

# Distribution and Morphology of the Colonial Scleractinian *Madracis pharensis* (Cnidaria, Anthozoa) in the Dardanelles (Marmara Sea, Turkey)

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**Abstract:** The benthic communities in the Dardanelles were investigated with scuba diving and manta-tow techniques between 2011 and 2013 at 200 stations with a depth between 1 and 50 m. In these studies, the scleractinian *Madracis pharensis* (Heller, 1868) was collected from coralligenous and rocky habitats at five different sites at depths between 20 and 39 m. The ecological features of the colonies were examined *in situ*. The present paper reports the species occurrence and reveals the habitat characteristics of the species for the first time from this area. With this new record the known global distributional range of the species has been updated and the knowledge on anthozoan ecology along the Turkish coasts was enhanced.

**Keywords:** *Madracis pharensis*, Scleractinia, coral ecology, new record, Dardanelles, Marmara Sea

## Introduction

Studies that focus on the coral fauna of Turkey with regard to Octocorallia and Hexacorallia (Cnidaria, Anthozoa), are generally rare. Since the marine surveys need the strenuous effort for both in shallow and deep water search, this set back further observations to date. Thus, the knowledge remained limited and still needs to be improved. So far 38 coral species have been recorded during marine surveys carried out in the Marmara Sea (Dardanelles), Mediterranean, and Northern Aegean coast of Turkey (ZIBROWIUS 1979, 1980, ERGEN *et al.* 1994, ÇINAR 2003, ÖZTÜRK 2004, ÇINAR *et al.* 2006; ÖZALP & ALPARSLAN 2011, GÖKALP 2011, ÖZALP 2012a, b, ÖZALP 2013a, b, TOPÇU & ÖZTÜRK 2013, ÇINAR *et al.* 2014).

The Dardanelles Strait represents a suitable area for hard coral communities establishing an environment for gorgonians, sponges and calcareous algae, with water qualities similar to those of the Mediterranean Sea. The first scleractinian records pertaining to the Marmara Sea coast of Turkey concern two scleractinian species, the azooxan-

thellate solitary coral *Caryophyllia smithii* Stokes et Broderip, 1828 and the zooxanthellate solitary coral *Balanophyllia europaea* (Risso, 1826) (see COLOMBO 1885, OSTROUMOFF 1896, MARION 1898). Half a century later, the occurrence of dead samples of the azooxanthellate solitary coral *Paracyathus pulchellus* (Philippi, 1842) was reported from the Bosphorus and added to the checklist for the region (DEMİR 1952). Additionally, *C. smithii* was recorded again from the Marmara Sea during studies of its benthos assemblages (TORTONESE 1959). The present study reports the first records of the colonial scleractinian *Madracis pharensis* (Heller, 1868) in this sea (Fig. 1) and for the Turkish marine fauna.

## Materials and methods

Connecting the Aegean Sea to the Sea of Marmara, the Dardanelles Strait is located between the eastern coast of Gallipoli Peninsula and the coastline of Çanakkale. The strait is 65 km long, with the nar-

rowest point of 1485 m (0.8 nautical miles). There are constant sea currents at the sampling sites varying from 2.4 to 5.2 kt. These currents have an effect to 14 m depth at both stations.

Samples were collected during field surveys on scleractinian biodiversity by scuba diving from three stations and five localities along the western coast of the Dardanelles. The sampling depth ranged from 20 m to 39 m. Among the 200 stations visited during a two-year period, *M. pharensis* colonies (Figs. 2, 3) were recorded at two sites. A third locality was found during other studies. A ruler and a 20 cm × 20 cm quadrat were used for taking individual size measurements *in situ*. The site characteristics and substratum on which the species existed were photographed and recorded with an underwater video camera. The materials were placed in seawater and transported alive to the laboratory. For identification, specimens were first rinsed for the removal of any particles and soaked in an H<sub>2</sub>O<sub>2</sub> solution for about three days. After removing the polyps, the dry skeleton structure was examined with an Olympus binocular stereo microscope. The specimens were deposited in the Piri Reis Naval Museum, Faculty of Marine Science and Technology, University of Onsekiz Mart (OM/PRM), Çanakkale.

