



Photo: Ocean Ministry

**J**ust 50 miles northwest of the busy streets of San Francisco and 20 miles offshore of the historic Point Reyes Lighthouse, an ocean metropolis bustles with life.

At the edge of the continental shelf, the rocky submarine peaks of Cordell Bank rise from the floor of the Pacific Ocean to within 115 feet of the surface. Surrounded by soft mud and sand, the hard surface of the bank provides an oasis where colorful invertebrates and fish grow and thrive.

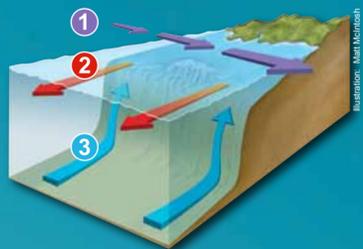
The combination of ocean conditions and this “underwater island” creates a unique “hotspot” that supports a diverse community of marine life above and below the surface. In addition to sustaining a vibrant ecosystem year round, the Cordell Bank region is a migratory destination for seabirds, whales, sea turtles and fishes that travel thousands of miles each year to feast on the seasonal bounty of these waters.

The extraordinary biodiversity of this special place was recognized in 1989, when Congress designated Cordell Bank National Marine Sanctuary.

## UPWELLING GENERATES FOOD!

Cordell Bank lies within the California Current ecosystem, one of the four major eastern boundary currents in the world. Coastal upwelling, an ocean process unique to eastern boundary currents, is largely responsible for the great wealth and diversity of marine life in the sanctuary. Here's how it works:

- 1 In the spring, persistent winds push water southward along the California coast.
- 2 Wind, the Earth's rotation and other forces drive surface water away from the shore.
- 3 This surface water is replaced by colder, nutrient-rich water that “wells up” from the deep, leading to blooms of plankton that form the base of a complex food web.



### Examples of Plankton:



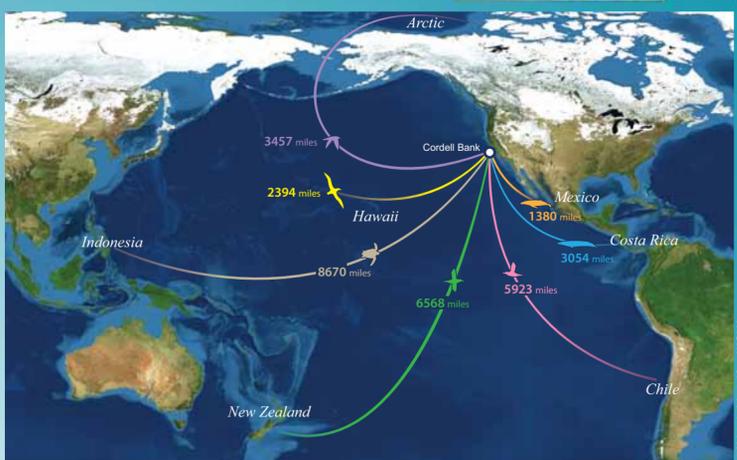
### Krill

Krill are shrimp-like crustaceans that measure about one inch in length and can be found in dense swarms in offshore waters. Krill are an important source of food for whales, seabirds and fishes.

## MIGRATION DESTINATION

Cordell Bank is more than just a hotspot for local marine life. It's also a popular dining stop on some of the longest animal migrations on the planet. Seabirds, marine mammals, sea turtles and fishes travel thousands of miles from around the Pacific Ocean to the West Coast every year to feed in these productive waters.

- Northern Fulmar
- Black-footed Albatross
- Leatherback Sea Turtle
- Sooty Shearwater
- Pink-footed Shearwater
- Blue Whale
- Humpback Whale

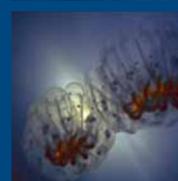


Map: Wikimedia, Adapted from NOAA Maps

## AN ABUNDANCE OF LIFE

### Seabirds

Sanctuary waters teem with life from upwelling that provides food for thousands of local seabirds nesting on the nearby Farallon Islands and coastal headlands like Point Reyes. In addition, migratory seabirds that spend most of their lives at sea come from around the globe to feed seasonally in the productive waters around Cordell Bank. Migratory visitors include Black-footed Albatross from the Northwestern Hawaiian Islands, Pink-footed Shearwaters from Chile, Sooty Shearwaters from New Zealand, and Northern Fulmars from the Arctic.



