

The California Current Marine Bird Conservation Plan

Executive Summary Report



Photo: Dave Gardner, PRBO Conservation Science

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The California Current Marine Bird Conservation Plan Executive Summary Report

*A summary of knowledge and recommendations
for the conservation of marine birds and their habitats throughout
the California Current Large Marine Ecosystem.*

Version 1.0

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LETTER FROM PRBO'S EXECUTIVE DIRECTOR

April, 2005

Dear Colleagues,

Protection and conservation of marine birds is synonymous with protection and conservation of ocean ecosystems. Though long revered as symbols of freedom and strength, seabirds are actually highly sensitive to changes and disturbances in their environment. From the wind-swept islands where seabirds roost and breed, to the estuarine, bay and pelagic zones where they feed, seabirds reflect the health and condition of the ecosystems upon which they survive.

As conspicuous top predators, seabirds alert us to changing ocean conditions and threats affecting other marine wildlife, including whales, sea turtles, seals, sea lions and commercial fish. From climate variability and food web composition to destructive fishing practices and toxic pollution —such as the DDT contamination that decimated populations of the majestic Brown Pelican in the late 1960s—seabirds can help us understand the state of our oceans and provide insights into sustainable management for the long-term.

Both the U.S. Commission on Ocean Policy and the Pew Oceans Commissions recently concluded that our oceans are in peril, with potentially grave socio-economic repercussions. As a nation, we must work together to ensure the health and restoration of these precious, and increasingly threatened, natural resources. We must develop policy and management efforts that are better coordinated, inclusive, and based on sound science.

With this urgent need in mind, PRBO developed this first-of-its-kind **California Current Marine Bird Conservation Plan (CCS Plan)**. The California Current System (CCS) is a vast and diverse oceanic domain spanning over 25 degrees of latitude, from southern British Columbia, Canada to Baja California, Mexico. One of only 5 highly productive eastern boundary current ocean systems on earth that together support over 50% of the world's commercial fisheries, the CCS supports a great diversity of seabirds, marine mammals and fish species.

The **CCS Plan** addresses seabird conservation from an ecosystem perspective, synthesizing information on multiple species, multiple habitats, ecological interactions, and the issues and threats that affect the health of seabirds, their prey and their environments.

This Plan has been created to provide ocean resource managers, policy makers, researchers and the public with science-based tools and recommendations to improve seabird and ocean conservation, to the benefit of marine wildlife and our communities that depend on the ocean for their livelihoods.

Herein you will find **The California Current Marine Bird Conservation Plan Executive Summary Report**. This summary report includes:

- The CCS Plan Executive Summary;
- Chapter 1: Introduction;
- Summaries of the CCS Plan's chapters and conservation recommendations.

Please use this report as a guide to the full chapters of the CCS Plan, which are available to download from our website at www.prbo.org/conservationplanning. The CCS Plan is a living document which will be modified as new information and scientific findings become available. Your input is most valuable to us and we welcome any questions or feedback.

Thank you for your interest in conserving our oceans. Together we can work towards a healthy CCS ecosystem that will benefit marine birds and other marine wildlife, our economies and our communities.

Sincerely,

Ellie M. Cohen
Executive Director
PRBO Conservation Science

EXECUTIVE SUMMARY

The California Current System (CCS) Marine Bird Conservation Plan (CCS Plan) is a collaborative effort of various agencies and organizations that are committed to the conservation of seabirds that breed or feed in the California Current. Extending from southern British Columbia, Canada to Baja California, Mexico, the CCS is a biologically rich large marine ecosystem, supporting a great diversity and abundance of seabirds, marine mammals, sea turtles, fishes and their prey.

The overarching mission of the CCS Plan is long-term conservation of marine birds and their prey. We define this as the maintenance of stable populations, capable of sustaining themselves into the future, as well as the protection and, restoration of all species of marine birds that migrate and breed throughout the CCS.

PRBO Conservation Science obtained funds for the development of the CCS Plan, initiated the project, and brought together the various individuals from agencies and organizations within the region that helped to prepare the CCS Plan.

The conservation agenda for seabirds and initial implementation design have been developed in partnership with a wide array of state and federal agencies, non-governmental research and conservation organizations, academic institutions, and individual researchers.

It is our hope that Version 1.0 of the CCS Plan reflects the start of a long-term process to update scientific information and modify conservation and management recommendations based on the latest information. Thus, we see the CCS Plan as a living document that should be reviewed, evaluated, and updated at regular intervals. In our view, revisions should take place every 3-5 years.

Goals

The main goals of this conservation planning effort are to:

- Compile information on California Current marine bird species and ecosystem features.
- Analyze and synthesize information on marine birds of the California Current and their relationships with their prey, natural enemies, and humans.
- Evaluate and identify gaps in information to be filled by future research and monitoring.
- Determine conservation needs from an ecosystem perspective and propose a conservation agenda.
- Initiate steps to implement the CCS Plan by developing strategies for partnerships and identifying “interest bridges” with user groups, agencies, and other organizations.

Overall Findings

In compiling data, identifying gaps, and writing the CCS Plan, a few general themes became apparent:

- (1) information on marine birds of the CCS is scattered, sometimes disorganized and is often difficult to obtain;
- (2) the current threats faced by marine birds in the CCS are numerous and in many cases are increasing in number and intensity; and
- (3) there are still many knowledge gaps that need to be filled in order to understand seabird conservation biology in a more complete manner.

