

**Office of National Marine Sanctuaries/National Centers for Coastal
Ocean Science Long-term Agreement (ONMS/NCCOS LTA)**

**2004 Annual Liaison Report on Existing and Potential ONMS/NCCOS
Collaborative Studies at the Cordell Bank National Marine Sanctuary
(CBNMS)**



Prepared by:

Jonathan Hare
National Centers for Coastal Ocean Science (NCCOS)
Center for Coastal Monitoring and Assessment (CCMA)



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1. Introduction

In April 2000, the National Centers for Coastal Ocean Science (NCCOS) and the Office of National Marine Sanctuaries (ONMS) began a partnership with the purpose of augmenting the management of the National Marine Sanctuaries (NMS) through increased scientific understanding of the sanctuary sites. The first few years of the partnership saw NCCOS scientists working with a handful of sanctuaries. As the partnership matured, collaborative efforts between NCCOS and ONMS increased, and in FY2004 and FY2005, research projects are tentatively funded in 9 of the 14 sites. In addition to research, NCCOS has appointed liaisons to each of the sites. Liaison duties include: being knowledgeable of science activities and capabilities of NCCOS, being knowledgeable of the site's management needs, being knowledgeable of ongoing research and science needs in the site, identifying and assessing research gaps and areas of potential collaboration between NCCOS and ONMS, and working with the site to refine and address their science needs to meet their management objectives.

2. Sanctuary Overview

The National Marine Sanctuary Program was created by Congress through Title III of the Marine Protection, Research and Sanctuaries Act of 1972. The Act allowed marine areas identified for their biodiversity, ecological integrity, and cultural legacy to receive protection similar to national parks.

The Cordell Bank National Marine Sanctuary (CBNMS) was established in 1989 to protect and preserve the extraordinary ecosystem, including marine birds, mammals, and other natural resources of Cordell Bank and its surrounding waters. The sanctuary was managed through the Gulf of the Farallones National Marine Sanctuary (GFNMS) until 1998, when a budget was allocated specifically for the management of CBNMS. CBNMS now has offices in Point Reyes National Seashore. Although distinct, CBNMS continues to work closely with GFNMS to fulfill both sanctuaries' missions.

CBNMS protects an area of 1362 km² off the northern California

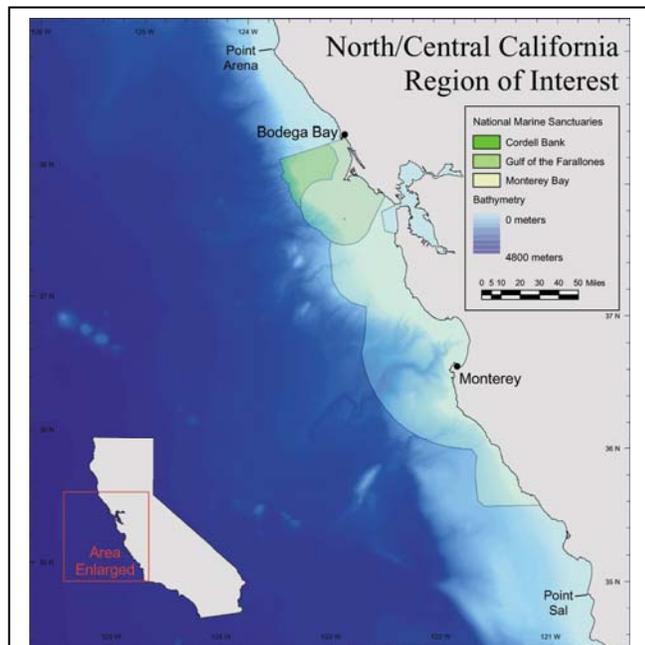


Figure 1. Map of north central California coast showing the boundaries of Cordell Bank National Marine Sanctuary, Gulf of the Farallones National Marine Sanctuary, and Monterey Bay National Marine Sanctuary.

coast. The focal point of the sanctuary is Cordell Bank, which is a granitic bank 8.3 km wide by 17.6 km long. The bank emerges from soft sediments of the continental shelf at roughly 120m and reaches to within 36 m of the ocean's surface. The combination of ocean conditions and undersea topography creates a rich and diverse marine community.

