



-REVIEW ARTICLE-

Lionfishes *Pterois miles* and *Pterois volitans* in the North-eastern Mediterranean Sea: Distribution, Habitation, Predation and Predators

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Abstract

The lionfish *Pterois miles* was first recorded in the Iskenderun Bay on 2014 in Turkish Marine waters, and then its distribution was extended to Mersin and Antalya Bays in 2014 in the Mediterranean part of Turkey. The first observation of *P. miles* in the Aegean Sea was from Fethiye region in July 2015. The extension of *P. miles* in Turkish marine waters seems to be fast even though it's slow moving feature. Second species of the lionfish, red lionfish *Pterois volitans*, was also recorded from Turkish Marine waters on May 2016 by a commercial purse seine at 30 m depth at Iskenderun Bay and underwater observation was also recorded on October 2016 at Antakya Bay. Therefore, the number of *Pterois* species in the Mediterranean Sea has reached to two, *P. miles* and *P. volitans*. Based on underwater observations, *P. miles* and *P. volitans* are usually observed in rocky and cave habitats and prefer 10-40 meters for feeding that may cause the reduction of populations of vanikoro sweeper (*Pempheris* spp.), cardinal fish (*Apogon* spp.) and red coat (*Sargocentron rubrum*) species. *P. miles* and *P. volitans* also show cohabitation and gathering usually with 2-5 individuals. Grouper species such as dusky gruper *Ephinephelus marginatus* and goldblotch grouper *Ephinephelus costae* are the main predators of the lionfishes.

Keywords:

Lionfishes, *Pterois miles*, *Pterois volitans*, Distribution, Habitation, Predation

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Introduction

The invasion and establishment of alien species is a major threat to marine biodiversity, structure and function that also have economic and human health implications (Charles & Dukes, 2007; Otero et al., 2013). There are 10 valid species of the genus *Pterois* in the world (Froese & Pauly, 2016). Lionfish inhabit in warm marine waters at depths from 1 to 300 feet

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on hard bottom, mud bottoms, mangroves, sea grasses, coral reef, and artificial reefs (Albins & Hixon, 2008; Ferrieira, 2015). The high feeding rates of lionfish pose a serious threat to its benthic ecosystems (Morris & Akins, 2009; Kulbicki et al., 2012; Higgs, 2013).

Morphological differences between *Pterois miles* and *Pterois volitans*

According to Schultz (1986), the main meristic characters to distinguish *P. volitans* from *P. miles* are that dorsal fin counts and anal fin counts are between 10-12 and 6-8 for *P. volitans*; and between 09-11 and 6 for *P. miles*, respectively. Moreover, one of the main meristic characters to distinguish *P. volitans* from *P. miles* are the horizontal scale rows count (Allen and Erdman, 2008). The above lateral line scale count for *P. volitans* and *P. miles* are overlapped which are 11-13 for *P. miles* and 8-14 for *P. volitans*. The below lateral line scale is very different for both species that are 17-21 for *P. miles* and 18-25 for *P. volitans*. Furthermore, *P. miles* has a smaller pectoral fin than *P. volitans* (Schultz, 1986), the pectoral fin of *P. volitans* is extending over the caudal fin. Also there are tiny brown spots surrounding the eye of *P. miles* that do not exist on the eyes of *P. volitans*.

Range extension of lionfish *P. miles* in the Mediterranean Sea

A single specimen of lionfish *P. miles* was the first recorded from the Mediterranean coast, Haifa Bay in 1991 (Golani & Sonin 1992), and later the two lionfish specimens were reported from Lebanon coast in the Mediterranean Sea (Bariche et al., 2013). Two unidentified lionfish specimens were also observed in Cyprus coast by Evripidou (2013). Bariche et al., (2013) stated that this reported species seemed to be most likely *P. miles*, which had been probably introduced into the Mediterranean Sea from the Red Sea via the Suez Canal. A single specimen of *P. miles* was captured in the Iskenderun Bay (Kaleköy), North-eastern Mediterranean part of Turkey at a depth of 25 m on a rocky bottom on 13 April 2014 (Turan et al., 2014), (Figure 1). Therefore, the occurrence of this species in the Turkish water seems to be due to its range expansion from the southern to the northern Mediterranean.



