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Chapter 47

Oceanic distribution ranges and conservation status of extant soft and hard reef coral genera

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ABSTRACT

An updated taxonomic overview is presented of extant genera of soft and hard reef corals. Of each genus and subgenus the known circum-tropical oceanic distribution (presence or absence) is indicated over six regions: West Indian Ocean, East Indian Ocean, West-Central Pacific, East Pacific, West Atlantic, and East Atlantic. In addition, the conservation status of each genus is given with regard to international trade (CITES) and whether it has been assessed against the Categories and Criteria of the IUCN Red List of Threatened Species. The totals of 126 soft coral genera (mostly Alcyonaceae) and 125 hard coral genera (predominantly Scleractinia) have been analyzed with regard to their distribution ranges. The West-Central Pacific is the oceanic region that is richest in genera of both reef-dwelling soft and hard corals. The most common range among the genera is the Indo-West Pacific, from the West Indian Ocean to the West-Central Pacific.

INTRODUCTION

Knowledge on the taxonomy and biogeography of reef corals has improved to a great extent in the last 40 years, which is partly due to an improved accessibility to coral reefs by the availability of SCUBA and the strong expansion of diving tourism. Besides sport divers, also increasing numbers of aquarium hobbyists have become interested in the biology of corals.

This increased attention has resulted in intensified collecting and traffic in corals. Therefore, international shipping of stony corals became regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (www1). Through CITES, the international export and import of stony corals has become restricted by annual quota for species (Wabnitz *et al*., 2003), but this does not limit domestic trade within the countries of origin. However, public awareness of the extinction risk of specific coral species collected from the wild has also stimulated the development of coral farming.

Besides coral trade, which aims at particular wanted coral species (Wabnitz *et al*., 2003), more general threats to coral conservation exist, such as destructive fisheries, coral mining, siltation, and global climate change (Hoeksema, 1997, 2004). Shallow-living reef corals in particular are subject to bleaching, which may also include species popular in aquariums, like for instance mushroom corals (Hoeksema, 1991). Because more awareness is needed for the conservation of threatened coral species, reef-dwelling stony corals were subject of an assessment of their extinction risk according to the protocols of the IUCN Red List of Threatened Species (www2). This was the first species-level assessment of reef corals against Red List Categories and Criteria, which was conducted by teams of coral specialists during workshops organized by the Global Marine Species Assessment (Carpenter *et al*., 2008a,b, www3).

More detailed information is available on the biogeography and biodiversity of stony corals than on soft coral species (Hoeksema, 2007). This is mostly due to the more elaborate method used to identify soft corals, i.e., microscopic study of specially prepared sclerites (Bayer *et al*., 1983: Fabricius and Alderslade, 2001;

Ofwegen, 2005), instead of an examination of the overall skeleton morphology of cleaned stony corals (e.g. Hoeksema, 1989; Hoeksema and Best, 1991; Cairns and Hoeksema, 1993; Wallace, 1999; Razak and Hoeksema, 2003). Some coral genera contain species that may be reef-dwelling (hermatypic) as well as non-reef-dwelling (ahermatypic) (e.g. Cairns, 2006), but this does not affect the eventual outcome of the present results. Besides, it is relevant to note that the diversity pattern at species level of deep-water scleractinians is very similar to that of shallow-water species (Cairns, 2007).

RESULTS

We present a list of reef coral genera, based on their present-day taxonomic classification and status (see notes underneath list). For each genus and subgenus, we indicate in which oceans they occur, altogether divided into six regions (Table 1). The classification and distribution ranges are predominantly based on earlier works (Wells, 1956; Cairns *et al*., 1999; Cairns *et al*., 2008; Veron, 2000; Fabricius and Alderslade, 2001; Hoeksema and Ofwegen, 2004; Daly *et al*., 2007; Cairns *et al*., 2008; Ofwegen *et al*., 2008).

Soft corals in the present analysis are predominantly Alcyonacea (subclass Octocorallia). Most stony corals are anthozoans belonging to the order Scleractinia (subclass Hexacorallia) and to the families Helioporidae and Tubiporidae (both subclass Octocorallia). Additional stony reef coral genera in the present report belong to the hydrozoan families Milleporidae (Subclass Anthoathecatae: Order Capitata) and Stylasteridae (Subclass Athecatae: Order Filifera). The classification of Scleractinia at suborder level, which has been stable for many years since Wells' (1956) revision, has recently become a subject of debate due to the application of molecular techniques that give a new insight into phylogenetic relationships (Veron *et al*., 1996; Fukami *et al*., 2004).

