

NOTES

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**VARIABILITY OF THE BLACK SCORPIONFISH,
SCORPAENA PORCUS LINNAEUS, 1758 (SCORPAENIDAE),
FROM TWO BLACK SEA LOCALITIES**

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Comparative investigation of morphological variability of the black scorpionfish, *Scorpaena porcus* Linnaeus, 1758, from two distant Black Sea localities – Foros village (Crimean Peninsula) and Malyi Utrish village (Krasnodar Krai) – was carried out. Due to sexual dimorphism in the black scorpionfish and small abundance of males in the samples, only mature females were analyzed. A total of 54 individuals were examined (29 from Foros and 25 from Malyi Utrish). We used 5 meristic and 26 morphometric characters. In the meristic characters, there were no region-related differences between black scorpionfish females from Foros and Malyi Utrish; in the morphometric characters (maximum body height, length of the first dorsal fin, distance between pectoral and abdominal fin, length of snout, eye diameter, and length of lower jaw), the differences were statistically significant. The canonical discriminant analysis showed that *S. porcus* females from Foros were correctly classified with an accuracy of 97%, while females from Malyi Utrish – with an accuracy of 100%. It was suggested that the obtained results are a manifestation of modification variability. However, there were no significant differences between black scorpionfish females from two localities in the total length and body mass, which could result from differences in trophic conditions and fish abundance. This may indicate the existence of a complex of modification and interpopulation variability in *S. porcus* from the investigated Black Sea localities. Though black scorpionfish pelagic eggs can be transported *via* sea currents, spatial isolation and limited migrations may lead to the formation of local populations of *S. porcus*. Nevertheless, analysis of genetic markers is required to test the hypothesis.

Keywords: *Scorpaena porcus*, morphological variability, interpopulation variability, isolation, Black Sea

The aim of the study is to carry out a comparative morphological analysis of the black scorpionfish *Scorpaena porcus* Linnaeus, 1758 from two distant Black Sea localities – the coastal zone off Foros village (Crimean Peninsula) and the coastal zone off Malyi Utrish village (Krasnodar Krai).

S. porcus were caught with hook fishing gear (spinning rods with different equipment) in the coastal zone off Foros village (44°38'82.88"N, 33°78'17.94"E) in July–August 2019 and in the vicinity of Malyi Utrish village (44°70'48.25"N, 37°47'04.52"E) in September 2019. Due to small abundance of males in the samples and possible sexual dimorphism in size characteristics [Peskov, Manilo, 2016], only females of the black scorpionfish were examined.

Morphometric measurements were carried out according to the scheme by I. Pravdin [1966], with 5 meristic and 26 morphometric characters being used. Body mass (m) was registered as well.

RESULTS

In the samples, the absolute length of females ranged from 14 to 26 cm; mass, from 46 to 304 g. The studied individuals of the black scorpionfish from the Foros and Malyi Utrish villages did not differ in meristic characters, while the differences in several morphometric characters were significant (Table 1). Interestingly, in all cases, the mean values of the characters were higher in fish caught in the coastal zone off Malyi Utrish village than in *S. porcus* caught in the coastal zone off Foros village.

Table 1. Significantly different measurement means, standard deviations, and *t*-test results for *Scorpaena porcus* females from two Black Sea localities

Character	Locality						<i>t</i> -test
	Foros (<i>n</i> = 29)			Malyi Utrish (<i>n</i> = 25)			
	Mean	Standard deviation	Standard error	Mean	Standard deviation	Standard error	
gh	4.56	0.89	0.17	5.13	0.73	0.15	2.56
tu	2.15	0.35	0.06	3.12	1.61	0.32	3.17
vz	1.99	0.46	0.09	2.27	0.39	0.08	2.37
an	1.39	0.31	0.06	1.62	0.23	0.05	3.04
np	1.37	0.18	0.03	1.53	0.16	0.03	3.26
k111	1.99	0.38	0.07	2.24	0.36	0.07	2.53

Note: gh, maximum body height; tu, maximum height of dorsal fin; vz, distance between pectoral and abdominal fin; an, length of snout; np, eye diameter; k111, length of lower jaw.

Moreover, according to the results of the discriminant analysis, which was carried out for the entire complex of morphometric characters, we obtained 98% of correct classifications of the black scorpionfish individuals by the localities. At the same time, 28 fish caught off the coast of Foros were in their own group (97%); only 1 *S. porcus* was classified by the value of the discriminant function with the individuals caught off the coast of Malyi Utrish. As for the individuals from Malyi Utrish, all 25 females (100%) were classified in their own group by the values of the discriminant function.

It is worth noting that observed high degree of discrimination of the black scorpionfish from Foros and Malyi Utrish villages was provided by the characters, the differences between the mean values of which were statistically significant. It cannot be ruled out that this is a manifestation of modification variability. However, it should be noted as follows: according to our data, there are no statistically significant differences in the body length and mass of female *S. porcus* from the coastal zones of Foros and Malyi Utrish, which could primarily be related to differences in trophic conditions and species population density in these localities.

S. porcus is known to lead a sedentary lifestyle [Smirnov, 1986]. Despite the presence of pelagic eggs in this species [Smirnov, 1986], which can be transported *via* sea currents, we believe that spatial isolation can play a significant role in the formation of local populations of the black scorpionfish. This is partly confirmed by the morphological differences revealed. Apparently, in this case, we deal with a combination of modification and interpopulation variability. However, to verify this assumption, analysis of genetic markers is required.

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ИЗМЕНЧИВОСТЬ МОРСКОГО ЕРША *SCORPAENA PORCUS* LINNAEUS, 1758 (SCORPAENIDAE) ИЗ ДВУХ МЕСТООБИТАНИЙ В ЧЁРНОМ МОРЕ

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Проведено сравнительное исследование морфологической изменчивости скорпены *Scorpaena porcus* Linnaeus, 1758 из двух отдалённых черноморских местообитаний — посёлков Форос (Крымский полуостров) и Малый Утриш (Краснодарский край). Из-за полового диморфизма у морского ерша и малого количества самцов в пробах для анализа использовали только половозрелых самок. Всего обследовано 54 скорпены (29 из Фороса и 25 из Малого Утриша). Использованы 5 меристических и 26 морфометрических признаков. По меристическим признакам региональные различия между самками скорпены из Фороса и Малого Утриша не отмечены, тогда как по морфометрическим (максимальная высота тела, длина первого спинного плавника, расстояние между грудными и брюшными плавниками, длина рыла, диаметр глаза и длина нижней челюсти) различия были статистически значимы. Канонический дискриминантный анализ показал, что самки *S. porcus* из Фороса правильно классифицируются с точностью 97 %, а самки из Малого Утриша — 100 %. Высказано предположение, что полученные результаты являются проявлением модификационной изменчивости. Между тем существенных различий между самками морского ерша из двух местонахождений по общей длине и массе тела не зарегистрировано, что могло быть обусловлено различиями в трофических условиях и в численности рыб. Это обстоятельство может свидетельствовать о наличии комплекса модификационной и межпопуляционной изменчивости у скорпены из исследованных черноморских биотопов. Несмотря на то, что пелагическая икра *S. porcus* может переноситься морскими течениями, пространственная изоляция и ограниченность миграций способны привести к формированию локальных популяций морского ерша. Однако для проверки предположения необходим анализ генетических маркеров.

Ключевые слова: *Scorpaena porcus*, морфологическая изменчивость, межпопуляционная изменчивость, изоляция, Чёрное море