

Updated checklist of sponges (Porifera) along the coasts of Turkey

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Abstract: This study compiled the data from previous papers emphasizing sponge species on the Turkish coasts. In total, 131 species belonging to 46 families have been reported: 82 species from the Aegean Sea, 63 species from the Sea of Marmara, 51 species from the Levantine Sea, and 13 species from the Black Sea. Among these species, 3 species are new records for the marine fauna of Turkey: *Rhizaxinella elongata*, *Axinyssa digitata*, and *Terpios gelatinosa*. *Raspalia viminalis* is a new record for the Sea of Marmara. The morphological and distributional features of 3 species are presented. In addition, a checklist of the sponge species reported from the Turkish coasts to date is provided.

Key words: Sponge diversity, new records, species distribution, Black Sea, Aegean Sea, Sea of Marmara, Levantine Sea

1. Introduction

The phylum Porifera (sponges) is known to be the most primitive metazoan group and has 4 classes, namely Calcarea (667 species in the world's oceans), Hexactinellida (589 species), Homoscleromorpha (84 species), and Demospongiae (6922 species) (Cárdenas et al., 2012; Van Soest et al., 2014).

In terms of the species richness, sponges are one of the most important groups (12.4% of total number of species) in the Mediterranean Sea (Coll et al., 2010). Zoogeographical distribution of sponge species in the Mediterranean was studied by Pérès and Picard (1958), Pansini and Longo (2003), and Voultsiadou (2009). The Mediterranean Sea was divided into 4 major zones by Voultsiadou (2009): northwestern, northeastern, central, and southeastern zones. The sponge biodiversity declines from west to east in the Mediterranean Sea (Voultsiadou-Koukoura and Van Soest, 1993). In the Levantine Sea, almost 85 sponge species have been reported by numerous authors (Burton, 1936; Lévi, 1956; Tournamal, 1967, 1969; Ilan et al., 1994, 2003; Perez et al., 2004; Vacelet et al., 2007; Vacelet and Perez, 2008; Voultsiadou, 2009), and the total number of the sponge species was reported to be 681 in the Mediterranean Sea (Coll et al., 2010).

According to Evcen and Çınar (2012), knowledge on the sponge species of the Turkish coasts is poor when

compared to that of the other parts of the Mediterranean. The oldest study on sponges of the coasts of Turkey dates back to 1885, when Colombo (1885) reported 5 sponge species from the Çanakkale Strait. Ostroumoff (1896) conducted a marine survey in the Sea of Marmara and reported 36 sponge species in the area. Devedjian (1926) also gave some information on sponges. Additional studies on sponge culture and economic importance were done by Dalkılıç (1982) and Gökalt (1974).

Sponge diversity in the Sea of Marmara was also studied by Demir (1952–1954), who found 10 sponge species near the Prince Islands and the İstanbul Strait. Afterwards, 13 sponge species was reported by Caspers (1968), 2 sponge species by Bayhan et al. (1989), 1 sponge species by Okuş (1986), and 19 sponge species by Topaloglu (2001a) in the area.

In the Aegean Sea, Sarıtaş (1972, 1973, 1974) conducted a series of studies on sponges and reported a total of 50 sponge species in İzmir Bay. Yazıcı (1978) collected sponge species around Gökçeada (northern Aegean Sea) and reported 15 sponge species. Several sponge species were also reported in general faunistic and ecological studies in the Aegean Sea (i.e. Geldiay and Kocataş, 1972; Kocataş, 1978; Ergüven et al., 1988; Kayağan et al., 1991; Ergen et al., 1994; Çınar and Ergen, 1998; Kocak et al., 1999; Topaloglu, 2001b; Çınar et al., 2002). Evcen and Çınar (2012) studied

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the sponge species from the Levantine coast of Turkey and provided a checklist of sponges for the coasts of Turkey. The authors reported 116 sponge species on the coasts of Turkey. A recent study by Topaloglu et al. (2013) encountered 2 sponge species from the Black Sea coast of Turkey.

This study has compiled the existing literature on the sponge species of the Turkish coasts with 3 additional new records for the marine fauna of Turkey and 1 new record for the Sea of Marmara. The aims of the study were to point out the sponge diversity along the Turkish coasts and to provide a checklist of sponge species that have been reported from the region.

2. Materials and method

The checklist was prepared by compiling all available literature on the marine sponge species in the seas surrounding Turkey (Black Sea, Sea of Marmara, Aegean Sea, and Levantine Sea). The first records of species were identified for each sea and their depth and habitat distributions were examined in light of the available regional literature. In addition, some species that represent new records for the fauna of Turkey or for a sea are presented and marked as PS in the Table. The stations where new records of species were found are indicated in Figure 1.

The sponge specimens were collected by scuba diving and bottom-trawling. The samples were fixed in 4% formalin solution in the field and preserved in the 70% ethanol in the laboratory. Preparation of spicules followed the standard method proposed by Rützler (1978). The tissue samples were boiled in nitric acid and spicules were mounted on microscope slides permanently after rinsing in pure water and ethanol. The spicule types and sizes were

identified. The World Porifera Database (Van Soest et al., 2014) was used for the description of species.