### Marine Mammals

More than 20 species of marine mammals frequent sanctuary waters. Seasonal migrants like blue whales from Costa Rica and humpback whales from Mexico feed in sanctuary waters in summer and fall. The sanctuary is an important feeding ground for these great whales, which are drawn to the area by an abundance of krill and small schooling fishes. Resident species including Pacific white-sided dolphins, Dall's porpoises, northern right whale dolphin, northern elephant seals and California sea lions can be seen most of the year in Cordell Bank National Marine Sanctuary.

### Open Ocean

When spring and summer upwelling winds subside, the surface currents around Cordell Bank relax. With this change, many gelatinous animals including salps, ctenophores and jellies fill the water column. Leatherback sea turtles, ocean sunfish and many species of rockfish eat these creatures that drift along in the open seas.

### Fish

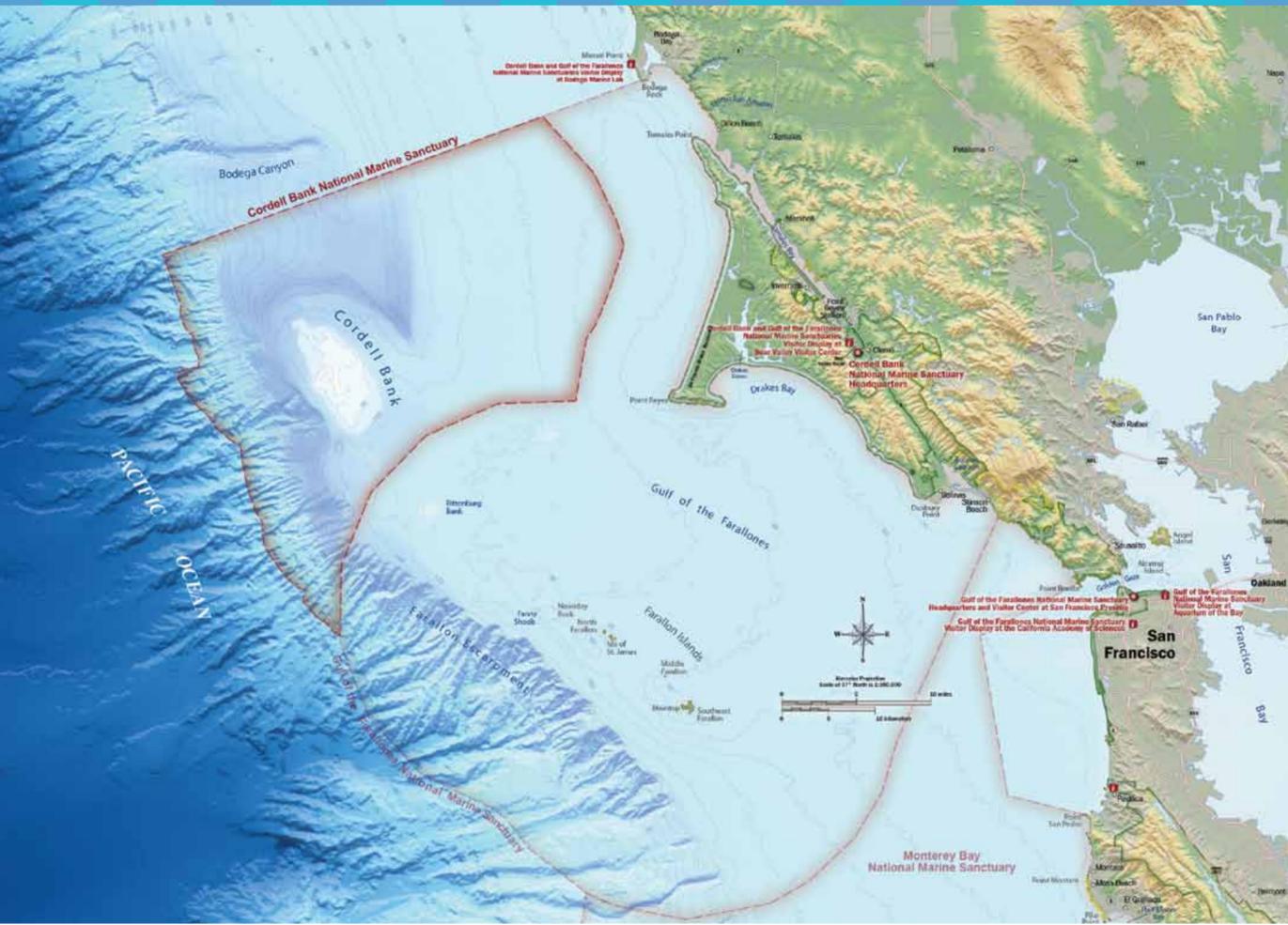
The diverse habitats of Cordell Bank support more than 150 species of fish. These range from the bottom-dwelling sanddabs and hagfish that live on the mud and sand to colorful rockfish that find refuge among the bank's granite rocks and gather in schools above its high pinnacles. Sharks and rays are also found on and around the bank, and Chinook and Coho salmon and albacore tuna visit sanctuary waters seasonally to feed. One remarkable sanctuary resident is the glowing, bioluminescent lantern fish, which rises from the depths at night to feed on plankton before descending into the darkness as the sun rises.



