

Bryozoa of the South China Sea—an overview

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Abstract. A checklist is presented of 532 species of named and known-undescribed bryozoans (Cyclostomata 36, Ctenostomata 17, Cheilostomata 479) from the South China Sea (SCS). This level of diversity is much less than what might be anticipated (900–1000 species) and no doubt reflects the paucity of sampling and description from the deep shoals and abyssal basin, eastern margin and the southwestern coasts of the SCS, particular biotopes, and knowledge of cryptic species. About 58% of the species are from the coastal waters of China, 22% from Singapore and 6% from the SCS coast of Peninsular Malaysia. A number of species have been recorded from the SCS coasts of the Philippines and Indonesia, but only two marine species have been formally reported from Vietnam, one from the SCS coast of Thailand, and none from East Malaysia, Brunei or Cambodia. Some 58% of all species are two-dimensional encrusters. Other colony morphologies include erect-flexible (22%), erect-rigid (14%), rooted-conical (6%) and free-living (1%). The most speciose families, each with 20 or more species, are Candidae, Conescharellinidae, Phidoloporidae, Bugulidae, Membraniporidae, Calloporidae and Smittinidae. Bryozoan diversity in coral-reef environments is affected by the same threats that diminish the diversity of other marine life, particularly pollution and land-based sediment. Though many species are physically small and cryptic, bryozoans can be common in coral-reef settings and high bryozoan diversity is indicative of a healthy reef environment.

Key words. Bryozoa, checklist, marine biodiversity, South China Sea

INTRODUCTION

Phylum Bryozoa comprises more than 6000 described living species. Bock & Gordon (2013) cited almost 5900 species in their classification of living Bryozoa and the latest statistics from the World Register of Marine Species (which also includes the ~90 freshwater species of Bryozoa) give a figure of 6173 species (WoRMS Editorial Board, 2016), based on the additional new species described since 2013. All are colonial or potentially so, ranging in maximum colony size through several orders of magnitude from less than a millimetre to more than a metre. The majority of species are marine and calcified. Accordingly, the largest and most robust species can superficially resemble certain cnidarians and be mistaken in the field for soft corals, hydrocorals and even scleractinian corals; some weakly calcified or uncalcified bushy bryozoans resemble hydroids. Others are conical-discoidal and either rooted or free-living on soft sediments, some bore into shells, and yet others live in the interstices of sand grains. The majority of bryozoans are two-dimensional encrusters, of which perhaps the most remarkable is the amphibious, leaf-encrusting *Amphibiobeania epiphylla* (Metcalfe et al., 2007), recently found on mangroves in Johor Strait, surviving subaerially at shoulder height above low-tide datum. Notable

morphologies include the relatively large fenestrate (lace-like) colonies of phidoloporids, often highly coloured, the small conical, rooted forms of deep-sea sediments, free-living colonies of sandy sediments and rare shell-boring forms. All of these morphologies are represented in the bryofauna of the South China Sea (SCS).

A checklist is presented here comprising 532 species of named and known-undescribed bryozoans from the SCS. This level of diversity is far less than what might be expected from such a large area that partly borders the highly biodiverse Coral Triangle. Ironically for such a populous region of the world, the bryozoans from the SCS are relatively poorly known, especially in the southwestern part. Whereas Chinese bryozoologists and marine biologists, especially in the context of marine fouling, have made an impressive series of studies in Chinese coastal waters and at the Spratly Islands (e.g., Li et al., 1964; Liu, 1980, 1982, 1984a, b, 1985, 1991, 1992; Liu & Li, 1987; Chang et al., 1981; Cai et al., 1983; Lu et al., 1988; Li, 1989, 1992; Huang et al., 1990; Lu, 1991; Zhang & Liu, 1995; Liu et al., 1999, 2003; Liu & Liu, 1999, 2008), very little sampling and/or documentation of Bryozoa has been achieved on the SCS coasts of Indonesia, Malaysia, Thailand, Cambodia and Vietnam. Equally, the deep-sea basins have been bryozoologically unexplored. HMS *Rambler* collected bryozoans on Macclesfield Bank (Paracel Islands) and Tizard Bank (Spratly Islands) in 1888 (Kirkpatrick, 1890); the United States Bureau of Fisheries steamer *Albatross* collected from some stations off the western Philippines (and Hong Kong) in 1908–1909 (Canu & Bassler, 1929) and reports of the (1899–1900) *Siboga* expedition to eastern Indonesian seas mention comparative

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Singapore material in the collection of the Natural History Museum, London (Harmer 1915, 1926, 1934, 1957). Goh (2010) made a study of fouling bryozoans in Singapore waters and, most recently, Tilbrook & Gordon (2015, in press) respectively presented a checklist of bryozoans from the Johor Straits and a checklist of all known species in Singaporean waters.

MATERIAL AND METHODS

The basic form of the checklist was prepared for the 'Workshop on Marine Ecosystems and Biodiversity: Cooperative Project under the ASEAN-China Declaration on the Conduct of the Parties in the South China Sea', held at the National University of Singapore, 31 July–4 August 2012. The species in the list were compiled from published literature, plus field collecting around Singapore during 2012–2014. Published sources include all those cited in the introduction (above) plus non-indigenous taxonomic works that describe additional species or give synonymies relevant to the SCS bryofauna (i.e., d'Orbigny, 1851–1854; Waters, 1905; Levinsen, 1909; Robertson, 1921; Androsova, 1963; Soule et al., 1999; Tilbrook, 1999, 2001, 2006; Tilbrook et al., 2001; Gordon & Rudman, 2006; Reverter-Gil et al., 2011). Field-collecting by the author and K.J. Tilbrook around Singapore subsequent to the SCS workshop added some additional species (Tilbrook & Gordon, 2015, in press). The most comprehensive identification guides for SCS Bryozoa are those of Chinese workers summarised in Liu et al. (2001) and for adjacent tropical seas (Canu & Bassler, 1929; Harmer, 1915, 1926, 1934, 1957; Tilbrook, 2006). The single most helpful source for the following species list was the Checklist of Marine Biota of Chinese Seas (Liu & Liu, 2008); this work, however, includes many manuscript names of species that have not been formally described or illustrated and the taxonomic status of these remains uncertain in the light of continuing description of bryozoans from other parts of the tropical western Pacific. Because of uncertainty surrounding some of the names in published lists, taxonomic judgements had to be made in compiling the checklist presented here. In order to give a more accurate indication of actual bryozoan diversity in the SCS, undescribed species have also been included in the checklist. Species listed by Liu & Liu (2008) from northern China beyond the geographic limits of the SCS are not included here.

