Sea anemone Diversity

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Sea anemones are animals belonging to the phylum Cnidaria, which includes the jellyfish, corals, and sea pens. They live in coastal waters throughout the world, are abundant in tropical oceans from the shore to a depth of 10,000 metres, and range in size from one centimetre to almost two metres in diameter. They attach themselves to rocks, seafloors, and other hard surfaces; some forms burrow in the mud and sand. There are over 1,000 species of sea anemones reported worldwide. They are usually about 2.5–10 cm across, but a few grow up to 1.8 m across.

India's scenario

Though India has 7600 km of coastline, studies on sea anemones in Indian waters are very limited. The actiniarian sea anemone fauna of India is so far known from a few places: West Bengal (Port Canning), Orissa (Chilika Lake), Tamil Nadu (Adyar backwaters, Palk Bay, and the Gulf of Mannar), Kerala (Cochin backwaters and Ashtamudi), Gujarat (Gulf of Kachchh), Maharashtra (Mumbai, Malvan), Goa, northern Karnataka, and the Andaman and Nicobar Islands.

The sea anemones of India were documented from various coastal and marine habitats of India (Annandale, 1907, 1915; Carlgren, 1925; Panikkar, 1936, 1937a-c, 1939; Parulekar, 1967, 1968, 1969a, 1971, 1990;

Seshaiya and Cuttress, 1969; Hartog and Vennam, 1993; Madhu and Madhu, 2007; Raghunathan et al., 2014), and the recorded diversity is represented by 54 species belonging to 40 genera and 20 families, and the majority of the records are from the west coast (Raghunathan et al., 2014). They are radial-symmetric with a columnar body and have a single body opening, the mouth, which is surrounded by tentacles. However, the body shape of sea anemones is often related to the habitat in which they live. Sea anemones are solitary polyps and are considerably larger and heavier than the polyps of hydrozoans (Barnes, 1982). They have a flat upper surface with a central mouth surrounded by tentacles, a tubular body, and a flat base that attaches to the substrate.

Taxonomic positions:

Kingdom: Animalia
Phylum: Cnidaria
Class: Anthozoa
Sub-class: Hexa-coralliaOrder: Actinaria

The class Anthozoa - key characters: (includes corals, anemones, sea pens and sea fans)solitary or colonial polyps that don't have a medusoid stage; they only live in the ocean; they are attached to or fixed to the substrate; their bodies are cylinder-shaped and symmetrical in two directions; about 6,100 species are known.

- The oral end is expanded to form an oral disc, bearing six to several hundred hollow tentacles surrounding the mouth; the ectoderm and endoderm are separated by a strong mesoglea containing fibres and cells.
- Vertical partitions are present in the entrance.
- A skeleton may or may not be present. (Absent in Sea Anemone).
- The sex cells are endodermal in origin, and the sexual products are discharged into the coelenteron for asexual reproduction by budding.

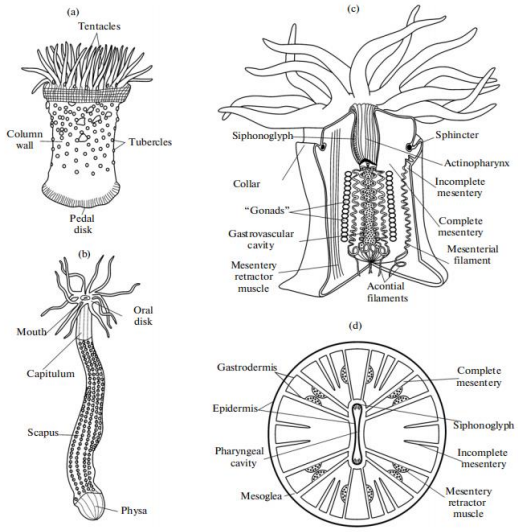
The Order: Actinaria

- Sea anemones are in the order Actinaria and are often called true anemones.
- They have an adhesive pedal disc or foot used to hold them in place and a hollow cylindrical or column-shaped body.
- An oral disc or mouth at the top is surrounded by a circle of tentacles containing stinging cells or nematocysts.
- They lack the calcareous skeletons in their bodies.

The Order: Ceriantharia

- They are also known as tube-dwelling anemones.
- Tube-dwelling anemones are known for being solitary and living and withdrawing into tubes that are buried in soft sediments.
- The tube anemones have elongated bodies adapted for burrowing, and they lack a pedal disc or foot.
- The cylindrical-shaped body is covered by a tube of secreted mucus and is usually hidden in the muddy substratum.
- The mouth is surrounded by short tentacles in the centre and longer tentacles on the margins.

Ceriantharia includes the orders Spirularia and Penicillaria.



External view and structure of sea anemones: (a) Anthopleura artemisia; (b) wormlike sea anemone Edwardsia andresi; (c) general anatomical scheme; and (d) scheme of trans verse section of sea anemone at the actinopharynx level (Bocharova & Kozevich, 2011).

