







SHORT COMMUNICATION

The first substantiated record of blunthead puffer *Sphoeroides pachygaster* (Müller and Troschel, 1848), from the coast of northern Cyprus (eastern Mediterranean)

Hasan Deniz Akbora^{1,2*}  • Robin Snape^{3,4}  • Deniz Ayas²  • Burak Ali Çiçek¹ 

¹ Department of Biological Sciences, Faculty of Arts and Sciences, Eastern Mediterranean University, Famagusta 99628, North Cyprus via Mersin 10, Turkey

² Faculty of Fisheries, Mersin University, Yenişehir Campus, 33160, Mersin, Turkey

³ SPOT: Society for Protection of Turtles. PK 42, Girne, Mersin 10, Turkey

⁴ Centre for Ecology and Conservation, College of Life and Environmental Sciences, University of Exeter, Penryn Campus, Cornwall TR10 9FE, United Kingdom

ARTICLE INFO

Article History:
Received: 20.04.2020
Received in revised form: 17.05.2020
Accepted: 30.05.2020
Available online: 09.07.2020

Keywords:
Tetraodontidae
Incidental catch
Morphometrics
Maximum size report
Levant Basin
A rare occurrence

ABSTRACT

Blunthead puffer *Sphoeroides pachygaster* (Müller and Troschel, 1848) is a circumglobally distributed Tetraodontid found in temperate and tropical waters. It is believed to have colonized the Mediterranean Sea from the Atlantic Ocean. There are relatively few records of this fish in the Mediterranean Sea. On March 2020, a mature female individual was caught incidentally by a commercial fisher in Northern Cyprus. The fish was 520 mm in total length and 1200 grams in total weight. Detailed morphometrics and meristics were reported. This study is the first substantiated record of *S. pachygaster* from Cyprus waters, and the specimen is the largest blunthead puffer reported with a 455 mm standard length and 520 mm total length.

Please cite this paper as follows:

Akbora, H. D., Snape, R., Ayas, D., Çiçek, B. A. (2021). The first substantiated record of blunthead puffer *Sphoeroides pachygaster* (Müller and Troschel, 1848), from the coast of northern Cyprus (eastern Mediterranean). *Marine Science and Technology Bulletin*, 10(1): 1-7.

* Corresponding author
E-mail address: hasan.deniz@emu.edu.tr (H. D. Akbora)



Introduction

Four genera of Tetraodontidae are found in the Mediterranean, which are *Torquigener*, *Ephippion*, *Sphoeroides*, and *Lagocephalus* (Golani, 1987, 1996; Reina-Hervás et al., 2004; Akyol et al., 2005; Corsini et al., 2005; Vacchi et al., 2007; Vella et al., 2017). The blunthead puffer, *Sphoeroides pachygaster* (Müller and Troschel, 1848), inhabits warm and tropical waters circumglobally and is distributed widely in the Atlantic Ocean (Sampaio et al., 2001), generally inhabiting the deep sea and found between depths of 50-480 m (Matasuura and Tyler, 1997). In the Mediterranean Sea, *S. pachygaster* was reported for the first time in 1979 in the waters of the Balearic Islands, Western Mediterranean Basin (Oliver, 1981). The species was first reported for the Eastern Mediterranean Basin of Israel in 1991 (Golani, 1996). Two specimens of *S. pachygaster* were reported from the North Aegean Sea in 2003 (Eryilmaz et al., 2003), and its northernmost record was from Slovenia (Adriatic) in 2012. *S. pachygaster* is broadly distributed throughout the Mediterranean Basin according to the available literature given for this species. But, reports of its existence in some areas are still relatively low (Lipej et al., 2013). The presence of *S. pachygaster* in Cyprus was first reported in 2005 by Katsanevakis et al. (2009).

