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Preliminary study on the biological traits of the Por's goatfish *Upeneus pori* (Chordata: Actinopterygii) off the southern coast of Lampedusa Island (Central Mediterranean)

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Abstract

One hundred and six specimens of the Por's goatfish, *Upeneus pori* Ben-Tuvia & Golani (1989), a Lessepsian species native to the Western Indian Ocean, were collected from bottom trawlers' catches from 2012 to 2016 on the deep shelf off the southern coast of Lampedusa Island (Strait of Sicily, Central Mediterranean Sea). Since it first appeared in Iskenderun Bay (Turkey) in 1950, the Por's goatfish has quickly spread in Levantine Sea waters to become a commercial species used by local fisheries, while continuing its range expansion along the south-eastern coasts of the Mediterranean. Because the Strait of Sicily currently represents the westernmost sector of this species distribution area, it might serve as a stepping-stone for this species' expansion in the western basin of the Mediterranean. Supporting this hypothesis was our finding of specimens with post-spawning gonads. The pattern of westward expansion by the Por's goatfish in the Mediterranean Sea and its settlement in the Strait of Sicily are discussed in relation to the warming trend over the last 30 years.

Keywords: Lessepsian species, tropicalisation, biodiversity, bio-invasion, Strait of Sicily

Introduction

The biodiversity of the Mediterranean Sea has changed considerably over the past two decades, mainly due to the increasing occurrence of non-indigenous species (NIS) introduced both naturally (i.e. via Suez Canal and the Strait of Gibraltar) and via human activities, such as marine shipping (e.g. ballast waters, fouling) and aquaculture (Galil et al. 2017; Scannella et al. 2017). However, the arrival of exotic species in the Mediterranean Sea is a dynamic ongoing process, in that the total number of NIS doubled (223%) between 1970 and 2015, with the greatest increase recorded in the last 25 years (Galil et al. 2016).

Recently, Zenetos et al. (2017) listed a total of 821 NIS in the region, of which 613 were defined as established. Fishes are an important component of this NIS list and almost half of them are Lessepsian species (i.e. Erythrean non-indigenous species: ENIS) that arrived from the Red Sea through the Suez Canal (Deidun et al. 2015). Most of these

ENIS fish species remain largely confined to waters of the Levantine Sea (Quignard & Tomasini 2000; Mavruk & Avsar 2007), the Mediterranean area with the highest water temperature and salinity. Lately, however, increasingly more fish species are showing a trend of westward geographical expansion alongside the ongoing warming of the Mediterranean Basin (Skiris et al. 2012). Clear examples of this movement are *Stephanolepis diaspros* Fraser-Brunner, 1940 (Deidun et al. 2015), *Siganus luridus* Rüppell, 1828 (Azzurro & Andaloro 2004), *Lagocephalus sceleratus* Gmelin, 1789 (Azzurro et al. 2014), *Acanthopagrus bifasciatus* Forsskål, 1775 (Ben Souissi et al. 2014), *Etrumeus teres* DeKay, 1842 (Falautano et al. 2006), and *Fistularia commersonii* Rüppell, 1838 (Azzurro et al. 2013). This last species represents the most successful example of fish colonisation in the Mediterranean, expanding its range to the whole basin in just 7 years (Azzurro et al. 2013; Vitale et al. 2016).

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Among the Lessepsian fish, the Por's goatfish (*Upeneus pori*) is native to the Western Indian Ocean, where its distribution ranges from the Red Sea to Oman, Madagascar and South Africa (Ben-Tuvia & Golani 1989). In the Mediterranean Sea this fish was first reported from Iskenderun Bay (Turkey) by Kosswig (1950) as *Upenoides* (= *Upeneus*) *tragula*. After this initial detection, *U. pori* was recorded off the coast of Israel (Golani 1994), Egypt (El-Sayed 1994), Lebanon (George & Athanassiou 1996) and Libya (El-Drawany 2013; Sergiwa et al. 2017). The species also appeared along the Tunisian coasts Gulf of Gabes and Bizerte Lagoon (Ben Souissi et al. 2005; Azzouz et al. 2010) where only two specimens were recorded, and, more recently, in the Aegean Sea (Filiz 2012; Stamouli & Dogrammatzi 2016).

Information on the biological traits of Por's goatfish in the Levantine Sea are provided by Taskavak and Bilecenoglu (2001), Cicek et al. (2002, 2006), Ismen (2006), Cicek and Avsar (2011), Ok (2012) and Edelist (2014). Recently, the biology of this species along the coasts of Libya was also studied (El-Drawany 2013; Sergiwa et al. 2017).

