

A revised description of *Scorpaena maderensis* (Scorpaenidae) by means of meristic and morphometric analysis

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A sample of 178 specimens, collected along the south-eastern coast of Sicily (central Mediterranean Sea), was analysed. Most meristic counts and measurements given by previous authors were updated, due to the larger variability observed in the present sample. Sexual dimorphism was observed in fish-size and in other morphometric measurements, mostly concerning the head region. The most useful diagnostic characters of *Scorpaena maderensis* were the presence of cycloid scales on the chest and the pectoral fin base, some features of body coloration and the shortness of supraocular tentacles, the latter two being easily detectable also during field observation. Only a few morphometric and meristic measurements, along with some morphological features, were indicated as further elements to distinguish *S. maderensis* from *S. porcus*.

INTRODUCTION

The Madeira rockfish *Scorpaena maderensis* Valenciennes, 1833 (Scorpaenidae) is distributed along the coasts of north-west Africa and in some islands of the eastern Atlantic (Cape Verde, Canaries, Madeira, Azores) (Cadenat, 1943; Eschmeyer, 1969; Hureau & Litvinenko, 1986; Morato et al., 2001). In the Mediterranean, its occurrence is reported for several localities, such as south-east Spain, Sicily, Greece (Ionian and south Aegean), Croatia, Lebanon and Cyprus (Bini, 1968; Tortonese, 1975; Kaspiris, 1976; Economidis & Daoulas, 1981; Hureau & Litvinenko, 1986; Fiorentino et al., 2004; Follesa et al., 2004).

First reported by Torchio (1962) and Bini (1968) from eastern Sicily (Messina and Siracuse), *S. maderensis* has been unrecorded in Italian waters up to the mid-1990s (Vacchi et al., 1999). More recently, ecological studies carried out in different areas of Sicily (central Mediterranean) have pointed out the dominance of this species in the benthic fish community of rocky shores, especially at very shallow depth (La Mesa et al., 2004). Such a very high density of *S. maderensis* was quite unexpected, considering the rarity of records of this species along the Italian coasts.

Seventeen specimens of *S. maderensis* were collected by Fröiland (1972) along the shores (mainly in tide-pools) of Cyprus, whereas only one specimen from the coast of Lebanon was described by Eschmeyer (1969). In the Ionian (Greek part) and south Aegean (Rhodes) seas, the first occurrence of this scorpaenid was documented by Kaspiris (1976) and Economidis & Daoulas (1981). Riera et al. (1995) included the Madeira rockfish in the Balearic ichthyofauna, indicating this species to be quite common along all the islands' coasts.

The lack of knowledge about the actual distribution and population density of *S. maderensis* in the Mediterranean might be partially explained by a misidentification with other scorpaenids. For instance, Fischer et al. (1987)

stated that *S. maderensis* has been frequently confused with the black scorpionfish *Scorpaena porcus* Linnaeus 1758, with which it shares a rocky habitat and some morphological features.

Furthermore, descriptions of *S. maderensis* presented by different authors were usually based on very few specimens and some disagreement can be observed among them. In order to give an accurate description of the species, the present study was focused on the morphometric and meristic characterization of a large sample of *S. maderensis*. A further aim was to provide clear diagnostic elements to facilitate the identification of the Madeira rockfish during field and laboratory studies, eliminating the risk of misidentification with *S. porcus* as well.

MATERIALS AND METHODS

General species description

Scorpaena maderensis is an inshore benthic species, preferentially inhabiting the rocky coasts of the islands between 20 m and 40 m depth (Bini, 1968; Hureau & Litvinenko, 1986; Fischer et al., 1987). A morphological description of such species, based on the most exhaustive literature data (Cadenat, 1943; Lozano Rey, 1952; Bini, 1968; Eschmeyer, 1969; Hureau & Litvinenko, 1986), can be summarized as follows (see also Table 1): size probably not exceeding 14–15 cm total length (usually 10 cm); body relatively high and covered by weakly ctenoid scales; chest and pectoral fin base with mostly cycloid scales, but most of head naked; head large, with several spines but no occipital pit; few and not well-developed fleshy skin flaps on body and short tentacles on head; dorsal, anal and pelvic fins with soft rays and spines; pectoral fins short and not reaching the first anal spine; colour variable; body dark with some pale areas, head brown mottled with white; dorsal fin blotched with brown and pectoral fin with elongate dark spots; anal and pelvic fins with brown and white spots; and dark vertical bars on body, more evident

