

**ACTINIARIA, CORALLIMORPHARIA, AND SCLERACTINIA
(HEXACORALLIA, ANTHOZOA) OF THE AEGEAN SEA, WITH A
CHECKLIST OF THE EASTERN MEDITERRANEAN AND BLACK SEA
SPECIES**

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ABSTRACT

Twenty-one hexacoral species belonging to the orders Actiniaria (3), Corallimorpharia (1), and Scleractinia (17) were collected in the North Aegean Sea. Three of these (*Amphianthus dohrnii*, *Cladopsammia rolandi*, and *Monomyces pygmaea*) are new records for the Eastern Mediterranean and two (*Lophelia pertusa* and *Madrepora oculata*) are new records for the Aegean Sea. It was estimated that 56 species belonging to these three orders have been found in the Eastern Mediterranean and Black Sea and are presented here for the first time in a checklist. Zoogeographical consideration of the Eastern Mediterranean hexacoral fauna shows that the bulk of the species can be characterized as Atlanto-Mediterranean, followed by the Mediterranean endemic and cosmopolitan species. In the Aegean, Atlanto-Mediterranean species dominate both in the order Actiniaria (78.5%) and in Scleractinia (70%). However, cosmopolitan species are more numerous among Scleractinia (25%) than among Actiniaria (3.6%); in the latter, endemic species appear with a greater percentage (14.3%). The number of species belonging to these three taxa known from the Mediterranean is estimated to be 88 species, 64 of which are characterized as Atlanto-Mediterranean, 15 as endemic, 8 as cosmopolitan and 1 as Indo-Mediterranean. The species numbers of all the above categories, except the last, seem to decrease generally from the Western to the Eastern Mediterranean and to the Black Sea, from which only a few species are known.

INTRODUCTION

Before the publication of some recent papers (e.g., Koukouras et al., 1992; Vafidis et al., 1994; Koukouras et al., 1995), the Aegean Sea was one of the less studied Mediterranean areas as far as benthic fauna is concerned. Our knowledge of the hexacoral fauna of the Aegean Sea is very limited compared with that of the Western Mediterranean. The bulk of the information on the Aegean hexacorals is included in a few publications, (Laborel, 1961; Cosar, 1974; Zibrowius, 1979; Doumenc et al., 1985; Doumenc et al., 1987; Chintiroglou and den Hartog, 1995).

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Additional scattered information on hexacorals in the Aegean Sea is found in a number of faunistic and ecological papers, (Forbes, 1844; Tortonese, 1947, 1951; Belloc, 1948; Pérès and Picard, 1958; Laborel, 1960; Rossi, 1961; Geldiay and Kocatas, 1972; Hottinger, 1974; Kocatas, 1978; Zibrowius, 1980; Bianchi and Morri, 1983; Diapoulis and Bogdanos, 1983; Chintiroglou, 1992; den Hartog et al., 1993; Chintiroglou & Stefanidou, 1994; den Hartog, 1995, in press.)

Regarding the hexacorals of the orders Actiniaria, Corallimorpharia and Scleractinia, review of the relevant literature shows that of a total of 88 Mediterranean species, only 52 have been reported from the Eastern Mediterranean (Levantine Basin and Aegean Sea), 44 from the Aegean Sea (including the Sea of Marmara).

This paper gives new information on the hexacoral fauna of the Aegean Sea, presents the first checklist of the orders Actiniaria, Scleractinia, and Corallimorpharia of the Eastern Mediterranean and Black Sea, and discusses and compares the biogeographic composition of these orders in the Aegean Sea with that of neighboring areas.

MATERIAL AND METHODS

Specimens have been collected since 1970, from 42 sampling stations in the North Aegean Sea (Fig. 1 and Table 1). Sampling was carried out by fishing nets, by free diving and scuba diving, and various types of trawls, dredges, and grabs, to a maximum depth of 300–350 m. All specimens are deposited in the Museum of the Department of Zoology, University of Thessaloniki.

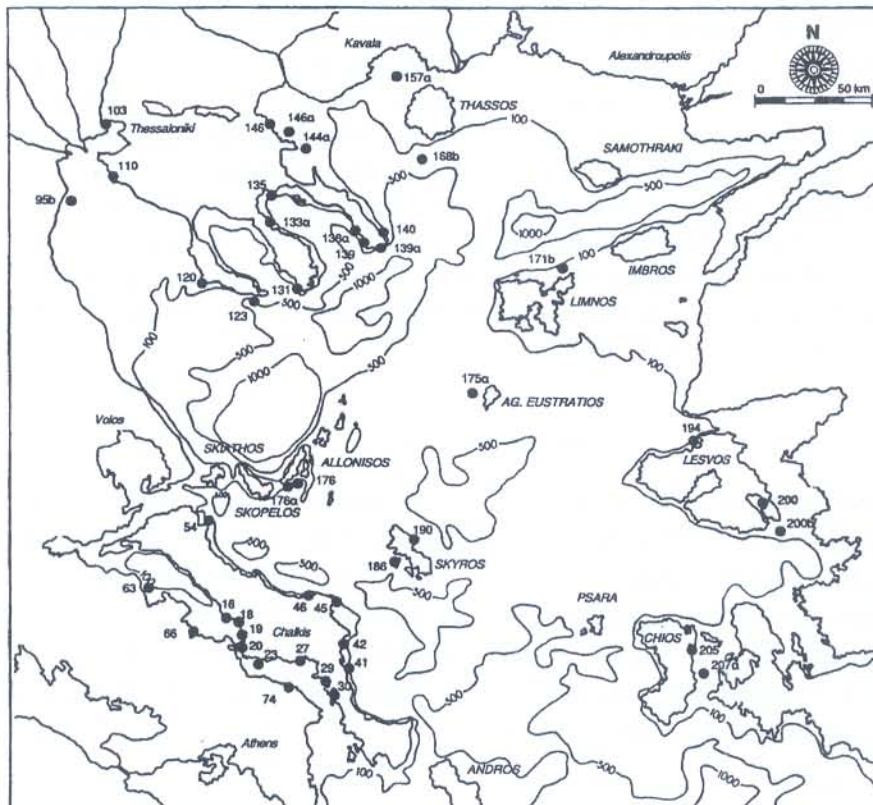


Fig. 1. Map of the North Aegean Sea, indicating sampling stations.