In order to assess the diversity hotspots and the areas where weak and intensive research efforts have been performed to date (gap analysis), the coasts of Turkey were divided into grids of 15 × 15 km. All distribution data of species were entered into an Excel file and then imported and digitized with ArcGIS 9.3.

3. Results and discussion

A total of 131 sponge species are presented in this study for Turkish Coasts. 13 of them were reported from the Black Sea, 63 from the Sea of Marmara, 82 from the Aegean Sea, and 51 from the Levantine Sea (Table; Figure 2). The list also includes 3 species (*Rhizaxinella elongata*, *Axinyssa digitata*, and *Terpios gelatinosa*) reported for the first time along the coasts of Turkey and 1 species (*Raspalia viminalis*) that is new to the Sea of Marmara. Brief descriptions of these species are given below.

Axinyssa digitata (Cabioch, 1968)

Material examined: One specimen from Saros Bay (station 1), 100–200 m depth, bottom-trawling (see Figure 1).

Description: Specimen massive, base of 0.8–3 cm in thickness from which arise irregular often coalescing conical digitations of 0.3–2.2 cm in height and 0.2–1.5 cm in diameter at their base. The surface is conulose and hispid, and along the digitations the conules are aligned to form longitudinal ridges with intervals of 0.5–1.5 mm. Spicules: Oxeas only, of a single but very variable category. They frequently have stair-stepped ends, and strongyloxea-like modifications are common. Most are curved and some have a median swelling. Size 315–890 × 6–22 µm (Figure 3). *A. digitata* has been reported from the coast of Israel (Carteron, 2002).

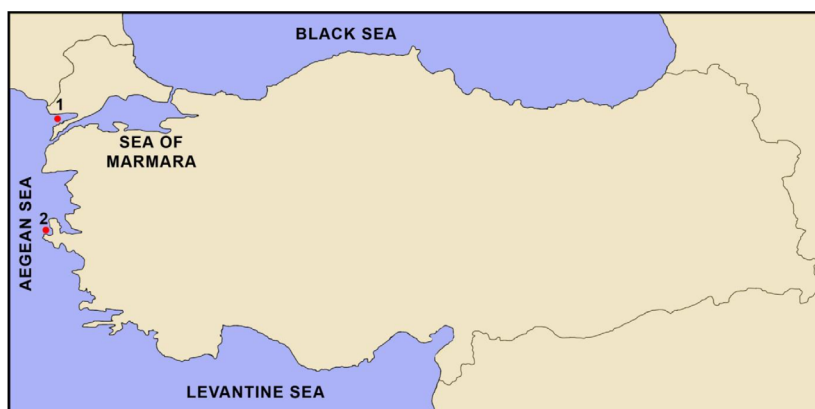


Figure 1. Sampling stations for 3 new records (1: station 1, Saros Bay, 2: station 2, Çeşme).

Table. Check list of sponge species from the coast of Turkey. BS: Black Sea; SM: Sea of Marmara; AS: Aegean Sea; LS: Levantine Sea; DR: depth range (I: 0–10 m; II: 11–50 m; III: 51–100 m; IV: 101–200 m; V: 201–400 m; VI: 401–600 m; VII: >600 m); H: habitat (Hs: Hard substratum); PS: present study.

Group/Species	BS	SM	AS	LS	DR	H
Phylum: PORIFERA						
Class: CALCAREA						
Family: Sycettidae						
<i>Sycon ciliatum</i> (Fabricius, 1780)	30	2, 3			II	Hs
<i>Sycon raphanus</i> Schmidt, 1862		5	13, 15, 18, 19, 21	28	I–III	Hs
<i>Sycon setosum</i> Schmidt, 1862	30				II	Hs
<i>Sycon tuba</i> Lendenfeld, 1891	30	3			III	Hs
Family: Grantiidae						
<i>Ute glabra</i> Schmidt, 1864		3			II	Hs
Family: Leucosoleniidae						
<i>Leucandra aspera</i> (Schmidt, 1862)		1	12, 13, 15		I–III	Hs
<i>Leucosolenia variabilis</i> (Haeckel, 1870)		5		28	I	Hs
Family: Clathrinidae					II	Hs
<i>Clathrina clathrus</i> (Schmidt, 1864)				28	I	Hs
<i>Clathrina reticulum</i> (Schmidt, 1862)			12		II	Hs
Class: HOMOSCLEROMORPHA						
Family: Oscarellidae						
<i>Oscarella lobularis</i> (Schmidt, 1862)		1		26	I–II	Hs
Class: DEMOSPONGIAE						
Family: Tethyidae						
<i>Tethya aurantium</i> (Pallas, 1766)		1, 3, 5, 22	7, 8, 9, 11, 13, 15, 19	29	I–II	Hs
Family: Spirastrellidae						
<i>Diplastrella bistellata</i> (Schmidt, 1862)		3		28	I	Hs
<i>Spirastrella cunctatrix</i> Schmidt, 1868				26, 28	I–II	Hs
Family: Clionaidae						
<i>Cliona celata</i> Grant, 1826		22	23	28	I–III	Hs
<i>Cliona vermifera</i> Hancock, 1867			7		I	Hs
<i>Cliona viridis</i> (Schmidt, 1862)		3	7, 9, 13	26	I–II	Hs
<i>Cliona schmidtii</i> (Ridley, 1881)			7, 9	28	I	Hs
<i>Cliothisa hancocki</i> (Topsent, 1888)			7, 9		I	Hs
Family: Suberitidae						
<i>Aaptos aaptos</i> (Schmidt, 1864)		1, 22	9		I–III	Hs
<i>Protosuberites denhartogi</i> Van Soest & de Kluijver, 2003		5	8, 9		I–II	Hs
<i>Rhizaxinella elongata</i> (Ridley & Dendy, 1886)			PS		I	Hs
<i>Rhizaxinella pyrifera</i> (Delle Chiaje, 1828)		25	15		I	Hs

Table. (Continued).

