Diversity of Porifera in the Mediterranean coralligenous accretions, with description of a new species

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Abstract
Temperate reefs, built by multilayers of encrusting algae accumulated during hundreds to thousands of years, represent one of the most important habitats of the Mediterranean Sea. These bioconstructions are known as “coralligenous” and their spatial complexity allows the formation of heterogeneous microhabitats offering opportunities for a large number of small cryptic species hardly ever considered.

Although sponges are the dominant animal taxon in the coralligenous rims with both insinuating and perforating species, this group is until now poorly known. Aim of this work is to develop a reference baseline about the taxonomic knowledge of sponges and, considering their high level of phenotypic plasticity, evaluate the importance of coralligenous accretions as a pocket for biodiversity conservation.

Collecting samples in four sites along the coast of the Ligurian Sea, we recorded 133 sponge taxa (115 of them identified at species level and 18 at genus level). One species, Eurypon gracilis is new for science; three species, Paratimea oxeata, Clathria (Microciona) haplotoxa and Eurypon denisae are new records for
the Italian sponge fauna, eleven species are new findings for the Ligurian Sea. Moreover, seventeen species have not been recorded before from the coralligenous community. The obtained data, together with an extensive review of the existing literature, increase to 273 the number of sponge species associated with the coralligenous concretions and confirm that this habitat is an extraordinary reservoir of biodiversity still largely unexplored, not only taxonomically, but also as to peculiar adaptations and life histories.

**Keywords**
Porifera, cryptic species, bioconstructions, Ligurian Sea

**Introduction**

The term “coralligenous” refers to a secondary hard substrate, formed by the concretion of algal thalli and, to a lesser extent, by animal skeletons. Two main types of coralligenous concretions can be distinguished: banks, which are built over more or less horizontal substrata, and rims, which develop in the outer parts of marine caves and on vertical cliffs (Ballesteros 2006). Coralligenous communities represent the temperate reefs of the Mediterranean Sea and along with the meadows of *Posidonia oceanica* (Boudouresque, 2004) are biodiversity hot spots in the basin. The holes and crevices of the coralligenous build-ups support a complex community dominated by suspension feeders (sponges, hydrozoans, serpulid polychates, molluscs, bryozoans and tunicates).

Laubier (1966) first emphasized the high biodiversity of the coralligenous and listed 544 invertebrate species from this assemblage in Banyuls. Later, Hong (1980), in an exhaustive survey of the coralligenous of Marseille, listed a total of 682 species, whilst other authors (Ros et al. 1984) reported 497 species of invertebrates from the algal concretions of the Medes Islands. Recently, Romdhane (2003) reported 35 algal species and 93 animal species from a coralligenous formation along a vertical cliff in the gulf of Tunis. However, the number of species living in the coralligenous assemblages is still undefined, because of the richness of the fauna (Laubier 1966), the habitat complexity (Pérès and Picard 1964, Ros et al. 1985), the wide depth range of the conglomerates (Ballesteros 2006), the sporadic presence of cryptic species and the scarcity of reference studies. A rapid, non-destructive protocol for biodiversity assessment and monitoring of coralligenous, based on photographic sampling, was recently proposed by Kipson et al. (2011).

Sponges, with 142 recorded species, are one of the most diverse group of sessile animals of the coralligenous assemblage (Ballesteros 2006). Some species, mainly belonging to the family Clionaidae, are active bioeroders representing the principal driving force in the turn-over of bioconstructions, both in temperate and tropical areas (Cerrano et al. 2001, Calcinaï et al. 2000, 2005, 2007c)

In the present paper, the species diversity of the coralligenous sponge fauna was studied in four sites of the Ligurian Sea, focusing on the relatively poorly known cryptic species boring or insinuating into the calcareous concretions. A new species for science and ten poorly known species, rarely recorded in the Mediterranean Sea, are treated exhaustively.
Materials and methods

Samples were collected between 30 and 40 m depth by SCUBA diving from 6 stations along the Ligurian coast where coralligenous is more developed (Fig. 1). Stations (from West to East) are: Santo Stefano Shoals, station 1; Gallinara Island, station 2 (Falconara) and station 3 (Sciusciaù); Portofino Promontory, Punta del Faro, station 4 and 5 (northern and southern side of the point); Punta Manara, station 6. Four blocks of coralligenous concretion, with an average volume of 20 l, were collected from each station.

All the sponge species settled on the surface of these blocks were sampled and identified.

Two of the four blocks from each station were cut into slices about 2 cm thick and observed by a stereomicroscope to detect the cryptic, generally small, endolithic sponges.

The spicule complement of each sponge specimen was analysed according to Rützler (1978). From 30 measurements for each spicule type, size range, mean and standard deviation (in brackets) were calculated. Dissociated spicules were transferred onto stubs and sputtered with gold for SEM analyses and observed with a Philips XL 20 scanning electron microscope. Whenever possible, skeletal architecture was examined in light and scanning electron microscope (SEM) on hand-cut sections of the ectosome and choanosome. Unfortunately, due to small size and cavity dwelling habit, for most specimens it was impossible to study the skeleton.

We followed the classification given by Hooper and van Soest (2002) and the updated nomenclature reported in the World Porifera Database (van Soest et al. 2013). The geographic distribution of sponges in the Mediterranean Sea was compared with that reported by Pansini and Longo (2003, 2008), considering nine biogeographic areas for the Italian seas.

Figure 1. The four studied localities along the Ligurian Coast: Santo Stefano Shoal (station 1), Gallinara Island (station 2–3), Punta del Faro (Portofino Promontory) (station 4–5) and Punta Manara (station 6).


Results

During this survey we have recorded 133 sponge taxa (115 of them identified at species level and 18 at genus level). One species is new for science, 17 are new findings for the coralligenous conglomerate, 11 of which for the Ligurian Sea and 3 for the Italian sponge fauna (Table 1). In the following taxonomic part we provide the description of the new species and of ten poorly known ones.

On the surfaces of the blocks 103 massive or encrusting species were recorded; inside the crevices of the conglomerate 63 species were observed and 33 shared both positions. Thirty species are exclusively endolithic demonstrating the abundance of cryptic sponges thriving inside the porous matrix of the coralligenous substrate (Table 1) (Fig. 2).