Table 1. Meristic characters of *Scorpaena maderensis* collected in the present sample or reported by previous authors. Values in parentheses indicate % of specimens in the total sample.

Source	Present data N=178	Cadenat, 1943 N=1	Lozano- Rey, 1952	Eschmeyer, 1969 N=11	Bini, 1968	Fröiland, 1972 N=17	Tortonese, 1975 N=5	Hureau & Livtinenko, 1986
Locality	Portopalo (south-east Sicily)	Cape Verde Islands		Azores, Madeira, Lebanon		Cyprus	Ionian Islands, Canary Islands, Siracuse	
Dorsal fin								
N. spines	XI (1.7); XII (97.2); XIII (1.1)	XII	XII	XII	XII	XII–XIII	XII	XII
Longest spine	IV (64); III, IV (1.1); IV, V (27); V (7.9)	IV–V			IV, V			
Shortest spine	I (16.3); X ^a (0.6); XI (69.1); I, XI (13.4); XII ^b (0.6)							
N. soft rays	9 (2.8); 10 (94.9); 11 (1.7); 12 (0.6)	10	9–10	9 ^c	9–10	8–9	9–10	9
Anal fin								
N. spines	III	III	III		III	III	III	
Longest spine	II	II			II			
Shortest spine	I							
N. soft rays	4 (2.2); 5 (97.8)	4	4		4–5	4	4–5	
Pelvic fin								
N. spines	I				I			
N. soft rays	5				5			
Pectoral fin ^d								
N. soft rays	12–15 (0.6); 13–15 (0.6); 14 (1.7); 14–15 (2.2); 15 (73); 15–16 (11.8); 16 (10.1)	15	15–16	15–17	15–16	15–16	15–16	15–16
Head spines								
Preorbital	2	+	2	2	2	2	2	2
Sub-orbital	2	+		2			2	2
Upper post-temporal	1			1				+
Lower post-temporal								+
Opercular	2	2						
Preopercular	4 (1.1); 5 (10.7); 6 (88.2)	6 ^c		3				2
Cleithral	2	+		2				2
Supracleithral	1	+						+
Nasal	1	+						+
Pre-ocular	1							+
Supra-ocular	1					no ^f		+
Post-ocular	1	+						+
Tympanic	1	+						+
Parietal	1	+						+
Nucal	1	+						+
Pterotic	1	+						+
Sphenotic	0 (3.9); 1 (92.7); 2 (3.4)	+						+
Skin flaps/tentacles ^g								
Nasal	2	+						
Mandibular	0 (0.6); 1 (7.3); 2 (31.4); 3 (28.6); 4 (20.8); 5 (6.7); 6 (3.4); 7 (0.6); 8 (0.6)	4	4				4	

continued

Table 1. (Continued).

Source	Present data N=178	Cadenat, 1943 N=1	Lozano- Rey, 1952	Eschmeyer, 1969 N=11	Bini, 1968	Fröiland, 1972 N=17	Tortonese, 1975 N=5	Hureau & Livtinenko, 1986
Locality	Portopalo (south-east Sicily)	Cape Verde Islands		Azores, Madeira, Lebanon		Cyprus	Ionian Islands, Canary Islands, Siracuse	
Supraocular	2	+		2			2	2
Lateral line								
Number of scales	45 (0.6); 46 (4.5); 47 (16.3); 48 (37.6); 49 (31.5); 50 (7.8); 51 (1.7)	48	<50		48	48–51		
Number of tubular scales	24 (3.9); 25 (21.3); 26 (61.3); 27 (13.5)	27		27	27	24–25	27	

^a, individual with 11 spines; ^b, individual with 13 spines; ^c, the last soft ray was double; ^d, in case of asymmetry, soft rays number of both body sides are shown; ^e, 5 plus 1 supplemental preopercular spine; ^f, the term postfrontal used by the author has been interpreted like synonym of supraocular; ^g, counts are referred to both body sides; +, the number was not reported; N., number of examined individuals.

