ISSN: 0001-5113 AADRAY	ACTA ADRIAT., 51(1): 45 - 53, 2010	UDC: 574.583 : 597.5 (262.4/.5)

Biometry analysis of the black scorpionfish, *Scorpaena porcus* (Linnaeus, 1758) from the eastern Adriatic Sea

Josipa FERRI[1]*, Mirela PETRIĆ[1] and Sanja MATIĆ-SKOKO[2]

[1]University of Split, Center of Marine Studies, Livanjska 5/III, 21 000 Split, Croatia

[2]Institute of Oceanography and Fisheries, Meštrovićevo Šet. 63, 21000 Split, Croatia

**Corresponding authors, e-mail: Josipa.Ferri@unist.hr*

A sample of 450 specimens of the black scorpionfish, Scorpaena porcus *(Linnaeus, 1758), from the middle and south Adriatic was biometrically analysed. The total length of all specimens ranged from 7.0 to 25.8 cm. Eighteen morphometric and eight meristic characteristics were determined. Sexual dimorphism was observed in seven morphometric measurements. There were no differences in meristic characters between sexes. Relative growth was studied by comparing changes in morphological characters with growth in standard and head length. The results obtained suggest the existence of one unique population of* S. porcus *in the Adriatic Sea.*

Key words: *Scorpaena porcus*, biometry, Adriatic Sea

INTRODUCTION

The black scorpionfish, *Scorpaena porcus* (Linnaeus, 1758), is one of the most common species of Scorpaenidae family in the Mediterranean and the Adriatic Sea. Apart from the Adriatic, it is distributed in the whole Mediterranean, including the Black Sea, and along the eastern Atlantic coast, from the British Isles to the Azores and the Canary Islands (HUREAU & LITVINENKO, 1986). *S. porcus* is an inshore benthic species, inhabiting rocky and sea-grass bottoms and being most numerous in the Adriatic at depths between 5 and 15 m (GRUBIŠIĆ, 1982). However, its distribution depends on the time of the day, the depth, the type of the bottom landscape and the study area (PASHKOV *et al.*, 1999). The black scorpionfish represents an important fishing object for trammel nets in the eastern Adriatic, and their proportion in catches increased in the 1962 – 1982 period (JARDAS & PALLAORO, 1989).

Although the diet (JARDAS & PALLAORO, 1991; ARCULEO *et al.*, 1993; MORTE *et al.*, 2001), reproductive biology and growth (BRADAI & BOUAIN, 1988, 1991; JARDAS & PALLAORO, 1992; KOCA, 2002; SÀBAT *et al.*, 2004; BILGIN & ÇELIK, 2009) of *S. porcus* have been studied in Mediterranean and Adriatic waters, morphometric and meristic characteristics of this very abundant species have not been systematically analysed. Some data on individual meristic characters of the black scorpionfish are available (CADENAT, 1943; ESCHMEYER, 1969; FISCHER *et al.*, 1987; JARDAS, 1996; LA MESA, 2005), but morphometry data are rare and incomplete (CADENAT, 1943; ESCHMEYER, 1969). In description of species, knowledge of its biometry is necessary especially because specimens from different areas differ from one another in morphology. The aim of

the present study is to investigate morphological properties of the Adriatic black scorpionfish population considering the sex of specimens, by analysing morphometric and meristic characters, variation of those characters as well as species relative growth. Results will provide the first complete biometric description of this species in the Adriatic Sea.

MATERIAL AND METHODS

A total of 450 black scorpionfish specimens were sampled to study biometric characteristics from October 2006 to December 2007. *S. porcus* specimens were collected by a trammel net (56 mm stretched mesh size inner panel) from seven localities along the eastern Adriatic coast, from its middle and southern part (Fig. 1). Bottoms at sampling sites were mostly rocky and rocky-sandy, with depths between one and 30 m.

