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OCCURRENCE AND DETAILED MORPHOMETRIC MEASUREMENTS OF RABBITFISH (*Chimaera monstrosa* Linnaeus, 1758) FROM THE GÖKÇEADA ISLAND (North Aegean Sea).

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ABSTRACT

Chimaeras belonging to the holocephali class have a wide depth distribution from batidemersal to benthopelagic, but they are mostly found at depths of 300-500 m. In this study the rabbitfish (*Chimaera monstrosa*, Linnaeus 1758) 100-400 m depths were collected from commercial trawlers around the Gökçeada Island between February 2019 and February 2020. For the purpose of the study, three females and one male individual measuring 11.4 – 41.5 cm in body length and weighing 5.82-228 g. After sampling, individuals were brought to the laboratory by paying attention to cold storage conditions in order to record their detailed measurements. For the morphometric measurements of the fish, a height measuring board with ± 1 mm precision, a precision balance with ± 0.01 g precision for weight measurements and a 1 mm precision caliper were used. This study reports the most detailed morphometric measurements of the species *Chimaera monstrosa* ever around the Gökçeada Island (North Aegean Sea).

Keywords: Rabbitfish, *Chimaera monstrosa*, Occurrence, Morphometric Measurements, Gökçeada Island.

INTRODUCTION

Cartilaginous fish are morphologically categorized into two groups. Elasmobranchs are the first group comprising sharks and rays, while the second – i.e., of chimaeras – consists of holocephalans (Gillis et al., 2011). Holocephalans, featuring the Chimaeridae family, are composed of two genera: *Chimaera* and *Hydrolagus*. They show marked morphological differences. To elaborate, *Hydrolagus* has no anal fin, but *Chimaera*'s anal fin is separated with a kick from the ventral caudal fin (Kemper et al., 2010a). Bathydemersal-to-benthopelagic holocephalan *C. monstrosa* are generally observed at depths between 300 m and 500 m. They usually occur in small groups and feed mainly on bottom-living invertebrates. Chimaeras feature a large head, long pointed body, whip-like tails, a caudal fin, a pair of pelvic and pectoral fins, and two dorsal fins. Their maximum length is 150 cm and their maximum weight is 2.5 kg (Muus and Dahlström, 1978; Muus and Nielsen, 1999). It is distinguishable by the first dorsal fin with a triangular shape and a spine in front of it (Didier et al., 2012). The spines are venomous and can cause painful wounds (Calis et al., 2005). Adults have scaleless skins, and newborns' dorsal sections of the head and trunk contain fine denticles embedded in the skin. Under the neurocranium occur the gill arches covered with a thick-walled operculum, supported by cartilage rays originating from the hyoid arch. Unlike elasmobranchs, they have a little opercular vent on both sides of the body, which is positioned from anterior to pectoral fin base.

Male individuals are characterized by frontal tenaculum, paired pelvic claspers, and prepelvic tenacula as sexual components, while juvenile males possess no tenacula. Availing of the pelvic

claspers, male conveys sperms into female's reproductive tract for internal fertilization (Didier et al., 2012). As typical of all chimeras, *C. monstrosa* is an oviparous species, and in hot seasons, females lay egg capsules below 100 meters (Calis et al., 2005). *C. monstrosa* has been recorded to prey on Bryozoa, Cnidaria, Crustacea, Mollusca, Tunicata, and Teleostei (Eronat, 2016). Chimeras are referred to as rabbitfish due to their noses and since their anterior tooth plates resemble rabbit mouth (Didier et al., 2012). A distinguishable brown pattern – dorsally brownish and ventrally whitish – is observed on their bodies. They also feature stripes and blotches on the lateral body. The margins of the fins are paler or more whitish than the body. Certain parts of the body have brown and silver network patterns (Jordan and Snyder, 2011; Luchetti et al., 2011). Some research studies provide records of *C. monstrosa* in the Mediterranean region, e.g., in the Gulf of Haifa (Goren and Galil, 1997), Italy (Matarrese et al., 1996), the North-East North Sea (Bergstad et al., 2003), the North Tyrrhenian Sea (Sartor et al., 2003), Syria (Ali, 2003), Balearic Sea (Sion et al., 2004), Sicily (Ragonese et al., 2013), Eastern Mediterranean (Eronat, 2016), Northwest Mediterranean (Çiftçi et al., 2019; Tamayo et al., 2021) Marmara Sea (Dalyan, 2010) and Aegean Sea (Geldiay, 1969; Damalas and Vassilopoulou, 2010), North Aegean Sea (Dalyan et al., 2021). This study presents the most detailed morphometric measurements of *C. monstrosa* in the Northern Aegean Sea and reports the presence of *C. monstrosa* around the Gökçeada Island.

