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Confirmation of the occurrence of three fish species in Maltese waters based on specimens collected through the EC's Data Collection Framework

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ABSTRACT

Based on the examination of recently available actual specimens, obtained through the reporting required by Member States for the European Commission's Data Collection Framework, three fishes whose presence in Maltese waters was uncertain, are now confirmed as occurring: *Dentex maroccanus* Valenciennes, 1830, *Sphyraena viridensis* Cuvier, 1829, and *Sphyraena sphyraena* Linnaeus, 1758. Accurate species identification is essential for reliable data collection during routine monitoring activities. It is suggested that in local fisheries records, *D. maroccanus* was previously misidentified as *D. macrophthalmus*, while despite past reports of alien sphyraenids, current findings confirm only native Mediterranean species of *Sphyraena* to be present in Maltese waters.

KEYWORDS: Commercial Fishing, Fish biology, Malta, Marine surveys, Misidentifications

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1. Introduction

Almost 550 species of fish have been reported at one time or another from Maltese waters (the General Fisheries Commission for the Mediterranean [GFCM] Geographical Subarea [GSA] 15). These were most recently reviewed by Borg et al. (2023), who authenticated 412 species, rejected 78 species, and considered 53 as likely occurring but whose presence needs confirmation. Specimens of three species which became available recently allowed us to confirm the occurrence of the Morocco dentex, *Dentex maroccanus,* in Maltese waters and to resolve the identity of the large and small species of barracuda (genus *Sphyraena*), both of which are relatively common, but which have frequently been misidentified**.**

2. Methods

Specimens of all three species discussed in this paper were obtained through routine activities of the Data Collection Framework (European Commission, n.d.), which is a national obligation for EU Member States, including Malta. Part of this obligation requires data collection on commercial fishing activities, such as '*lampara*' purse-seines and trammel nets, as well as fisheries-independent research surveys such as the MEDITS trawl survey (MEDITS working group, 2017). Following capture, the geographical coordinates were recorded and the specimens were stored on ice before being transported to the laboratory. Biometric data, sex, and maturity were recorded for each individual (Appendix 1). The maturity was determined according to the FAO maturity atlas (Follesa and Carbonara, 2019), and photographs were taken to record the specimens. Identifications were based on a detailed study of morphological and coloration characteristics as given in Bauchot et al. (1987) and Louisy (2020).

3. Results and Discussion

3.1. *Dentex maroccanus* Valenciennes, 1830.

Twenty-two individuals of *Dentex maroccanus* (Morocco dentex) were caught during the MEDITS trawling survey on 25th July 2023 at coordinates N 35° 56.0040', E 15° 5.9100'. These fish were caught from trawls at a depth of approximately 105m.

All individuals had 12 hard spines and 10-11 soft rays on the dorsal fin. The eyes were large with a diameter more or less equal to the length of the snout, with a yellow outer iris and an inner black pupil. The body was reddish-pink in colour, which was particularly vivid when they were freshly caught, and a small black spot was present at the base of the pectoral fins; the edge of the caudal fin was lined in red. All these features are characteristic of this species (Bauchot et al., 1986) (Figure 1).

