

Inventory of sponge fauna from the Singapore Strait to Taiwan Strait along the western coastline of the South China Sea

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Abstract. An inventory of the sponge fauna from the Singapore Strait to the Taiwan Strait along the western coastline of the South China Sea was compiled from published and grey literature from the following regions: Singapore, peninsular Malaysia, Thailand, Cambodia, Vietnam, southern China and Taiwan. This study provides a partial update to the “Checklist of sponges (Porifera) of the South China Sea region” published 15 years ago. A total of 388 sponge species belonging to 24 orders, 78 families and 158 genera are listed, with the following regional species diversities: Singapore (130); east coast of peninsular Malaysia (25); Gulf of Thailand (90); Vietnam (141); southern China (138); and Taiwan (64). A total of 12 new species and over 200 new records were added to the Porifera inventory of the South China Sea since 2001. Of the 388 species, only 16 species (4%) are widespread. They are: *Aaptos suberitoides*, *Acanthella cavernosa*, *Biemna fortis*, *Cinachyrella australiensis*, *Clathria (Thalysias) reinwardti*, *Coelocarteria singaporensis*, *Echinodictyum asperum*, *Hyrtios erectus*, *Haliclona (Gellius) cymaeformis*, *Iotrochota baculifera*, *I. purpurea*, *Mycale (Zygomycale) parishii*, *Neopetrosia exigua*, *Oceanapia sagittaria*, *Sphaciospongia vagabunda*, *Xestospongia testudinaria*. Only *X. testudinaria*, *M. (Zygomycale) parishii* and *C. australiensis* are present along the entire coastline from Singapore Strait to Taiwan Strait. Distinct sponge faunal assemblages occur between the equator and 25°N along the western coastline of the South China Sea.

Key words. Porifera, species inventory, biodiversity, Singapore, peninsular Malaysia, Thailand, Cambodia, Vietnam, southern China, Taiwan, South China Sea

INTRODUCTION

This paper is a partial but much required update to “Annotated checklist of sponges (Porifera) of the South China Sea region” by Hooper et al. (2000) for sponge fauna from the Singapore Strait to the Taiwan Strait along the western coastline of the South China Sea (see IHO, 1953 for definition), encompassing over 6000 km of coastline from the equator to 25°N in the Indo-West Pacific region. The study regions lying along this body of water are Singapore, peninsular Malaysia, Thailand, Cambodia, Vietnam, southern China and Taiwan. This water body is also referred to by various other names: the Chinese call it “南海” (Nan-hai) or “South Sea”; the Vietnamese call

it “Biển Đông” or “East Sea” while the rest of the countries (Cambodia, Thailand, Malaysia and Singapore) commonly refer to it as “South China Sea”. The South China Sea also encompasses several prominent water bodies, which include the Singapore Strait, Gulf of Thailand, Gulf of Tonkin, Qiongzhou Strait (琼州海峡) and Taiwan Strait.

Biodiversity work on sponges has progressed rapidly worldwide after the work of Hooper et al. (2000), with the advent of the Systema Porifera (Hooper & Van Soest, 2002) and World Porifera Database (Van Soest et al., 2016). However, sponge workers working in the South China Sea have conducted diversity studies mostly independently in their respective countries for the past decade. This timely study is a coordinated regional effort to consolidate knowledge of sponge fauna biodiversity and their distribution, to agree on the identification of sponges, and provide an accurate sponge inventory of the South China Sea region.

The South China Sea is probably one of the richest in terms of marine invertebrate biodiversity (see Ng & Tan, 2000; Hooper et al., 2000; Morton & Blackmore, 2001; Hoeksema, 2007; Huang et al., 2015). Much remains to be done on the identity of sponge fauna in this region. Many regional collections harbour a large number of sponge “Operation Taxonomic Units” (OTUs) and many species remain undetermined, judging from the new records and new species that are surfacing frequently. This study provides an inventory of all sponge species known from Singapore to Taiwan along the western coastline of the South China Sea.

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The following sections provide chronological accounts of sponge fauna studies carried out in Singapore, peninsular Malaysia, Thailand, Cambodia, Vietnam, southern China and Taiwan.

Singapore. The Neptune's Cup sponge, *Cliona patera* (Hardwicke, 1820), was the first sponge described from Singapore in the 19th century. This was followed by *Leucosolenia flexilis* (Haeckel, 1872), *Coelocarteria singaporensis* (Carter, 1883), and *Calyspongia (Cladochalina) diffusa* Ridley (1884). Subsequently, Dragnevitsch (1906) recorded 24 sponge species from Tanjong Pagar and Pulau Brani in the Singapore Strait. Recent additions to the species list include observations from general biodiversity surveys carried out by the Department of Zoology, University of Singapore (Chuang, 1961, 1973, 1977; Chou & Wong, 1985). During this period, a Dutch student, H. Moll, collected over 100 sponge specimens consisting of about 50 species in 1977–1978 (Van Soest pers. comm.) and they were deposited at Naturalis Biodiversity Center (formerly the Rijksmuseum van Natuurlijke Historie and the Zoölogisch Museum of the University of Amsterdam). Hooper et al. (2000) reported some 80 species with 13 new records. De Voogd & Cleary (2009) also recorded some 80 species with 26 new records. In the same year, Lim et al. (2009) recorded 62 species of fouling sponges on navigational buoys with 10 new records. Notably, a number of new species were reported recently: *Tethycometes radicata* Lim & Tan, 2008 was dredged from a muddy seabed in the Singapore Strait; *Suberites diversicolor* Becking & Lim, 2009 was described from estuarine waters; *Forcepia (Forcepia) vansoesti* Lim et al. (2012a) collected from fringing reefs in the Singapore Strait; Van Soest & De Voogd (2015) described *Clathrina sororcula* and *Anamixilla singaporensis* from the Sisters' Islands Marine Park, Singapore's first Marine Park that was established in 2014. The famed Neptune's Cup sponge in Singapore waters was rediscovered recently after over 100 years (Lim et al., 2012b). Recently *Geodia distincta* and *G. picteti* were recorded from the Johor Straits (Lim, 2015), while Van Soest & De Voogd (2015) recorded *Uteopsis argentea* in the Singapore Strait. The latest addition, *Theonella laena* Lim & Tan, 2016 associated with a siliquariid mollusc was described from specimens obtained off Raffles Lighthouse from 40 m depth during the Comprehensive Marine Biodiversity Survey expedition to the Singapore Strait (Lim & Tan, this volume).

