

## Range Expansion of *Equulites popei* (Whitley 1932) Along the Mediterranean Coast of Turkey

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Received date: 15.07.2019

Accepted date: 21.10.2019

How to cite: Ergüden, D., Gürlek, M., Uyan, A., Doğdu, S.A. & Turan, C. (2019). Range Expansion of *Equulites popei* (Whitley 1932) Along the Mediterranean Coast of Turkey. *Anatolian Env. and Anim. Sciences*, 4(3), 371-375.  
Atıf yapmak için: Ergüden, D., Gürlek, M., Uyan, A., Doğdu, S.A. & Turan, C. (2019). Türkiye'nin Akdeniz Sahilleri Boyunca *Equulites popei*'nin (Whitley 1932) Alan Genişlemesi. *Anadolu Çev. ve Hay. Dergisi*, 4(3), 371-375.

**Abstract:** On 26 October 2018, two specimens of *Equulites popei* (Whitley, 1932) were collected at a depth of 30 m from Yumurtalık coast, İskenderun Bay and other two specimens were captured by trammel net at a depth of 38 m in the vicinity of Antalya Bay on 17 March 2019. *Equulites popei* previously mistaken as *Equulites elongatus*, is a lessepsian migrant to the eastern Mediterranean Sea. The present study is the first confirmed reports of the species from İskenderun Bay and Antalya Bay, Mediterranean coast of Turkey. Besides, this report is the first observation for these locations and fills another gap in the distribution range of the species. All measurements and counts as well as morphological and color descriptions of *E. popei* agree with previous descriptions. The occurrence of this species in the Mediterranean Sea is the result of migration from the Red Sea via the Suez Canal.

**Keywords:** Eastern Mediterranean, Leionathidae, new record, Ponyfish, Lessepsian.

## Türkiye'nin Akdeniz Sahilleri Boyunca *Equulites popei*'nin (Whitley 1932) Alan Genişlemesi

**Öz:** 26 Ekim 2018'de, Yumurtalık sahili, İskenderun Körfezi'nden 30 m derinlikte iki adet *Equulites popei* örneği (Whitley, 1932) yakalandı ve diğer iki örnek, Antalya Körfezi civarında, 38 m derinlikte trol ağları tarafından 17 Mart 2019 avlandı. Daha önce *Equulites elongatus* olarak kabul edilen *Equulites popei*, Doğu Akdeniz'e bir Lessepsiyen göçmendir. Bu çalışma, Türkiye'nin Akdeniz kıyıları İskenderun Körfezi ve Antalya Körfezi'nden türün ilk teyit raporlarıdır. Ayrıca, bu rapor bu lokasyonlar için ilk gözlemdir ve türün dağılım aralığındaki bir başka boşluğu doldurmaktadır. *E. popei*'nin morfolojik ve renk tanımlarının yanı sıra tüm ölçümler ve sayımlar önceki açıklamalarla uyumludur. Bu türün Akdeniz'de ortaya çıkışı, Kızıldeniz'den Süveyş Kanalı yoluyla göç sonucudur.

**Anahtar sözcükler:** Doğu Akdeniz, Leionathidae, yeni kayıt, Eksi balığı, Lessepsiyen.

## INTRODUCTION

Leiognathidae family is represented by a one genus with 7 valid species (Sparks & Chakrabarty, 2015; Kimura et al., 2008; Suzuki & Kimura, 2017) in the Red Sea and areas of the Indo West Pasific. Two ponyfish species have been reported from the Mediterranean, namely species, *Equulites kluzingeri* (Steindachner, 1898) and *Equulites elongatus* (Günther, 1874). Previously reported as *Equulites elongatus* (Günther, 1874) does not occur in the Red Sea and Mediterranean (Suzuki & Kimura, 2017). Golani et al., (2011), stated that *E. elongatus* is restricted to north of Australia, eastern Indonesia, and Myanmar and all also previous reports of this species from the Red Sea and the Mediterranean Sea are misidentifications of *Equulites popei*.

*Equulites popei* (Whitley, 1932) is a lessepsian migrant to the eastern Mediterranean Sea. Golani et al., (2011) state that the occurrence of these species in the Mediterranean Sea is the result of migration from the Red Sea via the Suez Canal.

Although *E. popei* was earlier considered a junior synonym of *Equulites elongatus* (Günther, 1874), Suzuki & Kimura (2017), the mitochondrial DNA assessment indicated that these two nominal organisms were found as distinct and indicated that they represent a monophyletic cluster separated from other *Equulites* species and that *E. popei* is also a valid species belonging to the *E. elongatus* species group.