<i>Suberites carnosus</i> (Johnston, 1842)	30	5, 22		I–III	
<i>Suberites domuncula</i> (Olivi, 1792)	29, 30	3, 5, 22	9, 11, 13, 15, 23	I–III	Hs
<i>Suberites ficus</i> (Johnston, 1842)		22		I–III	Hs
<i>Suberites massa</i> Nardo, 1847		3	18	I	Hs
<i>Terpios gelatinosa</i> (Bowerbank, 1866)			PS2	I	Hs
Family: Placospongiidae					
<i>Placospongia decorticans</i> (Hanitsch, 1895)			7,9	I	Hs
Family: Timeidae					
<i>Timea fasciata</i> Topsent, 1934			9	I	Hs
<i>Timea mixta</i> (Topsent, 1896)			8		
<i>Timea stellata</i> (Bowerbank, 1866)			8, 9, 12	I	Hs
Family: Chalinidae					
<i>Chalinula limbata</i> (Montagu, 1818)		5		I	Hs
<i>Dendrectilla tremitensis</i> Pulitzer-Finali, 1983				27	II
<i>Haliclona alba</i> (Schmidt, 1862)	30	3		I–II	Hs
<i>Haliclona flavescens</i> (Topsent, 1893)				26	II
<i>Haliclona (Gellius) dubia</i> (Babic, 1922)			8,9	I–II	Hs
<i>Haliclona (Gellius) fibulata</i> (Schmidt, 1862)		3	8,9	I	Hs
<i>Haliclona (Haliclona) simulans</i> (Johnston, 1842)		16	13	II	Hs
<i>Haliclona (Halichoclona) fulva</i> (Topsent, 1893)				28	I
<i>Haliclona (Reniera) aquaeductus</i> (Schmidt, 1862)	30	3		VII	Hs
<i>Haliclona (Reniera) cinerea</i> (Grant, 1826)		5	15	I	Hs
<i>Haliclona (Reniera) cratera</i> (Schmidt, 1862)	30		15	I	Hs
<i>Haliclona (Reniera) mediterranea</i> Griessinger, 1971		22, 25		26	I–III
<i>Haliclona (Rhizoniera) grossa</i> (Schmidt, 1864)	30				II
<i>Haliclona (Rhizoniera) sarai</i> (Pulitzer-Finali, 1969)				27	II
Family: Niphatidae					
<i>Pachychalina rustica</i> Schmidt, 1868		3		I	Hs
Family: Phloeodictyidae					
<i>Calyx nicaeensis</i> (Risso, 1826)				26	II
Family: Callyspongiidae					
<i>Siphonochalina coriacea</i> Schmidt, 1868		1	15	I–II	Hs
Family: Petrosiidae					
<i>Petrosia (Petrosia) ficiformis</i> (Poiret, 1789)		1, 22	8, 9, 15, 23	26, 28	I–III
<i>Petrosia pulitzeri</i> (Pansini, 1996)		22			I–III
<i>Petrosia (Strongylophora) vansoesti</i> Boury-Esnault, Pansini & Uriz, 1994				28	I

Table. (Continued).

