

PART II: SANCTUARY MANAGEMENT PLAN

Section I: A Management Plan for the Proposed Cordell Bank National Marine Sanctuary

A. Introduction

National Marine Sanctuaries are designated in marine environments selected for their conservation, recreational, ecological, historical, research, educational, or esthetic values. The Marine Protection, Research and Sanctuaries Act of 1972, as amended and its implementing regulations (15 CFR 922) require that a management plan be prepared for each proposed Sanctuary. Once the Sanctuary is designated, the plan will be implemented. In general, management plans focus on Sanctuary goals and objectives, management responsibilities, research and interpretation programs, and policies to guide plan implementation.

The plan establishes an administrative framework in recognition of the need for cooperation and coordination to ensure effective management. The Marine and Estuarine Management Division (MEMD), National Oceanic and Atmospheric Administration (NOAA), is responsible for management of the site.

Variable funding for staff and program development over the next five years may affect specific aspects of Sanctuary management described in this plan. Modifications to the scope and scale of the programs may have to be made because of such unforeseeable changes in the level of funding. The goals and objectives of the plan will, however, remain unchanged.

B. Sanctuary Goals and Objectives

Sanctuary goals and objectives provide the framework for developing the management strategies. The goals and objectives direct Sanctuary activities towards the dual purposes of public use and resource conservation and are

consistent with the intent of the national program.

The management strategies planned for the proposed Cordell Bank National Marine Sanctuary (CBNMS) are directed to the goals and objectives outlined below. It should be noted that, although the Sanctuary goals are listed discreetly, they are actually overlapping. For instance, the research and interpretive efforts both contribute to resource protection and to enhancing public use of the Sanctuary.

1. Resource Protection

The goal assigned the highest priority for management is to protect the marine environment and resources of the CBNMS. The specific objectives of resource protection efforts are to:

- Establish cooperative agreements and other mechanisms for coordination among all the agencies participating in Sanctuary management;
- Develop an effective and coordinated program for the enforcement of Sanctuary regulations;
- Promote public awareness of and voluntary user compliance with regulations through an interpretive program stressing resource sensitivity and wise use; and
- Reduce threats to Sanctuary resources raised by major emergencies through contingency and emergency-response planning.

2. Research

The goal of Sanctuary research activities is to improve understanding of the Cordell Bank environment and resources and to resolve specific management problems, some of which may involve resources common to both Cordell Bank and the nearby Point Reyes-Farallon Islands National Marine Sanctuary (PRNMS).

(The current name of the Point Reyes-Farallon Islands National Marine Sanctuary is the Gulf of the Farallones National Marine Sanctuary. However, at the time of writing of the DEIS/MP for Cordell Bank National Marine Sanctuary the old name was still in use. To be consistent, during the

designation process for Cordell Bank, the old name of Point Reyes-Farallon Islands National Marine Sanctuary will be used). Research results will be used in interpretive programs for visitors and others interested in the Sanctuary, as well as for resource protection. Specific objectives of the research program are to:

- Establish a framework and procedures for administering research to ensure that research projects are responsive to management concerns and that results contribute to improved management of the Sanctuary;
- Gather baseline data on the physical, chemical and biological oceanography of the Sanctuary;
- Initiate a monitoring program to assess environmental changes as they occur;
- Identify the range of effects on the environment that would result from predicted changes in human activity;
- Incorporate research results into the interpretive program in a format useful for the general public; and
- Encourage information exchange among all the organizations and agencies undertaking management-related research in the Sanctuary to promote more informed management.

3. Interpretation

Interpretive programs should be directed to improving public awareness and understanding of the significance of the Sanctuary and the need to protect its resources. The management objectives designed to meet this goal are to:

- Provide the public with information on the Sanctuary, its goals and objectives, with an emphasis on the need to use these resources wisely to ensure their long-term viability;
- Broaden support for the Sanctuary and Sanctuary management by offering programs suited to visitors with a range of diverse interests;
- Provide for public involvement by encouraging feedback on the effectiveness of interpretive programs;
- Collaborate with other organizations to provide interpretive services, including extension and outreach programs and other volunteer projects, complementary to the Sanctuary program.

4. Visitor Use

The Sanctuary goal for visitor management is to encourage commercial and recreational use of the Sanctuary compatible with the primary goal of resource protection. Specific management objectives are to:

- ° Provide relevant information about Sanctuary regulations and use policies;
- ° Collaborate with public and private organizations in promoting compatible use of the Sanctuary by exchanging information concerning the commercial and recreational potential of the Sanctuary; and
- ° Monitor and assess the levels of use to identify and control potential degradation of resources and minimize potential user conflicts.

Section II: The Sanctuary Setting

The most important factors to be considered in developing a management plan for the proposed CBNMS are its location; its physical characteristics, environmental conditions, and biological resources; its uses; and the roles of the agencies with management responsibilities in the area. These factors will be summarized below to provide the background needed for understanding the plan.

A. The Regional Context

1. Sanctuary Location

Cordell Bank is located on the edge of the continental shelf, 20 miles due west of Point Reyes, California, or about 50 miles northwest of San Francisco (Figure 2). The center of the Bank is near 38°01' north latitude, 123°25' west longitude. The Bank itself is roughly elliptical, and within the 50 fathom (91 meter (m)) depth contour, it is 9.5 miles long and 4.5 miles wide and rests on a sea floor area of 18.14 square nautical miles. The preferred boundaries for the proposed Sanctuary would encompass the Bank and a large buffer zone in a protected area of 397.05 square nautical miles (See Figure 2).

Cordell Bank is the northernmost seamount on the California continental shelf. The continental shelf between the Bank and the headland at Point Reyes has an average depth of 60 fathoms (110 m). To the west the bottom falls quickly down the continental slope to the abyssal plain a few miles away. To the north there is no offshore area with physical features similar to Cordell Bank. Southeast of the Bank lie Fanny Shoal, Noonday Rock and the Farallon Islands, all of which are within the boundary of the PRNMS.

Regional Context

- · — · — Proposed Boundary #1
Cordell Bank National
Marine Sanctuary
- Point Reyes-Farallon
Islands National
Marine Sanctuary

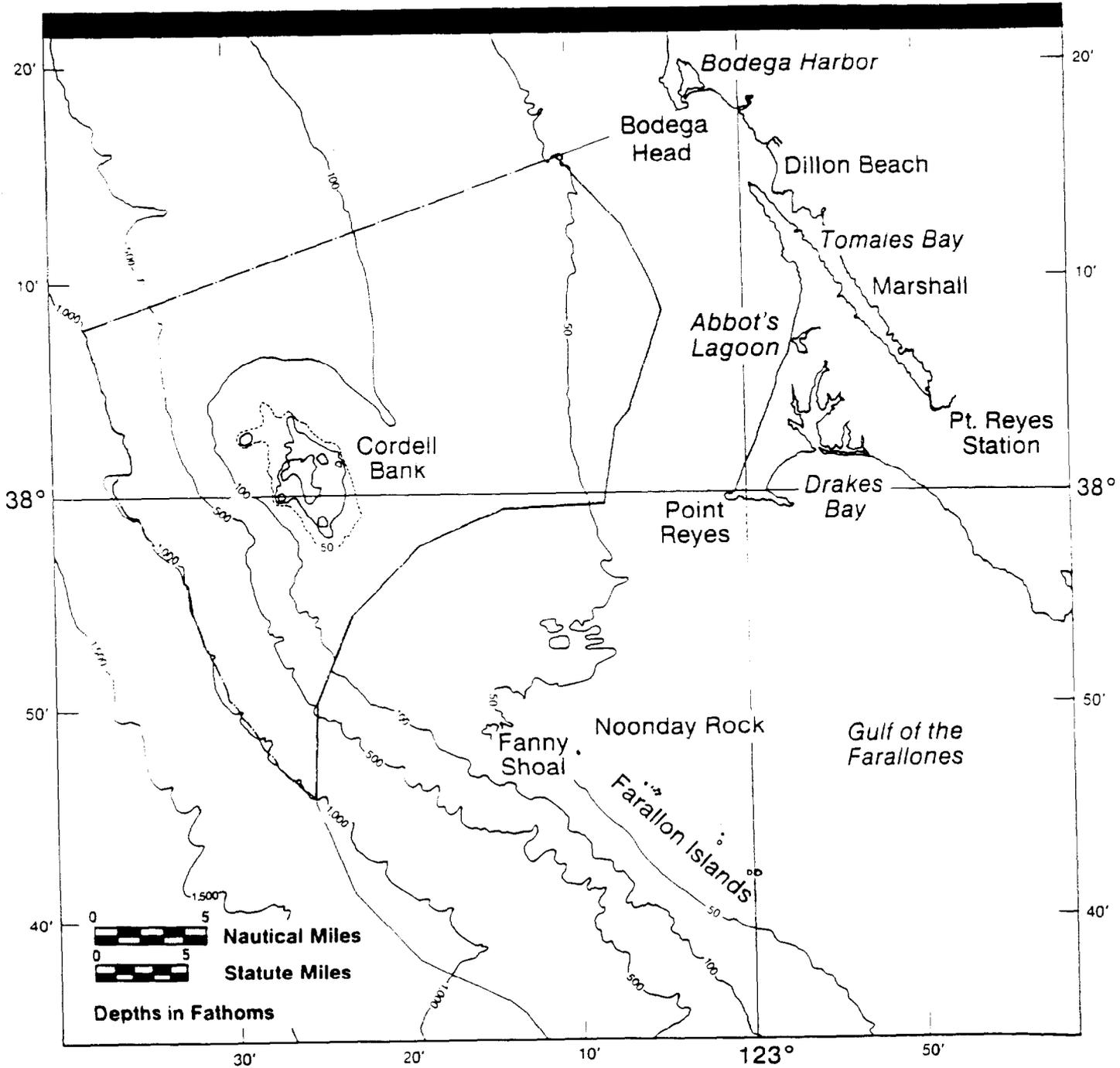


Figure 2

Source: National Ocean Service Nautical Chart 18640.

2. Regional Access

The proposed CBNMS is separated from the coast of Marin County by the northern arm of the PRNMS. Just to the north, in Sonoma County, is the Bodega Bay area. To the southeast is the major San Francisco-Oakland metropolitan area with a population of some five million people. San Francisco City and County function as the administrative center of the Bay area, providing headquarters for many financial, transportation, manufacturing, and government establishments. San Francisco also acts as the region's focal point for many trade and service activities and has extensive port facilities.