Table 2. Morphometric characters of *Scorpaena maderensis* and results of the comparison between sexes by one-way multivariate analysis of variance (MANOVA). The last three measurements are expressed as % BD, all the remaining (except for the ratios) as % standard length.

MANOVA results	Wilk's Lamda=0.53						F(27,144)=4.72***
	Total sample (N=178) ^a		Males (N=115)		Females (N=57)		Univariate F-values
	Mean ±SD	Range	Mean ±SD	Range	Mean ±SD	Range	
Total length	92.6 ±14.8	55.2–131.5	98.7 ±13.1	66.2–131.5	81.5 ±11.0	55.2–109.6	72.46***
Standard length	73.8 ±11.8	44.3–106.1	78.6 ±10.6	51.7–106.1	65.2 ±8.9	44.3–87.3	67.19***
Head length (HL)	42.2 ±2.3	29.4–47.4	42.2 ±2.3	29.4–46.6	42.2 ±2.2	36.4–47.4	<0.00
Body depth (BD)	35.8 ±2.1	27.1–42.9	36.0 ±1.9	30.6–41.5	35.5 ±2.4	27.1–42.9	1.89
Pectoral fin length	33.0 ±2.3	26.9–40.9	33.0 ±2.2	27.7–37.8	33.0 ±2.5	26.9–40.9	<0.00
Pelvic fin length	27.4 ±1.7	21.2–32.1	27.5 ±1.4	24.6–32.1	27.2 ±2.2	21.2–31.6	1.56
Caudal peduncle length	25.7 ±1.6	21.1–29.9	25.7 ±1.6	21.6–29.5	25.6 ±1.8	21.1–29.9	0.18
Caudal peduncle depth (CPD)	10.8 ±0.7	8.6–14.0	10.7 ±0.6	9.3–12.3	10.8 ±0.9	8.6–13.1	0.93
Snout length (SNL)	11.5 ±1.5	8.0–17.2	11.7 ±1.6	8.5–17.2	11.5 ±1.5	8.0–14.5	5.05*
Upper jaw length	21.4 ±1.5	16.1–24.7	21.6 ±1.4	16.1–24.7	20.9 ±1.5	17.6–23.6	10.39**
Preorbital depth	5.3 ±0.9	2.9–8.1	5.5 ±0.9	3.1–7.9	4.9 ±0.9	2.9–8.1	15.50***
Orbit diameter (OD)	12.0 ±1.0	8.9–14.5	11.7 ±1.0	8.9–13.8	12.6 ±1.0	10.3–14.5	35.42***
Interorbital width (IW)	6.8 ±0.6	5.1–9.6	6.8 ±0.6	5.1–9.6	6.8 ±0.6	5.6–8.7	0.08
Supraocular tentacle length (STL)	4.1 ±1.0	2.0–8.0	4.1 ±1.0	2.4–6.7	4.0 ±1.0	2.0–8.0	0.88
SDFSLS	6.4 ±0.8	1.7–8.5	6.4 ±0.9	1.7–8.5	6.3 ±0.8	4.7–8.3	1.73
LDFSLS	19.4 ±1.3	15.1–22.3	19.4 ±1.2	16.2–22.2	19.3 ±1.5	15.1–22.3	0.31
SAFSL	11.1 ±1.2	7.9–14.0	11.2 ±1.2	8.4–13.8	10.8 ±1.3	7.9–14.0	4.34*
LAFSL	23.8 ±1.6	18.1–28.2	23.8 ±1.4	19.1–26.5	23.8 ±1.9	18.1–28.2	0.04
PFSLS	16.5 ±1.3	11.2–19.6	16.4 ±1.3	11.2–19.3	16.6 ±1.3	14.0–19.6	0.72 ns
HL/OD	3.5 ±0.3	2.1–5.1	3.6 ±0.3	2.1–5.1	3.4 ±0.2	2.9–4.0	28.37*** ^b
OD/SNL	1.1 ±0.2	0.6–1.5	1.0 ±0.2	0.6–1.5	1.2 ±0.2	0.8–1.5	22.63***
IW/OD	0.6 ±0.1	0.4–0.9	0.6 ±0.1	0.4–0.9	0.5 ±0.0	0.4–0.7	21.87*** ^c
STL/OD	0.3 ±0.1	0.1–0.6	0.4 ±0.1	0.2–0.5	0.3 ±0.1	0.1–0.6	8.96**
II-AFS/I-AFS	2.2 ±0.2	1.6–2.8	2.1 ±0.2	1.6–2.7	2.2 ±0.2	1.8–2.8	5.19*
CPD	30.2 ±1.9	26.7–40.6	29.9 ±1.6	26.7–35.3	30.6 ±2.1	27.3–38.1	5.70* ^c
II-AFS	66.7 ±4.6	50.0–79.3	66.4 ±4.3	55.7–76.9	67.1 ±5.1	50.0–79.3	1.04
LDFSLS	54.3 ±3.8	43.5–65.0	54.1 ±3.5	46.5–62.3	54.5 ±4.4	43.5–65.0	0.49

