Species

To Cite:
Erguden D, Karayakar F, Acar MC, Ayas D. First record of *Remora remora* (Linnaeus, 1758) harvested from aquaculture cages in the Northeastern Mediterranean, Turkey. *Species* 2024; 25: e13s1643 doi: https://doi.org/10.54905/disssi.v25i75.e13s1643

Author Affiliation:
[1]University of Iskenderun Technical, Faculty of Marine Science and Technology, Iskenderun, Hatay, Turkey
[2]Mersin University, Fisheries Faculty, Mersin, Turkey

[*]**Corresponding Author**
University of Iskenderun Technical, Faculty of Marine Science and Technology, Iskenderun, Hatay,
Turkey
Email: deniz.erguden@iste.edu.tr; derguden@gmail.com

ORCID List
Deniz Erguden 0000-0002-2597-2151
Fahri Karayakar 0000-0002-8114-350X
Mert Can Acar 0000-0002-2726-8416
Deniz Ayas 0000-0001-6762-6284

Peer-Review History
Received: 28 January 2024
Reviewed & Revised: 31/January/2024 to 30/March/2024
Accepted: 03 April 2024
Published: 06 April 2024

Peer-Review Model
External peer-review was done through double-blind method.

Species
pISSN 2319–5746; eISSN 2319–5754

First record of *Remora remora* (Linnaeus, 1758) harvested from aquaculture cages in the Northeastern Mediterranean, Turkey

Deniz Erguden[1*], Fahri Karayakar[2], Mert Can Acar[2], Deniz Ayas[2]

ABSTRACT

On March 07, 2023, a specimen 67.6 cm in total length and 1902 g in weight, of the shark sucker *Remora remora* (Linnaeus, 1758) was harvested from aquaculture cages. The shark sucker specimen reported in this study entered the cage as a juvenile. At the end of the 12-month rearing period, it was determined that the individual had reached a length and weight greater than the maximum length and weight that the species can reach in its natural environment. In addition, the weight value reported in our study is higher than the weight value reported so far in the world for this species. In this study, we report for the first time that an individual shark sucker entered an aquaculture cage and was able to grow. Therefore, this study provides valuable information on the ability of wild fish species to enter the aquaculture cage and adapt to the new environment, regardless of their diet.

Keywords: Shark sucker, Echenidae, Net cage, Mersin Bay, Eastern Mediterranean

1. INTRODUCTION

Mariculture, which accounts for half of aquaculture production by weight, has shown great development in Turkey over the past 30 years, reaching a production potential of 514,805 tons in 2022. It is estimated that 59.7 million people are now directly involved in fisheries worldwide, and about one-third of them work in the aquaculture sector (FAO, 2019). Fish farms with floating cages serve as aquaculture production systems. Many studies on fish communities around aquaculture cages in the Mediterranean Sea have shown that species belonging to various fish groups such as clupeids, sparids, mugilids and carangids often congregate around fish farms (Arechavala-Lopez et al., 2014; Akyol et al., 2020).

The shark sucker *Remora remora* (Linnaeus, 1758) is a pelagic marine fish belonging to the family Echeneidae. This species is commonly found in warm marine

waters and has also been seen in the western and eastern Mediterranean (Froese and Pauly, 2024). Although various wild fish species are known to enter aquaculture cages where marine fish are reared and grow with aquaculture species, no information has been reported on this species growing in aquaculture cages. In our study, we report that a cosmopolitan shark sucker species can enter aquaculture cages as juveniles, grow in aquaculture cages, and develop adaptations to new environmental conditions.

2. MATERIALS AND METHODS

A single individual of *R. remora* collected from an aquaculture cage on Dana Island (Mersin Bay) on 07.03.2023 (Figure 1). The cage (Coordinates: 36°11'35.1"N 33°48'21.5"E) was located 20 km away from the Taşucu and at a depth of 5.5 km in Dana Island of Mersin Bay, north-eastern Mediterranean Sea (Figure 2). This species brought to the laboratory was identified after examination and morphometric measurements were made. Some morphometric characteristics of this individual were measured with a caliper with 0.01 mm precision. All morphological characters agree with those of (Muus and Nielsen, 1999). A photograph of the *R. remora* is presented in (Figure 3-4). The Mediterranean specimen was deposited at the Mersin University Marine Life Museum with catalog number MEUFC-24-11-147.

