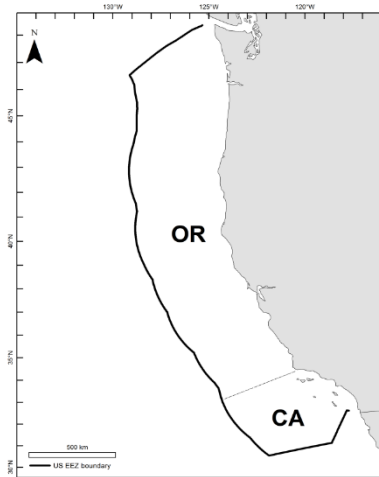


Deep-sea Coral Taxa in the U.S. West Coast Region: Depth and Geographic Distribution

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This annex to the U.S. West Coast chapter in “The State of Deep-Sea Coral and Sponge Ecosystems of the United States” lists deep-sea coral species in Phylum Cnidaria, Class Anthozoa, known to occur in the region (Figure 1). The list covers azooxanthellate, heterotrophic coral species that occur predominantly deeper than 50 m in U.S. waters off Washington, Oregon, and California. Details are provided on depth ranges and known geographic distribution within the region (Table 1). The list is adapted from Whitmire and Clarke (2007) and has been drawn from the published literature (including species descriptions) and from records in the collections of the United States National Museum of Natural History, the California Academy of Sciences, and the Santa Barbara Museum of Natural History. Taxonomic names are generally those currently accepted in the World



Register of Marine Species (WoRMS: <http://www.marinespecies.org>), and are arranged by order, then alphabetically by family, genus, and species. Data sources (references) listed are those principally used to establish geographic and depth distribution. The geographic distribution of the region is divided into two recognized biogeographic provinces: the Oregon Province (OR), which extends from Vancouver Island, Canada, to Point Arguello/Point Conception, USA; and the California Province (CA), which extends south from there to around Magdalena Bay, Mexico. In summary, we have confirmed the presence of 135 unique coral taxa in U.S. waters off Washington, Oregon, and California. Octocorals were the most speciose (101 taxa total), followed by scleractinians (19 taxa), antipatharians (9 taxa), and stylasterid corals (6 taxa), some of these taxa unidentified to species.

Figure 1. The U.S. West Coast region, delimiting the geographic boundaries considered in this work. The region is divided into the Oregon Province (OR) and the California Province (CA) as shown.

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Table 1. List of known deep-sea coral species in the Phylum Cnidaria, Class Anthozoa and Class Hydrozoa, and their reported distributions in U.S. waters off Washington, Oregon, and California. Bold text and blue-shaded fields indicate newly described species, new list additions, or range extensions since Whitmire and Clarke (2007). No symbols before bold & blue-shaded species names indicate newly described species, asterisks (*) denote new list additions, crosses (†) show name changes, and bold & blue-shaded depth and/or region fields represent range changes. "NR" indicates a lack of reported distribution or depth information. References are numbered to correspond with citations following the table, along with notes (in superscript letters) pertaining to individual taxa.

Distribution: OR = records from the Oregon Province; CA = records from the California Province.