Family: Dictyonellidae					
<i>Acanthella acuta</i> Schmidt, 1862	22		26	I–III	Hs
<i>Dictyonella incisa</i> (Schmidt, 1880)			27	II	Hs
<i>Dictyonella obtusa</i> (Schmidt, 1862)	3			II	Hs
<i>Dictyonella plicata</i> (Schmidt, 1880)	22			I–III	Hs
Family: Axinellidae					
<i>Axinella cannabina</i> (Esper, 1794)	3, 22	13, 15, 23	26	I–III	Hs
<i>Axinella damicornis</i> (Esper, 1794)	3, 22	9, 23	26	I–III	Hs
<i>Axinella polypoides</i> Schmidt, 1862	22	13, 15, 23		I–III	Hs
<i>Axinella pumila</i> Babic, 1922		9		II	Hs
<i>Axinella verrucosa</i> (Esper, 1794)		9, 13, 15	26	II	Hs
Family: Halichondriidae					
<i>Axinyssa digitata</i> (Cabioch, 1968)		PS		I	Hs
<i>Ciocalypa carballoi</i> Vacelet, Bitar, Carteron, Zibrowius & Perez, 2007			25	II	Hs
<i>Ciocalypa penicillus</i> (Schmidt, 1862)	22			I–III	Hs
<i>Hymeniacidon perlevis</i> (Montagu, 1818)	6	12		II	Hs
<i>Halichondria</i> (<i>Halichondria</i>) <i>panicea</i> (Pallas, 1766)	5	10, 15		I	Hs
<i>Halichondria</i> (<i>Eumastia</i>) <i>sitiens</i> (Schmidt, 1870)	6				
Family: Bubaridae					
<i>Hymerhabdia intermedia</i> Sarà & Siribelli, 1960			28	I	Hs
Family: Ancorinidae					
<i>Ancorina cerebrum</i> (Schmidt, 1862)	3	9		III	Hs
<i>Dercitus</i> (<i>Stoebea</i>) <i>plicatus</i> (Schmidt, 1868)		9		I	Hs
<i>Holoxea furtiva</i> Topsent, 1892		7, 9		I	Hs
<i>Stelletta dorsigera</i> Schmidt, 1864		9, 12		II	Hs
<i>Stelletta grubii</i> (Schmidt, 1862)		9		I	Hs
<i>Stelletta stellata</i> Topsent, 1893		9		I–II	Hs
<i>Stryphnus ponderosus</i> (Bowerbank, 1866)		9		III	Hs
Family: Pachastrellidae					
<i>Thenaea muricata</i> (Bowerbank, 1858)	3	9		III–VII	Hs
Family: Geodiidae					
<i>Erylus discophorus</i> (Schmidt, 1862)		7, 8, 9	28	I	Hs
<i>Geodia cydonium</i> (Jameson, 1811)	1, 3, 20	7, 8, 9, 13, 15		I–III	Hs
<i>Geodia conchilega</i> Schmidt, 1862	3	8, 9		I	Hs
<i>Geodia tuberosa</i> Schmidt, 1862	3			I	Hs
<i>Penares euastrum</i> (Schmidt, 1868)		9		III	
<i>Penares helleri</i> (Schmidt, 1864)		15		I	Hs

Table. (Continued).

Family: Calthropellidae					
<i>Calthropella stelligera</i> (Schmidt, 1868)		9		I	Hs
Family: Thoosidae					
<i>Alectona millari</i> Carter, 1879		7	28	I	Hs
Family: Mycalidae					
<i>Mycale (Aegogropila) contareni</i> (Martens, 1824)	3	8,9	28	I–III	Hs
<i>Mycale (Aegogropila) rotalis</i> (Bowerbank, 1874)		8,9	28	I–III	Hs
<i>Mycale (Aegogropila) tunicata</i> (Schmidt, 1862)		8, 9		I–III	Hs
<i>Mycale (Mycale) lingua</i> (Bowerbank, 1866)			28	I	Hs
<i>Mycale (Carmia) macilenta</i> (Bowerbank, 1866)		8, 9		I–III	
<i>Mycale (Mycale) massa</i> (Schmidt, 1862)	3	7, 9	28	I–III	Hs
Family: Tetillidae					
<i>Craniella cranium</i> (Müller, 1776)		9		III	Hs
Family: Samidae					
<i>Samus anonymus</i> Gray, 1867		9		I	Hs
Family: Plakinidae					
<i>Plakina monolopha</i> Schulze 1880		9		I	Hs
Family: Agelasidae					
<i>Agelas oroides</i> (Schmidt, 1862)	19	9, 15, 23	26	I–III	Hs
Family: Myxillidae					
<i>Myxilla (Myxilla) prouhoi</i> (Topsent, 1892)		9		II–III	Hs
<i>Myxilla (Myxilla) rosacea</i> (Lieberkühn, 1859)		7, 8, 9, 15		I–III	Hs
Family: Coelosphaeridae					
<i>Lissodendoryx (Anomodoryx) cavernosa</i> (Topsent, 1892)		8		I	Hs
Family: Crambeidae					
<i>Crambe crambe</i> (Schmidt, 1862)		7, 9	26, 28	I–II	Hs
Family: Crellidae					
<i>Crella (Crella) elegans</i> (Schmidt, 1862)	6			IV	Hs
<i>Crella (Pytheas) fusifera</i> Sarà, 1969		9		II	Hs
Family: Hymedesmiidae					
<i>Hemimycala columella</i> (Bowerbank, 1874)		15	26, 28	I	Hs
<i>Phorbas fictitius</i> (Bowerbank, 1866)	1, 3		26, 28	I–II	Hs
<i>Phorbas plumosus</i> (Montagu, 1818)			28	I	Hs
<i>Phorbas tenacior</i> (Topsent, 1925)			26	II	Hs
Family: Acarnidae					
<i>Acarnus tortilis</i> Topsent, 1892		8, 9		I–II	Hs
Family: Tedaniidae					
<i>Tedania (Tedania) anhelans</i> (Lieberkühn, 1859)	30	3	8, 9, 13, 15	I–II	Hs

Table. (Continued).