Figure 1 Image of the cages where *R. remora* was harvested in the Dana Island region

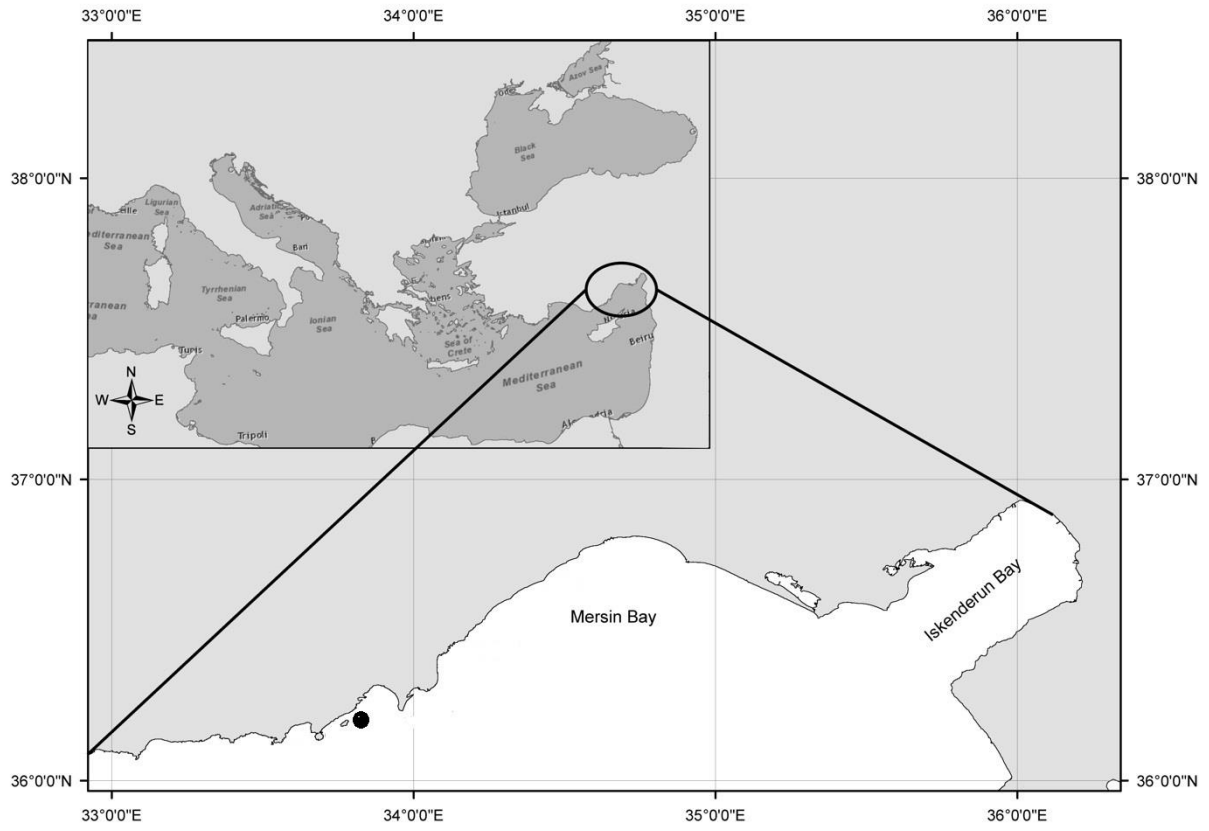

Figure 2 Map showing the aquaculture area (●) next to Dana Island

Figure 3 View of an individual of *R. remora* obtained from an aquaculture cage

Figure 4 View of the head and sucking disc of an individual of *R. remora* collected from an aquaculture cage.

3. RESULTS

The shark sucker specimen of *R. remora*, 67.6 cm total length and 1902 g weight. The following meristic characters: dorsal fin rays 23, anal fin rays 22, pectoral fin rays 26, and suction disk laminae (modified first dorsal fin), 21. Body elongate and stout. Head depressed. Head with a sucking disc that does not extend posteriorly to the end of the depressed pectoral fin, which is short and rounded. Caudal fin is emarginated. The first dorsal fin is shaped like a modified oval sucker-like organ with lamellar structures that can be opened and closed. The dorsal and anal fins originate well behind the midpoint of the standard length, low, longest ray (Lachner and Post, 1990). The body is brown and the sucker disk contained light brown and dark brown stripes in color. Some morphometric characteristics of the individual were determined and are presented in (Table 1). In addition, the morphometric measurements and meristic compared to previous reports from New Zeland Paulin and Habib, (1982) from Irish waters Quigley et al., (1994) and northeastern Mediterranean, Türkiye (Ergüden and Ayas, 2021).

