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-SHORT COMMUNICATION-

First Indo-Pacific fish species from the Black Sea coast of Turkey: Shrimp scad *Alepes djedaba* (Forsskål, 1775) (Carangidae)

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Abstract

One specimen of shrimp scad *Alepes djedaba* (Forsskål, 1775) was caught by using fish net at a depth of 30 m on 11 October 2017 from Sinop Bay, the West Black Sea. With the present study, *A. djedaba* is first lessepsian fish species in the Black Sea coast of Turkey. The migration of Indo-Pacific species to the Black Sea indicate that climate change is getting an important issue both for marine biodiversity and fisheries in the Black Sea.

Keywords:

Indo-Pacific, Lessepsian, the Black Sea, Shrimp scad, *Alepes djedaba*, climate change

Article history:

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Introduction

Nowadays, many alien fish species, which entered the Mediterranean through the Suez Canal, have established dense populations in the north-eastern coastal waters of Turkey (Turan et al., 2016).

The family of Carangidae comprises of 140 species in 32 genera of worldwide (Nelson, 2006). Species of Allepes genus are characterized by following characteristics: dorsal accessory lateral line terminating in front of spinous dorsal fin, teeth in both jaws consisting of the single row of continuous, small comb like teeth. The shrimp scad, *Alepes djedaba* (Forsskål, 1775), is a pelagic

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species inhabiting inshore waters, where it forms populations near rock reefs, often in turbid waters. *Alepes djedaba* is in competition with some native zooplanktivorous species (Carpenter et al., 1997). *A. djedaba* is a species of widespread tropical marine fish of the Carangidae family. This species is widespread in tropical areas of the Indo-Pasific (Red Sea and East Africa) through the Suez Canal (Golani, 1998). *A. djedaba* can be misidentified with several other species of the Carangidae family. A few Caranx species and *Pseudocaranx dentex* have a similar ellipsoidal, compressed body shape and a line of scutes along the lateral line. However, the posterior part of their pectoral fins, when folded along the flanks, does not overlap the first scutes. *A. djedaba* is widely distributed in the Indo-Pacific Ocean (Otero et al., 2013).

A. djedaba in the Mediterranean Sea was first recorded as *Caranx calla* along the Palestinian coast in 1927 by Steinitz (1927) (Figure 1). It has afterwards been recorded in Levantine coast of Turkey (Akyüz, 1957), the Aegean Sea coast of Greece (Bini, 1960), the Aegean Sea coast of Turkey (Geldiay, 1969), South Cyrus coast in the Levantine (Demetropoulos & Neocleus, 1969), Syrian coast in the Levantine (Bauchot, 1987), Ionian Sea coast of Greece (Fischer et al., 1987), Lebonan coast in the Levantine (Lakkis & Zeidane, 1989), Malta coast (Lanfranco, 1993), Egypt coasts (El Sayed, 1994), Libya coast (Shakman & Kinzelbach, 2007), the Sea of Marmara by Artüz and Kubanç (2014) (Figure 1). *A. djedaba* is now widespread species in the Levantine region of the Mediterranean (Smith-Vaniz, 1986; Carpenter et al., 1997).

A. djedaba was first reported from the north-eastern Mediterranean part of Turkey by Akyüz (1957), and then northward extension was reported in the the Aegean Sea coast of Turkey (Geldiay, 1969) and recently from the Sea of Marmara (Artüz and Kubanç, 2014) in Turkish marine waters. In this study, we reported the Black Sea extension of *Alepes djedaba* from Sinop coast as a first lessepsian fish species from the Black Sea coast of Turkey.

Material and Methods

One specimen of shrimp scad *A.djedaba* was caught by using fish net at a depth of 30 m on 11 October 2017 from Sinop Bay, the West Black Sea (Figure 1). The coordinates and sea surface temperature of sampling site were 42°00'10.8"N 35°11'02.5"E and 16.5 ^{0}C, respectively.

