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OCCURRENCE OF *PTEROIS MILES* (SCORPAENIDAE) IN THE MEDITERRANEAN SEA

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ABSTRACT

This paper presents an update of the Mediterranean distribution of Pterois miles, based on a comprehensive list of geo-referenced occurrences up to July 2024, including a maximum size report. On 11 July 2024, a huge specimen of P. miles was captured by commercial trammel net at a depth of 40 m off Kadirga cove, Marmaris, Muğla. The specimen has a total length of 437 mm and a wet weight of 1268 g. Following the initial Mediterranean record of P. miles in Israel in 1991, the species has exhibited a relatively rapid dispersal rate, subsequently expanding to the northern Aegean Sea (Edremit Bay) and southern Aegean Sea (southern Crete) as well as the Libyan Sea between 2016 and 2018. Since then, the species expanded its distribution range to the northernmost limit of the Adriatic Sea, reaching as far as Southern Sicily and the Gulf of Tunis.

Key words: Devil firefish, lionfish, maximum length, distribution, Aegean Sea

PRESENZA DI *PTEROIS MILES* (SCORPAENIDAE) NEL MAR MEDITERRANEO

SINTESI

Il presente lavoro presenta un aggiornamento della distribuzione mediterranea di Pterois miles, basato su un elenco completo di presenze georeferenziate fino al luglio 2024, compreso un rapporto sulle dimensioni massime. L'11 luglio 2024, un enorme esemplare di P. miles è stato catturato con un tramaglio commerciale a 40 m di profondità al largo di Kadirga cove, Marmaris, Muğla. L'esemplare ha una lunghezza totale di 437 mm e un peso umido di 1268 g. Dopo il primo ritrovamento mediterraneo di P. miles in Israele nel 1991, la specie ha mostrato un tasso di dispersione relativamente rapido, espandendosi successivamente al Mar Egeo settentrionale (Baia di Edremit) e al Mar Egeo meridionale (Creta meridionale), nonché al Mar Libico tra il 2016 e il 2018. Da allora, la specie ha ampliato il suo areale di distribuzione fino al limite più settentrionale dell'Adriatico, raggiungendo anche la Sicilia meridionale e il Golfo di Tunisi.

Parole chiave: pesce scorpione, lunghezza massima, distribuzione, Egeo

INTRODUCTION

The devil firefish, *Pterois miles* (Bennet, 1828) is a marine and reef-associated fish that inhabits shallow waters with rocky or sandy bottoms at a depth of 0 - 85 m (Froese & Pauly, 2024). *P. miles*, which reaches a length of 43 cm (Froese & Pauly, 2024), is an opportunistic predator that affects ecosystem dynamics through the consumption of large quantities of small-sized fish and crustaceans (Eddy *et al.*, 2016). It is distributed in a wide range, including the tropical waters of the Indian Ocean: the Persian Gulf (Wright, 1988); the Red Sea south to Port Alfred, South Africa and east to Sumatra, Indonesia (Fricke, 1999); and the Atlantic Ocean up to a depth of 60 meters (Sommer *et al.*, 1996). It has also been detected in the Mediterranean Sea (Golani & Sonin, 1992). *P. miles* is considered amongst the most successful invaders in the history of aquatic invasions (Bariche *et al.*, 2013). Their fin spines are highly venomous and can be fatal humans (Sommer *et al.*, 1996).

A recent genetic study revealed the origin of the lionfish invasion in the Mediterranean Sea (Bariche *et al.*, 2017). The authors determined that the most likely explanation for the Mediterranean invasion was the Lessepsian migration of lionfish from the

Red Sea into the Mediterranean through the Suez Canal. *P. miles* first appeared in the eastern Mediterranean Sea in 1991 in Haifa Bay, Israel (Golani & Sonin, 1992). After a gap of two decades, it was reported on the Lebanon coast (Bariche *et al.*, 2013), in İskenderun Bay, Türkiye (Turan *et al.*, 2014) and at Rhodes, Greece (Crocetta *et al.*, 2015). Apparently, it has spread relatively quickly and has further expanded to the northern Aegean Sea (Edremit Bay) and southern Aegean Sea (southern Crete) as well as the Libyan Sea between 2016 and 2018 (Dailianis *et al.*, 2016; Al Mabruk & Rizgalla, 2019; Aydın *et al.*, 2022). Then, it expanded its distribution range to the northernmost limit of the Ionian Sea, close to the border with the Adriatic Sea (Di Martino & Stancanelli, 2021) to southern Sicily (Azzurro *et al.*, 2017) and to the Gulf of Tunis (Dailianis *et al.*, 2016). This might be considered as the westernmost limit of its current distribution for the time being.

