

Expansion confirmation of the Indo-Pacific catfish, *Plotosus lineatus* (Thunberg, 1787), (Siluriformes: Plotosidae) into Syrian marine waters

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Abstract

The first record of two specimens of the striped eel catfish *Plotosus lineatus* (Thunberg, 1787), off the Syrian coast are reported in this work. This confirms the extension ranges of this species in the eastern Mediterranean. The two specimens (174, 181 mm TL) were caught On 29 October 2014, by spear gun at a depth of 3 m. The capture site was located 50 m off coast of Tartous city (35° 52' E, 34° 51' N). Morphometric and meristic characters of the collected specimens were recorded. This collection presents the first record of Plotosidae in Syrian coast, and confirms the Lessepsian migration of this species from the Red Sea via the Suez Canal. The occurrence of the species is commented and discussed, in the region where a sustainable population is probably established.

Keywords

Plotosus lineatus, Lessepsian Migration, Eastern Mediterranean, Syrian Coast

1. Introduction

Six hundred and eighty alien marine multicellular species have been recorded in the Mediterranean Sea (Galil and Goren, 2014). Nearly 100 Indo-Pacific fish species have been introduced through the Suez Canal and have been reported from the Levantine basin of the Mediterranean Sea. The number of alien species increased in the Eastern Mediterranean about 68.42% between years 2002-2010 (Oral, 2010), because of the opening of the Suez Canal, climate changes and international shipping activities. More than twenty five species recorded in the Levantine basin since the beginning of the 21st century (Stern *et al.*, 2014).

The Mediterranean Sea has been invaded by numerous alien species entering through the Suez Canal, Gibraltar, via human activities such ballast water, mariculture and other (FAO, 2010). The opening of the Suez Canal in 1869 enabled the migration between the Red Sea and the Mediterranean

Sea, dramatically affecting the biodiversity of the Mediterranean (Gewing *et al.*, 2014). One of the fish "Lessepsian species" is striped eel catfish, *Plotosus lineatus* (Thunberg, 1787).

The striped eel catfish, *Plotosus lineatus* (Thunberg, 1787) is widely distributed in the Indo-Pacific. It is the only representative of Plotosidae in the Red Sea (Goren and Dor, 1994; Golani and Bogorodsky, 2010). It is also known in older literature under its junior synonyms, *P. anguillaris* and *P. arab* (Fischer and Bianchi, 1984). It is found on reefs, along open coasts in estuaries and in tidal pools from the Red Sea and east Africa to Japan and Samoa (Golani *et al.*, 2013), along the entire coast line of Fishing Area 51, including islands north of approximately 30°S (Fischer and Bianchi, 1984). It has been recorded in the Suez Canal (Chabanaud, 1932), in the Gulf of Suez (Golani, 2002).

Recently, *P. lineatus* has migrated towards northern areas through Suez Canal and expanded into the eastern Mediterranean Sea (Bariche, 2012). The first Mediterranean record of *P. lineatus* was reported in the eastern Levantine

basin by Golani (2002). There are unpublished information about seeing specimens of this species in 2012 off the Lebanese water (Lakkis, pers. comm.), but the species was not record hitherto in Turkish coasts (Bilecenoglu *et al.*, 2014). Surveys conducted off the Syrian coast allowed to note the presence of specimens of *P. lineatus* by some divers where each swarm consists of hundreds of individuals, especially during the night and collects two specimens which are presented and described in this work.

2. Materials and Methods

During the year of 2014, several fishermen reported us about watching swimming groups of poison alien fishes in the Syrian coast. On 29 October 2014, two specimens were caught (174, 181 mm TL) on sandy-rocky bottom by using a spear gun, at a depth of 3 m. The capture site was located 50 m off coast of Tartous city (35° 52' E, 34° 51' N) as shown in Fig. 1. Morphometric and meristic characters of the collected specimens were recorded. Measurements were carried out to the nearest millimeter and their weights to the nearest gram, followed Fischer and Bianchi (1984), Randall (1995), Golani (2002) and Golani *et al.* (2013).

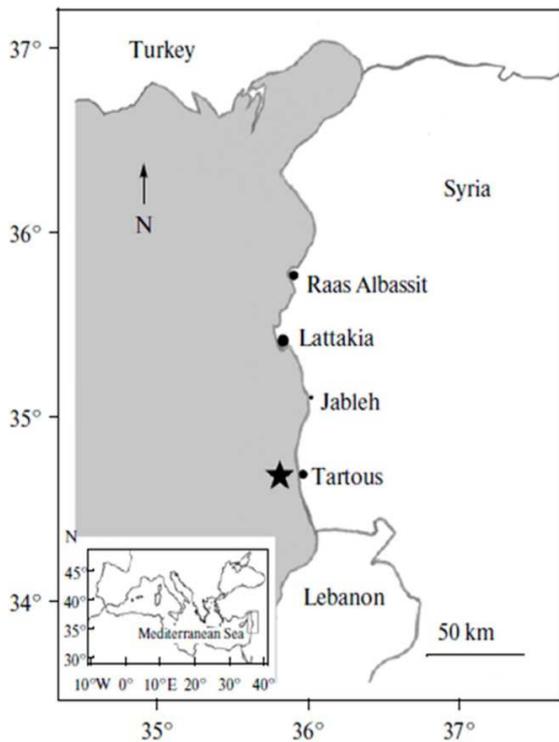


Fig 1. Map of the Mediterranean (below) and coast of Syria showing the capture site of *Plotosus lineatus* (black star).