The largest coastal settlement in the area of the proposed CBNMS is Bodega Harbor. There are several smaller communities in the vicinity, including Dillon Beach, Marshall, Inverness, and the village of Point Reyes Station. Bodega Bay provides the base for most of the commercial and recreational fishing on this part of the coast, but commercial fishermen also operate out of Tomales Bay and from more northerly coastal points. Drakes Bay at Point Reyes, 20 miles east of the Bank, is the closest harbor.

B. Sanctuary Resources

Cordell Bank is characterized by a combination of oceanic conditions and undersea topography that provides for a highly productive environment in a discrete, well-defined area (Schmieder, 1982a). The highest elevation on the Bank is 115 feet (35 m) below the sea surface, yet only a few miles away there are water depths of 6,000 feet (1830 m). The prevailing California Current flows southward along the coast while the upwelling of nutrient-rich, deep-ocean waters stimulate the growth of planktonic organisms. These nutrients, combined with high light penetration in Bank waters and the wide

depth ranges in the vicinity, have led to a unique association of subtidal and oceanic species. The food web includes various algae and numerous types of invertebrates, fish, marine mammals and seabirds.

1. Environmental Conditions

(a) Geology

Over the last 60 million years, a single monolith, called the Salinian Block, was detached from the mainland and carried several hundred kilometers to the northwest by the Pacific Plate. The San Andreas Fault is the eastern boundary of this block. Along its western edge, the block outcrops near Salinas, at the Farallones and at several other places. Cordell Bank is its northernmost offshore outcrop. The Salinian block is still moving north at a rate of a few centimeters per year, carrying the Bank with it (Schneider, 1982a).

In recent geologic times the Cordell Bank formation projected well above sea level. During several periods of glaciation over the past million years, enough water was locked up in glaciers to lower the sea level sufficiently for the Bank to have been exposed as an island. The record of these transitions may be found in the fossils of intertidal organisms. The most recent period of sea level reduction was the late Wisconsin, with the lowest sea level, more than 55 fathoms (100 m) below the present level, occurring about 15,000 years ago (Schneider, 1982a).

The few rock samples collected thus far at Cordell Bank are granodiorite (Schneider, 1985c). These samples show very close affinities with other granitic rocks of the northern Salinian sub-block. The overall topography is roughly flat or gently sloping at depths of 175 to 210 feet (54 to 64 m), however, the jagged ridges and pinnacles rising abruptly from this plain reach

up to between 140 and 115 feet (42 to 35 m) below the sea surface. In many places the sides of the ridges and pinnacles are extremely steep, often with slopes greater than 80° (Schmieder, 1984a).

The ocean bottom around the Bank and within the Sanctuary contains few distinguishing features and is chiefly comprised of mud and sand deposits (NOAA, 1987). In a plume to the south, and a fan to the east, of Cordell Bank there extends deposits of undifferentiated mud and sand. To the north and western boundary, along the Farallon escarpment, the continental shelf is entirely made up of fine sand deposits. The complexity of the underwater topography and sediment distribution increases near the coast within the Point Reyes-Farallon Islands National Marine Sanctuary.

(b) Meteorology

Meteorological conditions at Cordell Bank are broadly predictable in accordance with annual weather cycles, although there are sudden local changes that are difficult to forecast. The calmest period is between late September and mid-December. At that time, wind-speed is normally below ten knots, usually rising in the afternoon and becoming calm again after sunset. Local fog banks may form within 15 minutes, reducing visibility to almost zero, and clear as rapidly as they form. Small rain storms can be seen as they approach. They normally pass within an hour, sometimes leaving very clear, calm conditions.

The storm season begins in December and lasts until late spring or early summer. During this season, dense fogs are common and storms appear out of the north every few days. However storms can also come from the west and winds from the south can reach speeds of 30 to 40 knots. The late summer months are characterized by generally calm weather, interrupted at times by

sudden, unpredictable storms (Schneider, 1982a).

(c) Waves and Currents

The sea state at Cordell Bank, driven by the predominant northwest winds, follows much the same cycle as the weather. From December until late spring the sea state is seldom calm. There are, however, numerous calm periods during the summer. In October and November, the sea surface may be a glassy calm. During this period the sea state is usually three or below on the Beaufort scale and has an exceedingly long wavelength, as much as several hundred feet, thus presenting excellent conditions for surface vessel operations (Schneider, 1982a).

In the spring and summer, the wind-driven California current flows southward off the California coast at speeds of one to three knots. The westward deflection of this current off northern and central California carries surface waters to the upper levels of Cordell Bank. As the surface water is driven southward by the winds and westward by the Coriolis effect, it is replaced by deep, nutrient-rich offshore waters moving shoreward and to the surface. Upwelling usually occurs year round but is most persistent during the Spring and Summer in central California.

In the fall, as the winds die down, the surface current is reduced and a deep north-flowing subsurface current, called the Davidson Current, rises to the surface, temporarily reversing the direction of the flow. The net result is that very confused currents can be expected during this period. The Davidson current phase normally lasts until mid-February, after which the California current returns and upwelling resumes.

The oceanic water borne by the California current is clean, cold, and exceptionally clear. Water temperatures at the surface are 52° to 56°F.

(11.1°C to 13.3°C) and about 5° (2.8°C) colder near the bottom. The clarity of the water is the result of low particulate loading which permits sunlight to penetrate to much greater depths than would be normal along the nearby California coast. Visibility on the upper reaches of the Bank is almost always greater than 65 feet (19.8 m) during the fall (Point Reyes Bird Observatory, personal communication, 1987). At times it can be greater than 100 feet (30.5 m) (Schmieder, 1978; 1985c). The light penetration, combined with the availability of nutrients transported by upwelling, provides the conditions essential to the existence of the richly diverse Cordell Bank ecosystem (Schmieder, 1985).

2. Natural Resources

(a) Bottom Organisms

Many species of benthic organisms and plankton exist on Cordell Bank (Table 1). The high light penetration in Cordell Bank waters provides an environment suitable for photosynthesis in algae. The bulk of the algal biomass consists of red algae which can be found in the dim light at the lower levels of the Bank, as well as on the higher elevations where other types of algae are also present.

The abundant food supply available in Cordell Bank waters together with a diverse and heterogeneous substrate supports a community of filter feeders and predators that, for its depth and isolation, is surprisingly rich and varied. Several varieties of plant and animal life that were previously unknown have been discovered at Cordell Bank. Others are rare forms or species never before observed at such depths or in waters so far north or south (Schmieder, 1985a).

**Table 1: List of Selected Algae, Sponges and Invertebrates
Identified on Cordell Bank**

Red Algae:

New Genus and species, Family: Delesseriaceae
 New Genus and species, Family: Corallinaceae^a
Fosliella sps^a
Erythrocladia membranaceum
Porphyra sps
Rhodochorton concrescens
Leptofauchea pacifica
Maripelta rotata

Green Algae

Derbesia marina
Entocladia viridis

Brown Algae

New Genus and species, Family: Ectocarpales^a
Pilayella tenella

Diatom

Entopyla cf. entopyla incurvata

Sponges

Acarinus erithacus.....Red Volcano Sponge
Leucandra heathi.....Heath's Sponge
Polymastia pachymastia.....Aggregated vase Sponge
Sphaciospongia confoederata.....Grey Moon Sponge
Toxadocia spp.....White-finger Sponge

Other Invertebrates

Allopora californica.....California hydrocoral
Epizoanthus scotinus.....Yellow anemone
Metridium senile.....White-tipped anemone
Telia piscivora.....Rose anemone
Balanophyllia elegans.....Orange cup coral
Eudistylia polymorpha.....Feather-duster worm
Lepidonotus squamatus.....Twelve-scaled worm
Serpula vermicularis.....Red tube or plume worm
Balanus rubilus.....Giant acorn barnacle
Megabalanus californicus.....Red-striped acorn barnacle
Pandalus danae.....Coon-striped shrimp
Loxorhynchus crispatus.....Decorator crab
Hemigrapsus nudus.....Purple shore crab
Megatebennus bimaculatus.....two-spotted keyhole limpet
Crepipatella lingulata.....Half-slipper
Lamellaria diegoensis.....San Diego ear shell
Ocenebra atropurpurea.....Clathrate dwarf triton
Nassarius insculptus.....Smooth dog whelk
Mytilus californianus.....California mussel
Chlamys hastata.....Spear scallop
Chlamys sps. nov.....
Kellia laperousii.....Smooth Kelly clam
Tonicella lineata.....Lined chiton
Terebratulina unguicula.....Snake's-head lamp shell
Ophiothrix spiculata.....Spiny brittle star
Parastichopus californicus.....California Sea cucumber
Strongylocentrotus franciscanus.....Red sea urchin
Ascidia paratropa.....Glassy tunicate

Source: R.W. Schmeider, 1985a.

^aSilva, 1981, as cited in Schmeider, 1985.

One of the organisms inhabiting Cordell Bank surfaces is the purple hydrocoral, Allopora californica, found in large numbers, probably because of the high water quality and low collection pressure. Allopora thrives only in exceptionally clear, clean water. Residing among the tree-like branching colonies of Allopora are several species that are entirely dependent on it and can be found nowhere else. Among them are the pink snail, Pedicularia californica, the small barnacle, Armatobalanus nefrens, and the polychaete worm, Polydora alloporis. The snail resides on the hydrocoral branches. The barnacle and the worm are encased in the hydrocoral, although they maintain small openings through which they feed.

Allopora colonies also provide a favorable environment for algae, among them an undetermined genus of the brown algae, Ectocarpales, an undetermined genus of the red algae, Corallinaceae, and a newly discovered species of the red algae, Fosliella (Silva, 1981, as cited in Schmieder, 1985). Fosliella is normally found on plants or directly on the substrate. It has never before been observed living on an animal.

Other rare species on Cordell Bank surfaces include several previously undescribed sponge varieties and a scallop, Chlamys cf. C. hastata, with two patterns of microsculpture on its valves which may actually be two different subspecies (Roth, 1978, as cited by Schmieder, 1985). The shells of at least two previously undescribed snails were found in Bank sediments (McLean, 1985, as cited in Schmieder, 1985).

Some species at Cordell Bank are deep-water forms, but most are known from nearshore waters and some are even found in the intertidal zone. The occurrence of intertidal species in the deep water of Cordell Bank is surprising. Most of the flora and fauna live in densely packed masses near

the tops of the ridges and pinnacles. However, because the species living on the Bank do not have the same environmental requirements or tolerances, there is a marked variation from one depth to another in the distribution of organisms.

Bottom observations by divers of Cordell Bank Expeditions have provided considerable information on the distribution of biota at various depths. The following synopsis, drawn from Schmieder (1985), provides a generalized picture of habitat stratification, although specific sites may vary significantly.

