

Occurrence of lionfish, *Pterois miles* (Bennett, 1828) in the coast of Aegean Sea (Turkey): The northernmost dispersal record

Ege Denizi kıyılarında aslan balığının *Pterois miles* (Bennett, 1828) bulunuşu: En kuzey kaydı

Aytaç Özgül

Ege University, Faculty of Fisheries, 35100 İzmir-Turkey

 <https://orcid.org/0000-0001-7706-9012>

aytac.ozgul@ege.edu.tr

Received date: 27.11.2019

Accepted date: 20.01.2020

How to cite this paper:

Özgül, A. (2020). Occurrence of lionfish, *Pterois miles* (Bennett, 1828) in the coast of Aegean Sea (Turkey): The northernmost dispersal record. *Ege Journal of Fisheries and Aquatic Sciences*, 37(3), 313-317. DOI: [10.12714/egejfas.37.3.15](https://doi.org/10.12714/egejfas.37.3.15)

Abstract: *Pterois miles* (Bennett, 1828) is one of the worst aquatic invaders in history and its rapid dispersal in the Mediterranean Sea raise serious concerns for local communities. On August 2019, one specimen was caught by spear-fisher at depths of 15 m in Kokar Bay of Aegean Sea, Turkey. This occurrence represents the northernmost record of the species in the Aegean Sea.

Keywords: *Pterois miles*, devil firefish, alien species, Aegean Sea

Öz: *Pterois miles* (Bennett, 1828), tarihin en kötü istilacı türlerinden biridir ve Akdeniz'deki hızlı dağılımı yerel topluluklar için ciddi kaygılar doğurmaktadır. Ağustos 2019 tarihinde bir birey Ege Denizi'nde Kokar Koyu'nda bir zıpkıncı tarafından 15 m derinlikte yakalanmıştır. Bu kayıt, günümüze kadar türün Ege Denizi'ndeki en kuzey kaydını temsil etmektedir.

Anahtar kelimeler: *Pterois miles*, aslan balığı, yabancı türler, Ege Denizi

INTRODUCTION

The number of alien species becoming major invasive threat has been increasing in the Aegean Sea remarkably. A potentially destructive Indo-Pacific species, *Pterois miles* (Bennett, 1828), have recently been introduced to the Mediterranean, which may unfavorably affect not only the structure and function of local ecosystems but also the socio-economy, fishery, biodiversity and also even human health (Bilecenoğlu, 2018). *P. miles* is a species commonly found in the Indian Ocean and Red Sea (Froese and Pauly, 2019). They are usually found in reef fish communities (Green and Côté, 2009) and commonly found in water depths from 25 to 85 m on hard bottom, coral reefs and artificial substrate, sometimes found under ledges and hiding in crevices (Hare and Whitfield, 2003). They invade the Mediterranean from the Red Sea via the Suez Canal (Golani and Sonin, 1992).

Lionfish *P. miles* was recorded for the first time from the Mediterranean Sea at Haifa Bay in 1991 (Golani and Sonin, 1992), and later lionfish *P. miles* were reported from Lebanon coast (Bariche et al. 2013) and Cyprus coast (Evrpidou, 2013) and then sighted in Turkey (Turan et al., 2014), Rhodes in Greece (Crocetta et al., 2015). Recently, several records were reported from the southern coast of Turkey indicating a westerly migration of the species towards the Aegean Sea

(Bilge et al., 2016; Yağlıoğlu and Ayaş, 2016; Turan et al., 2017). First observation of *P. miles* from the Aegean Sea was reported from Fethiye Bay in July 2015 and Dalyan coast in August 2015 (Turan and Öztürk, 2015). Nowadays it also reported in Lebanon (Azzurro et al., 2017), Cyprus (Jimenez et al., 2016), Greece (Crocetta et al., 2015; Dailianis et al., 2016), Tunisia (Azzurro et al., 2017; Karachle et al., 2017), Libya (Mabruk and Rizgala, 2019) and also Italy (Azzurro et al., 2017). And over the last years, the species has expanded towards the northeast Aegean Sea. Up to the present, a northernmost occurrence of the species from the Didim coast off Turkey (Yapıcı, 2018). This ichthyologic note presents the northernmost record, updating our present knowledge on the distribution of Lessepsian *P. miles* for the Aegean Sea.