Peninsular Malaysia. The first sponge fauna report from the east coast of peninsular Malaysia was by Sollas (1902) who described five new species and recorded two species from Trengganu. Since then only Qaralleh et al. (2011) reported *Xestospongia testudinaria* and *Neopetrosia exigua* from Pahang and Hoeksema et al. (2014) reported the presence of *Terpios hoshinota* from Pulau Tioman Marine Parks. Similarly, there is only a handful of sponge fauna studies conducted in the west coast of peninsular Malaysia in the Malacca Strait. Gray (1858) described *Aphrocallistes beatrix* from Malacca and Bowerbank (1875) described a total of 14 new species from Malacca. The small number of species recorded from peninsular Malaysia is definitely not a reflection of the true sponge diversity in this rich marine

biodiversity area (see Harborne et al., 2000; Mazlan et al., 2005; Hoeksema, 2007; Huang et al., 2015).

Thailand. Topsent (1925) described the first sponge species, *Amorphinopsis siamensis* from the Gulf of Thailand. Many years later, McCauley et al. (1993) reported four species of sponges in Surat Thani province. In the same year, Hooper et al. (1993) redescribed *Oceanapia sagittaria* from the Gulf of Thailand. Since Hooper et al. (2000) listed eight species from the Gulf of Thailand, a number of studies have greatly increased the number of sponge records. Kritsanapuntu et al. (2001) reported 126 sponge species from coral reef in the eastern Gulf of Thailand with 20 new records. Putschakarn and co-workers subsequently added a new species (*Cladocroce burapha* Putschakarn et al., 2004b) and some 59 new records from the Gulf of Thailand (Putschakarn et al., 2004a, 2006, 2008; Putschakarn, 2006, 2007, 2011a, b; 2013; Putschakarn & Monkongsomboon, 2007; Putschakarn & Hongpatarakiri, 2012, 2013; Putschakarn, 2013). Hongpadharakiree et al. (2008) and Pumbua et al. (2009) contributed five new records during this period.

Cambodia. The coastline of Cambodia stretches some 300 km in the eastern Gulf of Thailand, lying between 11°33'N, 102°54'E and 10°22'N, 104°25'E. It is one of the least studied areas in this region. Dawydoff (1952) was the first author to record sponges from Cambodia, which were identified by Topsent. Three species are attributable to this area: *Cliothosa hancocki*, *Lissodendoryx (Waldoschmittia) schmidti* and *Hyrtios erectus*. Dawydoff's study included samples from Ca Mau to Phu Quoc islands, Nam Du island (now Vietnam), and Ream to Kohkong (now Cambodia). Most species in Dawydoff (1952) should be attributed to Vietnam as Phu Quoc (Vietnam) is just beside Ream (Cambodia). We feel that it is better to assign only the three species with Ream as locality (in the Gulf of Thailand) to Cambodia instead of all the species (some from as far north at Ha Long Bay) to Cambodia. No work on Cambodia sponge fauna has been done since Dawydoff (1952).

Vietnam. Lindgren (1898) recorded 20 species from Nha Trang bay (southern Vietnam) including the description of three new species. Subsequently Dawydoff (1952) listed 119 putative species (102 of which were identified to species level) in a paper on the Indo-Chinese marine benthic fauna, and some 60 new records were added (identifications by Topsent). Lévi (1961) recorded 28 species from Nha Trang that included four new species and 21 new records, and a further six sponge species were recorded from the intertidal rocky shores of Nha Trang Bay by Tran & Tran (1965). Gurjanova & Tran (1972) reported *Placospongia melobesioides* and *Tethya japonica* from the Tonkin Gulf, whilst Nguyen et al. (1977) produced an inventory of Vietnam sponge fauna with a total of 160 species including eight new records. Three decades later, identified samples collected in 2003 and 2004 deposited at the Museum of the Institute of Oceanography in Nha Trang. Eighty-nine species belonging to 63 genera, 36 families and 11 orders of sponge from the Nha Trang Bay were reported of which 18 were new records. A checklist of sponges recorded from

the South China Sea by Hooper et al. (2000) reported 176 morphospecies of demosponges with 129 species identified to species level from the coast of Vietnam. Calcinaï et al. (2006) reported nine boring species from Halong Bay and added seven new records. Azzini et al. (2007) reported 63 species from Halong Bay as well and added 16 new records during a recent survey. The most recent review of Vietnam sponge fauna by Thai (2013) who reported a total of 299 species. He is currently working on a large collection from southern Vietnam with some 1500 specimens deposited at the National Oceanographic Museum, Institute of Oceanography in Nha Trang. Another team at the Research Institute for Marine Fisheries (RIMF, Haiphong) led by Nguyen Khac Bat has a substantial collection from Co To and Ba Mun at the north, Con Co, Hai Van Son Cha, Hon Cau, Phu Quy at the central and Phu Quoc at the south are being identified (Ngyuyen Khac Bat, pers. comm.).

Southern China. Gray (1858b) described the first sponge recorded from southern China, *Aphroceras alcicornis*, which was collected in Hong Kong. Subsequently, the “Challenger” expedition provided two more sponge species, *Stelletta purpurea* and *Haliclona scyphonoïdes* from Hong Kong, both of which were described by Ridley (1884). Lindgren (1897) described *Caminus chinensis* and Brøndsted (1929) described three new species and recorded one more species off southern China. Many years later, Lévi (1964) described *Cladorhiza microchela* from the “China Sea” (mer de Chine) at 4330 m depth. Pulitzer-Finali (1982) recorded 10 species from Hong Kong, of which six were new species and Van Soest (1982) together recorded another nine species from Hong Kong. Li (1986) made a large collection from southern China and reported 27 fouling sponge species including five new species and five new records. Over 1000 sponge specimens were accumulated under his care at the Institute of Oceanology Chinese Academy of Sciences and he has since recorded 190 sponge species from China waters (Li, 2008) of which some 80 species were from the South China Sea. The sponge diversity in the South China Sea is considered the highest among the four major seas, i.e., China South Sea, China Bo Hai Sea, China Yellow Sea, and China East Sea (Zhang et al., 2003; Liu, 2013).