Morphometric measurements with percents of total length (TL) and counts were included in Table 1. The two specimens were preserved in 7% buffered formalin and deposited in the Ichthyological Collection of the Marine Sciences Laboratory, Agriculture Faculty at Tishreen University, Syria, under the catalogue numbers: 2271 M.S.L. (Fig 2).



Fig 2. *Plotosus lineatus* captured from Eastern Mediterranean off the Syrian coast: specimen referenced 2272 M.S.L. Scale bar= 20 mm.

Table 1. Morphometric measurements in mm and as a percentage of total length (%TL), weight in gram recorded in the two specimens of *Plotosus lineatus* off the Syrian coast.

Reference of specimens	2271 M.S.L		2272 M.S.L	
	mm	%TL	mm	%TL
Morphometric measurements				
Total length	181	100.0	174	100.0
Standard length	174	96.1	165	94.8
Head length	39	21.5	36	20.7
Interorbital space	11	6.1	12	6.9
Eye horizontal diameter	5	2.8	5	2.9
Eye vertical diameter	5	2.8	5	2.9
Iris horizontal diameter	2	1.1	2	1.1
Iris vertical diameter	2	1.1	2	1.1
Nasal barbel length	18	9.9	16	9.2
Maxillary barbel length	21	11.6	18	10.3
Mental barbel length	19	10.5	18	10.3
Pectoral fin length	19	10.5	19	10.9
Pectoral fin base	6	3.3	7	4.0
Pectoral fin spine length	9	5.0	10	5.7
Dorsal fin length	21	11.6	23	13.2
Dorsal fin base	9	5.0	8	4.6
Dorsal fin height	20	11.0	21	12.1
Dorsal fin spine length	12	6.6	11	6.3
Pelvic fin length	12	6.6	13	7.5
Pelvic fin base	7	3.9	7	4.0
Anal fin length	102	56.4	94	54.0
Anal fin base	98	54.1	91	52.3
Anal fin height	5	2.8	4	2.3
Body depth	23	12.7	27	15.5
Pre-pectoral length	32	17.7	33	19.0
Pre-dorsal length	47	26.0	44	25.3
Pre-anal length	76	42.0	75	43.1
Pre-pelvic length	64	35.4	61	35.1
Counts	2271 M.S.L		2272 M.S.L	
First dorsal fin spinous rays	1		1	
First dorsal fin soft rays	4		4	
Second dorsal fin soft rays	86		83	
Pectoral fin spinous rays	1		1	
Pectoral fin soft rays	10		10	
Anal fin soft rays	67		69	
Pelvic fin soft rays	11		11	
Total weight (g)	44.2		44.4	

3. Results and Discussion

The two specimens were identified as *Plotosus lineatus* (Thunberg, 1791) according to Fisher and Bianchi (1984). The specimens constitute the first record of this species in the Syrian waters and consequently the species should be added in the local ichthyofaunal list previously provided by Saad (2005).

These findings of *P. lineatus* constitute the first record of the species reported from the Syrian coast. Consequently, the addition of *P. lineatus* in the local ichthyofauna brings the number of species to 273, including 43 cartilaginous species and 230 teleost species (Saad *et al.*, 2004; Saad, 2005; Ali *et al.*, 2010, 2012, 2013a, 2013b; Ali *et al.*, 2014; Soliman *et al.*, 2014; Sabour *et al.*, 2014; Jawad *et al.*, 2015). Recent extensive assessments of fish have showed lower fish species of Syrian marine water than the neighboring countries, that may be due to the lack of Ichthyological investigation in the Syrian coast, not to oligotrophic nature of the area.

3.1. Description of the Two Syrian Specimens

D¹ I, 4; D² 83-86; A 67-69; P I, 10; V 11. Smooth body without scales, elongated, becoming compressed after the anus. Its depth constitutes 12.7-15.5 % of the total length TL). Head moderately large and broad, 20.7-21.5%. Pre-first dorsal 25.3-26.0%, pre-pectoral 17.7-19.0% pre-anal 42.0-43.1%, pre-pelvic fin 35.1-35.4%. Eyes are moderate, 12.8-13.9% of the head. Twenty- five to twenty- eight gill rakers on the anterior edge of the first gill arch, gill arch faces without papillae. The teeth in the upper jaw are conical and apparent while the mouth is closed. Upper jaw is overhanging, the lips are distinct. Irregular rows of teeth in the lower jaw, only the anterior ones are conical and becoming granular. Four pairs of barbels (1 nasal, 1 maxillary, 2 mentals). The nasal barbel is not extending well beyond posterior borders of eyes, the maxillary barbel reaching the posterior edge of eye or slightly beyond. The inner mental barbell is slightly shorter than the outer one. First dorsal fin with 1 spine stout (its length 27.7-30.2 of head length) and serrated edges. The last soft ray is doubled at base. The second dorsal fin long and confluent with the anal fin. The pectoral fin spine with a serrated edges and easily detached from the rest of the fin (Fig. 3).