Among soft corals, molecular studies have especially helped to get more clarity on the division and relationships between genera (e.g. McFadden *et al*., 2006; Groenenberg and Ofwegen, 2007).

Table 1: List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Explanation of list:

Oceanic distribution range:	WI	= West Indian Ocean
	EI	= East Indian Ocean
	WCP	= West and Central Pacific Ocean
	EP	= East Pacific Ocean
	WA	= West Atlantic Ocean
	EA	= East Atlantic Ocean
Conservation status:	C	= CITES Appendix 2 (www1)
	I	= in IUCN Red List assessment (www2)
Notes:	1-11	= See end of the list

Infrakingdom **Coelenterata** Leuckart, 1847
Phylum **Cnidaria** Hatschek, 1888
Superclass **Anthozoa** (Ehrenberg, 1831) Cavalier-Smith, 1998
Class **Anthozoa** Ehrenberg, 1831

Subclass **Octocorallia** Haeckel, 1866
Order **Helioporacea** Bock, 1938 (= **Coenothecalia** Bourne, 1895)

Family **Helioporidae** Moseley, 1876								
Heliopora de Blainville, 1830	WI	EI	WCP	-	-	-	C	I

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Order **Alcyonacea** Lamouroux, 1816									
Suborder **Stolonifera** Hickson, 1883									
Family **Acrossotidae** Bourne, 1914									
Acrossota Bourne, 1914	-	-	WCP	-	-	-	-	-	
Family **Clavulariidae** Hickson, 1894									
Carijoa Müller, 1867	WI	EI	WCP	-	WA	-	-	-	
Cervera Lopez-Gonzalez *et al.,* 1995	-	-	WCP?	-	-	EA	-	-	1
Clavularia Blainville, 1830	WI	EI	WCP	-	-	-	-	-	
Knopia Alderslade & McFadden, 2007	-	-	WCP	-	-	-	-	-	
Moolabalia Alderslade, 2001	-	-	WCP	-	-	-	-	-	
Paratelesto Utinomi, 1958	-	-	WCP	-	-	-	-	-	
Telesto Lamouroux, 1812	-	-	-	-	WA	-	-	-	
Family **Coelogorgiidae** Bourne, 1900									
Coelogorgia Milne Edwards & Haime, 1857	WI	EI	WCP	-	-	-	-	-	
Family **Tubiporidae** Ehrenberg, 1828									
Tubipora Linnaeus, 1758	WI	EI	WCP	-	-	-	C	I	
Suborder **Alcyoniina** Lamouroux, 1816									
Family **Xeniidae** Verrill, 1864									
Anthelia Lamarck, 1816	WI	EI	WCP	-	-	-	-	-	
Asterospicularia Utinomi, 1951	-	-	WCP	-	-	-	-	-	
Bayerxenia Alderslade, 2001	-	-	WCP	-	-	-	-	-	
Cespitularia Milne-Edwards, 1857	WI	EI	WCP	-	-	-	-	-	
Efflatounaria Gohar, 1934	WI	EI	WCP	-	-	-	-	-	
Funginus Tixier-Durivault, 1970	-	-	WCP	-	-	-	-	-	
Heteroxenia Kölliker, 1874	WI	EI	WCP	-	-	-	-	-	
Ingotia Alderslade, 2001	-	EI	WCP	-	-	-	-	-	
Ixion Alderslade, 2001	-	-	WCP	-	-	-	-	-	
Orangaslia Alderslade, 2001	-	-	WCP	-	-	-	-	-	
Ovabunda Alderslade, 2001	WI	-	-	-	-	-	-	-	
Sansibia Alderslade, 2000	WI	EI	WCP	-	-	-	-	-	
Sympodium Ehrenberg, 1834	WI	EI	WCP	-	-	-	-	-	
Xenia Lamarck, 1816	WI	EI	WCP	-	-	-	-	-	
Family **Paralcyoniidae** Gray 1869									
Ceeceenus Ofwegen & Benayahu, 2006	-	EI	WCP	-	-	-	-	-	
Studeriotes Thomson & Simpson, 1909	-	EI	WCP	-	-	-	-	-	
Family **Alcyoniidae** Lamouroux, 1812									
Alcyonium Linnaeus, 1758	-	-	-	-	-	EA	-	-	2
Bellonella Gray, 1862	-	-	WCP	-	-	-	-	-	
Cladiella Gray, 1869	WI	EI	WCP	-	-	-	-	-	
Eleutherobia Pütter, 1909	WI	-	WCP	-	-	-	-	-	
Klyxum Alderslade, 2000	WI	EI	WCP	-	-	-	-	-	
Lobophytum von Marenzeller, 1886	WI	EI	WCP	-	-	-	-	-	
Paraminabea Williams & Alderslade, 1999	WI	EI	WCP	-	-	-	-	-	
Rhytisma Alderslade, 2000	WI	EI	WCP	-	-	-	-	-	
Sarcophyton Lesson, 1834	WI	EI	WCP	-	-	-	-	-	
Sinularia May, 1898	WI	EI	WCP	-	-	-	-	-	
Protodendron Thomson & Dean, 1931	WI	-	WCP	-	-	-	-	-	
Family **Nephtheidae** Gray, 1862									
Capnella Gray, 1869	WI	EI	WCP	-	-	-	-	-	
Chromonephthea Ofwegen, 2006	-	EI	WCP	-	WA	-	-	-	3
Dendronephthya Kükenthal, 1905	WI	EI	WCP	-	-	-	-	-	
Lemnalia Gray, 1868	WI	EI	WCP	-	-	-	-	-	
Leptophyton Ofwegen & Schleyer, 1997	WI	-	-	-	-	-	-	-	