Taiwan. *Theonella swinhoei* was the first sponge described from Taiwan (Gray, 1868), followed by *Stelletta purpurea*, which was described by Lindgren (1897). Nearly a century later, several new species were collected: Bavestrello et al. (1995) described *Cliona desmoni* and *Spiroxya acus*, Calcinaï et al. (2001) described *Spiroxya macroxeata* and *Holoxea excavans*, and Tabachnick & Janussen (2004) described *Fieldingia valentini tizardi*. The majority of the recent sponge studies focused on bioactive compounds in sponges for medical and pharmaceutical applications (Hung, 1999; Lo, 1999; Huang, 2002; Liao, 2003; Zhou, 2004; Su et al., 2011). However, many of these sponges were often not suitably identified in these studies. There are also a number of publications on sponge ecology and reproduction e.g., *Spongia ceylonensis* (Chung et al., 2010) and *Cinachyrella australiensis* (Chen, 1988; Huang, 1995; Chen et al., 1997; Lu, 2003). Other studies focused on the

symbiotic microbial community in association with sponges (Yang, 2006), e.g., *Terpios hoshinota*, causing the “black disease” of reef-building corals at Green Island, Taiwan (Liao, 2007; Liao et al., 2007). In 2007, a preliminary survey on sponge fauna in southern Taiwan (Green Island and Kenting) carried out by De Voogd and Soong recorded 65 species (Shao et al., 2008). Li (2013) reported 28 species from the Penghu (Pescadores) archipelago of which 11 are new records. Hitherto, a total of 55 species belonging to 2 classes, 12 orders, and 24 families are reported from the Penghu archipelago and it is estimated that the total sponge diversity exceeds 100 species when cryptic and encrusting species are taken into account (Huang et al., 2016). Chou Yalan is currently working on the sponge fauna of Dongsha, Green Island and Orchid Island.

MATERIAL AND METHODS

All sponge species records were obtained from available literature (both published and grey) to the best of our knowledge. The sponge fauna of six coastal regions encompassing an area between latitudes 1–25°N and longitudes 103–122°E along the western coastline of the South China Sea, namely Singapore, peninsular Malaysia, Thailand, Vietnam (including three species from Cambodia: *Cliothosa hancocki*, *Lissodendoryx (Waldoschmittia) schmidtii* and *Hyrtios erectus*), southern China (from Hainan to Fujian, including Hong Kong and Macau) and Taiwan, are provided in the inventory along with distribution data of each species (Table 1). Species distributions (presence/absence) were also compiled from existing literature. The sponge species in the list are all recorded within the “territorial waters”, i.e., 12 nautical miles from the coast of the country as defined by the 1982 United Nations Convention on the Law of the Sea (UN General Assembly, 2016) unless indicated otherwise. The six study regions fall partially or fully inside the nine provinces of the Marine Ecoregions of the World (Spalding et al., 2007) namely: 1) East China Sea (no. 52, off Fujian province); 2) Gulf of Tonkin (no. 112, off East Vietnam); 3) Southern China (no. 113, off Fujian province); 4) South China Sea Oceanic Islands (no. 114, off China and Vietnam); 5) Gulf of Thailand (no. 115, Thailand); 6) Southern Vietnam (no. 116, off Southeast Vietnam); 7) Sunda Shelf/Java Sea (no. 117, off Southern Vietnam and East of Malaysia peninsula); 8) Malacca Strait (no. 118, tip of Malay peninsula and Singapore); and 9) South Kuroshio (no. 121, off East Taiwan). Only records with full Linnaean species names that were reliably identified are included. Only the first reference for each species is listed in the inventory for simplicity (see Introduction section for references to each region). The validity of all species entries were checked against the ‘World Porifera Database’ maintained by Van Soest et al. (2016). Synonyms and species typically distributed in the Atlantic, Mediterranean, Caribbean and etc., other than the Indo-Pacific, were excluded from the list.

Bray-Curtis similarity cluster analysis and Multidimensional scaling (MDS) analysis based on Jaccard similarity matrices were carried out from the species composition presence/absence data among study regions. Data from Singapore and

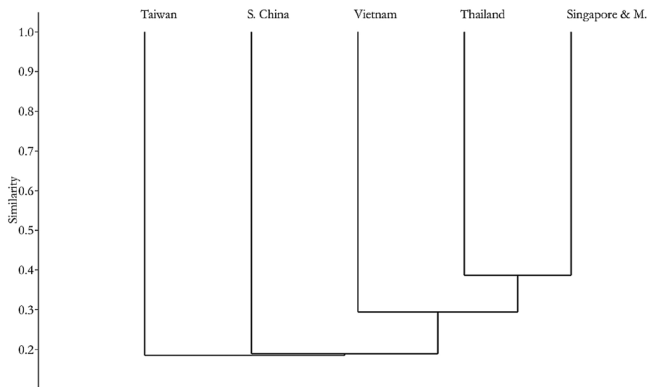


Fig. 1. Dendrogram based on Bray-Curtis similarity cluster analysis of sponge fauna in Singapore (combined with peninsular Malaysia), Thailand, Vietnam, southern China and Taiwan.

peninsular Malaysia were combined, data from peninsular Malaysia is too small and far from being complete. PAST (Paleontological Statistics software package for education, Version 3.11) by Hammer Ø et al. (2001) was used for the above statistical analyses.

The phylum Porifera is currently classified into four classes and seven subclasses. All the names in this study follow the “Systema Porifera” by Hooper & Van Soest (2002) and the major revisions in Demospongiae proposed by Morrow & Cárdenas (2015) as presented below.

- Phylum Porifera Grant, 1836
- Class Homoscleromorpha Bergquist, 1978
- Class Demospongiae Sollas, 1885
 - Subclass Verongimorpha Erpenbeck et al. 2012
 - Subclass Keratosa Grant, 1861
 - Subclass Heteroscleromorpha Cárdenas, Perez & Boury-Esnault, 2012
- Class Calcarea Bowerbank, 1862
 - Subclass Calcaronea Bidder, 1898
 - Subclass Calcinea Bidder, 1898
- Class Hexactinellida Schmidt, 1870
 - Subclass Amphidiscophora Schulze, 1886
 - Subclass Hexasterophora Schulze, 1886

RESULTS AND DISCUSSION

Species diversity. A total of 388 sponge species (i.e., with full Linnaean classification), belonging to 24 orders, 78 families and 158 genera are listed in this work. The number of species recorded for each region is as follows: Singapore (130); east coast of Peninsular Malaysia (25); Thailand (90); Cambodia (3); Vietnam (141); southern China (138); and Taiwan (64). The sponge inventory has been expanded significantly since the work of Hooper et al (2000) (except for Malaysia and Cambodia), with an addition of 12 new species and over 200 new records. These include Singapore with 80 new records and six new species; Thailand with some 80 new records and one new species; Vietnam with some 40 new records; southern China with some 50 new records and six

