

Note

Evidence on the presence of the butterflyfish *Chaetodon hoefleri* Steindachner, 1881 (Perciformes: Chaetodontidae) in the Mediterranean Sea

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Abstract: The four-banded butterflyfish *Chaetodon hoefleri* Steindachner, 1881, is a species native to the Tropical Eastern Atlantic. In this contribution, we report the occurrence of an individual in the Western Mediterranean Sea (WMED), off the coast of Al Hoceïma (Morocco). The record was based on a high-resolution photo uploaded and shared on the citizen science Facebook group, TunSea. Hereby we report an obvious signalization and we briefly describe it. The main pathways of penetration of the butterflyfish into the Mediterranean are also discussed. The role and the effectiveness of the citizen science are revealed again as an early warning system for non-indigenous species introduced into the Mediterranean Sea.

Keywords: Chaetodontidae; non-indigenous species; citizen science; Morocco; Mediterranean.

Introduction

The Chaetodontidae (Perciformes) constitutes a family commonly called butterflyfish. It is composed until March, 2025 of about 131 recognized species (<http://www.checklistbank.org/dataset/308619/taxon/7YP>) widely distributed in the Atlantic (tropical to temperate), Indian and Pacific Oceans. This fish family is very recognized by a compressed body, small terminal mouth and bright coloration. Currently, 4 alien fish species belonging to the Chaetodontidae family, have been reported from the Eastern Mediterranean Sea: *Chaetodon auriga* Forsskal, 1775,

Chaetodon austriacus Rüppel, 1836, *Chaetodon larvatus* Cuvier, 1831, and *Heniochus intermedius* Steindachner, 1893. These lessepsian migrant species, were reported respectively by Tiralongo et al., 2018; Goren et al., 2011; Salameh et al., 2011 and Gökoglu et al., 2003. *Chaetodon hoefleri* Steindachner, 1881, was originally described from Senegal by Steindachner (1881). The Word Register of Marine Species (WORMS) restricts its documented distribution to coasts from Cape Verde to South Angola and to South Africa. There is no documented presence

of this species in the Mediterranean Sea. Old information is doubtful, Louisy (2002) restricts its distribution to the West Africa and occasionally as far as the Mediterranean coasts of Morocco but Golani et al., 2021 did not mention the species in the second entirely revised edition of the Atlas of exotic fishes in the Mediterranean Sea. Hereby we report the first confirmed record of *C. hoefleri* in Mediterranean waters and discuss the possible introduction pathway.

Material and methods

The identification of the butterflyfish *Chaetodon hoefleri* was based on high resolution photo which was uploaded and shared on the Facebook group Tunsea (<https://www.facebook.com/groups/tunsea/posts/2842377249256332>). In this social media group, scientists, fishermen and others interested to the marine life share photos and videos of unusual findings. Distinctive morphological characters allowed accurate recognition of the species.

To search for the presence and the geographic distribution of *Chaetodon hoefleri*, we considered many web resources providing occurrence maps as the WoRMS Editorial Board (2025) (<https://www.marinespecies.org>) and the online searchable database (<https://www.ormef.eu>) about Mediterranean Exotic Fishes (ORMEF) providing updated geo-referenced information. At the date of 17 Avril 2025, it allows visualizing 12553 georeferenced occurrences on 221 fish species. Even though it is no longer maintained, the DAISIE dataset (Inventory of alien invasive species in Europe) by Roy et al. (2020) was also considered as an historical archive to search for our taxa, especially that it contains information about aquatic species (mostly introduced) occurring in Europe since 1500.

Results

In this work we present the record of an individual of the four-banded butterflyfish *C. hoefleri* (Figure 1) spotted on 29 March 2025 off Al Hoceïma coast (Mediterranean Moroccan waters). The photo shows the most diagnostic features enabled its unambiguous identification. The distinctive morphological characters were: 1) short, compressed body shape; 2) ray fins; 3) 11 dorsal spines; 4) four vertical brownish bands; 5) the first passing through the eyes; 6) the second band passes over the root of the pectoral and 7) the third one ends on the dorsal fin with a black spot. The estimated size based on the photo was approximately 11cm in total length (Figure 1).