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Litophyton Forskål, 1775	WI	EI	WCP	-	-	-	-	-
Neospongodes Kükenthal, 1905	-	-	-	-	WA	-	-	-
Nephthea Andouin, 1828	WI	EI	WCP	-	-	-	-	-
Pacifiphyton Williams, 1997	-	-	WCP	-	-	-	-	-
Paralemnalia Kükenthal, 1913	WI	EI	WCP	-	-	-	-	-
Scleronephthya Studer, 1887	WI	EI	WCP	-	-	-	-	-
Stereonephthya Kükenthal, 1905	WI	EI	WCP	-	-	-	-	-
Umbellulifera Thomson & Dean, 1931	WI	EI	WCP	-	-	-	-	-
Family **Nidaliidae** Gray, 1869								
Chironephthya Studer, 1887	WI	EI	WCP	-	-	-	-	-
Nephthyigorgia Kükenthal, 1910	-	EI	WCP	-	-	-	-	-
Nidalia Gray, 1834	-	EI	WCP	-	WA	-	-	-
Nidaliopsis Kükenthal, 1906	-	-	-	-	-	EA	-	-
Siphonogorgia Kölliker, 1874	WI	EI	WCP	-	-	-	-	-
Suborder **Scleraxonia** Studer, 1887								
Family **Anthothelidae** Broch, 1916								
Alertigorgia Kükenthal, 1908	-	EI	WCP	-	-	-	-	-
Anthopodium Verrill, 1872	-	-	-	-	WA	-	-	-
Diodogorgia Kükenthal, 1919	-	-	-	-	WA	-	-	-
Erythropodium Kölliker, 1865	-	-	WCP	-	WA	-	-	-
Iciligorgia Duchassaing, 1870	-	-	WCP	-	WA	-	-	-
Solenocaulon Gray, 1862	WI	EI	WCP	-	-	-	-	-
Titanideum Verrill, 1864	-	-	-	-	WA	-	-	-
Family **Briareidae** Gray, 1859								
Briareum Blainville, 1834	WI	EI	WCP	-	WA	-	-	-
Family **Melitheidae** Gray, 1870								
Acabaria Gray, 1859	WI	EI	WCP	-	-	-	-	-
Clathraria Gray, 1859	WI	EI	WCP	-	-	-	-	-
Melithaea Milne Edwards & Haime, 1857	WI	EI	WCP	-	-	-	-	-
Mopsella Gray, 1857	WI	EI	WCP	-	-	-	-	-
Wrightella Gray, 1870	WI	-	WCP	-	-	-	-	-
Family **Parisididae** Aurivillius, 1931								
Parisis Verrill, 1864	WI	-	WCP	-	-	-	-	-
Family **Subergorgiidae** Gray, 1859								
Annella Gray, 1858	WI	EI	WCP	-	-	-	-	-
Subergorgia Gray, 1857	WI	EI	WCP	-	-	-	-	-
Family **Keroeididae** Kinoshita, 1910								
Keroeides (Studer & Wright), 1887	WI	EI	WCP	-	-	-	-	-
Suborder **Holaxonia** Studer, 1887								
Family **Acanthogorgiidae** Gray, 1859								
Acanthogorgia Gray, 1857	WI	EI	WCP	-	-	-	-	-
Anthogorgia Verrill, 1868	WI	EI	WCP	-	-	-	-	-
Muricella Verrill, 1868	WI	EI	WCP	-	-	-	-	-
Family **Plexauridae** Gray, 1859								
Adelogorgia Bayer, 1958	-	-	-	EP	-	-	-	-
Astrogorgia Verrill, 1868	WI	EI	WCP	-	-	-	-	-
Bebryce Philippi, 1841	WI	EI	WCP	-	-	-	-	-
Discogorgia Kükenthal, 1919	WI	-	WCP	-	-	-	-	-
Echinogorgia Kölliker, 1865	WI	EI	WCP	EP	-	-	-	-