MATERIAL AND METHODS

On 26 August 2019, a specimen of *P. miles* was captured by a spearfisher from Kokar Bay-İzmir at depth of 15 m on rocky bottoms. The specimen was having a total length (TL) of 144 mm captured at 38.13520 N and 26.60980 E (Figure 1). The water temperature was 20.5°C. The specimen was identified based on the description provided by Golani et al. (2006). Fish were preserved in 10% buffered formalin and

deposited in the Ichthyological Collection of Ege University, Fisheries Faculty, under catalog numbers ESFM-PIS/2019-003.

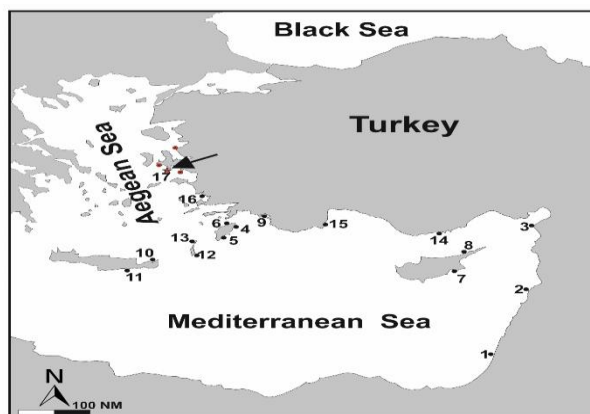


Figure 1. The distribution of *P. miles* occurrences in the Mediterranean Sea and, towards on the Aegean Sea (Red points indicated that underwater observation from spearfisher (Gökay Gülhep personal comm.)



Figure 2. *Pterois miles* captured off the Kokar Bay in the Aegean Sea

RESULTS

The captured specimen was 144 mm in total length, its total body weight was 38.8 g (Table 1). It was identified as a *P. miles* based on a combination of morphological characters, morphometric measurements, meristic counts and colour, which were in total agreement with previous descriptions of the species by Golani and Sonin (1992). It was measured to the nearest millimeter, and some morphometric measurements were indicated in Table 1.

DISCUSSION

The presence of *P. miles* in the Aegean Sea was first reported in 2015 in Rhodes (Crocetta et al., 2015), Fethiye and Dalyan (Turan and Öztürk, 2015). It has been emphasized by many authors that the temperature of seawaters will rise northward in the following years (Poursanidis, 2015; Giovos et

Behind the tows, individuals were preserved in a plastic case with ice, then delivered to the laboratory, immediately. The total length, total weight, otolith length, otolith width and otolith weight of *L. friesii* (n=213), *A. kessleri* (n=164), *G. biscayensis* (n=50), *S. solea* (n=25), *L. boscii* (n=17), *L. budegassa* (n=15) and *U. scaber* (n=13) were measured. Total length (TL) and weight measurements were conducted in the laboratory to the nearest 0.1 cm and 0.01g, respectively. The otoliths (sagittae) were removed and measured under stereoscopic microscope to the nearest 0.1 mm (TL). The weight of otoliths (OW) were measured with 0.0001 g digital analytical balance precision scale. Lengths of sagittae (OL) were recorded as the greatest distance measured from the anterior tip to the posterior edge, parallel to the sulcus. The width of sagitta (OWi) was determined by considering the greatest distance from the dorsal otolith edge to the ventral one, perpendicular to the sulcus (Harvey et al., 2000) (Figure 2).

al., 2018). This study supports the accuracy of these ideas. *P. miles* is expected to be detected further north in the coming years. It is reported by the spearfisher that lionfish are sight and caught further north from the area where the fish in this study was caught (Gökay Gülhep, pers.comm.). According to spearfisher *P. miles* also has been sighted in Kokay Bay (18 m; September 2019), Sığacık Bay (17 m, September 2019) and also Foça (15 m, October 2018). These observations also indicate that *P. miles* are successfully and rapidly expanding from the Mediterranean coasts northward to the Aegean Sea. Its extension may be determined by sea temperature (Turan et al., 2016). In recent years, the increase in the distribution towards the northern Aegean Sea, and the records of smallest individuals indicate that it has strengthened the spread and started to be one of the established species. *P. miles* get high scores in risk analysis studies on lespian species on outhwestern coasts of Turkey (Filiz et al., 2017; Bilge et al., 2019).

