Abstract

The Monterey Bay National Marine Sanctuary led a research cruise aboard the RV *Velero IV,* using the 2-person submersible *Delta*, 16-25 September 2003. Four research projects with overlapping goals were conducted in collaboration with 6 principal investigators, 9 participating institutions, and 15 participants. Thirty dives were conducted at 5 survey locations in depths of 60-350 meters. Projects included fish and invertebrate assemblage surveys at Soquel Canyon, Partington Canyon, and the Monterey Peninsula/Point Sur Area; ground-truthing of geological habitat, recorded earlier using side scan sonar, at Partington Canyon; and reconnaissance of the oil tanker *Montebello* attacked during World War II near Cambria, CA. Video data have yet to be analyzed. Biological and geological data will be used to determine habitat associations, and long-term changes in species and size composition. Preliminary results of the *Montebello* survey indicate that the ship's hull is intact.

Study Objectives

1. Survey of Demersal Fish and Macroinvertebrate Assemblages at Soquel Canyon. This project is a collaborative effort between the Sanctuary and Mary Yoklavich from NOAA Fisheries.
   a. Assess the importance of small-scale refugia to species of demersal rockfishes in the Soquel submarine canyon, located at the north end of Monterey Bay, CA.
   b. Revisit study sites that were surveyed in 1992-1993 using the *Delta* submersible, and estimate abundance, species-habitat relationships, and species and size composition of demersal fishes using transect methodology; comparisons will be made with data collected in 1992-1993 and also elsewhere off California during past years.

Lingcod (*Ophiodon elongatus*) and white-plumed anemone (*Metridium farcimen*). Photo: T. Laidig/NOAA.

2. Long-Term Monitoring of Demersal Fish and Macroinvertebrate Assemblages. This project is a collaborative effort between the Sanctuary and Richard Starr from California Sea Grant.
   a. Identify long-term trends in species composition, size composition, and relative abundance of demersal fishes and macroinvertebrates in selected areas of the Sanctuary;
   b. Evaluate recovery rates of fishes and macroinvertebrates in areas that were historically abundant but are now depleted, and compare those with population trends of species in similar habitats that are currently abundant.
   c. Explore potential sites for the long-term monitoring plan.
      i. Portuguese Ledge, just north of Monterey, CA was chosen because it has been historically fished, is in a relatively sheltered area, and is easily accessible from Monterey.
      ii. Additional dive locations to be visited will be off Point Sur, CA., fishermen and scientists will be consulted, and alternate locations may be selected depending on weather.

Montebello being launched on January 24, 1921 at East San Pedro, CA. Photo: Unocal.

3. Partington Canyon Habitat Characterization and Macrofauna Survey. This project is a collaborative effort between the Sanctuary and Joseph Bizzarro from the Center for Habitat Studies at Moss Landing Marine Laboratories.
   a. Ground-truth seafloor map of Partington Canyon, CA, which was produced with side scan sonar during summer 2003. Geologists will use the submersible to search for evidence of sediment transfer in the canyon.
   b. Survey demersal fishes and macroinvertebrates.

4. Shipwreck Reconnaissance: Oil Tanker Montebello. This project is a collaborative effort between the Sanctuary and Robert Schwemmer from the

Channel Islands National Marine Sanctuary.

a. Site reconnaissance for the potential threat posed by this 82 year old oil tanker, now 62 years underwater adjacent to the Sanctuary;
b. Characterize the archeological remains of the *Montebello* and record the bow section of the shipwreck partially recorded in 1996;
c. Characterize the fishes and invertebrates fauna
d. Organize and conduct media event, including interview with Richard Quincy, a seaman who was on-board the *Montebello* site when she was sunk.
e. Compare data and information collected during the 2003 *Delta* submersible dives to *Delta* submersible data collected in 1996 to assess biological changes and hull degradation.

Methods

The primary sampling tool for these projects was the manned-submersible *Delta*. Visual strip transects were used to survey fishes and macroinvertebrates in selected rocky habitats in shelf and slope habitats. Submersible strip transects followed protocols commonly used in underwater surveys (e.g., Stein et al 1992, Pearcy et al. 1992, Yoklavich et al. 2000, Yoklavich et al. 2002). Paired lasers were used to measure fishes, invertebrates, rocks, objects, and transects. Observations were recorded on mini-digital video tapes; which included verbal annotation of identification of species, estimation of species size, and depth of field. A submersible study of Soquel Canyon has been published, thus baseline data are available for comparison (Yoklavich et al. 2000).

