

## Preliminary Report on the Octocorals (Cnidaria: Anthozoa: Octocorallia) from the Ogasawara Islands

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**Abstract.** Approximately 400 octocoral specimens were collected from the Ogasawara Islands by SCUBA diving during 2013–2016 and by dredging surveys by the R/V Koyo of the Tokyo Metropolitan Ogasawara Fisheries Center in 2014 as part of the project “Biological Properties of Biodiversity Hotspots in Japan” at the National Museum of Nature and Science. Here we report on 52 lots of these octocoral specimens that have been identified to 42 species thus far. The specimens include seven species of three genera in two families of Stolonifera, 25 species of ten genera in two families of Alcyoniina, one species of Scleraxonia, and nine species of four genera in three families of Pennatulacea. Among them, three species of Stolonifera: *Clavularia* cf. *durum* Hickson, *C.* cf. *margaritiferae* Thomson & Henderson and *C.* cf. *repens* Thomson & Henderson, and five species of Alcyoniina: *Lobophytum variatum* Tixier-Durivault, *L.* cf. *mirabile* Tixier-Durivault, *Lohowia koosi* Alderslade, *Sarcophyton* cf. *boletiforme* Tixier-Durivault and *Sinularia linnei* Ofwegen, are new to Japan. In particular, *Lohowia koosi* is the first discovery since the original description from the east coast of Australia. In addition, the present identification results contain eight possibly undescribed species (one species each of *Clavularia*, *Cladiella*, *Klyxum*, *Paraminabea* and *Sarcophyton*, and three species of *Sinularia*). These results show that the octocorals of the Ogasawara Islands are likely to possess unique species diversity in Japanese waters. A systematic list of over 106 species (including multiple species not identified to species level) of octocorals of the Ogasawara Islands based on the present material and previous literature is presented here. However, this report does not include many soft corals and sea fans that have not yet been identified to the species level. These unidentified specimens include some of the collected specimens belonging to *Cladiella*, *Lobophytum*, *Sarcophyton*, *Sinularia*, *Litophyton*, and all collected specimens belonging to these taxa: *Dendronephthya*, *Scleronephthya*, *Stereonephthya*, *Chironophthya*, *Siphonogorgia*, Xeniidae and gorgonians other than *Briareum*. The entirety of these specimens including unidentified specimens collected in this survey will be published separately.

**Key words:** Ogasawara Islands, Octocorallia, new distribution records.

### Introduction

The octocoral fauna of the Ogasawara Islands (Bonin Islands) has been studied by several researchers, including a collection in the Museum of Comparative Zoology at Harvard College (Verrill, 1864), a Tokyo University Expedition to the Ogasawara Islands (Chichi-

jima Island) in 1894 (Utinomi, 1956a; Imahara, 2010), “Sixten Bock’s Expedition to Japan and the Bonin Islands (Chichi-jima Island, Ani-jima Island and Higashi-jima Island)” in 1914 (Aurivillius, 1931), “the Marine Biological Expedition to the Ogasawara (Bonin) Islands” by Toba Aquarium and Asahi Shinbun Publishing Company in 1968 (Ooishi, 1970), and a project

Table 1. Collection sites of scuba diving in 2013–2016 (see Fig. 1 for the details).

No. on Fig.1	Date	Geographical name of sampling site	Latitude, Longitude
<b>1. Chichi-jima Island</b>			
A1(1)	10 Nov. 2013	South entrance of Kominato	27°03.683'N, 142°11.417'E
A1(2)	12 Nov. 2013	Byobudani Coast	27°05.683'N, 142°12.183'E
A1(3)	30 June 2014	Omura Coast	27°05.060'N, 142°11.058'E
A1(4)	30 June 2014	Miyanohama Coast	27°06.317'N, 142°11.533'E
A1(5)	1 July 2014	Nagasaki Coast	27°06.017'N, 142°13.100'E
<b>2. Ani-jima Island (near Chichi-jima Island)</b>			
A2(1)	8 Nov. 2013	Takinoura Coast	27°07.083'N, 142°12.333'E
A2(2)	9 Nov. 2013	Toshutsubana Coast	27°12.016'N, 142°12.016'E
A2(3)	27 June 2014	Suji-iwamisaki Coast	27°07.333'N, 142°11.217'E
A2(4)	2 July 2014	Mansaku Coast	27°06.583'N, 142°13.250'E
<b>3. Ototo-jima Island (near Chichi-jima Island)</b>			
A3(1)	28 June 2014	Shikahama Coast	27°11.167'N, 142°11.100'E
<b>4. Nishi-jima Island (near Chichi-jima Island)</b>			
A4(1)	8 Nov. 2013	East coast of Nishi-jima Is.	27°06.967'N, 142°10.283'E
<b>5. Hitomaru-jima Island (near Chichi-jima Island)</b>			
A5(1)	14 Nov. 2013	West coast	27°07.333'N, 142°11.100'E
A5(2)	27 June 2014	Insaïdo	27°07.067'N, 142°11.450'E
<b>6. Hyotan-jima Island (near Chichi-jima Island)</b>			
A6(1)	28 June 2014	Insaïdo	27°07.767'N, 142°10.800'E
<b>7. Haha-jima Island</b>			
A7(1)	2 July 2015	North of Yonhon-iwa	26°38.933'N, 142°08.617'E
A7(2)	6 July 2015	South of Yonhon-iwa	26°38.850'N, 142°08.600'E
A7(3)	3 July 2015	South exit of the waterway at Yonhon-iwa	26°38.817'N, 142°08.600'E
A7(4)	5 July 2015	Iwashi-ne	26°39.667'N, 142°08.733'E
A7(5)	10 July 2016	Inarizushi-ne	26°39.967'N, 142°08.850'E
A7(6)	6 July 2015	A wreck at Horaine	26°37.287'N, 142°10.350'E
A7(7)	12 July 2016	Uentro (2)	26°39.550'N, 142°10.233'E
<b>8. Mukou-jima Island (near Haha-jima Island)</b>			
A8(1)	5 July 2015	Maguro-ana	26°36.617'N, 142°07.767'E
<b>9. Hira-shima Island (near Haha-jima Island)</b>			
A9(1)	3 July 2015	Sasao-ne	26°35.117'N, 142°09.750'E
<b>10. Mei-jima Island (near Haha-jima Island)</b>			
A10(1)	11 July 2016	West coast	26°34.133'N, 142°13.667'E
<b>11. Ane-jima Island (near Haha-jima Island)</b>			
A11(1)	13 July 2016	Nihon-iwa	26°32.567'N, 142°09.367'E

Table 2. Positive stations for octocoral specimens collected by biological dredge (50cm span opening) operated by R/V Koyo in 2014.

Station No.	Date	Locality	Depth
1	23 June 2014	ca. 10 km NW from Ototo-jima Island (27°12.783'N, 142°5.882'E–27°13.175'N, 142°5.916'E)	156.5–156.9 m
3	23 June 2014	ca. 8 km NNW from Ototo-jima Island (27°13.646'N, 142°6.743'E–27°13.348'N, 142°6.446'E)	156.1–156.1 m
5	23 June 2014	ca. 2 km W from Ototo-jima Island (27°10.751'N, 142°9.352'E–27°10.440'N, 142°8.917'E)	133.8–139.6 m
7	23 June 2014	ca. 2 km W from Ototo-jima Island (27°9.564'N, 142°10.431'E–27°9.257'N, 142°10.210'E)	69.2–75.1 m
9	24 June 2014	ca. 2 km W from Ototo-jima Island (27°0.359'N, 142°8.955'E–26°59.966'N, 142°8.904'E)	150.0–154.7 m
11	24 June 2014	ca. 1 km S from Chichi-jima Island (27°1.948'N, 142°12.490'E–27°1.806'N, 142°11.583'E)	106.7–88.8 m
15	25 June 2014	ca. 12 km WNW from Nishi-jima Island (27°12.226'N, 142°13.642'E–27°12.724'N, 142°13.474'E)	165.6–161.4 m

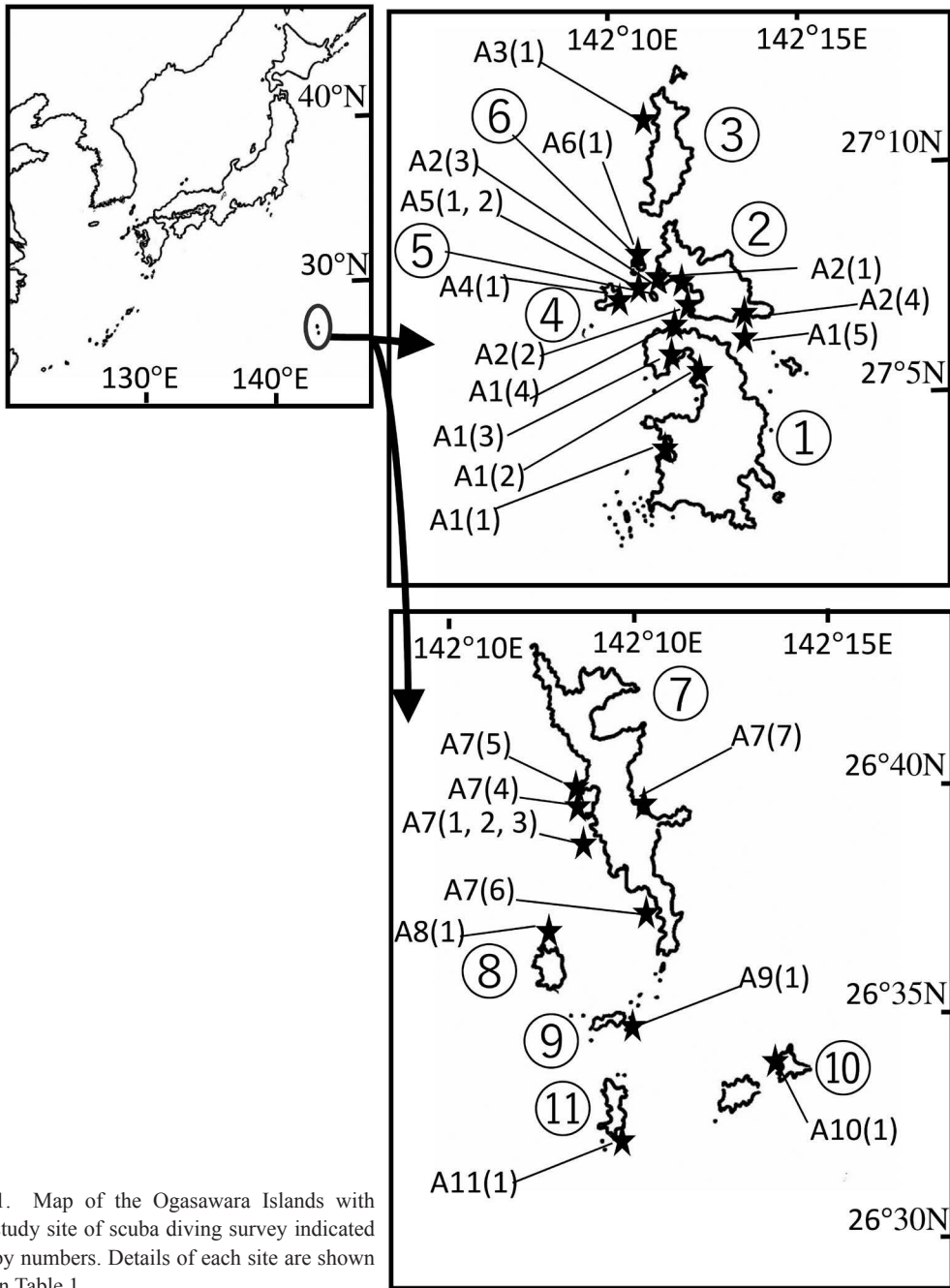


Fig. 1. Map of the Ogasawara Islands with study site of scuba diving survey indicated by numbers. Details of each site are shown in Table 1.

“Study on the Origin of Biodiversity in the Sagami Sea Fossa Magna Element and the Izu-Ogasawara Arc” by the National Museum of Nature and Science during 2007–2009 (Imahara, 2011). Through these surveys, 55 species of octocorals were recorded from the Ogasawara Islands.

Despite these works, knowledge of octocoral fauna in these islands is remarkably sparse when compared with other areas such as Sagami Bay (Imahara *et al.*, 2014). Additionally, in the report of Aurivillius (1931) who recorded ten gorgonian species from this area it was mentioned that

specimens contained four new species, and thus the Ogasawara Islands likely harbor undiscovered octocoral diversity. With this historical background, the National Museum of Nature and Science conducted a field survey of this area during 2013–2016. Approximately 400 colonies of octocoral specimens were collected as part of the project, “Biological Properties of Biodiversity Hotspots in Japan”. This is the first in a series of reports in which the octocoral fauna of the Ogasawara Islands will be revised through critical examination of the specimens collected during this survey.

### Materials and Methods

In this survey, information from previous literature was organized and new specimens were collected. New materials were collected by two methods, SCUBA diving in shallow waters (<30 m deep) during 2013–2016, and biological dredging (BD) surveys (59–171 m deep) by the R/V Koyo of the Tokyo Metropolitan Ogasawara Fisheries Center in 2014 (Tables 1–2). Sub-samples were taken from collected materials and preserved in 99.5% ethanol for future molecular studies. The remainders of the specimens were then fixed in 20% formalin overnight, rinsed for over 24 h in fresh water, and then transferred to 75% ethanol. Sclerites were obtained by dissolving the tissues in household bleach (10–13% sodium hypochlorite), followed by careful and repeated rinsing in distilled water. Sclerites were mounted via Eukitt (ORSAtec) for permanent microscope slides. Polyp measurements were obtained from drawings made under a stereomicroscope, whereas sclerites were measured by drawings made under a biological microscope. Observations of anthocodial formula were performed under a stereomicroscope using transparent polyps prepared with clove oil (see Imahara, 2014). Sclerite terminology followed Bayer *et al.* (1983). All newly collected specimens will be deposited in the National Museum of Nature and Science.

