CORDELL BANK

STATE OF THE SANCTUARY REPORT

NOAA ocean SERVICE

NATIONAL MARINE SANCTUARIES ™

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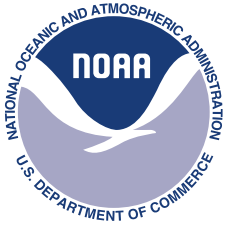

The National Marine Sanctuary Program

The National Marine Sanctuary Program, a network of 13 marine protected areas, encompasses marine and freshwater resources from Washington State to the Florida Keys and from Lake Huron to the Gulf of Mexico, American Samoa, and places in between. The National Oceanic and Atmospheric Administration's National Ocean Service has managed marine sanctuaries since the passage of the Marine Protection, Research, and Sanctuaries Act of 1972. Title III of that Act is now called the National Marine Sanctuaries Act.

Today, our marine sanctuaries contain deep ocean gardens, near-shore coral reefs, whale migration corridors, deep-sea canyons, and underwater archaeological sites. They range in size from one-quarter square mile in Fagatele Bay, American Samoa, to more than 5,300 square miles in Monterey Bay, California — one of the largest marine protected areas in the world. Together these sanctuaries protect nearly 18,000 square miles of coastal and open ocean waters and habitats. While some activities are managed to protect resources, certain multiple uses, such as recreation, commercial fishing, and shipping, are allowed to the extent that they are consistent with a sanctuary's resource protection mandates. Research, educational, and outreach activities are other major components in each sanctuary's program of resource protection.

The National Marine Sanctuary Program is a world leader in effective management, placing a primary emphasis on the protection of living marine resources and our nation's submerged cultural resources.

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Front Cover: Rosy Rockfish, *Sebastes rosaceus*, swims along the seafloor amidst strawberry anemones, *Corynactis californica*.
Photographer: Cordell Expeditions

Back Cover: Cordell Bank provides habitat for a diverse array of invertebrates and fish.
Photographer: Cordell Expeditions

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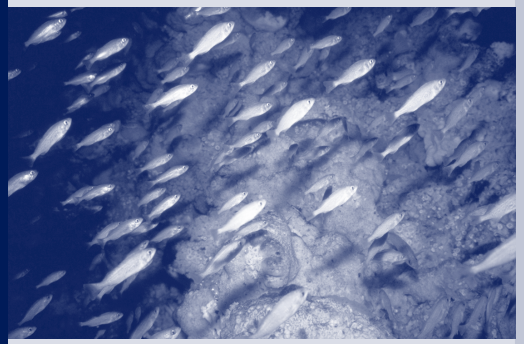
The Cordell Bank National Marine Sanctuary

Cordell Bank National Marine Sanctuary protects an area of 526 square miles (397 square nautical miles) off the northern California Coast. Cordell Bank is located at the edge of the continental shelf, about 43 nautical miles (nm) northwest of the Golden Gate bridge and 18 nm west of the Point Reyes lighthouse. The main feature of the Sanctuary is an offshore granite bank 4.5 miles wide by 9.5 miles long. The rocky bank emerges from the soft sediments of the continental shelf, with the upper pinnacles reaching to within 120 feet of the ocean's surface. Shelf depths at the base of the Bank are roughly 400 feet.

Cordell Bank National Marine Sanctuary protects one of the most productive offshore areas in the United States. The combination of ocean conditions and undersea topography supports a rich and diverse marine community. The prevailing California Current flows southward along the coast, and the upwelling of nutrient-rich, deep ocean water provides the foundation for a flourishing marine ecosystem. The site supports healthy resident populations and is a destination feeding ground for many migratory marine mammals, seabirds, and fishes. Invertebrates proliferate on the Bank and in the surrounding water column.

Mission: To protect the physical and biological resources of this unique offshore area.

The strawberry anemone, *Corynactis californica.*
Photographer: Cordell Expeditions



Juvenile rockfish at Cordell Bank.
Photographer: Cordell Expeditions

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An opportunistic Jaeger, *Stercorarius spp.*, looks for food near a humpback whale, *Megaptera novaeangliae* Photographer: Rich Stallcup

A mixed school of yellowtail, *Sebastes flavidus*, and blue rockfish, *Sebastes mystinus*, over Cordell Bank. Photographer: Cordell Expeditions

Executive Summary

In 1869 the abundance of wildlife helped Edward Cordell relocate an offshore Bank discovered by George Davidson in 1853. Today, Cordell Bank can still be located by a dramatic increase in wildlife activity over this submerged island. The Cordell Bank National Marine Sanctuary remains one of the most productive marine environments in the world. This area is a destination for migratory whales, seabirds and fishes. Resident populations of marine resources also thrive in these waters. In addition to the resident species of marine mammals, seabirds and fishes, sedentary invertebrates such as sponges and anemones carpet the upper areas of Cordell Bank.

It is an exciting time for Cordell Bank National Marine Sanctuary. The Sanctuary recently hired its first permanent staff and is in the process of moving to a new office in the Point Reyes National Seashore. This location provides many new opportunities for research, education and community outreach. A Cordell Bank Sanctuary Advisory Council is being formed to encourage community involvement in our Sanctuary and the current management review process. This process will assess changes and new issues which have arisen since the Sanctuary's management plan was implemented in 1989. People are encouraged to become involved by providing information on this magnificent place and on how the Sanctuary operates. Cordell Bank staff look forward to working with the community during the review of the Cordell Bank National Marine Sanctuary management plan.