CHECKLIST OF BRYOZOA REPORTED FOR THE SOUTH CHINA SEA

Abbreviations used below: CN China, HK Hong Kong, ID Indonesia, ML Malaysia, PA Paracel Islands, PH Philippines, SCS (unspecified South China Sea), SG Singapore, SP Spratly Islands, TH Thailand, TW Taiwan, VN Vietnam.

Class STENOLAEMATA

Order CYCLOSTOMATA

Incertae sedis

Crisinidae

Mesonea simplex Canu & Bassler, 1929 PH, SP

Suborder Tubuliporina

Annectocymidae

Annectocyma radicata (Kirkpatrick, 1888) CN

Diaperoeciidae

Diaperoecia macrostoma Lu, Nie & Zhong, 1988¹ SP

Neavianipora pulcherrima Kirkpatrick, 1890 SG, SP

Diastoporidae

Desmoplagioecia lineata (MacGillivray, 1885)¹ SG

Entalophoridae

Entalophora minor Lu, Nie & Zhong, 1988¹ SP

Entalophora cf. *unifasciata* (Canu & Bassler, 1929)¹ PH, SP

Oncousoeciidae

Filisarsa candeana (d'Orbigny, 1853)² CN

Filisarsa rustica (d'Orbigny, 1853)² HK

Plagioeciidae

Plagioecia sarniensis (Norman, 1864) SP

Tubuliporidae

Exidmonea pauper (Canu & Bassler, 1929) PH, SP

Exidmonea zengmuensis (Lu, Nie & Zhong, 1988)¹ SP

Platonea philippisae (Harmer, 1915) ID, PH, SP

Platonea scalaria Canu & Bassler, 1922 PH, SP

Platonea sinensis (Lu, Nie & Zhong, 1988)¹ SP

Tubulipora coeruleina Canu & Bassler, 1929 CN, PH, SP

Tubulipora pulcherrimoidea Liu in Liu, Yin & Ma, 2001 CN

Tubulipora pulchra MacGillivray, 1885³ CN

Tubulipora rugatata Liu in Liu, Yin & Ma, 2001 CN

Tubulipora similis Liu in Liu, Yin & Ma, 2001 CN

Suborder Articulata

Crisiidae³

Bierisia edwardsiana (d'Orbigny, 1841) CN

Crisia crisidioides Ortmann, 1890 CN, SP

Crisia cf. *cuneata* Maplestone, 1905 CN

Crisia delicatula Canu & Bassler, 1929 CN, PH, SP

Crisia eburneodenticulata Smitt ms in Busk, 1875 CN

Crisia elongata Milne-Edwards, 1838 SP

Crisia cf. *setosa* MacGillivray, 1869 SG, SP

Crisidia cornuta (Linnaeus, 1758) CN

Filicrisia alloeciata Liu in Liu, Yin & Ma, 2001 CN

Crisuliporidae

Crisulipora ijimai Okada, 1917 CN

Suborder Cerioporina

- Ceroporidae
Heteropora pelliculata Waters, 1879⁴ CN
 Suborder Rectangulata
 Lichenoporidae
Disporella capillata (Kirkpatrick, 1890) SP
Disporella imperialis (Ortmann, 1890) CN
Lichenopora capillata Kirkpatrick, 1890⁴ SP
Lichenopora radiata (Audouin, 1826)³ CN
Lichenopora simplex (Busk, 1875)⁵ SP
- Order CTENOSTOMATA
 Suborder Euctenostomatina
 Superfamily Alcyonidioidea
 Alcyonidiidae
Alcyonidium jauhar Tilbrook & Gordon, 2015 SG
Alcyonidium sp. CN, SG
 Superfamily Flustrellidoidea
 Pherusellidae
Pherusella flabellaris (Kirkpatrick, 1890) SP
 Superfamily Arachnidoidea
 Arachnidiidae
Nolella cf. *gigantea* (Busk, 1856) SG, SP
 Superfamily Victorelloidea
 Sundanellidae
Sundanella sibogae (Harmer, 1915) SG, SP
 Superfamily Walkerioidea
 Aeverrilliidae
Aeverrillia setigera (Hincks, 1887) SP
 Mimosellidae
Mimosella cf. *verticillata* (Heller, 1867) CN
 Walkeriidae
Walkeria tuberosa Heller, 1867³ SP
Walkeria uva (Linnaeus, 1758)³ SP
 Superfamily Vesicularioidea
 Buskiidae
Buskia nitens Alder, 1856 CN
 Vesiculariidae
Amathia convoluta Lamarck, 1816 CN
Amathia distans Busk, 1886³ CN
Amathia gracilis (Leidy, 1855) CN
Amathia imbricata (Adams, 1798) CN
Amathia vermetiformis Harmer, 1926 SG
Amathia verticillata (Della Chiaje, 1822) CN, SG
Amathia sp. SG
- Order CHEILOSTOMATA
 Suborder Inovicellina
 Superfamily Aeteoidea
 Aeteidae
Aetea anguina (Linnaeus, 1758)³ CN, VN
Aetea ligulata Busk, 1852 SG
Aetea truncata (Landsborough, 1852)³ CN, SP
Aetea n. sp. 1 Liu & Liu, 2008 PA
- Suborder Scrupariina
 Superfamily Scruparioidea
 Scrupariidae
Scruparia chelata (Linnaeus, 1758) CN, SP
- Suborder Malacostegina
- Superfamily Membraniporoidea
 Electridae
Arbocuspis bellula (Hincks, 1881) CN
Arbopercula bengalensis (Stoliczka, 1869) CN, SG
Arbopercula angulata (Levinsen, 1909) ML, HK, TH
Arbopercula devinensis (Robertson, 1921) CN
Aspidelectra bihamata Liu in Liu, Yin & Ma, 2001 CN
Conopeum eriophorum (Lamouroux, 1816) CN
Conopeum papillorum Tilbrook, Hayward & Gordon, 2001 SG
Conopeum n. sp. [Hainan] Liu & Liu, 2008 CN
Conopeum sp. SG
Electra inarmata Liu in Liu, Yin & Ma, 2001 CN
Electra inermis Liu in Liu, Yin & Ma, 2001 CN
Electra pseudopilosa Liu in Liu, Yin & Ma, 2001 CN
Electra tenuispinosa Liu in Liu, Yin & Ma, 2001 CN
Electra n. sp. [Hainan] Liu & Liu, 2008 CN
Pyripora n. sp.⁴ [as *Pyriporopsis*] Liu & Liu, 2008 SP
Tarsocryptus laboriosus (Tilbrook, 2006) SG
- Membraniporidae
Biflustra bartschi (Canu & Bassler, 1929) SP
Biflustra conjunctiva (Zhang & Liu, 1995) CN
Biflustra eriophoroidea (Liu, 1992) CN
Biflustra falsitenuis (Liu, 1992) CN
Biflustra grandicella (Canu & Bassler, 1929) CN, HK, SG
Biflustra irregularata (Liu, 1991) CN
Biflustra limosa (Waters, 1909) CN, SG
Biflustra limosoidea (Liu, 1991) CN
Biflustra lingdingensis (Liu & Li, 1987) CN
Biflustra paragranticella Liu in Liu, Yin & Ma, 2001) CN
Biflustra parasavartii (Liu, 1999) CN
Biflustra perambulata Louis & Menon, 2009 SG
Biflustra ramosa d'Orbigny, 1852 PH
Biflustra savartii (Audouin, 1826)³ CN
Biflustra similis (Liu, 1992) CN
Biflustra tenuis (Desor, 1848)³ CN
Biflustra virgata (Canu & Bassler, 1929) PH, SP
Biflustra n. sp. 1 Liu & Liu, 2008 SP
Biflustra n. sp. 2 [Hainan] Liu & Liu, 2008 CN
Biflustra n. sp. 3 [Spratly Islands] Liu & Liu, 2008 SP
Biflustra n. sp. 4 [Hainan] Liu & Liu, 2008 CN
Biflustra n. sp. 5 [Hainan] Liu & Liu, 2008 CN

