

Pomatoschistus marmoratus (Risso 1810), is it really a ‘New’ Species for Bulgarian Ichthyofauna?

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Abstract: The genus *Pomatoschistus* is represented in Black Sea by 3 species. Comparison with older material solves the problem concerning the taxonomic status of *Pomatoschistus marmoratus* and its misidentification with *P. microps* by some authors in the past. In view to the lack of recent investigations concerning Bulgarian gobiid fauna, it is given a morphological and genetic-biochemical description of this species.

Key words: *Pomatoschistus marmoratus*, Bulgarian Ichthyofauna, Black Sea, Gobiidae.

Introduction

The genus *Pomatoschistus* is represented in Black Sea by 3 species: *Pomatoschistus marmoratus* (Risso 1810), *P. minutus* (PALLAS 1770) and *P. bathi* (MILLER 1982) (MILLER 1986, VASIL’EVA & BOGORODSKII 2004). In the beginning of the previous century DRENSKY (1923) assumed that *P. microps* (KROYER 1838) is also inhabitant of Bulgarian Black Sea sector. BANARESCU (1964) and GHEORGIEV (1966) reached to the same conclusion. Later it was reported that *P. microps* is not typical for Black Sea, and could be found only in the Western Mediterranean and Eastern Atlantic Region (MILLER 1986). After mid-sixties, investigations concerning Bulgarian Black Sea fish fauna have been concentrated mainly on the dynamics and fisheries of some important valuable species as turbot, sprat, anchovy, etc. DOBROVOLOV *et al.* (1995) investigated the allozymic variation of *P. marmoratus*, but they did not comment its taxonomic status in connection with *P. microps* in Black Sea.

The aim of the investigation is to be accomplished a morphological and genetic-biochemical description of this species, and also to solve the problem of its taxonomic status and its misidentification with *P. microps* by some authors on the basis of comparison with older material.

Material and Methods

The material was collected in the period May-October 2009, fixed in 4% formaldehyde solution and deposited in the Institute of Zoology, BAS. Older material was also used for species determination according to MILLER (2004) and KOTTELAT & FREYHOF (2007). 20 specimens first described as *Gobius leopardinus* and later as *Pomatoschistus leopardinus* by DRENSKY (1923, 1931 respectively) and deposited at the National Museum of Natural History, BAS have also been compared with these, concerning the current study. The serial numbers of the banks in which

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Drensky's material is preserved are: 2/3, 2/4, 2/6, 2/7, 2/10, 2/11 and 2/16, collected from 1926 to 1928. 16 morphological characters of 39 specimens of *Pomatoschistus marmoratus* have been measured. Their statistical treatment includes descriptive and variation statistics by the aims of PAST statistical program. 30 specimens have been studied in terms of 12 enzymic and 5 general water soluble protein loci (Prot) according to DOBROVOLOV (1973, 1976), CLAYTON & GEE (1969) and SHAW & PRASAD (1970).

Results and Discussion

Diagnosis and description: *Pomatoschistus marmoratus* originated from Bulgarian Black Sea coast is a small-sized goby (Fig. 4), with maximum observed total length of 65.61 mm of a male specimen. The number of lateral line scales, D1, D2, A, P, V and C rays are given in Table 1. The head is comparatively small, the snout shorter than eye diameter and the interorbital space smaller than eye diameter (Table 2). The ventral fin is the longest one. Pectoral, second dorsal, anal and first dorsal fin length follow respectively. The breast is scaled, semi-scaled or completely scaleless in its posterior part. The praedorsal area up to the first dorsal fin is always free of scales. The belly area is also nude in its midline, from the basis of V to A. The ventral fin covers anus or reaches to without covering it, with the rear edge of anterior pelvic membrane showing two minute villi, which almost disappear when membrane is distending. The inferior joining of gill membrane (isthmus) is disposed in front of the end of praeopercles. Vertebrae are counted from 31 to 33. Swim bladder is present.

Suborbital pores α vary from 15 to 18. The b series intersects only the last two transversal suborbital series (out of 6-8 transversal suborbital series). These are short, neither reaching the orbit. The first paired orbital pores (σ) reach only to posterior nostrils. Frontal interorbital and median praeopercular (λ , and δ respectively) are present; the first is located in front of the orbital midline. The pore κ is sited on the line joining the posterior orbital margins. The horizontal line d does not extend under the last two transversal suborbital series. There are additional series of genipores disposed behind α and δ , below ρ' - ρ'' and above the pectoral fin (Fig. 2).

The basic statistical parameters calculated on the basis of body proportions are given in Table 2.