In the present study, we report the first biological information on *U. pori* occurring in the Strait of Sicily (General Fisheries Commission for the Mediterranean (GFCM) - Geographical Sub-Area (GSA) 13), currently the westernmost Mediterranean area where the species is confirmed as established. The biometrics, meristics, measurement size distribution, sex ratio, length-weight relationship (LWR), and length at age were described and compared with those studies carried out in the Central-Eastern Mediterranean Sea. The westward expansion of *U. pori* from the Levantine Sea as related to the ongoing warming trend of Mediterranean waters is also discussed, as well as the potential for this species' future expansion in the western basin.

Materials and methods

A total of 106 specimens of *U. pori* were collected from commercial trawlers that targeted the striped red mullet (*Mullus surmuletus* Linnaeus, 1758) off the south coast of Lampedusa Island in the period 2012–2016 (Figure 1).

Specifically, in 2012, 2014, 2015 and 2016 the numbers caught were respectively two, nine, 31 and 64 individuals. All the specimens were fished in autumn (November and December) from 50–70 m depth, identified and compared to the meristics and morphological characters provided by Ben-Tuvia and Golani (1989) and Ben Souissi et al. (2005) (Figure 2; Table I).

Each specimen was sexed, measured (total length: TL) to the nearest 0.1 cm, and weighed to the nearest 0.1 g. Maturity stage was determined by visual examination of the gonads according to a 7-stage gonadic scale. In particular, juveniles (immature) were classified within the first two stages while adults were classified by the third, fourth and fifth stages in the maturing, spawning phase and by the sixth and seventh stages in the post-spawning/resting phase (International bottom trawl survey in the Mediterranean (MEDITS) scale, Anonymous 2016).

The LWR for *U. pori* was calculated using the equation $W = aTL^b$ (Sparre et al. 1989), where W is wet body weight (g) and TL is total length (cm), with the estimated a and b parameters then compared with those reported for other Mediterranean areas (Table II). The condition factor (K) was calculated according to Bagenal and Tesch (1978) as:

$$K = \frac{W}{TL^b} * 100$$

Otoliths (sagittae) were extracted from each specimen and read as a whole under a stereomicroscope at 9× magnification with reflected light.

These readings were taken at least 3 times by two trained readers. When a mismatch in this count occurred, then the same two readers together re-analysed the otolith under a two-seat stereomicroscope. Since the specimens were collected only during autumn months, it was not possible to verify the periodicity of marks laid monthly following the classical marginal increment analysis (MIA; Campana 2001). Similar to *Mullus barbatus* Linnaeus, 1758, the first translucent ring was considered the demersal check laid down during bottom settlement after the pelagic life stage (Sieli et al. 2011). Annuli (i.e. winter rings) were identified as those translucent rings clearly marked all the way around the otolith. Assuming that one annulus is laid per year, a specimen's age was estimated by counting the number of annuli. To explore the relationship between the Por's goatfish's expansion in the central-south Mediterranean and the ongoing warming trend, we analysed the temporal pattern in the position of the 15°C isotherm for February and the species occurrence. According to Bianchi (2007), the 15°C isotherm is the main barrier to expansion of warm-affinity species from the eastern Mediterranean towards the western basin. Sea surface temperature (SST) data were obtained from E.U. Copernicus

