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FIRST RECORD OF KOREAN ROCKFISH *Sebastes schlegelii* (Hilgendorf, 1880), A NON-NATIVE SPECIES, ON THE ROMANIAN BLACK SEA COAST

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Abstract

The aim of this study is to inform about the first recorded specimens of the Korean rockfish Sebastes schlegelii (Hilgendorf, 1880) in the Romanian part of the Black Sea. The first three specimens sampled had total lengths as 30.7, 30.0 respectively 26.5 centimetres and weights of 543, 487 and 352 grams. All of them were males and their size patterns aligns with other records signalled in the Black Sea. Possible interactions of the S. schelegelii with local species should be monitored carefully. The samples collected represent the first records of the species along the Romanian Black Sea coast. This record highlights the need for continuous monitoring of invasive species due to the potential threats to aquatic community structure, affecting biodiversity and disturbing local trophic networks. In addition, the species could even establish a new opportunity in commercial and sport fisheries.

Key words*: Black Sea port area, fish, invasive species, monitoring.*

INTRODUCTION

Worldwide there is a growing demand for fish and seafood, while living aquatic resources decrease more and more (Nenciu et al., 2022). On the other hand, the balance and functioning of the ecosystem can be significantly disrupted by the introduction of invasive species. Well-grounded scientific data and information about their abundance and distribution are crucial to understand the ecologic and economic impact (Öztürk, 2021).

The Korean rockfish *Sebastes schlegelii* (Hilgendorf, 1880) (order Perciformes, suborder Scorpaenoidei), is part of the *Sebastidae* teleostean family, which includes 7 genera and 133 globally species (Froese & Pauly, 2023). This ovoviviparous, demersal species inhabits coastal areas and rocky bottoms (Yamada et al., 1995) at depths ranging from 3 to 100 meters in the temperate waters of the northwest Pacific, off the coasts of Japan, the Korean Peninsula, and China (Froese & Pauly, 2023). This species displays unique ecological traits, particularly favoring habitats such as rocky reefs, silt, and sandy bottoms (Zhang et al., 2015). The Korean rockfish, which can reach 65 cm in length and weigh up to 3.1 kg, may live for as long as 20 years (Novikov et al., 2002). It reaches sexual maturity at four years of age and is carnivorous, exhibiting selective feeding behavior that primarily targets fishes and shrimps (Chin et al., 2013; Zhang et al., 2014).

An unanticipated range expansion has been documented in the Black Sea, a shift linked to the transport of organisms via ship ballast water along Crimea's coastal areas (Boltachev & Karpova, 2013). Later observations confirmed that a self-sustaining population had become established from the northern Black Sea extending to the Caucasus coast (Karpova et al., 2021). Moreover, the most recent data indicate a significant further spread of the Korean rockfish into Turkish territorial waters in the southern Black Sea (Bilecenoğlu et al., 2023; Yağlıoğlu et al., 2023) as well as into Bulgarian waters (Ivanova et al., 2024).

This study presents the first record and geographical range expansion of Korean rockfish extending to the Romanian Black Sea coast.

MATERIALS AND METHODS

This research focuses on the southwestern region of the Black Sea. In line with the GFCM's classification of geographical

subareas (GSAs) for the Mediterranean, the Black Sea is designated as GSA29 (Carpentieri et al., 2020).

Three Korean rockfish specimens were captured by commercial fishermen in the Constanta Port area (coordinates: 28.700807 E/44.121319 N for two specimens, and 28.703985 E/44.114261 N for one specimen), near the northern dike (see Figure 1). The fishermen provided these samples because they were unable to identify the species, having never encountered them before. The gear used consisted of pots, an effective method for catching gobies on rocky bottoms. These pots were deployed approximately 5–10 meters away from and parallel to the northern dike of Constanta Port, at depths ranging from 5 to 12 meters. All specimens were collected during the April-May period, 2024.

Taxonomic identification of the specimens was conducted using the fish identification key (Nakabo, 2002; Bilecenoğlu et al., 2023), and their scientific names were verified with FishBase (Froese & Pauly, 2023). Total length (TL) was measured with an ichthyometer accurate to 0.1 cm, while body weight (W) was recorded using a scale precise to 0.01 g. Additionally, eighteen morphometric parameters were measured with a digital caliper accurate to 0.01 mm (Randall & Eschmeyer, 2001; Fischer, 2013; Karadurmuş et al., 2022; Aydın & Karadurmuş, 2023; Karadurmuş et al., 2024), with several parameters expressed as percentages of the standard length (SL%). Sex determination was based on the color and shape of the gonads, following Gunderson's (1994) guidelines. Age was determined by binocular analysis of otoliths immersed in 50% ethanol, under transmitted light (Carbonara & Follesa, 2019).