These studies drawn attention to the speed and seriousness of the invasion.

Table 1. Morphometric measurements in mm and as percentages of total length (%TL), standard length (%SL) meristic counts and weight in grams recorded in the specimen of *Pterois miles* from the Aegean Sea

Morphometric measurements	mm	TL%
Total length	144	100.0
Standard length	106	73.6
Barbel length	17	11.8
Head length	36	25.0
Body depth	38	26.4
Dorsal fin rays	10 + XIII	
Pelvic fin rays	5 + I	
Anal fin rays	6 + III	
Pectoral fin rays	14	
Caudal fin rays	15 + II	
Total weight (grams)	38.8	

Mediterranean seawater temperatures are steadily increasing, and alien species are spreading, causing community shifts and tropicalization (Lejeusne et al., 2010; Montefalcone et al., 2015) There are now >1000 alien species in the Mediterranean and the majority are thermophilic species that have entered the eastern basin through the Suez Canal (Katsanevakis et al., 2014). Recent enlargement of this canal

coupled with sea surface warming is raising concerns that this problem will get worse. *P. miles* has been considered highly temperature-dependent (Dabruzzi et al., 2017), according to Kimball et al. (2004) *P. miles* unable to survive below 10°C. However, Özgür-Özbek et al. (2017) reported that the *P. miles* continued feeding in low winter temperature (14.9°C) in the Mediterranean Sea. Although most recordings were obtained in the summer, seawater temperatures ranged from 14.3°C to 29.0°C (Yapıcı, 2018). In this study, the individual was observed in the period when the water temperature was high. Nonetheless, the more widespread colonization of the Mediterranean and Aegean region by *P. miles* seems no temperature-dependent. Further studies should focus on the interaction between lionfishes and seasonal water temperature variation in order to better understand whether temperature.

Lionfish are usually distributed in tropical marine waters, and have been found on hard bottoms, mangroves, sea grass, coral, and artificial reef communities (Gomez et al., 2013). In their original habitats, they occur along coral reefs and rocky shores down to depth of 50 m (Froese and Pauly, 2019). All records from various parts of the Mediterranean Sea report this species generally from depths of 2-110 m (Bariche et al., 2013; Oray et al., 2015; Kletou et al., 2016; Bilge et al., 2017; Yapıcı, 2018). Characteristics such as location, date, total length, observation method, habitat type and depth were obtained from peer-viewed publications to examine the journey of the species in the Mediterranean Sea (Figure 2; Table.2).

Table 2. The journey of *P. miles* from the Mediterranean Sea to the Aegean Sea (The number in front of each locality was shown in Figure 2)

No	Location	Coordinates	Length Range (TL mm)	Habitat	Depth (m)	Observation Method	Reference
1	Herzliya, Israel	-	328	-	35	Trawl	Golani & Sonin, 1992
2	Al Minie, Lebanon	34.29N 35.54E	209	Coralligenous	30	Gill net	Bariche et al., 2013
3	İskenderun, Turkey	36.17N 35.46E	276	Rocky bottom	25	-	Turan et al., 2014
4	Rhodes, Greece	36.38N 28.24E	-	Rocky bottom	7	Diving	Crocetta et al., 2015
5	Rhodes, Greece	35.91N 27.85E	-	Shipwreck	-	Diving	Crocetta et al., 2015
6	Rhodes, Greece	36.45N 28.21E	-	Rocky bottom	2	Diving	Crocetta et al., 2015
7	Ormidia, Cyprus	-	170	-	10	Gill net	Iglesias & Frotte, 2015
8	Karpas, Cyprus	-	373	Rocky bottom	40	Gill net	Oray et al., 2015
9	Dalyan, Turkey	-	-	Sandy bottom	11	Diving	Turan & Öztürk, 2015
10	NE Crete, Greece	35.20N 26.30E	250	Rocky bottom	33	Gill net	Daillianis et al., 2016
11	SE Crete, Greece	35.01N 25.96E	100	Rocky bottom	12-37	-	Daillianis et al., 2016
12	Karpathos Island, Greece	35.55N 27.20E	100	Rocky bottom	17	Diving	Mytilineou et al., 2016
13	Karpathos Island, Greece	35.50N 27.22E	200	Rocky bottom	16	Diving	Mytilineou et al., 2016
14	Mersin, Turkey	36.08N-33.40E	250	-	100-110	Trawl	Yağlıoğlu & Ayas, 2016
15	Kemer, Turkey	-	85-293	Rocky Bottom	10-15	Spearfishing	Özgür-Özbek et al., 2017
16	Didim-Aydın, Turkey	37.20N 27.14E	-	Rocky bottom	18	Diving	Yapıcı, 2018
17*	Kokar Bay, Turkey	38.13N 26.61E	144	Rocky bottom	15	Spearfishing	Present study

