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Some Observations on the Depth Range and Size of Devil Firefish *Pterois miles* (Bennett, 1828) (Scorpaenidae) in Silifke Mersin (Turkey)

Ertan Taskavak[1] • Sule Gurkan[1] • Burcu Taylan[1]✉

[1] Ege University, Faculty of Fisheries, Department of Basic Science, Bornova, İzmir, Turkey, ertan.taskavak@ege.edu.tr; sule.gurkan@ege.edu.tr; burcu.taylan@ege.edu.tr

✉ Corresponding Author: burcu.taylan@ege.edu.tr

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ABSTRACT

In this study, we discussed the size of devil firefish *Pterois miles* (Bennett, 1828) specimen obtained from commercial fishermen who trawl off the coast of Taşucu, Silifke (36°3'32.70"N; 34°3'51.33"E). The obtained specimen was 335 mm in total length, 258 cm in standard length, and 0.696 kg in weight. The dissected specimen was a mature male. The testicles were weighed as 20.77 g and are in the third maturity stage. Additionally, during scuba diving to the underwater cave of Mersin Silifke, Beşparmak Island, a group of devil firefish was photographed at depths less than 15 meters. Contrary to many records on the hard rocky bottom at depths more than 20 meters, it has been observed by us that many anglers on the dock of Mersin Taşucu port were catching the devil firefish together with sympatric pufferfish (*Lagocephalus sceleratus*) in shallow waters of sandy bottom less than 3 meters at depth.

INTRODUCTION

The members of the genera *Pterois* are native to coral reefs in the tropical waters of the South Pacific and Indian Oceans. Those are highly invasive species that threaten the well-being of coral reefs and other marine ecosystems, including the commercially and recreationally important fishes that depend on them. With the opening of the Suez Canal, the lessepsian fish species that have migrated from the Red Sea to the Mediterranean, consequently the coast of Turkey, gained momentum in recent years and reached 73 fish species (Turan et al., 2018). *Pterois miles*, a member of the family Scorpaenidae, is considered the most invasive fish species on the Atlantic and Mediterranean coasts (Kletou et al., 2016). Devil firefish *Pterois miles*, which have intense distribution in the Indian Ocean and the Mediterranean (Froese & Pauly, 2020), was reported for the first time by Golani & Sonin (1992) from the eastern Mediterranean, the Gulf of Haifa, in 1991. The first record of the Indo-Pacific lionfish for the Turkish coasts was given by Turan et al. (2014) from Iskenderun Bay. The Indo-Pacific immigrant *P. miles*, which are usually found in depths from 25 to 85 m on The hard rocky bottom, coral reefs and artificial substrate, may reach a maximum size of 35 cm in standard length (Sommer et al., 1996; Hare & Whitfield, 2003).

This study aims to document the size of the species and observations on the depths where the species was seen and caught, updating our knowledge on this alien fish species.

MATERIAL AND METHODS

In March 2020, a single male *P. miles* specimen was obtained from commercial fishermen who trawl off the coast of Taşucu, Silifke at depths of 100-110 meters (36°3'32.70"N;

34°3'51.33"E) during open fishing season (Figure 1). The species determination was assigned according to Golani & Sonin (1992). The determination of the age of the lionfish by any method was not taken into consideration in this study. Total length (TL), Standard length (SL), and weight (TW, g) measurements of the male specimen were determined in the laboratory with a measuring board (0.1 cm), and a digital balance to the nearest 0.01 g. 13 morphometric measurements (caudal peduncle length, peduncle height, head length, dorsal fin length, anal fin length, prepectoral length, prepelvic length, eye diameter, preorbital distance, preanal length, snout length, interorbital distance, supraorbital tentacles) were taken with a Mitutoyo digital caliper to nearest 0.01 millimeter, and similarly six meristic characters (size of gill rakers, dorsal fin ray, anal fin ray, pectoral fin ray, pelvic fin ray, caudal fin ray) were evaluated as well (Table 1). All morphometric and meristic measures were expressed as % of the standard length (SL) and four as % head length (HL). The Sample was preserved in a 4% formalin solution. After length and weight measuring processes, the specimen was dissected and its sex was determined.

