

Orbicella annularis (Boulder Star Coral)

Order: Scleractinia (Stony Corals)

Class: Anthozoa (Corals and Sea Anemones)

Phylum: Cnidaria (Corals, Sea Anemones and Jellyfish)



Fig. 1. Boulder star coral, *Orbicella annularis*.

[<http://www.caribbeanenvironments.com/blog/tag/agrra/> downloaded 15 October 2016]

TRAITS. The boulder star coral or lobed star coral *Orbicella annularis*, formerly known as *Montastraea annularis*, has the largest average colony size of any coral species (Fig. 1). Several morphological variations occur which depend on water depth, water currents, lighting and mineral concentrations. Colonies therefore exist as domes, columns or flat shelf-like structures (Dawson, 2006); however colonies are generally branching or lobed (Weil and Knowlton, 1994). Corallites (cups holding individual polyps) are 2.1-3.5mm in diameter, with 24-26 septa (dividing walls) and are uniformly spaced (Fig. 2). Septa usually have small teeth. Irregular corallite protrusions give the surface of the colony a rough texture. Colonies show variations in colour of the polyps, including shades of green to brown, yellow-brown and grey (Weil and Knowlton, 1994).

DISTRIBUTION. Widespread among the waters of the Caribbean Sea including the Bahamas, Florida, and the Gulf of Mexico (Fig. 3). Native to all islands in the Caribbean, for example, Trinidad and Tobago, Jamaica, Barbados and Grenada, among others (Aronson et al., 2008).

HABITAT AND ECOLOGY. Colonies thrive in marine waters ranging from 0.5-82m, however they are more abundant in reef environments from 1-10m deep (Aronson et al., 2008). Also found in lagoons and upper reef slopes. The Caribbean Sea is perfect for the growth of boulder star coral colonies as it provides all the optimal growth conditions such as warm water ranging from 23-29°C, clear water for light penetration and saline water ranging from 32-42 parts per thousand. The temperature and salinity of the water are essential for the secretion of the calcium carbonate exoskeleton from individual polyps. The boulder star coral cannot grow in opaque waters because, like all corals, light is required for the photosynthesis of the symbiotic algae zooxanthellae (NOAA, 2016). It is in this way that the coral obtains its energy, in fact, around three quarter of its energy requirements is obtained through this process. Additionally, the boulder star coral obtains nutrition when the polyps catch prey, mostly zooplankton (Weil and Knowlton, 1994).

REPRODUCTION. Reproduction is sexual. Boulder star coral is a hermaphrodite species. Each individual polyp houses both male and female reproductive organs which go on to produce the respective gametes. Gametogenesis a protogynous process in which eggs are developed mid-May to July and sperm are developed from July to August. Gametes are discharged in clusters (Fig. 4) and spawning occurs between mid-August and September. Fertilisation follows the ejection of sperm and eggs into the sea. Once fertilised, planulae larvae develop. Spawning and fertilisation can only occur in waters which are unpolluted (NatureServe Explorer, 2015).

BEHAVIOUR. Like other coral species, boulder star corals are sessile predators. They are non-locomotive organisms and as such, due to their limited movement, individual polyps move their tentacles to catch prey (Weil and Knowlton, 1994). Although they are sessile, colonies have been found miles apart from each other. This is because when the larvae develop after fertilisation, they travel great distances from their original spawning grounds before they attach to a surface. Unlike other members of the phylum Cnidaria, the medusa stage is absent. Only the polyp stage occurs after metamorphosis (Fig. 5). Similar to most corals, it is assumed that the average generation length for *O. annularis* is 10 years. Total longevity is most likely above ten years (Aronson et al., 2008). Colonies in high wave-swept waters produce sheet-like structures. Colonies in the shallow waters of Barbados and Tobago have long columnar shapes while colonies in the deeper waters of Bahamas have large lumpy shapes (Weil and Knowlton, 1994). Colour of the colonies depends highly on light intensity. Corals found in areas of high light intensity appear brighter in colour while those found in low light intensity areas possess darker shades. Colonial growth rates range from 6.3-11.2 mm per year depending on water depth (Hudson, 1981).

APPLIED BIOLOGY. Due to the massive size of *O. annularis* colonies, their presence in coral reefs aids in shoreline protection of Caribbean islands. Coral reefs and boulder star coral colonies form a barrier in the ocean that absorbs energy from storm waves, thus preventing coastal erosion. *O. annularis* colonies are spawning grounds for large numbers of fish and other aquatic organisms. This species therefore plays a pivotal role in maintaining the biodiversity in Caribbean waters. It is listed as endangered and major threats include infectious diseases such as the yellow band and black band disease, bleaching, predation by parrotfish, hurricanes, algal

overgrowth and sedimentation. Human threats include local fisheries, recreational and tourism activities and pollution (Aronson et al., 2008).