At depths greater than 230 feet (70 m), most of the bottom is covered with coarse gravel sediment. This sediment is almost entirely calcareous. It is the sifted, ground-up remains of gastropod shells, bivalve valves, urchin tests, sponge spicules, foraminifera tests, coral skeletons, and miscellaneous pieces of arthropods, fish scales, otoliths, and worm tubes. Within this sediment lives a variety of animals, mostly very small arthropods, worms, and protozoa. Wandering around the sediment are brittle stars and a few scavengers such as crabs and urchins.

At 210-foot (64 m) depths, the rocks protruding from the sediment tend to be quite bare. The biota at these depths consist for the most part of red algae, solitary anemones, a few small sponges, and small, scattered colonies of Allopora hydrocoral. Between the 200-foot and the 165-foot levels (60 to 50 m), the size of the Allopora colonies increases and isolated anemones, sea cucumbers, sea stars, and sea urchins can be found.

Between 165 and 150-foot (45 to 50 m) depths, all horizontal surfaces are covered by a blanket of organisms four to six inches thick, consisting largely of sponges, a few urchins and great numbers of decorator crabs. Above

150 feet (45 m), high light levels and current-borne nutrients create an ideal habitat for a wide variety of benthic organisms. In this zone, competition for space may become a major population limiting factor. Ridge surfaces are thickly covered with an abundance of sponges, anemones, hydrocorals, hydroids, and tunicates, and scattered crabs, holothurians, and gastropods. In places the cover is a foot thick and very brightly colored, mainly in white, pink, yellows, and reds. The brilliant reds produced by the florescent strawberry anemones are especially striking. The highest elevation on the Bank is encrusted from 115 to 125 feet (38 to 35 m) by a dense cap of barnacles and red algae.

Although a few of the organisms found on Cordell Bank are rare, most of them are commonly found elsewhere. The particular combination of plants and animals on the Bank and their variation with depth is, however, found in few other places. It is the specific environment of rocky ridges and pinnacles, strong current, and exceptionally clear water that makes this special community possible (Schmieder, 1985).

(b) Fishes

Thirty eight varieties of fish have been identified in Cordell Bank waters by R.W. Schmieder as well as additional species (M. Eldredge, personal communication, 1987) (Table 2). By far the most abundant, however, are the rockfish. The fourteen varieties of rockfish, Sebastes, at Cordell Bank range in size from the small, brilliantly-colored, rosy rockfish, S. rosaceus, that reach a maximum length of fourteen inches, to the bocaccio, S. paucispinis, and the yellow-eye, S. ruberrimus, which may attain a length of three feet (Fitch, 1969).

Table 2: Partial List of Fishes Identified in Cordell Bank Waters

<u>Anoplopoma fimbria</u>	Sablefish
<u>Arteidius corallinus</u>	Coralline sculpin
<u>A. meayui</u>	Puget sound sculpin
<u>Caulolatilus princeps</u>	Ocean whitefish
<u>Chirolopsis nugator</u>	Mosshead warbonnet
<u>Citharichthys sordidus</u>	Pacific sand dab
<u>Cololabis saira</u>	Pacific saury
<u>Engraulis mordax</u>	Northern anchovy
<u>Eopsetta jordani</u>	Petrale sole
<u>Hemilepidotus spinosus</u>	Brown Irish lord
<u>Hexagrammos decagrammus</u>	Kelp greenling
<u>Hydrolagus colliei</u>	Ratfish
<u>Isurus oxyrinchus</u>	Mako shark
<u>Lepidopsetta bilineata</u>	Rock sole ^b
<u>Mola mola</u>	Common Mola, ocean sunfish
<u>Onchorhynchus tshawytscha</u>	King salmon
<u>Ophiodon elongatus</u>	Lingcod
<u>Oxylebius pictus</u>	Painted greenling
<u>Paralabrax clathratus</u>	Kelp bass ^a
<u>Prionace glauca</u>	Blue shark
<u>Psettichthys melanostictus</u>	sand sole
<u>Scomber japonicus</u>	Pacific mackerel
<u>Sebastes constellatus</u>	Starry rockfish
<u>S. entomelas</u>	Widow rockfish
<u>S. flavidus</u>	Yellowtail rockfish
<u>S. levis</u>	Cowcod rockfish
<u>S. maliger</u>	Quillback rockfish
<u>S. melanops</u>	Black rockfish
<u>S. miniatus</u>	Vermilion rockfish
<u>S. mystinus</u>	Blue rockfish
<u>S. ovalis</u>	Speckled rockfish
<u>S. paucispinis</u>	Bocaccio
<u>S. pinniger</u>	Canary rockfish
<u>S. rosaceus</u>	Rosy rockfish
<u>S. ruberrimus</u>	Yelloweye rockfish
<u>S. serranoides</u>	Olive rockfish
<u>S. rosenblatti</u>	Greenspot rockfish ^b
<u>S. chlorostictus</u>	Greenstripe rockfish ^b
<u>S. goodei</u>	Chilipepper rockfish ^b
<u>Squalus acanthias</u>	Spiny dogfish ^b
<u>Thunnus alalunga</u>	Albacore tuna
<u>Torpedo californica</u>	Pacific electric ray
<u>Trachurus symmetricus</u>	Jack mackerel
<u>Xeneretmus triacanthus</u>	Bluespotted poacher

Source: R.W. Schneider, 1985a.

^aB. Tasto, 1988. Personal communication, CDFG, Menlo Park.

^bM. Eldridge, 1987. Personal communication, NMFS, Tiburon.

Rockfish of diverse colors and sizes are found at all depths around the Bank. Yellowtail rockfish, S. flavidus, congregate in large aggregations above the pinnacles and may be seen at lower depths intermixed with other varieties. At these lower levels the blue rockfish and several red varieties are especially colorful as they swim around the ridges and slopes. A few, however, are less readily visible. The yelloweye and rosy rockfishes, the starry rockfish, S. constellatus, and the quillback, S. maliger, spend much of their time concealed in Bank caves and crevices.

(c) Marine Mammals

Fourteen species of marine mammals are known to frequent the waters of Cordell Bank. Gray whales pass through the region east of the Bank on their annual migrations to and from their breeding grounds in the Gulf of California. Other mammals frequent the Bank either as transients or as year-around residents of central California offshore waters.

In September and October, 1981, and again during the same two months in 1982, observers from the California Marine Mammal Center and San Francisco State University recorded marine mammal sightings on 16 boat trips to Cordell Bank (Webber and Cooper, 1983). Four of these trips were made in 1981 and twelve in 1982. Thirteen species of marine mammals, all but the gray whale, were identified in 267 sightings made in the two years. Eight of the thirteen species were cetacean and five were pinniped (Table 3). Ten of these thirteen species were observed in waters directly over the Bank.

Table 3: Marine Mammals Observed on Cordell Bank

Cetacean Observations in Cordell Bank Vicinity

<u>Species</u>	<u>No. of Sightings</u>	<u>No. of Individuals</u>
Dall's Porpoise	69	450 (est.)
Humpback Whale	68	145
Blue Whale	9	14
Harbor Porpoise	8	83
Risso's Dolphin	3	100 (est.)
Pacific White-sided Dolphin	1	150-200 (est.)
Northern Right Whale Dolphin	1	7
Killer Whale	1	5

Pinniped Observation in Cordell Bank Vicinity

<u>Species</u>	<u>No. of Sightings</u>	<u>No. of Individuals</u>
California Sea Lion	47	400 (est.)*
Northern Fur Seal	24	25**
Steller Sea Lion	23	37
Northern Elephant Seal	7	7
Harbor Seal	6	6

Source: Webber and Cooper, 1983.

*It should be noted that a disproportionate number of these animals were sighted during the twelve 1982 cruises. Only 15 were sighted during the four 1981 cruises.

**As with the California sea lion, a disproportionate number of northern fur seals were sighted in 1982. Only two were observed during the 1981 cruises.

Among the cetaceans, Dall's porpoise was the most numerous and the most frequently sighted. The second most frequently seen cetacean was the humpback whale, an endangered species. Another endangered species, the blue whale, was sighted in substantial numbers. Both humpback and blue whales were observed directly over the Bank as well as in nearby waters. Individuals of both species exhibited feeding behavior (Webber and Cooper, 1983). Studies conducted by the University of California at Santa Cruz (Dohl, et al., 1982) suggest that a significant portion of the eastern Pacific humpback whale population may feed during the summer months along the central and northern California coast north of the Farallon Islands and west of Point Reyes (i.e., the Cordell Bank area).

The harbor porpoise, a species that is widely distributed in coastal waters, but rarely seen in California waters seaward of the 300 foot (90 m) isobath, was observed eight times during the Webber and Cooper surveys; four of these sightings were beyond the 300 foot isobath. Two of the sightings were of groups of some 30 animals; harbor porpoises are seldom seen in groups of more than ten. Three of the harbor porpoise sightings, including the two large groups, were directly over the Bank. Other cetaceans observed over the Bank were Risso's dolphins and killer whales. Pacific white-sided dolphins and northern right whale dolphins were sighted to the northwest of the bank.

The California sea lion, the most abundant of the pinnipeds in California coastal waters, was, as might be expected, observed more frequently and in greater numbers than other pinnipeds during the survey. They were usually sighted singly or in pairs, but the largest group observed consisted of 40 or 50 individuals travelling in association with Pacific white-sided dolphins (Webber and Cooper, 1983).

In late fall and winter, the northern fur seal is the most abundant pinniped in outer continental shelf waters off northern and central California. Most of these animals use summer breeding grounds in the Bering Sea and migrate to California waters in the fall, returning north in the spring. However, a small breeding group on San Miguel Island in the Channel Islands probably spends the entire year in California waters. The northern fur seals observed in the vicinity of Cordell Bank in September and October of 1981 and 1982 were probably all from the San Miguel Island breeding group as it was too early in the season for the Bering Sea population to have arrived (Webber and Cooper, 1983).

Steller sea lion populations in the Farallon Islands and Channel Islands have decreased drastically in recent years for reasons that are not well understood. A decline in prey availability may be one of several factors contributing to the decrease of these animals. Apparently, however, Cordell Bank remains an attractive feeding ground for them, possibly because of the abundance of rockfish found there. Slightly over sixty percent of the Steller sea lions sighted in the 1981-1982 marine mammal survey were directly over the Bank (Webber and Cooper, 1983).

