# Soft coral and Gorgonids Diversity

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Coral reefs, which constitutes 0.2% of the ocean's area, are the most productive and diverse ecosystems(Appeltans et al. 2012). Octocorals are one of the most abundant benthic animals in coral reef community.Octocorallia is a subclass within class Anthozoa and phylum Cnidaria. Soft corals, gorgonids, blue corals and sea pens belong to the subclass octocorallia. Globally, Octocorals are found in a11 marine environments from intertidal to the deep waters (Perez et al. 2016). In addition to serving as special importance for life-history stages for a wide range of different species, they also serve as microhabitats for marine animals and provide protection from predators. They are extremely significant from an ecological standpoint.Research on octocorals (soft corals and gorgonids) isinadequateas compared to hard corals, in spite of their importance to reef ecology and biodiversity.

Soft coralsare ahermatypic corals (Alcyonacea) that do not produce reefs or the calcium carbonate skeleton. They typically have vibrant colors and resemble underwater plants that sway in the ocean's waves. They are colonial, and small polyps frequently join together to become larger organisms.Gorgonidsare softcorals commonly known as Sea fans and Sea whips. They form colonies which are modular in nature, typically having several branches. They exhibit a rigid internal axis, made of calcite and gorgonin, in both the main stem and all of the branches.

These sclerites can be fused together or be made of scleroproteinous gorgonin. The soft tissue coenenchyme covering the entire axial skeleton is packed with many calcareous sclerites that are either embedded in it or resting on its surface.

#### General morphology

The characters including colony shape and sclerite characterization have historically been used to classify and identify members of theOrder Alcyonacea (Fabricius & Alderslade 2001).

# **Colony form**

The colony morphology of many common octocorals is branching type. Certain species can be easily distinguished based on the kind and degree of branching. Whip-like, capitate, encrusting, leaf-like, club-shaped, and pen-like are typical non-branching colony forms.

# Polyps

Each polyp has a cup-like form with a ring of tentacles encircling a central opening known as a pharynx, which serves as the organism's mouth and anus. Eight tentacles, or octo-coral, are borne by polyps invariably. These tentacles are typically (though not always) bordered along both edges by one or more rows of pinnules and eight complete mesenteries. Polyps can exist alone or in colonies. Monomorphic colonies are those that contain only one kind of polyp, whereas dimorphic colonies contain two different types of polyps. Monomorphic taxa are those that only have autozoid polyps (Bayer et 1983). A secondary reduced polyp a1. (siphonozooid) that is responsible for siphoning water into the colony and potentially involved in reproduction, may also be present in certain taxa which are deemed dimorphic (Bayer et al. 1983).

# Tissues

The outer layer of polyp tissue in contact with the external environment is the epidermis, which contains various specialized cells, such as cnidocytes. The inner tissue layer, the gastrodermis, lines the tentacles and the gastrodermal cavity, and thus covers eight mesenteries and the inner surface of the pharynx. The coenenchyme is the colonial tissue between the polyps and includes the calyces or polyp mounds (if present). This tissue is perforated by many solenia, the narrow canals that transport fluids between the polyps. In species that have a spiculated axis, the coenenchyme is often referred to as the cortex.

# Sclerites

All calcified tiny components imbedded in the coenenchyme of octocorals are referred to as sclerite. The terms capstan, spicule, spindle, double head, rod, plate, club, etc. are more precise terms for each sclerite form. Bayer et al.

(1983) provided images that represent the different morphologies of over 150 types of sclerites. With the exception of few species, sclerite morphology plays an important role in the classification and identification of octocorals.

#### Axis

Octocorals, or more precisely, the Alcyonacea, are divided into sub-orders based on axis shape. The axis of the majority species might be horny, horny and calcified, or largely composed of sclerites.

#### Systematics and Taxonomy

#### Class Anthozoa Ehrenberg, 1831

#### Subclass Octocorallia Haeckel, 1866

#### Order Alcyonacea Lamouroux, 1812

There are 46 families of soft corals and sea fans in the order Alcyonacea (McFadden et al., 2022). Traditional taxonomic classification of the order into different sub-orders and families mostly based on gross morphological features (presence/absence and composition of a skeletal axis and the overall growth form of the colony). Alcyonacea are further subdivided into six suborders such as Alcyoniina, Calcaxonia, Holaxonia, Protoalcyonaria, Scleraxonia, and Stolonifera.Gorgonids (sea fans and sea whips) belongs to three sub-orders such as Scleraxonia, Holaxonia and Calcaxonia depending on the structure of the supporting axis. The soft corals are included in three sub-orders such asProtoalcyonaria, Stolonifera, and Alcyoniina due to lack of internal axes (Grasshoff 1999). Taxonomic assignments are conventionally based on similarities in colony morphology and sclerites according to the classification of Bayer (1981). In the order Alcyonacea, family-level classification is still considered unstable 2010).However, (McFadden et al.. this classification is presently referred by the majority taxonomists.