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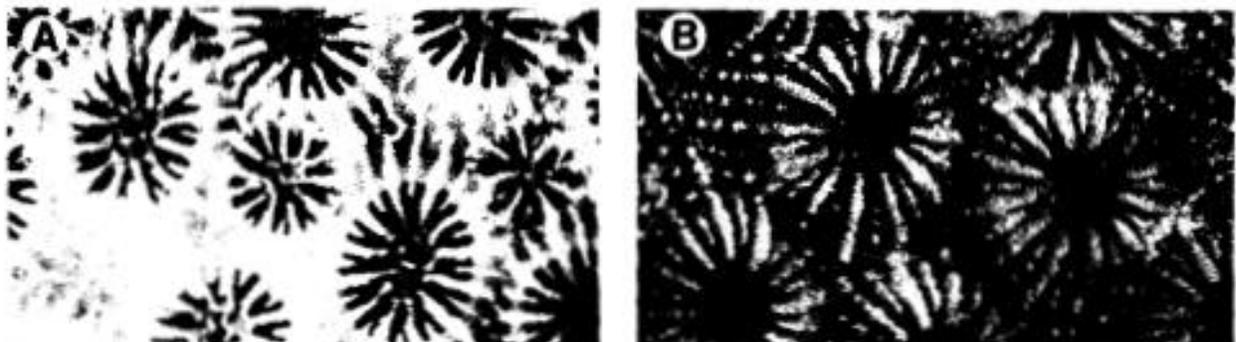


Fig. 2. Close-up of corallite structure of *O. annularis* for A) top of column, B) side of column.

[Fig.7 of Weil and Knowlton, 1994]



Fig. 3. Geographic distribution of *O. annularis*.

[<https://biodiversitywarriors.wikispaces.com/Boulder+Star+Coral>, downloaded 20 October 2016]



Fig. 4. Gamete clusters being released from *O. annularis*.

[<https://biodiversitywarriors.wikispaces.com/Boulder+Star+Coral>, downloaded 20 October 2016.]

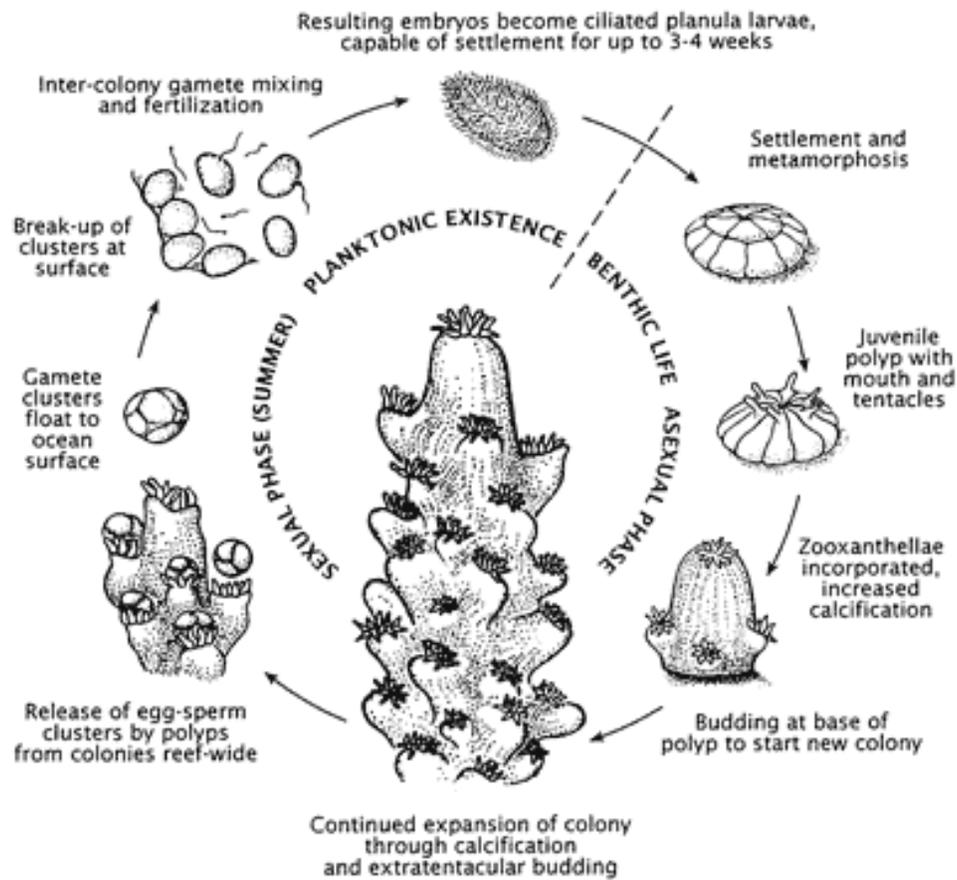


Fig. 5. General life cycle of a spawning hermaphroditic coral.

[<http://www.icriforum.org/about-coral-reefs/what-are-corals>, downloaded 20 October 2016]

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