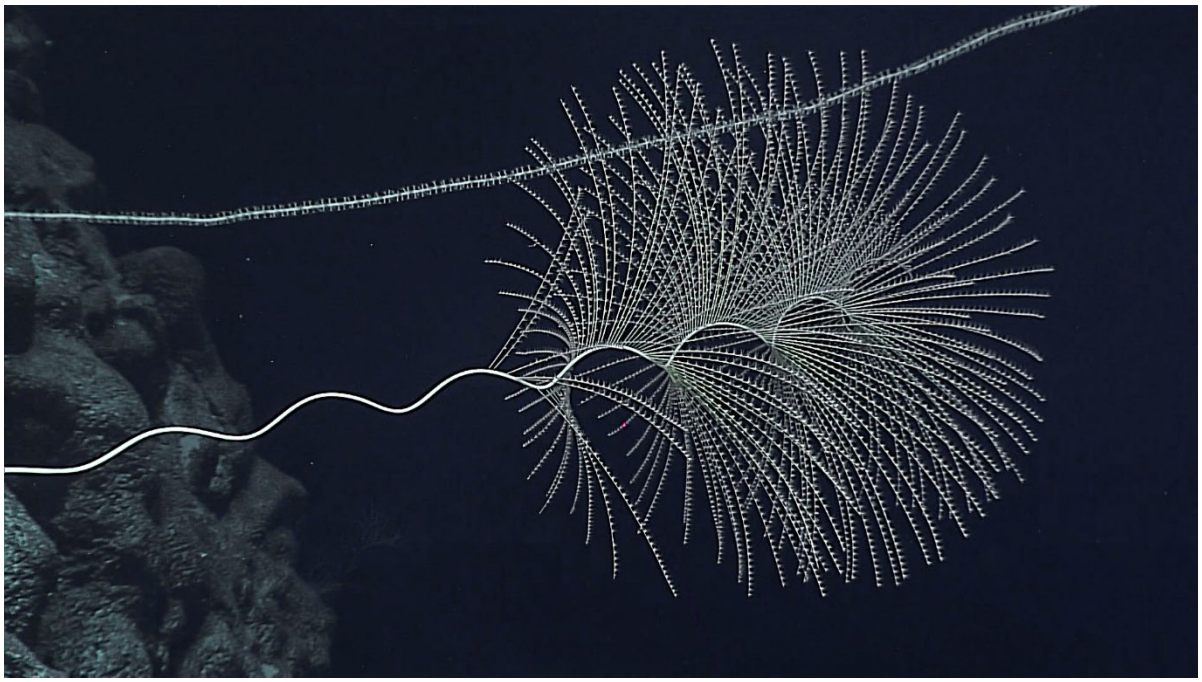
Preliminary List of Deep-Sea Coral Taxa in the American Samoa Region

Thomas F. Hourigan[1*], Christopher D. Kelley[2], Sarah Bingo[2], Meagan Putts[2], and Stephen D. Cairns[3]

1. Deep Sea Coral Research and Technology Program, Office of Habitat Conservation, Silver Spring, MD (*Corresponding Author: Tom.Hourigan@noaa.gov)
2. Department of Oceanography, University of Hawaii, Manoa, HI
3. National Museum of Natural History, Smithsonian Institution, Washington, DC



Preliminary List of Deep-Sea Coral Taxa in the American Samoa Region (v. 2021)

This annex to the U.S. Pacific Islands chapter in "The State of Deep-Sea Coral and Sponge Ecosystems of the United States" (Parrish et al. 2017) provides a list of deep-sea coral taxa in the Phylum Cnidaria, Classes Anthozoa and Hydrozoa, known to occur in U.S. waters around American Samoa (Figure 1). Most of these records are derived from observations and collections conducted in 2005 by the University of Hawai`i's Hawai`i Undersea Research Laboratory; and new deep-sea explorations in 2017 (Kelley et al. 2019) as part of the National Oceanic and Atmospheric Administration (NOAA) **C**ampaign to **A**ddress **P**acific monument **S**cience, **T**echnology, and **O**cean **NE**eds (CAPSTONE). CAPSTONE was a 3-year campaign from 2015 to 2017 designed to provide critical new information on the deep-water resources within the U.S. national marine monuments and sanctuaries located throughout the Pacific (Kennedy et al. 2019, Parke et al. 2021). In 2019, the Ocean Exploration Trust E/V *Nautilus* conducted further deep-sea remotely-operated vehicle (ROV) explorations in the American Samoa region.