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Echinomuricea Verrill, 1869	WI	EI	WCP	-	-	-	-	-
Eunicea Lamouroux, 1816	-	-	-	-	WA	-	-	-
Euplexaura Verrill, 1869	WI	EI	WCP	-	-	-	-	-
Heterogorgia Verrill, 1868	-	-	-	EP	-	-	-	-
Menella Gray, 1870	WI	EI	WCP	-	-	-	-	-
Muricea Lamouroux, 1821	-	-	-	EP	WA	-	-	-
Muriceopsis Aurivillius, 1931	-	-	-	-	WA	EA	-	-
Paracis Kükenthal, 1919	WI	-	WCP	-	-	-	-	-
Paramuricea Kölliker, 1865	-	-	-	-	-	EA	-	-
Paraplexaura Kükenthal, 1909	WI	EI	WCP	-	-	-	-	-
Plexaura Lamouroux, 1812	-	-	-	-	WA	-	-	-
Plexaurella Kölliker, 1865	-	-	-	-	WA	-	-	-
Psammogorgia Verrill, 1868	-	-	-	EP	-	-	-	-
Pseudoplexaura Wright & Studer, 1889	-	-	-	-	WA	-	-	-
Spinimuricea Grasshoff, 1992	-	-	-	-	-	EA	-	-
Thesea Duchassaing & Michelotti, 1860	-	-	-	EP	-	-	-	-
Trimuricea Gordon, 1926	WI	EI	WCP	-	-	-	-	-
Villogorgia Duchassaing & Michelotti, 1860	WI	EI	WCP	-	-	-	-	-
Family **Gorgoniidae** Lamouroux, 1812								
Eunicella Verrill, 1869	-	-	-	-	-	EA	-	-
Eugorgia Verrill, 1868	-	-	-	EP	-	-	-	-
Gorgonia Linnaeus, 1758	-	-	-	-	WA	-	-	-
Guaiagorgia Grasshoff & Alderslade, 1997	WI	EI	WCP	-	-	-	-	-
Hicksonella Nutting, 1910	-	-	WCP	-	-	-	-	-
Leptogorgia Milne Edwards & Haime, 1857	WI	EI	WCP	EP	WA	EA	-	-
Pacifigorgia Milne Edwards & Haime, 1857	-	-	-	EP	WA	-	-	-
Phycogorgia Milne Edwards & Haime, 1850	-	-	-	EP	-	-	-	-
Phyllogorgia Milne Edwards & Haime, 1850	-	-	-	-	WA	-	-	-
Pinnigorgia Grasshoff & Alderslade, 1997	-	-	WCP	-	-	-	-	-
Pseudopterogorgia Kükenthal, 1919	-	-	-	-	WA	-	-	-
Pterogorgia Ehrenberg, 1834	-	-	-	-	WA	-	-	-
Rumphella Bayer, 1955	WI	EI	WCP	-	-	-	-	-
Suborder **Calcaxonia** Grasshoff, 1999								
Family **Ellisellidae** Gray, 1859								
Ctenocella Valenciennes, 1855	-	EI	WCP	-	-	-	-	-
Dichotella Gray, 1870	-	-	WCP	-	-	-	-	-
Ellisella Gray, 1858	WI	EI	WCP	EP	WA	EA	-	-
Heliania Gray, 1860	-	EI	WCP	-	-	-	-	-
Junceella Valenciennes, 1855	WI	EI	WCP	-	-	-	-	-
Nicella Gray, 1870	WI	EI	WCP	-	WA	-	-	-
Verrucella Milne Edwards & Haime, 1857	WI	EI	WCP	-	-	-	-	-
Viminella Gray, 1870	WI	EI	WCP	-	-	-	-	-
Family **Ifalukellidae** Bayer, 1955								
Ifalukella Bayer, 1995	-	-	WCP	-	-	-	-	-
Plumigorgia Nutting, 1910	-	-	WCP	-	-	-	-	-
Family **Chrysogorgiidae** Verrill, 1883								
Stephanogorgia Bayer & Muzik, 1976	-	-	WCP	-	-	-	-	-
Family **Primnoidae** Gray, 1857								
Plumarella Gray, 1870	-	-	WCP	-	-	-	-	-
Family **Isididae** Lamouroux, 1812								
Isis Linnaeus, 1758	-	EI	WCP	-	-	-	-	-
Jasminisis Alderslade, 1998	-	-	WCP	-	-	-	-	-
Pteronisis Alderslade, 1998	-	-	WCP	-	-	-	-	-
Zignisis Alderslade, 1998	-	-	WCP	-	-	-	-	-

