Short communication

First Occurrence of *Heniochus intermedius* Steindachner, 1893 in The Syrian marine waters (Levantine basin)

Abstract

.On May 18, 2022, a Heniochus intermedius (Steindachner, 1893) individual with a total length of 140 mm and a total weight of 58.4 g was caught by trap at a depth of 14 meters, with a mixed bottom of sand and stones, in front of the beach of Banias (N: 35) ° 7. 0.5' 17', E: 35° 54' 14.73).In this work, we document the first record of a Red Sea species (Lesbesian immigrant), Heniochus intermedius (Steindachner, 1893), in the Syrian coast, the seventh record in the entire Mediterranean. As a result, the number of fish migrating from the Red Sea to the Syrian marine waters has reached 82 species. The methods of introduction and arrival of fish of this species into the Mediterranean are also discussed.

Key words:invasivespecies, Lessepsian migration, *Heniochus intermedius*, Mediterranean sea, Syria.

Introduction

Butterfly fishes (Chaetodontidae) are easily recognizable by their deep compact body,small tip, extending mouth, and bright coloration patterns [1,2]. The butterflyfish species of the family Chaetodontidae are also called coral fish and banner fish. In this family, 12 genera consist of 129 species[3]found mainly in the tropical Indo-West Pacific [2]. *Heniochus intermedius* Steindachner, 1893 considered endemic to the Red Sea and Gulf of Aden [1]. Butterflyfish resemble smaller versions of angelfish in the family Pomacanthidae, but unlike them, chetodontids do not have preopercular spines at the opercula [2]. TheChaetodontidae family is represented in Mediterranean by three species [4,5,6]: *Chaetodon austriacus* Ruppell, 1836; *Chaetodon larvatus* Cuvier, 1831; and *Heniochus intermedius S*teindachner, 1893. The species*H. intermedius* is diurnal and is usually observed in pairs or as solitary individuals and can be found down to 50 m depth [7]. It can reach 20 cm Total Length (TL)and is a benthic feeder living closely associated to coral reefs [4]. Recently, many species of Lesspesian fishes have invadedthe coastal waters of the Mediterranean in Syria, many species have been established and are important components of the coastal ichthyofauna [8,9,10,11]. Thespecies, *Chaetodon larvatus*Cuvier, 1831of the same family, was previously recorded in the Syrian coast [6]. *H. intermedius* was first reported in June 2002 off the Gulf of Antalya, Turkey [12]; This species was also subsequently identified in Lebanon [13]; in Haifa[14]; in Malta [15]; in

the Gulf of Iskenderun [5] and off Mersa Matruh, Eygpt [16].However, *H. intermedius* has not been reported along the Syrian coast.

With this result, the number of migratory fish species migrant from the Red sea in Syrian marine waters has reached 82 species.The cooperation between fishers and Ichthiologists (experts in fishery sciences) at Tishreen University enabled us to make the taxonomical definition and to evaluate the spatial distribution.

Materials and methods

On May 18th,One specimen ofa new fish species (Figure 1)was caught by the trap at a depth of 14 m, and a mixed bottom (sand and rocks) in front of the beach of Banias city (35° 7. 0.5' 17', E: 35° 54' 14.73") (Figure 2). By examining the morphological characteristics of the specimenaccording to Gokoglu et *al*.[12]. , it became clear to us that this specimen represents the species *H. intermedius*.

Figure 1. Specimen of *H. intermedius* caught from the coast of Banias on May 28th2022. The total body length: 14 cm, and the width of the fish body is 12 cm. Scale bar= 30 mm

