

populations, determining oil spill threats, basic characterization of habitats, and providing information for developing a national policy on undersea cables in Sanctuaries. The second section addresses how the research team is sharing and integrating regional research. This year, the Sanctuary Integrated Monitoring Network (SIMoN) web portal was released, providing a central, starting place for finding habitat information and monitoring trends in coastal central California. Finally, the report provides abstracts of the many presentations and publications that the Research Team has authored in 2003. Many partners were necessary for successfully completing all of these research efforts, and they are outlined in the report. For a full description of the Sanctuary Research Program, including current and historical activities, see the SIMoN web portal (<http://mbnms-simon.org>) and the Research and Monitoring section of the Sanctuary web site (<http://montereybay.noaa.gov>).

## MAJOR SANCTUARY FIELD PROJECTS

The Sanctuary Research Team will address management needs for information by becoming directly involved in research efforts. This often occurs when staff expertise is needed in either the subject matter or logistical support. In this section, we review four major Sanctuary research projects that involved off-shore ship time. Information on other Research Team field projects can be found in the abstracts at the end of this report.

### **Seafloor Mapping of Fanny Shoal and Partington Canyon: NOAA Ship *McARTHUR II* Cruise**

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Partington Canyon, along the Big Sur coastline.

### Abstract

In July 2003, the Monterey Bay National Marine Sanctuary in collaboration with 3 other federal agencies and two local research institutions led a six days research cruise aboard the NOAA Ship *McARTHUR II*. The United States Geological Survey (USGS) provided sidescan sonar technology to survey the seafloor at Fanny Shoal in the Gulf of Farallones National Marine Sanctuary, and in the vicinity of Partington Canyon in the Monterey Bay National Marine Sanctuary. The surveys revealed an extensive and a geologically complex basement and bedrock outcrop in Fanny Shoal, and a narrow continental shelf that is experiencing considerable littoral sediment transport in the Partington Canyon area. The Center for Habitat Studies at Moss Landing Marine Laboratories processed the data collected in Partington Canyon and produced a habitat map of the area surveyed. Fanny Shoal data will be processed and inventoried at the USGS in the coming year.

### Study Objectives

The objectives of this research cruise were to map the seafloor at Fanny Shoal in the Gulf of Farallones National Marine Sanctuary, and the vicinity of Partington Canyon in the Monterey Bay National Marine Sanctuary.



NOAA ship *McARTHUR II*.

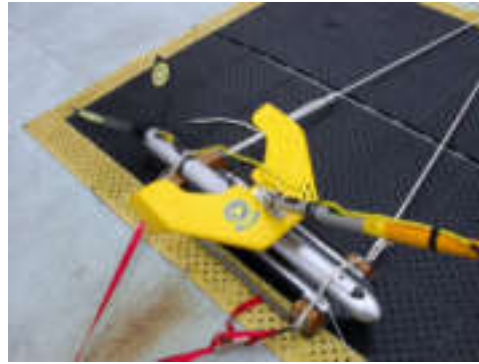
### Methods

Field operations were conducted from July 1 to 6, 2003, aboard the NOAA Ship *McARTHUR II*, a 224-foot vessel operated by NOAA Marine and Aviation Operations. The ship was acquired from the U.S. Navy in 2002 and converted by

Klein 3000 dual frequency  
side-scan sonar system.

NOAA from an ocean surveillance vessel to a multiple-disciplinary science platform capable of a broad range of missions. The *McARTHUR II* conducts oceanographic research and assessments throughout the eastern Pacific, including the U.S. West Coast, Central and South America. The *McARTHUR II* carries a complement of 5 officers, 17 crew members and up to 15 scientists.