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Subclass **Hexacorallia** Haeckel, 1866 (= Zoantharia Hyman, 1940)									
Order **Scleractinia** Bourne, 1900 (= Madereporaria Milne Edwards & Haime, 1857)									
Suborder **Astrocoeiina** Vaughan & Wells, 1943									
Family **Astrocoeniidae** Koby, 1890									
Madracis Milne Edwards & Haime, 1849	WI	EI	WCP	-	WA	EA	C	I	
Palauastrea Yabe & Sugiyama, 1941	-	EI	WCP	-	-	-	C	I	
Stephanocoenia Milne Edwards & Haime, 1849	-	-	-	-	WA	-	C	I	
Stylocoeniella Yabe & Sugiyama, 1935	WI	EI	WCP	-	-	-	C	I	
Family **Pocilloporidae** Gray, 1842									
Pocillopora Lamarck, 1816	WI	EI	WCP	EP	-	-	C	I	
Seriatopora Lamarck, 1816	WI	EI	WCP	-	-	-	C	I	
Stylophora Schweigger, 1819	WI	EI	WCP	-	-	-	C	I	
Family **Acroporidae** Verrill, 1902									
Acropora Oken, 1815	WI	EI	WCP	EP	WA	-	C	I	4
Anacropora Ridley, 1884	WI	EI	WCP	-	-	-	C	I	
Astreopora Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Enigmopora Ditlev, 2003	-	-	WCP	-	-	-	C	I	
Isopora Studer, 1878	WI	EI	WCP	-	-	-	C	I	4
Montipora Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Suborder **Fungiina** Verrill, 1865									
Family **Agariciidae** Gray, 1847									
Agaricia Lamarck, 1801	-	-	-	-	WA	-	C	I	
Coeloseris Vaughan, 1918	WI	EI	WCP	-	-	-	C	I	
Gardineroseris Scheer & Pillai, 1974	WI	EI	WCP	EP	-	-	C	I	
Leptoseris Milne Edwards & Haime, 1849	WI	EI	WCP	EP	WA	-	C	I	5
Pachyseris Milne Edwards & Haime, 1849	WI	EI	WCP	-	-	-	C	I	
Pavona Lamarck, 1801	WI	EI	WCP	EP	-	-	C	I	
Family **Siderastreidae** Vaughan & Wells, 1943									
Anomastraea Marenzeller, 1901	WI	-	-	-	-	-	C	I	
Coscinaraea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Horastrea Pichon, 1971	WI	-	-	-	-	-	C	I	
Psammocora Dana, 1846	WI	EI	WCP	EP	-	-	C	I	
Pseudosiderastrea Yabe & Sugiyama, 1935	WI	EI	WCP	-	-	-	C	I	
Siderastrea Blainville, 1830	WI	EI	WCP	EP	WA	EA	C	I	
Family **Fungiidae** Dana, 1846									
Cantharellus Hoeksema & Best, 1984	WI	EI	WCP	-	-	-	C	I	
Ctenactis Verrill, 1864	WI	EI	WCP	-	-	-	C	I	
Fungia Lamarck, 1801	WI	EI	WCP	EP	-	-	C	I	
subgenus *Cycloseris* Milne Edwards & Haime, 1849	WI	EI	WCP	EP	-	-	C	I	6, 7
subgenus *Danafungia* Wells, 1966	WI	EI	WCP	-	-	-	C	I	6
subgenus *Fungia* Lamarck, 1801	WI	EI	WCP	-	-	-	C	I	6
subgenus *Lobactis* Verrill, 1864	WI	EI	WCP	-	-	-	C	I	6
subgenus *Pleuractis* Verrill, 1864	WI	EI	WCP	-	-	-	C	I	6
subgenus *Verrillofungia* Wells, 1966	WI	EI	WCP	-	-	-	C	I	6
subgenus *Wellsofungia* Hoeksema, 1989	WI	EI	WCP	-	-	-	C	I	6
Halomitra Dana, 1846	WI	EI	WCP	-	-	-	C	I	
Heliofungia Wells, 1966	-	EI	WCP	-	-	-	C	I	
Herpolitha Eschscholtz, 1825	WI	EI	WCP	-	-	-	C	I	
Lithophyllon Rehberg, 1892	-	EI	WCP	-	-	-	C	I	
Podabacia Milne Edwards & Haime, 1849	WI	EI	WCP	-	-	-	C	I	
Polyphyllia de Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Sandalolitha Quelch, 1884	WI	EI	WCP	-	-	-	C	I	
Zoopilus Dana, 1846	-	-	WCP	-	-	-	C	I	