Like other pufferfish species, *S. pachygaster* is a predatory fish species. They mostly feed on mollusks, crustaceans, and teleosts (Carbonara et al., 2017). The largest individual reported for the species is 466 mm in total length (Rahman et al., 2014). Here we present the first record of *S. pachygaster* from the west coast of Northern Cyprus, maximum length report of the species up to date, and the first detailed morphometrics for this species on the island.

Material and Methods

During a fishing port survey carried out by bycatch observers of the non-governmental organization (NGO) Society for Protection of Turtles on March 11, 2020, a *S. pachygaster* specimen was noted among the threatened species bycatch reported by a participating commercial fisher. As part of a bycatch monitoring program, the fisher was being tracked using a remote GPS data logger (I Got U, GT-.600 recording one location every 5 minutes). The specimen was caught incidentally at a bottom-set trammel net at 250 m deep (recorded on the fishing vessel depth sounder), between four to seven nautical miles from the coast of Yedidalga, Northern Cyprus (Coordinates: 35°12.452 N, 32°49.891 E) (Figure 1).

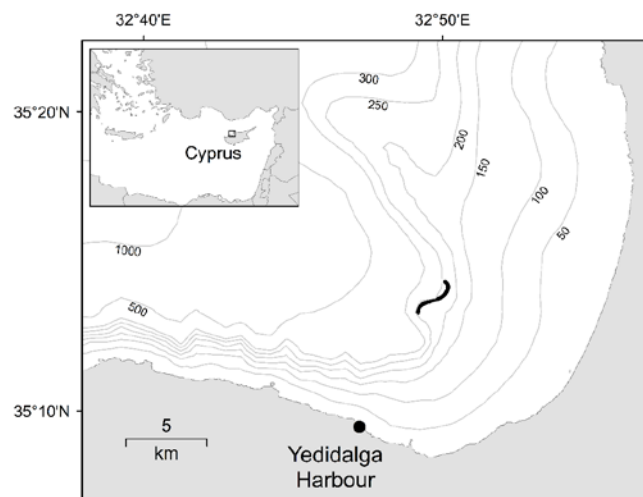


Figure 1. GPS track (dark black line) from an onboard data logger of the set placement in which *S. pachygaster* was caught off the coast of the west coast of Northern Cyprus. Bathymetric contours labeled are in meters

The fisher was targeting European hake (*Merluccius merluccius* (Linnaeus, 1758)) using a trammel net with a 25 mm internal mesh bar length, 140 mm outer nets, and a net height of 1.5-2 m. The length of the set was 3000 m. The setting of the net began at 03:34 and ended at 04:32. According to the fisher, the benthos substrate at the set location was muddy. The haul began at 06:02 and ended at 09:42. At the port, the participating fisher informed the observers of an unusual fish among the longnose spur dogs (*Squalus blainville* (Russo, 1827)) and thornback rays (*Raja clavata* (Linnaeus, 1758)) which were being reported routinely as bycatch. The specimen was transferred to the SPOT offices in Nicosia and immediately frozen.

On thawing for examination, species identification was accomplished, according to Cherif et al. (2010). Morphometric measurements were taken, stomach content was analyzed macroscopically, and gender was determined through macroscopic examination of the gonads.

Results

The *S. pachygaster* specimen was found to be a mature female. Its total length was 520 mm, and it weighed 1200 g. The stomach was empty, and part of the intestine had become prolapsed. The specimen (Figure 2) had a smooth skin without any scales or spines. The dorsal fin was short and located in the same vertical line with the anal fin. The pelvic fin was absent. The edges of the caudal fin were spherical, and the tip was flat. The pectoral fin was more prominent than other fins and, the base was darker. The lower part of the body was rough and white, with the potential for inflation of the body, like other puffers. The dorsal of the body was greyish-brown-green, and

Table 1. Comparison of morphometric and meristic characters of *S. pachygaster* with some previous studies