#### Methods for identification

Some basic laboratory equipments (dissection kit, Teasing needles or fine-pointed dental picks, Fine tipped forceps, Scalpels, Compound and Stereomicroscopes) are needed to examine specimens for identification. Furthermore, different chemicals are required to anesthetize, fix, and isolate sclerites. As with any work involving specialized tools and chemicals, care should be given to proper safety procedures and expert guidance. Basic procedure followed for identificationare as follows:

- a. Anaesthetization: Polyps can contract or completely retract into the coenenchyme in response to any disturbance of a live colony. Anaesthetizing the polyps in a colony to maintain them in their natural condition of expansion is crucial for accurate identification. There are different methods for anaesthetizing narcotizing marine or invertebrates. Magnesium sulfate solution (5 grams Magnesium sulfate and 45 milliliters de-ionized water) is the ideal choice in chemical narcotizing or relaxing octocoral polyps.
- b. **Specimen Fixation:** Once coral samples are removed from their aquatic environment, autolysis occurs, causing a breakdown of cells. A fixative solution is used to preserve soft tissue structure. Formalin is the easiest fixative, but may not retain nuclear details. Helly's Modified Seawater fixative is effective for histological work.
- **c.** Sclerites preparations: To collect tissue samples from a colony, remove fixed specimens from storage and cut them into pieces. Place the cut pieces on a glass slide and fit two to three samples on a microscope slide. Add sodium hypochlorite solution to the slide for digestion and separation of sclerites. After five minutes, the tissue breaks down, forming a foam or bubble, which is then removed by a teasing needle. Rinse the sclerites with distilled water and examine under a compound microscope.

#### **Diversity and Distribution**

Octocorals (soft corals and gorgonids) are found in all oceans across the world, ranging in depth from coastal waters to deep-sea abyssal depths, as well as from tropical to arctic regions (Van de Water et al., 2018). The Indo-Pacific's shallow coral reefs have been found to have the highest variety (Perez et al., 2016; Van de Water et al., 2018). Globally, benthic marine environments ranging from shallow waters to the deep sea are home to more than 3500 nominal species of gorgonian sea fans and soft corals (Williams and Cairns, 2018).

Pioneer works on alcyonarians from marine water of India was published in 1904 and 1905 by James Hornell and it was later discussed by Thomson and Crane (1909).Eight species have been documented from the Okhamandal, Gulf of Kutch. Moreover, an account of deep-sea alcyonaceans obtained from the Indian Ocean was published by Hickson (1903; 1905), Pratt (1903), Thomson and Henderson (1906), and Thomson and Henderson (1905). Gravely (1927) documented the distribution of alcyonarians around the Krusadai Island. A taxonomic study was carried out by Ridley (1888) on a few novel species of alcyonaceans that were gathered from the Indian Ocean and Bay of Bengal. According to Hickson (1931), there are a few extremely interesting issues raised by the limited collection of Alcyonaria from the Gulf of Mannar. There are 253 species of octocorals (Soft corals and gorgonids) from 66 genera and 21 families have been reported from Indian marine water. The species diversity have been reported more in the Andaman and Nicobar Islands (190 species) followed by Gulf of Mannar (47 species), and Lakshadweep islands (40 species). Species richness is highest for the family Alcyoniidae (87 species). Sinularia is reported to be more diverse among the octocoral genus from Indian coral reef ecosystem (Padmakumar and R. Chandran, 2012).

Pioneer research on the diversity of gorgonians from India was started in 1906 by Thomson and Henderson. They identified 50 species, 26 of which were new, from the oyster banks in the Gulf of Mannar. Later, 62 species from 27 genera and 22 species from 15 genera have been reported from Indian water byThomson and Simpson (1909) and Thomas and Rani (1987) respectively. There are reportedly 135 species of gorgonians in the Indian marine water. Venkataraman et al. (2004) reported 27 species of gorgonians from 8 families and 19 genera from India. Along the northeast coast of India,12 species of gorgonians from four families and nine genera have been documented (Thomas et al., 1995). However, only 10 species(four families and nine genera) have been recorded from the Andaman and Nicobar Islands (Venkataraman et al., 2004).

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