

Increasing Biodiversity of Coral Reefs by creating an Acropora nursery in Grand Turk, Turks and Caicos Islands

For the past two years, the Department of Environment and Coastal Resources (DECR) has worked tirelessly to keep its two BioRock® Reefs located in Grand Turk (*one at Governors Beach and the other in front of the South Base Oasis Dive Shop*) at peak performance.

The technology behind the BioRock® is simple as it works by submerging a negatively charged cathode framework structure made up of construction grade steel (in any desired shape) and a positively charged anode. With the structure in place, a low voltage electric current which is no risk to swimmers or divers, runs from the shore and between the steel causing white limestone (calcium carbonate) to crystallize from seawater onto the framework. From here, stressed, bleached and damaged corals are attached to the reef using simple steel tie wire. The advantage of this technology is that corals transplanted to these structures grow faster and can survive exposure to higher temperatures, 16-50 times more than corals that are of natural setting. This factor is particularly important given the impacts facing many coral reef ecosystems due to rising sea temperatures from global warming.

After hurricanes Hanna and Ike (September 2008) the Governor's Beach structure was fully standing since the waves passed straight through with little damage, the Oasis structures which were tie-wired rather than welded had one module collapse (since been replaced with a new, welded structure). Hurricane Ike was the strongest hurricane on record to hit Grand Turk. Most cables were replaced following the hurricanes due to damage from debris and high wave action. The projects lost about a third of the corals due to hurricanes. Most of those lost had only been wired a few days before and had not yet attached themselves firmly. After the impacts of Hanna and Ike the DECR moved more corals to the structures in an effort to replace the ones that were washed away by the hurricanes. Fish populations have increased with large numbers of juvenile fish along with seahorses, barracuda, turtles and stingrays. Soft corals and sponges have shown rapid growth but gorgonians have been susceptible to diseases and flamingo tongue snails. These projects have regenerated corals and fish populations in areas of barren sand or bedrock and are now attractive to snorkelers.

Systematic monitoring of the corals overtime showed that one species in particular, *Acropora sp.*, was a lot more sensitive than the other corals that had been transplanted and that this was not caused by the hurricane impacts. After careful consultation with Dr. Thomas Goreau President of the Global Coral Reef Alliance, who was the co-creator of the BioRock technology and a leading coral expert it was initially determined that they might be running into oxygen deficiency problems at night due to hydrogen bubbling from the Biorock process. It then was suggested to manage the power supply to the structures in a way that they are only powered during daylight.

Acropora palmata (common name elkhorn coral) and *Acropora cervicornis* (common name staghorn coral) are two species common to the Turks and Caicos Islands (TCI),

and along with other variety of *Acropora* across the Caribbean, their numbers have decreased significantly over the past twenty years due to White-band disease and their high sensitivity to various anthropogenic and natural factors. The question therefore was what could be done to address this problem?

The DECR decided that another smaller structure would be built to act as a nursery specifically for the struggling elkhorn and staghorn coral and to manage power supply for this structure specifically as recommended by Dr. Goreau. Consequently a project proposal was submitted to the Joint Nature Conservation Committee (JNCC). The project was approved and funds were granted by the JNCC to support this effort. As with previous structures, the construction of the new dome-like nursery was done by a local company: CB Construction and took approximately four weeks to complete. Once finished, it was placed in the center of the older more established reef at Governors Beach.

On Wednesday October 28, 2009, staff of the DECR with the help of volunteers (a tradition established by the DECR in Grand Turk for supporting the Biorock projects) successfully transferred the new structure where it will remain for certain time to allow sufficient accretion of calcium carbonate on the framework. Once accretion is complete, it will then be ready for coral transplantation.

It is expected that in summer 2010 the nursery would have all the corals transplanted onto it and the required equipment installed to supply power during daylight. From then, careful and systematic monitoring will be conducted by the DECR to assess coral health and growth on it.

DECR, December 2009

For more about the Biorock projects in Grand Turk see:

<http://www.environment.tc/content/root/files/20090414105717-BiorockGuidelinesGrandTurk.pdf>