A number of invertebrate species inhabit the rock bank including sponges, ascidians, anemones, hydrocorals, and sea stars. The soft sediment surrounding the bank also is assuredly rich in invertebrate species, but this community is less well documented than that on the bank itself. Two hundred and forty six fish species have been reported in CBNMS including 44 species of rockfish. Sand dab are abundant over the unconsolidated sediment of the sanctuary, and tuna and salmon are targeted by fishers in the water column. Twenty-six species of marine mammals are known to frequent the waters around Cordell Bank. The sanctuary is one of the most important feeding grounds in the world for the endangered blue and humpback whales. Pacific white-sided dolphins are common, and California sea lions, elephant seals, northern fur seals, and Steller sea lions frequent sanctuary waters to feed on krill, squid, and juvenile fishes. A wide variety of seabirds forage within CBNMS. Species include residents that nest on the nearby Farallone Islands (within GFNMS) and migratory species, which include five of the fourteen albatross species.

Currently, regulations prohibit: discharge of any material in the sanctuary; discharge of any material outside the sanctuary that harms resources inside the sanctuary; damage to or removal of invertebrates and plants within the 50 fathom isobath surrounding the bank; and exploring for, developing, or producing oil, gas, or minerals in the sanctuary ¹. California Fish and Game enforces federal as well as state fishing regulations in CBNMS. The US Coast Guard has broad responsibility for enforcing all Federal laws in navigable waters under U.S. jurisdiction.

3. Management Goals and Concerns

CBNMS is managed under the original 1989 management plan ². This plan is currently under revision, but the revision is being conducted jointly with the revision of the

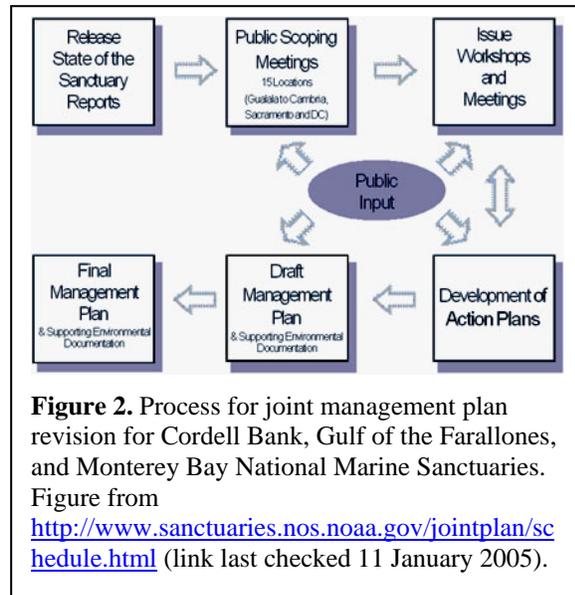


Figure 2. Process for joint management plan revision for Cordell Bank, Gulf of the Farallones, and Monterey Bay National Marine Sanctuaries. Figure from <http://www.sanctuaries.nos.noaa.gov/jointplan/schedule.html> (link last checked 11 January 2005).

¹ The complete regulations for CBNMS can be found at http://cordellbank.noaa.gov/management/CBNMS_Regs.pdf (link last checked 14 November, 2003)

² available at <http://www.sanctuaries.nos.noaa.gov/jointplan/CordellIMP.PDF> (link last checked on 11 January 2005)

management plans for MBNMS and CBNMS. These sanctuaries are located adjacent to one another, and share many of the same resources and management issues. All three sanctuaries also have overlapping interests and users groups. Action Plans have been developed for each sanctuary and are currently under review. In October 2004, the Pacific Fishery Management Council was asked to prepare draft sanctuary fishing regulations for MBNMS and CBNMS. Accompanying the request was a document that provided background information, action alternatives, and preferred actions. The preferred alternative for CBNMS is to exempt vertical-hook-and-line fishing from the prohibitions of affecting benthic invertebrates, algae, and the seafloor within the vicinity of Cordell Bank³. For the purposes of identifying management goals and concerns, the 1989 Management Plan and the recent Joint Management Plan Review Recommendations for CBNMS⁴ are used here as sources.