Measurements	This study		Cherif et al. (2010)		Hemida et al. (2009)	
	Value	%TL	Value	%TL	Value	%TL
Morphometrics (mm)						
TL	520	100	101	100	330	100
SL	455	87.5	90	89.1	295	89.4
HL	150	28.8	32.1	31.8	100	30.3
HH	92	17.7	25.3	25	60	18.2
EHD	28	5.4	8.1	8	21	6.4
EVD	18	3.5	4.1	4.1	21	6.4
IOS	65	12.5	17.9	17.7	30	9.1
SNL	79	15.2	11.4	11.3	40	12.1
POL	50	9.6	10.7	10.6	35	10.6
WOP	49	9.4	12.1	12	35	10.6
WGO	31	6.0	8.2	8.1	25	7.6
PDL	335	64.4	61.5	60.9	215	65.2
DFL	42	8.1	9.5	9.4	25	7.6
DFB	18	3.5	6.1	6	11	3.3
AFL	34	6.5	10.2	10.1	30	9.1
AFBL	12	2.3	3.5	3.5	11	3.3
PFL	63	12.1	13.4	13.3	30	9.1
CFL	65	12.5	15.6	15.4	38	11.5
BT	93	17.9	28.9	28.6	90	27.3
BH	82	15.8	33.9	33.6	90	27.3
NGD	7	1.3	3.7	3.7	6	1.8
NLD	4,3	0.8	2.6	2.6	4	1.2
INS	32	6.2	13.6	13.5	30	9.1
Meristics (mm)						
DFSR	8		8		8	
AFSR	8		8		8	
PFSR	16		15		15	
CFSR	13		12		10	
Weights (g)						
TW	1200		47.91		650	
LW	70		2.59			
GW	20		0.16			
Gender	Female		Female		Male	

Note: Abbreviations used: TL (Total length), SL (Standard length), HL (Head length), HH (Head height), EHD (Eye horizontal diameter), EVD (Eye vertical diameter), IOS (Interorbital space), SNL (Snout length), POL (Postorbital length), WOP (Width of pedunculum), WGO (Width of gill opening), PDL (Predorsal length), DFL (Dorsal fin base), AFL (Anal fin length), AFBL (Anal fin base length), PFL (Pectoral fin length), CFL (Caudal fin length), BT (Body thickness), BH (Body height), NGH (Nostril greatest diameter), NLD (Nostril lesser diameter), INS (Internarial space), DFSR (Dorsal fin soft rays), AFSR (Anal fin soft rays), PFSR (Pectoral fin soft rays), CFSR (Caudal fin soft rays), TW (Total weight), LW (Liver weight), GW (Gonad weight).

Table 2. Some capture data from the Mediterranean

Location	Year	Depth (m)	Catch method	Sex	Total Length (mm)	Reference
Strait of Sicily	1990-1994	80-400	Bottom trawl	♀,♂	95-455	Ragonese et al. (1997)
Saros Bay	1999-2001	125-180	Bottom trawl	N/A	167-395	Eryılmaz et al. (2003)
Tyrrhenian Sea	2004	360	Bottom trawl	♂	137	Psomadakis et al. (2008)
Algerian Coast	2008	150	Trawl	♂	330	Hemida et al. (2009)
Cyprus	2009	N/A	N/A	N/A	N/A	Katsanevakis et al. (2009)
Strait of Messina	2012	N/A	N/A	♂	280	Giordano et al. (2012)
Syria	2012	250	Bottom longline	♀	312-466	Rahman et al. (2014)
Adriatic Sea	2012-2015	75-125	Trawl and longline	♀,♂	200-355	Carbonara et al. (2017)
Cyprus	2020	250	Bottom trammel net	♀	520	Present study

there were dark blotches on the body. Its large eyes were oval-shaped, located dorsally in the head, and orientated longitudinally to the body. The head was large, and the snout was round. A pair of teeth in the upper and lower jaw were fused, and beak-shaped.



Figure 2. Photo taken by the observer while the specimen caught

All morphometric measurements and meristics of the specimen are given in Table 1, where they are also compared with those taken in two other chosen studies. Also, some capture data of *S. pachygaster* from the Mediterranean Sea were given in Table 2.

