

UDC 597.556.31(262.5)

**VARIABILITY IN THE NUMBER OF RAYS  
AND SPECIFICATION OF THE DORSAL FIN FORMULA  
OF THE BLACK SCORPIONFISH  
*SCORPAENA PORCUS* LINNAEUS, 1758 (PISCES: SCORPAENIDAE)  
FROM THE BLACK SEA**

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Received by the Editor 30.01.2020; after reviewing 20.06.2020;  
accepted for publication 24.12.2021; published online 22.03.2022.

Out of the morphological criteria for the fish species, the meristic (countable) characters are of the key role, in particular the number of rays in the fins. It is one of the stable signs of fish morphotype not subjected to size and age variability. At the same time, it is a clear taxonomic criterion. The aim of the work was to study the variability in the number of rays in the dorsal fin and to specify its formula for the black scorpionfish inhabiting the Black Sea off the coasts of the North Caucasus and Crimea. In total, 232 individuals of the black scorpionfish were investigated; those were sampled from six areas of the Black Sea off the coasts of the North Caucasus (Bolshoi Utrish, Magri, Loo, and Adler) and Crimea (Sevastopol and Feodosiya). The number of rays in the dorsal fin of each fish was counted, with dividing them into hard (unbranched) and soft (branched) ones. As established, the total number of rays in the dorsal fin of the black scorpionfish inhabiting the coasts of the North Caucasus and Crimea averaged ( $22.1 \pm 0.02$ ); the number of hard rays, ( $12.0 \pm 0.01$ ); and the number of soft rays, ( $10.1 \pm 0.03$ ). All three indicators are characterized by low variability (coefficient of variation is lower than 10 %). Fish caught off the coasts of the North Caucasus and Crimea differ statistically significantly from each other in the number of soft rays in the dorsal fin [ $(10.1 \pm 0.03)$  and  $(10.0 \pm 0.04)$ , respectively] and in the total number of rays in the dorsal fin [ $(22.1 \pm 0.03)$  and  $(22.0 \pm 0.04)$ , respectively]. The analysis of the results obtained reveals six possible variants of the dorsal fin formula for the black scorpionfish. Those are: D XI 10; D XI 11; D XII 9; D XII 10; D XII 11; and D XIII 10. The most common variant is D XII 10 averaging 83.2 % (75.0–88.9 % depending on the area). The updated dorsal fin formula for the black scorpionfish inhabiting the coasts of the North Caucasus and Crimea has the following form: D (XI) XII (XIII) (9) 10 (11). The formula can be used when compiling the species guides of the Black Sea fish. The results obtained were compared with those of other researchers. The causes for the disagreement between the results were analyzed.

**Keywords:** black scorpionfish *Scorpaena porcus*, dorsal fin formula, Black Sea, soft rays, hard rays, North Caucasus, Crimea

In recent years, due to development and significant expansion of the scope of molecular genetics methods, the leading role in evolutionary biology in general and fish taxonomy in particular belongs to molecular biological criteria of the species. Undoubtedly, those are of great importance, but the key

role of traditional morphological criteria has to be taken into account as well. Molecular genetics methods are based on the study of a part of the genotype, while the morphotype, despite its variability, is a concentrated manifestation of the genotype as a whole.

Out of the morphological criteria for the fish species, the meristic (countable) characters are the most significant ones, in particular the number of rays in the fins. Their number, as shown in many studies, is laid in the early stages of development; the final number is usually formed by the end of the first month of life (Makeeva, 1992 ; Novikov & Ruban, 1951 ; Reshetnikov & Popova, 2015 ; Sidorov & Reshetnikov, 2014). Therefore, the number of rays in the fin is one of the most stable signs of fish morphotype not subjected to size–age variability, which makes it a reliable taxonomic criterion.

In this work, we analyzed the variability in the number of rays in the dorsal fin of the black scorpionfish *Scorpaena porcus* Linnaeus, 1758: one of the common fish species of the coastal Black Sea shelf. When studying the morphological features of this fish caught off the coast of the North Caucasus and Crimea, the authors drew attention to the following: the number of rays in the dorsal fin of the black scorpionfish often differed from that indicated in the corresponding species guides of the Black Sea fish.

The aim of this work was to study the variability in the number of rays in the dorsal fin of the black scorpionfish inhabiting the Black Sea off the coast of the North Caucasus and Crimea, as well as to specify the dorsal fin formula.

## MATERIAL AND METHODS

The work is based on the results of the analysis of the number of rays in the dorsal fin of the black scorpionfish from several areas of its range in the Black Sea, as well as on the analysis of the corresponding literature data.