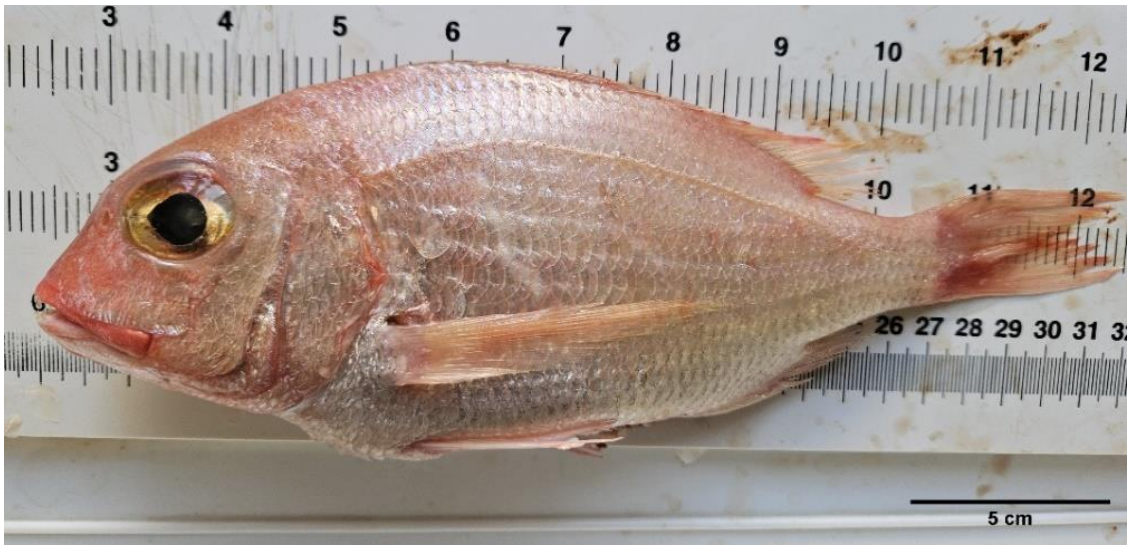

Figure 1. Image showing one of the *Dentex maroccanus* individuals recorded during the 2023 MEDITS survey**.**

3.2. *Sphyraena sphyraena* Linnaeus, 1758 and *Sphyraena viridensis* Cuvier, 1829.

Sphyraena sphyraena: Eleven individuals of the European barracuda (*S. sphyraena*) were captured through '*lampara*' purse-seine fishing on two occasions: 25th September and 25th October 2023 from coordinates N 35° 50.3520', E 14° 35.5638' and N 35° 53.1780', E 14° 45.7140' respectively, and all from a depth of approximately 90m.

These individuals all exhibited an elongated body with a pointed head, a protruding lower jaw terminating in an upward curve, and a mouth lined with sharp, long, needle-like teeth. The posterior edge of the pectoral fins did not coincide with the origin of the pelvic and dorsal fins. Vertical banding on the lateral side of the body was absent, and the operculum and preoperculum of these individuals were completely covered with scales. Above the lateral line, the body was greenish-yellow, whilst below it was a silvery-white (Figure 2).

Sphyraena viridensis: Three individuals of the yellowmouth barracuda (*S. viridensis*) were caught on 14th February 2024 using a trammel net, from off the northeast coast of Malta at coordinates N 35° 57.6660', E 14° 24.0060' from a depth of approximately 25m.

Similarly to the previous species, these specimens displayed an elongated body, a pointed head, a protruding lower jaw curved upward, and a mouth lined with needle-like teeth. Again, as in *S. sphyraena*, the posterior edge of the pectoral fins did not coincide with the origin of the pelvic and dorsal fins. However, unlike *S. sphyraena*, the lateral sides of the body had very clearly visible vertical bands, and the posterior edge of the preoperculum lacked any scales. Above the lateral line, the body was a dark blackish blue and was of a dull grey colour below it (Figure 3).

Figure 1. Image of two individuals of *Sphyraena sphyraena* caught during '*lampara*' purse-seine fishing in 2023. (A) shows the entire specimens, whilst (B) shows a close-up view of the head highlighting the presence of scales on the operculum and preoperculum (arrow).

Figure 2. Images showing one of the *Sphyraeana viridensis* individuals caught by trammel net in 2024. (A) displays the entire fish, whilst (B) shows a close-up view of the head, highlighting the lack of scales along the posterior edge of the preoperculum (arrow).

The distribution of *Dentex maroccanus* extends across the southern and eastern areas of the Mediterranean, recently including the Adriatic Sea and the Sea of Marmara, and the Eastern Atlantic Ocean, with records ranging from the Bay of Biscay to the Gulf of Guinea (Mina et al., 2023 and references therein; Grech et al., 2023). In their critical review of Maltese fishes, Borg et al. (2023) list this species as requiring confirmation since it has never been officially recorded from Maltese waters. It is the authors' view that there is a high probability that *D. maroccanus* was encountered in the past, but had most likely been misidentified as *Dentex macrophthalmus* (Bloch, 1791), which also occurs locally. The latter is similar in morphology; however, it lacks the black spot near the pectoral fins, while the edge of the caudal fin is lined in white rather than red, and the eye diameter is notably larger than the length of the snout (Fischer et al., 1987). This species is also known to occupy similar habitats and depth ranges to *D. maroccanus*, although these ranges vary depending upon environmental conditions (Maravelias et al., 2007). Neither *D. maroccanus* nor its congener *D. macrophthalmus* are commercial species, and while both are caught by trawling, they are normally discarded. Data from onboard observations and the annual MEDITS trawl survey show that *D. maroccanus* is actually more common than *D. macrophthalmus* (personal observations). Distinguishing between the two species makes monitoring of fishing discards more accurate.