Higher Taxon	Species	Distribution	Depth Range (m)	References	
Class Anthozoa					
Subclass Hexacorallia					
Order Antipatharia					
Family Antipathidae	<i>Antipathes dendrochristos</i> Opresko, 2005	OR,CA	91-427	1,2,3,4	
Family Cladopathidae	<i>Chrysopathes speciosa</i> Opresko, 2003	OR,CA	225-1400	5,6	
	*† <i>Heteropathes</i> sp. (= <i>Heliopathes</i> sp.)	OR	1700-3200	6	
	<i>Trissopathes pseudotristicha</i> Opresko, 2003	OR,CA	227-2972	5	
Family Schizopathidae ^a	*† <i>Alternatipathes alternata</i> (Brook, 1889) (= <i>Bathypathes alternata</i> Brook, 1889)	OR	412-4881	6,7,8	
	*† <i>Alternatipathes bipinnata</i> (Opresko, 2005) (= <i>Umbellapathes bipinnata</i> Opresko, 2005)	OR	1205-1383	6	
	* <i>Bathypathes patula</i> Brook, 1889	OR	225-4868	6	
	* <i>Lillipathes wingi</i> Opresko, 2005	OR	877-904	6	
	* <i>Parantipathes</i> sp.	OR,CA	490-2820	6	
Order Scleractinia					
Family Caryophylliidae	<i>Caryophyllia (Caryophyllia) arnoldi</i> Vaughan, 1900	OR,CA	40-656	9	
	* <i>Caryophyllia (Caryophyllia) diomedea</i> Marenzeller, 1904	CA	225-2200	10,11	
	* <i>Caryophyllia (Caryophyllia) quadragenaria</i> Alcock, 1902	CA	54-1669	9,10	
	<i>Coenocyathus bowersi</i> Vaughan, 1906	OR,CA	13-708	9,12	
	<i>Crispatotrochus foxi</i> (Durham & Barnard, 1952)	CA	82-272	9,13	
	<i>Desmophyllum dianthus</i> (Esper, 1794)	OR,CA	37-293	9,12	
	<i>Labyrinthocyathus quaylei</i> (Durham, 1947)	OR,CA	37-293	9	
	<i>Lophelia pertusa</i> (Linnaeus, 1758)	OR,CA	39-2775	9,12	
	<i>Nomlandia californica</i> Durham & Barnard, 1952	CA	82	9,13	
	<i>Paracyathus montereyensis</i> Durham, 1947	OR	75-146	9	
	<i>Paracyathus stearnsii</i> Verrill, 1869	OR,CA	6-835	9,12	
	Family Dendrophylliidae	<i>Balanophyllia (Balanophyllia) elegans</i> Verrill, 1864	OR,CA	1-1553	9,12
		<i>Dendrophyllia oldroyd</i> Oldroyd, 1924	CA	40-576	9
Family Flabellidae	<i>Javania californica</i> Cairns, 1994	OR	62-1553	9	
	<i>Polymyces montereyensis</i> (Durham, 1947)	OR,CA	69-212	6,14	

Higher Taxon	Species	Distribution	Depth Range (m)	References
Family Fungiacyathidae	<i>Fungiacyathus (Bathyactis) marenzelleri</i> (Vaughan, 1906)	OR,CA	1820-6328	9
Family Micrabaciidae	<i>Leptopenus discus</i> Moseley, 1881	OR,CA	3599-5000	9
Family Oculinidae	<i>Madrepora oculata</i> Linnaeus, 1758	CA	84-490	6,9
	<i>Oculina profunda</i> Cairns, 1991	OR	119-578	6,9

Higher Taxon	Species	Distribution	Depth Range (m)	References
Class Anthozoa				
Subclass Octocorallia				
Order Alcyonacea				
Family Acanthogorgiidae	* <i>Acanthogorgia gracillima</i> Kükenthal, 1909	CA	160	15,16
	<i>Acanthogorgia</i> sp.	OR,CA	49-2301	16,17,18
	† <i>Calcigorgia beringi</i> (Nutting, 1912) (= <i>Swiftia beringi</i> Nutting, 1912)	OR,CA	39-826	18,19
	<i>Calcigorgia spiculifera</i> Broch, 1935	OR	144-1159	18
	* <i>Muricella complanata</i> Wright & Studer, 1889	OR	521-653	6,16,20
Family Alcyoniidae	*† <i>Bathyalcyon robustum</i> Versluys, 1906 (= <i>Anthomastus robustum</i>)	OR	2449-3961	7,17
	* <i>Eleutherobia rubra</i> (Brundin, 1896)	OR,CA	80-905	6
	† <i>Heteropolypus ritteri</i> (Nutting, 1909) (= <i>Anthomastus ritteri</i> Nutting, 1909)	OR,CA	35-3330	7,14,18,21,22
Family Anthothelidae	* <i>Anthothela argentea</i> Studer, 1894 ^b	OR,CA	490-1050	6
	<i>Anthothela pacifica</i> (Kükenthal) ^b	OR,CA	201-350	15,16,23
Family Chrysogorgiidae	* <i>Chrysogorgia monticola</i> Cairns, 2007	OR	1711-3015	24
	* <i>Chrysogorgia pinnata</i> Cairns, 2007	OR	1968-3275	24
	<i>Iridogorgia</i> sp.	OR,CA	2027-2215	7,24,25
	<i>Radicipes</i> sp.	OR	NR	23
Family Clavulariidae	* <i>Clavularia grandiflora</i> (Nutting, 1908)	OR	593-1529	7,25
	<i>Clavularia</i> sp. A	OR	0-200	23
	<i>Clavularia</i> sp. H	CA	NR	12,26
	* <i>Telesto californica</i> Kükenthal, 1913	CA	55-91	6,12
	* <i>Telesto nuttingi</i> Kükenthal, 1913	CA	75-108	6,12
	<i>Telestula ambigua</i> Nutting, 1909	OR	958	22,23
Family Coralliidae	<i>Corallium</i> sp.	OR,CA	628-2447	17,25
Family Gorgoniidae	<i>Adelogorgia phyllosclera</i> Bayer, 1958	CA	9-595	12,15,16,18
	* <i>Eugorgia daniana</i> Verrill, 1868 (= <i>Leptogorgia daniana</i> (Verrill, 1868))	CA	6-70	27
	<i>Eugorgia rubens</i> Verrill, 1868 (= <i>Leptogorgia rubens</i> (Verrill, 1868))	OR,CA	50-200+	12,16,18,27
	* <i>Eugorgia</i> sp. nov.	CA	30-98	16