For the purposes of this list, deep-sea corals are defined as azooxanthellate, heterotrophic coral species occurring in waters 50 m deep or more. We provide details on the reported depth distribution of each species (Table 1). This list is based largely on surveys that were conducted deeper than 250 m. Therefore, the list does not include many species that occur in shallower waters. **Taxon identifications should be considered preliminary, as most were made from video without collected samples.** Taxonomic names are generally those currently accepted in the World Register of Marine Species (WoRMS), and are arranged by order, and alphabetically within order by family, genus, and species. Data sources (references) listed are those principally used to establish geographic and depth distribution.

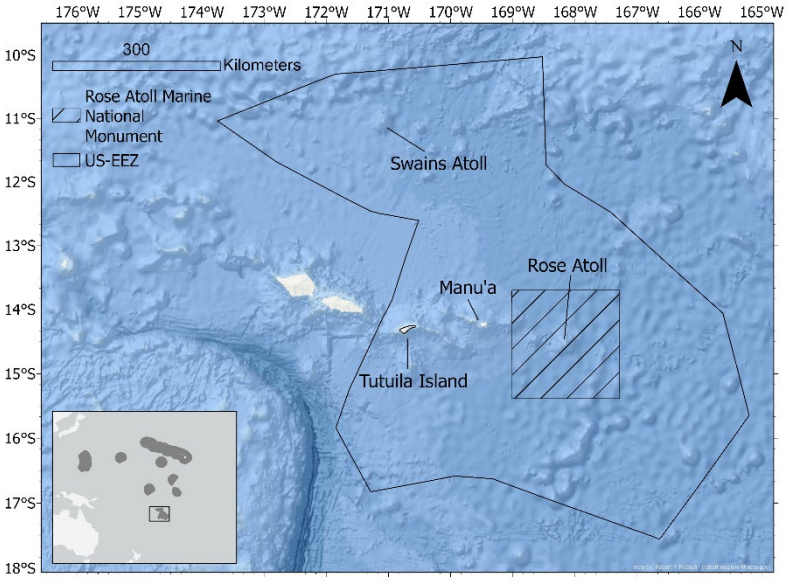


Figure 1. The U.S. exclusive economic zone (EEZ) surrounding the islands of American Samoa. The shaded area is the Rose Atoll Marine National Monument.

Recommended citation: Hourigan TF, Kelley CD, Bingo S, Putts M, Cairns SD (2022) Preliminary List of Deep-Sea Coral Taxa in the American Samoa Region (v. 2021). Online Supplement to The state of deep-sea coral and sponge ecosystems of the United States: https://doi.org/10.25923/wj31-g055

Cover Photo: A large chrysogorgiid (*Iridogorgia magnispiralis*) and a long, unbranched black coral at a depth of 2030 meters on a steep slope of Moki Seamount in American Samoa. Image credit: NOAA Ocean Exploration

Table 1. List of known deep-sea coral taxa in the Phylum Cnidaria, Class Anthozoa and Class Hydrozoa, and their reported distributions in U.S. waters of American Samoa (U.S. EEZ around the Islands of Tutuila, Ofu, Tau, Swains Atoll and Rose Atoll). Blue shaded fields indicate newly described species since 2017. "NR" indicates a lack of reported depth information. References are numbered to correspond with citations following the table, along with notes (in superscript letters) pertaining to individual taxa.

