



## The First Occurrence of Xanthochromic Fish, *Diplodus sargus* (Family: Sparidae) in the Eastern Mediterranean

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### Abstract

A single specimen white seabream, *Diplodus sargus* (Linnaeus, 1758), was recorded on 11 November 2019 from the coast of Konacık (Arsuz) in the Iskenderun Bay (North-eastern Mediterranean, Turkey). This specimen was identified as a specimen of *Diplodus sargus*. Known as Xanthochromism, abnormal skin coloration is an unusually yellow pigmentation in fishes. It is often associated with the lack of usual red pigmentation and its replacement with yellow. The present paper reported the first occurrence of the xanthochromic specimen of *Diplodus sargus* from Turkey's Mediterranean coast.

### Keywords:

White seabream, Xanthochromism, Mediterranean Sea, Iskenderun Bay, Turkey

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### Introduction

The family Sparidae is represented by ten genera distributed over the different waters in Turkey. However, the *Diplodus* genus described by five species in the Eastern Mediterranean Sea, Turkey: *Diplodus annularis* (Linnaeus, 1758), *Diplodus cervinus* (Lowe, 1838), *Diplodus puntazzo* (Walbaum, 1792), *Diplodus sargus* (Linnaeus, 1758), *Diplodus vulgaris* (Geoffroy Saint-Hilaire, 1817) (Fischer, 1987; Turan et al., 2007). These seabreams are inhabited tropical and temperate coastal waters. They are demersal inhabitants of the continental shelf and the slope.

The white seabream (*Diplodus sargus*) distribution includes the Mediterranean Sea, southwestern Black Sea, and the Eastern Atlantic Ocean from the Canary Islands and Madeira north to Brittany and also off Angola (Froese & Pauly, 2020; Golani et al., 2006).

*Diplodus sargus* is widespread and commercially important species and also locally abundant in appropriate habitats throughout the Mediterranean. *Diplodus sargus* have been recognized two geographic subspecies in the European region: *Diplodus sargus sargus* is occur in the

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Mediterranean and *Diplodus sargus cadeneti* in the northeastern Atlantic from the Bay of Biscay to Senegal, including the Azores, Madeira, and the Canary Islands (Summerer et al., 2001). However, Domingues et al. (2007) stated that considering species' genetic in the *D. sargus* species group, no genetic differences were found between *D. sargus* and *D. cadenati*. Recently, Fricke et al. (2016) has defined and reported a new sea bream species as *Diplodus levantinus* n. sp. from the Israel coast (southeastern Mediterranean) Sea for the whole Mediterranean.

Xanthochromism is an unusually yellow pigmentation in animal. It is usually associated with a lack of normal red pigmentation and replacing it with yellow. Although xanthism in fish is known as a genetically based condition that causes abnormal skin color from yellow to orange-gold, these species are rare in the seas. (Golani et al., 2019). Up to date, xanthochromic fish samples have been rarely reported in the Mediterranean.

In this study, the first xanthochromic case was reported for white seabream, *Diplodus sargus* from Iskenderun Bay, in the eastern Mediterranean Sea, Turkey, and up to date, no similar occurrence has been reported for this species in its native distribution area.

## Materials and Method

One individual of *Diplodus sargus* was captured by spear gun from Konacik coast (Arsuz), Iskenderun Bay (36°20'N–35°48'E) at a depth of 12 m on 11 December 2019 (Figure 1). After capture, fresh specimen was placed on crushed ice and transported to the laboratory for more detailed examination. This specimen was identified as a xanthochromic specimen of *Diplodus sargus* (Figure 2). Morphometric measurements were carried out to the nearest 0.1 mm by a caliper and meristic counts. The specimen was deposited in the collection of the Laboratory Fisheries Genetic and Ecology, Faculty of Marine Sciences and Technology, Iskenderun Technical University, Iskenderun-Hatay. All counts and measurements follow Bauchot & Hureau (1986).