In sea anemones, the tentacles number (from a few to hundreds), their colour, and their arrangements are the distinguishing characteristics for species identification. Normally, tentacles are short or long, thin or thick, pointed, blunt, globular, or tree-like.

Diversity and Distribution of sea anemones in India

Sl. No	Order/Family/Genus/Species	West Coast	East Coast	Andaman and Nicobar Islands
1	Order: Actiniaria Family: Acontiophoriidae,Carlgren 1938 Genus: *Acontiophorum* Carlgren, 1938 1. *Acontiophorum bombayensis* Parulekar,1968	Mumbai, Malvan and Karwar		
2	Family: Actiniidae Rafi nesque, 1815 Genus: *Actinogeton* Carlgren, 1938 2. *Gyractis sesere* (Haddon & Shackleton,1893) Genus: *Entacmaea* Ehrenberg, 1834 3. *Entacmaea quadricolor* (Rueppel and Leuckar, 1828) Genus: *Anemonia* Risso, 1826 4. *Anemonia indica* Parulekar, 1968 Genus: *Anthopleura* Duchassaing de Fonbressin & Michelotti, 1860 5. *Anthopleura asiatica* Uchida and	Mumbai (Cuffe Parade) Gulf of Kachchh, Maharastra, Goa and North Karnataka		North, Middle, South and Little Andaman, Ritchie's Archipelago and MGNP

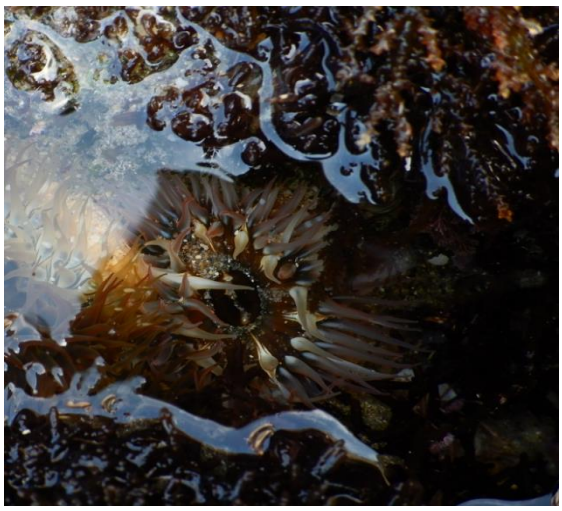
	Muramatsu, 1958 6. *Anthopleura midori* Uchida and Muramatsu,1958 7. *Anthopleura pacifi ca* Uchida & Muramatsu, 1958 8. *Anthopleura panikkarii* Parulekar, 1969 9. *Anthopleura handi* Dunn, 1978 Genus: *Bunodactis* Verrill, 1869 10. *Bunodactis nicobarica* Carlgren, 1928 Genus: *Bunodosoma* Verrill, 1899 11. *Bunodosoma granulifera* Leseur, 1917 Genus: *Cribrinopsis* Carlgren, 1921 12. *Cribrinopsis robertii* Parulekar, 1971 13. *Cribrinopsis* sp. Genus: *Glyphoperidium* Roule, 1909 14. *Glyphoperidium bursa* Roule, 1909 Genus: *Glyphostylum* Roule, 1909 15. *Glyphostylum calyx* Roule, 1909 Genus: *Parabunodactis* Carlgren, 1928 16. *Parabunodactis infl exibilis* Carlgren, 1928 Genus: *Paracondylactis* Carlgren, 1928 17. *Paracondylactis sinensis* Carlgren, 1934 18. *Paracondylactis sagarensis* Bhattacharya, 1979 Genus: *Macrodactyla* Haddon, 1898 19. *Macrodactyla doreensis* (Quoy & Gaimard, 1833)	Mumbai, Malavan and Anjidiv Island Maharashtra, Goa, and North Karnataka Mumbai, Malvan and Goa Maharashtra, Goa, North Karnataka and Kerala (Vizhinjam) Mumbai Maharashtra and Goa Mumbai Off Southwest Coast Off southwest coast and Lakshadweep Sea Bombay and Gujarat (Sikka)	Mandapam and Tuticorin Gangetic delta Sagar Island, Sunderbans	South Andaman (Port Blair) South Andaman Andaman Sea Andaman Sea Middle Andaman