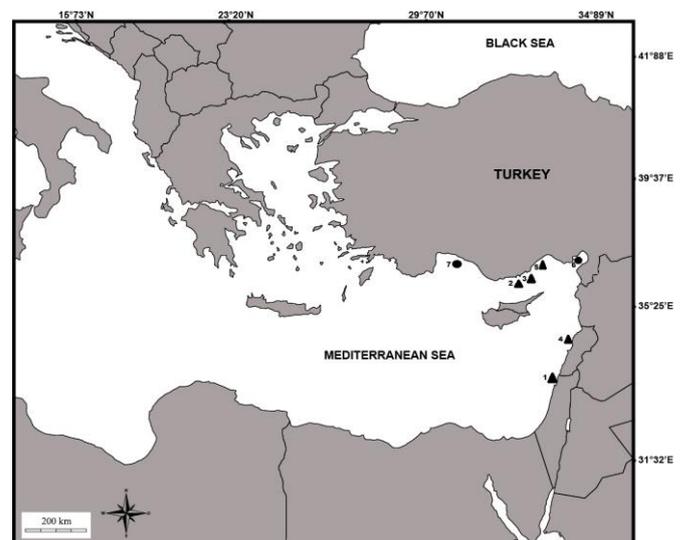
Before the study of Suzuki and Kimura (2017) *Equulites popei*, described mistakenly in many studies as *E. elongatus* which is a lessepsian migrant to the eastern Mediterranean Sea. It was recorded for the first time on the coast of Tel Aviv, Israel in 2010 (Golani et al., 2011). After several records of the species from the Turkish marine waters were reported from Mersin Bay (Tasucu and Mersin coast) in 2014-2015 (Irmak et al., 2015; Yokeş, 2015), from the Erdemli coast, Mersin (Sakınan et al., 2017). Subsequently, it was reported from southwest coast off Tripoli, Libya in 2016 by Crocetta & Bariche et al., (2017).

In this study, although the occurrence of *E. popei* has been reported from Turkish marine waters in the northeastern Mediterranean Sea in previous years (as *E. elongatus*), until now *E. popei* has not been reported from the Iskenderun Bay (southern Mediterranean coast of Turkey) and Antalya Bay (western Mediterranean coast of Turkey). Thus, the present study is the first confirmed report of the species from Iskenderun Bay and Antalya Bay, Mediterranean coast of Turkey.

## MATERIAL and METHODS

Two specimens of *E. popei* was caught in the coast of Yumurtalık, Turkey (Iskenderun Bay) by trammel net (44 mm of mesh size) at a depth of 30 m on 26 October 2018 (Coordinate; lat 36° 46' N, long 35° 50'E) (Figure 1) and

other two specimens (Figure 2) was captured in a trammel net at a depth of 38 m in Antalya coast (Belek, Antalya Bay) on 17 March 2019 (Coordinate; lat 36° 48' N, long 30° 50'E) (Figure 1). All morphometric measurements were made to the nearest 0.01 mm using digital caliper. The weights were measured with a precision scale of 0.01g. Most diagnostic features and morphometric characters were described according to Suzuki and Kimura, (2017). The specimens were deposited in 90 % ethanol solution among the Department of Marine Sciences, University of Iskenderun Technical collections (Figure 2).



**Figure 1.** Map showing capture sites of (black triangles indicates the previous report and black dot indicate the present record) *Equulites popei* in the Mediterranean Sea. 1- Tel Aviv, Israel (Golani et al., 2011); 2- Mersin coast, Turkey (Yokes, 2015); 3- Tasucu,-Mersin, Turkey (Irmak et al., 2015) 4- Tripoli, Lebanon (Yokes, 2015); 5- Erdemli coast (Mersin Bay) (Sakınan et al., 2017); 6- Present study-Yumurtalık coast (Iskenderun Bay) 7- Present study-Antalya coast (Antalya Bay).



**Figure 2.** *Equulites popei* (Whitley 1932) specimen caught on 17 March 2019 at Belek (Antalya Bay) at a depth of 36 m.

## RESULTS

Two specimens captured from Iskenderun Bay were between 71 and 66 mm standard length and the other two specimens obtained from Antalya Bay were between 80 and

77 mm standard length, during the present study (Table 1). The morphometric measurements, meristic counts and color were consistent with the description of *E. popei* given by Golani et al., (2011) and Suzuki & Kimura, (2017). All morphometric characters of the captured specimens are given in Table 1 and these results are compared with other previous publications (Golani et al., 2011; Irmak et al., 2015; Yokes, 2015; Sakman et al., 2017).

