



Hydroptila angustata Mosely, 1939 (Trichoptera: Hydroptilidae): A significant addition to the Micro-Caddisfly fauna of Northwest Africa

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ABSTRACT. The micro-caddisfly fauna of Morocco is still poorly known, despite its geographical location and the exceptional diversity of its ecosystems. Recent field surveys in northern Morocco have resulted in the discovery of *Hydroptila angustata* Mosely, 1939, providing the first evidence of its occurrence in freshwater ecosystems of Maghreb (Northwest Africa). Illustrations of the male genitalia are presented. The species was found in a protected area located in the Middle Atlas Massif, a cornerstone of aquatic biodiversity in Morocco. Further entomological studies could result in the discovery of the species elsewhere in Morocco and Northwest Africa. With this addition, the total number of caddisfly species in Morocco is now 88.

Keywords: caddisflies, aquatic insects, rare species, Maghreb, Middle Atlas

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INTRODUCTION

The Middle Atlas massif is a prominent geographical feature in Morocco, extending approximately 350 km from the south-western to north-eastern regions. Strategically positioned between the Rif and the High Atlas Mountains, this mountain range encompasses an expanse of 2.3 million hectares. The Middle Atlas is considered to be one of the most well-watered mountain ranges in the country, and as such, it is of significant hydrogeological interest in the region (Taybi et al., 2020). Indeed, it is regarded as the "water reservoir" of the country, characterised by a remarkable diversity of wetland habitats, with dozens of wetlands supporting a high level of biodiversity, including numerous endemic species (Glöer et al., 2020; Mabrouki et al., 2022, 2023a, 2023b; Bessalaya et al., 2024).

The Hydroptilidae are a large family of Trichoptera, also known as "microtrichopterans" or "microcaddisflies". The family includes small caddisflies and contains over 2,600 described species (Thomson, 2023). The larvae of the Hydroptilidae family are 2–3 mm long and build and carry a case that makes them more conspicuous. Due to their diminutive size, these larvae often go unnoticed during the initial stages of development (Oscoz et al., 2011). The family is represented by six genera in Morocco (Hajji, 2017; Mabrouki et al., 2020), including the genus *Hydroptila* Dalman, 1819. The genus *Hydroptila* is

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represented in the Western Palearctic region by approximately 5% of the total species of Trichoptera (Ibrahimi, 2024). The genus was represented by seven species in Morocco, namely *H. angulata* Mosely, 1922, *H. aurora* Malicky, 1997, *H. autonoe* Malicky, 1997, *H. campanulata* Morton, 1896, *H. mendli* Malicky, 1980, *H. cintrana* Morton, 1904 and *H. vectis* Curtis, 1834 (Malicky, 1997; Hajji, 2017; Touabay et al., 2002; Mabrouki et al., 2020). However, despite the recent taxonomic progress made on the Trichoptera of Morocco, the knowledge of the microcaddisfly fauna of the country is still limited. In this context, and with the aim of advancing the knowledge of caddisfly fauna, several field expeditions have been conducted in the northern part of Morocco, with a focus on its major geographical barriers, such as the Middle Atlas massif. These expeditions have resulted in the discovery of *Hydroptila angustata* Mosely, 1939, a new species record for the country and Northwest Africa.

MATERIAL AND METHODS

Study area in the Middle Atlas massif, the Zerrouka wetland (or Lake Zerrouka) is a protected area situated in the province of Ifrane, in the Middle Atlas Mountains, at an altitude of 1,613 metres (Fig. 1). It has been declared a Site of Biological and Ecological Interest (SIBE) by the Moroccan government. This area is an integral part of the Oued Tizguite wetland, of which the Zerrouka River is a tributary, which was designated a Ramsar site on 22.05.2019. The whole area is home to a remarkable aquatic biodiversity (for more details, see Mabrouki et al., 2022, 2023c).