Table 1

List of sampling stations, including toponyms, substratum type, sampling method, depth, and species found

Stat. 16.	Politika; rocks, <i>Cystoseira</i> ; 5 m; free diving: <i>C. caespitosa</i>
Stat. 18.	Artaki; rocks; 2 m; free diving: <i>C. caespitosa</i>
Stat. 19.	Manika; sand, stones; 2–10 m; free diving: <i>C. caespitosa</i> , <i>B.europaea</i>
Stat. 20.	Halkida; stones, 2–20 m; scuba diving: <i>C. caespitosa</i> , <i>C. smithii</i>
Stat. 27.	Kakia skala; rocks; 2–10 m; free diving: <i>C. caespitosa</i>
Stat. 29.	Boufalo; rocks; 3–15 m; scuba diving: <i>C. caespitosa</i>
Stat. 30.	Almyropotamos; rocks, maërl; 2–35 m; free diving, fishing nets: <i>C. caespitosa</i>
Stat. 41.	Gamila; rocks; 5 m; free diving: <i>C. caespitosa</i>
Stat. 42.	Petries; rocks; 2–15 m; free diving: <i>C. caespitosa</i>
Stat. 45.	Sutsini; rocks; 5 m; free diving: <i>C. caespitosa</i>
Stat. 46.	Methoni; rocks; 3–5 m; free diving: <i>C. caespitosa</i> , <i>M. pharensis</i>
Stat. 54.	Kotsikia; rocks; 1–5 m; free diving: <i>C. caespitosa</i>
Stat. 63.	Skala Atalantis; stones; 4 m; free diving: <i>C. caespitosa</i>
Stat. 66.	Skorponeria; sand-silt, stones; 10 m; free diving: <i>M. pharensis</i> , <i>H. durotrix</i> , <i>P. mouchezii</i> .
Stat. 74.	Varnavas; maërl; 25–37 m; fishing nets: <i>C. smithii</i> , <i>C. caespitosa</i>
Stat. 95b.	Thermaikos Gulf; sandy silt; 40 m; grab: <i>E. claparedii</i>
Stat. 103.	Kalochori Thermaikos Gulf; stones; 0.5 m; free diving: <i>A. striata</i>
Stat. 110.	Epanomi; stones; 3 m; free diving: <i>C. caespitosa</i>
Stat. 120.	Posidi; rocks; 2 m; free diving: <i>C. caespitosa</i>
Stat. 123.	Agia Paraskevi; rocks; 17 m; scuba diving: <i>C. inornata</i>
Stat. 131.	Porto Koufo; rocks; 1–25 m; scuba diving: <i>M. pharensis</i> , <i>C. smithii</i> , <i>C. inornata</i> , <i>P. muelleriae</i> , <i>H. durotrix</i> , <i>B. europaea</i> , <i>L. pruvoti</i>
Stat. 133a.	Vourvourou; maërl; 16 m; scuba diving: <i>C. caespitosa</i> , <i>C. smithii</i>
Stat. 135.	Pyrgadikia; rocks; 1–6 m; free diving: <i>C. caespitosa</i>
Stat. 138a.	Moni Grigoriou; rocks; 63 m; scuba diving: <i>C. calveri</i>
Stat. 139.	Skiti Agias Annas; rocks; 90 m; Agassiz trawl: <i>C. viridis</i>
Stat. 139a.	Akrotiri Athos; rocks, silt; 180–200 m; Agassiz trawl: <i>A. dohrnii</i> , <i>D. cristagalli</i>
Stat. 140.	Moni Megistis Lavras; rocks; 1–15 m; scuba diving: <i>C. inornata</i> , <i>H. durotrix</i> , <i>C. caespitosa</i>
Stat. 144a.	Eleutherides I.; rocks; 25–35 m; scuba diving: <i>C. smithii</i> , <i>B.europaea</i>
Stat. 146.	Olympiada; sand, sand-silt, <i>Zostera</i> ; 0–27 m; dredge: <i>H. durotrix</i>
Stat. 146a.	Strymonikos Gulf; sandy silt; 50 m; grab: <i>E. claparedii</i>
Stat. 157a.	Gulf of Kavala; silty sand; 45 m; grab: <i>E. claparedii</i>
Stat. 168b.	Off Limenaria Thasos I.; maërl, stones; 300–350 m; trawl: <i>M. oculata</i> , <i>L. pertusa</i>
Stat. 171b.	Off Plaka Limnos I.; maërl; 60–90 m; trawl: <i>D. cristagalli</i>
Stat. 175a.	Agios Stratis I.; maërl; 30–40 m; fishing nets: <i>C. caespitosa</i> , <i>C. smithii</i>
Stat. 176.	Votsi Alonnisos I.; rocks; 2–4 m; free diving: <i>C. caespitosa</i>
Stat. 176a.	S.W. of Alonnisos I.; rocks; 63 m; trawl: <i>C. viridis</i>
Stat. 186.	Skyros I.; maërl; 10–30 m; scuba diving: <i>C. inornata</i> , <i>C. caespitosa</i> , <i>C. smithii</i>
Stat. 190.	Skyros I.; rocks; 25–35 m; scuba diving: <i>B. europaea</i>
Stat. 194.	Mithymna; maërl; 170 m; trawl: <i>D. cornigera</i>
Stat. 200b.	Off Argilia; rocks; 20–40 m; scuba diving: <i>C. caespitosa</i> , <i>P. pulchellus</i> , <i>M. pygmaea</i> , <i>B. europaea</i> ; maërl; 70–90 m; trawl: <i>P. pulchellus</i> , <i>C. calveri</i>
Stat. 205.	Tavros I., Chios; stones; 3–5 m; free diving: <i>M. pharensis</i> , <i>C. caespitosa</i>
Stat. 207a.	Off Chios; maërl; 35–45 m; trawl: <i>C. rolandi</i>

