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SHORT COMMUNICATION

First record of the snake blenny, *Ophidion rochei* Müller, 1845 (Actinopterygii: Ophidiiformes: Ophidiidae), from the Sea of Azov

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Abstract

The first record of an Atlantic origin species, the Roche's snake blenny O*phidion rochei* Müller, 1845, in the Black Sea is provided from the south-east Sea of Azov. Its appearance in the Sea of Azov can be explained by the increase in water salinity of the sea in recent years.

Keywords: Black Sea, Kerch Strait, first record, distribution, marine fish

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The Sea of Azov is a small and shallow enclosed sea connected to the north-eastern Black Sea through a narrow strait, the Kerch Strait, and thus belonging to the Mediterranean system of the northern Atlantic Ocean. Its main hydrological feature is low salinity (1–10‰) due to a large freshwater discharge by rivers and limited water exchange with the more saline (17–18‰) Black Sea. Salinity in the Sea of Azov is variable – lower in the large bays adjacent to the Don and Kuban river mouths and higher in the open sea, especially near the Kerch Strait. Besides, it is characterized by long-term fluctuations, both on average and in different areas, due to, mainly, freshwater discharge.

A significant increase in sea salinity due to the anthropogenic withdrawal of freshwater runoff, which coincided with the period of low water availability of the Don and Kuban Rivers, was observed in the 1970s. The maximum salinity (an average annual value of 13.76‰) was recorded in 1976. In close proximity to the Kerch Strait, due to the advection of Black Sea waters, the average salinity exceeded 15‰ approaching in the bottom layer in the autumn the salinity that of the Black Sea, 18.2‰ (Matishov *et al.* 2006).

Since the late 1970s, due to more favourable climatic conditions that contributed to increased river runoff, salinity in the Azov Sea started to gradually decrease (Matishov *et al.* 2006). Thus, the average salinity of the sea was 11.46‰ from 1982 to 1985, and 10.27 ‰ from 1998 to 2003; by 2006 it reached the lowest value in the current century, 9.29‰ (Kuropatkin *et al.* 2013).

Since 2007, the Azov Sea has again entered the period of progressive salinity rising (Kuropatkin *et al.* 2013; Zhukova *et al.* 2015) as a result of the decline in the Don River runoff amid increased evaporation associated with the climate warming. The recent increase of salinity is more considerable than in the 1970s (Berdnikov *et al.* 2019). For example, between 2015 and 2016, brackish water (4–8‰) was recorded in the Don avandelta area, usually almost fresh, due to a decrease in river runoff and substitution of its shortage with water of the Black Sea origin (Matishov *et al.* 2017). In 2017, the average salinity of the Azov Sea was 13.8‰, and has continued to increase, reaching at present 14‰ (unpublished data).

Due to the complex hydrological regime of the Sea of Azov, its native fish fauna has different origins including freshwater species, brackish Ponto-Caspian relicts, and Atlantic-Mediterranean marine species. Marine species are mostly euryhaline seasonal migrants from the Black Sea. Some of them perform regular annual migrations, timed to coincide with a warm season, such as *Chelon auratus* (Risso, 1810), *Atherina boyeri* Risso, 1810, and *Mullus barbatus* Linnaeus, 1758). Others appear occasionally in small numbers, such as *Pomatomus saltatrix* (Linnaeus, 1766), *Diplodus annularis* (Linnaeus, 1758), *Sciaena umbra* Linnaeus, 1758, and *Pegusa nasuta* (Pallas, 1814). At the same time, during the periods of extreme salinity rising, previously unrecorded marine species inhabiting the Black and Mediterranean Seas have been found in the Sea of Azov from time to time, for example, *Atherina hepsetus* Linnaeus, 1758, *Diplodus puntazzo* (Walbaum, 1792), *Symphodus cinereus* (Bonnaterre, 1788), *Gobius niger* Linnaeus, 1758, *Pomatoschistus minutus* (Pallas, 1770) and some others in the 1970s (Volovik and Chihachev 1998). The list of fishes registered in the Sea of Azov included 120 species and subspecies belonging to 39 families (Diripasko *et al.* 2011; Diripasko *et al.* 2015) before the finding of the Roche's snake blenny presented in this paper.

A single specimen of *Ophidion rochei* was collected in the southern part of the Sea of Azov (45°27.5'N, 36°58.3'E) on October 15, 2017 (Figure 1) from a trawl sample at a depth of 7–8 m with water salinity of about 16‰ (15.2‰ in surface water) during a research fishery survey.

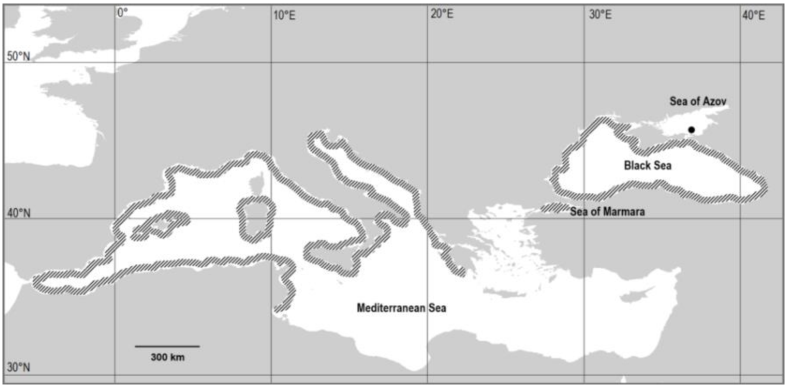

Figure 1. The map showing the sampling site (dot) of *Ophidion rochei* in the Sea of Azov (45°27.5'N, 36°58.3'E) and its historical range (diagonal hatching) based on Fischer *et al.* (1987) and Svetovidov (1964).