Sex dimorphism and ratio: during the breeding period (when the material was collected) 15 specimens occurred to be males and 24 females, out of 39 collected specimens, or the sex ratio is 38.5% males and 61.5% females. It is possible that this value shows seasonal varieties, in view to lack of more data. All of the males show 4-6 vertical bands across the body, whereas in females the same number of darker spots can be established. Single fins are darker in males than in females, the second possess a dark spot in the lower jaw, which is absent in males, or other species from genus *Pomatoschistus* in Black Sea. A comparison between the measured body proportions in both sexes has been accomplished in terms of principal component analysis. As it can be established on the basis of the first component histogram, the single fins length (except caudal) differs according to sex. The second one points some differences in some head proportions (Fig. 1a, 1b). In view to these morphometric differences it is suggested that sexes can be distinguished safely only on the basis of their coloration.

Allozymic variation: The phenotypic expression of the analyzed 12 enzymic loci is proved to be conservative. Neither these, nor the expressed 5 water soluble protein loci are polymorphic as also is mentioned in DOBROVOLOV *et al.* (1995) (Fig. 3, Table 3).

Distribution: The examined specimens of *Pomatoschistus marmoratus* have been distributed in shallow waters (0.3-4 m depth) in various sites of approximately the whole Bulgarian Black Sea coast: from Durankulak in north (43°41'55"N, 28° 34'17"E) to Sinemorets in south (42°03'13"N, 27°59'15"E). Preliminary data show, that this goby lives on sand substrate in small loose shoals, formed by both sexes.

Taxonomic status: All of the specimens collected by Drensky during 1926-1928 have occurred to be misidentified as *Pomatoschistus microps* instead of *Pomatoschistus marmoratus*, since the first species is not typical inhabitant in Black Sea according to MILLER (2004). On the basis of this mistake further reports have also kept the same line: BANARESCU (1964) and GHEORGIEV (1966) reached to the same conclusion. They both gave a good de-

Table 1. Basic meristic parameters of *Pomatoschistus marmoratus* from Bulgarian Black Sea coast.

Morphological character	Minimal value	Maximal value	Range
Number of lateral line scales	37	45	8
Number of first dorsal fin rays	VI	VII	1
Number of second dorsal fin rays	I 9	I 11	2
Number of anal fin rays	I 9	I 11	2
Number of pectoral fin rays	19	20	1
Number of ventral fin rays	10	10	0
Number of caudal fin rays	32	36	4

Table 2. Basic statistical parameters calculated on the basis of body proportions of *Pomatoschistus marmoratus*.

Morphological characters		Statistical parameters		n	Mean	Mean standard error	Median	Standard deviation	Variance	Skeweness	Minimum value	Maximum value	Range
In % of standard length	1	Head length (Lc)	39	27.50	0.22	27.28	1.35	1.84	0.76	24.73	31.71	6.98	
	2	Maximum body height (H)	39	16.54	0.18	16.36	1.15	1.33	0.36	14.62	18.91	4.29	
	3	Minimum body height (h)	39	7.24	0.11	6.99	0.71	0.51	0.45	6.04	8.60	2.56	
	4	Praedorsal length to D1 (praed1)	39	35.62	0.24	35.49	1.52	2.33	-0.094	31.27	39.00	7.73	
	5	Praedorsal length to D2 (praed2)	39	56.22	0.27	56.74	1.72	2.96	-0.759	51.28	59.27	7.99	
	6	Praeanal length (Praeanal)	39	58.89	0.24	58.94	1.48	2.19	0.33	55.58	62.18	6.60	
	7	D1 length (D1)	39	12.25	0.25	12.52	1.53	2.35	0.00	9.55	15.10	5.55	
	8	D2 length (D2)	39	17.86	0.45	18.13	2.82	7.98	-0.32	10.57	23.32	12.75	
	9	A length (A)	39	15.21	0.42	15.27	2.65	7.022	0.00	10.04	20.32	10.28	
	10	P length (P)	39	20.38	0.30	19.98	1.89	3.57	1.016	17.21	26.46	9.25	
	11	V length (V)	39	24.24	0.22	24.31	1.94	1.94	-0.02	21.79	26.81	5.02	
In % of head length	12	Snout length (Lr)	39	22.38	0.36	22.50	2.27	5.15	-0.02	17.87	27.07	9.20	
	13	Eye diameter (Do)	39	25.66	0.34	25.38	2.13	4.55	2.22	21.90	35.09	13.19	
	14	Postorbital length (Spo)	39	56.02	0.32	56.16	2.00	4.03	-0.04	51.78	61.07	9.29	
	15	Interorbital length (Io)	39	5.04	0.18	4.91	1.15	1.32	0.07	2.95	7.17	4.22	
	16	Head height (Hc)	39	60.52	0.43	60.18	2.69	7.24	0.28	55.63	67.58	11.95	