Table 1 Comparison of morphometric and meristic characteristics of *R. remora* specimens obtained from aquaculture cages (Mersin Bay, Turkey) with previous records (Paulin and Habib, 1982; Quigley et al., 1994; Ergüden and Ayas, 2021).

Measurements (cm)	Present Study (n=1)	Ergüden and Ayas, (2021) (n=2)	Paulin and Habib, (1982) (n= 36)	Quigley et al., (1994) (n=1)
Total length	67.6	33.0-66.0	-	36.5
Standard length	60.1	26.7-53.5	6.0-26.5	29.5
Head length	11.4	6.8-13.5	2.6-3.0	7.5
Body depth	8.1	1.9-3.9	1.3-1.6	-
Disc length	13.7	4.8-9.6	3.2-3.9	9.5
Disc width	4.9	2.5-4.9	1.4-2.0	4.3

Eye diameter	1.3	0.6-1.3	0.3-0.5	-
Pre-orbital distance	5.9	2.9-5.9	-	-
Postorbital distance	5.3	2.7-5.5	-	-
Dorsal fin length	13.5	4.0-8.0	2.6-3.2	-
Pre-dorsal length	31.6	8.8-17.7	6.2-7.0	-
Pre-anal length	32.3	20.0-40.0	-	-
Caudal peduncle length	2.8	0.9-1.8	0.5-.0.7	-
Meristic Characters				
Dorsal fin rays	36	21-23	20-24	21
Anal fin rays	32	21-22	-	21
Pectoral fin rays	25	25-26	-	25
Disc laminae	21	19-22	16-18	17

4. DISCUSSION

The shark suckers lower jaw projects beyond the upper, and the animal lacks a swim bladder. It swims well on its own, with a sinuous, or curved, motion. This species can reach 86.4 cm in total length Claro, (1994), and common length 40 cm (Sanches, 1991). The maximum known weight of this species is 1.1 kg (IGFA, 2001). The anterior dorsal fins of shark suckers have evolved to allow them to attach to smooth surfaces by suction, and they spend their lives attached to a host animal such as a whale, turtle, shark, or ray, as well as to ships (Froese and Pauly, 2024; Eschmeyer et al., 1983). Recently, Ergüden and Ayas, (2021) reported the first confirmed record of two *Remora* specimens after separation from the turtle from the northeastern Mediterranean coast of Turkey.

According to Akyol et al., (2020), it is explained that aquaculture fish cages attract wild species due to the fish pellets falling to the bottom without being consumed by the cultured species and ensuring that they accumulate on the bottom. It is reported that some of these species enter the cages as juveniles and are harvested together with the aquaculture species. In previous years, Çiftçi and Ayas, (2022) reported a non-native species, *Pempheris rhomboidae*, in aquaculture in fish cages in the same region. Considering the mesh size (25 mm) of the aquaculture cage, it is estimated that this shark sucker entered the cage as a juvenile and grew in a short time, reaching a weight greater than the maximum weight previously reported by IGFA, (2001) in the natural environment in a short time of 12 months.

Besides, the weight value reported in our study is higher than the weight value (1902 g.) reported so far in the world for this species. This species is thought that shark sucker may have entered the cage as a juvenile after being separated from one of the sharks seen from time to time around the cage, probably due to the presence of aquaculture cages in the area. In this study, it was found that some morphometric characteristics of the individual collected from the cage were close to those of individuals caught in the wild (Table 1). However, from meristic counts, it was observed that the numbers of dorsal rays (21-27) and anal rays (22-24) were higher than the ranges of ray numbers reported in the literature. It is believed that this is due to the fact that under aquaculture conditions they can access much more of the food found in their natural habitat with the least amount of energy, resulting in rapid growth in a short period of time.

Although this species feeds primarily on host feces as well as plankton and parasitic copepods Cressey and Lachner, (1970), Bohlke and Chaplin, (1993) in nature. Younger specimens of shark suckers are more active as parasite scavengers. As we found in our study, it grew by feeding on the pellets in the cage and became much larger in a short period of time. It is very interesting that a fish found in nature as a sucker can survive and grow successfully on pellet feed without a host in fish farms. It shows the species' ability to adapt to different environmental conditions. In addition, the weight reported in our study is higher than previously reported for this species and is new information that should be added to the literature.

To date, there is no previous record of this species obtained from aquaculture cages. In this study, it is stated that the shark sucker individual obtained from the cage for the first time completed its development in a shorter time than the individuals in its natural environment and that a shark sucker species can adapt to aquaculture conditions. In recent years, it has been observed that both native and non-native species grow in net cages after entering the juvenile stage, so it is important to monitor these cages regularly in the future.