Overall Recommendations

The CCS Plan provides specific recommendations for researchers, managers, educators, conservationists, and policy-makers to guide seabird conservation in the CCS. Recommendations are listed at the end of Chapters 2-12 and could be used to structure management programs.

CHAPTER 1. INTRODUCTION

The California Current System (CCS) is a large marine ecosystem, stretching from British Columbia to Baja California. This system hosts an abundance and diversity of marine life including over 150 species of breeding and migrating seabirds, at least 29 species of whales and dolphins, and a variety of sea turtles, seals, sea lions, and fish. As one of the world's five eastern boundary current systems, the waters in the CCS are extremely productive, yet variable, and serve as a "feeding trough" of the North Pacific. As such, the region supports many far-ranging species from the Southern Hemisphere, as well as major resident populations of seabirds and other organisms of the Northern Hemisphere. The CCS is home to fishery and eco-tourism industries essential to the coastal economies of North America.

An Ecosystem Approach to Seabird Conservation

Upper trophic-level predators such as seabirds depend on marine invertebrates and fishes for their survival. Owing to exceptional ocean climate variability, the food webs of seabirds in the CCS change considerably over multiple time scales—from seasonal to centurial. Therefore, in order to develop an understanding of seabird population change, and its causes, it is crucial to include an understanding of temporal environmental variability and ecosystem and seabird response.

An ecosystem-level approach to seabird conservation considers the relationships of all species in the environment, including both breeding and migratory species, as well as all positive and negative interactions that affect seabird demography. At the core of this approach is the study and understanding of food web and predator-prey dynamics. By striving to understand these relationships, steps can be taken to manage and sustain key prey that support CCS seabirds. In general, the food webs of marine birds in the CCS consists of small coastal pelagic fish, young-of-the-year-predatory fish (e.g., salmonids and groundfish), macro-zooplankton (large copepods and euphausiid crustaceans), and squids. These prey species vary in distribution and abundance in relation to environmental variability, such as the El Niño/La Niña cycle and lower frequency ocean climate changes of the Pacific Decadal Oscillation.

An ecosystem-level approach also includes understanding of the habitats of seabirds including both the island rocks and bays where they roost and breed as well as the open ocean where they feed. Spatial variability in habitat characteristics and qualities must be quantified and key habitats protected where necessary.

Finally, an ecosystem-level approach includes humans in the seabird conservation equation. Coastal development, pollution, overexploitation of marine resources, and climate change are the principle negative influences that humans impose on the CCS ecosystem. However, humans must also be part of the solution. Therefore, an ecosystem-level approach to seabird conservation must include a strategy for involving coastal communities in identifying issues and developing solutions.



Photo: David Gardner

*Western Gull adult on nest with three eggs.
Año Nuevo Island, CA*

1.1 NEED FOR AN ECOSYSTEM-LEVEL MARINE BIRD CONSERVATION PLAN

As environmental threats and stressors continue to grow, an ecosystem approach is both timely and needed for the conservation of seabirds and the ocean environment. Many recent studies have demonstrated the decline of marine biodiversity, the decline of marine top predators (fish, birds, mammals), and the collapse of commercial fisheries around the world (8, 9). In the CCS we have witnessed this decline in sardine, salmon, and groundfish fisheries as well as a decline of many seabird and marine mammal populations. Many species have been listed under the Endangered Species Act, and while some species have recovered (e.g., gray whale), others continue to exist in a diminished state.

The myriad of species and conservation problems in the CCS are interrelated and often tend to exacerbate one another. Fishing impacts have received scrutiny and fishers have, somewhat unfairly, received the brunt of criticism with respect to many issues in ocean ecosystem management. The situation is actually quite complex, with the future of northeastern Pacific fisheries intimately linked with the future of the ecosystem's integrity, which varies in relation to *both* natural and anthropogenic factors.

One solution is to adjust marine management towards an integrated multi-species, multi-disciplinary approach that considers the entire ocean ecosystem—including humans. Understanding the significance of natural and human influences on marine systems from climate variability to exploitation, is essential for making appropriate long-term policy and management decisions in support of healthier oceans and seabird populations.

1.2 WHAT IS AN ECOSYSTEM CONSERVATION PLAN? A CONCEPTUAL MODEL

Both “bottom-up” and “top-down” forces influence seabirds in the California Current. “Bottom-up” factors affect the prey consumed by seabirds. Bottom-up factors include climatic forces that alter winds, currents, sea temperature, salinity, and nutrient input. Top-down factors include human-induced interactions, such as pollution and fisheries and natural sources of mortality from predators, diseases, and parasites.

Bottom-up and top-down factors interact. For example, fishery effects on seabird food webs can be either positive or negative. In the southern CCS, a large fishery for market squid (*Loligo opalescens*) may reduce the availability of this critical winter food resource for seabirds. However, in the northern CCS, an extensive fishery for hake (*Merluccius productus*) may improve the feeding opportunities for seabirds by removing large fish which compete with seabirds for a similar prey base (euphausiid crustaceans and small fishes). The sum of all these factors has direct and indirect effects on marine birds by altering foraging success, demographic parameters, and ultimately population dynamics. Therefore, this conservation plan focuses on the role of variable or simultaneous and interacting bottom-up and top-down forces in managing marine bird communities and populations.