^a, Total sample includes also six undetermined individuals; ^b, no transformation produces homogeneous variances; ^c, log₁₀ transformed data. *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$. SDFSLS, length of shortest spine of dorsal fin; LDFSLS, length of longest spine of dorsal fin; SAFSL, length of shortest spine of anal fin; LAFSL, length of longest spine of anal fin; PFSLS, length of spine of pelvic fin; II-AFS, second spine of anal fin; I-AFS, first spine of anal fin.

below the soft rays of dorsal fin and on the caudal peduncle.

Collection of samples and measurements

The samples were collected during July 2001 and May 2002 in a shallow (0–3 m depth) rocky shore at Portopalo di Capo Passero (south-eastern Sicily, central Mediterranean Sea). A total of 178 Madeira rockfish was caught by snorkelling using a small landing net. Soon after their capture, fish were transferred to a laboratory and then sexed and measured. All measurements were recorded using a 0.1 mm dial caliper. Sex was determined by examining the gonad morphology under a dissecting microscope or, in case of uncertainty, through observation

of histological sections. Head spines and lateral line scales were counted on the left side of the fish under a dissecting microscope.

For each specimen, several morphometric and meristic data were recorded (Tables 1 & 2). As meristic characters (Figure 1), the number of soft rays and spine of dorsal, anal, pelvic and pectoral fins were evaluated, along with the number of lateral line scales, skin flaps (nasal and mandibular) and tentacles (supraocular). Head spines were counted and classified according to Hureau & Litvinenko (1986). Measurement terminology followed that of Heemstra & Randall (1993) with some additions: supraocular tentacle length (STL); length of shortest spine of dorsal fin (SDFSL); length of longest spine of dorsal fin (LDFSL); length of shortest spine of anal fin (SAFSL);

