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Short Commincation

A Review on the Occurrence of the Blunthead Puffer, *Sphoeroides pachygaster* (Müller & Troschel, 1848) in the Mediterranean with a New Occurrence from Oran Bay (Western Algeria)

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ABSTRACT

The blunthead puffer, *Sphoeroides pachygaster* was first recorded in Algerian waters in 2009 from Annaba Gulf (Western Mediterranean) caught by a trawler at 150 m depth. Since then the records show there been no further observations in Algerian waters. In this paper, we report a new record of *S. pachygaster* from western Algerian coasts, eleven years after it was first recorded in Eastern Algeria. Two specimens were caught, the first by an angler in Bousfer beach on 25th January, 2020, measuring 360.6 mm TL and weighting 2250g and the second by trammel net in "Les Andalouses" bay measuring 409.5 mm TL and weighting 2420g. Accordingly, we describe biometrical and meristic characteristics, literature, databases and fish collections reviews of this Tetraodontidae, a species new to the Western Algerian fish fauna.

Keywords: Puffer, Blunthead, Tetraodontidae, Oran Bay, Algeria, Western Mediterranean

INTRODUCTION

Non-native fauna or flora are organisms found outside their known area of distribution in which the Mediterranean Sea is not part of their original distribution area (UNEP-MAP-RAC/SPA.2011). Marine environment is continuously assaulted by anthropic activities pressures namely habitat destruction, resources over-exploitation and climate change (Crain et al., 2008; Halpern et al., 2015). Occhipinti-Ambrogi & Galil (2010), stated that climate change on its own facilitates overcoming historic geographic barriers.

Blunthead *Sphoeroides pachygaster* is a marine benthopelagic species living in a depth between 50 and 480 m (Matsuura and Tyler, 1997) but usually lives between 50 and 250 m (Ragonese et al., 1992). Found in all oceans of central and temperate latitudes (Shipp, 1974 in Carpenter et al., 2016) it is also the most wide-ranging species in the genus Sphoeroides (Shipp, 2002). This family shares with its near relatives, the diodontidae, the ability to inflate, probably for protection from predation (Martin and Drewry,1978). It inhabits sandy, muddy and rocky bottoms (Schneider, 1990) and young specimens are pelagic (Robins and Ray, 1986). *S. pachygaster* feeds mainly on squid (Smith and Heemstra, 1986), cuttlefish, octopus, but also feeds on small bony fish (Psomadakis et al., 2008). Juveniles of *S. pachygaster* are known to be pelagic whereas adults prefer benthic habitats such as sandy, muddy, and rocky bottoms (Robins and Ray 1986; Tortonese, 1986). In general, Tetraodontidae are capable of inflating their abdomens with water when frightened or disturbed and are capable of producing and accumulating toxins such as tetrodotoxin and saxitoxin in the skin, gonads, and liver. The de-

gree of toxicity varies by species, and also according to geographic area and season (Allen and Erdmann, 2012). Noguchi and Arakawa (2008) consider blunthead puffer as weakly toxic while in the Mediterranean, it is considered non-toxic (Ragonese and Morara 2012). Little is known about reproduction and other life history aspects of this species.

Sphoeroides pachygaster is not directly targeted by fishing gears but can be a by-catch of semi-industrial fishing, purse seines, trawls, gillnets, bottom longlines, drifting longlines. Shao et al., (2014) stated that it is a least concern species on the IUCN Red List (ver 3.1) and that although it may be subject to high discard mortality when taken as bycatch in some fisheries, there do not appear to be any major threats and there are no recorded population declines.