The frequency of species was estimated using the Soyer's (1970) index:  $f=m/M*100$ , where m= number of stations where the species was found and M= total number of stations. For each colony biomass, total number of corallites, total number of

colonies, width-length-height dimensions and substratum cover rate were noted.

## Results

Order SCLERACTINIA

Suborder ASTROCOENIINA

Family POCILLOPORIDAE

*Madracis pharensis* (Heller, 1868)

(Fig. 2-4)

**Material examined: Dardanelles (Marmara Sea)**, BASI marine surveys, OM/PRM-CR, 2012-7, four colonies, Çamburnu region (St. 1), 40°10'04.71"N-26°22'19.49"E, 31 m, 30 January 2012, rocky substratum associated with dense coralline algae; OM/PRM-CR, 2012-8, seven colonies, 40°10'05.56"N-26°22'20.01"E, 38-39 m, 21 March 2012, rocky substratum. OM/PRM-CR, 2012-9, three colonies, Soğandere region (St. 2), 40°06'18.49"N-26°19'36.17"E, 20 m, 09 April 2012, rocky substratum with dense coralline algae; OM/PRM-CR, 2012-10, six colonies, 40°06'15.53"N-26°19'31.27"E, 17 June 2012, with highly populated coralligenous formation; OM/PRM-CR, 2013-11, one colony, 40°05'35.50"N-26°18'36.15"E, 17 November 2013, with highly populated calcareous algae and some other scleractinians and zoantharians, i.e. *Caryophyllia smithii* and *Parazoanthus axinellae* (Schmidt, 1862).

**Diagnosis:** Colonies cerioid. Corallites juxtaposed and interconnected to one another by fused walls. Calyx circled and equal in all directions (up

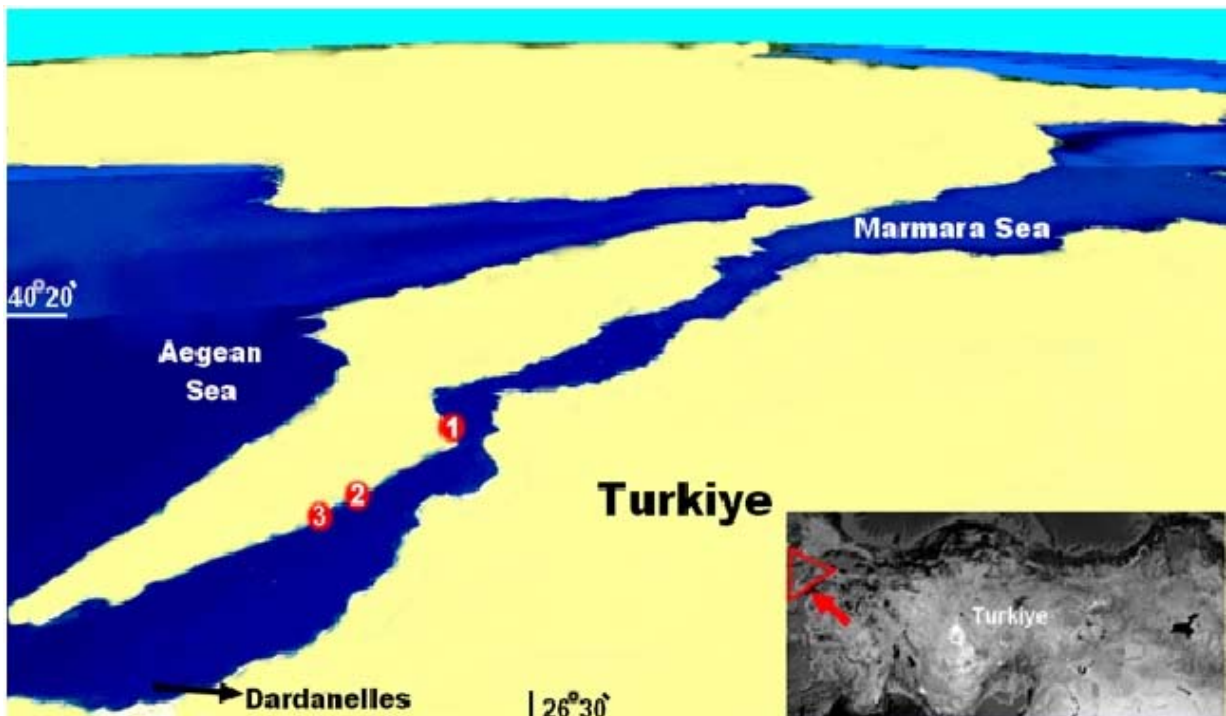


Fig. 1. Map of the studied areas in the Dardanelles (1 Çamburnu region 2 Soğandere region)