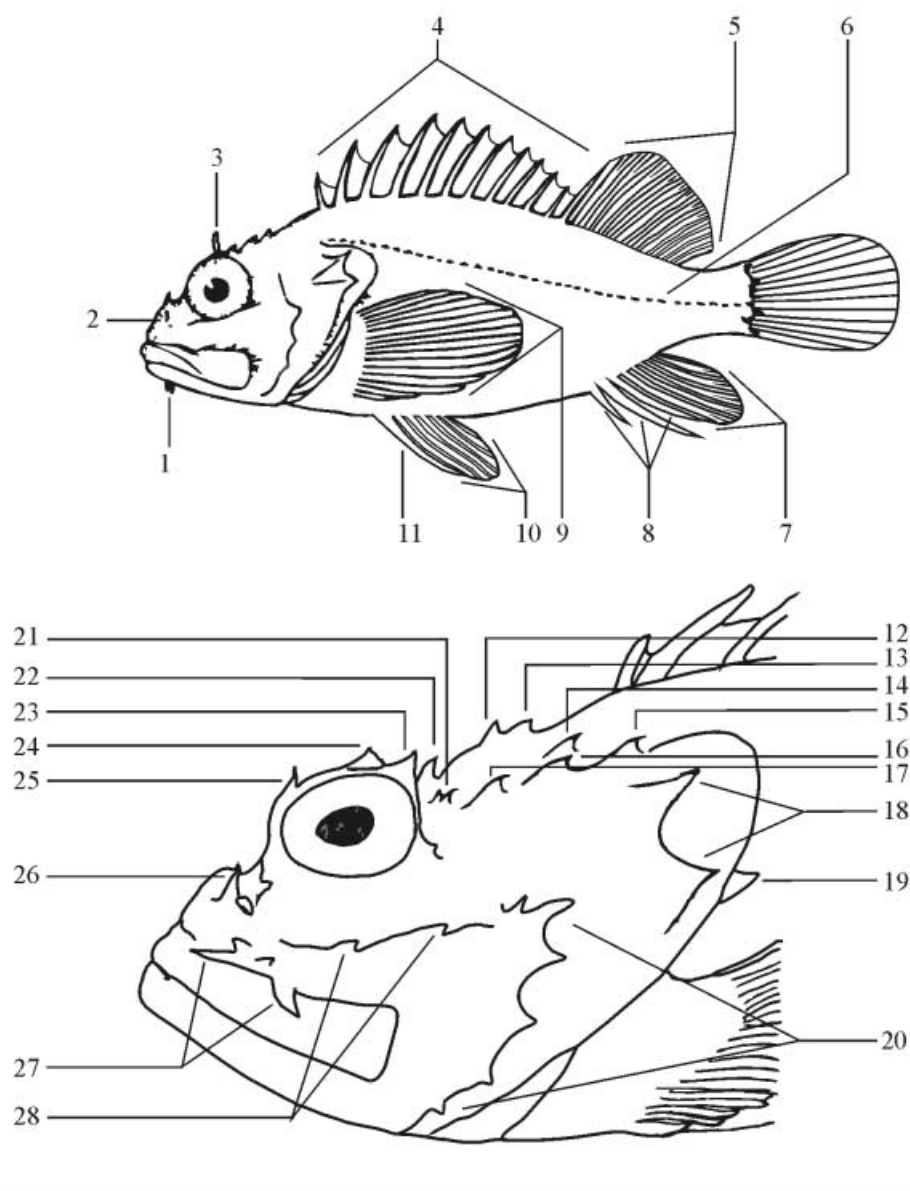


Figure 1. Line drawing of the body shape and head morphology of *Scorpaena maderensis*. Numbered lines indicate the following meristic characters: mandibular skin flap (1); nasal skin flap (2); supraocular tentacle (3); dorsal fin spines (4); dorsal fin soft rays (5); lateral line scales (6); anal fin soft rays (7); anal fin spines (8); pectoral fin soft rays (9); pelvic fin soft rays (10); pelvic fin spine (11); head spines: parietal (12); nucal (13); upper post-temporal (14); supracleithral (15); lower post-temporal (16); pterotic (17); opercular (18); cleithral (19); preopercular (20); sphenotic (21); tympanic (22); post-ocular (23); supra-ocular (24); pre-ocular (25); nasal (26); preorbital (27); and sub-orbital (28).

length of longest spine of anal fin (LAFSL); length of spine of pelvic fin (PFSL). Morphometric measurements, generally expressed as percentage of standard length (SL), and the relationship among some of them were compared between sex by a one-way multivariate analysis of variance (MANOVA). Homogeneity of variances was tested by Cochran's test and, whenever necessary, data were transformed and newly tested. When transformation did not produce homogeneous variances, a setting of $\alpha=0.01$ was used to compensate for the increased likelihood of Type I error (Underwood, 1997).