Family: Raspailiidae					
<i>Raspailia</i> (<i>Raspailia</i>) <i>viminalis</i> Schmidt, 1862	PS	9, 11, 15		II	Hs
Family: Microcionidae					
<i>Clathria</i> (<i>Clathria</i>) <i>coralloides</i> (Olivi, 1792)		15		II	Hs
<i>Clathria</i> (<i>Microciona</i>) <i>strepsitoxa</i> (Hope, 1889)	22	23		I–III	Hs
<i>Clathria</i> (<i>Thalysias</i>) <i>jolicoeuri</i> (Topsent, 1892)		8, 12		II	Hs
Family: Desmacellidae					
<i>Desmacella</i> <i>inornata</i> (Bowerbank, 1866)			28	I	Hs
Family: Irciniidae					
<i>Ircinia</i> <i>dendroides</i> (Schmidt, 1862)			28	I	Hs
<i>Ircinia</i> <i>variabilis</i> (Schmidt, 1862)	3	15	26	I–II	Hs
<i>Sarcotragus</i> <i>foetidus</i> Schmidt, 1862	3	12, 15, 18, 20, 24	28	I–II	Hs
<i>Sarcotragus</i> <i>spinosulus</i> Schmidt, 1862			26, 28	II	Hs
Family: Dysideidae					
<i>Dysidea</i> <i>avara</i> (Schmidt, 1862)	3	13, 15	26	I–III	Hs
<i>Dysidea</i> <i>fragilis</i> (Montagu, 1818)	29, 30	3	27	I–III	Hs
<i>Dysidea</i> <i>incrustans</i> (Schmidt, 1862)	2, 3			I	Hs
<i>Dysidea</i> <i>tupha</i> (Martens, 1824)		15		I	Hs
<i>Pleraplysilla</i> <i>spinifera</i> (Schulze, 1879)			26	II	Hs
Family: Thorectidae					
<i>Cacospongia</i> <i>mollior</i> Schmidt, 1862	3			I	Hs
<i>Fasciospongia</i> <i>cavernosa</i> (Schmidt, 1862)	1, 3			I–II	Hs
<i>Hyrtios</i> <i>collectrix</i> (Schulze, 1880)			27	II	Hs
<i>Scalarispongia</i> <i>scalaris</i> (Schmidt, 1862)	3	15	26, 27	I–II	Hs
Family: Spongiidae					
<i>Hippospongia</i> <i>communis</i> (Lamarck, 1814)	3	13, 15		II–III	Hs
<i>Spongia</i> (<i>Spongia</i>) <i>officinalis</i> Linnaeus, 1759	30	3, 14, 15, 17, 21	4, 26	I–III	Hs
<i>Spongia</i> (<i>Spongia</i>) <i>virgultosa</i> (Schmidt, 1868)		15		I	Hs
Family: Aplysiniidae					
<i>Aplysina</i> <i>aerophoba</i> Nardo, 1843	3, 16	11, 15, 18, 23	26, 28	I–III	Hs
Family: Halisarcidae					
<i>Halisarca</i> <i>dujardinii</i> Jonston, 1842	30			II	Hs
Family: Chondrillidae					
<i>Chondrilla</i> <i>nucula</i> Schmidt, 1862			26	II	Hs
<i>Chondrosia</i> <i>reniformis</i> Nardo, 1847	13	15, 18, 23	26, 28	I	Hs

1: Colombo (1885), 2: Ostroumoff (1894), 3: Ostroumoff (1896), 4: Gruvel (1931), 5: Demir (1952–1954), 6: Caspers (1968), 7: Saritaş (1972), 8: Saritaş (1973), 9: Saritaş (1974), 10: Pınar (1974), 11: Geldiay and Kocataş (1972), 12: Kocataş (1978), 13: Yazıcı (1978), 14: Okuş (1986), 15: Ergüven et al. (1988), 16: Bayhan et al. (1989), 17: Balkıs (1992), 18: Ergen et al. (1994), 19: Ergen and Çınar (1994), 20: Çınar and Ergen (1998), 21: Kocak et al. (1999), 22: Topaloglu (2001a), 23: Topaloğlu (2001b), 24: Çınar et al. (2002), 25: Uysal et al. (2002), 26: Gözcelioğlu (2011), 27: Gözcelioğlu et al. (2011), 28: Evcen and Çınar (2012), 29: Topaloglu et al. (2013), 30: Bacescu et al. (1971).