- Biflustra* n. sp. 6 [Hainan] Liu & Liu, 2008 CN
Biflustra n. sp. 7 Liu & Liu, 2008 SCS
Jellyella eburnea (Hincks, 1891) SP
Jellyella tuberculata (Bosc, 1802) CN, HK, SG
Jellyella tuberculatoidea (Liu, 1999) CN
- Sinoflustridae
Membraniporopsis bifloris (Wang & Tung, 1976) CN
Membraniporopsis serrilamelloides (Liu & Li, 1987) CN
Sinoflustra amoyensis (Robertson, 1921) CN, SG
Sinoflustra annae (Osburn, 1953) CN, SG
- Suborder Thalamoporellina
 Superfamily Thalamoporelloidea
 Steginoporellidae
Labioporella cornuta Harmer, 1926 CN
Steginoporella magnilabris (Busk, 1854) CN, HK, SG
- Thalamoporellidae
Thalamoporella granulata Levinsen, 1909 SP
Thalamoporella hamata Harmer, 1926 SP
Thalamoporella harmelini Soule, Soule & Chaney, 1999 CN
Thalamoporella linearis Canu & Bassler, 1929 HK
Thalamoporella labiata Levinsen, 1909 CN, TW, SG
Thalamoporella lioticha (Ortmann, 1890) CN
Thalamoporella cf. *rozieri* (Audouin, 1826) SP
Thalamoporella stapifera Levinsen, 1909 CN
Thalamoporella tubifera Levinsen, 1909 CN, SG
- Suborder Neocheilostomina
 Superfamily Calloporoidea
 Antroporidae
Akatopora leucocypha (Marcus, 1937)³ SP
Akatopora tincta (Hastings, 1930) CN
Antropora granulifera (Hincks, 1880) CN, PH
Antropora minor (Hincks, 1880) CN, SG
Antropora subvespertilio (Canu & Bassler, 1929) PH, SP
Antropora n. sp. 1 Liu & Liu, 2008 SCS
Antropora n. sp. 2 [Hainan] Liu & Liu, 2008 CN
Antropora n. sp. 3 [Hainan] Liu & Liu, 2008 CN
Antropora n. sp. 4 [Spratly Islands] Liu & Liu, 2008 SP
Antropora n. sp. 5 [Hainan] Liu & Liu, 2008 CN
Parantropora laguncula (Canu & Bassler, 1929) SP
- Calloporidae
Amphiblestrum n. sp. [South China] Liu & Liu, 2008 CN
Aplousina n. sp. 1 Liu & Liu, 2008 SCS
- Aplousina* n. sp. 2 [Spratly Islands] Liu & Liu, 2008 SP
Aplousina n. sp. 3 [Hainan] Liu & Liu, 2008 CN
Aplousina n. sp. 4 [Spratly Islands] Liu & Liu, 2008 SP
Callopora n. sp. 1 [Hainan] Liu & Liu, 2008 CN
Callopora n. sp. 2 Liu & Liu, 2008 SCS
Callopora n. sp. 3 [Hainan] Liu & Liu, 2008 CN
Copidozoum n. sp. Liu & Liu, 2008 SCS
Corbulella corbula (Hincks, 1880) SG
Corbulella laguncula (Liu, 1991) SP
Corbulella n. sp. [Spratly Islands] Liu & Liu, 2008 CN
Cranosina coronata (Hincks, 1881) SG, SP
Cranosina philippinensis (Canu & Bassler, 1929) HK
Cranosina n. sp. [Paracel Islands] Liu & Liu, 2008 PA
Crassimarginatella corniculata Tilbrook, Gordon & Hayward, 2001 SG
Crassimarginatella cf. *crassimarginata* (Hincks, 1880)³ CN
Crassimarginatella cf. *papulifera* (MacGillivray, 1882) SG
Crassimarginatella n. sp. 1 [Guangdong] Liu & Liu, 2008 CN
Crassimarginatella n. sp. 2 [Paracel Islands] Liu & Liu, 2008 PA
Crepis sidneyi Reverter-Gil, Souto & Fernández-Pulpeiro, 2011 SG
Crepis sinensis Reverter-Gil, Souto & Fernández-Pulpeiro, 2011 CN
Parellisina curvirostris (Hincks, 1862) SG
Parellisina n. sp. 1 Liu & Liu, 2008 SCS
Parellisina n. sp. 2 Liu & Liu, 2008 SCS
Ramphonotus n. sp. 1 Liu & Liu, 2008 SCS
Ramphonotus n. sp. 2 Liu & Liu, 2008 SCS
Retevirgula n. sp. Liu & Liu, 2008 SCS
- Chaperiidae
Chaperia cf. *acanthina* (Lamouroux, 1824) CN
Chaperiopsis n. sp. [Hainan] Liu & Liu, 2008 CN
- Cupuladriidae
Cupuladria elegans Lu, 1991 SP
Cupuladria guineensis (Busk, 1854) CN, SG
Vibracellina viator Canu & Bassler, 1929 PH, SP
Vibracellina sp. [“semiglobosa”] Lu et al. in Lu, 1991 SP
- Farciminariidae
Didymozoum simplex (Busk, 1852) SP
- Hiantoporidae
Hiantopora intermedia (Kirkpatrick, 1890) CN
Hiantopora pleuroaviculata (Liu, 1991) SP