In total, 232 specimens of the black scorpionfish from six areas of the Black Sea off the coast of the North Caucasus and Crimea were studied, *inter alia*: from Sevastopol, 22 specimens; from Feodosiya, 58; from Bolshoi Utrish, 46; from Magri, 44; from Loo, 18; and from Adler, 44 (Fig. 1).

The material was random samples of the black scorpionfish from the catches of fishing brigades engaged in coastal fishing with fixed seines and gill nets. Fish were caught on spinning rods with different types of equipment as well. The black scorpionfish were sampled in different seasons in 2017–2019.



**Fig. 1.** Map of sampling points for factual material: 1, Sevastopol; 2, Feodosiya; 3, Bolshoi Utrish; 4, Magri; 5, Loo; 6, Adler

Using a dissecting needle, the total number of rays in the dorsal fin and the number of hard (unbranched) and soft (branched) rays were counted in each fish specimen. The last two rays of the soft part of the dorsal fin, which were located on a common base, were counted as separate ones. According to the recommendations of Yu. Reshetnikov and O. Popova (2015), the rays were counted twice; in the case of a discrepancy between the results obtained, the rays were counted once more. When counting the rays in small fish, we used an MBS-9 binocular microscope with 4× to 8× magnification.

The obtained results were mathematically processed with the methods of variation and multivariate statistics in the Statistica package ver. 10.0 for Windows.

## RESULTS

The analysis showed that the mean value of the total number of rays in the dorsal fin of the black scorpionfish inhabiting the Black Sea off the coast of the Caucasus and Crimea was ( $22.1 \pm 0.02$ ), with the variation range 21–23. The modal group included fish with 22 rays (85.3 %).

The mean number of hard (unbranched) rays in the dorsal fin was ( $12.0 \pm 0.01$ ); the mean number of soft (branched) rays was ( $10.1 \pm 0.03$ ). The ranges were 11–13 and 9–11 rays, respectively. By the number of hard rays, the modal group included fish with 12 rays (96.6 %); by the number of soft rays, it included specimens with 10 rays (83.6 %).

The coefficients of variation of the number of rays had the following values: the total number of rays, 1.71 %; the number of hard rays, 1.54 %; and the number of soft rays, 3.91 %. So, the analyzed parameters were referred to features with a low degree of variation; this allowed using them as a reliable morphological marker of species affiliation.

In fish from six water areas, the differences between the mean values of the number of rays in the dorsal fin were insignificant (Table 1). The effect of the “catchment area” factor on the values given in Table 1 was assessed by the one-way ANOVA. It revealed the lack of statistically significant relationships between the habitat area and such factors as “total number of rays in the dorsal fin” ( $F = 1.9$  and  $p = 0.079$ ) and “number of hard rays in the dorsal fin” ( $F = 1.2$  and  $p = 0.308$ ), with a parallel effect of the catchment area on the “number of soft rays in the dorsal fin” factor ( $F = 2.4$  and  $p = 0.032$ ), which was simultaneously characterized by a higher degree of variation.

**Table 1.** Mean, minimum, and maximum values of the number of rays in the dorsal fin of the black scorpionfish from different areas of the Black Sea (Sevastopol, Feodosiya, Bolshoi Utrish, Magri, Loo, and Adler)

Parameter	Number of rays	
	$\bar{x} \pm m_{\bar{x}}$	<i>min–max</i>
Sevastopol (22 ind.)		
Number of hard rays	$12.0 \pm 0.00$	12–12
Number of soft rays*	$9.9 \pm 0.09$	9–11
Total number of rays	$21.9 \pm 0.09$	21–23
Feodosiya (58 ind.)		
Number of hard rays	$12.0 \pm 0.02$	11–13
Number of soft rays	$10.0 \pm 0.04$	9–11
Total number of rays	$22.0 \pm 0.04$	21–23

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Parameter	Number of rays	
	$\bar{x} \pm m_{\bar{x}}$	<i>min-max</i>
Bolshoi Utrish (46 ind.)		
Number of hard rays	11.9 ± 0.04	11–12
Number of soft rays	10.2 ± 0.06	9–11
Total number of rays	22.1 ± 0.06	21–23
Magri (44 ind.)		
Number of hard rays	12.0 ± 0.02	11–12
Number of soft rays	10.2 ± 0.07	9–11
Total number of rays	22.2 ± 0.07	21–23
Loo (18 ind.)		
Number of hard rays	12.0 ± 0.00	12–12
Number of soft rays	10.1 ± 0.10	10–11
Total number of rays	22.1 ± 0.10	22–23
Adler (44 ind.)		
Number of hard rays	12.0 ± 0.02	11–12
Number of soft rays	10.1 ± 0.05	9–11
Total number of rays	22.1 ± 0.05	21–23

**Note:** \* – hereinafter, when presenting our own data on the number of rays in the dorsal fin, we considered the last two, located on a common base, rays of the soft part of the dorsal fin as separate rays.