The 1989 Management Plan identified four goals and management strategies to achieve these goals. Each is listed below with a brief discussion of the strategies.

1) Protect the marine environment and resources of CBNMS (Resource Protection). To ensure that resources are protected, CBNMS endeavors a) to coordinate policies and procedures among the agencies sharing responsibilities, b) to involve other agencies in the development of new procedures to address specific management concerns, and c) to enforce sanctuary regulations. The current regulations to effect resource protection are discussed above.

2) Improve understanding of the Cordell Bank environment and resources to resolve management problems (Research). To achieve this understanding, three research priorities were identified: a) baseline studies to describe the natural environment, examine the ecology of living resources, and describe the patterns of human use; b) monitoring activities to document changes in environmental quality, ecology, and human activity, and c) studies to assess the causes and consequences of environmental and ecological change. A discussion of current research activities is presented below.

3) Implement interpretative programs to improve public awareness and understanding of the significance of the sanctuary and the need to protect its resources (Education). The plan calls for establishing interpretative programs for visitors to CBNMS, to CBNMS and GFNMS offices, and interested groups not actually visiting the sanctuary.

4) Encourage commercial and recreational use of the sanctuary compatible with the primary goals of resource protection (Outreach).

³ <http://sanctuaries.nos.noaa.gov/jointplan/documents/304analysisHI.pdf> (link last checked on 11 January, 2005)

⁴ available at http://www.sanctuaries.noaa.gov/jointplan/reptoad/cb_pdf/cb_reptoad.pdf(link last checked 11 January 2005)

The Joint Management Plan Review Recommendations for CBNMS included four site-specific issues that almost parallel to the four original management goals.

1) Education – The stated goals were to use education as a management tool to help protect sanctuary resources, use education to complement other sanctuary programs, and to continually reach broader audiences to create an informed and involved public. To achieve these goals, four objectives and 17 strategies were defined.

2) Ecosystem Protection - The stated goal was to better understand and allow for fishing activities that are compatible with sanctuary goals and ecosystem health. Five objectives were identified: a) establish a working relationship with Pacific Fisheries Management Council, b) track and evaluate existing, new, and emerging fishing issues for their potential impacts on sanctuary resources, c) support adaptive management plans that promote ecosystem health, d) develop a definition of ‘compatible use’ for fishing activities that complement the sanctuary’s primary objective of resource protection, and e) broaden and formalize partnerships between sanctuary, fishing community, and non-governmental organizations (NGO’s). To achieve these goals, 10 strategies were identified.

3) Partnerships with community groups – Through community partnerships, CBNMS will leverage opportunities to develop public awareness, education, and stewardship; obtain volunteer, financial, and in-kind support; and increase research opportunities. To achieve these partnership goals, four objectives and 13 strategies were defined.

4) Research – Three research goals were identified: a) increase knowledge and understanding of the Cordell Bank ecosystem, b) develop research programs to identify and address specific resource management issues, and c) develop monitoring programs to understand long-term status and trends to guide management. To achieve these three goals 11 strategies were identified. These are discussed in more detail below.

In addition to developing strategies on four issues of concern, several changes in regulations were recommended in the Joint Management Plan Review. Several modifications were suggested for current regulations: 1) changes to the language prohibiting discharges, 2) changes to the language regarding the removal of organisms, and 3) a change the boundary description to “area of submerged lands”. Several new regulations also were proposed: 4) no disturbing the submerged lands of the sanctuary on the Bank, or within the 50 fathom isobath around the Bank, except to anchor beyond the 50 fathom isobath; 5) prohibiting the taking of any marine mammal, marine reptile, or seabird; 6) prohibiting lightering (transferring cargo from one vessel to another) in the sanctuary; 7) prohibiting introduction of exotic or genetically modified species; 8) prohibiting feeding or attracting a living resource, except for lawful fishing; and 9) adoption of a cruise ship discharge prohibition consistent with MBNMS’s new proposal. Most of these new regulations are related with the goal of protecting the marine environment and resources of CBNMS.