3	Family: Actinodendronidae Haddon, 1898 Genus: *Actinodendron* de Blainville, 1830 20. *Actinodendron glomeratum* Haddon, 1898			Ritchie's Archipelago
4	Family: Actinostoiidae Carlgren, 1938 Genus: *Bathydactylus* Carlgren, 1928 21. *Bathydactylus valdiviae* Carlgren, 1928	Off west coast		
5	Family: Aiptasiidae Carlgren,1924 Genus: *Aiptasia* Gosse, 1858 22. *Aiptasia* sp. Genus: *Neoaiptasia* Parulekar, 1969 23. *Neoaiptasia commensali* Parulekar, 1969	Mumbai Padmagad		
6	Family: Aiptasiomorphidae (Stephenson, 1920) Genus: *Haliplanella* Hand, 1956 24. *Haliplanella lineata* (Verrill, 1870)	Gulf of Kachchh, Mumbai, Central and southwest coast		
7	Family: Aliciidae (Duerden, 1897) Genus: *Alicia* Johnson, 1861 25. *Alicia sansibarensis* Carlgren, 1900	Central and southwest coast		
8	Family: Boloceroidae Carlgren, 1924 Genus: *Boloceractis* Panikkar, 1937 26. *Boloceractis gopalayi* Panikkar, 1937 Genus: *Boloceroides* Carlgren, 1899 27. *Boloceroides mcmurrichi* Kwiteriewski, 1898 Genus: *Bunodeopsis* Andres, 1881 28. *Bunodeopsis* sp.	Cochin backwaters and Asthamudi Lake Central westcoast	Chennai Chennai	
9	Family: Diadumeneidae (Stephenson, 1920) Genus: *Diadumene* Stephenson, 1920 29. *Diadumene schilleriana* Stoliczka, 1863	West coast	Tuticorin, Mandapam, Chandipur and Digha	
10	Family: Edwardsiidae Andres, 1880 Genus: *Edwardsia* Quatrefages, 1842 30. *Edwardsia jonesii* Seshaiya & Curtress, 1969 31. *Edwardsia tinctrix* Annandale, 1915	Mumbai, Malvan and Goa	Port Novo (Tamil Nadu) Chennai,	

			Chilka Lake	
11	Family: Halcampidae Andreas, 1883 Genus: *Halcampa* Gosse, 1858 32. *Halcampa capensis* Carlgren, 1938 Genus: *Mena* Stephenson, 1920 33. *Mena limnicola* Annandlae, 1915	Northwest coast	Chilka Lake and Balramghadi (Odisha)	
12	Family: Haliactiidae Carlgren, 1949 Genus: *Pelocoetes* Annandale, 1915 34. *Pelocoetes exul* (Annandlae, 1915) 35. *Pelocoetes minima* Panikkar, 1939 Genus: *Phytocoetes* Annandale, 1915 36. *Phytocoetes gangeticus* Annandale, 1915 Genus: *Phytocoetopsis* Panikkar 1936 37. *Phytocoetopsis ramunni* Panikkar, 1936 Genus: *Stephensonactis* Panikkar, 1936 38. *Stephensonactis ornata* Panikkar, 1936	Gulf of Cambay, Mumbai, Malvan, Goa estuaries, and Cochin backwaters West coast West coast	Chennai and Gangetic delta Chennai and Sagar Island East coast Chennai East coast	
13	Family: Haloclavidae Verrill, 1899 Genus: *Metapeachia* Carlgren, 1943 39. *Metapeachia tropica* Panikkar, 1938	Mumbai, Malvan and Goa	Kurusadai Island in Gulf of Mannar	
14	Family: Hormathiidae Carlgren, 1932 Genus: *Calliactis* Verrill, 1869 40. *Calliactis miriam* Haddon & Shackleton, 1893 Genus: *Paraphellia* Haddon, 1889 41. *Paraphellia sanzoi* Colabresi, 1926	Gulf of Kachchh		South Andaman
15	Family: Isophelliidae Stephenson, 1935 Genus: *Telmatactis* Gravier, 1916 42. *Telmatactis decora* (Hemprich &			South Andaman

	Ehrenberg in Ehrenberg, 1834)			
16	Family: Metridiidae (Carlgren 1893) Genus: *Metridium* de Blainville, 1824 43. *Metridium senile* (Linnaeus, 1761)	West coast	East coast	South Andaman (Port Blair)
17	Family: Nevadneidae, Carlgren 1925 Genus: *Nevadne* Stephenson, 1922 44. *Nevadne glauca* Annandale 1915	Goa estuaries	Chilka Lake	
18	Family: Phymanthidae Andres, 1883 Genus: *Phymanthus* Milne Edwards, 1857 45. *Phymanthus buitendijki* Pax, 1924 *46. Phymanthus loligo* Hand E Ehrenberg 1834	Gulf of Kachchh	Gulf of Mannar	South Andaman
19	Family: Stichodactylidae Andres, 1883 Genus: *Heteractis* Milne Edwards, 1857 47. *Heteractis aurora* (Quoy and Gaimard, 1833) 48. *Heteractis crispa* (Hemprich & Ehrenberg, 1834) 49. *Heteractis magnifi ca* (Quoy and Gaimard, 1833) 50. *Heteractis malu* (Haddon & Shackleton, 1893) Genus: *Stichodactyla* Brandt, 1835 51. *Stichodactyla gigantea* (Forskål, 1775) 52. *Stichodactyla haddoni* (Saville-Kent, 1893) 53. *Stichodactyla mertensii* (Brandt, 1835)	Gulf of Kachchh	Gulf of Mannar	South Andaman and MGMNP North, Middle and Little Andaman, MGMNP, Ritchie's Archipelago and Nicobar North, Middle, South and Little Andaman, MGMNP, Ritchie's Archipelago and Nicobar South, Middle, and North Andaman MGMNP North, Middle and South Andaman, and MGMNP