Figure 1. The range expansion of *P. miles* from the southern to the northern Mediterranean

Range extension and expansion of *P. miles* and *P. volitans* in the Turkish Marine Waters

After first observation of a single specimen of *P. miles* in the Iskenderun Bay (Kaleköy), North-eastern Mediterranean part of Turkey. *P. miles* was became rapidly abundant in all coastal part of the Iskenderun and Antakya Bays. An underwater observation of *P. miles* is given in Figure 2. The extension of *P. miles* along Turkish coasts with underwater observations, reports and captures have been given by divers and fishermen at Antalya Gazipaşa in May 2014, Antalya (Kemer, Demre and Kaş) in June 2014 (Turan & Öztürk, 2015). Yaglioglu and Ayaş (2016) also reported *P. miles* from the Mersin Bay which indicate its extension from east to west, Antalya Bay. First observation of *P. miles* from the Aegean Sea was reported from the Fethiye Bay (Önder Mogol, Personel Communication) in July 2015 and then from Dalyan coast in August 2015 (Figure 3) (Turan & Öztürk, 2015). These observations indicate that *P.miles* is successfully and rapidly expanding its distribution northward to the Aegean Sea (Figure 3). Its extension in the Aegean Sea may be determined by sea temperature.



Figure 2. *P. miles* in the Antakya Bay, north-eastern Mediterranean Sea



Figure 3. Range extension of *P. miles* in the Turkish Marine waters

The red lionfish *Pterois volitans* (Linnaeus, 1758) is distributed in the Pacific Ocean (North and South), Atlantic Ocean (North and South) and also found in the Indo-West Pacific Ocean (Schultz, 1986; Whitfield et al., 2002; Kimball et al., 2004; Froese & Pauly, 2016). A single male specimen of red lionfish *Pterois volitans* was recorded for the first time on 13 May 2016 from the Iskenderun Bay, North-eastern Mediterranean, Turkey (Gurlek et al., 2016) that was first record of the red lionfish *P. volitans* along the Mediterranean Sea.

Moreover, underwater observations of *Pterois volitans* specimens were also recorded from the Antakya Bay in the northeaster Mediterranean Sea in October 2016 (Figure 4) that indicate the establishment of the red lionfish in the Mediterranean Sea.



Figure 4. First record (1) and occurrence (2) *P. volitans* in Turkish marine waters.

An underwater observation of *P. miles* is given in Figure 5. Possible future extension and expansion of the red lionfish *Pterois volitans* in Turkish marine waters are expected to be as lionfish *P. miles*, described above.



Figure 5. Red lionfish *P. volitans* in the Antakya Bay, north-eastern Mediterranean Sea.

Habitation, predation and predators of Pterois miles and Pterois volitans

Pterois species generally inhabit small caves and under big rocks (Figure 6), and during each diving we occasionally come cross vanikoro sweeper (*Pempheris* spp.), cardinal fish (*Apogon* spp.) and red coat (*Sargocentron rubrum*) and we used to see these species in these habitats in the Antakya Bay.



Figure 6. Lionfish usually stay in small caves and under big rocks in which other species that used to live in these habitats were not observed.

This observation lead us to think three possibilities that, first, lionfishes presumably feed on vanikoro sweeper (*Pempheris* spp.), cardinal fish (*Apogon* spp.) and red coat (*Sargocentron rubrum*) species. On the other hand, secondly, these species may also move away from their habitats due to protecting themselves from the lionfishes. Moreover, both possibilities together may be occurring in these habitats.

During underwater research, grouper species such as dusky grouper and goldblotch grouper were following the lionfishes and one dusky grouper captured the lionfish and digested it (Figure 7 and 8). Therefore, top predators are very important for the depletion of lionfishes that indicate conservation of top predators help to struggle lionfishes in Turkish marine waters since fishing activities such as trawling and purse seiner and also nets do not help to struggle lionfish which usually inhabit under big rocks and caves.