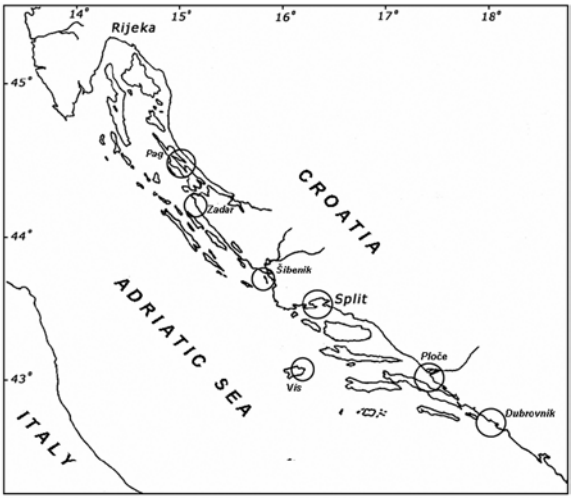

Fig. 1. Sampling areas of the black scorpionfish, Scorpaena porcus *in the eastern mid (Pag, Zadar, Šibenik, the Split area and Vis Island) and south (Ploče and the Dubrovnik area) Adriatic*

All body lengths were measured to the nearest 0.1 cm. Sex was determined macroscopically according to the shape and appearance of the gonads. The specimens without developed gonads were classified as immature. 18 morphometric and 8 meristic characters were measured. Morphometric characters included total length (TL), standard length (SL), lengths of dorsal (LD) and anal fin base (LA), lengths of pectoral (LP), ventral (LV) and caudal fins (LC), predorsal (PD), preanal (PA), preventral (PV) and prepectoral (PP) distances, maximum (H) and minimum body heights (h), head length (CL), eye diameter (O) and preocular (PO), interocular (IO) and postocular distances (OLO). Meristic characters included number of rays in dorsal (D), pectoral (P), ventral (V), anal (A) and caudal (C) fins, number of gillrakers (Brsp), number of scales on linea lateralis (L. lat), and number of vertebrae (Vert) (Fig. 2). Standard length was expressed as a percentage of the total length while other body measurements were expressed as percentages of the standard length. Head measurements were expressed as percentages of the head length.

For testing the sex ratio a simple Chi-square test was used. Biometry data were analysed by arithmetic means, standard deviations and variability coefficients. Statistical differences between mean values of morphometric and meristic characters of males and females were determined by Student's *t* test ($p < 0.05$). In order to compare growth, length – length relationships were established using linear regression analysis.

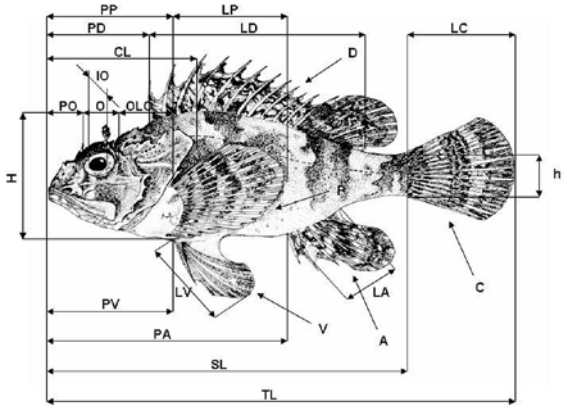

Fig. 2. Morphometric and meristic characteristics of the black scorpionfish, Scorpaena porcus: *total length (TL), standard length (SL), dorsal fin base length (LD), anal fin base length (LA), pectoral fin length (LP), ventral fin length (LV), caudal fin length (LC), predorsal distance (PD), preanal distance (PA), preventral distance (PV), prepectoral distance (PP), maximum body height (H), minimum body height (h), head length (CL), eye diameter (O), preocular distance (PO), interocular distance (IO), postocular distance (OLO) and number of rays in dorsal (D), pectoral (P), ventral (V), anal (A) and caudal (C) fins*

RESULTS

Overall, 450 specimens of *S. porcus* were examined for morphometric and meristic characters. The sample was composed of 179 males, 226 females and 45 immature specimens. The sex ratio differed statistically from the expected 1:1 (χ^2 =5.454; $p<0.05$). Total length (TL) ranged from 7.0 to 25.8 cm (15.35±3.29) for all specimens, with females ranging from 10.2 to 25.8 cm (16.41±3.40), males from 10.3 to 23.4 cm (15.10±2.48), and immature specimens from 7.0 to 12.5 cm (11.01±1.05). Mean values of all 18 morphometric characteristics of females were significantly higher than those of males ($p<0.05$). Differences between the sexes were statistically significant in seven morphometric relationships (Table 1); standard length (SL) in relation to total length (TL); length of anal fin base (LA); pectoral (LP), ventral (LV) and caudal fin (LC) length in relation to standard length (SL); preanal distance (PA) in relation to standard length (SL) and postocular distance (OLO) in relation to head length (CL). Morphometric measurements for the total sample of black scorpionfish are also presented in Table 1. Variability coefficients were within a relatively large range, varying from 2.64 to 17.89% for the SL/TL and IO/CL relationships, respectively.

