

INTERPRETATION OF SIDE-SCAN SONAR RECORDS FOR ROCKFISH HABITAT ANALYSIS: EXAMPLES FROM MONTEREY BAY

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Even with decreased landings in recent years, rockfishes are among the most valuable fisheries in California. As their name suggests, many species of rockfishes are associated with rock substrata during most of their lives. Deepwater, rocky outcrops may prove to be important rockfish habitat as local stocks are depleted in shallow, accessible areas. Along the central California coast, several submarine canyons cut into the continental shelf and bring deep water close to shore. We hypothesize that rock outcrops in deep, isolated areas along the steep canyon walls act as a natural harvest refugia for exploited rockfish populations, and allow several species to attain larger sizes and higher abundance than in adjacent, heavily fished areas.

With support from the West Coast National Undersea Research Center, a cooperative project between geologists and fishery biologists was recently undertaken in Monterey Bay. By integrating remote-census, geophysical techniques (e.g., side-scan sonar), *in situ* submersible observations, and fishery information (Figure 1), we have started to evaluate rockfish resources, including species composition, abundance, and distribution, within heavily fished and lightly fished areas of the same depth and microhabitat in the Monterey Bay submarine canyon system and nearby areas. From bottom profiles and navigational data, we have produced accurate, high-resolution bathymetric basemaps. We also have conducted side-scan sonar surveys of the seafloor in several submarine canyons within Monterey Bay and along the central California coast, as well as of shallow rock outcrops historically fished within the bay. Side-scan sonar is the perfect method for differentiating blocks of hard substrata, which appear dark, from surrounding soft sediments because of their greatly different reflectivity (Figure 2). Quality of our side-scan data has ranged from good to excellent; they are primarily dependent on ship speed and bottom topography. Sonographs along each track line were combined with navigational plots to form mosaics of benthic habitat. Plotting the side-scan targets on regional bathymetry, we can quantify the amount of exposed, hard substrata available at depths suitable to rockfishes. Interpretations of the sonographs are verified by observations made from a submersible and integrated with microhabitat information.

From the geophysical surveys and submersible observations, Soquel Canyon is characterized by extensive erosion, with sharp, steep relief and many isolated rock outcrops that provide ideal shelter for large

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fishes. The most likely rockfish habitat in the headward parts of Monterey, Ascension, and Ano Nuevo Canyons appears in sonographs as well-defined ledges of bedded sedimentary rock. Rockfish habitat at historically fished sites within the Bay comprise large areas of granite and sedimentary outcrops that are surrounded by flat, mud-sand seafloor. Secondary to fish habitat characterization, these results will extend our understanding of regional seafloor geology and provide associated high-resolution maps of the area.

At least 33 species of rockfishes have been identified from preliminary analyses of 80 video-documented, submersible dives. Species composition, size, relative abundance, and habitat specificity are being evaluated. Several distinct assemblages of rockfishes were obvious from initial observations. Large schools of young-of-the-year rockfishes were documented in shallow rock areas of low relief outside submarine canyons, and almost absent at any depth within the canyons. Very specific assemblages of small species, previously considered uncommon, occurred in high numbers over offshore, submerged beach terraces of well-rounded cobble. High numbers of large species (up to 1 m) were closely associated with rock ledges, caves, overhangs, boulders, and broken rock of exposed mudstone interspersed with soft mud on steep sides of canyons. Observations from more heavily fished areas suggest these species are probably protected from excessive harvest on inaccessible, isolated outcrops in the canyons.

We are continuing analyses of the video transects using a geographical information system (GIS) to visualize, map, and analyze these spatially referenced data sets. Integrating side-scan sonar and submersible surveys is very effective in assessing fish assemblages with heterogeneous distributions that are closely associated with deepwater, rocky areas and unavailable to other methods of evaluation.