The other two pinnipeds sighted in the vicinity of Cordell Bank were the northern elephant seal and the harbor seal. Although northern elephant seals are rarely encountered at sea, five adult males and two sub-adults were sighted. All of the adult males were seen directly over the Bank and all five were resting or sleeping. As these animals are believed to feed at night, they might be expected to sleep during daylight hours. Their presence over the Bank might be explained by the fact that rockfish is a part of their diet. Harbor seals, a coastal species, were only observed shoreward of the 300 foot

(90 m) isobath during the 1981-1982 survey (Webber and Cooper, 1983). In another study, however, a harbor seal was sighted just north of the Bank (Dohl et al., 1982).

(d) Seabirds

The waters of Cordell Bank provide a rich feeding ground for a diverse multitude of seabirds. During the winter, spring, and summer, seabird density over Cordell bank is among the highest for central California waters (Dohl, et al., 1982). Density declines somewhat in autumn, but remains relatively high.

Regular trips to observe seabirds at Cordell Bank have been made for many years by personnel from the Point Reyes Bird Observatory and by other individuals (Parmeter, 1985). Forty-seven seabird varieties (Table 4) have been identified foraging near Cordell Bank. Some of these species, however, are represented by only a few individuals, often transients. Most of the birds belong to species that breed along the central California coast or on the nearby Farallon Islands (Table 4, note). These birds commonly forage in continental shelf waters between Bodega Bay and Point Ano Nuevo.

The predominant species in these waters are common murrelets, Cassin's auklets, pigeon guillemots, western gulls, and cormorants (Briggs, et al., 1985). Great numbers of shearwaters forage in these waters during the summer and fall and red phalaropes appear abundantly in the fall along the continental slope and in areas of upwelling. Brown pelicans also frequent the area in summer and fall. Webber and Cooper reported sighting brown pelicans on eight of twelve expeditions to Cordell Bank in September and October, 1981 to 1982 (Webber and Cooper, 1983).

For most of these birds, Cordell Bank's attraction as a feeding ground is the result of its plentiful population of rockfish. In studies of seabirds in

Table 4: Seabirds Observed on Cordell Bank

<u>Brachyramphus marmeratus</u>	Marbled murrelet
<u>Branta bernicla</u>	Brandt
<u>Catharacta skua</u>	South polar skua
<u>Cerorhinca monocerata</u>	Rhinoceros auklet
<u>Cephus columba</u>	Pigeon gillemot*
<u>Diomedea nigripes</u>	Black-footed albatross
<u>Endomychura hypoleuca</u>	Xantus' murrelet
<u>Fulmarus glacialis</u>	Northern fulmar
<u>Gavia arctica</u>	Arctic loon
<u>G. immer</u>	Common loon
<u>G. stellata</u>	Red-throated loon
<u>Larus argentatus</u>	Herring gull
<u>L. californicus</u>	California gull
<u>L. canus</u>	Mew gull
<u>L. heermanni</u>	Heermann's gull
<u>L. hyperboreus</u>	Glaucus gull
<u>L. occidentalis</u>	Western gull*
<u>L. philadelphia</u>	Bonaparte's gull
<u>L. thayeri</u>	Thayer's gull
<u>Phalaropus lobatus</u>	Red Necked phalarope
<u>P. fulicaria</u>	Red phalarope
<u>Fratercula cirrhata</u>	Tufted puffin*
<u>Oceanodroma homochroa</u>	Ashey storm petrel*
<u>O. furcata</u>	Fork-tailed storm petrel
<u>O. leucorhoa</u>	Leach's storm petrel*
<u>O. melania</u>	Black storm petrel
<u>Pelecanus occidentalis</u>	Brown pelican
<u>Phalacrocorax auritus</u>	Double-crested cormorant*
<u>P. pelagicus</u>	Pelagic cormorant*
<u>P. penicillatus</u>	Brandt's cormorant*
<u>Ptychoramphus aleuticus</u>	Cassin's auklet*
<u>Puffinus carneipes</u>	Flesh-footed shearwater
<u>P. bulleri</u>	Buller's shearwater
<u>P. creatopus</u>	Pink-footed shearwater
<u>P. griseus</u>	Sooty shearwater
<u>P. puffinus</u>	Manx shearwater
<u>P. tenuirostris</u>	Short-tailed shearwater
<u>Rissa tridactyla</u>	Black-legged kittiwake
<u>Stercorarius parasitus</u>	Parasitic jaeger
<u>S. pomarinus</u>	Pomarine jaeger
<u>Sterna forsteri</u>	Forster's tern
<u>S. hirundo</u>	Common tern
<u>S. paradisaea</u>	Arctic tern
<u>Synthliboramphus antiquus</u>	Ancient murrelet
<u>Uria aalge</u>	Common murre*
<u>Xema sabini</u>	Sabine's gull

* Species that breed on the Farallon Islands

Source: R.W. Schneider, 1985a and PRBO, 1987, Personal communication.

the Gulf of Farallones, it was found that, unless unusually warm sea temperatures reduced their abundance, juvenile rockfish were clearly the major constituent in the diet of all species except Cassin's auklet (Briggs, et al., 1985, Appendix II). Further, in years when juvenile rockfish are exceptionally abundant during the summer months, seabird breeding success is also exceptional. Even Cassin's auklets, essentially plankton feeders, depend on rockfish populations in the area of the Farallon Islands. Rockfish larvae are the third most important item in the diet of Cassin's auklets found in the area (Briggs, et al., 1985).

Because of their feeding habits, Cassin's auklets are particularly drawn to areas of upwelling such as Cordell Bank, where foraging flocks of several hundred have been observed. Although Cassin's auklets do not participate significantly in feeding flocks consisting of mixed species, they have been recorded at Cordell Bank in apparent association with phalaropes and humpback whales, both plankton feeders (Briggs, et al., 1985; Webber and Cooper, 1983).

3. Historical and Cultural Resources

Cordell Bank may have been exposed as an island during the late Pleistocene epoch, but there is little likelihood of human habitation there at that time. The earliest evidence of human occupation in California coastal counties dates from about 5,000 years ago (MMS, 1982), at which time Cordell Bank had long ceased to be an island. However, even if humans did reach the Bank while it was exposed, erosion during its submergence would have destroyed any archeological evidence of their occupancy (Watt, 1984).

Despite the fact that many shipwrecks are found along the coast of California there is presently no evidence of any historical or cultural resources within the proposed Sanctuary.

C. Human Activities

1. Fishing

The most important human activity at Cordell Bank is commercial and recreational fishing. Fishing in Bank waters is regulated by the groundfish and salmon Fishery Management Plans (FMP's) prepared by the Pacific Fishery Management Council and approved by the National Marine Fisheries Service (NMFS), in accordance with the Magnuson Fishery Conservation and Management Act (See Appendix 2).

Commercial fishing-gear restrictions in present and past FMP's have included the prohibition of gill-net fishing above the 38th parallel, the northern part of the Bank. Below the 38th parallel, however, gill-net fishing was permitted until July 30, 1985, when a new California law banned it in that area as well.

Sport-fishing data collected by the California Department of Fish and Game (CF&G) (Table 5) indicate that after rockfish, the most important fish stocks at Cordell Bank are lingcod, jack mackerel, and king salmon. However, numbers of rockfish heavily dominate the size of the recreational catch, reflecting its great value to the local fishermen. Of the non-rockfish varieties lingcod was taken the most frequently. Yet, the catch of lingcod represented only 2.1% of the total from 1970 through 1981. Lingcod have been reported to weigh as much as 105 pounds but the maximum size normally caught is about four feet long and weighs fifty pounds. From late fall to early winter, the spawning period, the male guards the eggs in rocky crevices until they spawn, but otherwise lingcod are found at all depths in waters around Cordell Bank (Fitch, 1969).

Jack mackerel are pelagic, schooling fish, often found near the surface

in the vicinity of offshore reefs or banks, including Cordell Bank. Although their maximum size and weight have been reported to be 32 inches and five pounds, they are only 14 inches long at three years of age (Fitch, 1969). Jack mackerel, like the rockfish, are known to be eaten by seals and sea lions, several of the porpoises, and by some rockfish varieties.

Approximately one-eighth of one percent of the sport-fishing catch at Cordell Bank during the ten-year period consisted of king salmon. Various types of small fish, including rockfish, are part of the diet of mature king salmon; the salmon may possibly be drawn to Cordell Bank by its abundance of rockfish. Although king salmon have been recorded at weights of well above a hundred pounds, the average ocean-caught fish weighs between 10 and 15 pounds (Fitch, 1969).

Recreational fishing at Cordell Bank is done from fishing excursion boats, based largely in Bodega Bay or Sausalito. According to data collected from 1970 through 1981 by the CF&G, the most intensive sport fishing is in the four months of July through October (see Table 5). During this period, the average monthly sports fishing effort, as measured in boat-days, was almost twice the average for December and January, when the weather is at its worst and the least activity occurs. According to these data, 97.7 percent of the 1970-1981 total catch was rockfish. Only 2.1 percent of this catch was lingcod and the catch of other fish species was proportionately negligible. It can be assumed that the commercial catch is similarly dominated by rockfish (J. Underhill, 1988, personal communication).

Table: 5: Recreational Fishing Activity at Cordell Bank (1970-1981)

Month	Total Fish	Number Anglers	Boat Days	Angler Hours	Jack Mackerel	Lingcod	Rockfish	Salmon	Others
Jan	27145	2382	103	7807		818	26298	2	27
Feb	35855	3601	136	12448	43	1328	34390	74	63
Mar	40023	3850	144	12663		1281	38711	18	13
Apr	33747	3319	126	11349		867	32815	47	18
May	37722	3658	147	12322	25	592	37077	33	20
Jun	39403	3520	138	11108	33	454	38675	245	29
Jul	55807	5508	202	17771	187	586	55113	47	61
Aug	62783	5766	201	18261	239	743	61903	34	103
Sep	66113	6469	232	21069	185	1019	65016	21	57
Oct	55469	5726	212	19037	98	1398	53991	15	65
Nov	40538	4008	159	13245		1176	39227	104	31
Dec	26599	2458	111	8240		648	25923	2	26
Total	521204	50265	1911	165320	810	10910	509139	642	513

Source: California Department of Fish and Game data, analyzed by Cordell Bank Expeditions (Schmieder, Personal communication, May 4, 1984).

2. Oil and Gas Activities

There is no current oil and gas activity in the vicinity of Cordell Bank although such development has been planned in the past. The Bureau of Land Management (BLM), in the Department of the Interior, selected tracts for Outer Continental Shelf (OCS) Lease Sale #53 in October, 1978. A number of nominations to include Cordell Bank in the sale were received during the preselection process. Although the final selection of tracts did not include any in the immediate vicinity of Cordell Bank, eight tracts, amounting to 34,560 acres, were selected in the Bodega Basin, northwest of Cordell Bank (BLM, 1980). In April, 1981, the Secretary of the Interior issued a Final notice of sale in which the eight Bodega Basin tracts were deleted from Lease Sale #53.