Reconnaissance of the *Montebello* was conducted by circumnavigating the main structure and hull, bow section, and propellor. The biological characterization was opportunistic, and did not include strip transects, due to ghost fishing gear hazards. Shipwreck structure and biological data will be compared to the 1996 survey (Hunter 2002; personal communication, Robert Schwemmer).

Findings

The Sanctuary and partners conducted 30 dives during 8 days at 5 survey locations in depths of 60-350 m. Video data have yet to be analyzed. Using video footage and geographical position information, we will describe fish and invertebrate assemblages, estimate densities, determine habitat associations, and evaluate and modify the design of a long-term monitoring plan.

The hull of the *Montebello* appeared to be intact, with small “rust bulges” on both sides of the hull near the stern area. These may be early signs of hull decay. There was no sign of oil leakage underwater or on the surface. In addition, no oil-associated bacteria were observed. Characterization of the structure, and further comparison with the 1996, including biological data, will be analyzed.

Relevance to Resource Management

The Sanctuary was established for the purpose of resource protection, research, education, and public use of this national treasure. The Sanctuary research program assesses change in species and habitats, and participates in regional research to better understand the Sanctuary ecosystem.

One of the mandates of the Sanctuary, as it pertains to characterizing submerged cultural resources, is to assess and provide protection. The *Montebello* is an oil tanker that was sunk by a Japanese submarine during World War II. *Montebello*'s historic role is important both regionally and to our nation. Although the shipwreck's position is just outside the southern sanctuary boundary, potential oil leaks from the *Montebello*'s hull is a probable threat to the marine resources of the sanctuary and contiguous waters, assuming the *Montebello*'s cargo of 73,571 barrels (3,089,982 gallons) of unrefined petroleum are entombed in the slowly deteriorating steel hull. The *Montebello* is also host to a magnificent biologically rich marine life community, on the wreck and in the surrounding water column.

Environmental Impact of the ATOC/Pioneer Seamount Submarine Cable: R/V *Pt Lobos* and R/V *Western Flyer* Cruises

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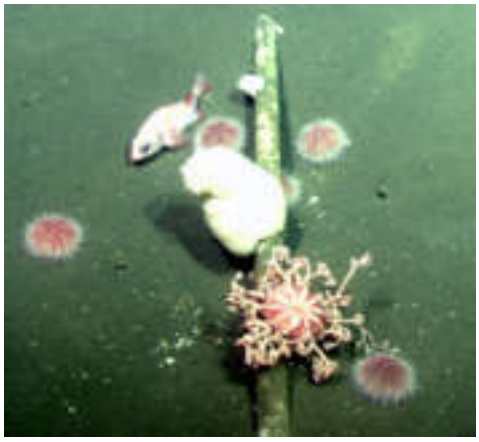
Abstract

To better understand the potential impacts of the presence of cables on the seabed, a study of the environmental impacts of the ATOC/Pioneer Seamount cable was conducted. The 95 km long, submarine, coaxial cable extends between Pioneer Seamount and the Pillar Point Air Force Station in Half Moon Bay, California. Approximately two-thirds of the cable lies within the Monterey Bay National Marine Sanctuary. The cable is permitted to NOAA Oceanic and Atmospheric Research for transmitting data from a hydrophone array on Pioneer Seamount to shore. The cable was installed unburied on the seafloor in 1995. A

RV *Lobos*. Photo: MBARI Copyright 2003.

total of 13 sites along the 95 km cable route were surveyed using MBARI ROVs *Ventana* and *Tiburon* equipped with cable-tracking tools during research cruises on February10-14, 2003 and July 28–August 1, 2003. Quantitative comparison between cable and control sites was performed at nine stations. A total of 42 hours of video footage and 138 push cores were collected over 15.1 km of seafloor. Approximately 12.1 km of the cable was observed (13% of the cable route). The condition of the cable, its effect on the seafloor, and its effect on benthic megafauna and infauna were determined.