Table 1. List of Demospongiae and Homoscleromorpha species living outside and inside the coralligenous blocks (SSS: Santo Stefano Shoals, station 1; GI: Gallinara Island, station 2-3; PF: Punta del Faro, station 4-5; PM: Punta Manara, station 6; * new finding for the coralligenous concretion; ** new finding for the Ligurian Sea; *** new finding for the Italian sponge fauna).

| Species                     | Sites | SSS | GI | PF | PM | Epilithic | Endolithic |
|-----------------------------|------|-----|----|----|----|-----------|------------|
| Ocearella lobularis (Schmidt, 1862) |      |     |    |    |    |           |            |
| Plakina trilopha Schulze, 1880     | +    | +   |    |    |    |           |            |
| Plakinastrella copiosa Schulze, 1880 | +    |     |    |    |    |           |            |
| Plakortis simplex Schulze, 1880     | +    |     |    |    |    |           |            |
| Samus anonymus Gray, 1867          | +    | +   |    |    |    |           |            |
| Stelletta grubii Schmidt, 1862      | +    |     |    |    |    |           |            |
| Stelletta lactea Carter, 1871 *     | +    |     |    |    |    |           |            |
| Stelletta stellata Topsent, 1893 * |      |     |    |    |    |           |            |
| Jaspis incrustans Topsent, 1890 ** | +    | +   |    |    |    |           |            |
| Jaspis johnstoni (Schmidt, 1862)    | +    | +   |    |    |    |           |            |
| Penares euastrum (Schmidt, 1868)    | +    | +   |    |    |    |           |            |
| Dercitus (Stoeba) plicatus (Schmidt, 1868) | +    | +   |    |    |    |           |            |
| Pachastrella sp.                    | +    |     |    |    |    |           |            |
| Erylus discophorus (Schmidt, 1862)  | +    | +   |    |    |    |           |            |
| Geodia conchilega Schmidt, 1862      | +    | +   |    |    |    |           |            |
| Geodia cylindrium Schmidt, 1862      | +    | +   |    |    |    |           |            |
| Pachastrella monilifera Schmidt, 1868 | +    | +   |    |    |    |           |            |
| Poecillastra compressa (Bowerbank, 1866) | +    | +   |    |    |    |           |            |
| Triptolemma simplex (Sarà, 1959)    | +    | +   |    |    |    |           |            |
| Cliona bartoni Topsent, 1932 * **   | +    |     |    |    |    |           |            |
| Cliona celata Grant, 1826           | +    | +   |    |    |    |           |            |
| Cliona janitrix Topsent, 1932        | +    | +   |    |    |    |           |            |
| Cliona schmitidii (Ridley, 1881)     | +    |     |    |    |    |           |            |
| Cliona viridis Schmidt, 1862         | +    | +   |    |    |    |           |            |
| Cliona sp.                           | +    |     |    |    |    |           |            |
| Dotona pulchella mediterranea Rossell & Uriz, 2002 | +    |     |    |    |    |           |            |
| Spiroxya corallophila (Calcina et al., 2002) | +    |     |    |    |    |           |            |
| Spiroxya heteroclitia Topsent, 1896  | +    | +   |    |    |    |           |            |
| Species                        | Melone, 1965 | Bavestrello, Calcinai & Sarà, 1996 | Pulitzer-Finali, 1978 | Polymastia sp. | Aaptos aaptos (Schmidt, 1864) | Prosuberites longispinus Topsent, 1893 | Pseudosuberites sulphureus (Bowerbank, 1866) | Suberites carnosus (Johnston, 1842) | Suberites domuncula (Olivi, 1792) | Suberites sp. | Terpios gelatinosa (Bowerbank, 1866) | Timea stellata (Bowerbank, 1866) | Timea unistellata (Topsent, 1892) | Chondrosia reniformis Nardo, 1847 | Acarnus souriei Levi, 1952 | Acarnus sp. | Clathria (Microciona) armata (Bowerbank, 1866) | Clathria (Microciona) atrasanguinea (Bowerbank, 1862) | Clathria (Microciona) gradalis Topsent, 1925 | Clathria (Microciona) haploota (Topsent, 1928) | Clathria (Microciona) toxistyla (Sarà, 1959) | Clathria (Microciona) toxivaria (Sarà, 1959) | Clathria (Microciona) sp. | Antho (Antho) involvens (Schmidt, 1864) | Eurypon cf. cinctum Sarà, 1960 | Eurypon clavatum (Bowerbank, 1866) | Eurypon coronula (Bowerbank, 1874) | Eurypon denisae Vacelet, 1969 | Eurypon gracilis sp. n. Bertolino, Calcinai & Pansini | Eurypon major Sarà & Siribelli, 1960 | Eurypon topsenti Pulitzer-Finali, 1983 | Eurypon vesiculare Sarà & Siribelli, 1960 | Eurypon sp. | Raspaciona aculeata (Johnston, 1842) | Raspaciona sp. | Forcepia (Leptolabis) brunnea (Topsent, 1904) | Lisodendoryx (Lisodendoryx) isodictyalis (Carter, 1882) | Lisodendoryx (Anomodoryx) cavernosa (Topsent, 1892) | Crambe crambe (Schmidt, 1862) | Crella (Crella) elegans (Schmidt, 1862) | Crella (Crella) mollior Topsent, 1925 | Crella (Grayella) pulvinar (Schmidt, 1868) | Hemimycale columella (Bowerbank, 1864) | Hymedesmia (Hymedesmia) baculifera Topsent, 1901 | Hymedesmia (Hymedesmia) rissoi Topsent, 1936 | Hymedesmia sp. |
| Species                                      | Presence |
|---------------------------------------------|----------|
| Hymedesmia (Stylopus) coriacea              | + + + +  |
| Phorbas fictitius                          | + + + +  |
| Phorbas mercator (Schmidt, 1868) *          | +        |
| Phorbas lieberkuhnii (Burton, 1930)         | +        |
| Phorbas tenacior (Topsent, 1925)            | + + + +  |
| Phorbas sp.                                 | + + +    |
| Plocamionida ambigua (Bowerbank, 1866) *    | + + + +  |
| Tedania (Tedania) anhelans (Lieberkühn, 1859) | + +    |
| Mycale (Aegopropila) tunicata (Schmidt, 1862) * | +    |
| Mycale (Paresperella) serrulata Sarà & Siribelli, 1960 ** *** | + + |
| Merlia normani Kirkpatrick, 1908 *          | + +      |
| Axinella damicornis (Esper, 1794)           | + + + +  |
| Axinella polyoides Schmidt, 1862            | +        |
| Axinella verrucosa (Esper, 1794)            | + +      |
| Phakellia sp.                               | + +      |
| Bubaris carcisis Vacelet, 1969               | + + + +  |
| Bubaris vermiculata (Bowerbank, 1866)       | +        |
| Hymerhabdia oxytrunca Topsent, 1904         | +        |
| Hymerhabdia typica Topsent, 1892 *          | +        |
| Hymerhabdia sp.                             | +        |
| Halicnemia geniculata Sarà, 1958 * **       | +        |
| Halicnemia patera Bowerbank, 1864           | +        |
| Acanthella acuta Schmidt, 1862              | + + + +  |
| Dictyonella incisa (Schmidt, 1880)          | + + + +  |
| Dictyonella marsilii (Topsent, 1893)        | +        |
| Dictyonella pelligera (Schmidt, 1862)       | + + + +  |
| Dictyonella sp.                             | +        |
| Halichondria (Halichondria) contorta Sarà, 1961 | + +  |
| Halichondria (Halichondria) cf. convolvens Sarà, 1960 | +  |
| Halichondria (Halichondria) genitrix Schmidt, 1862 | + +  |
| Halichondria (Halichondria) panicea Pallas, 1766 | + +  |
| Halichondria sp.                            | +        |
| Agelas oroides Schmidt, 1864                | + + + +  |
| Dendroxea leni (Topsent, 1892)              | + + + +  |
| Haliclonia (Gellius) angulata (Bowerbank, 1866) | + + +  |
| Haliclonia (Gellius) marismedi (Pulitzer-Finali, 1978) * ** | + + + +  |
| Haliclonia (Halichoclona) fulva (Topsent, 1893) | + + + +  |
| Haliclonia (Halichoclona) paretalis (Topsent, 1893) | + + +  |
| Haliclonia (Haliclonia) sp.                 | + + +    |
| Haliclonia (Reniera) cinerea Grant, 1826    | +        |
| Haliclonia (Reniera) citrina (Topsent, 1892) | + +  |
| Haliclonia (Reniera) sp.                    | + +      |
| Haliclonia (Soestella) arenata Griessinger, 1971 | + +  |
| Haliclonia (Soestella) mucosa (Griessinger, 1971) | + +  |
| Haliclonia sp.                              | + +      |
| Siphonodictyon insidiosum (Johnson, 1899)    | + + + +  |
| Petrosia (Petrosia) clavata (Esper, 1794)   | + + +    |
| Petrosia (Petrosia) ficiformis (Poiré, 1798) | + + + +  |
Ircinia variabilis (Schmidt, 1862) + + + + + + 
Sarcotragus spinosulus Schmidt, 1862 + + + + + + 
Cacospongia mollior Schmidt, 1862 + + + + + + 
Spongia (Spongia) officinalis Linnaeus, 1759 + + + + + + 
Spongia (Spongia) virgulosa (Schmidt, 1868) + + + + + + 
Dysidea avara (Schmidt, 1862) + + + + + + 
Dysidea sp. + + + + + + 
Pleraplysilla spinifera (Schulze, 1879) + + + + + + 
Aplysina cavernicola Vacelet, 1959 + + + + + + 