Table 1. Relationships of morphometric characters (%) for males (n = 179), females (n = 226) and total sample (n = 450) of the black scorpionfish, Scorpaena porcus *from the eastern Adriatic Sea; SD = standard deviation; V = variability coefficient*

*Relationship**	*Sex*	*Range (%)*	*Mean ± SD*	t	*V (%)*
SL/TL	♂	66.91 – 82.93	76.53 ± 1.980	4.88**	2.59
	♀	72.94 – 88.48	77.50 ± 1.981		2.56
	total	66.91 – 88.48	76.96 ± 2.034		2.64
CL/SL	♂	34.56 – 46.49	40.42 ± 2.238		5.54
	♀	34.01 – 45.74	40.37 ± 2.259	0.48	5.59
	total	34.01 – 46.94	40.45 ± 2.259		5.58
LD/SL	♂	50.49 – 69.77	59.07 ± 3.358		5.68
	♀	43.97 – 66.91	58.89 ± 3.445	0.50	5.85
	total	43.97 – 66.97	59.14 ± 3.360		5.68
LA/SL	♂	11.18 – 21.87	15.01 ± 1.598		10.64
	♀	10.48 – 20.00	14.53 ± 1.637	2.95**	11.26
	total	10.48 – 21.87	14.82 ± 1.659		11.19
LP/SL	♂	24.80 – 38.38	31.31 ± 2.711		8.66
	♀	23.85 – 35.11	30.02 ± 2.468	4.93**	8.22
	total	23.85 – 40.69	30.78 ± 2.714		8.81
LV/SL	♂	21.31 – 34.41	28.06 ± 2.558		9.11
	♀	21.26 – 32.46	26.59 ± 2.263	6.04**	8.51
	total	21.26 – 34.48	27.29 ± 2.550		9.35
LC/SL	♂	23.35 – 34.75	28.17 ± 2.067		7.34
	♀	19.51 – 33.61	26.96 ± 2.211	5.68**	8.20
	total	19.51 – 34.75	27.68 ± 2.265		8.18

Table 1. cont'd

PD/SL	♂	26.59 – 41.44	32.38 ± 2.390		7.38
	♀	26.05 – 37.65	32.13 ± 2.197	1.73	6.84
	total	26.05 – 42.35	32.32 ± 2.347		7.26
PA/SL	♂	60.19 – 74.60	67.69 ± 2.385		3.52
	♀	57.82 – 80.00	68.45 ± 2.884	2.85**	4.21
	total	57.82 – 80.00	68.11 ± 2.781		4.08
PP/SL	♂	32.74 – 50.69	38.11 ± 2.474		6.49
	♀	30.61 – 48.03	37.75 ± 2.307	1.48	6.11
	total	30.61 – 50.69	37.97 ± 2.392		6.30
PV/SL	♂	23.40 – 47.66	39.87 ± 3.710		9.30
	♀	25.00 – 47.76	40.12 ± 2.981	0.74	7.43
	total	23.26 – 47.76	40.08 ± 3.459		8.63
H/SL	♂	26.40 – 45.76	36.89 ± 2.761		7.48
	♀	30.49 – 47.37	37.11 ± 2.573	0.82	6.93
	total	26.40 – 47.37	37.02 ± 2.623		7.08
h/SL	♂	6.76 – 13.79	9.59 ± 0.909		9.48
	♀	7.19 – 13.47	9.69 ± 0.824	1.23	8.50
	total	6.17 – 13.79	9.61 ± 0.915		9.52
O/CL	♂	14.28 – 32.61	22.21 ± 3.191		14.37
	♀	13.64 – 31.25	21.78 ± 3.099	1.38	14.78
	total	13.64 – 32.61	22.09 ± 3.192		14.72
IO/CL	♂	7.69 – 22.73	12.47 ± 2.087		16.74
	♀	4.17 – 23.08	12.51 ± 2.246	0.19	17.96
	total	4.17 – 23.08	12.61 ± 2.255		17.89
PO/CL	♂	15.38 – 36.73	24.49 ± 3.684		15.04
	♀	10.42 – 36.36	25.03 ± 3.275	1.53	13.08
	total	10.42 – 36.73	24.59 ± 3.525		14.33
OLO/CL	♂	20.51 – 65.45	46.16 ± 5.057		10.96
	♀	21.85 – 57.69	47.51 ± 4.343	2.83**	9.14
	total	20.51 – 65.45	46.82 ± 4.684		10.00
h/H	♂	16.67 – 38.09	26.08 ± 2.730		10.46
	♀	21.21 – 36.17	26.19 ± 2.260	0.40	8.63
	total	16.13 – 38.09	26.04 ± 2.625		10.08

