

RESEARCH ARTICLE

**Westward spreading of the Pope's ponyfish
Equulites popei in the Mediterranean: new occurrences
from Antalya Bay with emphasis on its abundance and
distribution**

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Abstract

The Pope's ponyfish *Equulites popei* (Whitley, 1932) is a marine fish native to the wide Indo-Pacific area and is considered an alien species in the Mediterranean Sea. A total of 10 individuals were collected, in May 2019, from Antalya Bay (Turkey, northwestern Levant Basin). These records represent the westernmost occurrence of the fish in the Mediterranean Sea. We also provide information on its catch per unit area (27 ind.km⁻²) and the maximum depth of its occurrence (150 m) in the Mediterranean Sea.

Keywords: Leiognathidae, alien species, Levant Basin, maximum depth, range expansion

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Introduction

The structure of the marine communities in the eastern Mediterranean Sea is profoundly affected by the continuous introduction of species of tropical origin, mainly via the Suez Canal (Lessepsian migration). The number of Lessepsian fish species has already exceeded 100, and many of them have established viable populations that have dominated local fish assemblages (e.g. Galil *et al.* 2017; Mavruk *et al.* 2017; Zenetos 2017). The arrival of an alien species to a new region is very important to document as it is crucial for studying its spatio-temporal spread, particularly if it becomes invasive.

The family Leiognathidae (ponyfishes) is constituted by 10 genera and 48 species, typically distributed along coastal waters of the Indo-West Pacific

region (Froese and Pauly 2019). They are known to be common in shallow areas where they feed on benthic invertebrates (Danil'chenko 1960).

Equulites popei (Whitley, 1932) was first recorded as an alien ponyfish, from the vicinity of Tel Aviv (Golani *et al.* 2011), but was identified as *E. elongatus* (Günther, 1874). It was collected afterward from Mersin region (Taşucu coast) separately by Irmak *et al.* (2015) and Yokeş (2015). Sakinan *et al.* (2017) also recorded the species from Erdemli, Mersin. *Equulites elongatus* was split afterwards into three different species, one of which is *E. popei*, the species that entered the Mediterranean Sea (Suzuki and Kimura 2017). Subsequently, Crocetta and Bariche (in Gerovasileiou *et al.* 2017) reported *E. popei* from Lebanon filling the gap in its distribution along the Levant coast. Another alien congener *E. klunzingeri* (Steindachner, 1898) is also present in the eastern Mediterranean, including the coast of Turkey (Gucu *et al.* 1994; Mavruk *et al.* 2017).

Here we report the westernmost occurrence of *E. popei* in the Mediterranean Sea, 300 km west from the last observation point (Yokeş 2015) and provide knowledge on the population of the species in Antalya Bay. We also suggest a new maximum depth record for *E. popei* from 150 m depth.

Materials and Methods

Between 21 and 25 May 2019, bottom trawl operations were performed in Antalya Bay (36.71°N, 30.88°E). During this survey, a total of 10 individuals of *E. popei* were collected at four different hauls (Table 1). Catch per unit area in number (CPUA_N) values were calculated using the following formula given by Sparre and Venema (1998);

$$CPUA_N (\text{individual}/\text{km}^2) = \frac{C_N}{A}; A = D \cdot \text{hr} \cdot X2$$

Here, C_N refers the catch in numbers and A refers the area swept by the bottom trawl. A is calculated using the distance (D) covered by each trawl hauls, the length of the head-rope (hr=17.5m) and the fraction of head-rope length (X2) which was assumed as 0.5.

Out of the 10 sampled individuals, only four were in good condition. Meristic and morphometric characters were counted and measured respectively. Minimum, maximum, average values and their standard errors (SE) were calculated for each measurement and proportion. In the laboratory, the species was identified following the morphological descriptions provided by Suzuki and Kimura (2017) and specimens were fixed afterwards in 4% buffered formaldehyde solution and deposited in the collection of Cukurova University, Fisheries Faculty with the following collection code: E_pop_Ant_21.May.2019_01-10.

Table 1. Details of bottom trawl operations and presence, numbers (N) and catch per unit area (CPUA_N) values of *Equulites popei* in each trawl haul. Latitude (Lat.) and Longitude (Long.) values indicate the midpoints of transects.

Transect	Date	Time	Duration	Depth (m)	Lat. (North)	Long. (East)	N. of <i>E. popei</i>	CPUA _N (ind. km ⁻²)
1	21.05.2019	10:30	00:30	50	36.818°	30.924°	3	83
2	21.05.2019	13:30	00:30	60	36.815°	30.929°	0	0
3	21.05.2019	15:20	00:30	50	36.819°	30.961°	1	26
4	22.05.2019	04:10	01:45	40	36.816°	31.002°	0	0
5	22.05.2019	09:30	00:30	40	36.791°	31.174°	3	80
6	22.05.2019	11:15	00:30	50	36.784°	31.203°	0	0
7	22.05.2019	15:10	00:35	150	36.760°	31.189°	3	82
8	22.05.2019	17:10	00:35	50	36.786°	31.185°	0	0
9	23.05.2019	15:50	02:40	40	36.800°	31.094°	0	0
10	23.05.2019	20:50	03:00	25	36.815°	30.992°	0	0

Results

The individuals that were studied (90.4-98.3 mm TL; 78.9-85.2 mm SL; n = 4) can be described as follows: the body is slender and body depth (BD) is $26.7\% \pm 0.3$ of standard length (SL). Eye diameter (ED) is $80.5 \pm 1.9\%$ of post orbital length (POL) (Table 2). Posterior margin of adipose eyelid is notched (Figure 2b). Mouth is protractile. Meristics are as follows; D: VIII+16, A: III+14, V: I+5 and P: 15. Color is dark gray in the upper and silver gray in the lower side of the body. There are numerous dark spots and blotches on the dorso-lateral side of the body. None of the blotches were observed to be forming a ring mark (Figure 2a). Posterior margin of adipose eyelid is notched (Figure 2b).