The main areas as used for the species distribution in the Mediterranean are adapted from Pérès and Picard (1964) and Por and Dimentman (1989). The Sea of Marmara is here annexed to the Aegean area. The Eastern Mediterranean also comprises the Levantine Basin and the Aegean Sea.

RESULTS AND DISCUSSION

MATERIAL EXAMINED

ACTINIARIA. The material from the North Aegean Sea includes 42 specimens belonging to 3 species (Table 2). Material from 15 species, from the same area studied by Doumenc et al. (1985) is not included here. The three species are:

Actinia striata (Rizzi, 1907)

Actinia striata, Schmidt, 1972, p. 69, Abb. 27a.

Three individuals from station 103, depth 0.5 m, on midlittoral stones, in a polluted estuarine area.

Distribution: In the Mediterranean, this species is known from the Western Basin (Schmidt, 1972) and the Adriatic (Pax & Müller, 1962). Chintiroglou (1992) briefly mentioned it from the Aegean without reporting its exact location. Chintiroglou and Stefanidou (1994) also reported it from Thasos Island and Thermaikos Gulf. The present data confirm its presence in the Aegean Sea and in the Eastern Mediterranean. In the Atlantic, *A. striata* is known from the Azores (Schmidt, 1972).

Amphianthus dohrnii (Koch, 1878)

Amphianthus dohrnii, Schmidt, 1972, p. 40, Abb. 20d.

Twelve individuals from station 139a, depth 180–200 m, on the gorgonian *Swiftia dubia* Thomson, 1929, attached to a rock.

Distribution (Fig. 2): First record from the Eastern Mediterranean. In the Western Basin reported from the Gulf of Naples (Andres, 1884), the Gulf of Genova (Rossi, 1950), and the Catalan coast (Gili, 1987). Also known in the Adriatic (Pax and Müller, 1962). In the Atlantic known from Portugal and the British Isles (Nobre, 1931; Stephenson, 1935; Manuel, 1981)

Edwardsia claparedii (Panceri, 1869)

Edwardsia claparedii, Manuel, 1981, p. 198, figs 71A–C.

Twenty-seven individuals from stations: 95b, 146a, 157a, depths 40–50 m, from sandy silt (median diameter = 40 μm) and silty sand (median diameter = 70–80 μm).

Distribution: In the Eastern Mediterranean recorded from the Gulf of Izmir, Aegean Sea, by Cosar (1974) as *Edwardsia* sp.; from Strymonikos Gulf by Dounas (1986) as *Edwardsia* sp.; from the Gulf of Kavala by Papazacharias (1991) as *Edwardsia* sp.;

Table 2

Checklist of the Eastern Mediterranean and Black Sea Actiniaria, Corallimorpharia, and Scleractinia, and with their distribution in the Mediterranean areas. Species marked with *** are reported for the first time from the Eastern Mediterranean and those with ** for the first time from the Aegean Sea. Other species found by the authors in the N. Aegean are marked with *