Fig. 2. Macro-photograph of *M. pharensis* from Soğandere region, 21 m

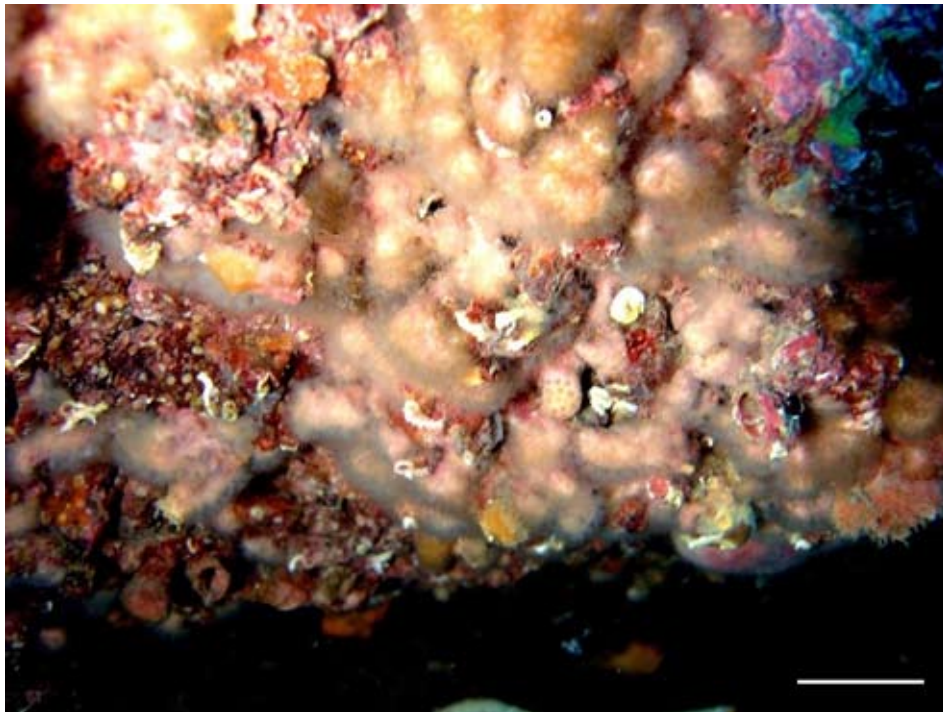


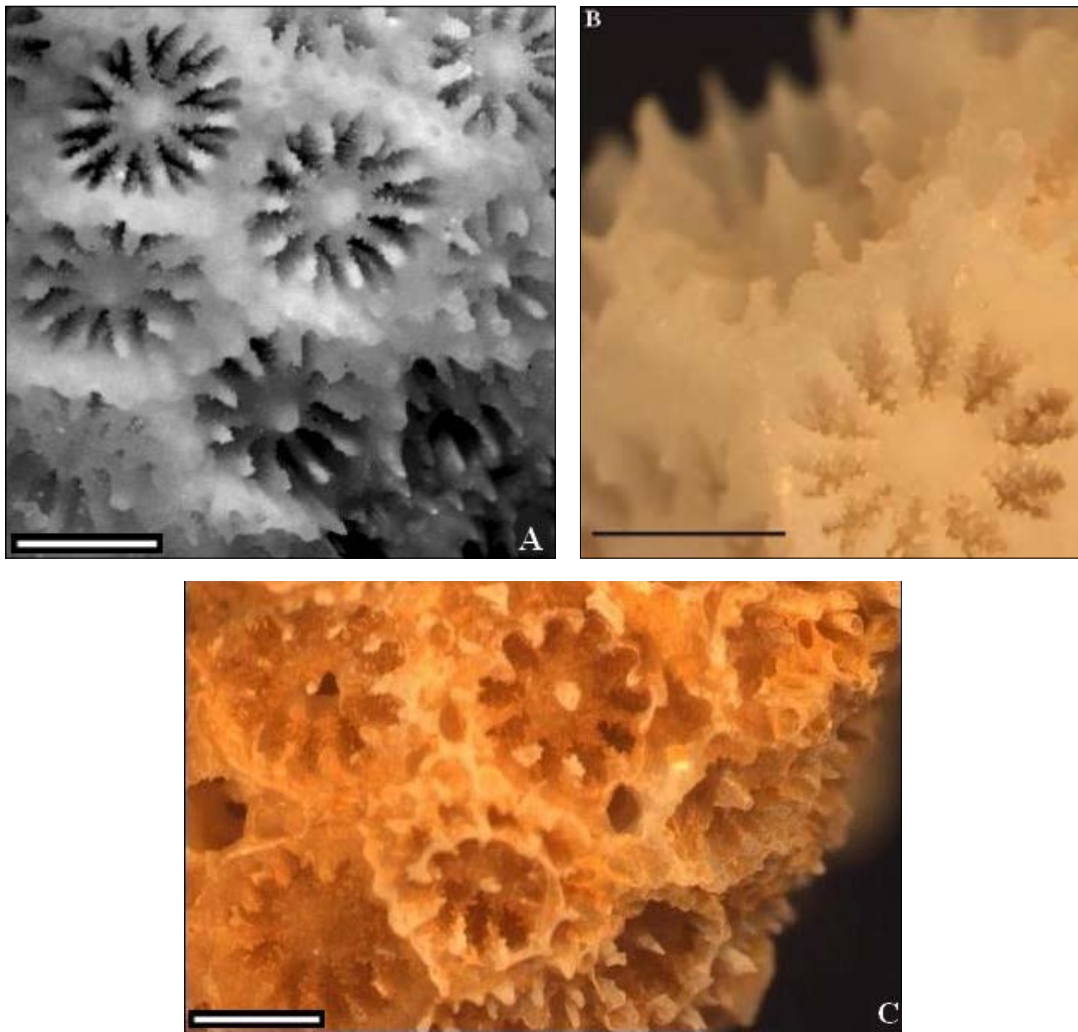
Fig. 3. Wide-angle photograph *M. pharensis* colonies from Çamburnu region, 39 m

to 3 mm in diameter). Columella adjacent to septa, conical and pointed in some polyps with spine-like (styliform) structure (Fig. 4).

**General Distribution:** The species was previously recorded from the Aegean Sea by FORBES (1844), HELLER (1868), PÉRÈS & PICARD (1958), ZIBROWIUS (1979), VAFIDIS *et al.* (1997) and MORRI *et al.* (2000). The first report from Turkey was from the southern coast, Antalya (BITAR, ZIBROWIUS 1997), while the species from the Aegean coast of Turkey

has been reported for the first time from Çatal Island, Bodrum (GÖKALP 2011).

Many small colonies of *M. pharensis* were recorded from the studied sites. The colonies had been observed mostly at the opening and ceiling of dimly lit crevices and overhanging rocky surfaces. In the studied area red calcareous algae, polychaete assemblages, octocorals and sponges were very common. Due to the continuous current system in the area and strong eddies from the surface to 14 m depth,



**Fig. 4.** Microscopic images of *M. pharensis*: a - corallites and coenosteum, b - calyx, columella and septa structures, c - dead colony

no turbidity was measured in the waters all year round. During the surveys, four scleractinians were found: *Cladocora caespitosa* (Linnaeus, 1758), *Balanophyllia europaea*, *Caryophyllia smithii* and *Madracis pharensis*. The latter was reported from the Marmara Sea region (Dardanelles) for the first time. In total, only five *M. pharensis* colonies were found and examined at 20-39 m (Table 1).

The fourth group observed in Sta 2-B had the highest number of corallites (per colony) and occupied a larger substratum surface area than the others (53.84% coverage). The surface area of colonies varied from 1950 to 3500 cm<sup>2</sup> (mean value 2373 cm<sup>2</sup> for Sta 1; 3150 cm<sup>2</sup> for Sta 2). The mean values for colony size differed from 65 to 76 cm in width and 36.5 to 41,5 cm in length (Table 2).

The species was found only at two stations. The occurrence frequency of *M. pharensis* was only 1.5%. According to Soyer's (1970) index, the spreading feature can be defined as rare ( $f < 25$ ).

