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Agriculture, Fisheries and Conservation Department

Marine Parks Featured Story

Hard Coral Restoration in Hoi Ha Wan Marine Park (Part 1)

This featured story outlines the background, initiation and preliminary work of the hard coral restoration project in Hoi Ha Wan Marine Park.

Some dominant coral species in Hoi Ha Wan Marine Park, *Goniopora* (front) and *Pavona* (back)

With 84 hard coral species, Hong Kong has a higher coral diversity than the Caribbean Sea. Hoi Ha Wan Marine Park alone hosts more than 70% of our local species. The coral community at Hoi Ha Wan is home to more than 120 species of reef fishes and other marine invertebrates.

Pavona bed at Coral Beach

Flagship coral species, *Platygyra*, in northeastern Hong Kong waters

Bioerosion

However, corals in Hong Kong are facing various threats, including a natural process known as bioerosion. Bioerosion is the degradation of coral skeleton caused by the activities of organisms which drill into the material in search of food or to create a home. In Hong Kong, the major bioeroders include microbes, bivalves, sponges, tubeworms, and sea urchins. Among these bioeroders, the long-spined sea urchin, *Diadema setosum* (see images below), is often blamed for damaging the reef framework (Dumont *et al.*, 2013; Lam *et al.*, 2007). This bioerosion may result in the unusual 'mushroom' shape of coral skeleton as the sea urchins erode the base and make them susceptible to collapse (Glynn, 1997).

Long-spined sea urchins, *Diadema setosum*, in Hong Kong waters

A Healthy Coral Community Needs Sea Urchins

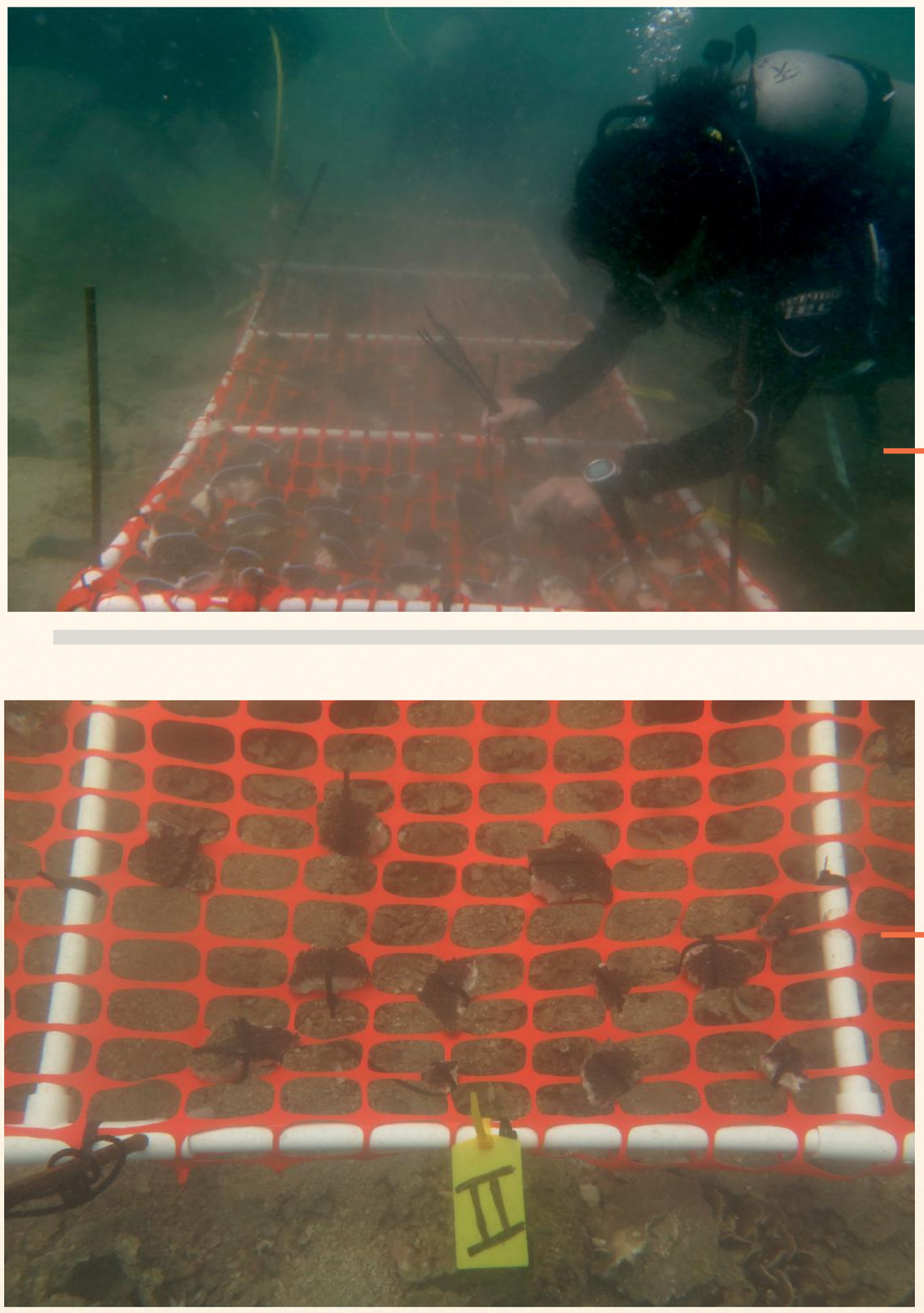
The competition between coral and algae has been generally seen as the major factor shaping coral reef health. Algae and coral are competitors for limited space on the seafloor. Globally, the increase in algae due to the removal of herbivores has "tipped the balance" against coral growth, health and resilience. While sea urchins are considered bioeroders, they are also herbivores that consume and control the population of algae. Hence, they play an important role in maintaining the health of coral reef by balancing coral-algal competition (Glynn, 1997).