In Turkish seas, since the first recording (Turan *et al.*, 2014), the species has been recorded in various studies (Bilge *et al.*, 2016; Yağlıoğlu & Ayaş, 2016; Özgür Özbek *et al.*, 2017; Dağhan & Demirhan, 2020; Tanrıverdi *et al.*, 2022). Sporadically, the fish has moved to the western part of Anatolia. Therefore, the first occurrence reports for the Aegean Sea



Fig. 1: A huge *Pterois miles*, 437 mm TL (1268 g), caught at Marmaris, southeastern Aegean Sea.

Sl. 1: Ogromen primerek vrste *Pterois miles*, 437 mm TL (1268 g), ujet v Marmarisu, jugovzhodno Egejsko morje.

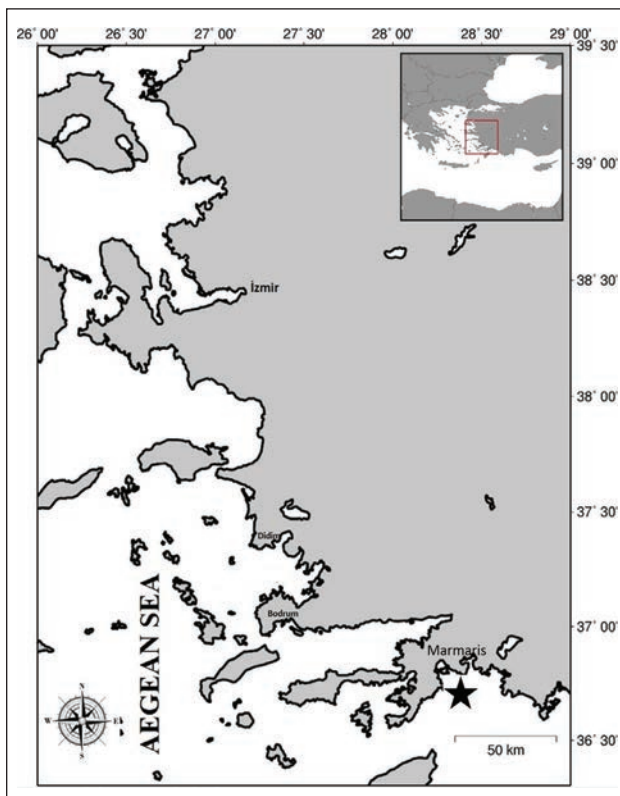


Fig. 2: Sampling site (black star) of *Pterois miles* captured at Marmaris, southeastern Aegean Sea.
Sl. 2: Mesto vzorčenja (črna zvezda) primerka vrste *Pterois miles*, ujetega v Marmarisu, jugovzhodno Egejsko morje.

were from the Dalyan coast (Muğla) in 2015 (Turan & Öztürk, 2015). The distribution of the species along the Aegean Sea has expanded towards the northern latitudes of the Aegean Sea. The species has been observed in Kokar Bay, Izmir (Özgül, 2020), Karaburun, Izmir Bay (Oruç *et al.*, 2022) and Edremit Bay (Aydın *et al.*, 2022; Alkan *et al.*, 2023). In this study, we present updated records of *P. miles* in the Mediterranean, including a recent sighting of a large individual in the southern Aegean Sea.

MATERIAL AND METHODS

On 11 July 2024, a huge specimen of *Pterois miles* (Fig. 1) was captured by a commercial trammel net (mesh size 100 mm) targeting grouper and common dentex off Kadirga cove, Marmaris, Muğla (coordinates: 36°43'49"N and 28°18'19"E), at a depth of 40 m (Fig. 2). Morphometric measurements were recorded to the nearest millimetre and weighing in grams. The specimen was preserved in 6% formaldehyde solution and subsequently deposited in the Ichthyological Collection of the Fisheries

Tab. 1: Morphometric measurements and percentages of total length (TL%) of the *Pterois miles*, captured at Marmaris, southeastern Aegean Sea.