Body color is brown with three narrow white stripes, two of them originating at the snout, one crossing above the eye, the other below, they extended to near the caudal peduncle, while the third strip extends from the belly backward to the caudal peduncle. Second dorsal and anal fin paler than the rest of the body with black margin. Ventral surface white, with brownish red dendrite organ. All counts, measurements and color patterns agree with Fischer and Bianchi (1984), Randall (1995), Golani (2002) and Golani *et al.* (2013).

Dispersion of the Lessepsian fish in the Mediterranean Sea depends on several factors such as similar temperature conditions, and cyclonic Mediterranean shore currents to the Levantine Sea (FAO, 2010); the Atlantic current direction which moves along the northern African coasts to Egypt coast, directs the eggs and larvae of the alien species firstly forward Levantine basin. Most of the successful species are eurythermic and euryhaline species and they can adapt to other ecological conditions such as feeding and habitat type (Mavruk and Avsar, 2008).

Several species in this recent wave of successful Indo-

Pacific invaders have established large populations with considerable effects on the local biota (Edelist *et al.*, 2011). The definitive intrusion and the expansion of some alien species in the eastern Mediterranean, such as *P. lineatus*, could threaten the biodiversity due to the competition pressure with the native species, especially; it's feeding habits which include crustaceans, mollusks and small fishes. *P. lineatus* is an inshore species, inhabits a variety of habitats, such as lagoons, sandy substrates and coral reefs. It is known as a euryhaline species which enters estuaries and even fresh waters. The juveniles of *P. lineatus* form densely packed aggregations and move together, resembling a large object or animal. *P. lineatus* is notorious for being highly venomous and should be handled with great caution.

Marine biologists have justifiably focused on biology and ecology of alien species and their spreading across the Mediterranean coasts, considering the undisputed effects of their invasion on native marine communities and ecosystems as well as on catch composition in commercial fisheries (Goren and Galil, 2005). However, *P. lineatus* does not have such these characters, due to its negative impact on tourism, fisheries and human health (FAO, 2010), no value in commercial fisheries. The venom glands are located along the dorsal and pectoral spines. When the spines penetrate foreign body, the venom is injected and causes great pain (Randall, 1983).

P. lineatus is the second marine catfish recorded from the Mediterranean. Golani and Sonin (1996) reported from the Eastern Mediterranean coasts a single specimen of Atlantic *Arius parkii* Gunther, 1864 (family Ariidae).

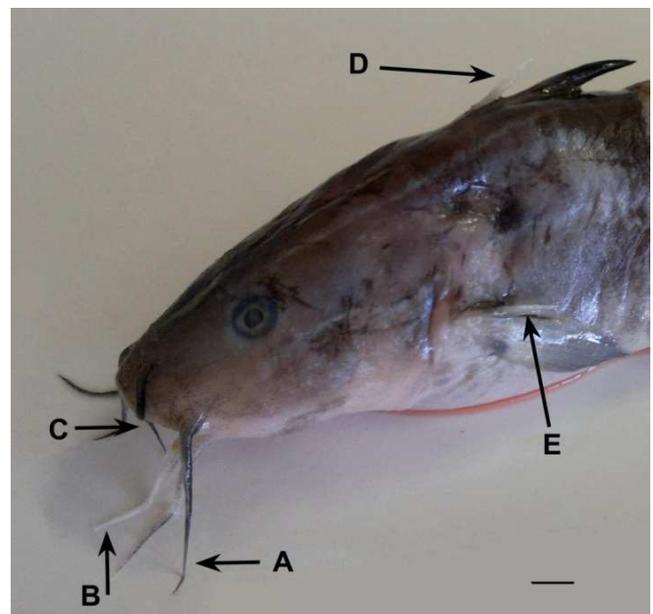


Fig 3. Head of specimen reference 2272 M.S.L, showing maxillary barbel (A), mental barbel (B), nasal barbel (C), first dorsal fin spine (D) and pectoral fin spine (E). Scale bar= 10 mm.

4. Conclusions

Syria, just like the neighboring countries, is one of the

most influenced countries by the invasive alien species due to its proximity to the Suez Canal and the dense maritime traffic along its coastline (Cinar *et al.*, 2005). Invasive species, in fact, may alter the evolutionary pathway of native species by competitive exclusion, niche displacement, predation and other ecological and genetic mechanisms (Mooney and Cleland, 2001).

The striped eel catfish *P. lineatus* may contribute to increase this alternation, because it is one of the most abundant and dominant Indo-Pacific alien fishes along the Levantine basin of the Mediterranean Sea at the onset of the current decade (Stern *et al.*, 2014). It has shown impressive population increases within few years of its first appearance in the Mediterranean Sea (Goren *et al.*, 2010). So it deserves a thorough study in order to show its role in the local ecosystem and its impact on native species, on tourism and on fishermen health.

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