A successful day and a half survey was completed at Fanny Shoal with the collection of approximately 160-line km of side-scan sonar images. Approximately 140-line km of side-scan sonar images were collected in the Partington Canyon area. Weather was windy, cool, and foggy with rough seas and the survey was prematurely terminated due to deteriorating weather



conditions with increasing wind, gusting to 62 knots. The survey of the Partington Canyon area was divided into 3 different, but contiguous, sections. They are from south to north: Slate Rock (or Big Creek North), Partington Canyon, and Pfeiffer Point. The reason for the division was because of weather conditions in the area. The initial area of interest extended from the head

of Partington Canyon northward to the Point Sur platform. Unfortunately, high winds and fog prevented surveys in the north area, so the study area was extended to the south, located in the lee of the Point Sur headland and somewhat protected from the weather.

Digital side-scanning sonar data were collected with a Klein 3000 dual frequency side-scanning sonar system (100 & 455 kHz) provided by the USGS. Parallel transect lines, 2 to 15 km in length, were run at a speed ranging from 1.5 to 4 knots depending on water depth and local conditions. Precise navigation and positioning were done with a differential global positioning system (dGPS) and the USGS YoNav navigation system. All data were collected at a 200 m swath width (100m/channel) and line spacing was 150 m giving a 50% overlap. A meter wheel was not on the side-scan sonar cable winch, so amount of cable out was not accurately determined. A general estimate of 120-150 m offset between the side-scan sonar fish and GPS antennas was estimated. Most data were processed aboard using the Center for Habitat Studies' Triton-Elics ISIS processing system and a preliminary (non-geo-referenced) mosaic was constructed for the Fanny Shoal survey. The side-scan data collected at Fanny Shoal and Partington Canyon during this cruise will be processed and inventoried by the USGS and should be available to the public by summer 2004.

The Center for Habitat Studies at the Moss Landing Marine Laboratories processed the data collected at Partington Canyon and constructed marine benthic habitat maps. Because layback information was not collected during

the side-scan survey, the data was manually georectified in ArcGIS using approximations of layback and then snapping files to what limited bathymetric features were available for correlation. Due to the sparsity of high resolution bathymetry and the irregular bathymetry over which the survey was carried out, potential positional accuracy is most likely on. Using processed side-scan data, layouts (maps) were created in ArcView. A scale of 1:10,000 was chosen for habitat interpretations. Seven marine benthic habitat types were defined from the side-scan sonar imagery dataset using a marine benthic habitat characterization scheme modified after (Greene et al. 1999).

## Findings

### Fanny Shoal Survey

#### *Geology*

Based on the fractured and jointed patterns and the linear and curved forms imaged in the side-scan sonar data, geologists interpreted the site to contain extensive areas of rock outcrop consisting of both plutonic and sedimentary rock types. Based on the known terrestrial and nearshore geology, the outcrop appears to be comprised of a central core of plutonic rock (most probably Cretaceous granite) with likely late Tertiary (most probably Miocene Monterey Formation) and sedimentary rocks (most probably Pliocene Drakes Bay Formation or Purisima Formation) lapping onto, or faulted against, the plutonic core. The sedimentary rocks range from fairly thick massive beds (characteristic of the Purisima Formation) to thin repetitive beds (characteristic of the