Management Plan Review

Management plans are sanctuary-specific planning and management documents required by law for all National Marine Sanctuaries. These plans describe regulations, boundaries, resource protection, research, and education programs to guide future management activities. They specify how sanctuaries can continue to conserve, protect, and enhance their nationally significant living and cultural resources.

The Cordell Bank National Marine Sanctuary management plan dates back to 1989. Since then significant scientific discoveries and resource issues have emerged. Using a community-based process that will provide numerous opportunities for public input, the Sanctuary will determine whether current issues and threats to the resources are the same as when the initial management plan was developed,

and whether the management put in place at that time is protecting current sanctuary resources. The review will also evaluate management strategies, regulations, and boundaries. Ultimately, this review ensures that the Cordell Bank National Marine Sanctuary will better protect, conserve, and enhance its marine resources for current and future generations.

How To Get Involved

Public participation is vital to the management plan review. This is a chance to provide input regarding the future of the Cordell Bank National Marine Sanctuary. The management plan review will begin with a series of scoping meetings in the fall of 2001. Public comment during these meetings will help identify the issues to be addressed in the updated plan.

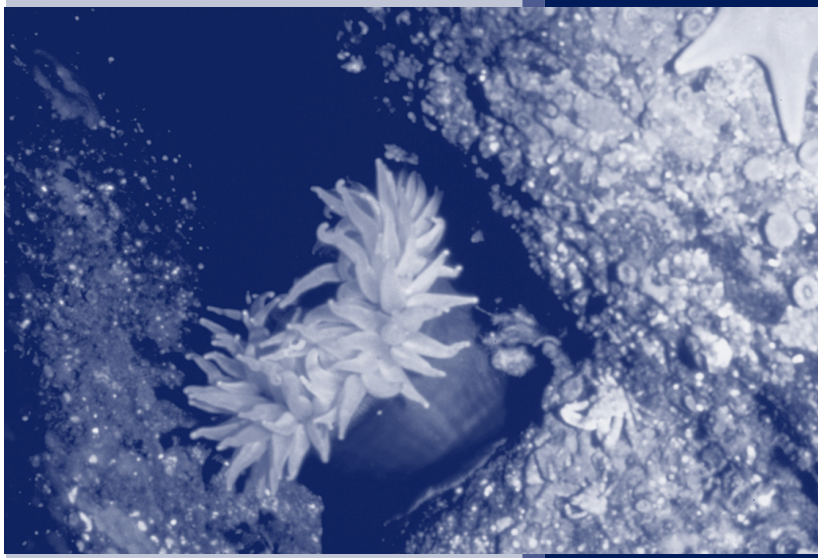
A Draft Management Plan and Draft Environmental Impact Statement will be developed, and additional public comment will be solicited. Public meetings will be advertised through various media outlets, including local papers and the Sanctuary Web page. To get on the mailing list, write: Cordell Bank National Marine Sanctuary, P.O. Box 159, Olema CA, 94950. The Sanctuary can also be contacted by calling the office at (415) 464-5247 or by e-mail**:** cordellbank@noaa.gov.

About This Document

The State of the Sanctuary document is an overview on the current status of the Sanctuary to use as a basis for revising the management plan. This document discusses management activities, accomplishments, issues and ecosystem of Cordell Bank National Marine Sanctuary since its designation in 1989.

Public Input Opportunities

- **Public Scoping meetings**
- **Sanctuary Advisory Council meetings**
- **Public Workshops**
- **Draft Management Plan Hearings**



The anemone, *Urticina piscivora,* feeds on fish and is one of several species of anemones found on the Bank. Photographer: Cordell Expeditions

The Black-footed Albatross, *Phoebastria nigripes*. Photographer: Rich Stallcup

Bodega Head shelters Bodega Bay and Harbor from predominant northwest swell. Photographer: GFNMS Library

Background

Purpose

National marine sanctuaries are special places and have been established for their natural and/or cultural significance. One of the richest environments in the world, the Cordell Bank National Marine Sanctuary was established due to its unique biological, geological, and oceanographic resources.

Designation

In July 1981, NOAA received a recommendation from Cordell Expeditions, a nonprofit association dedicated to exploring and conserving the Bank, to establish Cordell Bank as a National Marine Sanctuary. The Bank was proposed for inclusion in the National Marine Sanctuary System because of its unique geology, extraordinarily diverse and abundant marine life, and proximity to Point Reyes National Seashore, the Farallon Islands National Wildlife refuge, and the Gulf of the Farallones National Marine Sanctuary. In response, NOAA evaluated the proposal in accordance with the requirements of the National Marine Sanctuary Program regulations (15 CFR 922) and found it to be eligible for inclusion. Cordell Bank National Marine Sanctuary was formally designated on May 17, 1989.

Regional Context

The eastern edge of the Sanctuary is located 6 nm from shore and is separated from the coast of Marin and Sonoma Counties by the northern arm of the Gulf of the Farallones National Marine Sanctuary. The coastal areas of west Marin and Sonoma Counties are sparsely populated, with ranching, dairy farms, agriculture, and public open space maintaining their rural character. Most of the people in Marin and Sonoma Counties live about an hour inland from the coast. Bodega Bay is an active fishing port that harbors the closest marinas to the Sanctuary. This harbor also serves as the departure point for charter vessels that provide recreational fishing and wildlife viewing opportunities in the Sanctuary.

