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Bryozoan diversity in the Mediterranean Sea: an update

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Abstract

This paper provides a current view of the bryozoan diversity of the Mediterranean Sea updating the checklist by Rosso (2003). Bryozoans presently living in the Mediterranean increase to 556 species, 212 genera and 93 families. Cheilostomes largely prevail (424 species, 159 genera and 64 families) followed by cyclostomes (75 species, 26 genera and 11 families) and ctenostomes (57 species, 27 genera and 18 families). Few families and genera make the bulk of this biodiversity whereas one third of families are monospecific. The number of species-rank taxa has increased by 81 in the last dozen years but most of these additions relate to the revision of material from old collections and to the introduction of non-indigenous species. Most of the bryozoan diversity is distributed in the coralligenous and dark and semi-dark cave biocoenoses followed by detritic bottoms. Diversity lowers in shallow-water vegetated bottoms and in bathyal habitats. A further increase in diversity is expected from investigation of still poorly known areas and habitats and the need for rapid assessment is remarked on in view of the management of Mediterranean habitats through the EU Marine Strategy Directive.

Keywords: Bryozoa, Mediterranean, updated checklist, SEM taxonomy, environmental change, human impact, non-indigenous species.

Introduction

“In knowledge of biodiversity lie both clues to our past and our best hopes for the future”. This sentence from Wheeler *et al.* (2012) epitomizes the feeling of the participants in a discussion about the importance of assessing the present state of global species biodiversity. A comprehensive knowledge of biodiversity is especially relevant nowadays when sudden environmental changes, largely induced or exacerbated by human activities, pose a threat to habitats and the species living in them. Current European regulations include the protection of habitats in order to protect their biodiversity (Boero & Bonsdorff, 2007). An effort is needed to achieve a more comprehensive knowledge of the distribution of global biodiversity in order to understand its origin and evolution (through phylogeny), to protect it against climatic changes and deal with the ever-increasing introduction of non-indigenous species, as well as for recreational and other practical reasons (exploration for new substances, process understanding, etc.). Bryozoans are a target group to address many of the above-mentioned points, as they are significant components of the fossil record because of their calcium carbonate skeletons, and a major component of biodiversity in the modern ocean from shallow-water habitats to the deep-sea. Some species may have roles in structuring habitats, some are the source of pharmacologically exploited compounds, and some develop large and colourful colonies attractive to scuba divers.

In this context, the present work aims to explore present-day Mediterranean bryozoan diversity. Since the last checklist of Rosso was published in 2003, an update and revisions are necessary because of the large number of taxonomic papers published, either introducing new species based on the study of museum collections as well as new sampling, or solving taxonomic puzzles.

Materials and Methods

The present compilation derives from the revision and updating of the Mediterranean bryozoan checklist of Rosso (2003). New data come from: 1) a checklist of bryozoans from Italian Seas (Rosso *et al.*, 2010a); 2) ‘old’ papers previously unavailable; 3) surveys including lists of bryozoan species from specific habitats and/or geographical areas, especially neglected sectors such as northern Africa and the Aegean-Levantine seas; 4) recent taxonomic papers, including revisions and new reports from the Mediterranean and beyond; 5) taxonomic papers introducing new genera and families which better accommodate existing Mediterranean taxa; 6) papers on Cenozoic faunas with notes on Recent species; and 7) papers on non-indigenous species. Additional information comes from personal unpublished data and on-going research in the Sicily Channel and Sardinia (AR & EDM) and selected Aegean sites (Gerovasileiou & Rosso, in

prep.). The complete list of checked references not directly cited in the text is given in Appendix 1.

Bryozoan species present in the Mediterranean Sea are listed in Table 1 using the systematic order of families proposed by Bock & Gordon (2013), integrated with the listing of genera in the Bryozoa Homepage edited by Bock (bryozoa.net) and WoRMS (World Register of Marine Species) compiled by Bock & Gordon (2016) (<http://www.catalogueoflife.org/col/details/database/id/81>).

All changes made to the species list of Rosso (2003) are indicated in Table 1, including: 1) newly added species, genera and families; 2) names derived from new combinations; 3) addition of species following the splitting of species complexes; and 4) the status of non-indigenous bryozoans (NIB) in the Mediterranean Sea. Further remarks, numbered from 1 to 140 in Table 1 and included in Appendix 2, complement the species entry. Comments were omitted for all the entries previously discussed in Rosso *et al.* (2010a). In cases where the genus is stipulated but the species is undetermined (e.g., *Annectocyma* sp.) the taxon is listed only if it is the unique occurrence of the genus, or if it is clearly distinct from established species, thoroughly described and figured (e.g., *Stomatopora* sp. *sensu* Harmelin, 1976).

Table 2 summarizes the relationships among taxa within the groups. Tables 3 and 4 are lists of species erected in old papers and lacking a comprehensive description and illustrations, subsequently reported only in reviews and checklists from the Adriatic Sea (Heller, 1867; Hincks, 1886; Novosel & Požar-Domac, 2001, and references therein), the Aegean-Black Sea (Koçak & Aydin Önen, 2014, and references therein) and the NW African area (Canu & Bassler, 1930; d'Hondt & Mascarell, 2004; Ayari & Taylor, 2014). These species were not included in Table 1 because revision of the original material is needed to ascertain their validity. Table 5 lists the species present in Rosso (2003) but missing in the current compilation, with comments and references supporting their exclusion. To compare previous and current estimates of Mediterranean bryodiversity, the figures reported in Rosso (2003) were corrected, adding overlooked species and removing others because they were mistakenly believed to live in the Mediterranean. Figures were also corrected to consider subspecies as distinct taxa. A further comparison was made with data available from the literature for well-investigated geographical areas and the global ocean. The diversity of bryozoans in selected Mediterranean habitats is also shown using plots.

Results

Present-day bryodiversity in the Mediterranean Sea

The present-day Mediterranean bryozoan fauna numbers 556 species in 212 genera and 93 families (Tabs 1, 2). They mostly belong to Gymnolaemata, comprising

481 species (86.5%), 186 genera (87.7%) and 82 families (88.2%). Cheilostomatida account for the greater part of this diversity, dominating at species level with 424 species (76.3%) (Figs 1, 2). This figure is slightly lower at genus level (159 genera, 75.0%) and especially at family level (64 families, 68.8%). Cheilostomatida outnumbers both Cyclostomatida (unique living representatives of the Stenolaemata), which include 75 species (13.5%), 26 genera (12.3%) and 11 families (11.8%), and Ctenostomatida with only 57 species (10.2%), 27 genera (12.7%) and 18 families (19.4%).

Table 2 and Figure 3 show that most of the bryodiversity is contained within a few families, whereas 28 families, corresponding to 30% of the total, are represented by a single genus and a single species. This figure is particularly marked for cheilostomes (31% of families), but slightly lowers for cyclostomes and ctenostomes (nearly 27% and 28% of families, respectively). Two exceptionally species-rich cheilostome families (Phidoloporidae and Celleporidae), with 71 species, correspond to 12.8% of the total species diversity. These along with another four families – the cheilostome Bitectiporidae (29 spp.), Cribrilinidae (25 spp.), Calloporidae (23 spp.) and Smitinidae (22 spp.) – represent 6.5% of the families but more than the 30.6% of the species. Four further families – the cyclostome Crisiidae (19 spp.) and the cheilostome Bugulidae (19 spp.), Romancheinidae (19 spp.) and Candididae (18 spp.) – raise this figure to 10.8% of families and 44% of species.

The above-mentioned families also include the greatest number of genera (Tabs 1, 2). It is well known, for instance, that Calloporidae, one of the largest families with respect to generic diversity, is considered as a waste-bin for basal, paraphyletic neocheilostomes (Di Martino & Taylor, 2012). With 66 species, calloporids are also the most speciose family in the New Zealand Exclusive Economic Zone (Gordon *et al.*, 2009). Mediterranean Calloporidae include 12 genera with 1–2 species each, exceptionally 4 (*Copidozoum*) or 5 (*Callopora*), totalling 23 species. Phidoloporidae and Celleporidae also have a high generic diversity, comprising 11 and 9 genera respectively, several of which are monospecific, while a few are exceptionally rich, such as the phidoloporid genera *Reteporella* (15 spp.), *Rhynchozoon* (7 spp.) and *Schizoretepora* (5 spp.), and the celleporid genera *Celleporina* (10 spp.) and *Turbicellepora* (10 spp.).

The other species-rich families include some of the most species-rich genera: Bitectiporidae with *Schizomavella* (22 spp.), Cribrilinidae with *Puellina* (18 spp.), Smitinidae with *Parasmittina* (8 spp.) and *Smittina* (7 spp.), and Crisiidae with *Crisia* (15 spp.) accounting for most of their diversity. Additional species-rich genera are *Disporella* (9 spp.), *Alcyonidium* (8 spp.), *Schizoporella* (10 spp.), *Escharella* (9 spp.) and *Microporella* (8 spp.). All of these genera are well known to be species-rich both in the Mediterranean (Rosso, 2003) and worldwide

Table 1. List of bryozoan species known living in the Mediterranean Sea to date. For each species the following information is reported (related columns are marked with a star): A = new additions after Rosso (2003); B = new taxonomic combinations; C = dismantling of species complexes or newly proposed synonymies; NIB = status of Non-Indigenous Bryozoan. For some taxa, the numbers reported in 'Remarks' refer to the notes listed in Appendix 2.

Mediterranean Bryozoa	A	B	C	NIB	R
Stenolaemata Borg, 1941					
Cyclostomatida Busk, 1852					
Stomatoporidae Pergens & Meunier, 1886					
Stomatopora Bronn, 1825					
<i>Stomatopora gingrina</i> Jullien, 1882					
<i>Stomatopora</i> sp. <i>sensu</i> Harmelin, 1979					
Oncousoeciidae Canu, 1918					
Anguisia Jullien, 1882					
<i>Anguisia verrucosa</i> Jullien, 1882					
Filisparsa d'Orbigny, 1853					
<i>Filisparsa profunda</i> Harmelin & d'Hondt, 1982					
'Microecia' Canu, 1918					
' <i>Microecia</i> ' <i>corrugata</i> (Harmelin, 1979)					
' <i>Microecia</i> ' <i>occulta</i> (Harmelin, 1976)					
' <i>Microecia suborbicularis</i> ' <i>sensu</i> Harmelin, 1976					
Microeciella Taylor & Sequeiros, 1982					
<i>Microeciella suborbicularis</i> (Hincks, 1880)					
Proboscina Audouin, 1826		*			
? <i>Proboscina boryi</i> (Audouin, 1826)		*		*?	1
Tubuliporidae Johnston, 1838					
Idmidronea Canu & Bassler, 1920					
<i>Idmidronea triforis</i> (Heller, 1867)					
<i>Idmidronea coerulea</i> Harmelin, 1976					
<i>Idmidronea flexuosa</i> (Pourtalès, 1867)					
Platonea Canu & Bassler, 1920					
<i>Platonea stoechas</i> Harmelin, 1976					
Tubulipora Lamarck, 1816					
<i>Tubulipora aperta</i> Harmer, 1898					
<i>Tubulipora hemiphragmata</i> Harmelin, 1976					
<i>Tubulipora liliacea</i> (Pallas, 1766)					
<i>Tubulipora notomale</i> (Busk, 1875)					
<i>Tubulipora plumosa</i> Harmer, 1898					
<i>Tubulipora ziczac</i> Harmelin, 1976					
Plagioeciidae Canu, 1918					
Cardioecia Canu & Bassler, 1922					
" <i>Cardioecia</i> " <i>watersi</i> (O'Donoghue & de Watteville, 1939)					
Desmeplagioecia Canu & Bassler, 1920					
<i>Desmeplagioecia amphorae</i> Harmelin, 1976					
<i>Desmeplagioecia violacea</i> Harmelin, 1976					
Diplosolen Canu, 1918					
<i>Diplosolen obelius</i> (Johnston, 1838)					2
Plagioecia Canu, 1918					
<i>Plagioecia dorsalis</i> (Waters, 1879)					3
<i>Plagioecia inoedificata</i> (Jullien, 1882)					
<i>Plagioecia patina</i> (Lamarck, 1816)					
<i>Plagioecia platydiscus</i> Harmelin, 1976					
<i>Plagioecia sarniensis</i> (Norman, 1864)					
Terviidae Canu & Bassler, 1920					
Tervia Jullien, 1882					
<i>Tervia irregularis</i> (Meneghini, 1844)					
Annectocymidae Hayward & Ryland, 1985					
Annectocyma Hayward & Ryland, 1985					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Annectocyma arcuata</i> (Harmelin, 1976)					
<i>Annectocyma major</i> (Johnston, 1847)					
<i>Annectocyma tubulosa</i> (Busk, 1875)					
Entalophoroecia Harmelin, 1976					
<i>Entalophoroecia balgimae</i> Harmelin & d'Hondt, 1992					
<i>Entalophoroecia deflexa</i> Couch, 1844					
<i>Entalophoroecia elegans</i> (Norman, 1909)					
<i>Entalophoroecia gracilis</i> Harmelin, 1976					
<i>Entalophoroecia robusta</i> Harmelin, 1976					
Harmelinopora Brood, 1976	*				4
<i>Harmelinopora indistincta</i> (Canu & Bassler, 1929)		*			
Entalophoridae Reuss, 1869					
Mecynoecia Canu, 1918					
<i>Mecynoecia delicatula</i> (Busk, 1875)					
Fron diporidae Busk, 1875					
Fron dipora Link, 1807					
<i>Fron dipora verrucosa</i> (Lamouroux, 1821)					5
Crisiidae Johnston, 1838					
Bicrisia d'Orbigny, 1853					
<i>Bicrisia gibraltarensis</i> Harmelin, 1990					
Crisia Lamouroux, 1812					
<i>Crisia aculeata</i> Hassall, 1841					
<i>Crisia cuneata</i> Maplestone, 1905					
<i>Crisia calyptostoma</i> Hayward & Ryland, 1978	*				6
<i>Crisia denticulata</i> (Lamarck, 1816)					
<i>Crisia eburnea</i> (Linnaeus, 1758)					
<i>Crisia eburnea harmelini</i> d'Hondt, 1988					7
<i>Crisia elongata</i> (Milne-Edwards, 1867)					
<i>Crisia fistulosa</i> Heller, 1867					
<i>Crisia oranensis</i> Waters, 1916					
<i>Crisia pyrula</i> Harmelin, 1990					
<i>Crisia ramosa</i> Harmer, 1891					
<i>Crisia recurva</i> Heller, 1867					
<i>Crisia sigmoidea</i> Waters, 1916					
<i>Crisia tenella tenella</i> Calvet, 1906					
<i>Crisia tenella longinodata</i> Rosso, 1998	*				8
Crisidia Milne-Edwards, 1838					
<i>Crisidia cornuta</i> (Linnaeus, 1758)					
Filicrisia d'Orbigny, 1853					
<i>Filicrisia geniculata</i> (Milne-Edwards, 1838)					
<i>Filicrisia</i> sp. <i>sensu</i> Harmelin & d'Hondt, 1982					
Horneridae Smitt, 1867					
Hornera Lamouroux, 1821					
<i>Hornera frondiculata</i> Lamouroux, 1821					
" <i>Hornera lichenoides</i> " Auctt. not (Linnaeus, 1758)					9
Lichenoporidae Smitt, 1867					10
Disporella Gray, 1848					11
<i>Disporella alboranensis</i> Alvarez, 1992	*				
<i>Disporella borgi</i> Alvarez, 1995	*				
<i>Disporella boutani</i> Alvarez, 1995	*				
<i>Disporella fimbriata</i> (Busk, 1875)					
<i>Disporella harmeri</i> (Neviani, 1939)	*				
<i>Disporella hispida</i> (Fleming, 1828)					12
<i>Disporella pyramidata</i> Alvarez, 1992	*				
<i>Disporella robusta</i> Alvarez, 1992	*				
<i>Disporella smitti</i> (Calvet, 1906)	*				

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Patinella</i> Gray, 1848					13
<i>Patinella aztiensis</i> (Alvarez, 1994)	*				14
<i>Patinella flosculus</i> (Hincks, 1862)	*				14
<i>Patinella mediterranea</i> (de Blainville, 1834)					
<i>Patinella radiata</i> (Audouin, 1826)					
<i>Patinella verrucaria</i> (Fabricius, 1780)					
Gymnolaemata Allman, 1856					
Ctenostomatida Busk, 1852					
Benedeniporidae Delage & Hérouard, 1897					
<i>Benedenipora</i> Pergens, 1889					
<i>Benedenipora catenata</i> Pergens, 1889					
<i>Benedenipora delicatula</i> d'Hondt & Geraci, 1975					
Alcyonidiidae Johnston, 1838					
<i>Alcyonidioides</i> d'Hondt, 2001	*				15
<i>Alcyonidioides mytili</i> (Dalyell, 1848)					
<i>Alcyonidium</i> Lamouroux, 1813					16
<i>Alcyonidium albidum</i> Alder, 1857					
<i>Alcyonidium cellarioides</i> (Calvet, 1900)					
<i>Alcyonidium duplex</i> Prohuo, 1892					
<i>Alcyonidium gelatinosum</i> (Linnaeus, 1761)					
<i>Alcyonidium mamillatum</i> Alder, 1857					
<i>Alcyonidium polyoum</i> (Hassall, 1841)					
<i>Alcyonidium variegatum</i> Prohuo, 1892					
<i>Alcyonidium vicarians</i> d'Hondt & Chimenz Gusso, 2006	*				
Lobiancopora Pergens, 1889					
<i>Lobiancopora hyalina</i> Pergens, 1889					
Clavoporidae Osburn & Soule, 1953					
<i>Clavopora</i> Busk, 1874					
<i>Clavopora hystericis</i> Busk, 1874					
<i>Clavopora</i> sp. sensu Gautier, 1954	*				17
Metalcyonidium d'Hondt, 1975					
<i>Metalcyonidium gautieri</i> d'Hondt, 1975					
Pherusellidae Osburn & Soule, 1953					
<i>Pherusella</i> Soule, 1951					
<i>Pherusella brevituba</i> Soule, 1951				*	
<i>Pherusella tubulosa</i> (Ellis & Solander, 1786)					
Victorellidae Hincks, 1880					
<i>Bulbella</i> Braem, 1951	*				
<i>Bulbella abscondita</i> Braem, 1951	*				
<i>Tanganella</i> Braem, 1951	*				
<i>Tanganella muelleri</i> (Kraepelin, 1887)	*				
<i>Victorella</i> Saville Kent, 1870					
<i>Victorella pavida</i> Saville Kent, 1870					
Nolellidae Harmer, 1915					
<i>Nolella</i> Gosse, 1855					
<i>Nolella dilatata</i> (Hincks, 1860)					
<i>Nolella stipata</i> Gosse, 1855					
Immergentiidae Silén, 1846					
<i>Immergentia</i> Silén, 1846					
<i>Immergentia orbignyana</i> (Fischer, 1866)		*			
Vesiculariidae Hincks, 1880					
<i>Amathia</i> Lamouroux, 1812					18
<i>Amathia delicatula</i> Souto, Fernández-Pulpeiro & Reverter-Gil, 2010	*				
<i>Amathia distans</i> Busk, 1886					
<i>Amathia gracilis</i> (Leidy, 1855)		*			
<i>Amathia gracillima</i> (Hincks, 1877)		*		*	