In 1982, a Congressionally-imposed moratorium closed most offshore areas of central and northern California, including the area around Cordell Bank, to oil and gas leasing. This moratorium came to an end in November 1985, when Congress did not continue it. In February 1986, the Minerals Management Service (MMS), which had replaced the BLM in implementing the Department of the Interior's responsibilities under the Outer Continental Shelf Lands Act, published its 5-year plan for the OCS leasing program. This plan, includes Lease Sale #119 for the Central Californian Coast and defers Cordell Bank, within the 91 meter (49.76 fathom) isobath from leasing during the 5-year program (MMS, 1986) (Figure 3).

3. Commercial Shipping

Cordell Bank is located near the northern sea lanes used by commercial ships bound to and from San Francisco Bay ports. In 1984, 3,947 self-

propelled commercial ships entered the Bay. Of this number, 995 were tankers and 2,952 carried dry cargo or passengers. Similar numbers of outward bound ships of both types left the Bay (U.S. Army Corps of Engineers, 1986). The shipping lanes used by these ships were established by the U.S. Coast Guard (USCG) vessel traffic separation scheme for Bay ports (Figure 4). Ships using the northern lanes pass to the east of Cordell Bank.

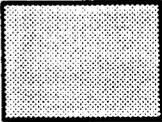
4. Military Activity

The Cordell Bank area is the site of regular U.S. Navy submarine, surface and air operations. Airspace Warning Area, W-260, overlaps the northern half of the Bank. Airspace Warning Area, W-513, and Submarine Diving Area, U-3, overlap the southern part of the Bank. Submarine activity in this area is comprised of trial diving exercises and equipment checkouts, usually following vessel overhaul or refitting. Exercises occur in Area U-3 on an average of about ten days per month. The Navy conducts aircraft and surface vessel exercises in the Warning Areas. These exercises are often coordinated with submarine operations (see Figure 4).

5. Research and Education

Cordell Bank was discovered by George Davidson of the U.S. Coast and Geodetic Survey on the night of October 20, 1853. No further exploration was carried out until June 1869, when Edward Cordell, at Davidson's suggestion, relocated the Bank and mapped its general contours. The Bank was again surveyed in 1873, 1911, and 1929, but its detailed structure remained unknown. In 1949-1950, G. Dallas Hanna of the California Academy of Sciences obtained samples of rock with a dredge. They were identified as granodiorite, thus establishing the connection to the Salinian Block. Since 1978, Cordell Bank

Potential Oil and Gas Development Near Cordell Bank

- Proposed Boundary #1 Cordell Bank National Marine Sanctuary
-  Areas Proposed for Offshore Oil Drilling under Lease Sale #119

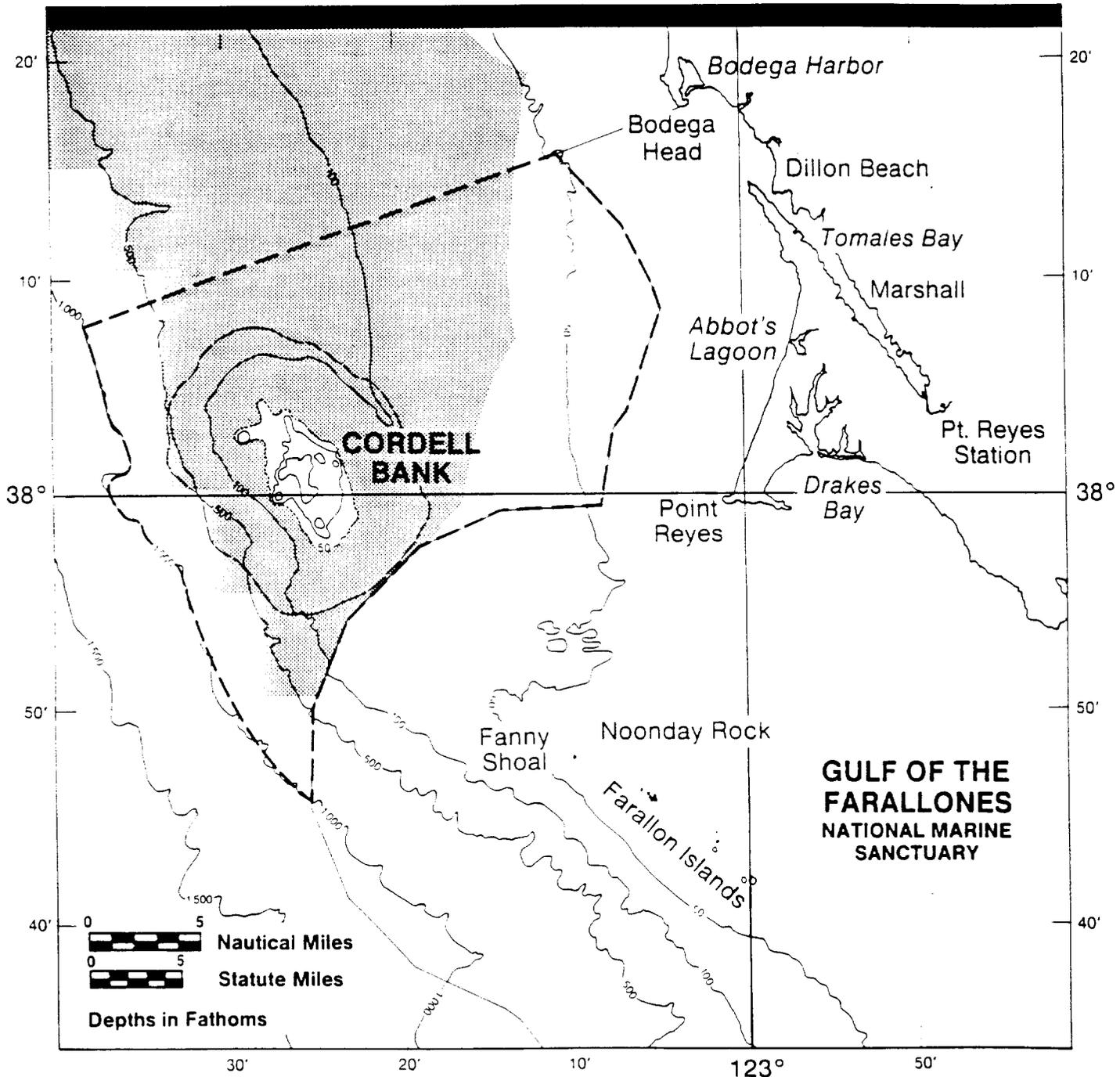
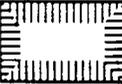


Figure 3

Sources: National Ocean Service Nautical Chart 18640; Department of the Interior, OCS Oil and Gas 5 Year Plan, 1987.

Shipping and Military Activity

-  Existing Shipping Lanes
-  Point Reyes-Farallon Islands National Marine Sanctuary Boundary
-  Zone of Activity

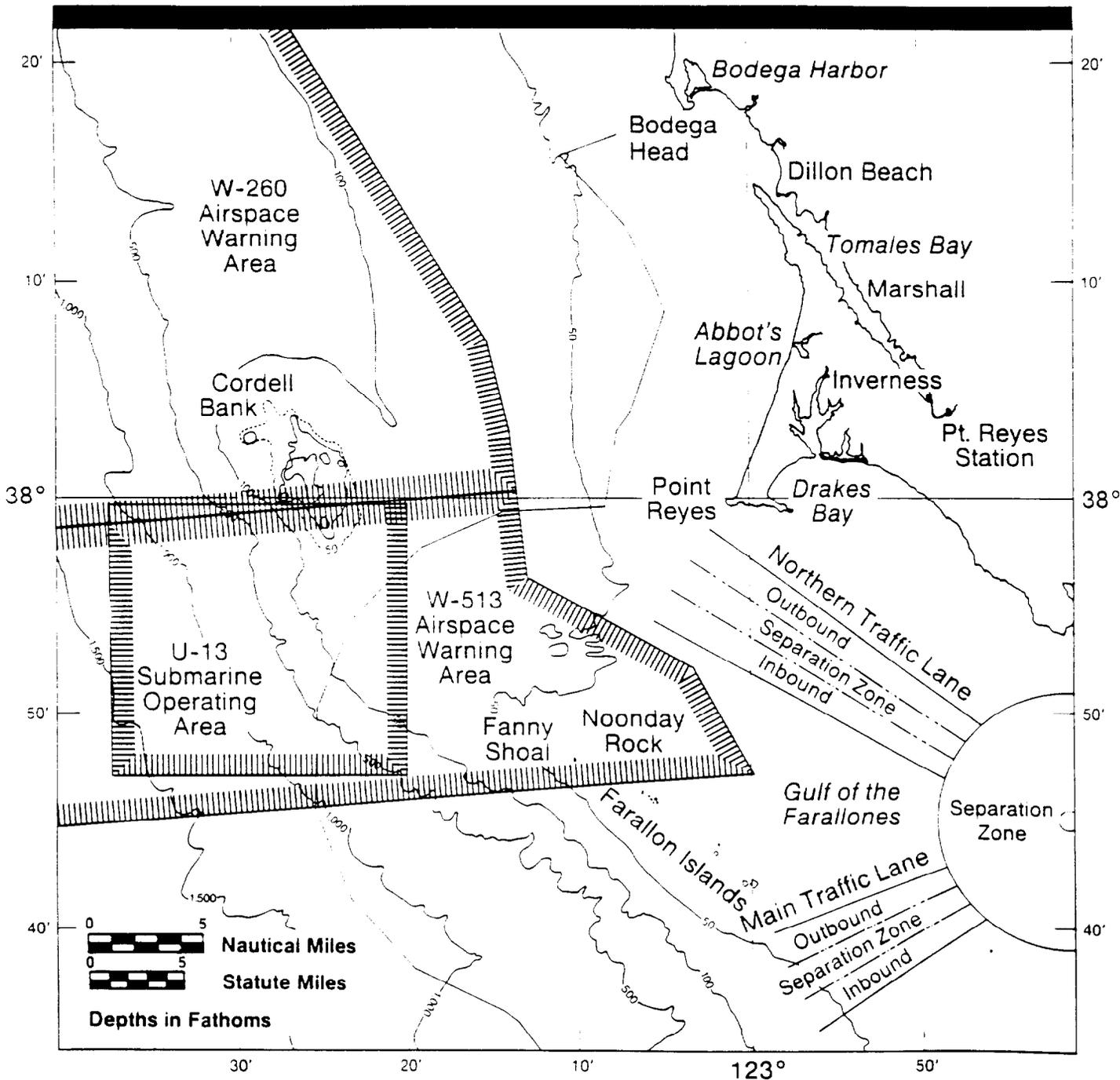


Figure 4

Sources: Defense Mapping Agency Chart 18005; National Ocean Service Nautical Chart 18640.