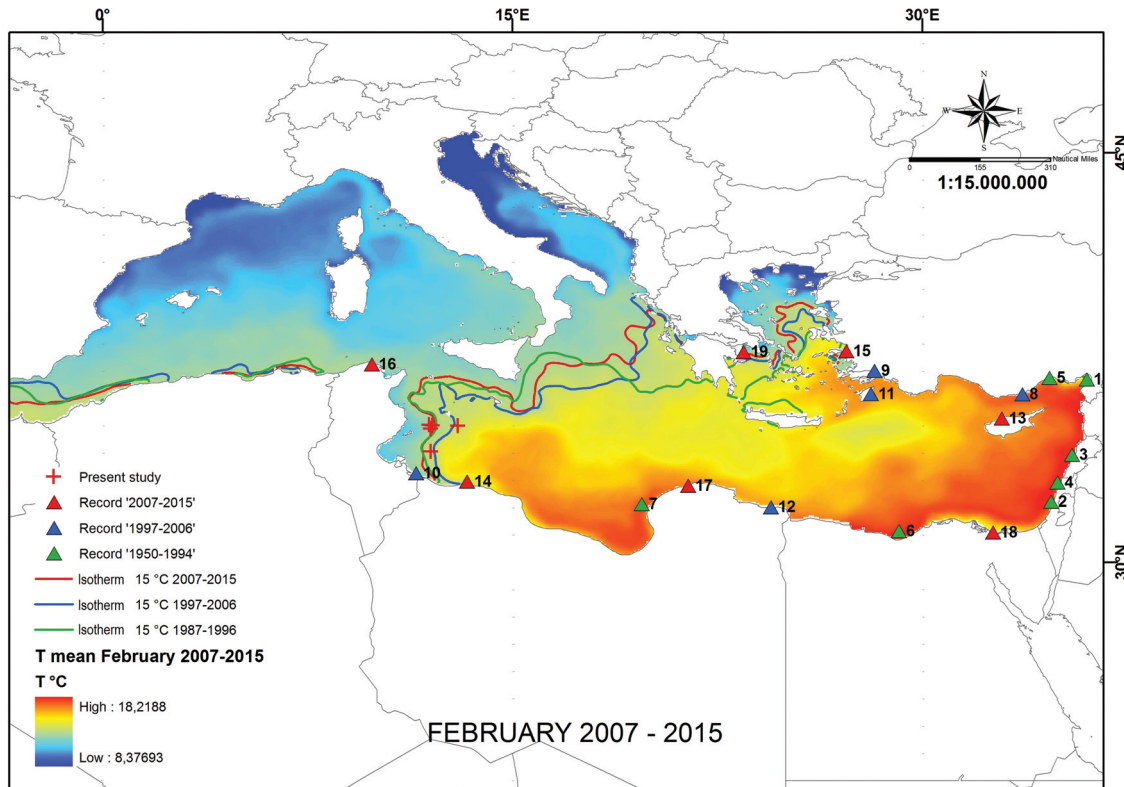


Figure 1. Updated map showing location of *Upeneus pori* first records in the Mediterranean basin reported according to the catch date. 1: 1950 (Kosswig 1950); 2: 1953 (Ben-Tuvia 1953); 3: 1954 (George & Athanassiou 1996); 4: 1984–1986 (Golani 1994); 5: 1991–1994 (Torcu & Mater 2000); 6: 1994 (El-Sayed 1994); 7: 1994 (Ben-Abdallah et al. 2005); 8: 1999–2000 (Cicek et al. 2002); 9: 2000–2001 (Ögretmen et al. 2016); 10: 2003 (Ben Souissi et al. 2005); 11: 2003 (Corsini et al. 2005); 12: 2005–2006 (Shakman 2007); 13: (Tzomos 2007); 14: 2007–2008 (El-Drawany 2013); 15: 2009 (Filiz 2012); 16: 2010 (Azzouz et al. 2010); 17: 2010–2012 (Bazairi et al. 2013); 18: 2011–2012 (Ramadan & El-Halfawy 2014); 19: 2015 (Stamouli & Dogrammatzi 2016); +: present study.



Figure 2. *Upeneus pori* caught off Lampedusa Island (Strait of Sicily).

Marine Service Information (Simoncelli et al. 2014) and averaged over three decennial periods: 1987–1996, 1997–2006 and 2007–2015.

Results

Upeneus pori specimens showed an elongated body. The snout is rounded. The chin has two short,

thin barbels. The body is reddish-brown with darker hues above and lighter hues below. The upper lobe of caudal fin has 4–7 oblique crossbars; the lower lobe has 4–7 crossbars occupying less than half of the outer side of the lobe, followed by an almost solid brown space, while the inner edge of the lobe is crossed by 3–4 oblique bars (Figure 2; Table I).

Table I. Biometric comparisons of *Upeneus pori* among Mediterranean authors, expressed as percentage of standard length (%SL), together with meristic counts (*Ben Souissi et al. 2005, **Ben-Tuvia & Golani 1989). Moreover, mean, standard deviation (SD), and minimum and maximum values recorded in the present study are provided. NA: Not Available.