* abbreviations as in Fig. 2

** statistically significant ($t \geq 1.96$; $p \leq 0.05$)

Meristic data from the present study are shown in Table 2. Analyses of variance did not show any statistically significant differences in meristic characters between males and females. In all specimens, the dorsal fin ray was composed of twelve spines and ten soft rays and the ventral fin ray of one spine and five soft rays. The anal fin was composed of three spines and five to six soft rays and the number of pectoral fin rays ranged between 16 and 17.

Table 2. Meristic characters for males (n=179) and females (n=226) of the black scorpionfish, Scorpaena porcus *from the eastern Adriatic Sea; SD=standard deviation; V=variability coefficient*

Meristic character	*Sex*	*Range*	*Mean ± SD*	t	*V (%)*
No. rays in dorsal fin	♂	XII 10	22.00 ± 0	0	0
	♀	XII 10	22.00 ± 0		
No. rays in anal fin	♂	III 5-6	8.81 ± 0.393	0.33	4.46
	♀	III 5-6	8.82 ± 0.382		4.33
No. rays in pectoral fin	♂	16–17	15.89 ± 0.310	0.17	1.95
	♀	16–17	15.88 ± 0.320		2.02
No. rays in ventral fin	♂	I 5	6.00 ± 0	0	0
	♀	I 5	6.00 ± 0		
No. rays in caudal fin	♂	13–17	15.93 ± 0.590	0.74	3.70
	♀	13–17	15.88 ± 0.686		4.32
No. branchiospines	♂	14–17	15.52 ± 0.422	0.76	2.72
	♀	14–17	15.59 ± 0.489		3.14
No. vertebrae	♂	24	24.00 ± 0	0	0
	♀	24	24.00 ± 0		
No. scales in linea lateralis	♂	52–55	53.47 ± 0.610	0.27	1.14
	♀	52–55	53.45 ± 0. 640		1.20

Table 3. Meristic characters of the black scorpionfish, Scorpaena porcus *from the Atlantic, Mediterranean with Black Sea, and the Adriatic*

Area	Atlantic Mediterranean	Atlantic	Mediterranean Black Sea	Adriatic	Atlantic Mediterranean	Adriatic
Author	CADENAT (1943)	ESCHMEYER (1969)	FISCHER *et al.* (1987)	JARDAS (1996)	LA MESA (2005)	This study
Dorsal fin (no. rays)	XII+9-10	XII+9	XII+9-10	XII+9-10	XII+8-11	XII+10
Anal fin (no. rays)	III+5-6	-	III+5	III+5-6	III+4-6	III+5-6
Pectoral fin (no. rays)	17	16-18	16-18	16-18	16-18	16-17
Ventral fin (no. rays)	-	-	-	I+5	I+5	I+5
Caudal fin (no. rays)	-	-	-	-	-	13-17
Linea lateralis (no. scales)	-	65-70	65-70	52-55	52-65	52-55
Branchiospines (no.)	-	16-18	16-19	-	-	14-17
Vertebrae (no.)	-	24	-	-	-	24

The coefficients of linear regressions show that bigger *S. porcus* specimens have a shorter head (a= - 0.056; R^2 =0.175), shorter predorsal (a= - 0.083; R^2 =0.188) and preventral (a= - 0.068; R^2 =0.147) distances, smaller base lengths of dorsal (a= - 0.260; R^2 =0.445) and anal fins (a= - 0.093; R^2 =0.402) and smaller lengths of pectoral (a= - 0.231; R^2 =0.457), ventral (a= - 0.201; R^2 =0.591) and caudal fins (a= - 0.264; R^2 =0.882). Preocular (a= + 0.261; R^2 =0.624) and postocular distances (a= + 0.285; R^2 =0.391) are larger in bigger fish and at the same

time, eye diameter (a = - 0.243; R^2 = 0.438) and interocular distances (a= - 0.141; R^2 =0.346) are shorter in larger *S. porcus* specimens.