### Results

The octocoral fauna of the Ogasawara Islands has previously been studied by several researchers (Aurivillius, 1931; Utinomi, 1956a; Ooishi, 1970; Imahara, 2010, 2011). Through these previous surveys, 55 species of octocorals were recorded from the Ogasawara Islands. In this new survey, approximately 400 specimens were collected from the Ogasawara Islands, and 52 have been identified to 42 species to date. These include seven species of three genera in two families of Stolonifera, 25 species of ten genera in two families of Alcyoniina, one species of Scleraxonia, and nine species of four genera in three families of Pennatulacea. For *Heliopora*, we did not collect the specimens in this survey, but confirmed the distribution at the several points in this survey. The octocorals found thus far from the Ogasawara Islands are listed (Table 3).

### Systematic Notes

Order **Alcyonacea** Lamouroux, 1812  
 Suborder **Stolonifera** Thomson & Simpson, 1909  
 Family **Clavulariidae** Hickson, 1894  
 Subfamily **Clavulariinae** Hickson, 1894

*Clavularia mikado* Utinomi, 1955  
 [Japanese name: Mikado-umiduta]  
 (Figs. 2 A–C)

Material. One fragment, (coll. no. 2014-085-32), St. 7, R/V Koyo, ca. 2 km W from Ototo-jima I., 27°9.564'N, 142°10.431'E–27°9.257'N, 142°10.210'E, 69.2–75.1 m, BD, 23 June 2014.

Known distribution record. Japan (Sagami Bay, 4–70 m).

*Clavularia cf. durum* Hickson, 1921  
 (Figs. 2D–F)

Material. One colony (coll. no. 2014-085-0), St. 1, R/V Koyo, ca. 10 km NW from Ototo-jima I., 27°12.783'N, 142°5.882'E–27°13.175'N, 142°5.916'E, 156.5–156.9 m, BD, 23 June 2014.

Remarks. This specimen closely resembles *C. durum* in that the sclerites of body wall of both

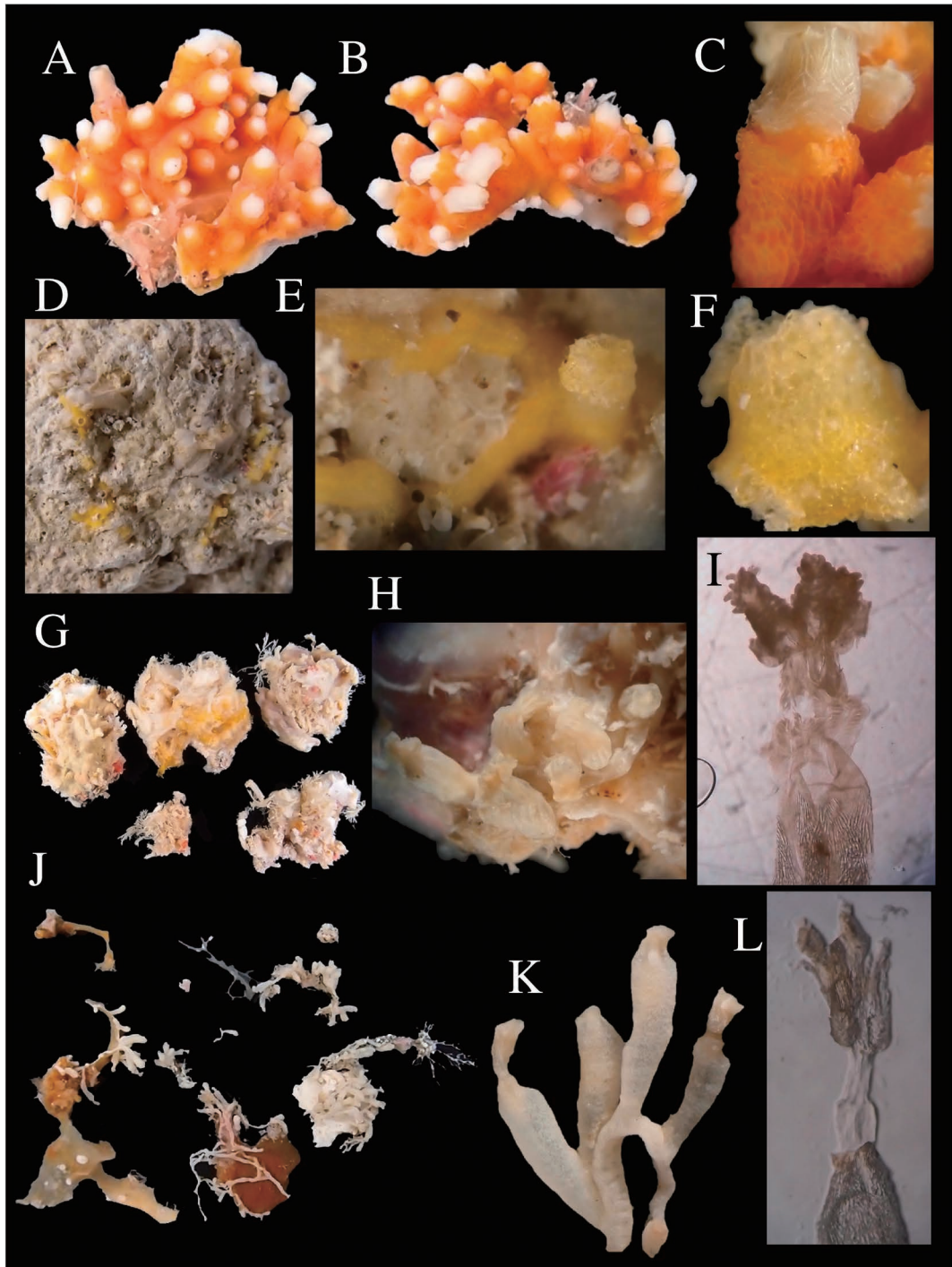


Fig. 2. A–C: *Clavularia mikado* (coll. no. 2014-085-32); D–F: *C. cf. durum* (coll. no. 2014-085-0); G–I: *C. cf. margaritiferae*, (coll. no. 2015-103); J–L: *C. cf. repens* (coll. no. 2014-085-1).

Table 3. List of octocorals from the Ogasawara Islands.

Species name	References
Order Alcyonacea Lamouroux, 1812	
Suborder Stolonifera Thomson & Simpson, 1909	
Family Clavulariidae Hickson, 1894	
Subfamily Clavulariinae Hickson, 1894	
<i>Clavularia mikado</i> Utinomi, 1955	This study
<i>Cl. cf. durum</i> Hickson, 1921	This study
<i>Cl. cf. margaritiferae</i> Thomson & Henderson, 1905	This study
<i>Cl. cf. repens</i> Thomson & Henderson, 1906	This study
<i>Cl. sp. aff. ornata</i> Thomson & Dean, 1931	This study
Subfamily Telestinae Milne Edwards & Haime, 1857	
<i>Telesto cf. tubulosa</i> Kinoshita 1909	This study
Family Tubiporidae Ehrenberg, 1828	
<i>Tubipora musica</i> Linnaeus, 1858	Utinomi 1956b, Ooishi 1970, This study
Suborder Alcyoniina Lamouroux, 1812	
Family Alcyoniidae Lamouroux, 1812	
<i>Aldersladum cf. jengi</i> Benayahu & McFadden, 2011	This study
<i>Anthomastus granulatus</i> Kükenthal, 1910	Imahara 2011
<i>Cladiella digitulata</i> (Klunzinger, 1877)	This study
<i>Cl. sphaerophora</i> (Ehrenberg, 1834)	Utinomi 1956a, Imahara 2010, This study
<i>Cl. sp. aff. arborea</i> Utinomi, 1954	This study
<i>Cl. spp.</i>	Imahara 2010, This study
<i>Eleutherobia cf. sumbawaensis</i> Verseveldt & Bayer, 1988	Imahara 2011
<i>Klyxum simplex</i> Thomson & Dean, 1931	This study
<i>Kl. sp. aff. simplex</i> Thomson & Dean, 1931	This study
<i>Lobophytum crassospiculatum</i> (Moser, 1919)	Utinomi 1956a
<i>Lo. crebrilicatum</i> von Marenzeller, 1886	Ooishi 1970, Imahara 2010, This study
<i>Lo. pauciflorum</i> (Ehrenberg, 1834)	This study
<i>Lo. variatum</i> Tixier-Durivault, 1957	This study
<i>Lo. cf. mirabile</i> Tixier-Durivault, 1956	This study
<i>Lo. spp.</i>	Imahara 2010, This study
<i>Lohowia koosi</i> Alderslade, 2003	This study
<i>Paraminabea sp. aff. kosiensis</i> Williams, 1992	This study
<i>Sarcophyton glaucum</i> (Quoy & Gaimard, 1833)	Utinomi 1956b, Ooishi 1970
<i>Sa. trocheliophorum</i> Marenzeller, 1886	Ooishi 1970, This study
<i>Sa. cf. boletiforme</i> Tixier-Durivault, 1958	This study
<i>Sa. cf. glaucum</i> (Quoy & Gaimard, 1833)	This study
<i>Sa. cf. infundibuliforme</i> Tixier-Durivault, 1958	This study
<i>Sa. sp. aff. tumulosum</i> Benayahu & Ofwegen, 2009	This study
<i>Sa. spp.</i>	This study
<i>Sinularia brassica</i> May, 1898	This study
<i>Si. linnei</i> van Ofwegen 2008	This study
<i>Si. polydactyla</i> (Ehrenberg, 1834)	Utinomi 1956b, Ooishi 1970, Imahara 2011
<i>Si. sp. aff. erecta</i> Tixier-Durivault, 1945	This study
<i>Si. sp. aff. heterospiculata</i> Verseveldt, 1970	This study
<i>Si. sp. aff. pumilia</i> Dautova, van Ofwegen & Savinkin, 2010	This study
<i>Si. spp.</i>	This study
Family Nephtheidae Gray, 1862	
<i>Coronephthya macrospiculata</i> (Thomson & Mackinnon, 1910)	Imahara 2011, This study
<i>Dendronephthya armata</i> (Holm, 1894)	Imahara 2011
<i>De. carnea</i> (Wright & Studer, 1889)	Imahara 2011
<i>De. cervicornis</i> (Wright & Studer, 1889)	Imahara 2011
<i>De. gigantea</i> (Verrill, 1864)	Ooishi 1970
<i>De. gracillima</i> (Holm, 1894)	Imahara 2011
<i>De. grandiflora</i> (Henderson, in Thomson and Simpson, 1909)	Imahara 2011
<i>De. mirabilis</i> (Henderson, in Thomson and Simpson, 1909)	Imahara 2011
<i>De. nipponica</i> Utinomi, 1952	Ooishi 1970
<i>De. pectinata</i> (Holm, 1894)	Imahara 2011
<i>De. puetteri</i> Kükenthal, 1905	Imahara 2011
<i>De. rigida</i> (Studer, 1888)	Imahara 2011
<i>De. snelliusi</i> Verseveldt, 1966	Imahara 2011
<i>De. spinifera</i> Holm, 1895	Ooishi 1970, Imahara 2011
<i>De. tenera</i> (Holm, 1894)	Imahara 2011
<i>De. spp.</i>	This study
<i>Litophyton striatum</i> (Kükenthal, 1903)	This study
<i>Li. cf. chabrolii</i> (Kaudouin, 1828)	This study
<i>Li. spp.</i>	This study
<i>Scleronephthya spp.</i>	This study
<i>Stereonephthya whiteleggei</i> Kükenthal, 1905	Imahara 2011
<i>St. spp.</i>	This study
<i>Umbellulifera striata</i> (Thomson & Henderson, 1905)	Imahara 2011

Table 3. Continued.