Hexacorallia	WM	CM	AD	AS	LB	BS	ZC
Actiniaria							
<i>Actinauge richardi</i> (Marion, 1882)	x	x	x	x			AM
<i>Actinia cari</i> Delle Chiaje, 1825	x	x	x	x			AM
<i>Actinia equina mediterranea</i> Schmidt, 1971	x	x	x	x	x	x	C
* <i>Actinia striata</i> Rizzi, 1907	x		x	x			AM
<i>Adamsia palliata</i> (O.F. Müller, 1788)	x	x	x	x	x		AM
<i>Aiptasia diaphana</i> (Rapp, 1829)	x	x		x	x		IM
<i>Aiptasia mutabilis</i> (Gravenhorst, 1831)	x	x	x	x	x		AM
<i>Aiptasiogeton comatus</i> (Andres, 1881)	x		x	x	x		AM
<i>Alicia mirabilis</i> (Johnson, 1861)	x				x		AM
*** <i>Amphianthus dohrnii</i> (Koch, 1878)	x	x	x	x			AM
<i>Andresia parthenopea</i> (Andres, 1883)	x		x	x			AM
<i>Anemonia melanaster</i> (Verril, 1901)					x		AM
<i>Anemonia viridis</i> (Forsk., 1775)	x	x	x	x	x		AM
<i>Anthopleura ballii</i> (Cocks, 1850)	x		x		x		AM
<i>Bunodactis rubripunctata</i> (Grube, 1840)	x		x		x		AM
<i>Bunodactis verrucosa</i> (Pennant, 1777)	x		x	x			AM
<i>Bunodeopsis strumosa</i> Andres, 1881	x		x	x			E
<i>Calliactis parasitica</i> (Couch, 1842)	x	x	x	x	x		AM
<i>Cereus pedunculatus</i> (Pennant, 1777)	x	x	x	x	x		E
<i>Condylactis aurantiaca</i> (Delle Chiaje, 1825)	x	x	x	x	x		AM
<i>Diadumene luciae</i> (Verril, 1898)	x		x		x	x	AM
* <i>Edwardsia claparedii</i> (Panceri, 1869)	x		x	x		x	AM
<i>Hormathia coronata</i> (Gosse, 1858)	x	x	x	x			AM
<i>Mesacmaea mitchellii</i> (Gosse, 1853)	x		x	x			AM
<i>Paranemonia vouliagmeniensis</i> Doumenc et al., 1987			x				E
<i>Paraphellia sanzoi</i> Calabresi 1926					x		E
<i>Peachia cylindrica</i> (Reid, 1848)	x		x	x		x	AM
<i>Phymanthus pulcher</i> (Andres, 1883)	x		x	x			E
<i>Sagartia elegans</i> (Dalyell, 1848)	x		x	x			AM
<i>Sagartiogeton undatus</i> (O.F. Müller, 1788)	x	x	x	x		x	AM
<i>Scolanthus callimorphus</i> (Gosse, 1853)	x			x			AM
<i>Synhalcampella oustromovi</i> (Wyragéwitch, 1905)					x		E
<i>Telmatactis cricoides</i> (Duchassaing, 1850)		x		x	x		AM
<i>Telmatactis forskalii</i> (Ehrenberg, 1834)	x	x	x	x	x		AM
<i>Telmatactis solidago</i> (Duchassaing & Michelotti, 1864)				x			AM
Corallimorpharia							
* <i>Corynactis viridis</i> Allman, 1846	x		x	x			AM

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Table 2 continued

Scleractinia							
*	<i>Balanophyllia europaea</i> (Risso,1826)	x	x	x	x	AM	
	<i>Balanophyllia regia</i> Gosse,1860	x			x	AM	
*	<i>Caryophyllia calveri</i> Duncan,1873	x		x	x	x	AM
*	<i>Caryophyllia inornata</i> (Duncan,1878)	x	x	x	x	x	AM
*	<i>Caryophyllia smithii</i> Stokes & Broderip,1828	x	x	x	x		AM
*	<i>Cladocora caespitosa</i> (Linnaeus,1767)	x	x	x	x	x	AM
***	<i>Cladopsammia rolandi</i> Lacaze-Duthiers,1897	x	x		x		E
*	<i>Dendrophyllia cornigera</i> (Lamarck,1816)	x			x	x	AM
*	<i>Desmophyllum cristagalli</i> Milne Edwards & Haime,1848	x	x		x	x	C
	<i>Guynia annulata</i> Duncan,1872	x	x	x	x		C
*	<i>Hoplangia durotrix</i> Gosse,1860	x	x	x	x	x	AM
*	<i>Leptopsammia pruvoti</i> Lacaze-Duthiers,1897	x	x	x	x	x	AM
**	<i>Lophelia pertusa</i> (Linnaeus,1758)	x	x	x	x	x	C
*	<i>Madracis pharensis</i> (Heller,1868)	x	x	x	x	x	AM
**	<i>Madrepora oculata</i> Linnaeus,1758	x	x	x	x	x	C
***	<i>Monomyces pygmaea</i> (Risso,1826)	x	x	x	x		AM
*	<i>Paracyathus pulchellus</i> (Philippi,1842)	x	x	x	x	x	AM
*	<i>Phyllangia mouchezii</i> (Lacaze-Duthiers,1897)	x	x	x	x	x	AM
*	<i>Polycyathus muelleriae</i> (Abel,1959)	x	x	x	x	x	AM
	<i>Stenocyathus vermiformis</i> (Pourtales,1868)	x	x		x	x	C

AD—Adriatic Sea, AS—Aegean Sea, BS—Black Sea, CM—Central Mediterranean, LB—Levantine Basin, WM—Western Mediterranean. Zoogeographical characterization (ZC): AM—Atlanto-Mediterranean, C—Cosmopolitan, E—possibly endemic, IM—Indo-Mediterranean.

from the Aegean in general by Chintiroglou (1992). Reported in the Black Sea, Crimea Peninsula, by Milovidova and Kiryukhina (1978). Also known from the Adriatic (Pax and Müller, 1962) and the Western Basin (Andres, 1884). In the Atlantic reported from the south and west coasts of Britain and the northern coast of France (Manuel, 1981).

CORALLIMORPHARIA. One of the two Mediterranean species of this order was found in the Aegean.

Corynactis viridis Allman, 1846

Corynactis viridis, den Hartog et al., 1993, p. 5, figs 1–25, tabs 1–2.

Twenty-five individuals from stations 139, depth 90 m, and 176a, depth 63 m, on rocks. At station 139 together with the gorgonian *Paramuricea clavata* (Risso, 1826), at station 176a with the precious coral *Corallium rubrum* (Linnaeus, 1758).

Distribution: Reported for the first time in the Eastern Mediterranean by den Hartog et al. (1993) from our station 176a. Station 139, depth of 90 m, is the deepest record of this species. Its distribution in the Adriatic, the Western Mediterranean, and the Eastern Atlantic has been given in detail by den Hartog et al. (1993).