To the southeast of the Sanctuary is the major San Francisco-Oakland metropolitan area, with a population of about seven million. The City and County of San Francisco functions as the administrative center of the Bay Area, providing a focal point for many financial, transportation, manufacturing, and government establishments, and a source of jobs for area residents. Commercial shipping is also an important activity in the Sanctuary. The northern shipping lane of San Francisco Bay passes through the Sanctuary.

Sanctuary Uses

Commercial Shipping

The southeast corner of Cordell Bank is located approximately 5 nm from the terminus of the northern shipping lanes designated by the U.S. Coast Guard. Vessel traffic entering or leaving San Francisco Bay via the northern lane passes through the Sanctuary. From June 1, 2000, through June 30, 2001, some 2,291 commercial vessels reported using the northbound shipping lanes. Of these, 935 were inbound and 1,356 were outbound.

Fishing

The Cordell Bank area supports an active commercial and recreational fishery. Commercial and recreational activity is regulated by the Pacific Fishery Management Council and the California Department of Fish and Game. Commercial fisheries generally target rockfish, flatfish, salmonids, roundfish and albacore tuna. Recreational fisheries generally focus on rockfish, lingcod, salmon, and albacore tuna. Most of the private boats and charter vessels that fish at Cordell Bank are from Bodega Bay. Recreational fishing at Cordell Bank is strongly influenced by the weather. Strong winds and rough ocean conditions often prevent smaller boats from venturing out to the bank.

Research and Education

The first research effort at Cordell Bank occurred in 1869 when Edward Cordell mapped the Bank. Research was confined to geographic surveys and rock sampling. In the 1970s and 80s Cordell Expeditions, a nonprofit organization, initiated a process of exploration to describe the Bank. Today, the majority of research and monitoring efforts in the Sanctuary are conducted by or through the Bodega Marine Laboratory, the Sanctuary, and the National Marine Fisheries Service (NMFS). Every year, NMFS assesses juvenile rockfish recruitment and conducts population surveys for adult fishes. The Sanctuary has been conducting monitoring programs since 1997. These programs have included the investigation of oceanographic conditions and how they relate to the distribution and abundance of krill, seabirds, and whales.

Wildlife-viewing opportunities are an increasingly popular activity at Cordell Bank. The birding community has traveled to the Bank for many years to observe species of open ocean seabirds. More species of albatross have been seen over Cordell Bank than anywhere else in the Northern Hemisphere.

Recreational fishing is a popular activity at Cordell Bank. Photographer: Cordell Expeditions

Black-footed Albatross, *Phoebastria nigripes*.
Photographer: Rich Stallcup

The California sea lion, *Zalophus californianus.*
Photographer: GFNMS

Sunset over Cordell Bank from a research vessel.
Photographer: GFNMS

Because of the abundance of food, the Cordell Bank area is a destination feeding ground for humpback and blue whales. Beginning in early summer and continuing through fall, feeding humpback and blue whales frequent Sanctuary waters. This coincides with the calmest weather of the year, and many charter vessels from Bodega Bay and San Francisco make regular whale-watching trips to the Bank at this time.

Sanctuary Management Activities and Operations

Since its designation in 1989, the Sanctuary has grown from having no staff or budget to a dedicated staff of three and a budget of $480,000. The first full-time staff person was hired in 1995, but was funded by the Gulf of the Farallones National Marine Sanctuary. In 1998, a $129,000 budget was allocated, and in 2000, two additional staff were hired. Limited staff and funding have required the Sanctuary to seek partnerships to help protect its physical and biological resources.

The Sanctuary office is located in the Point Reyes National Seashore, just outside Olema in western Marin County, California. Cordell Bank National Marine Sanctuary (NMS) shares its southern and eastern boundaries with the Gulf of the Farallones National Marine Sanctuary. Cordell Bank is managed by the Gulf of the Farallones National Marine Sanctuary manager, who is assisted by the Farallones' NMS research coordinator.

Cordell Bank NMS was established to protect the ecosystem's natural features while allowing people to use and enjoy the ocean in sustainable ways. Sanctuaries provide research and education programs that promote understanding and stewardship of our oceans. The Sanctuary manages and protects its resources through research, monitoring, interpretation, and education programs.

Implementation Success for Management Plan

Since the management plan for the Sanctuary was developed in 1989, a significant number of issues have been addressed. Specific actions from the management plan are listed in the following table along with the tools used in their implementation.

Resource Protection

Actions	Implementation
Identify resources at risk	Marine Mammal monitoring, seabird surveys, plankton surveys, circulation studies, visual assessments using remotely operated vehicles and submersibles
Emergency response and contingency planning	Respond to oil spills, develop emergency response plan, collaborate on developing application protocols for dispersants, participate in developing area contingency plan
Enforce regulations and assess discharge violation patterns	Permit process, enforcement actions
Review coastal and offshore development proposals	Project evaluation, permits
Enhance resource protection through coordinated activities that complement existing regulatory authorities	Partnerships with California Department of Fish and Game, National Marine Fisheries Service, Point Reyes National Seashore, U.S. Coast Guard