Discussion

In the publication of the CLOFNAM (checklist of the Fishes of the North-Eastern Atlantic and the Mediterranean), Monod (1979) mentioned at page 422 that he has seen a living specimen taken at Les Goudes, near Marseille in July 1959. A footnote related to that page mentioned that it was not even certain that some concerned individuals belonged to the genus *Chaetodon*. In addition, Torchio (1968) mentioned the possible presence of "*Chaetodon cfr. Hoefleri*" near the Central Mediterranean but Orsi Relini (2010) did not add the species to any official list since he was doubtful as to whether its occurrence was not naturally induced.

Chaetodon hoefleri has not been cited later casting doubt on these old and doubtful records by Monod (1979) and Torchio (1968). It is only the Eschmeyer's catalog of fishes (Fricke et al. 2025) that took these questionable records into account based on the inventory by Psomadakis et al. (2012) taking up these old previous citations.

In addition, the species is not included in the Mediterranean lists of alien, cryptogenic or rare species by Zenetos et

al. (2010). Katsanevakis et al. (2020) ; Kovačić et al. (2021); Ragkousis et al. (2023) and by Báez et al. (2025).

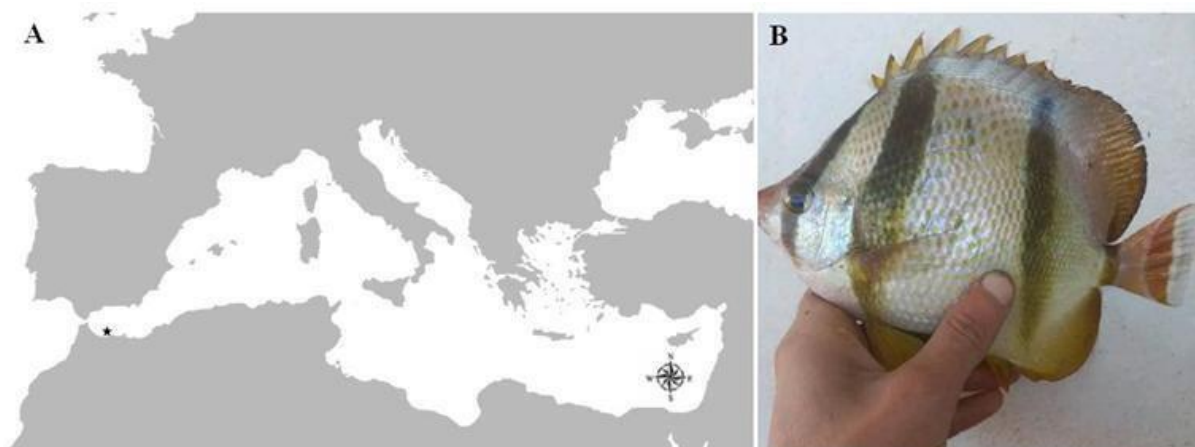


Figure 1. (A) The black star indicates the area in which the specimen of *Chaetodon hoefleri* was caught (Western Mediterranean Sea); (B) *C. hoefleri* from AL Hoceïma, Morocco.

The ORMEF (Occurrence Records of Mediterranean Exotic Fishes) database by Azzuro et al., 2021 highlighted the presence of only the 4 chaetodontidae species presented above. According to Azzuro et al. (2024), this web platform information spans from 1896 (Dulčić et al. 2004) to the last records by Ragkousis et al. (2023).

The present sighting, reported through the citizen science, constitutes the first evident observation of a captured species of *Chaetodon hoefleri* off the coast of Al Hoceïma (Morocco) and in the entire Mediterranean Sea.

Given the absence of any other record from the Eastern Mediterranean Sea, and that the distance to the Strait of Gibraltar is not so great (≈ 150 km), it is likely for this individual to be an Atlantic migrant. Other introduction modes can't be excluded especially an intentional release in the wild, since butterflyfishes are common aquarium fishes, and that *C. hoefleri* has not been observed from the Atlantic coast of Morocco.

This first recent record of *Chaetodon hoefleri* from the Western Mediterranean Sea falls into the classification of

a « casual non-indigenous » species according to the widely used categories of establishment status (Occhipinti et al., 2011; Essl et al., 2018; Ayari et al., 2021) defined by Zenetos et al. (2010).

Citizen science platforms constitute an early warning system finding and identifying non-indigenous species introduced into the Mediterranean Sea. This contribution reveals once again its effectiveness in assessing ecological trends in different fish populations.

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