## Discussion

During BASI marine surveys, started to specify the ecological and distributional features of scleractinians, 200 stations were investigated using scuba diving and manta-tow techniques along about 38 miles of coastline of the Dardanelles (Marmara Sea) between the depths of 1-50 m. The present study provides a particular information on *M. pharensis*, about its morphological and distributional features. In previous investigations *M. pharensis* was recorded at up to 20 m depth only from one area, Çatal Island, Bodrum, at the Turkish coast (GÖKALP 2011). In the latter study, the maximum corallite width was mentioned as 2 mm, while we found a calyx with diameter of 3 mm. However, during the current research a deeper bathymetric range was recorded.

*Madracis pharensis* is widespread in the Aegean and Mediterranean Seas and occurs in the Western

**Table 1.** *Madracis pharensis* collections at the sites and recorded ecological data. Abbreviations: Sta: stations, Sta 1 - Çamburnu region, Sta 2- Soğandere region; A -, first area, B- second area; r - rock, ca- calcereous algae, p- polychaeta, s- sponge; TNOC- total number of colony on rock surface, NOTC- total number of corallites of all colonies on rock surface; Biomass- calculated by 10 corallites; TSA- total spreading area of colonies on rock surface; SAR- surface area of rock. Colony group represent all small colonies spread over an area

Colony Group	Depth (m)	Substrata	Station/ Area	TNOC	NOTC	Biomass (gr)	TSA (cm <sup>2</sup> )	SAR (cm <sup>2</sup> )	Covering (%)
1	31 m	r, ca, p, s	STA1-A	41	785	63.96	1950	19000	10,26
2	38-39 m	r, ca	STA1-B	30	812	94.42	2795	13800	20,25
3	20 m	r	STA2-A	23	330	206.75	2800	21100	13,27
4	23 m	r,ca,p	STA2-B	62	1148	413.5	3500	6500	53,84
5	26 m	r, ca, s	STA 3	27	372	300	2020	66000	3,06

**Table 2.** Mean ecological values of *M. pharensis* by station (5 specimens). The size measurements represent the size of all colonies involved in a group. NOTC - total number of corallites of all colonies on rock surface, Biomass - calculated by 10 corallites, TSA - total spreading area of colonies on rock surface.

<i>Madracis pharensis</i>	NOTC	TSA (cm <sup>2</sup> )	Total Biomass (gr)	Width (cm)	Length (cm)	Height (cm)
<b>Mean±SE Min-Max</b>						
<b>Sta 1</b>	798.5±13.5 785-812	2373±423 1950-2795	79.2±15.2 64-94	65±0 65-65	36.5±6.5 30-43	2.5±0.5 2-3
<b>Sta 2</b>	739±409 330-1148	3150±350 2800-3500	310±103 207-414	76±4 72-80	41.5±6.5 35-48	5±1 4-6

Atlantic, Madeira Archipelagos, Canary Islands and the Azores (ZIBROWIUS 1980).

The occurrence of species in the Dardanelles is now reported from the area for the first time and it hinges on the effect of incoming currents of the Aegean Sea. However, it is hypothesised that the transport of ballast waters by shipping may also influence the dispersal of corals (FINE *et al.* 2001, ZENETOS *et al.* 2012, HOEKSEMA & OCAÑA VICENTE 2014). Fouling by corals on metal surfaces of ships and other floating devices may be another possibility (SERRANO *et al.* 2013). Furthermore, a change in the physical setting may also be important for the range expansion of corals (FENNER & BANKS 2004, SAMMORCO *et al.* 2010, HOEKSEMA *et al.* 2012). The Dardanelles is accepted as an area mainly related to the Marmara Sea, the water characteristics are similar to those in the Mediterranean and thus, there are many species in common with the Mediterranean

Sea (*Posidonia* and *Zostera* seagrasses, scleractinians, gorgonians, holothurians, etc.). The density of the scleractinians at the European side of the Dardanelles was higher than those at the Anatolian side because of the largely existing rocky habitats and the strong surface currents.

Although research efforts for studying the anthozoan fauna in Turkey has increased during the last years, the existing data are still scarce. Further studies on population dynamics of scleractinians are needed in the Northern Aegean and Marmara Sea regions for a better understanding of the future of hard coral species in this region.

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