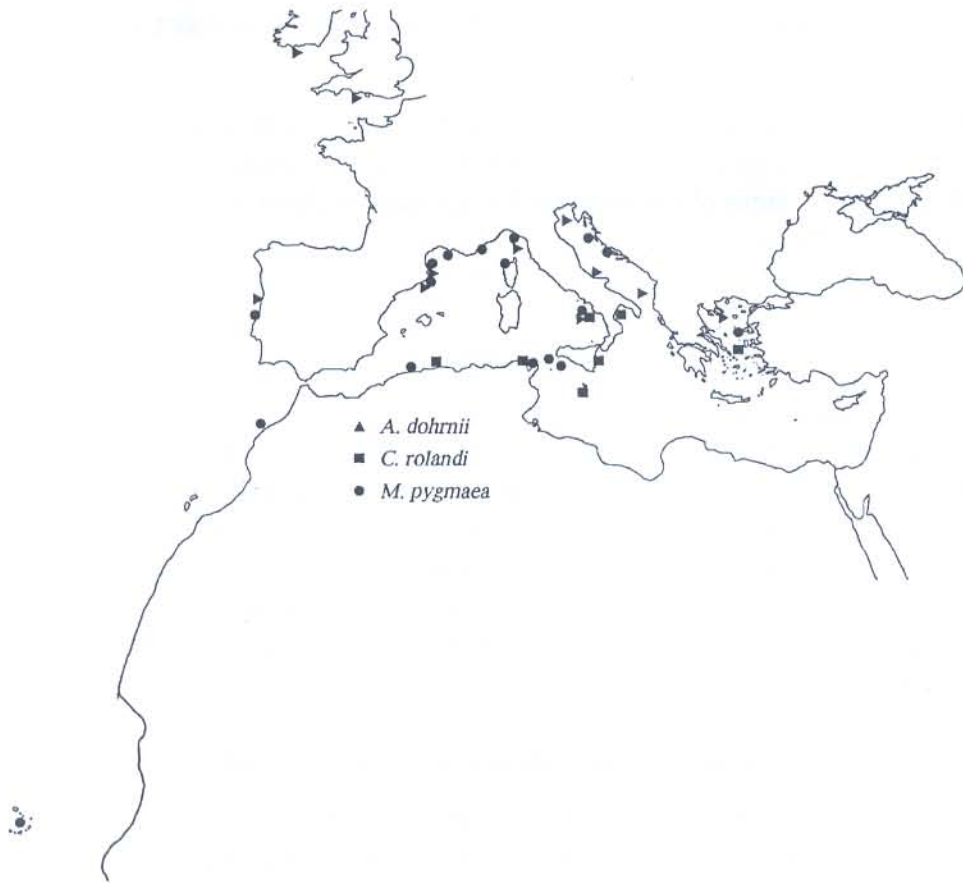


Fig. 2. Distribution of *A. dohrnii*, *C. rolandi*, and *M. pygmaea* in the Mediterranean and the European Atlantic coast.

SCLERACTINIA. Our material includes 429 individuals and 138 colonies belonging to 17 species (Table 2). Four species are of special interest:

Madrepora oculata Linnaeus, 1758

Madrepora oculata, Zibrowius, 1980, p. 36, pl. 13 A–P.

Two broken live colonies from station 168b, depth 300–350 m, on a stone, together with *Lophelia pertusa*.

Distribution: First record from the Aegean Sea. Previously reported in the Eastern Mediterranean only from Kastelorizo Island (Zibrowius, 1979). Known from various localities of the Western Mediterranean (Zibrowius, 1980; Gili, 1987) and the Adriatic (Pax and Müller, 1962). Also widely distributed in the Atlantic and Indo-Pacific Oceans (Zibrowius, 1980, 1985).

Lophelia pertusa (Linnaeus, 1758)

Lophelia pertusa, Zibrowius, 1980, p. 126, pl. 66 A–Z.

Many live and dead fragments of colonies from station 168b, depth 300–350 m, together with *Madrepora oculata*.

Distribution: First record from the Aegean Sea. Previously reported in the Eastern Mediterranean only from Kastelorizo Island, to the east of Rhodes (Zibrowius, 1979). Known from various areas of the Western Mediterranean (Best, 1970; Zibrowius, 1980) and the Adriatic (Pax and Müller, 1962). Also widely distributed in the Atlantic and Indian Oceans (Zibrowius, 1980; Manuel, 1981; Zibrowius and Gili, 1990).

Monomyces pygmaea (Risso, 1826)

Monomyces pygmaea, Zibrowius, 1980, p. 154, pl. 80 A–L.

Seven individuals from station 200b, depths 20–40 m, on rocky bottom.

Distribution (Fig. 2): First record from the Eastern Mediterranean. Known from many localities in the Western Mediterranean (Duncan, 1873; Jourdan 1880; Döderlein, 1913; Rossi, 1957, 1961; Laubier, 1966; Zibrowius, 1980; Gili, 1981, 1987) and the Adriatic Sea (Pax and Müller, 1962; Zibrowius and Grieshaber, 1977). Also known from Portugal, Morocco, and the Cape Verde Islands (Zibrowius and Saldanha, 1976; Zibrowius, 1983).

Cladopsammia rolandi Lacaze-Duthiers, 1897

Cladopsammia rolandi, Zibrowius, 1980, p. 180, pl. 91 A–Z.

One colony from station 207a, depth 35–45 m, sciaphilic algae community (“precoralligenous”).

Distribution (Fig. 2): First record from the Eastern Mediterranean. Previously known from a few areas of the Southwestern and Central Mediterranean not east of the Gulf of Taranto (Döderlein, 1913; Joubin, 1927; Rossi, 1958, 1961; Zibrowius, 1980).