Discussion

The introduction of pufferfish species to the Mediterranean is a well-known issue. *Lagocephalus lagocephalus* (Linnaeus, 1758) is a native pufferfish species for the Mediterranean Sea. *Ephippion guttifer* (Bennett, 1831), *Spherooides marmoratus* (Lowe, 1838), *S. pachygaster* (Müller and Troschel, 1848), and *S. spengleri* (Bloch, 1785) are migrated from the Atlantic Ocean. *Tylerius spinosissimus* (Regan, 1908), *Torquigener flavimaculosus* (Hardy and Randall, 1983), *L. sceleratus* (Gmelin, 1789), *L. spadiceus* (Richardson, 1845), *L. suezensis* (Clark and Gohar, 1953) and *L. guentheri* (Miranda Ribeiro,

1915) are Lessepsian migrants (Bariche et al., 2015; Vella et al., 2017). The global conservation status of *S. pachygaster* is reported as Least Concern in The IUCN Red List of Threatened Species (Shao et al., 2014).

With the ability to inflate their bodies with air or water, they can protect themselves from many predator fishes who ingest by vacuum in the Mediterranean Sea (Brainerd, 1994). Besides, many types of pufferfish cannot be used as a food source for humans, thanks to the tetrodotoxin they contain, and so are not commercially exploited and can be returned to the sea alive. Some species of pufferfish, including *S. pachygaster*, are known to be non-toxic (Tani, 1945; Jeong et al., 1994). A study shows that *S. pachygaster* can accumulate TTX if incubated with it for a long time (Nagashima et al., 2018). Since it is known that TTX is transferred to pufferfish through the food chain (Bane et al., 2014), it would be more accurate to say that *S. pachygaster* can accommodate TTX in favorable conditions. Therefore, consumption can lead to severe poisoning cases. *S. pachygaster* can be distinguished from other Tetraodontidae members by several characteristics. First, it prefers to live in deeper waters than other species living in the Mediterranean Sea. Its body structure is chunkier than other species, and the skin is completely smooth. The snout is rounded. The dorsal of the body is grayish and covered with brownish spots. Fins are relatively shorter than other species of their size (Rahman et al., 2014).

With its 455 mm standard length and 520 mm total length, our specimen is the largest blunthead puffer ever reported globally, but it is not the heaviest. The most massive individual was reported by Rahman et al. (2014) as 1850 gr. The fish's stomach was found to be empty, which may, in part, be due to vomiting and prolapse during capture. In order to reach a more reliable conclusion on the spawning season, more fish samples must be collected, and maturity studies should be conducted. All the morphometric and meristic data agreed with the

previous studies. According to Table 1, anal fin length, anal fin base length, body thickness, and body height percentages are smaller in our study. These differences may be coincidental or related to the age and biological condition of the fish. In order to make healthy comments on this subject, length-weight and age analysis should be done on more samples.

The most common technique to catch *S. pachygaster* is trawling. The catching of fish occurred mostly at depths of more than 100 m. The genders of the captured samples are variable. Juvenile and adult individuals were caught at similar depths together in the same studies (Ragonese et al., 1997; Eryılmaz et al., 2003; Psomadakis et al., 2008; Hemida et al., 2009; Rahman et al., 2014; Carbonara et al., 2017). *S. pachygaster* caught in our research is the first case of catch by using a bottom trammel net.