Figure 1. Bottom trawling area where *Pterois miles* specimen was caught as bycatch (36°3'32.70"N; 34°3'51.33"E).

In addition to the size record obtained from a single specimen, during scuba diving to the underwater cave of Mersin Silifke, Beşparmak Island to monitor the Mediterranean monk seal, *Monachus monachus*, a group of devil firefish was photographed (Figure 2). Moreover, in 2018, 2019, and 2020 we observed that many anglers on the dock of Mersin Taşucu port have also occasionally caught the devil firefish.

Table 1. Metric (mm) and meristic characteristics of *Pterois miles* specimen caught in March 2020 off the coast of Taşucu, Mersin Turkey

Metric measurements	**This Study**		**Oray et al. (2015)**		**Turan et al. (2014)**		**Golani & Sonin (1992)**	
	mm	*SL%*	*mm*	*SL%*	*mm*	*SL%*	*mm*	*SL%*
Total length	335.00		373.00		276.00			
Standard length	258.00		275.00		211.00		328.00	
Body width	92.98	36.04	110.80	40.30		32.20		41.40
Caudal peduncle length	39.93	15.48	43.80	15.90				
Peduncle height	29.34	11.40	23.80	8.70				
Head length	80,53	31.21	84.90	30.80		30.80		31.70
Dorsal fin length	155.10	60.12	164.60	59.80				
Anal fin length	45.73	17.72	45.90	16.70				
Prepectoral length	70.40	27.29	91.20	33.20				
Prepelvic length	79.37	30.76	87.60	31.90				
Eye diameter	7.50	9.31 %HL	9.70	11.5 %HL				19.6 %HL
Preorbital distance	35.54	13.78	23.90	28.20				
Preanal length	185.00	71.70	188.60	68.60				
Snout length	39.69	47.43 %HL				31.2 %HL		39.9 %HL
Interorbital distance	12.78	15.27 %HL	15.70	18.50		34.21 %HL		23.8%HL
Supraorbital tentacles	23.42	29.08 %HL				33.85 %HL		
Meristic characters								
Dorsal Fin rays	XIII + 11		XIII + 11			XIII + 10	XII+I+10	
Anal Fin rays	III + 7		III + 7			III + 6	III + 6	
Pectoral fin rays	14		14			13	14	
Pelvic Fin rays	I, 5		I, 5			I, 6		
Caudal Fin soft Rays	13					14		
Gill rakers	16					14	14	