Video data indicated the nature of interaction between the cable and the seafloor. Rocky nearshore areas, where wave energies are greatest, showed the clearest evidence of impact. Here, evidence of abrasion included frayed and unraveling portions of the cable's armor and vertical grooves in the rock apparently cut by the cable. The greatest incision and armor damage occurred on ledges between spans in irregular rock outcrop areas. Unlike the nearshore rocky region, neither the rocks nor the cable appeared damaged along outcrops on Pioneer Seamount. Multiple loops of slack cable added during a 1997 cable repair operation were found lying flat on the seafloor. Several sharp kinks in the cable were seen at 240 m water depths in an area subjected to intense trawling activity. Two crossings with other cables were also seen. Most of the cable has become buried with time in sediment substrates on the continental shelf whereas much of the cable remains exposed in sediments at deeper depths. The cable is exposed in rocky environments of the nearshore region and on all of Pioneer Seamount.



A variety of organisms living on or near the ATOC/ Pioneer Seamount cable: basket star (Gorgonocephalidae), anemone (*Metridium farcimen*), rockfish (*Sebastes sp.*) and urchins (*Allocentrotus fragilis*). Photo: MBARI/ NOAA Copyright 2003.

The main biological features

Anemones (*Metridium farcimen*) living on the ATOC/Pioneer Seamount cable. Photo: MBARI/ NOAA Copyright 2003.

associated with the cable were organisms utilizing the cable as substrate and occasionally as shelter. Considerable care was taken to count megafauna in video transects and macrofauna from the top 5 cm of push cores. Few differences were found between cable and control sites at the 95% confidence level. Cnidaria (especially anemones such as *Metridium farcimen* and *Stomphia sp*.) colonize the cable and were more abundant in cable transects at most soft sediment sites. Where the cable was buried, the presence of linear rows of anemones proved to be reliable indicators of the cable's position. Flatfish and rockfish apparently congregate near the cable. The cable may also have a subtle local hydrodynamic effect that concentrated shell hash and drift kelp near the cable. Coarse extrapolation of the transect data suggest that approximately 500,000 organisms may live on or near the cable.

Study Objectives

- Describe state of the cable (buried, suspended, damaged, entangled, etc.)
- Observe any effects of cable on the seafloor
- Analyze effects of cable on benthic organisms

Methods

Survey locations were chosen to target representative substrate and habitat types, features of interest, and for logistical reasons. Side scan sonar data collected on October 21-25, 2002 from the R/V *Zephyr* helped select these sites.

A total of 13 sites along the 95 km cable route were surveyed using MBARI ROVs *Ventana* and *Tiburon* during research cruises on February 10-14, 2003 and July 28–August 1, 2003. Cable-tracking tools were used to aid in cable location and to quantify burial depth. An Innovatum Ultra 44 was installed on the ROV *Ventana* during the February 2003 survey and a TSS 350 was installed on the ROV *Tiburon* during the July 2003 cruise. Tone generators were connected to the shore end of the cable during each cruise and used to send a 25 Hz signal along the cable that would be located by the cable-tracking apparatus installed on the ROVs.

Quantitative comparison of megafauna and infauna along cable (<1 m) and control (~100m from cable) transects was performed at nine stations. Video footage and digital still images were collected and megafaunal abundance was analyzed at two scales: entire video frame and in a region of interest 48 cm x 66 cm centered on the cable or in the center of the frame in control transects. Lasers mounted on the ROVs were used to define the size of the area covered in the video images. If the substrate was soft sediment, push cores were collected

within an estimated 30 cm of the cable. Infaunal organisms (macrofauna) were sorted from the top 5 cm and mean organism abundance and number of different taxa were statistically compared. In all cases, organism identification was performed to the lowest practical taxonomic level and organisms were grouped into functional groups prior to comparison. Transect lengths at sites where cable and control data were collected ranged from 30 to 870 m with most transects 200 to 500 m long.

RV *Western Flyer.* Photo: Todd Walsh Copyright 2000 MBARI.

