Patterns of coral community structure and species diversity on a submerged shelf edge reef off southwestern Puerto Rico

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by
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A thesis submitted in partial fulfillment
of the requirements for the degree of

Master of Science

In the Department of Marine Science

December 1980

Approved:

Member Graduate Committee	Date
Member Graduate Committee	Date
Chairman Graduate Committee	Date
Representative Graduate School	Date
Director of Department	Date
Director of Graduate Studies	Date

ABSTRACT

This study investigates the community structure of hermatypic corals in terms of species composition, zonation and diversity patterns and suggests possible factors affecting the observed distributions. At each of two sites on the shelf edge submerged barrier reef off southwest Puerto Rico a series of photo-quadrat transects were run parallel to the depth contours from the north edge of the reef, over it and down to a depth of 30 m. Species abundance data was obtained by projection analysis using a 200 random point count method.

This reef system has a present day deep water reef community living on a shallow water reef structure that was formed during a lower sea level stand. Scleractinian corals are the most important hermatypic organisms on this reef with 37 Caribbean species sampled in the photographs. Kulzcinski's similarity index and dendrogram analysis of all transects surveyed enables the reef to be divided into different zones on the basis of numerical data on species richness and relative abundances. The two sites are quite similar in topography and community parameters (species richness, coral coverage, diversity and zonation) with the main difference being that one site (Site I) has a 40 m wider reef crest portion. At both sites the community parameters appear to be primarily controlled by the dominant species (Acropora cervicornis and/or Montastrea annularis) within each described zone. Low species richness and diversity values in the A. cervicornis zone indicate that a relatively long time (in terms of coral growth) has passed since the last major disturbance disrupted the ability of this fast growing species to dominate entirely the portions of the reef where it is found. Greatest number of species and living coral coverage were found just behind and on the shelf edge whereas the highest species diversity values were found on the reef crest areas where colony size and coral coverage were low. This suggests that the reef crest is a relatively disturbed habitat in which wave surge and sediment scouring inhibit large size and dominance. An Agaricia lamarki zone was found to be present at depths below 25 m, which is similar to other localities in the Caribbean.

The Shannon-Weaver species diversity index, based on number of colonies, is shown to be of questionable value when a large percentage of the coral cover is composed of species that form thickets rather than discrete colonies. The photo-quadrat method using point count projection analysis is shown to give accurate results of coral coverage in low relief communities and significantly more accurate results than the traditional line transect method for obtaining coral coverage values.

This study indicates that the shelf edge submerged barrier reef system off southwestern Puerto Rico is a well-developed, actively constructing reef supporting a lush deep water reef community on the sea-ward portions of its structure. In terms of species richness and species diversity of hermatypic corals, similar values are reported from other reef localities in the world despite differences in species composition and community structure.