

-SHORT COMMUNICATION-

First Record of the *Pempheris rhomboidea* (Kossmann & Räuber, 1877) from Mersin Bay, Northeastern Mediterranean Sea

Nuray Çiftçi*, Mısra Bakan, Deniz Ayas

Faculty of Fisheries, Mersin University, Mersin, Turkey

Abstract

In this study, eight individuals of *Pempheris rhomboidea* (Kossmann & Räuber, 1877) were for the first time caught in the Mersin Bay, Northeastern Mediterranean Sea. Some morphometric and meristic characters of these individuals were measured. The average standard length (SL): 90.13 mm, total length (TL): 112.62 mm, the length of longest pectoral fin (LPF): 25.88 mm, the length of longest dorsal fin ray (LDF): 21.25 mm, SL/LPF: 3.88, SL/LDF: 4.24, A: III, 39-42; D: VI, 9; LL pore scales: 55-58. The ratio of eye diameter (ED) to standard length (SL) is 7.95. The presence of the non-indigenous *Pempheris rhomboidea* was reported for the first time from Northeastern Mediterranean Sea and second time from Turkish marine waters.

Keywords:

Pempheridae, Sweeper, First Record, Northeastern Mediterranean Sea, Mersin Bay, Turkey

Article history:

Received 28 September 2018, Accepted 30 January 2019, Available online 31 January 2019

Introduction

P. rhomboidea (Kossmann & Räuber, 1877) belongs to the Pempheridae family of Perciformes (Romero, 2002). The average standard length of this species is 13.2 cm (Randall & Victor, 2015). *P. rhomboidea* is a neritic species, which lives in the pelagic region, the coral reef and the rocky outcrop of the tropical and temperate waters in the Indo-Pacific and Western Atlantic (Azzurro et al., 2015). Their body is shaped rhomboid flattened from the sides, and this species is characterized by big eyes and short nose. They usually go out at night to feed on zooplankton in the reefs in which they live in bulk (Mooi & Randall 2014; Randall & Victor, 2015). It is reported that the

* Corresponding Author: Nuray ÇİFTÇİ, e-mail: nciftci@mersin.edu.tr

species is an invasive species that migrated from the Red Sea to the Mediterranean Sea and changed the structure of the ecosystem (Azzurro et al., 2015).

The identification of species belonging to *Pempheris* genus are very difficult. With the help of systematic and molecular studies, errors in the nomenclature of the species belonging to this genus have been tried to be corrected (Koeda et al., 2014; Azzurro et al., 2015). Goren (1986) stated that even in a particular geographic region, there could be taxonomic problems related to these species and the number of species could change.

Dor (1984) reported that *P. mangula*, *P. oualensis*, *P. schwenkii*, and *P. vanicolensis* belonging to *Pempheris* genus in Red Sea whereas Golani & Diamant (1991) have only accepted the presence of *P. vanicolensis* in the Red Sea. Goren & Dor (1994) added *P. molucca* to the species list and also reported the distribution of five *Pempheris* species in the Red Sea. Golani & Bogorodsky (2010) reported two species of *Pempheris*, *P. schwenkii*, *P. rhomboidea*, in the fish check-list of Red Sea. Randall et al. (2013) argued that *P. vanicolensis* should be named as *P. flavicycla marisrubri* (Azzurro et al., 2015).

According to Eschmeyer (2013), there are 48 species belonging to the *Pempheridae* family, however 30 species of them are valid species. This family consists of 4 species containing *Parapriacanthus* genus and 26 species containing *Pempheris* genus (Koeda et al. 2013; Randall & Victor, 2015). Koeda et al. (2014) reported that there are 4 different species of *Pempheris* genus (*P. adusta*, *P. mangula*, *P. nesogallica*, and new species *P. tominagai*). Randall et al. (2014) refuted the information belonging to the 4 *Pempheris* species which were claimed to be distributed in the Red Sea by Koeda et al. (2014). Randall & Bineesh (2014) reported 5 species of *Pempheris* genus in the Indian Ocean. These include: *P. flavicycla*; *P. malabarica*; *P. mangula* identified as a neotype; *P. sarayu* was reported as a new species, and *P. schwenkii* which is the first record for India. Azzurro et al. (2015) reported the presence of *P. flavicycla*, *P. rhomboidea*, and *P. tominagai* in the Red Sea as a result of molecular analysis. Randall & Victor (2015) stated that 34 species identified in the Indian Ocean belonging to the genus *Pempheris* have reached 47 species.

