Using GIS landscape analysis tools with high-resolution multibeam bathymetry and ROV mapping to model rockfish distribution and abundance on the Del Monte shale beds, Monterey Bay, California.

A Capstone Project
Earth Systems Science Policy
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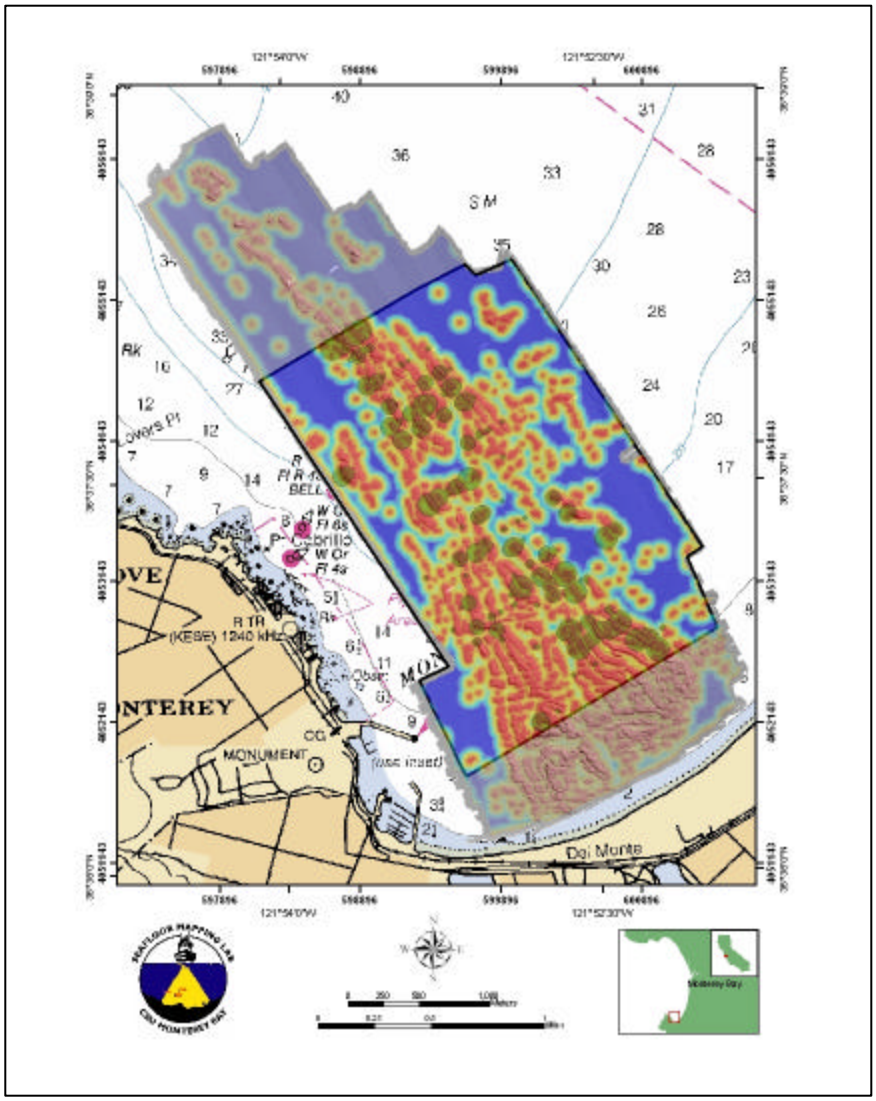
By



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ABSTRACT

Accurate and efficient species-based habitat assessment is in great demand for the marine environment. In light of declining rockfish stocks, effective tools capable of providing accurate stock assessments of near-shore, high relief habitat would be invaluable to both state and federal resource managers. Multibeam bathymetry, when analyzed with GIS landscape analysis tools, can create effective models capable of predicting "preferred" habitat based on species-specific parameters. For this study, high-resolution multibeam data of the Del Monte shale beds in Monterey Bay, California were analyzed in GIS for slope, rugosity, and relative topographic position to assess and quantify rockfish (*Sebastes* spp.) habitat preference. Video transects collected by a remotely operated vehicle (ROV) provided habitat ground-truth and fish distribution data for the modeling process. A series of habitat suitability models were created in GIS by combining different suitability factors from multibeam-derived grids: slope, rugosity, topographic position index (TPI) and depth. "Distance to preferred" categories for each of the parameters were determined for 8 rockfish species. Of these, "Distance to Peak" features identified by TPI_{50} proved to be the most effective means of modeling fish distribution, and successfully predicted an average of 80% of the 8 rockfish species. Using fish distribution information collected from the ROV, stock estimates were calculated for the shale beds study area. By combining GIS landscape analysis tools with multibeam bathymetry and ROV video data, we have created a predictive tool that can locate areas of "most suitable" habitat given rockfish-specific parameters.

INTRODUCTION

There is a great need for accurate and efficient species-based identification and classification of marine habitats. The health of marine ecosystems depends on the abundance and diversity of life within the ecosystem, as well as the quality of habitat associated with the area (Adams et al. 1995). Understanding the link between marine resources and their habitat can help reveal ecosystem dynamics affecting both large- and small-scale patterns of species distribution and abundance.

Over the past several decades, marine resources have been declining, and many species have reached critically low levels (Starr 1998, 2002; Mason 1999). The National Marine Fisheries Service (NMFS) manages 61 of the 96 species of rockfish (genus *Sebastes*) found along the Pacific Coast from Washington to California. Of these species, 9 are currently listed as "overfished." Other species often caught as "bycatch" during the harvest of