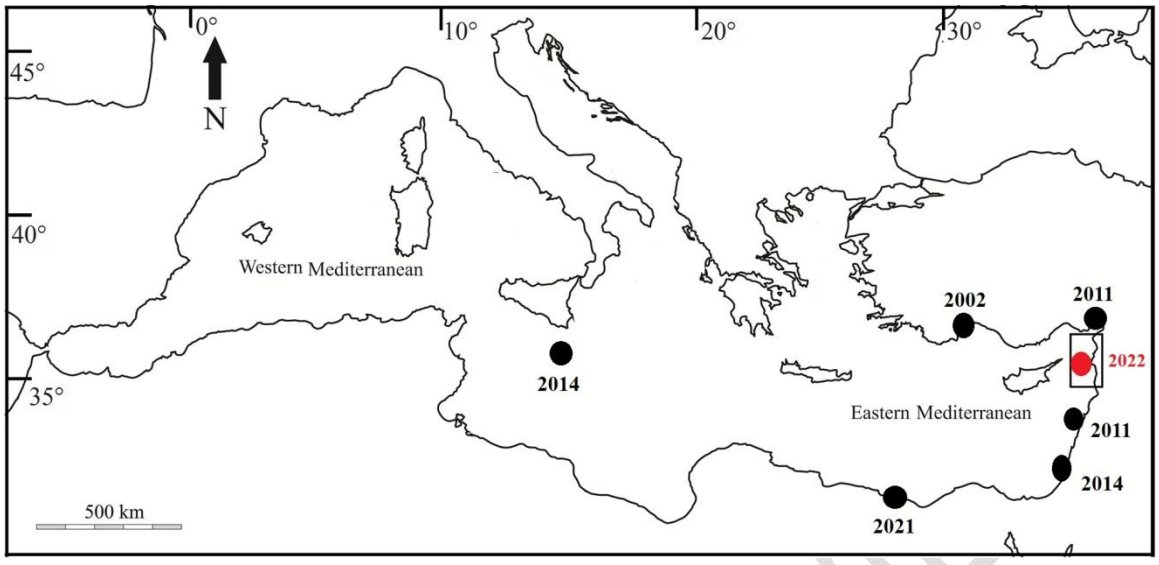

Figure2. Map of the Mediterranean Sea; the locations of *Heniochus intermedius* (●: present study; ●: previous studies) are indicated.

Results and Discussion

The taxonomic position of the specimen was determined by the following external characteristics: the color of the fish is yellowish ventrally and whitish dorsally, with two typical black bands distinguishing the species. Both bands were dorsally spread and more defined ventrally. The pectoral and caudal fins are yellow, as well as the posterior and anterior parts of the dorsal fin, the posterior and anterior parts of the anal and pelvic fins were black (Fig. 1). Meristic numbers (Table 1) agree with those given by Randall [1]

The fish colorwas yellowish ventrally and whitish dorsally, with the two typical black bands that characterize the species. Both bands were diffuse dorsally and more marked ventrally. The posterior and anterior parts of the dorsal fin, as well as the pectoral and caudal fins were yellow. The posterior and anterior parts of the anal and pelvic fins were black (Figure 1). Meristic counts (Table 1) agree with those given by Randall [1]

Table 1. Meristic counts, Total length and Total body weight of the specimen of *Heniochus intermedius* caught from the coast of Banias in May 2022.

Meristic counts	
Dorsal fin rays	XI + 25
Anal fin rays	III + 18
Pectoral fin rays	16
Pelvic fin rays	I + 5
Caudal fin rays	23
Total body Wight (g)	58.4

Total Length (mm) 140

Heniochus intermedius is distributed in the Indo-West Pacific Ocean throughout tropical waters of the Red Sea and the Gulf of Aden. It is found in rocky and reef slopes at depths of 3–50 m [17,18]. Adults are usually solitary or paired, and occasionally in groups [1,17]. It is suggested that climate change and increased anthropogenic actions are the main factors affecting the distribution pattern and species composition in the Mediterranean [19]; these combined effects caused an increase of the abundanceof subtropical species in the warm-temperate Mediterranean [20,21]. The emigration of Red Sea fish species via the Suez Canal is an ongoing process, which is altering local fish community structure[22,23,24]. During the last 20 years*H. intermedius* has shown an expansion toward the eastern side of the Mediterranean sea. This situation is probably explained by biotic and abiotic factors, including food availability, competition with indigenous species, and water mass movements(currents). However, it is difficult to predict which of these factors will influence further the eastward movement of this Lessepsian species. Our finding of *H. intermedius* in the Banias coast is the first occurrence of this species on the Syrian territorial water.Since this species was recorded a few times in Alexandria, Haifa, Beirut, Iskenderun, and currently in Banias, this supports the hypothesis of migration through the Suez Canal and denies the hypothesis of its introduction into the eastern Mediterranean through ballast water only.