Species name	References
Family Nidaliidae Gray, 1869	
Subfamily Nidaliinae Gray, 1869	
<i>Nidalia macrospina</i> Kükenthal, 1906	Imahara 2011
<i>Ni. palmata</i> (Simpson, 1907)	Imahara 2011
<i>Ni.</i> spp.	Imahara 2011
Subfamily Siphonogorgiinae Kölliker, 1874	
<i>Chironophthya chalmaersi</i> Verseveldt, 1966	Imahara 2011
<i>Ch. dofeini</i> Kükenthal, 1906	Imahara 2011
<i>Ch.</i> spp.	This study
<i>Nephtyigorgia</i> cf. <i>annectens</i> (Thomson & Simpson, 1909)	Imahara 2011
<i>Siphonogorgia lobata</i> Verseveldt, 1982	Imahara 2011
<i>Si.</i> spp.	This study
Family Xenidiidae Ehrenberg, 1828	
Xenidiidae gen spp.	This study
Suborder Scleroxonia Studer, 1887	
Family Anthothelidae Broch, 1916	
<i>Iciligorgia boniensis</i> Aurivillius, 1931	Aurivillius 1931
Family Briareidae Gray, 1859	
<i>Briareum violaceum</i> (Quoy & Gaimard, 1833)	Utinomi 1956a, b, Imahara 2010, This study
Family Coralliidae Lamouroux, 1812	
<i>Pleurocorallium elatum</i> Ridley, 1882	Aurivillius 1931, Kishinouye 1903, 1904
<i>Pl. konajoi</i> (Kishinouye, 1903)	Kishinouye 1903, 1904
<i>Corallium japonicum</i> Kishinouye, 1903	Kishinouye 1903, 1904, Utinomi 1965
Family Melithaeidae Gray, 1870	
<i>Melithaea</i> sp.	Ooishi, 1970
Melithaeidae gen. spp.	This study
Family Parisididae Aurivillius, 1931	
<i>Parisid australis</i> Wright & Studer, 1889	Aurivillius 1931
<i>Pa. minor</i> Wright & Studer, 1889	Aurivillius 1931
Suborder Holaxonia Studer, 1887	
Family Acanthogorgiidae Gray, 1859	
<i>Acanthogorgia japonica</i> Kükenthal & Gorzawsky, 1908	Aurivillius 1931
<i>Ac. multispina</i> Kükenthal & Gorzawsky, 1908	Aurivillius 1931
<i>Ac. radians</i> Kükenthal & Gorzawsky, 1908	Ooishi 1970
<i>Ac.</i> spp.	This study
<i>Anthogorgia bocki</i> Aurivillius, 1931	Aurivillius 1931, Utinomi 1965
Family Gorgoniidae Lamouroux, 1812	
<i>Leptogorgia ampla</i> Verrill, 1864	Verrill 1864
Family Plexauridae Gray, 1859	
<i>Bebryce bocki</i> Aurivillius, 1931	Aurivillius 1931, Utinomi 1965
<i>Be. boniensis</i> Aurivillius, 1931	Aurivillius 1931
<i>Euplexaura boninensis</i> (Aurivillius, 1931)	Aurivillius 1931 ( <i>Thesea boniensis</i> )
<i>Villogorgia cristata</i> Aurivillius, 1931	Aurivillius 1931
<i>Vi. cristata papillata</i> Aurivillius, 1931	Aurivillius 1931
<i>Vi. teretiflora</i> Aurivillius, 1931	Aurivillius 1931
Plexauridae gen spp.	This study
Suborder Calcaxonia Grasshoff, 1999	
Family Ellisellidae Gray, 1859	
Ellisellidae gen spp.	This study
Family Primnoidae Milne-Edwards, 1857	
<i>Plumarella dofeini</i> Kükenthal & Gorzawsky, 1908	Aurivillius 1931
Primnoidae gen. spp.	This study
Order Pennatulacea Verrill, 1865a	
Suborder Sessiliflorae Kükenthal, 1915	
Family Kophobelemnidae Gray, 1960	
<i>Sclerobelemon burgeri</i> (Herklots, 1858)	This study
Suborder Subselliiflorae Kükenthal, 1915	
Family Virgulariidae Verrill, 1868	
<i>Scytalium martensi</i> Kölliker, 1870	This study
<i>Sc. splendens</i> (Thomson & Henderson, 1906)	This study
<i>Virgularia gustaviana</i> (Herklots, 1863)	This study
<i>Vi. halisceptrum</i> Broch, 1910	This study
<i>Vi. cf. brochi</i> Kükenthal, 1915	This study
Family Pennatulidae Ehrenberg, 1834	
<i>Pteroeides caledonicum</i> Kölliker, 1872	This study
<i>Pt. dofeini</i> Balss, 1910	This study
<i>Pt. cf. dofeini</i> Balss, 1910	Imahara 2011, This study
Order Helioporacea Bock, 1938	
Family Helioporidae Moseley, 1876	
<i>Heliopora coerulea</i> (Pallas, 1766)	Utinomi 1965, This study (visual check only)

the stolon and the calyces are inseparably fused. However, the original description of *C. durum* is very simple and there are no figures, so the identity of the species is unknown.

Distribution of *C. durum*. Australia (Adelaide, 36–55 m and shallow water off Victoria).

***Clavularia* cf. *margaritiferae***

Thomson & Henderson, 1905

(Figs. 2G–I)

Materials. Five fragments belonging to one colony (coll. no. 2015-103), south exit of the waterway at Yonhon-iwa, Haha-jima I., 26°38.817'N, 142°08.600'E, 13.5 m, SCUBA, 3 July 2015.

Remarks. This specimen is similar to *C. margaritiferae* in the external form of colony and polyps. Although there are no sclerites in the tentacles of this specimen, it is different in that there are numerous elongated rods in *C. margaritiferae*, but not in this specimen.

Distribution of *C. margaritiferae*. Pearl Banks, Gulf of Manaar, Laccadive Sea in the Indian Ocean.

***Clavularia* cf. *repens***

Thomson & Henderson, 1906

(Figs. 2J–L)

Materials. Five fragments belonging to one colony (coll. no. 2014-085-1), St. 1, R/V Koyo, ca. 10 km NW from Ototo-jima I., 27°12.783'N, 142°5.882'E–27°13.175'N, 142°5.916'E, 156.5–156.9 m, BD, 23 June 2014.

Remarks. This specimen resembles *C. repens* and *C. eburnea* Kükenthal, 1906 in having a large number of capstans in the stolons. In this specimen, stolons are ribbon-like, and the length of the calyces (anthostele) are about 3 mm long. *C. eburnea* is clearly different in that the stolons are membrane-like and the calyces are about 6 mm long. *C. repens* is different in color from this specimen (white vs reddish with brown polyps in *C. repens*). The sclerites of calyces and anthocodial formula of *C. repens* are unknown.

Distribution of *C. repens*. Chuaka Bay, Zanzibar.

***Clavularia* sp. aff. *ornata***

Thomson & Dean, 1931

(Figs. 3A–D)

Materials. Two fragments (coll. no. 2014-085-3), St. 3, R/V Koyo, ca. 8 km NNW from Ototo-jima I., 27°13.646'N, 142°6.743'E–27°13.348'N, 142°6.446'E, 156.1–156.1 m, BD, 23 June 2014. One fragment (coll. no. 2014-085-21), St. 5, R/V Koyo, ca. 2 km W from Ototo-jima I., 27°10.751'N, 142°9.352'E–27°10.440'N, 142°8.917'E, 133.8–139.6 m, BD, 23 June 2014.

Remarks. These specimens closely resemble *C. ornata* in the external form of colony, arrangement of polyps and anthocodial formula, but significantly differ in the length of the calyces (<2.4 mm vs <5.0 mm in *C. ornata*), and the shape of sclerites of calyces (variety branched spindles vs simple plump spindles).

Distribution of *C. ornata*. Indonesia (Flores Sea, 794 m and near the boundary between the Celebes Sea and the Molucca Sea, 1165–1264 m).

**Subfamily *Telestinae***

Milne Edwards & Haime, 1857

***Telesto* cf. *tubulosa* Kinoshita, 1909**

[Japanese name: Kuda-koeda]

(Figs. 3E–H)

Material. One colony with three stems (coll. no. 2104-085-7), St. 3, R/V Koyo, ca. 8 km NNW from Ototo-jima I., 27°13.646'N, 142°6.743'E–27°13.348'N, 142°6.446'E, 156.1–156.1 m, BD, 23 June 2014.

Remarks. This specimen has a small amount of mesogloea near the proximal portion of stem (Fig. 3H). *Telesto* lacks mesogloea in the stem, a stem filled with mesogloea is a feature of *Telestula*. Therefore, this specimen needs to be examined further.

Distribution of *Telesto tubulosa*. Japan (Sagami Bay to southwest off Kyushu). 75–150 m.

**Family *Tubiporidae* Ehrenberg, 1828**

***Tubipora musica* Linnaeus, 1758**

[Japanese name: Kudasango]

(Figs. 3I–K)

Materials. One fragment (coll. no. 2013-101), east



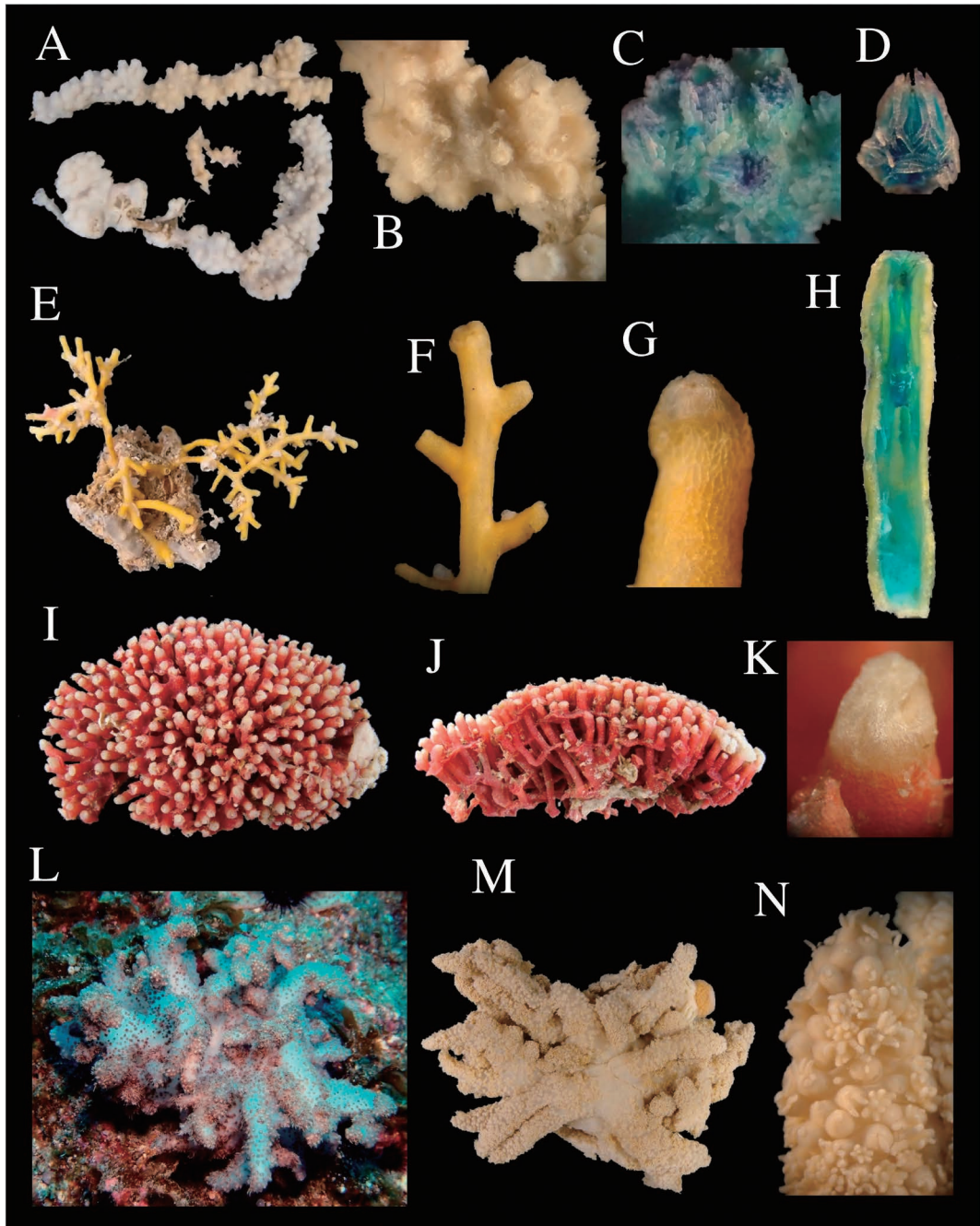


Fig. 3. A–D: *Clavularia* sp. aff. *ornata* (coll. no. 2014-085-3); E–H: *Telesto* cf. *tubulosa* (coll. no. 2014-085-7); I–J: *Tubipora musica* (coll. no. 2015-122), K: *T. musica* (coll. no. 2014-047); L–N: *Alderladum* cf. *jengi* (coll. no. 2016-100).

coast of Nishi-jima I., 27°6.967'N, 142°10.283'E, 15.4m, SCUBA, 8 Nov. 2013. One fragment (coll. no. 2013-106), Takinoura Coast, Ani-jima I., 27°7.083'N, 142°12.333'E,

2.0m, SCUBA, 8 Nov. 2013. One fragment (coll. no. 2013-131), South entrance of Kominato, Chichi-jima I., 27°3.683'N, 142°11.417'E, 8.9m, SCUBA, 10 Nov. 2013.

One fragment (coll. no. 2014-006), Suji-iwamisaki Coast, Ani-jima I., 27°7.333'N, 142°11.217'E, 8.3 m, SCUBA, 27 June 2014. One fragment (coll. no. 2014-047), Nagasaki Coast, Chichi-jima I., 27°6.017'N, 142°13.100'E, 8.4 m, SCUBA, 1 July 2014. One fragment, (coll. no. 2014-085-47), St. 11, R/V Koyo, ca. 1 km S from Chichi-jima I., 27°1.948'N, 142°12.490'E–27°1.806'N, 142°11.583'E, 106.7–88.8 m, BD, 24 June 2014. One fragment (coll. no. 2015-122), Iwashine, Haha-jima I., 26°39.667'N 142°08.733'E, 19.0 m, SCUBA, 5 July 2015.

Known distribution record. Widely distributed around IWP tropical seas, Japan (Kii Peninsula, Ogasawara Is, Amami-oshima I., Ryukyu Archipelago), Taiwan, Australia, etc.

Suborder **Alcyoniina** Lamouroux, 1816

Family **Alcyoniidae** Lamouroux, 1812

*Aldersladum* cf. *jengi*

Benayahu & McFadden, 2011

(Figs. 3L–N)

Material. A colony (coll. no. 2016-100), Nihon-iwa, Ane-jima I., 26°32.567'N, 142°9.367'E, 21.7 m, SCUBA, 13 July 2016.

Remarks. Although this specimen resembles *A. jengi* in the shape and size of colony and sclerites, basal sclerites are large (up to 0.12 mm long vs. up to 0.06 mm long in *A. jengi*), rough and rugged.

Known distribution record of *A. jengi*. Japan (Yoron I. and Okinoerabu I.), Taiwan.

*Cladiella digitulata* (Klunzinger, 1877)

[Japanese name: Yubi-notosaka]

(Figs. 4A–D)

Material. One colony (coll. no. 2015-140), A wreck at Horaine, Haha-jima I., 26°37.287'N, 142°10.350'E, 15.1 m, SCUBA, 6 July 2015.

Known distribution record. Japan (Sagami Bay, Tanabe Bay, Inan Coast, Ryukyu Archipelago), Hong Kong, Philippines, Indonesia, Papua New Guinea, Zanzibar, New Caledonia, Red Sea, East Indies. 25 m deep.