- Quadricellariidae
Nellia tenella (Lamarck, 1816) CN, SG
Nellia tenuis Harmer, 1926 SP
- Superfamily Flustroidea
 Flustridae
Carbasea meridionalis Liu, 1982 CN
Carbasea n. sp. [Spratly Islands] Liu & Liu, 2008 CN
Hincksina n. sp. 1 [Spratly Islands] Liu & Liu, 2008 SP
Hincksina n. sp. 2 [Hainan] Liu & Liu, 2008 CN
Hincksina n. sp. 3 [Hainan] Liu & Liu, 2008 CN
Retiflustra anatina (Liu, 1982) CN
Retiflustra reticulum (Hincks, 1882) SP
Retiflustra schoenau Levinsen, 1909 CN, SG
Retiflustra sinica (Liu, 1982) CN
- Superfamily Buguloidea
 Beaniidae
Amphibiobeania epiphylla Metcalfe, Gordon & Hayward, 2007 SG
Beania aspinosa Liu, 1984 CN
Beania cookae Tilbrook, Hayward & Gordon, 2001 CN, SG
Beania cupulariensis Osburn, 1914 CN
Beania discodermiae (Ortmann, 1890) CN
Beania cf. *hirtissima* (Heller, 1867) CN
Beania intermedia (Hincks, 1881) CN
Beania lagenula Tilbrook, 2006 CN
Beania petiolata Harmer, 1926 CN
Beania regularis Thornely, 1916 CN, SG
Beania cf. *spinigera* (MacGillivray, 1860) CN
- Bugulidae
Bicelliella gracilis (Busk, 1852) CN
Bugula neritina (Linnaeus, 1758) CN, SG
Bugula robusta MacGillivray, 1869³ CN
Bugula scaphoides Kirkpatrick, 1890 PA
Bugula subglobosa Harmer, 1926 CN
Bugulina stolonifera (Ryland, 1960) CN
Bugula subglobosa Harmer, 1926 CN
Bugula n. sp. 1 Liu & Liu, 2008 SCS
Bugula n. sp. 2 [Spratly Islands] Liu & Liu, 2008 SP
Bugula n. sp. 3 [Spratly Islands] Liu & Liu, 2008 SP
Bugula n. sp. 4 [Hainan] Liu & Liu, 2008 CN
Bugula ? n. sp. [*Brettia vectifera*] Liu & Liu, 2008 SP
Caulibugula caliculata (Levinsen, 1909) HK
Caulibugula ciliata (Robertson, 1905) CN
Caulibugula dendrograpta (Waters, 1913) CN
Caulibugula gracilentia Liu, 1985 CN
Caulibugula hainanica Liu, 1984 CN
Caulibugula inermis Harmer, 1926 CN
Caulibugula irregularis Liu, 1985 CN
Caulibugula longirostrata Liu, 1985 CN
Caulibugula mortenseni (Marcus, 1925) CN
Caulibugula sinica Liu, 1985 CN
Caulibugula zanzibariensis (Waters, 1913) CN
Caulibugula n. sp. 1 [Spratly Islands] Liu & Liu, 2008 SP
Caulibugula n. sp. 2 [Hainan] Liu & Liu, 2008 CN
Caulibugula n. sp. 3 [Hainan] Liu & Liu, 2008 CN
Falsibugula sinica Liu, 1984 CN
Virididentula dentata (Lamouroux, 1816) CN, SG
- Candidae
Amastigia cf. *rudis* Busk, 1852 CN
Amastigia varians Liu, 1984 CN
Amastigia xishaensis Liu, 1984 PA
Aspiscellaria frondis (Kirkpatrick, 1890) SG
Caberea brevigaleata Canu & Bassler, 1929 PH, SP
Caberea climacina Ortmann, 1890 CN
Caberea hataii Okada, 1929 CN
Caberea lata Busk, 1852 HK, SP, VN
Caberea sinensis Lu, 1991 SP
Caberea symmetrica Liu, 1984 CN
Caberea transversa Harmer, 1926 SG
Caberea tsuchimensis Okada, 1923 CN
Caberea n. sp. [Spratly Islands] Liu & Liu, 2008 CN
Canda clypeata (Haswell, 1880) SP
Canda pecten Thornely, 1907 CN
Canda scutata Harmer, 1926 SP
Cradoscrupocellaria nanshaensis Liu, 1991 SP
Cradoscrupocellaria uniseriata Liu, 1984 CN
Licornia bifurcata (Liu in Liu, Yin & Ma, 2001) [preoccupied] CN
Licornia curvata (Harmer, 1926) PH, SG, SP
Licornia diadema Busk, 1852 CN
Licornia ferox Busk, 1852 SG, SP
Licornia longispinosa Harmer, 1926 SG
Licornia securifera (Busk, 1884) SP
Licornia sinuosa (Canu & Bassler, 1927) SG
Licornia spatulata (d'Orbigny, 1851) CN
Licornia spatulatoidea (Liu, 1980) CN
Licornia unicornis (Liu, 1980) CN
Menipea multipartita (Yang & Lu, 1981) SP
Paralicornia obtecta (Haswell, 1880) SP
Paralicornia sinuosa (Canu & Bassler, 1927) SG
Scrupocellaria delilii (Audouin, 1826)³ CN
Scrupocaberea cf. *maderensis* Busk, 1860 CN
Scrupocellaria n. sp. 1 Liu & Liu, 2008 SCS
Scrupocellaria n. sp. 2 [Hainan] Liu & Liu, 2008 CN
Scrupocellaria n. sp. 3 [Paracel Islands] Liu & Liu, 2008 PA
Scrupocellaria n. sp. 4 [Spratly Islands] Liu & Liu, 2008 SP
Scrupocellaria n. sp. 5 [Spratly Islands] Liu & Liu, 2008 SP
Scrupocellaria n. sp. 6 [Hainan] Liu & Liu, 2008 CN

