Habitat-specific survey methods to improve assessments of rockfishes off California and Alaska

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Many fish stocks have strong affinities to specific habitats, resulting in patchy spatial distributions in abundance. Sample stratification or otherwise explicitly incorporating habitats into survey design can increase precision and accuracy of estimated densities of these stocks. Several economically valuable rockfish species off Alaska and the west coast of North America occur in rugged rocky terrain, making them impossible to accurately survey using such conventional methods as bottom trawl gear. We have developed direct count, habitat-specific methods to improve stock assessments of a number of these species in the Gulf of Alaska and California. Seafloor maps of substratum type and bathymetry are used to identify and quantify rockfish habitats on a large spatial scale, providing the frame within which to distribute sampling effort. Fish surveys, distributed by habitat, are conducted from a human-occupied research submersible. Abundance and biomass are estimated from fish density, size composition, and area of the habitat. These habitat-specific visual survey methods not only contribute to improved assessments of rockfish stocks, but also are necessary for an ecosystem approach to the management of diverse communities on rocky areas of shelf and slope. Additionally, we are using these methods to characterize fish and habitat associations to improve identification of essential fish habitats, to design and monitor marine protected areas, and to understand the significance of deep sea coral habitats.

Integrating benthic community structure data into a stratified random sampling design to improve reef fish abundance estimates in the Northwestern Hawaiian Islands

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From 2007 to 2009, the Pacific Islands Fisheries Science Center Coral Reef Ecosystem Division participated in a pilot study to assess the feasibility of a stratified random survey design (StRS) aimed at collecting fishery independent data on the spatial distribution, abundance, size composition, and habitats of coral reef fishes in the Northwestern Hawaiian Islands (NWHI). The sampling design used a combination of reef zone (forereef, lagoon, and backreef) and depth categories (shallow: 0–6 m; moderate: 6–18 m; and deep: 18–33 m) to partition the survey domain into strata. Concurrent with a subset of fish surveys, benthic cover and coral population (density and size structure) data were collected. Analysis of benthic cover and coral abundance data revealed high spatial heterogeneity within habitat strata; therefore, we post-stratified the survey domain to incorporate the two predominant wave regimes in the NWHI (northwest swell and trade wind swell) which previous studies have shown greatly influence benthic community structure. Post-stratification results indicate an increase in precision of domain wide estimates of benthic cover and coral abundance compared to the original StRS design as well as improved precision of abundance estimates for eight candidate fish species. Variability of benthic habitats within several 'post strata' suggests that further refinement of habitat maps could improve performance of fish stock assessments in the NWHI. We recommend an approach to improving habitat maps based on higher resolution wave exposure data.

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