MATERIAL AND METHODS

C. monstrosa was collected from commercial bottom trawlers around the Gökçeada Island from February 2019 to February 2020. Trawl shots were carried out at depths of 100 to 400 m (Fig. 1). The samples were brought to laboratory cold storage conditions. The species were identified according to Kemper et al. (2010b). All the morphometric measurements were performed to the nearest 0.01 cm using dial calipers and a precision balance with a readability of 0.1 g. (Fig. 2)



Figure 1. Study area around Gökçeada Island, North Aegean Sea



Figure 2. Rabbit fish, *Chimaera monstrosa* Linnaeus, 1758

RESULTS

In this study, 4 (3 female and 1 male) individuals with body lengths of 11.4 – 41.5 cm and total weights of 5.82 – 228 g were sampled (Tab. 1).

Table 1. Detailed morphometric measurements of *Chimaera monstrosa*.

Measurement (mm)	Abbreviation list	Sex			
		♂	♀	♀	♀
Body length	BDL	388	357	415	114
Total length	TL	566	571	556	186
Precaudal length	PCL	301	273	327	96
Snout-to-anus length	SVL	145	135	173	5.00
Trunk length	TRL	83.8	75.8	99.8	26.9
Head length	HDL	64.0	56.1	74.6	23.2
Preoral length	POR	37.4	35.4	47.0	13.7
Prenasal length	PRN	29.2	26.2	38.1	7.79
Preorbital length	POB	35.4	32.9	34.0	12.3
Eye length	EYL	23.7	20.4	23.6	6.84
Height of eye	EYH	20.0	20.3	17.0	6.07
Pre-second dorsal length	PD2	121	102	122	38.3
Pre-first dorsal length	PD1	80.0	73.1	74.1	25.6
Length of first dorsal fin base	D1B	49.2	35.5	44.7	5.73
Dorsal spine length along anterior margin	DSA	59.0	48.4	54.5	15.1
Max. height of first dorsal fin	D1H	49.7	39.1	45.1	13.8
Length of base of second dorsal fin	D2B	185	163	199	48.5
Max. height of second dorsal fin	D2H	15.7	14.5	16.3	2.34
Interdorsal space	IDS	8.26	5.53	7.7	2.3
Length of dorsal margin of caudal fin	CDM	60.2	58.3	61.7	13.1
Max. length of dorsal lobe of caudal fin	CDH	7.33	6.38	9.47	1.48
Total caudal fin length	CTL	87.2	69.9	85.3	22.0
Length of ventral margin of caudal fin	CVM	82.5	67.7	89.2	25.6
Max. height of ventral lobe of caudal fin	CVH	7.97	5.28	6.63	1.45
Caudal peduncle height	CPH	6.12	5.64	7.40	2.02
Pectoral fin anterior margin	P1A	98.2	89.3	102	28.3
Pelvic fin anterior margin	P2A	55.7	40.2	59.9	9.72
Length of rear base of pectoral fin to anterior base of pelvic fin	P2P	72.2	66.3	87.3	20.9
Length of space between pelvic fins and caudal fin	PCA	139	111	150	30.9
Origin of first dorsal fin origin of pectoral fin	D1P1	47.2	39.4	53.5	14.8
Origin of first dorsal fin origin of pelvic fin	D1P2	81.2	67.3	97.2	20.9
Origin of second dorsal fin to origin pectoral fin	D2P1	63.3	57.7	73.5	19.5
Origin of second dorsal fin to origin pelvic fin	D2P2	54.1	48.7	63.3	14.0
Total clasper length	CLT	12.4			5.82
Weight (g)	W	228 g	176 g	311 g	g