Total number of species 61 70 71 61 103 63

**Figure 2.** Porosity of the coralligenous concretion. A Holes and cavities of the coralligenous concretion. B Magnification of the holes. C Magnification of a natural hole occupied by spicules of *Pachastrella monilifera*. D Spicules of *Jaspis johnstoni* in a natural cavity in the coralligenous concretion. E Cavity excavated by a boring sponge with excavation marks (pits) on the wall. F Border between the area excavated by a boring sponge (right) and the not excavated area (left).
Among the 63 species recorded inside the conglomerate, 53 were insinuating and 10 boring (Table 1). From the first group six species: *Geodia cydonium* (Jameson, 1811) (Fig. 3 A), *Poecillastra compressa* (Bowerbank, 1866) (Fig. 3 D), *Stelletta grubii* Schmidt, 1862, *Paratimea oxeata* Pulitzer-Finali, 1978 (Fig. 3 E), *Hymedesmia (Hymedesma) baculifera* (Topsent, 1901) and *Mycale (Paresperella) serrulata* (Sara & Siribelli, 1960) were hitherto recorded encrusting or massive; four species: *Erylus discophorus* (Schmidt, 1862), *Penares euasrum* (Schmidt, 1868), *Geodia conchilega* Schmidt, 1862 (Fig. 3 B) and *Pachastrella monilifera* Schmidt, 1868 (Fig. 3 C) were generally recorded as massive but also described as insinuating by Pulitzer-Finali (1970, 1983) and Calcinai et al. (2007b).
Species descriptions

Class Demospongiae
Order Hadromerida
Family Clionaidae
Genus *Cliona*

*Cliona burtoni* Topsent, 1932
http://species-id.net/wiki/Cliona_burtoni
Figs 4A–L

*Cliona burtoni* Topsent, 1932: 577.

**Material examined.** Specimen IG-S-BL1-F5B-spB; dry state, Gallinara Island (station 3, Sciusciaù) 44°01’34”N, 8°13’45”E, depth 30 m, collected 17-06-2009. The specimen was entirely used for spicule preparations.

**Description.** Boring sponge in alpha growth form, occupying a surface of 1 cm² in a section of conglomerate. Colour beige in dry state.

Skeleton. Not observed.

Spicules. Macroscleres: tylostyles to subtylostyles straight or slightly curved, 132 (225) 287 × 5 (6) 7.5 μm. Heads with a rounded or oval tyle, sometimes in terminal position but more often shifted along the shaft (Figs 4 A, B, C). Microscleres: spirasters of various shape and thickness, straight or curved, 10 (26.5) 45 × 1.25 (10) 17.5 μm. The most abundant have scattered conical spines (Figs 4 D, E, F, G, H, I, J, K) and numerous are amphiaster-like (Figs 4 H, I, K). The smaller ones are microspinated (Fig. 4 J, L).

**Distribution and discussion.** This is a Mediterranean endemic species (Pansini and Longo 2008) originally described from Corsica (Strait of Bonifacio), where it is known to bore into calcareous rocks and mollusc shells (Topsent 1932). This is a new record for the Ligurian Sea (Gallinara Island) and the coralligenous assemblage and the first finding after the original description.

Family Hemiasterellidae
Genus *Paratimea*

*Paratimea oxeata* Pulitzer-Finali, 1978
http://species-id.net/wiki/Paratimea_oxeata
Figs 5A–D

*Paratimea oxeata* Pulitzer-Finali, 1978: 39.

**Material examined.** Specimen SSS-BL1-F3A-spH; alcohol and dry state; Santo Stefano Shoals (station 1), 43°49’N, 7°54’E, depth 35 m, collected 14-02-2008. The specimen was entirely used for spicule preparations.
Description. Very small (0.5 cm²) insinuating sponge (Fig. 5 A) detected inside a cavity of a slice of a coralligenous block. Grey coloured in dry state.

Skeleton. Not observed.

Spicules. Macroscleres: oxeas in two size categories: I) large oxeas curved, bent or flexuous, with hastate tips (Fig. 5 B), 810 (961.25) 1200 × 15 (18) 25 μm; II) small
oxeas curved or flexuous (Fig. 5 C), 300 (546.6) 700 × 2.5 (4.75) 5 μm. Microscleres: oxyasters with more or less marked centrum with 9-12 conical rays, 25 (41.5) 60 μm in diameter. In some cases the number of rays is reduced (Fig. 5 D).

Figure 5. Paratimea oxeata. A Specimen in the coralligenous accretions (arrows) B Large oxeas C Small oxeas D Oxyasters.
**Distribution and discussion.** The species was described from Naples (Pulitzer-Finali 1978) where it occurred on rocky bottoms at 60-100 meter depth. This is a new record for the coralligenous assemblage and for the Ligurian Sea and it is probably endemic for the Mediterranean Sea (Pansini and Longo 2008). This is its first finding after the original description.

Order Poecilosclerida  
Suborder Microcionina  
Family Microcionidae  
Genus *Clathria*  
Subgenus *Microciona*  

*Clathria* (*Microciona*) *armata* (Bowerbank, 1862)  
http://species-id.net/wiki/Clathria_armata  
Figs 6A–F

*Microciona armata* Bowerbank, 1862; 1866: 129.

**Material examined.** Specimen IG-F-BL4-sp2-fot.; alcohol preserved, Gallinara Island (station 2, Falconara) 44°01’22"N, 8°13’34"E, depth 35 m, collected 31-7-2009.

**Description.** Thickly encrusting sponge (3-5 mm thick) covering a surface of 1.5 cm² on a coralligenous block (Fig. 6 A). Surface irregular, smooth. Consistency soft. The red-orange colour of the living specimen slightly fades when alcohol preserved.

Skeleton. Not observed.