We collected adult caddisflies with ultraviolet light traps, entomological nets, and handpicking from the riparian vegetation near the stream. Sampling with ultraviolet light traps follows a procedure by Malicky (2004). Specimens were stored directly in 80% ethanol. Abdomens were macerated in KOH and preserved in glycerine. The rest of the specimen is preserved in 70% alcohol. The photos were taken with an Olympus® SZ50 camera. Specimens of *Hydroptila angustata* are deposited in the collection of the Faculty of Mathematics and Natural Sciences, University of Prishtina, collection 'Halil Ibrahimi-Morocco' (FMNSHIM).

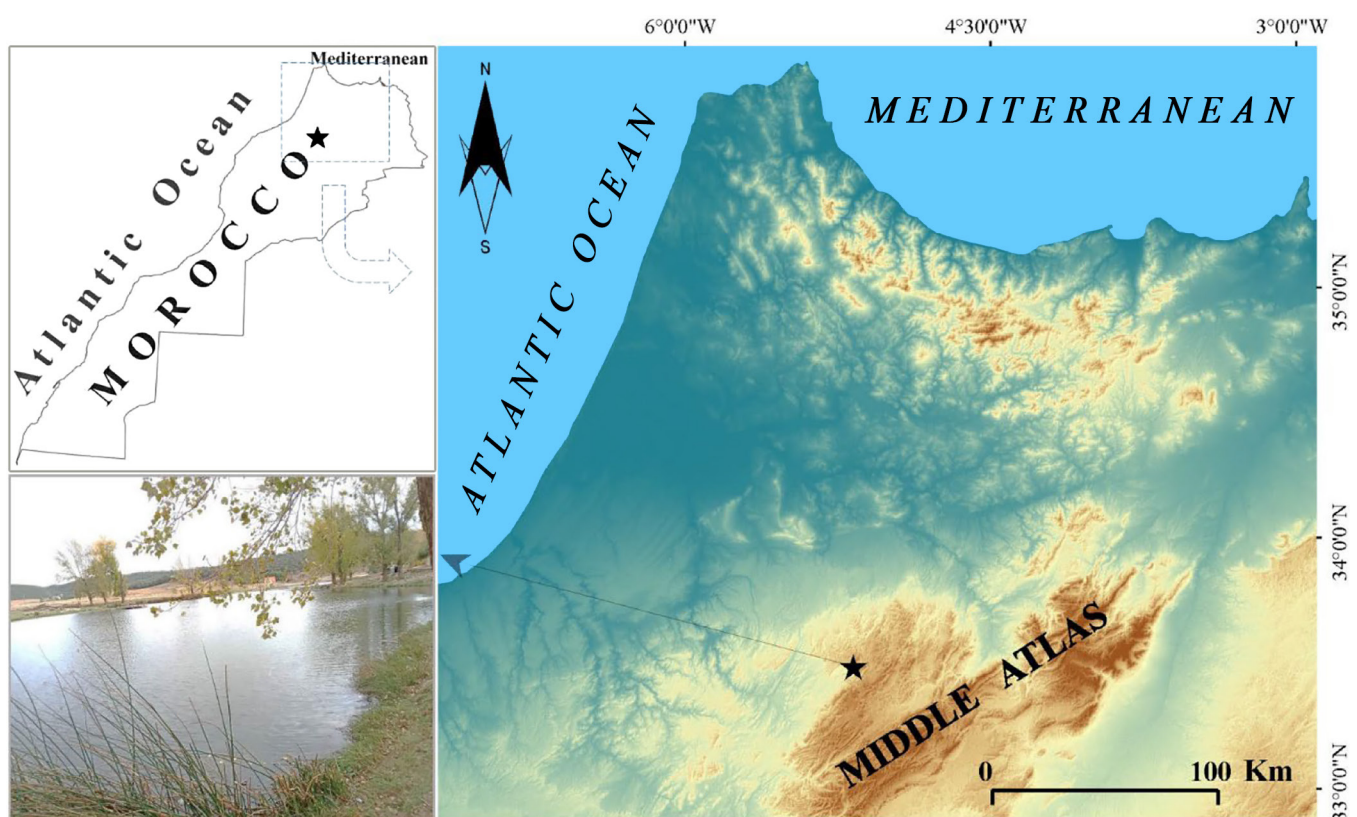


Figure 1. Location of Zerrouka wetland in the Middle Atlas and Morocco, and a view of the habitat.