Findings

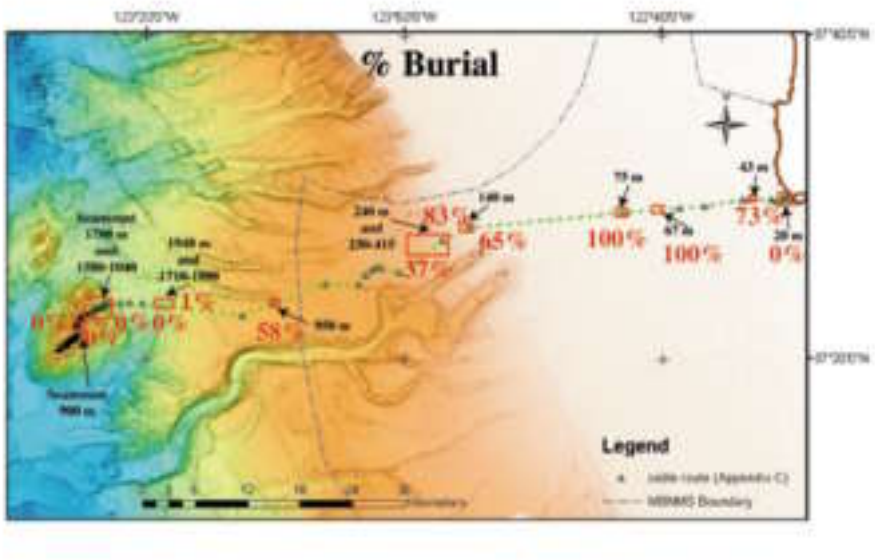
A total of 42 hours of video and 138 push cores were collected from 13 stations using the ROVs *Ventana* and *Tiburon* equipped with cable-tracking tools. A cumulative distance of 15.1 km of seafloor was surveyed along 13 cable and nine control transects. Thirteen percent (12.1 km) of the cable route was observed.

Video observations indicated the nature of interaction between the cable and seafloor. Most of the cable has become buried with time in sediment substrates on the continental shelf (water depths <120 m) whereas much of the cable remains exposed on the seafloor at deeper depths. Burial depth on the continental shelf ranged from 0 to 27 cm and averaged approximately 10 cm. Burial depth may fluctuate due to shifting substrate and buried cable may become exposed during storms. The cable is exposed in rocky environments of the nearshore region and on all of Pioneer Seamount.

The cable's condition was assessed where it was exposed on the seafloor. Video images from the rocky nearshore areas, where wave energies are greatest, show the clearest evidence that the cable has been damaged. Here, evidence of abrasion included frayed and unraveled portions of the cable's armor. In many places the cable occupies vertical grooves in the rock that were apparently cut by the cable. Incisions ranged from 6.6 cm (diameter of double armored cable)

to 45 cm wide. The greatest incision and armor damage occurred on ledges between spans in rocky areas with irregular bathymetry. Snagged kelp was seen intertwined with frayed cable in the near shore areas.

The most notable suspensions were in rocky areas with irregular bathymetry. Such rocky areas occur at both ends of the cable. Suspensions up to 40 m long and greater than 1 m high were seen in the nearshore rocky area and up to 25 m long and 2 m high were seen on Pioneer Seamount. Unlike the nearshore rocky region, neither the rocks nor the cable appeared damaged along outcrops on Pioneer Seamount. Short (~10 cm) suspensions were also common bridging low spots associated with irregular topography in sediment substrate areas. Multiple loops of slack cable, added during a 1997 cable repair operation, were found lying flat on the seafloor at 950 m water depths. Several sharp kinks in the cable were seen at 240 m water depths in an area subjected to intense trawling activity (NRC 2002). Cable crossings were seen in 13 m water depth at 37° 29' 50" N, 122° 33' 04" W and in 344 m water depth at 37° 29' 54" N, 122° 30' 30" W.



Map showing the percentage of cable buried at surveyed locations.