Higher Taxon	Species	Distribution	Depth Range (m)	References
Family Gorgoniidae, cont.	† <i>Leptogorgia chilensis</i> Verrill, 1868 (= <i>Leptogorgia caryi</i> Verrill, 1868) ^c	OR,CA	5-231	6,12,15,18,28
	* <i>Leptogorgia filicrispa</i> Horvath, 2011	CA	20-87	29
	* <i>Leptogorgia</i> sp. A (likely <i>L. tricolorata</i> Breedy and Cortés, 2011)	CA	36-91	16
Family Isididae ^d	<i>Acanella</i> sp.	OR,CA	975-2844	7,17
	* <i>Bathygorgia profunda</i> (Wright, 1885)	OR	1405	25
	* <i>Isidella tentaculum</i> Etnoyer, 2008	OR,CA	720-1050	30
	<i>Keratois flabellum</i> (Nutting, 1908)	OR	1829 -2012	14
	<i>Keratois philippinensis</i> (Wright and Studer, 1889)	OR	1262-1463	14
	<i>Keratois</i> sp.	OR,CA	436-1910	16
	<i>Lepidisis</i> sp.	OR,CA	180-3317	6,7
Family Nephtheidae	* <i>Gersemia juliepackardae</i> Williams & Lundsten, 2009	OR,CA	519-2034	31
	<i>Gersemia rubiformis</i> (Ehrenberg, 1834) (= <i>Alcyonium</i> sp. indet. sensu Williams 2013) ^e	OR	9-137	23,32
	* <i>Neospongodes</i> sp.	OR	1600	14
Family Paragorgiidae	<i>Paragorgia arborea</i> (Linnaeus, 1758)	OR,CA	18-2936	6,15,16,33,34
	* <i>Paragorgia regalis</i> Nutting, 1912	CA	1840	6
	* <i>Paragorgia stephencairnsi</i> Sanchez, 2005	OR,CA	350-490	6,33,35
	* <i>Paragorgia yutlinux</i> Sanchez, 2005	OR,CA	487-861	6,35
	* <i>Sibogorgia cauliflora</i> Herrera, Baco & Sánchez, 2010	OR,CA	2493-3042	36
	* <i>Sibogorgia</i> sp. (poss. sp. nov.)	OR,CA	255-1600	16
Family Plexauridae	* <i>Plexaurid</i> gen. et. sp. indet. ^f	OR	368	14
	† <i>Chromoplexaura marki</i> (Kükenthal, 1913) (= <i>Euplexaura marki</i> Kükenthal, 1913)	OR,CA	9-200	4,14,15,16,32
	<i>Heterogorgia tortuosa</i> Verrill, 1868	CA	0-130	12,14
	<i>Muricea californica</i> Aurivillius, 1931	CA	1-452	12,37
	<i>Muricea fruticosa</i> Verrill, 1869	CA	23-84	12,37
	* <i>Psammogorgia arbuscula</i> (Verrill, 1866)	CA	64-95	14
	† <i>Psammogorgia simplex</i> Nutting 1909 (= <i>Euplexaura simplex</i> ; <i>Swiftia simplex</i>)	OR,CA	147-2123	6,15,18,25,16,19,38
	† <i>Psammogorgia torreyi</i> Nutting, 1909 (= <i>Swiftia torreyi</i> (Nutting, 1909))	OR,CA	30-1752	6,23
	* <i>Swiftia farallonesica</i> Williams and Breedy, 2016	OR	181-190	39,40
	<i>Swiftia kofoidi</i> (Nutting, 1909)	(OR) ^g ,CA	91-2393	6,14,15,16,18
	<i>Swiftia pacifica</i> (Nutting, 1912)	OR,(CA) ^g	89-2904	6,15,16,18,19
	* <i>Swiftia pusilla</i> (Nutting, 1909) (comb. nov., Breedy and Guzmán, 2015)	CA	166-177	16,41
	<i>Swiftia spauldingi</i> (Nutting, 1909)	OR	49-342	6,15,18,19
	<i>Thesea</i> sp. A ^h	CA	27-200	12,16
	<i>Thesea</i> sp. B ^h	CA	27-200	12,16