**Description of the specimens:** Body elongated and slender, mouth highly protrusible, snout pointed. Single dorsal fin with 8 spines and 16 rays. Anal fin with 3 spines

and 14 rays. Pectoral fin with 15-16 rays. Pelvic fin small with a single spine and five rays, its origin is slightly beyond the pectoral fin origin. Caudal fin forked.

The color of the specimen was upper body silvery brown with scattered dark blotches; lower part of body and belly silver-grey; posterior margin of operculum pale yellow; pectoral fins are pale yellow; black lines along the caudal-fin rays; posterior margin of caudal fin dark.

**Table 1.** Morphometric features of *Equulites popei* in Iskenderun and Antalya Bays, Turkey and compared its previous record from Erdemli coast Sakinan et al., (2017), Tasucu (Irmak et al., 2015) and vicinity of Mersin, Turkey) (Yokes, 2015) and Tel Aviv, Israel (Golani et al., 2011) the Mediterranean Sea. Morphometric measurements as proportions are given in parantheses.

Measurements	Present Study		Sakman et al., (2017)	Irmak et al., (2015)	Yokes, (2015)	Golani, (2011)
	Value (mm)					
<b>Morphometric Characters</b>						
<b>Locality</b>	<b>Iskenderun Bay, Turkey</b>	<b>Antalya Bay, Turkey</b>	<b>Mersin Bay, Turkey</b>	<b>Mersin Bay, Turkey</b>	<b>Mersin Bay, Turkey</b>	<b>Tel Aviv coast, Israel</b>
Number of specimens	2	2	40	5	8	1
TL- Total Length	90.2-81.9	98.9-96.5	104.4-87.5	-	-	-
SL- Standard Length	71.3-65.7	80.2-77.4	84.5-72.1	79.2-67.9	72.4-43.2	72.8
% in TL	(79.04-80.26)	(81.09-80.12)				
HL- Head Length	19.6-18.2	22.1-21.9	22.0-19.2	-	20.3-12.6	-
% in SL	(27.46-27.71)	(27.55-28.29)			(28.03-29.16)	
Pre.O.L – Pre-orbital Length	6.2-5.6	6.9-6.7	6.9-5.8	-	-	-
% in HL	(31.53-32.16)	(31.22-30.59)		(31.30)*		
ED – Eye diameter	7.0-5.9	8.4-8.1	8.1-6.4	-	11.8-4.3	-
in HL	(35.81-32.32)	(38.01-36.98)		(33.17)*	(58.12-34.12)	(33.33)*
Pre.D.L – Pre-dorsal length	26.8-23.7	29.7-28.9	39.1-28.7	-	30.6-15.5	-
% in SL	(37.62-36.04)	(37.03-37.33)		(37.69)*	(42.26-35.88)	
Pre.P.L – Prepectoral fin length	20.0-19.7	22.7-22.1	24.0-19.5	-	-	-
% in SL	(28.09-30.06)	(28.03-28.55)		(27.46)*		
PFL – Pectoral fin length	12.4-10.4	14.2-13.6	-	-	-	-
% in SL	(17.47-15.88)	(17.70-17.57)		(16.62)*		
Pre.A.L – Pre-anal length	38.8-35.8	43.3-41.9	-	-	-	-
% in SL	(54.37-54.54)	(53.99-54.13)		(53.20)*		
An.F.B.L. – Anal fin base length	29.5-26.3	33.2-31.6	-	-	-	-
% in SL	(41.31-40.01)	(41.39-40.82)		(42.97)*		
C.P.L. – Caudal peduncle length	2.9-2.8	3.3-3.1	-	-	-	-
% in SL	(4.06-4.26)	(4.11-4.01)		(3.78)*		
D.F.O.B.D. – Dorsal fin origin at body depth % in SL	18.6-15.1	20.9-19.6	-	-	-	-
	(26.05-23.05)	(26.06-25.32)		(26.10)*		(27.02)*
Pelvic fin insertion to anal fin origin % in SL	25.5-23.2	28.8-27.7	-	-	-	-
	(35.76-35.31)	(35.91-35.78)				
Pelvic fin insertion to the center of anus % in SL	9.3-8.5	10.2-9.7	-	-	-	-
	(13.04-12.93)	(12.72-12.53)				
Weight (g)	6.60-5.40	7.10-6.90	-	-	-	-
<b>Meristic Characters</b>						
Dorsal fin rays	VIII+16	VIII+16	VIII+16	-	VIII+16	VIII+16
Pectoral fin rays	16-15	16	15	14-16	16	12
Pelvic fin rays	I+5	I+5	I+5	-	I+5	I+5
Anal fin rays	III+14	III+14	III+14	-	III+14	III+14
Lateral line scales	8-12/13-18	8-12/13-18	-	-	-	-
(Above /Below)						

\*This measurements are given as mean.