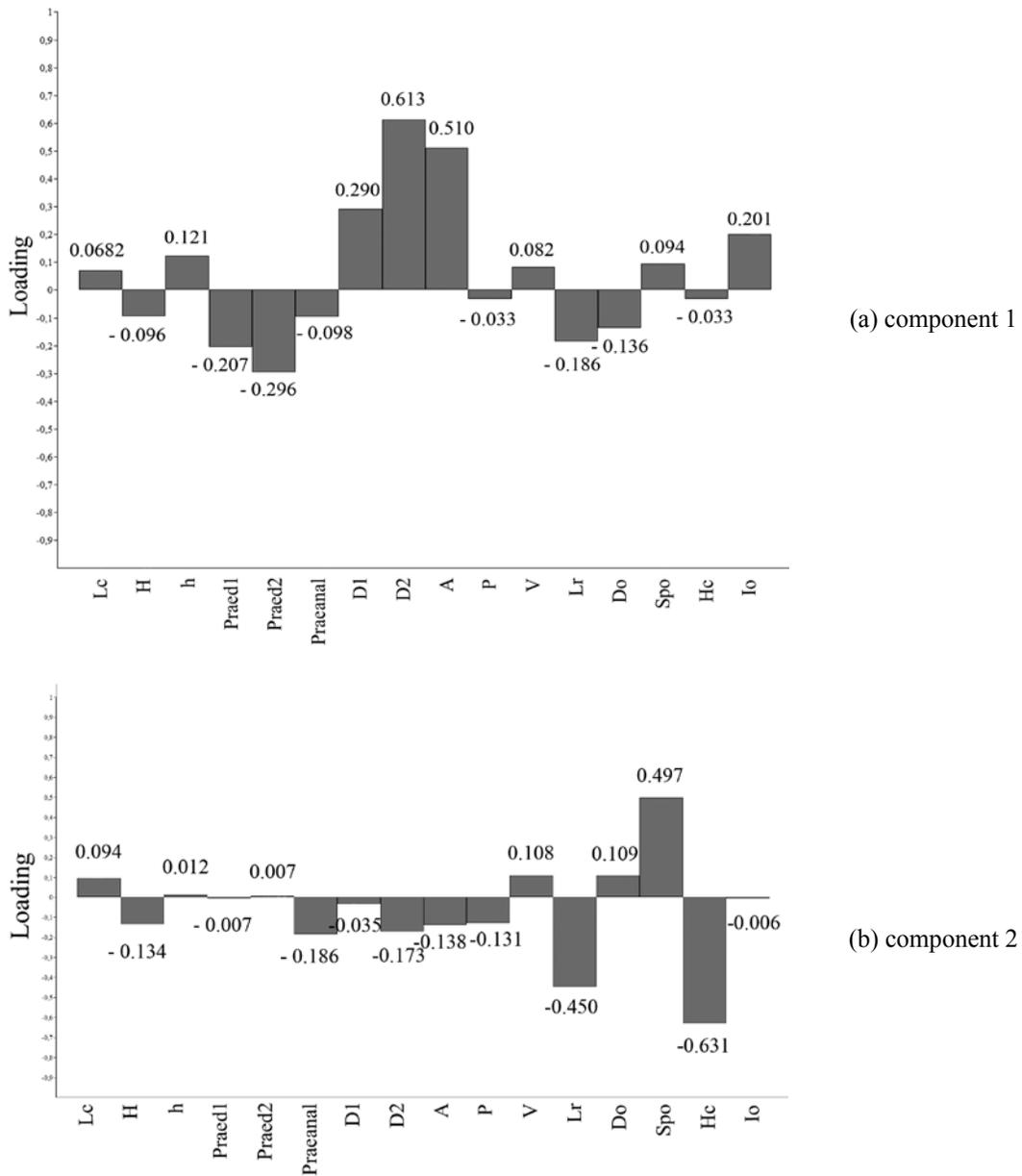


Fig. 1. Principal component analysis: comparison between males/females' measured morphological characters (designations as in Table 2).

Fig. 2. Canal sensory system of *Pomatoschistus marmoratus* from Bulgarian Black Sea coast.

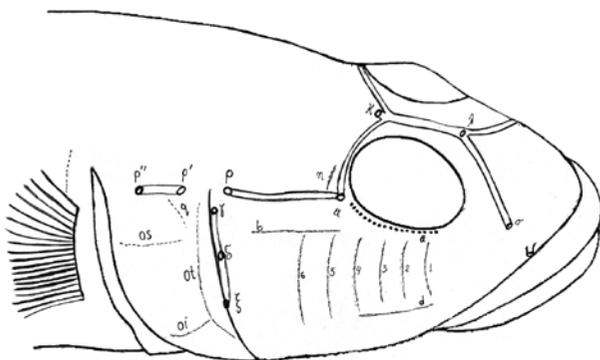


Table 3. Genetic frequencies of 12 enzymic loci of *Pomatoschistus marmoratus* from Bulgarian Black Sea coast.