Biometrics (measurements)	Present study				% SL	*	**
	Mean (mm)	SD (mm)	Minimum (mm)	Maximum (mm)		Mean (mm)	Mean (mm)
Total length	143.9	8.6	122	162		110	124
Standard length	115.5	7.7	95	137		93	98
Fork length	126.7	8.1	110	147	109.7	105.1	NA
Head length	29.7	2.3	24.5	35.9	25.8	26.6	23.5
Eye length	8.0	0.8	6.7	10.9	7.0	6.8	7.2
Length of upper jaw	11.4	1.7	8.8	20.4	9.8	NA	NA
Length of barbels	17.6	2.3	13	24.1	15.3	14.9	15.8
Operculum thick	16.1	1.3	12.6	19	14.0	NA	NA
Operculum height	22.1	1.7	18	26.4	19.2	NA	NA
Caudal fin length	30.2	2.5	25.8	35.5	26.1	18.7	NA
Anal fin height	16.3	1.4	13	19.2	14.1	15.8	13.6
Base anal fin width	12.4	1.1	10.1	16	10.8	15.9	NA
Pelvic fin length	19.6	1.6	15.7	22.8	17.0	17.7	20.4
Base pelvic fin width	5.2	1.0	3.2	8.3	4.5	5.16	NA
Pectoral fin length	21.3	1.7	18.2	25.2	18.4	17.8	20.3
Base pectoral fin width	4.7	0.5	3.6	6.2	4.1	4.4	NA
First dorsal fin height	20.6	1.5	16.2	24.9	17.8	16.3	14.8
Base dorsal fin width	17.5	2.2	5.3	22.4	15.2	14.1	NA
Second dorsal fin height	16.8	1.4	14	20.7	14.5	16.3	14.8
Base dorsal fin width	16.1	1.2	13.3	19.3	13.9	14.5	NA
Meristics (counts)			Present study			*	**
Dorsal ray			VII + 9			VII + 9	VII + 9
Pelvic ray			I + 5			I + 5	-
Pectoral ray			14			14	-
Anal ray			-			I + 7	I + 7
Upper caudal lobe			4-7			-	3-7
Lower caudal lobe			4-7			-	5-7

Table II. Synopsis of the available information on sex ratio, length-weight relationship (LWR), and LWR type of *Upeneus pori* (A+ positive allometric growth; A- negative allometric growth; I isometric growth) in different Mediterranean areas.

Region	n	Sex ratio (F:M)	a	b	Sex	L min- L max (cm)	R ²	Growth type	Source
Turkey	102		0.0050	3.26	Pooled	9.1-14.7	0.980	A ⁺	Taskavak & Bilecenoglu (2001)
Mersin Bay, Turkey	1225		0.0087	3.05	Pooled	5.1-15.5	0.963	I	Cicek et al. (2006)
Iskenderun Bay, Turkey	616	1.10:1.00	0.0102	3.01	Pooled	6.6-17.0	0.990	I	Ismen (2006)
	292		0.0108	2.99	M	6.6-15.1	0.990	I	
	324		0.0097	3.03	F	7.0-17.0	0.990	I	
Iskenderun Bay, Turkey	247		0.0107	2.95	Pooled	6.3-15.5	0.961	A-	Cicek & Avsar (2011)
Mersin Bay, Turkey	1973	1.00:0.82	0.0067	3.15	Pooled	8.0-19.2	0.994	A ⁺	Ok (2012)
	562		0.0074	3.11	M	8.0-16.1	0.982	A ⁺	
	661		0.0071	3.14	F	8.3-19.2	0.988	A ⁺	
Tripoli coast, Libya	234	1.00:1.08	0.0106	2.99	M	10.2-17.4	0.980	I	El-Drawany (2013)
	252		0.0107	3.00	F	10.4-17.2	0.990	I	
Israel	68		0.0050	3.31	Pooled	7.0-17.5	0.977	A ⁺	Edelist (2014)
Off Lampedusa, Italy	95	3.59:1.00	0.0132	2.92	Pooled	12.2-16.2	0.862	A-	Present study

The catch sample was composed of *U. pori* specimens between 12.2 and 16.2 cm TL, with the females (12.2 and 16.2 cm TL) significantly longer (Kruskal–Wallis test: $P < 0.01$) than the males (12.6–15.4 cm TL; Figure 3).

Females accounted for approximately 78% of the total sample. Examination of the female gonads showed that 49 specimens (mean \pm standard deviation: 14.3 ± 0.8 cm TL) had a translucent ovary that was approximately half as long as the body cavity, but with no visible eggs, thus indicating either an immature stage or a recovering phase. A total of 22 specimens (15.0 ± 0.5 cm TL) were maturing, with eggs visible within a translucent ovaric tunica two-thirds the length of their body cavity. Just four specimens (15.0 ± 0.9 cm TL) were mature, having an ovary with conspicuous superficial blood vessels and ripe eggs, while another four (15.3 ± 0.6 cm TL) were spent, featuring flaccid ovaric walls that contained remnants of disintegrated eggs.