The collected specimen was preserved in 4% formaldehyde solution and deposited in the collection of the Institute of Fisheries and Marine Ecology (IFEM). An examination of the main morphological features was performed as described below. A morphometric comparison is presented with the Black Sea specimens based on literature (Movchan 1988).

The specimen was 17.2 cm long (TL) and weighed 22.6 g. The main morphometric characteristics are given in Table 1, which shows that the specimen does not differ from the Black Sea individuals as its values are within the ranges of their values in the Black Sea fish.

The body is low, elongated, laterally compressed. The scales are small, not overlapping, widely separated. The mouth is large; the upper jaw is longer than the lower jaw. The gill rakers on the first left gill arch are in two rows and variable in shape: elongated in the outer row of the lower arm of and in the form of tubercles with seta-like denticles at the apex. The dorsal and anal fins are extended and merged with the caudal fin. The pelvic fins are situated on the chin and look like a forked barbel. The body colouration is pale brown; a narrow black fringe is along the outer margin of the dorsal and anal fins (Figure 2).

Figure 2. O*phidion rochei*, TL 17.2 cm; Sea of Azov, October 15, 2017.

Table 1. Morphometric comparison of O*phidion rochei* from the Black Sea and the Sea of Azov

Characters	Black Sea, Karadag, Crimea, Movchan 1988 (n=45)		Sea of Azov, this study (n=1)
	Range	Mean	
Total length (cm)	13.8–23.2	19.0	17.2
%TL			
Maximum body depth	13.0–18.2	16.0	14.7
Maximum body width	8.3–13.8	10.4	10.6
Predorsal length	30.1–34.3	32.2	30.9
Preanal length	43.9–49.5	47.0	44.7
Pectoral – anal fin origin length	25.0–31.4	28.2	28.5
Pectoral – pelvic fin origin length	12.7–16.3	15.2	13.3
Dorsal fin base length	64.3–71.4	67.7	67.8
Dorsal fin depth	1.9–4.4	3.0	1.8
Anal fin base length	49.5–55.7	53.0	51.7
Anal fin depth	2.2–4.3	3.1	3.4
Pectoral fin length	8.7–10.9	9.8	10.6
External ray length of pelvic fin	4.2–12.1	8.5	9.6
Internal ray length of pelvic fin	5.0–11.4	8.1	8.9
Caudal fin length	2.1–4.4	3.2	3.4
Head length	19.9–22.8	21.4	20.0
%HL			
Head depth at nape	53.1–68.2	61.4	63.7
Head depth through eye	36.8–50.0	42.5	48.3
Snout length	19.6–23.8	21.8	21.2
Eye horizontal diameter	20.4–27.5	23.5	23.8
Postorbital distance	50.0–59.5	54.9	58.1
Maximum head width	41.9–57.8	49.2	45.4
Interorbital width	11.9–18.2	14.1	14.2
Length of upper jaw	47.9–57.1	52.0	54.4
Length of lower jaw	40.5–48.8	44.2	42.7

*Total length TL; Head length HL

Ophidion rochei is a marine species distributed in the western and northern parts of the Mediterranean Sea (Fischer *et al.* 1987, Nielsen *et al.* 1999), Marmara and Black Seas (Svetovidov 1964; Vasil'eva 2007) including the Kerch Strait (Shaganov 2013).

Appearance of *O. rochei* in the Azov Sea, apparently, was made possible due to the significant salinity raising in the southern region of the sea happened in recent years. In the process of advection, denser Black Sea water masses move into the Sea of Azov through the Kerch Strait in the bottom layer, maintaining its salinity in the area adjacent to the strait. Thus, there is no threshold in the form of a sharp gradient of salinity at the entrance to the Azov Sea, which contributes to the local movement of the species in an area with somewhat lower salinity.

This is confirmed by the distribution *O. rochei* in the Black Sea in Ukraine in comparison with the salinity levels. The species occurs along the Crimean coast of the Kerch Strait (14–12‰), is common along the southern coast of Crimea (17–18‰), much less abundant in Karkinit Bay, and only occasionally occurs in the northwestern part of the sea (14–12‰ in the area between the Dniester and the Danube) (Movchan 1988; Shaganov 2013). Off Zmeiny Island (about 19 miles east of the Danube mouth, 14.5–17.0‰), *O. rochei* is assessed as "common species" (Snigirov *et al.* 2012).

The above data allow us to assume that the optimal level of water salinity in the habitats of *O. rochei* should be at least 15‰. During the period of the last century's salinity increase in the Sea of Azov, *O. rochei* could well penetrate into the southern part of the sea, but was not recorded because of its secretive lifestyle and low abundance. It is a solitary benthic fish, mainly dwells over sandy bottoms, nocturnal, slowly moving. During day time, it stays almost motionless, burrowed into the substrate (Svetovidov 1964; Movchan 1988). The probability of finding solitary fishes living such a secretive lifestyle with traditional fishing gear is extremely low, in fact, a matter of chance. Targeted studies with specialized fishing techniques are needed for such purposes.

Describing the catch in the Kerch Strait when *O. rochei* was recorded, Shaganov (2013) indicated the use of different fishing gear, e.g., bottom traps, lifting nets, hook gear, as well as underwater observations using light diving equipment. Although there are no data which fishing gear was used for sampling *O. rochei*, a wide range of collecting methods has proved effective.

Under the conditions of the present hydrochemical regime of the Sea of Azov and the continuation of the water salinity increase, it can be assumed that *O. rochei* will spread in the southern region of the Sea of Azov adjacent to the Kerch Strait, off the coasts of the Taman' and Crimean Peninsulas. It can also be expected high is the probability of penetration from the Black Sea of some other marine species, previously not observed in the Sea of Azov.

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