In Cyprus waters, introduced *Lagocephalus sceleratus* (Gmelin, 1789) and *Torquigener flavimaculosus* (Hardy and Randall, 1983) are the most abundantly observed and caught pufferfish species according to local fishers (Personal observation). Some commercial vessels land more than a ton of *L. sceleratus* annually (Robin Snape, unpublished data). Blunthead puffer is a deep-sea species and generally does not frequent the shallower depths of most commercially targeted species in Cyprus (most commercial fishing in Northern Cyprus occurs on the benthos at <100 m depth, Robin Snape personal observation). This species is somewhat protected from fisheries through its habitat preferences and may also be underrepresented in related research. *S. pachygaster* was recorded for the first time from Cyprus in 2005 (Katsanevakis et al., 2009). For *L. sceleratus* in Cyprus, gonadosomatic index and toxicity studies are present (Rousou et al., 2014; Akbara et al., 2020). There is a gap of information for the toxicity of *S. pachygaster* in Cyprus. Under the Fisheries Retailing Places Regulation (14.10.2005 - R.G. 176 - ANNEX III - A.E. 596 Regulation); "It is forbidden to sell pufferfish (Tetraodontidae, Canthigasteridae), porcupine fish (Diodontidae), and prop/moons (Molidae)" (KKTC Mahkemeleri, 2020). Despite the stated ban in the regulation, many species of pufferfish are consumed unconsciously by many people due to their consumption in the Far Eastern countries. To prevent the risks that may arise in the case of encountering this rare species in the region, the toxicity study should be conducted by conducting targeted sampling of the species. Locals must be informed of the results collected.

Conclusion

In Cyprus, trawling is prohibited, and this reduces the chance of encounters of organisms such as *S. pachygaster*,

which are living in the deep seas. The specimen presented in this study is the biggest individual reported up to date, and the first *S. pachygaster*, which was reported to catch by a bottom trammel net.

Acknowledgements

The authors thank Kemal Çolak, the owner and captain of the commercial vessel, for participating in this research and to SPOT's bycatch project team, specifically Çiğdem Çağlar who reported the specimen. We also acknowledge the Northern Cyprus Ministry for Agriculture and Natural Resources for permitting us to undertake this work.

Compliance with Ethical Standards

Authors' Contributions

Author HDA designed the study, HDA and RS wrote the first draft of the manuscript, DA and BAÇ contributed to the presentation of the results. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

References

- Akbora, H. D., Kunter, İ., Erçetin, T., Elagöz, A. M. & Çiçek, B. A. (2020). Determination of tetrodotoxin (TTX) levels in various tissues of the silver cheeked puffer fish (*Lagocephalus sceleratus* (Gmelin, 1789)) in Northern Cyprus Sea (Eastern Mediterranean). *Toxicon*, **175**: 1-6. <https://doi.org/10.1016/j.toxicon.2019.12.002>
- Akyol, O., Ünal, V., Ceyhan, T. & Bilecenoglu, M. (2005). First confirmed record of *Lagocephalus sceleratus* (Gmelin, 1789) in the Mediterranean Sea. *Journal of Fish Biology*, **66**(4): 1183-1186. <https://doi.org/10.1111/j.0022-1112.2005.00667.x>
- Bane, V., Lehane, M., Dikshit, M., O'Riordan, A. & Furey, A. (2014). Tetrodotoxin: Chemistry, toxicity, source, distribution and detection. *Toxins*, **6**(2): 693-755. <https://doi.org/10.3390/toxins6020693>