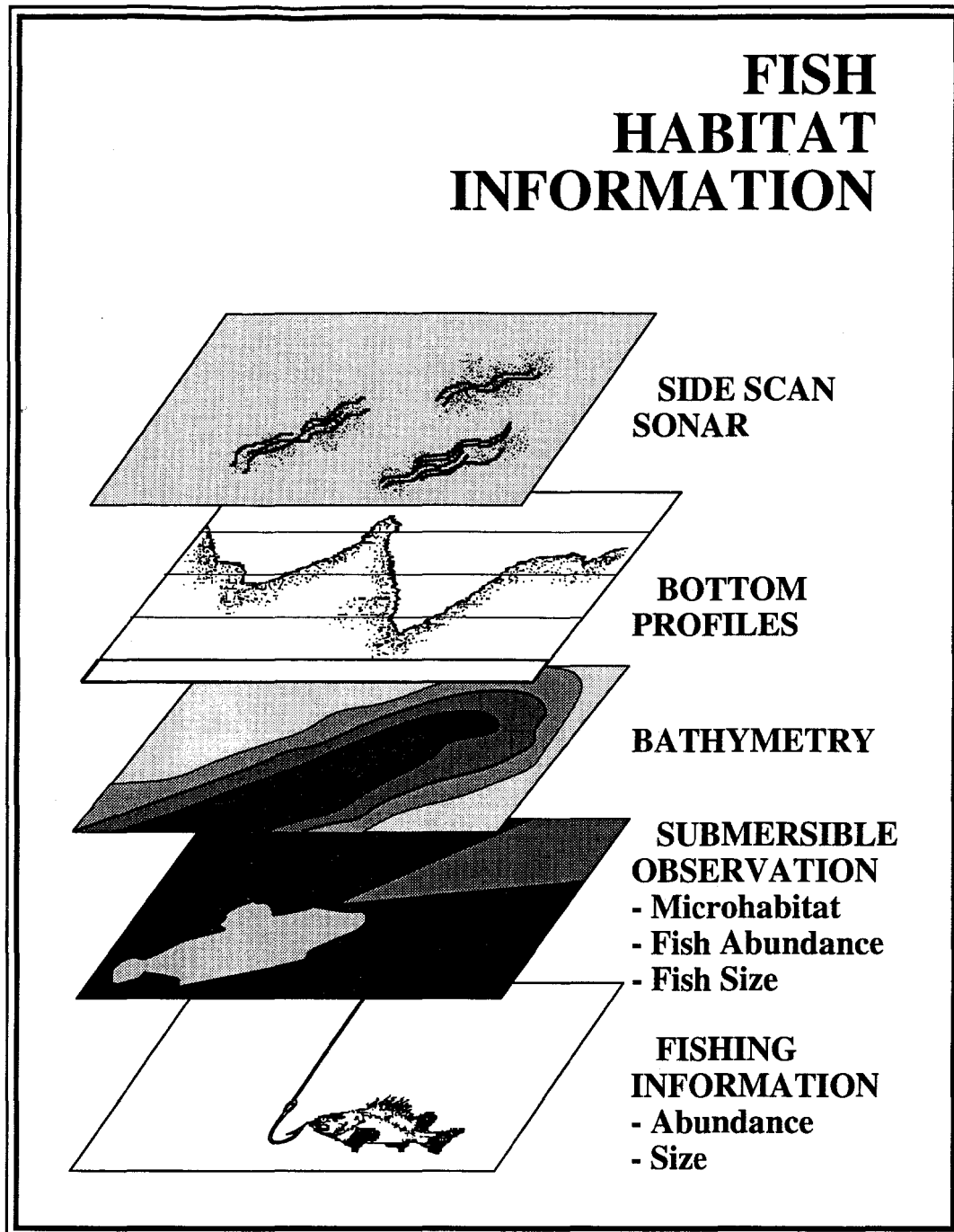


Figure 1. Data sets used to evaluate rockfish assemblages and associated habitat.