1.3 GEOGRAPHIC AND TAXONOMIC CONSIDERATIONS

Geography

The California Current forms the eastern leg of the North Pacific Gyre, which rotates in a clockwise fashion around the Pacific basin. The geographic coverage of the CCS Plan encompasses coastal and pelagic regions that are under the direct influence of the California Current (CC), a large, slow-moving, southward-flowing pelagic current along the west coast of North America. For this plan, we assume the northern extent of the California Current reaches the coast of North America at the northern tip of Vancouver Island, British Columbia, Canada. We assume the southern extent of the California Current flows westward away from the North American coast at Punta Eugenia, Baja California Peninsula, Mexico (Fig. 1.1). These boundaries vary in relation to major east-west currents of the North Pacific Gyre (the North Pacific Current [West Wind Drift] and North Equatorial Current, respectively). Northern and southern delineations of this ecosystem are also supported by upwelling centers which infuse coastal waters with cold, nutrient enriched waters.

Together, the California Current and upwelling centers make the CCS essentially a temperate, sub-arctic ecosystem, though periodic intrusions of sub-tropical waters during El Niño events can dramatically alter the occurrence of sub-arctic vs. sub-tropical species in the region. Moreover, to the south of Punta Eugenia, mangroves become the dominant coastal vegetation, whereas north of this point, mangrove swamps are not found. The western boundary for the CCS Plan is the 200-mile Exclusive Economic Zones (EEZs) of Mexico, the U.S., and Canada. This boundary is political, rather than oceanographic or biological. In summary, we have chosen these delineations because they reflect core areas of the CCS from an oceanographic-biological perspective from north to south, and core management areas from east to west.

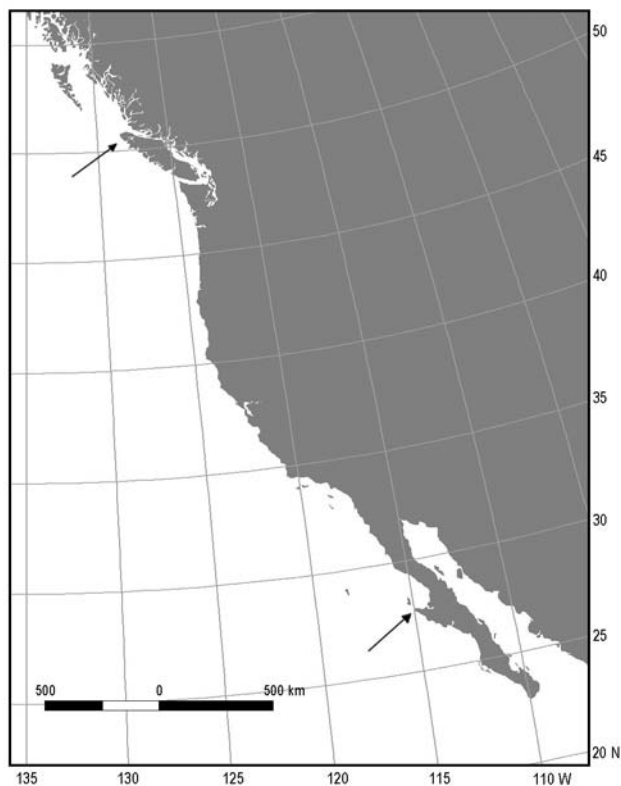


Figure 1.1 – Map of the geographic regions included in the CCS Plan. Arrows indicate the northern and southern limits (see text for details).

Taxonomy

The CCS Plan includes all seabirds that breed or feed within the CCS. Some of these species, such as loons, phalaropes, and grebes, breed or feed inland for part of the year, but feed within the CCS during the non-breeding season. Other species, like shearwaters, breed in the Southern Hemisphere, but migrate each austral winter to forage in the CCS. There are a total of 38 breeders within the CCS, and a minimum of 53 species of common migrants, although this diversity varies considerably from year to year (**Appendix A**).

The focal species encompassed in the CCS Plan are those that feed primarily in the open ocean, ‘beyond the surf zone’. These species belong to the families Gaviidae (loons), Podicipedidae (grebes), Diomedidae (albatrosses), Procellariidae (shearwaters and petrels), Hydrobatidae (storm-petrels), Fregatidae (frigatebirds), Phaethontidae (tropicbirds), Pelecanidae (pelicans), Phalacrocoracidae (cormorants), Scolopacidae (phalaropes), Laridae (skuas, jaegers, gulls, and terns), and Alcidae (auks and puffins).

1.4 GENERAL CHARACTERISTICS OF CCS MARINE BIRDS

Seabirds are marine organisms. Many species come ashore only to breed, while the remainder of the year is spent on the ocean. The amount of time spent on the water varies between species. Albatross, for example, spend the majority of their life at sea, often not touching land for years at a time, whereas gulls spend as much or more time on land than at sea during the non-breeding season.

Regardless of the time spent at sea, a common characteristic of all seabirds is that they rely on marine habitats for nutrition. Whether surface gleaners, plunge divers, or pursuit divers, seabird diet consists of small fish, squid and zooplankton year-round. This may be supplemented with the eggs and chicks of other seabirds, carrion, and human refuse (e.g., fishing offal), however in all cases, the majority of food is obtained from the ocean.

The abundance of food in the CCS, resulting from great ocean productivity, attracts millions of seabirds that breed and migrate throughout the CCS each year. As a result of feeding opportunities and breeding habitat, the avifauna of the California Current is diverse and abundant, and includes species with sub-arctic to sub-tropical biogeographic affinities. Migrant species which travel to these waters to forage typically outnumber the breeding species on an annual basis (10, 11).

