

HC283 Sea urchin population and ecology around the Cayos Cochinos, Honduras

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The Cayos Cochinos Islands are located about 18km off the northern Honduran coast and comprises the very southern end of the Meso-American Barrier Reef System (MBRS), the second largest barrier reef in the world. The islands and surrounding seas were designated as a National Marine Monument by the Honduran Government in 1993 and remains the only such area in Honduras. The islands have been established as a protected area by the Honduran Government under the banner of the Cayos Cochinos Marine Protected Area (CCMPA) and managed by the Honduran Coral Reef Foundation (HCRF). This agreement established specific protection for the reefs and the wildlife on the islands.

The continued functioning of the reef systems within the CCMPA is of critical importance for the conservation of valuable local biodiversity, but also to the local communities who are highly dependent on the income generated through fishing and ecotourism. Thus, annual monitoring of economically and/or ecologically important species within the CCMPA is essential for assessing the health of the reef system and to provide early warning signs of any negative trends in reef health.

Sea urchins hold a very highly important role within the ecology of coral reefs, acting as one of the main grazers of algae and ensuring that a low algal density is maintained on the reefs and corals dominate. Without such grazing the potential is for algae species to grow unregulated and smother and eventually kill corals, leading to a phase shift from coral dominated to algal dominated reefs.

There are four dominant species of urchins on Caribbean reefs, the long-spined urchin (*Diadema antillarum*), reef urchin (*Echinometra viridis*), rock-boring urchin (*Echinometra lucunter*) and pencil urchin (*Eucidaris tribuloides*). Of these, the long-spined urchin was the largest and most significant grazer. However, in 1983 an as yet unidentified disease decimated the populations of the long-spined urchin throughout the Caribbean. Mortality rates were between 95-99%, with 99.9% recorded in some locations. Because urchins may live for 100+ years, regrowth of the populations has been slow and indeed absent in some areas.

The consequences of this mass mortality (the largest ever recorded in the marine environment) are varied. The majority of reefs have maintained coral dominance, due in part to increased grazing by other urchins and herbivorous fish species compensating for the loss in the long-spined urchin. However, many reefs have undergone a phase shift and are now dominated by algae with severe ecological and economic consequences. The main example of this being the Jamaican coral reefs that are now nearly all algal dominated and as a result both the dive tourist and fishing industries have been heavily impacted.

The reefs within the CCMPA have so far maintained coral dominance, but long-spined urchin populations remain low and, therefore, the reefs remain highly vulnerable to a possible future phase shift to algal dominance. This program aims to assess if and how urchin populations are changing,

determine the rate of increase of the long-spined urchin population and potentially offer an early warning sign if populations of any urchin species begin to decline. In addition to these surveys the ecology of the urchin species needs to be studied so we can better understand the role of urchins in reef ecosystem dynamics and use this information in management practices that will ensure against a future phase shift.

A total of 18 reefs have been surveyed around the CCMPA for populations of the four dominant species of urchins. Surveys are performed by snorkelling 15m transects at depths between 1-2m and recording all urchins observed 2m either side of the transect line (resulting in a 30m² survey area for each transect). Research students will also collect data on the benthic environment at each site by identifying the substrate (e.g. hard coral, algae, sponge, sand, bare rock) at 50cm intervals along the transect tape.

The data collected can be used to look at overall population densities of urchins within the CCMPA and data from previous years will be available to investigate possible temporal changes in urchin populations. It will also be possible to compare differences in abundance between the individual reefs and to relate this to benthic data collected. In addition, students may decide to utilise data collected as part of the Operation Wallacea Reef Check surveys to investigate possible relationships between urchin densities and other important herbivores on the reefs such as parrot and surgeon fish.

Suggested Reading

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