*Cladiella sphaerophora* (Ehrenberg, 1834)

[Japanese name: Tama-notosaka]

(Figs. 4E–I)

Material. One colony (coll. no. 2014-074), Mansaku Coast, Ani-jima I., 27°6.583'N, 142°13.250'E, 1.0 m, SCUBA, 2 July 2014.

Known distribution record. Japan (Ogasawara Is., Ryukyu Archipelago), Taiwan, Malay Archipelago, Polynesia, New Caledonia, Red Sea, Seychelles, Madagascar, Zanzibar, East Indies. 1–15 m deep.

*Cladiella* sp. aff. *arborea* Utinomi, 1954

(Figs. 4J–M)

Material. One colony (coll. no. 2013-116), Toshutsuana Coast, Ani-jima I., 27°12.016'N, 142°12.016'E, 6.0 m, SCUBA, 9 Nov. 2013.

Remarks. This specimen resembles *C. arborea* Utinomi, 1954a (: 50, fig. 5, pl. 1, fig. 1) from Kii Peninsula, and *C. humesi* Verseveldt, 1974 (: 98–99, fig. 2, pl. 1, fig. 2) from New Caledonia in the shape of colony and sclerites, however both species with numerous finger-biscuit-like sclerites in the tentacles (this specimen completely devoid of sclerites in polyps). Whereas the large dumb-bells in the base of *C. arborea* are up to 0.90 mm long, and those of *C. humesi* are up to 0.135 mm long, those of this specimen are 0.180 mm long. Also, this specimen resembles *C. steineri* Verseveldt, 1982 (: 145–147, fig. 2, pl. 1, fig. 3) from the Gulf of Thailand in the shape of colony, however *C. steineri* with scales in the distal portion of the tentacles, and the coenenchymal large sclerites of *C. steineri* are capstans, up to 0.082 mm long.

Known distribution record of *C. arborea*. Japan (Tanabe Bay). Shallow waters.

*Klyxum simplex* Thomson & Dean, 1931

(Figs. 4N–Q)

Material. A part of a colony (coll. no. 2014-072), Mansaku Coast, Ani-jima I., 27°6.583' N, 142°13.25' E., 6.8 m, SCUBA, 2 July 2014.

Known distribution record. Japan (Sesoko I. in Okinawa I.), Taiwan, Guam, Malay Archipelago,

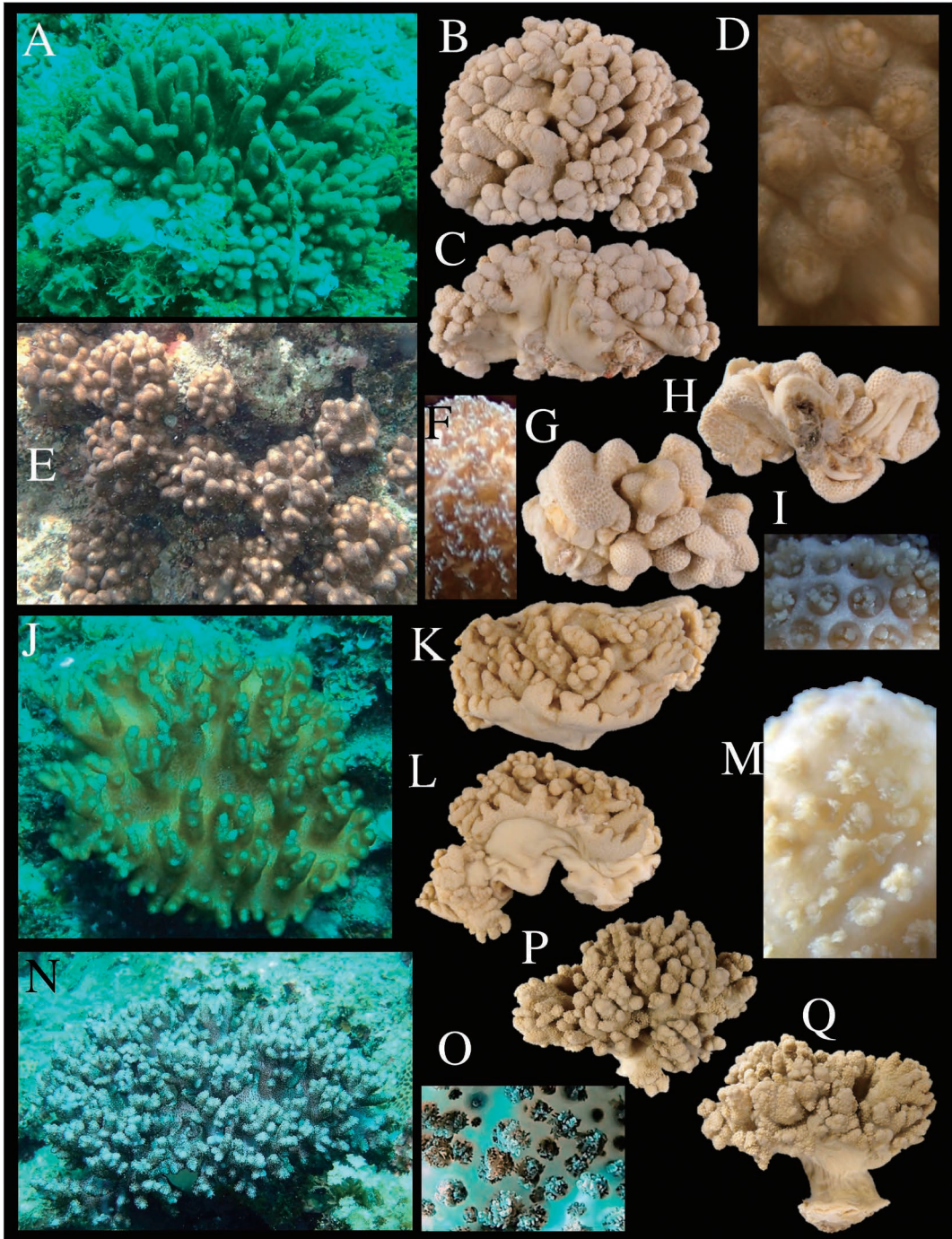


Fig. 4. A–D: *Cldiella digitulata* (coll. no. 2015-140); E–I: *C. sphaerophora* (coll. no. 2014-074); J–M: *C. sp. aff. arborea* (coll. no. 2013-116); N–Q: *Klyxym simplex* (coll. no. 2014-072).

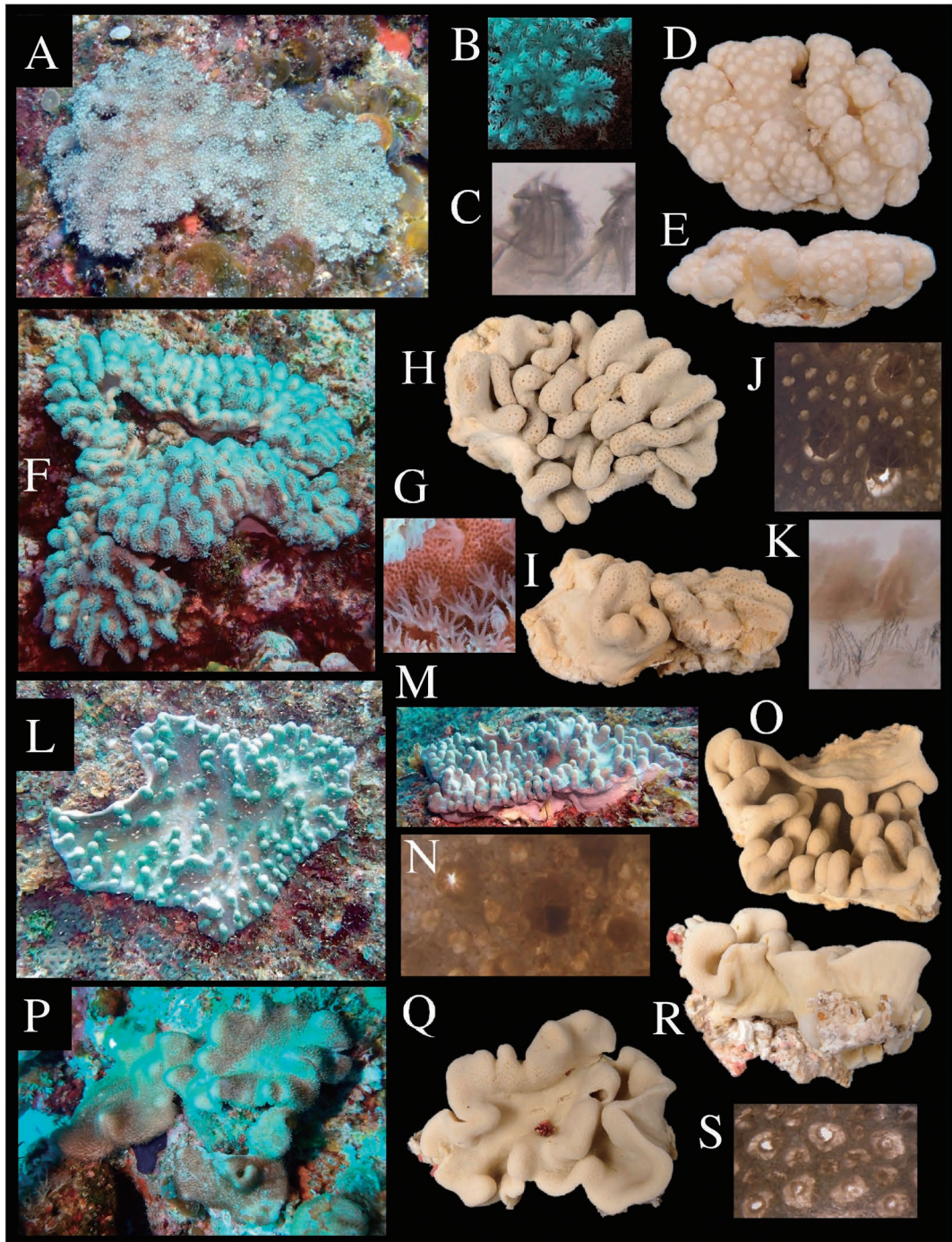


Fig. 5. A–E: *Klyxum* sp. aff. *simplex* (coll. no. 2016-083); F–K: *Lobophytum crebriplacatum* (coll. no. 2013-149); L–O: *L. pauciflorum* (coll. no. 2014-020); P–S: *L. variatum* (coll. no. 2015-095).

New Caledonia, Madagascar. Intertidal–320 m deep.

***Klyxum* sp. aff. *simplex*** Thomson & Dean, 1931  
(Figs. 5A–E)

Material. A colony (coll. no. 2016-083), Uentoro (2), Haha-jima I., 26°39.550'N, 142°10.233'E, 19.6 m, SCUBA, 12 July 2016.

Remarks. This specimen resembles *K. simplex* in the shape and size of sclerites. However, this specimen has elongated rods, ca. 1.0 mm long, arranged *en chevron* below the proximal portion of tentacle (*K. simplex* with small rods, up to 0.08 mm long, only in the tentacles), and coenenchymal sclerites (spindles) reach 1 mm in length (those of *K. simplex* are up to 0.5 mm long).

Known distribution record of *K. simplex*. Japan (Sesoko I. in Okinawa I.), Taiwan, Guam, Malay Archipelago, New Caledonia, Madagascar. Intertidal–320 m deep.

***Lobophytum crebriplicatum***  
von Marenzeller, 1886  
(Figs. 5F–K)

Material. One colony (coll. no. 2013-149), west coast of Hitomaru-jima I., 27°7.333'N, 142°11.100'E, 24.1 m, SCUBA, 14 Nov. 2013.

Remarks. Although this specimen resembles *L. oblongum* Tixier-Durivault, 1956 rather than *L. crebriplicatum*, Verseveldt (1983) regarded the former as the latter junior synonym. This species has been recorded from Tsurihama at Chichi-jima I., by Utinomi (1956a).

Known distribution record. Japan (Chichi-jima I. in Ogasawara Is.), Tonga I., Great Barrier Reef, Palau, widespread in the warm West Pacific and Indian Ocean.

***Lobophytum pauciflorum*** (Ehrenberg, 1834)  
[Japanese name: Ibo-unetake]  
(Figs. 5L–O)

Material. Part of a colony (coll. no. 2014-020), Insaído, Hyotan-jima I., 27°7.767'N, 142°10.800'E, 4.6 m, SCUBA, 28 June 2014.

Known distribution record. Widespread in the

tropical/subtropical West Pacific and Indian Ocean.

***Lobophytum variatum*** Tixier-Durivault, 1957  
(Figs. 5P–S)

Material. One colony (coll. no. 2015-095), Sasao-ne, Hira-shima I., 26°35.117'N, 142°9.750'E, 17.9 m, SCUBA, 3 July 2015.

Known distribution record. New Caledonia and Madagascar.

***Lobophytum* cf. *mirabile*** Tixier-Durivault, 1956  
(Figs. 6A–D)

Materials. Three colonies connected by the part to the base of stolon (coll. no. 2015-123), Iwashine, Haha-jima I., 26°39.667'N, 142°8.733'E, 12.0 m, SCUBA, 5 July 2015.

Remarks. This specimen similar to *L. crebriplicatum* Marenzeller, 1886 in the shape of lobes, and in the shapes of most sclerites of the coenenchyma. However, the presence of the long stalk and the shuttle-like sclerites in the cortex of lobes well agree with this species.

Known distribution record. Madagascar and Pacific Ocean (unknown locality).

***Lohowia koosi*** Alderslade, 2003  
(Figs. 6E–L)

Material. Part of a colony (coll. no. 2016-096), Nihoniwa, Ane-jima I., 26°32.567'N, 142°9.367'E, 24.9 m, SCUBA, 13 July 2016.

