



THE FIRST RECORD OF *TVETENIA BAVARICA*, *PARALAUTERBORNIELLA NIGROHALTERALIS* (CHIRONOMIDAE), AND THE DIXIDAE FAMILY IN ALBANIA

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Abstract. The Culicomorpha (Diptera: Nematocera) of Albania are poorly known; there have been only a few studies dedicated to Chironomidae in the 21st century. Small streams are a common habitat in Albania, but their fauna is poorly studied. In 2024 and 2025, the faunistic studies dedicated to aquatic midges were conducted at four sites in two streams. Despite their low elevation, the streams differ from each other in regard to their hydrological features. The Chironomidae and Dixidae were collected using a hydrobiological hand net and identified with morphological and molecular methods. *Tvetenia bavarica* and *Paralauterborniella nigrohalteralis* are recorded in Albania for the first time. *Chironomus salinarius*, previously recorded from Laguna di Karavasta, is confirmed in the country through molecular identification. The current number of Chironomidae reported from Albania is 90. Dixidae (*Dixa nebulosa*) are detected as a family for the first time in Albania. The study indicates that even small streams at the Adriatic coast may host new aquatic taxa for the country. This concerns especially taxonomically diverse families like Chironomidae. Albania has never been the subject of extensive dipterological research. The progressive degradation of freshwater in the Mediterranean region implies a need for a systematic biodiversity assessment of streams and rivers across the western Balkan Peninsula.

INTRODUCTION

Culicomorpha is a diverse group of aquatic nematoceran flies, which includes, a.o., the Chironomidae (chironomids) and the Dixidae (meniscus midges) families. Chironomidae are commonly used in ecological research and in water quality assessments (Armitage et al. 1995; Rossaro and Marziali 2024). Given the importance of this group for environmental health research, it is essential to gain the best possible understanding of its diversity and distribution. The aquatic Diptera fauna of the Balkan Peninsula is one of the least recognised in Europe and highly underestimated in Albania. Two faunistic surveys on Chironomidae conducted in the 21st century (Plóciennik 2008; Bitušík and Trnková 2019) and records of singular species from caves (Sarbu et al. 2024; Kocot-Zalewska et al. 2025) demonstrate that even a small sampling effort may result in recording new species for the country. Bitušík and Trnková (2019) pro-

vided the first checklist of Chironomidae in Albania that consists of 85 species. This should be a small part of the total species diversity, as Gadawski (2020) encountered 152 new Chironomidae species only in Lake Shkodra in nearby Montenegro. Besides big lakes (Shkodra, Ohrid, and Prespa) and the Fierza reservoir, the country has a dense river system of many small and larger streams. While some streams are protected for their high biodiversity, the true richness of these ecosystems remains significantly underestimated. This is largely since key benthic groups, such as Chironomidae, remain poorly documented (Meulenbroek et al. 2021). The small Diptera families like Dixidae are even less recognised in the region. In recent years, the family was surveyed in Croatia (Ivković and Ivanković 2019), but the southern Balkans do not have up-to-date checklists.

Here we present the new faunistic studies on the Chironomidae and the Dixidae families from Albania. The

survey was conducted at two small tributaries of the Adriatic Sea. The collected material is not numerous, but it significantly contributes to the Culicomorpha checklist of the country. It gives the first records of two species and a family to the checklist of the Albanian dipteran fauna.

MATERIALS AND METHODS

Study sites

There were four sampling sites located in Albanian rivers: one at an unnamed stream flowing through Velipoja

town and three at an unnamed stream flowing through Orikum town (Figure 1).

The research had a faunistic character, so the sampling effort was not dedicated to following the community structure but to providing a brief view of the dominant taxa. The studied material was collected using a professional hand net with a mesh size of 0.25 mm. The macroinvertebrates were collected by kick sampling, sorted on-site alive, and preserved in 96% ethanol. The ethanol in the samples was exchanged after 24 h and then after two months to ensure optimal tissue preservation for subsequent genetic analysis. At each site, samples were collected from all representative habitats. The