Identification of species belonging to *Sphyraena* has been a recurrent problem in the Mediterranean Sea, as a result of similarities in morphology and of overlap in habitat, depth range, and niche of the species. Nominally, seven species of *Sphyraena* have been reported; however, fewer species may in fact occur, particularly due to uncertainty in the identity of recently introduced alien sphyraenids, which have been recorded under various names, some of which are regarded as synonyms (Kiparissis et al., 2020). There is confusion in the literature between *Sphyraena chrysotaenia* Klunzinger, 1884, and *Sphyraena pinguis* Günther, 1874, and between *Sphyraena flavicauda* Rüppell, 1838, and *Sphyraena obtusata* Cuvier, 1829. CIESM's atlas of exotic fishes in the Mediterranean Sea (Golani et al., 2021) considers *S. chrysotaenia* and *S. flavicauda* as the two alien sphyraenids present, whereas Louisy (2020) has suggested these aliens to be *S. pinguis* and *S. obtusata*.

According to the critical review of Borg et al. (2023), only the native Mediterranean *S. viridensis* has been authenticated to occur in Maltese waters, but at least one other species of *Sphyraena* of unknown identity is also present. Both *S. chrysotaenia* and *S. sphyraena* have been reported, but due to the confused taxonomy of the former and because older published records do not separate *S. sphyraena* from *S. viridensis*, Borg et al. (2023) consider both species to need authentication.

4. Conclusion

Through the present study, two species of *Sphyraena* – *S. viridensis* and *S. sphyraena* – have been confirmed as occurring locally, both of which are native Mediterranean species. Up to the time of writing, there are still no confirmed local records of any alien sphyraenid. The larger *Sphyraena* is frequently consumed locally, even if not highly sought after; these fish therefore have a low commercial interest. Both species are routinely encountered during monitoring activities,

and differentiation between them is important for accurate data collection purposes.

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Compliance with Ethical Standards

Conflict of interest
The authors declare that they have no competing interests**.**

Ethical approval
Ethics committee approval is not required.

Data availability
Not applicable.

Consent for publication
Not applicable.

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Appendix 1:

Dentex maroccanus biometric data:

Table 1. Biometric data obtained from the 22 individuals of *Dentex maroccanus*. All length parameters are in mm, whilst weight is in g.

N.	SL	TL	FL	BD	PDL	PAL	CFL	HL	PeFL	PFL	ED	W	S	M
1	198	217	241	84	55	124	42	67	68	42	21	232.8	M	3
2	164	183	205	65	58	100	31	51	53	32	19	142.5	F	2B
3	184	207	230	71	65	114	46	62	58	36	22	188.9	M	2B
4	166	184	209	64	46	101	44	54	51	34	18	138.4	F	3
5	175	197	220	69	58	102	43	59	51	36	21	169.1	F	2B
6	150	168	191	60	51	97	39	49	49	30	18	113.5	M	3
7	171	192	218	67	62	114	46	62	53	34	22	170.3	F	3
8	166	186	208	65	58	102	43	51	49	33	18	142.6	F	2B
9	173	192	218	67	57	105	48	59	52	35	20	152.5	F	2B
10	168	186	210	65	63	101	43	58	56	34	20	151.5	F	3
11	151	172	193	64	51	93	38	53	53	33	19	138.7	F	3
12	156	177	200	63	59	97	40	53	54	33	19	140.1	F	3
13	163	182	204	62	51	101	41	55	52	34	18	137.7	F	3
14	154	174	197	62	56	93	39	52	51	31	17	128.6	F	3
15	166	187	210	65	53	101	40	56	56	30	18	133.8	F	3
16	169	192	216	64	55	98	40	58	56	35	19	135.2	M	2B
17	162	182	203	61	54	99	41	57	54	33	20	136.2	F	3
18	147	165	187	55	52	92	37	52	50	31	18	107.7	F	3
19	159	175	198	62	48	95	38	51	51	34	16	115	F	3
20	145	161	180	57	50	88	38	50	53	32	18	112.4	F	3
21	167	188	212	65	58	101	42	57	59	36	20	148.5	M	2B
22	155	171	198	57	56	99	38	54	48	32	18	108.2	F	3
Average	**164.05**	**183.55**	**206.73**	**64.27**	**55.27**	**100.77**	**40.77**	**55.45**	**53.50**	**33.64**	**19.05**	**142.92**		
Std. dev.	**12.26**	**13.28**	**14.05**	**5.82**	**4.81**	**8.01**	**3.68**	**4.54**	**4.33**	**2.59**	**1.56**	**28.71**		