- Scrupocellaria* n. sp. 7 [Spratly Islands] Liu & Liu, 2008 SP
Tricellaria multispinosa Liu, 1984 CN
Tricellaria sp. SP
- Epistomiidae
Synnotum aegyptiacum (Audouin, 1826) CN, SG
Synnotum pemaense Waters, 1913 CN, SP
- Incertae sedis
Brettia mollis Harmer, 1926⁴ CN
- Superfamily Microporoidea
 Calescharidae
Caleschara minuta (Maplestone, 1909) SG
- Monoporellidae
Monoporella cf. *nodulifera* (Hincks, 1881) CN
- Onychocellidae
Onychocella cf. *angulosa* (Reuss, 1848) PA, SP
Onychocella subsymmetrica Canu & Bassler, 1929 PH, SP
Smittipora cordiformis Harmer, 1926 CN, SG
Smittipora harmeriana (Canu & Bassler, 1929) CN
Smittipora philippinensis (Canu & Bassler, 1929) CN, PH
- Poricellariidae
Poricellaria ratoniensis (Waters, 1887) CN, SG
- Superfamily Cellarioidea
 Cellariidae
Cellaria boninensis Silén, 1938 CN
Cellaria gracilis Busk, 1852 SP
Cellaria sp. [ms 'sinica'] Liu unpublished in Liu 2008) PA
Cellaria punctata (Busk, 1852) SG
Mesostomaria sp. SP
- Superfamily Cribrilinoidea
 Catenicellidae
Catenicella elegans Busk, 1852 SP
Catenicella triangulifera (Harmer, 1957) CN, ID, SG
Catenicella uberrima (Harmer, 1957) CN, ID, SG
Vasignyella otophora (Kirkpatrick, 1890) SG, SP
- Cribrilinidae
Cribralaria setosa (Kirkpatrick, 1890) SP
Figularia cf. *figularis* (Johnston, 1847) CN
Figularia fissa (Hincks, 1880) SG, SP
Figularia fissurata Canu & Bassler, 1929 PH
Puellina biavicularia (Kataoka, 1961) SP
Puellina sp. [ms 'biaviculariata'] Liu unpublished in Liu, 2008) PA CN
Puellina flabellifera (Kirkpatrick, 1888) CN
Puellina harmeri (Ristedt, 1985) CN, PH
Puellina sp. [ms 'innominatoidea'] Liu unpublished in Liu, 2008) PA CN
Puellina cf. *setosa* (Waters, 1899) SP
Puellina vicariata (Waters, 1923) PA, SG, SP
- Eurystomellidae
Integripelta acanthus Gordon & Rudman, 2006 HK
Integripelta shirayamai Gordon, Mawatari & Kajihara, 2002 CN
- Savignyellidae
Savignyella lafontii (Audouin, 1826) CN, SG
- Superfamily Hippothooidea
 Chorizoporidae
Chorizopora brongniartii (Audouin, 1826) CN, SG, SP
- Hippothoidae
Hippothoa flagellum Manzoni, 1870 CN
Hippothoa imperforata Liu in Liu, Yin & Ma, 2001 CN
- Trypostegidae
Trypostega henrychaneyi Tilbrook, 2006 SG, SP
- Superfamily Arachnopusioidea
 Arachnopusiidae
Poricella celleporoides (Busk, 1884) SG
Poricella spathulata (Canu & Bassler, 1929) CN, SG
- Exechonellidae
Exechonella ampullacea Hayward & Ryland, 1995 SG
Exechonella discoidea Canu & Bassler, 1929 PH
Exechonella cf. *grandis* (Duvergier, 1921) SG
Exechonella cf. *magna* (MacGillivray, 1895) CN
Exechonella cf. *tuberculata* (MacGillivray, 1883) CN
- Superfamily Adeonoidea
 Adeonidae
Adeona articulata Canu & Bassler, 1929 SG
Adeona sinensis Lu, 1991 SP
Adeonella extensa Harmer, 1957 ID, SG
Adeonella intricaria Busk, 1884 SG
Adeonella japonica Ortmann, 1890 CN
Adeonella lichenoides (Lamarck, 1816) CN, HK, SG
Adeonella sp. ["elegans"] Lu, Nie & Zhong in Lu 1991 SP
Adeonellopsis arculifera (Canu & Bassler, 1929) PH, SP
Adeonellopsis cf. *coscinophora* (Reuss, 1848) PA
Adeonellopsis cf. *pentapora* Canu & Bassler, 1929
Reptadeonella fissa (Hincks, 1880) SG
Reptadeonella joloensis (Bassler, 1936) PH, SP
- Superfamily Lepralielloidea
 Lepraliellidae
Celleporaria aperta (Hincks, 1882) CN, SG
Celleporaria erectorostris (Canu & Bassler, 1929) PH
Celleporaria fusca (Busk, 1854) SG