The Joint Management Review Panel Recommendations also proposed developing a framework for identifying and analyzing boundary options. Part of the process involves understanding the ecological role of CBNMS in relation to the northern California shelf ecosystem, as well as understanding how processes acting in the larger ecosystem affect the resources of CBNMS.

4. Current Sanctuary Research Projects and Summary of Ongoing and Planned NCCOS/ONMS Partnership Activities

Habitat Investigations– CBNMS has been conducting habitat investigations on Cordell Bank since 2001. The Delta submersible and Velero IV remotely operated vehicle (ROV) were used to conduct initial surveys of Cordell Bank. Characterizing habitats and documenting species distribution and abundance assist in understanding the Cordell Bank ecosystem. The sanctuary planned to conduct this work annually, but the work has been limited by the weather and ship availability. During 2004, a research cruise was conducted with a primary goal of bathymetric mapping, but information on benthic habitats in MBNMS, GFNMS, and CBNMS was also collected⁵.

Bathymetry Mapping - CBNMS are trying to extend their habitat studies by having multibeam surveys done of the entire sanctuary. The U.S. Geological Survey (USGS) participated in the 2004 cruise and several tracklines were made within CBNMS.

Ecosystem Dynamics Study – CBNMS is involved in exploration and investigation of marine life and through a joint project with GFNMS. This long-term study focuses on the dynamics of krill, an important species in the food web of CBNMS. Both acoustic and net sampling are used and the parameters affecting krill distribution are measured. These data are also analyzed in combination with seabird and marine mammal observation data. Some of these data have been described in a publication *Beyond the Golden Gate-Oceanography, Geology, Biology, and Environmental Issues in the Gulf of the Farallones*⁶.

Remote Sensing Applications – As part of the FY2004 and FY2005 ONMS/NCCOS partnership, CCMA was funded to apply several remotely sensed data sets to describe the oceanography in the area of CBNMS (as well as GFNMS and MBNMS). This project directly contributes to one of the CBNMS priority research needs: complete and detailed understanding of the oceanographic and atmospheric conditions in and around the sanctuary (see below). Processing of monthly, 5 day, and 8 day Pathfinder SST data has been completed for data from 1985-2001. Time series data has been extracted from the available SST data for all three sanctuaries. Chlorophyll and turbidity imagery (SeaWiFS) are continuously being processed as they are received. Characterization of the sanctuaries physically has begun with the application of remote sensing techniques trying to identify patterns in the data.

⁵ http://www.mbnms-simon.org/other/moreLinks/whats_new_mac.php (link last checked 11 January 2005)

⁶ <http://geopubs.wr.usgs.gov/circular/c1198/C-1198.pdf> (link last checked 11 January 11, 2005)

Biogeographic Assessment – CCMA conducted a biogeographic assessment of the northern California coast including CBNMS⁷. The assessment identifies and collects relevant biological datasets for the sanctuary and combines these datasets in a GIS framework. This assessment is being used in the revision of the Joint Management Plan for MBNMS, GFNMS, and CBNMS.

Exploring Albatross Movements - Starting in August 2004, Oikonos-Ecosystem Knowledge in collaboration with National Fish and Wildlife Foundation, Moss Landing Marine Lab, Duke University, and Claremont College, launched a multi-disciplinary research program to assess the habitats and the conservation status of marine birds in the California Current System. Within this larger ecosystem-level context, the albatross project⁸ addresses two complimentary priorities: 1) to provide needed information on the conservation status of the Black-footed Albatross (*Phoebastria nigripes*) off the West Coast of North America, and 2) to enhance the understanding of the foraging grounds and movements of this threatened species across the northeast Pacific Ocean. 9 birds were tagged in August 2004 from the CBNMS research vessel *C. Magister*.

5. Research Gaps and Future Needs

ONMS conducted comprehensive assessment of the science activities in the program (Gittings et al., 2002)⁹. The information in the assessment was largely identified in a 2001 workshop, which evaluated how well the sanctuary management issues were being addressed by science activity and provided direction for future science resources. The assessment was both across the program and site specific and serves here as a starting point for identifying research gaps and future needs for CBNMS.

Priority information needs identified by Gittings *et al.* (2002) for CBNMS include examining the effectiveness of zoning regimes, understanding the effects of natural events on harvested organisms, determining the factors that control year-class strength, and generating GIS compatible data of critical habitat for species of concern.