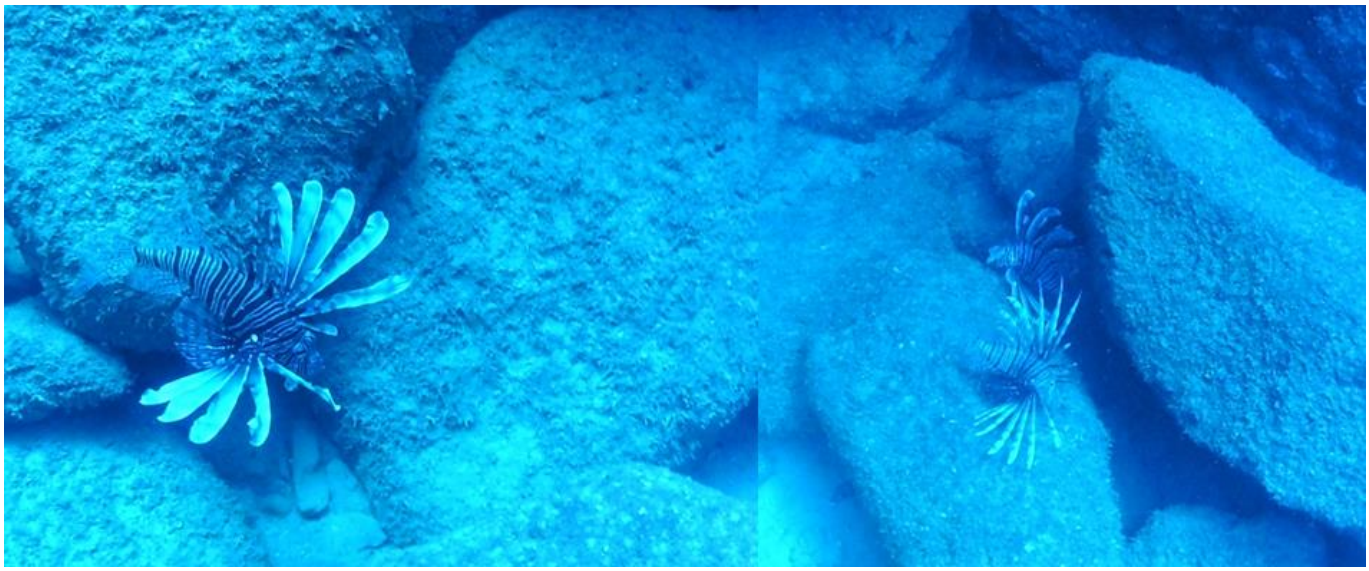

Figure 3. The invasive *Pterois miles* photographed by diver, Fatih Volkan Özel during scuba diving to the underwater cave of Mersin, Silifke Beşparmak Island on September 12, 2018

RESULTS AND DISCUSSION

The obtained specimen was 335 mm in total length, 258 mm in standard length, and 0.696 kg in weight. The determined morphometric and meristic characters of the specimen were given in Table 1. It was seen that the dissected specimen was a mature male (Figure 3). The testicles were weighed as 20.77 g and are in the third maturity stage, according to Holden & Raitt (1974).

Figure 2. A male Indo-Pacific lionfish *Pterois miles* and its testes, caught off the coast of Taşucu, Silifke Mersin

The captured specimen of Turan et al. (2014), who gave the first record of *P. miles* for the Turkish marine waters, was 276 mm in total length and 211 mm in standard length. In our study, it was determined that the *P. miles* specimen belongs to the largest individual identified in the Turkish seas (except for the ambiguous record given by Dağhan & Demirhan (2020) for Iskenderun Bay) as well as the third one in the Mediterranean. Studying some bio-ecological characteristics of 179 *P. miles* specimens caught from Iskenderun Bay, Dağhan & Demirhan (2020) stated length and age group of their specimens only in the abstract section of their study, which ranged between 14.5-35.5 cm and 1-6 years, respectively. The 37.3-centimeter fish length (27.5 cm Standard length) given by Oray et al. (2015) is the second maximum length of *P. miles* recorded for the Mediterranean. A 328 mm *Pterois miles* specimen of Golani & Sonin (1992), which was given for the first time from the Mediterranean almost three decades ago, is the largest one recorded in the Mediterranean so far. Considering the species' further westward distribution in the Mediterranean, Zannaki et al. (2019) and Vavasis et al. (2020) recorded 31.5 and 22.5 cm of *P. miles* specimens, respectively, for the Greek marine waters.

The presence and abundance of relatively larger individuals in a fish population may give some insight into the existence of fishing pressure on the related species, as well as the prey-predator relationship. Growth is critically important since body size strongly influences predator-prey interactions (Rice et al., 1993; Lorenzen, 2006) and is a key determinant of reproductive output in fishes (Hixon et al., 2013). In the determination of growth parameters, they are freely estimated with the exception of the maximum observed size, a common convention. Constraining the maximum observed size is usually required if relatively few old fish are captured, and the length data contained little information about maximum size. However, in Von Bertalanffy growth parameters, Dağhan & Demirhan (2020) calculated L_∞ value with the data obtained from age readings as 44.6271 cm for 179 *P. miles* specimens (female and male together) from Iskenderun Bay.