- Bariche, M., Torres, M., Smith, C., Sayar, N., Azzurro, E., Baker, R. & Bernardi, G. (2015). Red Sea fishes in the Mediterranean Sea: A preliminary investigation of a biological invasion using DNA barcoding. *Journal of Biogeography*, **42**(12): 2363-2373. <https://doi.org/10.1111/jbi.12595>
- Brainerd, E. L. (1994). Pufferfish inflation: functional morphology of postcranial structures in *Diodon holocanthus* (Tetraodontiformes). *Journal of Morphology*, **220**(3): 243-261. <https://doi.org/10.1002/jmor.1052200304>
- Carbonara, P., Kolutari, J., Đurović, M., Gaudio, P., Ikica, Z., Kroqi, G., Milone, N. & Spedicato, M. T. (2017). The presence of Tetraodontidae species in the Central Mediterranean: An update from the southern Adriatic Sea. *Acta Adriatica: International Journal of Marine Sciences*, **58**: 325–338. <https://doi.org/10.32582/aa.58.2.11>
- Cherif, M., Amor, M. M. B., Bdioui, M., Salem, S. B., Missaoui, H. & Capapé, C. (2010). Additional records of the blunthead puffer, *Sphoeroides pachygaster* (Osteichthyes: Tetraodontidae) off the Tunisian coast (Central Mediterranean). *Annales: Series Historia Naturalis*, **20**: 33-36.
- Corsini, M., Margies, P., Kondilatos, G. & Economidis, P. S. (2005). Lessepsian migration of fishes to the Aegean Sea: First record of *Tylerius spinosissimus* (Tetraodontidae) from the Mediterranean, and six more fish records from Rhodes. *Cybium*, **29**(4): 347-354.
- Eryılmaz, L., Özuluğ, M. & Meriç, N. (2003). The smooth pufferfish, *Sphoeroides pachygaster* (müller & troschel, 1848) (Teleostei: Tetraodontidae), new to the northern Aegean Sea. *Zoology in the Middle East*, **28**: 125-126. <https://doi.org/10.1080/09397140.2003.10637962>
- Giordano, D., Profeta, A., Pirrera, L., Soraci, F., Perdichizzi, F., Greco, S., Perdichizzi, A. & Rinelli, P. (2012). On the occurrence of the blunthead puffer, *Sphoeroides pachygaster* (Osteichthyes: Tetraodontidae), in the Strait of Messina (Central Mediterranean). *Journal of Marine Biology*, **2012**: 462407. <https://doi.org/10.1155/2012/462407>
- Golani, D. (1996). The marine ichthyofauna of the eastern Levant - History, inventory, and characterization. *Israel Journal of Zoology*, **42**(1): 15-55. <https://doi.org/10.1080/00212210.1996.10688830>
- Golani, D. (1987). The Red Sea pufferfish, *Torquigener flavimaculosus* Hardy & Randall 1983, a new Suez Canal migrant to the Eastern Mediterranean (Pisces: Tetraodontidae). *Senckenbergiana Maritima: wissenschaftliche Mitteilungen der Senckenbergischen naturforschenden Gesellschaft*, **5-6**: 339-343.
- Hemida, F., Ben Amor, M. M. & Capapé, C. (2009). First confirmed record of the blunthead puffer, *Sphoeroides pachygaster* (Osteichthyes: Tetraodontidae) off the Algerian coast (south-western Mediterranean). *Pan-American Journal of Aquatic Sciences*, **4**(2): 188-192.
- Jeong, D. Y., Kim, D. S., Lee, M. J., Kim, S. R., Byun, D. S., Kim, H. D. & Park, Y. H. (1994). Toxicity of several puffers collected at a fish market of Pusan, Korea. *Korean Journal of Fisheries and Aquatic Sciences*, **27**(6): 682-689.
- Katsanevakis, S., Tsiamis, K., Ioannou, G., Michailidis, N. & Zenetos, A. (2009). Inventory of alien marine species of Cyprus (2009). *Mediterranean Marine Science*, **10**(2): 109-133. <https://doi.org/10.12681/mms.113>
- KKTC Mahkemeleri. (2020). Tüzükler. Retrieved on May 17, 2020 from <https://www.mahkemeler.net/cgi-bin/showtuzuk2.aspx>
- Lipej, L., Mavrič, B. & Paliska, D. (2013). New northernmost record of the blunthead pufferfish, *Sphoeroides pachygaster* (Osteichthyes: Tetraodontidae) in the Mediterranean Sea. *Annales: Series Historia Naturalis*, **23**: 103-114.
- Matsuura, K. & Tyler, J. C. (1997). Tetraodontiform fishes, mostly from deep waters, of New Caledonia. *Résultats des campagnes MUSORSTOM*, **17**: 173-208.
- Nagashima, Y., Ohta, A., Yin, X., Ishizaki, S., Matsumoto, T., Doi, H. & Ishibashi, T. (2018). Difference in uptake of tetrodotoxin and saxitoxins into liver tissue slices among pufferfish, boxfish and porcupinefish. *Marine Drugs*, **16**(1): 17. <https://doi.org/10.3390/md16010017>
- Oliver, P. (1981). Sobre la aparición de algunos peces raros en las Islas Baleares. *Boletín Instituto Español de Oceanografía*, **6**: 59-64.
- Psomadakis, P. N., Ceddia, P. & Vacchi, M. (2008). Additional record of *Sphoeroides pachygaster* (Pisces: Tetraodontidae) in the Tyrrhenian Sea and notes on the distribution of the species in the Mediterranean. *Marine Biodiversity Records*, **1**: e18. <https://doi.org/10.1017/s1755267206001862>