A review of available literature showed that a reduced number of articles dealt with this Tetraodontidae: Ishizaki et al., (2006); Vella et al., (2017) on molecular identification, Carlucci et al., (2019) on isolation of glycoconjugates, Nagashima et al., (2018) on toxicity, Ragonese and Morara (2012); Peatman et al., (2017) on bycatch; Cammilleri et al., (2019) on parasites. The remaining available documentation focused on occurrence all around the world: Wirtz et al., (2017) in Ascension Island (South Atlantic Ocean); Sampaio et al., (2001) in Brazilian waters; Gilhen et al., (1985) in Canadian waters; Hanel and John, (2014) in Cape Verde islands; Quero et al., (1991; 1998); Bearez et al., (2017) in Atlantic French waters; Wheeler and Van Oijen, (1985); Quigley and Flannery, (1992; 2004) in Irish waters; Shinohara et al., (2009, 2011, 2014) in Japanese waters; Duffy and Ahyung, (2015) in New Zealander waters; Okan and Aydın, (2017) in Turkish waters; Edwards and Glass, (1987) in Saint Helena Island (South Atlantic Ocean).

In the Mediterranean basin, the first occurrence of this Tetraodontidae was observed for the first time in 1979 (Oliver, 1981) near the Balearic Islands, since then the blunthead puffer has spread through the western Mediterranean as a new environment; in the western basin it was recorded first in the early '90s in Tunisian waters Bradai et al., (1993) then in Algerian waters Hemida et al., (2009). in central Mediterranean, it was recorded first in Italian waters Tursi (1992); then in Croatian waters Dulcic (2002); Slovenian waters Lipej et al., (2013) and Libyan waters Shakman et al., (2017). The occurrence of *S. pachygaster* in eastern Mediterranean was noticed lately, first in Turkish waters Erilmaz et al., (2003); then in Greek waters Peristeraki et al., (2006); in Syrian waters Rahman et al., (2014); Egyptian Farrag et al., (2016) bottom trawl; and Lebanese waters Crocetta and Bariche in Gerovasileiou et al., (2017). Except observation of Hemida et al., (2009), in eastern Algeria (Annaba) up to date, no works or new occurrences were reported on this Tetraodontidae for Algerian water this last decade.

Here, we report the first confirmed record of the blunthead, *Sphoeroides pacygaster* from the Oran shoreline and the second for Algerian waters. This record is also an additional data for the entire Mediterranean basin to help with monitoring and managing invasive species newly established.

MATERIALS AND METHODS

On January 25th, 2020 a blunthead puffer (Fig.1) was caught by an angler in Bousfer Beach (35°43'33.1"N 0°50'56.5"W) at 300 m from the shoreline at a depth of 10 m using squid as bait. The second specimen was caught on May 5th, 2020 in "les Andalouses" Bay (35°45'36.1"N 0°53'58.7"W) by trammel net at 120 m depth but the specimen was in a deteriorated (dried out) condition. The two fishermen reported the specimens and donated them to our team composed of researchers from university Oran1 Ahmed BENBELLA and marine ecology association members (BARBAROUS). Morphometric and meristic characteristics were taken.

Figure 1. Caught specimen of *Sphoeroides pachygaster* reported in this study (36.06 cm TL) caught in Oran Bay, Algeria (Photographed by L. Bensahla-Talet).

Measures were carried out using a caliper to the nearest 0.01 mm. Three meristic characters and thirteen morphometric characteristics (Fig.2) were measured: total length TL; standard length SL; preocular POD1; eye diameter ED; post ocular POD2 distance; post ocular POD3 distance; dorsal fin length DFL; pectoral fin length PFL; Inter orbital distance (IOD); Body thickness (BT); maximum body height Hmax; minimum body height Hmin; Caudal width (CFW).

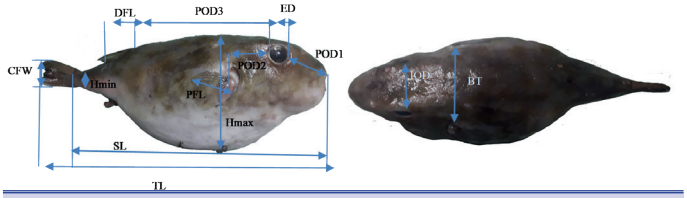

Figure 2. Morphometric measurements of the blunthead puffer *Sphoeroides pachygaster* caught in Bousfer Beach.

RESULTS AND DISCUSSION

Specimen morphological characteristics were in accordance with those described by Shipp (1974) for blunthead *Sphoeroides pachygaster*, the body was entirely smooth; pigmentation mostly uniformed, except for a few dark spots on the flanks. Also, this species differs from other species of Sphoeroides genus by hav-

ing no spinules or spines on the body. Morphometric measurements are presented in Table 1.