Research and Monitoring

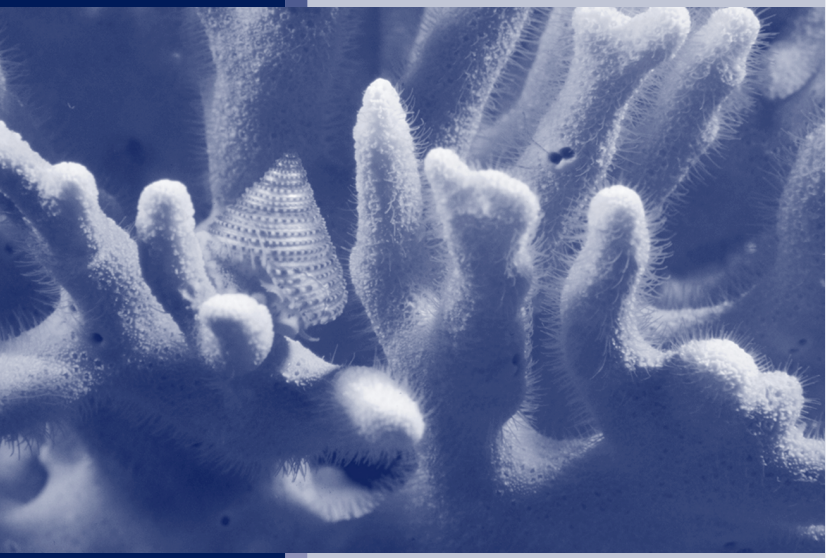
Support research and monitoring to improve management	Bathymetric, contaminant, larval recruitment, and krill abundance studies; marine mammal and seabird surveys; and photo identification of blue and humpback whales for population assessments.
Gather baseline data on the physical, biological, and chemical oceanography of the Sanctuary	Cruises and instrumentation are in place to monitor biological, physical, and chemical properties of the Sanctuary
Initiate a monitoring program to assess environmental changes as they occur	Ecosystem Dynamics Study designed to study the relationship between oceanographic conditions and the distribution and abundance of marine organisms; initiating visual assessments on Cordell Bank to monitor reef community
Incorporate research results into interpretive program in a format useful for the public	Slide presentation on ecology of Cordell Bank, traveling display on Sanctuary habitats and resources, interpretive panels in visitor centers, evening lecture series

Regulations

To protect its natural wonders, activities that could harm the health of the Sanctuary are prohibited. Uses compatible with the goals of resource protection are allowed, but may be regulated. The following activities are prohibited within the Sanctuary:

1. Discharges or deposits within the Sanctuary (with the exception of fish, chumming materials, or bait produced and discarded during routine fishing activities; engine exhaust; and water and biodegradable effluent incidental to vessel operations, e.g., deck wash down and gray water but excluding oily bilge wastes).
2. Discharges or deposits from beyond the Sanctuary boundaries, if the substance or material discharged enters the Sanctuary and injures a Sanctuary resource (with the exceptions noted in #1).
3. Removing, taking, or injuring, or attempting to remove, take, or injure, benthic invertebrates or algae located on Cordell Bank or within the 50-fathom isobath surrounding the Bank (except for accidental removal, injury, or takings during normal fishing operations).
4. Exploring for, or developing, or producing, oil, gas, or minerals in any area of the Sanctuary.

This is a summary of the activities prohibited by the National Marine Sanctuary Program regulations and is intended for easy reference only. The summary does not include all exemptions or other activities regulated within the Sanctuary under other local, state, or federal authorities. The full text of the regulations is published at 15 CFR Part 922.



The top shell, *Calliostoma annulatum*., nestled in fingers of the California hydrocoral, *Stylaster californicus*. Photographer: Cordell Expeditions

Humpback whale, *Megaptera novaeangliae*, populations are recovering after years of commercial harvest. Photographer: Tom Kieckefer

Research and Monitoring (continued)	
Actions	**Implementation**
Encourage information exchange among research organizations	Sanctuary hosts workshop every other year for local research community to foster exchange of ideas
Education	
Provide public with information on the Sanctuary	Outreach events include fairs, school presentations, evening lecture series, visitor centers, student summits, teacher workshops
Broaden support through programs suited to visitors with broad range of interests	Brochure, newsletter, wildlife viewing excursions, evening lecture series, visitor centers
Collaborate with other organizations to provide interpretive services	Cooperative events with Farallones Marine Sanctuary Association, Oceanic Society, Headlands Institute, Army Corps of Engineers Bay Model, Point Reyes Seashore Association.
Visitor Use	
Provide relevant information	Brochure, visitor centers

Emerging Issues and Opportunities

Several successful programs and parterships have been developed to address some of the major issues facing the Sanctuary. Following is a summary of accomplishments and current issues as they apply to resource management, research and monitoring, and outreach and education.

Resource Protection

Wildlife Disturbances. Human activities continually pose a threat to the health of Sanctuary wildlife. Typical disturbances are caused by vessel traffic and low-flying aircraft. They Sanctuary has responded to these threats by establishing education programs aimed to reduce potential negative impacts from wildlife viewing activities.

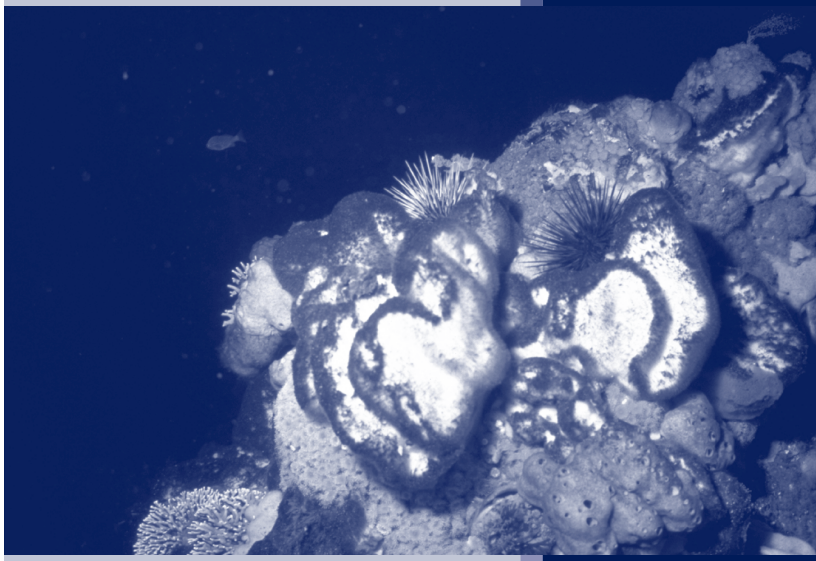
Bioprospecting. Plants have historically provided a source for medicinal treatments, and pharmaceutical research has expanded into the marine environment. Recent inquiries about collecting Sanctuary resources for biochemical analysis are an indication of expansion in this field.