Higher Taxon	Species	Distribution	Depth Range (m)	References
Family Primnoidae	<i>Callogorgia kinoshitae</i> Kükenthal, 1913	OR	99-1646	14,16,42
	* <i>Calyptrophora</i> sp. cf. of <i>C. antilla</i> Bayer, 2001	OR	1110-1763	24
	<i>Calyptrophora bayeri</i> Cairns, 2007	OR	1683	24,42
	<i>Calyptrophora laevispinosa</i> Cairns, 2007	OR	3107	24,42
	<i>Narella alaskensis</i> Cairns and Baco, 2007	OR	2192-3075	20
	* <i>Narella bowersi</i> (Nutting, 1908)	OR	1218-2600	24
	<i>Parastenella doederleini</i> (Wright and Studer, 1889)	OR	1390-2380	42
	<i>Parastenella gymnogaster</i> Cairns, 2007	OR	1962-2773	24
	<i>Parastenella pacifica</i> Cairns, 2007	OR	1498-1986	15,16,24
	* <i>Parastenella ramosa</i> (Studer, 1894)	OR,CA	619-3427	18,20,24
	<i>Plumarella longispina</i> Kinoshita, 1908	OR,CA	80-732	6,14,15,16,18
	<i>Primnoa pacifica</i> Kinoshita, 1907	OR	272-279	6,18,42
	† <i>Thouarella</i> sp. (= <i>Amphilaphis</i> sp.)	OR, CA	114-195	14,43
Family Xenidiidae	* <i>Anthelia</i> sp.	OR	1034-1107	14
Order Pennatulacea				
Family Anthoptilidae	† <i>Anthoptilum grandiflorum</i> (Verrill, 1879) (= <i>Anthoptilum thomsoni</i> Kölliker, 1880; <i>Anthoptilum simplex</i> Kölliker; <i>Benthoptilum sertum</i> Verrill, 1885)	OR, CA	72-3651	6,14,18,22,44,45
	* <i>Anthoptilum lithophilum</i> Williams and Alderslade, 2011	OR, CA	669-700	46
Family Funiculinidae	* <i>Funiculina armata</i> (Verrill, 1879)	CA	611-1097	6,44
	<i>Funiculina parkeri</i> (Kükenthal, 1909)	OR, CA	200-1409	6,14,22
	* <i>Funiculina quadrangularis</i> (Pallas, 1766)	OR, CA	763-2740	14,18
Family Halipteridae	† <i>Halipteris californica</i> (Moroff, 1902) (= <i>Halipteris contorta</i> (Nutting, 1909); <i>Stachyptilum quadridentatum</i> (Nutting, 1909))	OR,CA	46-2780	6,12,14,18,22,25
	*† <i>Halipteris willemoesi</i> Kölliker, 1870 (= <i>Halipteris septentrionalis</i> (Nutting, 1909))	OR	75-1164	6,14,18
Family Kophobelemnidae	<i>Kophobelemnon affine</i> (Studer, 1894)	OR	2430-2710	22
	<i>Kophobelemnon hispidum</i> Nutting, 1912	OR	NR	23,44
	† <i>Kophobelemnon macrospinosum</i> Thomson, 1927 (= <i>Kophobelemnon biflorum</i>)	OR	2434-2499	23,25
Family Pennatulidae	† <i>Pennatula phosphorea</i> Linnaeus, 1758 (= <i>Pennatula phosphorea</i> var. <i>californica</i> (Kükenthal, 1913); <i>Pennatula californica</i> Kükenthal 1913)	OR,CA	519-2825	6,12,14,18,22
	† <i>Ptilosarcus gurneyi</i> (Gray, 1860) (= <i>Ptilosarcus quadrangularis</i> (Moroff, 1902))	OR,CA	16-475	6,12,14,18,22,44
Family Protoptilidae	† <i>Distichoptilum gracile</i> (Verrill, 1882) (= <i>Distichoptilum verrilli</i> (Studer, 1901))	OR	1881-3361	14,18,22
	† <i>Distichoptilum rigidum</i> (Nutting, 1912) (= <i>Helicoptilum rigidum</i> (Nutting, 1912))	OR	1862-1937	23,44
	* <i>Protoptilum</i> sp.	OR	150-3306	14,18,25