- Celleporaria inaudita* Tilbrook, Hayward & Gordon, 2001 CN
Celleporaria multiformata Liu in Liu, Yin & Ma, 2001 CN
Celleporaria pilaefera (Canu & Bassler, 1929) CN, PH
Celleporaria tridenticulata (Busk, 1881) CN, SG
Celleporaria umbonatoidea (Liu & Li, 1987) CN
Drepanophora corrugata (Thornely, 1905) CN
Drepanophora incisor (Thornely, 1905) CN
Drepanophora indica Hayward, 1988 SG
Drepanophora verrucosa Winston & Heimberg, 1986 CN, ID
- Romancheinidae
Exochella cf. *longirostris* Jullien, 1888 CN
Hippomenella sp. SG
Neolagenipora cf. *collaris* (Norman, 1867) CN
- Umbonulidae
 “*Umbonula verrucosa* (Esper, 1790)” CN
- Superfamily Smittinoidea
- Bitectiporidae
Hippoporina indica Pillai, 1978 CN, HK, SG
Hippothyris reticulata Liu in Liu, Yin & Ma, 2001⁴ CN
Metroperiella montferrandii (Audouin, 1826) CN
Metroperiella triquetra (Harmer, 1957) CN, ID
Parkermavella sinica (Liu in Liu, Yin & Ma, 2001) CN
Parkermavella sp. SG
Schizomavella n. sp. Liu & Liu, 2008 SCS
- Lanceoporidae
Calyptotheca australis (Haswell, 1880) CN
Calyptotheca capitifera (Canu & Bassler, 1929) CN, PH
Calyptotheca inaequalis Harmer, 1957 CN, IN
Calyptotheca inclusa (Thornely, 1906) CN, HK
Calyptotheca ingens (Canu & Bassler, 1929) HK
Calyptotheca parcimunita Harmer, 1957 CN, ID
Calyptotheca tenuata Harmer, 1957 CN, ID, SG
Calyptotheca wasinensis (Waters, 1913) CN, SG
Calyptotheca sp. 1 SP
Calyptotheca sp. 2 SP
Emballothea acutirostris Harmer, 1957 CN, ID, PH
Emballothea pacifica Harmer, 1957 CN, ID, SP
Lanceopora formosa Harmer, 1957 CN, ID
Lanceopora n. sp. Liu & Liu, 2008 CN
- Lanceopora* sp. SG
- Smittinidae
Parasmittina acuta (Canu & Bassler, 1929) CN, PH
Parasmittina bimucronata (Hincks, 1884) CN
Parasmittina circinanata Liu in Liu, Yin & Ma, 2001 CN
Parasmittina delicatula (Busk, 1884) CN
Parasmittina galerita Ryland & Hayward, 1992 CN, SG
Parasmittina glomerata (Thornely, 1912) CN
Parasmittina hastingsae Soule & Soule, 1973 CN
Parasmittina longirostrata Liu in Liu, Yin & Ma, 2001 CN
Parasmittina nitida (Canu & Bassler, 1929) SP
Parasmittina cf. *parsevalii* (Audouin, 1826) CN
Parasmittina pinctatae Liu in Liu, Yin & Ma, 2001 CN
Parasmittina cf. *raigii* (Audouin, 1826) CN
Parasmittina vacuramosa Lu, Nie & Zhong in Lu, 1991 SG, SP
Parasmittina winstonae Liu in Liu, Yin & Ma, 2001 CN
Parasmittina n. sp. Liu & Liu, 2008 SCS
Pleurocodonellina macroperforata Tilbrook, 2006 SG
Pleurocodonellina microperforata Tilbrook, 2006 CN
Smittina nitidissima (Hincks, 1880) CN³
Smittoidea levis (Kirkpatrick, 1890) CH
Smittoidea pacifica Soule & Soule, 1973 CH
Smittoidea n. sp. Liu & Liu, 2008 CH
- Watersiporidae
Watersipora subatra (Ortmann, 1890) SG
Watersipora subtorquata (d’Orbigny, 1852) CN
- Superfamily Schizoporelloidea
- Actisecidae
Actisecos regularis Canu & Bassler, 1929 PH, SP
- Cheiloporinidae
Cheiloporina haddoni (Harmer, 1957) CN, ID
- Escharinidae
Bryopesanser capitaneus Tilbrook, 2006 SP
Bryopesanser ephymatotes Tilbrook, 2012 SP
Bryopesanser grandicella (Canu & Bassler, 1929) CN, PH
Bryopesanser latesco Tilbrook, 2006 SG
- Gigantoporidae
Cosciniopsis lonchaea (Busk, 1884) CN, HK, PA, SP
Cosciniopsis onucha (Kirkpatrick, 1890) ID, SP
Gigantopora mutabilis (Canu & Bassler, 1929) CN, PH

- Gigantopora pupa* (Jullien in Jullien & Calvet, 1903) CN, PH
Gigantopora spiculifera Canu & Bassler, 1927 SP
- Hippaliosinidae
Hippaliosina acutirostris Canu & Bassler, 1929 CN, PH
Hippaliosina adhaerens (Thornely, 1905) CN
Hippaliosina oviceolata Harmer, 1957 CN, ID
Hippaliosina triforma Canu & Bassler, 1929 CH, PH, SG, SP
- Hippopodinidae
Hippopodina feegeensis (Busk, 1884) CN, HK, SG, PH
Hippopodina iririkiensis Tilbrook, 1999 CN, SG, PH
Hippopodina tahitiensis (Leca & d'Hondt, 1993) SG
Thornelya ceylonica (Thornely, 1905) CN
- Lacernidae
Arthropoma cf. *cecilia* (Audouin, 1826) CN
Phonicosia cf. *circinata* (MacGillivray, 1869) CN
- Margarettidae
Margaretta gracilior (Ortmann, 1890) SP
Margaretta gracilis (Canu & Bassler, 1929) PH, SP
Margaretta opuntioides (Pallas, 1766) SG, SP
Margaretta triplex Harmer, 1957 SP
- Microporellidae
Calloporina sculpta Canu & Bassler, 1929 CN, PH
Fenestulina harmeri Winston & Heimberg, 1986 CN, ID
Fenestulina cf. *infundibulipora* Canu & Bassler, 1929 CN
Fenestulina orientalis Liu, Liu & Sun, 2003 CN
Microporella clypeiformis Liu, Liu & Sun, 2003 CN
Microporella epihalimeda Tilbrook, 2006 CN
Microporella monilifera Liu, Liu & Sun, 2003 CN
Microporella pectinata Tilbrook, 2006 CN
Microporella vibraculifera (Hincks, 1882) CN
- Pacificincolidae
Pacificincola aviculifera (Osburn, 1914) CN
- Petraliellidae
Mucropetraliella bifidata Tilbrook, 2006 CN, SG
Mucropetraliella bispinata Liu in Liu, Yin & Ma, 2001 CN
Mucropetraliella oculifera Harmer, 1957 ID, SG
Mucropetraliella philippinensis (Canu & Bassler, 1929) CN, ID, PH
Mucropetraliella radiata Liu in Liu, Yin & Ma, 2001 CN
Mucropetraliella robusta (Canu & Bassler, 1929) CN, PH
- Mucropetraliella thenardii* (Audouin, 1826) SG
Mucropetraliella watersi Harmer, 1957 CN, PH
Petraliella buski Stach, 1936 CN
Petraliella crassocirca (Canu & Bassler, 1929) PH, SP
Petraliella dentilabris (Ortmann, 1892) CN, SG
Petraliella magna (d'Orbigny, 1852) CN
Sinupetraliella umbonata (Okada & Mawatari, 1937) CN
- Porinidae
Porina australiensis (Haswell, 1880) SP
Porina longicollis (Canu & Bassler, 1929) PH, SP
Porina vertebralis (Stoliczka, 1865) SP
- Robertsonidridae
Robertsonidra argentea (Hincks, 1881) CN, SG
Robertsonidra praecipua Hayward & Ryland, 1995 CN
- Schizoporellidae
Schizoporella erratoidea Liu in Liu, Yin & Ma, 2001 CN
Schizoporella japonica Ortmann, 1890 CN
Schizoporella tumulosa Hincks, 1883 CN
Stylopoma amboyna Tilbrook, 2001) SG, SP
Stylopoma novum Tilbrook, 2001 CN
Stylopoma varus Tilbrook, 2001 SP
Stylopoma velatum Tilbrook, 2001 SG, SP
Stylopoma viride (Thornely, 1905) SG
- Tetraplariidae
Tetraplaria immersa (Haswell, 1880) SP
Tetraplaria regularis (Lu, Nie & Zhong in Lu, 1991) SP
- Superfamily Didymoselloidea
 Didymosellidae
Tubiporella boninensis Borg, 1940
- Superfamily Mamilloporoidea
 Cleidochasmatidae
Anchicleidochasma mirabile (Harmer, 1957) SP, PH
Characodoma bassleri (Calvet, 1931) CN, SP
Characodoma biavicularium (Canu & Bassler, 1929) SP, PH
Characodoma elegans (Lu, 1991) SP
Characodoma lagena (Lu, 1991) SP
Characodoma latisinuatum Harmer, 1957 CN, ID
Characodoma peristomarium (Canu & Bassler, 1929) CN, ID, PH
Characodoma protrusum (Thornely, 1905) CN
Characodoma sinensis (Lu, 1991) SP
- Crepidacanthidae
Crepidacantha carsioseta Winston & Heimberg, 1986 CN, ID
Crepidacantha cf. *crinispina* Levinsen, 1909 CN
Crepidacantha poissonii (Audouin, 1826) CN

