Meta-Analysis of Reef Fish Data in Hawaii: Biogeogrpahy and Gradients of Human Impacts

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PROJECT OVERVIEW

This project conducted a comprehensive examination of reef fish assemblage structure across Hawaii. 25 data sets representing more than 25,000 individual fish surveys since the year 2000 were synthesized. The results show clear, distinct bioregions across the archipelago that give us a better understanding of reef fish macroecology and have important implications for management at the regional scale. The findings from this study also highlight the negative impacts of human population pressure on reef fishes, particularly around Oahu and Maui.

PROJECT GOALS AND OBJECTIVES

One of the major obstacles to wise management of coral reef fisheries is the lack of sound information on population abundance at spatial scales commensurate with the uses of these resources. This information is critical to developing sustainable fisheries management strategies, improving management of existing Marine Protected Areas (MPAs), designing future MPA networks, and aiding in the development of comprehensive marine spatial planning.

This study, for the first time, has synthesized all these data sets into a single and spatially comprehensive database in order to characterize reef fish assemblages around Hawaii while controlling for habitat, wave exposure, and geographic influences.

RESULTS

- Over one-quarter of the species (27%) examined in the MHI appeared to be depleted below 10% of unfished abundance, while 42% were below 25% of unfished abundance
- Endemic species were much more common at the northern end of the chain
- The traditional Hawaiian district or moku was used as a unit of spatial stratification. Moku explained 63% of the variability in resource fish biomass
- Biomass of resource species was negatively correlated with human population pressure among mokus.
- Older MPAs had the highest resource fish biomass while newer MPAs had fewer numbers and smaller sizes of resource fishes.

MANAGEMENT OUTCOMES

A more holistic approach that includes community-based management, expansion of the MPA network with a greater emphasis on no-take reserves, improvements to current fisheries regulations including enhanced enforcement efforts, and finally a greater emphasis on marine education and ocean awareness are necessary.