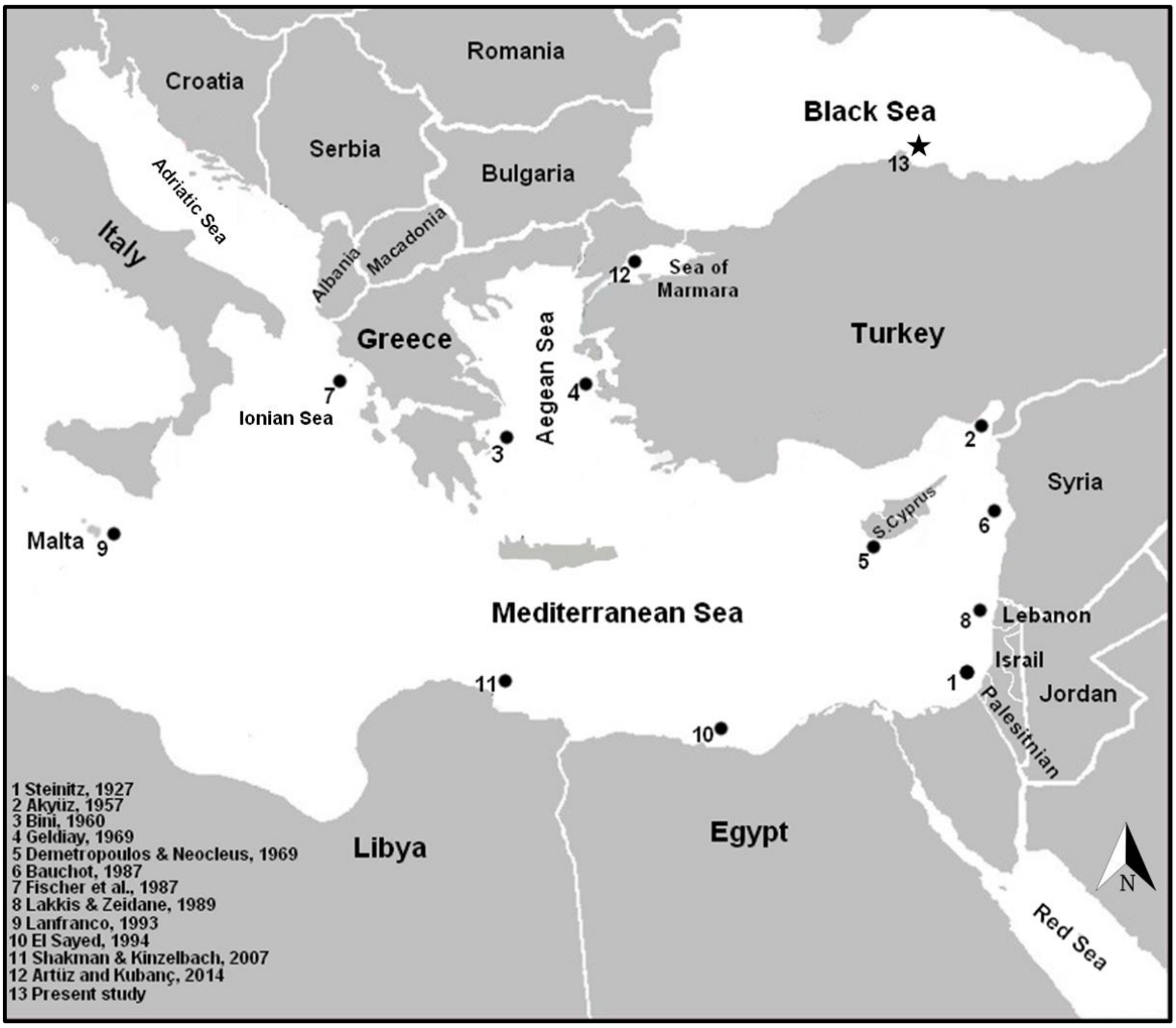

Figure 1. Sampling location (13) of *Alepes djedaba* from Sinop Bay, and the previous reported locations (1-12) in the Mediterranean.

Morphometric and meristic characters of the collected specimen were taken, and morphometric measurements of the specimen were made to the nearest 0.01 mm using digital caliper. The specimen is deposited with museum number of MSM-PIS/2017-3 in the Museum of the Faculty of Marine Sciences and Technology, Iskenderun Technical University.

Figure 2. The captured specimen of *Alepes djedaba* from Sinop Bay (West Black Sea, Turkey).

Result

All measurements, morphological descriptions and colorations of the captured specimen were agree with previous descriptions given by Smith-Vaniz (1986) and Nelson (2006) and the diagnostic features of the captured *A. djedaba* specimen were compared with previously reported studies, Smith-Vaniz (1986), Gücü et al., (1994), Iwatsuki and Kimura (1996) and Artüz and Kubanç (2014) (Table 1).

The captured specimen of *A. djedaba* was 169 mm in total length, 126 mm in standard length and 52.75 g in total weight. Pale greenish blue color above, silvery white color below, lateral of body with yellow lane, caudal fin yellow, operculum with black spot on margin, the pectoral fin is falcate. Upper jaw anteriorly with two unsteady lines of short conical teeth posteriorly internal surface of jaw paved with blunt teeth. Gill rakers on first gill arch: 10 on upper part, 28 on lower. Meristic counts were: D_1 VIII; D_2 I+25; A II, I+19; C 26; P I+19; V I+6. Morphometric measurements and meristic counts of the captured specimen are given at Table 1.

Table 1. Morphometric and meristic measurements of the captured *A.djedaba*, compared with the previous studies.