However, at a higher level of geographic generalization, when uniting four water areas (Bolshoi Utrish, Magri, Loo, and Adler) into the “North Caucasus” group and two (Sevastopol and Feodosiya) into the “Crimea” group, it turned out that the number of rays in the dorsal fin of the black scorpionfish from these areas could significantly differ. Specifically, the differences were registered when analyzing the geographic variability of the number of soft rays in the dorsal fin ( $F = 7.3$  and  $p = 0.008$ ) and when analyzing the variability of the total number of rays in the dorsal fin ( $F = 4.1$  and  $p = 0.043$ ). Fish inhabiting the Black Sea off the coast of the Caucasus are characterized by higher mean values of the number of soft rays and total number of rays in the dorsal fin in comparison with fish caught off the coast of Crimea (Table 2).

**Table 2.** Mean, minimum, and maximum values of the number of rays in the dorsal fin of the black scorpionfish from different areas of the Black Sea (North Caucasus and Crimea)

Parameter	Number of rays	
	$\bar{x} \pm m_{\bar{x}}$	<i>min-max</i>
Crimean shelf of the Black Sea (Sevastopol and Feodosiya)		
Number of hard rays	12.0 ± 0.02	11–13
Number of soft rays	10.0 ± 0.04	9–11
Total number of rays	22.0 ± 0.04	21–23
North Caucasian shelf of the Black Sea (Bolshoi Utrish, Magri, Loo, and Adler)		
Number of hard rays	12.0 ± 0.02	11–12
Number of soft rays	10.1 ± 0.03	9–11
Total number of rays	22.1 ± 0.03	21–23

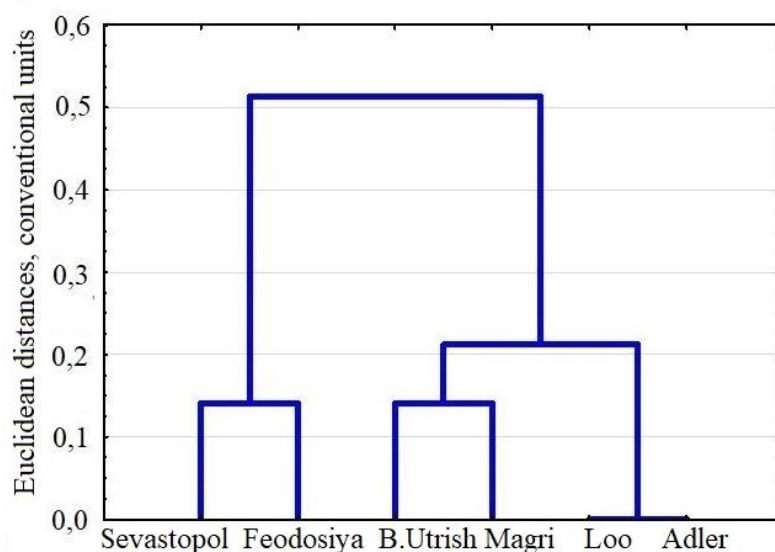
The mean values of the number of soft rays in the dorsal fin of the black scorpionfish inhabiting the coast of Crimea varied depending on the water area 9.9 to 10.0. For the fish sampled off the coast of the North Caucasus, those were slightly higher: 10.1 to 10.2. The mean value of the total number of rays in the dorsal fin was characterized by a similar dependence: 21.9–22.0 for the “Crimean” fish and 22.1–22.2 for the “North Caucasian” specimens (Table 2).

This fact, in our opinion, can be considered as a manifestation of the clinal variability of the number of rays in the dorsal fin of the black scorpionfish.

The geographic variability in the number of rays in the dorsal fin of the studied species was confirmed by the results of the cluster analysis (Ward’s method) as well. The mean values of three parameters for different water areas (the total number of rays in the dorsal fin, the number of hard rays in the dorsal fin, and the number of soft rays in the dorsal fin) were subjected to clustering. Importantly, the samples quite clearly differed in terms of geography (Fig. 2). At a distance of about 0.52 conventional units, two groups were formed: the “North Caucasian” and “Crimean” ones. In its turn, the “North Caucasian” group at a distance of about 0.22 conventional units formed two subgroups: “Utrish–Magri” (these water areas are located to the west within the North Caucasian shelf) and “Loo–Adler” (located to the east).