Spicules. Macroscleres: acanthostyles in two size categories: I) large acanthostyles slightly curved, with obtuse spines concentrated on the head (Fig. 6 B), 220 (484.5) 830 × 3.75 (8.5) 12 μm; II) small acanthostyles, with scattered spines, but more concentrated on the head (Fig. 6 C), 100 (110) 122.5 × 3.75 (5) 6 μm; subtylostyles straight, often with slightly spined head (Fig. 6 D), 440 (503.7) 550 × 2.5 (2.9) 3.8 μm. Microscleres: palmate isochelae (Fig. 6 E), 10 (12.5) 13.5 μm long. Toxas of variable size, with more or less wide central curvature and slightly reflexed smooth points (Fig. 6 F), 80 (114.5) 210 μm long.

**Distribution and discussion.** This species has been recorded on rocky walls and on mollusc shells from 10 to 180 m depth (Bowerbank 1866, Arndt 1934, Pulitzer-Finali 1983, van Soest and Stone 1986). It is widely distributed in the Mediterranean Sea (Northern Adriatic Sea, Alboran Sea and Ionian Sea (Pansini and Longo 2003, 2008) and along the Atlantic coast of Europe: Arctic, Sweden, Ireland, United Kingdom, France (van Soest et al. 2013).

This specimen, like that described by van Soest and Stone (1986), differs from the type material in the toxa dimensions. Actually Bowerbank measured small toxas 50 μm long and large toxas 130 μm long dividing them in two size categories. Van Soest and Stone (1986) confirm the large variability of spicule size. The species is a new finding for the coralligenous community and the Ligurian Sea.
Figure 6. *Clathria* (*Microciona*) armata. A Specimen on the surface of the coralligenous block B Large acanthostyle heads C Small acanthostyle D Subtylostyle with spined head E Palmate isochelae F Toxas of variable size, with smooth extremities.
**Clathria (Microciona) haplotoxa** (Topsent, 1928)
http://species-id.net/wiki/Clathria_haplotoxa
Figs 7A–F

*Leptoclathria haplotoxa* Topsent, 1928: 298.

**Material examined.** Specimen IG-F-BL3-sp5-fot.; alcohol preserved, Gallinara Island (station 2, Falconara) 44°01'22"N, 8°13'34"E, depth 35 m, collected 17-06-2009. The specimen was entirely used for spicule preparations.

**Description.** Encrusting sponge on the surface of a coralligenous block, 2 cm in diameter. Surface hispid. Colour brick red (Fig. 7 A).

**Skeleton.** Not observed.

**Spicules.**
- Macroscleres: strongyles straight, smooth, 112.5 (178) 215 × 2.5 μm (Fig. 7 B); acanthostyles straight with a characteristic constriction under the head, in two size categories: I) large acanthostyles (Fig. 7 C), 150 (175.5) 210 μm and II) small acanthostyles (Fig. 7 D), 55 (74.5) 102.5 × 2.5 (3.5) 5 μm. Microscleres: palmate isochelae with straight shaft (Fig. 7 E), 12.5 (13.8) 15 μm long; toxas thin, smooth, with wide central curvature and slightly reflexed points, 30 (32.5) 37.5 μm long (Fig. 7 F).

**Distribution and discussion.** Described from Porto Santo Bay (Madeira) the species extends south to the Sahelian Upwelling (Lévi 1956). In the Mediterranean Sea it was only recorded from Tunisia (Ben Mustapha et al. 2003). It is a new finding for the Italian sponge fauna and for the coralligenous community.

**Family Raspailiidae**
**Subfamily Raspailiinae**
**Genus Eurypon**

**Eurypon denisae** Vacelet, 1969
http://species-id.net/wiki/Eurypon_denisae
Figs 8A–E

**Eurypon denisae** Vacelet, 1969: 188.

**Material examined.** Specimen IG-S-BL3 sp10-fot.; alcohol preserved, Gallinara Island (station 3, Sciusciaù) 44°01'34"N, 8°13'45"E, depth 30 m, collected 31-07-2009.

**Description.** Encrusting sponge covering a surface of 3 cm² on a coralligenous block. Surface hispid. Colour in life white.

**Skeleton.** Ectosomal skeleton absent. Choanosomal skeleton consisting of basal acanthostyles with heads embedded in a spongin layer and bundles of very long tylostyles protruding through the sponge surface which appears hispid.

**Spicules.**
- Long tylostyles, slightly curved or straight, with rather irregular heads, 1066 (1774) 2236 × 5 (8.5) 12.5 μm (Fig. 8 A); anisoxeas straight or faintly curved,
Figure 7. Clathria (Microciona) haplotoxa. A Specimen on the surface of a coralligenous block B Strongyle C Large acanthostyle D Small acanthostyle E Isochela F Toxa.
Figure 8. *Eurypon denisae*. A Tylostyles with variable head B Large acanthostyles C Small acanthostyles D Anisoxeas E Magnifications of the extremities of an anisoxea.
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Diversity of Porifera in the Mediterranean coralligenous accretions, with description...

200 (220) 250 × 5 (5.5) 7 μm (Figs 8 D–E); acanthostyles in two size categories: I) large, straight acanthostyles, often with inconspicuous heads, uniformly but faintly spined, 107.7 (134.5) 170 × 7.5 (9) 12 μm (Fig. 8 B); II) small, straight acanthostyles with stouter and longer spines, 60 (68) 77.5 × 7.5 (8) 10 μm (Fig. 8 C).

**Distribution and discussion.** The species was originally described by Vacelet (1969) from a coral bottom in the bathyal zone (300–350 m depth) of the Gulf of Lions. This second finding is a new record for the Italian seas and the coralligenous community.

*Eurypon gracilis* Bertolino, Calcinaí & Pansini, sp. n.

http://zoobank.org/E2792BEE-BEC2-41E5-BB7E-E32969E50A1C

http://species-id.net/wiki/Eurypon_gracilis

Figs 9A–G

**Material examined.** Type specimen: Holotype MSNG 57017. Specimen PdF-S-BL4-sp18-sciaf., on a coralligenous concretion, depth 40 m, Stat. 4, 27-07-2009. leg. M. Bertolino, alcohol preserved.

**Type locality.** Italy, Ligurian Sea, Portofino Promontory (Punta del Faro) 44°17′54.20″N, 9°13′06.93″E.

**Other examined material.** Specimen IG-F-BL1-sp4-fot.; specimen IG-F-BL1-sp15-fot.; alcohol preserved, Gallinara Island (station 2, Falconara) 44°01′22″N 8°13′34″E, depth 35 m, collected 17-06-2009; specimen IG-S-BL3-sp6-fot.; alcohol preserved, Gallinara Island (station 3, Sciusciaù) 44°01′34″N, 8°13′45″E, depth 30 m, collected 17-06-2009; specimen PM-BL1-sp9-sciaf.; alcohol preserved, Punta Manara (station 6) 44°15′05.61″N, 9°24′09.33″E, depth 35 m, collected 13-06-2009.

**Description.** All the specimens were encrusting on the surface of coralligenous blocks, covering surfaces up to 2 cm². The sponge surface is corrugated, hispid. The colour in life is brick red (Fig. 9 A).