Observation of the male gonads revealed 18 specimens (13.6 ± 0.8 cm TL) that were maturing or in a recovering phase (symmetrical testes, approximately half the body cavity length), two specimens (13.0 and 14.5 cm TLs) that were mature (whitish to creamy testes, approximately two-thirds the body cavity length), and two (13.5 and 14.9 cm TLs) that were spent (blood-shot and flabby testes, shrunken to approximately half of body cavity length).

Since the length–weight plot showed no sex difference, and given the reduced number of males in the sample, the LWR was analysed by pooling the two sexes (Figure 4).

This relationship took the form of $W = 0.0132TL^{2.923}$ ($r^2 = 0.862$), which corresponded to

negative allometric growth (t -test: $P < 0.01$) and the lowest b parameter for *U. pori* in the Mediterranean. The average value of condition factor (K) for this species was 1.34. The main results for the sex ratio and LWR of the *U. pori* collected in the present study, and a comparison with those from the literature, are summarised in Table II.

According to Tuset et al. (2012), the otolith shape is elliptic and the ventral margin crenate. The anterior region is peaked while the posterior region is oblique. Otolith inspection indicated the occurrence of a translucent zone along the margin, suggesting that fish were in a period of slow growth. The ring pattern featured well-defined translucent rings appearing all around the otoliths, which might indicate a seasonal growth pattern (Figure 5).

The specimens' estimated ages ranged between 1 and 5 years old for a female of 15.9 cm. Age class 2+ predominated in both sexes, accounting for approximately 54 and 58% of the females and males, respectively (Table III).

The SST data indicated that the 15°C February isotherm in the Aegean and Eastern Ionian Sea (Eastern Mediterranean Sea) has gradually moved northward over the last 30 years. In the Strait of Sicily (Central Mediterranean Sea), the 15°C February isotherm oscillated during the same period but without a specific directional pattern (Figure 1).

Discussion

After first being recorded off the Mediterranean Turkish coast, *U. pori* spread and established in Levantine waters, off Lebanon and Israel, during the 1950s. Between the middle 1980s and the

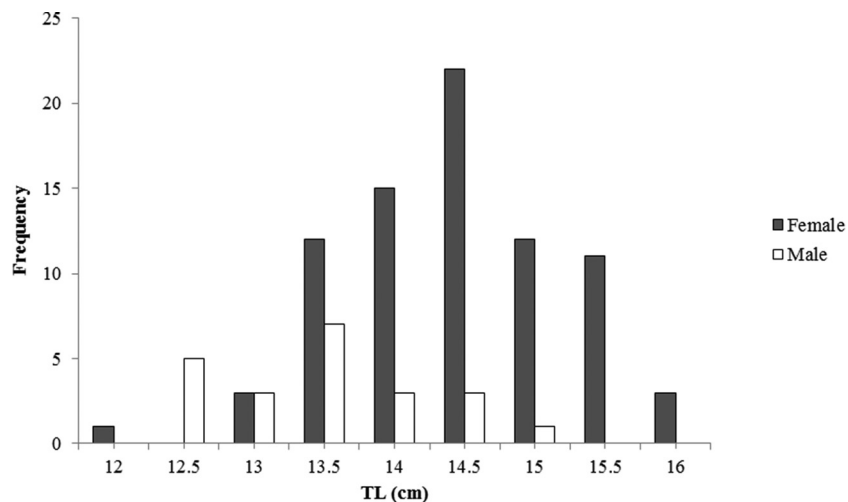


Figure 3. Length frequency distribution (LFD) of *Upeneus pori* recorded off Lampedusa Island (Strait of Sicily).