BIOGEOGRAPHIC ANALYSIS OF THE MEDITERRANEAN AND BLACK SEA FAUNA OF ACTINIARIA, CORALLIMORPHARIA, AND SCLERACTINIA

According to the literature, the number of species known from the Mediterranean and the Black Sea is 53 for Actiniaria (Andres, 1884; Pax and Müller, 1962; Schmidt, 1972; Gili, 1987; Ates, 1992; etc.), 2 for Corallimorpharia (Gili, 1987; den Hartog et al., 1993; etc.), and 33 for Scleractinia (Zibrowius, 1980; Gili, 1987; etc.). Fig. 3 shows these as percentages of the total Mediterranean and Black Sea species.

Western Mediterranean. In this area, the three orders are represented by their highest percentages. Actiniaria 86.8%, Scleractinia 100%, and Corallimorpharia 100%. This can be attributed not only to the relatively intensive sampling effort carried out in this area, but also to the Atlantic species extending their distribution only in the Western Mediterranean, and possibly to the existence of certain endemic species.

Central Mediterranean. Only 32.1% of the total actinarian fauna and 66.7% of the scleractinian fauna were found in this area. Corallimorpharia have not yet been recorded. Actiniaria were less intensively collected than Scleractinia. The existing information is included in papers by Parenzan (1972, 1981), Schmidt (1972), etc., for the

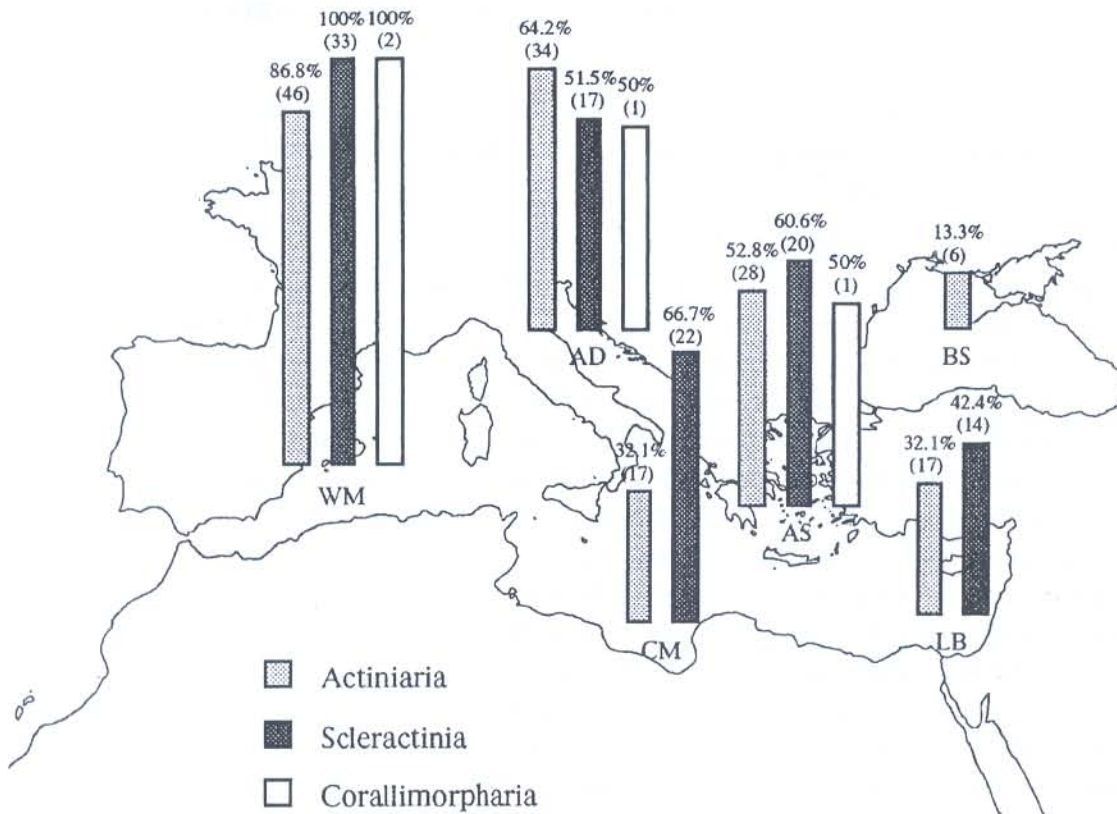


Fig. 3. Distribution of the known Actiniaria, Scleractinia, and Corallimorpharia in the five main areas of the Mediterranean and Black Sea, as numbers and percentages of the total Mediterranean and BS species. All other abbreviations as in Table 2.

former and Pérès and Picard (1956), Rossi (1961), Micallef and Evans (1968), Zibrowius (1980), etc., for the latter.

Adriatic Sea. Actiniaria comprise 64.2% of the known Mediterranean species (Pax and Müller, 1962; Gamulin-Brida, 1967, 1974; Fedra, 1978), while Scleractinia comprise 51.5% of the known species (Pax and Müller, 1962; Zibrowius and Grieshaber, 1977; Zibrowius, 1980). Den Hartog et al. (1993) reported the corallimorpharian *C. viridis* from this area without mentioning the exact locality.

Levantine Basin. The species percentages recorded from this area are 32.1% of the known Mediterranean species for Actiniaria and 42.4% for Scleractinia, lower than in any other Mediterranean area. Information on Actiniaria was given by Pax (1925), Bodenheimer (1935), Carlgren (1949), Pérès and Picard (1958), Schmidt (1972), and den Hartog (1995, in press); information on Scleractinia by Joubin (1930), Best (1966, 1968), Zibrowius (1979, 1980), and Galil and Zibrowius (1994).