**Skeleton.** The skeleton consists of a basal layer of spongin in which the spicules are vertically positioned, perpendicular to the substrate. Both the categories of acanthostyles are close one another (Fig. 9 C) with the heads embedded in the basal spongin layer. Styles and oxeas—with the same vertical arrangement—are grouped in bundles which are faintly echinated, in their lower part, by the smaller acanthostyles (Fig. 9 B). Oxeas are positioned in the basal part of the bundles. The styles protrude trough the sponge surface making it hispid.

**Spicules.** Long styles to tylostyles, curved or flexuous (Fig. 9 D), 788 (1101) 1280 × 5 (6.8) 10 μm; oxeas thin, almost straight or with a slight curvature (Fig. 9 E), 365 (483) 650 × 2.5 μm; acanthostyles without head and uniformly spined, in two sizes categories: I) large acanthostyles, straight or slightly curved with rather small spines (Fig. 9 F), 200 (253) 320 × 5 (6) 7.7 μm; II) small acanthostyles straight, with spines more robust than in the previous category (Fig. 9 G), 90 (119.5) 160 × 2.5 (3.8) 5 μm.

**Etymology.** The species is named after the slenderness of all the spicule types.

**Distribution.** So far known only from the Ligurian Sea.
Figure 9. Eurypon gracilis sp. n. A Holotype B Skeleton C Portion of the skeleton with large and small echinating acanthostyles D Long style E Oxea F Large acanthostyle with scattered small spines G Small acanthostyle.
Ecology. It lives at 30–40 m depth on coralligenous concretion, characterized by the presence of a Paramuricea clavata facies.

Discussion. This species, characterized by a microcionid skeleton with a basal layer of spongin, extra-axial spicules and echinating achantostyles embedded in spongin fibres, clearly belongs to the genus Eurypon.

Only five, out of the numerous species of the genus Eurypon found in the temperate Western Atlantic have oxeas or tornotes as structural megascleres together with styles or tylostyles. All of them (E. cinctum Sarà, 1960, E. denisae Vacelet, 1969, E. obtusum Vacelet, 1969, E. major Sarà & Siribelli, 1960 and E. lacazei (Topsent, 1891) occur in the Mediterranean Sea. E. cinctum showing a lilac colour, achantostyles with discrete heads and different size in the other megascleres is not close to the new species. E. denisae is also different according to the description given above. E. obtusum is grey in colour and has smaller oxeas and acanthostyles than those of the present species, but the maximum length of its tylostyles is unknown. E. lacazei remarkably differs from the present species for the green colour and spicule shape and size. The closest species to the new one is E. major but its tylostyles are longer and stouter (1445–2210 × 10–17 μm) and differ in the shape of the heads, while the acanthostyles, in a single size category, have well formed heads. Only two other species from the temperate Atlantic: E. lictor (Topsent, 1904) and E. (Acantheurypon) micronale (Topsent, 1928) present oxeas. However, they are both deep species (recorded deeper than 1500 m from the Azores) and they differ also in the spicule characters from E. gracilis sp. n. There are two other species of Eurypon with oxeas reported in the literature: E. calypsoi Lévi, 1958 from the Red Sea which is blue in colour and E. fulvum Lévi, 1969 from South Africa which is yellow. Both have a single size category of acanthostyles and differ in the spicule morphology. E. gracilis therefore has to be considered as new for science.

Suborder Myxillina
Family Coelosphaeridae
Genus Forcepia
Subgenus Leptolabis

Forcepia (Leptolabis) brunnea (Topsent, 1904)
http://species-id.net/wiki/Forcepia_brunnea
Figs 10A–F

Leptolabis forcipula var. brunnea Topsent, 1904: 182.
Leptolabis brunnea Topsent, 1928: 278.

Material examined. Specimen PdF-NE-BL2A-sp15-sciaf.; alcohol preserved, Portofino Promontory (Punta del Faro, station 4) 44°17’55.61”N, 9°13’07.95”E, 40 m depth, collected on 27-08-2009; specimen IG-S-BL3-sp13-sciaf.; alcohol preserved, Gallinara
Figure 10. Forcepia (Leptolabis) brunnea. A Anisotylotes B Acanthostyles C Symmetric forceps D Asymmetric forceps E Large and small sigmas F Isochelae.
Island (station 3, Sciusciaù) 44°01'34"N, 8°13'45"E, depth 30 m, collected on 17-06-2009; specimen PdF-BL8-sp50-sciaf.; alcohol preserved, Portofino Promontory (Punta del Faro, station 4) 44°17'55.61"N, 9°13'07.95"E, 30 m depth, collected on 25-01-2013.

**Description.** Thin, small encrusting sponges (up to 0.5 cm²) on the surface of coralligenous blocks. Colour in life yellow-orange.

Skeleton. Basal acanthostyles erect on the substrate in a hymedesmioid arrangement. Other spicule types not detectable from the skeleton.

Spicules. Megascleres: anisotylotes straight or faintly curved, with slightly different extremities and a few malformations along the shaft (Fig. 10 A), 127.5 (157.7) 280.5 × 1.25 (2.3) 2.5 μm; acanthostyles straight, conical with discrete but not swollen heads. Spines evenly distributed, slightly stouter on the spicule head (Fig. 10 B), 61.2 (92.2) 142.8 × 5.2 (7.5) 10.4 μm. Microscleres: acanthose symmetric forceps with straight legs, ending in small, button-like swellings with toothed margin (Fig. 10 C). They measure 12.5 (15.8) 17.5 × 2.5 μm in length, the distance between the legs being 5.2 (7.2) 7.5 μm. Acanthose asymmetric forceps, very thin, have unequal legs (Fig. 10 D), the longer of which is straight or curved inward, 20.4 (22.3) 25 × 1.5 μm. Sigmas in two size categories: the larger ones, “C” shaped (Fig. 10 E) or more rarely “S” shaped, 40.8 (64.3) 80 × 2.5 μm are very abundant, the smaller, 17.5–25.5 μm are rare. Pal-mate isochelae (Fig. 10 F), 18 (20) 20.8 μm long.

**Distribution and discussion.** Topsent (1904) describes three species of *Leptolabis* from the Azores: *L. forcipula* var. *brunnea*, *L. arcuata* and *L. assimilis*. The same author in 1928 states that the former three species actually belong to a single species: *Leptolabis brunnea* which shows a high variability in the large forceps shape.

*L. brunnea* was afterwards recorded from the Far-Oer Islands, the Azores, Spain (NW coast, Strait of Gibraltar, Castellón, Girona), France (Marseille, Monaco), Italy (Gulf of Naples), between 4 and 1360 m depth. It lives in caves, detritic bottoms, coralligenous concretions and epibiotic on other organisms (Topsent 1904, 1928, Sarà 1960, Poulquier 1972, Carballo 1994, Cristobo 1996). This is the second finding for the Italian seas and a new finding for the Ligurian Sea.

**Family Hymedesmiidae**
**Genus Hymedesmia**
**Subgenus Hymedesmia**

*Hymedesmia (Hymedesmia) rissoi* Topsent, 1936

http://species-id.net/wiki/Hymedesmia_rissoi

Figs 11A–D

*Hymedesmia gracilisigma* var. *rissoi* Topsent, 1936: 35.