## DISCUSSION

The genus *Equulites* is a genus of ponyfishes distributed wide geographic ranges extending from the North West Pacific south to North Australia, Indo-West Pacific,

Red Sea, and Western Mediterranean (Sparks & Chakrabarty, 2015; Froese & Pauly, 2019).

The native range of *E. popei* includes from Japan, Philippines, Malaysia (Sabah), Thailand (Gulf of Thailand),

Oman, the Red Sea, and Mozambique (Jayabalan et al., 2010; Jawad et al., 2013; Fricke et al., 2019).

Ponyfishes are widely distributed in the shallow coastal regions in the Indo-West Pacific, from surface down to 170 m (Yokes, 2015). In the Mediterranean (Turkey coast), Yokes, (2015) reported of *E. popei* as at depths of 45 m and 90 m and indicated that it can inhabit in deeper waters. In this study, we captured the ponyfish specimens of *E. popei* by trammel net at depths of 30-36 m from Iskenderun and Antalya Bays. However, the depth recordings of our obtained samples are similar to the depth recordings of the samples obtained from the Mediterranean Sea (Golani et al., 2011) and slightly different from the depth recordings of the samples obtained from the Mersin coast (Irmak et al., 2015; Yokes, 2015).

*E. popei* is a small non-commercial fish species typically inhabits in shallow areas. This species feeds on bottom invertebrates (Froese & Pauly, 2019). *E. popei* shows a lessepsian migrant to the eastern Mediterranean Sea (Golani et al., 2019), and now, is it widespread all the Mediterranean Sea. *Equulites popei* can be distinguished from the other lessepsian member of the Leiognathids by the coloration having pattern of dorsolateral dark markings on body, elongated body shape and highly protrusible mouth (Suzuki & Kimura, 2017).

*Equulites popei* is highly similar to *E. elongatus* in having large eyes, short postorbital head length and lightly expanding neural and hemal spines of the fourth preural centrum (Suzuki & Kimura, 2017). *E. popei* differ from *E. elongatus* in having a dorsolateral body with large dark blotches rarely forming ring marks (0-2) and few (0-5) dark spots smaller than a half of pupil diameter (vs.1-9 and 0-14) and also *E. popei* has counts of scales above and below the lateral line (8-13 and 12-19) compared with *E. elongatus* (vs. 5-9 and 9-14). Besides, *E. popei* is distinguished from *E. elongatus* in having distance from pelvic-fin insertion to center of anus 35-50% of the distance from pelvic-fin insertion to anal-fin origin (vs. 30-42%) (Suzuki & Kimura, 2017).

Comparing our four specimens of *E. popei* with the eight specimens and five specimens obtained by Yokes, (2015) and Irmak et al., (2015), it is clear that the body measurements of the samples obtained by Irmak et al., (2015) are similar to the ranges of the body measurements obtained from our study, but these ranges are slightly different from the samples taken from Mersin Bay (Yokes, 2015; Sakıman et al., 2017), (Table 1). On the other hand, the eye diameter is wider and Pre-dorsal length is slightly larger in the Mersin specimens compared with the Yumurtalık and Antalya specimens (Table 1).

Recently, many invasive fish species has entered from the Atlantic, Pacific and Red Sea to the Mediterranean Sea (Golani et al., 2019) and many species have invaded the Mediterranean species, and settled in this area, because, the

occurrence of this species from the northeastern part of the Mediterranean Sea might be due to changing trophic or ecological conditions of these marine ecosystem (Turan et al., 2016). Golani, (1998) stated that many lessepsian fish migrants are characterized by their high mobility and high reproduction.

Nowadays, *E. popei* is considered as a successful invader distributed throughout the Mediterranean Sea (Golani et al., 2011; Irmak et al., 2015; Yokes, 2015). In addition, the present record of *E. popei* in the Eastern Mediterranean coast of Turkey indicated the southern and western extension of the species and this report is the first observation for the Iskenderun Bay and Antalya Bay fills another gap in the distribution range of the species.

#### ACKNOWLEDGEMENTS

Thanks to Republic of Turkey Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Research and Policies (Project No: TAGEM-16/AR-GE/21) for financial support.

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