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Amathia imbricata</i> (Adams, 1798)		*			
<i>Amathia lendigera</i> (Linnaeus, 1761)					
<i>Amathia minoricensis</i> Souto, Fernández-Pulpeiro & Reverter-Gil, 2010	*				
<i>Amathia pruvoti</i> (Calvet, 1911)					
<i>Amathia pustulosa</i> (Ellis & Solander, 1786)		*			
<i>Amathia semiconvoluta</i> (Lamoroux, 1824)					
<i>Amatia tortuosa</i> Tenison-Woods, 1880					
<i>Amathia verticillata</i> (Delle Chiaje, 1822)		*		*	19
<i>Amathia vidovici</i> (Heller, 1867)					
Vesicularia Thompson, 1830					
<i>Vesicularia spinosa</i> (Linnaeus, 1767)					
Buskiidae Hincks, 1880					
Buskia Alder, 1857					
<i>Buskia nitens</i> Alder, 1857					
<i>Buskia socialis</i> Hincks, 1887					
Triticellidae Sars, 1873					
Triticella Dalyell, 1848					
<i>Triticella flava</i> Dalyell, 1848					
<i>Triticella pedicellata</i> (Alder, 1857)					
Triticellopsis Gautier, 1961					
<i>Triticellopsis tissieri</i> Gautier, 1961					
Aeverrilliidae Jebram, 1973	*				20
Aeverrillia Marcus, 1941	*				21
<i>Aeverrillia setigera</i> (Hincks, 1887)	*			*	22
Farrellidae d'Hondt, 1983	*				
Farrella Ehrenberg, 1838					
<i>Farrella repens</i> (Farre, 1837)					
Walkeridae Hincks, 1880					
Walkeria Fleming, 1823					
<i>Walkeria atlantica</i> (Busk, 1886)					
<i>Walkeria tuberosa</i> (Heller, 1867)					
<i>Walkeria uva</i> (Linnaeus, 1758)					
Mimosellidae Hincks, 1877					
Bantariella Jebram, 1973					
<i>Bantariella verticillata</i> (Heller, 1867)		*			
Mimosella Hincks, 1851					
<i>Mimosella crosslandi</i> d'Hondt, 1983					
<i>Mimosella gracilis</i> Hincks, 1851					
Hypophorellidae Prenant & Bobin, 1956					
Hypophorella Ehlers, 1876					
<i>Hypophorella expansa</i> Ehlers, 1876					
Arachnidiidae Hincks, 1880					
Arachnidium Hincks, 1859					
<i>Arachnidium hippothooides</i> Hincks, 1862					
Arachnoidella d'Hondt, 1983	*				23
<i>Arachnoidella annosciae</i> d'Hondt & Geraci, 1976		*			
<i>Arachnoidella protecta</i> (Harmer, 1915)		*		*	24
Spathiporidae Pohowsky, 1978					
Spathipora Fischer, 1866					
<i>Spathipora comma</i> (Soule, 1950)					
<i>Spathipora sertum</i> Fischer, 1860					
Penetrantiidae Silén, 1946					
Penetrantia Silén, 1946					
<i>Penetrantia brevis</i> Silén, 1946					
Cheilostomatida Busk, 1852					
Aeteidae Smitt, 1868					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Aetea</i> Lamouroux, 1812					
<i>Aetea anguina</i> (Linnaeus, 1758)					
<i>Aetea lepadiformis</i> Waters, 1906					
<i>Aetea longicollis</i> Jullien & Calvet, 1903					
<i>Aetea sica</i> (Couch, 1844)					
<i>Aetea truncata</i> (Landsborough, 1852)					
Scrupariidae Busk, 1852					
Scruparia Oken, 1815					
<i>Scruparia ambigua</i> (d'Orbigny, 1841)					
<i>Scruparia chelata</i> (Linnaeus, 1758)					
Eucrateidae Johnston, 1847					
Eucratea Lamouroux, 1812					
<i>Eucratea loricata</i> (Linnaeus, 1758)					
Membraniporidae Busk, 1852					
Acanthodesia Canu & Bassler, 1919					25
<i>Acanthodesia savartii</i> (Audouin, 1826)		*			26
Membranipora de Blainville, 1830					
<i>Membranipora membranacea</i> (Linnaeus, 1767)					
<i>Membranipora tenuis</i> Desor, 1848					27
Electridae d'Orbigny, 1851					
Arbopercula Nikulina, 2010	*				28
<i>Arbopercula tenella</i> (Hincks, 1880)				*	28
Conopeum Gray, 1848					
<i>Conopeum ponticum</i> Hayward, 2001	*			*	29
<i>Conopeum reticulum</i> (Linnaeus, 1767)					
<i>Conopeum seurati</i> (Canu, 1928)					30
Einhornia Nikulina, 2007	*				31
<i>Einhornia crustulenta</i> (Pallas, 1766)		*			
Electra Lamouroux, 1816					
<i>Electra monostachys</i> (Busk, 1854)					
<i>Electra pilosa</i> (Linnaeus, 1767)					
<i>Electra posidoniae</i> Gautier, 1954					
<i>Electra repiachovi</i> Ostroumoff, 1886					32
<i>Electra verticillata</i> (Ellis & Solander, 1786)					
Pyripora d'Orbigny, 1852					
<i>Pyripora catenularia</i> (Fleming, 1828)					
<i>Pyripora</i> sp. sensu Hayward & McKinney, 2002					33
Tendridae Vigneaux, 1949					
Tendra Nordman, 1839					
<i>Tendra zostericola</i> Nordman, 1839					
Thalamoporellidae Levinsen, 1902					
Thalamoporella Hincks, 1887					34
<i>Thalamoporella gothica</i> (Busk, 1856)				*?	
<i>Thalamoporella harmelini</i> Soule, Soule & Chaney, 1999				*?	34
<i>Thalamoporella rozieri</i> (Audouin, 1826)				*?	
<i>Thalamoporella</i> sp. sensu Sokolover, Taylor & Ilan, 2016	*			*?	35
Calloporidae Norman, 1903					
Alderina Norman, 1903					
<i>Alderina imbellis</i> (Hincks, 1860)					
Allantopora Lang, 1914					36
<i>Allantopora minuta</i> (Harmelin, 1973)		*			36
Amphiblestrum Gray, 1848					
<i>Amphiblestrum lyrulatum</i> (Calvet, 1907)					
<i>Amphiblestrum (Aviculamphiblestrum) ruggeroi</i> Rosso, 1999					
Aplousina Canu & Bassler, 1927					
<i>Aplousina capriensis</i> (Waters, 1898)					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Aplousina filum</i> (Jullien & Calvet, 1903)					
Barrosia Souto, Reverter-Gil & Fernández-Pulpeiro, 2010	*				
<i>Barrosia balearica</i> Souto, Reverter-Gil & Fernández-Pulpeiro, 2010	*				
Callopora Gray, 1848					
<i>Callopora depressa</i> Cook, 1968					
<i>Callopora dumerilii dumerilii</i> (Audouin, 1826)					
<i>Callopora dumerilii pouilleti</i> (Alder, 1857)					
<i>Callopora lineata</i> (Linnaeus, 1767)					
<i>Callopora rylandi</i> Bobin & Prenant, 1965					
Copidozoum Harmer, 1926					
<i>Copidozoum balgimae</i> Reverter-Gil & Fernández-Pulpeiro, 1999					
<i>Copidozoum exiguum</i> (Barroso, 1920)					
<i>Copidozoum planum</i> (Hincks, 1880)					
<i>Copidozoum tenuirostre</i> (Hincks, 1880)					
Corbulella Gordon, 1984	*				37
<i>Corbulella maderensis</i> (Waters, 1898)		*			37
Crassimarginatella Canu, 1900					
<i>Crassimarginatella crassimarginata</i> (Hincks, 1880)					
<i>Crassimarginatella solidula</i> (Hincks, 1860)					
Ellisina Norman, 1903					
<i>Ellisina gautieri</i> Fernández Pulpeiro & Reverter Gil, 1993					
Parellisina Osburn, 1940					
<i>Parellisina curvirostris curvirostris</i> (Hincks, 1862)					
<i>Parellisina curvirostris raibauti</i> Ben Ismail, Ben Hassine, Mascarell & d'Hondt, 2010	*				
Retevirgula Brown, 1948					
<i>Retevirgula akdenizae</i> Chimenz, Nicoletti & Lippi Boncambi, 1997					
Antroporidae Vigneaux, 1949					
Rosseliana Jullien, 1888					
<i>Rosseliana rosselii</i> (Audouin, 1826)					
Akatopora Davis, 1934	*				
<i>Akatopora leucocypha</i> (Marcus, 1937)	*			*	38
Cymuloporidae Winston & Vieira, 2013	*				39
Crepis Jullien, 1882					
<i>Crepis harmelini</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2011				*	40
Chaperiidae Jullien, 1888					
Chaperiopsis Uttley, 1949					
<i>Chaperiopsis annulus</i> (Manzoni, 1870)					
<i>Chaperiopsis hirsuta</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2009	*				41
Heliodomidae Vigneaux, 1949					
Setosellina Calvet, 1906					
<i>Setosellina capriensis</i> (Waters, 1926)					
<i>Setosellina roulei</i> Calvet, 1906					
Cupuladriidae Lagaaij, 1952					
Cupuladria Canu & Bassler, 1919					
<i>Cupuladria biporosa</i> (Canu & Bassler, 1923)					
<i>Cupuladria canariensis</i> (Busk, 1859)					
Reussirella Baluk & Radwanski, 1984					
<i>Reussirella doma</i> (d'Orbigny, 1853)					
<i>Reussirella multispinata</i> (Canu & Bassler, 1923)					42
Flustridae Fleming, 1828					
Chartella Gray, 1848					
<i>Chartella papyracea</i> (Ellis & Solander, 1786)					
<i>Chartella papyrea</i> (Pallas, 1766)					
<i>Chartella tenella</i> (Hincks, 1887)					
Gregarinidra Barroso, 1949					
<i>Gregarinidra gregaria</i> (Heller, 1867)					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
Hincksina Norman, 1903					
<i>Hincksina calpensis</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2012			*		43
<i>Hincksina flustroides flustroides</i> (Hincks, 1877)					
<i>Hincksina flustroides crassispinata</i> Gautier, 1962					
Hincksinoflustra Bobin & Prenant, 1961					
<i>Hincksinoflustra octodon</i> (Busk, 1852)					
Securiflustra Silén, 1941					
<i>Securiflustra securifrons</i> (Pallas, 1766)					
Bugulidae Gray, 1848					
Bicellariella Levinsen, 1909					
<i>Bicellariella ciliata</i> (Linnaeus, 1758)					
Bugula Oken, 1815					
<i>Bugula gautieri</i> Ryland, 1962					
<i>Bugula neritina</i> (Linnaeus, 1758)				*	44
<i>Bugula robusta</i> (MacGillivray, 1869)					
Bugulina Gray, 1848	*				45
<i>Bugulina avicularia</i> (Linnaeus, 1758)		*			
<i>Bugulina calathus calathus</i> (Norman, 1868)		*			
<i>Bugulina calathus minor</i> (Ryland, 1962)		*			
<i>Bugulina flabellata</i> (Thompson in Gray, 1848)		*			
<i>Bugulina fulva</i> (Ryland, 1960)		*		*?	
<i>Bugulina simplex</i> (Hincks, 1886)		*			
<i>Bugulina spicata</i> (Hincks, 1886)		*			
<i>Bugulina stolonifera</i> (Ryland, 1960)		*			
<i>Bugulina turbinata</i> (Alder, 1857)		*			
Crisularia Gray, 1848	*				45
<i>Crisularia aperta</i> (Hincks, 1886)		*			
<i>Crisularia gracilis</i> (Busk, 1858)		*			
<i>Crisularia plumosa</i> (Pallas, 1766)		*		*	
<i>Crisularia serrata</i> (Lamarck, 1816)		*	*	*	46
Kinetoskias Daniëlsen, 1868					
<i>Kinetoskias smitti</i> Daniëlsen, 1868					
Sessibugula Osburn, 1950					
<i>Sessibugula barrosoi</i> López de la Cuadra & Garcia-Gómez, 1994					
Beaniidae Canu & Bassler, 1927					
Beania Johnston, 1940					
<i>Beania cylindrica</i> (Hincks, 1886)					
<i>Beania hirtissima</i> (Heller, 1867)					
<i>Beania magellanica</i> (Busk, 1852)					
<i>Beania mirabilis</i> Johnston, 1840					
Epistomiidae Gregory, 1893					
Epistomia Fleming, 1828					
<i>Epistomia bursaria</i> (Linnaeus, 1758)					
Synnotum Pieper, 1881					
<i>Synnotum egyptiacum</i> (Audouin, 1826)					
Candidae d'Orbigny, 1851					
Caberea Lamouroux, 1816					
<i>Caberea boryi</i> (Audouin, 1826)					
Cradoscrupocellaria Vieira, Spencer Jones & Winston, 2013	*				47
<i>Cradoscrupocellaria aegyptiana</i> Vieira, Spencer Jones & Winston, 2013			*		48
<i>Cradoscrupocellaria bertholleti</i> (Audouin, 1826)		*			
<i>Cradoscrupocellaria ellisi</i> (Vieira & Spencer Jones, 2012)	*				
<i>Cradoscrupocellaria gautieri</i> Vieira, Spencer Jones & Winston, 2013	*				
<i>Cradoscrupocellaria hirsuta</i> (Jullien & Calvet, 1903)	*			*	49
<i>Cradoscrupocellaria lagaaij</i> Vieira, Spencer Jones & Winston, 2013	*				
<i>Cradoscrupocellaria macrorhyncha</i> (Gautier, 1962)		*			