Top predators are very important to decrease lionfishes populations that indicate conservation of top predators to struggle lionfishes. Lionfish have very few documented natural predators due to their venomous spines. Grouper species such as dusky grouper *Epinephelus marginatus*, goldblotch grouper *Epinephelus costae* and blue-spotted cornetfish *Fistularia commersonii* are the main predators of the lionfishes (Bernadsky and Goulet, 1991; Maljković et al., 2008; Turan et al., 2017). Especially groupers of these species, as these may, may help control the spread of invasive fish (Mumby et al., 2011; Kletou et al., 2016). However, illegal fishing pressure on these species should be controlled in the Mediterranean and the Aegean Sea. Since fishing activities such as trawling and purse seiner and also trammel nets do not the solution to struggle lionfish, which usually inhabit under big rocks and caves. Therefore, predators of lionfish need to be supported in this struggle. Countries in the Mediterranean Sea organize campaigns and spearfishing competitions to eradicate lionfish

and also encourage of human consumption (Bilecenoğlu, 2018). However, some researchers point out that complete eradication of lionfish is impossible; these organizations only may help to keep their population under control and protect the native marine ecosystems.

In conclusion, the status of *P. miles* in the Mediterranean and adjacent seas should be monitored closely via formal and citizen sciences. The recent and rapid expansion of the *P. miles* in the Mediterranean is therefore alarming and requires the immediate action of all concerned stakeholders in the area (Bariche et al., 2017). Finally, it is vital that the ecology and distribution of the invasive species are fully understood to design the most effective form of control.

ACKNOWLEDGMENT

Author would like to thank Gökay Gülhep for his help in providing this specimen.