RESULTS

Taxonomic hierarchy

Class Insecta Linnaeus, 1758

Order Trichoptera Kirby, 1813

Family Hydroptilidae Stephens, 1836

Subfamily Hydroptilinae Stephens, 1836

Genus *Hydroptila* Dalman 1819

Hydroptila angustata Mosely, 1939

Materials examined. 2 ♂♂. Morocco, Fez-Mekens Region, Ifrane Province, Oued Tizghit and Zerrouka lakes, 33°32'51.6"N 5°05'44.1"W, 1,600 m above sea level (a.s.l.).

Diagnosis. The male genitalia (Fig. 2) of the observed specimens correspond closely with the illustrations provided by Malicky (2004). The right-angled truncation of segment X in the lateral view, in conjunction with the inferior appendages that bear pointed apices and a transversal band, facilitates unambiguous differentiation of this species from closely related *Hydroptila* species.

Distribution and ecology. *Hydroptila angustata* was first described in Egypt and has since been found across a relatively wide area of the Western Palearctic region, including: Austria, Bulgaria, China, Korean Peninsula, Cyprus, Czech Republic, Egypt, Greece, Hungary, Iran, Italy, Kazakhstan, Lebanon, Montenegro, Romania, Russia, Spain, Syria, Turkey, Ukraine and Uzbekistan (Yang et al., 2016; Thomson, 2023; Bozdoğan et al., 2025). The species seems to have a wide ecological spectrum in the river systems of the eastern Mediterranean, from springs to large low-altitude rivers (Botosaneanu, 1992). The imago stage of the species is reported throughout the year (Graf et al., 2008); Morocco (New record for Morocco and Northwest Africa).