### On the Bank

Rising from the soft sediments of the continental shelf, Cordell Bank is covered with a vibrant tapestry of life. Brightly colored corals, sponges, anemones and other invertebrates crowd the hard surface of the bank, while crabs, octopus and sea stars are on the move in search of food. Plankton floating in the water column wash over the bank and provide an abundant supply of food for this diverse marine community.

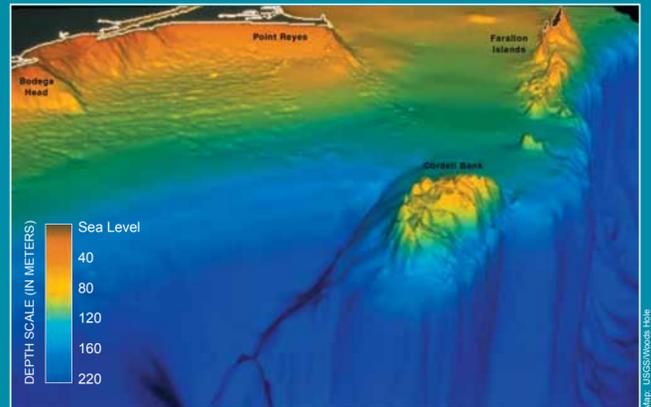
# CORDELL BANK NATIONAL MARINE SANCTUARY



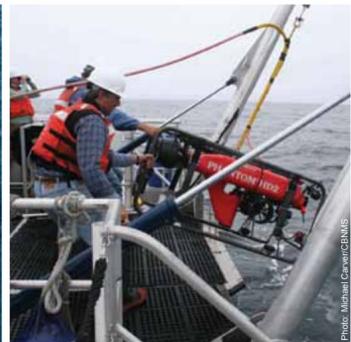
## NATIONAL MARINE SANCTUARY SYSTEM



The Office of National Marine Sanctuaries serves as the trustee for a system of 14 marine protected areas encompassing more than 150,000 square miles of marine and Great Lakes waters from Washington state to the Florida Keys, and from Lake Huron to American Samoa. The system includes 13 national marine sanctuaries and the Papahānaumokuākea Marine National Monument. For more information on the National Marine Sanctuary System, visit: <http://sanctuaries.noaa.gov>



This 3-D image is the seafloor extending west of Point Reyes to the edge of the continental shelf. The vertical relief of the continental slope is exaggerated due to the spatial scale of the image. The close proximity of a shallow, rocky habitat to the deep open ocean ecosystem contributes to the spectacular biological diversity at Cordell Bank.



**R/V Fulmar**  
Science staff use the 67-foot NOAA research vessel *Fulmar* to carry out scientific missions within the sanctuary.

**Remotely Operated Vehicle (ROV)**  
Controlled from the surface, ROVs can deliver real-time video from the depths of the sanctuary and have been used to remove debris from the bank.

**Exhibits**  
Exhibits bring the mystery and beauty of Cordell Bank National Marine Sanctuary to visitor centers and museums.

**Outreach**  
Lectures, teacher trainings, film screenings and field events are some of the ways the sanctuary shares the richness and diversity of Cordell Bank's ecosystem with the public.

**Resource Protection**  
Sanctuary staff work with partners to identify and address threats to sanctuary marine life and habitats.

**Enforcement**  
The sanctuary works with NOAA, the U.S. Coast Guard and local agencies to enforce sanctuary regulations.

## PROTECTING THE SANCTUARY

**Research**  
Scientific research, exploration and monitoring are essential to better understand and protect the marine life and habitats of Cordell Bank National Marine Sanctuary. Through partnerships with universities, research institutions and state and federal agencies, sanctuary staff work with the scientific community to conduct rigorous, issue-driven research with the goal of providing sound data to inform resource management.

**Education**  
Cordell Bank's offshore location makes it inaccessible to many, but innovative education and outreach programming brings the wonder of this underwater treasure to the public. Exhibits, multimedia, teacher training, field seminars, lectures and films are just some of the ways the sanctuary reaches out to diverse audiences to emphasize the importance of a healthy ocean in our lives.