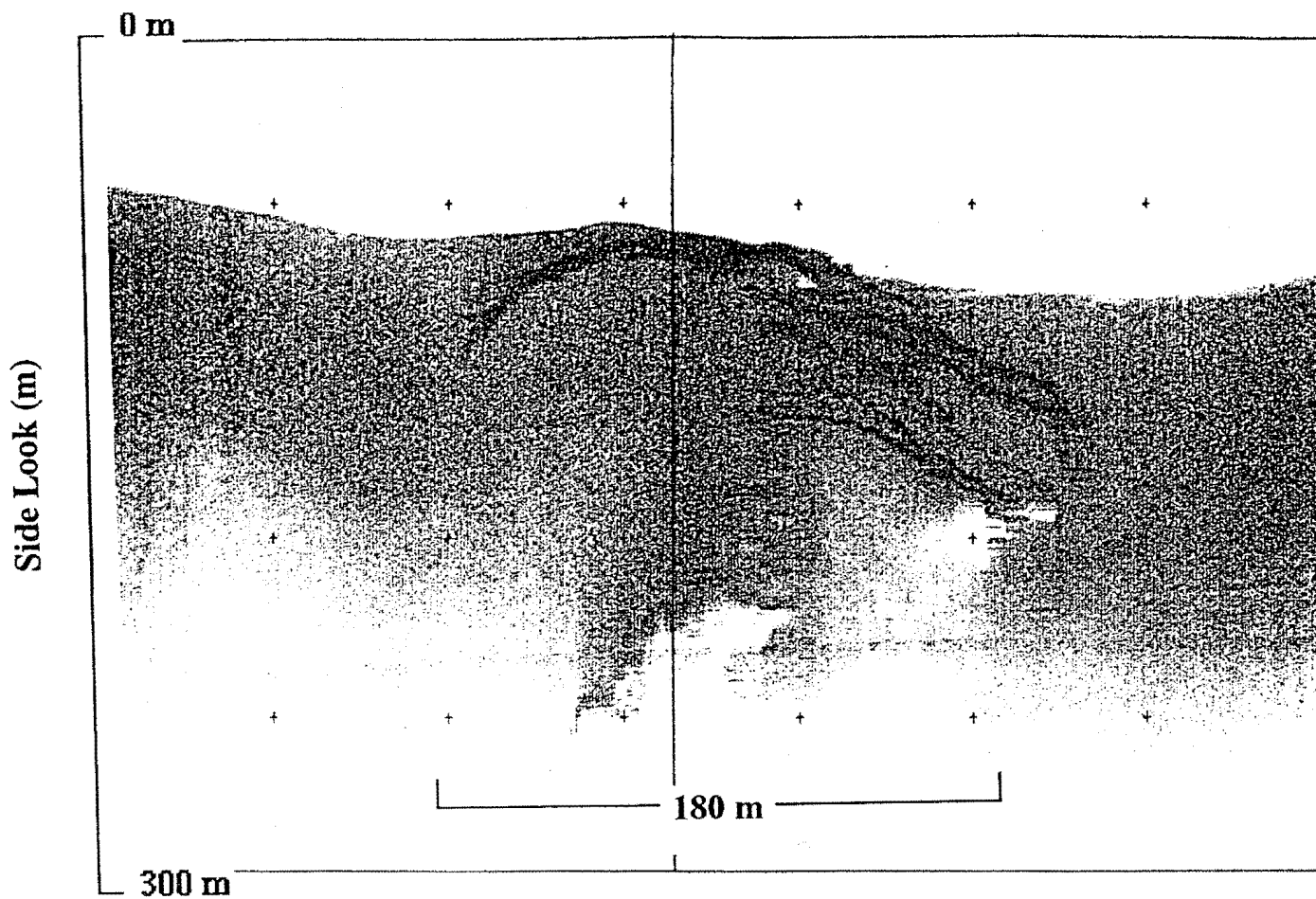
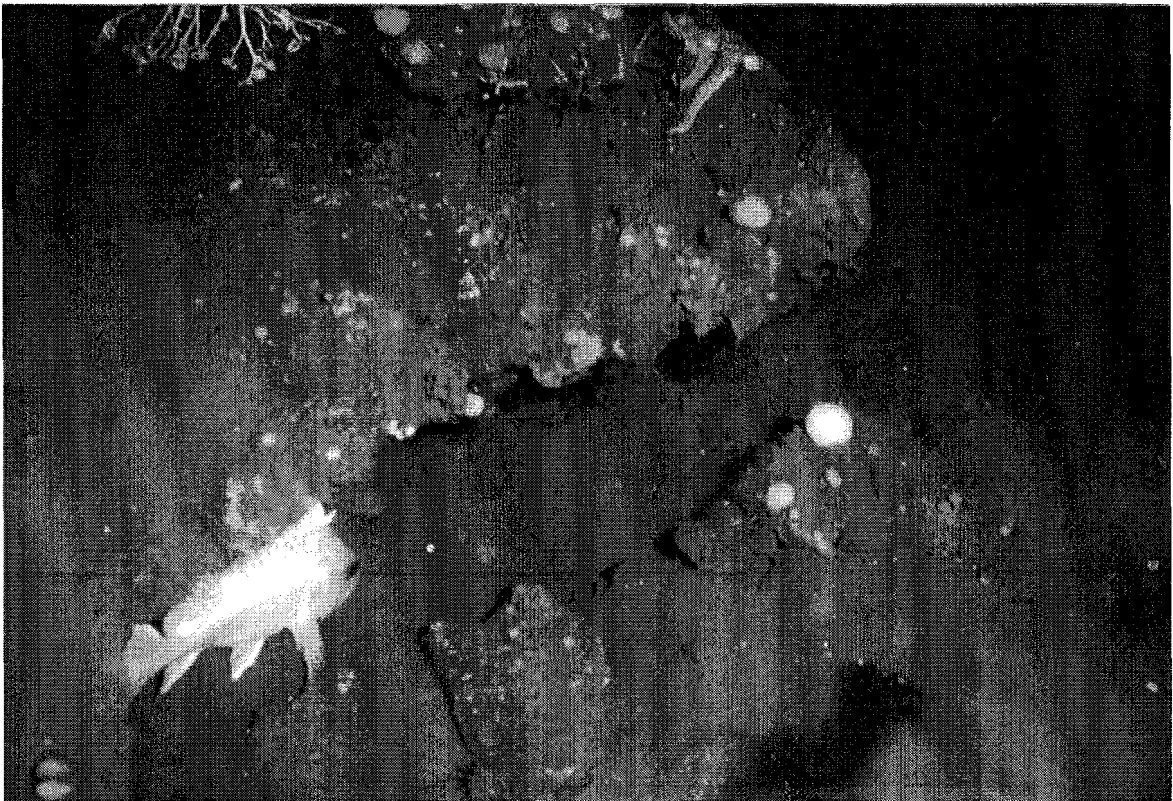