**Material examined.** Specimen IG-F-BL3-F18b-spA; Specimen IG-F-BL4-sp9-sciaf.; specimen IG-F-BL4 sp11-fot.; alcohol preserved, Gallinara Island (station 2, Falcon-
Figure 11. *Hymedesmia (Hymedesmia) rissoi*. A Tornote, sometimes modified into subtylotes and strongyles B Acanthostyles C Arcuate isochelae D Thin sigmas.
Diversity of Porifera in the Mediterranean coralligenous accretions, with description...

ara) 44°01’22”N, 8°13’34”E, depth 35 m, collected on 17-06-2009; specimen SSS-BL1-sp11-sciatf.; Santo Stefano Shoals, (station 1), 43°49’N, 7°54’E, depth 35 m, collected on 14-02-2008.

Description. Small (0.5 cm²), slimy, coriaceous encrusting sponge, grey in colour after alcohol preservation, recorded both on the surface and inside the coralligenous blocks.

Skeleton. Not observed.

Spicules. Megascleres: straight or slightly sinuous anisotornotes, sometimes modified in anisotylotes or strongyles (Fig. 11 A), 140 (175) 177.5 × 2.5 (2.7) 3.75 μm; acanthostyles in a single size category, 67.5 (84) 105 × 2.5 (3.5) 3.75 μm, devoid of conspicuous heads. The extremities may be pointed or blunt (Figs 11 B, C). Microscleres: arcuate isochelae (Fig. 11 D), 25 (25.6) 27.5 μm long; thin sigmas “C” (Fig. 11 E) and “S” shaped, 32.5 (35) 37.5 × 1.25 μm.

Distribution and discussion. In the original description Topsent (1936) distinguished in this species two size classes of acanthostyles similar in shape: the larger were 185–265 μm in length and the smaller 75–115 μm. Subtylotes straight or sometimes slightly sinuous, 225–275 × 3.5–4.5 μm, arcuate isochelae 23–25 μm long and sigmas 40–50 μm long and less than 1 μm thick. The specimens here described match with Topsent’s description apart from the presence of a single size class of acanthostyles. However, other authors (Sarà and Siribelli 1962), recorded a single class of acanthostyles as well. This is a Mediterranean endemic species (Ligurian Sea and Central Tyrrhenian Sea). It was found on Cladocora caespitosa, at 15–40 m depth (Topsent 1936) and on coralligenous bottom, at 40–70 m depth (Sarà and Siribelli 1962).

Suborder Mycalina
Family Mycalidae
Genus Mycale
Subgenus Paresperella

Mycale (Paresperella) serrulata Sarà & Siribelli, 1960
http://species-id.net/wiki/Mycale_serrulata
Figs 12A–D

Mycale (Paresperella) serrulata Sarà & Siribelli, 1960: 51.

Material examined. Specimen IG-F-BL3-F4B-spA; specimen IG-F-BL3-F17B-spA alcohol preserved, Gallinara Island (station 2, Falconara) 44°01’22”N, 8°13’34”E, depth 35 m, collected on 31-07-2009. The specimen was entirely used for spicule preparations.

Description. Small, encrusting and insinuating sponge, beige in the dry state, occupying a small cavity (1 cm³) in a coralligenous block.
Figure 12. *Mycale* (*Paresperella*) *serrulata*. **A–B** Mycalostyles **B** Large anisochelae **C** Small anisochelae **D** Magnifications of the serrated edge of a sigma.
Skeleton. Not observed.

Spicules. Megascleres: mycalostyles straight or flexuous, with acerate tip (Fig. 12 A), 310 (325) 340 × 3.75 (5) 7.5 μm. Microscleres: anisochelae in two size categories. I) The larger ones, 25 (29.5) 35 μm, have the bigger tooth palmate and the smaller often characterized by a conspicuous point and slightly diverging outwards alae; a hole is detectable at the smaller extremity (Fig. 12 B). II) The smaller ones measure, 12.5 (13.7) 15 μm (Fig. 12 C). Sigmas “C” shaped, 64 (78) 100 × 2.5 (2.7) 5 μm, with the convex edge serrated (Fig. 12 D).

**Distribution and discussion.** *Mycale (Paresperella) serrulata* Sarà & Siribelli, 1960, was originally described from a detritic bottom of the Gulf of Naples at 30-40 m depth. Voultsiadou and Vafidis (2004) recorded the species encrusting on *Fasciospongia cavernosa* at 90 m depth in the Aegean Sea. *M. (Paresperella) serrulata* is a Mediterranean endemic species. Pansini and Longo (2008) recorded it for the first time for the Ligurian Sea and the coralligenous community.

**Order Halichondrida**
**Family Eteroxyidae**
**Genus Halicnemia**

*Halicnemia geniculata* Sarà, 1958
http://species-id.net/wiki/Halicnemia_geniculata
Figs 13A–D

*Halicnemia geniculata* Sarà, 1958: 237.

**Material examined.** Specimen IG-F-BL4-sp1-sciaf.; alcohol preserved, Gallinara Island (station 2, Falconara) 44°01’22”N, 8°13’34”E, depth 35 m, collected on 17-06-2009. The specimen was entirely used for spicule preparations.

**Description.** Small and thin, yellow-ochre encrustation (1 cm²) on a coralligenous block.

Skeleton. Not observed.

Spicules. Long tylostyles, 405 (1351.7) 1976 × 1.5 (2.7) 4 μm, generally straight, with terminal or subterminal swellings variable in shape; irregular and polytylote forms are to be found (Fig. 13 A). Rabdhotylostyles with heads as above, 147 (242) 705 × 1.5 (2.7) 4 μm (Fig. 13 B); oxeas long, sinuous and thin, 460 (757) 1118 × 1.5 (2.5) 5 mm (Fig. 13 C); acanthoxeas slightly curved or bent, uniformly spined, 42.5 (51.8) 62.5 × 1.5 (1.8) 2 μm (Fig. 13 D).

**Distribution and discussion.** This species, originally described from a superficial cave of the Gulf of Naples (Sarà 1958) was recorded at 60–70 m depth in the same area (Sarà and Siribelli 1962) and in caves close to Marseille (Pouliquen 1972). It is a Mediterranean endemic species (Pansini and Longo 2008) and a new finding for the Ligurian Sea and the coralligenous community.
Figure 13. Halicnemia geniculata. A Magnifications of the tylostyle heads B Rabdhotylostyles C Oxeas, long, sinuous and thin D Acanthoxeas.
Order Haplosclerida
Suborder Haplosclerina
Family Chalinidae
Genus Haliclona
Subgenus Gellius

Haliclona (Gellius) marismedi (Pulitzer-Finali, 1978)
http://species-id.net/wiki/Haliclona_marismedi
Figs 14A–F

Gellius marismedi, Pulitzer-Finali, 1978: 81.

Material examined. Specimen PM-BL1-sp7-sciaf.; specimen PM-BL1-sp8-sciaf.; specimen PM-BL2b-sp6-sciaf.; specimen PM-BL2b-sp6a-sciaf.; Punta Manara (station 6) 44°15′05.61″N, 9°24′09.33″E, depth 35 m, collected 13-07-2009; specimen IG-S-BL1-sp2-sciaf.; Gallinara Island (station 3, Sciusciaù) 44°01′34″N, 8°13′45″E, depth 30 m, collected on17-06-2009.

Description. Small (1-1.5 cm²) encrusting and insinuating sponge, beige or brown, detected on the surface and inside a coralligenous block. Surface smooth, consistency soft (Fig. 14 A).