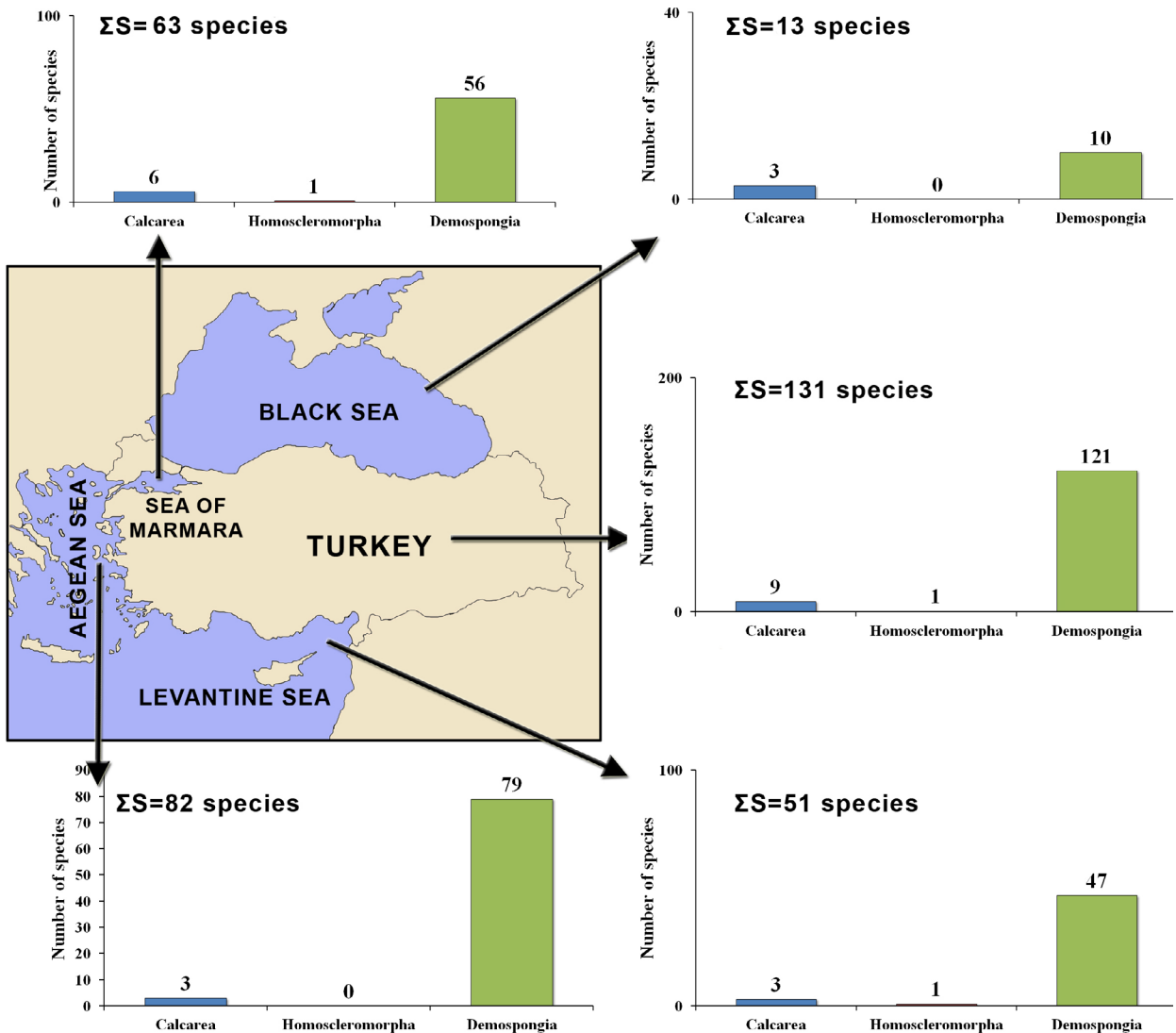


Figure 2. The number of sponge species according to seas.

***Rhizaxinella elongata* (Ridley and Dendy, 1886)**

Material examined: One specimen from Saros Bay (station 1), 100–200 m depth, bottom-trawling (see Figure 1).

Description: The species is a yellowish gray, stalked, oval, solid sponge. It has fine hispid surface and firm consistency. The body is solid, elongated, up to 6 cm long. Spicules: Styles and tylostyles, long, smooth, in 3 categories: long styles: 1750–2000 × 14–16 μm, intermediate styles: 500–2000 × 5–6 μm, and small tylostyles: 200–400 × 3–6 μm (Figure 4). Previously it has been reported from the eastern Mediterranean Sea (Carteron, 2002).

***Terpios gelatinosa* (Bowerbank, 1866)**

Material examined: Many specimens from Ildırı Bay, Çeşme (station 2), 0–10 m, scuba diving (see Figure 2).

Description: It is recognizable by its blue colors. The blue or orange-yellow color persists in alcohol and in dried specimens. Oscules are minute, not distinct to the naked eye. Surface is smooth and hispid, quite thin. Spicules: only tylostyles (200–480 × 4–8 μm), have well-developed head. Tylostyle's apex of the lobes is divided in various ways. Lobate swellings are a characteristic feature of the genus *Terpios*. Forming the skeleton, spicules are connected to each other in the form of a brush (Figure 5). *Terpios gelatinosa* is very common on rocky substrata and the undersides of boulders. In the Mediterranean it occurs on algae and other sponges, and it occurs on the Aegean coasts and islands, where it has been recorded in various habitat types by several authors (Pérès and Picard, 1958; Voultsiadou, 2005; Gerovasileiou and Voultsiadou, 2013).