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Family **Poritidae** Gray, 1842									
Alveopora Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Calathiscus Claereboudt & Al-Amri, 2004	WI	-	-	-	-	-	C	I	8
Goniopora Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Porites Link, 1807	WI	EI	WCP	EP	WA	EA	C	I	
Poritipora Veron, 2000	WI	EI	-	-	-	-	C	I	
Stylaraea Milne Edwards & Haime, 1851	WI	EI	WCP	-	-	-	C	I	
Suborder **Faviina** Vaughan & Wells, 1943									
Family **Faviidae** Gregory, 1900									
Australogyra Veron & Pichon, 1982	-	-	WCP	-	-	-	C	I	
Barabattoia Yabe & Sugiyama, 1941	-	EI	WCP	-	-	-	C	I	
Caulastrea Dana, 1846	WI	EI	WCP	-	-	-	C	I	
Cladocora Ehrenberg, 1834	-	-	-	-	WA	EA	C	I	
Colpophyllia Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	
Cyphastrea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Diploastrea Matthai, 1914	WI	EI	WCP	-	-	-	C	I	
Diploria Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	
Echinopora Lamarck, 1816	WI	EI	WCP	-	-	-	C	I	
Erythrastrea Scheer & Pillai, 1983	WI	-	-	-	-	-	C	I	
Favia Oken, 1815	WI	EI	WCP	-	WA	EA	C	I	9
Favites Link, 1807	WI	EI	WCP	-	-	-	C	I	
Goniastrea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Leptastrea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Leptoria Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Manicina Ehrenberg, 1834	-	-	-	-	WA	-	C	I	
Montastrea de Blainville, 1830	WI	EI	WCP	-	WA	EA	C	I	
Moseleya Quelch, 1884	-	EI	WCP	-	-	-	C	I	
Oulastrea Milne Edwards & Haime, 1848	-	EI	WCP	-	-	-	C	I	
Oulophyllia Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Parasimplastrea Sheppard, 1985	WI	-	-	-	-	-	C	I	
Platygyra Ehrenberg, 1834	WI	EI	WCP	-	-	-	C	I	
Plesiastrea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Solenastrea Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	
Family **Trachyphylliidae** Verrill, 1901									
Trachyphyllia Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Family **Oculinidae** Gray, 1847									
Galaxea Oken, 1815	WI	EI	WCP	-	-	-	C	I	10
Oculina Gray, 1847	-	-	-	-	WA	EA	C	I	
Simplastrea Umbgrove, 1939	-	-	WCP	-	-	-	C	I	
Schizoculina Wells, 1837	-	-	-	-	-	EA	C	I	
Family **Meandrinidae** Gray, 1847									
Ctenella Matthai, 1928	WI	-	-	-	-	-	C	I	
Dendrogyra Ehrenberg, 1834	-	-	-	-	WA	-	C	I	
Dichocoenia Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	
Eusmilia Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	11
Gyrosmilia Milne Edwards & Haime, 1851	WI	-	-	-	-	-	C	I	11
Meandrina Lamarck, 1801	-	-	-	-	WA	-	C	I	
Montigyra Matthai, 1928	-	EI	-	-	-	-	C	I	11
Family **Merulinidae** Verrill, 1866									
Boninastrea Yabe & Sugiyama, 1935	-	-	WCP	-	-	-	C	I	
Hydnophora Fischer de Waldheim, 1807	WI	EI	WCP	-	-	-	C	I	
Merulina Ehrenberg, 1834	WI	EI	WCP	-	-	-	C	I	
Paraclavarina Veron, 1985	-	-	WCP	-	-	-	C	I	
Scapophyllia Milne Edwards & Haime, 1848	-	EI	WCP	-	-	-	C	I	