Skeleton. The choanosome consists of multispicular primary lines connected by unispicular secondary tracts, creating a confused reticulation.

Spicules. Oxeas gently curved with hastate extremities detectable only in the larger spicules (Fig. 14 B), 220 (245) 275 × 2.5 (4.5) 6.25 μm; toxas with more or less angulate central curvature and slightly reflexed points in two size categories: I) 27.5 (45.5) 57.5 μm (Fig. 14 C) and II) 10 (11.5) 12.5 μm (Fig. 14 D); two types of thin sigmas, “C” shaped, I) 22.5 (23.7) 25 μm and II) 10 (13.6) 17.5 μm (Figs 14 E, F).

Distribution and discussion. Pulitzer-Finali (1978) described the species from a specimen epibiothic on Hyrtios collectrix (Schulze, 1880) found on dead, sanded Posidonia beds, at 50 m depth in the Bay of Naples. The same author considered conspecific with G. marismedi the specimen from Banyuls-sur-Mer (rocky walls in shaded areas at 2–17 m depth and horizontal substrates at 20–40 m depth) attributed to Gelliodes luridus (Lundbeck, 1902) by Boury-Esnault (1971).

This is a new finding for the Ligurian Sea and the coralligenous community and the third record after the original description.
Figure 14. *Haliclona* (*Gellius*) *marismedi*. A Specimen on the surface of the coralligenous block and insinuating into it B Oxeas C Large toxas D Small toxas E Large sigma F Small sigma.
Discussion

According to the latest available revision of coralligenous biodiversity (Ballesteros 2006), 142 species of sponges have been recorded associated with this community. Adding to this list the species recorded on the coralligenous of Apulia (Sarà 1968, 1969), Liguria (Pansini and Pronzato 1973; Calcini et al. 2007a; Calcini et al. in prep.; Bertolino et al. 2008) and the Aegean Sea (Kefalas et al. 2003; Kefalas and Castritsi-Catharios 2012) those found associated to red coral (Melone 1965; Temp-lado et al. 1986; Corriero et al. 1988; 1997; Maldonado 1992; Bavestrello et al. 1996; Calcini et al. 2007b) and the data of the present study, the total number of sponge species hitherto associated to the coralligenous community increases to 273 (Table 2).

This increasing is related to the difficulty of studying the organisms inhabiting the coralligenous concretions due to the complexity of the habitat, the high diversity, and the depth where these structures are located (Kipson et al. 2011). Our study, based on the collection of blocks and their sectioning into slices, allowed the identification of species that would have been otherwise completely disregarded.

Among the insinuating species observed in the coralligenous crevices we have found several species previously recorded with a massive habitus in deeper waters. *Pachastrella monilifera* Schmidt, 1868 and *Poecillastra compressa* (Bowerbank, 1866) were the species with the highest phenotypic plasticity, since they usually appear with large, fun shaped specimens, in deep habitats (Bo et al. 2012), while in the coralligenous community they live in crevices and fissures of the concretion. Our results support the idea that environments rich in microhabitats may act as shelters essential for the dispersal of many deep water species, enlarging their distribution range (Bo et al. 2011). Therefore we can emphasize the importance of the coralligenous concretion, not only as reservoir of biodiversity, but also as an important “stepping-stone” able to facilitate the dispersal of species along vertical gradients.

As to the boring sponges, *Cliona janitrix* is indicated by Ballesteros (2006) and Calcini et al. (2007b) as the key species in the bio-erosive processes involving *Coral-lium rubrum*, whereas *Cliona viridis* has the same role in the coralligenous matrix (Rosal et al. 1999). According to our data *Cliona celata* Grant, 1826, *C. schmidtii* (Ridley, 1881), *Spiroxya corallophila* (Calcini, Cerrano & Bavestrello, 2002), *S. heteroclitia* Topsent, 1896 and *Siphonodictyon insidiosum* (Johnson, 1899) may also be considered important in the bio erosive processes acting upon the coralligenous structure. SEM analyses showed that three other species: *Jaspis johnstoni* (Schmidt, 1862), *Dercitus (Stoeba) plicatus* (Schmidt, 1868), *Samus anonymus* Gray, 1867, suspected to be excavating (Carter 1880, Thomas 1973, van Soest and Hooper 2002), actually do not bore the coralligenous substratum but only occupy cavities of the porous concretion and the chambers previously excavated by boring sponges (Figs 2 E–F). *Cliona viridis, Jaspis johnstoni* and *Dercitus (Stoeba) plicatus*, able to penetrate 5 cm into the substrate, are the species reaching the greatest depth inside the concretion.
Table 2. List of sponge species (Demospongiae and Homoscleromorpha) hitherto recorded associated to the coralligenous community.