Equulites popei specimens were observed in four bottom trawl hauls out of 10 operations (Table 1). In three of the “positive” hauls, transects were located between 40 and 50 m. On the other hand, three individuals were collected from Transect 7 at 150 m depth contour. The CPUA_N of *E. popei* ranged between 0 and 83 ind.km⁻² with an average value of 27 ind.km⁻² in the shelf area of Antalya Bay.



Figure 1. (a) *Equulites popei* specimens collected from Antalya Bay, (b) notch in the posterior eyelid after specimen was stained with carmin red (C.I. 75470)

Table 2. Morphometric characteristics of four specimens of *Equulites popei* from Antalya Bay and other regions

	Antalya Bay (this study)				Previous studies*						
	Min	Max	Mean	SE	1	2	3	4	5	6	7
Total Length (mm)	90.4	98.3	93.8	1.7							
Standard Length (mm)	78.9	85.2	81.4	1.4			62.4				
Body Depth (mm)	21.1	23.3	21.7	0.5							
Body Depth in Standard Length (%)	26.1	27.3	26.7	0.3	20-28	27			25-31	25-30	23-26
Head Length (mm)	20.4	22.5	21.1	0.5			16.6				
Head Length in Standard Length (%)	25.2	26.5	25.9	0.3	26-30	28	25-29		24-28	29-33	29-31
Eye Diameter (mm)	6.1	6.7	6.6	0.2							
Postorbital Length (mm)	8.0	8.3	8.1	0.1							
Postorbital Length in Head Length (%)	36.8	40.0	38.6	0.8	28-38				40-44	29-35	
Eye Diameter in Postorbital Length (%)	75.0	83.7	80.5	1.9	>78				71	100	
Eye Diameter in Head Length (%)	29.9	32.4	31.1	0.6	26-40	33		33	32-38	26-34	29-35
Preorbital Length (mm)	5.7	6.1	5.9	0.1							
Preorbital Length in Head Length (%)	26.5	30.0	28.0	0.7	27-38			31	29-33	26-32	29-35

*1: Suzuki and Kimura 2017, 2: Golani *et al.* 2011-Israel, 3: Yokeş 2015-Taşucu, 4: Irmak *et al.* 2015-Taşucu, 5: Sakinan *et al.* 2017-Erdemli, 6: Jayabalan *et al.* 2010-Oman, 7: Jawad *et al.* 2013-Oman

Discussion

The genus *Equulites* is currently constituted of nine valid species inhabiting the Indo-Pacific region (Suzuki and Kimura 2017). *Equulites popei* can be distinguished from other leiognathids by its slender body whose BD is 20-30% of SL. The ED of *E. popei* is larger than 78% of POL which is narrower than 68% in *E. aethopos*. *Equulites popei* can be distinguished from *E. elongatus* by the shape of dark blotches and spots on the dorso-lateral body among which at least one forms a ring mark in *E. elongatus* (Suzuki and Kimura 2017). All descriptive characters, measurements, counts and coloration of the specimens caught from Antalya Bay followed closely those given for *E. popei* in Suzuki and Kimura (2017) as well as other specimens reported from the Mediterranean and Red Sea (Table 2).

The depth range of *E. popei* is currently considered to be 20 to 100 m depth (Froese and Pauly, 2019). In our work, three individuals were collected at 150 m depth off Antalya Bay, which represents a new maximum depth for this species, at least in the Mediterranean Sea.

Equulites popei seems to be continuously spreading westwards since its first record, finding suitable habitats on soft bottoms of the Mediterranean that range from a few meters down to about 150 m depth. The number of individuals collected from multiple trawl hauls and different depths can be considered an indication of the presence of an established population in the region. It is unclear with which species *E. popei* is competing for resources and its invasive potential is yet to be studied. Its congener *E. klunzingeri* live in shallow soft bottoms of the Mediterranean, such as in the Gulf of Iskenderun (Mavruk *et al.* 2017), Mersin (Gucu *et al.* 1994) and Antalya (de Meo *et al.* 2017), where it is quite abundant.

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Akdeniz’de *Equulites popei*’nin batı yönlü yayılımı: türün Antalya Körfezi’ndeki ilk kaydı ile bolluk ve dağılımı

Öz

İnce pul balığı, *Equulites popei* (Whitley, 1932) Hint-Pasifik zoo-coğrafi alanının geniş bir bölümünde doğal olarak yayılmakta olup, Akdeniz’de yabancı bir tür olarak değerlendirilmektedir. Levant Baseni’nin kuzeybatı kıyılarında, Antalya Körfezi’nde (36.71°N, 30.88°E), Mayıs 2019 itibarıyla gerçekleştirilen dip trolü örneklemelerinin

dördünde bu türe ait toplam 10 bireyle karşılaşmıştır. Bu konum, türün şimdiye kadar rapor edildiği en batıdaki noktayı temsil etmektedir. Ayrıca çalışma kapsamında türün bolluğu (27 birey.km⁻²) ve bulunduğu maksimum derinlik (150 m) de rapor edilmiştir.

Anahtar kelimeler: Leiognathidae, yabancı tür, Levant Baseni, maksimum derinlik, yayılma

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