Wildlife Species Range Expansion. Prior to the establishment of laws and policies protecting marine wildlife populations, human predation and harvest of many species dramatically diminished their numbers and reduced geographic ranges. Today, protected species in the Sanctuary are reclaiming the historic extent of their range as their numbers increase. This trend can conflict with human uses which developed in the animals' absence. Of particular concern are several species of whales, seals and seabirds.

Marine Reserves/Zoning. The California Department of Fish and Game, under the mandate of the Marine Life Protection Act, is currently developing a plan to restructure existing marine-managed areas and to establish new marine reserves throughout the state. Cordell Bank does not fall under this program, as it lies solely in federal waters. In addition, the Pacific Fisheries Management Council is starting to look into using Essential Fish Habitat Reserves (EFHRs) as a fishery-management tool. Independent of the management plan review, staff from all California National Marine Sanctuaries will coordinate with these agencies and community members, such as fishers and conservation groups, to ensure that the overall health of the Sanctuary's ecosystem is sustained.

Salvage of Cultural Resources. The abundance of shipwrecks along the California coast suggests that future underwater exploration of these resources is likely. Prehistoric use of the island, when the Bank was exposed during the last ice age, may also attract attention. Until recently, Cordell Bank and the surrounding seabed have been inaccessible due to location, depth, and currents. Improving technology, such as sonar, remotely operated vehicles, and manned submersibles, has reduced some constraints to exploration.

Underwater Sound. The Sanctuary has been subjected to increasing sources of sound, introduced into the marine environment, that are suspected of attaining levels detrimental to animals. These sources include engine noise, and commercial, experimental, and exploration activities.



Algae and invertebrates cover the shallower surfaces on Cordell Bank. Photographer: Cordell Expeditions

Seabirds above the Sanctuary. Photographer: GFNMS library

The leatherback sea turtle, *Dermochelys coriacea*. Photographer: Nancy Black

Charter boats offer wildlife viewing opportunities in the Sanctuary. Photographer: GFNMS

Commercial Submerged Cables. Rapid expansion of communication technology has created a sudden demand for installation of cables on the seafloor. To ensure consistency, the National Marine Sanctuary Program is drafting a policy paper addressing cable deployment in Sanctuaries. Cable deployment in Cordell Bank NMS is prohibited and inappropriate given the nature of its bathymetry.

Research and Monitoring

Bathymetric Mapping. Surveys are underway to document the habitat types and biological characteristics of Cordell Bank. New technology enables us to develop more precise maps of the seafloor to better describe Sanctuary habitats and associated biological communities.

Volunteer Monitoring Program. To capitalize on the presence of knowledgeable people with an established presence in the Sanctuary, a new volunteer program called "Seawatch" is planned. This program is modeled after the highly successful "Beach Watch" program at the Gulf of the Farallones NMS. The Sanctuary will train and organize a volunteer force within the offshore boating and fishing community to monitor the Sanctuary.

Monitoring Harmful Algal Blooms. Negative impacts from harmful algal blooms are becoming increasingly common, and species associated with these outbreaks will be monitored.

Education, Interpretation, and Outreach

The education position for the Sanctuary was filled for the first time in 2000. This addition to the staff will allow the Sanctuary to better address its education and outreach responsibilities.

Sanctury Resources

Cordell Bank National Marine Sanctuary is located in one of the world's four major upwelling systems. The upwelling of nutrient-rich, deep ocean water provides a food-rich environment and promotes the growth of organisms at all levels of the marine food web. The vertical relief and hard substrate of the

Bank provides habitat with near-shore characteristics in an open ocean environment 20 nm from shore.

The resident reef community associated with the Bank is ecologically linked with the open ocean (pelagic) community, which includes animals traveling thousands of miles each year to feed there. The result is a fascinating array of resident and transient animals, and tremendous biological diversity in the vicinity of Cordell Bank.