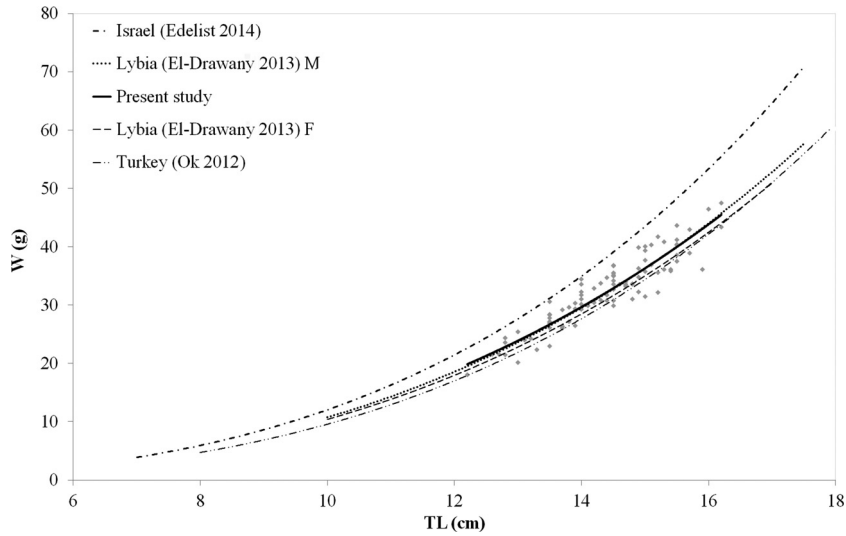


Figure 4. Weight at length (grey diamonds) and length weight relationship (LWR, continuous curve) of *Upeneus pori* recorded off Lampedusa island (Strait of Sicily). Available LWRs of the species from other areas of the Mediterranean are also reported (dotted curves).

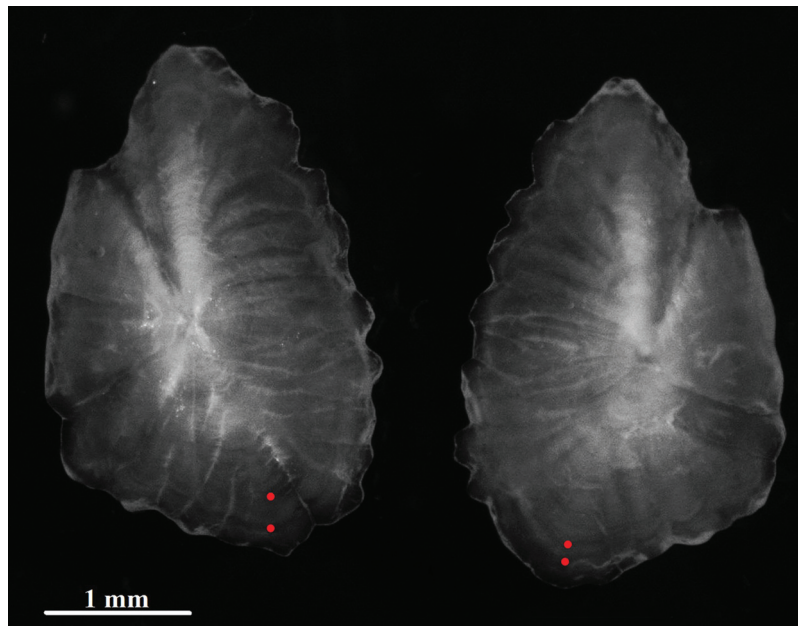


Figure 5. Otoliths (*sagittae*) of a *Upeneus pori* female, 15.2 cm TL, caught off Lampedusa Island (magnification 70×).

middle 1990s, the species expanded westward along the northern coast of Africa, reaching the Gulf of Sirte in 1994, the southern Aegean Sea in the second half of the 2000s, and more recently the Strait of Sicily. But its north-east expansion along the Turkish coast has been slower, with *U. pori* reaching the areas adjacent to Rhodes Island only in the early-middle 2000s (e.g. Corsini et al. 2005) (Figure 1).

Our results showed that the Por's goatfish is well established on the East Tunisian continental shelf, with its population size likely increasing. In the early

2000s just two specimens were recorded in Bahiret El Biban (Ben Souissi et al. 2005) and the Bizerte lagoons (Azzouz et al. 2010), but in 2016 this reached 64 specimens collected off Lampedusa Island in a single trawl fishing trip. All these findings should be probably interpreted as the natural expansion of the Libyan population described in 2007–2008 by El-Drawany (2013).

Morphometric and meristic data of *U. pori* specimens collected off Lampedusa Island and relative length proportions generally corresponded to those

Table III. Mean, standard deviation, minimum and maximum length at age (total length, TL; all in mm) of the *Upeneus pori* caught off Lampedusa Island (Strait of Sicily). NA: Not Available.