The main observed biological differences between cable and control areas were the number of organisms attached or adjacent to the cable. Anemones colonized the cable and were more abundant in cable transects at most soft sediment sites. Where the cable was buried, the presence of linear rows of anemones proved to be a reliable indicator of the cable's position. Coarse extrapolation of transect data suggests over 50,000 anemones may live in the modified habitat created by the cable. Echinoderms and sponges were also seen living on the cable. At three of nine stations, flatfish and rockfish congregated near the cable. The cable has had no apparent effect on infaunal abundance. Other differences between cable and control sites were probably

due to patchiness of animals. Considerable care was taken to count megafauna in video transects and macrofauna from the top 5 cm of push cores. Few differences were found between cable and control sites at the 95% confidence level. The cable may also subtly affect local hydrodynamic conditions that concentrate shell hash and drift kelp near the cable.

Relevance to Resource Management

Results and observations from this survey will aid decision makers regarding the ATOC/Pioneer Seamount cable's future and provide scientific data for shaping cable policy within Sanctuaries.

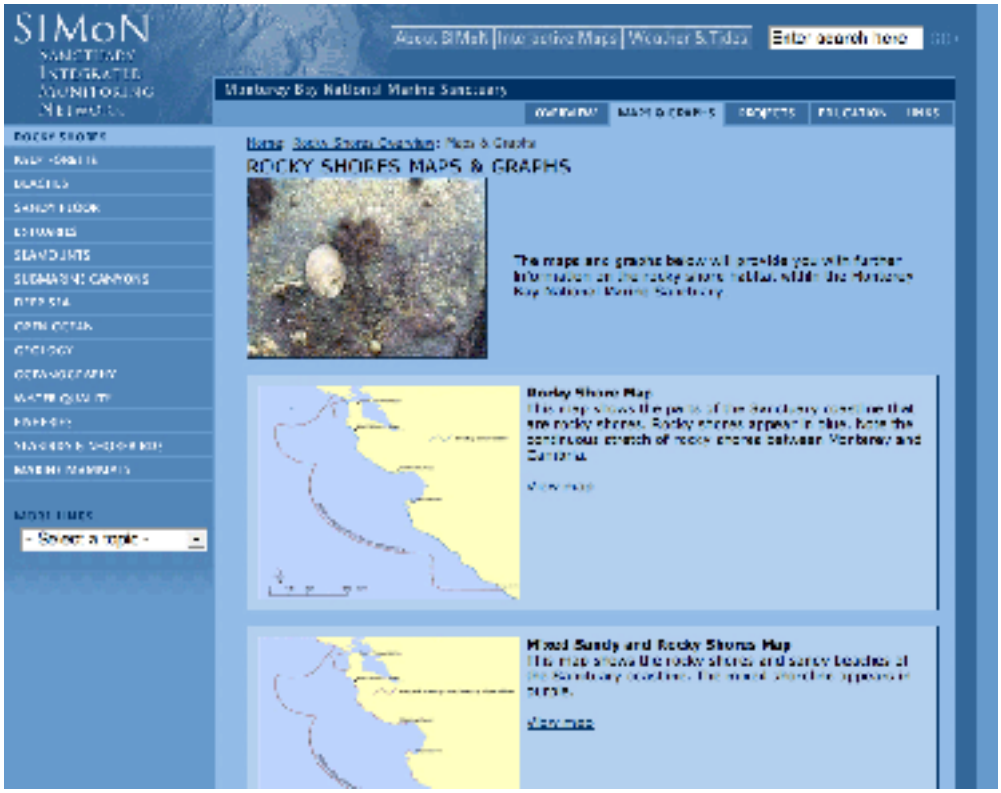
INTEGRATING RESEARCH INFORMATION

Sanctuary Integrated Monitoring Network (SIMoN): Web Portal

The SIMoN portal (http://www.mbnms-simon.org) is the primary outreach tool of the SIMoN program. It was released to the public in 2003. Aimed at sharing monitoring-related information to a diverse audience, including educators, resource managers, marine scientists, and the public, this web site provides information suitable for users of varying scientific knowledge and experience. The SIMoN web site also serves as the central point for the integration of current and historic monitoring programs in the Monterey Bay National Marine Sanctuary, including SIMoN's own field projects.

Home page of the SIMoN website. Fifteen sections along the left-hand side represent the major habitats and issues of the Sanctuary.

Overview page of the rocky shores section. Each section has an overview page that provides information on the natural history and monitoring issues of the habitat/issue.



Maps and graphs page of the rocky shores section. Each section has a page that uses static maps and graphs to provide specific monitoring information.