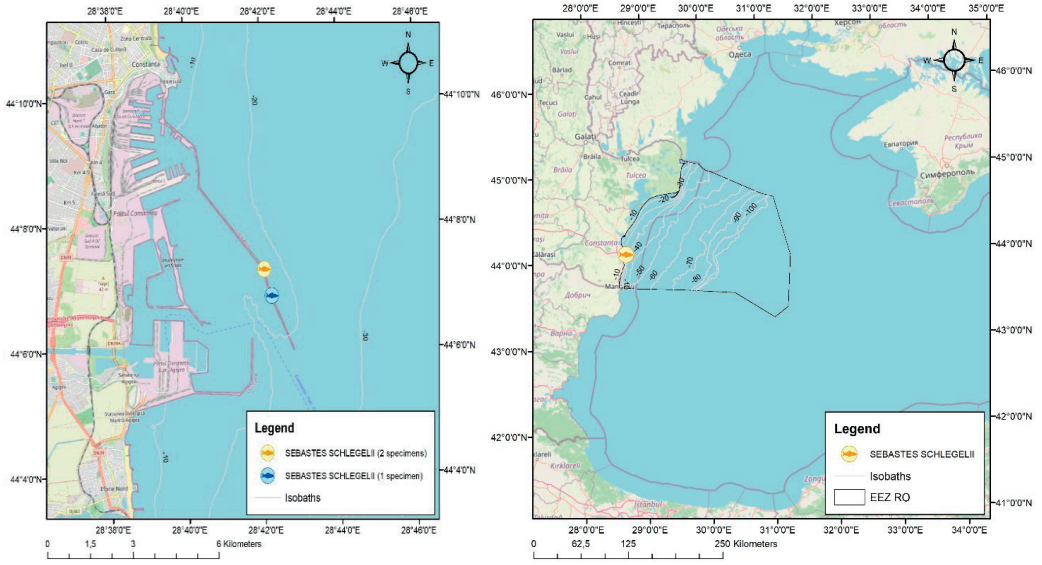

Figure 1. Map of the *Sebastes schlegelii* capture sites in the Romanian coast (Original, made by Dragos Niculescu, NIMRD)

RESULTS AND DISCUSSIONS

The specimens display robust, slightly laterally compressed bodies and large heads equipped with prominent spines (Figures 2 and 3). They feature three lachrymal spines - one of which is distinctly separated from the other two (Figure 3). Additionally, strong nasal, preopercular, and postocular spines are evident, while the superior cranial spines and suborbital ridge are only weakly developed (Figure 3). The preopercle carries five spines, with the second being the longest.

On the upper margin of the opercle, two flattened spines directed posteriorly can be seen, the upper spine being larger. The dorsal

fin is composed of a single structure with 13 spines and 13 soft rays (XIII-13), with the 13th spine - providing anterior support to the soft portion - exceeding the length of the 12th. The pelvic and anal fins follow the formulae I-5 and III-8, respectively, and the caudal fin is rounded.

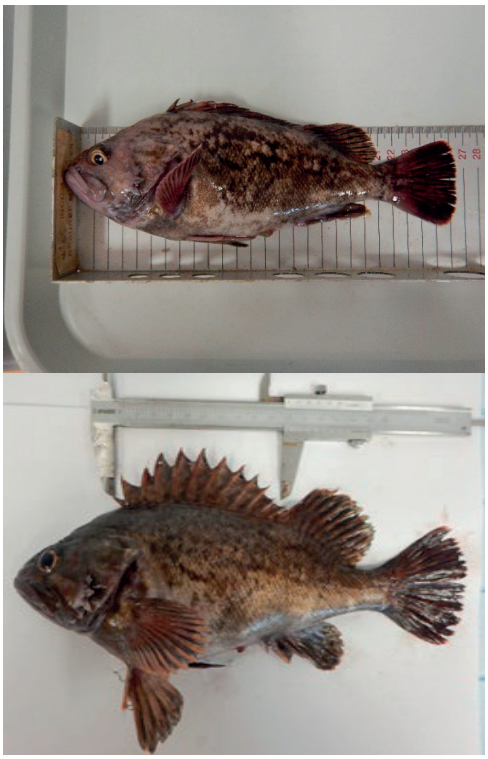

Figure 2. Examined specimens of *S. schlegelii* (up - Total Length; down - first dorsal fin) (original)

The body is covered in ctenoid scales, and 46 pored scales have been counted along the lateral line. There are 25 gill rakers on the first gill arch on the left side of the head. The mouth is large and obliquely oriented, with a maxilla extending beyond the posterior edge of the eye (Figure 3). In terms of coloration, the body is primarily brown with darker shades on the dorsal side that gradually fade to a paler ventral surface, which is light grayish with brownish spots. A dark brown stripe runs along the maxilla, and two dark bands extend radially from the eye, with the anterior band being more pronounced. Detailed morphometric measurements for these specimens are provided in Table 1.