Table 1. Morphometric (in cm) and meristic characters of analyzed specimen of blunt head *Sphoeroides pachygaster* from the western Algerian costs (Oran Bay).

Measurements	Length (mm)	% of TL	Length (mm)	% of TL
Total length (TL)	384.00	100.00	409.50	100.00
Standard length (SL)	342.40	89.17	356.40	8.70
Preorbital distance (POD1)	55.78	14.53	54.92	1.34
Eye diameter (ED)	23.60	6.15	24.40	0.60
Post orbital distance (POD2)	43.42	11.31	39.41	0.96
Post orbital distance (POD3)	178.28	46.43	187.84	45.87
Inter orbital distance (IOD)	66.40	17.29	55.65	13.59
Body thickness (BT)	115.34	30.04	104.06	25.41
Pectoral fin length (PFL)	51.29	13.36	62.70	15.31
Dorsal fin length (DFL)	36.98	9.63	24.04	5.87
Hmax	126.03	32.82	113.6	27.74
Hmin	15.94	4.15	17.56	4.29
Caudal fin width (CW)	57.26	14.91	55.21	13.48
Meristic characters				
Dorsal fin rays		8		
Anal fin rays		8		
Pectoral fin rays		14		

Streftaris and Zenetos (2006) included *Sphoeroides pachygaster* in the list of the 100 "Worst Invasives" in the Mediterranean coming from the Atlantic Ocean; characterized by a fast spread (Ragonese et al., 1997; Psomadakis et al., 2008; Lipej et al., 2013). In the Mediterranean basin, the first occurrence of this Tetraodontidae was observed for the first time in 1979 (Oliver, 1981) near the Balearic Islands, since then the blunthead puffer has spread through the western Mediterranean as a new environment; in the western basin it was recorded first in the early '90s in Tunisian waters Bradai et al., (1993) then Cherif et al., (2010); Enajjar et al., (2015) then in Algerian waters Hemida et al., (2009).

The majority of records concerning this invasive species (Figure 3) were made in central Mediterranean, first in Italian waters Tursi (1992); Arculeo and Riggio (1994); Ragonese et al., (1997); Bedini (1998); Ligas et al., (2007); Psomadakis et al., (2008); Giordano et al., (2012); Carbonara et al., (2017) then in Croatian waters Dulcic (2002); Slovenian waters Lipej et al., (2013) and Libyan waters Shakman et al., (2017) but established population seems to be concentrated between Italian waters and Malta (Ragonese et al., 1997; Sciberras and Schembri 2007; Ragonese and Morara 2012; Evans et al., 2015).