- Ragonese, S., Jereb, P. & Morara, U. (1997). Morphometric relationships of *Sphoeroides pachygaster* (Pisces - Tetraodontidae) of the strait of Sicily (Mediterranean Sea). *Cahiers de Biologie Marine*, **38**(4): 283-290.
- Rahman, W. A., Galiya, M. & Ali, A. K. (2014). First record of the blunthead puffer *Sphoeroides pachygaster* (Osteichthyes: Tetraodontidae) in Syrian marine waters (eastern Mediterranean). *Marine Biodiversity Records*, **7**: e31. <https://doi.org/10.1017/S1755267214000244>
- Reina-Hervás, J. A., García Raso, J. E. & Manjón-Cabeza, M. E. (2004). First record of *Sphoeroides spengleri* (Osteichthyes: Tetraodontidae) in the Mediterranean Sea. *Journal of the Marine Biological Association of the United Kingdom*, **84**(5): 1089-1090. <https://doi.org/10.1017/S0025315404010495h>
- Rousou, M., Ganias, K., Kletou, D., Loucaides, A. & Tsinganis, M. (2014). Maturity of the pufferfish *Lagocephalus sceleratus* in the southeastern Mediterranean Sea. *Sexuality and Early Development in Aquatic Organisms*, **1**: 35-44. <https://doi.org/10.3354/sedao00005>
- Sampaio, C. L. S., Lopes, P. R. D. & Olavo, G. (2001). Registros de *Lagocephalus lagocephalus* (Linnaeus, 1758) e *Sphoeroides pachygaster* (Müller & Troschel, 1848) (Actinopterygii: Tetraodontidae) para o litoral da Bahia, nordeste do Brasil. *Interciencia*, **26**: 157-160.
- Shao, K., Liu, M., Jing, L., Matsuura, K., Hardy, G. & Leis, J. L. (2014). *Sphoeroides pachygaster*. The IUCN Red List of Threatened Species 2014: e. T190193A1943625. <https://doi.org/10.2305/IUCN.UK.2014-3.RLTS.T190193A1943625.en> Downloaded on 09 April 2020.
- Tani, T. (1945). Nihonsan fugu no chudokugakutekikenkyu (Toxicological studies on Japanese puffer). *Tokyo, Teikokutosho*, **1945**: 15-27.
- Vacchi, M., Bussotti, S., Miglietta, A. M. & Guidetti, P. (2007). Presence of the Guinean puffer *Sphoeroides marmoratus* (Lowe, 1838) in the Mediterranean Sea. *Journal of Fish Biology*, **71**(4): 1215-1219. <https://doi.org/10.1111/j.1095-8649.2007.01578.x>
- Vella, A., Vella, N., Karakulak, F. S. & Oray, I. (2017). DNA barcoding of Tetraodontidae species from the Mediterranean Sea: Filling knowledge gaps for improved taxonomic accuracy. *Genetics of Aquatic Organisms*, **1**: 61-69. https://doi.org/10.4194/2459-1831-v1_2_05