Iglésias & Frotté (2015) reported *P. rhomboidea* from Coast of Cyprus in the fish checklist. Akyol et al. (2017) reported the first record of *P. rhomboidea* from the Aegean Sea. The first species record of the *Pempheris* from Mersin Bay has been reported as *P. vanicolensis* (Gücü et al., 1994). In a later study, *P. vanicolensis* was recorded in the Gulf of Antalya (Bilecenoglu & Taşkavak, 1999). It was previously reported that *P. mangula* was identified as *P. vanicolensis* in the Mediterranean Sea (Froese & Pauly, 2018).

In this research, it is aimed to determine the species of 8 individuals of *Pempheris* genus catching from Mersin Bay and to determine some morphometric and meristic measurements of individuals. In addition, it was aimed to gather together the issues related to the identification of species in this genus.

Materials and Methods

Eight individuals of *P. rhomboidea* (Kossmann & Räuber, 1877) were caught by a trammel net at a depth of 30 m on 10 May 2018 in the Northeastern Mediterranean Sea (Mersin Bay) (coordinate: 36°46'20"N, 34°36'57"E). These specimens were preserved in 4% formalin and were deposited in the Museum of the Systematic, Faculty of Fisheries, Mersin University, (catalogue number: MEUFC-18-11-077). This species belongs to *Pempheridae* Family of Perciformes. Morphometric

and meristic characters of these individuals are given and sampling point of the species in the Mediterranean Sea is presented in Map (Figure 1). Photographs of caught individuals are shown in Figures 2.

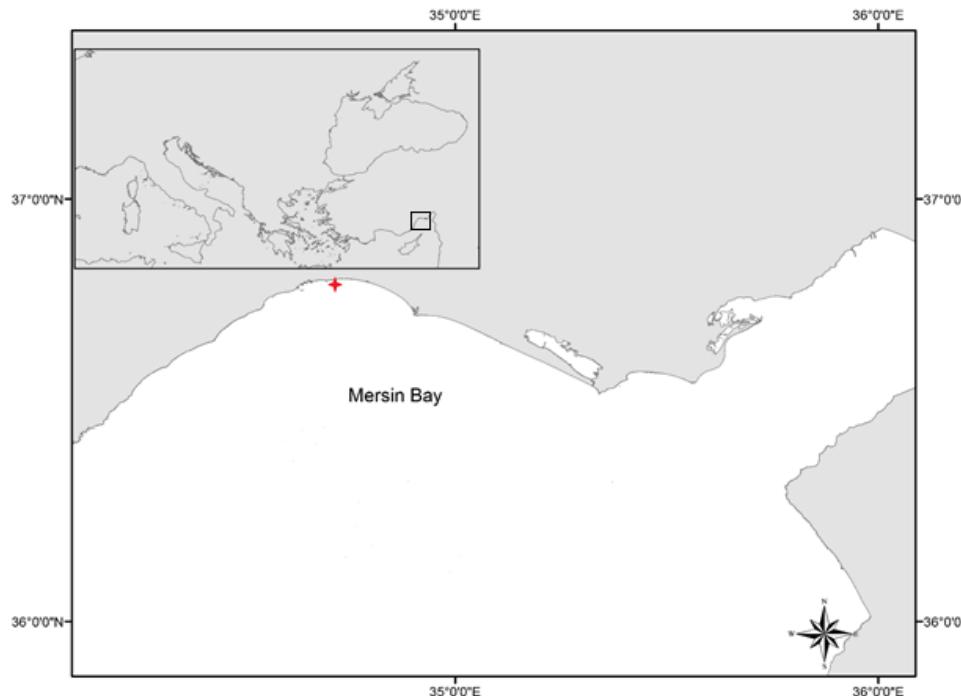


Figure 1. The red mark indicates the location where the specimens was caught



Figure 2. An individual of *P. rhomboidea* caught from Mersin Bay

The key features used in the identification of species belonging to the genus *Pempheris* are shown below.