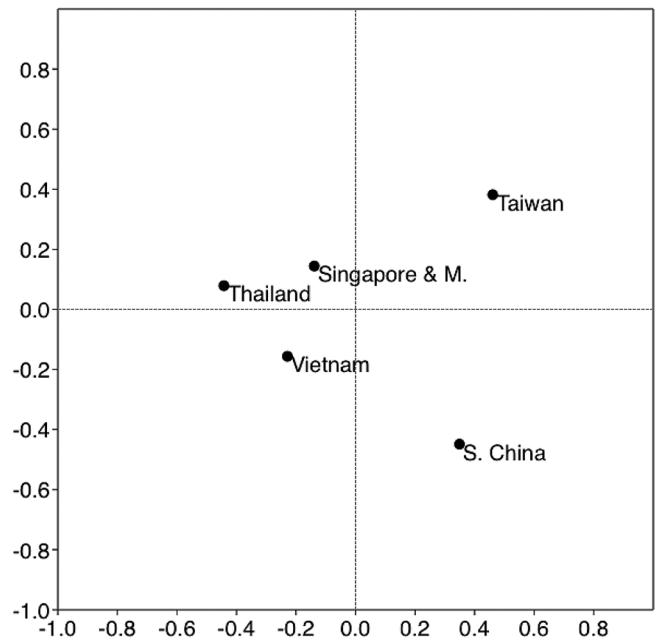


Fig. 2. MDS (multi-dimensional scaling) ordination based on the Jaccard similarity matrix of sponge species occurring in Singapore (combined with peninsular Malaysia), Thailand, Vietnam, southern China and Taiwan.

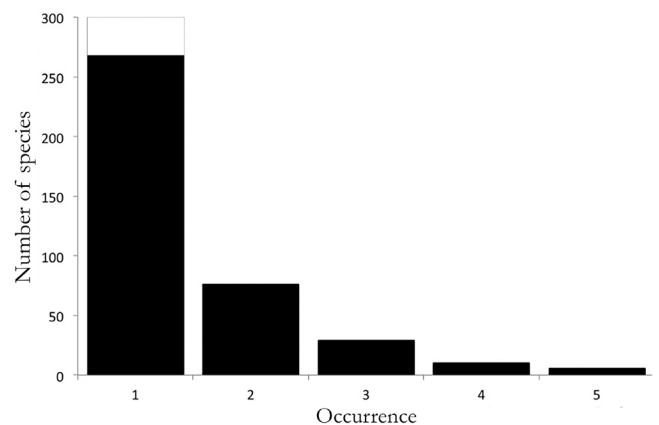


Fig. 3. Frequency of co-occurrence of sponge species in five regions along the western coastline fringing the South China Sea. A total of 267 (out of 388) species were documented from only one region. Only 16 sponge species were found to be widespread, co-occurring in either four or five localities. The regions consisted of Singapore (combined with peninsular Malaysia), Thailand, Vietnam, southern China and Taiwan.

new species; and Taiwan with 60 new records. However, the current number of 388 species is still an underestimate of the true diversity of the study area, and this applies similarly for each region, especially peninsular Malaysia and Cambodia. The number is also far lower than the figure of approximately 1500 species presented in Hooper et al. (2000). The main reason is because the islands of Indonesia, and the Philippines, the northern coast of Borneo, the Malacca Strait and Andaman Sea were not considered in this study. In addition, a large number of OTUs and extrinsic species names were excluded. These extrinsic names included synonyms and species with obvious disjunct distributions in the Atlantic Ocean, Caribbean Sea, etc. Such species names appeared in a number of publications on sponges in the South China Sea

Table 1. Inventory of sponge species from Singapore, peninsular Malaysia, Thailand, Vietnam (including Cambodia), southern China to Taiwan, as represented by S, M, Th; V; C and Ta respectively, along the western coastline of the South China Sea.

S/N	Species	Reference
Phylum Porifera		
Class Homosclerophorida		
Homosclerophorida; Plakinidae; <i>Plakortis</i>		
1	<i>Plakortis lita</i> De Laubenfels, 1954	Ta, Shao et al. (2008)
Class Demospongiae		
Subclass Verongimorpha		
Chondrosiida; Chondrosiidae; <i>Chondrosia</i>		
2	<i>Chondrosia chucalla</i> De Laubenfels, 1954	Ta, Shao et al. (2008)
3	<i>Chondrosia corticata</i> Thiele, 1900	S, Lim et al. (2012a); Ta, Huang et al. (2016)
4	<i>Chondrosia reticulata</i> (Carter, 1886)	Th, Kritsanapuntu et al. (2001)
Chondrillida; Chondrillidae; <i>Chondrilla</i>		
5	<i>Chondrilla australiensis</i> Carter, 1873	S, De Voogd & Cleary (2009); Th, Kritsanapuntu et al. (2001); V, Lindgren (1897)
6	<i>Chondrilla mixta</i> Schulze, 1877	S, Lim et al. (2012a)
Chondrillida; Halisarcidae; <i>Halisarca</i>		
7	<i>Halisarca ectofibrosa</i> Vacelet, Vasseur & Lévi, 1976	Th, Putchakarn et al. (2004a)
Verongida; Aplysinellidae; <i>Aplysinella</i>		
8	<i>Aplysinella strongylata</i> Bergquist, 1980	V, Chervyakova (2007)
Verongida; Aplysinellidae; <i>Suberea</i>		
9	<i>Suberea</i> aff. <i>clavata</i> (Pulitzer-Finali, 1982)	Ta, Shao et al. (2008)
10	<i>Suberea</i> aff. <i>praetensa</i> (Row, 1911)	Th, Putchakarn et al. (2008)
Verongida; Ianthellidae; <i>Hexadella</i>		
11	<i>Hexadella indica</i> Dendy, 1905	S, Lim et al. (2012a)
Verongida; Ianthellidae; <i>Ianthella</i>		
12	<i>Ianthella flabelliformis</i> (Pallas, 1766)	V, Nguyen et al. (1977)
Verongida; Pseudoceratinidae; <i>Pseudoceratina</i>		
13	<i>Pseudoceratina purpurea</i> (Carter, 1880)	S, De Voogd & Cleary (2009); Th, Putchakarn et al. (2004a); C, Van Soest (1982)
14	<i>Pseudoceratina verrucosa</i> Bergquist, 1995	V, Chervyakova (2007)
Subclass Keratosa		
Dendroceratida; Darwinellidae; <i>Chelonaplysilla</i>		
15	<i>Chelonaplysilla erecta</i> (Row, 1911)	S, Lim et al. (2009); Th, Putchakarn et al. (2004a)
Dendroceratida; Darwinellidae; <i>Dendrilla</i>		
16	<i>Dendrilla membranosa</i> (Pallas, 1766)	V, Dawydoff (1952)
17	<i>Dendrilla rosea</i> Lendenfeld, 1883	C, Li (2008)
Dendroceratida; Dictyodendrillidae; <i>Igernella</i>		
18	<i>Igernella mirabilis</i> Lévi, 1961	C, Xu et al. (2010)
Dendroceratida; Dictyodendrillidae; <i>Spongionella</i>		
19	<i>Spongionella monoprocta</i> Lévi, 1961	V, Lévi (1961)
Dictyoceratida; Dysideidae; <i>Citronia</i>		
20	<i>Citronia</i> aff. <i>vasiformis</i> (Bergquist, 1995)	Ta, Shao et al. (2008)
Dictyoceratida; Dysideidae; <i>Dysidea</i>		
21	<i>Dysidea arenaria</i> Bergquist, 1965	Th, Putchakarn et al. (2004a); C, Qiu & Wang (2008)
22	<i>Dysidea cinerea</i> Keller, 1889	V, Azzini et al. (2007); C, Van Soest (1982)
23	<i>Dysidea digitata</i> (Sollas, 1902)	M, Sollas (1902)
24	<i>Dysidea frondosa</i> Bergquist, 1995	S, De Voogd & Cleary (2009); Ta, Shao et al. (2008)
25	<i>Dysidea granulosa</i> Bergquist, 1965	Ta, Shao et al. (2008)