REFERENCES

- Al Mabruk, S.A.A. & Rizgala, J. (2019). First record of lionfish (Scorpaenidae: Pterois) from Libyan waters. *Journal of Black Sea/Mediterranean Environment*, 25(1), 108-114.
- Azzurro, E. & Bariche, M. (2017). Local knowledge and awareness on the incipient lionfish invasion in the eastern Mediterranean Sea. *Marine and Freshwater Research*, 68(10), 1950-1954. DOI: [10.1071/mf16358](https://doi.org/10.1071/mf16358)
- Bariche, M., Torres, M. & Azzurro, E. (2013). The Presence of the invasive Lionfish Pterois miles in the Mediterranean Sea. *Mediterranean Marine Science*, 14(2), 292. DOI: [10.12681/mms.428](https://doi.org/10.12681/mms.428)
- Bernadsky, G. & Goulet, D. (1991). A natural predator of the lionfish Pterois miles. *Copeia*, 1991, 230-231.
- Bilecenoğlu, M. (2018). Controlling the lionfish invasion in the eastern Mediterranean Sea. In Hüseyinoğlu, M.F., & Öztürk, B. (Eds.), *Lionfish Invasion and Its Management in the Mediterranean Sea* (pp:1-9). Turkish Marine Research Foundation (TUDAV) Publication no: 49, Istanbul, Turkey. 121 pp.
- Bilge, G., Filiz, H., Yapıcı, S. & Gülşahin, A. (2016). On the occurrence of the devil firefish Pterois miles (Scorpaenidae), from the southern Aegean Sea with an elaborate occurrences in the Mediterranean coast of Turkey. *Hydromedit, 2nd International Congress on Applied Ichthyology & Aquatic Environment*. 10 - 12 November 2016, Messolonghi, Greece. Book of Proceedings pp: 324-327.
- Bilge, G., Filiz, H. & Yapıcı, S. (2017). Occurrences of Pterois miles (Bennett, 1828) between 1992 and 2016 from Turkey and the Mediterranean Sea. *Journal of Black Sea/Mediterranean Environment*, 23(3): 201-208.
- Bilge, G., Filiz, H., Yapıcı, S., Tarkan, A.S. & Vilizzi, L. (2019). A risk screening study on the potential invasiveness of Lessepsian fishes in the south-western coasts of Anatolia. *Acta Ichthyologica et Piscatoria*, 49(1), 23-31. DOI: [10.3750/AIEP/02422](https://doi.org/10.3750/AIEP/02422)
- Crocetta, F., Agius, D., Balistreri, P., Bariche, M., Bayhan, Y., Çakır, M., Ciriaco, S., Corsini-Foka, M., Deidun, A., El Zrelli, R., Ergüden, D., Evans, J., Ghelia, M., Giavasi, M., Kleitou, P., Kondylatos, G., Lipej, L., Mifsud, C., Özvarol, Y., Pagano, A., Portelli, P., Poursanidis, D., Rabaoui, L., Schembri, P., Taşkın, E., Tiralongo, F. & Zenetos, A. (2015). New Mediterranean Biodiversity Records (October 2015). *Mediterranean Marine Science*, 16(3), 682-702. DOI: [10.12681/mms.1477](https://doi.org/10.12681/mms.1477)
- Dabruzzi, T., Bennett, W. & Fanguie, N. (2017). Thermal ecology of red lionfish Pterois volitans from southeast Sulawesi, Indonesia, with comparisons to other Scorpaenidae. *Aquatic Biology*, 26, 1-14. DOI: [10.3354/ab00668](https://doi.org/10.3354/ab00668)