Age class	Female (min–max)	Male (min–max)	Pooled (min–max)
1	131 ± 12 (122–139)	133 ± 5 (126–137)	132 ± 7 (122–139)
2	144 ± 6 (132–155)	134 ± 6 (127–142)	142 ± 7 (127–155)
3	149 ± 8 (132–162)	147 ± 10 (140–154)	148 ± 8 (132–162)
4	156 ± 6 (150–162)	149 ± 0 149	154 ± 6 (149–162)
5	159 ± 0 159	NA	159 ± 0 159

reported by Ben Souissi et al. (2005) and Ben-Tuvia and Golani (1989), with exception of caudal fin length, base anal fin width and first dorsal fin height (Table I).

The modal total lengths – 14.5 cm TL for females and 13.5 cm TL for males – of the specimens collected in this study were higher than the corresponding sizes reported from Turkey (Ismen 2006), at 13.0 and 12.0 cm TL. Furthermore, Akar and Gündoğdu (2013) and Cicek and Avsar (2011) reported the modal length as 9.0 cm TL, also from Turkey. Recently, in the Gulf of Suez, Sabrah et al. (2017) collected specimens that were 9.0 to 16 cm long, with a modal length of 15 and 10 cm TL, respectively, for the females and males. The maximum length recorded in the present study was 3.0 cm shorter than maximum length reported in the Mediterranean (19.2 cm TL) – by Ok (2012) in Turkey – and in its native area (Randall 1995). Such differences may be explained by the fact that the samples included in this study were collected during commercial trawling that targeted *M. surmuletus* always at the same depth (from 50 to 70 m) and in one season (autumn). As such, our sampling likely represented only a fraction of the existing population.

The specimens collected off Lampedusa Island showed a negative allometric growth pattern ($b = 2.92$), which is the lowest yet recognised in the Mediterranean (see Table II). However, when comparing the LWR for the pooled-sex sample with those from the available literature, our curve looked quite similar to these other ones, with the exception of those specimens caught off Israel (Edelist 2014). However, unlike the available data for other Mediterranean regions, the sex ratio of our sample was skewed towards females (Table II), a discrepancy that is likely explained by the restricted depth range in the Strait of Sicily from which our specimens were captured. Since

the largest specimens of Mullidae, usually females, occur on the deepest marine bottoms (Warburton & Blaber 1992; Machias & Labropoulou 2002), the unbalanced sex ratio in our study is not that surprising.

Spawning data for the Por's goatfish collected off Lampedusa Island indicated a spawning period that extended into autumn. Most of the studies carried out in the Mediterranean limit this species' spawning season to the period from April to September (Golani 1994), with its spawning peak varying longitudinally from April (Turkey: Cicek et al. 2002; Ismen 2006; Ok 2012) to May (Egypt: Ramadan & El-Halfawy 2014) and June (Libya: El-Drawany 2013). Our results agree with Mediterranean records for the Gulf of Suez, for which the spawning period extends from May to September (Sabrah et al. 2017).

A preliminary analysis of the age structure of the specimens sampled off Lampedusa Island indicated a predominance (approx. 55%) of age class 2 or higher, similar to that found off the Turkish coasts by Ismen (2006). Due to the small number of specimens we collected it was not possible to estimate a von Bertalanffy growth curve. Nonetheless, superimposing our length-at-age estimates with the available von Bertalanffy curves suggests that our specimens in age class 1+ were apparently larger than those from other Mediterranean areas, while our specimens in age classes 2+ and 3+ overlapped with the curves reported by Ok (2012) from Turkey and by El-Drawany (2013) from Lybia (Figure 6).

Although based on a few individuals, our lengths at age classes 4 and 5 seem shorter than those reported in the literature for other Mediterranean areas. According to El-Drawany (2013), *U. pori* attained more than 51% of its maximum size during the first year of life, after which its annual growth rate ranged between 1.4 and 3.7 cm. Similarly, the Por's goatfish in Turkey attained approximately 48% of its calculated maximum size during the first year of life, after which its annual growth rate decreased to between 1 and 3 cm (Ismen 2006).