DISCUSSION

Data from this study present the first report on the existence of morphometric variations between sexes in the Adriatic black scorpionfish population. KAIM-MALKA & JACOB (1985) reported on sexual differences of *S. porcus* from the Marseille area, but just in size of males and females. According to them, males attained a larger size than females which is contrary to the findings of this study and for the Black Sea population of this species (BILGIN & ÇELIK, 2009). Spatial segregation by sex could be one reason for this difference (LARSON, 1980; WEARMOUTH & SIMS, 2008). As PASHKOV *et al.* (1999) noted, *S. porcus* is a slow moving species which concentrates among rocks in the daytime, while at night it is active and disperses across the near-shore zone, staying mainly in open bottom sites. On the other hand, females are perhaps more vulnerable to trammel net catches during reproduction time and, due to methodological reasons, we just have not caught larger males. Differences in biometric characters and in sizes of males and females are also reported for some other scorpaenids. MORATO *et al.* (2001) reported that *Scorpaena notata* males are larger in size than females, as suggested by the length – weight relationship of this species. LA MESA (2005) represented differences between sexes in morphometric measurements for *S. notata*, mainly concerning the head region.

The high values of variability coefficients (>10%) were found for morphometric characters which relate to head length. In fish, values of this coefficient within populations are usually far greater than 10% (CARVALHO, 1993). MAMURIS *et al.* (1998) and QUILANG *et al.* (2007) reported on low values of variability coefficients for the silver perch, *Leipotherapon plumbeus*, and red mullet, *Mullus barbatus*, respectively, which indicate minimal or very low intrapopulation variation.

Only CADENAT (1943) published data on some morphometric relationships but just one is comparable - the eye diameter in relation to head length. Others refer to total body length so they are not comparable to those from the present study. According to CADENAT (1943) the eye diameter of *S. porcus* constitutes 21 to 27% of the head length, which fits within the much wider range (13.64 to 32.61%) from this study. This larger variation is likely due to a larger sample of analysed black scorpionfish specimens in this study since the aforementioned author based his results on very few specimens.

Meristic characters of the black scorpionfish from the eastern Adriatic mostly agree when compared with data from other areas (Table 3). The number of rays in the ventral fin (I+5) and the number of vertebrae (24) are the same for all compared locations (Atlantic, Mediterranean, Black Sea and Adriatic). The number of spined rays in the dorsal fin (XII) was constant in fish from all areas but the number of soft rays varied from 8 to 11, though most commonly 9-10. The number of spined rays in the anal fin (III) was also constant while the number of soft rays varied from 4 to 6, though most commonly 5-6, as in this study. According to ESCHMEYER (1969) and FISCHER *et al.* (1987) the number of scales in linea lateralis for the black scorpionfish population in the Atlantic and Mediterranean varied between 65 and 70. In this study, the number of scales in linea lateralis is much smaller and varied between 52 and 55 which confirmed prior findings for the Adriatic (JARDAS, 1996) and for the Atlantic and Mediterranean (LA MESA, 2005). This meristic character showed a larger variation than previously documented (ESCHMEYER, 1969; FISCHER *et al.,* 1987) and is probably related to the larger analysed sample and wider size-interval of *S. porcus* specimens in this study.

The number of branchiospines in this study varied between 14 and 17 which differ from reported data for the Mediterranean black scorpionfish population (FISCHER *et al.*, 1987). According to LINDSEY (1981) a shift in branchiospine counts is possible within very few generations as a result of adaptation to environmental changes. In this study, it is difficult to determine if biotic or abiotic factors contributed to this small shift in branchiospine counts or this variation is due to a larger analysed sample, as already mentioned

regarding the comparison of obtained meristic and morphometric characters with those previously documented.

CONCLUSIONS

Although this study showed the existence of morphometric differences and sexual dimorphism, most of the investigated morphometric characters are not sufficient to discriminate males from females due to the relatively large overlap in their range. Also, obtained results suggested the existence of one unique population of *S. porcus* in the Adriatic. However, differences in meristic characters between the black scorpionfish populations in the Atlantic, Mediterranean and Adriatic exist and could be the result of different environmental conditions. So, further studies should investigate the possible connection between observed variability and environmental factors.