S/N	Species	Reference
	Tetractinellida; Geodiidae; Erylus	
207	<i>Erylus placenta</i> Thiele, 1898	V, Dawydoff (1952)
208	<i>Erylus proximus</i> Dendy, 1916	Ta, Huang et al. (2016)
	Tetractinellida; Geodiidae; Geodia	
209	<i>Geodia arripiens</i> Lindgren, 1897	V, Lindgren (1897)
210	<i>Geodia berryi</i> (Sollas, 1888)	V, Lindgren (1897)
211	<i>Geodia distincta</i> Lindgren, 1897	S, Lim (2015)
212	<i>Geodia japonica spherulifera</i> Wilson, 1925	C, Zhang & Che (2001)
213	<i>Geodia nigra</i> (Lindgren, 1897)	V, Dawydoff (1952)
214	<i>Geodia picteti</i> (Topsent, 1897)	S, Lim (2015); Th, Putschakarn (2006)
	Tetractinellida; Pachastrellidae; Dercitus	
215	<i>Dercitus (Stoeba) pauper</i> Sollas, 1902	M, Sollas (1902)
	Tetractinellida; Theneidae; Thenea	
216	<i>Thenea wyvillei</i> Sollas, 1886	V, Dawydoff (1952)
	Tetractinellida; Theonellidae; Discodermia	
217	<i>Discodermia calyx</i> Döderlein, 1884	C, He et al. (2013)
	Tetractinellida; Theonellidae; Theonella	
218	<i>Theonella cylindrica</i> Wilson, 1925	S, Hooper et al. (2000)
219	<i>Theonella laena</i> Lim & Tan, 2016	S, Lim & Tan (2016)
220	<i>Theonella swinhoei</i> Gray, 1868	C, Zhang et al. (2010a); Ta, Gray (1868)
	Tetractinellida; Thoosidae; Neamphius	
221	<i>Neamphius huxleyi</i> (Sollas, 1888)	Ta, Shao et al. (2008)
	Tetractinellida; Tetillidae; Cinachyrella	
222	<i>Cinachyrella arabica</i> (Carter, 1869)	S, Dragnewitsch (1905)
223	<i>Cinachyrella australiensis</i> (Carter, 1886)	S, De Voogd & Cleary (2009); M, Sollas (1902); Th, Kritsanapuntu et al. (2001); V, Lévi (1961); C, Xiao et al. (2005); Ta, Chen et al. (1997)
	Tetractinellida; Tetillidae; Craniella	
224	<i>Craniella abracadabra</i> De Laubenfels, 1954	S, Lim et al. (2012a); Th, Kritsanapuntu et al. (2001)
	Tetractinellida; Tetillidae; Paratetilla	
225	<i>Paratetilla bacca</i> (Selenka, 1867)	S, De Voogd & Cleary (2009); Th, Kritsanapuntu et al. (2001)
	Tetractinellida; Tetillidae; Tetilla	
226	<i>Tetilla japonica</i> Lampe, 1886	Th, Putschakarn (2006); V, Dawydoff (1952)
227	<i>Tetilla ridleyi</i> Sollas, 1888	M, Sollas (1902)
	Agelasida; Agelasidae; Agelas	
228	<i>Agelas</i> aff. <i>ceylonica</i> Dendy, 1905	Ta, Shao et al. (2008)
229	<i>Agelas cavernosa</i> Thiele, 1903	S, Lim et al. (2012a); Ta, Huang et al. (2016)
230	<i>Agelas mauritiana</i> (Carter, 1883)	V, Nguyen et al. (1977); C, Yang et al. (2012)
231	<i>Agelas nakamurai</i> Hoshino, 1985	Ta, Shao et al. (2008)
232	<i>Agelas nemoechinata</i> Hoshino, 1985	Ta, Shao et al. (2008)
233	<i>Agelas robusta</i> Pulitzer-Finali, 1982	C, Pulitzer-Finali (1982); Ta, Shao et al. (2008)
	Agelasida; Astroscleridae; Astrosclera	
234	<i>Astrosclera willeyana</i> Lister, 1900	C, Yang & Li (2012)
	Agelasida; Hymerhabdiidae; Prosuberites	
235	<i>Prosuberites oleteira</i> De Laubenfels, 1957	S, Lim et al. (2009)
	Desmacellida; Desmacellidae; Desmacella	
236	<i>Desmacella democratica</i> (Sollas, 1902)	M, Sollas (1902)
237	<i>Desmacella tylostrongyla</i> (Li, 1986)	C, Li (1986)
	Poecilosclerida; Acarnidae; Acarnus	
238	<i>Acarnus bergquistae</i> Van Soest, Hooper & Hiemstra, 1991	V, Dawydoff (1952)
239	<i>Acarnus primigenius</i> Hiemstra & Hooper, 1991	S, Lim et al. (2012a)