In the Joint Management Plan Review Recommendations, a number of research topics were proposed and prioritized. These are listed below in order of identified priority.

RE-1. [Develop a] complete and detailed understanding of the oceanographic and atmospheric conditions in and around the sanctuary is needed. Priority Level 1.

RE-2. Catalog and identify unsorted Cordell Bank specimens housed at the California Academy of Sciences. Priority Level 1.

RE-3. Characterize and map habitats within CBNMS using sonar. Priority Level 1.

⁷ http://biogeo.nos.noaa.gov/products/canms_cd/ (link last checked 11 January 11, 2005)

⁸ <http://www.oikonos.org/projects/albatross.htm> (link last checked 11 January 11, 2005)

⁹ Gittings, S., K. Benson, P. Souik, and M. Tartt. 2002. Sanctuary Science: Evaluation of Status and Information Need. Available at: http://sanctuaries.nos.noaa.gov/library/national/science_eval.pdf

RE-4. Survey available museum collections, data archives and literature indexing services for Cordell Bank specimens, data, and publications. Priority Level 1.

RE-10. Maintain on-going monitoring of fish and invertebrate assemblages in relation to the fine-scale habitat of the Bank portion of CBNMS. Priority Level 1.

RE-5. Characterize and map the soft-bottom habitats and epifaunal communities of CBNMS. Priority Level 2.

RE-11. Marine mammal observations using ships of opportunity. Priority Level 2.

RE-12. Monitor the temporal and spatial patterns of marine mammals and birds visiting CBNMS. Priority Level 2.

RE-7. Characterize the temporal and spatial patterns of marine mammals and birds visiting the CBNMS. Priority Level 2.

RE-6. Characterize soft bottom infaunal community of CBNMS. Priority Level 3.

RE-8. Characterize surface and subsurface current patterns at the microcosm scale of CBNMS. Priority Level 3.

RE-9. Develop on-going, long-term oceanographic monitoring program. Priority Level 3.

The needs identified in Gittings *et al.* (2002) mesh somewhat with the specific research needs identified in the Joint Management Plan Review Recommendations. Understanding the effects of natural events on harvested organisms will be achieved in part through research recommendations RE-1, RE-8, RE-9, and RE-10. Generating GIS compatible data of critical habitat for species of concern will be addressed through research recommendations RE-3, RE-5, and RE-10. Determining the factors that control year-class strength will be partially addressed by RE-1, RE-2, RE-4, RE-10, but the research recommendations alone will not provide a process-oriented understanding of the factors that affect year-class strength. Finally, examining the effectiveness of zoning regimes is in part addressed by research recommendations RE-1, RE-3, RE-5, RE-6 and RE-8, as well as some of the recommendations made with regard to developing a framework for identifying and analyzing boundary options.

Thus, there seem to be few gaps in the CBNMS research plan. One area, which was mentioned above, was the Joint Management Plan Review Recommendations did not specifically mention process-oriented work to understand the dynamics of species with CBNMS. Many of the elements to conduct such work are in the plan such as the Ecosystem Dynamics Study and the desire to develop a complete and detailed understanding of the oceanographic and atmospheric conditions in and around the

sanctuary. CBNMS staff should consider how important is the need to determine the factors that control year-class strength (Gittings et al. 2002).

Some of the ecosystem monitoring goals of CBNMS could possibly be integrated with monitoring activities conducted by the National Marine Fisheries Service Southwest Fisheries Science Center (SWFSC). Plankton surveys occur off of southern California as part of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program. Juvenile rockfish surveys are conducted by scientists at the SWFSC Santa Cruz Laboratory. Marine mammal surveys also are conducted by the SWFSC. Integration of efforts and combination of resources, in addition to that identified in the Joint Management Plan Review Recommendations, could benefit both the missions of SWFSC and NMS.