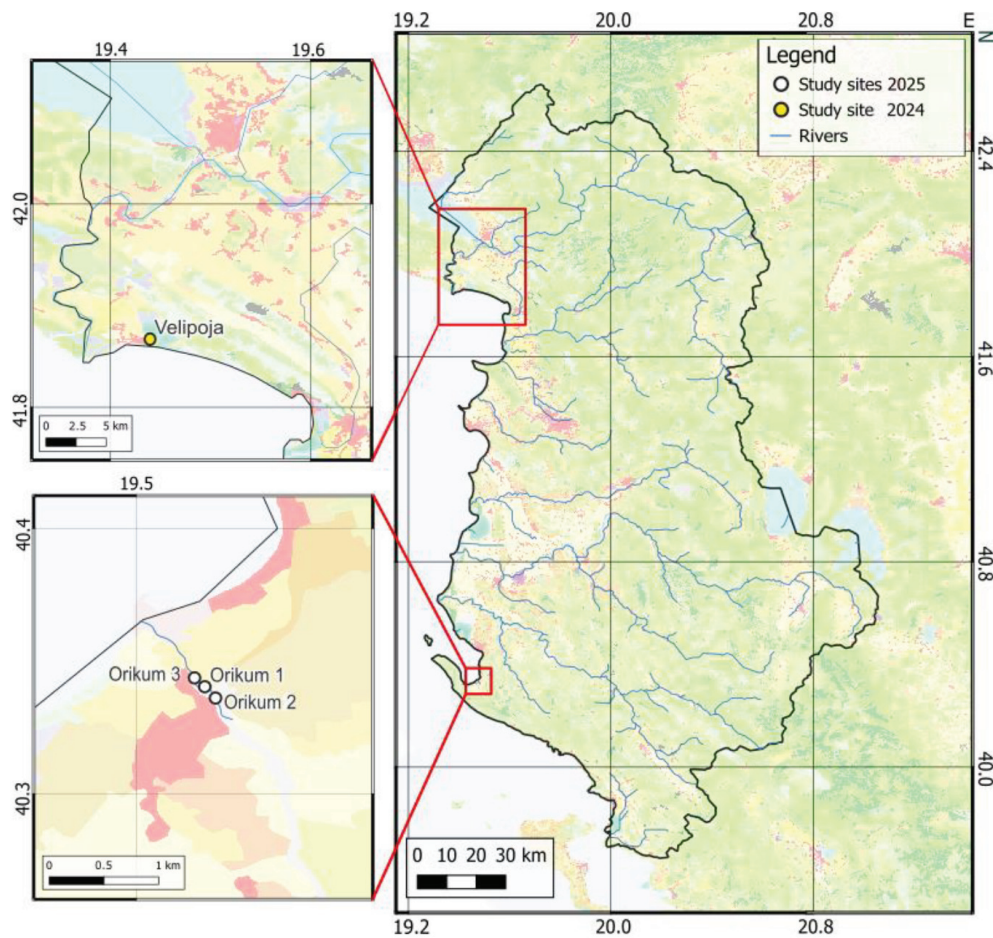


Figure 1. Study area (maps prepared in QGIS 3.44.9).

- 1) Orikum 1: 14.08.2025; 40°19'55.2"N, 19°28'37.6"E; 4 m a.s.l. Orikum town and the unnamed stream that flow through its suburbs are located in the southwest of Albania. The sampling point was located on a plateau, close to the town, between the urbanised area and the meadows. The riverbanks were covered with grass and aquatic vegetation. The rocky bottom was covered densely with filamentous algae. The width of the watercourse was ca. 10 m, and the depth was approximately 15 cm.
- 2) Orikum 2: 14.08.2025; 40°19'52.0"N, 19°28'42.5"E; 4 m a.s.l. The riverbanks at the sampling point were barely covered with vegetation. It was located just a few meters downstream of the waterfall. The width of the watercourse was ca. 4 m, and the depth at the deepest point reached several meters.
- 3) Orikum 3: 21.08.2025; 40°19'58.4"N, 19°28'35.4"E; 7 m a.s.l. The riverbanks were covered with reed vegetation. There were also patches of algae on the top of the stones covering the riverbed. The width of the watercourse was ca. 10 m, and the depth was up to 30 cm.
- 4) Velipoja: 09.07.2024; 41°51'53.9"N, 19°26'27.9"E; 1 m a.s.l. Velipoja is located in north-western Albania. The sampling point was located in abandoned agricultural land. Near the sampling site, there was a waste disposal area. The riverbanks were overgrown with grasses, sedges, and mugworts. At the sampled river section, there was scarce aquatic vegetation. The riverbed was muddy. The width of the stream was approximately 20 m, and the depth was about 1 m.