We believe that this preliminary information on the biological traits of *U. pori* on the continental shelf off Lampedusa Island is relevant for monitoring this species' spread in the Mediterranean Sea. The Lampedusa population of Por's goatfish represents the westernmost occurrence of the species; hence, it can potentially serve for its further expansion into the central and western Mediterranean basin via the Strait of Sicily. The abundance of the species in this area, now documented by > 100 specimens caught by trawling, likely indicates the occurrence of an established population, one that is probably positively affected by the ongoing phase of increasing temperature and salinity in the

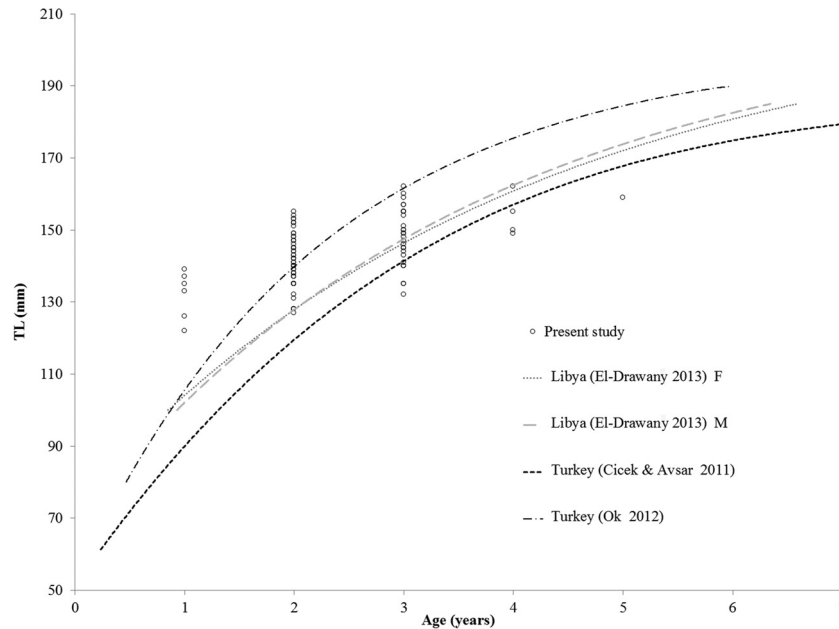


Figure 6. Length-at-age of *Upeneus pori* recorded off Lampedusa Island (Strait of Sicily). Available von Bertalanffy growth curves of the species from other areas of the Mediterranean are also reported (dotted curves).

Mediterranean waters (Adloff et al. 2015). The rise in sea surface temperature over the last 20 years has led to a progressive, although non-linear, westward shift of the 15°C isotherm. This isotherm is regarded as one of the main abiotic barriers for constraining the expansion of warm-affinity species from the eastern to the western Mediterranean basin (Bianchi 2007). This applies to the Por's goatfish, as its distribution range seems at the moment limited to those areas with a winter SST over 15°C. It is clear, however, that other environmental factors could play an important role in the future expansion of this species. For example, to investigate the reason behind the fast colonisation of the whole Mediterranean by *Fistularia commersonii*, Azzurro et al. (2013) used a habitat suitability model and found a significant effect of both chlorophyll *a* and salinity.

Warming and climate change have been shown to favour both the entry and the dispersal of tropical species in the Mediterranean Sea (Astraldi et al. 1995; Ben Rais Lasram et al. 2008; Raitos et al. 2010; Skliris et al. 2012), some of which have already reached its northernmost sectors (Dulčić et al. 2007; Daniel et al. 2009; Lipej et al. 2009; Puce et al. 2009). Indeed, the fast global warming has inevitably led to a progressive vanishing of the thermal differences among surface waters across the basin. This process is likely to produce a progressive north-west shift of the water temperature and salinity barriers limiting non-

native species distributions in Mediterranean. This should lead to an increased expansion of the “warm” aquatic biota and the replacement of “cold species”, with as-yet uncertain impacts on biodiversity and ecosystem services. Por's goatfish, similarly to what has already occurred off the coast of the Middle East (Ismen 2006; De Meo et al. 2017), has become a new fishery resource for local fishing fleets. However, any economic benefits produced will depend on how this species impacts the indigenous species, in particular its potential competitors, namely the autochthonous goatfish *M. barbatus* and *M. surmuletus*.

Geolocation information

Geolocation information about the finding of *U. pori* caught between 2012 and 2016 in the Strait of Sicily.

Date	Lat.	Long.
2012	35 20	12 20
2014	35 14	12 05
2015	35 05	13 05
2016	34 37	12 17
2016	35 10	12 22
2016	35 10	12 22
2016	35 12	12 40

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This study has been conducted using E.U. Copernicus Marine Service Information. Furthermore, all specimens were caught within the module of monitoring commercial catch (CampBioI) of the European Data Collection Framework (DCF).

Disclosure statement

No potential conflict of interest was reported by the authors.

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