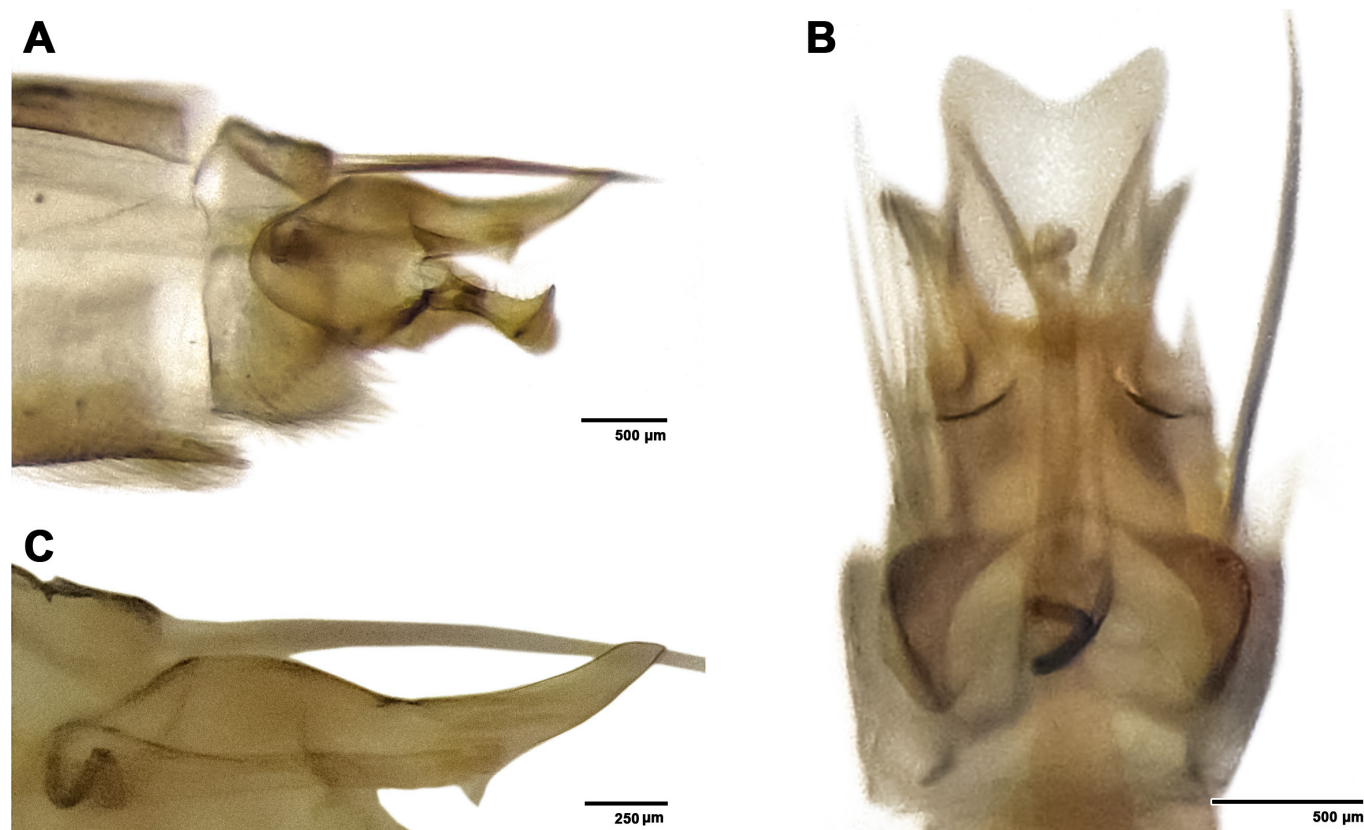


Figure 2. Male genitalia of *Hydroptila angustata* Mosely, 1939, found in Morocco. **A.** Lateral view; **B.** Dorsal view; **C.** The right-angled truncation of segment X.

Genus *Tinodes* Curtis, 1834

Tinodes sp.

Materials examined. 4 larvae. Morocco, Fez-Mekens Region, Ifrane Province, Oued Tizghit and Zerrouka lakes, 33°32'51.6"N 5°05'44.1"W, 1,600 m above sea level (a.s.l.), deposited in the Mabrouki Y. & Taybi A.F. collection.

Genus *Hydropsyche* Pictet, 1834

Hydropsyche sp.

Materials examined. 10 larvae. Morocco, Fez-Mekens Region, Ifrane Province, Oued Tizghit and Zerrouka lakes, 33°32'51.6"N 5°05'44.1"W, 1,600 m above sea level (a.s.l.), deposited in the Mabrouki Y. & Taybi A.F. collection.

DISCUSSION

Aquatic insects, including Trichoptera, play a vital role in terms of biodiversity and ecosystem functioning, and consequently in the stability of ecosystems (Wallace & Webster, 1996; Tachet et al., 2010; Morse, 2024). Furthermore, they facilitate the identification of alterations induced by human activity, the establishment of criteria for the protection and restoration of ecologically significant ecosystems, and the integrated management of wetlands (Abellán et al., 2007; Ibrahimi, 2024). Consequently, the possession of accurate knowledge regarding species presence and distribution is imperative for the effective protection of biodiversity (Millán et al., 2014). In this paper, we confirm the presence of *Hydroptila angustata* in Morocco and the Maghreb, bringing the total number of caddisflies in Morocco to 88 species. Knowledge of the Trichoptera fauna of Morocco has advanced in recent years, with many new species added recently, including species new to science (Harrak et al., 2024; Mabrouki et al., 2024; Taybi et al., 2024a). Even though Morocco has still been incompletely investigated in general regarding its caddisfly fauna, despite its geographic position and extraordinary diversity of ecosystems. Considering the high number of caddisflies found in neighbouring areas such as the southern Iberian Peninsula, further intensive studies and collecting expeditions are likely to increase the number of Trichoptera species known to occur in Morocco, which are urgently needed.