- Dailianis, T., Akyol, O., Babali, N., Bariche, M., Crocetta, F., Gerovasileiou, V., Chanem, R., Gököğlu, M., Hasiotis, T., Izquierdo-Muñoz, A., Julian, D., Katsanevakis, S., Lipez, L., Mancini, E., Mytilineou, C., Ounifi Ben Amor, K., Özgül, A., Ragkousis, M., Rubio-Portillo, E., Servello, G., Sini, K., Stamouli, C., Sterioti, A., Teker, S., Tiralongo, F. & Trkov, D. (2016). New Mediterranean Biodiversity Records (July 2016). *Mediterranean Marine Science*, 17(2), 608-626. DOI: [10.12681/mms.1734](https://doi.org/10.12681/mms.1734)
- Evrpidou, S. (2013). Toxic Lionfish makes its way to Cyprus waters. <http://www.cyprus-mail.com/cyprus/toxic-lionfish-makes-its-way-cyprus-waters/20130220>. (Accessed 22 February 2013)
- Filiz, H., Tarkan, A.S., Bilge, G. & Yapıcı, S. (2017). Assessment of invasiveness potential of Pterois miles by the Aquatic Species Invasiveness Screening Kit. *Journal of Black Sea/Mediterranean Environment*. 23(1):17-37.
- Froese, R. & Pauly, D. (2019). FishBase. World Wide Web electronic publication. www.fishbase.org, version (10/2019).
- Giovas, I., Kletou, P., Paravas, P., Marmara, D., Romanidis-Kyriakidis, G. & Poursanidis, D. (2018). Citizen scientists monitoring the establishment and expansion of Pterois miles (Bennett, 1828) in the Aegean Sea, Greece. *Cahiers de Biologie Marine*, 59, 359-365. DOI: [10.21411/CBM.A.8DFA67CE](https://doi.org/10.21411/CBM.A.8DFA67CE)
- Golani, D. & Sonin, O. (1992). New records of the Red Sea fishes, Pterois miles (Scorpaenidae) and Pteragogus pelycus (Labridae) from the eastern Mediterranean Sea. *Japanese Journal of Ichthyology*, 39(2), 167-169.
- Golani, D., Öztürk, B. & Başusta, N. (2006). Fishes of the eastern Mediterranean. Turkish Marine Research Foundation. Pub. Number: 24. Istanbul, Turkey. 259 pp.
- Gomez, L.R., Anderson, J.L., Akins, D.S.A., Buddo, G., Garcia-Moliner, F., Gourdin, M., Laurent, C., Lilyestrom, J.A., Morris, J., Ramnanan, N. & Torres, R. (2013). Regional strategy for the control of invasive lionfish in the wider Caribbean. *International Coral Reef Initiative*, 31 pp.
- Green, S.J. & Côté, I.M. (2009). Record densities of Indo-Pacific Lionfish on Bahamian coral reefs. *Coral Reefs*, 28, 107-107. DOI: [10.1007/s00338-008-0446-8](https://doi.org/10.1007/s00338-008-0446-8)
- Hare, J.A. & Whitfield, P.E. (2003). An integrated assessment of the introduction of lionfish (*Pterois volitans/miles* complex) to the western Atlantic Ocean. *NOAA Technical Memorandum NOS NCCOS 2*, 21 pp.
- Iglésias, S. & Frotté, L. (2015). Alien marine fishes in Cyprus: update and new records. *Aquatic Invasions*, 10(4), 425-438. DOI: [10.3391/ai.2015.10.4.06](https://doi.org/10.3391/ai.2015.10.4.06)
- Jimenez, C., Petrou, A., Andreou, V., Hadjiannou, L., Wolf, W., Koutsoloukas, N. & Abu Alhaja, R. (2016). Veni, vidi, vici: The successful establishment of the lionfish Pterois miles in Cyprus (Levantine Sea). *Rapp Comm int Mer Médit*, 41, 417.