samples were faunistic and represented all dominant habitats in the sampling sites. In 2024, 33 Chironomidae larvae were collected, whereas in 2025, 20 Chironomidae larvae and 2 Dixidae larvae were collected. The Chironomidae and Dixidae larvae were mounted on permanent slides in Hoyer's medium and identified using the keys by Andersen et al. (2013), Moller Pillot and Klink (2003), and Disney (1999). Reference materials are stored in the collection of the first author.

To confirm and refine morphological identification, 30 individuals of *Chironomus* and one *Cricotopus bicinctus* were subjected to molecular analysis. The DNA isolation was performed using the GeneMATRIX Tissue DNA Purification Kit (manufactured by EurX) following the manufacturer's protocol. Molecular procedures followed the Polish Barcode of Life protocols: the amplification of the cytochrome oxidase subunit I gene (COI) was performed using primer pair LCO1490-JJ and HCO2198-JJ (Folmer et al. 1994). Quality control and the sequencing of the DNA barcoding fragment were carried out using the approach presented in Srivathsan et al. (2021, 2024) employing Oxford Nanopore Technology. The sequencing results were demultiplexed, and DNA barcodes were determined using ONT barcoder 2.0 (Srivathsan et al. 2024). The obtained sequences were identified by comparing them with publicly available ones from the BOLD database (<https://www.boldsystems.org>). All the Chironomidae sequences are deposited in BOLD in the dataset "DS-BALCHIR Chironomidae of the Balkan Peninsula" (DOI: [dx.doi.org/10.5883/DS-BALCHIR](https://doi.org/10.5883/DS-BALCHIR)).

RESULTS

The collected Chironomidae larvae were identified as eight species. Two of them, i.e., *Tvetenia bavarica* Goetghebuer, 1934 and *Paralauterborniella nigrohalteralis* (Malloch, 1915) were recorded in Albania for the first time. Additionally, *Chironomus salinarius* Kieffer, 1915 is confirmed with molecular identification to be recorded in Albania. The Dixidae family (represented by *Dixa nebulosa*) was recorded in Albania for the first time (Figure 2). All the species are widespread in Europe; their occurrence is presented in Albania and the surrounding countries below.

Family: Chironomidae

Subfamily: Orthocladiinae

Cricotopus s.str. *bicinctus* Meigen 1818. Velipoja – 1 larva (morphological and molecular identification (morph. i. and mol. i.)); Orikum 1 – 1 larva (morph. i.); Orikum 2 – 5 larvae (morph. i.); Orikum 3 – 3 larvae (morph. i.). Besides Albania, this species is recorded

in all surrounding countries (www.gbif.org; Smiljkov and Slavevska-Stamenković 2004; Ashe and O'Connor 2012; Płóciennik and Pešić 2012; Płóciennik and Karaouzas 2014; Bilalli et al. 2025).

Cricotopus s.str. *trifascia* Edwards, 1929. Orikum 3 – 1 larva (morph. i.). Besides Albania, it is recorded in Greece and Montenegro (www.gbif.org; Ashe and O'Connor 2012; Płóciennik and Pešić 2012; Płóciennik and Karaouzas 2014).

Rheocricotopus (*Psilocricotopus*) *chalybeatus* Edwards, 1929. Orikum 3 – 1 larva (morph. i.). Besides Albania, it is recorded in Greece, Kosovo, and Montenegro (www.gbif.org; Ashe and O'Connor 2012; Płóciennik and Pešić 2012; Płóciennik and Karaouzas 2014; Bilalli et al. 2025).

Tvetenia bavarica Goetghebuer, 1934. Orikum 1 – 1 larva (morph. i.); Orikum 3 – 2 larvae (morph. i.). Species recorded in Albania for the first time (Bitušik and Trnková 2019), earlier recorded in Kosovo and Montenegro (www.gbif.org; Ashe and O'Connor 2012; Gadawski 2020; Płóciennik et al. 2023).