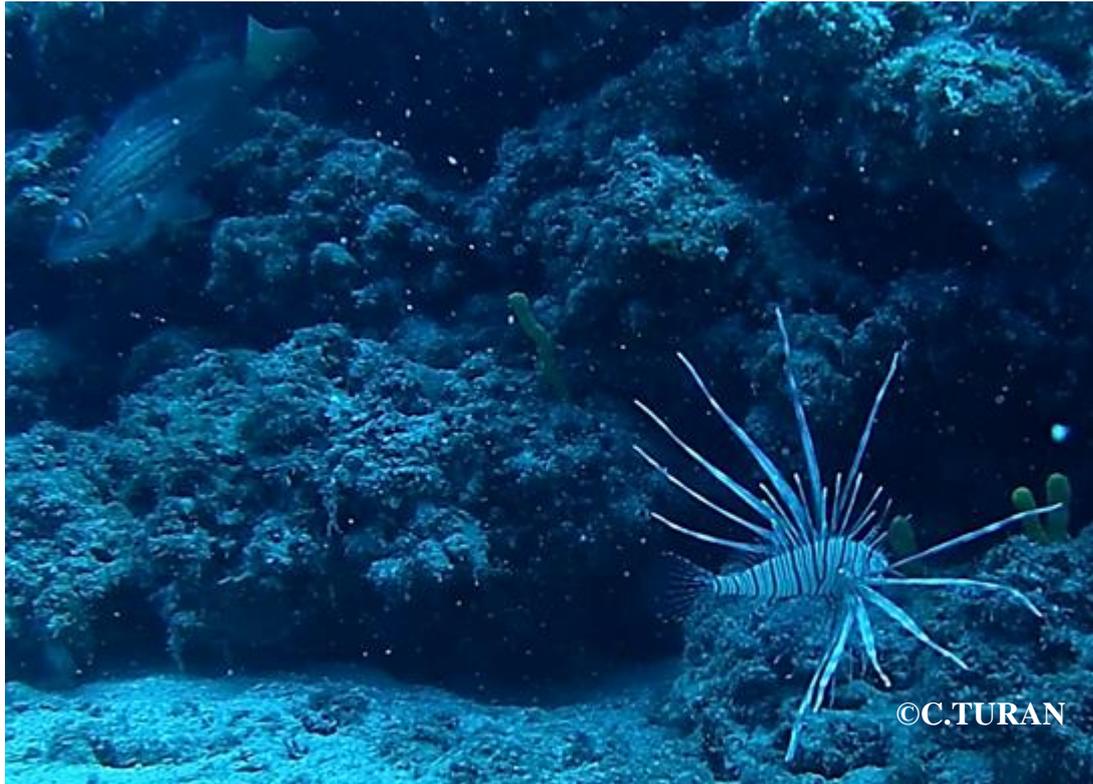


Figure 7. Goldblotch grouper *Ephinephelus costae* are following up red lionfish *P. volitans* in the Antakya Bay, north-eastern Mediterranean Sea.



Figure 8. Dusky grouper *Ephinephelus marginatus* is swallowing the lionfish in the Antakya Bay, north-eastern Mediterranean Sea.

The number of lionfishes are getting increased in marine waters of Turkey and also in the Mediterranean Sea. There are 10 valid species of the lionfishes inhabiting in the Pacific Ocean and Atlantic Ocean, and we do not know how many of them will come to the Mediterranean Sea.

The rapid extension of lionfish to the other part of the Aegean Sea (Greece waters) may be prevented due to the high current system of the Aegean Sea. Therefore, lionfish may have difficulty to come cross to the other part of the Aegean Sea. Nevertheless, the distribution of lionfish may extend to other European waters such as Ionian Sea, Maltase waters and Southern Italian Coasts in the near future.

Countries in the Pacific Ocean facing serious problems with lionfishes and organising many campaigns to eradicate lionfish. However, some researchers point out that complete eradication of lionfish is impossible, these campaigns only help to keep their population in check and protect the native marine ecosystems (Spencer, 2013).

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