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Licornia</i> van Beneden, 1850	*				50
<i>Licornia jolloisi</i> (Audouin, 1826)		*		*	51
<i>Licornia vierai</i> Sokolover, Taylor & Ilan, 2016	*				
Scrupocaberea Vieira, Spencer Jones, Winston, Migotto & Marques, 2014	*				52
<i>Scrupocaberea maderensis</i> (Busk, 1860)		*			
Scrupocellaria van Beneden, 1845					
<i>Scrupocellaria aegeensis</i> Harmelin, 1969					
<i>Scrupocellaria delilii</i> (Audouin, 1826)					
<i>Scrupocellaria incurvata</i> Waters, 1896					
<i>Scrupocellaria muricata</i> (Lamouroux, 1816)				*	53
<i>Scrupocellaria scrupea</i> Busk, 1852					
<i>Scrupocellaria scruposa</i> (Linnaeus, 1758)				*?	54
Tricellaria Fleming, 1828					
<i>Tricellaria inopinata</i> d'Hondt & Occhipinti Ambrogi, 1985				*	
Microporidae Gray, 1848					
Calpensia Jullien, 1888					
<i>Calpensia nobilis</i> (Esper, 1796)					
Coronellina Prenant & Bobin, 1966					
<i>Coronellina fagei</i> (Gautier, 1962)					
Micropora Gray, 1848					
<i>Micropora coriacea</i> (Johnston, 1847)					
<i>Micropora normani</i> Levinsen, 1909					
Mollia Lamouroux, 1816					
<i>Mollia circumcincta</i> (Heller, 1867)					
<i>Mollia multijuncta</i> (Waters, 1879)					
<i>Mollia patellaria</i> (Moll, 1803)					
Steraechmella Lagaaij, 1952					
<i>Steraechmella buski</i> Lagaaij, 1952					
Setosellidae Levinsen, 1909					
Setosella Hincks, 1877					
<i>Setosella cavernicola</i> Harmelin, 1977					
<i>Setosella folini</i> Jullien, 1882					
<i>Setosella vulnerata</i> (Busk, 1860)					
Onychocellidae Jullien, 1882					
Onychocella Jullien, 1882					
<i>Onychocella angulosa</i> (Reuss, 1847)					
<i>Onychocella marioni</i> (Jullien, 1881)					
<i>Onychocella vibraculifera</i> Neviani, 1895					
Smittipora Jullien, 1882				*	55
<i>Smittipora disjuncta</i> (Canu & Bassler, 1930)					
Chlidiidae Busk, 1884					
Chlidonia Lamouroux, 1824					
<i>Chlidonia pyriformis</i> (Bertoloni, 1810)					
Cellariidae Fleming, 1828					
Cellaria Ellis & Solander, 1786					
<i>Cellaria fistulosa</i> (Linnaeus, 1758)					
<i>Cellaria normani</i> (Hastings, 1947)					
<i>Cellaria salicornioides</i> Lamouroux, 1816					
<i>Cellaria sinuosa</i> (Hassall, 1840)					
Euginoma Jullien, 1882					
<i>Euginoma reticulata</i> d'Hondt, 1981					
Monoporellidae Hincks, 1882					
Monoporella Hincks, 1881					
<i>Monoporella bouchardii</i> (Audouin, 1826)				*	56
Cribriliniidae Hincks, 1879					
Collarina Jullien, 1886					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Collarina balzaci</i> (Audouin, 1826)					
<i>Distansescharella</i> d'Orbigny, 1853					
<i>Distansescharella alcicornis</i> (Jullien, 1882)		*			57
<i>Distansescharella seguenzai</i> (Cipolla, 1921)					
<i>Figularia</i> Jullien, 1886					
<i>Figularia figularis</i> (Johnston, 1847)					
<i>Klugerella</i> Moyano, 1991		*			58
<i>Klugerella marcusii</i> (Cook, 1967)					
<i>Membraniporella</i> Smitt, 1873					
<i>Membraniporella nitida</i> (Johnston, 1838)					
<i>Membraniporella</i> sp. 1 <i>sensu</i> Chimenz Gusso <i>et al.</i> , 2014		*			
<i>Puellina</i> Jullien, 1886					
<i>Puellina (Cribrilaria) arrecta</i> Bishop & Househam, 1987					
<i>Puellina (Cribrilaria) cassidainsis</i> Harmelin, 1984					
<i>Puellina (Cribrilaria) hincksi</i> (Friedl, 1917)					
<i>Puellina (Cribrilaria) innominata</i> (Couch, 1844)					
<i>Puellina (Cribrilaria) mikelae</i> Harmelin, 2006					
<i>Puellina (Cribrilaria) minima</i> Harmelin, 1984					
<i>Puellina (Cribrilaria) picardi</i> Harmelin, 1988					
<i>Puellina (Cribrilaria) pseudoradiata pseudoradiata</i> Harmelin & Aristegui, 1988					
<i>Puellina (Cribrilaria) radiata</i> (Moll, 1803)					
<i>Puellina (Cribrilaria) scripta</i> (Reuss, 1848)					
<i>Puellina (Cribrilaria) setiformis romana</i> Harmelin & Aristegui, 1988					
<i>Puellina (Cribrilaria) venusta</i> (Canu & Bassler, 1925)					
<i>Puellina (Glabrilaria) pedunculata</i> (Gautier, 1956)					
<i>Puellina (Glabrilaria) corbula</i> Bishop & Househam, 1987					
<i>Puellina (Glabrilaria) orientalis orientalis</i> Harmelin & Aristegui, 1988					
<i>Puellina (Glabrilaria) orientalis lusitanica</i> (Harmelin, 1988)					
<i>Puellina (Puellina) gattyae</i> (Landsborough, 1852)					
<i>Puellina (Puellina) setosa</i> (Waters, 1899)					
Catenicellidae Busk, 1852		*			
<i>Catenicella</i> de Blainville, 1830		*			
<i>Catenicella paradoxa</i> Rosso, 2009		*		*	
Savignyellidae Levinsen, 1909					
<i>Savignyella</i> Levinsen, 1909					
<i>Savignyella lafontii</i> (Audouin, 1826)					
Hippothoidae Busk, 1859					
<i>Celleporella</i> Gray, 1848					
<i>Celleporella carolinensis</i> Ryland, 1979		*		*	
<i>Celleporella hyalina</i> (Linnaeus, 1767)					
<i>Hippothoa</i> Lamouroux, 1821					
<i>Hippothoa divaricata</i> Lamouroux, 1821					
<i>Hippothoa flagellum</i> Manzoni, 1870					
Chorizoporidae Vigneaux, 1949					
<i>Chorizopora</i> Hincks, 1879					
<i>Chorizopora brongniartii</i> (Audouin, 1826)					
Trypostegidae Gordon, Tilbrook & Winston in Winston 2005					
<i>Trypostega</i> Levinsen, 1909					
<i>Trypostega claviculata</i> (Hincks, 1884)					
<i>Trypostega venusta</i> (Norman, 1864)					
Haplopomidae Gordon in De Blauwe, 2009		*			
<i>Haplopoma</i> Levinsen, 1909					
<i>Haplopoma bimucronatum bimucronatum</i> (Moll, 1803)					
<i>Haplopoma bimucronatum occiduum</i> (Waters, 1879)					
<i>Haplopoma graniferum graniferum</i> (Johnston, 1847)					
<i>Haplopoma graniferum carinatum</i> (Calvet, 1902)					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Haplopoma impressum</i> (Audouin, 1826)					
<i>Haplopoma sciaphilum</i> Silén & Harmelin, 1976					
Pasytheidae Davis, 1934	*				
Gemellipora Smitt, 1873	*				
<i>Gemellipora</i> sp. cf. <i>eburnea</i> (Smitt, 1873)	*		*		59
Exechonellidae Harmer, 1957					
Exechonella Duvergier, 1924					
<i>Exechonella antillea</i> (Osburn, 1927)					
Adeonidae Busk, 1884					
Adeonella Busk, 1884					
<i>Adeonella calveti</i> Canu & Bassler, 1930					
<i>Adeonella flabellata</i> Rosso & Novosel, 2010	*				
<i>Adeonella pallasii</i> (Heller, 1867)					
<i>Adeonella pozarae</i> Rosso & Novosel, 2010	*				
Adeonellopsis MacGillivray, 1886					
<i>Adeonellopsis distoma</i> (Busk, 1858)					
Anarthropora Smitt, 1868					
<i>Anarthropora monodon</i> (Busk, 1860)					
Reptadeonella Busk, 1884					
<i>Reptadeonella insidiosa</i> (Jullien & Calvet, 1903)					
<i>Reptadeonella violacea</i> (Johnston, 1847)					
Lepraliellidae Vigneaux, 1949					
Celleporaria Lamouroux, 1821	*				60
<i>Celleporaria aperta</i> (Hincks, 1882)	*			*	61
<i>Celleporaria brunnea</i> (Hincks, 1884)	*			*	62
<i>Celleporaria</i> sp. aff. <i>brunnea</i> (Hincks, 1884)	*			*	63
<i>Celleporaria fusca</i> (Busk, 1854)	*			*	64
<i>Celleporaria labelligera</i> Harmer, 1957	*			*	65
? <i>Celleporaria sherryae</i> Winston, 2005	*			*	66
<i>Celleporaria vermiformis</i> (Waters, 1909)	*			*	67
Drepanophora Harmer, 1957	*				68
<i>Drepanophora birbira</i> Powell, 1967	*			*	68
Bryocryptellidae Vigneaux, 1949					
Bryocryptella Cossman, 1906					
<i>Bryocryptella koehleri</i> (Calvet, 1896)					
<i>Bryocryptella tubulata</i> (Busk, 1861)			*		69
Buchneria Harmer, 1957					
<i>Buchneria fayalensis</i> (Waters, 1888)					
Palmiskenea Bishop & Hayward, 1989					
<i>Palmiskenea gautieri</i> Madurell, Zabala, Domínguez-Carrió & Gili, 2013	*				70
<i>Palmiskenea skenei</i> (Ellis & Solander, 1786)					
Porella Gray, 1848					
<i>Porella concinna concinna</i> (Busk, 1854)					
<i>Porella concinna tubulata</i> Calvet, 1927					
<i>Porella laevis</i> (Fleming, 1828)		*			71
<i>Porella minuta</i> (Norman, 1868)					
Romancheinidae Jullien, 1888	*				72
Escharella Gray, 1848					
<i>Escharella acuta</i> Zabala, Maluquer & Harmelin, 1993					
<i>Escharella immersa</i> (Fleming, 1828)					
<i>Escharella longicollis</i> (Jullien, 1882)					
<i>Escharella octodentata</i> (Hincks, 1880)					
<i>Escharella prealta</i> (Calvet, 1907)					
<i>Escharella quadrata</i> López de la Cuadra & García-Gómez, 2001	*				
<i>Escharella rylandi</i> Geraci, 1974					
<i>Escharella variolosa</i> (Johnston, 1838)					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Escharella ventricosa</i> (Hassall, 1842)					
Escharoides Milne-Edwards, 1836					
<i>Escharoides coccinea</i> (Abildgaard, 1806)					
<i>Escharoides mamillata</i> (Wood, 1844)					
<i>Escharoides megarostris</i> (Canu & Bassler, 1928)					
Hemicyclopora Norman, 1894					
<i>Hemicyclopora collarina</i> Canu & Lecointre, 1930	*				73
<i>Hemicyclopora dentata</i> López de la Cuadra & Garcia-Gómez, 1991					
<i>Hemicyclopora discrepans</i> (Jullien & Calvet, 1903)					
<i>Hemicyclopora multispinata</i> (Busk, 1861)					
Hippopleurifera Canu & Bassler, 1925					
<i>Hippopleurifera pulchra</i> (Manzoni, 1870)					
Neolagenipora Vigneaux, 1949					
<i>Neolagenipora collaris</i> (Norman, 1967)	*				74
<i>Neolagenipora eximia</i> (Hincks, 1860)					
Umbonulidae Canu, 1904					
Umbonula Hincks, 1880					
<i>Umbonula ovicellata</i> Hastings, 1944					
Tessaradomidae Jullien & Calvet, 1903					
Tessaradoma Norman, 1869					
<i>Tessaradoma boreale</i> (Busk, 1860)					
Jaculinidae Zabala, 1986					
Jaculina Jullien & Calvet, 1903					
<i>Jaculina blanchardi</i> Jullien & Calvet, 1903					
<i>Jaculina parallelata</i> (Waters, 1895)					
<i>Jaculina tessellata</i> Hayward, 1979					
Smittinidae Levinsen, 1909					
Parasmittina Osburn, 1952					
<i>Parasmittina aegyptiaca</i> (Waters, 1909)	*			*	75
<i>Parasmittina parsevalii</i> (Audouin, 1826)	*			*	76
<i>Parasmittina protecta</i> (Thornely, 1905)	*			*	77
<i>Parasmittina raigii</i> (Audouin, 1826)				*	78
<i>Parasmittina rouvillei</i> (Calvet, 1902)					
<i>Parasmittina serruloides</i> Harmelin, Bitar & Zibrowius, 2009	*			*	79
<i>Parasmittina spondylicula</i> Harmelin, Bitar & Zibrowius, 2009	*			*	79
<i>Parasmittina trispinosa</i> (Johnston, 1838)					80
Phylactella Hincks, 1879					
<i>Phylactella mediterranea</i> Rosso, 2004					
Prenantia Gautier, 1962					
<i>Prenantia cheilostoma</i> (Manzoni, 1869)					
<i>Prenantia inerma</i> (Calvet, 1906)	*				81
<i>Prenantia ligulata</i> (Manzoni, 1870)					
Smittina Norman, 1903					
<i>Smittina affinis</i> (Hincks, 1862)					
<i>Smittina cervicornis</i> (Pallas, 1766)					
<i>Smittina colleti</i> (Jullien & Calvet, 1903)					
<i>Smittina crystallina</i> (Norman, 1867)					
<i>Smittina landsborovii</i> (Johnston, 1847)					
<i>Smittina nitidissima</i> (Hincks, 1880)			*	*	82
<i>Smittina remotorostrata</i> (Canu & Bassler, 1928)					
Smittoidea Osburn, 1952					
<i>Smittoidea marmorea</i> (Hincks, 1877)					
<i>Smittoidea ophidiana</i> (Waters, 1879)					
<i>Smittoidea reticulata</i> (MacGillivray, 1842)					
Bitectiporidae MacGillivray, 1895					
Hippoporina Neviani, 1895					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Hippoporina lineolifera</i> (Hincks, 1886)					
<i>Hippoporina pertusa</i> (Esper, 1796)					
<i>Hippoporina teresae</i> Souto, Reverter-Gil & Fernández-Pulpeiro, 2010	*				
Metropieriella Canu & Bassler, 1917					
<i>Metropieriella gay</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2009	*				83
<i>Metropieriella lepralioides</i> (Calvet, 1903)					
Pentapora Fischer, 1807					
<i>Pentapora fascialis</i> (Pallas, 1766)					
<i>Pentapora ottomuelleriana</i> (Moll, 1803)					
Schizomavella Canu & Bassler, 1917					84
<i>Schizomavella adriatica</i> Reverter-Gil, Souto, Novosel & Tilbrook, 2016	*				
<i>Schizomavella mystacea</i> Reverter-Gil, Souto, Novosel & Tilbrook, 2016	*				
<i>Schizomavella rosae</i> Reverter-Gil, Souto, Novosel & Tilbrook, 2016	*				
<i>Schizomavella rudis</i> (Manzoni, 1869)					85
<i>Schizomavella stanislavi</i> Reverter-Gil, Souto, Novosel & Tilbrook, 2016	*				
<i>Schizomavella tubulata</i> Reverter-Gil, Souto, Novosel & Tilbrook, 2016	*				
<i>Schizomavella (Calvetomavella) discoidea</i> (Busk, 1859)					86
<i>Schizomavella (Calvetomavella) neptuni</i> (Jullien, 1882)			*		87
<i>Schizomavella (Schizomavella) asymetrica</i> (Calvet, 1927)					
<i>Schizomavella (Schizomavella) cornuta</i> (Heller, 1867)					88
<i>Schizomavella (Schizomavella) fischeri</i> (Jullien, 1882)	*				89
<i>Schizomavella (Schizomavella) gautieri</i> Reverter-Gil & Fernández-Pulpeiro, 1997	*				
<i>Schizomavella (Schizomavella) grandiporosa</i> Canu & Bassler, 1925	*				90
<i>Schizomavella (Schizomavella) halimeda</i> (Gautier, 1955)	*				
<i>Schizomavella (Schizomavella) hastata</i> (Hincks, 1862)					91
<i>Schizomavella (Schizomavella) hirsuta</i> (Calvet, 1927)					
<i>Schizomavella (Schizomavella) inordinata</i> Canu & Bassler, 1930					
<i>Schizomavella (Schizomavella) linearis</i> (Hassall, 1841)					
<i>Schizomavella (Schizomavella) mamillata</i> (Hincks, 1880)					
<i>Schizomavella (Schizomavella) subsolana</i> Hayward & McKinney, 2002					
<i>Schizomavella (Schizomavella) teresae</i> Reverter-Gil & Fernández-Pulpeiro, 1996					
<i>Schizomavella (Schizomavella) triangularis</i> Reverter-Gil & Fernández-Pulpeiro, 1997					
Lanceoporidae Harmer, 1957					
Calypthotheca Harmer, 1957					
<i>Calypthotheca obscura</i> Harmelin, López de la Cuadra & Garcia-Gómez, 1989					
<i>Calypthotheca rugosa</i> Hayward, 1974					
Stephanotheca Reverter-Gil, Souto & Fernández-Pulpeiro, 2012	*				92
<i>Stephanotheca arrogata</i> (Waters, 1879)		*			
<i>Stephanotheca barrosoi</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2012	*				
<i>Stephanotheca monoecensis</i> (Calvet, 1927)					
<i>Stephanotheca perforata</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2012	*				
<i>Stephanotheca triangulata</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2012	*				
<i>Stephanotheca watersi</i> Reverter-Gil, Souto & Fernández-Pulpeiro, 2012	*				
Watersiporidae Vigneaux, 1949					
Watersipora Neviani, 1896					
<i>Watersipora arcuata</i> Banta, 1969	*			*	93
<i>Watersipora complanata</i> (Norman, 1864)					94
<i>Watersipora cucullata</i> (Busk, 1854)					
<i>Watersipora souleorum</i> Vieira, Spencer Jones & Taylor, 2014	*				95
<i>Watersipora subtorquata</i> (d'Orbigny, 1852)				*	96
Schizoporellidae Jullien, 1882					
Schizobrachiella Canu & Bassler, 1920					
<i>Schizobrachiella sanguinea</i> (Norman, 1868)					
Schizoporella Hincks, 1877					
<i>Schizoporella dunkeri</i> (Reuss, 1848)					
<i>Schizoporella errata</i> (Waters, 1878)					97

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Schizoporella magnifica</i> (Hincks, 1886)					
<i>Schizoporella mutabilis</i> Calvet, 1927					
<i>Schizoporella patula</i> Hayward & Ryland, 1995	*			*?	98
<i>Schizoporella tetragona</i> (Reuss, 1848)					
<i>Schizoporella unicornis</i> (Johnston, 1844)					
<i>Schizoporella</i> sp. 1 <i>sensu</i> Chimenz Gusso <i>et al.</i> , 2014	*				99
<i>Schizoporella</i> sp. 2 <i>sensu</i> Chimenz Gusso <i>et al.</i> , 2014	*				100
<i>Schizoporella</i> sp. 3 <i>sensu</i> Chimenz Gusso <i>et al.</i> , 2014	*				101
Stylopoma Levinsen, 1909					102
<i>Stylopoma inchoans</i> Tilbrook, 2000				*?	102
Margarettidae Harmer, 1957					
Margaretta Gray, 1843					
<i>Margaretta cereoides</i> (Ellis & Solander, 1786)					
Myriaporidae Gray, 1841					
Myriapora de Blainville, 1830					
<i>Myriapora truncata</i> (Pallas, 1766)					
Hippopodinidae Levinsen, 1909					
Hippopodina Levinsen, 1909					
<i>Hippopodina ambita</i> (Hayward, 1974)					103
<i>Hippopodina feegeensis</i> (Busk, 1884)				*	104
<i>Hippopodina iririkiensis</i> Tilbrook, 1999				*	105
Escharinidae Tilbrook, 2006	*				106
Escharina Milne-Edwards, 1836					
<i>Escharina dutertrei protecta</i> Zabala, Maluquer & Harmelin, 1993					
<i>Escharina johnstoni</i> (Quelch, 1884)					
<i>Escharina vulgaris</i> (Moll, 1803)					
Herentia Gray, 1848	*				
<i>Herentia hyndmanni</i> (Johnston, 1847)		*			
Hippomenella Canu & Bassler, 1917					
<i>Hippomenella mucronelliformis</i> (Waters, 1899)					
Therenia David & Pouyet, 1978					
<i>Therenia rosei</i> Berning, Tilbrook & Rosso, 2008				*	
<i>Therenia majae</i> Berning, Tilbrook & Rosso, 2008	*				
Cryptosulidae Vigneaux, 1949					
Cryptosula Canu & Bassler, 1925					
<i>Cryptosula pallasiana</i> (Moll, 1803)					
Cheiloporinidae Bassler, 1936					
Cheiloporina Canu & Bassler, 1923					
" <i>Cheiloporina</i> " <i>circumcincta</i> (Neviani, 1896)					
Teuchoporidae Neviani, 1895					
Theuchopora Neviani, 1895					
<i>Theuchopora edwardsi</i> (Jullien, 1882)					
Phoceanidae Vigneaux, 1949					
Phoceana Jullien & Calvet, 1903					
<i>Phoceana columnaris</i> Jullien & Calvet, 1903					
<i>Phoceana tubulifera</i> (Heller, 1867)					
Sertulipora Harmelin & d'Hondt, 1992	*				
<i>Sertulipora guttata</i> Harmelin & d'Hondt, 1992	*				107
Hippaliosinidae Winston, 2005	*				108
Hippaliosina Canu, 1918					
<i>Hippaliosina acutirostris</i> Canu & Bassler, 1929	*			*	109
<i>Hippaliosina depressa</i> (Busk, 1854)					
Microporellidae Hincks, 1879					
Calloporina Neviani, 1895					
<i>Calloporina decorata</i> (Reuss, 1847)					110
Diporula Hincks, 1879					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Diporula verrucosa</i> (Peach, 1868)					
Fenestrulina Jullien, 1888					
<i>Fenestrulina barrosoi</i> Alvarez, 1993	*				111
<i>Fenestrulina joannae</i> (Calvet, 1902)					
<i>Fenestrulina juani</i> Souto, Reverter-Gil & Fernández-Pulpeiro, 2010	*				
<i>Fenestrulina malusii</i> (Audouin, 1826)					
Microporella Hincks, 1877					
<i>Microporella appendiculata</i> (Heller, 1867)					
<i>Microporella browni</i> Harmelin, Ostrowsky, Cáceres-Chamizo & Sanner, 2011	*			*	112
<i>Microporella</i> gr. <i>ciliata</i> (Pallas, 1766)					113
<i>Microporella coronata</i> (Audouin, 1826)			*	*	114
<i>Microporella genisii</i> (Audouin, 1826)	*			*	115
<i>Microporella harmeri</i> Hayward, 1988	*			*	116
<i>Microporella marsupiata</i> (Busk, 1860)					
<i>Microporella orientalis</i> Harmer, 1957					117
Robertsonidridae Rosso, 2010	*				
Bertorsonidra Rosso, 2010	*				
<i>Bertorsonidra prenanti</i> (Gautier, 1955)			*		
Petraliellidae Harmer, 1957	*				118
Mucropetraliella Stach, 1936	*				118
<i>Mucropetraliella thenardii</i> (Audouin, 1826)	*			*	118
Lacernidae Jullien, 1888					
Arthropoma Levinsen, 1909					
<i>Arthropoma cecilii</i> (Audouin, 1826)					
Cribellopora Gautier, 1957					
<i>Cribellopora simplex</i> Gautier, 1957	*				119
<i>Cribellopora trichotoma</i> (Waters, 1918)					
Crepidacanthidae Levinsen, 1909					
Crepidacantha Levinsen, 1909					
<i>Crepidacantha poissonii</i> (Audouin, 1826)				*	
Cleidochasmatidae Cheetham & Sandberg, 1964					
Cleidochasmidra Ünsal & d'Hondt, 1979					
<i>Cleidochasmidra portisi</i> (Neviani, 1895)			*		120
Characodoma Maplestone, 1900					
<i>Characodoma mamillatum</i> (Seguenza, 1879)					
<i>Characodoma oranense</i> (Waters, 1918)					
Colatooeciidae Winston, 2005	*				
Trematooecia Osburn, 1940					
<i>Trematooecia ligulata</i> Ayari & Taylor, 2008			*		
<i>Trematooecia mikeli</i> Sokolover, Taylor & Ilan, 2016	*			*	121
Celleporidae Johnston, 1838					
Buffonellaria Canu & Bassler, 1917					122
<i>Buffonellaria antoniettae</i> Berning & Kuklinski, 2008	*		*P		
<i>Buffonellaria harmelini</i> Berning & Kuklinski, 2008	*		*P		
<i>Buffonellaria muriella</i> Berning & Kuklinski, 2008	*		*P		
<i>Buffonellaria</i> sp. 1 Berning & Kuklinski, 2008	*		*P		
Buskea Heller, 1867					
<i>Buskea dichotoma</i> (Hincks, 1862)					
<i>Buskea nitida</i> Heller, 1867					
Cellepora Linnaeus, 1767					
<i>Cellepora adriatica</i> Hayward & McKinney, 2002					
<i>Cellepora posidoniae</i> (Hayward, 1975)					
<i>Cellepora pumicosa</i> (Pallas, 1766)			*		123
Celleporina Gray, 1848					
<i>Celleporina bitari</i> Harmelin, 2014	*			*	124
<i>Celleporina caminata</i> (Waters, 1879)			*		125