S/N	Species	Reference
240	<i>Acarinus ternatus</i> Ridley, 1884	S, Lim et al. (2012a)
241	<i>Acarinus wolfgangi</i> Keller, 1889	S, Lim et al. (2012a)
Poecilosclerida; Acarnidae; Damiria		
242	<i>Damiria simplex</i> Keller, 1891	S, Lim et al. (2012a); V, Chervyakova (2007)
Poecilosclerida; Cladorhizidae; Chondrocladia		
243	<i>Chondrocladia (Chondrocladia) arenifera</i> Brøndsted, 1929	C, Brøndsted (1929); Ta, Brøndsted (1929)
Poecilosclerida; Crambeidae; Monanchora		
244	<i>Monanchora clathrata</i> Carter, 1883	S, Lim et al. (2012a); V, Lévi (1961);
245	<i>Monanchora pulchra</i> (Lambe, 1895)	C, Li (2008)
246	<i>Monanchora unguiculata</i> (Dendy, 1922)	S, Lim et al. (2012a); Th, Putschakarn et al. (2004a); V, Chervyakova (2007)
Poecilosclerida; Crellidae; Crella		
247	<i>Crella (Grayella) aff. papillata</i> (Lévi, 1958)	Ta, Shao et al. (2008)
Poecilosclerida; Coelosphaeridae; Coelosphaera		
248	<i>Coelosphaera (Coelosphaera) navicelligera</i> (Ridley, 1884)	Th, Hongpadharakiree et al. (2008); V, Lindgren (1897)
249	<i>Forcepia (Foecepia) vansoesti</i> Lim et al., 2012	S, Lim et al. (2012a)
Poecilosclerida; Coelosphaeridae; Lissodendoryx		
250	<i>Lissodendoryx (Lissodendoryx) ternatensis</i> (Thiele, 1903)	C, Brøndsted (1929); Ta, Brøndsted (1929)
251	<i>Lissodendoryx (Lissodendoryx) tylostyla</i> Li, 1986	C, Li (1986)
252	<i>Lissodendoryx (Waldoschmittia) schmidti</i> (Ridley, 1884)	Th, Dawydoff (1952); V, Lindgren (1897)
Poecilosclerida; Desmacididae; Desmapsamma		
253	<i>Desmapsamma vervoorti</i> Van Soest, 1998	Th, Putschakarn (2006)
Poecilosclerida; Esperipsidae; Esperipsis		
254	<i>Esperipsis plumosa</i> Tanita, 1965	C, Li (2008)
Poecilosclerida; Guitarridae; Tetrápocillon		
255	<i>Tetrápocillon patbergquistae</i> Fromont et al., 2011	S, Lim et al. (2012a)
Poecilosclerida; Hymedesmiidae; Phorbis		
256	<i>Phorbis arborescens</i> (Ridley, 1884)	Th, Kritsanapuntu et al. (2001)
Poecilosclerida; Iotrochotidae; Iotrochota		
257	<i>Iotrochota baculifera</i> Ridley, 1884	S, Hooper et al. (2000); Th, Kritsanapuntu et al. (2001); V, Lindgren (1897); C, Fan et al. (2010); Ta, Huang et al. (2016)
258	<i>Iotrochota iota</i> (De Laubenfels, 1954)	C, Li (2008)
259	<i>Iotrochota purpurea</i> (Bowerbank, 1875)	S, De Voogd & Cleary (2009); M, Bowerbank (1875); Th, Kritsanapuntu et al. (2001); V, Dawydoff (1952); C, Shen et al. (2012)
Poecilosclerida; Isodictyidae; Coelocartheria		
260	<i>Coelocartheria aff. agglomerans</i> Azzini, Calcinaï & Pansini 2007	Ta, Shao et al. (2008)
261	<i>Coelocartheria singaporensis</i> (Carter, 1883)	S, Carter (1883b); Th, Kritsanapuntu et al. (2001); V, Lindgren (1897); C, Li (2008)
Poecilosclerida; Isodictyidae; Isodictya		
262	<i>Isodictya palmata</i> (Ellis & Solander, 1786)	C, Li (2008)
Poecilosclerida; Latrunculiidae; Latrunculia		
263	<i>Latrunculia laevis</i> Lindgren, 1897	V, Lindgren (1897)
Poecilosclerida; Microcionidae; Clathria		
264	<i>Clathria (Clathria) chelifera</i> (Hentschel, 1911)	V, Hooper (1996)
265	<i>Clathria (Clathria) gorgonioides</i> (Dendy, 1916)	V, Dawydoff (1952)
266	<i>Clathria (Clathria) transiens</i> Hallmann, 1912	S, Chuang (1961)
267	<i>Clathria (Microcionia) aceratoobtusa</i> (Carter, 1887)	Th, Hooper et al. (2000)
268	<i>Clathria (Microcionia) anonyma</i> Burton, 1959	Th, Putschakarn (2006)
269	<i>Clathria (Thalysias) cervicornis</i> (Thiele, 1903)	S, Hooper et al. (2000)
270	<i>Clathria (Thalysias) coralliophila</i> (Thiele, 1903)	V, Dawydoff (1952)
271	<i>Clathria (Thalysias) erecta</i> (Thiele, 1899)	V, Lévi (1961)