Superfamily Celleporoidea

Celleporidae

- Celleporina costazii* (Audouin, 1826) CN
Celleporina geminata (Ortmann, 1890) CN
Celleporina hainanica Liu in Liu, Yin & Ma, 2001 CN
Celleporina perplexa (Harmer, 1957) SP
Celleporina pisiformis (Canu & Bassler, 1929) CN, PH
Celleporina porosissima Harmer, 1957 CN, ID
Celleporina radiata (Ortmann, 1890) CN
Celleporina serrirostrata Liu in Liu, Yin & Ma, 2001 CN
Celleporina sinensis (Canu & Bassler, 1929) HK
Celleporina sinica Liu in Liu, Yin & Ma, 2001 CN
Celleporina cf. *spatula* (MacGillivray, 1887) CN
Celleporina n. sp. Liu & Liu, 2008 CN
Turbicellepora ampla (Kirkpatrick, 1888) PA, SG?
Turbicellepora redoutei (Audouin, 1826) CN

Colatooeciidae

- Cigclisula areolata* (Kirkpatrick, 1890) SG
Cigclisula fruticosa Hayward & Ryland, 1995 SG
Cigclisula occlusa (Busk, 1884) SG
Trematooecia clivulata Tilbrook, 2006 CN, SG

Hippoporidridae

- Hippoporidra* cf. *calcareia* (Smitt, 1873) CN

Lekythoporidae

- Poecilopora cribritheca* (Harmer, 1957) PH, SP

Phidoloporidae

- Fodinella spinigera* (Philipps, 1900) CN, HK
Iodictyum gibberosum (Buchner, 1924) CN, PH
Iodictyum sanguineum (Ortmann, 1890) SG, SP
Iodictyum willeyi Harmer, 1934 SP
Hippoporella calyciformis (Philipps, 1900) ID, PA
Lifuella granulata (Liu in Liu, Yin & Ma, 2001) HK
Lifuella lepralielloida (Liu in Liu, Yin & Ma, 2001) CN
Lifuella multidentata (Thornely, 1905) CN
Plesiocleidochasma fallax (Canu & Bassler, 1929) PH, SP
Plesiocleidochasma laterale (Harmer, 1957) CN, ID, SG
Reteporella abnormis Lu, Nie & Zhong in Lu, 1991 SP
Reteporella laxipes nonforata Lu, Nie & Zhong in Lu, 1991 SP
Reteporella nanshaensis Lu, Nie & Zhong in Lu, 1991 SP

- Reteporella graefei* (Kirchenpauer, 1869) SP
Reteporella suluensis Harmer, 1934 CN
Reteporellina babelensis (Chapman, 1941) CN
Reteporellina pectinata (Kirkpatrick, 1890) PA
Rhynchozoon detectum Harmer, 1957 SP
Rhynchozoon globosum Harmer, 1957 SP
Rhynchozoon haha Hayward, 1988 SG
Rhynchozoon multiformatum Liu in Liu, Yin & Ma, 2001 CN
Rhynchozoon obliquimandibulatum Liu in Liu, Yin & Ma, 2001 CN
Rhynchozoon rostratum (Busk, 1856) SP
Schedocleidochasma porcellaniforme Soule, Soule & Chaney, 1999 CN
Triphyllozoon arcuatum (MacGillivray, 1889) SG
Triphyllozoon hirsutum (Busk, 1884) CN, SG
Triphyllozoon inovicellatum Liu & Li, 1987 CN
Triphyllozoon mucronatum (Busk, 1884) CN
Triphyllozoon sinicum Liu & Li, 1987 HK
Triphyllozoon tubulatum (Busk, 1884) SG

Superfamily Conescharellinoidea

Conescharellinidae

- Conescharellina abnormis* Lu, 1991 SP
Conescharellina angustata d'Orbigny, 1852 CN
Conescharellina breviconica Canu & Bassler, 1929 PH, SP
Conescharellina catella Canu & Bassler, 1929 CN, PH, SG
Conescharellina concava Canu & Bassler, 1929 CN, HK
Conescharellina crassa (Tenison-Woods, 1880) CN
Conescharellina elongata Canu & Bassler, 1929 PH, SP
Conescharellina jucunda Canu & Bassler, 1929 PH, SP
Conescharellina lacrimula Lu, 1991 SP
Conescharellina lunata Canu & Bassler, 1929 PH, SP
Conescharellina nanshaensis Lu, 1991 SP
Conescharellina ovalis Harmer, 1957 ID, SP
Conescharellina petaliformis Lu, 1991 SP
Conescharellina n. sp. [Fujian] Liu & Liu, 2008 CN
Flabellopora arcuifera Canu & Bassler, 1929 PH, SP
Flabellopora acutirostris Canu & Bassler, 1929 CN, PH
Flabellopora elegans d'Orbigny, 1852 CN
Flabellopora irregularis Canu & Bassler, 1929 CN, HK, SG
Flabellopora lenticularis Canu & Bassler, 1929 PH, SP
Flabellopora pisiformis Canu & Bassler, 1929 CN, PH

Flabellopora planata Canu & Bassler, 1929
PH, SP
Flabellopora pusilla Canu & Bassler, 1929
CN, PH
Flabellopora umbonata (Haswell, 1881) CN
Trochosodon bilamella Lu, 1991 SP
Trochosodon linearis Canu & Bassler, 1929
SP
Trochosodon pacificum Lu, 1991 SP
Trochosodon parvulum Canu & Bassler, 1929
PH, SP
Trochosodon radiatus (Canu & Bassler, 1929)
PH, SP
Zeugltopora flabelloformis (Lu, 1991) SP
Zeugltopora pagoda (Lu, 1991) SP
Zeugltopora trinodata (Lu, 1991) SP
Zeugltopora n. sp. [Spratly Islands] Liu & Liu,
2008 SP

¹Taylor & Gordon (2001) note that the identity of tropical material attributed to this species by Harmer (1915) is “very doubtful”.

