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# First record of *Hydropsyche cornuta* Martynov, 1909 (Trichoptera, Hydropsychidae) from Iran

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## ABSTRACT

Caddisfly sampling conducted during July 2021 from the Shalmash Waterfall in the West Azerbaijan Province of Iran, revealed the first record of *Hydropsyche cornuta* Martynov, 1909 for Iran. Previously this species had been known from several localities in Türkiye and few localities in Georgia, Lebanon and Syria. The morphology of male genitalia in the collected specimens from Iran corresponds to the described species. This discovery increases considerably the known areal of *Hydropsyche cornuta* and contributes to the knowledge of the Iranian Hydropsychidae. Shalmash Waterfall from where the new record is found is otherwise known for exceptional composition of aquatic insect fauna, including rare and endemic species.

*Keywords*: Aquatic biodiversity, caddisflies, West Azerbaijan Province, Shalmash Waterfall.

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## INTRODUCTION

The family Hydropsychidae, within the order Trichoptera, comprises net-spinning caddisflies commonly inhabiting mostly lotic freshwater ecosystems but found in lentic habitats as well. Species of this family are characterized by their larval ability to construct silk nets, which they utilize for filter feeding on fine particulate organic matter. They are important constituents of aquatic ecosystems and serve as vital bioindicators in freshwater biomonitoring, with many species adapted to different pollution levels. Hydropsychidae play a significant role in the trophic dynamics of aquatic ecosystems (Morse, Frandsen, Graf, & Thomas, 2019; Ibrahimi, 2024).

Taxonomic knowledge of Hydropsychidae of Iran is still limited, same as with many other families of caddisflies. Considerable areas of this country still remain insufficiently explored. Other than this, Hydropsychidae, along with other families of Trichoptera has been used frequently in biomonitoring in Iran (e.g. Varnosfaderany, Ebrahimi, Mirghaffary, & Safyanian, 2010; Aazami, Sari, Abdoli, Sohrami, & Van den Brink, 2015).

In this paper we give a list of species collected at Shalmash Waterfall in Iran during July 2021 and discuss particularly the presence of *Hydropsyche cornuta* in this area.

## MATERIAL AND METHODS

**Fieldwork, identification and taxonomic work.** Adult caddisflies were collected on 29$^{th}$ and 30$^{th}$ July 2021 using entomological net and handpicking during the daylight as well as ultraviolet light traps during the night. The collected specimens were stored directly in 90% ethanol and are deposited at the Department of Biology, Faculty of Mathematics and Natural Sciences, University of Prishtina “Hasan Prishtina,” Prishtinë, Kosovo. The specimens were identified under a stereomicroscope with determination keys from Malicky (2004) and Kumanski (1985, 1988). Systematic nomenclature follows Morse (2024).

Photographs of the specimens were taken using an Olympus SC53 camera attached to the Olympus SZX16 stereomicroscope and subsequently processed with Adobe Photoshop CC software.

**Sampling area.** Shalmash Falls is a series of three waterfalls spanning 200 meters, with the southernmost being the main waterfall due to its height and slope. The sampling station is located at 36°5’52.20” N, 45°29’31.35” E, 1141 m asl. The northern waterfall is surrounded by forest and is constitutes an important attraction (Khezri, 2000). These falls are part of a tributary of the Little Zab River, which originates from the springs and glacier-fed streams of the Zagros Mountains. The river flows through Sardasht County and the village of Shalmash in the southern part of West Azerbaijan Province. The region is characterized by humid and cold climate (Salari, 2020).

Near the sampling station, the riverbed consists of a rocky substrate with stones, pebbles, and gravel, along with some fine sediment. Less than half of the streambank at the sampling site has vegetation coverage. Significant disruption of streambank vegetation and limited high riparian vegetation were observed at the sampling site but throughout the river segment nearby as well.

## RESULTS

During this investigation we found 8 species belonging to 6 genera and 4 families (Table 1). The family with the highest number of species was Hydropsychidae with 4 in total, while Rhyacophilidae and Psychomyiidae were found with a single species each. The species with the highest number of specimens was *Psychomyia pusilla* Fabricius, 1781, with 86 specimens in total, while *Oxyethira falcata* Morton, 1893 was found with a single male specimen.

The found male specimens of *Hydropsyche cornuta* (Figs. 1- 2) correspond with the described species by Martynov (1909) and redescribed by Botosaneanu (2004). The head and thorax are dark brown, lighter ventrally, the abdomen is generally light brown, the antennae yellowish; the legs are brown. Forewing color brown in preserved specimens, hind wing color lighter than forewings. Abdominal segment IX with dorsal median keel which in dorsal view is elongated, generally triangularly shaped. Intersegmental profile between the segments IX and X in lateral view deep. Segment X in lateral view apically pointed. The phallic apparatus deeply curved mesally in lateral view; apically wider in ventral view. Harpago basally wide, apically narrow and pointed in lateral view.