The capture of these three specimens marks the first confirmed appearance of the Korean rockfish along Romania's Black Sea coast and are in line with morphological characteristics reported by other authors. After these records signaled, other individuals were caught by fisherman along the Romanian littoral, which is an indicator that the species are adapted well, and they have the capacity to thrive in Black Sea waters. Based on Novikov et al. (2002), this species reaches maturity at around 27 cm, indicating that the specimens collected were mature and likely in their spawning phase. Microscopic examination of their gonads further confirmed that the individuals were male. Binocular analysis of the otoliths indicated that the specimens were two years old.

Figure 3. Head view of *Sebastes schlegelii*, showcasing distinctive spine formations used for identification (up - front; down - side) (original)

Within the local ecosystem, where larger species such as turbot and dogfish are present, the Korean rockfish is notably large and may occupy a significant trophic position. The rocky bottoms and dike structures, which provide ideal conditions for this species, are generally inhabited by smaller fish, like gobies.

Table 1. Overview of *Sebastes schlegelii* morphometric data and its comparison with earlier Black Sea records

Variables	Present study 2025	Karpova et al. 2021	Bilecenoğlu et al., 2023	Yağlıoğlu et al., 2023	Karadurmuş et al., 2024	Ivanova et al., 2024
Number of specimens	3	5	1	1	1	1
Total length (cm)	26.5-30.7	32.5-39.1	24.5	34.9	27.5	23
Standard length (cm)	21.3-24.5	27.7-33.1	20.6	29.9	24	20
Weight (g)	352-543	710.0-1151.2	282.1	-	459.2	227
Head length (mm)	34.4-36.2	35.5-40.1	34	30.4	36.7	36.5
Eye diameter (mm)	7.4-7.5	-	-	5.7	7.5	6.5
Pre-dorsal length (mm)	32.8-33.1	33.0-35.8	27.1	31	33.3	27.5
Dorsal fin base length (mm)	61.6-62.9	62.5-62.7	60.8	-	63.8	56
Pre-anal length (mm)	66.7-68.4	67.8-69.2	66.7	-	68.8	64
Anal fin base length (mm)	14.7-17.4	15.5-16.4	15.9	17.7	20.4	16.5
Pre-pelvic length (mm)	30.9-31.3	37.4-38.9	39	33.9	41.3	38
Pelvic fin length (mm)	21.9-22.4	20.3-20.6	22.7	34	22.5	19.5
Pre-pectoral length (mm)	27.6-29.43	33.6-35.5	29.8	-	37.1	34
Pectoral fin length (mm)	20.6-23.5	21.2-22.9	25.2	20.1	24.2	22.5
Body depth (mm)	29.64-33.3	-	36.5	34	38.3	-
Caudal peduncle depth (mm)	9.1-10.3	10.2-10.5	9.7	10.1	9.2	9

The Korean rockfish exhibits a remarkable ability to tolerate a wide range of seabed temperatures, thriving in environments from 3°C to 28°C (Kim et al., 2001; Zhang et al., 2015). For instance, the Sea of Marmara features surface temperatures ranging between 6°C and 24.5°C, while below 40 meters, the temperature remains relatively constant at about 14.5°C (Beşiktepe et al., 1994). This thermal profile aligns well with the species known tolerance limits, indicating that the Sea of Marmara could offer a supportive habitat. However, climate change is predicted to challenge these conditions (Zhang et al., 2015; Chen et al., 2021), highlighting the species potential vulnerability to environmental alterations. Moreover, in its native range, the economic and recreational importance of the Korean rockfish has led to declines in both average individual weight and catch per unit effort due to overfishing (Chen et al., 2018).

In addition, the recording of higher temperatures in the Black Sea basin, probably as a result of the global climate change phenomenon, has created favorable conditions for some invasive species, highlighting the need for careful monitoring and the implementation of proactive management to protect the ecosystem and local fisheries.

CONCLUSIONS

The Black Sea basin is poorer in fish species compared to the Mediterranean Sea, so an invasive fish species such as *Sebastes schlegelii* could affect the ecosystem and the food chain, with a huge impact on native species.

Monitoring and analysis of this new species must continue, researchers will face challenges in identifying risks and solutions to this problem, while the species could even create a new niche in commercial and sport fishing.

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