*Broken spine

*

DISCUSSION

C. monstrosa so far has been reported in the Eastern Atlantic, Northern Norway and Iceland, Skagerrak and Kattégat, the Western Mediterranean, Southern Morocco, including the Azores and Madeira Islands, and Oshima, Japan (Didier, 1998). In 2019, Çiftçi et al. calculated the detailed body length ratios of *C. monstrosa* that they sampled at depths of 456 – 690 m in the Mediterranean Sea, Northern Cyprus. They report that the total height of the sampled individual was 80.3 cm. Calis et al. 2005. calculated the age and growth of 62 individuals (10 male/52 females) that they retrieved from commercial fishermen in the Rockall Trough and Faroe-Shetland Channel in August and October 2001. They found that the total height of the sampled individuals ranged from 26 to 74 cm, and their ages from 3 to 30 years for the male individuals and 4 to 26 years for the female individuals. They recorded the von Bertalanffy growth parameters of *C. monstrosa* to be $L_{\infty} = 78.87$ (cm), $K = 0.0673$ years, and $t_0 = -2.513$ (years). Damalas and Vassilopoulou (2011) state in their 10-year (1995-2006) study that they performed with bottom trawling in the Aegean Sea that a total of 339 *C. monstrosa* were fished as bycatch. In the study conducted at a depth of 550 m in the Sığacık Bay, the Mediterranean Sea in 2008, Eronat examined the feeding ecology of 97 *C. monstrosa* individuals ranging from 7.80 to 45.5 cm in length. In his study, she identified 11 food items in 6 groups. According to the index of relative importance, the most common food groups were crustacea (IRI=80%) and mollusca (IRI=16%). Eronat also estimated the trophic level at 3.50. Moura et al. 2004. found that the diet of *Chimaera monstrosa* individuals captured through bottom trawling on the southern Portuguese continental slope was high in diversity and there were compositional differences by size groups. They found that individuals smaller than 22 cm in length mainly fed on amphipods, individuals from 22 to 46 cm on amphipods and decapods, and individuals larger than 46 cm had the least diverse diets to mainly prey on decapods. Tamayo et al. 2021. analyzed the stomach contents of 86 *Chimaera monstrosa* individuals living in the deep-sea waters of the Gulf of Lions (Northwestern Mediterranean). They revealed that *Chimaera monstrosa* in the Mediterranean ecosystem is a mesopredator, specialized in the consumption of crustaceans and feeding almost solely on the decapod *Monodaeus couchii*, regardless of sex or maturity stage. In the research conducted in the Western Mediterranean between November 1976 and October 1978, Macpherson analyzed the stomach content of 206 *C. monstrosa* individuals. He states that the stomach contents consisted almost entirely of ophiuroids, benthic crustaceans, and polychaetes and that the prevalence of *Brachiura* and *Macrura Reptantia* increased with the individuals' body length. The maximum length of *C. monstrosa* so far is 150 cm, the maximum weight is 2.5 kg, and the length at maturity is 45.9 cm (Muus and Dahlström, 1978; Muus and Nielsen, 1999; Moura et al., 2004).

The lengths of the individuals in this study range between 11.4 and 41.5 cm, and their weights between 5.82 and 228 g. It was determined that the sampled individuals didn't reach the maturity height specified in the literature. Among the important reasons for these differences may be various ecological factors such as temperature, specific spawning, feeding conditions and biotopic characteristics (Ricker, 1975). A comparative analysis could not be performed since there is no detailed morphometric measurement record of *C. monstrosa* around the Gökçeada Island.

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