Physical Resources

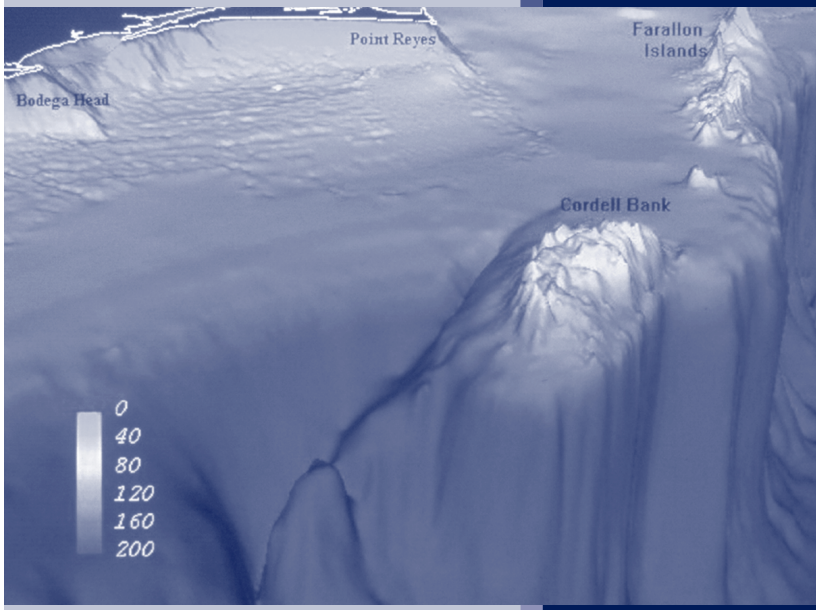
Geology

Cordell Bank is part of a granite block that was created as part of the southern Sierra Nevada range some 93 million years ago. The Bank is one of the few offshore areas where the granite block emerges from the newer sediments that make up most of the continental shelf.

The top of the Bank slopes gently at depths of 175 to 210 feet. The jagged ridges and pinnacles that rise abruptly from this plain, however, reach up 140 to 120 feet below the sea surface. In many places, the sides of the ridges and pinnacles are extremely steep, often with slopes greater than 80 degrees. Six nm to the west of the Bank, along the Sanctuary boundary, the continental slope drops steeply to 6,000 feet and more.

Oceanographic Seasons

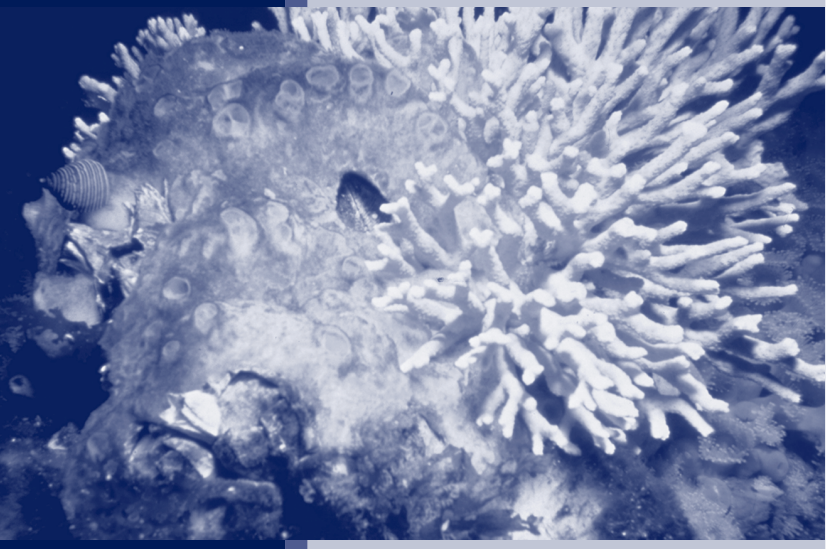
The calendar year at Cordell Bank can be broken into three oceanographic seasons: The upwelling season, the relaxation season, and the winter storm season. The upwelling season typically begins with the spring transition, characterized by strong persistent winds from the northwest. This usually occurs sometime in late February or early March, and is the start of the annual productivity cycle along northern and central California. During this season, upwelling and favorable winds from the northwest alternate with periods of calm. These winds generally begin to subside by late July. August through mid-November is the relaxation season. During this time, winds are mostly light and variable, and the seas can be calm for a week or two at a time. This changes abruptly with the arrival of the first winter storms from the Gulf of Alaska. From late November through early February, winter storms create large waves and strong winds along the coast. Ocean conditions can be treacherous all year, but especially during winter storms.



A side-scan sonar image of Cordell Bank looking from the northwest. The depth contour scale is shown in meters. Photographer: USGS, Woods Hole, MA.

The comb jelly, *Boere forskalii*, is one of many open ocean animals that benefit from the productivity at Cordell Bank. Photographer: L+L Langstroth

Several major oil spills have impacted the Sanctuary in the last 10 years.
Photographer: GFNMS library



Shallower areas on the Bank are covered with invertebrates like this yellow sponge, *Halichondria panicea*, top snail, *Calliostoma spp.*, barnacle, *Balanus spp.,* and the California hydrocoral, *Stylaster californicus.*
Photographer: Cordell Expeditions

Water Quality

Oceanic water quality along central California is generally good, except in areas adjacent to population centers such as San Francisco Bay. Trace-metal levels from water samples within and outside of San Francisco Bay have been found to be higher than trace-metal levels along the central-northern California coast, a fact that reflects the influence of San Francisco Bay on adjacent oceanic waters. Chlorinated hydrocarbons (DDTs and PCBs) were found to be elevated in Steller sea lions, and may be related to premature births in this species. Elevated organochlorine levels have also been found in Common Murres at the Farallon Islands.

Since 1970, there have been regular reports of oil-soaked birds at the Farallon Islands, suggesting frequent offshore releases of hydrocarbons from vessels. Vessels cleaning tanks and pumping bilges prior to entering San Francisco Bay are suspected as being the source of this pollution. Samples collected by the Gulf of the Farallones NMS Beach Watch program and analysis by the California Department of Fish and Game's Office of Spill Prevention and Response, have confirmed this pollution source.

