Millepora alcicornis (Branching Fire Coral)

Order: Anthoathecata (Fire Corals)
Class: Hydrozoa (Hydroids)
Phylum: Cnidaria (Corals, Sea Anemones and Jellyfish)

Fig. 1. Fire coral, *Millepora alcicornis*.

[http://www.advancedaquarist.com/2008/5/aafeature1#section-4, downloaded 13 March 2015]

TRAITS. *Millepora alcicornis* morphology is highly variable. They become established as encrustations on wreckages of ships, dead corals and rocks. These encrustations then develop into plates or blades in locations with abundant water movement, and a branched, cylindrical structure (which most colonies develop) that grows to a maximum height of 50cm in sheltered reef locations or deep lagoons (Lewis, 1989). The branches are brown to pale, creamy yellow, with white tips (Fig. 1). Those living on horizontal surfaces are smaller and reach higher densities than those on vertical surfaces (Edmunds, 1999). Covering the smooth and calcareous surface of *Millepora alcicornis* are zooids or polyps (Cairns, 1982) serving different functions (Fig. 2). The food consuming gastrozooids are surrounded by dactylozooids which house the cnidarian stinging cells for prey capture and defence. The fire coral lacks the corallites (cups holding individual polyps) found in the stony corals.

DISTRIBUTION. Can typically be found in tropical and sub-tropical waters such as those in the Atlantic-Caribbean, Florida, Cape Verde Islands (Laborel, 1974) and the southwest Gulf of Mexico (Tunnell, 1988). A species in Bermuda is also referred to as *Millepora alcicornis* but is very different from the rest of the Caribbean (Sterrer and Schoepfer-Sterrer, 1986). In Trinidad and Tobago it is native species.

HABITAT AND ACTIVITY. This species is the only Caribbean fire coral that commonly can be found deeper than 10m with its depth range of 1-50m (Cairns, 1982), and is relatively uncommon in shallow surge zones (Humann and DeLoach, 2006) and low light intensities. It lives attached to wreckages of ships, dead corals and rocks, on reefs, in colonies and have a tendency to encrust and overgrow other species. *Millepora* can be found in disturbed habitats and can rapidly recover from bleaching events and siltation. *Millepora alcicornis* colonies have an affinity for live gorgonians (sea fan) and tend to redirect horizontal growth of many specialized branches toward a target gorgonian forming hand like structures which encircle and encrust the gorgonian and extending the *Millepora* (Wahle, 1980).

FOOD AND FEEDING. The gastrozooids and dactylozooids are used for feeding. The gastrozooids are small, plump food processing and digestive sites and the dactylozooids which have hair-like tentacles covered in cnidoblasts, catch the food to be digested by producing toxins (from the cnidocysts) that immobilize the prey before the tentacles thrust it through the mouth of an adjacent gastrozooid. In addition to prey capture, *Millepora alcicornis* use their special symbiotic relationship with algae living within its tissues called zooxanthellae, to obtain nutrients. The zooxanthellae produce food via photosynthesis (light requiring process), thus the other half of the relationship is the protection and access to sunlight which the coral provides the algae.

POPULATION ECOLOGY. *Millepora alcicornis* display all the traits of a typical hydrozoan, except that they morphologically and ecologically resemble the hermatypic scleractinian corals (true corals or stony corals) in terms of their secretion of a calciferous skeleton. Their importance in reef building is second only to hermatypic corals, and they share the symbiotic relationship with zooxanthellae algae (Lewis, 1989). They are found in fixed colonies joined via the body cavity and colonies are normally oriented perpendicular to current motion. The species is highly abundant with an average population size has been estimated to be between 2500 and 10,000 individuals (Chiappone and Peters, 2015). The average age of mature *Millepora alcicornis* has been estimated to be greater than 8 years, and average growth rates and sizes suggest a generation length of 10 years (Obura et al. 2008).

REPRODUCTION. *Millepora alcicornis* reproduce sexually. Sexual reproduction is seasonal, beginning with the appearance of the ampulla (found in the polyps) and the release of medusa (small jellyfish stage), usually in the rainy season (Amaral et al, 1997) which is from June to December in Trinidad and Tobago. The reproductive organs are contained in the medusa, which release gametes into the water. Fertilised eggs develop into generally planktonic, small, cilia-covered larvae that will eventually encrust a substrate and form new colonies. The gametes are sexually mature in about 20 -30 days. The medusa however live only for a matter of hours. Fire corals primarily consist of hydroid colonies usually separated in terms of sex. This means members are either male or female and each colony can produce either eggs or sperm, but not both. The female medusa produces three to five eggs before sinking to the bottom whilst the males have a

single sperm sac containing many sperm. There is minimal parental investment. The eggs are simply released and left to thrive on their own. *Millepora alcicornis* also utilise asexually reproduction, by fragmentation, where branches from one (parent) colony becomes attached to a substrate to reproduce other new colonies (Edmunds, 1999), genetically identical to the parent colony.

