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Multivariate analysis of long-term ecological change in coral reef epibenthic communities: A tool to address the effects of environmental- and management-linked influences.

Multivariate analysis techniques have been tested for their ability to discriminate patterns of temporal variation in the coral reef community structure within the Luis Peña Channel Marine Fishery Reserve (LPCMFR), Culebra Island, PR. Line-intercept video-transects were used to address ecological change between years 1997 and 2002. There was a 33 to 41% decline in coral species richness, a 32 to 58% decline in colony abundance, a 33 to 50% decline in the % of coral cover, and a 308 to 558% increase in the % of macroalgal cover. A significant difference between years in the reef epibenthic community structure was observed when using multi-dimensional scaling ordination (stress 0.08). A 2-way crossed ANOSIM test showed that there were significant differences in the community structure between years (0.6%) and a significant interaction between years and depth (0.5%). Community structure was more significantly different with increasing time. There were no significant differences between depth zones, suggesting that coral decline occurs independently of depth. The key taxa responsible for these differences included macroalgae, total algae, filamentous algae, and more recently, cyanobacteria. A Caswell's neutral model test showed significant differences in the coral species diversity through time. Major causes of coral mortality included recurrent White Plague outbreaks, followed by algal overgrowth. It is suggested that chronic change in water quality is affecting coral reef decline and remains to be studied. Understanding these variation patterns will be the first step towards linking these patterns to environmental variation and to management-linked influences.

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