

Confirmed Occurrence of *Mola mola* (Linnaeus, 1758) from Mersin Bay (Northeastern Mediterranean)

Deniz Ergüden¹, Deniz Ayas²

Cite this article as: Ergüden, D. & Ayas, D. (2021). Confirmed occurrence of *Mola mola* (Linnaeus, 1758) from Mersin bay (Northeastern Mediterranean). *Aquatic Sciences and Engineering*, 36(1), 11-14.

ABSTRACT

In June 2018, a single female specimen of the Ocean sunfish, *Mola mola* (Linnaeus, 1758) (122 cm in total length and 80 kg in weight) was caught by a commercial trammel net at a depth of 393 m in Mersin Bay (Bozyazı coast), Turkey. This paper presents the first substantiated occurrence and hence, the confirmation of *M. mola* in the Northeastern Mediterranean, Turkey. Morphological and meristic measurements of the specimen were made and recorded with the catalog number MEUFC-18-11-101 in the Museum of the Systematic in, Mersin University's Faculty of Fisheries. Morphometric and meristic data matched other recordings of this species from parts of the Mediterranean, and the historical captured record of the species in the Mediterranean was documented.

Keywords: Ocean sunfish, rare occurrence, Mersin Bay, Mediterranean Sea, Turkey

ORCID IDs of the author:
D.E. 0000-0002-2597-2151;
D.A. 0000-0001-6762-6284

¹İskenderun University
Department of Marine Sciences,
Faculty of Marine Science and
Technology, Technical,
Hatay, Turkey

²Mersin of University Faculty of
Fisheries, Mersin, Turkey

Submitted:
25.01.2020

Revision Requested:
22.04.2020

Last Revision Received:
22.04.2020

Accepted:
07.05.2020

Online published:
21.10.2020

Correspondence:
Deniz Ergüden
E-mail:
deniz.erguden@iste.edu.tr

©Copyright 2021 The Author(s)
Available online at
<https://dergipark.org.tr/ase>

INTRODUCTION

The ocean sunfish, *Mola mola* (Linnaeus, 1758) is an oceanodromous, pelagic-oceanic species belonging to the Molidae family, and is the largest and most fecund Teleost fish in the world (Pope et al., 2010). Ocean sunfish are a generally solitary and highly migratory fish species, found in subtropical waters between depths of 30-480 m (Fricke, Kulbicki, & Wantiez, 2011). This species is distributed in the temperate and tropical regions of the Mediterranean, Atlantic, Indian, and Pacific Oceans (Sims & Southall, 2002; Froese & Pauly, 2019).

Ocean sunfish reach a maximum total length of 420 cm (Potter, Galuardi, & Howell, 2011) and a maximum published weight of 2,300 kg (Roach, 2003; Matsuura, 2015). They feed on fish, mollusks, zooplankton, jellyfish, crustaceans, and brittle stars (Clemens & Wilby, 1961; Scott & Scott, 1988; Kuitert & Tonzuka, 2001). Ocean sunfish are thought to migrate to higher latitudes in response to zooplankton migrations during the spring and summer months (Liu, Lee, Joung, & Chang, 2009).

The ocean sunfish is rarely found in the eastern Mediterranean Sea and the Adriatic Sea (Jardas, 1996; Dulcic et al., 2007). Recently, *M. mola* was recorded in Almazora, Castellon (Spain) in the western Mediterranean Sea (Ahuir-Baraja, Yamanou, & Kubicek, 2017). According to Silvani et al. (1999), this species was incidentally caught by regional fishermen in Mediterranean waters.

In Turkish waters, *M. mola* has previously been found in the Mediterranean Sea (Akyuz, 1957; Basusta & Erdem, 2000), and the Aegean Sea (Akşiray, 1958). Bilecenoglu et al. (2014) mentioned *M. mola* found in the northern Aegean Sea and the Marmara Sea in the marine checklist. *M. mola* was further documented off the Rize coast (Turkey) in the Black Sea (Öztürk & Özbulut, 2016). However, morphometric and meristic characteristics of the species among those that were caught were not recorded.

While *M. mola* has been found and documented in the Mediterranean Sea in Turkey in previous years (Bilecenoglu, Kaya, Cihangir, & Çiçek, 2014; Öztürk & Özbulut, 2016), this species is ex-

tremely rare in the northeastern part of the Mediterranean Sea. *M. mola* has not been previously documented in the Bay of Mersin.