Table 1. The list of species and number of specimens collected at Shalmash Waterfall on 29th and 30th July 2021.

| Species | Male ♂ | Female ♀ | Total |
|---|---|---|---|
| **Rhyacophilidae** | | | |
| *Rhyacophila nubila* Zetterstedt, 1840 | 3 | 4 | 7 |
| **Psychomyiidae** | | | |
| *Psychomyia pusilla* Fabricius, 1781 | 71 | 15 | 86 |
| **Hydroptilidae** | | | |
| *Oxyethira falcata* Morton, 1893 | 1 | | 1 |
| *Hydroptila taurica* Martynov, 1934 | 2 | | 2 |
| **Hydropsychidae** | | | |
| *Cheumatopsyche persica* Mey, 2004 | 3 | | 3 |
| *Hydropsyche bitlis* Malicky, 1986 | 2 | | 2 |
| *Hydropsyche cornuta* Martynov, 1909 | 2 | | 2 |
| *Hydropsyche iokaste* Malicky, 1999 | 5 | | 5 |


Figure 1. Habitus of *Hydropsyche cornuta.*

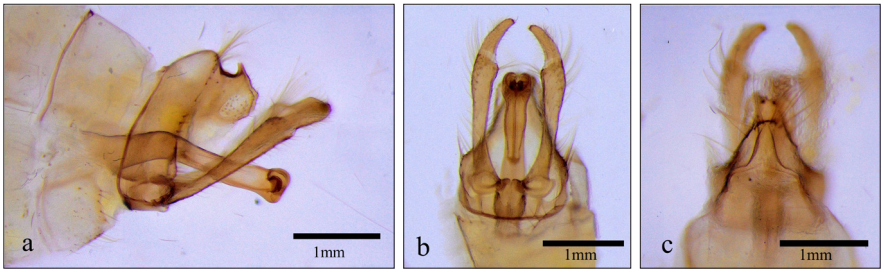


Figure 2. Male genitalia of *Hydropsyche cornuta*. a) Lateral view; b) ventral view; c) dorsal view.

## DISCUSSION

The family Hydropsychidae, known for its ecological diversity and wide distribution in freshwater habitats, includes several species endemic to Iran. During this study we found several species of this family with restricted distributions such as: *Hydropsyche bitlis* Malicky, 1986, *Hydropsyche iokaste* Malicky, 1999, and *Cheumatopsyche persica* Mey, 2004. *Hydropsyche bitlis* was originally described from Türkiye, from where it is known in several localities and is currently reported from a single locality in Iran (Neu, Malicky, Graf, & Schmidt-Kloiber, 2018). The locality from where we found this species during this investigation is close to the previously reported locality in Iran. *Hydropsyche iokaste* was described from Iran and up to now was only known from the Elburz Mountain in Iran. It's finding in the Sardasht area increases its known areal for several hundred kilometers. *Cheumatopsyche persica* was described from Iran and was consequently found in Türkiye as well (Küçükbasmacı & Kıyak, 2017). It is altogether known only from few localities and our finding greatly expands its known areal. These findings are significant as they contribute to a more comprehensive understanding of the biogeography of Hydropsychidae in Iran, particularly within the genus *Hydropsyche* Pictet, 1834, which has been relatively understudied in the region.

Previous research on the genus *Hydropsyche* in Iran has documented a limited number of species, with some recognized as endemics. However, the discovery of these three species, along with the identification of *Hydropsyche cornuta* -a rare species previously recorded only in Türkiye, Syria, Lebanon (Sipahiler, 2008), and its type locality in Georgia-marks a considerable expansion of our knowledge. The presence of *H. cornuta* in Iran extends its known range substantially, suggesting that the species' distribution may be broader and more complex than currently understood. This discovery not only raises questions about the potential for other undiscovered species within the genus in Iran but also emphasizes the necessity for more detailed and systematic taxonomic studies in the region. Further research is needed to explore the full extent of the diversity within the Hydropsychidae family in Iran. Recently a new species of this family was described from Kurdistan Province of Iran, namely *Hydropsyche kurdistanica* Ibrahimi & Mohammadi (Ibrahimi, Mohammadi, Ghaderi, & Karimian, 2023a). In neighboring Türkiye several endemic species of this family are known.

The Shalmash Waterfalls, where this investigation was conducted, are well-known for their rich diversity of aquatic insect species. This area has garnered attention for hosting several localized endemics, highlighting its ecological significance. Notably, recent studies have uncovered a new species of Diptera, *Paracricotopus davoodi* Ghaderi, Ibrahimi, Namayandeh, & Mohammadi (Ghaderi, Ibrahimi, Namayandeh, & Mohammadi, 2024), which adds to the growing list of unique and specialized species inhabiting this region. The discovery of such endemics and newly described species underscores the importance of the Shalmash Waterfalls as a biodiversity hotspot, necessitating further research and conservation efforts to protect its unique aquatic ecosystems. This area's diverse and specialized fauna offer valuable insights into the biogeographical patterns and evolutionary processes shaping the region's aquatic insect communities.

This study enhances our understanding of the distributional patterns of the family Hydropsychidae and aligns with the recent surge in research focused on caddisflies in Iran (e.g. Ibrahimi et al., 2023b, 2023c, 2024; Olah & Johansson, 2008; Olah et al., 2017). As noted by these studies and the current one, certain genera of Hydropsychidae and Limnephilidae are of special importance in Iran in terms of endemism and distribution. By documenting new species and extending the known ranges of existing ones, this work contributes to the broader effort to map the biodiversity of Trichoptera in the region. The findings support ongoing studies that aim to uncover the ecological roles and evolutionary histories of these aquatic insects in Iran's diverse freshwater habitats.

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