

Additional records of three exotic teleost species Dory snapper *Lutjanus fulviflamma* (Lutjanidae), Emperor angelfish *Pomacanthus imperator* and yellow bar angelfish *P. maculosus* (Pomacanthidae) from the Syrian coast (Eastern Mediterranean Sea)

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Abstract

The authors present new captures of three exotic teleost species in the Syrian marine waters. The first capture concerned a specimen of Dory snapper *Lutjanus fulviflamma* (Forsskål, 1775) which measured 222 mm total length (TL) and weighed 161 g. The second capture was a yellow bar angelfish *Pomacanthus maculosus* (Forsskål, 1775) which measured 245 mm total length and weighed 489 g. The third capture was a specimen of Emperor angelfish *Pomacanthus imperator* (Bloch, 1787) which measured 175 mm total length and weighed 456 g. These new captures suggest that viable populations of these three species are successfully established in the Syrian marine waters.

Key words: Lutjanidae, Pomacanthidae, migration, population, extension range, Levant Basin, Syrian coast.

Introduction

Since Gruvel (1931), it clearly appeared that the Syrian marine waters displayed favorable environmental parameters for the development and the production of local fisheries. Such opinion was furtherly confirmed by Foulquié and Dupuy de la Grandrive (2003) and more recently by Ali (2018). On the other hand, these favorable parameters contribute to both development and production of local fisheries that play an important economical role for the country. Concomitantly, due to the global warming of the Mediterranean Sea and the vicinity of Suez Canal, several species incoming from the Red

Sea regularly, known as Lessepsian migrants (*sensu* Por, 1978) invaded the area and globally the Levant Basin (Golani *et al.*, 2021). In the present paper, are reported from the Syrian marine waters new captures of three exotic species: Dory snapper *Lutjanus fulviflamma* (Forsskål, 1775), Emperor angelfish *Pomacanthus imperator* (Bloch, 1787) and yellowbar angelfish *P. maculosus* (Forsskål, 1775). These three species are herein described and some comments are given concerning their distribution in the area and the Mediterranean Sea.

Materials and Methods

On 4 August 2023, a specimen of *Lutjanus fulviflamma* (Forsskål, 1775) was caught off Baniyas by 35° 25' 29" N and 35° 56' 45" E, (Fig. 1) using commercial gillnet, at depth of 40 m, on muddy bottom. Measurements were carried out to the nearest millimetre with percentages of total length (%TL), meristic counts and total body weight. They are compared with those of the first substantiated record from the eastern Mediterranean Sea (MSL 14/2022), (Table 1).

On 31 August 2023 a specimen of *Pomacanthus maculosus* (Forsskål, 1775) was caught by a speargun at a depth of 1.5 m, on rocky bottom. The capture occurred off Baniyas by 35° 13' 13" N; 35° 56' 18" E, (Fig. 1). Similarly to *Lutjanus fulviflamma*, measurements were recorded to the nearest millimeter with percentages of total length (%TL), meristic counts and total body weight. They are also compared with those carried out on the first record from the Syrian marine water (ERHI 33-2022) (Table 3).

On 3 November 2023 a specimen of *Pomacanthus imperator* (Bloch, 1787) was caught using a speargun at a depth about 25 m, above a rocky bottom off Baniyas city by 35° 31' 24" N; 35° 56' 32" E, (Fig. 1). Also, measurements were recorded to the nearest millimeter with percentages of total length (%TL), meristic counts and total body weight, they also compared with those carried out on the first record as an adult specimen (Capapé *et al.*, 2018), and an other juvenile specimen (Ali *et al.*, 2022) from the Syrian marine waters (Table 2).

The three studied specimens were preserved in 10 % buffered formaldehyde and deposited in the Ichthyological Collection of the Marine Sciences Laboratory, Faculty of Agriculture, Tishreen University, receiving the following catalogue numbers 2327 MSL for *Lutjanus fulviflamma*, 2326 MSL for *Pomacanthus maculosus* and 2328 MSL for *P. imperator*, respectively.