Based on the analysis of the number of hard and soft rays in each individual, we revealed six possible variants of the dorsal fin formula for the black scorpionfish inhabiting the coast of the North Caucasus and Crimea: D XI 10; D XI 11; D XII 9; D XII 10; D XII 11; and D XIII 10. The frequency of their occurrence in different water areas and on average in two areas is given in Table 3.

Obviously, the variant D XII 10 was the most widespread one, both in the sample in general and in each of the analyzed water areas. Moreover, the individuals with the variant D XII 11 were registered in each water area, although in relatively small numbers (from 4.6 % in the Sevastopol area to 20.4 % in the Magri area). Other “morphotypes” – D XI 10; D XI 11; D XII 9; and D XIII 10 – were recorded not in all the areas studied and were rather rare. The exception was the water area of the Sevastopol Bay: 13.6 % of the individuals analyzed had the fin formula D XII 9.



**Fig. 2.** Results of the cluster analysis by the number of rays in the dorsal fin of the black scorpionfish (groups from different areas of the Black Sea) (Ward’s method)

**Table 3.** Frequency of occurrence of different variants of the dorsal fin formula for the black scorpionfish off the coasts of the North Caucasus and Crimea

Water area	Ratio of fish with different dorsal fin formulas, %					
	XI 10	XI 11	XII 9	XII 10	XII 11	XIII 10
Sevastopol	0.0	0.0	13.6	81.8	4.6	0.0
Feodosiya	0.0	1.7	3.4	88.0	5.2	1.7
Bolshoi Utrish	2.2	6.5	2.2	80.4	8.7	0.0
Magri	0.0	2.3	2.3	75.0	20.4	0.0
Loo	0.0	0.0	0.0	88.9	11.1	0.0
Adler	0.0	2.3	2.3	86.3	9.1	0.0
<b>Mean</b>	0.4	2.6	3.5	83.2	9.9	0.4

The number of hard rays in the dorsal fin in the studied black scorpionfish varied from 11 (3.0 % of fish) to 13 (0.4 % of fish), with a significant prevalence of specimens with 12 rays (96.6 %) (Table 2). The number of soft rays in the dorsal fin of the analyzed black scorpionfish varied from 9 (3.5 %) to 11 (12.5 %), with a prevalence of individuals with 10 rays (84.0 %) (Table 2).

Thus, the specified formula of the dorsal fin for the black scorpionfish inhabiting the Black Sea off the coast of the North Caucasus and Crimea has the following form: D (XI) XII (XIII) (9) 10 (11).

## DISCUSSION

The first description of the black scorpionfish as a biological species according to the principles of binary nomenclature was carried out by C. Linnaeus in his classic work “Systema naturae...” (1758). He gave four descriptions, with the following notes and dorsal fin formulas:

“S. cirri ad oculos neresque. D  $\frac{12}{22}$ ;

*Muf. Ad. Fr.* I. p. 68. Zeus cirris supra oculos & nares. D  $\frac{12}{21}$ ;

*Art. gen.* 47. *fun.* 75. Scorpaena pinnulis ad oculos & nares. D  $\frac{12}{21}$ ;

*Haffelqv. itin.* 330. idem. D  $\frac{12}{21}$ ”.

Importantly, in three out of four descriptions by C. Linnaeus (1758), it is indicated that the dorsal fin of the black scorpionfish has 21 rays, including 12 hard and 9 soft ones. According to the fourth description, the dorsal fin has 22 rays (12 hard and 10 soft ones).