N.: Individual number, SL: Standard length, TL: Total length, FL: Fork length, BD: Body depth, PDL: predorsal length, PAL: preanal length, CFL: Caudal fin length, HL: head length, PeFL: Pectoral fin length, PFL: pelvic fin length, ED: eye diameter, W: weight, S: Sex and M: maturity.

***Sphyraena sphyraena* biometric data:**

Table 2. Biometric data obtained from the 11 individuals of *Sphyraena sphyraena*. All length parameters are in mm, whilst weight is in g. The date of capture of individuals 1-5 (25/08/23) whilst for 6-11 (25/10/23).

N.	SL	TL	FL	BD	PDL	PAL	CFL	HL	PeFL	PFL	ED	W	S	M
1	396	400	446	40	177	274	42	114	38	30	15	255.1	F	3
2	371	377	418	40	166	258	41	110	35	30	17	270	F	3
3	328	331	364	37	147	220	37	99	28	27	14	184.5	M	3
4	321	328	359	37	144	218	34	98	30	25	14	165.2	M	2C
5	313	317	355	37	140	213	38	95	34	27	13	166.3	M	3
6	304	310	344	39	134	208	31	92	28	26	12	151.8	M	2C
7	260	266	297	28	117	183	30	82	26	23	10	96.8	M	2C
8	314	320	357	37	142	218	39	95	29	27	13	181.2	M	2C
9	298	302	338	33	136	207	37	90	29	25	11	144.7	M	2C
10	255	264	292	32	115	178	32	80	26	21	11	90.6	M	2C
11	269	274	302	34	120	183	34	80	26	22	10	107.8	M	2C
Average	**305.47**	**311.26**	**345.21**	**34.84**	**137.32**	**210.42**	**35.53**	**92.42**	**29.26**	**25.21**	**12.32**	**156.46**		
Std. Dev.	**54.67**	**54.62**	**60.18**	**4.92**	**23.42**	**36.52**	**5.33**	**13.81**	**5.06**	**3.88**	**2.14**	**70.09**		

N.: Individual number, SL: Standard length, TL: Total length, FL: Fork length, BD: Body depth, PDL: predorsal length, PAL: preanal length, CFL: Caudal fin length, HL: head length, PeFL: Pectoral fin length, PFL: pelvic fin length, ED: eye diameter, W: weight, S: Sex and M: maturity.

***Sphyraena viridensis* biometric data:**

Table 3. Biometric data obtained from the 3 individuals of *Sphyraena viridensis*. All length parameters are in mm, whilst weight is in g.

N.	SL	TL	FL	BD	PDL	PAL	CFL	HL	PeFL	PFL	ED	W	S	M
1	650	663	740	73	284	480	89	194	64	51	22	1363.6	F	4A
2	572	583	656	68	252	399	79	173	59	50	22	964.3	M	4A
3	508	515	588	58	224	351	74	157	53	44	20	632.9	F	4A
Average	**576.67**	**587.00**	**661.33**	**66.33**	**253.33**	**410.00**	**80.67**	**174.67**	**58.67**	**48.33**	**21.33**	**986.93**		
Std. Dev.	**71.11**	**74.08**	**76.14**	**7.64**	**30.02**	**65.20**	**7.64**	**18.56**	**5.51**	**3.79**	**1.15**	**365.88**		

N.: Individual number, SL: Standard length, TL: Total length, FL: Fork length, BD: Body depth, PDL: predorsal length, PAL: preanal length, CFL: Caudal fin length, HL: head length, PeFL: Pectoral fin length, PFL: pelvic fin length, ED: eye diameter, W: weight, S: Sex and M: maturity.