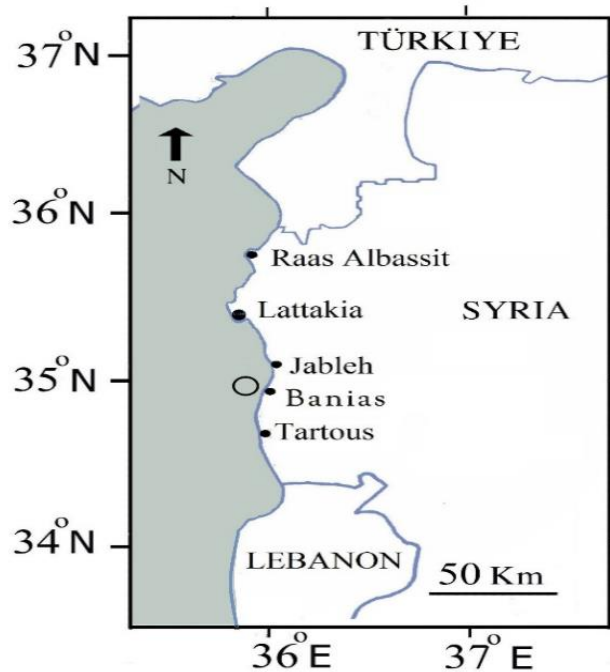


Figure 1: Map of the Syrian coast with a circle including the capture sites of the specimens of *Lutjanus fulviflamma* (ref. MSL 14/2022, Saad *et al.*, 2022; ref. MSL 2327, this study), the specimens of *Pomacanthus maculosus* (ref. ERHI 33-2022, Capapé *et al.*, 2023; ref. 2326 MSL, this study), and the specimens of *P. imperator* (ref. 73 - 2022 ERHI, Ali *et al.*, 2022; ref. MSL 2328, this study).

Results and Discussion

Dory snapper *Lutjanus fulviflamma* (Forsskål, 1775)

The specimen of Dory snapper *Lutjanus fulviflamma* was measured as 222 mm total length (TL), and weighed 161 g. It was a medium sized specimen, large specimens reach 350 mm TL according to Allen (1985). It was identified via the combination of main morphological characters: body moderately deep, no gap between temporal scale bands of each side, preopercular notch and knob poorly developed, vomerine tooth patch triangular with a medial posterior extension, posterior profile of dorsal and anal fins angular, caudal fin slightly emarginate. Color: silver and upper sides dusky; lower sides whitish; whitish belly, a series of 4 yellow stripes on sides, a prominent black spot at level of lateral line below base of anterior part of soft portion of dorsal fin, fins yellowish (Fig. 2).



Figure 2: Specimen of *Lutjanus fulviflamma* (ref. 2327 MSL) collected from the Syrian coast, off Baniyas, scale bar = 20 mm.

Table 1: Morphometric measurements in mm and as percentages of total length (%TL), meristic counts and weight in gram recorded in the specimen of *Lutjanus fulviflamma*, captured from the Syrian coast off Baniyas, (ref. 2327 MSL, this study) compared with the first substantiated record (ref. MSL 14/2022, Saad *et al.*, 2022).

Morphometric measurements	This study (MSL. 2327)		Saad <i>et al.</i> , 2022 (MSL 14/2022)	
	mm	%TL	mm	%TL
Total length (TL)	222	100.0	245	100.0
Standard length (SL)	187	84.2	195	79.6
Body depth	62	27.9	62	25.3
Head length	68	30.6	72	29.4
Eye diameter	15	6.8	17	6.9
Preorbital space	18	8.1	21	8.6
Pre-dorsal length	66	29.7	71	36.4
Pre-pectoral length	57	25.7	63	32.3
Pre-pelvic length	65	29.3	74	37.9
Pre-anal length	127	57.2	137	70.2
Total weight (g)	161		208	
Meristic counts				
Dorsal fin	X +14		X+14	
Pectoral fin	15		15	
Pelvic fin	I+6		I + 5	
Anal fin	III+8		III + 8	

General morphology, morphometric measurements, meristic counts and color are in total agreement with the previous descriptions of the species, such as Allen (1985), Randall *et al.* (1997), Vella *et al.* (2015), and Golani *et al.* (2021)

Lutjanus fulviflamma is widely distributed throughout the Indo-Pacific from South Africa to the Red Sea (Golani *et al.*, 2021) The species was recorded for the first time in the Mediterranean Sea from Malta in 2013 (Vella *et al.*, 2015), relatively far from Suez Canal and since no new finding was reported to date in this sea. Therefore, Vella *et al.* (2015) noted that such occurrence in the central Mediterranean Sea remains obscure and could not be considered as a Lessepsian migration (*sensu* Por, 1978) but the consequence of a human transportation via ballast water tanks or an aquarium release from marine vessels visiting the area. It was firstly reported in the Syrian marine waters by Saad *et al.* (2022) and the present specimen constitutes the second record of *L. fulviflamma* for the area and the third for the Mediterranean Sea. A migration from Malta Islands toward the Syrian coast remains questionable and the species could be considered as a Lessepsian migrant. The present record indicates that a viable population of *L. fulviflamma* probably occurs in the area.