Seabirds have several characteristics that make them uniquely adapted to marine life. Generally speaking these include extremely dense waterproof feathers, layers of fat to insulate against cold waters, and a desalinization system to remove and excrete the excess salt. Many seabirds are long-lived (some > 50 years), have low reproductive rates, and delay sexual maturity until they are 5-10 years of age. These life history characteristics make most CCS seabirds vulnerable to morbidity and very slow to recover from population declines due to anthropogenic and/or natural changes in the environment.



Photo: David Gardner

Common Murre adults in the colony. Southeast Farallon Island, CA.

1.5 CONSERVATION AND MANAGEMENT CHALLENGES AND OPPORTUNITIES

The same factors that make the CCS so attractive to seabirds also pose conservation and management challenges and opportunities. Perhaps the greatest conservation challenge is that seabird foraging habitats are in the ocean, and the ocean is commonly viewed and regulated as a public resource held in trust for the common good. Therefore, seabirds are affected by the ‘tragedy of the commons’ as are fisheries.

Contrary to the situation in terrestrial ecosystems where land use can be defined and exchanged on the free market, ocean protection strategies are mostly limited to stewardship. Even for the terrestrial habitats where seabirds court, breed, and roost, the situation is markedly different than that of most other bird species. This is because seabirds tend to congregate on offshore rocks, pinnacles, and islands, and along the coast of North America these lands are primarily owned and controlled by the government. The degree of stewardship of seabird habitats varies, ranging from near-total protection from human use (e.g., Farallon Island National Wildlife Refuge) to biodiversity stewardship as merely one of several goals, as is the case on islands used for strategic defense purposes (e.g., San Clemente Island in the Channel Islands, operated by the U.S. Navy).

Opportunities for the conservation of aquatic habitats have been increasing in recent years. In response to a considerable body of research on the utility of ‘no-take marine reserves’ for biodiversity conservation, the U.S., Mexican, and Canadian governments are making strides towards creating a “network” of marine protected areas (MPA) along the west coast. In addition, there have been major ocean policy reviews such as the Pew Oceans Commission and the U.S. Commission on Ocean Policy reports, new ocean conservation legislation at both the state and federal levels, and increasing public awareness of ocean (and seabird) conservation issues. Many ongoing marine conservation and fishery management initiatives along the Pacific coast of North America now include ‘ecosystem considerations’, with seabirds being part of this novel approach (e.g., see the Pacific Coast Ocean Observing System Science Plan, www.pacoos.org).

One of the primary goals of the CCS Plan is to broaden the appreciation of seabirds as marine organisms and to ensure that the ecological needs and conservation issues facing seabirds are considered as various new marine conservation and policy initiatives develop. The overall implementation recommendation for the CCS Plan is to facilitate region-wide, coordinated monitoring, research, and conservation planning through formation of a ‘Joint Venture’. Chapter 12 details the value of joint ventures as effective venues for bringing together disparate stakeholders for ocean and seabird conservation in the CCS.



Photo: Eric Preston

*Black-footed Albatross adult on water.
West of San Francisco, CA.*

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The California Current Marine Bird Conservation Plan Appendix 1

Breeding and Migrating Seabirds in the California Current System



Photos: Eric Preston, David Gardner and Ben Saenz

APPENDIX 1: BREEDING AND MIGRATING SEABIRDS IN THE CALIFORNIA CURRENT SYSTEM

Breeding seabirds in the California Current System and their basic breeding distribution

(CA = California, OR = Oregon, WA = Washington, CN = Canada, MX = Mexico).

Common Name	Scientific Name	Breeding Range
Ancient Murrelet	<i>Synthliboramphus antiquus</i>	WA, CN
Arctic Tern	<i>Sterna paradisaea</i>	WA
Ashy Storm-Petrel	<i>Oceanodroma homochroa</i>	CA, MX
Black Skimmer	<i>Rynchops niger</i>	CA
Black Storm-Petrel	<i>Oceanodroma melania</i>	CA, MX
Black-vented Shearwater	<i>Puffinus opisthomelas</i>	MX
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	CA, OR, WA, CN, MX
Brown Pelican	<i>Pelecanus occidentalis</i>	CA, MX
California Gull	<i>Larus californicus</i>	CA, OR, WA
Caspian Tern	<i>Sterna caspia</i>	CA, OR, WA, CN
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	CA, OR, WA, CN, MX
Common Murre	<i>Uria aalge</i>	CA, OR, WA, CN
Craveri's Murrelet	<i>Synthliboramphus craveri</i>	MX
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	CA, OR, WA, CN, MX
Elegant Tern	<i>Sterna elegans</i>	CA, MX
Fork-tailed Storm-Petrel	<i>Oceanodroma furcata</i>	CA, OR, WA, CN
Forster's Tern	<i>Sterna forsteri</i>	CA
Glaucous-winged Gull	<i>Larus glaucescens</i>	OR, WA, CN
Gull-billed Tern	<i>Sterna nilotica</i>	CA, MX
Heermann's Gull	<i>Larus heermanni</i>	MX
Horned Puffin	<i>Fratercula corniculata</i>	CN
Laysan Albatross	<i>Phoebastria immutabilis</i>	MX
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	CA, OR, WA, CN, MX
Least Storm-Petrel	<i>Oceanodroma microsoma</i>	MX
Least Tern	<i>Sterna antillarum</i>	CA, MX
Magnificent Frigatebird	<i>Fregata magnificens</i>	MX
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	CA, OR, WA, CN
Mew Gull	<i>Larus canus</i>	CN
Northern Fulmar	<i>Fulmarus glacialis</i>	CN
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>	CA, OR, WA, CN, MX
Pigeon Guillemot	<i>Cephus columba</i>	CA, OR, WA, CN
Rhinoceros Auklet	<i>Cerorhinca monocerata</i>	CA, OR, WA, CN
Ring-billed Gull	<i>Larus delawarensis</i>	CA, OR, WA
Royal Tern	<i>Sterna maxima</i>	CA, MX
Thick-billed Murre	<i>Uria lomvia</i>	CN
Tufted Puffin	<i>Fratercula cirrhata</i>	CA, OR, WA, CN
Western Gull	<i>Larus occidentalis</i>	CA, OR, WA, CN, MX
Xantus's Murrelet	<i>Synthliboramphus hypoleucus</i>	CA, MX