This study aims to confirm its occurrence with some morphological properties from the Bozyazı coast (Mersin Bay, Northeastern Mediterranean). Additionally, historical records of ocean sunfishes in the Mediterranean coast will be discussed.

MATERIALS AND METHODS

Study area: The present study documents the findings of one ocean sunfish, *M. mola*, in the Bozyazı coast, Mersin Bay, Turkey (Figure 1) in June 2018. Bozyazı coast is an area on the Northeastern Mediterranean coast of Turkey with a highly productive coastal bottom, which promotes the development of plankton and is suitable for trawl fishing.

Sampling: One female specimen of *M. mola* (Linnaeus, 1758) was caught by a trammel net on 05 June 2018 in the Bozyazı Coast (Mersin Bay) (Coordinate: 36°05'15.2"N 32°58'28.7"E). This specimen was preserved in 4% formalin and deposited in the Museum of the Systematic, Faculty of Fisheries, Mersin University, (catalog number: MEUFC-18-11-101). Morphometric and mer-



Figure 2. Specimen of *Mola mola* caught from Mersin Bay (Bozyazı coast).

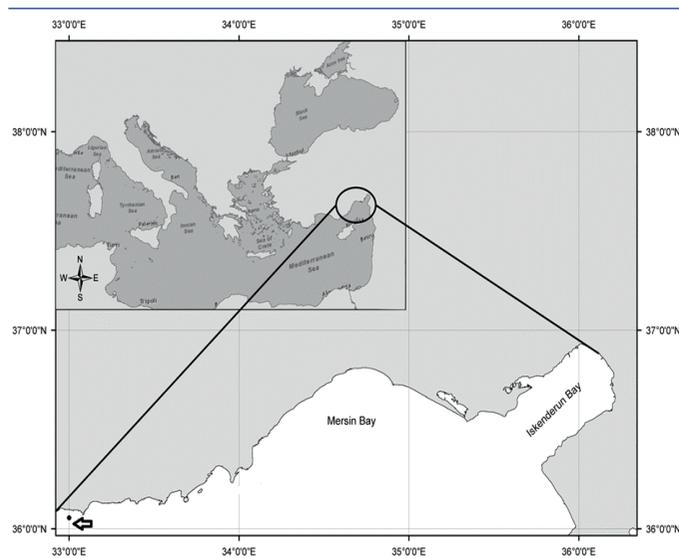


Figure 1. The black circle indicates the location where the specimen was caught.

istic characters of this specimen are given in Table 1 and the sampling point of the species in the Mediterranean coast of Turkey is presented in the map (Figure 1). A photograph of the caught specimen is shown in Figure 2.

RESULTS AND DISCUSSION

In this study, a female individual (total size of 122 cm, weighing 80 kg) of *M. mola* was caught from the Bozyazı coast in June 2018. Some morphometric and meristic measurements of this individual were made and are presented in Table 1. Morphometric and meristic measurements of the captured individual were compared with the measurements of a large individual of *M. mola*

which was caught off the coast of Spain by Ahuir-Baraja et al. (2017), (Table 1). The historical captured record of the species in the Mediterranean and the Black Sea is documented in Table 2.

Ocean sunfish have a large body that is compressed and ovular. The scaleless body is covered with extremely thick, elastic skin and irregular patches of tubercles over their body (Hutchins, 2004; Wheeler, 1969; Smith, 1965). The dorsal and anal fins of ocean sunfish are tall, and the pectoral fins point toward the dorsal fin. The caudal fin is replaced by a rudder-like structure called 'clavus'. Its mouth is very small and its teeth are fused to form a beak-like structure (Hutchins, 2004). Gill openings are reduced to a small hole at the base of the pectoral fins.

Adult ocean sunfish do not possess a lateral line, and only one gill opening is visible on each side, located near the base of the pectoral fins (Hutchins, 2004; Smith & Heemstra, 1986). Adults do not have a caudal fin or caudal peduncle. Instead, they have a clavus, which is a truncated tail, used more like a rudder than for propulsion. The clavus reaches from the rear edge of the dorsal fin to the rear edge of the anal fin (Wheeler, 1969; Hutchins, 2004). There is no swim bladder in adults.

Ocean sunfish vary in coloration, though the head, back, tips of the anal and dorsal fins and clavus are generally a mixture of dark grey-brown and dark silvery grey (Hutchins, 2004; Humann & Deloach, 2002). They have a white belly and sometimes have white splotches on their fins and dorsal side (Humann & Deloach, 2002).