Tvetenia calvescens Edwards, 1929. Orikum 1 – 1 larva (morph. i.); Orikum 3 – 1 larva (morph. i.). Besides Albania, it is recorded in Kosovo and Montenegro (www.gbif.org; Ashe and O'Connor 2012; Gadawski 2020; Bilalli et al. 2025).

Subfamily: Chironominae

Chironomus salinarius Kieffer, 1915. Velipoja – 30 larvae (morph. i. and mol. i.). Species recorded previously in Albania from Karavasta Lagoon on larval material were identified only using their morphological features (Casellato et al. 1997). The species is also recorded in Greece and Montenegro (Evangelopoulos et al. 2008; Móra and Csabai 2008; Gadawski 2020).

Paralauterborniella nigrohalteralis (Malloch, 1915). Orikum 2 – 1 larva (morph. i.). Species recorded in Albania for the first time (Bitušik and Trnková 2019). Previously recorded in Montenegro (Płóciennik and Pešić 2012; Gadawski 2020).

Polypedilum (*Uresipedilum*) *convictum* Walker, 1856. Orikum 1 – 2 larvae (morph. i.), Orikum 3 – 1 larva (morph. i.). Besides Albania, it is also recorded in Greece, Kosovo, Montenegro and possibly in Macedonia (www.gbif.org; Šapkarev 1975; Móra and Csabai 2008; Płóciennik and Pešić 2012; Gadawski et al. 2022; Bilalli et al. 2025).

Family: Dixidae

Dixa nebulosa Meigen, 1830. Orikum 1 – 1 larva (morph. i.); Orikum 3 – 1 larva (morph. i.). Family and species recorded in Albania for the first time. Previously

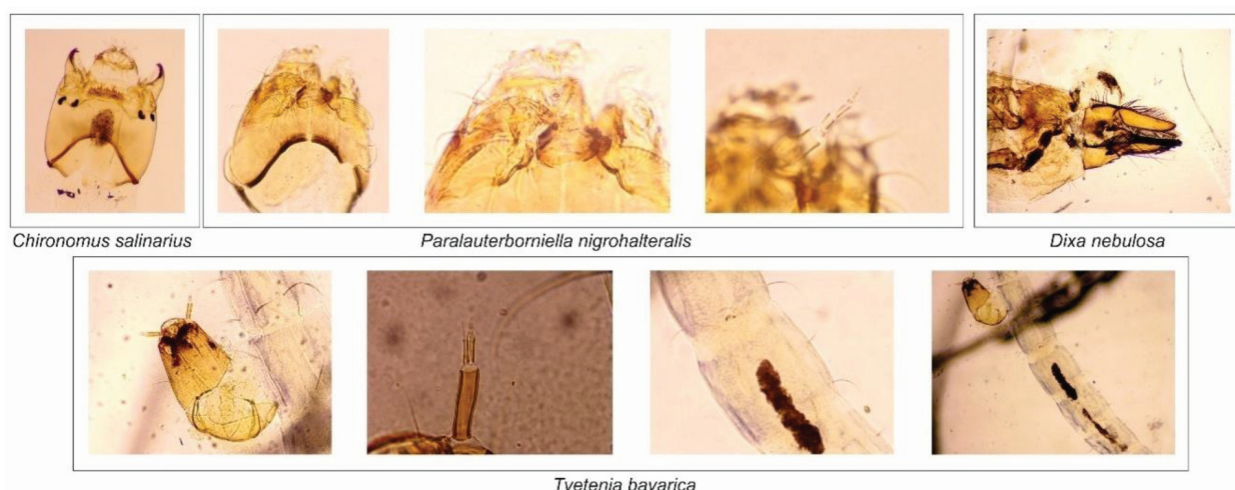


Figure 2. Newly recorded species (images under 10×10 and 10×40 magnification): *Chironomus salinarius* – head capsule; *Paralauterborniella nigrohalteralis* – head capsule, mentum, antenna; *Dixia nebulosa* – posterior paddle of lateral plates with caudal appendage; *Tvetenia bavarica* – head capsule, antenna, abdominal segment with setation, abdomen with setation.

recorded in Greece and Montenegro (Koç et al. 2006; Ivković and Ivanković 2019).