Remarks. *Lohowia* is monospecific genus and *L. koosi* was a species that had not been reported anywhere since it was discovered from 13 meters off Lord Howe Island off the east coast of Australia. This discovery is the second record in the world. Of this record, although geographically far away from the type locality, this specimen well agrees with the original description of this species.

Known distribution record. Type locality only, Lord Howe I., Australia, 13 m deep.

***Paraminabea* sp. aff. *kosiensis* Williams, 1992**  
(Figs. 6M–O)

Materials. Two colonies (coll. no. 2015-128), Maguro-ana, Mukou-jima I., 26°36.617'N, 142°07.767'E, 21.5 m, SCUBA, 5 July 2015.

Remarks. These specimens resemble *P. kosiensis* in shape and size of both colony and sclerites. However, the shape of these specimens is more slender and the sclerites composition is slightly different. Sclerites throughout the colonies of these specimens are radiates and warty clubs, although those of *P. kosiensis* are radiates and thorny spindles.

Known distribution record of *P. kosiensis*. Natal (South Africa), 370 m deep.

***Sarcophyton trocheliophorum***

von Marenzeller, 1886

[Japanese name: Hidaberi-umikinoko]

(Figs. 6P–U)

Materials. Part of a colony (coll. no. 2013-107), Takinoura Coast, Ani-jima I., 27°7.083'N, 142°12.333'E, 2.0 m, SCUBA, 8 Nov. 2013. One colony (coll. no. 2014-034), Insaïdo, Hitomaru-jima I., 27°7.067'N, 142°11.450'E, 6.3 m, SCUBA, 27 June 2014.

Remarks. We examined two specimens similar in external morphology, arrangement of polyps, and in characteristics of sclerites to each other. However, with respect to the shape of the prominences of the sclerites interior of the disc, most of the sclerites of one colony (coll. no. 2013-107) were bifurcated, whereas in the other colony (coll. no. 2015-034) they were different; being smooth conical. Marenzeller (1886) described both types of sclerites intermingled about these prominences. In addition, Verseveldt (1982), who re-described Marenzeller's lectotype, illustrated the shape of these two types of prominences. For this reason, it was thought that there was a large mutation for each colony regarding the sclerite prominences of the disc interior of this species.

Known distribution record. Widespread in the warm West Pacific and Indian Ocean.

***Sarcophyton* cf. *boletiforme***

Tixier-Durivault, 1958

(Figs. 7A–D)

Material. One colony (coll. no. 2016-053-32), Inarizushi-ne, Haha-jima I., 26°39.967'N, 142°8.850'E, 7 m, SCUBA, 10 July 2016.

Remarks. The external form of perfect mushroom-like colonies with a thin margin resembles the following four species: *S. boletiforme*, *S. portentosum*, *S. spongiosum* and *S. tenuispiculatum*. The cortical sclerites of capitulum of this specimen are rods <0.18 mm long and spindles <0.5 mm long, not club-shaped, and those of the interior of stalk are slender spindles <1.8 mm long. Therefore, this specimen belongs to Key 3 of Verseveldt (1982). Among the above four species, only *S. boletiforme* corresponds to Key 3. This specimen and *S. boletiforme* are similar in composition of anthocodial formula (>8p + (2–3) Cr). However, the sizes of the sclerites of the interior of colony are different between this specimen and *S. boletiforme* as follows: length of the smooth needles interior of disc (<0.33 mm vs 0.60 mm), that of spindles interior of stalk (<1.78 mm vs <1.10 mm). Among the species described after Verseveldt (1982), there are no species similar to this specimen.

Known distribution record. Gulf of Suez.

***Sarcophyton* cf. *glaucom***

(Quoy & Gaimard, 1833)

[Japanese name: Oo-umikinoko]

(Figs. 7E–H)

Material. One colony (coll. no. 2015-125), Maguro-ana, Mukou-jima I., 26°36.617'N, 142°7.767'E, 26.5 m, SCUBA, 5 July 2015.

Remarks. Colony very small, the external form is different from the general form of this species, since it is a complete mushroom shape without the folding of disc periphery. But the features of the sclerites of each part agree well with this species. Tixier-Durivault (1958) described that polyps have sclerites arranged *en chevron* at only the distal portion of anthocodiae and tentacles in the re-description of the two syntypes of this spe-

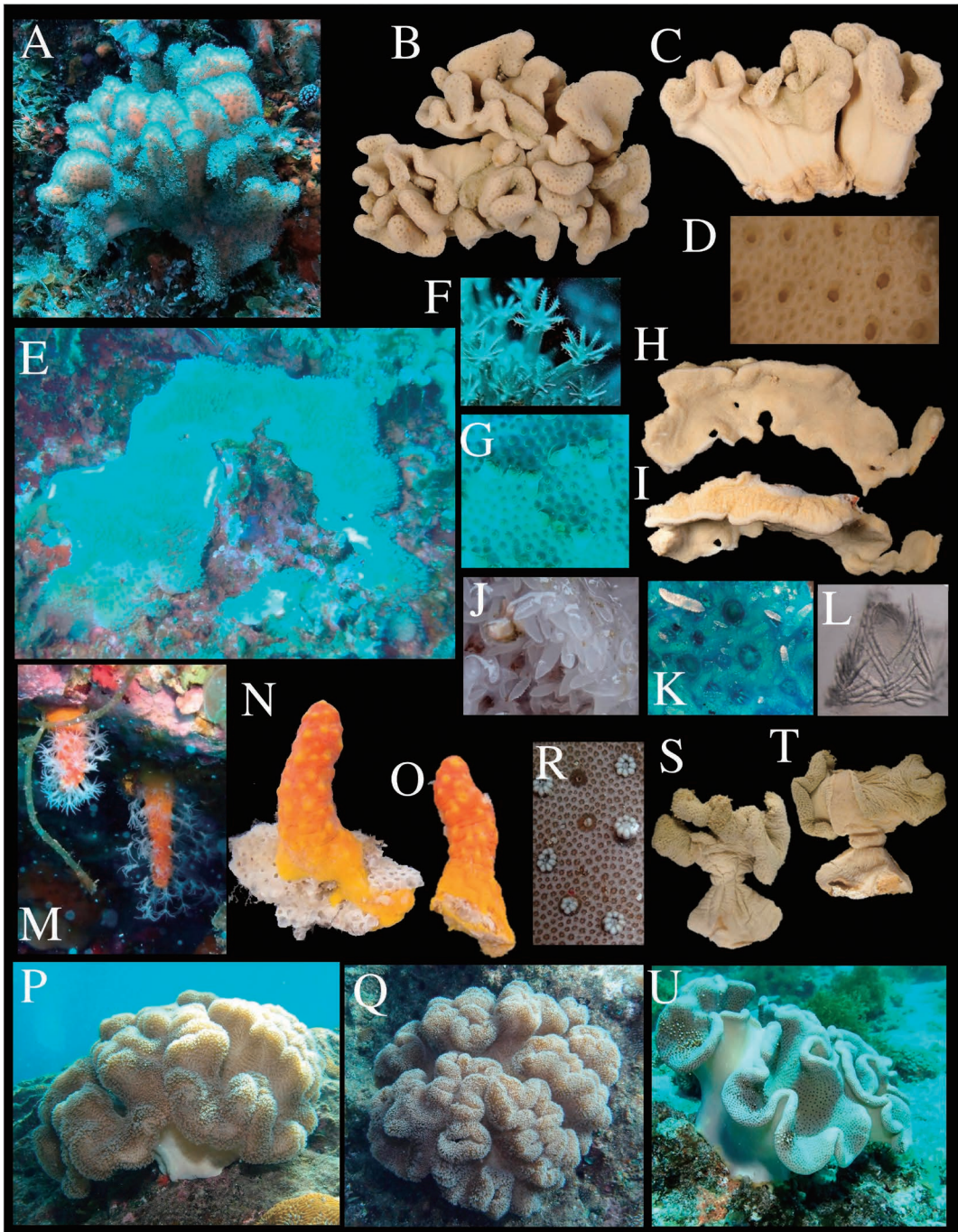


Fig. 6. A–D: *Lobophytum* cf. *mirabile* (coll. no. 2015-123); E–L: *Lohowia kooi* (coll. no. 2016-096); M–O: *Paraminabea* sp. aff. *kosiensis* (coll. no. 2015-128);

P–U: *Sarcophyton trocheliophorum* (P–T: coll. no. 2013-107; U: coll. no. 2014-034).

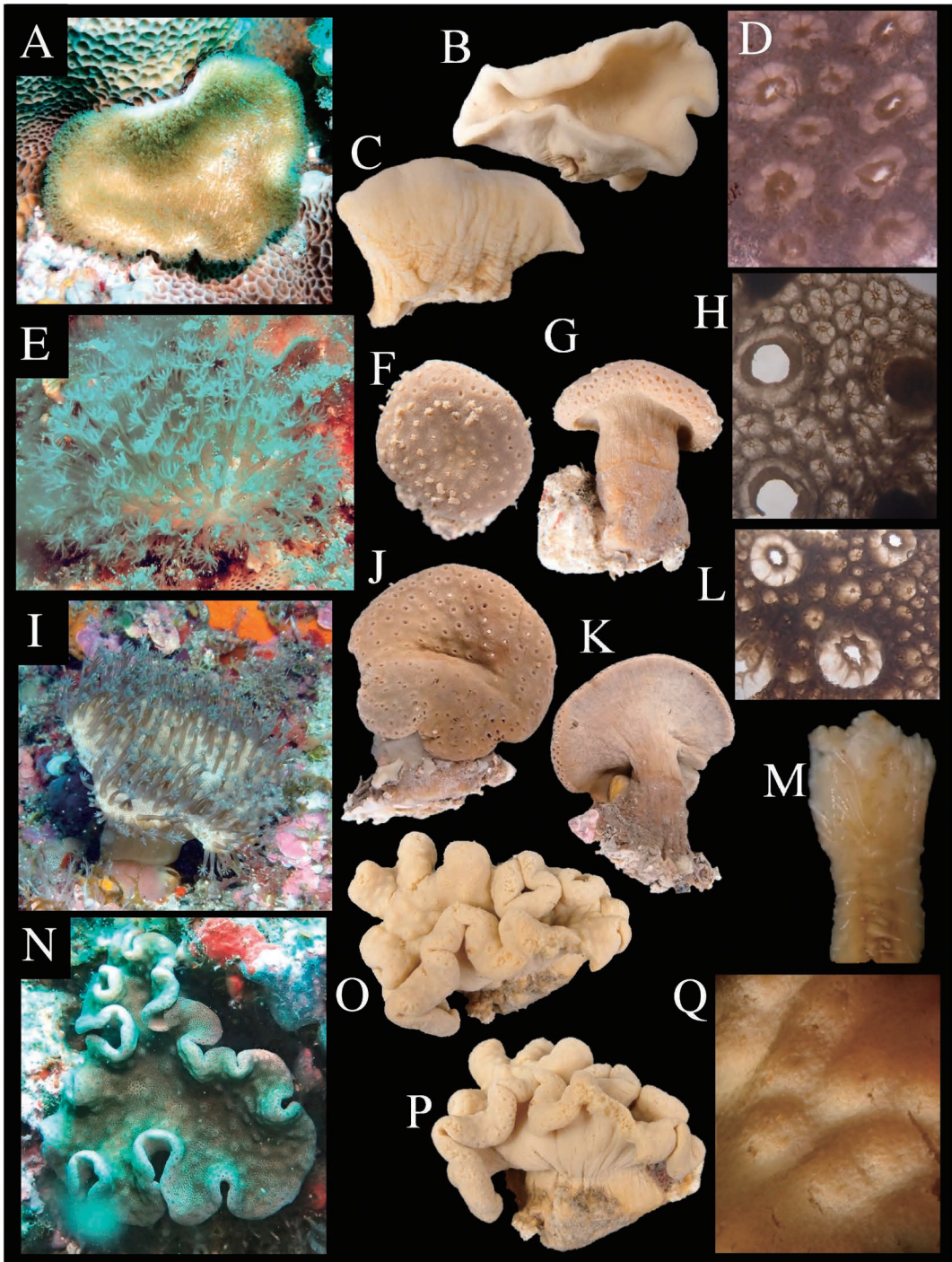


Fig. 7. A–D: *Sarcophyton* cf. *boletiforme* (coll. no. 2016-053-32); E–H: *S.* cf. *glaucum* (coll. no. 2015-125); I–M: *S.* cf. *infundibuliforme* (coll. no. 2015-138); N–Q: *S.* sp. aff. *tumulosum* (coll. no. 2014-040).



cies stored in the Muséum National d'Histoire Naturelles, Paris. This specimen differs from the syntypes of this species in that the whole polyps including anthostele are covered with numerous small sclerites.

Known distribution record. Widespread in the warm West Pacific and Indian Ocean.

***Sarcophyton* cf. *infundibuliforme***

Tixier-Durivault, 1958

(Figs. 7I–M)

Material. One colony (coll. no. 2015-138), south exit of the waterway at Yonhon-iwa, Haha-jima I., 26°38.817'N, 142°8.600'E, 15.4m, SCUBA, 3 July 2015.

Remarks. This species was described by Tixier-Durivault (1958) and Verseveldt (1982), and the former described the existence of rods lined up *en chevron* in polyps. Although this specimen is mostly in agreement with their description, it is different from their description in that the polyps have no sclerites or a few rods that are disorderd at the base of the tentacles.

Known distribution record. Japan (Ishigaki I.), Taiwan, Papua New Guinea, Ceylon I., Madagascar, Tanzania, Sodwana Bay (South Africa). 1–44m.

***Sarcophyton* sp. aff. *tumulosum***

Benayahu & Ofwegen, 2009

(Figs. 7N–Q)

Material. One colony (coll. no. 2014-040), Miyano-hama Coast, Chichi-jima I., 27°6.317'N, 142°11.533'E, 8.9m, SCUBA, 30 June 2014.