Common migrant seabirds in the CCS

Based on observations from the California Cooperative Oceanic Fisheries Investigation (CalCOFI) (1987-2003) and Department of Fisheries and Oceans Canada-Line P (DFO-Line P) programs (1996-2003). CalCOFI and Line P capture the northern and southern extremes of the CCS.

Red-throated Loon <i>Gavia stellata</i>	Manx Shearwater <i>Puffinus puffinus</i>	Parasitic Jaeger <i>Stercorarius parasiticus</i>
Pacific Loon <i>Gavia pacifica</i>	Short-tailed Shearwater <i>Puffinus tenuirostris</i>	Pomarine Jaeger <i>Stercorarius pomarinus</i>
Arctic Loon <i>Gavia arctica</i>	Sooty Shearwater <i>Puffinus griseus</i>	South Polar Skua <i>Stercorarius maccormicki</i>
Common Loon <i>Gavia immer</i>	Wilson's Storm-Petrel <i>Oceanites oceanicus</i>	Little Gull <i>Larus minutus</i>
Yellow-billed Loon <i>Gavia adamsii</i>	Red-billed Tropicbird <i>Phaethon aethereus</i>	Bonaparte's Gull <i>Larus philadelphia</i>
Red-necked Grebe <i>Podiceps grisegena</i>	Red-tailed Tropicbird <i>Phaethon rubricauda</i>	Black-headed Gull <i>Larus ridibundus</i>
Horned Grebe <i>Podiceps auritus</i>	Red-faced Cormorant <i>Phalacrocorax urile</i>	Franklin's Gull <i>Larus pipixcan</i>
Eared Grebe <i>Podiceps nigricollis</i>	Masked Booby <i>Sula dactylatra</i>	Thayer's Gull <i>Larus thayeri</i>
Western Grebe <i>Aechmophorus occidentalis</i>	Brown Booby <i>Sula leucogaster</i>	Glaucous Gull <i>Larus hyperboreus</i>
Clark's Grebe <i>Aechmophorus clarkii</i>	Blue-footed Booby <i>Sula nebouxii</i>	Slaty-backed Gull <i>Larus schistisagus</i>
Short-tailed Albatross <i>Phoebastria albatrus</i>	Red-footed Booby <i>Sula sula</i>	Sabine's Gull <i>Xema sabini</i>
Black-footed Albatross <i>Phoebastria nigripes</i>	Surf Scoter <i>Melanitta perspicillata</i>	Black-legged Kittiwake <i>Rissa tridactyla</i>
Mottled Petrel <i>Pterodroma inexpectata</i>	Black Scoter <i>Melanitta nigra</i>	Common Tern <i>Sterna hirundo</i>
Cook's Petrel <i>Pterodroma cookii</i>	White-winged Scoter <i>Melanitta fusca</i>	Black Tern <i>Chlidonias niger</i>
Murphy's Petrel <i>Pterodroma ultima</i>	Red-breasted Merganser <i>Mergus serrator</i>	Kittlitz's Murrelet <i>Brachyramphus brevirostris</i>
Buller's Shearwater <i>Puffinus bulleri</i>	Red Phalarope <i>Phalaropus fulicaria</i>	Parakeet Auklet <i>Aethia psittacula</i>
Pink-footed Shearwater <i>Puffinus creatopus</i>	Red-necked Phalarope <i>Phalaropus lobatus</i>	Crested Auklet <i>Aethia cristatella</i>
Flesh-footed Shearwater <i>Puffinus carneipes</i>	Long-tailed Jaeger <i>Stercorarius longicaudus</i>	

The California Current
Marine Bird Conservation Plan
Summary of Research and
Conservation Recommendations:
Chapters 2–12



Photos: David Gardner and Eric Preston

Chapter 2 Summary

SEABIRD STATUS, CONSERVATION, AND MANAGEMENT IN THE CALIFORNIA CURRENT

For seabird conservation in the California Current to be successful several factors need to be determined. These include:

- the status of breeding and migratory marine birds in the CCS, including population estimates, distribution, and main threats at colonies and at sea;
- current conservation status in the U.S., Canada, Mexico, and globally;
- current habitat protection, both on land and at sea; and
- management jurisdiction for seabirds and their habitats.

Chapter 2 of the CCS Plan provides individual species accounts, highlights current habitat protection efforts and discusses current seabird conservation status at the state, federal, and global levels (**appendices B.1, B.2 and C.1, C.2**).

In addition, chapter 2 provides a broad overview of the most important agencies, legislation, executive orders and initiatives established at the federal and state level that can be used to influence seabird conservation in the CCS.

For the full version of Chapter 2, and appendices listed above, please visit www.prbo.org/conservationplanning.