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Celleporina canariensis</i> Aristegui, 1989					
<i>Celleporina decipiens</i> Hayward, 1976					
<i>Celleporina hassalli</i> (Johnston, 1847)					
<i>Celleporina lucida</i> (Hincks, 1880)					
<i>Celleporina mediterranea</i> Souto, Reverter-Gil & De Blauwe, 2014	*				
<i>Celleporina siphuncula</i> Hayward & McKinney, 2002					
<i>Celleporina truncatorostris</i> (Canu & Bassler, 1930)	*				126
<i>Celleporina tubulosa</i> (Hincks, 1880)					
Lagenipora Hincks, 1877					
<i>Lagenipora lepralioides</i> (Norman, 1868)					
<i>Lagenipora</i> sp. <i>sensu</i> Zabala & Maluquer, 1988					
Omalosecosa Canu & Bassler, 1925					
<i>Omalosecosa ramulosa</i> (Linnaeus, 1767)					
Palmicellaria Alder, 1864					
<i>Palmicellaria elegans</i> Alder, 1864					
Predanophora Tilbrook, 2006	*				127
<i>Predanophora longiuscula</i> (Harmer, 1957)	*			*	127
Turbicellepora Ryland, 1963					
<i>Turbicellepora avicularis</i> (Hincks, 1860)					
<i>Turbicellepora camera</i> Hayward, 1978					
<i>Turbicellepora cantabra</i> (Barroso, 1919)					
<i>Turbicellepora coronopus</i> (Wood, 1844)					
<i>Turbicellepora coronopusoida</i> (Calvet, 1931)					
<i>Turbicellepora crenulata</i> Hayward, 1978					
<i>Turbicellepora magnicostata</i> (Barroso, 1919)					
<i>Turbicellepora robusta</i> (Barroso, 1921)	*				128
<i>Turbicellepora torquata</i> Hayward, 1978					
<i>Turbicellepora tubigera</i> (Busk, 1859)					
Hippoporidridae Vigneaux, 1949					
Hagiosynodos Bishop & Hayward, 1989					129
<i>Hagiosynodos hadros</i> Hayward & McKinney, 2002					
<i>Hagiosynodos latus</i> (Busk, 1856)					
<i>Hagiosynodos strophiae</i> (Canu & Bassler, 1930)	*				130
Hippoporidra Canu & Bassler, 1927					
<i>Hippoporidra picardi</i> Gautier, 1962					
Scorpiodinipora Balavoine, 1959	*				131
<i>Scorpiodinipora costulata</i> (Canu & Bassler, 1929)	*			*	131
Phidoloporidae Gabb & Horn, 1862					
Crenulatella Sokolover, Taylor & Ilan, 2016	*				
<i>Crenulatella levantinisensis</i> Sokolover, Taylor & Ilan, 2016	*			*?	
Dentiporella Barroso, 1926					
<i>Dentiporella sardonica</i> (Waters, 1879)					132
Hippellozoon Canu & Bassler, 1917					
<i>Hippellozoon mediterraneum</i> (Waters, 1895)					
Plesioleidochasma Soule, Soule & Chaney, 1991					133
<i>Plesioleidochasma mediterraneum</i> Chimenz Gusso & Soule, 2003					134
<i>Plesioleidochasma porcellaniforme</i> (Soule, Soule & Chaney, 1991)		*			135
Reteporellina Harmer, 1933					
<i>Reteporellina delicatula</i> Hayward, 1974					
Reteporella Busk, 1884					
<i>Reteporella aporosa</i> (Waters, 1894)					
<i>Reteporella beaniana</i> (King, 1846)					
<i>Reteporella complanata</i> (Waters, 1894)					
<i>Reteporella couchii couchii</i> (Hincks, 1878)					
<i>Reteporella couchii biaviculata</i> (Waters, 1894)					
<i>Reteporella elegans</i> Harmelin, 1976					

(continued)

Table 1 (continued)

Mediterranean Bryozoa	A	B	C	NIB	R
<i>Reteporella feuerborni</i> Hass, 1948					
<i>Reteporella grimaldii</i> (Jullien & Calvet, 1903)					
<i>Reteporella harmeri</i> Hass, 1948					
<i>Reteporella jermanensis</i> (Waters, 1909)				*	136
<i>Reteporella mediterranea</i> Hass, 1948					
<i>Reteporella pelecanus</i> López de la Cuadra & Garcia-Gómez, 2001	*				
<i>Reteporella soudbournensis</i> (Gautier, 1962)					
<i>Reteporella sparteli</i> (Calvet, 1906)					
<i>Reteporella</i> sp. <i>sensu</i> Sokolover, Taylor & Ilan, 2016	*				137
Rhynchozoon Hincks, 1895					
<i>Rhynchozoon bispinosum</i> (Johnston, 1847)					
<i>Rhynchozoon digitatum</i> (Waters, 1879)					
<i>Rhynchozoon larreyi</i> (Audouin, 1826)				*	138
<i>Rhynchozoon neapolitanum</i> Gautier, 1962					
<i>Rhynchozoon pseudodigitatum</i> Zabala & Maluquer, 1988					
<i>Rhynchozoon quadrispinatum</i> Zabala & Maluquer, 1988					
<i>Rhynchozoon</i> sp.1 <i>sensu</i> Hayward, 1974					
Schizoretepora Gregory, 1893					
<i>Schizoretepora hassi</i> Harmelin, Bitar & Zibrowius, 2007	*			*	139
<i>Schizoretepora imperati</i> (Busk, 1884)					140
<i>Schizoretepora longisetae</i> (Canu & Bassler, 1928)					
<i>Schizoretepora serratimargo</i> (Hincks, 1886)		*			
<i>Schizoretepora solanderia</i> (Risso, 1826)					
Schizotheca Hincks, 1877					
<i>Schizotheca fissa</i> (Busk, 1856)					
<i>Schizotheca tuberigera</i> (Jullien & Calvet, 1903)					
Stephanollona Duvergier, 1920					
<i>Stephanollona armata</i> (Hincks, 1861)					
Triphyllozoon Canu & Bassler, 1917					
<i>Triphyllozoon hirsutum</i> (Busk, 1884)					

(e.g., Taylor & Mawatari, 2005; Tilbrook, 2006; bryozoa.net, accessed 16.2.2016).

A high generic diversity characterises also the ctenostome genus *Amathia*, presently including 13 species from the Mediterranean, contrasting with the 6 species reported by Rosso (2003). This remarkable increase derives from the inclusion of species previously assigned to *Bowerbankia* and *Zoobotryon* (see Tab. 1, Appendix 2) in *Amathia* (Waeschenbach *et al.*, 2015). Conversely, the revisions of *Scrupocellaria* by Vieira & Spencer Jones (2012) and Vieira *et al.* (2013a, 2013b, 2014a) have lowered the number of Mediterranean species assigned to the genus to 6, compared with the 11 reported by Rosso (2003). This is due to the resurrection of *Licornia* and the creation of two new genera, *Cradoscrupocellaria* and *Scrupocaberea*, into which respectively 2, 7 and 1 species from the Mediterranean have been transferred. A similar trend characterises *Bugula*, which declines from 16 to 3 species following the transfer of most of its Mediterranean species into *Bugulina* (9 spp.) and *Crisularia* (4 spp.) by Fehlaue-Ale *et al.* (2015).

Celleporaria, absent in Rosso (2003), is now represented by 7 species all considered as non-indigenous. Ten

genera, namely *Tubulipora* (6 spp.), *Plagioecia* (6 spp.), *Haplopoma* (6 spp.), *Stephanotheca* (6 spp.), *Entalophoroecia* (5 spp.), *Patinella* (5 spp.), *Electra* (5 spp.), *Aetea* (5 spp.), *Callopora* (5 spp.) and *Watersipora* (5 spp.), have intermediate diversities.

Nearly 50% of the genera found in the Mediterranean are monospecific, with the highest percentage for ctenostomes (56%), while cyclostomes and cheilostomes share similar values slightly over 46%.

Current versus previous estimates of Mediterranean bryodiversity

Compared to the previous compilation of Rosso (2003), the total number of species has increased from 475 to 556. The 81 new entries mostly consist of newly erected species or derive from the revision of the material housed in the collections of the Natural History Museum, London and the Muséum National d'Histoire Naturelle, Paris, which has led to the identification of new species in some genera, as well as to the erection of new genera and the transfer of existing species to them. This is the case for the bitectiporid genus *Schizomavella* with the newly erected subgenus, *Calvetomavella*, and the mor-

Table 2. Bryozoan diversity in the Mediterranean Sea. For each family the number of genera and species is reported. Total values for orders, classes and the phylum are given in bold.

	F	G	Sp		F	G	Sp
BRYOZOA	93	212	556	Cheilostomatida			
STENOLAEMATA	11	26	75	Beaniidae		1	4
Cyclostomatida	11	26	75	Epistomiidae		2	2
Stomatoporidae		1	2	Candidae		6	18
Oncousoeciidae		5	7	Microporidae		5	8
Tubuliporidae		3	10	Setosellidae		1	3
Plagioeciidae		4	9	Onychoceiidae		2	4
Terviidae		1	1	Chlidoniidae		1	1
Annectocymidae		3	9	Cellariidae		2	5
Entalophoridae		1	1	Monoporellidae		1	1
Fron diporidae		1	1	Cribrilinidae		6	25
Crisiidae		4	19	Catenicellidae		1	1
Horneridae		1	2	Savignyellidae		1	1
Lichenoporidae		2	14	Hippothoidae		2	4
GYMNOLAEMATA	82	186	481	Chorizoporidae		1	1
Ctenostomatida	18	27	57	Trypostegidae		1	2
Benedeniporidae		1	2	Haplopomidae		1	6
Alcyonidiidae		3	10	Pasytheidae		1	1
Clavoporidae		2	3	Exechonellidae		1	1
Pherusellidae		1	2	Adeonidae		4	8
Victorellidae		3	3	Lepraliellidae		2	8
Nolellidae		1	2	Bryocryptellidae		4	9
Immergentiidae		1	1	Romancheinidae		5	19
Vesiculariidae		2	14	Umbonulidae		1	1
Buskiidae		1	2	Tessaradomidae		1	1
Triticellidae		2	3	Jaculinidae		1	3
Aeverilliidae		1	1	Smittinidae		5	22
Farrellidae		1	1	Bitectiporidae		4	29
Walkeriiidae		1	3	Lanceoporidae		2	8
Mimosellidae		2	3	Watersiporidae		1	5
Hypophorellidae		1	1	Schizoporellidae		3	12
Arachnidiidae		2	3	Margarettidae		1	1
Spathiporidae		1	2	Myriaporidae		1	1
Penetrantiidae		1	1	Hippopodinidae		1	3
Cheilostomatida	64	159	424	Escharinidae		4	7
Aeteidae		1	5	Cryptosulidae		1	1
Scrupariidae		1	2	Cheiloporinidae		1	1
Eucrateidae		1	1	Teuchoporidae		1	1
Membraniporidae		2	3	Phoceanidae		2	3
Electridae		5	12	Hippaliosinidae		1	2
Tendridae		1	1	Microporellidae		4	14
Thalamoporellidae		1	4	Robertsonidridae		1	1
Calloporidae		12	23	Petralliellidae		1	1
Antroporidae		2	2	Lacernidae		2	3
Cymuloporidae		1	1	Crepidacanthidae		1	1
Chaperiidae		1	2	Cleidochasmatidae		2	3
Heliodomidae		1	2	Colatoeciidae		1	2
Cupuladriidae		2	4	Celleporidae		9	34
Flustridae		5	9	Hippoporidridae		3	5
Bugulidae		6	19	Phidoloporidae		11	37

phologically similar lanceoporid genus *Stephanotheca* (Reverter-Gil *et al.*, 2012a, 2015). Nine new species were described as thriving exclusively in the Mediterranean or having a wider distribution including this basin (Tab. 1, Appendix 2). A large impact has been caused within the Candidae by the revision of *Scrupocellaria*

(see above) and the description of four new species living in the Mediterranean. The same is true for *Buffonellaria* (Berning & Kukliński, 2008), *Therenia* (Berning *et al.*, 2008) and *Adeonella* (Rosso & Novosel, 2010). These revisions have led to the erection of new species and to the recognition of others still undescribed, as well

Table 3. List of equivocal reports of bryozoan species from the Mediterranean requiring a revision of the type material to ascertain their validity. A. Species erected by Heller (1867) and only occasionally subsequently reported, but considered as unidentifiable in the checklist for the Adriatic Sea by Novosel & Požar-Domac (2001). Brusina (1907) and Friedl (1918), *vide* Novosel & Požar-Domac (2001). B. Species erected by Canu & Bassler (1930) from off Tunisia. C. Species erected by O'Donoghue & de Watteville (1939) from off Alexandria (Egypt).

A. Species erected by Heller (1867)	
<i>Alecto johnstoni</i>	also in Brusina (1907)
<i>Alecto parasitica</i>	
<i>Cellepora corticalis</i>	also in Friedl (1918)
<i>Cellepora hincksii</i>	
<i>Discosparsa annularis</i>	also in Brusina (1907)
<i>Escharina vulgaris</i> var. <i>botterii</i>	also in Friedl (1918)
<i>Escharina vulgaris</i> var. <i>stossichi</i>	also in Friedl (1918)
<i>Lepralia foraminifera</i>	
<i>Lepralia perugiana</i>	
<i>Lepralia stossici</i>	
<i>Membranipora rostrata</i>	
B. Species erected by Canu & Bassler (1930)	
<i>Schizellozoon granulosum</i>	Never reported after its introduction, it is considered as an invalid species in Bryozoa (accessed 12.2.2016).
<i>Schizopodrella elliptica</i>	This species has been allocated in <i>Schizoporella</i> by Gautier (1962) and in <i>Schizomavella</i> by Ayari & Taylor (2014). Zabala (1986) stated that this species and the following two might be synonyms with other species.
<i>Schizopodrella erectorostris</i>	Reported in Bock (www.bryozoa.net) and WoRMS as <i>Schizoporella erectorostris</i> (accessed 12.2.2016).
<i>Schizopodrella grandicella</i>	Reported in Bock (www.bryozoa.net) and WoRMS as <i>Schizoporella grandicella</i> (accessed 12.2.2016).
<i>Schismopora truncatorostris</i>	Reported exclusively by Ayari & Taylor (2014) within the genus <i>Celleporina</i> although usually allocated in <i>Turbicellepora</i> in Bock (www.bryozoa.net) and WoRMS (accessed 12.2.2016).
C. Species erected by O'Donoghue & de Watteville (1939)	
<i>Vibracellina mediterranea</i>	Both are considered as valid species, but the descriptions and drawings provided by the authors are insufficient to discriminate these species from similar ones. The revision of the type material is critical to ascertain their current validity.
<i>Schizomavella alexandriae</i>	

as to questioning the presence of some species. Species new to science are also recognised in *Schizoporella* (Chimenz Gusso *et al.*, 2014), *Microporella* (AR & EDM, unpublished data), and other taxa left in open nomenclature (see Tab. 1). A single species was also described for *Celleporina* (Souto *et al.*, 2015) and *Watersipora* (Vieira *et al.*, 2014b). These species, although representing new entries for the present compilation, were all present in the Mediterranean at least since the time of their collection, often dating back to the beginning of the 20th century or even the second half of the 19th century.

New collections, essentially made during the last decade, have added mainly non-indigenous species (Tab. 1, Fig. 4, Appendix 2). Sampling efforts in the Levantine Sea have allowed the assessment of biodiversity along the coasts of Israel and Lebanon (Harmelin, 2014; Harmelin *et al.*, 2016; Sokolover *et al.*, 2016), establishing the first Mediterranean records for several species known from the Red Sea and the Indian Ocean and subordinately from other regions. Interestingly, most of the non-indigenous species belong to a few genera. With seven species, *Celle-*

poraria is the most diverse, followed by *Parasmittina* (3 spp.), *Microporella* (2 spp.), and *Proboscina*, *Conopeum*, *Akatopora*, *Smittina*, *Scorpionidipora*, *Mucropetraliella* and *Predanophora* with one species each (Harmelin, 2014; Harmelin *et al.*, 2016; Sokolover *et al.*, 2016). Mostly localised in the eastern sector (Koçak, 2007; Zenetos *et al.*, 2012; Harmelin, 2014; Harmelin *et al.*, 2016), a few species have wider distributions throughout the Mediterranean, such as *Celleporaria brunnea* (see Lodola *et al.*, 2015) and *Smittina nitidissima* (see Rosso *et al.*, in press). In contrast, single species, such as *Watersipora arcuata*, have been reported as non-indigenous bryozoans (NIBs) exclusively from other Mediterranean regions (Ferrario *et al.*, 2015). Subordinate, but numerous, are NIB additions consisting of new species erected for specimens from the Mediterranean but considered native to other seas. Almost all NIBs are from the Levantine Sea and include *Parasmittina serruloides* and *P. spondylicola*, *Celleporina bitari*, *Microporella browni*, *Trematoecia mikeli* and *Schizoretopena hassi* among others (Harmelin *et al.*, 2007, 2009, 2011, 2016; Harm-

Table 4. List of questionable reports of bryozoan species from the Mediterranean in ‘old’ papers and subsequently in modern compilations. The validity of all these species and/or their presence in the Mediterranean needs verification. A. Species listed in Novosel & Požar-Domac (2001) from the Adriatic Sea based on records from taxonomists and ecologists working between the second part of the 19th and the first part of the 20th centuries. Some of these species were erected based on Eocene material and have already been considered as unidentifiable by Novosel & Požar-Domac (2001). Grube (1861), Lorenz (1863), Brusina (1907), Friedl (1918), Vátova (1928), Kolosvári (1943), Gamulin-Brida *et al.* (1968), Zavodnik & Zavodnik (1982; 1984) and Seneš (1988a; 1988; 1989) *vide* Novosel & Požar-Domac (2001). B. Species reported in Koçak & Ayden Önen (2014) for seas around Turkey. Their known distribution outside the Mediterranean may point to potential misidentification. Alternatively, the Mediterranean occurrences if proven, may be interpreted as the result of human-mediated introductions. Ostroumoff (1896) and Pinar (1974), *vide* Koçak & Ayden Önen (2014).