Tab. 1: Morfometrične meritve in deleži celotne dolžine (TL%) primerka vrste *Pterois miles*, ujetega v Marmarisu, jugovzhodno Egejsko morje.

Morphometrics	mm	%TL
Total length	437	-
Standard length	340	77.8
Fork length	110	25.2
Body depth	21	4.8
Head length	35	8.0
Eye diameter	119	27.2
Snout length	88	20.1
Upper jaw length	234	53.5
Lower jaw length	102	23.3
Base of first dorsal fin length	27	6.2
Meristic counts		
Dorsal fin	XIII + 10	
Anal fin	III + 6	
Pectoral fin	14	
Ventral fin	I + 5	
Weight (g)	1268	

Faculty, Ege University, under catalogue number ESFM-PIS/2024-03. To ascertain the distribution of *P. miles* throughout the Mediterranean Sea, we undertook a review of the literature, applying the criteria between 1 and 5 (i.e. verified presence in collection, publications on evidences from photo, morphological or genetic data, expert providing individual collecting data and expert performing broad study) for the confirmed presence of the fish species (see Kovačić *et al.*, 2020).

RESULTS AND DISCUSSION

The specimen was measured to the nearest millimetre. For species identification, we followed Bariche *et al.*, (2013), Turan *et al.*, (2014), Dağhan & Demirhan (2020) and Froese & Pauly (2024). Morphometric measurements and percentages of total length (TL%) of *Pterois miles* are provided in Tab. 1. This specimen is of considerable size (437 mm TL, 1268 g wet weight), exceeding the previously reported greatest length in unpublished data by Ulman *et al.*, (2022) (see FishBase). Moreover,

Tab. 2: Records of *Pterois miles* throughout the Mediterranean Sea (*BS: beach seine; CCS: communication with citizen scientists; GN: gillnet; LL: longline; OD: observation by diver; SG: speargun; T: trawl; TN: trammel net; WT: wire-trap).
Tab. 2: Zapisi o pojavljanju vrste *Pterois miles* v Sredozemskem morju (*BS: obalna potegalka; CCS: komunikacija na podlagi občanske znanosti; GN: zabodna mreža; LL: parangal; OD: opazovanje potapljača; SG: podvodna puška; T: vlečna mreža; TN: trislojna mreža; WT: žična past).