| Oscarellidae          | 35. Caninella intuta (Topsent, 1892) |
|-----------------------|-------------------------------------|
| Oscarella lobularis   | (Schmidt, 1862)                     |
| Plakinidae            |                                     |
| 2. Corticium candelabrum Schmidt, 1862 |
| 3. Placinolopha moncharmonti (Sarà, 1960) |
| 4. Plakina monolopha Schulze, 1880 |
| 5. Plakina dilopha Schulze, 1880 |
| 6. Plakina trilopha Schulze, 1880 |
| 7. Plakinastrella copiosa Schulze, 1880 |
| 8. Plakinastrella mixta Maldonado, 1992 |
| 9. Plakortis simplex Schulze, 1880 |
| Tetillidae            |                                     |
| 10. Cramiella cranium (Müller, 1776) |
| Samidae               |                                     |
| 11. Samus anonymus Gray, 1867 |
| Ancorinidae           |                                     |
| 12. Stelletta dorsigera Schmidt, 1862 |
| 13. Stelletta grubii Schmidt, 1862 |
| 14. Stelletta lactea Carter, 1871 |
| 15. Stelletta stellata Topsent, 1893 |
| 16. Jaspi incrustans (Topsent, 1890) |
| 17. Jaspi johnstonii (Schmidt, 1862) |
| 18. Stryphhus mucronatus (Schmidt, 1868) |
| 19. Stryphhus ponderosus (Bowerbank, 1866) |
| 20. Penares candidata (Schmidt, 1868) |
| 21. Penares eusquarry (Schmidt, 1868) |
| 22. Penares helleri (Schmidt, 1864) |
| 23. Holoxoa furivia Topsent, 1892 |
| 24. Dercitus (Dercitus) bucklandi (Bowerbank, 1858) |
| 25. Dercitus (Stoebo) plicata (Schmidt, 1868) |
| Calthropellidae        |                                     |
| 26. Calthropella (Calthropella) pathologica (Schmidt, 1868) |
| 27. Calthropella (Corticellopsis) stelligera (Schmidt, 1868) |
| Geodiidae             |                                     |
| 28. Erylus discophorus (Schmidt, 1862) |
| 29. Erylus papulifer Pulitzer-Finali, 1983 |
| 30. Caminus vulcani Schmidt, 1862 |
| 31. Pachymatiomina johnstonia (Bowerbank in Johnston, 1842) |
| 32. Geodia anepe (Vosmaer, 1894) |
| 33. Geodia conchilega Schmidt, 1862 |
| 34. Geodia cydonium Jamenson, 1811 |
| 36. Pachastrella monilifera Schmidt, 1868 |
| 37. Poccilastrea compressa (Bowerbank, 1866) |
| 38. Nethea amygdaloides (Carter, 1876) |
| 39. Thesea muriaria (Bowerbank, 1858) |
| 40. Triptolemma simplex (Sarà, 1959) |
| 41. Vulcaneella (Vulcaneella) gracilis (Sollas, 1888) |
| 42. Annulastrella verrucolosa (Pulitzer-Finali, 1983) |
| Clionaidae             |                                     |
| 43. Cliona burtoni Topsent, 1932 |
| 44. Cliona carteri (Ridley, 1881) |
| 45. Cliona celata Grant, 1826 |
| 46. Cliona lobata Hancock, 1849 |
| 47. Cliona janitrix Topsent, 1932 |
| 48. Cliona rhodensis Rützler & Bromley, 1981 |
| 49. Cliona schmidtii (Ridley, 1881) |
| 50. Cliona theosina Topsent, 1888 |
| 51. Cliona vermisira Hancock, 1867 |
| 52. Cliona viridis Schmidt, 1862 |
| 53. Dotona pulchella mediterranea Rosell & Uriz, 2002 |
| 54. Pione vastifica (Hancock, 1849) |
| 55. Spiroxya canalicula (Calcina, Cerrano & Bavestrello, 2002) |
| 56. Spiroxya heterocita Topsent, 1896 |
| 57. Spiroxya levigata (Topsent, 1898) |
| 58. Spiroxya sarai (Melone, 1965) |
| Thoosidae              |                                     |
| 59. Alectona milli Carter, 1879 |
| 60. Delectona ciconiae Bavestrello, Calcina & Sarà, 1996 |
| 61. Delectona madreporica Bavestrello et al., 1997 |
| 62. Thoosa armata Topsent, 1888 |
| 63. Thoosa mollis Volz, 1939 |
| Hemistrellidae         |                                     |
| 64. Panitima constellata (Topsent, 1893) |
| 65. Panitima oxastra Pulitzer-Finali, 1978 |
| Stelligeridae          |                                     |
| 66. Stelligera rigida (Montagu, 1818) |
| Polymastiidae          |                                     |
| 67. Polymastia inflata Cabioch, 1968 |
| 68. Polymastia mambillaris (Müller, 1806) |
| 69. Polymastia polystola Vacelet, 1969 |
| 70. Quasillina brevis (Bowerbank, 1861) |
Diversity of Porifera in the Mediterranean coralligenous accretions, with description...
145. Crella (Pyebrea) signata Topsent, 1925
146. Crella (Ysea) rosea (Topsent, 1892)

Desmacididae
147. Desmacidon adriaticum Sarà, 1969
148. Desmacidon fruticosum (Montagu, 1818)

Hymedesmiidae
149. Henimycale columnella (Bowerbank, 1864)
150. Hymedesmia (Hymedesmia) baculifera (Topsent, 1901)
151. Hymedesmia (Hymedesmia) paupertas (Bowerbank, 1866)
152. Hymedesmia (Hymedesmia) peachi Bowerbank, 1882
153. Hymedesmia (Hymedesmia) plicata Topsent, 1928
154. Hymedesmia (Hymedesmia) risoi Topsent, 1936
155. Hymedesmia (Hymedesmia) versicolor (Topsent, 1893)
156. Hymedesmia (Stylopus) coriacea (Fristedt, 1885)
157. Phorbas dives (Topsent, 1891)
158. Phorbas fibulatus (Topsent, 1893)
159. Phorbas fictitious Bowerbank, 1866
160. Phorbas mercator (Schmidt, 1868)
161. Phorbas tenacior (Topsent, 1925)
162. Plocamionida ambiguia (Bowerbank, 1866)

Myxillidae
163. Myxilla (Myxilla) rosacea (Lieberkühn, 1859)

Tedaniidae
164. Tedania (Tedania) anhelans Lieberkühn, 1849

Desmacellidae
165. Biemma parthenope Pulitzer-Finali, 1978
166. Biemma varians (Bowerbank, 1858)
167. Desmecella annae Schmidt, 1870
168. Desmecella inornata (Bowerbank, 1866)

Esperiopsidae
169. Ulosa stiposa (Esper, 1794)

Tadacanthidae
170. Tadacanthus (Vomerula) falcata (Bowerbank, 1874)

Mycaleidae
171. Mycale (Mycale) lingua (Bowerbank, 1866)
172. Mycale (Mycale) massa (Schmidt, 1862)
173. Mycale (Aegogopila) contarenii (Lieberkühn, 1859)
174. Mycale (Aegogopila) truncata (Schmidt, 1862)
175. Mycale (Paresperella) serrulata Sarà & Siribelli, 1960

Merliidae
176. Merlia normani Kirkpatrick, 1908

Podospongiiidae
177. Podospongia lovenii Bocage, 1870

Latrunculiidae
178. Latruncula (Bianunulata) citharistae Vacelet, 1969
179. Sceptrella biannulata (Topsent, 1892)
180. Sceptrella insignis (Topsent, 1890)

Axinellidae
181. Axinella cananberina (Esper, 1794)
182. Axinella damicornis (Esper, 1794)
183. Axinella rugosa (Bowerbank, 1866)
184. Axinella polyposes Schmidt, 1862
185. Axinella verrucosa (Esper, 1794)
186. Phakellia robusta Bowerbank, 1866
187. Phakellia ventilabrum (Linnaeus, 1767)

Bubaridae
188. Bubaris carciata Vacelet, 1969
189. Bubaris verruculata (Bowerbank, 1866)
190. Cerbaris curvispiculifer (Carter, 1880)
191. Monocrepidion verruculatum Topsent, 1898

Hymerhabdidae
192. Hymerhabdia oxyrunca Topsent, 1904
193. Hymerhabdia typica Topsent, 1892

Heteroxyidae
194. Halicinemia geniculata Sarà, 1958
195. Halicinemia patera Bowerbank, 1864

Dictyonellidae
196. Acantherella acuta Schmidt, 1862
197. Dictyonella incisa (Schmidt, 1880)
198. Dictyonella marsili (Topsent, 1893)
199. Dictyonella obtusa (Schmidt, 1862)
200. Dictyonella pelligera (Schmidt, 1862)

Halichondriidae
201. Axinynia aurantiaca (Schmidt, 1864)
202. Halichondria (Halichondria) bowernbiki Burton, 1930
203. Halichondria (Halichondria) contorta (Sarà, 1961)
204. Halichondria (Halichondria) convolvana Sarà, 1960
205. Halichondria (Halichondria) genitrix (Schmidt, 1870)
206. Halichondria (Halichondria) panacea (Pallas, 1766)
207. Halichondria (Halichondria) semitubulosa Lieberkühn, 1859
208. Hymeniacidon perlevis (Montagu, 1818)
209. Hymeniacidon rugosa (Schmidt, 1868)
210. Laminosponge subtilis Pulitzer-Finali, 1983
211. Spongozortes intricatus (Topsent, 1892)
212. Spongozortes flavescens Pulitzer-Finali, 1983
213. Topsentia glabra (Topsent, 1898)
214. Topsentia taceleti Kefalas & Castriti- Cathariós, 2012
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