A. Species reported by Novosel & Požar-Domac (2001)	
<i>Adeonella lichenoides</i> (Lamarck, 1816)	in Heller (1867) and Friedl (1918)
<i>Aetea truncata</i> forma <i>pygmaea</i> Hincks, 1886	in Friedl (1918)
<i>Amphiblestrum solidum</i> (Packard, 1863)	in Friedl (1918)
<i>Bowerbankia pustulosa</i> var. <i>biserialis</i> (Hincks, 1887)	in Friedl (1918)
<i>Carbasea pusilla</i> (Hincks, 1887)	in Friedl (1918) and Vátova (1928)
<i>Cellaria avicularia</i> Pallas, 1766	in Grube (1861)
<i>Chorizopora brongniartii</i> var. <i>punctata</i> Friedl, 1917	in Friedl (1918) and Vátova (1928)
<i>Cribrilina annulata</i> (O. Fabricius, 1870)	in Heller (1867)
<i>Cribrilina cribrifera</i> var. <i>perforata</i> Friedl, 1917	in Friedl (1918) and Vátova (1928)
<i>Crisiella producta</i> (Smitt, 1865)	in Kolosvári (1943) and Brusina (1907)
<i>Cycloporella costata</i> (MacGillivray, 1869)	in Brusina (1907)
<i>Dendrobeatia murrayana</i> (Bean, in Johnston, 1847)	in Friedl (1918)
<i>Discopora verrucosa</i> Esper, 1794	in Friedl (1918) and Vátova (1928)
<i>Escharoides alvarezii</i> (d’Orbigny, 1851)	in Friedl (1918)
<i>Idmonea tubulipora</i> Meneghini, 1844	in Heller (1867), Friedl (1918) and Vátova (1928)
<i>Lepralia alata</i> Busk, 1854	in Heller (1867)
<i>Lepralia annulatipora</i> Manzoni, 1871	in Friedl (1918)
<i>Lichenopora cristata</i> Busk, 1875	in Brusina (1907)
<i>Lichenopora pustulosa</i> d’Orbigny, 1850	in Brusina (1907)
<i>Microporella heckelii</i> (Reuss, 1848)	in Kolosvári (1943)
<i>Oochilina tenuirostris</i> (Hincks, 1880)	in Friedl (1918) and Vátova (1928)
<i>Polytrema corallina</i> d’Orbigny, 1850	in Heller (1867)
<i>Reteporella beaniana</i> (King, 1846)	in Gamulin-Brida <i>et al.</i> (1968), Zavodnik & Zavodnik (1982, 1984) and Seneš (1988a, b, 1989)
<i>Schizoporella atrofusca</i> (Busk, 1856)	in Hincks (1886)
<i>Siniopelta costata</i> (MacGillivray, 1868)	in Friedl (1918)
<i>Stomatopora repens</i> (Wood, 1844)	in Brusina (1907)
<i>Tubulipora foraminulata</i> Lamarck, 1816	in Lorenz (1863)
B. Species reported by Koçak & Ayden Önen (2014)	
<i>Amathia citrina</i> (Hincks, 1877)	in Ünsal (1975), known from the N Atlantic and the North Sea
<i>Aplousina gigantea</i> Canu & Bassler, 1927	in Pinar (1974), known from the W Atlantic, Florida (Winston, 2005) and the Gulf of Mexico (Winston & Maturro, 2009)
<i>Buskea billardi</i> (Calvet, 1906)	in Ünsal & d’Hondt (1978–79), Atlantic deep-water species (Harmelin & d’Hondt, 1992)
<i>Cellepora birostrata</i> Canu & Bassler, 1928	in Ünsal (1975)
<i>Celleporina costata</i> (MacGillivray, 1869)	in Ostroumoff (1896), reported from SE Australia (e.g., Gordon <i>et al.</i> , 2009)
<i>Corbulipora tubulifera</i> (Hincks, 1881)	in Ostroumoff (1896), species known from SE Australia (Bock & Cook, 2001)
<i>Idmidronea bidenkapi</i> (Kluge, 1955)	in Aslan Cihangir (2007)
<i>Mecynoecea proboscidea</i> (Milne-Edwards, 1838)	in Ostroumoff (1896)
<i>Margaretta buski</i> Harmer, 1957	in Ünsal (1975), species known from the W Atlantic, Florida (Winston, 2005) and Gulf of Mexico (Winston & Maturro, 2009)
<i>Onychocella antiqua</i> (Busk, 1858)	in Ünsal (1975), reported from Madeira (Norman, 1909)
<i>Stomacrustula sinuosa</i> (Busk, 1860)	in Ünsal (1975)
<i>Tubulipora biserialis</i> Canu & Bassler, 1925	in Ünsal (1975), species with a boreo-arctic distribution (e.g., Winston & Hayward, 2012)
<i>Tubulipora flabellaris</i> (O.Fabricius, 1780)	in Ünsal (1975), species with a northern distribution (Harmelin, 1976)

Table 5. List of bryozoan species reported in Rosso (2003) but removed from the present compilation with comments.

Taxa removed from Rosso (2003)	
Species and subspecies	
<i>Annectocyma</i> sp.	In cases where the genus is stipulated but the species is undetermined, without the authors providing any formal description and/or figures, the taxon has been removed from the list (except when it is a unique occurrence of the genus).
<i>Lichenopora</i> sp.	
<i>Lichenopora</i> sp. nov.	
<i>Eucratea</i> sp.	
<i>Terminoflustra</i> sp.	
<i>Schizomavella</i> sp.	
<i>Calyptotheca</i> sp.	
<i>Tubulipora phalangea</i> Couch, 1844	Removed because of its boreo-arctic distribution (Hayward & Ryland, 1999). The Mediterranean <i>T. liliacea</i> develops similar characters, becoming pretty undistinguishable (Harmelin, 1976).
<i>Crisia kerguelensis</i> Busk, 1876	Removed because of its Indian Ocean distribution (Harmelin, 1990).
<i>Crisia occidentalis</i> Trask, 1857	Replaced by <i>Crisia eburnea harmelini</i> d'Hondt, 1988.
<i>Paludicella articulata</i> (Ehrenberg, 1831)	Removed because restricted to freshwater habitats (Hayward, 1985).
<i>Amphiblestrum flemingi</i> (Busk, 1854)	A northern taxon reported in Friedl (1918), Kolosváry (1943), and listed in Novosel & Požar-Domac (2001).
<i>Ramphonotus minax</i> (Busk, 1860)	See comments in Rosso <i>et al.</i> (2010a)
<i>Carbasa carbasa</i> (Ellis & Solander, 1786)	Mediterranean records often questioned (see Zabala & Maluquer, 1988).
<i>Flustra foliacea</i> (Linnaeus, 1758)	A northern taxon reported in Heller (1867) and listed in Novosel & Požar-Domac (2001).
<i>Beania robusta</i> (Hincks, 1881)	See Rosso <i>et al.</i> (2010a).
<i>Cribrilina punctata</i> (Hassall, 1841)	Reported dubitatively by Gautier (1962), it has a boreal geographical distribution (Hayward & Ryland, 1998). The misidentification with <i>Collarina balzaci</i> is likely, owing to their superficial similarities.
<i>Puellina</i> (<i>Cribrilaria</i>) cf. <i>arrecta</i> Bishop & Househam, 1987 in Zabala & Maluquer (1988)	A new species, <i>Puellina mickelae</i> Harmelin, 2006, has been erected for this taxon.
<i>Adeonellopsis multiporosa</i> Aristegui, 1985	Originally described from the Canary Islands, and later reported from off Cadiz, it is absent from the Mediterranean (Harmelin & d'Hondt, 1993).
<i>Adeonella polystomella</i> (Reuss, 1848)	See Rosso & Novosel (2010).
<i>Parasmittina tropica tropica</i> (Waters, 1909)	See Hayward & McKinney (2002).
<i>Metroperiella lacunata</i> Hayward & Hansen, 1999	Single record in Novosel & Požar-Domac (2001) possibly based on Heller (1867) reporting <i>Metroperiella galeata</i> (Busk, 1854), erroneously synonymized with this species.
<i>Pentapora foliacea</i> (Ellis & Solander, 1786)	A northern taxon (see Lombardi <i>et al.</i> , 2010).
<i>Schizomavella leontiniensis</i> (Waters, 1878)	See Reverter-Gil <i>et al.</i> (2015b).
<i>Schizomavella linearis crucifera</i> (Norman, 1869)	Single questioned record in Gautier (1962).
<i>Schizomavella marsupifera</i> (Busk, 1884)	The unique record in Gautier (1962) seems to refer to <i>Hippoporella lineolifera</i> (Hincks, 1886) following Hayward & McKinney (2002).
<i>Cylindroporella tubulosa</i> (Norman, 1868)	The unique record of this species in Laubier (1966) is questioned owing to its boreo-arctic distribution, see also Zabala & Maluquer (1988).
<i>Stephanotheca ochracea</i> (Hincks, 1862)	See Reverter-Gil <i>et al.</i> (2012, 2016).
<i>Buffonellaria divergens</i> (Smitt, 1873)	Restricted to the western Atlantic (see Berning & Kukliński, 2008), Mediterranean occurrences need revision. They may potentially belong to one of the species already described by the authors or are new to science.
<i>Hippoporella hippopus</i> (Smitt, 1868)	Restricted to the British Isles in the eastern Atlantic (Hayward & Ryland, 1999), and to the Gulf of Maine in the western Atlantic (Winston & Hayward, 2012). Koçak & Ayden Önen (2014) refer to the single questionable record of Ünsal (1975).
<i>Hagiosynodos kirchenpaueri kirchenpaueri</i> (Heller, 1867)	See comments in Rosso <i>et al.</i> (2010a).
<i>Hagiosynodos kirchenpaueri tregoubovii</i> Gautier, 1962	See comments in Rosso <i>et al.</i> (2010a).

(continued)

Table 5 (continued)

Taxa removed from Rosso (2003)	
<i>Rhynchozoon revelatus</i> Hayward & McKinney, 2002	Junior synonym of <i>Dentiporella sardonica</i> (Waters, 1879), see Souto <i>et al.</i> (2010b).
Genera	
<i>Paludicella</i> Davenport, 1891	<i>Paludicella articulata</i> removed.
<i>Porelloides</i> Hayward, 1979	Species now assigned to <i>Porella</i> .
<i>Cosciniopsis</i> Canu & Bassler, 1927	Species now assigned to <i>Hippopodina</i> .
<i>Cylindroporella</i> Hincks, 1877	<i>Cylindroporella tubulosa</i> (Norman, 1868) removed.
<i>Cribrilina</i> Gray, 1848	Species now assigned to <i>Distansescharella</i> .
<i>Schedocleidochasma</i> Soule, Soule & Chaney, 1991	Species now assigned to <i>Plesiocleidochasma</i> .
Families	
Diastoporidae Gregory, 1899	<i>Desmeplagioecia</i> now in Plagioeciidae.
Filisparsidae Borg, 1944	Unaccepted, junior synonym of Oncousociidae.
Paludicellidae Allman, 1885	<i>Paludicella articulata</i> removed.
Terebriporidae d'Orbigny, 1847	<i>Terebripora orbignyana</i> now in <i>Immergentia</i> .
Aeonellidae Gregory, 1893	Now considered as synonymous of Aeonidae Busk, 1884.
Calescharidae Cook & Bock, 2001	Displacement of <i>Coronellina</i> in Microporidae, see Souto <i>et al.</i> (2014).
Escharellidae Levinsen, 1909	Combined in the Romancheinidae.
Exochellidae Bassler, 1935	<i>Cosciniopsis</i> and <i>Cylindroporella</i> removed.
Gigantoporidae Bassler, 1935	<i>Hagiosynodos</i> now in Hippoporidridae.
Lepraliellidae Vigneaux, 1949	

lin 2014; Sokolover *et al.*, 2016). In contrast, *Catenicella paradoxa* was erected from material from the Ionian Sea (Rosso, 2009a) and later reported exclusively from this region (Rosso *et al.*, in press).

Further new additions are species that were previously known from the Mediterranean basin but only as fossils. For example, the cyclostome *Crisia tenella longinodata*, a deep-water taxon erected for Pleistocene material from Southern Italy (Rosso, 1998), was later discovered in submerged Holocene assemblages from the Ionian Sea (Rosso *et al.*, 2010b), and finally found alive at nearly 300 m depth in the Bari Canyon, Adriatic Sea (D'Onghia *et al.*, 2015). The cheilostome *Gemellipora* sp. cf. *eburnea* was reported (as *Gemellipora eburnea* Smitt) from Pleistocene outcrops (Rosso, 2005a) and Late Holocene submarine sediments (Di Geronimo *et al.*, 2001), while another cheilostome *Sertulipora guttata* was found in Early Pleistocene submerged sediments (Rosso, 1990, as *Cheilonella* sp.). Both of these species are alive today in the Ionian Sea (Rosso *et al.*, in prep.). Another cheilostome, *Neolagenipora collaris*, previously reported from restricted sectors of the NE Atlantic, was found in deep-water settings of the Cap de Creus shelf in the north-western Mediterranean (Madurell *et al.*, 2013). The species was known as a skeletobiont in Early Pleistocene shell lags in Sicily (Rosso, 2005b; Rosso & Sanfilippo, 2005). The finding of *Hemicyclopora collarina* in French caves (Harmelin, 2003) represents the first record of this fossil species, previously known from outside the Mediterranean area.

Proportions of bryozoan higher taxa: comparisons with previous Mediterranean and global data

The proportions of the three bryozoan orders, based on the present compilation, generally fit with the figures of previous checklists (Fig. 1). Compared to Harmelin (1992), there is a slight decrease in ctenostomes (10.2% vs 11.0%), mostly counterbalanced by an increase in cyclostomes (13.5% vs 12.6%), while cheilostomes (76.3% vs 76.4%) remain more or less equal. These figures were slightly different in Rosso (2003), with cheilostomes falling around two percent (74.6%) compensated by cyclostomes (14.1%). The proportions are even more dissimilar if compared to the global figures (Bock & Gordon, 2013), with cheilostomes standing at 85.1%, followed by cyclostomes at 9.4% and ctenostomes at only 5.5% (Fig. 2). The Mediterranean bryozoan fauna represents about 9.6% of global bryozoan diversity (or slightly less, 9.4%, considering data reported in Appeltans *et al.*, 2012). The Mediterranean cheilostome fauna represents 8.6% of the global value, while Mediterranean cyclostomes represent 13.8% of global cyclostome diversity, and ctenostomes account for 17.9% of global diversity. Harmelin (1992) and later Rosso (2003) explained the high incidence of cyclostomes as probably related to the intensive investigation of the group in the Mediterranean. The same may apply for ctenostomes. It is likely that the proportions of the orders may be biased by the different research efforts in time and space, with ctenostomes and cyclostomes often less investigated than cheilostomes. Gordon *et al.* (2009), for instance, noted a significant increase in the percentage of cyclostomes when adding undescribed species to the data, rising from 6% to 18%.

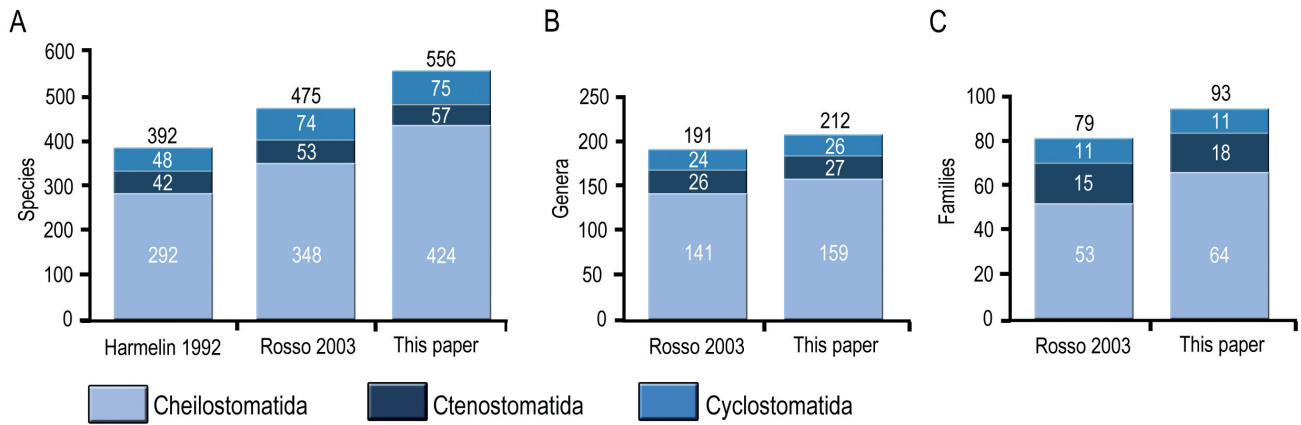


Fig. 1: A. Comparison of the total number of bryozoan species in the Mediterranean (including cyclostomes, ctenostomes and cheilostomes) from Harmelin (1992), Rosso (2003) and the present paper. B and C compare data from Rosso (2003) and the present paper for genera and families, respectively.