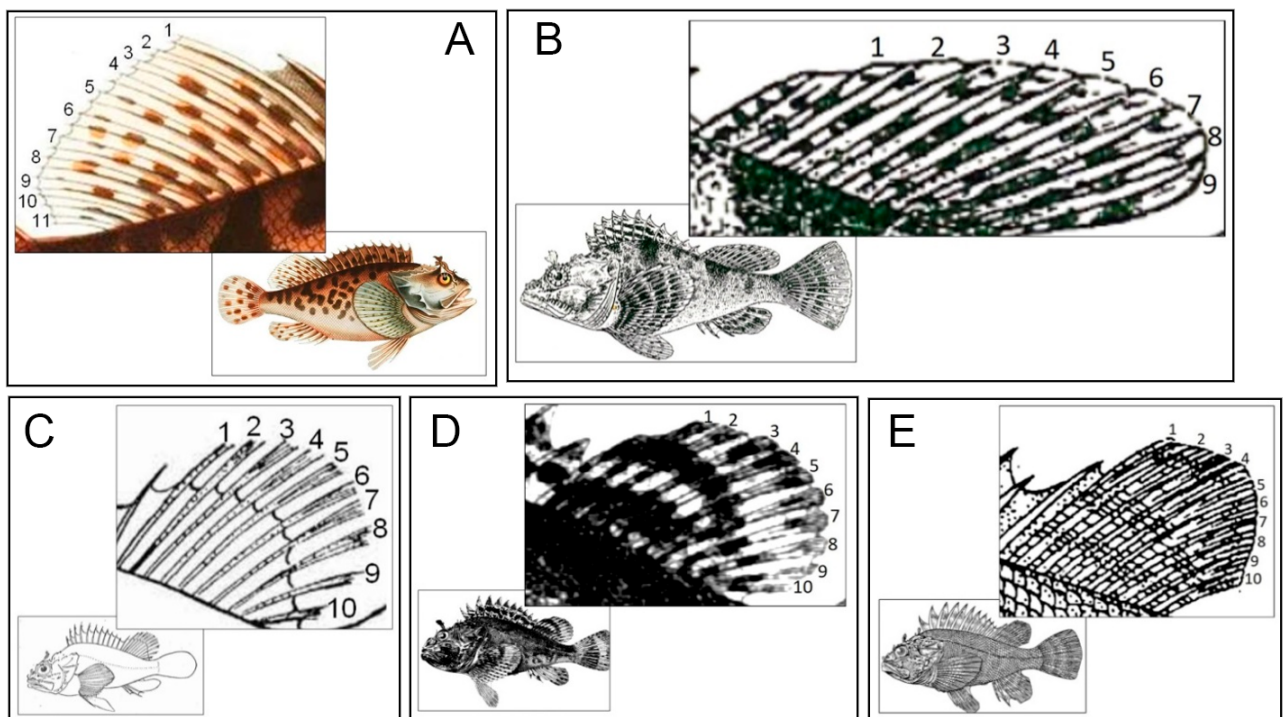
M. E. Bloch (1787) pointed out the following formula of the dorsal fin for the black scorpionfish: D XII/XXI (in total, 21 rays; out of them, 12 are hard and 9 are soft). At the same time, in the illustrated atlas (Bloch, 1785–1795), the dorsal fin of the black scorpionfish is drawn with 12 hard and 11 (not 9, as indicated in the description) soft rays (Fig. 3A).

J. Cuvier and A. Valenciennes (1829) did not give any number of rays in the fins of the black scorpionfish, but indicated that it is similar to the number in *Scorpaena scrofa* (this species has 12 hard and 9 soft rays in the dorsal fin). At the same time, this work is the first one with a note that the last soft ray of the dorsal fin in the black scorpionfish is split into two.

Referring to (Cuvier & Valenciennes, 1829), J. E. De Kay (1842) described the dorsal fin of *S. porcus* as having 12 hard and 9 soft rays – D XII 9 – as well. However, the researcher did not specify that the last soft ray is split into two.

In the classical works of Soviet ichthyologists (Knipovich, 1939 ; Promyslovye ryby USSR, 1949), the dorsal fin of the black scorpionfish was described as having 12 hard rays and 9 soft ones: D XI.I 9 and D XII 9, respectively. There were no notes on any morphological features of the last soft ray. At the same time, in the drawing of the black scorpionfish in the book “Commercial Fish of the USSR” (Promyslovye ryby USSR, 1949), the fish had 9 soft rays, with the last one being not split into two (Fig. 3B). Later, a similar formula for the dorsal fin of the black scorpionfish – D XII 9 – was given by V. Lebedev *et al.* (1969) and E. Vasil’eva (2007).

J. Cadenat (1943) pointed out the following formula of the dorsal fin for the black scorpionfish: XII 9–10. The description was accompanied by the drawing of a fish with 10 soft rays in the dorsal fin (Fig. 3C).



**Fig. 3.** View of the soft part of the black scorpionfish dorsal fin in various species guides (rays were numbered by the authors of this article): A, M. E. Bloch (1785–1795); B, Commercial Fish of the USSR (Promyslovye ryby USSR, 1949); C, J. Cadenat (1943); D, A. N. Svetovidov (1964); E, A. I. Smirnov (1986)

A. Svetovidov (1964) gave an extended formula of the dorsal fin for the Black Sea black scorpionfish, with the variability of the number of rays specified: D (XI) XII (8) 9. The morphology of the last ray was not detailed. The description was accompanied by the drawing of a fish with 12 hard rays and 9 soft ones. Importantly, the last soft ray was shown split into two at the base (Fig. 3D).

A similar formula of the dorsal fin for the species analyzed – D (XI) XII (8) 9 – was indicated by A. Boltachev and E. Karpova (2017). A close one – D XI–XII 8–9 – was specified by N. Myagkov (1994).