The Mediterranean Sea is the most globally impactedecoregion by bioinvasions [25]. To date, more than 110 alien fish species have been recorded in the Mediterranean Sea [26], and theirinvasion rate seems to increase continuously, primarily due to the opening of the Suez Canal [25].

Since the first registration of this species in the Mediterranean took place in the Gulf of Antalya in 2002 [12], this leads to the belief that its entry into the Mediterranean did not take place in the form of a natural migration through the Suez Canal, but through the transfer of larvae within the ballast waters coming from the Indian Ocean or the Red Sea to a portAntalya, and from there it spread,.Because if the first entry into the Mediterranean was through the Suez Canal, it is logical to first register its presence on the eastern coast of the Mediterranean before reaching the south of the southern coast of Turkey

Monitoring programs, with the help of citizen scientists, appear to be an excellent low-cost support to study the dynamics of the biological invasions in the basin and to upgrade the checklist in the Syrian marine region [11,16].

Conclusion

The increasing number of exotic fish, in the Mediterranean, especially in the eastern part including the Syrian coasts, indicates a significant change in the ecosystem due to the change of biodiversity in this area. Accordingly, Lessepsian migration appears to be the most likely method for the introduction of H. intermedius into the Mediterranean, but the hypothesis of aquifer release or ballast water transfer cannot be completely excluded.

Refrences

1. Randall J E. Red Sea Reef Fishes. IMMEL Publishing, London, UK.1983; 192 pp.
2. Nelson J.S, grande T.C. Wilson M.V.H. Fishes of the world. Fifth edition. Wiley, United States of America. 2016; 707p
3. Kidadl. Com.Fun Saddle Butterflyfish Facts For Kids. 2022. (https://kidadl.com/facts/animals/saddle-butterflyfish-facts) .Last seen on July 11, 2022.
4. Golani D., Orsi Relini L., Massuti E., Quignard J. P. CIESM Atlas of Exotic Species in the Mediterranean. In: Fishes,Vol. 1. F. Briand (Ed.). 2002; CIESM Publishers, Monaco. http://www.ciesm.org/online/atlas/intro.htm (accessed on June 2015).
5. Erguden M., Çekiç M., Erguden S.A., Turan C. Occurrence of Heniochus intermedius Steindachner, 1893 in Iskenderun Bay, Turkey. Journal of Applied Ichthyology, 2016; 32, 375–376.
6. Ali M., Saad A., Solimn A., Rafrafi-Nouira S., Capape C. Confirmed occurrence in the Mediterranean Sea of Red Sea orange face butterflyfish *Chaetodon larvatus* (Osteichthyes: Chaetodontida) and first record from the Syrian coast. *Cahiers de Biologie marine*,2017; 58, 367-369.
7. Taquet M, Diringer A. Poissons de l'Océan Indien et de la Mer Rouge. Editions Quæ, Versailles, France, 2007; 528 pp.
8. Saad A. Check-list of bony fish collected from the coast of Syria. Turkish Journal of Fisheries and Aquatic Science.2005; 5, 99– 106.
9. Ulman A., Saad A., Zylich K., Pauly D., Zeller D. Reconstruction of Syria's Fisheries Catches From 1950–2010: Signs Of Overexploitation. Acta Ichthyologica Et Piscatoria. 2015; 45 (3): 259–272.
10. Saad A., Sabour W., Solaiman A. Contribution to study of the catch effort production of fishing effort by artisanal fishing gears and the qualitative and quantitative composition of the catch in the marine waters of Tartous Governorate. Tichreen University Journal Biological Sciences Series, 2017; 8(1), 12-32.