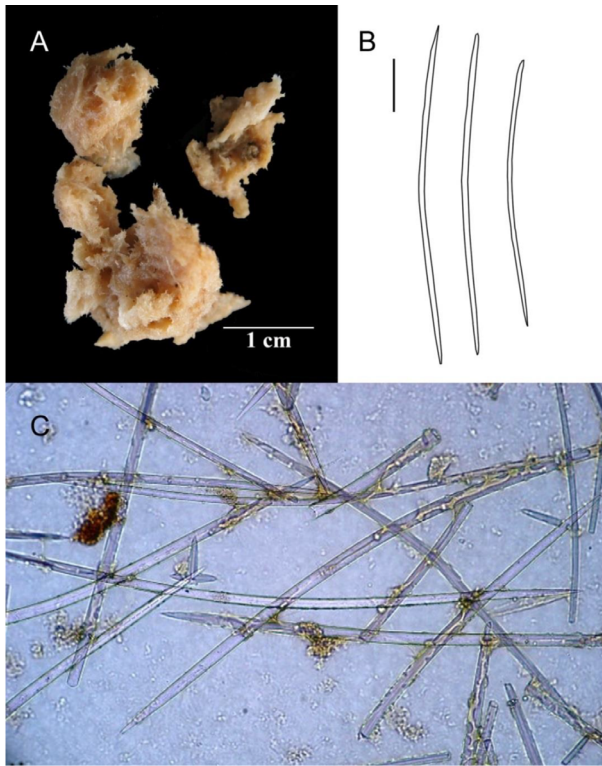


Figure 3. A) Photograph of *Axinyssa digitata*. B) Spicules of *Axinyssa digitata*: oxeas. Scale: 100 μ m. C) Overview of spicules.

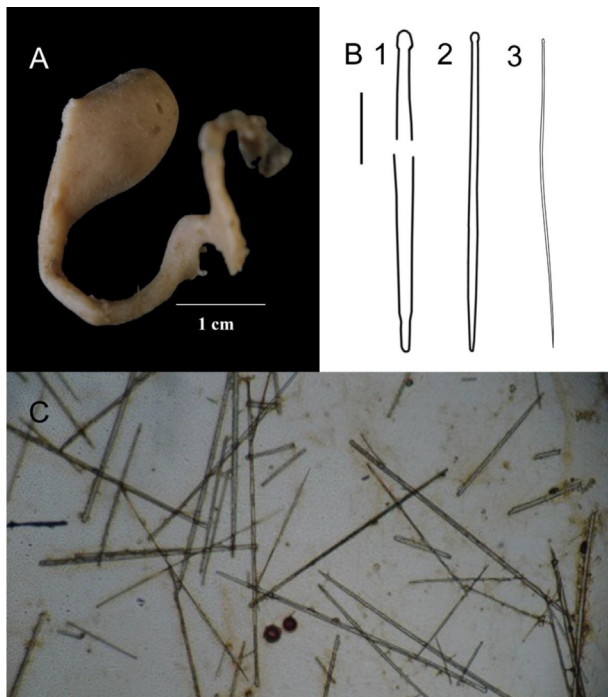


Figure 4. A) Photograph of *Rhizaxinella elongata*. B) Spicules of *Rhizaxinella elongata*: 1- long tylostyles, 2- intermediate tylostyles, 3- small tylostyles. Scale: 1- 300 μ m, 2- 100 μ m, 3- 50 μ m. C) Overview of spicules.

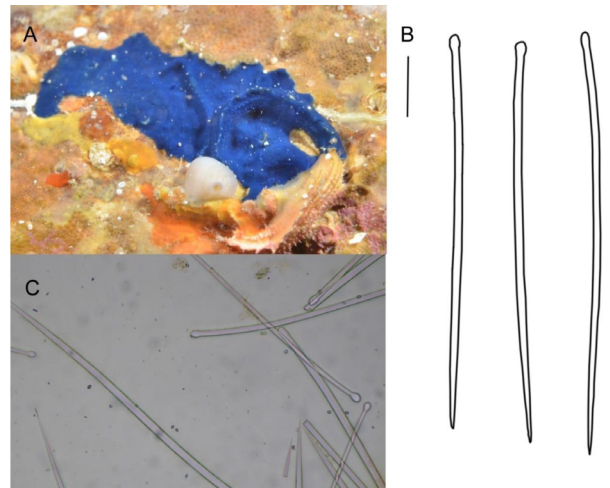


Figure 5. A) Photograph of *Terpios gelatinosa*. B) Spicules of *Terpios gelatinosa*: tylostyles. Scale: 100 μ m. C) Overview of spicules.

The pioneer studies on sponges along the coasts of Turkey were carried out by Colombo (1885), Ostroumoff (1894, 1896), and Demir (1952–1954). The species *Geodia baretti* was listed in the Sea of Marmara in the previous checklist by Evcen and Çınar (2012), based on reports by Colombo (1885), Ostroumoff (1894, 1896), and Demir (1952–1954). The global distribution of the species is in the Arctic, Norway, Sweden, and North Atlantic (according to World Porifera Database, 2014). The orthotrien spicules that Demir (1952–1954) mentioned in the description of the species are characteristic to *Geodia cydonium*. Topaloğlu (1999) also pointed out this fact after personal communication with RVM Van Soest. However, *Geodia gigas* and *Geodia placenta* are considered synonyms of *Geodia cydonium* (Jameson, 1811) (Cárdenas, 2010; Cárdenas et al., 2013). Therefore, *G. baretti*, *G. gigas*, and *G. placenta* were eliminated from the checklist.

Ostroumoff (1896) reported 2 new species from the Sea of Marmara. These [*Cometella stolonifera* (Ostroumoff, 1896) and *Suberites appendiculatus* (Ostroumoff, 1896)] are actually considered to be nomen nudum (Evcen and Çınar, 2012). According to the World Porifera Database, however, *Oceanapia robusta* (Bowerbank, 1866) (given by Ostroumoff, 1896) has not been recorded from the Mediterranean Sea. Therefore, *O. robusta* was removed from the checklist.