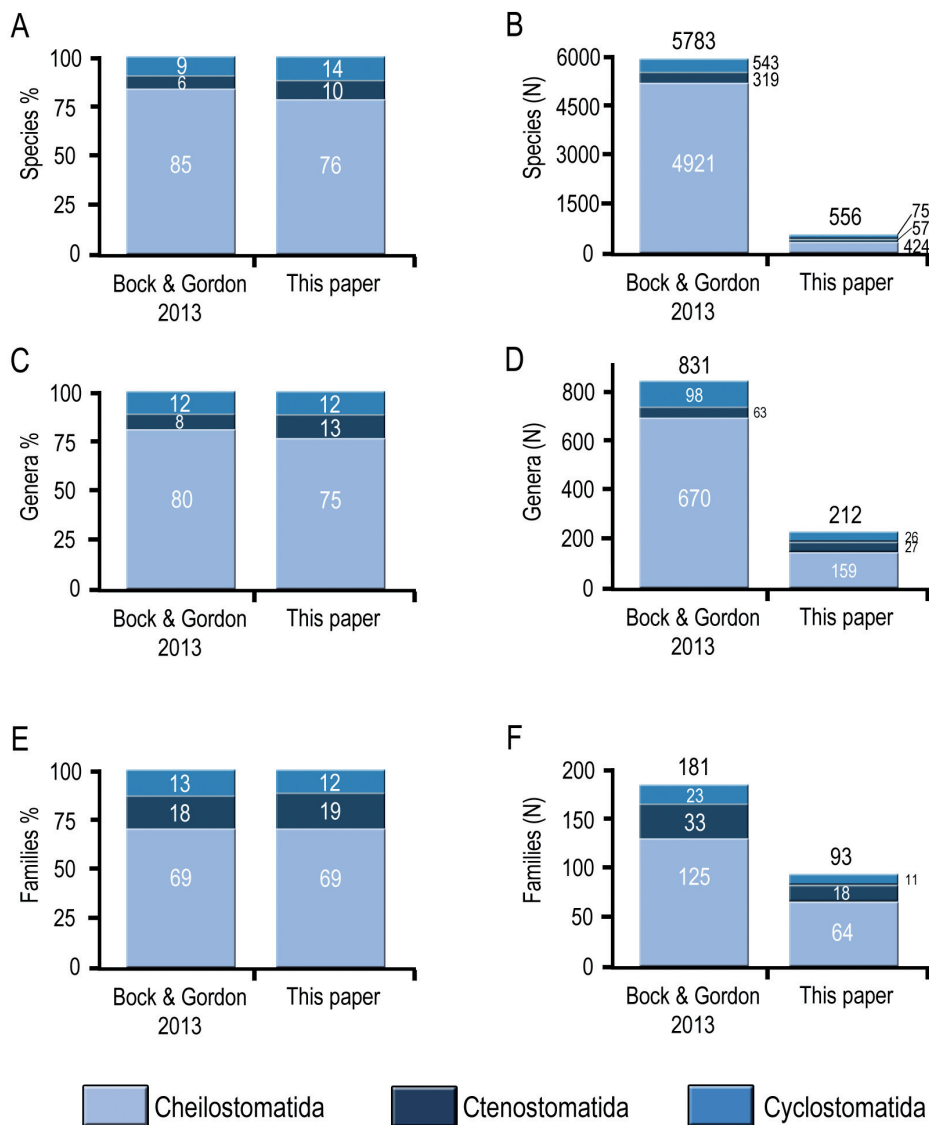


Fig. 2: Comparison of the total number of bryozoan species (A-B) genera (C-D) and families (E-F) (including cyclostomes, ctenostomes and cheilostomes), from the Mediterranean (present paper) and the global oceans as reported in Bock & Gordon (2013). Plots report percentages (left) and the total numbers of species, genera and families (right).

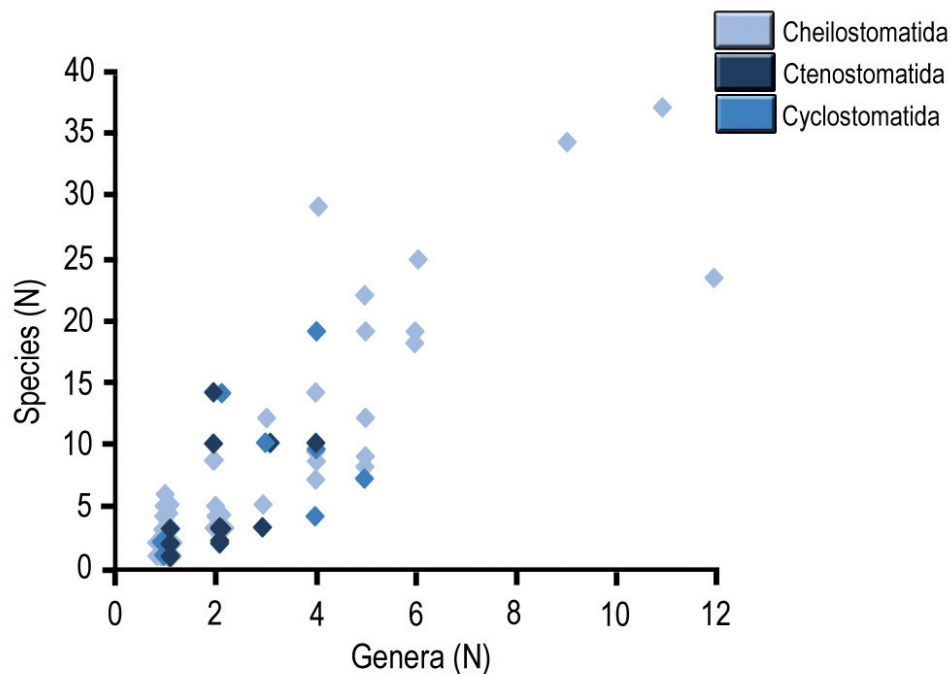


Fig. 3: Plots of Mediterranean bryozoan families (including cyclostomes, ctenostomes and cheilostomes) based on the number of genera and species they contain (from data reported in Table 2).

The proportions among orders (Fig. 2) are similar at generic level, although there is a slight increase in ctenostomes (from 10% at species level to 13% at genus level) and a decrease in cheilostomes (from nearly 76% to

75%). The proportions change more at family level with the ctenostomes exceeding 19% and the cheilostomes dropping to about 69%.

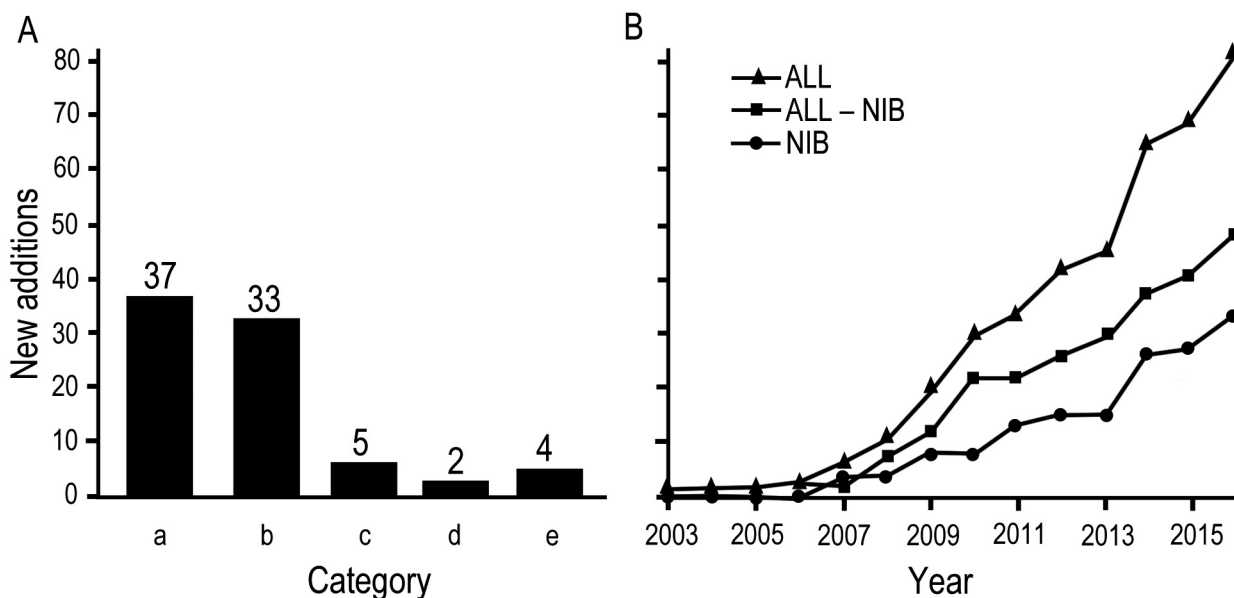


Fig. 4: A. Number of taxa considered as new additions at species level in the present compilation compared to Rosso (2003) divided into the following categories: a, newly described species; b, Non-Indigenous Bryozoan (NIB); c, first living record of a species previously known only from the fossil record; d, species previously left in open nomenclature or resurrected; e, first report after the original description. B. Cumulative curves for the total number of species added per year (since 2003) compared with the number of NIBs introduced per year.

Distribution of bryodiversity among selected bryozoan-rich habitats

Information on bryozoan diversity within habitats is scarce and scattered through a restricted number of papers that aim to characterize specific associations (e.g., Laubier, 1966; Harmelin, 1976; Rosso, 1996; Rosso *et al.*, 2013a and references therein; Di Martino & Taylor, 2014 and reference therein). We combined information from general lists published in these and other papers with the preliminary data available from ongoing research projects (see Fig. 5 and references therein). The results show that the richest bryozoan diversity pertains in the Coralligenous (219 spp.) and the Dark and Semi-Dark cave (GO–GSO) (220 spp.) biocoenoses (Figs 5, 6). Both habitats are particularly suitable for bryozoans, being characterised by the availability of a permanent hard substratum to be colonised, the presence of large- to small-sized cavities and crevices offering a wide range of microhabitats and diminished light, counterbalanced by a certain degree of confinement and consequent depletion in oxygen and food, as well as sediment smothering (see Harmelin, 1986, 1997, 2000; Rosso *et al.*, 2012a, 2013b). Similar microhabitats are also offered by small hard substrata on detritic bottoms (see Harmelin, 1976). Considering the soft bottoms of the outer-shelf to the upper-slope (60–300 m deep) as a whole, the bryozoan association is diverse, totalling 189 species, some of which are shared with the above-mentioned habitats while some others are adapted to colonize directly heterometric, usually bioclastic bottoms or are restricted to specific depth ranges (Harmelin, 1976; Rosso, 1996; Rosso *et al.*, 2014). Bryodiversity decreases markedly when considering only the Coastal Detritic Biocoenosis (DC), declining to 92 species, 90% of which are shared with the other detritic associations.

Intermediate levels of bryodiversity are found in the shallow-water biocoenoses of the Infralittoral Algae (134 spp.) and the *Posidonia* meadows (152 spp.). Both biocoenoses offer ephemeral, laminar-to-filamentous, highly flexible substrata consisting of plant bodies, increased shading from the illuminated leaf tips to the relative darkness of the stems, rhizoids or rhizomes, and a decreasing in the typically multidirectional hydrodynamic energy for which small encrusters and erect flexible species are specifically adapted (Rosso *et al.*, submitted), from 0 to about 30–35 m depth.

The lowest bryodiversity is associated with deep-water corals, with only 61 species, mainly represented by small-sized encrusters (Rosso *et al.*, 2010b), currently reported in the depth range of 180–750 m. This habitat is characterised by complete darkness, long-lasting hard substrata provided by exposed coral skeletons, coral rubble and occasionally by firm- and hardgrounds (Rosso *et al.*, 2010b), a relatively stable temperature throughout the year, moderate siltation, locally low to moderate energy because of unidirectional currents responsible for oxygen and food supply, and possible starvation periods, with some exceptions for canyon-related sites.

Cheilostomes tend to dominate in all of these habitats (Figs 5, 6), accounting for four-fifths of each association, but they decrease to less than 74% in vegetated bottoms where a higher proportion of ctenostomes (more than the 6% and 11% of species in HP and AP, respectively) is present compared to other habitats. Lacking a mineralised skeleton, ctenostomes are particularly adapted for the colonisation of soft and flexible algal thalli and *Posidonia* leaves in high-energy environments. Some species have been described as obligate ‘epiphytes’ (i.e.

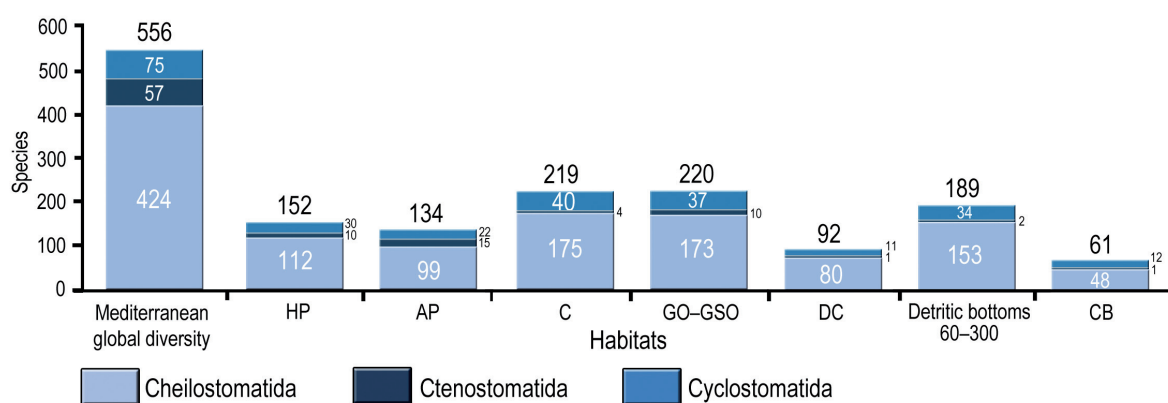


Fig. 5: Total number of cyclostomes, ctenostomes and cheilostomes in the main Mediterranean benthic habitats and biocoenotic associations. The same feature for the entire Mediterranean is given for comparison. AP: Biocoenosis of the Fotophilic or Infralittoral Algae; HP: Biocoenosis of the *Posidonia* seagrass; GSO–GO: cave and cryptic habitats hosting the Biocoenoses of the semi-dark and dark caves; C: Coralligenous; DC: Biocoenosis of the Coastal Detritic Bottoms; CB: Biocoenosis of the White Corals (or deep-water corals); Data are based on: HP = Di Martino & Taylor (2014); *Cystoseira* communities in the AP = Campisi (1973), Galluzzo (1993), Nicoletti *et al.* (1996), Novosel *et al.* (2004) and Rosso *et al.* (submitted); C = Rosso & Sanfilippo (2009), AR (unpublished data) and lists given by Laubier (1966) and Ballesteros (2006); DC = Rosso (1996); undifferentiated deep-water detritic associations (DDA) = Harmelin (1976), Rosso (1996), Madurell *et al.* (2013) and Rosso *et al.* (2014); CB = Zabala *et al.* (1993), Mastrotoaro *et al.* (2010), D’Onghia *et al.* (2015) and Rosso *et al.* (in prep.); GSO–GO = Gerovasileiou & Rosso (in prep.).

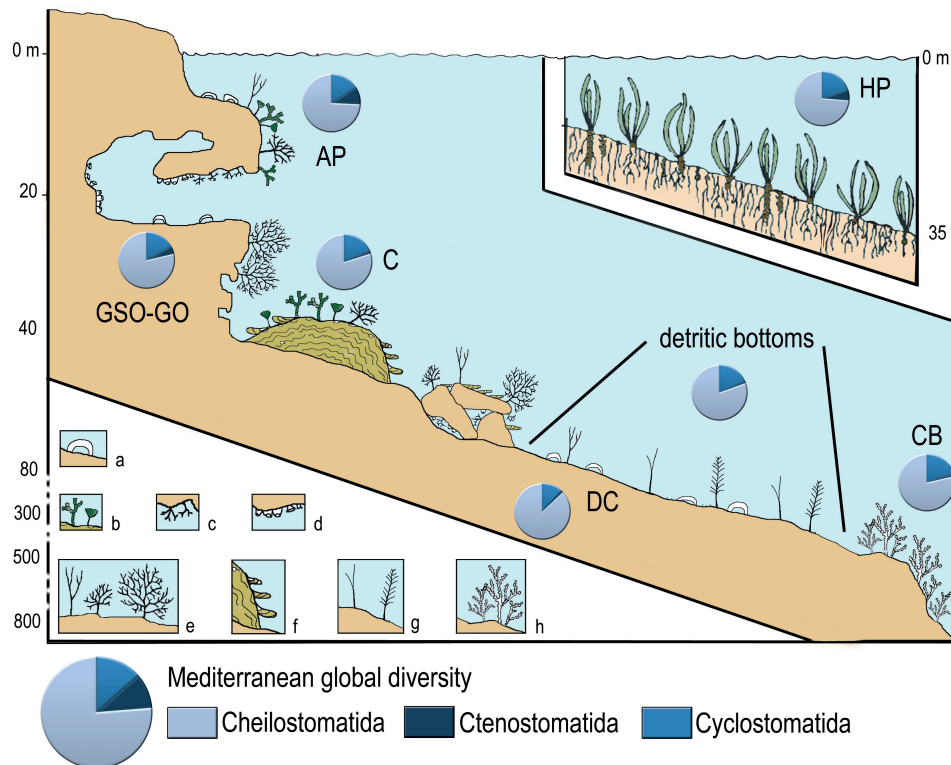


Fig. 6: Relative percentages of bryozoan species (including cyclostomes, ctenostomes and cheilostomes) in the main Mediterranean benthic habitats and bionomic associations. The proportion of the three groups for the entire Mediterranean is given for comparison. a: small objects lying on the bottom; b: the green algae *Halimeda tuna* and *Flabellia petiolata*; c: *Corallium rubrum*; d: sciaphilic sponges and scleractinians; e: the gorgonaceans *Eunicella stricta*, *E. cavolinii* and *Paramuricea clavata*; f: crustose coralline algae and Coralligenous concretions; g: hydrozoans and antipatarians; h: the scleractinian *Ma-drepora oculata*. See Fig. 5 for references and abbreviations. Scheme inspired by Harmelin (1976).

always growing on living plant substrates) by Hayward & Ryland (1999). In contrast, ctenostomes are decidedly subordinate in all other habitats, with values usually lower than the 2%, except for the GO–GSO group of biocoenoses where they reach 4.5%, possibly linked to special microenvironments offered by some sponges. Cyclostomes are present with values ranging from the 16.4% to 19.7%, except for the DC in which they account for nearly the 12%.

Non-Indigenous Bryozoans (NIBs) in the Mediterranean Sea

Ten percent of species (59 out of 556 spp.) living today in the Mediterranean Sea are considered NIBs, although some of them only tentatively (e.g., *?Proboscina boryi*). Species that have been reported only once in past decades were omitted from the present compilation (see Appendix 2) because they are considered as accidentally present for a limited period of time. Most NIBs are cheilostomes (53 spp. in 33 genera), while only a few are ctenostomes (5 spp. in 4 genera), and a single species is a cyclostome. Some genera, among which *Celleporaria*, *Stylopoma* and *Thalamoporella*, are represented in the Mediterranean only by NIBs.

Several Mediterranean NIBs have been interpreted

as cryptic species whose origin/provenance remains to be ascertained (Zenetos *et al.*, 2012). Among NIBs, some are now considered established (e.g., *Arachnoidella protecta*) and others pseudoindigenous (e.g., *Amathia verticillata* in Galil & Gevili, 2014). However, a better understanding of their taxonomic status, as well as their natural range and effect of climate change on geographical distributions (i.e. their northward shift in the northern hemisphere) is needed.