- Karachle, P.K., Zenetos, A. & Xentidis, N.J. (2017). The Esenias Countries' Marine Alien Species Experts: An Updated Inventory. *Acta Zoologica Bulgarica*, 9, 261-282
- Katsanevakis, S., Coll, M., Piroddi, C., Steenbeek, J., Lasram, B.R.F., Zenetos, A. & Cardoso, A.C. (2014). Invading the Mediterranean Sea: Biodiversity patterns shaped by human activities. *Frontiers in Marine Science*, 1, 32. DOI: [10.3389/fmars.2014.00032](https://doi.org/10.3389/fmars.2014.00032)
- Kimball, M., Miller, J., Whitfield, P. & Hare, J. (2004). Thermal tolerance and potential distribution of invasive lionfish (*Pterois volitans/miles* complex) on the east coast of the United States. *Marine Ecology Progress Series*, 283, 269-278. DOI: [10.3354/meps283269](https://doi.org/10.3354/meps283269)
- Kleitou, D., Hall-Spencer, J.M. & Kleitou, P. (2016). A lionfish (*Pterois miles*) invasion has begun in the Mediterranean Sea. *Marine Biodiversity Records*, 9(1), 46 DOI: [10.1186/s41200-016-0065-y](https://doi.org/10.1186/s41200-016-0065-y)
- Lejeune, C., Chevaldonné, P., Pergent-Martini, C., Boudouresque, C.F. & Perez, T. (2010). Climate change effects on a miniature ocean: the highly diverse, highly impacted Mediterranean Sea. *Trends in Ecology and Evolution*, 25(4), 250-60. DOI: [10.1016/j.tree.2009.10.009](https://doi.org/10.1016/j.tree.2009.10.009)
- Majković, A., Van Leeuwen, T. & Cove, S. (2008). Predation on the invasive red lionfish, *Pterois volitans* (Pisces: Scorpaenidae), by native groupers in the Bahamas. *Coral Reefs*, 27, 501. DOI: [10.1007/s00338-008-0372-9](https://doi.org/10.1007/s00338-008-0372-9)
- Montefalcone, M., Morri, C., Parravicini, V. & Bianchi, C.N. (2015). A tale of two invaders: divergent spreading kinetics of the alien green algae *Caulerpa taxifolia* and *Caulerpa cylindracea*. *Biological Invasions*, 17, 2717-2728.
- Mumby, P.J., Harborne, A.R. & Brumbaugh, D.R. (2011). Grouper as a natural biocontrol of invasive lionfish. *PLoS ONE* 6(6): e21510. DOI: [10.1371/journal.pone.0021510](https://doi.org/10.1371/journal.pone.0021510)
- Mytiliineou, C., Akel, E.K., Babali, N., Balistreri, P., Bariche, M., Boyacı, Y.O., Cilenti, L., Constantinou, C., Crocetta, F., Çelik, M., Dereli, H., Dounas, C., Durucan, F., Garrido, A., Gerovasileiou, V., Kapiris, K., Kebapcioglu, T., Kleitou, P., Krystalas, A., Lipej, L., Maina, I., Marakis, P., Mavrić, B., Moussa, R., Peña-Rivas, L., Poursanidis, D., Renda, W., Rizkalla, S.I., Rosso, A., Scirocco, T., Sciuto, F., Servello, G., Tiralongo, F., Yapıcı, S. & Zenetos, A. (2016). New Mediterranean biodiversity records (November, 2016). *Mediterranean Marine Science*, 17(3), 794-821. DOI: [10.12681/mms.1976](https://doi.org/10.12681/mms.1976)
- Oray, I.K., Sinay, E., Karakulak, F.S. & Yıldız, T. (2015). An expected marine alien fish caught at the coast of Northern Cyprus: *Pterois miles* (Bennett, 1828). *Journal of Applied Ichthyology*, 31 (4), 733-735. DOI: [10.1111/jai.12857](https://doi.org/10.1111/jai.12857)
- Özgür-Özbek, E., Mavruk, S., Saygu, İ. & Öztürk, B. (2017). Lionfish distribution in the eastern Mediterranean coast of Turkey. *Journal of the Black Sea/Mediterranean Environment*, 23(1), 1-16.
- Poursanidis, D. (2015). Ecological Niche Modeling of the the invasive lionfish *Pterois miles* (Bennett, 1828) in the Mediterranean Sea. In Eleventh Panhellenic Symposium on Oceanography and Fisheries (p:621-624). Mytilene, Lesvos Island, Greece.
- Turan, C., Ergüden, D., Gürlek, M., Yağlıoğlu, D., Uyan, A. & Uygur, N. (2014). First record of the Indo-Pacific lionfish *Pterois miles* (Bennett, 1828) (Osteichthyes: Scorpaenidae) for the Turkish marine waters. *Journal of the Black Sea/Mediterranean Environment*, 20, 158-163.
- Turan, C. & Öztürk, B. (2015). First record of the lionfish *Pterois miles* from the Aegean Sea. *Journal of the Black Sea/Mediterranean Environment*, 21, 334-338.
- Turan, C., Ergüden, D. & Gürlek, M. (2016). Climate change and biodiversity effects in Turkish Seas. *Natural and Engineering Sciences*, 1(2), 15-24.
- Turan, C., Uygur, N. & İğde, M. (2017). Lionfishes *Pterois miles* and *Pterois volitans* in the North-eastern Mediterranean Sea: Distribution, habitation, predation and predators. *Natural and Engineering Sciences*, 2(1), 35-43.
- Yağlıoğlu, D. & Ayas, D. (2016). New occurrence data of four alien fishes (*Pisodonophis semicinctus*, *Pterois miles*, *Scarus ghobban* and *Parupeneus forsskali*) from the North Eastern Mediterranean (Yeşilovacık Bay, Turkey). *Biharean Biologist*, 10 (2), 150-152.
- Yapıcı, S. (2018). *Piscis non grata* in the Mediterranean Sea: *Pterois miles* (Bennett, 1828). *Ege Journal of Fisheries and Aquatic Sciences*, 35(4), 467-474. DOI: [10.12714/egejfas.2018.35.4.13](https://doi.org/10.12714/egejfas.2018.35.4.13)