Expeditions, a nonprofit organization dedicated to the exploration and description of this site, has carried out an annual series of high resolution depth surveys and scuba dives to obtain biological specimens and underwater photographs (Schmieder, 1978, 1979, 1981, 1984a, 1985b, 1985c, 1985d). Cordell Bank Expedition's depth surveys revealed errors in the existing charts of the Bank and provided information on a number of previously unsuspected topographic features. Other results of this research include a list of over 450 species found on the Bank, in surrounding waters and the air above. This list is based on direct observations made by Cordell Bank Expeditions and on information provided by the CF&G and other sources, including personnel of the California Marine Mammal Center who participated in several of the annual field investigations to record observations of cetaceans, pinnipeds, and seabirds.

The NOAA coastal survey ship, DAVIDSON, surveyed Cordell Bank in May, 1985, in conjunction with a larger hydrographic survey of waters off northern California. Data in the Cordell Bank area was collected with a bottom resolution of 20 by 20 feet and is being used by NOAA to produce a chart at a scale of 1:20,000. A chart at this scale would have a bottom resolution of 140 by 140 feet; it would thus be of little use as baseline information on the narrow ridges and peaks at the top of the Bank where most of the biological communities are concentrated. However, copies of the raw data collected on the DAVIDSON survey were provided to Cordell Bank Expeditions for use in producing detailed plots of Bank surfaces and the biological communities inhabiting them (Kruse and Schmieder, 1986).

Although there has been increasing research at Cordell Bank in recent years, there has been no similar organized effort to educate the public about

the Bank. Information developed by Cordell Bank Expeditions has occasionally been summarized in periodical literature. However, an organized educational program concerning Cordell Bank resources will be possible with Sanctuary designation.

Section III: Action Plan

A. Overall Management and Development Concept

The long-term protection of resources has the highest management priority in this plan. Ensuring the protection of Sanctuary resources depends on several factors affecting the feasibility of proposed programs and actions. Factors affecting management of the proposed Sanctuary include: its size; its depth and location; its proximity to the PRNMS; and the need to coordinate the responsibility for comprehensive management of the site with other authorities.

Visitor use of Cordell Bank waters is limited by weather conditions and by the Bank's remoteness from the California coast. The size and proximity of Cordell Bank to the PRNMS makes it feasible and cost-effective for the PRNMS manager and staff to provide the management needed for the proposed CBNMS. These constraints obviate the need for a Sanctuary management structure of the size required for other established sanctuaries. This concept of combined management is an important feature of the management plan.

Understanding the ecological relationships among the diverse species of benthic organisms, fish, mammals and seabirds that are dependent on the Cordell Bank environment is of prime importance in protecting these resources. The plan calls for a research effort to characterize and monitor environmental conditions and to detect significant changes in the status of populations. These studies will provide management with a basis for formulating contingency plans and for responding to unforeseen threats to the environment.

The general public and interested organizations in central and northern California will play important roles in attaining resource protection goals in

the Sanctuary. Interpretive programs fostering public understanding and, hence, support for management objectives, are inherent in the plan's concept. The establishment of a CENMS will provide an excellent opportunity to inform the public about the value of efforts to protect its fragile resources and the need for a long-term management framework. Effective communication will depend on publications, exhibits, and special events that convey the significance of the Sanctuary's resources to a varied public.

The management plan proposes actions tailored to specific issues affecting the Sanctuary. The plan recognizes the need for a balanced approach reflecting the existing protection priorities and the multiple use character of the area. Implementation of this plan will entail cooperation and coordination among several agencies including the USCG and the U.S. National Park Service (NPS). Information exchange, sharing facilities and staff, and the coordination of policies and procedures for resource protection will be features of all programs, including research and interpretation. The plan is designed to guide management of the proposed CENMS for the first five years after implementation. During this period, management initiatives will generally fall into three basic programs: Resource Protection, Research, and Interpretation. The remainder of this section describes guidelines and initiatives for each program.

B. Resource Protection

1. General Context for Management

The proposed designation of Cordell Bank as a National Marine Sanctuary focuses attention on the value of the area's resources. To ensure that these resources are protected, the Sanctuary resource protection program includes:

- (1) coordination of policies and procedures among the agencies sharing

responsibility for resource protection; (2) participation by other agencies in the development of new procedures to address specific management concerns (i.e., monitoring and emergency-response programs); and (3) the enforcement of Sanctuary regulations in addition to those already in place.

2. Designation Document and Sanctuary Regulations

A summary of the existing regulatory regime in the area of the proposed CBNMS is included in Part III--(Section 1) Status Quo Alternative. The regulations under this regime will not be affected by Sanctuary designation. The proposed Designation Document (Appendix 1) describes the relationship between Sanctuary designation and other regulatory programs. The proposed Designation Document also includes:

- ° a list of activities subject to regulation now or in the future;
- ° regulations for specified activities; and
- ° provisions for additional regulations, as necessary.

To ensure protection of Sanctuary resources and conservation of Cordell Bank's valuable habitat, NOAA proposes two additional regulations governing discharges and damaging benthic resources. If necessary to protect Sanctuary resources, hydrocarbon activities, anchoring on Cordell Bank or within the 50-fathom isobath surrounding the Bank, and removing, taking, or injuring or attempting to remove, take, or injure historical or cultural resources may be regulated in the future.

(a) Discharges

Discharges or deposits within the Sanctuary are prohibited. Discharges or deposits from beyond Sanctuary boundaries are also prohibited if the substance or material discharged enters the Sanctuary and injures a Sanctuary resource. Exceptions to these prohibitions include vessel cooling waters, fish wastes

and bait, marine sanitation device effluents, and discharges, such as deckwashings, authorized for routine operations.

(b) Removing, Taking or Injuring Benthic Resources

Removing, taking, or injuring or attempting to remove, take, or injure benthic invertebrates or algae located on Cordell Bank or within the fifty fathom isobath surrounding the Bank is prohibited, except as authorized by permit from NOAA for scientific research, educational, salvage, or Sanctuary management purposes.

(c) Oil and Gas Activities

If oil and gas activities are permitted in the future within the boundaries of the Sanctuary by the Department of the Interior OCS Leasing Program, Sanctuary regulations may be promulgated to restrict or prohibit such operations if it is determined that they may have adverse effects on the Sanctuary's resources. NOAA will actively consult with the Department of Interior concerning any proposed oil and gas activities in the area and NOAA will carefully monitor any exploration and development activities that may impact the Sanctuary's resources. Any regulation prohibiting hydrocarbon operations would apply throughout the Sanctuary.

(d) Cultural and Historical Resources

It is necessary to protect and manage any historical and cultural resources that may be in the Sanctuary. Therefore, any activity that leads to the discovery or finding of cultural or historical resources will be carefully monitored and regulations will be proposed if deemed necessary to protect such resources. Any regulation prohibiting removing, taking, or injuring or attempting to remove, take, or injure historical or cultural resources would apply throughout the Sanctuary.

(e) Anchoring

At present few vessels visit Cordell Bank and anchor on it. However, anchoring on the Bank can injure or destroy benthic organisms by physical impact and by dragging of the anchor chain. Anchoring could have a significant effect on the benthic flora and fauna and should be carefully monitored. Regulation of anchoring would be considered if anchoring activities increase and threaten the Bank's resources. This potential regulation would only apply to Cordell Bank and the area within the 50 fathom contour surrounding Cordell Bank. It is in this area where the benthic resources are most concentrated and potentially susceptible to anchor damage.

Note: Military Operations.

The regulation of activities within the CENMS shall not prohibit any activity conducted by the Department of Defense that is necessary for national defense. All activities being carried out by the Department of Defense within the Sanctuary on the effective date of designation that are necessary for the national defense are not subject to Sanctuary prohibitions. The exemption of additional activities shall be determined in consultation between NOAA and the Department of Defense.

3. Contingency Plans for Major Emergencies

The resources of the CENMS are susceptible to natural and human-related changes. Many of these changes are gradual and can be detected only through long-term monitoring of environmental and biological indicators. However, certain changes in conditions (due to an accidental oil spill, for example) could seriously impact resources and present severe health and safety hazards.

Under the National Contingency Plan for the removal of oil and hazardous

substances, remedial action to control or remove this type of material that could endanger the public health is the responsibility of U.S. Coast Guard directed Regional Response Teams acting through an On-Scene Coordinator and a Regional Response Center.

The Eleventh Coast Guard District will provide Regional Response Center facilities. The On-Scene Coordinator will receive scientific support from NOAA and assistance as necessary from the Regional Response Team and other appropriate Federal and state agencies. Assistance is also possible from private groups such as Clean Bay, an industry-supported oil spill clean-up cooperative operating in the San Francisco Bay area.

To provide further protection to Cordell Bank resources, the MEMD will monitor and assess the state of preparedness as it relates to the Sanctuary. This action will entail exchanging information with government and industry response teams and seeking their support in assessing detection and clean-up capabilities that can be used to protect Bank resources.

A MEMD-level contingency and emergency-response plan is now under preparation. After its completion, a Sanctuary-specific contingency and emergency-response plan will be prepared. This plan will:

- describe emergency-response procedures and coordination requirements for MEMD and Sanctuary staff; and
- provide a geographic information system depicting resources at risk; and
- outline procedures for emergency research; and
- provide damage assessment guidelines.

In conjunction with this plan, agreements may be formulated to improve spill detection programs and augment containment capabilities (i.e., with additional equipment, staff, and deployment plans). These efforts will be

closely coordinated with similar efforts to protect the PRNMS.

4. Encouraging Compatible Use of the Sanctuary

Encouraging the public to use the Sanctuary in ways that are compatible with the protection of significant resources is an important aspect of the resource program. The MEMD will encourage compatible visitor use by undertaking the following:

- ° Monitoring commercial and recreational activities in the Sanctuary and encouraging other agencies to do so to detect areas of particular management concern;
- ° Exchanging information on commercial and recreational activities in the Sanctuary;
- ° Consulting with other agencies on policies and proposals for the management of activities which may affect protection of Sanctuary resources; and
- ° Developing materials aimed at enhancing public awareness of the Sanctuary's resources and their need for protection.