Higher Taxon	Species	Depth range (m)	References
Class Anthozoa Subclass Hexacorallia			
Order Antipatharia			
Family Antipathidae	*Antipathes* sp. cf. *A. griggi* Opresko, 2009 (Reported as *Antipathes dichotoma* Pallas, 1766)	<110 [a]	1
	Antipathes sp. cf. *A. grandis* Verrill, 1928	20-140 [a]	1
	Stichopathes sp.	229-437	2,3
Family Aphanipathidae	*Acanthopathes* sp.	281	2
	cf. *Aphanostichopathes* sp. (reported as *Stichopathes* sp.)[b]	892-2097	2,3,4
	Asteriopathes sp.	233-234	3
	Pteridopathes tanycrada Opresko, 2004	166-181	3
Family Cladopathidae	*Heteropathes* cf. *americana*	604-627	2
	Hexapathes sp.	498	2
	Trissopathes sp.	1843-2392	2,3
Family Myriopathidae	*Cupressopathes* sp.	181-931	2,3
	Myriopathes sp. cf. *M. ulex* (Ellis & Solander, 1786) (= *Antipathes ulex*)	25-364 [a]	1
Family Schizopathidae	*Bathypathes* sp.	517-2189	3,4
	Bathypathes sp. cf. *B. patula* Brook, 1889	2356-3697	2,5
	***Bathypathes pseudoalternata* Molodtsova, Opresko & Wagner, 2022**[c] [not *Alternatipathes alternata* (Brook, 1889)]	2189	3,6
	Dendropathes sp.	684-681	3
	Lillipathes sp.	1298-1954	3,4
	Parantipathes sp.	565-2475	2,5
	Stauropathes sp.	1688-1799	3
	Umbellapathes sp.	322-1670	2,7
Family Stylopathidae	*Stylopathes* sp.	484	3,4
	Tylopathes sp.	923	2
Order Scleractinia			
Family Caryophylliidae	*Caryophyllia* sp. cf. *C. (Caryophyllia) atlantica* (Duncan,1873)	751	3
	Caryophyllia (Caryophyllia) scobinosa Alcock, 1902	302-2450 [d]	8
	Caryophyllia (Caryophyllia) near *perculta* Cairns, 1991	434	5

Higher Taxon	Species	Depth range (m)	References
Family Caryophylliidae cont.	*Trochocyathus* sp.	504	5
Family Dendrophylliidae	*Dendrophyllia alcocki* (Wells, 1954)	345	5
	Eguchipsammia sp.	254-380	2
	Enallopsammia rostrata (Pourtalès, 1878) [=*Enallopsammia amphelioides* (Alcock, 1902)]	370-1425	2,3
	Endopsammia regularis (Gardiner, 1899)	8-73	5,9
Family Flabellidae	*Flabellum* sp.	347-557	3
	Polymyces wellsi Cairns, 1991	336-1162	2,3
Family Oculinidae	*Madrepora oculata* Linnaeus, 1758 (= *Madrepora kauaiensis* Vaughan, 1907)	472-478	3