Higher Taxon	Species	Distribution	Depth Range (m)	References
Family Scleroptilidae	<i>Scleroptilum</i> sp.	OR	109	44
Family Stachyptilidae	<i>Stachyptilum superbum</i> (Studer, 1894)	OR,CA	388-1244	12,18,22
Family Umbellulidae	* <i>Umbellula huxleyi</i> (Kölliker, 1880)	CA	914-927	6,47
	† <i>Umbellula lindahli</i> (Kölliker, 1880) (= <i>Umbellula carpenteri</i> (Kölliker, 1880))	OR, CA	914-927	14,23
	<i>Umbellula magniflora</i> (Kölliker, 1880)	OR, CA	854-1084	6,22,25
Family Virgularidae	<i>Acanthoptilum album</i> Nutting, 1909	OR	10-150	22
	* <i>Acanthoptilum annulatum</i> Nutting, 1909	OR	146	6,14
	<i>Acanthoptilum gracile</i> (Gabb, 1863)	OR, CA	5-1981	18,22,48
	* <i>Acanthoptilum scalpelifolium</i> Moroff, 1902	CA	79	14
	<i>Stylatula elongata</i> (Gabb, 1862)	OR,CA	2-820	22,44,49
	<i>Stylatula gracilis</i> (Gabb, 1862)	OR,CA	50-261	22,49
	† <i>Virgularia agassizi</i> Studer, 1894 (= <i>Virgularia cystiferum</i> (Nutting, 1909))	CA	30-1000	12,22
	† <i>Virgularia bromleyi</i> Kölliker, 1880 (= <i>Virgularia californica</i> Pfeffer, 1886)	CA	5-90	12

Higher Taxon	Species	Distribution	Depth Range (m)	References
Class Hydrozoa				
Subclass Hydroidolina				
Order Anthoathecata				
Family Stylasteridae	<i>Errinopora pourtalesii</i> (Dall, 1884)	OR	40-658	50
	† <i>Stylanthea papillosa</i> (Dall, 1884) (= <i>Stylanthea petrograpta</i> (Fisher, 1938); <i>Stylanthea porphyra</i> Fisher 1931)	OR	0-140	50
	<i>Stylaster californicus</i> (Verrill, 1866)	OR,CA	4-126	14,25,51
	* <i>Stylaster parageus columbiensis</i> Cairns and Linder, 2011	OR	246-285	50
	<i>Stylaster venustus</i> (Verrill, 1870)	OR	10-108	50
	* <i>Stylaster verrillii</i> (Dall, 1884)	OR	21-393	50

Notes

- a. Black corals identified as belonging to the genera *Bathypathes*, *Lillipathes*, *Parantipathes*, and *Umbellapathes* have also been observed off S. California (CA province), but have not been identified to species. L. Lundsten (pers. com.).
- b. *Anthothela argentea* and *Anthothela pacifica* may represent the same species, based on examinations of material by E. Horvath (pers. com.).
- c. *Leptogorgia caryi* (included in the 2007 list) is synonymous with *Leptogorgia chilensis* Verrill, 1868. Breedy and Guzman (2007).
- d. Specimens identified as *Keratoisis* sp. were also observed and collected from Southern California (CA province; (NMNH Invertebrate Zoology Collections; SBMNH Invertebrate Zoology Online Collections), but not identified to species.
- e. *Gersemia rubiformis* (Ehrenberg, 1834). Ref: Williams GC (2013) New taxa and revisionary systematics of alcyonacean octocorals from the Pacific coast of North America (Cnidaria, Anthozoa). ZooKeys:15-42
- f. Plexaurid gen. et. sp. indet. is based on a single specimen at CAS, originally identified as *Echinogorgia* sp. More recently, Gary Williams (CAS) described the specimen as “significantly different than other members of *Echinogorgia*, which is an Indo-Pacific genus” (G. Williams, pers. com.).
- g. *Swiftia kofoidi* (Nutting, 1909) and *Swiftia pacifica* (Nutting, 1912) are related species that exhibit geographic transitional morphology around Pt. Conception, CA, with *S. kofoidi* and *S. pacifica* seemingly limited to the CA and OR provinces, respectively (Horvath in prep).
- h. *Thesea* sp. A and *Thesea* sp. B may represent the same species (Horvath in prep).

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