

OCYDROMIA (DIPTERA: HYBOTIDAE) IN MOROCCO: MOLECULAR TEST OF FAUNAL COMPOSITION, NEW DATA ON DISTRIBUTION AND ECOLOGY

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We present here the first update on the distribution of the genus *Ocydromia* in Morocco since its initial record more than a century ago, based on *Ocydromia glabricula*. The data, based on surveys conducted over more than two decades across Morocco, confirm that *Ocydromia glabricula* remains the sole representative of its genus in Morocco. Among the hundreds of surveyed sites in different regions of Morocco, including both protected and non-protected areas, *Ocydromia glabricula* was encountered exclusively in certain Protected Areas in the Moroccan Rif. For the first time, the COI barcodes of the species from North Africa have been presented, with some elucidation into the genetic relationships among specimens. Some new insights into the ecology of *Ocydromia glabricula* are provided as well.

Key words: barcoding, Empidoidea, Moroccan Protected Areas, new records, Ocydromiinae

Ocydromia Meigen, 1820 is one of the 15 genera currently included in the subfamily Ocydromiinae (Wahlberg & Johanson, 2018), comprising medium-sized predacious species with a body length of about 3.0–4.5 mm. It is a poorly represented genus with only nine species known in the world (Sinclair & Cumming, 2017), of which *Ocydromia glabricula* (Fallén, 1816) and *Ocydromia melanopleura* Loew, 1840 are the only species known to occur in the Western Palaearctic region. In North Africa, as a region within the Western Palaearctic, the genus *Ocydromia* has so far been reported only from Morocco, represented by *Ocydromia glabricula*. However, this record dates back to a single observation in 1913 (Becker & Stein, 1913), and no further occurrences have since been documented. Therefore, we provide here an updated account of the genus *Ocydromia* in Morocco based on nearly two decades of field investigations, covering hundreds of sites surveyed across various regions of Morocco (Rif; Eastern Morocco; Atlantic Plain; Middle, High and Anti Atlas and the Sahara) by the last author and her team of students, including both protected and non-protected areas.

The investigations show that, despite this large coverage, *Ocydromia glabricula* (Electronic Supplement 3: Fig. S1, Fig. S2) remains the only species recorded since its last report over a century ago, thus confirming its status as the sole representative of the genus *Ocydromia*

within Morocco. During these surveys, *Ocydromia glabricula* was recorded exclusively in Protected Areas in the Moroccan Rif region, suggesting a high degree of ecological specialisation and sensitivity to anthropogenic disturbance. This further emphasises the function of these areas as critical refuges for biodiversity and their strategic importance for conserving rare, elusive, or vulnerable species often absent from more disturbed habitats. The ten positive sites where the species was found are as follows (designations are in Electronic Supplement 3: Fig. S4): S1 (Oued Farda), S2 (Lemtahene), S3 (Centre Bouhachem), S4 (Medchar Lemtahene), S5 (Ajihouen), S6 (Bab Berred), S7 (Dayat Fifi), S8 (Oued Asellam), S9 (Fifi forest), S10 (Riba). The sites are spread across the following Protected Areas in the Western part of the Rif: National Park of Talassemtane (NPTL), Natural Park of Bouhachem (NPBH), the Site of Biological and Ecological Interest of Tizirane (SIBE Tizirane), and the Mediterranean Intercontinental Biosphere Reserve (MIBR) (Electronic Supplement 3: Fig. S3, Table S1). Finding the species exclusively in the Rif, including the original record in 1913, may be explained by its affinity to the climatic and ecological conditions prevailing in this region.

The specimens were collected using a sweep net and Malaise trap, then preserved in alcohol and deposited at the Laboratory of Ecology, Systematics and Conservation of Bio-

diversity at the University Abdelmalek Essaadi in Tétouan. Identification was conducted using the key of Chvála (1983). Males were identified based mainly on genitalia, which has been macerated in 10% KOH for 24 h to allow for detailed observation. Females were confirmed with COI (cytochrome c oxidase subunit I) barcoding, using the protocol described in Electronic Supplement 1, providing therefore the first COI barcodes of the species from North Africa (Electronic Supplement 2). Examined material with BOLD Process ID and Genbank Accession (Acc.) numbers, are listed as follow: 3 ♂, S1, 16.05.2016, sweep net, leg. K. Kettani; 1 ♂, S2, 07.05.2017–30.05.2017, Malaise trap, leg. K. Kettani; 1 ♂, S10, 29.04.2019–22.05.2019, Malaise trap, leg. K. Kettani; 1 ♀, S3, 22.05.2019–25.06.2019, Malaise trap, leg. K. Kettani (BOLD ID: OGMOR007-25; Genbank Acc.: PZ095443); 1 ♂, S8, 22.03.2021, sweep net, leg. K. Kettani; 1 ♀, S7, 06.05.2021, sweep net, leg. K. Kettani (BOLD ID: OGMOR004-25; Genbank Acc.: PZ095440); 1 ♀, S9, 06.05.2021, sweep net, leg. K. Kettani (BOLD ID: OGMOR006-25; Genbank Acc.: PZ095442); 1 ♀, S6, 15.05.2021, sweep net, leg. A. Ajaha (BOLD ID: OGMOR002-25; Genbank Acc.: PZ095438); 2 ♀, S4, 09.04.2022, sweep net, leg. K. Kettani (BOLD ID: OGMOR003-25, OGMOR005-25; Genbank Acc.: PZ095439, PZ095441); 1 ♀, S5, 12.03.2023, sweep net, leg. A. Ajaha (BOLD ID: OGMOR001-25; Genbank Acc.: PZ095437).