²Recorded by d’Orbigny (1851) from Chinese waters but not illustrated. *Idmonea rustica* d’Orbigny, 1853 was attributed by Waters (1905) to *Filisarsa*.

³A number of species listed for Chinese waters by Liu & Liu (2008) are nominally European, southern Australian or cosmopolitan and the specimens need checking.

⁴Generic status needs confirmation.

⁵Fide Kirkpatrick (1890); status needs checking.

DISCUSSION

Unsurprisingly, the largest proportion of the species in the checklist (57.8%) are found in the coastal waters of mainland China (including Hainan and Hong Kong), reflecting the extensive area of coastline and the high level of Chinese bryozoological research since the early 1980s. Some 22% of the species are found in the waters of Singapore and 6% on the SCS coast of Johore State, Malaysia. A number of species have been recorded from the SCS coasts of the Philippines and Indonesia, but only two species have been formally reported from the coast of Vietnam, one from the SCS coast of Thailand and none from East Malaysia, Brunei or Cambodia.

What is the anticipated diversity of Bryozoa in the SCS? The Siboga expedition collected about 517 species from mostly the Indonesian part of the Coral triangle. On a comparative basis, 317 named bryozoan species are known at the Great Barrier Reef from historic collecting and published literature to 2005 (Gordon & Bock, 2008) but hundreds of additional undescribed species both reside in museum collections and have been collected in the course of the CReefs field programme of the Census of Marine Life and a total of at least 1000 species for the entire area of the reef (344,400 km²) is anticipated (Tilbrook & Gordon, 2013). The area of the SCS is 3.5 million km². About 500 species are known from the smaller Mediterranean Sea area (2.5 million km²) (Rosso, 2003; Koçak & Aydin Önen, 2014). Nearly 1000 bryozoan species (named and known-undescribed) are known from the larger, more-temperate New Zealand EEZ (4.2

million km²) and up to 1200 species in total are expected there (Gordon et al., 2009). New sampling in little-explored tropical Pacific areas (e.g., Vanuatu, Solomon Islands) has yielded between 22% and 40% new bryozoan species in each study (Tilbrook et al., 2001; Tilbrook, 2006). Therefore, a total fauna of 900–1000 species of bryozoans might result from all environments in the SCS when fully known, based on more intensive collecting over a wider area, especially along the more-biodiverse eastern margin, in bryozoologically unexplored deep shoaling areas and the abyssal basin, and in unexplored biotopes (e.g., the interstitial bryozoan fauna of gravels and coarse sands), as well as resolution of cryptic species through gene sequencing.

Gordon (1987) compared the numbers of bryozoan species with different kinds of colonial morphologies that may be represented on hard and soft substrata in different environments. Using a large taxonomic dataset (837 species in the New Zealand Exclusive Economic Zone), he found that, across all environments in the New Zealand region (subtropical to subantarctic, rocky coast, benthic shell gravel, volcanic gravel, foram ooze, deep-sea rock, etc.), the proportions are approximately 58% two-dimensional encrusters, 26% erect-flexible, 12% erect-rigid, 3% rooted-conical and 1% free-living. For the entire SCS these proportions are very similar—currently 57% two-dimensional encrusters, 22% erect-flexible, 14% erect-rigid, 6% rooted-conical and 1% free-living—and may change relatively little when the fauna is fully known. Seven families have 20 or more species—Candidae (mostly erect-flexible) 43; Conescharellinidae (mostly rooted-conical) 32; Phidoloporidae (mostly erect-rigid lace bryozoans) 30; Bugulidae (erect-flexible) 28; Membraniporidae (mostly erect-rigid and foliaceous, plus encrusting) 27; Calloporidae (mostly encrusting) 26; and Smittinidae (mostly encrusting) 21.

It is probably not generally appreciated that bryozoan diversity can be very high in tropical reef environments. Apart from some turfing, robustly encrusting, or prominent erect species, however, most bryozoans are small and cryptic, living on the undersides of coral heads or worn coral boulders, often in the spaces between branches or in excavations provided by other organisms. Where boulders and rubble are common, bryozoans can be found in abundance, especially at the reef edge at low water and on the seaward slope. Where space allows, as on the underside of concave surfaces, relatively large, erect colonies can grow. Maxwell (1968) noted that bryozoans may be prolific on windward reef slopes below the main level of wave action.

Although bryozoans in tropical reefs may not generally achieve the structural dominance that occurs in some temperate settings (e.g., Wood et al., 2012), they can nevertheless play several important roles in reef environments. Cuffey (1977) reviewed and summarised these roles as exhibited during geological time (bryozoans have a spectacular fossil record, with ca. 15,000 named species). Today their major roles on reefs are as hidden encrusters, cavity dwellers, cavity fillers, and dead-coral veneers; between reefs they can act as

sediment binders, stabilisers, and trappers. Hence, they can contribute to reef build-up, especially those that engage in self-overgrowth or which grow over other organisms. Such colonies tend to become a permanent part of the calcareous mass that comprises a reef, acting as accessory frame-builders. Alternatively, those bryozoans that break up upon the death of the colony can contribute to the sediment that forms between clumps and reefs, just as they do in more temperate settings (Wass et al., 1970). Encrusting bryozoans can also be found on mangroves (leaves and pneumatophores) and mobile animals. Unusual such substrata include reptiles and king crabs—for example the cheilostome *Arbopercula angulata* has been found encrusting the sea snakes *Lapemis hardwickii* Gray and *Enhydrina schistosa* Daudin and the xiphosuran *Tachypleus gigas* (Müller) in the southern SCS (Key et al. 1995, 1996a, b).

Bryozoan diversity in coral-reef environments is affected by the same threats that diminish the diversity of other marine life, particularly pollution and land-based sediment. Though many species are physically small, bryozoans as a whole are highly diverse and high bryozoan diversity, as for other suspension feeders susceptible to smothering by sediment, is indicative of a healthy reef environment.

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