Acropora palmata (Elkhorn Coral)

Order: Scleractinia (Stony Corals)
Class: Anthozoa (Corals and Sea Anemones)
Phylum: Cnidaria (Corals, Sea Anemones and Jellyfish)

Fig. 1. Elkhorn coral, *Acropora palmata*.

[https://www.edf.org/oceans/day-8-journey-cubas-underwater-eden, downloaded 5 March 2016]

TRAITS. *Acropora palmata* has a long, branching shape which resembles elk antlers, spanning up to 1.5m in diameter (Noyd et al., 2014). This species of coral has a three dimensional structure that is highly complex, with thick branches that are characteristic of the elkhorn coral (Rosenberg and Loya, 2004). Elkhorn corals are cream to brownish yellow in colour, with pale cream to white branch tips (Voss, 1980). *Acropora palmata* may grow to a height of 3m in reef areas that are exposed to strong waves (Fig. 1).

DISTRIBUTION. *Acropora palmata* can typically be found on several reefs near the Bahamas, southern Florida and throughout the Caribbean, extending to Venezuela (NOAA Fisheries, 2014). Elkhorn coral is endemic to the Caribbean. In Trinidad and Tobago, *Acropora palmata* can be found in the Buccoo Reef in Tobago, where they are located in close proximity to the Starlet Coral Reef (Cameron, 2014).

HABITAT AND ACTIVITY. Elkhorn corals thrive in parts of Florida and the Caribbean where the water is free of sediments, due to the absence of a cleaning system containing cilia and mucus (Kaplan, 1982). They are found in fore reefs in areas that are shallow (0-5m) to intermediate in depth (5-2m5) (Aronson, 2007), in areas with strong wave action. Elkhorn corals have a tendency to dwarf other coral species. *Acropora palmata* is able to recover rapidly from extensive damage from disturbances such as hurricanes, due to fragmentation or asexual reproduction (National Park Service, 2016). However, recovery from the white pox disease or bleaching has been very challenging.

FOOD AND FEEDING. In elkhorn corals, polyps have tentacles with cnidoblasts (Fig. 2) that paralyse and capture organisms, and then move the paralysed organisms to the mouth for digestion in the gastrovascular cavity (Karleskint et al., 2013). Organisms captured by elkhorn coral polyps include small zooplankton. *Acropora palmata* also receives its nutrition by making use of its symbiotic relationship with zooxanthellae (microscopic algae), that are located in the polyp's tissues (Smithsonian Marine Station, 2013). The zooxanthellae provide coral polyps with nutrients such as the products of photosynthesis (amino acids and glucose) and also oxygen. In return, the corals provide waste products as nutrients, and a habitat for the zooxanthellae.

POPULATION ECOLOGY. *Acropora palmata* has a great importance in maintaining the integrity of coral reefs in the Caribbean, both functionally and structurally, such as the provision of calcium carbonate deposits in large amounts (Rosenberg and Loya, 2004). Elkhorn coral colonies grow rapidly at a rate of 6-12cm annually, eventually reaching a maximum size in approximately 12 years (National Park Service, 2016). Individual polyps can only live for 2-3 years, while colonies can last for centuries (Biological Bulletin, 2009). This species of coral is highly abundant and they are the dominant reef building coral of the Caribbean.

REPRODUCTION. Reproduction in *Acropora palmata* takes place both sexually and asexually. In the eastern Caribbean, these corals reproduce sexually due to their high densities, but they reproduce asexually in the western Caribbean due to the large distances between colonies (Goldberg, 2013). Asexual reproduction is the dominant mode of reproduction for elkhorn corals, involves the formation of new colonies when branches break off the corals and then becomes attached to a substrate (NOAA Fisheries, 2014). The polyps within the skeletal structure of the broken branches then multiply and form a new colony. Asexual reproduction in *Acropora palmata* is initiated by physical disturbances such as hurricanes, specifically in the north-western Caribbean. Sexual reproduction in elkhorn corals involves the release of millions of gametes from individual colonies that are hermaphrodites (both male and female) during broadcast spawning (NOAA Fisheries, 2014). These gametes are formed within the mesenteries from temporary gonads for external fertilization (Veron, 1995). After fertilization, the development of the larvae then takes place in plankton for several days. The planula larvae of *Acropora palmata* are incompetent for settling until approximately 8 days of development. After settling on an appropriate substrate, the planula larvae then undergo metamorphosis to adjust to the benthic lifestyle of a calcified coral.

BEHAVIOUR. In *Acropora palmata*, the polyps do not communicate with each other, except during reproduction (NOAA Fisheries, 2014). Elkhorn corals tend to tower over other corals such as fire corals, due to the inability of other coral species to compete with the elkhorn corals

(Kaplan, 1982). There are instances where the upper reef crest in some parts of the Caribbean are made up of elkhorn corals. For defence from predators such as fireworms, the coral polyps retract and hide in their skeletal structure (Fig. 3) (NOAA Fisheries, 2014). They also release nematocysts that are venomous when touched, as a tactile response which can cause paralysis of organisms. Also, in defence against invasive microorganisms, elkhorn corals contain mucus on their surfaces that is secreted by bacterial species that produce antibiotics (Choffness et al., 2013).

APPLIED ECOLOGY. *Acropora palmata* was listed as critically endangered by the International Union for Conservation of Nature and Natural Resources (Beckman, 2013). This is due to the fact that this species of coral has declined by 90% over the past 30 years due to several drivers of decline (Burns and Osofsky, 2009). These drivers include coral bleaching which have contributed to the decline in elkhorn corals through the loss of zooxanthellae, due to global warming (Burns and Osofsky, 2009). Diseases such as the white band disease have also contributed to this decline by causing coral tissues to peel off. Global warming has also led to an increase in the intensity of hurricanes which destroy reef tracks. Furthermore, ocean acidification due to high levels of carbon dioxide have led to a reduction in elkhorn coral reefs (Griffis and Howard, 2013). *Acropora palmata* is not harvested for the aquarium trade unlike *Acropora cervicornis,* due to strict environmental laws, and have no importance commercially. For the conservation of elkhorn corals in Trinidad and Tobago, the Buccoo Reef Trust was registered in Trinidad and Tobago as a non-profitable company to provide education, outreach and research programs (MyTobago, 2008). This trust has provided education and awareness to visitors and school children in Trinidad and Tobago. Also, the elkhorn coral reef in Tobago is designated under the Marine Areas Act of Trinidad and Tobago as part of the National Protected Areas Policy (Government of the Republic of Trinidad and Tobago, 2011).

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Posted online: 2016

Fig. 2. Elkhorn coral polyps with tentacles extended.

[http://divepix.webdhb.com/index.php/fr/component/k2/199, downloaded 5 March 2016]

Fig. 3. Skeletal structure of *Acropora palmata*.

[http://blogs.egu.eu/network/bar/2014/09/15/coral-wanted-dead-and-alive-a-brief-excursion-into-the-world-of-coral-science/, downloaded 5 March 2016]