DISCUSSION

The species found in Orikum are typical of small, upland brooks (Moller Pillot 2009, 2013; Moller Pillot and Klink 2003). The stream directly flows to the sea, but according to Moller Pillot's classification (2009, 2013), among the collected species, there are no taxa resistant to high salinity except for *Cricotopus trifascia* and *Cricotopus bicinctus*. Nearly all species are associated with well-oxygenated streams with a fast current and a hard bottom. Only *Cricotopus bicinctus* tolerates higher pollution; most species live in clear waters and scrape algae, diatoms, and detritus from the stones. Both *Tvetenia*, including *Tvetenia bavarica*, are associated with cold, oligosaprobic, and fast-flowing streams (Moller Pillot 2013; Moog et al. 2017). The chironomids earlier recorded in Albania by Plóciennik (2008) and Bitušik and Trnková (2019) were found previously in mid- to upper-elevated streams with a higher current, turbulent water, and a hard bottom covered with filamentous algae. Only *Cricotopus bicinctus* was collected from the Drinit River near Shkodra (Plóciennik 2008). Bitušik and Trnková (2019) collected some of them in Lake Ohrid. *Dixa nebulosa* was found at the Orikum sites with reed belts or higher grass vegetation at the banks, which is in line with the species' habitat preferences (Disney 1999). *Paralauterborniella nigrohalteralis* breaks from the assemblage nature. It dwells on a muddy bottom in streams, where it builds tubes and feeds on the fine particulate organic matter. It prefers slow current or lentic waters but still requires high oxygen content (Moller Pillot 2009). This species was collected at a

sampling point with a slower current than the others. Velipoja has a muddy bottom and a weak current. As the sampling point is near the sea, salty marine waters may flow through the groundwater to the stream, though the salinity was not measured in this study. Besides *Cricotopus bicinctus*, other taxa recorded in Orikum could not stand such conditions. However, halophilous *Chironomus salinarius* predominates in Velipoja (Moller Pillot 2009; Cartier et al. 2011).

The *Chironomus salinarius* larvae were earlier detected at Laguna di Karavasta (Casellato et al. 1997), but they were identified only using their morphological features. The *Chironomus* genus is species-rich, and its larvae are difficult to distinguish morphologically. *Chironomus salinarius* is the most halophilous species from this genus, widely distributed in brackish waters of Europe (Cartier et al. 2011). Its occurrence in Laguna di Karavasta is ecologically justified. Nevertheless, the molecular identification with a barcode confirms the presence of the species in Albania. *Tvetenia bavarica* is also widespread, but as an ecologically sensitive species, it is restricted to clean waters and usually stays at higher elevations. The relatively rare *Paralauterborniella nigrohalteralis* was encountered earlier in Montenegro (www.gbif.org; Plóciennik and Pešić 2012; Gadawski 2020). Whereas Bitušik and Trnková (2019) do not place *Chironomus salinarius* on their checklist, *Tvetenia bavarica* and *Paralauterborniella nigrohalteralis* are new to Albania; *Tanytarsus triangularis* Goetghebuer, 1928, and *Diamesa bohemani* Goetghebuer, 1932 were recently detected in Albanian caves (Sarbu et al. 2024; Kocot-Zalewska et al. 2025). The current number of Chironomidae reported from Albania is 90. Besides the new chironomid species, the meniscus midges (Dixidae) as a family were discovered in Albania for the first time. This is a very common family that probably occurs

in every country in Europe. *Dixa nebulosa* is one of its widespread species (www.gbif.org). The fact that it was found in Albania for the first time indicates very limited recognition of the local fly fauna. Further research on the diversity and distribution of Culicomorpha in the southern Balkan Peninsula is required.

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Author's contribution

A.S.: Conceptualisation, Investigation, Writing – Original Draft, Writing – Review & Editing; **K.S.:** Investigation, Writing – Original Draft, Writing – Review & Editing; **A.W.:** Visualisation, Writing – Original Draft, Writing – Review & Editing; **M.P.:** Conceptualisation, Investigation, Visualisation, Writing – Original Draft, Writing – Review & Editing, Supervision.

Conflict of interest statement

As authors of this article, we declare that we do not have any conflict of interest.

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