S/N	Species	Reference
272	<i>Clathria (Thalysias) fasciculata</i> Wilson, 1925	C, Xiao et al. (2002)
273	<i>Clathria (Thalysias) filifer</i> (Ridley & Dendy, 1886)	S, Dragnevitsch (1905); V, Dawydoff (1952)
274	<i>Clathria (Thalysias) reinwardti</i> Vosmaer, 1880	S, Hooper et al. (2000); Th, Kritsanapuntu et al. (2001); V, Dawydoff (1952); Ta, Shao et al. (2008)
275	<i>Clathria (Thalysias) robusta</i> (Dendy, 1922)	S, Burton & Rao (1932)
276	<i>Clathria (Thalysias) spinifera</i> (Lindgren, 1897)	V, Lindgren (1897)
277	<i>Clathria (Thalysias) tingens</i> (Hooper, 1996)	Th, Pumbua et al. (2009)
278	<i>Clathria (Thalysias) toxifera</i> (Hentschel, 1912)	S, Hooper et al. (2000); Th, Hooper et al. (2000)
279	<i>Clathria (Thalysias) vulpina</i> (Lamarck, 1814)	S, Hooper et al. (2000); M, Bowerbank (1875); V, Dawydoff (1952); Ta, Shao et al. (2008)
280	<i>Clathria (Wilsonella) foraminifera</i> (Burton & Rao, 1932)	S, De Voogd & Cleary (2009)
281	<i>Clathria (Wilsonella) lindgreni</i> Hooper, 1996	V, Dawydoff (1952)
282	<i>Clathria (Wilsonella) tuberosa</i> (Bowerbank, 1875)	S, Hooper et al. (2000); M, Bowerbank (1875)
Poecilosclerida; Microcionidae; Echinochalina		
283	<i>Echinochalina (Echinochalina) intermedia</i> (Whitelegge, 1902)	V, Chervyakova (2007)
Poecilosclerida; Microcionidae; Holopsamma		
284	<i>Holopsamma laminaefavosa</i> (Carter, 1885)	S, Dragnevitsch (1905)
Poecilosclerida; Mycalidae; Mycale		
285	<i>Mycale (Aegogropila) adhaerens</i> (Lambe, 1893)	C, Li (2008)
286	<i>Mycale (Aegogropila) crassissima</i> (Dendy, 1905)	S, De Voogd & Cleary (2009); V, Lévi (1961)
287	<i>Mycale (Aegogropila) pellucida</i> (Ridley, 1884)	V, Dawydoff (1952)
288	<i>Mycale (Aegogropila) phillipensis</i> (Dendy, 1896)	V, Lindgren (1897); C, Pulitzer-Finali (1982)
289	<i>Mycale (Aegogropila) plumosa</i> sensu Hoshino, 1981	C, Li (2008)
290	<i>Mycale (Aegogropila) sulevoidea</i> Sollas, 1902	S, Lim et al. (2009); M, Sollas (1902); Th, Pumbua et al. (2009)
291	<i>Mycale (Carmia) murrayi</i> (Ridley & Dendy, 1886)	S, Dragnevitsch (1905)
292	<i>Mycale (Carmia) phyllophila</i> Hentschel, 1911	V, Tran (1967); C, Van Soest (1982)
293	<i>Mycale (Mycale) grandis</i> Gray, 1867	S, Lim et al. (2012a); Th, Putchakarn et al. (2004a)
294	<i>Mycale (Mycale) gravelyi</i> Burton, 1937	V, Nguyen et al. (1977)
295	<i>Mycale (Mycale) indica</i> (Carter, 1887)	S, Lim et al. (2012a)
296	<i>Mycale (Mycale) sulcata</i> Hentschel, 1911	S, Lim et al. (2012a)
297	<i>Mycale (Zygomycale) parishii</i> (Bowerbank, 1875)	S, Burton & Rao (1932); M, Bowerbank (1875); Th, Putchakarn et al. (2004a); V, Azzini et al. (2007); C, Li (2008); Ta, Huang et al. (2016)
298	<i>Mycale vermistyla</i> Li, 1986	C, Li (1986)
Poecilosclerida; Myxillidae; Psammochela		
299	<i>Psammochela elegans</i> Dendy, 1916	Th, Putchakarn et al. (2008)
300	<i>Psammochela psammodes</i> (Hentschel, 1911)	S, Lim et al. (2012a)
Poecilosclerida; Podospongiidae; Diacarnus		
301	<i>Diacarnus megaspinorhabdosa</i> Kelly-Borges & Vacelet, 1995	Ta, Shao et al. (2008)
Poecilosclerida; Podospongiidae; Negombata		
302	<i>Negombata corticata</i> (Carter, 1879)	C, Chao et al. (2010)
Poecilosclerida; Tedaniidae; Tedania		
303	<i>Tedania (Tedania) brevispiculata</i> Thiele, 1903	V, Lévi (1961)
304	<i>Tedania (Tedania) maeandrica</i> Thiele, 1903	Th, Putchakarn (2006)
305	<i>Tedania (Tedania) strongyla</i> Li, 1986	C, Li (1986)
Clionaida; Clionidae; Cliona		
306	<i>Cliona albimarginata</i> Calcinai, Bavestrello & Cerrano, 2005	Th, Pumbua et al. (2009)
307	<i>Cliona aurivilli</i> (Lindgren, 1897)	Th, Putchakarn et al. (2004a); V, Azzini et al. (2007)
308	<i>Cliona</i> cf. <i>celata</i> Grant, 1826	Th, Putchakarn & Hongpatarakiri (2012); V, Dawydoff (1952)
309	<i>Cliona desimoni</i> Bavestrello, Calcinai & Sarà, 1995	Ta, Bavestrello et al. (1995)
310	<i>Cliona mucronata</i> Sollas, 1878	V, Dawydoff (1952)
311	<i>Cliona orientalis</i> Thiele, 1900	S, Lim et al. (2012a); Th, Putchakarn & Hongpatarakiri (2012); V, Calcinai et al. (2006)
312	<i>Cliona patera</i> (Hardwicke, 1820)	S, Hardwicke (1820); V, Dawydoff (1952)
313	<i>Cliona utricularis</i> Calcinai, Bavestrello & Cerrano, 2005	S, Lim et al. (2012a); Th, Pumbua et al. (2009)

