

HB284 Influences on reef fish populations on contrasting reef systems in Honduras

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Coral reefs are highly dynamic and biologically diverse ecosystems of great conservation and economic value. Although coral reef fisheries make up less than 1% of global commercial fisheries, they contribute approximately 6 million tons of fish, valued in the region of \$6 billion, per year. Coral reef fisheries also supply food for over a billion people each year, 85% of which are dependent upon the reefs for the majority of their protein. Thus, managing coral reef fisheries sustainably is critical to the economies of the countries where coral reefs are found, but also to the coastal communities that are heavily reliant on these fisheries for their daily sustenance.

Sustainable management of healthy reef fish populations is also essential for the continued functioning of the reef system as a whole. For example, overfishing important herbivores can decrease grazing pressures and ultimately result in phase shifts from coral dominated to algal dominated systems. Maintaining the dynamic equilibrium within coral reef systems is vital for ensuring both biological diversity and local fisheries are safeguarded. Thus, annual monitoring of economically and/or ecologically important species is essential for assessing the health of the reef system and to provide early warning signs of any negative trends in fish populations.

The Islands of Utila and the Cayos Cochinos, Honduras provide a valuable opportunity to compare reef fish community structure and population densities both within and outside of a marine protected area. The Cayos Cochinos were designated as a protected area by the Honduran Government under the banner of the Cayos Cochinos Marine Protected Area (CCMPA) and are managed by the Honduran Coral Reef Foundation (HCRF). This agreement established specific protection for the reefs and the wildlife on the islands. In contrast, the reefs around the island of Utila are not situated within a marine protected area and, as a result, experience higher fishing pressures as well as increased anthropogenic disturbance from higher levels of coastal development and scuba diving related tourism.

The dive tourism industry in Utila is heavily dependent on the health of the surrounding reefs and associated fish populations. In recognition of the value of the reefs to the survival of their own businesses, the dive centres work together with the Bay Islands Conservation Association (BICA), to help protect the surrounding reef systems. Community led conservation initiatives such as this go some way to help safeguard the reefs around Utila, however, local fisheries are less regulated than in the CCMPA. Thus, Utila and the CCMPA can be used as a useful comparison to see how fishing pressures influence reef fish populations and to assess the effectiveness of management practices within and outside the protected area.

In addition to the differences in fishing pressures, another interesting comparison between the CCMPA and Utila is the distribution of associated mangrove systems. Utila has extensive mangrove systems around its coastline while within the CCMPA mangroves are only found in one small area on the largest island, Cayo Mayor. Mangroves act as nurseries for many species of juvenile reef fish and it has been

estimated that biomass of these species can be as much as 60% greater on reefs with associated mangroves compared to reefs where mangroves are absent. Thus, in addition to looking at differences in commercially valuable fish populations, it may be informative to also compare those species that are known to use mangrove habitats as juvenile nurseries.

Survey Protocols

Traditionally, surveys of reef fish populations, as well as benthic and invertebrate community structure, have been conducted by underwater visual census (UVC) by a team of scuba divers. However, the recent development of stereo video equipment for surveying reef fish communities is allowing large volumes of data to be collected within a single dive and analysed in detail back in the laboratory. An added advantage of stereo video surveys (SVS) over UVC, or even surveys that use a single video camera, is that SVS allows the researcher to accurately measure the size of the fish observed on the transect with computer analysis. The ability to accurately assess fish size makes it possible to estimate and compare biomass of fish populations on the reefs inside and outside of the marine protected area. Although fish size has often been approximated during UVC, it has been shown that these approximations introduce a large degree of error and, thus, it is very difficult to make reliable comparisons of fish biomass between areas. Thus, SVS provides a sophisticated and novel approach to reef fish surveys that is allowing the first accurate assessment of the biomass of fish populations in Honduran reef systems. In addition to running SVS, traditional UVC surveys are also conducted in order to make direct comparisons with previous year's data and to also compare the results of the two survey methods.

Stereo Video Surveys

Stereo Video Surveys (SVS) are carried out by a small team of scuba divers with the principal investigator operating the stereo video equipment. Up to 12 consecutive transects can be filmed per dive using this method, although the actual number will depend on the dive site and the experience of the surveyors. Transects are conducted at both 8m and 12m. Stereo-video footage is converted from MTS to AVI format using MTS converter and then analyzed using the program *EventMeasure*. Footage from left and right cameras is then synchronized in *EventMeasure* using the synchronizing diode. Individual fish are identified by family, genus, and species, and lengths calculated from snout to base of tail.

Underwater Visual Census

Underwater visual census (UVC) are carried out by a team of scuba divers, with one diver recording all fish observed along a 20m transect. Fish are counted 2.5m either side and 5m above the transect line, giving a survey area of 500m³. Two other members of the survey team will follow behind and simultaneously survey the coral, invertebrate and benthic structure along the transect line covering an area of 100m². Transects are conducted at both 8m and 12m.

Students may design projects that look at differences in fish community assemblages, abundance and biomass inside and outside the MPA. Students may also look at the differences in the estimates produced by the two survey methodologies (UVC vs SVS) and comment on their relative merits for marine conservation monitoring. It will also be possible to use data from previous years in order to investigate temporal changes in parameters of interest.

Suggested Reading

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