Remarks. This specimen like *S. tumulosum* Benayahu and Ofwegen (2009), bears distinct and irregularly spaced conical mounds on the surface of disc (Fig. 6Q). According to Benayahu and Ofwegen, mounds on the disc are a unique feature with in *Sarcophyton* that only appear in *S. tumulosum*. However, since the sclerites of the stalk interior of *S. tumulosum* are oblong sclerites <0.28mm long, the current specimen is different. On the other hand, the sclerites of the coenenchyme of this specimen agree well with *S. glaucum* except at the interiors of stalks, with

spindles >2mm long in *S. glaucum* whereas spindles are <1.0mm long in this specimen. In addition, *S. glaucum* with conical mounds on the surface of the disc has never been reported.

Distribution of *S. tumulesum*. Hong Kong, 6–10m deep.

***Sinularia brassica* May, 1898**

(Figs. 8A–D)

Material. One colony (coll. no. 2015-139), South of Yonhon-iwa, Haha-jima I., 26°38.850'N, 142°8.600'E, 15.4m, SCUBA, 6 July 2015.

Remarks. This specimen is an encrusting type (= *S. dura* Pratt, 1903).

Known distribution record. Indo-West Pacific from South Africa and Red Sea to Australia, Micronesia, and Japan, 2–40m deep.

***Sinularia linnei* van Ofwegen, 2008**

(Figs. 8E–G)

Material. One colony (coll. no. 2015-088), Sasao-ne, Hira-shima I., 26°35.117'N, 142°9.750'E, 22.9m, SCUBA, 3 July 2015.

Known distribution record. Bremer I., NT of Australia, 1–3m deep.

***Sinularia* sp. aff. *erecta* Tixier-Durivault, 1945**

(Figs. 8H–L)

Material. Part of a colony (coll. no. 2014-010), Shikahama Coast, Ototo-jima I., 27°11.167'N, 142°11.100'E, 21.0m, SCUBA, 28 June 2014.

Remarks. “*leptoclados*-type” sclerites of this specimen resemble *S. erecta*. However, in *S. erecta*, lobes are cylindrical and crowded, whereas in this specimen lobes are elongated tapered finger-like and sparsely distributed. On the other hand, the shape and arrangement of lobes are similar to *S. polydactyla* and one specimen of *S. gaweli* (ZMTAU Co. 29239) recorded from Guam by Benayahu (1997). However, clubs of these two species are not “*leptoclados*-type”. Morphological traits of this species seem to belong to Clade 5 C of McFadden *et al.* (2009).

Distribution of *S. erecta*. Ryukyu Archipelago, Taiwan, Guam, Red Sea, Madagascar, Reunion,

South Africa.

*Sinularia* sp. aff. *heterospiculata*

Verseveldt, 1970  
(Figs. 8M–R)

Material. Part of a colony (coll. no. 2015-087), Sasao-ne, Hira-shima I., 26°35.117'N, 142°9.750'E, 24.1 m, SCUBA, 3 July 2015.

Remarks. This specimen resembles *S. polydactyla* (Ehrenberg, 1834) in the appearance of the colony, but hardly any sclerites in the cortex of the lobes are similar to those of the current specimen. This specimen, on the other hand, is similar to *S. heterospiculata* in sclerite composition. However, this specimen is different from *S. heterospiculata* in that colony is encrusting with a capitulum wider than the length of the stalk, and that the polyps are sclerites-free except for the tentacles.

Distribution of *S. heterospiculata*. Madagascar, 25 m deep.

*Sinularia* sp. aff. *pumilia*

Dautova, van Ofwegen & Savinkin, 2010  
(Figs. 9A–E)

Material. Part of a colony (coll. no. 2015-119), Iwashine, Haha-jima I., 26°39.667'N, 142°8.733'E, 22.3 m, SCUBA, 5 July 2015.

Remarks. This specimen resembles *S. pumilia* by having both “*leptocladus*-type” clubs and capstan-like clubs in the cortex. It also coincides with *S. pumilia* in that spindles of the interior of base are ramified on one end. However, it is different from *S. pumilia* in that the colony is encrusting-type without a stalk and that there are many ramified spindles in the lobe interior. This specimen is similar to specimens of *Sinularia* sp. aff. *erecta* (coll. no. 2014-010), but lobes are thinner, and the edge is an upward wall fringed with finger-like lobes. In addition, this specimen is different from specimen (coll. no. 2014-010) in that the clubs' head is thicker and that there are ramified spindles in the interior of colony. Morphological traits of this species seem to belong to Clade 5 C of McFadden *et al.* (2009).

Distribution of *S. pumilia*. Nha Trang Bay, Vietnam. 4–20 m deep.

Family **Nephtheidae** Gray, 1862

*Coronephtya macrospiculata*  
(Thomson & Mackinnon, 1910)

[Japanese name: Kan'muritosaka]  
(Figs. 9F–I)

Materials. Two colonies (coll. no. 2014-087), St. 9, R/V Koyo, ca. 2 km W from Ototo-jima I., 27°0.359'N, 142°8.955'E–26°59.966'N, 142°8.904'E, 150.0–154.7 m, BD, 24 June 2014.

Known distribution record. Japan (Sagami Bay, Suruga Bay, Cape Sata of Kagoshima Pref.), Solomon I., Indian Ocean. 92–278 m deep.

*Litophyton striatum* (Kükenthal, 1903)

[Japanese name: Suji-chidimitosaka]  
(Figs. 9J–N)

Materials. Four colonies (coll. no. 2016-069), west coast of Mei-jima I., 26°34.133'N, 142°13.667'E, 15.6 m, SCUBA, 11 July 2016.

Remarks. Until recently this species was known as a species of the genus *Nephthea* (Audouin, 1826), but was transferred to *Litophyton* (Forskål, 1775) by Ofwegen (2016).

Known distribution record. Japan (Kerama Is.), Red Sea, Socotra, Chagos Archipelago, Madagascar. 0–35 m deep.

*Litophyton* cf. *chabrolii* (Audouin, 1828)

[Japanese name: Chidimitosaka]  
(Figs. 10A–D)

Materials. Four colonies (coll. no. 2015-094), Sasao-ne, Hira-shima I., 26°35.117'N, 142°9.750'E, 17.9 m, SCUBA, 3 July 2015.

Remarks. Although this species was the type species of the genus *Nephthea*, it was transferred to *Litophyton* by Ofwegen (2016). This specimen is in good agreement with the features of this species described by Utinomi (1954b) and Verseveldt *et al.* (1966). Ofwegen (2016) examined many specimens from the Red Sea and Indo-Pacific that had been identified as *N. chabrolii*, and as a result he concluded that not all speci-

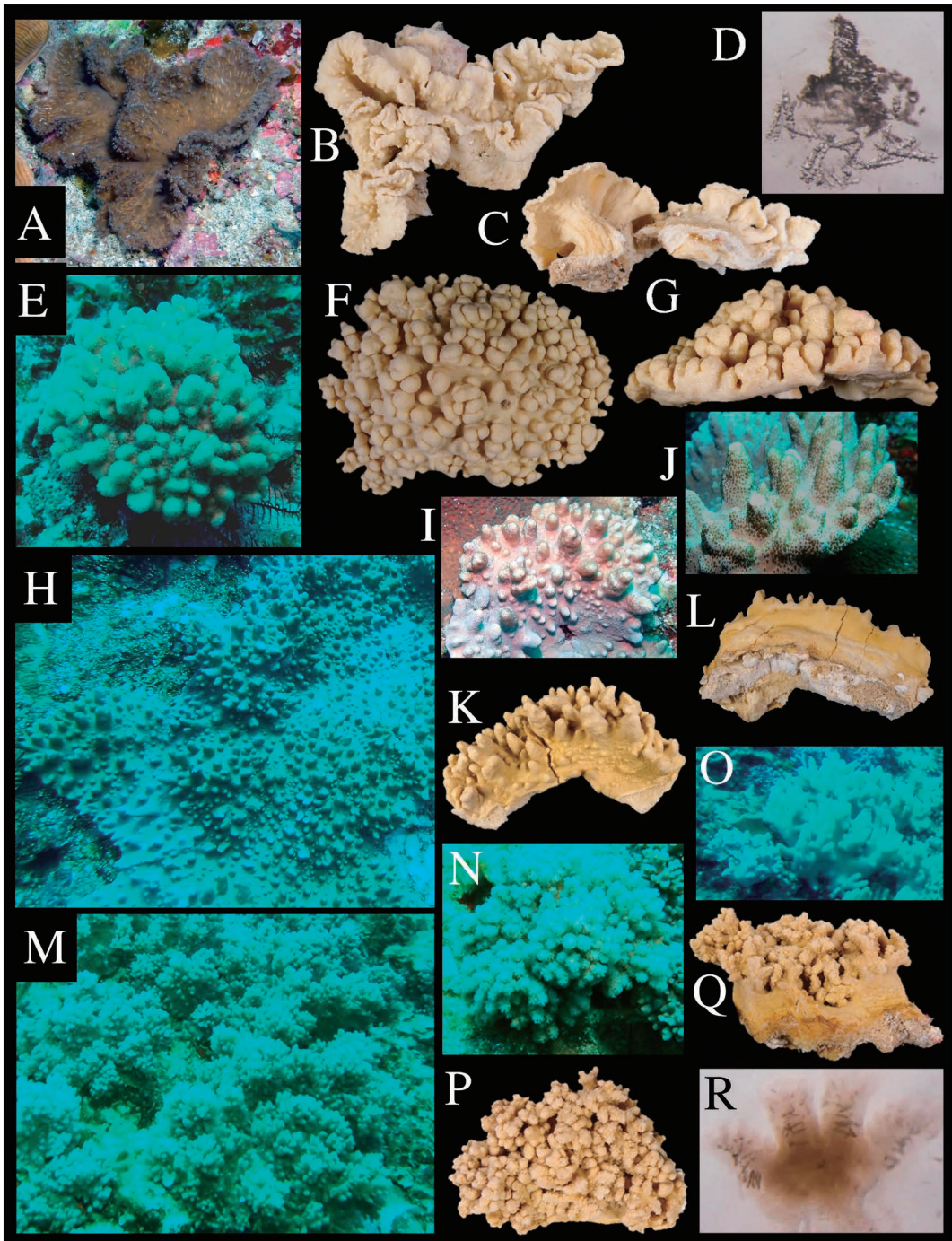


Fig. 8. A–D: *Simularia brassica* (coll. no. 2015-139); E–G: *C. linnei* (coll. no. 2015-088); H–L: *S. sp. aff. erecta* (coll. no. 2014-010); M–R: *S. sp. aff. heterospiculata* (coll. no. 2015-087).

mens except for those from the Red Sea were *N. chabrolii*.

Known distribution record of *L. chabrolii* as

considered by Ofwegen (2016). Gulf of Aqaba, Red Sea.

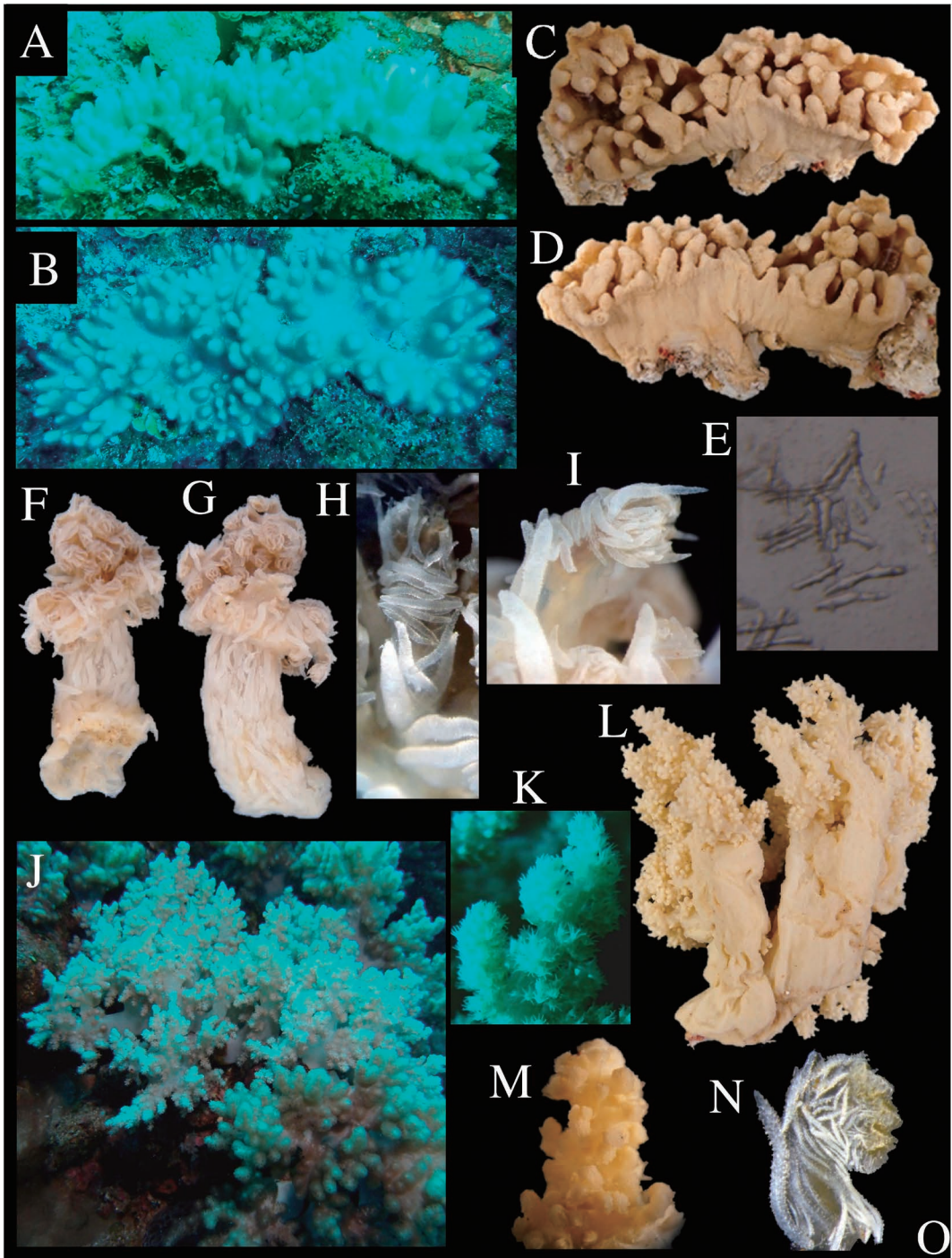


Fig. 9. A–E: *Sinularia* sp. aff. *pumilia* (coll. no. 2015-119); F–I: *Coronephthya macrospiculata* (coll. no. 2014-087); J–N: *Litophyton striatum* (coll. no. 2016-069).