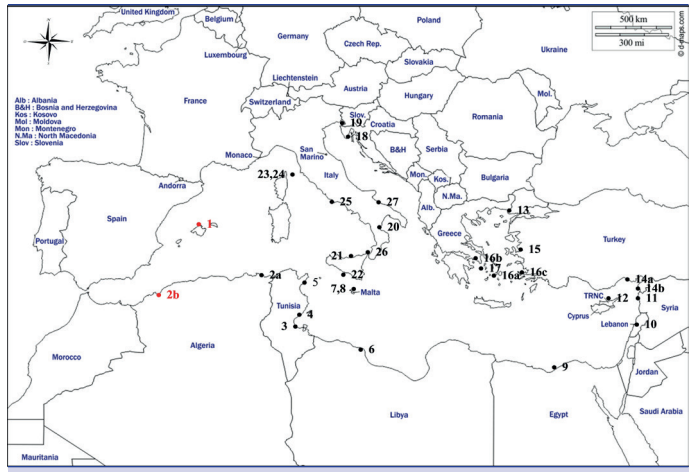

Figure 3. Map showing countries in the Mediterranean Sea where Blunthead *Sphoeroides pachygaster* has been recorded (1-first record in the Mediterranean, 2b-new record in Oran Bay in red). (d-maps.com©2020 adapted). 1) Oliver,1981, 2a) Hemida et al.,2009, 2b) Present study, 3) Bradai et al., 1993, 4) Cherif et al., 2010, 5) Enajjar et al., 2015, 6) Shakman et al., 2017, 7) Sciberras and Schembri, 2007, 8) Evans et al., 2015, 9) Farrag et al 2016, 10) Crocetta et al 2017, 11) Rahman et al., 2014, 12) Ioannou et al 2009 in Katsanevakis et al., 2009, 13) Erilmaz et al., 2003, 14a) Erguden et al in Elefteriou et al., 2011, 14b) Erguden et al in Elefteriou et al., 2011, 15) Akyol and Aydin 2017, 16a) Peristeraki et al 2006, 16b) Peristeraki et al 2006, 16c) Peristeraki et al 2006, 17) Dailanis et al., 2016, 18) Dulcic,2002, 19) Lipej et al.,2013, 20) Tursi,1992, 21) Arculeo and Riggio,1994, 22) Ragonese et al., 1997, 3) Bedini, 1998, 24) Ligas et al 2007, 25) Psomadakis et al., 2008 , 26) Giordano et al 2012, 27) Carbonara et al., 2017.

The occurrence of *S. pachygaster* in eastern Mediterranean was noticed lately, first in Turkish waters Erilmaz et al., (2003); Erguden et al in Elefteriou et al., (2011); Akyol and Aydin (2017), then in Syrian waters Rahman et al., (2014); Greek waters Peristeraki et al., (2006); Dailanis et al., (2016); Egyptian Farrag et al., (2016); and Lebanese waters Crocetta and Bariche in Gerovasileiou et al., (2017). Except observation of Hemida et al., (2009), up to date, no works or new occurrence were reported on this Tetraodontidae for Algerian waters.

In a recent study, Kleitou et al., (2020) noticed that a large number of pufferfish species (Diodontidae and Tetraodontidae) have invaded or expanded their ranges in the Mediterranean Sea. Golani et al., (2002) supported the hypothesis that the blunthead puffer entered the Mediterranean from the Atlantic Ocean via Gibraltar Strait given

that most of the records were recorded from the western and central Mediterranean regions. Coll et al., (2010) characterized the semi-enclosed Mediterranean Sea as a basin "under siege" at the forefront of ecosystem alterations, facing human pressures. The spread of non-indigenous species these last year's causes an increasing impact over time, resulting in changes in trophic flows, interactions between native and non-indigenous species and biodiversity loss and/or changes (Galil, 2007; Corrales, 2019).

Global warming was already mentioned in several regions of the world (Walther et al., 2002; Parmesan, 2006; González-Lorenzo et al., 2013). Santos et al., (2012) observed a change in species distribution around the Canary Islands related to an increase in sea surface temperature (SST) this thirty years with records of temperatures over 24 °C. in the Mediterranean basin. Moullec et al., (2016) concluded the same phenomenon and deducted that temperature has a major direct effect on the physiology, growth, reproduction, recruitment and behavior of poikilothermic organisms such as fish. It is clear that the warming of the Mediterranean Sea nowadays affects the fitness of marine biota as already shown by records of changes in abundance, survival, fertility, phenology and the most important species migration (Quero et al., 1998, Dulčić 2002, Marbà et al., 2015). Data available from online biogeographic information databases contain between 2,435 (GBIF,2020) and (OBIS,2020) 2900 georeferenced records with a majority around the Australian continent and Eastern Atlantic which let us suppose that migration of this invasive species initiated from the West African coastline to reach the Mediterranean basin.

CONCLUSION

We concluded that citizens have contributed and still contribute to the detection of non-indigenous species in Algerian waters via social media as it is the case of our study which is an efficient tool already tried in other regions of the Mediterranean (Giovos et al., 2019; Kleitou et al., 2019; Kousteni et al., 2019). We believe that eco-citizen concept coupled with NGO efforts can surely contribute to enrich future databases of alien marine species and cover all Algerian coastline to detect, manage and monitor this biological invasion harmful to aquatic biodiversity.

Conflict of interests: There are no conflicts of interest to declare.

Ethics committee approval: Ethics committee approval is not required.

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Disclosure: -

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