Table 3. Summary of meristic characters of *Scorpaena maderensis* and *Scorpaena porcus*. Valuable characters to distinguish *S. maderensis* from *S. porcus* are in bold.

	<i>S. maderensis</i>	<i>S. porcus</i> *
Dorsal fin		
N. spines	XI–XIII	XII
Longest spine	III, IV, V	III, IV, V
N. soft rays	9–12	8–11
Anal fin		
N. spines	III	III
Longest spine	II	II
N. soft rays	4–5	4–6
Pelvic fin		
N. spines	I	I
N. soft rays	5	5
Pectoral fin		
N. soft rays	12–16	16–18
Head spines		
Preorbital	2	2
Sub-orbital	2	2–3
Upper post-temporal	1	+
Lower post-temporal	1	+
Opercular	2	2
Preopercular	4–6	6
Cleithral	2	+
Supracleithral	1	+
Nasal	1	+
Pre-ocular	1	+
Supra-ocular	1	+
Post-ocular	1	+
Tympanic	1	1
Parietal	1	1
Nucal	1	1
Pterotic	1	+
Sphenotic	0–2	+
Skin flaps/tentacles		
Nasal	2	+
Mandibular	0–8	0
Supraocular	2	2
Lateral line		
N. of scales	45–51	52–65

*, Data source (Cadenat, 1945; Eschmeyer, 1969; Fröiland, 1972; Tortonese, 1975; Hureau & Livtinenko, 1986; Fischer et al., 1987). +, the number was not reported; N., number of examined individuals.

RESULTS

Overall, 178 specimens of *Scorpaena maderensis* were examined for meristic and morphometric data. The fish sample was composed of 115 males, 57 females and six undetermined individuals, covering a wide size-range, from 55.2 mm to 131.5 mm total length (TL).

Meristic data from the present sample and those reported by previous authors are shown in Table 1. The number of dorsal fin spines and soft rays ranged between 11–13 and 9–12, respectively. However, XII–10 was the most common dorsal fin ray formula. The fourth (often with the fifth) and the eleventh (or sometimes the first) spines of dorsal fin were the longest and the shortest, respectively. In almost all the specimens, the anal fin was composed of three spines and five soft rays, the first and second spines being always the shortest and the longest, respectively. The pelvic fin ray was composed of one spine and five soft rays. The number of pectoral fin rays ranged between 12 and 16 and frequently showed a bilateral asymmetry (15% of total sample).

All the specimens were characterized by a complex pattern of head spines, more or less developed. The number of spines of each class was generally constant, with the exception of preopercular and sphenotic spines. In comparison with previous descriptions, a greater number of spines was observed on the preopercular margin. Two spines were always present on the preorbital bone, the posterior one pointing backward.

A pair of nasal fleshy skin flaps and supraocular tentacles was always present. Skin flaps were observed also on the lower jaw, but their number changed largely depending on specimen.

The number of lateral line scales varied between 45 and 51, and about 50% of them were tubed scales.

The morphometric measurements of fish sampled are summarized in Table 2. The MANOVA results indicated highly significant differences between males and females. Among the dependent variables, SL showed significant differences between sexes, with males significantly longer

Table 4. Summary of morphometric characters (range) of *Scorpaena maderensis* and *Scorpaena porcus*. Valuable characters to distinguish *S. maderensis* from *S. porcus* are in bold. The first spine of the anal fin is expressed as % body depth, all the remaining (except for the ratios) as % standard length.