Locus	Genetic frequencies	
EST-1*	1	0
EST-2*	1	0
LDH-A*	1	0
LDH-B*	1	0
mMDH*	1	0
sMDH-1*	1	0
sMDH-2*	1	0
sSOD	1	0
sMEP-1*	1	0
mMEP*	1	0
PGM-1*	1	0
PGM-2*	1	0

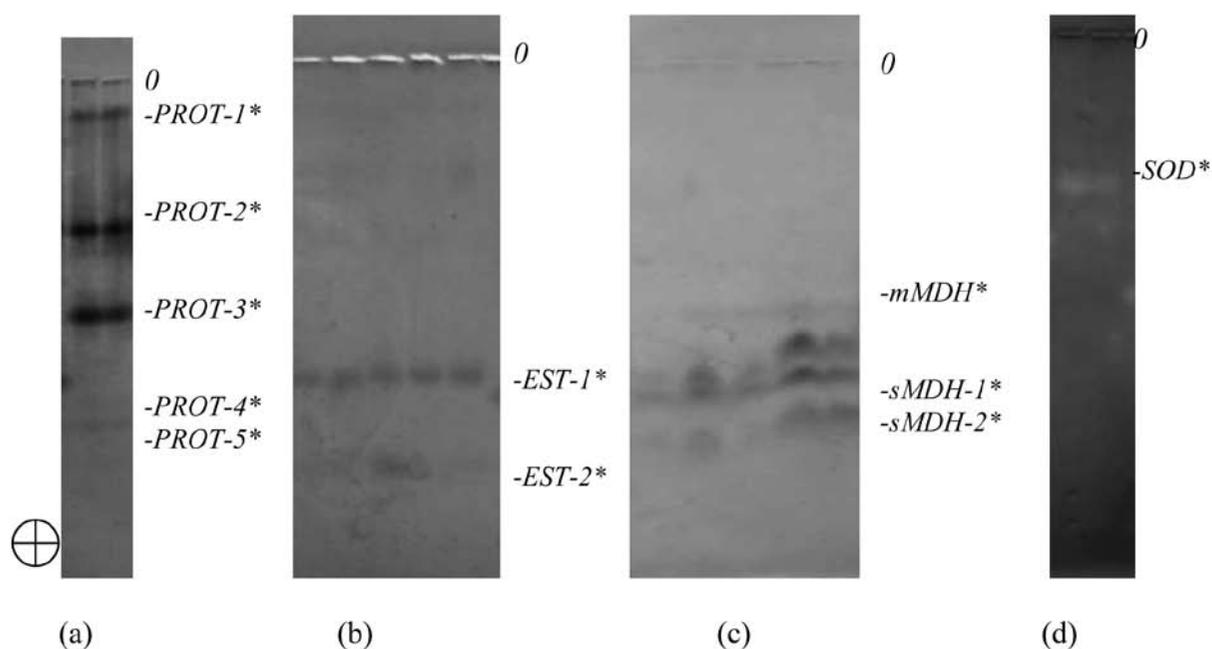


Fig. 3. Electrophoregrams of muscle water soluble proteins-*PROT* (a), esterases-*EST* (b), malate dehydrogenase-*MDH* (c), superoxide dismutase-*SOD* (d) of *Pomatoschistus marmoratus*.



Fig. 4. *Pomatoschistus marmoratus* from Bulgarian Black Sea coast (Durankulak, 43°41'55"N, 28° 34'17"E).

scription of the species but did not take into account some important traits as the pale throat, the female's dark spot on mandibula and the presence/absence on scales of the breast area, which are distinguishing between *Pomatoschistus microps* and *Pomatoschistus marmoratus*. Other authors in their work concerning the circumponctic gobiid fish fauna also mention that the first is not typical for Black Sea (MILLER 1986). DOBROVOLOV *et al.* (1995) recognized and investigated the allozymic variation of *P. marmoratus*, but they did not comment its taxonomic status in con-

nection with *P. microps* in Black Sea.

On the basis of the mentioned data it is clear that *Pomatoschistus marmoratus* does not represent a relatively new species for Bulgarian ichthyofauna. Its presence has not been noted more recently, in view to misidentification as *Pomatoschistus microps* and lack of further investigations till mid sixties.

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