Since the establishment of the Sanctuary, several oil spills have occurred in or near its waters that have seriously impacted Sanctuary wildlife and their habitats. In 1984, the T/V PUERTO RICAN spilled an estimated 1.4 million gallons of oil. At least 3,000 seabirds and aquatic birds were killed. In 1986, the barge APEX HOUSTON released an estimated 10,000 to 20,000 gallons of oil, killing at least 10,000 birds. In 1996, the vessel CAPE MOHICAN released 50,000 gallons of oil into San Francisco Bay. Much of this oil found its way into the Sanctuary. During the winter of 1997-1998 oily tarballs appeared along coastal beaches over a four-month period. The number of seabirds this event may have affected is unknown. Sanctuary staff work cooperatively with other agencies and resource trustees in detecting and responding to spill events.

Biological Resources

Benthic Organisms

A healthy cover of benthic organisms can be seen on the upper rock surfaces of Cordell Bank. The high light penetration allows for algal photosynthesis far deeper than in similar habitats on the mainland. The constant food supply washing the Bank, combined with a hard substrate for attachment, provide ideal conditions that support a rich assemblage of benthic invertebrates. Space is the limiting factor on

the upper pinnacles and ridges of Cordell Bank. Ridges are thickly covered with sponges, anemones, hydrocorals, hydroids, and tunicates, and scattered crabs, holothurians, and gastropods. In some places, the cover is up to one foot thick and very brightly colored, mainly in white, pink, yellow, and red. The brilliant reds produced by the fluorescent strawberry anemones are especially striking.

Fishes

More than 180 species of fish have been identified in the Cordell Bank National Marine Sanctuary. Many species of rockfish (*Sebastes* spp.) can be found at all depths and habitats on and around the Bank. Lingcod (*Ophiodon elongatus*) are especially numerous in the wintertime, when they move up onto the Bank to spawn. Many species of flatfish (Bothidae and Pleuronectidae) use the soft-bottom habitat around the Bank, and albacore tuna (*Thunnus alalunga*) and salmon (*Oncorhynchus* spp.) frequent the Sanctuary on a seasonal basis. Albacore and salmon both feed on lanternfishes (Myctophidae), which migrate nightly into shallow surface layers from deeper daytime haunts. The recovery of Pacific sardine (*Sardinops sagax*) populations is apparent in the waters surrounding Cordell Bank.

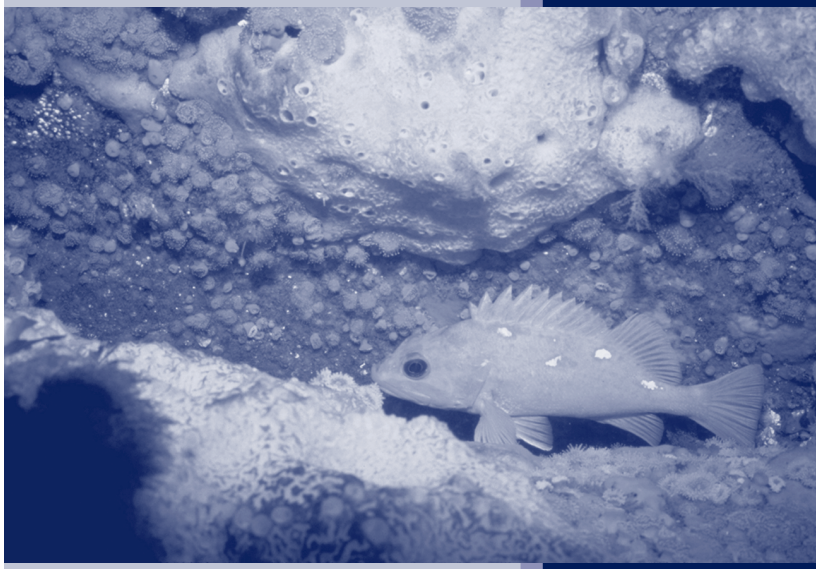
Marine Mammals

Twenty-six species of marine mammals (a combination of resident and migratory species) have been observed within the Sanctuary. Gray whales, for example, pass the Bank on their annual migrations between Arctic feeding grounds and Mexican breeding areas.

The Dall's porpoise is one of the most frequently sighted marine mammals in the Sanctuary, along with humpback and blue whales. Individuals of all species use the Bank as a destination feeding ground. Large numbers of the eastern Pacific humpback whales and blue whales feed during the summer months within the Cordell Bank-Bodega Canyon area.

The harbor porpoise, a species widely distributed in coastal waters but rarely seen offshore, is regularly observed within the Sanctuary's shallow areas. Pacific white-sided dolphins and northern right whale dolphins are abundant. Other cetaceans observed in the Sanctuary include Risso's dolphins and killer whales.

The California sea lion, the most abundant pinniped in California waters, has been observed more frequently, and in greater numbers than other pinnipeds. The northern fur seal is also abundant in the area in late fall and winter (most of them use summer breeding grounds in the Channel Islands). Steller sea lions have decreased drastically in California in recent years, but Cordell Bank remains a