BEHAVIOUR. *Millepora alcicornis* share behaviour common to most *Millepora* species worldwide, that is, communication using tactile and chemical sensing structures. They are aggressive in nature and tend to completely encrust living sessile organisms. They particularly target gorgonians, taking a shape often assumed to be representative of the *Millepora* species, but is in fact it is representative of the shape of the encrusted object. They also overshadow and crowd out nearby competitors through rapid growth. Dactylozooids, with nematocyst-laden tentacles which function for food capture, also provide the *Millepora alcicornis* with this takeover property in addition to defence, releasing a strong, stinging toxin which is painful to prey and humans alike, and predators such as some fireworms (like *Hermadice carunculata*), filefishes from the genera *Cantherhines* and *Aluterus*, and specialist nudibranchs of the genus *Phyllidia*, making the *Millepora* very resistant to attack.

APPLIED ECOLOGY. *Millepora alcicornis* is listed by the International Union for Conservation of Nature and Natural Resources as "Least Concern", in spite of the reduction in historical baselines by approximately 10% (Obura et al. 2008), because its resilience and abundance result in a minimal level of threat towards it. Typical threats to coral reefs globally, affect *Millepora alcicornis*. Human pressures such as over-fishing, pollution and poor land management practices; global climate change, especially the consequent temperature extremes, which result in bleaching (loss of zooxanthellae) and increasing incidence of disease; ocean acidification and increased storm severity all threaten *Millepora alcicornis* populations.

Although the *Millepora* species are a target in the aquarium trade *Millepora alcicornis* has no commercial importance. In Trinidad and Tobago *M. alcicornis* is protected by the same laws that govern coral reefs in general, that is, they are recognised as protected areas under the National Protected Areas Policy 2011 (EMA, 2011). Non-profit and non-governmental organisations such as the Buccoo Reef Trust and Coral Cay Conservation and governmental organisations such as the Tobago House of Assembly, all have made significant contributions towards coral reef protection in Trinidad and Tobago, from which the *Millepora* have benefited. *Millepora alcicornis* is an important framework builder of its reef habitat. These protection initiatives have generally been of the educative nature, raising awareness of the status of corals and coral reefs and the public' role in their preservation. Preservation techniques like cryo-preservation as well as artificial propagation of gametes have been suggested for the conservation of coral biodiversity (Obura et al. 2008) in other parts of the Caribbean and elsewhere. Indirectly, efforts towards the minimising of human negative activities such as water pollution, over-harvesting and improper harvesting methods are also significant in the preservation of corals, reefs and *Millepora alcicornis*.

REFERENCES

Amaral, F.M.D., R.S. Silva, L.M. Silva, and A. Solé-Cava, (1997). Molecular systematics of *Millepora alcicornis* and *Millepora* braziliensis (Hydrozoa: Milleporidae) from Brazil. Proceeding 8th Internacional Coral Reef Symposium 2: 1577-1580. Austin, A. D.; Au

Cairns, S.D. (1982). Stony Corals (Cnidaria: Hydrozoa, Scleractinia) of Carrie Bow Cay, Belize. Smithson. Contr. Mar. Sci., 12:271.

Chiappone, M., and E. Peters. (2015). *Millepora alcicornis*. NatureServe Explorers. Accessed March 20, 2015. http://explorer.natureserve.org/servlet/NatureServe?searchName=*Millepora*+alcicornis.
Edmunds, P. J. (1999). "The role of colony morphology and substratum inclination in the success of *Millepora alcicornis* on shallow coral reefs". Coral Reefs 18 (2): 133–140. doi:10.1007/s003380050167.
EMA (2011). "National Protected Areas Policy 2011". Environmental Management Authority (E.M.A.), accessed March 24, 2015, http://www.ema.co.tt/new/images/policies/protected_areas.pdf
Humann, P., N. Deloach. (2002). Odd-Shaped Swimmers. Pp. 419 in Reef Fish Identification of Florida, Caribbean, Bahamas, Vol. 2, 3rd Edition. Jacksonville: New World Publicators, Inc.
Laborel J. (1974). West African reef corals: A hypothesis on their origin. Proc 2nd Int Coral Reef Symp 1: 425−442
Lewis John. B. (1989). The ecology of *Millepora*. Coral Reefs, 8:99.
Obura, D., D. Fenner, B. Hoeksema, L. Devantier, and C. Sheppard. (2008). *Millepora alcicornis*. The IUCN Red List of Threatened Species. Version 2014.3. Accessed March 25, 2015, www.iucnredlist.org.
Sterrer, Wolfgang, and Christiane Schoepfer-Sterrer. (1986). Marine fauna and flora of Bermuda. Wiley. p. 134.
Tunnell, J.W. Jr. (1988). Regional comparison of south-western Gulf of Mexico to Caribbean Sea coral reefs. Proceedings of the 6th International Coral Reef Symposium 3: 303-308.
Wahle, Charles M. (1980). Detection, Pursuit, and overgrowth of Tropical Gorgonians by Milleporid Hydrocorals: Perseus and Medusa Revisited. Science, 208:689.
Wilkinson, C. (2004). Status of Coral Reefs of the World. Australian Institute of Marine Science, Townsville, Australia.

Author: Shenecia Anderson
Posted online: 2015

Fig. 2. Zooids on the surface of *Millepora alcicornis*.

[http://www.thecephalopodpage.org/MarineInvertebrateZoology/images/*Millepora*alcicornis.jpg, downloaded 13 March 2015]