In Table 4, the data are given on the number of rays in the dorsal fin of the black scorpionfish according to various researchers.

**Table 4.** Generalized literature data of the dorsal fin formula for the black scorpionfish

Reference	Dorsal fin formula	Note
Linnaeus, 1758	$\frac{12}{22}, \frac{12}{21}, \frac{12}{21}, \frac{12}{21}$	The numerator is the number of hard rays; the denominator is the total number of rays
Bloch, 1787	$\frac{XII}{XXI}$	The numerator is the number of hard rays; the denominator is the total number of rays. In the Atlas (Bloch, 1785–1795), on the drawing by L. Schmidt, there are 12 hard rays and 11 soft ones
Cuvier & Valenciennes, 1829	XII 9	As specified, the last soft ray is split into two (p. 291)
De Kay, 1842	XII 9	–
Knipovich, 1939	XI.I 9	–
Slastenenko, 1939	XI–XII, I (9) 10 (11)	–
Cadenat, 1943	XII 9–10	In the drawing of a fish (p. 544), there are 10 soft rays
Promyslovye ryby USSR, 1949	XII 9	In the drawing of a fish (p. 661), there are 9 soft rays. The last soft ray is not split into two
Svetovidov, 1964	(XI) XII (8) 9	In the drawing of a fish (p. 471), there are 9 soft rays. The last soft ray is split into two
Jardas, 1996	XII 9–10	–
Lebedev et al., 1969	XII 9	–
Eschmeyer, 1969	XII 9	As specified, the last soft ray is split into two (p. 84)
Smirnov, 1986	X–XII 8–10	–
Fischer et al., 1987	XII 9–10	–
Myagkov, 1994	XI–XII 8–9	–
Basusta et al., 1997	XII 11	–
La Mes, 2005	XII 8–11	–
Vasil'eva, 2007	XII 9	–
Ferri et al., 2010	XII 10	–
Boltachev & Karpova, 2017	(XI) XII (8) 9	–
Fricke et al., 2018	XII 7–9	As specified, the last soft ray is split into two (p. 172)
Authors' data	D (XI) XII (XIII) (9) 10 (11)	When considering two last soft rays located on a common base as separate rays
	D (XI) XII (XIII) (8) 9 (10)	When considering two last soft rays as one ray

E. Slastenenko (1939) and A. Smirnov (1986) gave the most variable formulas for the dorsal fin of the black scorpionfish: D XI–XII, I (9) 10 (11) and D X–XII 8–10, respectively. In the second reference, the description was accompanied by the drawing of a fish with 12 hard and 10 soft rays in the dorsal fin (Fig. 3E).

Obviously, the published data differ in the number of rays in the dorsal fin of the black scorpionfish, especially in its soft part. Moreover, in most cases, when describing the formula of the dorsal fin for the species studied, neither rare morphotypes nor ranges of variation of the criterion values are indicated.

Our data (Table 3) cover rare morphotypes and a range of variation in the number of rays in the dorsal fin, both soft and hard (see Tables 1 and 2). This information can be used in species guides for the Black Sea fish when compiling identification keys and giving generalized morphological characteristics of the species.



Let us consider in more detail the issue of the number of rays in the soft part of the dorsal fin of the black scorpionfish. As mentioned above, some researchers indicate that its last soft ray is split into two, but most authors do not comment on this morphological feature.

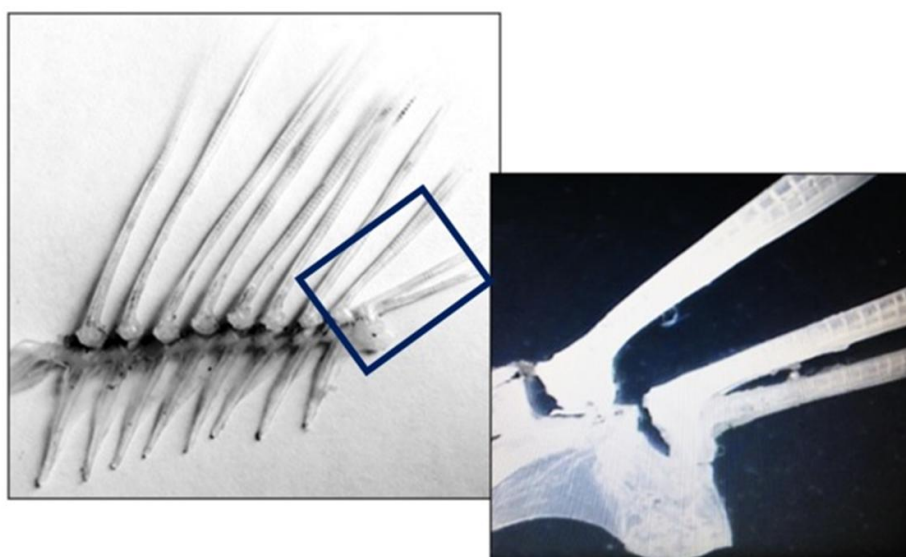
Fig. 4 shows the soft part of the dorsal fin of the black scorpionfish inhabiting the Black Sea. Visually, there are 10 soft rays. However, a study of the fin skeleton allows concluding that the last two rays have a common base (Fig. 5). Due to this anatomical feature, the authors could use different approaches when counting the number of soft rays in the dorsal fin.