Anal fin dusky Lateral-line pored scales 54–57 (52–59); 32–39 (36–42) anal segmented rays.....*P. rhomboidea* (Azzurro et al., 2015)

Scales on chest one-half cycloid and one-half ctenoid; longest dorsal-fin ray 4.05–4.25 in SL; lateral-line scales 52–58 (Red Sea, and as an immigrant to the Mediterranean Sea).....*P. rhomboidea* (Randall & Victor, 2015)

Results

In this study, eight individuals of *P. rhomboidea* (Kossmann & Räuber, 1877) were caught by a trammel net at a depth of 30 m out in Mersin Bay. The average of some morphometric measurements of eight individuals and their standard errors are shown in the Table 1.

Table 1. Some morphometric measurements of *P. rhomboidea* individuals

Characters	$\bar{X} \pm S_x$ (mm)
Standard length	90.13±6.20
Total length	112.62 ±6.95
Body depth	39.2 ±2.56
Body width	11.4 ±2.07
Head length	26.9 ±3.03
Eye diameter (ED)	12.7 ±1.28
Interorbital width	9.3 ±1.04
Caudal peduncle length	13.56 ±1.15
Pre-dorsal length	36.3 ±2.30
Pre-anal length	45 ±2.98
Base of Dorsal Fin	15.4 ±2.28
First dorsal spine	15.9 ±2.90
Longest dorsal fin ray	21.25 ±1.28
Longest pectoral fin length	25.88 ±1.96
Base of anal fin	39.8 ±5.46
First anal spine	1.5 ±0.76
Longest anal ray	13.3 ±3.24
Caudal fin length	20 ±3.63
Pelvic spine length	10.1 ±0.86
Pelvic fin length	14 ±1.51
SL/LPF	3.88 ±0.15
SL/LDF	4.24 ±0.08
SL/ED	7.95 ±0.62

($\bar{X} \pm S_x$: mean ± standart eror; n=8)

While body color of all individuals has silvery, fins are yellowish and the ends of the fins are black line. The meristic characters of these species caught in Mersin Bay were found A: III, 39-42; D: VI, 9-10, LL: 55-58.

Discussion

P. rhomboidea is a non-indigenous species that migrate from Red Sea to the Mediterranean Sea since the opening of the Suez Canal. The first records of the species were given in the 1800s (Russell 1803; Cuvier, 1829). The identification of species belonging to this family of Indo-Pasific are generally based on the distribution areas and morphometric properties (Koeda et al., 2014; Randall & Bineesh 2014). There have been various misidentification in identifying the species and different opinions have been put forward (Koeda et al., 2014; Randall et al., 2014; Akyol et al., 2017). These misidentifications have been tried to be corrected by the molecular studies (Azzurro et al., 2015).

The keys belonging to Pempheridae family were formed (Azzurro et al., 2015; Randall & Victor, 2015). These keys were used in the identification of these individuals caught from Mersin Bay. The number of pore scales on the line lateral was 55-58 and the number of anal fin soft rays were 39-42, spines were 3. The SL/LDF ratio was determined as 4.24 in this study. According to the number of lateral-line pored scales (54-57) and anal rays (32-39) (Azzurro et al., 2015) and according to the SL/LDF ratio (4.05-4.25) (Randall & Victor, 2015) the species was determined to be *P. rhomboidea*. We have determined that the measurements obtained from individuals for identification are compatible with both keys.

Koeda et al., (2014) reported that Pempheris species entering the Levant Basin was *P. mangula* and this species was synonymous with *P. rhomboidea* as a result of molecular studies. Morphometric measurements of both the identification keys and the literature indicate that all individuals caught from Mersin Bay are *P. rhomboidea*. Morphometric measurements and molecular analysis revealed that *P. rhomboidea* is a synonym of *P. mangula*. However, according to pictures in the literature of the species *P. mangula* is more reddish-bronze and *P. rhomboidea* is predominantly gray.

It was reported that the colors of the individuals which entered the first record in Visakhapatnam were reddish bronze and 42 soft rays were found on the anal fin and the species was given the name “mangula” (Russell, 1803). In 1829, Cuvier named this species as *P. mangula*. Koeda et al. (2014) reported that four species belonging to the genus Pempheris were distributed to the west of the Red Sea. Researchers also reported that among these species, *P. mangula* migrated to the Eastern Mediterranean Sea as a result of the opening of the Suez Canal. As characteristics of *P. mangula* separated from the other three species the size of the eyes; to be excessive dorso-ventral depth; be the blackish tip of dorsal fin; to be 49-60 pored scales along the lateral line were noted by Koeda et al. (2014). Genetic studies conducted in the same study indicated that *P. rhomboidea* is a synonym of *P. mangula* (Koeda et al., 2014). As a result of the morphological measurements, *P. rhomboidea* has 54-57 pores on the lateral line; 32-39 segmented and brown ray was found in anal fin (Azzurro et al., 2015).