Higher Taxon	Species	Depth range (m)	References
Class Anthozoa Subclass Octocorallia			
Order Alcyonacea			
Family Acanthogorgiidae	*Acanthogorgia* sp.	308-1666	2,3,5
Family Alcyoniidae	*Anthomastus* sp.	243-1759	2,3,5
	Pseudoanthomastus sp.	343-1739	2,3,5
Family Chrysogorgiidae	*Chrysogorgia admete* Bayer & Stefani, 1988	1992	5
	Chrysogorgia chryseis Bayer & Stefani, 1988	1597-2211	3
	Chrysogorgia flavescens Nutting, 1908	2354	2
	Chrysogorgia geniculata (Wright & Studer, 1889)	513-2433	2,3,5,7
	Chrysogorgia stellata Nutting, 1908	2042-2349	2,3
	Iridogorgia magnispiralis Watling, 2007	1628-2990	2,7
	Metallogorgia melanotrichos (Wright & Studer, 1889)	1651	7
	Pseudochrysogorgia sp.[e]	2362	5,10
	Ramuligorgia militaris (Nutting, 1908) (=*Pleurogorgia militaris* Nutting, 1908)	1568-3926	2,3,5
Family Coralliidae	*Hemicorallium* sp.	1321-2028	3
Family Ellisellidae	*Ellisella* sp.	257	5
Family Keratoisididae [f] (formerly Isididae, in part)	*Jasonisis* sp.	1573-2439	2,3
	cf. *Lepidisis* sp. [g]	2449	5
	Orstomisis sp.	482-575	2,3
Family Nephtheidae	*Scleronephthya* sp.	234-352	2,3
Family Paragorgiidae	*Paragorgia* sp. [h]	447-1943	2,3,4,7
Family Parisididae	*Parisis* sp.	238-259	2
Family Plexauridae	*Paracis* sp.	217-737	2,3,4
	Thesea sp.	258	5
Family Primnoidae	***Callogorgia cracentis* Cairns, 2018**	1703-1754	2

Higher Taxon	Species	Depth range (m)	References
Family Primnoidae cont.	*Calyptrophora* cf. *angularis* (Nutting, 1908)	2941-3021	2
	Calyptrophora diaphana Cairns, 2012	403-425	3,4
	***Calyptrophora distolos* Cairns, 2018**	2994	5,11
Family Primnoidae cont.	*Calyptrophora wyvillei* Wright, 1885	504-541	3
	Candidella gigantea (Wright & Studer, 1889)	1723-2310	3,4
	***Macroprimnoa ornata* Cairns 2018**	2940-3033	2
	Paracalyptrophora hawaiiensis Cairns, 2009	434-448	2,5,11
	***Paracalyptrophora spiralis* Cairns, 2018**	234-349	3,5,11
Subergorgiidae	*Annella mollis* (Nutting, 1910)	NA	5
	Annella reticulata (Ellis & Solander, 1786)	112-158	3
Victorgorgiidae	*Victorgorgia alba* (Nutting, 1908)[i] (= *Anthothela nuttingi* Bayer, 1956)	355-1847	2,3
Order Pennatulacea			
Family Anthoptilidae	*Anthoptilum* sp.[j]	1447-1572	2
Family Balticinidae[i] (=Halipteridae)	*Balticina* sp. (=*Halipteris* sp.)	1564	3
Family Pennatulidae	*Pennatula* sp.	563-590	3,4

Higher Taxon	Species	Depth range (m)	References
Phylum Cnidaria Class Hydrozoa			
Order Anthoathecata			
Family Stylasteridae	*Stylaster* sp.	289-343	3

Notes:

a. The depth distribution of several of the shallower taxa of black corals reported to occur in American Samoa is not documented. The depth ranges here are estimated based on reported depths elsewhere in the Central Pacific by (Wagner 2015)

b. At least two different deepwater unbranched black coral morphotypes occurring at depths from 892-2097 were initially identified as *Stichopathes* sp. Based on Opresko et al. (2021), these appear to belong in the new genus *Aphanostichopathes* in the Family Aphanipathidae.

c. Molodtsova et al. (2022) redescribed a black coral in the family Schizopathidae with alternating bilateral pinnules that had previously been identified as *Bathypathes alternata* [now *Alternatipathes alternata* (Brook, 1889)]. They reported this coral, *Bathypathes pseudoalternata*, found predominantly at shallower depths than *A. alternata*, from Swains Island Ridge.

d. This is the full depth range reported for *C. scobinosa*, not the observations in Samoa

e. USNM 1453668 - Identified as *Pseudochrysogorgia* sp.; listed as *Chrysogorgia* sp. 36 of Untiedt et al. (2021)

f. Saucier et al. (2021) have revised the phylogeny of the bamboo corals (formerly Isididae), resulting in five families. The bamboo corals described from American Samoa all appear to belong in the new family Keratoisididae. These

represent a number of the different clades within the Keratoisididae proposed by Watling et al. (2022), but cannot yet be fully described.