Sampling locations	Depth (m)	Method of detection*	Date	N	Size range (TL, mm)	References
Herzliya, Israel	35	T	28 July 1991	1	328 SL	Golani & Sonin (1992)
Al Minie, Lebanon	?	WT	02 Oct. 2012	1	?	Bariche <i>et al.</i> (2013)
Al Minie, Lebanon	30	TN	12 Dec. 2012	1	209	Bariche <i>et al.</i> (2013)
Limassol, Cyprus	?	?	? Feb. 2013	1	?	Kletou <i>et al.</i> (2016)
Cypriot waters	2-35	CCS	2012-2015	79	50-300	Jimenez <i>et al.</i> (2016)
Lebanese coasts	12-37	CCS	Jun. 2013-Oct. 2015	47	?	Dailianis <i>et al.</i> (2016)
Iskenderun Bay, NE Medit.	25	?	13 Apr. 2014	1	276	Turan <i>et al.</i> (2014)
Ormidia, Cyprus NE Medit.	10	GN	22 May 2014	1	170	Iglésias & Frotté (2015).
Limassol, Cyprus, NE Medit.	15	?	? Jan. 2015	1	?	Kletou <i>et al.</i> (2016)
Karpas, N Cyprus, NE Medit.	40	GN	26 Feb. 2015	1	373	Oray <i>et al.</i> (2015)
Larnaca, Cyprus, NE Medit.	40	?	? May 2015	1	?	Kletou <i>et al.</i> (2016)
Zembra Island, Tunisia	5	?	? Jun. 2015	1	202	Ounifi Ben Amor & Ghanem (2016)
Ayios Theodoros, Cyprus, NE Med.	15	?	? July 2015	1	?	Kletou <i>et al.</i> (2016)
Kallithea, Rhodes, SE Aegean	7	OD	15 July 2015	1	?	Crocetta <i>et al.</i> (2015)
Plimiri, Rhodes, SE Aegean	?	OD	02 Aug. 2015	1	?	Crocetta <i>et al.</i> (2015)
Dalyan, SE Aegean	11	OD	? Aug. 2015	1	?	Turan & Öztürk (2015)
Psaropoula, Rhodes, SE Aegean	2	OD	23 Sep. 2015	1	?	Crocetta <i>et al.</i> (2015)
Lattakia, Syrian coasts	1	T	28 Sep. 2015	1	211	Ali <i>et al.</i> (2016)
Cape Bon, Tunisia	?	OD	? Sep. 2015	1	?	Dailianis <i>et al.</i> (2016)
Off Kavro, Kriti, Greece	?	GN	? Nov. 2015	2	?	Dailianis <i>et al.</i> (2016)
Kouremenos Bay, Kriti, Greece	33	GN	? Nov. 2015	1	250	Dailianis <i>et al.</i> (2016)
Jableh, Syrian coasts	1	T	10 Dec. 2015	1	269	Ali <i>et al.</i> (2016)
Yeşilovacık Bay, NE Medit.	100	T	20 Dec. 2015	1	250	Yağlıoğlu & Ayas (2016)
Datça, SE Aegean	10	GN	19 Apr. 2016	1	200	Bilge <i>et al.</i> (2016)
SE Kriti, Greece	18-30	GN	24 Jul. 2016	1	100	Dailianis <i>et al.</i> (2016)
E Rhodes, SE Aegean	1-50	SG-BS-LL	May 2016-Nov. 2017	42	149-315	Zannaki <i>et al.</i> (2019)
Karpathos Island, Greece	9-17	OD	? Aug. 2016	3	100-200	Mytilineou <i>et al.</i> (2016)
S Sicily, Italy	3.5	OD	23 Sep. 2016	1	120	Azzurro <i>et al.</i> (2017)
Kemer, Antalya, NE Medit.	10-15	SG	20 Jan.-10 Feb. 2017	8	85-293	Özgür-Özbek <i>et al.</i> (2017)
Didim, SE Aegean	18	OD	05 Apr. 2017	1	?	Yapıcı (2018)
Lattakia, Syrian coasts	25	WT	29 May 2017	1	226	Ali <i>et al.</i> (2017)
S Cyprus, NE Medit.	5-40	SG	Sep. 2017-Aug. 2018	82	158-390	Mouchlianitis <i>et al.</i> (2022)
Iskenderun Bay, NE Medit.	?	SG-TN	Mar. 2018-Apr. 2019	179	145-355	Dağhan & Demirhan (2020)
Marsa Metruh, Egypt, SE Medit.	7-27	SG	17 Aug. 2018	2	200-400	Al Mabruk <i>et al.</i> (2020)
Gulf of Antalya, NE Medit.	8-22	SG	Oct. 2018-May 2019	35	131-352	Tanrıverdi <i>et al.</i> (2022)

Wadi Al-Klag, Libya	25-27	SG	01 Dec. 2018	1	?	Al Mabruk & Rizgalla (2019)
Karsa, Libya	8	LL	04 Dec. 2018	1	?	Al Mabruk & Rizgalla (2019)
Lecce, Italy, Adriatic	?	OD	20 July 2019	1	?	Di Martino & Stancanelli (2021)
Dhermi, Albania, Adriatic	?	OD	28 July 2019	1	?	Di Martino & Stancanelli (2021)
Kokar Bay, SE Aegean Sea	15	SG	26 Aug. 2019	1	144	Özgül (2020)
Brindisi, Italy, Adriatic	?	OD	09 Aug. 2020	1	?	Di Martino & Stancanelli (2021)
Edremit Bay, NE Aegean	70	T	07 Oct. 2020	1	224	Aydın <i>et al.</i> (2022)
Karaburun, Izmir, N Aegean	36	OD	18 Mar. 2021	1	309	Oruç <i>et al.</i> (2022)
Çökertme, Bodrum, SE Aegean	10	?	15 July 2021	1	340	Soykan & Ulaş (2022)
Vis Island, Croatia, Adriatic	15	OD	13 Aug. 2021	1	150	Dragičević <i>et al.</i> (2021)
E Rhodes, Greece, SE Aegean	8-35	GN-TN	Apr. 2021- Mar. 2022	363	160-380	Kondylatos <i>et al.</i> (2024)
Edremit Bay, NE Aegean	12	SG	11 June 2023	1	297	Alkan <i>et al.</i> (2023)
Marmaris, SE Aegean Sea	40	TN	11 July 2024	1	437	Present study

according to the records included in this study (see the size range column in Tab. 2), such a large specimen has never previously been caught. However, a local fisher claimed to have seen one larger than this (Coşkun Kılıç, *pers.comm.*).