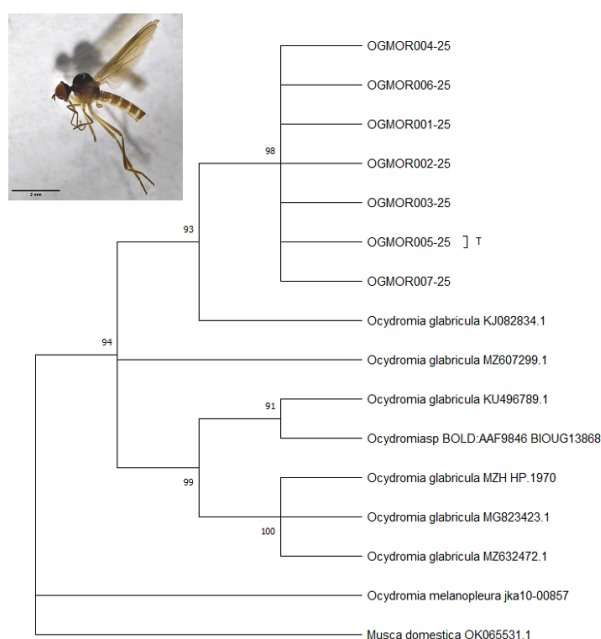


Fig. 1. Bootstrapped Maximum Likelihood tree of female COI sequences of *Ocydromia glabricula*.

Molecular notes. The bootstrapped Maximum Likelihood tree (Fig. 1) of the seven barcoded females, shows very strong support in the phylogenetic reconstruction, with bootstrap values between 91 and 100, indicating a high genetic consistency among the sequences, which typically results in low intraspecific variation. The pairwise COI distances among specimens (Electronic Supplement 3: Table S2) are very low, ranging from 0.00158 and 0.01441 fully supporting the Neighbour Joining tree, further confirming low intraspecific variation. Our results suggest that the Moroccan population forms a homogenous group without significant genetic variation.

Ecological notes. In terms of habitat preferences, we observed the presence of *Ocydromia glabricula* in three distinct habitat types: 1) Shaded upland forests, mainly comprising *Pinus pinaster* Aiton forest (S4), as well as mixed forests associating *Pinus pinaster*, *Quercus suber* L., *Quercus ilex* L., *Quercus canariensis* Willd., *Quercus faginea* Lam. or *Arbutus unedo* L. (S2, S3, S5, S6, S9, S10). 2) Wetland-associated forests, including those bordering rivers and streams (S8), or stagnant water bodies, such as peat bogs (S7). These forests are characterised mainly by *Quercus canariensis* with a shrub layer of *Cistus crispus* L., *Juncus* sp. 3) Riverbank vegetation (S1), characterised by diverse shrub and herbaceous vegetation, including *Nerium oleander* L., *Pistacia lentiscus* L., *Rubus ulmifolius* Schott, *Viburnum tinus* L., *Phillyrea latifolia* L., and *Salix pedicellata* Desf. These patterns are consistent with several previous studies that reported the species in similar habitats (e.g. Berezhnova, 2021; Oboňa et al., 2021). In terms of phenology, our observations extend the known species phenological window (from the end of April to October), as we detected the species as early as March (12.03 and 22.03) and early April (09.04), constituting the first mention of the species at such early date. This suggests a phenological plasticity of the species, allowing it to adapt to varied bioclimatic contexts.

Supporting Information

Additional data for the paper by Zouhair et al. (2026) may be found in the [Supporting Information](#).

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В данной работе представлены первые обновленные данные о распространении рода *Ocydromia* в Марокко с момента его первого упоминания более века назад, основанные на данных по *Ocydromia glabricula*. Данные, полученные в результате исследований, проведенных в Марокко на протяжении более двух десятилетий, подтверждают, что *Ocydromia glabricula* остается единственным представителем рода *Ocydromia* в Марокко. Среди сотен обследованных участков в различных регионах Марокко, включая как охраняемые, так и неохраняемые территории, *Ocydromia glabricula* был обнаружен исключительно на особо охраняемых природных территориях региона Эр-Риф Марокко. Впервые представлен баркодинг последовательности COI (баркод-региона) данного вида из Северной Африки, а также даны некоторые пояснения относительно генетических связей между образцами. Представлены новые данные об экологии *Ocydromia glabricula*.

Ключевые слова: Empidoidea, Ocydromiinae, баркодинг, новые находки, особо охраняемые природные территории Марокко