In studies conducted in the Mediterranean Sea, Bilecenoglu & Taskavak (1999) from the Gulf of Antalya, Gucu et al. (1994) from Mersin Bay reported that the specimens of Pempheris was *P. vanicolensis*. In spite of this, Froese & Pauly (2018) allege that *P. mangula* and *P. rhomboidea* from the Pempheris genus distribute in the Mediterranean Sea. According to this literature *P. mangula* is a demersal tropical species whereas *P. rhomboidea* is a pelagic tropical species (Froese & Pauly, 2018). In previous studies, Pempheris individuals from the coast of

Turkey has been reported as *P. vanicolensis*. The specimens reported in these studies may be *P. rhomboidea*. In this study, morphometric characters of each individual were measured in order to prevent possible errors in defining species (Table 1). Some meristic characteristics are D: VI, 9; A: III, 37-42 also support that the species in this study is *P. rhomboidea*. It is distinguished by the following characters: Dorsal spines: 6; Dorsal soft rays: 9-10; Anal spines: 3; Anal soft rays: 35-48. There is a blackish spot on pectoral fin base (Randall & Victor, 2015).

No morphometric measurements of *P. rhomboidea* were found in the literature. Randall & Bineesh (2014) determined morphometric measurements of *P. sarayu*. According to the researchers, *P. sarayu* and *P. rhomboidea* differ from each other in terms of the size of the eye, the pre-pelvic fin length, the fork of the caudal fin, the black color on the terminal of dorsal fin, body depth. They can be separated by a more grayish of *P. rhomboidea* and by a more copper of the *P. sarayu*.

Table 2. Comparison of some morphometric measurements of *P. sarayu* and *P. rhomboidea*

(mm)	<i>P. sarayu</i> (Randall & Bineesh, 2014)	<i>P. rhomboidea</i> (this research)
Standard length	130	90.13
Body depth	48.5	39.2
Body width	15.4	11.4
Head length	30.5	26.9
Caudal peduncle length	7.7	13.56
Pre-dorsal length	37.6	36.3
Pre-anal length	50.3	45
Base of dorsal fin	19.3	15.4
First dorsal spine	8.1	15.9
Longest dorsal ray	25.2	19.6
Base of anal fin	58.5	39.8
First anal spine	3.9	1.5
Longest anal ray	25.3	13.3
Caudal fin length	24.0	20
Pelvic spine length	13.5	10.1
Pelvic fin length	16.2	14

According to the comparison, *P. rhomboidea* caught from Mersin Bay was smaller than *P. sarayu* in terms of the specific morphometric measurements, and the given information in the literature was confirmed by our study (Table 2). *P. rhomboidea* was first recorded in the Aegean Sea by Akyol et al. (2017) which provided the first record of this species from Turkish coastal waters (Turan et al., 2018). The second record of *P. rhomboidea* from the Mediterranean coastal waters of Turkey was given with this study. At that time, occurrence of this species in the Northeastern Mediterranean Sea has also been reported from Coast of Cyprus (Iglésias & Frotté, 2015). The occurrence and extension of this species like other nonindigenous species are mostly due to global climate change and other anthropogenic factors as described by Turan et al. (2017).