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Family **Mussidae** Ortmann, 1890									
Acanthastrea Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Australomussa Veron, 1985	-	EI	WCP	-	-	-	C	I	
Blastomussa Wells, 1961	WI	EI	WCP	-	-	-	C	I	
Cynarina Brüggemann, 1877	WI	EI	WCP	-	-	-	C	I	
Indophyllia Gerth, 1921	-	-	WCP	-	-	-	C	I	
Isophyllia Milne Edwards & Haime, 1851	-	-	-	-	WA	-	C	I	
Lobophyllia de Blainville, 1830	WI	EI	WCP	-	-	-	C	I	
Mycetophyllia Milne Edwards & Haime, 1848	-	-	-	-	WA	-	C	I	
Micromussa Veron, 2000	WI	EI	WCP	-	-	-	C	I	
Mussa Oken, 1815	-	-	-	-	WA	-	C	I	
Mussismilia Ortmann, 1890	-	-	-	-	WA	-	C	I	
Scolymia Haime, 1952	WI	EI	WCP	-	WA	EA	C	I	12
Symphyllia Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Family ***Pectiniidae*** Vaughan & Wells, 1943									
Echinomorpha Veron, 2000	-	-	WCP	-	-	-	C	I	
Echinophyllia Klunzinger, 1879	WI	EI	WCP	-	-	-	C	I	
Mycedium Oken, 1815	WI	EI	WCP	-	-	-	C	I	
Oxypora Saville-Kent, 1871	WI	EI	WCP	-	-	-	C	I	
Pectinia Oken, 1815	WI	EI	WCP	-	-	-	C	I	13
Family **Rhizangiidae** d'Orbigny, 1851									
Astrangia Milne Edwards & Haime, 1848	-	-	-	-	WA	EA	C	I	
Suborder **Caryophylliina** Vaughan & Wells, 1943									
Family **Caryophylliidae** Gray, 1847									
Heterocyathus Milne Edwards & Haime, 1848	-	EI	WCP	EP	WA	-	C	I	14
Family **Euphyllidae** Veron, 2000									
Catalaphyllia Wells, 1971	-	EI	WCP	-	-	-	C	I	
Euphyllia Dana, 1846	-	EI	WCP	-	-	-	C	I	
Nemenzophyllia Hodgson & Ross, 1981	-	EI	WCP	-	-	-	C	I	
Physogyra Quelch, 1884	-	-	WCP	-	-	-	C	I	
Plerogyra Mile Edwards & Haime, 1848	-	-	WCP	-	-	-	C	I	
Suborder **Dendrophylliina** Vaughan & Wells, 1943									
Family **Dendrophyllidae** Gray, 1847									
Balanophyllia Wood, 1844	WI	EI	WCP	EP	WA	EA	C	I	
Dendrophyllia de Blainville, 1830	WI	EI	WCP	EP	WA	EA	C	I	
Duncanopsammia Wells, 1936	-	EI	WCP	-	-	-	C	I	
Heteropsammia Milne Edwards & Haime, 1848	WI	EI	WCP	-	-	-	C	I	
Tubastraea Lesson, 1829	WI	EI	WCP	EP	WA	EA	C	I	
Turbinaria Oken, 1815	WI	EI	WCP	-	-	-	C	I	
Superclass **Hydrozoa** Owen, 1943									
Class **Leptolida** Haeckel, 1879									
Subclass **Anthoathecatae** Cornelius, 1992									
Order **Capitata** Kühn, 1913									
Superfamily **Zancleoidea** Russel, 1828									
Family **Milleporidae** Fleming, 1828									
Millepora Linnaeus, 1758	WI	EI	WCP	EP	WA	-	C	I	

Table 1 (continued): List of extant reef coral genera with their presence or absence (-) in tropical oceanic regions, and their conservation status.

Subclass **Athecatae** Hincks, 1868								
Order **Filifera** Kühn, 1913								
Superfamily **Hydractinioidea** Bouillion, 1978								
Family ***Stylasteridae*** Gray, 1847								
Distichopora Lamarck, 1816	WI	EI	WCP	EP	WA	-	C	-
Stylaster Gray, 1831	WI	EI	WCP	EP	WA	EA	C	-