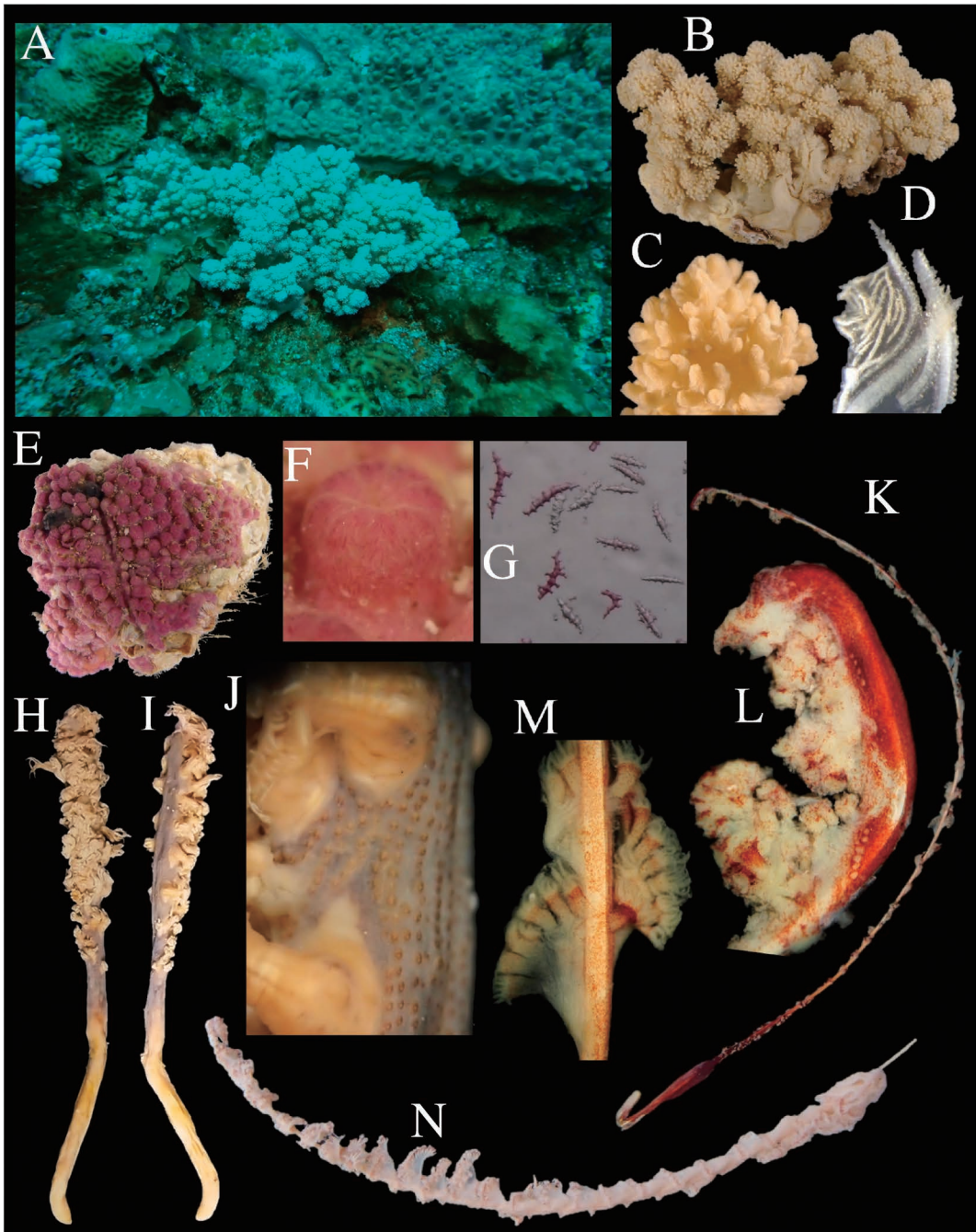


Fig. 10. A–D: *Litophyton* cf. *chabrolii* (coll. no. 2015-094); E–G: *Briareum violaceum* (coll. no. 2013-119); H–J: *Sclerobelemnon burgeri* (coll. no. 2014-085-24); K–M: *Scytalium martensi* (coll. no. 2014-085-2); N: *Scytalium splendens* (coll. no. 2014-085-71).

Suborder **Scleraxonia** Studer, 1887  
Family **Briareidae** Gray, 1859

***Briareum violaceum*** (Quoy & Gaimard, 1833)  
[Japanese name: Murasakihanaduta]  
(Figs. 10E–G)

Material. One fragment (coll. no. 2013-119), Toshutsubana Coast, Ani-jima I., 27°12.016'N, 142°12.016'E, 10.0m, SCUBA, 9 Nov. 2013.

Known distribution record. Japan (Ogasawara Is, Ryukyu Archipelago), Taiwan, Philippines, Indonesia, Solomon Is., Malay Archipelago, Australia, East Indies, and IWP tropical seas.

Order **Pennatulacea** Verrill, 1865  
Suborder **Sessiliflorae** Kükenthal, 1915  
Family **Kophobelemnidae** Gray, 1960

***Sclerobelemnon burgeri*** (Herklots, 1858)  
[Japanese name: Aioi-umisaboten]  
(Figs. 10H–J)

Material. One colony (coll. no. 2014-085-24), St. 5, R/V Koyo, ca. 2km W from Ototo-jima I., 27°10.751'N, 142°9.352'E–27°10.440'N, 142°8.917'E, 133.8–139.6m, BD, 23 June 2014.

Known distribution record. Japan (Boso Peninsula to Ryukyu Archipelago), Korea, Malay Archipelago (?) and Indian Ocean. 10–28m, (? 180m).

Suborder **Subselliflorae** Kükenthal, 1915  
Family **Virgulariidae** Verrill, 1868

***Scytalium martensi*** Kölliker, 1870  
[Renamed Japanese name:  
Mahtensu-hoso-umiera]  
(Figs. 10K–M)

Material. One colony (coll. no. 2014-085-2), St. 1, R/V Koyo, ca. 10km NW from Ototo-jima I., 27°12.783'N, 142°5.882'E–27°13.175'N, 142°5.916'E, 156.5–156.9m, BD, 23 June 2014.

Known distribution record. Japan, Malay Archipelago and Indian Ocean (Ceylon I. and Madagascar). Shallow water and 62–210m.

***Scytalium splendens***  
(Thomson & Henderson, 1906)  
[Japanese name: Hoso-umiera]  
(Fig. 10N)

Materials. Two fragments probably belonging to one colony (coll. no. 2014-085-71), St. 15, R/V Koyo, ca. 12km WNW from Nishi-jima I., 27°12.226'N, 142°13.642'E–27°12.724'N, 142°13.474'E, 165.6–161.4m, BD, 25 June 2014.

Known distribution record. Japan (Sagami Bay, Tosa Bay), Korea (?), Madagascar (?) and Andaman Sea. 20–200m.

***Virgularia gustaviana*** (Herklots, 1863)  
[Japanese name: Yanagi-umiera]  
(Figs. 11A–D)

Material. One colony (coll. no. 2014-085-9), St. 3, R/V Koyo, ca. 8km NNW from Ototo-jima I., 27°13.646'N, 142°6.743'E–27°13.348'N, 142°6.446'E, 156.1–156.1m, BD, 23 June 2014.

Known distribution record. Japan (Tsugaru Strait (?), Mutsu Bay, Sagami Bay, Tosa Bay), Korea, China Sea, Malay Archipelago, Australia and Indian Ocean. 4.5–150m deep.

***Virgularia halisceptrum*** Broch, 1910  
[Japanese name: Madara-yanagi-umiera]  
(Figs. 11E–G)

Material. One colony (coll. no. 2013-141), Byobudani Coast, Chichi-jima I. 27°5.683'N, 142°12.183'E, 5.0m, SCUBA, 12 Nov. 2013.

Known distribution record. Japan (Sagami Bay, Suruga Bay, Ryukyu Archipelago), Korea, Vietnam, Madagascar, Red Sea and southwest coast of India (Cochin). 20–72m deep.

***Virgularia cf. brochi*** Kükenthal, 1915  
[Japanese name: Hime-yanagi-umiera]  
(Figs. 11H–K)

Material. One colony (coll. no. 2014-042), Omura Coast, Chichi-jima I., 27°5.060'N, 142°11.058'E, 18.8m, SCUBA, 30 June 2014.

Remarks. This specimen closely resembles *V. brochi*, except that the number of polyps per polyp leaf is 5 at maximum (*V. brochi* 6–7).

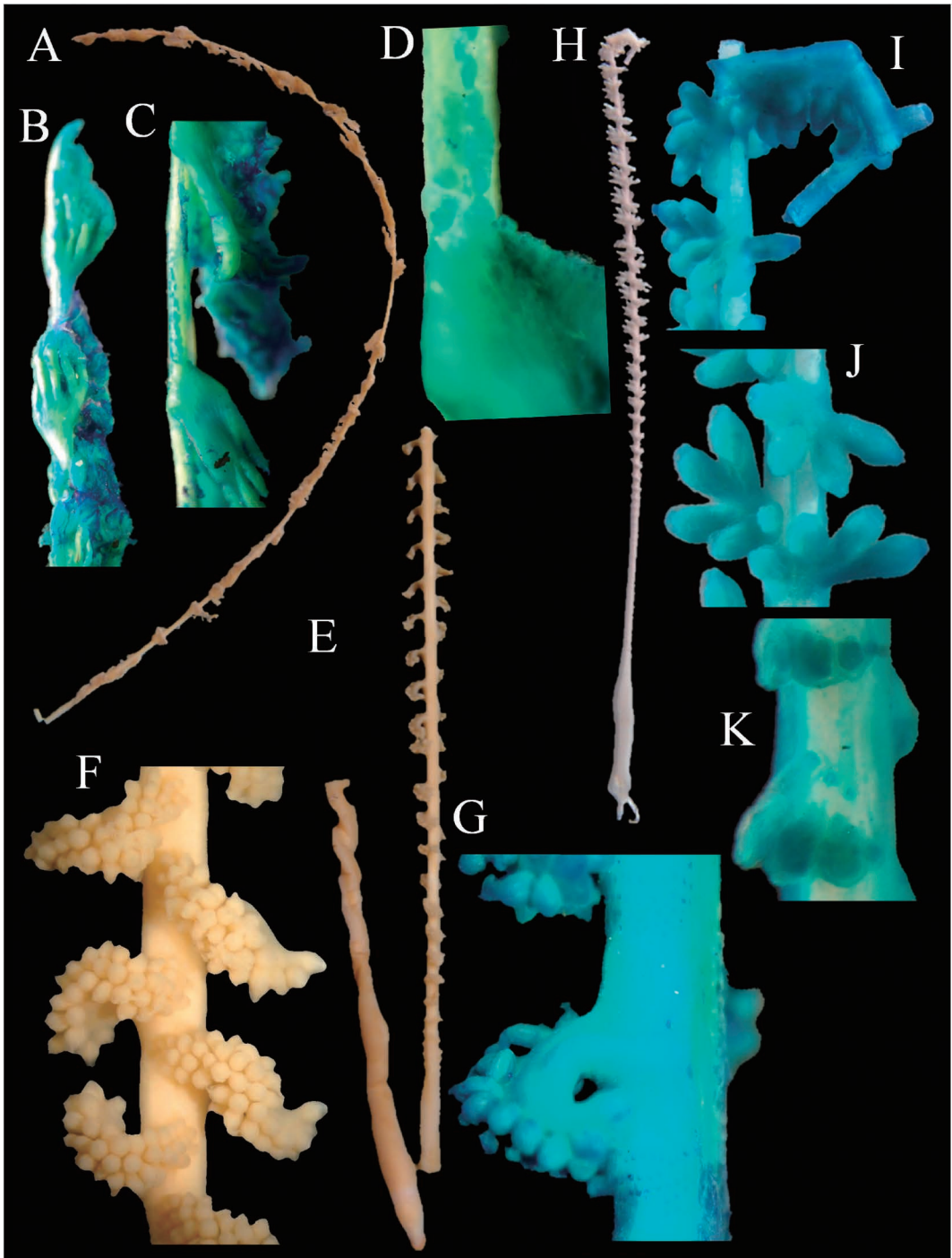


Fig. 11. A–D: *Virgularia gustaviana* (coll. no. 2014-085-9); E–G: *V. halisceptrum* (coll. no. 2013-141); H–K: *V. cf. brochi* (coll. no. 2014-042).