Meristic characters	Present Study	Smith-Vaniz (1986)	Gücü et al., (1994)	Iwatsuki and Kimura (1996)	Artüz and Kubanç (2014)
Total weight (g)	52.75	-	-		71
Total length (mm)	169	-	235	-	116
Standard Length (mm)	126	-	-	167	88.4
In % of standard length					
Head length	26.98	-	-	-	25.2
Body depth	34.92	-	-	-	33.2

Predorsal fin length	36.50	-	-	-	33.4
Prepectoral fin length	35.7	-	-	-	34
Prepelvic fin length	34.1	-	-	-	31.8
Preanal fin length	55.5				51.7
Dorsal fin length	62.69	-	-	-	60.4
Pectoral fin length	28.57	-	-	-	-
Pelvic fin length	10.3	-	-	-	12.5
Anal fin length	38.8	-	-	-	42.5
In % of head length					
Snout length	-	-	-	-	29.5
Eye diameter	23.5	-	-	-	27.8
Interorbital with	-	-	-	-	31.4
Counts					
Dorsal fin rays	VIII, I+25	VIII, I+22-25	VIII, I+24	VIII,I+24-25	VIII, I+25
Pectoral fin rays	I+19	-	-	I+22	I+19
Ventral fin rays	I+6	-	I+5	-	I+5
Anal fin rays	II, I+19	II, I+18-20	II,I+19	II,I+18-21	II, I+20
Curved lateral scales	35	31-36	-	-	35
Straight lateral scutes	48	41-48	-	44-45	48
Gill rakers	38	30-42	39	35-37	36

Discussion

The number of lessepsian fish migrants in the Mediterranean Sea has rapidly increased in recent years (Gurlek et al., 2016; Doğdu et al., 2016). Moreover, occurrence of the Atlanto-Mediterranean species in the Black Sea has also been increased (Yağlıoğlu et al., 2014 and Lipej et al., 2017). In the president study, *A. djedaba* is reported as second Indo-Paficic species in the Black Sea since the first Indo-Pacifc species *Sphyraena obtusata* was given by Boltachev (2009). The increase in water temperature has been considered as a main reason for the increasing entry of Indo-Pacific species in the Mediterranean Sea (Ben Rais Lasram et al., 2010; Golani, 2010; Turan et al. 2016). Turan et al. (2016) reported that there is an increased trend of temperature for the Black Se due to global climate change. Turan et al. (2016) also indicated that the increased trend of temperature may increase the number of Mediterranean Atlantic and lessepsian fish species in the Black Sea. As indicated in the Figure 3 and 4, there is increasing sea surface temperature trend in the Black sea for the last four decades.

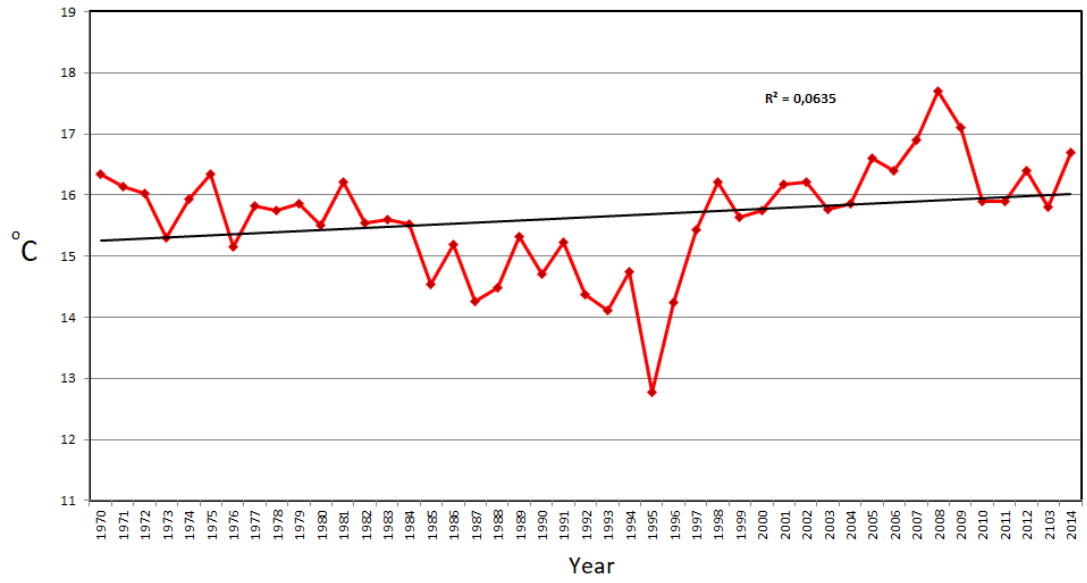

Figure 3. The sea surface temperature from İstanbul Black sea coast between 1970 and 2011 (modified from Turan et al. 2016).