Morocco is among the richest countries in North Africa in terms of wetlands, with 38 wetlands currently listed as RAMSAR sites (Azeroual et al., 2000; Chillasse & Dakki, 2004). A significant number of these wetlands are located in the Middle Atlas, which play an important role in the national hydrological, socio-economic and ecological systems (Chillasse et al., 2001). However, the country has recently experienced a significant rainfall deficit, leading to severe droughts that have had substantial consequences for water resources (El Morabet et al., 2022). In recent years, a significant number of freshwater ecosystems within the Middle Atlas massif have undergone desiccation. Given the high rate of endemism within the Moroccan fauna, it is probable that numerous extinctions have occurred. The scarcity of water resources in Morocco, attributable to the semi-arid climate that characterises most of the country, is compounded by anthropogenic activities and water pollution, including physical alterations such as channelisation and impoundments, which have a detrimental effect on hydrology and benthic habitat (Berrahou et al., 2001; Mabrouki et al., 2019; Taybi et al., 2020). The situation is further complicated by the presence of alien and invasive species, which represent a new emerging threat to the aquatic biodiversity of Morocco. The Middle Atlas massif, encompassing the Zerrouka wetland, is home to rich and endemic aquatic fauna, including Trichoptera such as *Agapetus dolichopterus* Giudicelli & Dakki, 1980; *Pseudoneureclipsis maroccanus* Dakki & Malicky, 1980, and *Tinodes atlasensis* Ibrahimi, Mabrouki & Taybi, 2021 (Giudicelli & Dakki, 1980; Ibrahimi et al., 2021; Mabrouki et al., 2020). However, this wet massif also constitutes a significant focal point for biological invasions within Moroccan freshwater systems, with a substantial number of alien species having been identified in the wetland (Mabrouki et al., 2023c; Taybi et al., 2023, 2024b). Major efforts are needed to improve the understanding and knowledge of the aquatic invertebrate fauna of Morocco, which still lacks conservation assessments compared to the vertebrates, especially in the context of climate change and desertification scenarios and biological invasion threatening the aquatic ecosystems of North Africa as a whole.

Species of the Hydroptilidae family have often disjunct distributions, low populations and are thus often neglected in caddisfly studies. Several low-scale distributed species have been reported for the first time from particular countries in the Western Palearctic lately (Ibrahimi et al., 2014, 2017, 2019, 2025; Cerjanec et al., 2020; Salihu et al., 2023; Bilalli et al., 2024; Musliu et al., 2024). Because of this, it is highly expected that future caddisfly studies in Morocco will reveal more species of this family.

AUTHOR'S CONTRIBUTION

The authors confirm their contributions to the paper as follows: All authors contributed equally to the following activities: conceptualization, formal analysis, methodology, investigation, and writing—review and editing. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the collection of the Faculty of Mathematics and Natural Sciences, University of Prishtina, collection 'Halil Ibrahimi-Morocco' (FMNSHIM), and are available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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حضور *Hydroptila angustata* Mosely, 1939 (Trichoptera: Hydroptilidae): گزارش جدید مهم برای فون ریزبال موداران شمال غرب آفریقا

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چکیده: علی‌رغم موقعیت جغرافیایی و تنوع استثنایی اکوسیستم‌ها، فون ریزبال موداران در کشور مراکش هنوز به خوبی شناخته نشده است. بررسی‌های میدانی اخیر در شمال مراکش منجر به کشف گونه *Hydroptila angustata* Mosely, 1939 شد. این اولین گزارش از حضور این گونه در اکوسیستم‌های آب شیرین مراکش (شمال غرب آفریقا) است. تصاویری از اندام زادآوری حشره نر ارایه شد این گونه در یک منطقه حفاظت‌شده واقع در رشته‌کوه‌های میانه اطلس یافت شده است که منشاء تنوع زیستی آبی در مراکش به شمار می‌رود. مطالعات بیشتر ممکن است منجر به کشف این گونه در نقاط دیگر مراکش و شمال غرب آفریقا شود. بر اساس یافته‌های جدید، تعداد کل گونه‌های بال موداران در مراکش اکنون به ۸۸ می‌رسد.

واژگان کلیدی: بال موداران، حشرات آب‌زی، گونه‌های کمیاب، مغرب، میان‌اطلس