The low number of species known from this area is a result of the restricted sampling effort as well as the impoverishment of its fauna (Por and Dimentman, 1989; Koukouras and Russo, 1991; etc.). Of the 17 actiniarian species, only two, *Anemonia melanaster*

and *Paraphellia sanzoi* were not found in either the Mediterranean or Black Sea areas (Calgren, 1949; den Hartog, in press). None of the hexacoral species studied here is a Lessepsian immigrant.

Aegean Sea (including Sea of Marmara). 27 species of Actiniaria are known from the Aegean Sea (Cosar, 1974; Doumenc et al., 1985; Doumenc et al., 1987; Chintiroglou, 1992; Chintiroglou and Stefanidou, 1994; Chintiroglou and den Hartog, 1995; den Hartog, 1995, in press), 1 species of Corallimorpharia (den Hartog et al., 1993) and 16 species of Scleractinia (Pérès and Picard, 1958; Geldiay and Kocatas, 1972; Zibrowius, 1979, 1980, etc.). During the present study, 1 species of Actiniaria, and 4 of Scleractinia were added to the known species of the Aegean Sea, raising the number of Actiniaria from the Aegean to 28 (52.8% of the known Mediterranean species of Actiniaria), and that of Scleractinia to 20 (60.6%). An updated list of all the species of the three orders known from the Aegean, the Levantine Basin, and the Black Sea is given in Table 2, which also lists the species in the other Mediterranean areas. The actinarians *Paranemonia vouliagmeniensis* and *Telmatactis solidago* are not yet known from other Mediterranean areas (Doumenc et al., 1987; den Hartog, 1995). Perhaps *P. vouliagmeniensis* occurs only in its very special type locality. *Scolanthus callimorphus* found in the area along the island of Rhodos, South Aegean (den Hartog, in press), is known elsewhere only from the western Mediterranean (Calgren, 1931). Among Scleractinia, *Balanophyllia regia* found on the southwest coast of Crete (Zibrowius, 1979), is also known only from the western Mediterranean (Zibrowius, 1980).

The lack of intensive study of the Aegean is a possible reason why its hexacorallian fauna seems to be poor in species number in comparison with other Mediterranean areas. In the future, it may prove to be relatively rich, as is supported by the results of studies on other benthic animal taxa (e.g., Koukouras et al., 1992; Voultziadou-Koukoura and Koukouras, 1993; Vafidis et al., 1994; Stefanidou and Voultziadou-Koukoura, 1995).

Eastern Mediterranean. Although there are significant differences between the Aegean Sea and the Levantine Basin (Pérès and Picard, 1964; Por and Dimentman, 1989; etc.), we examined these two areas together, as opposed to other Mediterranean areas. We observed: 34 Actiniaria species from the Eastern Mediterranean, making up 64.2% of the known Actiniaria species, 1 Corallimorpharia (50%) and 20 Scleractinia (60.6%). From the species found in the North Aegean, three (the actinarian *A. dohrnii* and the scleractinians *C. rolandi* and *M. pygmaea*) are reported as new elements of the Eastern Mediterranean fauna (Table 2). The low species number found in the Eastern Mediterranean can also be attributed mainly to incomplete study of the area. The difference between the fauna of the Aegean and the Levantine Basin is obvious, (a) because of the different numbers of species found in each area and (b) because in the Levantine Basin, although poorer in species number, 6 actinarian species (*Alicia mirabilis*, *Anemonia melanaster*, *Anthopleura ballii*, *Bunodactis rubripunctata*, *Diadumene luciae*, and *Paraphellia sanzoi*) exist which have not been found in the Aegean. The number of species the two areas have in common, is 25 (45.5%).

Black Sea. Only 5 Mediterranean actinarian species have been reported from the Black Sea; among them *Diadumene luciae* (as *Haliplanella lineata*) (Bacescu et al., 1971; Andriescou, 1977; Motas, 1977). *Synhalcampella oustromovi* is known only from the Black Sea and is possibly an endemic. So, only 6 Actiniaria (11.3% of the known species) are known from this area.

No Corallimorpharia or Scleractinia are known from the Black Sea. It should be remembered (Vafidis et al., 1994) that only one species of octocoral, the pennatulacean *Virgularia mirabilis* (Linnaeus, 1758), has been reported from the Black Sea near the Bosphorus. This confirms that Scleractinia and Octocorallia are more sensitive than certain Actiniaria to the peculiar oceanographic conditions prevailing there, especially the low salinity and secondarily low temperature (e.g., Caspers, 1957).

Zoogeographical characterization. Fifty-six species of Hexacorallia belonging to the three orders are currently known from the Eastern Mediterranean and the Black Sea. From these, only the actinarian *Aiptasia diaphana* has also been reported from the Red Sea (Gulf of Aqaba) according to Schmidt (1972) and because of this record it could be characterized as Indo-Mediterranean (IM). As can be seen from Table 2, of the remaining 55 species, 7 (12.5%) are endemic, 6 (10.7%) are cosmopolitan, and 42 (75.0%) are Atlanto-Mediterranean. *Synhalcampella oustromovi* is the only endemic species in the Black Sea.

The three orders are represented in the Aegean by 49 species (Tables 2 and 3): 1 Indo-Mediterranean, 5 endemic, 6 cosmopolitan, and 37 Atlanto-Mediterranean. The percentages of the above categories in Actiniaria (28 species) and Scleractinia (20 species) in the Aegean is given in Fig. 4. In both orders, the Atlanto-Mediterranean species are the most dominant. However, the second group in Actiniaria are the endemic species, while in Scleractinia, it is the cosmopolitan species.