REFERENCES

ARCULEO, M., C. FROGLIA & S. RIGGIO. 1993. Food partitioning between *Serranus scriba* and *Scorpaena porcus* (Perciformes) on the infralittoral ground of the South Tyrrhenian Sea. Cybium, 17(3): 251-258.

BILGIN, S. & E.Ş. ÇELIK. 2009. Age, growth and reproduction of the black scorpionfish, *Scorpaena porcus* (Pisces, Scorpaenidae), on the Black Sea coast of Turkey. J. Appl. Ichthyol., 25(1): 55-60.

BRADAI, M.N. & A. BOUAIN. 1988. Age et croissance de *Scorpaena porcus* et *Scorpaena scrofa* du Golfe de Gabès (Age and growth of *Scorpaena porcus* and *Scorpaena scrofa* from the Gabes gulf). Bull. Inst. Natl. Sci. Tech. Océanogr. Pêche Sallammbô, 15: 13-38.

BRADAI, M.N. & A. BOUAIN. 1991. Reproduction de *Scorpaena porcus* (Linne, 1758) et de *Scorpaena scrofa* (Linne, 1758) (Pisces, Scorpaenidae) du Golfe de Gabes (Reproduction of *Scorpaena porcus* (Linne, 1758) and *Scorpaena scrofa* (Linne, 1758) (Pisces, Scorpaenidae) from the Gabes gulf). Oebalia, 17: 167-180.

CADENAT, L. 1943. Les Scorpaenidae de l'Atlantique et de la Méditerranée. Première note: le genre *Scorpaena* (Scorpaenidae of the Atlantic and Mediterranean. First note: *Scorpaena* genus). Rev. Trav. Off. Pêch. Marit., 13: 525-563.

CARVALHO, G.R. 1993. Evolutionary aspects of fish distribution: genetic variability and adaptation. J. Fish. Biol., 43(Suppl. A): 53-73.

ESCHMEYER, W.N. 1969. A systematic review of the Scorpionfishes of the Atlantic Ocean (Pisces, Scorpaenidae). Calif. Acad. Sci., 79: 130 pp.

FISCHER, W., M. SCHNEIDER & M.L. BAUCHOT. 1987. Fiches d'identification des espèces pour les besoins de la péche, Méditerranée et Mer Noire (Fish identification for fishery purposes, Mediterranean and Black Sea). Zone de péche, Rome, FAO, 37(2): 1295-1300.

GRUBIŠIĆ, F. 1982. Ribe, rakovi i školjke Jadrana (Fishes, crabs and shells in the Adriatic). ''Liburnija'' Rijeka, 240 pp.

HUREAU, J.C. & N.I. LITVINENKO. 1986. Scorpaenidae. In: P.J.P. Whitehead *et al.* (Editors). Fishes of the North-eastern Atlantic and the Mediterranean. UNESCO, Paris, pp. 1211-1229.

JARDAS, I. 1996. Jadranska ihtiofauna (The Adriatic ichthyofauna). Školska knjiga, Zagreb, 533 pp.

JARDAS, I. & A. PALLAORO. 1989. Neki pokazatelji opadanja biološkog bogatstva priobalnog područja Jadrana (1960-1988) (Some indicators of the decline of the coastal Adriatic fishing resources (1960-1988)). Pogledi, 19: 159-176.

JARDAS, I. & A. PALLAORO. 1991. Food and feeding habits of black scorpionfish (*Scorpaena porcus* L. 1758) (Pisces, Scorpaenidae) along the Adriatic coast. Acta Adriat., 32(2): 885-898.

JARDAS, I. & A. PALLAORO. 1992. Age and growth of Black Scorpionfish, *Scorpaena porcus* L.,

1758, in the Adriatic Sea. Rapp. Comm. int. Mer Médit., 33: 296.

KAIM-MALKA, R.A. & S.S. JAKOB. 1985. Données preliminaires sur la biologie de trois especes de Scorpaenidae de la region de Marseille (Preliminary data on the biology of three Scorpaenidae species from the Marseille area). Rapp. Comm. int. Mer Médit., 29: 45-47.