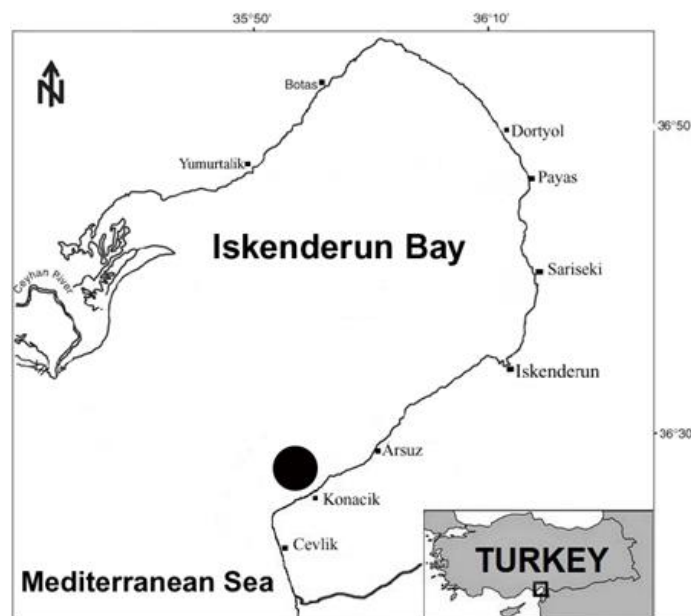


Figure 1. The location where (●) *Diplodus sargus* is caught in the Eastern Mediterranean, Turkey



Figure 2. *Diplodus sargus* (Linnaeus, 1758) caught in Iskenderun Bay

## Results

The xanthochromic specimen of *D. sargus* had the following features: Body oval and deep, more or less compressed, back elevated. Scales on cheeks and opercle. Terminal mouth slightly protusible, lips thin. Jaws are reaching back to the vertical of anterior of eye. Eight incisiform teeth in front of upper and lower jaws, followed by well-developed 3-4 rows molar teeth (Upper Jaw: 28; Lower Jaw: 20). Gill rakers 15 (6+9) on the first-gill arch. Dorsal fin with 12 spines and 12 rays. Anal fin with three spines and 13 rays. Pectoral fin long and reaching well behind the anus with 15 rays. Pelvic fin origin behind pectoral fin origin with one spine and five rays. A small orange spot at the upper base of the pectoral fin. Lateral line scales 67 to caudal base. Body light yellow and orange with 18 longitudinal fine yellow lines. The detailed morphometric and meristic characters of the specimen are given in Table 1.

Colour: Head gold yellowish. Body with 8 light yellow vertical bands. Premaxilla area surrounding the eye and upper margin of operculum light yellow and orange. The membrane of spinous dorsal fin and dorsal ray light yellowish and orange. Pectoral and anal fins light to bright orange. The upper part of caudal peduncle light gold yellow. Caudal fin forked and hind edges dark orange.

Table 1. Morphometric and meristic data of *Diplodus sargus* captured from Iskenderun Bay, Eastern Mediterranean

Morphometric Characters	Values	
	cm	%
Total length (TL)	22.5	-
Fork length (FL)	21.9	97.3 TL
Standard length (SL)	19.4	85.3 TL
Body depth (BD)	8.4	37.3 TL
Head length (HL)	6.3	28.0 TL
Head weight (HW)	3.7	16.4 TL
Eye diameter (ED )	1.7	27.8 HL
Inter-orbital distance (IOD)	2.7	44.2 HL
Snouth length	1.6	25.4 HL
Pre-orbital length	3.0	47.6 HL
Pre-operculum	4.9	21.7 HL
Pre-dorsal length	9.8	43.5 TL
Pre-pectoral length	7.2	32.0 TL
Pre-anal length	14.1	62.6 TL
Pre-pelvic length	7.9	35.1 TL
Dorsal fin base length	11.5	-
Pectoral fin base length	7.4	-
Anal fin base length	4.5	-
Caudal peduncle depth	2.2	-
Meristic Characters	Counts	
Dorsal fin rays	XII+ 13	
Anal fin rays	III+ 13	
Pectoral fin rays	15	
Ventral fin rays	I+ 5	
Caudal fin rays	18	
	Values (g)	
Weight	292	