11. Ali M. An updated checklist of the marine fishes from Syria with emphasis on alien species. Mediterranean Marine Sceince, 2018; 19(2): 388-393.

12. Gökoglu M., T. Bodur and Y. Kaya. First record of the Red Sea bannerfish (*Heniochus intermedius* Steindachner, 1893) from the Mediterranean Sea. *Journal of Zoology*, 2003; 49: 324-325.

13. Bariche M. Recent evidence on the presence of Heniochus intermedius (Teleostei: Chaetodontidae) and Platycephalus indicus (Teleostei: Platycephalidae) in the Mediterranean Sea. BioInvasions Records, 2012; 1, 53–57.

14. Tsadok R., Shemesh E., Popovich Y., Sabag Y., Golani D., Tcheronov D. New record and occurrence of the Red Sea bannerfish, Heniochus intermedius (Actinopterygii: Perciformes: Chaetodontidae), in the Mediterranean Sea. Acta Ichthyologica et Piscatoria, 2015; 45, 331–333.

15. Evans J., Tonna R., Schembri P. Portent or accident? Two new records of thermophilic fish from the central Mediterranean. Bio- Invasions Records, 2015; 4, 299–304.

16. Al Mabruk S.A.A., Abdulghani A., Nour O.M., Adel M., Crocetta F., Doumpas N., Kleitou P., Tiralongo F. The role of social media in compensating for the lack of field studies: Five new fish species for Mediterranean Egypt. *Journal of Fish Biology*, 2021; 1–6. https://doi.org/ 10.1111/jfb.14721.

17. Lieske E. Myers R. Coral Reef Fishes: Indo-Pacific & Caribbean including the Red Sea. Harper Collins Publishers, Collins Pocket Guide. 1994; 400 pp.

18. Froese R. and Pauly D.Editors. FishBase. World Wide Web electronic publication.2022. www.fishbase.org, version (02/2022).

19. Zenetos A, Galanidi M. Mediterranean non indigenous species at the start of the 2020s: recent changes. Marine Biodiversity Records, 2020; 13:10. https://doi.org/10.1186/s41200-020-00191-4.

20. Bianchi C.N. Biodiversity issues for the forthcoming tropical Mediterranean Sea. Hydrobiologia, 2007; 580, 7–21.

21. Azzurro E., Bolognini L., Dragičević B., Drakulović D., Dulčić J., Fanelli E., Marković O. Detecting the occurrence of indigenous and non-indigenous megafauna through fishermen knowledge: A complementary tool to coastal and port surveys. Marine Pollution Bulletin, 2015; 147: 229–236, https://doi.org/10.1016/j.marpolbul.2018.01.016.

22. Golani D. Impact of Red Sea fish migrants through the Suez Canal on the aquatic environment of the Eastern Mediterranean. Bulletin SeriesYale School *of* Forestry *and* Environmental Studies, 1998; 103, 375–387.

23. Golani, D. Colonization of the Mediterranean by Red Sea fishes via the Suez Canal Lessepsian migration. In: Fish invasions of the Mediterranean Sea: changes and renewal. D. Golani and B. Appelbaum-Golani (Eds). Pensoft Publishers, Sofia-Moscow, 2010; pp. 145–188.

24. Philippart C.J.M., Anadón R., Danovaro R., Dippner J.W., Drinkwater K.F., Hawkins S.J., Oguz G.T., Sullivan G.O., Reid P.C. Impacts of climate change on European marine ecosystems: Observations, expectations and indicators. Journal of Experimental Marine Biology and Ecology, 2011; 400. 52–69.

25. Katsanevakis S., Wallentinus I., Zenetos A., Leppäkoski E., Çinar M. E, Oztürk B., Grabowski M., Golani D.,Cardoso A. C. 'Impacts of invasive alien marine species on ecosystem services and biodiversity: a pan-European review', Aquatic Invasions, 2014; 9(4), pp. 391–423.

26. IUCN. Some marine alien invasive species in the Mediterranean Sea. https://www.iucn.org/news/west-asia/202102/some-marine-alien-invasive-species-mediterranean-sea. Checked on 13 July 2022.