Apparently, it is the reason of the differences in the number of soft rays in the dorsal fin of the black scorpionfish indicated by researchers: 8, 9, 10, or 11 (Table 4).

G. Sidorov and Yu. Reshetnikov (2014) draw attention to this feature of counting the number of rays in fins. The authors specified: “usually, the last branched ray in dorsal and anal fins is split and is considered as one ray”.

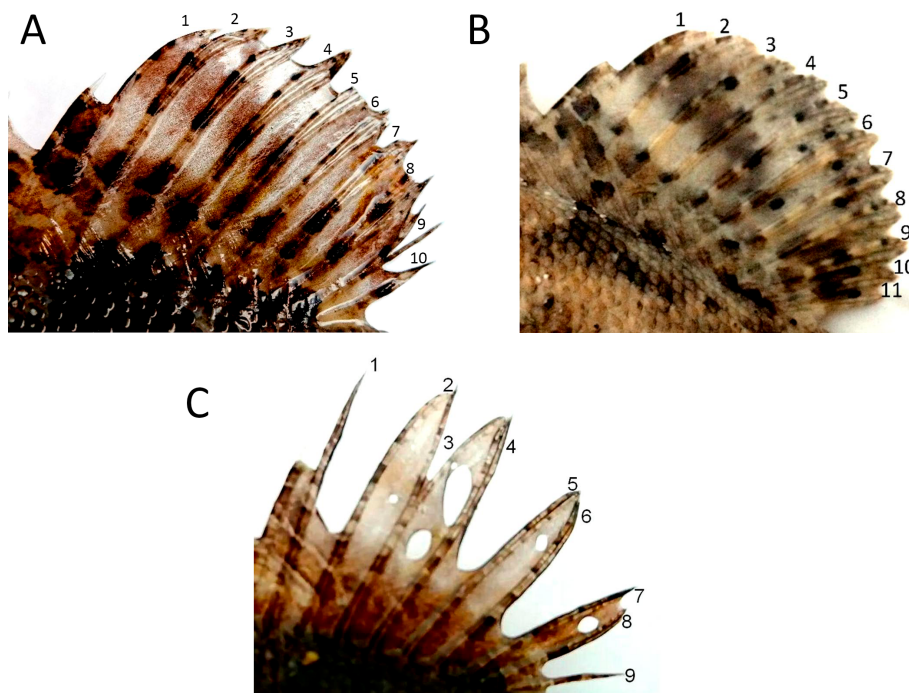


**Fig. 4.** View of the typical soft part of the black scorpionfish dorsal fin (May 2019, Feodosiya area, ♀)



**Fig. 5.** Typical skeleton structure of the soft part of the black scorpionfish dorsal fin (photo by the authors)

In our opinion, since during visual inspection (without removal of soft tissues from the fin skeleton), the last rays of the dorsal fin look like two separate ones, they are better considered separately: *e. g.*, Fig. 6A, 10 soft rays; Fig. 6B, 11 soft rays; and Fig. 6C, 9 soft rays. However, when describing the fin formula, it is necessary to indicate that the counting of the number of rays was carried out without preliminary removal of soft tissues from the skeleton and that the last two rays may have a common base.