g. Unbranched bamboo corals had previously been identified as *Lepidisis* sp. Watling and France (2021) recently redescribed the genus *Lepidisis*. They note that many species previously described as *Lepidisis* probably belong in different genera, therefore we have revised this category to "cf. *Lepidisis* sp." pending further investigation. Some of the West Coast specimens previously
h. Some 2005 video observations were identified as *Paragorgia regalis* Nutting, 1912, but we have not found specimens to confirm this identification.
i. Moore et al. (2017) have placed *Anthothela nuttingi* Bayer, 1956 (originally *Clematissa alba* Nutting, 1908) in the genus *Victorgorgia* based on morphological characteristics and phylogenetic reconstructions using mitochondrial gene regions.
j. Specimens of "rock sea pens" identified as *Anthoptilum* sp. While most sea pens occur in soft sediments, rock sea pens have specially adapted peduncles that allow them to attach to hard substrata.
k. Pérez et al. (2021) established Balticinidae and *Balticina* as the valid family and genus names for the sea pens most commonly identified as Halipteridae and *Halipteris*.

Literature Cited

Kelley CD, Bingo SRD, Putts MR, Moriwake V, Herrera, S, Jackson M (2019) A Characterization of the Coral and Sponge Communities in American Samoa and the Cook Islands from *Okeanos Explorer* Surveys Between February 8 and May 3, 2017. A Report to the NOAA Deep-Sea Coral Research and Technology Program. University of Hawai`i. 46 pp.

Kennedy BRC, Cantwell K, Malik M, Kelley C, Potter J, Elliott K, Lobecker E, Gray LM, Sowers D, White MP, France SC, Auscavitch S, Mah C, Moriwake V, Bingo SRD, Putts M, Rotjan RD (2019) The Unknown and the Unexplored: Insights Into the Pacific Deep-Sea Following NOAA CAPSTONE Expeditions. Frontiers in Marine Science 6:480. doi: 10.3389/fmars.2019.00480

Moore KM, Alderslade P, Miller KJ (2014) A taxonomic revision of *Anthothela* (Octocorallia: Scleraxonia: Anthothelidae) and related genera, with the addition of new taxa, using morphological and molecular data. Zootaxa 4304(1)

Opresko DM, Bo M, Stein DP, Evankow A, Distel DL, Brugler MR (2021) Description of two new genera and two new species of antipatharian corals in the family Aphanipathidae (Cnidaria: Anthozoa: Antipatharia). Zootaxa 4966:161-174

Parke M, Kelley C, Putts M, Moriwake V, Bingo SRD, Elliot K, Smith J, Montgomery AD, Parrish F, Kahng SE, Baco-Taylor A, Roark B, Wagner D (2021) Deep Sea Coral Research and Technology Program: Pacific Islands deep-sea coral and sponge initiative final report. US Dept of Commerce, NOAA Technical Memorandum NMFS-PIFSC-117, 123 p doi:1025923/j6vh-ca45

Parrish FA, Baco AR, Kelley C, Reiswig HM (2017) State of Deep-Sea Coral and Sponge Ecosystems of the U.S. Pacific Islands Region. In: Hourigan TF, Etnoyer PJ, Cairns SD (eds) The State of Deep-Sea Coral and Sponge Ecosystems of the United States. National Oceanic and Atmospheric Administration, Silver Spring, MD

Pérez CD, Cordeiro RTS, Williams GC, Gomes PB (2021) Revised nomenclature of the sea pen genus *Balticina* Gray, 1870 (= *Halipteris* Kölliker, 1870) (Anthozoa: Octocorallia). Zootaxa 4966:237–244

Saucier EH, France SC, Watling Les (2021) Toward a revision of the bamboo corals: Part 3, deconstructing the Family Isididae. Zootaxa 5047:247-272