Monitoring and information exchange programs are discussed under research (Subsection C). The development of materials is discussed under interpretation (Subsection D).

5. Surveillance and Enforcement

A primary feature of the resource protection program is the surveillance of Sanctuary waters and enforcement of applicable regulations. The USCG has broad responsibility for enforcing all Federal laws in navigable waters under U.S. jurisdiction. Where these laws regulate fishing harvests, the USCG works closely with the NMFS and the CF&G. The CF&G enforces Federal as well as California fishing regulations in the exclusive economic zone and acts as the primary agency for the enforcement of fishery regulations applying to Cordell Bank.

Sanctuary designation would have the effect of broadening USCG

enforcement responsibilities to include the enforcement of Sanctuary regulations. However, in the event that analyses of use patterns after Sanctuary designation indicate that additional surveillance is required, NOAA will provide for more intensive enforcement to protect Sanctuary resources. The effectiveness of Sanctuary enforcement operations will be evaluated two years after Sanctuary designation and annually thereafter.

(a) Public Education and Information

Because the most effective enforcement is prevention, the Sanctuary interpretive program will make every effort to inform users of the need to use the Sanctuary environment wisely. Much of this effort will involve the preparation of easily understood brochures and other written materials on regulations, and the reasons for them. These materials will be made available to all Sanctuary users.

(b) Planning and Coordination

Information obtained from the research program and from surveillance-enforcement activities on Sanctuary visitor use patterns, frequently occurring violations, and potentially sensitive resources, will be reviewed in periodic meetings between the Sanctuary Manager and enforcement agency personnel to determine the adequacy of surveillance levels.

C. Research

1. General Context for Management

Effective management of the CBNMS will require the inauguration of a research program that addresses management issues. Knowing how a system works is essential in developing effective solutions to management problems. Research funded by the MEMD will be directed to improving knowledge of the Sanctuary's environment and resources and of how they may be affected by

various types of human activity. The general direction of the research program and the process for preparing an annual Sanctuary Research Plan is discussed below.

2. Framework for Research

The research program consists of three major project categories:

- ° Baseline studies to determine the features and processes of the natural environment; to determine the abundance, distribution, and interaction of the living resources; and to describe the pattern of human activity in the Sanctuary; and
- ° Monitoring to document changes in environmental quality, in ecology, and in human activity; and
- ° Predictive studies to assess the causes and effects of environmental and ecological changes.

Each of these categories is described in more detail below:

(a) Baseline Studies

Baseline studies will be designed to obtain a better understanding of the hydrology and ecology of the Sanctuary. Because Cordell Bank is located in an area subject to hydrocarbon spills, Sanctuary managers need sound information on water circulation. This information would be used to improve understanding of the dispersion pattern of possible oil spills as part of the Sanctuary's contingency planning efforts.

Comprehensive knowledge of the distribution of bottom organisms and their dependence on environmental factors is needed for interpretation as well as for resource protection. The environment at representative depths and locations should be characterized by the collection of additional baseline data on water temperature and salinity, light penetration, upwelling circulation and nutrient-load. This information should be correlated with data on the abundance and distribution, by depth zone and location of species populations living on Bank surfaces. Data of this type have been collected by

Cordell Bank Expeditions (Section II), but there are still many gaps in our knowledge of Bank ecology.

A fishery stock assessment should be instituted to determine the species composition and abundance of the rockfish population on Cordell Bank. The data collected in this study would serve to document the Bank's value as fishery habitat and provide the basis for estimating the effects, if any, of increased fishing intensity on the fishery.

(b) Monitoring

Effective management requires a data base more comprehensive than simply the number of plants, animals, and non-living elements within the Sanctuary. It requires an understanding of long-term changes to the status of the resources. Monitoring provides such understanding. Monitoring data indicative of the relative health of resources can be used to detect ecological changes and trends. This program should include pollution monitoring studies and studies to monitor the population dynamics of species inhabiting the upper reaches of Cordell Bank's ridges and pinnacles. Changes in the relative distribution of these species could indicate the existence of natural or man-caused threats to Bank resources.

Other studies should monitor the effects of anchoring on Bank surfaces; changes in rockfish abundance and in the proportions of adult to juvenile rockfish; fluctuations in the abundance of whale, seal and seabird species in the Sanctuary; and the intensity and relative importance of sport fishing, commercial fishing and nature observation activity.

(c) Predictive Studies

In addition to baseline research and monitoring, the Sanctuary research program will include studies, as needed, to analyze the causes and

consequences of changes in the ecosystem and to predict the effects on it of new or more intense human activity in the area. Studies could be made to determine the effects on marine mammals of possible increases in boating activity if heightened interest in whale watching and fishing excursions results from Sanctuary establishment. A knowledge of these effects would enable management to provide information to Sanctuary users to avoid disturbing these animals unnecessarily.

Other studies of whales, seals and seabirds in the Sanctuary could be initiated to determine their range, where they come from, and how dependent they are on the food resources of the Bank. These studies should be closely tied into similar studies conducted in the PRNMS research program. One such study, for example, might be an investigation to determine (1) whether the decrease in Steller sea lions in the Farallon and Channel Islands can be attributed to a decline in prey availability and (2) the importance of the Cordell Bank rockfish stocks in sustaining the remaining Steller sea lion population.

3. Selection and Management of Research Projects

To ensure that projects considered for funding by the MEMD are directed to the resolution of management issues and concerns, the Sanctuary Manager and the MEMD, will follow procedures developed by the MEMD to ensure that each Sanctuary's research program is consistent with overall Program policies and directions. These procedures include: (1) preparing an annual Sanctuary Research Plan (SRP) and (2) monitoring the progress of research in the Sanctuary. To a large degree, the research program for the CENMS will be carried out in conjunction with the research program at the PRNMS.

(a) Preparing an Annual Plan

Each year a Sanctuary Research Plan (SRP) will be prepared for the CENMS. The SRP will then be incorporated into a national plan which includes annual plans for each Sanctuary. Steps involved in the annual planning process include:

- Identifying management concerns for the Sanctuary with supporting evidence or rationales.
- Based on the identification of management concerns, research priorities shall be established. Research priorities are established by the Sanctuary Manager in cooperation with the MEMD. The most important factors to be considered in establishing annual research priorities will be the following:
 - (1) Immediate or evolving management issues that may be resolved through directed research projects;
 - (2) The prospects of research already in progress; and
 - (3) The availability of funds, equipment and instruments for research support.
- After the management concerns are identified, a research announcement and request for detailed project ideas or concepts is prepared. The announcement discusses the management concerns, and summarizes past and ongoing research. Its purpose is to solicit suggestions for specific research that can help resolve management issues. Research workshops are held occasionally to facilitate the identification of research problems;
- Based on research suggestions generated by the announcement, workshops, or other means, a draft SRP is prepared. The SRP lists the proposed research projects with rationales. The list is priority-ranked by the Sanctuary Manager.
- The draft SRP is sent to the MEMD and is circulated for peer review.
- A final SRP is prepared. This SRP includes documentation of how each project meets the national selection criteria. The final SRP is sent to the MEMD where it is incorporated into a national Sanctuary Research Plan. The highest ranking research projects are selected from the national plan and a procurement schedule is prepared.

If research proposals include activities that are prohibited by Sanctuary regulations a permit may be issued by NOAA upon application by researchers or, it may be determined that all or part of the research should be conducted

outside of the Sanctuary. Research on protected or endangered species, such as the brown pelican and certain marine mammals, may require additional research permits from other agencies.

(a) Monitoring Progress

The Sanctuary Manager will monitor the performance of research projects and keep records of all research underway, equipment being used on site, frequency of researchers' visits, and progress to date. Progress reports and final reports to the MEMD and Sanctuary Manager will be required to assure conformance to schedules outlined under the terms of the contract. Final reports may be reviewed by recognized scientists and resource managers before approval by the MEMD. Outstanding project reports will be published by the MEMD in its Technical Report Series.

4. Information Exchange

To complement directly funded research, the MEMD will encourage research funded from other sources particularly where it supports Sanctuary management objectives. In this regard, the MEMD will make available to other agencies and private institutions current Sanctuary resource data obtained from past and ongoing research projects.

D. Interpretation

1. General Context for Management

Increased public understanding and appreciation of the natural value of Cordell Bank resources is essential for their protection. The interpretive program for the CBNMS will be focused on improving public awareness of the Sanctuary and providing information on Bank resources and Sanctuary regulations designed to protect them.

2. Interpretive Opportunities

Opportunities for interpreting the CBNMS fall into three broad categories: interpretation for visitors to the Sanctuary, for visitors to the PRNMS headquarters at Fort Mason in San Francisco, and for interested groups not visiting either location.

In the case of visitors to the Sanctuary, opportunities for interpretation are limited by the isolation of Cordell Bank, weather conditions, and the fact that many of its living resources are at least 115 feet (35.1 m) below the water surface. Recreational diving can be extremely dangerous at this depth.

With the exception of scientific research parties, visitors to Cordell Bank waters can generally be classified as fishermen and nature viewers. Most of the fishing on the Bank is commercial, but there is also considerable recreational fishing from excursion boats. Although recreational fishermen visit the Bank throughout the year, the greatest fishing activity occurs during a four month period, July through October. Activity is reduced during the remaining eight months because of weather constraints.

Whale watching and other nature viewing at Cordell Bank is generally incidental to sport fishing from excursion boats, but there is a potential for excursions solely for the purpose of nature viewing. Nature enthusiasts visiting Cordell Bank have the opportunity to enjoy watching sea lions, porpoises and great whales as well as the large flocks of seabirds that feed in Bank waters. Brochures and interpretive materials will be made available to fishermen and nature viewers to make them aware of Sanctuary regulations, particularly with regard to waste disposal, and to inform them about the seabirds and marine mammals that may be seen in the Sanctuary and the rich

ecological communities lying beneath its waters.

The establishment of the PRNMS headquarters at Fort Mason and the existence of other visitor and information centers along the coast provide an opportunity to inform visitors to these sites about Cordell Bank's environment. Most of these visitors would not normally visit Cordell Bank; yet, given the opportunity to see interpretive exhibits and brochures about the Sanctuary at these centers, their appreciation for the special qualities of the Bank environment should be enhanced.

Finally, the CENMS interpretive program will try to reach groups in the coastal region of California and elsewhere who have an interest in Cordell Bank and related areas, but are not apt to visit it or the PRNMS. This project entails identifying these groups and making interpretive materials available to them.