	<i>S. maderensis</i>	<i>S. porcus</i> *
Head length	29.4–47.4	37–47
Body depth	27.1–42.9	36–43
Snout length	8.0–17.2	9–13
Upper jaw length	16.1–24.7	20–22
Orbit diameter	8.9–14.5	11–13
Interorbital width	5.1–9.6	5.1–8.0
HL/OD	2.1–5.1	3.7–4.8
OD/SNL	0.6–1.5	1.0–1.2
IW/OD	0.4–0.9	0.4–0.6
STL/OD	0.1–0.6	$\cong 1$
II-AFS	50.0–79.3	38–50

For abbreviations see Table 2. *, Data source (Cadenat, 1945; Bini, 1968; Eschmeyer, 1969; Fröiland, 1972; Tortonese, 1975; Hureau & Livtinenko, 1986; Fischer et al., 1987).

Table 5. *Morphometric characters (mean \pm SD, range in parentheses) of Scorpaena maderensis reported by previous authors. The last three measurements are expressed as % body depth, all the remaining (except for the ratios) as % standard length.*

Source	Cadenat, 1943 N=1	Lozano- Rey, 1952	Bini, 1968	Eschmeyer, 1969 N=11	Fröiland, 1972 N=17	Tortonese, 1975 N=5	Hureau & Livtinenko, 1986
Locality	Cape Verde Islands			Azores, Madeira, Lebanon	Cyprus	Ionian Islands, Canary Islands, Siracuse	
Total length	128			(41–100)	73.4 \pm 13.8 (41–97)		
Standard length	102				59.9 \pm 11.1 (33–78)		
Head length	40.2			(40–43) ^a	39.5 \pm 1.5 (36.7–41.5)		
Body depth	33.3	33.3		(33–35) ^a	33.1 \pm 1.3 (31.1–35.4)		
Pelvic fin length	29.4						
Caudal peduncle depth	10.8						
Snout length	11.8			(11–12) ^a	13.1 \pm 1.7 (10.9–17.6)		10
Upper jaw length				(20–23) ^a			
Orbit diameter	10.8			(10–12) ^a			
Interorbital width	7.3			(4.1–5.0) ^a			
PFSL	18.6						
HL/OD	3.7	(3.5–4.0)		(3.5–4.0)			
OD/SNL	0.9	≤ 1	< 1	(0.9–1.1)		$\cong 1$	$\cong 1$
IW/OD	0.7		< 0.5	(0.4–0.5)			
STL/OD				< 0.5			< 0.5
II-AFS/I-AFS			> 2				
CPD	32.3						
II-AFS	67.6						
LDFS	61.7						

For abbreviations see Table 2. ^a, Data from samples of Madeira and Lebanon (7 specimens).

than females. Head morphology showed sexual dimorphism as well. Males had snout (SNL), upper jaws (UJL) and preorbital depth (PD) longer than females, whereas the latter were characterized by a larger orbit diameter (OD) (in relation to both SL and SNL). Caudal peduncle depth (CPD) was significantly higher in females than in males, but only when expressed as percentage of body depth (BD). Moreover, the shortest anal fin spine was significantly longer in males than in females. As a result, males showed also a mean ratio between the longest and shortest anal fin spines significantly lower than females.

Some meristic counts and morphometric measurements of *S. maderensis* were compared with those reported for the black scorpionfish *Scorpaena porcus* by previous authors (Tables 3 & 4). The two species overlapped to a different extent for all the characters, with few exceptions. No mandibular skin flaps were reported for *S. porcus*, whereas in *S. maderensis* they were always (except for one specimen) present. The lateral line scales were more numerous in *S. porcus* than in *S. maderensis*, and their range did not overlap. The ratio STL/OD, which was considered as a relative measure of the supraocular tentacle length, was usually lower (on average around 1/3) in *S. maderensis* than in *S. porcus*. Finally, the second spine of anal fin was in all the specimens of *S. maderensis* longer (when expressed as percentage of BD) than the maximum value observed in the other scorpaenid.