***Sea urchins* help maintaining balance between coral and algae growth**

The Urgent Needs for Management Action

In the winter of 2015 and 2016, the massive brain corals (*Platygyra* sp.; the dominant coral species in Hong Kong) in northeastern waters, including those in Hoi Ha Wan Marine Park, were partially died, leaving them with patchy living tissues. Two main concerns here: 1) due to the seasonal temperature change in Hong Kong, the window for growth and recovery for coral is limited; and 2) without living coral tissues, the skeletons quickly became fouled by algae, which were subsequently grazed by urchins and further eroding the remaining skeletons. Therefore, this partial mortality left the reef framework vulnerable to accelerated bioerosion. If these eroded colonies collapse, their remaining living tissues may be buried in the sand where they are likely to die. Thus, there was an urgent need for management action to assist with the recovery of this flagship coral species.

Restoration in Action



In collaboration with the Swire Institute of Marine Science of the University of Hong Kong, a restoration project was initiated in Hoi Ha Wan Marine Park in 2016. With the goal of restoring the *Platygyra* population in the marine park, the restoration method the Project Team adopted has been proven in other international coral restoration projects and we wish to test its feasibility in Hong Kong. As the first phase of the project, some severely eroded Platygyra colonies with healthy living tissues were selected for this trial experiment. They were fragmented into small pieces which were then reared on the nursery platform that has been set on the seabed for recovery and allowed to grow bigger.

Nursery platform **for temporarily keeping the small coral fragments**

After nurturing the fragments for a year, they were then out-planted to pre-selected substrates such as rocks and robust yet dead coral skeleton at suitable water depth. The Project Team has been monitoring the growth and survivorship of the out-planted corals every month since summer 2017. The initial result is encouraging that re-sheeting of live coral tissues over surrounding substrates and fusion of live coral tissues between fragments were observed among the out-planted coral fragments. More results will be presented in the second part of this Featured Story. Stay tuned!

Transplanted coral fragments grew healthily and started to fuse together

References

Dumont, C. P., Lau, D. C. C., Astudillo, J. C., Fong, K. F., Chak, S. T. C., & Qiu, J.-W. (2013). Coral bioerosion by the sea urchin Diadema setosum in Hong Kong: Susceptibility of different coral species. Journal of Experimental Marine Biology and Ecology, 441(C), 71–79. http://doi.org/10.1016/j.jembe.2013.01.018

Glynn, P. W. (1997). Bioerosion and Coral Reef Growth: A Dynamic Balance. Life and Death of Coral Reefs, 69–98.

Lam, K., Shin, P. K. S., & Hodgson, P. (2007). Severe bioerosion caused by an outbreak of corallivorous Drupella and Diadema at Hoi Ha Wan Marine Park, Hong Kong. Coral Reefs, 26(4), 893–893. http://doi.org/10.1007/s00338-007-0288-9

Photography

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About this featured story

This featured story is a joint product of Agriculture, Fisheries and Conservation Department and the Swire Institute of Marine Science of the University of Hong Kong.

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