KOCA, H.U. 2002. The determination of gonadosomatic index and flesh productivity of scorpion fish (*Scorpaena porcus* Linne., 1758). Turk. J. Vet. Anim. Sci., 26(1): 61-64.

LA MESA, G. 2005. A revised description of *Scorpaena maderensis* (Scorpaenidae) by means of meristic and morphometric analysis. J. Mar. Biol. Ass. U.K., 85: 1263-1270.

LARSON, R.J. 1980. Territorial behaviour of the Black and Yellow Rockfish and Gopher Rockfish (Scorpaenidae, *Sebastes*). Mar. Biol., 58(2): 111-122.

LINDSEY, C.C. 1981. Stocks are chameleons: plasticity in gill rakers of coregonid fishes. Can. J. Fish. Aquat. Sci., 38: 1497-1506.

MAMURIS, Z., A.P. APOSTOLIDIS, P. PANAGIOTAKI, A.J. THEREDOROU & C. TRIANTAPHYLLIDIS. 1998. Morphological variation between red mullet populations in Greece. J. Fish Biol., 52: 107-117.

MORATO, T., P. ALFONSO, P. LOURINHO, J.P. BARREIROS, R.S. SANTOS & R.D.M. NASH. 2001. Length – weight relationship for 21 coastal fish species of the Azores, north-eastern Atlantic. Fish. Res., 50: 297-302.

MORTE, S., M.J. REDON & A. SANZ-BRAU. 2001. Diet of *Scorpaena porcus* and *Scorpaena notata* (Pisces: Scorpaenidae) in the Western Mediterranean. Cah. Biol. Mar., 42(4): 333-344.

PASHKOV, A.N., N.F. SHEVCHENKO, L.S. OVEN, V.E. GIRAGOSOV & M.V KRUGLOV. 1999. Distribution, numbers, and principal population indexes of *Scorpaena porcus* under anthropogenic pollution of the Black Sea. J. Ichthyol., 39(8): 634-641.

QUILANG, J.P., Z.U. BASIAO, R.C. PAGULAYAN, R.R. RODEROS & E.B. BARRIOS. 2007. Meristic and morphometric variation in the silver perch, *Lepiotherapon plumbeus* (Kner, 1864), from three lakes in the Philippines. J. Appl. Ichthyol., 23: 561-567.

SÀBAT, M., M.R. HERNÁNDEZ, M. MUÑOZ & M. CASADEVALL. 2004. Ovarian structure and annual reproductive cycle of *Scorpaena porcus*. Rapp. Comm. int. Mer Médit., 37: 431.

WEARMOUTH, V.J. & D.W. SIMS. 2008. Sexual Segregation in Marine Fish, Reptiles, Birds and Mammals: Behaviour Patterns, Mechanisms and Conservation Implication. Adv. Mar. Biol., 54: 107-170.

Received: 10 March 2009
Accepted: 8 April 2010

Analiza biometrijskih svojstava škrpuna, *Scorpaena porcus* (Linnaeus, 1758) u istočnom Jadranu

Josipa FERRI[1]*, Mirela PETRIĆ[1] i Sanja MATIĆ-SKOKO[2]

[1]*Sveučilište u Splitu, Centar za studije mora, Livanjska 5/III, 21 000 Split, Hrvatska*

[2]*Institut za oceanografiju i ribarstvo, Meštrovićevo šet. 63, 21 000 Split, Hrvatska*

** Kontakt adresa, e-mail: Josipa.Ferri@unist.hr*

SAŽETAK

Biometrijska su svojstva analizirana na 450 primjeraka škrpuna, *Scorpaena porcus* (Linnaeus, 1758), s područja srednjeg i južnog Jadrana. Ukupna je dužina svih jedinki bila u rasponu od 7,0 do 25,8 cm. Određeno je osamnaest morfometrijskih i osam merističkih značajki. Spolni dimorfizam je uočen na sedam morfometrijskih značajki. Razlike u merističkim osobinama među spolovima nisu uočene. Relativan rast je analiziran uspoređivanjem promjena morfoloških značajki s porastom standardne dužine tijela i dužine glave. Dobiveni rezultati upućuju na jedinstvenu populaciju vrste *S. porcus* u Jadranskom moru.

Ključne riječi: *Scorpaena porcus*, biometrija, Jadransko more