The number of NIBs has increased remarkably since the last update by Zenetos *et al.* (2012), which listed 31 species, a figure that included only three of the 27 NIBs recently reported from the Levantine Sea (Harmelin *et al.*, 2016). The introduction of NIBs into the Mediterranean is mainly linked to shipping (mostly through hull fouling and ballast waters), corridors, aquaculture, and also natural and anthropogenic drifting (Watts *et al.*, 1998; Zenetos *et al.*, 2012; Harmelin, 2014; Harmelin *et al.*, 2016 and references therein). Looking at the data reported above, the importance of the Suez Canal as the main route for the so-called ‘lessepsian’ migrants is evident. These NIBs are native to the Indian or the Pacific oceans and are usually restricted to the Levantine coasts with a few exceptions that are more widespread in the Mediterranean. Most have not been reported from the Red Sea (see Harmelin *et al.*, 2016), possibly because of

the scant information available on bryozoans from this region. Analogously, knowledge of bryozoans inhabiting shelf settings of the Atlantic off north Africa is remarkably poor.

Discussion

The increase in the Mediterranean bryozoan diversity by 81 species (accounting for about 15% of the total) since Rosso (2003) is essentially based on the revision of species complexes using Scanning Electron Microscopy (SEM). The use of the SEM as a standard tool and its even greater availability has allowed the redescription of early described species, with improved appreciation of diagnostic morphological characters, including small-scale details difficult to resolve using optical microscopy (Taylor, 1990), enabling the discrimination of cryptic species. SEM study is, for instance, necessary for all the taxa reported in Table 3 and 4, pending the localisation of the type material, in order to clarify their validity. This examination may drive a further increase in the number of species recorded in the Mediterranean.

Based on the present compilation, Mediterranean bryodiversity accounts for about 10% of global bryozoan diversity, a figure that agrees with the figure obtained for the Mediterranean biota as a whole, confirming the currently accepted idea that the Mediterranean Sea makes up a significant percentage of global biodiversity in relation to its limited surface and volume (Bianchi & Morri, 2000). The high diversity of the Mediterranean can be reasonably explained by the interplay of: 1) the deep knowledge acquired during more than two centuries of investigation, and 2) the complex geological evolution of the basin and the story of its colonisation, including exchanges with the Indo-Pacific and Atlantic realms at its eastern and western ends, respectively (Di Geronimo, 1990; Harmelin & d'Hondt, 1992; Taviani, 2002, 2003, among others). Accordingly, the present-day fauna includes: 1) endemic taxa; 2) species of tropical Indo-Pacific affinity, pointing to the origination of the Mediterranean Sea from the closure of the Mesozoic Tethys Ocean; 3) species with a wide Atlantic-Mediterranean distribution, including cold/cool or warm/temperate species introduced during Quaternary glacial and interglacial phases, respectively; 4) widespread taxa now progressively split; 5) new colonisers, largely represented by Non-Indigenous Species, introduced by human activities and, subordinately, as a consequence of the global climatic change and tropicalization of the Mediterranean that has favoured the expansion of warm-water species.

Mediterranean bryozoan diversity is high when compared with other regions of the globe, such as the southwestern Atlantic (López Gappa, 2000, reporting 246 spp.), but low compared to others. Gordon *et al.* (2009), for instance, reported 953 species for New Zealand, one of the

best-investigated regions in recent times. Interestingly, a relevant component of this biodiversity relates to deep-sea habitats, including seamounts and ridges, from which a large number of new species and higher taxa have been described (Gordon & Taylor, 2010; Gordon, 2014).

Although Mediterranean deep-water habitats are known as relatively depleted in macrofaunal species, new bryozoans are being discovered in these still poorly investigated habitats (D'Onghia *et al.*, 2015; Rosso *et al.*, in prep.), as predicted by Rosso (2003). Danovaro *et al.* (2010) estimated that 76% of the Mediterranean macrofauna living between 200 and 4000 m is still undescribed. Extensive deep-water Mediterranean regions are still completely unexplored, or are known only for the cold-water coral communities inhabiting them (Danovaro *et al.*, 2010, fig. 1; Taviani *et al.*, 2011), but still unexplored for bryozoans. This is the case for the Tyrrhenian Sea and its seamounts, potentially highly suitable for bryozoan colonisation and diversification.

Further additions are expected also from specific regions, mostly from the eastern sector including the Adriatic, the Aegean and the Levantine seas, as recently shown by new species reported from restricted areas and depth horizons (see Harmelin *et al.*, 2016; Sokolover *et al.*, 2016; AR, pers. obs.). A rapid and more consistent increase in bryozoan species might be supplied by NIBs, and specifically by lessepsian migrants, entering the Mediterranean through the Suez Canal, as foreseen by Galil (2007), Zenetos *et al.* (2012) and Harmelin (2014). Their transit may be facilitated by the enlargement of the channel completed in 2015 with the consequent rise of shipping traffic, as feared by Galil *et al.* (2015) and Harmelin *et al.* (2016). Although often largely recognisable, it is expected that this component will change and impact local biodiversity to a certain extent.

Our data on Mediterranean bryozoan diversity is, however, still highly biased by the differences in knowledge among orders, regions and habitats. The awareness of these wide gaps, combined with the evidence that only 6 new species per year (including NIBs) have been documented from the basin in the last decade, raise the question about the 'real' total figure we may expect.

The expected global diversity of bryozoans, estimated after the description of 2800–5200 estimated undiscovered species based on both morphological and molecular data (Gordon & Bock in Appeltans *et al.*, 2012) ranges from 8700 to 11,100 species. Assuming a proportional contribution of the Mediterranean component to global diversity, an increase of about 280–500 species might be expected, leading to 850–1050 Mediterranean species in total. This evaluation roughly parallels >1000 bryozoan species estimated for the Japanese region by Scholz *et al.* (2007) and 1200 species for New Zealand reported by Gordon *et al.* (2009). At the present rate of description and recording of new taxa, the time needed to fill the gap is several decades. This is a challenging schedule taking into ac-

count the few taxonomists presently involved in the study of living bryozoans. An effort would be desirable from all countries bordering the Mediterranean to contribute their own data to the mapping of the biosphere in the next 50 years, as recommended by Wheeler *et al.* (2012). However, this time span far exceeds 2020, the deadline fixed by the European Union (EU) to achieve the Good Environmental Status for marine habitats. As the main goal of the habitat directive of the Marine Strategy is the conservation of biological diversity at species, habitat and ecosystem levels (see Katsanevakis *et al.*, 2011, among others), including protection against the impact of non indigenous species (see Zenetos *et al.*, 2012), a faster achievement of a fairly complete knowledge of the biodiversity, including bryozoans, will help individual countries and the EU to better organize and implement the ecosystem-based marine spatial management for the Mediterranean.

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Appendix 1

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Appendix 2

Remarks concerning the taxa in Table 1.

1. ?*Proboscina boryi* (Audouin, 1826): Harmelin *et al.* (2016) tentatively assigned some Lebanese colonies to this species, originally described from the Red Sea and never reported previously from the Mediterranean and considered as a potential NIB.
2. *Diplosolen obelius* (Johnston, 1838): inconsistently reported as *D. obelia* or *D. obelium* in the past literature, the genus name derives from a Greek masculine noun.
3. *Plagioecia dorsalis* (Waters, 1879): Harmelin (1976) tentatively synonymized *Diastopora rugosa* Canu & Bassler, 1930 with this species.
4. *Harmelinopora* Brood, 1976: genus erected to include the type species *H. plana* Brood, 1976 and *H. indistincta* (Canu & Bassler, 1929), even though never used for the latter species by subsequent authors. Characterised by encrusting colonies, autozooids somehow box-like shaped and inner hemisepta, this genus better fits *H. indistincta* than *Annectocyma*.
5. *Fron dipora verrucosa* (Lamouroux, 1821): Harmelin (1976) tentatively synonymized *Fron dipora gracilis* Canu & Bassler, 1930 with this species.
6. *Crisia calyptostoma* Hayward & Ryland, 1978: recorded in the Mediterranean by Harmelin (1990), this species was overlooked in Rosso (2003).
7. *Crisia eburnea harmelini* d'Hondt, 1988: this species replaced *C. occidentalis* Trask, 1857, a NE Pacific species.
8. *Crisia tenella longinodata* Rosso, 1998: living colonies of this subspecies, previously known only from the Pleistocene of Southern Italy, were recently found in the Bari Canyon (D'Onghia *et al.*, 2015).
9. "*Hornera lichenoides*" Auctt. not (Linnaeus, 1758): Mediterranean colonies attributed to "*Hornera lichenoides*" belong to a different undescribed species clearly distinguishable from the North Atlantic one (Rosso, 2009b; Abdel-Salam, 2014).
10. Lichenoporidae Smitt, 1867: two genera, *Disporella* Gray, 1848 and *Patinella* Gray, 1848, and several species represent this family in the Mediterranean. A revision is needed to confirm their validity (see also comments below).
11. *Disporella* Gray, 1848: Alvarez (1992, 1994, 1995) reported seven species of *Disporella* as present in the Mediterranean: *D. pyramidata*, *D. robusta*, *D. alboranensis*, *D. smitti*, *D. harmeri*, *D. borgi* and *D. boutani*, which were never recorded again after their description.
12. *Disporella hispida* (Fleming, 1828): Alvarez (1994) states that *D. hispida* is absent in the Mediterranean and all the occurrences should be transferred to *D. alboranensis* Alvarez, 1992.
13. *Patinella* Gray, 1848: *Lichenopora distincta* Alvarez, 1993 is likely to be a species of *Patinella*.
14. *Patinella aziensis* Alvarez, 1994 and *P. flosculus* (Hincks, 1862): new additions based on Ayari & Taylor (2014) and d'Hondt & Mascarell (2004).
15. *Alcyonidioides* d'Hondt, 2001: is introduced to allocate *Alcyonidium mytili* Dalyell, 1848.
16. *Alcyonidium* Lamouroux, 1813: nine species of *Alcyonidium* are reported from the Mediterranean (d'Hondt, 1983), some of them doubtfully. Ryland & Porter (2003) demonstrated the distinction of *A. polyoum* (Hassall, 1841) from *A. gelatinosum* (Linnaeus, 1761), previously synonymised (Thorpe & Winston, 1984). *A. mamillatum* Alder, 1857 is reported from the Ebro Delta on *Goneplax* (Abelló & Corbera, 1996) and the Marmara Sea (Demir, 1952-54 *vide* Koçak & Aydin Önen, 2014).
17. *Clavopora* sp. *sensu* Gautier, 1954: this species is distinguishable from *C. hystricis* Busk, 1874 in the number of the tentacles, 20-24 in *C. sp.* vs 12-14 in *C. hystricis* (Prenant & Bobin, 1956; d'Hondt, 1983).
18. *Amathia* Lamouroux, 1812: based on molecular phylogenetic analysis, Waeschenbach *et al.* (2015) suggested the synonymy of the genera *Bowerbankia* and *Zoobotryon* with *Amathia*. Mediterranean species previously placed in the latter two genera are consequently transferred to *Amathia*.
19. *Amathia verticillata* (Delle Chiaje, 1822): erroneously considered as an indigenous species, it is pseudoindigenous in the Mediterranean (Floerl *et al.*, 2009; Galil & Gevili, 2014; Ferrario *et al.*, 2014).
20. Aeveverillidae Jebram, 1973: family added because of the insertion of *Aeveverillia setigera* (Hincks, 1887).
21. *Aeveverillia* Marcus, 1941: genus added because of the insertion of *Aeveverillia setigera* (Hincks, 1887).
22. *Aeveverillia setigera* (Hincks, 1887): first reported from the Suez Channel by Hastings (1927), this species was overlooked in Rosso (2003). Zenetos *et al.* (2012) refers to this species as a NIB for the Mediterranean.
23. *Arachnoidella* d'Hondt, 1983: initially introduced as a subgenus, Gordon (1986) proposed *Arachnoidella* be raised to generic status to include the marine species previously assigned to *Arachnoidea* (see bryozoa.net by P. Bock, accessed 13.2.2016).
24. *Arachnoidella protecta* Harmer, 1915: Occhipinti Ambrogio *et al.* (2010) and Zenetos *et al.* (2012) consider this species as established in the Mediterranean.
25. *Acanthodesia* Canu & Bassler, 1919: this genus is doubtfully placed in the family Membraniporidae (see bryozoa.net by P. Bock, accessed 13.2.2016).
26. *Acanthodesia savartii* (Audouin, 1826): this species, assigned to *Membranipora* in Rosso (2003), better fits in *Acanthodesia* based on Taylor & Tan (2015).
27. *Membranipora tenuis* Desor, 1848: this species has been reported from the coasts of Tunisia as *Hemiseptella africana* by Canu & Bassler (1930) as reported in Zabala & Maluquer (1988), and subsequently listed in d'Hondt & Mascarell (2004) and Ayari & Taylor (2014).
28. *Arbopercula* Nikulina, 2010: genus introduced to include *Electra tenella* (Hincks, 1880) as suggested by Tilbrook & Gordon (2015): the authors proposed the new combination *Arbocuspis tenella* but *Arbopercula* was intended (D. Gordon,

- pers. comm.). This species also includes *Electra* cf. *tenella* of Rosso (2003).
29. *Conopeum ponticum* Hayward, 2001: this species has been recorded from Israel by Sokolover *et al.* (2016), and considered as a NIB for the Mediterranean.
30. *Conopeum seurati* (Canu, 1928): *Nitscheina pulchella* Canu & Bassler (1930) from Tunisia is likely to be the same species, based on d'Hondt & Mascarell (2004).
31. *Einhornia* Nikulina, 2007: the type species of this genus is the Mediterranean *Electra crustulenta* (Pallas, 1766).
32. *Electra repiachovi* Ostroumoff, 1886: the entry of this species is based on the Turkish records of Koçak & Aydin Önen (2014) and references therein.
33. *Pyripora* sp. *sensu* Hayward & McKinney, 2002: although left in open nomenclature, the authors clearly stated the separation of this species from *P. catenularia* (Hayward & McKinney, 2002: p. 16). Adriatic specimens differ in having longer caudae and a proximolateral rather than distolateral budding, and in the absence of a well developed cryptocystal rim around the opesia.
34. *Thalamoporella* Hincks, 1887: based on the present-day warm-water distribution, all the species of this genus may be considered as NIBs in the Mediterranean, although Harmelin *et al.* (2016) considered *Thalamoporella harmelini* Soule, Soule & Chaney, 1999 as cryptogenic.
35. *Thalamoporella* sp. *sensu* Sokolover, Taylor & Ilan, 2016: this species is introduced for specimens from Lebanon similar to *T. rozieri* (Audouin, 1826) in the shape and size of the ovicell but which differs in the shape of the orifice and tubercles.
36. *Allantopora* Lang, 1914: this genus replaces *Daisyella*, erroneously reported in Rosso (2003) for *Callopora minuta* (Harmelin, 1973), following Rosso & Taylor (2002).
37. *Corbulella* Gordon, 1984: this genus is added because of the displacement of *Crassimarginatella maderensis* (Waters, 1898) in *Corbulella* as already stated in Gordon (1984).
38. *Akatopora leucocypha* (Marcus, 1937): Harmelin (2014) and Harmelin *et al.* (2016) recorded this species from Lebanon and considered it as a NIB in the Mediterranean.
39. Cymuloporidae Winston & Vieira, 2013: this family is erected to accommodate the genus *Crepis* Jullien, 1882, besides *Cymulopora* Winston & Håkansson, 1986. Both genera are distinguished from the Microporidae, in which they were previously placed, in having uniserial colonies, a cauda and an extensive cryptocyst.
40. *Crepis harmelini* Reverter-Gil, Souto & Fernández-Pulpeiro, 2011: this species was introduced for Mediterranean specimens from Gibraltar previously assigned to *Crepis longipes* Jullien, 1882.
41. *Chaperiopsis hirsuta* Reverter-Gil, Souto & Fernández-Pulpeiro, 2009: besides than the authors, also Chimenz Gusso *et al.* (2014) recorded this species.
42. *Reussirella multispinata* (Canu & Bassler, 1923): Ayari & Taylor (2014) recorded living colonies of this species.
43. *Hincksina calpensis* Reverter-Gil, Souto & Fernández-Pulpeiro, 2012: this species replaces *Hincksina sceletos* (Busk, 1858) reported in Rosso (2003), the presence of which seems to be restricted to Madeira (Reverter-Gil *et al.*, 2012b).
44. *Bugula neritina* (Linnaeus, 1758): NIB in the Mediterranean (Zenetos *et al.*, 2012; Harmelin *et al.*, 2016).
45. *Bugulina* Gray, 1848 and *Crisularia* Gray, 1848: Fehlauser-Ale *et al.* (2015) resurrected these two genera to accommodate some species previously assigned to *Bugula* Oken, 1815.
46. *Crisularia serrata* (Lamarck, 1816): based on the articulation of the outermost spine, Chimenz Gusso *et al.* (2014) disagree with the synonymy proposed by d'Hondt (1997) with *Bugula germanae* (Calvet, 1902), accepted in Rosso *et al.* (2010a).
47. *Cradoscrupocellaria* Vieira, Spencer Jones & Winston, 2013a: genus erected to accommodate some species previously assigned to *Scrupocellaria* van Beneden, 1845. After the revision of the genus by Vieira *et al.* (2014a), all the Mediterranean occurrences need to be verified.
48. *Cradoscrupocellaria aegyptiana* Vieira, Spencer Jones & Winston, 2013a: this species replaces the record of *Scrupocellaria reptans* (Linnaeus, 1767), from Alexandria of O'Donoghue & de Watteville (1939). The distribution of *Scrupocellaria reptans* (Linnaeus, 1767) seems restricted to the British Isles, northern Atlantic (Vieira *et al.*, 2013a).
49. *Cradoscrupocellaria hirsuta* (Jullien & Calvet, 1903): reported as limited to the Atlantic by Vieira *et al.* (2013a), this species is also present in several Mediterranean localities, including the Sicilian Channel, the Adriatic and Ionian Sea, and the Ibero-Provençal Basin (Rosso *et al.*, in press).
50. *Licornia* van Beneden, 1850: Vieira *et al.* (2013b) resurrected this genus to accommodate some species previously assigned to *Scrupocellaria* van Beneden, 1845.
51. *Licornia jolloisi* (Audouin, 1826): NIB in the Mediterranean (Zenetos *et al.*, 2012; Harmelin *et al.*, 2016; Sokolover *et al.*, 2016).
52. *Scrupocaberea* Vieira, Spencer Jones, Winston, Migotto & Marques, 2014: genus erected to accommodate some species previously assigned to *Scrupocellaria* van Beneden, 1845.
53. *Scrupocellaria muricata* (Lamoureaux, 1816): this species replaces *Scrupocellaria spatulata* (d'Orbigny, 1851) following d'Hondt (2000).
54. *Scrupocellaria scruposa* (Linnaeus, 1758): De Blauwe & Faasse (2001) indicate this species as indigenous of the Netherlands, and therefore may be considered as a NIB in the Mediterranean.
55. *Smittipora* Jullien, 1882: this genus replaces *Rectonychocella* Canu & Bassler, 1917, considered synonym of *Smittipora* since Harmer (1926), and subsequently by Harmelin (1969). See also bryozoa.net by P. Bock (accessed 8.2.2016).
56. *Monoporella bouchardii* (Audouin, 1826): this species replaces *Monoporella fimbriata carinifera* Canu & Bassler, 1927 as suggested by Harmelin (2014), Chimenz Gusso *et al.* (2014) and Harmelin *et al.* (2016).
57. *Distansescharella alcicornis* (Jullien, 1882): previously assigned to *Cribrilina* Gray, 1848, this species is now moved into *Distansescharella* d'Orbigny, 1853 following López-Fé (2006).
58. *Klugerella* Moyano, 1991: this genus is added to accommodate *Membraniporella marcusii* Cook, 1967 (López de la Cuadra & García-Gómez, 2000).
59. *Gemellipora* sp. cf. *eburnea* (Smitt, 1873): the morphological characters shown by the Mediterranean specimens differ from those of the nominal species (AR, pers. obs.).