## Discussion

White seabream is a demersal and oceanodromous species (Bauchot & Hureau, 1986). This species usually inhabit rocky habitats to depths of about 0-50 m (Carpenter et al., 1997; Froese & Pauly, 2020). According to Pajuelo & Lorenzo (2002), *D. sargus* occurs to 150 m in the Canary Islands. However, adults live in small groups using holes and crevices as refugees (Golani et al., 2006). Juveniles prefer to form large schools in shallow sandy bottoms. They enter lagoons during spring and, after in autumn, return to the sea (Golani et al., 2006). *D. sargus* is a commonly found size of 22 cm, TL. The reported is the maximum length for this species is 45 cm, TL (Bauchot, 1987), and it can live to 12 years of age (Pajuelo & Lorenzo, 2002). Adults feed on shellfish and other benthic invertebrates (Bauchot, 1987), while the juveniles are omnivores (Fischer et al., 1987).

*Diplodus sargus* exhibits protandrous hermaphroditism (Pajuelo & Lorenzo, 2002) but has also been described as a rudimentary hermaphrodite exhibiting partial protandry (Mouine et al., 2007). However, protandry with possible digyny was later confirmed by Pajuelo et al., 2007; Sadovy de Mitcheson & Liu (2008).

Xanthochromism is characterized by a loss or severe reduction of darker pigments allowing the remaining non-melanin pigments to be unusually dominant (Pattengill-Semmens, 1999). As in some fish species, abnormal coloration is observed on the skin, where the average color is replaced by yellow. This situation is widely due to a lack of dark pigment, which has yellow forms green. In this case, all skin pigments except yellow and orange are lost in the fish. Quigley et al. (2017) declared these color anomalies in fish are seen as albinism, partial albinism, xanthochroism, melanism, and leucism. However, they stated these situations could be stem from skin pathologies, diet, hormonal imbalances, interspecific hybrids, and particularly, from nonlethal genetic mutations.

To date, there are several studies of xanthochromic fish species in the Mediterranean waters. These species are reported from coastal waters of Turkey (Akyol & Şen, 2012; Tokaç et al., 2013; Ulutürk et al., 2015), Nature Park Lastovo archipelago, eastern Adriatic Sea (Stagličić et al., 2019) and Israel (Golani et al., 2019). Golani et al. (2019) reported in this study, xanthochromic two demersal species: *Epinephelus marginatus* from the Israeli coasts of the Mediterranean Sea and *D. vulgaris* from the Lipsi, Dodecanese, Aegean Sea (Greece). Besides stated, a might probably be a xanthism specimen of Mediterranean horse mackerel, *Trachurus mediterraneus* in the same study, the first recorded specimen of *Trachurus declivis* from the Eastern Mediterranean Sea.

Recently, xanthochromic thinlip grey mullet, *Chelon ramada* has been reported from Izmir Bay in the Aegean Sea, Turkey by Akalin & Tosunoglu (2020). Also, the same authors stated that a xanthochroic individual of *D. sargus* was identified in Greece from a photo shared on the social media platform.

Although xanthochroic pigmentary anomaly has been reported for a number of fish taxa; it is still considered particularly rare. According to Carson (2011) this natural phenomenon often it is seen on a single specimen or with low population frequencies.

Here we report the first record on xanthochromic of white seabream *Diplodus sargus* in the eastern Mediterranean Sea. We hope that the study will contribute to the literature as the first color abnormality encountered in fish species in this region.

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### **Author Contributions**

D.E.: Designed the study, Data curation, Validation, Investigation, Formal analysis, Writing - original draft, Writing, M.G.: Data curation, Validation, Supervision, Investigation, original draft, Writing - review & editing. F.K.: Supervision, Investigation, Formal analysis, C.T.: Data curation, Validation, Supervision, Investigation, Formal analysis, Writing - original draft, Writing - review & editing.

### Conflict of Interest

The authors declare that they have no competing interests.

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