3. Interpretive Programs

Interpretation for the CENMS will consist of three distinct sub-programs:

- ° Site visitor programs for fishing and whale watching excursions and other recreational visitors to Sanctuary waters;
- ° Information center programs for those visiting the facilities at the PRNMS and other nearby information centers; and
- ° Outreach programs for interested groups not visiting either Sanctuary.

It should be noted again, however, that many of these programs will be carried out in coordination with programs sponsored by the PRNMS.

(a) Site Visitor Programs

On-site interpretation will consist largely of written material describing the Sanctuary and explaining its regulations. This information will be available to participants in fishing and nature viewing excursions. The program will rely heavily on the cooperation of excursion boat operators.

If there is sufficient public interest and if funding and staff resources are available for expanding this program, the Sanctuary Manager will consider co-sponsoring special excursions to Cordell Bank waters, organized by non-profit organizations, and providing on-board interpreters.

(b) Information Center Programs

CENMS exhibits will be established at the PRNMS facility at Fort Mason. The feasibility of establishing additional distribution points for brochures and information and space for posters and displays will be investigated. Possible distribution point locations include visitor and information centers at Audubon Canyon Ranch, Bolinas Lagoon Nature Preserve, Point Reyes Bird Observatory, the Point Reyes National Seashore, Tomales Bay State Park, Bodega Marine Laboratory, and the Farallon Islands National Wildlife Refuge visitor facility located in Newark, California.

(c) Outreach Programs

These programs will be carried out in conjunction with similar PRNMS programs to provide off-site interpretation. Where possible, they will involve close cooperation with environmental study groups, such as the Oceanic and Audubon Societies and the Whale Center; research and education organizations, such as the California Academy of Sciences and the University of California; local officials in Marin and Sonoma counties; and representatives of the tourism and recreational and commercial fishing industries. These groups will be provided with interpretive materials on the Sanctuary and will be encouraged to inform others of the availability of these materials. If interest is strong enough, a slide presentation or mobile exhibit may be developed for the use of schools and private groups.

Section IV. Administration

A. Administrative Framework

This section of the management plan describes the roles of the agencies that will be involved in Sanctuary management, proposes strategies to coordinate their activities, and provides for periodic evaluation of the effectiveness of the management plan. Sanctuary management consists of three functions: resource protection, research, and interpretation. Administration oversees all other functions and establishes who is responsible for implementing specific programs. The administrative framework ensures that all management activities are coordinated.

The MEMD is responsible for the overall management of the proposed CENMS. The MEMD will coordinate its on-site activities through cooperative agreements with the NPS and the USCG. The general administrative role of each agency is as follows.

1. Marine and Estuarine Management Division

The National Marine Sanctuary Program is managed by the MEMD. A site-specific management plan is prepared for each Sanctuary to ensure that on-site activities in resource protection, research, and interpretation are coordinated and consistent with Sanctuary goals and objectives.

The MEMD develops a general budget setting out expenditures for program development, operating costs, and staffing. Funding priorities will be reviewed and adjusted annually to reflect evolving conditions in the proposed CENMS and National Marine Sanctuary Program priorities and requirements. The MEMD also establishes policies and procedures in response to specific issues in each Sanctuary. Detailed MEMD responsibilities are listed under the resource protection, research, and interpretation sections which follow.

The Sanctuary Manager for the PRNMS reports directly to the MEMD and serves as Sanctuary Manager for the proposed CENMS. In this capacity, the Manager represents the MEMD and is the primary spokesperson for the CENMS. The manager's headquarters are located in Fort Mason at the Golden Gate National Recreation Area (GGNRA).

2. National Park Service

Through an interagency agreement, the NPS cooperates and assists in carrying out on-site management activities for the PRNMS. These activities are conducted by personnel at the GGNRA. These personnel will conduct similar management activities for the proposed CENMS.

3. U.S. Coast Guard

The USCG is responsible for enforcing Federal laws in waters under U.S. jurisdiction. This mission includes the enforcement of Sanctuary regulations promulgated for the CENMS. The USCG also manages operations for the control or removal of oil and hazardous substances resulting from offshore spills.

B. Resource Protection: Roles and Responsibilities

1. Marine and Estuarine Management Division

- (a) Approves priorities for funding for resource protection;
- (b) Monitors the effectiveness of interagency agreements for surveillance and enforcement and negotiates changes where required;
- (c) Develops contingency and emergency-response plans and, based on these plans, negotiates applicable interagency agreements;
- (d) Monitors the effectiveness of existing Sanctuary regulations and enacts changes where necessary; and
- (e) Coordinates efforts to protect and manage Sanctuary resources with other Federal agencies and with public and private organizations as well.

2. Sanctuary Manager

- (a) Recommends to the MEMD priorities for allocating funds annually to resource protection;
- (b) Assists in the coordination of surveillance and enforcement activities by providing liaison with the USCG and other agencies;
- (c) Reports regularly to the MEMD on surveillance and enforcement activities, violations, and emergencies;
- (d) Provides information for use in training Sanctuary enforcement officials;
- (e) Monitors and evaluates the adequacy of emergency-response plans and procedures in the Sanctuary;
- (f) Maintains a record of emergency events (e.g., oil spills) in and around the Sanctuary; and
- (g) Evaluates overall progress toward the resource protection objectives of the Sanctuary program and prepares semi-annual and bi-monthly progress reports highlighting activities for the MEMD.

3. U.S. Coast Guard

- (a) Holds broad responsibility for enforcing all Federal laws throughout the Sanctuary;
- (b) Ensures enforcement of Sanctuary regulations; and
- (c) Provides on-scene coordination and Regional Response Center facilities under the National Contingency Plan for the removal of oil and hazardous substances in the event of a spill that threatens the Sanctuary.

C. Research: Roles and Responsibilities

1. Marine and Estuarine Management Division

- (a) Prepares annual SRP's for each Sanctuary;
- (b) Prepares an annual National Research Plan (NRP) and budget, based on the SRP's of individual sanctuaries and in accordance with priorities determined at the national level;
- (c) Sets dates for procurement based on the NRP;
- (d) Administers interagency agreements and contracts for research;
- (e) Reviews all interim and final research reports submitted by the Sanctuary Manager; and

- (f) Issues permits for research activities, considering the recommendations of the Sanctuary Manager, to ensure consistency with Sanctuary regulations and provide additional technical review where necessary.

2. Sanctuary Manager

- (a) Recommends generic areas of research to resolve management issues;
- (b) Develops the Sanctuary research plan; and
- (c) Reviews research documents and progress reports submitted by contractors.
- (d) Prepares assessments of research needs and priorities based on management requirements and research continuity;
- (e) Prepares recommendations for SRP's;
- (f) Implements the SRP's;
- (g) Coordinates research and monitoring activities in the Sanctuary in cooperation with the MEMD and other interested parties; and
- (h) Coordinates an on-site process for reviewing and evaluating research proposals and permit requests, considering the views of the MEMD, concerned individuals and interest groups.

D. Interpretation: Roles and Responsibilities

1. Marine and Estuarine Management Division

- (a) Reviews and approves the list of annual priorities for interpretation and the annual interpretation budget prepared by the Sanctuary Manager;
- (b) Reviews and approves design proposals for all interpretive facilities; and
- (c) Evaluates progress toward accomplishing objectives for interpretation and adjusts long-term priorities accordingly.

2. Sanctuary Manager

- (a) Recommends annually to the MEMD a list of priorities and an annual budget for interpretation;
- (b) Prepares and circulates as required RFP's for interpretive projects;
- (c) Supervises the design and production of interpretive materials and facilities for the Sanctuary;

- (d) Provides training for NPS staff assigned to the Sanctuary;
- (e) Encourages local and regional organizations to participate in Sanctuary interpretation;
- (f) Disseminates information about the National Marine Sanctuary Program and the CBNMS; and
- (g) Oversees the development of any facilities constructed for the proposed Sanctuary, reviews site analyses and design specifications, awards construction and maintenance contracts, and performs similar tasks.

3. National Park Service

- (a) Publicizes the Sanctuary as appropriate and develops a local constituency by means of brochures, presentations, structured events, articles for publication, and other activities consistent with the management plan; and
- (b) In cooperation with the Sanctuary Manager, establishes and operates combined PRNMS-CBNMS information and interpretation facilities to increase public awareness and appreciation of the resources of the Sanctuary.

E. General Administration: Roles and Responsibilities

1. Marine and Estuarine Management Division

- (a) Ensures that the Sanctuary is operated in a manner consistent with established national program policies and with applicable national and international laws and provides guidance to the Sanctuary Manager;
- (b) Identifies, analyzes, and resolves Sanctuary management problems and issues;
- (c) Formulates comprehensive, long-term management plans for the Sanctuary and revises the management plan as necessary;
- (d) Directs and assists the Sanctuary Manager in the implementation of the management plan;
- (e) Coordinates Sanctuary management with other Federal and State agencies and private organizations;
- (f) Evaluates the effectiveness of Sanctuary management and regulatory measures;
- (g) Prepares a program budget for the Sanctuary; and
- (h) Provides funding for overall Sanctuary management and administration.

2. Sanctuary Manager

- (a) Coordinates on-site efforts of all parties involved in Sanctuary activities, including NPS, NOAA, USCG, PRNMS and the public;
- (b) Reviews the management plan periodically and recommends changes to the MEMD as needed;
- (c) Assists the MEMD in preparing the annual budget for the Sanctuary;
- (d) Oversees day-to-day operation of the Sanctuary, including administrative functions such as bookkeeping, purchasing and keeping records of visitor activities;
- (e) Supervises Sanctuary staff and other personnel, including interpretive employees, assigned to the Sanctuary; and
- (f) Represents the Sanctuary viewpoint on local issues and at public forums.

3. National Park Service

- (a) Assists in the preparation and implementation of a comprehensive, long-term management plan for the proposed Sanctuary;
- (b) Assists in the periodic review of the management plan; and
- (c) Provides support for day-to-day Sanctuary operation and general administration.

F. Staffing Levels

Management of the proposed Sanctuary will rely on the use of personnel at the PRNMS. Additional personnel may be hired, if necessary. The Sanctuary staff will work closely with the USCG and other agencies in providing enforcement and surveillance in the area of the proposed Sanctuary. The details of further staffing will be determined during the first year of operation.

G. Headquarters and Visitor Center Facilities

Because the management of the CENMS will be a collateral function of the manager and staff of the PRNMS, the headquarters for the two sanctuaries will be combined. The headquarters and administrative offices of the PRNMS are in

San Francisco, at Fort Mason, the NPS headquarters for the GENRA. This site serves as the primary visitor information center for the PRNMS; it will serve the same function for the CENMS.