Acknowledgements

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

References

- Akyol, O., Düzbastılar, F.O. & Ceyhan, T. (2017). First Report of *Pempheris rhomboidea* (Perciformes: Pempheridae) Beneath Offshore Sea-Cages in the Aegean Sea. *Turkish Journal of Fisheries and Aquatic Sciences*, 17, 449-450.
- Azzurro, E., Goren, M., Diamant, A., Galil, B. & Bernardi, G. (2015). Establishing the identity and assessing the Dynamics of invasion in the Mediterranean Sea by the dusky sweeper, *Pempheris rhomboidea* Kossmann&Räuber, 1877 (Pempheridae, Perciformes). *Biol Invasions*, 17, 815–826.
- Bilecenoglu, M. & Taşkavak, E. (1999). Some observations on the habitat of the Red Sea Immigrant Sweeper, *Pempheris vanicolensis*, on the Mediterranean coast of Turkey *Zoology in the Middle East*, 17, 67-70.
- Cuvier, G. (1829). Le Règne Animal, Ed. 2. Chez Deterville, Paris, 406 pp.
- Dor, M. (1984). *Checklist of the fishes of the Red Sea*. The Israel Academy of Sciences and Humanities, Jerusalem, 437 pp.
- Eschmeyer, W.N. (2013). Catalog of fishes electronic version (version 15 December 2013).
- Froese, R. & D. Pauly. Editors. 2018. FishBase. World Wide Web electronic publication. www.fishbase.org, version (06/2018).
- Goren, M. (1986). *Checklist of the fishes of the Red Sea by Menachem Dor*. Copeia 1986:267-268.
- Goren, M. & Dor, M. (1994). An updated checklist of the fishes of the Red Sea. ClofresII, The Israel Academy of Sciences and Humanities, Jerusalem, 120 pp.
- Golani, D. & Diamant, A. (1991). Biology of the sweeper, *Pempheris vanicolensis* Cuvier and Valenciennes, a Lessepsian migrant in the eastern Mediterranean, with a comparison with the original Red Sea population. *Journal of Fish Biology*, 39, 819-827.
- Golani, D. & Bogorodsky, S.V. (2010). The fishes of the Red Sea-reappraisal and updated checklist. *Zootaxa*, 2463, 1-135.
- Güçü, A. C., Bingel, F., Avşar, D. & Uysal, N. (1994). Distribution and occurrence of Red Sea fish at the Turkish Mediterranean coast-northern cilician basin. *Acta Adriatica*, 34 (1/2), 103-113.
- Iglésias, S. P. & Frotté, L. (2015). Alien marine fishes in Cyprus: update and new records. *Aquatic Invasions*, 10(4), 425-438.
- Koeda, K., Yoshino, T. & Tachihara, K. (2013). Identificational keys of *Pempheris adusta* Bleeker, 1877 (Pempheridae) with comments on its standard Japanese name. *Japanese Journal of Ichthyology*, 60 (2), 123–128.
- Koeda, K., Yoshino, T., Imai, H. & Tachihara, K. (2014). A review of the genus *Pempheris* (Perciformes, Pempheridae), with description of a new species. *Zootaxa*, 3793(3), 301–330. <http://dx.doi.org/10.11646/zootaxa.3793.3.1>
- Mooi, R.D. & Randall, J.E. (2014). *Pempheris bexillon*, a new species of sweeper (Teleostei: Pempheridae) from the Western Indian Ocean. *Zootaxa*, 3780 (2), 388-398.
- Randall, J.E., Bogorodsky, S.V., Alpermann, T.J., Satapoomin, U., Mooi, R.D. & Mal, A.O. (2013). *Pempheris flavicycla*, a new pempherid fish from the Indian Ocean, previously identified as *P. vanicolensis* Cuvier. *Journal of the Ocean Science Foundation*, 9, 1-23.

- Randall, J.E. & Bineesh, K.K. (2014). Review of the fishes of the genus *Pempheris* (Perciformes: Pempheridae) of India, with description of a new species and a neotype for *P. mangula* Cuvier. *Journal of the Ocean Science Foundation*, 10, 21.
- Randall, J. E., Victor, B.C., Alpermann, T.J., Bogorodsky, S.V., Mal, A.O., Satapoomin, U. & Bineesh, K.K. (2014). Rebuttal to Koeda et al. (2014) on the Red Sea fishes of the perciform genus *Pempheri*. *Zootaxa*, 3887(3), 377-392.
- Randall, J.E. & Victor, B.C. (2015). Descriptions of thirty-four new species of the fish genus *Pempheris* (Perciformes: Pempheridae), with a key to the species of the western Indian Ocean. *J. Ocean Sci. Found.* 18, 1-77.
- Romero, P., 2002. An etymological dictionary of taxonomy. Madrid, unpublished.
- Russell, P. (1803). Descriptions and Figures of Two Hundred Fishes Collected at Visagapatam on the Coast of Coromandel. G. and W. Nicol, London, 85 pp.
- Turan, C., Erguden, D., Gürlek, M. (2016). Climate Change and Biodiversity Effects in Turkish Seas. *Natural and Engineering Sciences*, 1(2), 15-24.
- Turan, C., Gürlek, M., Başusta, N., Uyan, A., Doğdu, S., Karan, S. (2018). A Checklist of the Non-indigenous Fishes in Turkish Marine Waters. *Natural and Engineering Sciences*, 3(3), 333-358.