The highest number of species was reported from the Aegean Sea (Sarıtaş, 1972, 1973, 1974; Kocataş, 1978; Yazıcı, 1978; Ergüven, 1988; Ergen and Çınar, 1994; Ergen et al. 1994; Kocak et al., 1999; Topaloğlu, 2001b; Çınar et al., 2002). While the Mediterranean records of

Lissodendoryx isodictyalis and *Rhabderemia indica* (given by Saritaş, 1972, 1973, 1974) are considered invalid, *Clathrina coriacea* (Ergüven, 1988) has not been recorded in the Mediterranean Sea according to the World Porifera Database (2014). The number of publications on sponges in the Aegean Sea is relatively high compared to the other coasts of Turkey. The area also has many suitable habitats for sponges, like rock reefs and islands. Three new records of sponges are also being reported from the Aegean Sea in the present study.

The sponge species from the Levantine Sea were reported by Gruvel (1931), Gözcüoğlu (2011), and Evcen and Çınar (2012). According to Evcen and Çınar (2012), the biodiversity of sponges has rarely been a subject of study in the Levantine Sea. The authors reported 29 sponge species in the area, 8 of which were new records for the marine fauna of Turkey. Gözcüoğlu (2011) reported 27 sponge species from the Aegean and Mediterranean coasts of Turkey and 5 of those species were new records for the marine fauna of Turkey. In total, 49 sponge species have been reported from the Levantine Sea coast of Turkey.

Only 2 species [*Dysidea fragilis* (Montagu, 1814) and *Suberites domuncula* (Olivi, 1792)] were reported from the western Black Sea coast of Turkey by Topaloğlu et al. (2013). Kaminskaya (1968) reported 26 sponge species, of which 5 species were endemic, for all of the Black Sea. The western part of the Black Sea may be more diverse than the eastern part for sponge species due to Mediterranean-originated currents that flow to the Black Sea via the İstanbul Strait.

The highest number of sponge species was reported from the Aegean Sea (82), where many suitable habitats for sponges exist, like rock reefs and islands. This is followed by the Sea of Marmara (63), where the sponge species were mostly sampled from the islands. The Sea of Marmara is

called the Turkish Straits System (TSS) together with the Çanakkale and İstanbul Straits. This area also represents a biological corridor, a barrier, and a transitional zone between the Mediterranean and Black sea basins. On the other hand, the straits allow the acclimatization of certain species of Mediterranean origin such as decapod crustaceans, anthozoans, and sponges penetrating to the Sea of Marmara and Black Sea (Öztürk and Öztürk, 1996). Therefore, many benthic species were not able to pass through the TSS and populated in the Black Sea. According to Oğuz and Öztürk (2011), one-third of benthic and pelagic taxa were able to migrate and settle successfully in the Black Sea.

According to data available, the hotspot area in terms of sponge species richness is Gökçeada, where more than 27 species were found in 2 grids (15 × 15 km) (Figure 6). The other areas with relatively high numbers of sponge species are Edremit Bay, İzmir Bay, and Kaş. Almost all areas of the Black Sea (except for 2 grids) and the majority of areas of the other seas remain unexplored in terms of sponge species.

This study compiled the diversity of sponge studies for the Turkish marine fauna. Some authors reported sponge species in some specific areas, such as Ergüven et al. (1988) for Gökçeada, Topaloglu (2001a) for the Sea of Marmara, and Evcen and Çınar (2012) for the Levantine Sea. Evcen and Çınar (2012) presented a checklist for sponge fauna of Turkey with 116 species. The present study has increased the number of sponge species known from the coasts of Turkey to 131. We think that sponges are actually more diverse. More studies are needed, especially for the Black Sea coast. In this way, the actual number of sponge species in Turkey will be available, and their function in the marine ecosystem will become clearer.

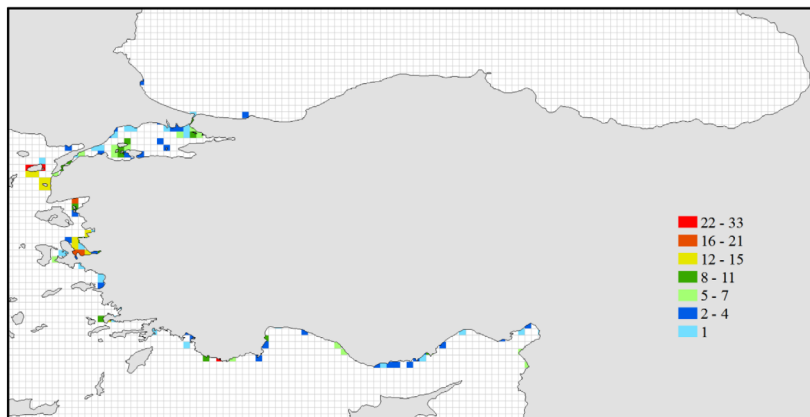


Figure 6. The number of sponge species along the coasts of Turkey. Each grid is 15 × 15 km in dimension.

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