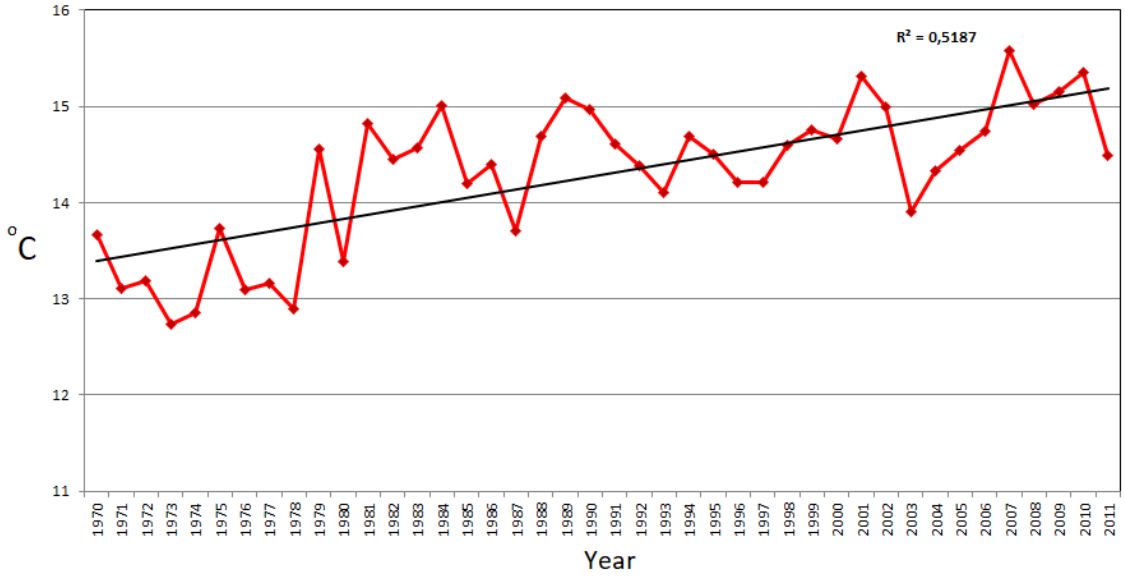

Figure 4. The sea surface temperature from Samsun coast between 1970 and 2011 (modified from Turan et al. 2016).

In the present study, the diagnostic futures of the captured specimen is overlapping with the previous reports as described in Table 1. Smith-Vaniz (1986) reported the characteristic features of *A. djedaba*: Gill rakers 10-13 upper, 27-32 lower in first gill arch. Shoulder girdle margin smooth, without papillae. Dorsal fin VIII+I+22-25; anal fin II+I+18-20; Curved lateral line with 31-36 scales and 0-3 scutes; straight lateral line with 41-48 scutes. Colour: greyish-green above,

slivery to white below; black botch on posterodorsal margin of opercle, bordered above by a smaller white spot: soft dorsal fin lobedusky, pale white distally; caudal fin yellowish, except lower lobe dusky to block disally size: to 20 cm fork length, common to 20 cm (Smith-Vaniz, 1986; Nelson, 2006). Gücü et al., (1994) reported the characteristic features of *A. djedaba* diagnostic counts were; total gill rakers 39, dorsal fin VIII, I+24, anal fin II,I+19, ventral fin I+5. Iwatsuki and Kimura (1996) reported that diagnostic counts of *A.djedaba* were; total gill rakers 35-37, dorsal fin VIII, I+25, pectoral fin I+19, Ventral fin I+5, anal fin II, I+20, curved lateral scales 35 and straight lateral scutes 48. Artüz and Kubanç (2014) reported first record of *A. djedaba* from the Sea of Marmara, and the counts were; total gill rakers 36, dorsal fin VIII, I+25, pectoral fin rays I+19, ventral fin rays I+5, anal fin rays II, I+20, curved lateral scales 35 and straight lateral scutes 48.

While the captured one specimens of *A. djedaba* do not necessarily indicate existence of an established population in the Black Sea, but this species apparently migrate from the Marmara Sea via the Istanbul Strait (Bosphorus) to the Black Sea, since it was reported from the Marmara Sea by Artüz and Kubanç (2014). Therefore, the Sea of Marmara is a very important biological corridor for migratory species from both the Black Sea and the Mediterranean Sea, and the Turkish straits form an "acclimatization zone" for transiting species, allowing those from the Mediterranean to adjust to the different environmental conditions in the Black Sea.

The abundance and expansion of *A. djedaba* should be monitored to be able to follow its impacts on native fauna in the Black Sea. Moreover, settlement process of *A. djedaba* in the Black Sea will probably be accelerated or facilitated by increased trend of water temperature by global climate change as indicated in the Figure 3 and 4.

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