60. *Celleporaria* Lamouroux, 1821: this genus is added following the records of several species from different sectors of the Mediterranean Sea, mostly from the Levantine Basin. All *Celleporaria* species can be considered as NIBs in the Mediterranean. A further species *C. pilaefera* (Canu & Bassler, 1929) was omitted as it was found only once off Malta (Agius *et al.*, 1977; Sciberras & Schembri, 2007).
61. *Celleporaria aperta* (Hincks, 1882): reported as a NIB in Malta (Sciberras & Schembri, 2007) and Israel (Sokolover *et al.*, 2016).
62. *Celleporaria brunnea* (Hincks, 1884): reported as a NIB from several Mediterranean localities (Koçak, 2007; Lodola *et al.*, 2015; Harmelin, 2014; Koçak & Aydin Önen, 2014; Harmelin *et al.*, 2016).
63. *Celleporaria* sp. aff. *brunnea* (Hincks, 1884): reported as a NIB from Lebanon by Harmelin (2014). Specimens similar to *C. brunnea* were also collected in north-eastern Sicily (AR, unpublished data).
64. *Celleporaria fusca* (Busk, 1854): reported by d'Hondt (1988) from Haifa and listed in Koçak (2007).
65. *Celleporaria labelligera* Harmer, 1957: reported as a NIB from Lebanon by Harmelin (2014).
66. *Celleporaria sherryae* Winston, 2005: specimens tentatively assigned to this species are reported as a NIB from Lebanon by Harmelin (2014).
67. *Celleporaria vermiformis* (Waters, 1909): reported as a NIB from Lebanon by Harmelin (2014).
68. *Drepanophora* Harmer, 1957: this genus is added because of *Drepanophora birbira* Powell, 1967, reported as a NIB from Lebanon by Harmelin (2014), and from Israel by Sokolover *et al.* (2016).
69. *Bryocryptella tubulata* (Busk, 1861): *Porella tubulata* in Rosso (2003).
70. *Palmiskenea gautieri* Madurell, Zabala, Domínguez-Carrió & Gili, 2013: past occurrences of *Palmicellaria* aff. *aviculifera* Canu & Bassler, 1928 may refer to this species which, described from the western sector, may be widespread in the Mediterranean.
71. *Porella laevis* (Fleming, 1828): previously placed in *Porelloides* Hayward, 1979, genus consequently removed from the list.
72. Romancheinidae Jullien, 1888: following Gordon (2014), this family is introduced to include Exochellidae (genera *Hippopleurifera* and *Escharoides*) and Escharellidae (genera *Escharella*, *Hemicyclopora* and *Neolagenipora*) and to accommodate *Hippomenella* previously considered as incertae sedis.
73. *Hemicyclopora collarina* Canu & Lecointre, 1930: this species, described based on fossil material, was reported by Harmelin (2003) from the caves of Port Cros and Ayari & Taylor (2014) from off Tunisia.
74. *Neolagenipora collaris* (Norman, 1967): Madurell *et al.* (2013) reported this species from Cap de Creus.
75. *Parasmittina aegyptiaca* (Waters, 1909): found in Lebanon and Israel, this species is considered as a lessepsian immigrant from the Red Sea (Harmelin *et al.*, 2009; Sokolover *et al.*, 2016).
76. *Parasmittina parsevalii* (Audouin, 1826): reported only by Ayari & Taylor (2014), this species originally from the Red Sea may be considered as a NIB in the Mediterranean.
77. *Parasmittina protecta* (Thornely, 1905): species recorded from Lebanon by Harmelin *et al.* (2009) and from Israel by Sokolover *et al.* (2016).
78. *Parasmittina raigii* (Audouin, 1826): *Smittina baccata* Canu & Bassler, 1930 may be synonymized with this species based on Zabala (1986) and d'Hondt & Ben Ismail (2008). The latter authors also synonymized *Smittina porosa* Canu & Bassler, 1930.
79. *Parasmittina serruloides* and *Parasmittina spondylicula* Harmelin, Bitar & Zibrowius, 2009: found in Lebanon, these two species are considered as lessepsian immigrants from the Red Sea (Harmelin *et al.*, 2009).
80. *Parasmittina trispinosa* (Johnston, 1838): presence uncertain needs to be confirmed.
81. *Prenantia inerma* (Calvet, 1906): this species first synonymised by Poluzzi (1975) with *P. lygulata* (Manzoni, 1870), is added following Pizzaferrri (2010). The two species seem to differ only in the size of the zooids.
82. *Smittina nitidissima* (Hincks, 1880): this species replaces *Smittina malleolus* (Hincks, 1884). Reported from Israel and Lebanon by d'Hondt (1988) (as *S. malleolus*), and subsequently by Harmelin *et al.* (2009) and Harmelin *et al.* (2016). It was also found in Sicily (Plemmirio) by Rosso *et al.* (in press).
83. *Metroperiella gay* Reverter-Gil, Souto & Fernández-Pulpeiro, 2009: described from the Atlantic, this species is recorded in the Mediterranean by Madurell *et al.* (2013).
84. *Schizomavella* Canu & Bassler, 1917: species of *Schizomavella* are referred to the subgenera *Calvetomavella* and *Schizomavella* according to Reverter-Gil *et al.* (2015) and bryozoa.net by P. Bock and Word Register of Marine Species, accessed 8.2.2016.
85. *Schizomavella rudis* (Manzoni, 1869): Reverter-Gil *et al.* (2012a, 2016) doubted the validity of this species stating that the type material no longer exists. The authors erected instead *Stephanotheca watersi* and *Schizomavella adriatica* to accommodate Mediterranean colonies previously assigned to *S. rudis*. However, a further research of the old type material, often challenging, may be beneficial to accommodate specimens currently unassigned neither to *S. watersi* either to *S. adriatica*.
86. *Schizomavella* (*Calvetomavella*) *discoidea* (Busk, 1859): Reverter-Gil *et al.* (2015) considered this species absent from the Mediterranean. The Mediterranean colonies from deep waters belong to a very similar, undescribed species (AR, unpublished data).
87. *Schizomavella* (*Calvetomavella*) *neptuni* (Jullien, 1882): previously *Schizoporella neptuni*, Reverter-Gil *et al.* (2015) proposed the new combination.
88. *Schizomavella* (*Schizomavella*) *cornuta* (Heller, 1867): Reverter-Gil *et al.* (2016) include among the synonymies of this species *Schizomavella auriculata ornata* Canu & Bassler, 1928.
89. *Schizomavella* (*Schizomavella*) *fischeri* (Jullien, 1882): Reverter-Gil *et al.* (2015) do not corroborate the conspecificity of the Mediterranean records with the Atlantic species because no SEM images are provided in any of the related papers. However, we can confirm the occurrences associated with the deep-water corals in Mastrototaro *et al.* (2010).
90. *Schizomavella* (*Schizomavella*) *grandiporosa* Canu &

- Bassler, 1925: this species is reported from the south-western Mediterranean (Souto *et al.*, 2013).
91. *Schizomavella* (*Schizomavella*) *hastata* (Hincks, 1862): Reverter-Gil *et al.* (2016) doubted about the presence of this species in the Mediterranean. All the occurrences need revision. Some may belong to *S. linearis*, as seen for certain Adriatic colonies.
92. *Stephanotheca* Reverter-Gil, Souto & Fernández-Pulpeiro, 2012a: genus erected to accommodate newly described species as well as some species previously assigned to *Schizomavella* but differing in the morphology of the orifice and ovicell.
93. *Watersipora arcuata* Banta, 1969: Ferrario *et al.* (2015) reported this species from the Ligurian Sea.
94. *Watersipora complanata* (Norman, 1864): we agree with Harmelin (2014) about the need of a better generic placement for this species.
95. *Watersipora souleorum* Vieira, Spencer Jones & Taylor, 2014: specimens of the Waters' Collection collected in the Tyrrhenian Sea, off Naples, in 1912 are assigned by the authors to this new species. However, its presence nowadays needs to be confirmed (Harmelin, 2014).
96. *Watersipora subtorquata* (d'Orbigny, 1852): NIB in the Mediterranean (Harmelin *et al.*, 2016).
97. *Schizoporella errata* (Waters, 1878): Tompsett *et al.* (2009) synonymized *Schizopodrella violacea* Canu & Bassler, 1930 with this species.
98. *Schizoporella patula* Hayward & Ryland, 1995: originally described from the north-eastern Atlantic and the North Sea, this species is listed based on the record of Ayari & Taylor (2014) along the costs of Tunisia.
99. *Schizoporella* sp. 1 *sensu* Chimenz Gusso *et al.* (2014): the authors distinguished three species of *Schizoporella* (see also comments 95 and 96 below) from other con-generics, leaving them in open nomenclature. *S.* sp. 1 shares some superficial features with *S. cornualis* Hayward & Ryland, 1995, but it differs in having a larger orifice, a shorter U-shaped sinus, shorter rounded condyles, and avicularia more proximally placed and laterally directed, with the rostrum tips ending no further than the distal margin of the orifice.
100. *Schizoporella* sp. 2 *sensu* Chimenz Gusso *et al.* (2014): the general appearance of *S.* sp. 2 is similar to *S. hesperia* Hayward & Ryland, 1995, but Mediterranean colonies differ in having a larger sinus, smaller condyles and up to four avicularia per zooid.
101. *Schizoporella* sp. 3 *sensu* Chimenz Gusso *et al.* (2014): similar to *S. patula* Hayward & Ryland, 1995, this species is distinguishable in having a larger orifice, a different shape of the sinus, shorter condyles and oral spines.
102. *Stylopoma* Levinsen, 1909: the first record of this genus in the Mediterranean is in Tilbrook (2000). The author assigned to *Stylopoma inchoans* Tilbrook, 2000 some specimens collected during the Mediterranean HMS Porcupine cruise (July-October 1870) and reported in Hastings (1968). Subsequent occurrences are from the southern sector (Ben Ismail, 2012; Ben Ismail *et al.*, 2012; Ayari & Taylor, 2014). Widespread in the tropics, this genus may be considered as a NIB in the Mediterranean.
103. *Hippopodina ambita* (Hayward, 1974): previously in *Cosciniopsis* Canu & Bassler, 1927, now in *Hippopodina* as proposed by Banta & Carson (1977) and accepted by Harmelin *et al.* (2016).
104. *Hippopodina feegeensis* (Busk, 1884): Tilbrook (2006) doubted that the Mediterranean colonies reported by Powell (1969) effectively belong to this species.
105. *Hippopodina iririkiensis* Tilbrook, 1999: specimens described by Eitan (1972) are assigned by Tilbrook (1999) to his new species suggesting for it the status of NIB as also reported in Zenetos *et al.* (2012).
106. Escharinidae Tilbrook, 2006: family introduced to accommodate several genera previously considered as incertae sedis.
107. *Sertulipora guttata* Harmelin & d'Hondt, 1992: originally described from the north-eastern Atlantic, this species was reported from Mediterranean submarine fossil assemblages (Rosso, 1990; Harmelin & d'Hondt, 1992), and subsequently found alive off Malta in 2009 during the MEDCOR Cruise (Rosso *et al.*, in prep.).
108. Hippaliosinidae Winston, 2005: family erected to accommodate the genus *Hippaliosina* Canu, 1918 previously considered as incertae sedis.
109. *Hippaliosina acutirostris* Canu & Bassler, 1929: overlooked in Rosso (2003). Reported by Powell (1969) is considered as a NIB (Zenetos *et al.*, 2012).
110. *Calloporina decorata* (Reuss, 1847): Berning (2012) suggested to review the conspecificity of the present-day Mediterranean specimens with the fossil ones, based on the number of oral spines in ovicellate zooids and the morphology of avicularia.
111. *Fenestulina barrosoi* Alvarez, 1993: overlooked in Rosso (2003), this species occurs in the Alboran Sea.
112. *Microporella browni* Harmelin, Ostrowsky, Cáceres-Chamizo & Sanner, 2011: this species, considered as a native from Oman, is absent in the Red Sea and a NIB in Lebanon, possibly introduced via shipping (Harmelin *et al.*, 2011).
113. *Microporella ciliata* (Pallas, 1766): after the selection of a lectotype by Kukliński & Taylor (2008), a revision of all the Mediterranean occurrences is needed for this species complex. At least two new species are awaiting description (AR & EDM, unpublished data).
114. *Microporella coronata* (Audouin & Savigny, 1826): this species, considered as a NIB in the Mediterranean (Harmelin *et al.*, 2016), replaces *Microporella umbracula* (Audouin, 1826), following Harmelin *et al.* (2011).
115. *Microporella genisii* (Audouin, 1826): added based on the record of Harmelin *et al.* (2011) from Lebanon.
116. *Microporella harmeri* Hayward, 1988: added based on the records of Harmelin *et al.* (2011) from Lebanon and Sokolover *et al.* (2016) from Israel.
117. *Microporella orientalis* Harmer, 1957: Harmelin *et al.* (2011) reassigned some of the Mediterranean specimens attributed to *M. orientalis* to *M. harmeri* or *M. genisii*. The specimen from the Aegean Sea in Hayward (1974) doubtless belongs to *M. orientalis*. Other occurrences need to be verified.
118. Petraliellidae Harmer, 1957 and *Mucropetraliella* Stach, 1936: family and genus added because of the occurrence of *Mucropetraliella thenardii* (Audouin & Savigny, 1926) as a NIB in Lebanon (Harmelin, 2014) and Israel (Sokolover *et al.*, 2016).

119. *Cribellopora simplex* Gautier, 1957: taxon resurrected by Souto *et al.* (2010a). Records of *C. trichotoma* (Waters, 1918) from the Mediterranean may belong to this species, which is doubtless present in the Sicily Channel (AR, pers. obs.).
120. *Cleidochasmidra portisi* (Neviani, 1895): taxon resurrected by Rosso *et al.* (2015), replaces *C. canakkalense* Ünsal & d'Hondt, 1989.
121. *Trematooecia mikeli* Sokolover, Taylor & Ilan, 2016: this species, as figured in Sokolover *et al.* (2016, p. 451, fig. 13), seems to fit better in *Celleporaria*. The authors suggested for it the status of NIB, which will persist in the case of its attribution to *Celleporaria* (see comment 60).
122. *Buffonellaria* Canu & Bassler, 1917: Berning & Kukliński (2008) reassigned part of the Mediterranean occurrences, previously all assigned to *Buffonellaria divergens* (Smitt, 1873), to four different species, mentioning the presence of at least two more undescribed species.
123. *Cellepora pumicosa* (Pallas, 1766): this species replaces *C. pumicosa* (Waters, 1879). The status of this species is unclear because several authors used the same name to indicate taxa with different morphological characters and size, referring confusedly or incompletely to the past literature. The revision of all the types is needed to clarify the taxonomy, and the Mediterranean occurrences should then be revised accordingly.
124. *Celleporina bitari* Harmelin, 2014: Harmelin (2014) reported this species from Lebanon as a lessepsian immigrant, possibly introduced via shipping.
125. *Celleporina caminata* (Waters, 1879): this species replaces *Celleporina globulosa* d'Orbigny, 1852.
126. *Celleporina truncatorostris* (Canu & Bassler, 1930): based on the unique record from Tunisia (Canu & Bassler, 1930; Ayari & Taylor, 2014).
127. *Predanophora* Tilbrook, 2006: genus introduced for *P. longiuscula* (Harmer, 1957) recorded by Harmelin (2014) off Lebanon and considered as a NIB in the Mediterranean.
128. *Turbicellepora robusta* (Barroso, 1921): overlooked in Rosso (2003).
129. *Hagiosynodos* Bishop & Hayward, 1989: previously placed in the family Lepraliellidae, this genus was tentatively displaced in the family Cheiloporinidae by Hayward & MacKinney (2002). Here we follow its inclusion in the family Hippoporidridae as suggested by Sosa-Yanez *et al.* (2015). A revision is needed to ascertain the validity of all the species and subspecies included in the genus.
130. *Hagiosynodos strophiae* (Canu & Bassler, 1930): based on the unique record from Tunisia (Canu & Bassler, 1930; Ayari & Taylor, 2014).
131. *Scorpiodiniopora* Balavoine, 1959: genus introduced for *S. costulata* (Canu & Bassler, 1929) recorded by Harmelin *et al.* (2012) off Lebanon and considered as a lessepsian immigrant.
132. *Dentiporella sardonica* (Waters, 1879): senior synonym of *Rhynchozoon revelatus* Hayward & McKinney, 2002. *Dentiporella* is considered a valid genus by Souto *et al.* (2010b), consequently inverted commas used in Rosso (2003) have been removed.
133. *Plesioleidochasma* Soule, Soule & Chaney, 1991: genus introduced based on the synonymy with *Schedocleidochasma* Soule, Soule & Chaney, 1991 proposed by Berning (2012).
134. *Plesioleidochasma mediterraneum* Chimenz Gusso & Soule, 2003: Mediterranean occurrences of *Cleidochasma porcellanum* Busk, 1860 refer to *P. mediterraneum* as reported in Chimenz Gusso & Soule (2003). The same for occurrences of *Hippoporina simplex* Canu & Bassler, 1930, synonymized with *C. porcellanum* by Cook (1964) and accepted by Zabala (1986) and d'Hondt & Ben Ismail (2008), but still reported as *H. simplex* in Ayari & Taylor (2014).
135. *Plesioleidochasma porcellaniforme* (Soule, Soule & Chaney, 1991): reported as *Schedocleidochasma* in Rosso (2003).
136. *Reteporella jermanensis* (Waters, 1909): reported off Israel by d'Hondt (1988) and Galil (2007), this species is considered as a lessepsian immigrant.
137. *Reteporella* sp. *sensu* Sokolover, Taylor & Ilan, 2016: this species has some similarities with *R. beaniana* but lacks its stout oral spines.
138. *Rhynchozoon larreyi* (Audouin, 1826): reported from the eastern sector of the Mediterranean, off Turkey (Ünsal & d'Hondt, 1978-79; Çinar *et al.*, 2005), Lebanon and Israel (d'Hondt, 1988; Harmelin *et al.*, 2016).
139. *Schizoretepora hassi* Harmelin, Bitar & Zibrowius, 2007: recorded off Lebanon by Harmelin *et al.* (2007) and reported as a NIB from the Red Sea or as an endemic taxon with a very restricted distribution in the Levantine Basin. Harmelin *et al.* (2016) consider this species as cryptogenic.
140. *Schizoretepora imperati* (Busk, 1884): *Schizellozoon aviculiferum* Canu & Bassler (1930) is possibly a synonym as suggested in Zabala (1986) and d'Hondt & Ben Ismail (2008).