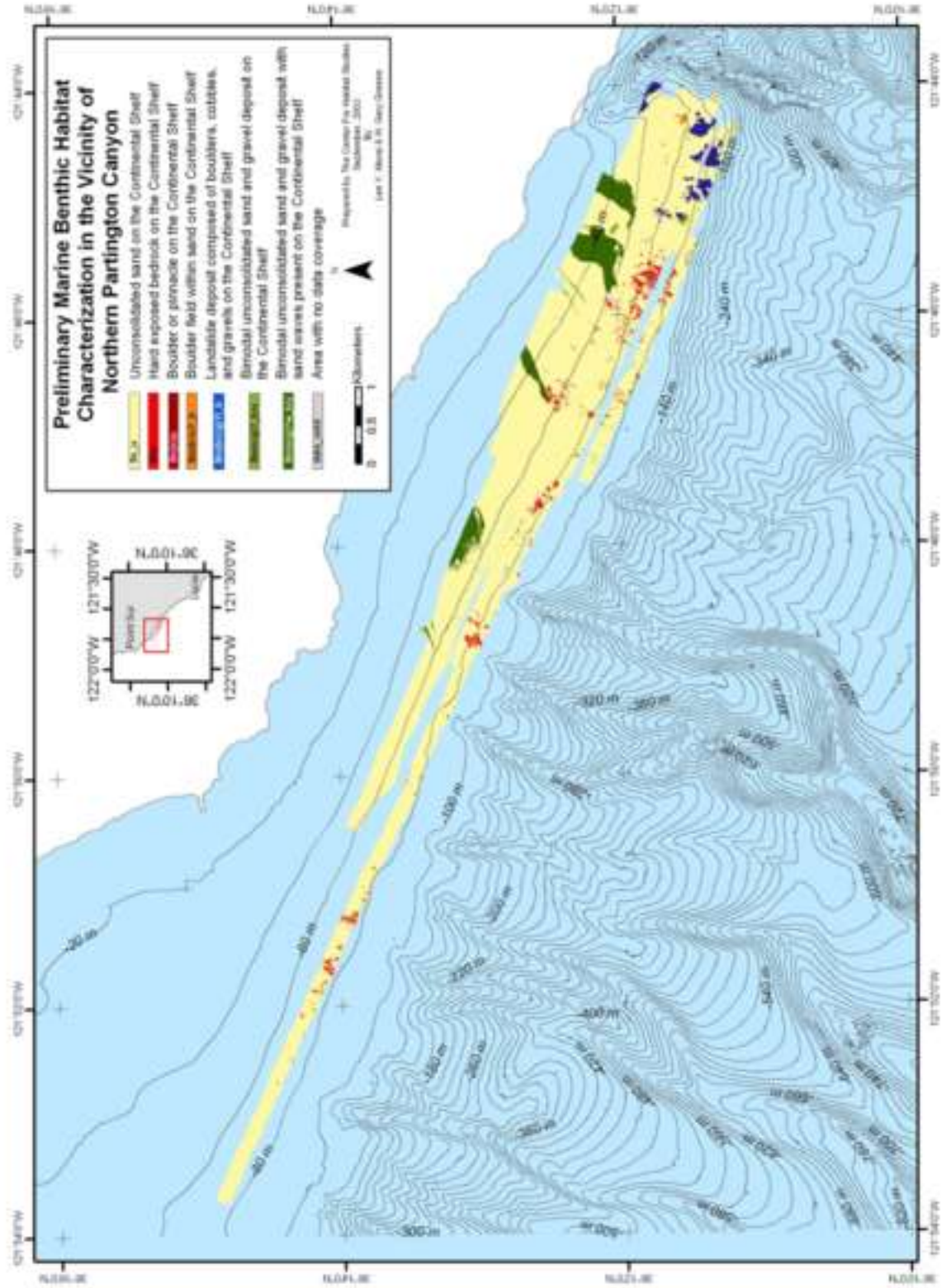
rhythmically bedded Monterey Formation or Santa Cruz Mudstone). Much of the sedimentary rock is differentially eroded producing a serrated surface expression. The sedimentary rocks vary in dip from nearly flat-lying to steeply dipping. They are highly deformed with many folds. Both the plutonic and sedimentary rocks exhibit several sets of fractures and joints. More major through-going faults were identified and have a general East-West trend, oblique to the onshore regional structural trend.



Scientists don survival suits during a drill.

#### *Marine Benthic Habitats*

Based on the geologic interpretations and the backscatter patterns of the side-scan sonar data, a variety of marine benthic habitats were initially identified. These habitats consist primarily of craggy rock with many cracks and crevices, boulders, pinnacles, scarps, interfaces, sand, gravel patches, and caves. These habitats are close together as the rock exposures are surrounded with boulders and coarse-grain (gravel and sand) rippled sediment patches and stringers.



Map of marine benthic habitat north of Partington Canyon.