5. CONCLUSIONS

This study reports for the first time that *R. remora* grows in aquaculture cages. The fact that *R. remora* can survive in aquaculture cages outside its own life cycle may mean that this species does not have difficulty in adapting to new environmental conditions. It is necessary to investigate what the effects of these behavioral adaptations of marine species to aquaculture cages mean for the ecosystem.

Acknowledgements

The authors thank the aquaculture plant staff for providing the sample.

Authors' Contribution

Writing - original draft, methodology, writing – review and editing: DE, Interview, sampling, visualization: FK, Editing, final check control: MCA, Conceptualization, Investigation, original draft, writing - review & editing, validation: DA.

Ethical approval

The Animal ethical guidelines are followed in the study for species observation & identification.

Informed consent

Not applicable.

Conflicts of interests:

The authors declare that there are no conflicts of interests.

Funding:

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES

1. Akyol O, Özgül A, Düzbastılar FO, Şen H, Ortiz-de-Urbina JM, Ceyhan T. Seasonal variations in wild fish aggregation near sea-cage fish farms in the Turkish Aegean Sea. Aquac Rep 2020; 18:100478. doi: 10.1016/j.aqrep.2020.100478
2. Arechavala-Lopez P, Izquierdo-Gomez D, Sanchez-Jerez P. First report of a swordfish (*Xiphias gladius* Linnaeus, 1758) beneath open-sea farming cages in the Western Mediterranean Sea. Mediterr Mar Sci 2014; 15(1):72-73. doi: 10.12681/mms.503
3. Bohlke JE, Chaplin CCG. Fishes of the Bahamas and adjacent tropical waters. 2nd edition. University of Texas Press, Austin 1993; 771.
4. Çiftçi N, Ayas D. First record of *Pempheris rhomboidea* (Kossmann & Räuber, 1877) harvested from aquaculture fish cages. NESciences 2022; 7(2):182-189. doi: 10.28978/nesciences.1159280
5. Claro R. Características generales de la ictiofauna. Ecología de los peces marinos de Cuba (R. Claro Ed.), Instituto de Oceanología Academia de Ciencias de Cuba and Centro de Investigaciones de Quintana Roo 1994; 55-70.
6. Cressey RF, Lachner EA. The parasitic copepod diet and life history of diskfishes (Echeneidae). Copeia 1970; 1970(2):310-318. doi: 10.2307/1441652
7. Ergüden D, Ayas D. The confirmed occurrence of two specimens of *Remora remora* (Linnaeus, 1758) from Mersin Bay (Ne Mediterranean, Turkey). Aquat Res 2021; 4(3):293-298. doi: 10.3153/AR21023
8. Eschmeyer WN, Herald ES, Hammann H. A field guide to Pacific coast fishes of North America. Boston (MA, USA): Houghton Mifflin Company. Xii, 1983; 336.
9. FAO. FAO yearbook. Fishery and Aquaculture Statistics 2017/FAO annuaire. Statistiques des pêches et de l'aquaculture 2017/ FAO anuario. Estadísticas de pesca y acuicultura 2017. Rome 2019.
10. Froese R, Pauly D. Fish Base. World Wide Web Electronic Publications, 2024.

11. IGFA. Database of IGFA angling records until 2001. IGFA, Fort Lauderdale, USA 2001.
12. Lachner EA, Post A. Echeneidae. Check-list of the fishes of the eastern tropical Atlantic (CLOFETA) (JC. Quéro, JC. Hureau, C. Karrer, A. Post and L. Saldanha, Eds.), JNICT, Lisbon; SEI, Paris; and UNESCO, Paris, 1990; 2:725-728.
13. Muus BJ, Nielsen JG. Sea fish. Scandinavian Fishing Year Book. Hedehusene, Denmark, 1999; 340.
14. Paulin CD, Habib G. Remoras (Pisces: Echeneidae) from New Zealand. New Zeal J Zool 1982; 9(1):33-36. doi: 10.1080/03014223.1982.10423834
15. Quigley DTG, Flannery K, O'Shea J. *Remora remora remora* L. in Irish waters: Further records and a review of Irish records. Irh Nat J 1994; 24(12):499-502.
16. Sanches JG. Catálogo dos principais peixes marinhos da República de Guiné-Bissau. Publ Avuls Inst Nac Invest Pescas 1991; 16:429.