Figure 2. Side-scan sonograph of rock outcrop on steep submarine canyon wall in Monterey Bay. Strong acoustic reflectors are from exposed bedding faces, white areas are shadows behind faces, and gray areas are nonreflective mud. These mudstone beds comprise rockfish habitat. Interpretations were verified by direct observations from submersible.

WORKSHOP PROCEEDINGS

Applications of Side-Scan Sonar and Laser-Line Systems in Fisheries Research

Coast Bastion Inn
Nanaimo, British Columbia, Canada
January 20, 1994



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PREFACE

The collection of abstracts in this volume represents the proceedings of a workshop held on January 20, 1994, at the Coast Bastion Inn, Nanaimo, British Columbia, Canada, directly following the 8th Western Groundfish Conference. Funding for the workshop was provided by the West Coast National Undersea Research Center, and sponsorship was provided by the Alaska Department of Fish and Game. The moderators gratefully acknowledge the following persons for their help during the workshop and their associated activities: Dr. Ray Highsmith and David Doudna, WCNURC, Greg Cailliet, Rick Starr, Jan Straley, and Mary Yoklavich. The moderators would also like to thank the organizing committee of the 8th Western Groundfish Conference from the Pacific Biological Station, Department of Fisheries and Oceans, for their support of our workshop: Rick Stanley, Lynne Yamanaka, Debra Murie, Max Stocker, Judy Stolz, Carol Roy, and Bruce Leaman.

The workshop's primary purpose was to bring together marine fishery biologists, marine geologists, and technology representatives to discuss the availability, applications, and limitations of side-scan sonar and laser-line technologies as it relates to the investigation of marine fish habitats. A total of 14 presentations were made. In all, we received abstracts and extended abstracts for 13 of the presentations: 3 related to fisheries applications, 3 related to geology and fish habitats, and 7 that were more technology related. The intent of publishing these abstracts is to provide the reader with a source for locating more detailed information on the successful application of side-scan and laser-line technology in fisheries research.

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