Wagner D (2015) A taxonomic survey of the shallow-water (<150 m) black corals (Cnidaria: Antipatharia) of the Hawaiian Islands. Frontiers in Marine Science 2:24. doi: 10.3389/fmars.2015.00024

Watling L, Saucier EH, France SC (2022) Towards a revision of the bamboo corals (Octocorallia): Part 4, delineating the family Keratoisididae. Zootaxa 5093:337-375. https://doi.org/10.11646/zootaxa.5093.3.4

Acknowledgements

We thank the scientists and crew of the American Samoa expeditions of NOAA Ship *Okeanos Explorer* (EX1702), and of the Ocean Exploration Trust's E/V *Nautilus* (NA112). Special thanks to Virginia Moriwake of the University of Hawaii's Deep-Sea Animal Research Center, who was central to much of the video annotation work for these expeditions. Heather Coleman and Arvind Shantharam assisted with the references and design. This is a publication of NOAA's Deep Sea Coral Research and Technology Program.

References

1. Western Pacific Fishery Management Council (2005) Fishery Ecosystem Plan for the American Samoa Archipelago

2. Kelley CD, Bingo SRD, Putts MR, Moriwake V, Herrera, S, Jackson M (2019) A Characterization of the Coral and Sponge Communities in American Samoa and the Cook Islands from *Okeanos Explorer* Surveys Between February 8 and May 3, 2017. A Report to the NOAA Deep-Sea Coral Research and Technology Program. University of Hawai`i. 46 pp.

3. Ocean Exploration Trust & University of Hawai'i (2019) Coral occurrence observations submitted to the NOAA National Database for Deep-Sea Corals and Sponges (https://deepseacoraldata.noaa.gov). DSCRTP Dataset ID: OET_NA112. Principal investigators: Sudek, M. and Spathias, H. Database version: 20211110-0.

4. Museum of Comparative Zoology, Harvard (2021) Invertebrate Zoology Collections - Online Collection Database; Accessed 11/20/2021

5. National Museum of Natural History (NMNH) (2021) Invertebrate Zoology Collections - Online Collection Database; Accessed 11/20/2021. U.S. National Museum of Natural History, Smithsonian Institution, Washington D.C.

6. Molodtsova TN, Opresko DM, Wagner D (2022) Description of a new and widely distributed species of *Bathypathes* (Cnidaria: Anthozoa: Antipatharia: Schizopathidae) previously misidentified as *Bathypathes alternata* Brook, 1889. PeerJ 10:e12638 DOI 10.7717/peerj.12638

7. University of Hawaii - Hawaii Undersea Research Laboratory (UH-HURL) Archives (2016) Video Annotation record in the NOAA Deep-Sea Coral and Sponge Database (https://deepseacoraldata.noaa.gov/).

8. Kitahara MV, Cairns SD (2021) Azooxanthellate Scleractinia (Cnidaria, Anthozoa) from New Caledonia, in *Tropical Deep-Sea Benthos 32*. Museum national d'Histoire naturelle, Paris, 722 p. (Memoires du Museum national d'Histoire naturelle; 215). ISBN: 978-2-85653-935-4Vol 32

9. Montgomery AD, Fenner D, Toonen RJ (2019) Annotated checklist for stony corals of American Samoa with reference to mesophotic depth records. ZooKeys 849:1-170

10. Untiedt CB, Quattrini AM, McFadden CS, Alderslade PA, Pante E, Burridge CP (2021) Phylogenetic relationships within *Chrysogorgia* (Alcyonacea: Octocorallia), a morphologically diverse genus of octocoral, revealed using a target enrichment approach. Frontiers in Marine Science 7. https://doi.org/10.3389/fmars.2020.599984

11. Cairns SD (2018) Primnoidae (Cnidaria: Octocorallia: Calcaxonia) of the Okeanos Explorer expeditions (CAPSTONE) to the central Pacific. Zootaxa 4532:1-43