Molas are distinguished by their distinct morphological characteristics, which include reduced/fused caudal elements, presence of a clavus in place of the caudal fin, absence of a swim bladder, and a degenerate, cartilaginous skeleton (Pope et al., 2010). Adults are found on slopes adjacent to deep water where they come in for shelter and for seeking cleaner fishes (Kuiter & Tonzuka, 2001). They swim upright and close to the surface. The dorsal fin often protrudes above the water (Pope et al., 2010). Molas may contain the same toxin as puffers and porcupine fish (Parsons, 1986; Bayhan & Kaya, 2015).

Table 1. Comparison of *Mola mola* individuals in terms of morphometric and meristic measurements.

Morphometric Characters (cm)	Present Study	Ahuir-Baraja et al. (2017)
Total length	122	240
Standard length	97	-
Head length (Head bump) length	16	18
Snout length	10	-
Maximum body depth (total body depth)	175	260
Body width (body depth)	67	122.5
Upper jaw length	7	-
Lower jaw length	5.5	-
Distance between dorsal and anal fin tip	64	-
Preorbital length	18	-
Preopercular opening length	35	-
Eye diameter (horizontal)	5.5	9
Eye diameter (vertical)	4	-
Eye ball diameter	2.5	-
Mouth diameter	9	10.1
Inter-orbital distance	28	-
Length of gill opening	3.2	-
Distance between eye and operculum	14	-
Operculum height	7.5	-
Pectoral fin base	8.5	-
Pectoral fin height	15	-
Pectoral fin length	18	18.4
Dorsal fin base	29	-
Dorsal fin height	27	-
Dorsal fin length	60	81
Anal fin base	28	-
Anal fin height	26.5	-
Anal fin length	53	74
Distance between dorsal and anal fin mid base	55	-
Distance between snout and dorsal fin origin	72	-
Distance between snout and anus	73	-
Distance between snout and pectoral fin	40	-
Distance between anus and anal fin origin	10	-
Prepectoral fin distance	38	-
Predorsal fin distance	65	-
Preanal fin distance	61	-
Clavus width	59	-
Meristic Characters		
Clavus rays	12	-
Clavus ossicles	8	-
Clavus lobes	8	-
Pectoral fin rays (left)	12	-
Dorsal fin rays	15	-
Anal fin rays	14	-

Table 2. Previous capture records of *Mola mola* in the Mediterranean and Black Sea in 1781-2018.

Author(s)	Year(s)	Location	Country	Depth	Total Length, TL (cm)	Weight (kg)
Basusta & Erdem (2000)	1994-1996	Karatas coast, Eastern Mediterranean	Turkey	25	133.2	105
Saad (2005)	1996-1999	Syrian coast, Eastern Mediterranean	Syria	-	-	-
Dulcic et al. (2007)	1781-2006	Adriatic coasts, Adriatic Sea	Croatia	-	-	-
Ahuir-Baraja et al. (2017)	February 2007	Almazora, Castellon, western Mediterranean Sea	Spain	surface	240	-
Öztürk & Özbulut (2016)	March 2016	Rize coast, Black Sea	Turkey	surface	^130-150	-
This study	June 2018	Bozyazi coast, Mersin Bay (North Eastern Mediterranean)	Turkey	393	122	80

To date, there is little information available about the habitat, ecology, and population of *M. mola*. This species is listed as Vulnerable (VU) in the Global Red List by the International Union for Conservation of Nature, IUCN (IUCN, 2018; Liu et al., 2015) and considered as Data Deficient (DD) in the Mediterranean Sea (Abdul Malak et al., 2011). Marine ecosystems are greatly affected by bottom trawling in Turkish coasts, which destroys benthic and pelagic fauna (Abdul Malak et al., 2011). The coastal bottom of the Bozyazi coast, located in the northeastern Mediterranean Sea, is suitable for trawl fishing. According to Sims & Southall (2002) and Houghton et al. (2006), sightings of *M. mola* at temperate latitudes are more common in summer months. Therefore, populations of *M. mola* can be said to increase in higher seawater temperatures in this region (Turan, Ergüden, & Gurlek, 2016). Furthermore, as Turkey's Mediterranean coast provides suitable areas for feeding, it is a migration destination for *M. mola*.

CONCLUSION

Although *M. mola* is not a commercial target species, taken as by-catch during commercial trawling, it is important for the biodiversity of Mersin Bay and Turkish ichthyofauna. Besides, this record is significant because the last capture record of *M. mola* in the region was made over 34 years ago in the Mediterranean coastal waters of Turkey. Therefore, the species is considered as exceptionally rare in the Mediterranean region of Turkey.