Table 3 shows the composition of the known faunas of Actiniaria, Corallimorpharia, and Scleractinia for each Mediterranean area and the Black Sea as well as for the entire

Table 3

Composition of the fauna of the three orders, in the Mediterranean and the Black Sea, and separately in each geographical area (abbreviations as in Table 2) regarding the zoogeographical characterization of the species. A, Actiniaria; C, Corallimorpharia; S, Scleractinia

Mediterranean areas	WM			CM			AD			AS			LB			BS			M					
	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C			
Hexacoral orders																								
Atlanto-Mediterranean	32	26	2	13	16	-	27	14	1	22	14	1	13	10	-	4	-	-	36	26	2			
Indo-Mediterranean	1	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	-	-			
Cosmopolitan	2	6	-	1	5	-	1	3	-	1	5	-	1	4	-	1	-	-	2	6	-			
Endemic	11	1	-	2	1	-	6	-	-	4	1	-	2	-	-	1	-	-	14	1	-			
TOTAL	81			39			52			49			31			6			88					

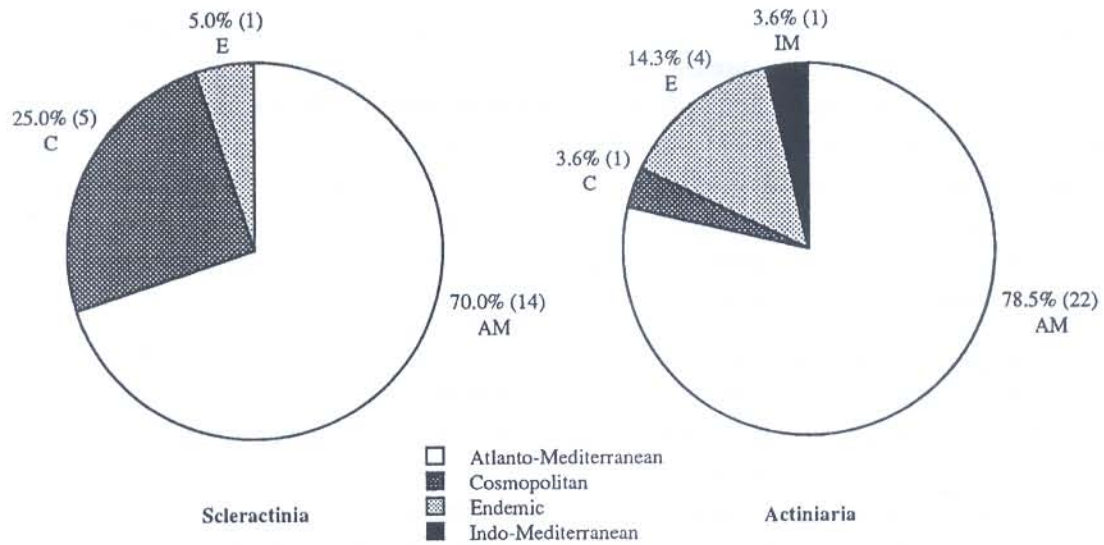


Fig. 4. Zoogeographical characterization of Actiniaria and Scleractinia in the Aegean Sea (numbers and percentages). Abbreviations as in Table 2.

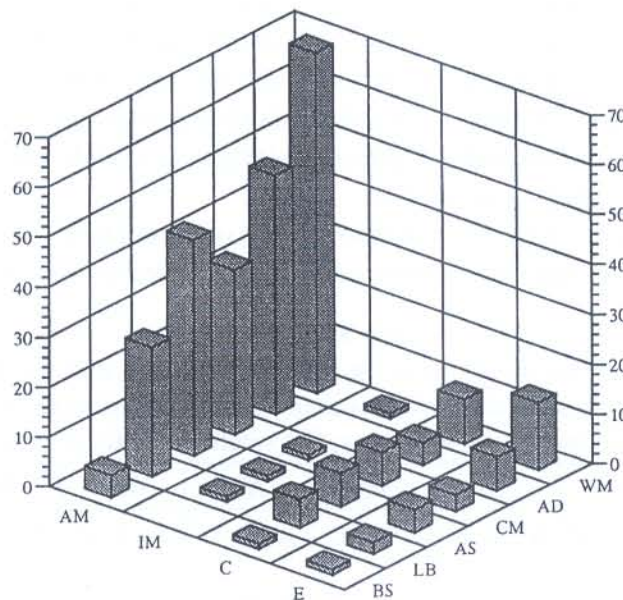


Fig. 5. Distribution of the three orders of Hexacorallia in the main geographic areas of the Mediterranean and the Black Sea, and zoogeographical characterization of the species, as percentages of the known species number (88 species). Abbreviations as in Table 2.

Mediterranean, as far as the zoogeographical characterization of the species is concerned. On the basis of the data in Table 3, Fig. 5 was constructed, giving the species numbers of biogeographical categories as percentages of the total number of the Mediterranean and Black Sea species. The high dominance of the Atlanto-Mediterranean species in all these areas is obvious, while the dominances of cosmopolitan and endemic species differ among the various areas of the Mediterranean. In the Adriatic and the

Western Mediterranean endemics appear to dominate, while in the Aegean, the Central Mediterranean, and the Levantine, the cosmopolitan species are dominant. The percentages of the Atlanto-Mediterranean species, and to a lesser degree those of endemic and cosmopolitan species, decrease from the west and north to the east and south of the Mediterranean. However, this pattern should be considered with caution as long as the Mediterranean areas and especially the Central Mediterranean, are not equally studied.

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NOTE ADDED IN PROOF

In a personal communication with Dr. den Hartog we were informed about the presence of *Paranemonia cinerea* in Lesbos Island, which is a new record for the Aegean Sea.