DISCUSSION

The morphological description of the Madeira rockfish *Scorpaena maderensis* reported in the literature has been

largely updated by the present data. Most information reported elsewhere remains substantially valid, but incomplete. A lot of meristic and morphometric characters showed a larger variation than previously documented, likely due to a larger sample of fish available. Formulas of dorsal, anal and pectoral fin rays have been partially revised, in order to cover the whole observed variation. Also noteworthy was the frequent bilateral asymmetry in the pectoral fin rays, a phenomenon often used as an indicator of perturbed development (Robinson & Wardrop, 2002). In comparison with previous studies (Table 5), the present sample encompassed also a wider size-interval. A general agreement with the literature data was observed for HL, BD, SNL and UJL. Conversely, interorbital width (IW) was in all the specimens larger than the maximum value given by Eschmeyer (1969). The caudal peduncle depth was around 30% of body depth, as previously reported by Cadenat (1943). Orbit diameter and its relationships with other measurements, such as HL, SNL, IW and STL, were on average similar to those reported by earlier authors, although their variation was higher. Similarly, the ratio between the second and the first spine of anal fin showed a larger variation with respect to previous authors (Bini, 1968), although its average value was comparable. The proportion between the longest spines of anal (i.e. the second one) and dorsal fin and BD were similar to that observed elsewhere (Cadenat, 1943).

The complex pattern of head spines showed almost no differences among individuals. All the collected specimens had numerous skin flaps and tentacles on the head, a morphological feature poorly documented in the earlier

descriptions of *S. maderensis*. In this species, the mandibular skin flaps and supraocular tentacles are much smaller and less evident than in other scorpaenids, such as *Scorpaena scrofa* and *Scorpaena porcus*, where they represented distinctive characters (Bini, 1968; Tortonese, 1975; Hureau & Litvinenko, 1986; Fischer et al., 1987).

Sexual differences in morphometric and meristic characters of *S. maderensis* are here reported for the first time. In this study, differences between sexes were observed both in fish size and in other morphometric measurements, mainly concerning the head region. Indeed, males attained a larger size than females, as suggested by the length–weight relationship of this species reported from the Azores (Morato et al., 2001). Similar results were obtained in other scorpaenids as well, such as *Scorpaena notata* and *S. porcus* off Marseille (Kaim-Malka & Jacob, 1985). In spite of the above mentioned sexual differences, most of the investigated morphometric characters do not seem to be rigorous tools to discriminate between males and females, due to the large overlap in their range.

In earlier descriptions of the Madeira rockfish, some diagnostic characters were identified. However, the effectiveness of these characters should be revised taking into account additional aspects, such as the experimental conditions (namely if the observation was performed *in situ* or on collected specimens). The absence of an occipital pit, usually indicated as a main diagnostic feature for *S. maderensis* with respect to other congeneric species (Bini, 1968; Tortonese, 1975; Hureau & Litvinenko, 1986; Fischer et al., 1987), did not appear to be so evident. On the other hand, the presence of cycloid scales on the chest and pectoral fin base was very distinctive, although not easily detectable during field observation. In field studies, for instance visual census of fish community, the most useful diagnostic characters of *S. maderensis* can be considered some features of body coloration, such as the dark vertical bars below the soft rays of the dorsal fin and on the caudal peduncle (a double anastomosed dark bar) and fin (one dark bar far from the edge), and the shortness of supraocular tentacles, which in *S. porcus* are very long and evident.

Concerning the problem of misidentification of *S. maderensis* with *S. porcus*, a large overlap between them does really exist for almost all the studied counts and measurements. Only few morphometric and meristic characters, such as the relative sizes of supraocular tentacles and second anal fin spine, the presence of mandibular skin flaps and the number of lateral line scales represent *per se* critical elements. Two other distinguishing characters were generally reported by previous authors (Cadenat, 1943; Lozano Rey, 1952; Bini, 1968; Eschmeyer, 1969). The posterior spine on the preorbital bone pointed backward in *S. maderensis* and downward in *S. porcus*. Furthermore, the last dorsal fin ray was completely joined with the caudal peduncle in *S. maderensis*, whereas this linkage was barely developed in *S. porcus*. All but one (namely the size of supraocular tentacles) of the above mentioned characters, although very distinctive, are easy to detect on collected specimens, but not during field observation.

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