Photo: David Gardner

Double-crested Cormorant adult. Alcatraz Island, CA.

Chapter 3 Summary

SEABIRD HABITATS OF THE CALIFORNIA CURRENT AND ADJACENT ECOSYSTEMS

The coastal and offshore areas of the California Current region provide a variety of feeding, roosting and nesting habitats for seabirds. Chapter 3 of the CCS Plan presents a summary of both terrestrial and marine habitat use.

For the full version of Chapter 3 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 3 on conserving and managing seabird habitats in the CCS.

Chapter 3 Research and Monitoring Recommendations

1. Identify important roosting and breeding habitats within the CCS, and their protection status.
2. Identify important historic breeding and roosting sites, the causes for change in use of these areas, and whether restoration is warranted.
3. Identify locations where introduced plants and animals limit seabird breeding opportunities.
4. Identify cases where seabird breeding is limited by interactions with overabundant species (e.g., gulls).
5. Identify areas of high boat or air traffic that cause potential or actual disturbance to seabird colonies.
6. Identify the principle predators at colonies, and those colonies that are most threatened by predators.
7. Identify major threats to seabirds during their migration through the CCS and/or at their wintering grounds.
8. Investigate the effects of native animal disturbance at seabird colonies (e.g., pelicans, geese, eagles, pinnipeds).
9. Evaluate the effects of reintroduction of eagles and falcons on seabird populations.

Chapter 3 Conservation and Management Recommendations

1. Work in cooperation with agencies to protect important seabird habitats from human disturbance and introduction of non-native species.
2. Develop and implement programs to eradicate introduced predators and prevent further predatory mammal introductions on islands.
3. Restore colonies that have been damaged by human disturbance and mammalian introductions. Develop a plan to restore and expand breeding populations on islands from which seabirds have been extirpated or reduced.
4. Regulate areas with high boat traffic, such as ferries, recreational boaters and kayakers, that affect seabird colonies.
5. Increase enforcement of airplane and helicopter ceiling regulations.
6. Monitor and evaluate effectiveness of artificial habitat (e.g., nest boxes) on populations of select species.
7. Continue to use social attraction methods as needed for restoration and management. Identify and monitor locations and species for which this technique may increase population size.
8. Facilitate projects that involve vegetation restoration for burrow-nesting seabirds.
9. Work to decrease attraction of egg and chick predators to seabird nesting habitats (e.g., the interaction of campgrounds with corvids and Marbled Murrelets in coastal forests).

Chapter 4 Summary

DEMOGRAPHY AND POPULATION DYNAMIC MODELS AS A CORNERSTONE OF SEABIRD CONSERVATION AND MANAGEMENT

Seabirds of the CCS face many conservation challenges. The primary challenge is to maintain or restore populations in the face of habitat destruction, predation, prey depletion, and bycatch mortality.

Population dynamics for all species reflect, ultimately, four processes: reproduction, survival, recruitment and movement. Seabird life histories are characterized by long adult life spans, low reproductive rates and deferred maturity. Once breeding begins it can be intermittent (in some species not all breeding-age adults attempt to reproduce every year). These life history characteristics make seabirds of the CCS vulnerable, particularly to events that kill breeding age birds.

Recent developments in quantitative population biology are providing new tools for seabird conservation. First, in the past few decades there have been major advances in seabird population ecology. This has been fueled by sophisticated methods to estimate demographic parameters, such as adult survival, which has been difficult to estimate in the past. Second, there has been extensive elaboration of theoretical models and frameworks which can be applied to seabird populations. These include metapopulation models, source/sink models, and stochastic population models, including population viability analyses.

Chapter 4 of the CCS Plan reviews aspects of demography relevant to seabird conservation, and provides a framework for developing and evaluating conservation and management efforts from a population biology context.

For a full version of Chapter 4 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 4 of the CCS Plan.

Chapter 4 Research and Monitoring Recommendations

1. Include assessments of adult survival as an essential component of all seabird monitoring programs in the CCS.
2. Study sources of adult, nestling and egg mortality for all seabird species.
3. Conduct research to determine which demographic parameters are most sensitive to temporal environmental variability. This will facilitate the development of predictive population models.
4. As possible, add measurements of demographic parameters to long-term seabird monitoring programs.
5. Conduct research into how demographic parameters co-vary through time to aid in the development of predictive models.
6. Investigate spatial variation of species demographic parameters for metapopulation modeling efforts.

Chapter 4 Conservation and Management Recommendations

1. Identify and quantify sources of mortality for seabird species of concern.
2. Increase the use of modeling in decision making and as a practical conservation tool in general.
3. Train new experts (i.e. graduate students) in quantitative population biology and the use of population dynamics modeling for seabird conservation.

Chapter 5 Summary

CLIMATE AND FOOD: “BOTTOM UP” CONTROL OF SEABIRD POPULATIONS

“Bottom-up” control of seabird populations includes factors that influence the prey that are consumed by seabirds, namely zooplankton, squid, and fish. Spatial and temporal ocean climate variability and change is the principal mechanism for bottom-up control of seabird population parameters and dynamics.

Chapter 5 explores how seabirds respond to temporal environmental variability and change in the CCS. This chapter includes descriptions of large scale oceanographic and atmospheric processes and the effects of climate variability on seabird food webs.