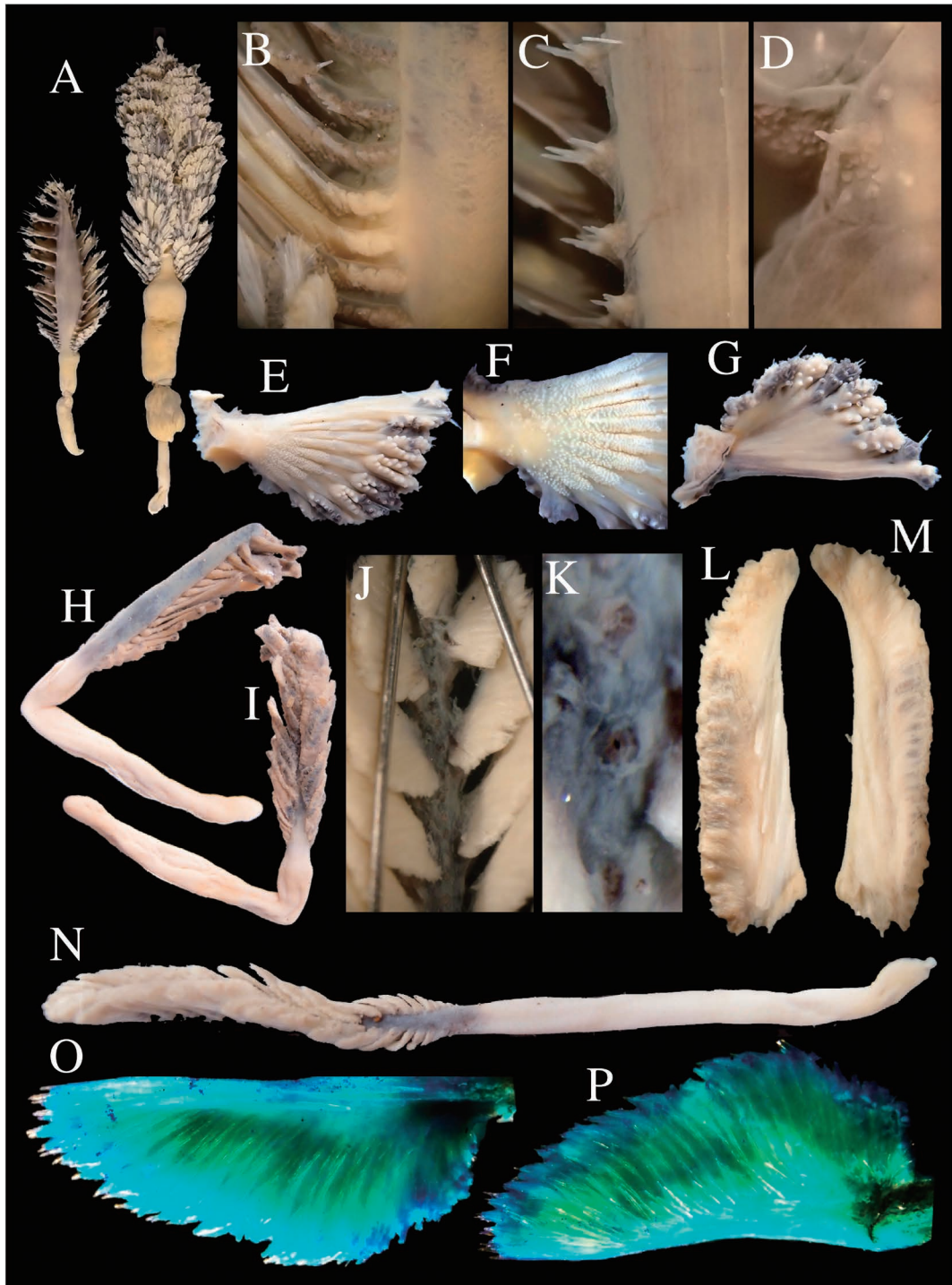


Fig. 12. A–G: *Pteroeides caledonicum* (coll. no. 2013-140); H–M: *P. dofleini* (coll. no. 2014-085-8); N–P: *P. cf. dofleini* (coll. no. 2014-085-49).



Distribution of *V. brochi*. Japan (Kii Peninsula) and New Zealand.

Family **Pennatulidae** Ehrenberg, 1834

***Pteroeides caledonicum*** Kölliker, 1872

[Japanese name: Komochi-toge-umiera]

(Figs. 12A–G)

Materials. Five colonies (coll. no. 2013-140), Byobudani Coast, Chichi-jima I., 27°5.683'N, 142°12.183'E, 5–10m, SCUBA, 12 Nov. 2013. Three colonies (coll. no. 2014-043), Omura Coast, Chichi-jima I., 27°5.060'N, 142°11.058'E, 16.4m, SCUBA, 30 June 2014. One colony (coll. no. 2014-044), Omura Coast, Chichi-jima I., 27°5.06'N, 142°11.058'E, 9.4m, SCUBA, 30 June 2014.

Known distribution record. Japan (Iriomote I.), Indonesia (Ambon I.) and New Caledonia. 27–28m deep.

***Pteroeides dofleini*** Balss, 1910

[Japanese name: Dofura-in-toge-umiera]

(Figs. 12H–M)

Material. One colony (coll. no. 2014-085-8), St. 3, R/V Koyo, ca. 8 km NNW from Ototo-jima I., 27°13.646'N, 142°6.743'E–27°13.348'N, 142°6.446'E, 156.1–156.1 m, BD, 23 June 2014.

Known distribution record. Japan (Iriomote I.), Indonesia (Ambon I.) and New Caledonia. 27–28m deep.

***Pteroeides* cf. *dofleini*** Balss, 1910

[Japanese name: dofura-in-toge-umiera]

(Figs. 12N–P)

Material. One colony, (coll. no. 2014-085-49), St. 11, R/V Koyo, ca. 1 km S from Chichi-jima I., 27°1.948'N, 142°12.490'E–27°1.806'N, 142°11.583'E, 106.7–88.8m, BD, 24 June 2014.

Remarks. Upper portion of ventral side of rachis covered with numerous small needles not seen in *P. dofleini*.

## Discussion

According to the results of this survey, more than 106 species including eight possible undescribed species of octocorals were found in the

Ogasawara Islands (Table 3). Of the 42 species that were identified from the newly obtained specimens through the present survey, eight species (three species of Stolonifera: *Clavularia* cf. *durum* Hickson, *C.* cf. *margaritiferae* Thomson and Henderson and *C.* cf. *repens* Thomson and Henderson, and five species of Alcyoniina: *Lobophyllum variatum* Tixier-Durivault, *L.* cf. *mirabile* Tixier-Durivault, *Lohowia koosi* Alderslade, *Sarcophyton* cf. *boletiforme* Tixier-Durivault and *Sinularia linnei* Ofwegen) represent the first records in Japan. In addition, the present identification results contain eight possibly undescribed species (one species each of *Clavularia*, *Cladiella*, *Klyxum*, *Paraminabea* and *Sarcophyton*, and three species of *Sinularia*). Compared with the fact that 141 species (including eight possibly undescribed species) of octocorals have been found from the Ryukyu Archipelago (Thomson and Rennet, 1927; Utinomi, 1976a, 1976b, 1977a, 1977b; Imahara, 1991, 1996; Benayahu, 1995, 2002; Williams, 1999; Miyazaki and Reimer, 2015; Imahara *et al.*, 2017), the representative tropical/subtropical waters of Japan, the number of octocoral species found in the Ogasawara Islands is simply about 3/4 of that in the Ryukyu Archipelago. However, considering that the identification of octocorals from the Ogasawara Islands has not been completed yet, and that there is a high possibility that many undiscovered species of octocorals also remain in the Ryukyu Archipelago, it is not yet appropriate to compare the species diversity of octocorals in both waters based on a comparison of species numbers. Therefore, here we compare the diversity of octocorals in both waters at the genus level. For example, in Clavulariidae (Stolonifera), two genera (*Clavularia* and *Telesto*) are found in the Ogasawara Islands, while four genera (*Clavularia*, *Sarcodictyon*, *Carijoa* and *Coelogorgia*) are found in the Ryukyu Archipelago. In addition, in Alcyoniidae of Alcyoniina, while eight genera (*Aldersladum*, *Cladiella*, *Klyxum*, *Lobophyllum*, *Lohowia*, *Paraminabea*, *Sarcophyton* and *Sinularia*) are found in the Ogasawara Islands, nine genera (*Aldersladum*, *Cladi-*

*ella*, *Klyxum*, *Lobophytum*, *Parasphaerasclera*, *Protodendron*, *Rhytisma*, *Sarcophyton* and *Sinularia*) are known from the Ryukyu Archipelago. Furthermore, in Nephtheidae, five genera (*Coronophthya*, *Dendronephthya*, *Litophyton*, *Scleronephthya* and *Stereonephthya*) are found from the Ogasawara Islands, whereas from the Ryukyu Archipelago at least eight genera (*Capnella*, *Dendronephthya*, *Lemnalia*, *Litophyton*, *Pacificphyton*, *Paralemnalia*, *Scleronephthya* and *Nephtheidae* gen.) are found (in addition to these genera, *Stereonephthya* has also been found: Imahara, unpublished). Thus, the Ogasawara Islands' octocoral species diversity can be considered to be slightly lower than that of the Ryukyu Archipelago. However, at the species level, Ogasawara Islands' *Lobophytum*, *Sarcophyton*, *Sinularia*, etc. contain species not found in the Ryukyu Archipelago. Furthermore, since our finding of *Lohowia koosi* represents the first record from outside Australia, which is the type locality of this genus and species, our results suggest that the octocoral community of Ogasawara Islands may have developed differently from those of the Ryukyu Archipelago. These results demonstrate that the octocorals of Ogasawara Islands likely contain additional unique species diversity in Japanese waters.

There have been several reports on octocorals from oceanic islands in the Pacific (Utinomi, 1956a; Verseveldt, 1978, 1983a; Ofwegen, 2008), but the only comprehensive reports are from Guam Island (Gawel, 1976, 1977; Verseveldt, 1978, 1983a; Benayahu, 1997). A total of 40 species of 15 genera of octocorals (*Cladiella*, *Klyxum*, *Lobophytum*, *Sarcophyton* and *Sinularia* in Alcyoniidae; *Capnella*, *Dendronephthya*, *Lemnalia*, *Paralemnalia* and *Stereonephthya* in Nephtheidae; *Siphonogorgia* in Nidaliidae; *Anthelia*, *Asterospicularia*, *Sympodium* in Xenidae, and *Briareum* in Briareidae) have been recorded from Guam. Comparing the genus numbers for the two families of comparable Alcyoniidae and Nephtheidae, the Ogasawara Islands have 15 genera, the Ryukyu Archipelago has 21 genera and Guam Islands have 10 genera. These

results show that the numbers of genera decrease corresponding to an increase in distance from the Asian continent. On the other hand, it is possible that three genera, *Capnella*, *Lemnalia*, *Paralemnalia*, which have been confirmed in both the Ryukyu Archipelago and Guam Island, are not in the Ogasawara Islands, and that this is characteristic of a lowered dispersal ability of these three genera.

However, this report does not include many soft corals and sea fans that have not yet been identified to the species level. Among them, specimens belonging to the following genera and families are included: part of *Cladiella*, part of *Lobophytum*, part of *Sarcophyton*, part of *Sinularia*, part of *Litophyton*, and all specimens of the following taxa: *Dendronephthya*, *Scleronephthya*, *Stereonephthya*, *Chironophthya*, *Siphonogorgia*, Xenidae and gorgonians other than *Briareum*. After the examination of these specimens has progressed, the features of the octocoral fauna of the Ogasawara Islands will become more clearly known.

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## 小笠原諸島の八放サンゴ類相（予報）

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国立科学博物館の総合研究プロジェクト「日本の生物多様性ホットスポットの構造に関する研究」の一環として、小笠原諸島海域の八放サンゴ類相解明を目的として調査研究を実施した。その結果、2013～2016年の潜水調査並びに2014年の東京都小笠原水産センターの調査指導船「興洋」によるドレッジ調査によって、八放サンゴ類標本約400点を収集することができた。これまでに52標本についての研究が進み、それらはウミトサカ目ではウミヅタ亜目の2科3属7種、ウミトサカ亜目の2科10属25種、石軸亜目の1種、そして、ウミエラ目の3科4属9種の合計42種に分類された。それらのうち、ウミヅタ亜目3種 (*Clavularia* cf. *durum* Hickson, *C. cf. margaritiferae* Thomson & Henderson, *C. cf. repens* Thomson & Henderson), ウミトサカ亜目5種 (*Lobophytum variatum* Tixier-Durivault, *L. cf. mirabile* Tixier-Durivault, *Lohowia koosi* Alderslade, *Sarcophyton* cf. *boletiforme* Tixier-Durivault, *Sinularia linnei* Ofwegen) は日本新記録種であった。また、*Lohowia koosi* は、原産地であるオーストラリア東岸以外では初めての発見であった。さらに、42種の中には未記載種の可能性の高い8種 (*Clavularia* 属1種: *C. sp. aff. ornata* Thomson & Dean, *Cladiella* 属1種: *C. sp. aff. arborea* Utinomi, *Klyxum* 属1種: *K. sp. aff. simplex* Thomson & Dean, *Paraminabea* 属1種: *P. sp. aff. kosiensis* Williams, *Sarcophyton* 属1種: *S. sp. aff. tumulosum* Benayahu & Ofwegen, *Sinularia* 属3種: *S. sp. aff. erecta* Tixier-Durivault, *S. sp. aff. heterospiculata* Verseveldt, *S. sp. aff. pumilia* Dautova et al.) が含まれていることも明らかとなった。これらの結果から、小笠原諸島海域の八放サンゴ類は、日本周辺海域のなかでも独特な多様性を持っていることが示された。本報告では、現在までに同定を終えた今回の調査結果とこれまでの文献から得られた情報を基に、小笠原産の八放サンゴリストを掲載した。なお、今回の報告では、現時点で未同定の *Cladiella*, *Lobophytum*, *Sarcophyton*, *Sinularia*, *Litophyton* の各一部の標本と、*Dendronephthya*, *Scleronephthya*, *Stereonephthya*, *Chironephthya*, *Siphonogoriga*, *Xeniidae*, および *Briareum* を除くヤギ類のすべての標本についての情報が掲載されなかった。これら未同定種なども含めた小笠原諸島海域の八放サンゴ類相については、今後随時出版する予定である。