				North Andaman
20	Family: Thalassianthidae Milne Edwards, 1857 Genus: *Cryptodendrum* Klunzinger, 1877 54. *Cryptodendrum adhaesivum* Milne Edwards, 1857			South, Middle, and North Andaman
	Number of Families, Genera & Species recorded	**17, 29 & 32**	**11, 16 & 19**	**8, 13 & 19**



Tentacle Sea anemone, *Anthopleura sp*

*Anthopleura sp*collectedfrom Notchiurani, Gulf of Mannar. (Photo Credit: S. Thirumalaiselvan)

The oral disc is small, tentacles are moderately long and tapered at the tip. Verrucae is not prominent to which pieces of shell and gravel adhere at the distal part. The oral disc is dark brown, mouth is raised on the cone. Tentacles are transparent with prominent irregular lines (spots) that can be seen on the upper side and they are broad at the base and tapered at the tip. The column is white, and firmly attached to the substratum.

Carpet Sea anemone, *Stichodactyla sp*

The oral disc is flat, broad, and deeply folded with numerous short tentacles which are highly robust at the periphery of the disc. Tentacles are grey or green in colour and adhesive, no tentacles aroundthe mouth, the upper side of the oral disc is pale orange and the column is brown in colour.

Stichodactyla haddoni from the Gulf of Mannar. (Photo Credit: Raju Saravanan)

Tube-dwelling anemones, *Cerianthus sp*

Cerianthus membranaceus reported from Mediterranean and East Atlantic water. (Photo Credit: G. Mazza)

They do not have a pedal disc with which to hold themselves in position. They live semi-buried in a soft substrate surrounded by a parchment-like tube which they secrete. This surrounds the whole anemone up to its crown of tentacles. Sand grains, debris and shell fragments usually stick to the outer side of the

tube. Some of the larger species can have a column of up to 25 inches (64 cm) in length.

Sea Anemone venom

Sea Anemone venom is delivered from specialised stinging cells called nematocysts that are fired semi-autonomously after mechanical or chemical stimulation and can penetrate skin to deliver venom. Nematocysts are utilised by anemones for a range of functions, including protection from predators, interspecific competition, and the acquisition of prey. In addition to nematocysts, anemones also secrete a mucus coat as a form of self-protection that contains cytolysins and neurotoxins.

References

Daly, M., Fautin, D.G. and Cappola, V.A., 2003. Systematics of the hexacorallia (Cnidaria: Anthozoa). *Zoological Journal of the Linnean Society*, *139*(3), pp.419-437.

Bocharova, E.S. and Kozevich, I.A., 2011. Modes of reproduction in sea anemones (Cnidaria, Anthozoa). *Biology bulletin*, *38*, pp.849-860.

Raghunathan, C., Raghuraman, R., Choudhury, S. and Venkataraman, K., 2014. Diversity and distribution of sea anemones in India with special reference to Andaman and Nicobar Islands. *Records of the Zoological Survey of India*, *114*(2), pp.269-294.

Davie, P.J. and Phillips, J.A., 2008. Thirteenth International Marine Biological Workshop: The Marine Fauna and Flora of Moreton Bay, Queensland. *Memoirs of the Queensland Museum*, *54(1)*, p.35-64.

Madhu, R. and Madhu, K., 2007. Occurrence of anemonefishes and host sea anemones in Andaman and Nicobar Islands. *Journal of the Marine Biological Association of India*, *49*(2), pp.118-126.

Fautin, D.G., Tan, R., Liang, W., Yap, N., Hee, T.S., Crowther, A., Goodwill, R., Sanpanich, K. and Chieh, T.Y., 2015. Sea anemones (Cnidaria: Actiniaria) of Singapore: shallow-water species known also from the Indian subcontinent. *Raffles Bulletin of Zoology*.

Parulekar, A., 1990. Actiniarian sea anemone fauna of India. In: Marine Bio fouling and Power Plants (Eds. K.V.K. Niltil and V.P. Venegopalan) P. 218-228.

Fautin, D.G. and G.R. Allen, 1992. Field guide to anemone fishes and other host sea anemones. Western Australian Museum, Perth, Australia, 67p