowland streams and rivers (Ibrahimi et al, 2012). This is especially true for *R. nubila.* The broad distribution of *R. nubila* across all four sites, accompanied by its high number of specimens, suggests both habitat suitability and considerable tolerance of this species for different habitat conditions (Ibrahimi, Kučinić, Gashi, & Grapci-Kotori 2014; Ibrahimi et al, 2012, 2015b; Bilalli et al, 2018; Ibrahimi, & Sejdiu, 2018). The presence of *R. macedonica*, a Balkan regional endemic previously reported from Albania, Serbia, Greece and North Macedonia, further reinforces the biogeographical continuity of this mountain fauna and highlights the importance of Kosovo's northern rivers as part of the broader Balkan area (Ibrahimi, Bilalli, Musliu, & Geci, 2025; Valladolid et al, 2021, 2022).

In contrast, *Philopotamus montanus* represents a species with wide ecological tolerance, frequently occurring in both pristine and moderately impacted streams across Europe (Neu, Malicky, Graf, & Schmidt-Kloiber, 2018; Graf et al, 2008). Its dominance in terms of spatial occurrence and sex-balanced population indicates stable reproductive activity and successful adult emergence during the sampling period. Other widely distributed taxa such as *Hydropsyche instabilis* and *Polycentropus slovenica* further reflect the presence in a wide range of stream conditions (Ibrahimi, Kučinić, Gashi, & Grapci-Kotori 2014; Ibrahimi et al, 2012, 2015b, 2019a, 2019b; Neu, Malicky, Graf, & Schmidt-Kloiber, 2018), particularly in mid-elevation sites like Selac I and II, where sedimentation and riparian disturbance were visually more apparent.

Species restricted to single sites offer additional insight into habitat specialization and microhabitat heterogeneity. For example, *Rhyacophila polonica*, a species with Central and Eastern European affinities, and *R. tristis*, often associated with cold, fast-flowing streams with boulder substrates (Neu, Malicky, Graf, & Schmidt-Kloiber, 2018; Ibrahimi et al, 2017), were both recorded only at Selac III. Similarly, *Wormaldia subnigra* - found exclusively at this site-has been associated with unpolluted, shaded streams, further confirming the ecological integrity of Selac III relative to the other stations. These site-restricted occurrences emphasize the need for site-specific conservation attention and suggest that high-altitude reaches in Kosovo may harbor further undescribed or unrecorded species if more intensive surveys are undertaken.

The most remarkable result of the study is the detection of *Hydroptila occulta*, here reported for the first time from Kosovo (Fig. 3). Although collected in relatively low numbers (n = 8), its occurrence at all four sampling sites is noteworthy. *Hydroptila occulta* is a widely distributed yet often underreported European microcaddisfly (Thomson, 2023), likely due to its minute adult size and small populations. Its detection across variable habitats-from high-gradient streams to more open mid-basin sites-indicates that the species may be more common in the Balkans than previously assumed, and its absence in past records from Kosovo is likely due to undersampling of adult *Hydroptilidae*. This finding adds to a growing list of hydroptilid records expanding in the Western Balkans and supports the call for increased microtrichopteran monitoring in regional biodiversity surveys. Increased sampling during the past years in this part of the Western Balkans showed that employment of different sampling techniques along with prolonged sampling will provide data about these species of the Hydroptilidae family which are often overlooked (Bilalli, Ibrahimi, Musliu, Geci, & Grapci-Kotori, 2024; Ibrahimi, Bilalli, Geci, & Musliu, 2024; Ibrahimi, Bilalli, Musliu, Geci, & Grapci Kotori, 2025).

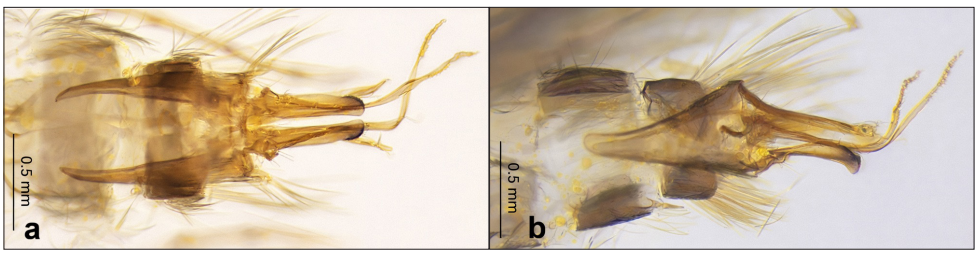

Figure 3. *Hydroptila occulta* (Eaton, 1873) a) Ventral view; b) Lateral view.

Site-level diversity patterns, while not dramatically different in species counts, nevertheless reflect ecological gradients within the basin. Selac III with 13 recorded species, was characterized by lower levels of anthropogenic disturbance, cooler water temperatures, and more complex channel structures. The higher faunal richness observed in these sites is consistent with predictions based on habitat heterogeneity and refuge availability. In contrast, Bistricë, Selac I and II hosted fewer species and were dominated by more generalist taxa. The observed distributions therefore underline the importance of preserving diverse stream types within a single basin to maintain overall faunal diversity.

This study fills a critical gap in the faunistic knowledge of Kosovo's caddisfly fauna and underscores the taxonomic and ecological value of targeted area for survey. The presence of species with conservation interest due to its association with relatively undisturbed sites, combined with the first national record of *Hydroptila occulta*, validates importance of the Bajgorë area. Further efforts should include multi-seasonal sampling, presuming that more species, potentially rare, will be found (Cerjanec et al, 2020; Kučinić et al, 2015; Ibrahimi, Jahiji, & Bilalli, 2017; Ibrahimi, Pali, Bilalli, & Musliu, 2019). This will also add to the list of the species of the Hydroptilidae family, which are also rarely reported from other parts of South-eastern Europe as well (Cerjanec et al, 2018; Kucinic et. al, 2015; Ibrahimi et al, 2017, 2019).

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