Following a discussion of climate variability, Chapter 5 turns to the role of dietary analyses and prey consumption models in seabird conservation. The results of prey consumption models are highly valuable for conservation and management of *both* seabirds and fisheries. For example, including estimates of prey consumption in fisheries management plans can be used to establish ecologically sensitive fishery quotas. Prey consumption models can also be used to establish the role of seabirds in the natural mortality of fish. In seabird conservation efforts prey consumption models are especially useful tools to examine the impacts of fisheries on seabird populations as well as characterizing the effects of interannual and interdecadal variability in ocean climate on fish and fisheries in the CCS.

For the full version of Chapter 5 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 5 of the CCS Plan.

Chapter 5 Research and Monitoring Recommendations

1. Investigate prey consumption by seabirds (at short and long time scales) in the CCS to assess seabird prey requirements, seabird-based prey mortality, potential conflicts with current or future fisheries, and the consequences of removal of predatory fish to ecosystem structure and functioning.
2. Enhance monitoring of the effects of climate change on seabird diet and population dynamics of prey (fish, squid, zooplankton); use and develop novel techniques of dietary analysis (e.g., Stable Isotope Analysis, Fatty Acid Analysis).
3. Develop programs and databases that enable spatial and temporal comparisons of seabird diets and prey characteristics.
4. Establish standardized methodologies for use in studying diet and prey consumption for a variety of seabird colonies in the CCS.

Chapter 5 Conservation and Management Recommendations

1. Integrate seabird prey requirements into state and federal fishery management plans.
2. Investigate seabird prey requirements prior to opening new fisheries in the CCS.

Chapter 6 Summary

PREDATORS, COMPETITORS, DISEASE, AND HUMAN INTERACTIONS: “TOP DOWN” CONTROL OF SEABIRD POPULATIONS

Marine birds in the Pacific are faced with many threats, on land and at sea, natural as well as anthropogenic. Natural threats include predators, disease, parasites and marine biotoxins.

Anthropogenic threats include loss or degradation of habitat, human disturbance, introduced species, mortality from oil and other marine pollution, and fisheries interactions that cause direct seabird mortality (i.e., bycatch).

Chapter 6 discusses several top-down effects on seabird populations. The most serious direct effect is seabird bycatch. Indirect effects which threaten seabird population health include disturbance to seabirds at colonies, oil contamination from vessels, and disease.

For a full version of Chapter 6 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 6 of the CCS Plan.



Photo: Suzi Eszterhas

Brandt's Cormorant parent and chick. Alcatraz Island, CA.

Chapter 6 Research and Monitoring Recommendations

Bycatch and other Fisheries Interactions:

1. Foster communication with agencies involved in fisheries management to keep informed of potential or emerging fisheries that may affect seabird bycatch in the CCS.
2. Use population dynamics models to estimate and evaluate the potential impacts of fisheries bycatch on seabird populations.
3. Identify current or potential impacts of aquaculture (e.g., salmon farming) on seabirds, including change in predator-prey interactions and competition.
4. Identify the spatial and temporal overlap between seabird foraging “hotspots” and fisheries in the CCS.
5. Collate and distribute information regarding seabird species that are affected by fisheries bycatch.
6. Investigate how international fisheries affect seabirds of the CCS.
7. Model population decline of seabird species (e.g., Sooty Shearwaters, Black footed Albatross) in relation to both bycatch and climate/ecosystem change.
8. Identify areas of high boat traffic that have potential or actual conflicts with seabirds at-sea.
9. Continue, or begin, population monitoring programs of seabird species that are impacted or have the potential for being impacted by fisheries.
10. Conduct studies on foraging ranges and diet of seabirds (e.g., Short-tailed, Black-footed, and Laysan albatross) which are often victims of bycatch.
11. Assess each fishery in U.S. Pacific waters for seabird bycatch. Design mitigation measures that are fisheries- and species-specific to minimize or eliminate bycatch.

Disease, Parasites, and Biotoxins:

1. Identify the main seabird diseases, parasites, and biotoxins responsible for seabird mortality events and model their effects on seabird population dynamics.
2. Conduct surveys for diseases present in adult seabirds, fledglings and juveniles to evaluate how diseases are affecting different age classes of seabirds.
3. Develop a standardized collection protocol for unusual mortality events for both live and dead birds.
4. Develop a seabird stranding network (similar to the Marine Mammal Stranding Network) to facilitate pathological and toxicological sampling.
5. Develop collaborations with the USGS—Wildlife Health Laboratory and local agency and university partners to facilitate necropsies and pathological examinations during seabird mortality events.
6. Coordinate dispersal of dead seabirds for research and specimen archival.
7. Establish an archival freezer for future use studies of seabird genetics, pathology, parasitology, etc.
8. Determine whether parasite loads, disease prevalence, or pathogen prevalence is greater in habitats that are more fragmented, more disturbed, and/or more polluted.
9. Evaluate breeding success in relation to contaminants and potential pathogens.
10. Evaluate environmental conditions associated with harmful algal blooms (HABs) and determine whether agricultural run-off and coastal development is contributing to this problem.
11. Conduct research on HABs and the physiological and pathological effects on seabirds.
12. Determine prevalence of West Nile Virus in seabirds and evaluate potential mortality from spread of this disease.
13. Test for prevalence of the following diseases in seabirds in the CCS: New Castle’s, St. Louis, Western Encephalitis viruses.