Forty-eight distinct sightings of a total of 879 specimens of *P. miles* were made at about 43 different locations throughout the Mediterranean from 1991 to 11 July 2024 (see, Tab. 2). A considerable number of photographs of *P. miles* from a multitude of geographical locations are being uploaded to social media every day; thus, it is evident that the population of *P. miles* is more substantial than Tab. 2 suggests. To gain a more accurate understanding of the situation, we have considered reports published in scientific journals and have omitted reports of lionfish sightings on electronic social media, such as Facebook, along with photographs taken by local divers.

As a rapid invader, *P. miles* reached Tunisia, Italy, Albania and Libya and colonised the majority of the eastern Mediterranean over a three-decade period (Tab. 2). Indeed, the species has become well established over the past 12 years (as documented by Bariche *et al.*, 2013). A number of studies on invasive alien species have attributed this phenomenon to changes in seawater temperatures resulting from global warming (Bianchi & Morri, 2003; Azzurro *et al.*, 2019; Dimitriadis *et al.*, 2020; Turan, 2020; Uzman *et al.*, 2022). Dimitriadis *et al.* (2020) posited that the mean winter sea surface temperature (i.e. 15.3°C winter isotherm) represents the primary limiting factor governing the range expansion of the species. Consequently, *P. miles* could potentially expand further in the Mediterranean Sea, with the exception of the coolest northernmost regions. Turan (2020) supports this point based on a ‘max-like’ distribution mapping analysis that identifies

appropriate habitats under the current climate condition, *P. miles* predominantly occurs in the eastern coastal areas of the Mediterranean, with no pattern of distribution in the Marmara and Black Seas.

In conclusion, *P. miles* is now a well-established species, especially in the eastern part of the Mediterranean and its population is increasing day by day. Although the continuing distribution of this species cannot be prevented, some efforts can be made to reduce its population. Kletou *et al.* (2016) believe that there is a strong motivation to aid removal efforts. The authors argue that the lionfish is safe to consume after the venomous dorsal, pelvic fin and anal fin spines are removed, and its edibility can be promoted; removal programs should also be combined with efforts to restore populations of potential predators of lionfish, such as the dusky grouper (Kletou *et al.*, 2016). The fact that lionfish are edible focuses the fight against this invasive species on a catch and consume approach. For example, the Mediterranean Conservation Society (MCS) purchased over four tonnes of lionfish for distribution from small-scale fishermen in the southern Aegean Sea during the last fishing season. As a result of promotional activities carried out by MCS, lionfish are now on the menus of some luxury restaurants and consumed by the public. This removal activity may be a factor limiting the increase of the species in the area.

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POJAVLJANJE NAVADNE PLAMENKE *PTEROIS MILES* (SCORPAENIDAE) V SREDOZEMSKEM MORJU

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POVZETEK

Avtorja poročata posodobljen seznam o razširjenosti navadne plamenke *Pterois miles* v Sredozemskem morju, ki temelji na izčrpnem seznamu georeferenciranih dogodkov do julija 2024, vključno s poročilom o največji velikosti. Enajstega julija 2024 so s komercialno trislojno mrežo na globini 40 m pri zalivu Kadirga, Marmaris, Muğla ujeli ogromen primerek plamenke. Meril je 437 mm v dolžino in tehtal 1268 g. Po začetnem sredozemskem zapisu o pojavljanju vrste *P. miles* v Izraelu leta 1991 se je vrsta pričela hitro širiti in se postopno razširila v severno Egejsko morje (zaliv Edremit) in južno Egejsko morje (južna Kreta) ter Libijsko morje med 2016 in 2018. Odtlej je vrsta razširila svoje območje razširjenosti do severne meje razširjenosti v Jadranskem morju, vse do južne Sicilije in Tuniškega zaliva.

Ključne besede: navadna plamenka, plamenke, največja dolžina, razširjenost, Egejsko morje

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