S/N	Species	Reference
	Clionaida; Clionaidae; Cliothosa	
314	<i>Cliothisa aurivillii</i> (Lindgren, 1897)	V, Dawydoff (1952)
315	<i>Cliothisa hancocki</i> (Topsent, 1888)	Th, Dawydoff (1952); V, Calcinai et al. (2006)
	Clionaida; Clionaidae; Sphaciospongia	
316	<i>Sphaciospongia areolata</i> (Dendy, 1897)	V, Dawydoff (1952)
317	<i>Sphaciospongia inconstans</i> (Dendy, 1887)	S, Chuang (1961); M, Sollas (1902); V, Chervyakova (2007)
318	<i>Sphaciospongia lacunosa</i> (Kieschnick, 1898)	S, Dragnewitsch (1905)
319	<i>Sphaciospongia purpurea</i> (Lamarck, 1815)	S, Chuang (1961); C, Li (2008)
320	<i>Sphaciospongia solida</i> (Ridley & Dendy, 1886)	Th, Putschakarn (2006); V, Calcinai et al. (2006)
321	<i>Sphaciospongia tentorioides</i> (Dendy, 1905)	V, Calcinai et al. (2006)
322	<i>Sphaciospongia vagabunda</i> (Ridley, 1884)	S, Chuang (1973); Th, Kritsanapuntu et al. (2001); V, Chervyakova (2007); C, Xiao et al. (2004)
	Clionaida; Clionaidae; Spiroxya	
323	<i>Spiroxya acus</i> (Bavestrello, Calcinai & Sarà, 1995)	Ta, Bavestrello et al. (1995)
324	<i>Spiroxya macroxeata</i> (Calcinai, Bavestrello, Cerrano & Sarà, 2001)	Ta, Calcinai et al. (2001)
	Clionaida; Spirastrellidae; Spirastrella	
325	<i>Spirastrella decumbens</i> Ridley, 1884	S, Lim et al. (2012a); V, Calcinai et al. (2006)
	Clionaida; Placospongiidae; Placospongia	
326	<i>Placospongia carinata</i> (Bowerbank, 1858)	S, Lim et al. (2012a); V, Chervyakova (2007)
327	<i>Placospongia melobesoides</i> Gray, 1867	S, De Voogd & Cleary (2009); Th, Putschakarn (2011a); V, Dawydoff (1952);
	Tethyida; Tethyidae; Tethya	
328	<i>Tethya ingalli</i> Bowerbank, 1858	M, Sollas (1902); V, Dawydoff (1952);
329	<i>Tethya japonica</i> Sollas, 1888	V, Dawydoff (1952); C, Li (2008)
330	<i>Tethya robusta</i> (Bowerbank, 1873)	S, Lim et al. (2009); Th, Putschakarn & Hongpatarakiri (2012); C, Li (2008)
331	<i>Tethya seychellensis</i> (Wright, 1881)	Th, Putschakarn (2006); V, Azzini et al. (2007)
	Tethyida; Tethyidae; Tethycometes	
332	<i>Tethycometes radicata</i> Lim & Tan, 2008	S, Lim & Tan (2008)
	Tethyida; Tethyidae; Xenospongia	
333	<i>Xenospongia patelliformis</i> Gray, 1858	V, Lévi (1961)
	Tethyida; Timeidae; Timea	
334	<i>Timea aurantiaca</i> (Bergquist, 1968)	Th, Pumbua et al. (2009)
	Suberitida; Suberitidae; Aptos	
335	<i>Aptos laxosuberites</i> (Sollas, 1902)	M, Sollas (1902)
336	<i>Aptos suberitoides</i> (Brøndsted, 1934)	S, De Voogd & Cleary (2009); V, Lévi (1961); C, Liu et al. (2012); Ta, Shao et al. (2008)
	Suberitida; Suberitidae; Protosuberites	
337	<i>Protosuberites proteus</i> (Hentschel, 1909)	V, Dawydoff (1952)
	Suberitida; Suberitidae; Pseudosuberites	
338	<i>Pseudosuberites cava</i> Sollas, 1902	S, Lim et al. (2012a); M, Sollas (1902)
339	<i>Pseudosuberites lobulatus</i> (Lévi, 1961)	V, Lévi (1961)
	Suberitida; Suberitidae; Suberites	
340	<i>Suberites diversicolor</i> Becking & Lim, 2009	S, Becking & Lim (2009)
341	<i>Suberites tylobtus</i> Lévi, 1958	C, Li et al. (2000)
	Suberitida; Suberitidae; Terpios	
342	<i>Terpios cruciata</i> (Dendy, 1905)	S, Lim et al. (2012a); V, Azzini et al. (2007)
343	<i>Terpios granulosa</i> Bergquist, 1967	S, Lim et al. (2012a); Th, Putschakarn et al. (2004a)
344	<i>Terpios hoshinota</i> Rützler & Muzik, 1993	M, Hoeksema et al. (2014); Ta, Liao et al. (2007)

S/N	Species	Reference
Suberitida; Halichondriidae; Amorphinopsis		
345	<i>Amorphinopsis excavans</i> Carter, 1887	S, Lim et al. (2009); Th, Putschakarn et al. (2004a); V, Azzini et al. (2007)
346	<i>Amorphinopsis fenestrata</i> (Ridley, 1884)	V, Lindgren (1897)
347	<i>Amorphinopsis foetida</i> (Dendy, 1889)	V, Lévi (1961); C, Li (2008)
348	<i>Amorphinopsis siamensis</i> (Topsent, 1925)	Th, Topsent (1925)
Suberitida; Halichondriidae; Axinyssa		
349	<i>Axinyssa aplysinoides</i> (Dendy, 1922)	Th, Putschakarn (2006); C, Li (2008)
350	<i>Axinyssa pitys</i> (De Laubenfels, 1954)	S, Chuang (1973)
351	<i>Axinyssa variabilis</i> (Lindgren, 1897)	V, Lindgren (1897); C, Li (2008)
Suberitida; Halichondriidae; Ciocalypta		
352	<i>Ciocalypta</i> aff. <i>tyleri</i> Bowerbank, 1873	Ta, Huang et al. (2016)
353	<i>Ciocalypta melichlora</i> Sollas, 1902	M, Sollas (1902)
354	<i>Ciocalypta rutila</i> Sollas, 1902	M, Sollas (1902)
Suberitida; Halichondriidae; Epipolasis		
355	<i>Epipolasis suluensis</i> (Wilson, 1925)	S, Lim et al. (2012a)
Suberitida; Halichondriidae; Halichondria		
356	<i>Halichondria (Halichondria) armata</i> Lindgren, 1897	C, Li (2008)
357	<i>Halichondria (Halichondria) cartilaginea</i> (Esper, 1794)	S, Lim et al. (2012a); Th, Kritsanapuntu et al. (2001); V, Lévi (1961)
Suberitida; Halichondriidae; Hymeniacion		
358	<i>Hymeniacion agminata</i> Ridley, 1884	C, Li (2008)
Suberitida; Halichondriidae; Spongosorites		
359	<i>Spongosorites lapidiformis</i> Dendy, 1905	C, Li (2008)
Suberitida; Halichondriidae; Topsentia		
360	<i>Topsentia rugosa</i> (Ridley & Dendy, 1886)	C, Li (2008)
Class Calcarea		
Subclass Calcinea		
Clathrinida; Clathrinidae; Clathrina		
361	<i>Clathrina flexili</i> (Haeckel, 1872)	S, Haeckel (1872)
362	<i>Clathrina sororcula</i> Van Soest & De Voogd, 2015	S, Van Soest & De Voogd (2015)
Clathrinida; Clathrinidae; Guancha		
363	<i>Guancha macleayi</i> (Lendenfeld, 1885)	V, Dawydoff (1952)
Clathrinida; Leucettidae; Leucetta		
364	<i>Leucetta chagosensis</i> Dendy, 1913	Ta, Shao et al. (2008)
Clathrinida; Leucaltidae; Leucettusa		
365	<i>Leucettusa haeckeliana</i> (Poléjaeff, 1883)	V, Dawydoff (1952)
Leucosolenida; Jenkinidae; Anamixilla		
366	<i>Anamixilla singaporensis</i> Van Soest & De Voogd, 2015	S, Van Soest & De Voogd (2015)
Leucosolenida; Grantiidae; Aphroceras		
367	<i>Aphroceras alciicornis</i> Gray, 1858	C, Gray (1858b)
Leucosolenida; Heteropiidae; Heteropia		
368	<i>Heteropia glomerata</i> (Bowerbank, 1873)	C, Li (2008)
369	<i>Heteropia striata</i> Hozawa, 1916	V, Dawydoff (1952)
Subclass Calcaronea		
Leucosolenida; Grantiidae; Leucandra		
370	<i>Leucandra capillata</i> (Poléjaeff, 1883)	V, Dawydoff (1952)
371	<i>Leucandra loricata</i> (Poléjaeff, 1883)	V, Dawydoff (1952)

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