**Fig. 6.** Soft part of the black scorpionfish dorsal fin with different number of soft (branched) rays: A, 10; B, 11; C, 9

### Conclusions:

1. In the dorsal fin of the black scorpionfish inhabiting the Black Sea off the coast of the Caucasus and Crimea, the mean values of the total number of rays, the number of hard (unbranched) rays, and the number of soft (branched) rays are  $(22.1 \pm 0.02)$  (the variation range 21 to 23);  $(12.0 \pm 0.01)$  (11 to 13); and  $(10.1 \pm 0.03)$  (9 to 11), respectively. All three considered criteria are the features with low variability (coefficient of variation is  $< 10\%$ ).
2. Fish inhabiting the coast of the North Caucasus and Crimea statistically significantly differ in the number of soft rays in the dorsal fin:  $(10.1 \pm 0.03)$  and  $(10.0 \pm 0.04)$ , respectively. They statistically significantly differ in the total number of rays in the fin as well:  $(22.1 \pm 0.03)$  and  $(22.0 \pm 0.04)$ , respectively. According to the results of the cluster analysis by three criteria (the total number of rays in the dorsal fin, the number of hard rays, and the number of soft rays), the samples quite clearly differ in terms of geography: there are the “North Caucasian” and “Crimean” groups.
3. In the black scorpionfish inhabiting the coast of the North Caucasus and Crimea, six possible variants of the dorsal fin formula are revealed: D XI 10; D XI 11; D XII 9; D XII 10; D XII 11; and D XIII 10. The most common variant is D XII 10: depending on the water area, it was registered in 75.0–88.9 % of fish.
4. The specified formula of the dorsal fin for the black scorpionfish (with separate counting of the last two branched rays located on one base) has the following form: D (XI) XII (XIII) (9) 10 (11).

**Acknowledgement.** The authors express their gratitude to D. Kutsyn (IBSS) for providing the black scorpionfish specimens caught off the coast of Sevastopol and to V. Merzlikin, E. Sigida, and R. Ashigyan (Azov–Black Sea branch of the FSBSI “VNIRO”) for sampling the fish in the water areas of Feodosiya, Bolshoi Utrish, and Adler.

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**ИЗМЕНЧИВОСТЬ ЧИСЛА ЛУЧЕЙ  
И УТОЧНЕНИЕ ФОРМУЛЫ СПИННОГО ПЛАВНИКА МОРСКОГО ЕРША  
SCORPAENA PORCUS LINNAEUS, 1758 (PISCES: SCORPAENIDAE),  
ОБИТАЮЩЕГО В ЧЁРНОМ МОРЕ**

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Ключевая роль среди морфологических критериев вида у рыб принадлежит меристическим (счётным) признакам, в частности числу лучей в плавниках. Это один из наиболее стабильных признаков морфотипа рыб, не подверженный размерно-возрастной изменчивости. При этом он может являться чётким таксономическим критерием. Целью работы было изучить изменчивость количества лучей в спинном плавнике морского ерша, обитающего в Чёрном море у берегов Северного Кавказа и Крыма, а также уточнить его формулу. В основу работы положены

результаты исследования 232 особей этого вида из шести участков Чёрного моря, находящихся у берегов Северного Кавказа (Большой Утриш, Магри, Лоо и Адлер) и Крыма (Севастополь и Феодосия). У каждой рыбы просчитывали количество лучей в спинном плавнике с разделением их на жёсткие (неветвистые) и мягкие (ветвистые). Установлено, что у морского ерша, обитающего у берегов Северного Кавказа и Крыма, средние значения общего количества лучей в спинном плавнике составляют  $(22,1 \pm 0,02)$ , количества жёстких лучей —  $(12,0 \pm 0,01)$ , мягких —  $(10,1 \pm 0,03)$ . Все три показателя характеризуются низкой степенью варьирования (коэффициент вариации — менее 10 %). Рыбы, отловленные у берегов Северного Кавказа и Крыма, статистически достоверно отличаются друг от друга по количеству мягких лучей в спинном плавнике [ $(10,1 \pm 0,03)$  и  $(10,0 \pm 0,04)$  соответственно] и по общему числу лучей в нём [ $(22,1 \pm 0,03)$  и  $(22,0 \pm 0,04)$  соответственно]. У изученных рыб выявлено существование шести возможных вариантов формулы спинного плавника: D XI 10; D XI 11; D XII 9; D XII 10; D XII 11; D XIII 10. Наиболее распространённым является вариант D XII 10 — в среднем 83,2 % (75,0–88,9 % в зависимости от участка). Уточнённая формула спинного плавника морского ерша, обитающего у берегов Северного Кавказа и Крыма, имеет следующий вид: D (XI) XII (XIII) (9) 10 (11). Формулу можно использовать при составлении определителей рыб Чёрного моря. Проведено сравнение полученных авторами данных по числу лучей в спинном плавнике морского ерша с результатами других исследователей. Проанализированы причины имеющихся отличий с точки зрения разницы в применяемых методических подходах к подсчёту количества лучей в мягкой части плавника.

**Ключевые слова:** морской ёрш *Scorpaena porcus*, формула спинного плавника, Чёрное море, мягкие лучи, жёсткие лучи, Северный Кавказ, Крым