6. Overview of NCCOS Science Capabilities

NCCOS was formed in March 1999 to concentrate coastal research capabilities within an NOS office. Elements forming NCCOS were drawn from the National Ocean Service (NOS) and the National Marine Fisheries Service (NMFS). NCCOS is composed of a headquarters in Silver Spring, Maryland, and five research centers: the Center for Sponsored Coastal Ocean Research in Silver Spring, Maryland; the Center for Coastal Monitoring and Assessment in Silver Spring, Maryland; the Center for Coastal Fisheries and Habitat Research in Beaufort, North Carolina; the Center for Coastal Environmental Health and Biomolecular Research in Charleston, South Carolina; and the Hollings Marine Laboratory in Charleston, South Carolina.

The focus of NCCOS is to provide useful and valuable scientific information and services through the conduct and support of research to further the NOAA environmental and economic missions. The scientists within NCCOS conduct applied research and manage complex long-term research projects. The projects provide a link between research science in academia and the needs of those who make decisions on use of coastal and marine areas. Driven by NOAA's mandates in content and in timing, the science conducted and supported by NCCOS focuses on applicability to agency and constituents' needs for practical answers.

Each Center has specific capabilities and research expertise in important ocean and coastal issues and contributes in its own way to the overall NCCOS mission.

Center for Sponsored Coastal Ocean Research – CSCOR provides funding to academic and federal researchers investigating a wide range of science issues directly related to NOAA's management needs. Funded programs include GLOBEC (Global Ocean Ecosystem Dynamics) and ECOHAB (Ecology and Oceanography of Harmful Algal Blooms). More information about CSCOR can be found on the Center's factsheet (http://coastalscience.noaa.gov/documents/factsheet_cscor.pdf) and on their website (<http://www.cop.noaa.gov>).

Center for Coastal Monitoring and Assessment – CCMA conducts monitoring and assessment of coastal environmental quality, coastal habitats, and coastal resource distribution. Major programs exist in biogeographic characterization, bioeffects monitoring, and remote sensing. CCMA also has extensive GIS expertise. More information about CCMA can be found on the Center’s factsheet (http://coastalscience.noaa.gov/documents/factsheet_ccma.pdf) and on their website (<http://ccmaserver.nos.noaa.gov>).

Center for Coastal Fisheries and Habitat Research – CCFHR conducts research on habitat ecology, fisheries oceanography, and plankton ecology and physiology. Research blends field-base studies, laboratory studies, and modeling activities. The Center has also the capability to culture marine and estuarine species. In addition, NMFS researchers are part of CCFHR and research themes include marine mammal and sea turtle research, reef fish ecology, and population dynamics. More information about CCFHR can be found on the Center’s factsheet (http://coastalscience.noaa.gov/documents/factsheet_ccfhr.pdf) and on their website (<http://shrimp.ccfhrb.noaa.gov>).

Center for Coastal Environmental Health and Biomolecular Research – CCEHBR used a combination of chemical, biomolecular, toxicological and ecological techniques to examine health of coastal ecosystems, environmental quality, and public health impacts. Major research areas include marine ecotoxicology, marine pathology, coral health, invasive species management, protected species health, marine forensics, and environmental risk analysis. More information about CCEHBR can be found on the Center’s factsheet (http://coastalscience.noaa.gov/documents/factsheet_ccehbr.pdf) and on their website (<http://www.chbr.noaa.gov>).

Hollings Marine Laboratory – HML opened in 2002 and provides science and biotechnology applications to examine the linkages between the environment and human health. HML is co-occupied by several partnering institutions including NCCOS, South Carolina Department of Natural Resources, University of Charleston, National Institute of Standards and Technology, and the Medical University of South Carolina. More information about HML can be found on the Center’s factsheet (http://coastalscience.noaa.gov/documents/factsheet_hml.pdf) and on their website (<http://www.nccos.noaa.gov/about/hml.html>).

CONTACTS

Office of National Marine Sanctuaries

Jan Roletto, Research Coordinator

Cordell Bank National Marine Sanctuary

PH: (415) 561-6622 ext. 207

Internet Address: Jan.Roletto@noaa.gov

<http://cordellbank.noaa.gov/>

National Centers for Coastal Ocean Science

Dr. Jonathan Hare

Center for Coastal Fisheries and Habitat Research

PH: (252) 728-8732

Internet Address: jon.hare@noaa.gov

<http://ccfhr.nos.noaa.gov/>