Emperor angelfish *Pomacanthus imperator* (Bloch, 1787)

The specimen of Emperor angelfish *Pomacanthus imperator* measured 175mm TL, 145mm SL, and weighted 456g. Dorsal fin 14 spines, 21 yellow horizontal to upwardly oblique bands on body. Triangular, dark, blue-edged area from isthmus to lateral line origin, and similarly colored eye band, caudal fin yellow. General shape, morphometric measurements, meristic counts and color are in total agreement with Heemstra (2022); Capapé *et al.* (2018); and Golani *et al.* (2021). (Fig. 3).



Figure 3: Specimen of *Pomacanthus imperator* (ref. 2328 MSL) collected from the Syrian coast, off Baniyas, scale bar = 30 mm.

Table 2: Morphometric measurements in mm and as percentages of total length (%TL), meristic counts and weight in gram recorded in the specimen of *Pomacanthus imperator*, captured from the Syrian coast off Baniyas, (ref. 2328 MSL, this study) compared with the first record (Capapé et al., 2018), and a juvenile specimen (Ali et al., 2022).

Morphometric measurements	This study		Capapé et al. (2018)		Ali et al., (2022)	
	mm	%TL	mm	%TL	mm	%TL
Total length	175	100.0	326	100.0	122	100.0
Standard length	145	82.9	276	84.7	97	79.5
Head length	42	24.0	77	23.6	23	18.9
Body depth	100	57.1	154	47.2	35	28.7
Interorbital space	16	9.1	24	7.4	11	11.3
Eye diameter	9	5.1	14	4.3	8	6.6
Preorbital length	14	8.0	35	10.7	9	9.3
Snout length	22	12.6	25	7.7	11	9.0
Dorsal fin length	117	66.9	212	65.0	76	68.4
Pectoral fin length	38	21.7	68	20.9	20	16.4
Pelvic fin length	50	28.6	89	27.3	22	18.0
Anal fin length	56	32.0	123	37.7	26	21.3
Pre-pectoral length	35	20.0	71	21.8	38	31.1
Pre-dorsal length	40	22.9	90	27.6	40	32.8
Pre-pelvic length	47	26.9	86	26.4	30	24.6
Pre-anal length	98	56.0	169	51.8	68	55.7
Total weight (g)	456		1232		47	
Meristic counts						
Dorsal fin rays	XIV+ 20		XIV +20		XIV + 19	
Pectoral fin rays	18		18		18	
Pelvic fin rays	I+5		I + 5		I+5	
Anal fin rays	III+19		III+ 19		III+17	
Caudal fin rays	17		16		17	
Lateral line scales	74		77		72	

Yellowbar angelfish *Pomacanthus maculosus* (Forsskål, 1775)

The specimen of yellowbar angelfish *Pomacanthus maculosus* was measured as 245 mm total length and weighed 489 g. It was identified as *Pomacanthus maculosus* by the combination of the following morphological characters: body deep and compressed, almost circular;

head deep, snout short; mouth small, with brush-like teeth, preopercle with a large spine at its angle and vertical margin, smooth; bone between preopercle and operculum without spines; bone under eye without large, rear-pointing spines, front soft rays of dorsal and anal fin both with filaments; tail fin rounded, body with large and small scales, irregularly arranged, very rough, with distinct ridges on the exposed part, scales extend out onto the median fins; without "axillary process" (an enlarged scale) at the base of the pelvic fins; lateral line complete, colour of the body violet blue, with a narrow, vertical yellow oval bar on midbody; scales on forehead and nape dark blue; tail fin yellowish-white with blue marks. This colour is characteristic of adult specimens following Golani *et al.* (2021) who noted that in juvenile specimens the body is dark blue with fine, vertical light blue and with lines dark blue, and thin pale blue and white bars; center of body with yellow mark on upper side; tail fin transparent (Fig. 4).



Figure 4: Specimen of *Pomacanthus maculosus* (ref. 2326 MSL) collected from the Syrian coast, off Baniyas, scale bar = 30 mm.

Morphology, morphometric measurements, meristic counts and colour are in total accordance with previous descriptions of the species such as Bariche (2010), Salameh *et al.* (2012), Evans *et al.* (2016), Al Mabruk *et al.* (2021), Golani *et al.* (2021) and Capapé *et al.* (2023). The present finding constitutes the third record of *Pomacanthus maculosus* from the coast of Syria.

Table 3: Morphometric measurements in mm and as percentages of total length (%TL), meristic counts and weight in gram recorded in the specimen of *Pomacanthus maculosus*, captured from the Syrian coast off Banias, (ref. 2326 MSL, this study) compared with the first substantiated record (ref. ERHI 33-2022, Capapé et al., 2023).