**Resource Protection**  
Protecting sanctuary resources is a collaborative process involving local, state and federal agencies, as well as nonprofit organizations and academic institutions. With the help of numerous partners and the sanctuary advisory council, Cordell Bank National Marine Sanctuary focuses on education, permitting, regulations and enforcement to help protect the resources of this special place.

## HISTORY OF CORDELL BANK

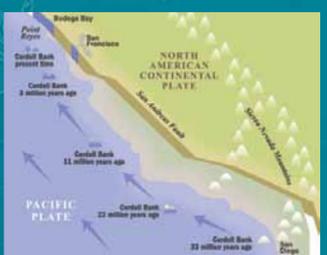
**Human History**  
Dating back to the earliest human settlement of coastal California, inhabitants have turned to the sea for food, travel and trade. Native Americans like the Coast Miwok people would have found resources plentiful close to shore, and likely had little reason to venture far out to sea. Cordell Bank, located 22 miles west of the Point Reyes headlands, remained hidden beneath the waves until after the Gold Rush, when a boom in maritime commerce provided new incentive to survey the California coastline for safer ship travel.

California's northern coast. The bank was later mapped by Edward Cordell, an accomplished surveyor who also mapped Stellwagen Bank in Massachusetts, now the site of Stellwagen Bank National Marine Sanctuary.

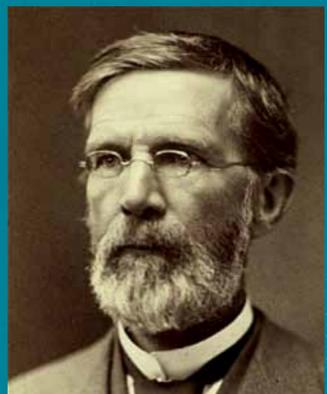
While Cordell Bank was always considered a productive fishing area, little else was known about the marine life on the bank until 1977, when the non-profit research group Cordell Expeditions explored it underwater for the first time. Over the next 10 years, the group documented the incredible biological diversity on and around the bank. Their efforts were instrumental in the creation of Cordell Bank National Marine Sanctuary on May 24, 1989.

**Island on the Move**  
Cordell Bank was not always located off Northern California — or underwater, for that matter. It was formed at the edge of the North American Continental Plate approximately 93 million years ago as part of the southern Sierra Nevada Mountains. Over millions of years, the neighboring Pacific Plate drifted northward, shearing off a piece of the North American plate and carrying Cordell Bank to its present location near Point Reyes. The bank continues to move north at a rate of about two inches per year.

Between 20,000 and 15,000 years ago, when sea level was more than 300 feet lower than it is today, it is thought that the majority of Cordell Bank was above the surface — a true



"island on the move." Rising sea levels eventually submerged the bank, and it now lies more than 100 feet below the surface.



George Davidson, a Coast Survey geographer, is credited with the initial discovery of Cordell Bank in 1853.



Divers with Cordell Expeditions found a flourishing underwater oasis when they began exploring Cordell Bank in 1977, ultimately leading to the designation of Cordell Bank National Marine Sanctuary in 1989.

**What Is a Bank?**  
A bank is a raised section of the seafloor on the continental shelf, where the ocean is relatively shallow. Banks generally cover large areas but do not reach very high into the water column, unlike the submerged pinnacles known as "seamounts" that often rise thousands of feet from great depths. Both banks and seamounts are underwater oases for marine life, creating food-rich ecosystems where diverse creatures live and congregate above and below the ocean's surface.

## ACTIVITIES & REGULATIONS

**Activities**  
Cordell Bank's remote location and unpredictable sea conditions make the sanctuary an ideal refuge for ocean life, but a difficult place for humans to visit. Opportunities for recreation in the sanctuary are limited, with a handful of commercial operators offering seasonal wildlife watching tours. Recreational scuba diving is not recommended due to depth and strong currents. Some fishing is allowed in the sanctuary; check local regulations before venturing out.



### Sanctuary Regulations

The following activities are prohibited:

- Removing, taking, or injuring benthic (bottom-dwelling) organisms
- Discharging oil and other materials
- Exploring and extracting hydrocarbons
- Anchoring shallower than 50 fathoms (300 feet)
- Disturbing the seabed

Permits for scientific and educational activities may be issued by the sanctuary for regulated activities. This summary is for reference only and does not include all sanctuary regulations, exemptions or other activities regulated within the sanctuary under local, state, or federal authorities. For more information about sanctuary regulations, please refer to the *Federal Register* for the full text and definitions: *Federal Register*/Vol. 73, No. 225. Published November 20, 2008/15 CFR Part 922.

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Learn about the non-profit Cordell Marine Sanctuary Foundation at: <http://cordellfoundation.org>