Conflict of interests: The authors declare that for this article they have no actual, potential or perceived conflict of interests.

Ethics committee approval: Ethics committee approval is not required.

Funding: -

Acknowledgments: This study was supported by the Research Fund of Mersin University in Turkey with Project Number: 2017-2-AP2-2353.

Disclosure: -

REFERENCES

- Abdul Malak, D., Livingstone, S. R., Pollard, D., Polidoro, B. A., Cuttelod, A., Bariche, M. Bilecenoglu, M., Carpenter, K. E., Collette, B. B., Francour, P., Goren, M., Kara, M. H., Massuti, E., Papaconstantinou, C. & Tunesi, L. (2011). *Overview of the conservation status of the marine fishes of the Mediterranean Sea*. Gland, Switzerland and Malaga, Spain: IUCN. ISBN 978-2-8317-1307-6
- Ahuir-Baraja, A. E., Yamanou Y. & Kubicek, L. (2017). First confirmed record of *Mola* sp. a in the western Mediterranean Sea: morphological, molecular and parasitological findings. *Journal of Fish Biology*, 90, 1133-1141. [CrossRef]
- Aksiray, F. (1958). First observation of a fish species at Turkish seas (in Turkish). *Hidrobiolozi Mecmuasi*, 4(3-4), 161-164.
- Akyüz, E. (1957). Observations on the Iskenderun red mullet (*Mullus barbatus*) and its environment. *Pulications of the General Fisheries Council for the Mediterranean (GFCM), GFCM Proceedings and Technical Paper*, 4(38), 305-326.
- Basusta, N. & Erdem, U. (2000). A study on the pelagic and demersal fishes of Iskenderun Bay. *Turkish Journal of Zoology*, 24(Suppl.), 1-19.
- Bayhan, B. & Kaya, M. (2015). An updated checklist of poisonous fishes of Turkish Aegean Sea. *Journal of Coastal Life and Medicine*, 3(7), 579-581. [CrossRef]
- Bilecenoglu, M., Kaya, M., Cihangir, B. & Çiçek, E. (2014). An updated checklist of the marine fishes of Turkey. *Turkish Journal of Zoology*, 38, 901-929. [CrossRef]
- Claro, R. (1994). Características generales de la ictiofauna. In: R. Claro (Ed.), *Ecología de los peces marinos de Cuba*. (pp. 55-70). Instituto de Oceanología Academia de Ciencias de Cuba and Centro de Investigaciones de Quintana Roo.
- Clemens, W. A. & Wilb, G. V. (1961). *Fishes of the Pacific coast of Canada*. 2nd edition. *Canadian Bulletin of Fisheries and Aquatic Sciences*, 68, 1-443.
- Dulcic, J., Beg Paklar, P. G., Grbec, B., Morovic, M., Matic, F. & Lipej, L. (2007). On the occurrence of ocean sunfish *Mola mola* and slender sunfish *Ranzania laevis* in the Adriatic Sea. *Journal of the Marine Biological Association of the United Kingdom*, 87, 789-796. [CrossRef]
- Fricke, R., Kulbicki, M. & Wantiez, L. (2011). Checklist of the fishes of New Caledonia, and their distribution in the Southwest Pacific Ocean (Pisces). *Stuttgarter Beitrage zur Naturkunde. A, Neue Series, (Biologie)*, 4, 341-463.
- Froese, R. & Pauly, D. (2019). *Fishbase. Worldwide Web Electronic Publication*. Retrieved from <http://www.fishbase.org> (accessed 04.02.2019).
- Houghton, J. D. R., Doyle, T. K., Davenport, J. & Hays, G. C. (2006). The ocean sunfish *Mola mola*: insights into distribution, abundance and behaviour in the Irish and Celtic Seas. *Journal of the Marine Biological Association of the United Kingdom*, 86, 1237-1243. [CrossRef]
- Humann, P. & Deloach, N. (2002). *Odd-shaped swimmers*. Reef fish identification of Florida, Caribbean, Bahamas, Jacksonville: New World Publishers, Inc.
- Hutchins, M. (2004). Tetraodontiformes. *Grzimek's Animal Life Encyclopedia*, Vol. 5, fishes II, 2nd Edition (pp. 477-478). Detroit: Thompson Gale. ISBN 9780787665722