Morphometric measurements	This study (2326 MSL)		Capapé et al. (2023) ERHI 33-2022	
	mm	%TL	mm	%TL
Total length	245	100.0	275	100.0
Standard length (SL)	200	81.6	222	80.7
Body depth	140	57.1	150	54.5
Head length	55	22.4	60	21.8
Eye diameter	12	4.9	12	4.4
Snout length	15	6.1	35	12.7
Upper jaw length	8	3.3	9	3.3
Lower jaw length	9	3.7	10	3.6
Dorsal fin length	210	85.7	212	77.1
Pectoral fin length	52	21.2	62	22.5
Pelvic fin length	78	31.8	86	31.3
Anal fin length	111	45.3	155	56.4
Caudal fin length	45	18.4	53	19.3
Pre-dorsal length	61	24.9	75	27.3
Pre-pectoral length	60	24.5	63	22.9
Pre-pelvic length	77	31.4	83	30.2
Pre-anal length	140	57.1	143	52.0
Total weight (g)	489		602	
Meristic counts				
Dorsal fin	XII+20		XII+21	
Pectoral fin	18		17	
Pelvic fin	I+5		I+5	
Anal fin	III+19		III+19	
Caudal fin	15		15	
Number of gill-raker on the first branchial arch	17 (4+13)		17(5+12)	

Additionally, *P. maculosus* is the second species of the genus *Pomacanthus* Lacépède, 1802, occurring in the Syrian marine waters, the first species being emperor angelfish *P. imperator* (Bloch, 1787)

recorded by Capapé *et al.* (2018). *P. imperator* mainly differs from *P. maculosus* by some colour patterns. *P. imperator* displays diagonal alternative stripes of narrow yellow and wider bluish-purple, black mask with bluish margin on the eye, and by yellow ends of dorsal and caudal fins (Golani *et al.*, 2021). Other morphological characters allow to distinguish both species, such as lack anal fin both with filaments, first 5-7 dorsal fin spines deeply notched, 4th and 5th dorsal rays and 4th and 5th anal rays very elongated, as one of the best instances.

Salameh *et al.* (2012) noted that the source of *Pomacanthus maculosus* could be due to a Lessepsian migration. The captures of the species in different regions of the Mediterranean Sea indicate that a substantial population is at present successfully established in this sea, at least in eastern and central areas as suggested by Golani *et al.* (2021). The present findings of *P. imperator* and *P. maculosus* could be considered as an extension range of the distribution for both species in the Levant Basin. Conversely, a possible escape or a release from aquarium, or possibly a ship's ballast water cannot be totally ruled out (Zavala-Jiménez, 2022). It appears that Pomacanthid species display the morphology of poor swimmers and are not prone to large migrations.

These new captures of *Lutjanus fulviflamma*, *Pomacanthus imperator* and *P. maculosus* suggest that these species found sufficient resources to develop and reproduce in the Syrian marine waters, and probably viable populations are currently establishing in the region. Similar patterns were observed during several decades by various non-indigenous species in the Syrian coast. Therefore, this latter constitutes a hot spot for this kind of species, as a suitable hypothesis. So, an up-dated check-list of the fish species from the Syrian marine water remains necessary and useful. Compared with the previous work of Ali (2018), it will be a good support to delineate the real status of these species in the area and their qualitative and quantitative impact on local fisheries. The economical aspects of these fisheries cannot be totally ruled out.

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تسجيلات إضافية لثلاثة أنواع سمكية عظمية غريبة *Dory snapper Lutjanus fulviflamma* (Lutjanidae), Emperor angelfish *Pomacanthus imperator* and yellow bar angelfish *P. maculosus* (Pomacanthidae) من الساحل السوري (شرق البحر الأبيض المتوسط)

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المستخلص

يعرض المؤلفون ثلاث عمليات أسر جديدة لثلاث عينات تنتمي لأنواع سمكية عظمية غريبة في المياه البحرية السورية، العينة الأولى تنتمي للنوع *Lutjanus fulviflamma* (Forsskål, 1775)، بلغ طولها الكلي 222 ملم ووزنها الكلي 161 غ، وكانت العينة الثانية من النوع *Pomacanthus maculosus* (Forsskål, 1775) بلغ طولها الكلي 245 ملم ووزنها 489 غ، أما العينة الثالثة فكانت تنتمي للنوع *Pomacanthus imperator* (Bloch, 1787) وقد بلغ طولها الكلي 175 ملم ووزنها 456 غ. إن عمليات الأسر الثلاثة هذه تقترح إمكانية تأسيس جماعات سمكية من هذه الأنواع الثلاثة وانتشارها بنجاح في المياه البحرية السورية.
كلمات مفتاحية: Lutjanidae, Pomacanthidae، هجرة، حوض بلاد الشام، الساحل السوري.