In addition to the size record obtained from a single specimen, another issue we want to discuss in this study is

the depths where the devil firefish were observed or caught. In the easternmost Mediterranean range of this invasive species, the depths are recorded as 35 m (trawl) by Golani & Sonin (1992) and 30 m (gill net) Bariche et al. (2013) for Israel and Lebanon, respectively. Similarly, Turan et al. (2014) and Oray et al. (2015) have given the depths, which this invasive species was caught, as 25 and 40 meters, respectively, for Turkey and Cyprus. In their study on invasive lionfish caught from the locality and depths where we made our observations and sampling presented here, Yaglioglu & Ayas (2016) mentioned specimens caught with bottom trawl at 100-110 meters depths in Yeşilovacık Bay, Mersin. On the other hand, unlike the examples given above, a total of 36 samples were captured by spear gun on rocky bottoms at depths ranging from 1 to10 meters on the coast of Rhodes Island (Zannaki et al., 2019). In contrast, Turan & Öztürk (2015) observed this nuisance invader for the first time at 11 m depth on a sandy bottom in Dalyan on the Aegean Sea coast of Turkey. In 2019, diver Fatih Volkan Özel photographed a group of devil firefish with GoPro HERO7 White by an underwater cave entrance of Beşparmak Island, Mersin. This observation on the hard rocky bottom was at depths less than 15 meters (Figure 2). Contrary to our observation on the hard rocky bottom, in 2018, 2019, and 2020 it has been observed that amateur fishers on the dock of Mersin Taşucu port were catching the devil firefish together with sympatric pufferfish (*Lagocephalus sceleratus*) in shallow waters of sandy bottom less than 3 meters at depth.

Invasion of marine alien species, both vertebrate and invertebrate, is one of the most critical threats negatively affecting marine biodiversity worldwide. *P. miles* has been reported to be among the most invasive species documented among aquatic creatures (Hixon et al., 2013). This Red Sea immigrant fish threaten native fish and the environment in coastal waters. They are capable of causing extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats. *P. miles*, with a Basic Risk Assessment (BRA) score of 45.5, is the most invasive species known in the Mediterranean to date and the most severely threatening species to biodiversity (Bilge et al., 2019). Up to date, considering the sizes of *P. miles* found in the Mediterranean (328 mm SL by Golani & Sonin, 1992; 373 mm TL and 275.0 SL by Oray et al., 2015; and 335 mm TL 258 mm SL by the present study) and the prey fish found in their stomach contents (23 genera of 13 families given by Zannaki et al., 2019 and *Mullus surmuletus*, Gobiidae sp., given by Özgür Özbek et al., 2017) as well as the effects of lionfish predation on adult fish is also likely to represent a significant impact of this invasive species on native communities in the Mediterranean.

CONCLUSION

Consequently, the findings we have obtained here regarding the maximum sizes of *P. miles* in the Mediterranean, the depths where we observed the species and the sandy bottom on which the fish were seen show how devil firefish settle successfully at Turkey's Mediterranean coasts. Moreover, the fact that the captured devil firefish is a mature male with 20.77 grams of testicles may also indicate that this species can reproduce successfully in the eastern Mediterranean basin. In his study aims to predict the potential geographic distribution and future expansion of *Pterois miles* with ecological niche modeling along the Mediterranean Sea, Turan (2020) claimed that almost more than 2/3 of the whole Mediterranean would be in trouble with this invader in a few decades. Thus, ministries that are directly related to the subject (Ministry of Food, Agriculture and Livestock and Minister of Environment and Urbanization), universities, nongovernmental organizations, relevant fisheries sector representatives and fisheries cooperatives have to hard to develop ways to prevent and control further spread existing populations.

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Compliance With Ethical Standards

Authors' Contributions

Authors have contributed equally to the paper.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

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