- IUCN, (2019). *Red List of Threatened Species*. Version 2018-2. Retrieved from <http://www.iucnredlist.org> (accessed 02.02.2019).
- Jardas, I. (1996). Adriatic ichthyofauna (in Croatian). *Školska knjiga d. d., Zagreb*, 1-2, 29-36.
- Kuiter, R. H. & Tonzuka, T. (2001). *Pictorial guide to Indonesian reef fishes*. Part 3. Jawfishes- Sunfishes, Opistognathidae – Molidae. Melbourne, Australia: Zoonetics. ISBN 9789799818805
- Liu, K., Lee, M., Joung, S. & Chang, Y. (2009). Age and growth estimates of the sharptail mola, *Masturus lanceolatus*, in waters of eastern Taiwan. *Fisheries Research*, 95(2-3), 154-160. [CrossRef]
- Liu, J., Zapfe, G., Shao, K. T., Leis, J., L., Matsuura, K., Hardy, G., Liu, M., Robertson, R. & Tyler, J. (2015). *Mola mola* (errata version published in 2016). *The IUCN Red List of Threatened Species 2015*: e.T190422A97667070. Downloaded on 04 February 2019.
- Matsuura, K. (2015). Taxonomy and systematics of tetraodontiform fishes: a review focusing primarily on progress in the period from 1980 to 2014. *Ichthyological Research*, 62, 72-113. [CrossRef]
- Öztürk, R. Ç. & Özbülüt, E. (2016). First record of the ocean sunfish, *Mola mola* (Linnaeus 1758), from the Black Sea. *Journal of the Black Sea/ Mediterranean Environment*, 22(2), 190-193.
- Parsons, C. (1986). *Dangerous marine animals of the Pacific coast*. San Luis Obispo, California: Helm Publishing. ISBN 0936940034
- Pope, E. C., Hays, G. C., Thys, T. M., Doyle, T. K., Sims, D. W., Queiroz, N., Hobson, V. J., Kubicek L. & Houghton, J. D. R. (2010). The biology and ecology of the ocean sunfish, *Mola mola*: a review of current knowledge and future research perspectives. *Reviews in Fish Biology and Fishes*, 20(4), 471-487. [CrossRef]
- Potter, I. F., Galuardi, B. & Howell, W. H. (2011). Horizontal movement of ocean sunfish, *Mola mola*, in the northwest Atlantic. *Marine Biology*, 158, 531-540. [CrossRef]
- Roach, J. (2003). World's heaviest bony fish discovered?. Retrieved from http://news.nationalgeographic.com/news/2003/05/0513_030513_sunfish.html (accessed 02.02.2019).
- Saad, A. (2005). Checklist of bony fish collected from the Coast of Syria. *Turkish Journal of Fisheries and Aquatic Sciences*, 5, 99-106.
- Scott, W. B. & Scott, M. G. (1988). Atlantic fishes of Canada. *Canadian Bulletin of Fisheries and Aquatic Sciences*, 1-731.
- Silvani, L., Gazo, M. & Aguilar, A. (1999). Spanish driftnet fishing and incidental catches in the western Mediterranean. *Biological Conservation*, 90, 79-859. [CrossRef]
- Sims, D. & Southall, E. (2002). Occurrence of ocean sunfish, *Mola mola* near fronts in the western English Channel. *Journal of the Marine Biological Association of the United Kingdom*, 82(5), 927-928. [CrossRef]
- Smith, J. (1965). *The sea fishes of Southern Africa*. South Africa: Central News Agency, Ltd.
- Smith, M. & Heemstra, P. (1986). Smith's sea fishes. In M.M. Smith & P.C. Heemstra (Eds.), *Smiths' Sea Fishes* (pp. 894-907). Berlin: Springer-Verlag. ISBN 978-3-642-82860-7
- Tortonese, E. (1990). Molidae. In J. C. Quero, J. C. Hureau, C. Karrer, A. Post & L. Saldanha (Eds.), *Check-list of the fishes of the eastern tropical Atlantic (CLOFETA)* (pp. 1077-1079). Vol. 2. JNICT, Lisbon; SEI, Paris; and UNESCO, Paris
- Turan, C., Erguden, D. & Gurlek, M. (2016). Climate change and biodiversity effects in Turkish Seas. *Natural and Engineering Sciences*, 1, 15-24. [CrossRef]
- Wheeler, A. (1969). *The fishes of the British Isles and North-West Europe*. Michigan State Michigan: University Press. ISBN 9780333059555