The rosy rockfish, *Sebastes rosaceus*.
Photographer: Cordell Expeditions

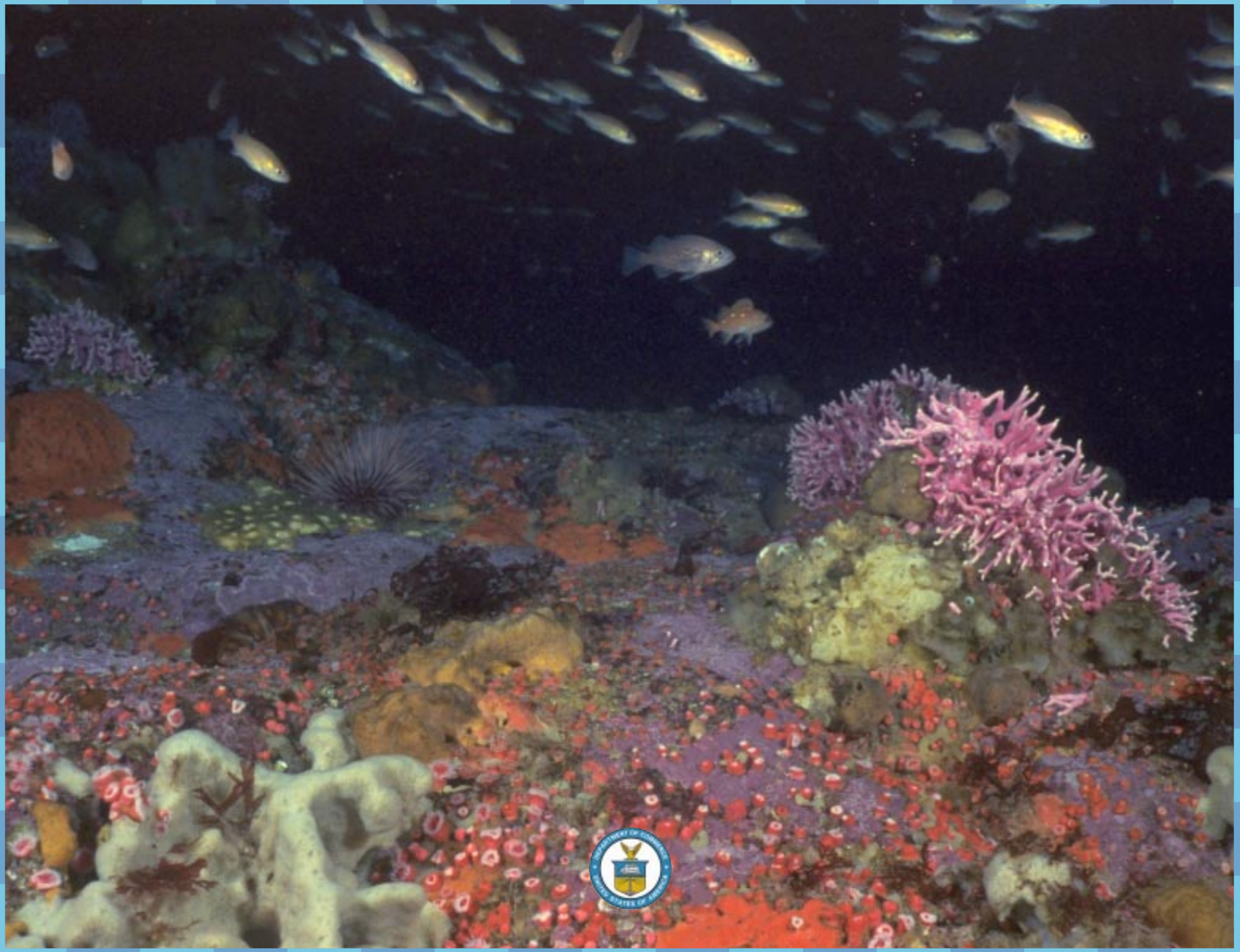
Blue whales, *Balaenoptera musculus*.
Photographer: Dan Shapiro

The pink-footed Shearwater, *Puffinus creatopus*.
Photographer: Rich Stallcup

Hundreds of thousands of shearwaters, *Puffinus spp.,* stop and feed at Cordell Bank during their annual migration through the Sanctuary.
Photographer:Rich Stallcup

feeding area for this species, possibly because of the abundance of rockfish and sardines around the Bank. Nearby rookeries include Año Nuevo Island and the Farallon Islands. The sea lions' winter haul-out grounds include Point Reyes and the rocky islands off the Sonoma County coast.

Seabirds

The waters around Cordell Bank provide critical foraging habitat for many species of seabirds. Seabird density over Cordell Bank can be among the highest of any area in central and northern California. Fifty-nine seabird species have been identified feeding in or near the Sanctuary. Like the fishes and marine mammals, the composition of seabirds found at Cordell Bank are a mix of local breeding birds and highly migratory, open-ocean species. While the local representatives use the nearby Farallon Islands and Point Reyes areas to nest, some migrants nest thousands of miles away. A recent study using radio tags documented that Black-footed Albatross nesting in the northwest Hawaiian Islands as "commuting" to Cordell Bank waters to gather food for their chicks before returning to their nest on Midway Atoll. Other migratory species use the productive waters around the Bank as a stopover on their annual migration route. Hundreds of thousands of Sooty Shearwaters can be seen on days when they are migrating through the Sanctuary. Sanctuary waters are equally important to local breeders. Most of the world's small population of Ashy Storm-petrels, which nest on Southeast Farallon Island, can be seen on the water near the Bank, and more than 20,000 Cassin's Auklets have been counted in a single day.

Some common Sanctuary species include the Black-footed Albatross (*Phoebastria nigripes*), Northern Fulmar (*Fulmarus glacialis*), Sooty Shearwater (*Puffinus griseus*), storm petrels (*Oceanodroma* spp.), Cassin's Auklet (*Ptychoramphus aleuticus*), Rhinoceros Auklet (*Cerorhinca monocerata*), phalaropes (*Phalaropus* spp.) and many species of gulls.