1. *Cervera* occurs in the Indo-Pacific according to Fabricius & Alderslade (2001), but this may concern a yet undescribed genus. The original genus *Cervera* López-González, Ocaña, García Gómez & Núñez, 1995 (family Cornulariidae) includes two species from the East Atlantic (www4).
2. Tixier-Durivault (1955) and Verseveldt and Ofwegen (1992) described *Alcyonium* species from shallow water of the tropical East Atlantic. They probably belong to yet undescribed genera.
3. One assumedly invasive species is known from Brazil (Ofwegen, 2005).
4. *Isopora* was upgraded from subgenus to genus level and excluded from *Acropora* (Wallace *et al.*, 2007).
5 *Helioseris* Milne Edwards & Haime, 1849 has been synonymised with *Leptoseris* (Wells, 1956; Veron, 2000).
6. Subgenera will likely be upgraded to genus level (Hoeksema, 1989; Gittenberger *et al.*, 2006).
7. *Diaseris* Milne Edwards & Haime, 1849 has been synonymised with *Cycloseris* (Hoeksema, 1989).
8. A recently described monospecific Arabian Gulf endemic (Claereboudt & Al-Amri, 2004).
9. *Favia* species of the IWP and Atlantic may not be directly related (Fukami *et al.*, 2004).
10. *Acrhelia* Milne Edwards & Haime, 1849 was synonymised with *Galaxea* (Veron, 2000).
11. Moved from the Caryophyllidae (Veron, 2000).
12. *Scolymia* species of the IWP and Atlantic may not be directly related (Fukami *et al.*, 2004).
13. *Physophyllia* Duncan, 1884 was synonymised with *Pectinia* (Veron, 2000).
14. The record of *Heterocyathus* from the West Atlantic (Colombia) is very recent. It is as yet not officially published (Reyes and Santodomingo, 2004; Gracia *et al.*, 2004; Reyes *et al.*, in press).

BIOGEOGRAPHIC ANALYSIS

There is strong resemblance between soft and hard coral genera with regard to their relative abundance in six major oceanic regions (Table 2). The West-Central Pacific (WCP) is the oceanic region that shows the highest concentrations of genera for both categories; it is also known as the Central-West Pacific (Cairns, 2006). The West and East Indian Ocean regions (WI, EI) are almost as rich as the West-Central Pacific with regard to hard coral genera but distinctly poorer with regard to soft coral genera. The East Atlantic (EA) and the East Pacific (EP) are the poorest regions. The West Atlantic (WA) is twice as rich in comparison. On average, higher numbers of hard coral genera are represented in oceanic regions than soft coral genera. They have been investigated more intensively and this may be why they show wider distribution ranges (Table 3).

In a comparison of distribution ranges of reef coral genera it is obvious that Indo-West Pacific ranges (WI-EI-WCP) are most common (Table 3). A large majority of ranges includes the WCP

Table 2: Abundance of reef coral (sub)genera in six tropical oceanic regions explained in Table 1.

Region:	WI	EI	WCP	EP	WA	EA	Total number of representations in any oceanic region
Soft coral genera (n=126)	64	65	97	11	25	09	274
Hard coral genera (n=125)	84	91	99	17	32	14	336

Table 3: Numbers of soft and hard reef coral (sub)genera in distribution ranges over oceanic regions (see Table 1).

	Soft coral genera	Hard coral genera	Total
WI	2	7	9
WI-EI	0	1	1
WI-EI-WCP	54	56	110
WI-EI-WCP-EP	1	6	7
WI-EI-WCP-EP-WA	0	4	4
WI-EI-WCP-EP-WA-EA	1	6	7
EI	0	1	1
EI-WCP	8	12	20
	Soft coral genera	Hard coral genera	Total
EI-WCP-EP	0	0	0
EI-WCP-EP-WA	0	1	1
WCP	22	10	32
WCP-EP	0	0	0
EP	6	0	6
EP-WA	2	0	2
WA	13	14	27
WA-EA	1	3	4
EA	5	1	6
EA-WI	0	0	0
Disjunct ranges incl. WCP	11	4	1

region. There are some genera endemic to a single oceanic region, such as the West and East Indian Ocean (WI, EI) predominantly with regard to hard coral genera, whereas the West-Central Pacific (WCP), the East Pacific (EI), and the East Atlantic (EA) show dominance of endemic soft coral genera. In the West Atlantic (WA), endemic soft and hard coral are nearly equally represented. Genera represented by a pan-Indian Ocean range (**WI-EI**) are uncommon. Several genera range only from the East Indian Ocean into the West Central Pacific (**EI-WCP**), or only from the West to the East Atlantic (**WA-EA**), but no genera are known only across the Pacific (**WCP-EP**). A few genera are represented at both sides of the former Panama Seaway (WI-EI-WCP-**EP-WA**, WI-EI-WCP-**EP-WA**-EA, EI-WCP-**EP-WA**, **EP-WA**, **EP-WA**-EA), which ceased to exist in the Pliocene, while only seven genera with circumtropical ranges (**WI**-EI-WCP-EP-WA-**EA**) have remained at both sides of former Tethys Sea (EA-WI) after its closure when Africa collided with Eurasia (Eocene - Late Miocene). Most coral genera showing disjunct ranges belong to the Alcyonacea, which may indicate that this group of soft corals has been studied less intensively.

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