Chapter 6 Conservation and Management Recommendations

Fishing Interactions and Marine Ecosystem Protection:

1. Managers need to be aware of emerging fisheries that could potentially impact seabird bycatch and take action before they become a problem.
2. Examine krill fishing moratoriums in California National Marine Sanctuaries (NMS) and work to establish a CCS-wide ban on krill fishing.
3. Ban fishing for forage species around important seabird breeding colonies and foraging areas.
4. Despite the obvious value of Observer Programs and the necessity of these programs for documenting impacts of fisheries on seabirds and other marine animals, there are few Observer Programs for Pacific fisheries. Fisheries that have a high potential for seabird bycatch need to be identified, and funding secured for observer coverage for these fisheries.
5. Resolution is needed for conflict between tribal gillnet fishing in Washington State and seabird bycatch.
6. Work with appropriate agencies to develop solutions for studying and lessening, as needed, interactions between seabirds and aquaculture.
7. Establish a network of Marine Protected Areas for seabird foraging “hotspots” in the CCS.

Disease, Parasites, Marine biotoxins:

1. Establish a national and international database of seabird morbidity and mortality events of both natural and anthropogenic causes.

Chapter 7 Summary

OTHER HUMAN-SEABIRD INTERACTIONS

Fisheries are just one human-seabird interaction that can have significant effects on seabird populations. Additional interactions that can have population-level consequences for seabirds in the CCS include habitat change, pollution, and disturbance.

Chapter 7 of the CCS Plan discusses and highlights various human-seabird interactions, including loss of nesting or roosting habitats, modification of marine habitats, the impact of introduced and “overabundant” species, effects of pollution (oil, organochlorine, metal and plastic), and direct human disturbance at colonies.

For a full version of Chapter 7 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 7 of the CCS Plan.

Chapter 7 Research and Monitoring Recommendations

1. Investigate and model short-term and long-term effects of oil spills (chronic and catastrophic) on seabird prey, habitats, and population dynamics.
3. When an oil spill occurs, model the mortality of all species affected to determine appropriate mitigation and restoration efforts.
4. Assess oil pollution threats along the coast and identify areas most at risk (based on frequency of vessel traffic, time of year, and seabird numbers and diversity, etc.).
5. Implement regular monitoring of contaminant levels in seabird eggs, feathers, and tissues and of the effects of contaminants on seabird demography (survival and fecundity). Use bycaught seabirds to monitor contaminant levels.
6. Evaluate sublethal effects of contaminants.
7. Determine whether environmental contaminants are affecting breeding hormone concentrations and reproductive success.
8. Identify sources of contaminants and garbage in marine systems.
9. Examine levels of ingestion of plastics and other garbage in live and dead seabirds; determine the magnitude of this problem at the population level.
10. Map all sunken vessels in the CCS, with information on oil quantity and type aboard each vessel, date of sinking, depth, etc.
11. Identify which seabird species and colonies are most at risk from freshwater runoff (non point contaminant sources), especially from urban and agricultural centers.
12. Create a database that contains the results of seabird contaminant analyses and distribute this information to agencies with mandates to maintain water quality.
13. Investigate more thoroughly the interactions between terrestrial and marine environments regarding contaminant introductions to the ocean.
14. Consider removing fuel/oil from large-volume sunken vessels near colonies or near important seabird foraging habitats.
15. Conduct float/sink dispersal studies on small seabirds (nearshore and near island) to evaluate beach deposition rates.
16. Further investigate and document the effects of human disturbance on seabirds.

Chapter 7 Conservation and Management Recommendations

1. Ensure that all oil transportation vessels have a double hull.
2. Change routes of major oil transportation vessels and barges based on studies of main current and wind patterns (by season) and potential impacts on important seabird colonies. Conduct studies to identify the level of “threat” in case of major oil spill at important colonies and where changes need to be recommended.
3. Enforce current bilge pumping regulations and work with appropriate agencies to increase strictness of regulations.
4. Use California oil spill response and documentation protocols as a model and make them available to other states in the CCS that lack comparable response protocols.
5. Create a database that includes a list of sensitive seabird areas, sensitive times of year, and a list of contact people for each of these areas. This database should be made available in the case of oil spills or other contaminant emergencies.
6. Require bilge tank cleaning to occur further offshore than current regulations mandate.
7. Work with waste removal and sanitation departments to decrease exposure of seabirds to garbage.
8. Evaluate and monitor the effects of light-intensive fishing activities on offshore, nearshore, and island colonies.
9. Include fisheries effects in management plans. Priority topics to include are: bycatch; light effects on seabirds; and disturbance of seabird colonies or roost sites by fishing vessels.



Photo: David Gardner

Heerman's Gull adult foraging. Ocean Beach, San Francisco, CA.

Chapter 8 Summary

USE OF SEABIRDS AS ECOLOGICAL INDICATORS AND BIOLOGICAL SAMPLERS OF THE CALIFORNIA CURRENT

Higher trophic level predators, such as predatory fish, seabirds and marine mammals depend on the ocean for survival and reproduction. As such, they may be good integrators and indicators of ecosystem ‘health’, including spatial and temporal variability in food web dynamics, prey stocks, and the effects of human activities.

Seabirds may be useful indicators because they are conspicuous and can be relatively easy to study. A number of commonly measured seabird parameters may be useful as ecosystem indicators. These include: diet, reproductive success, adult survival, and fledging mass.

Chapter 8 of the CCS Plan discusses the various ways that seabirds can be used as ecological indicators and biological samplers. Seabird indicators and samplers may aid in understanding and forecasting fish and zooplankton stocks, variation in habitat qualities, fishery statistics, and levels of marine pollutants.

For a full version of Chapter 8 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 8 of the CCS Plan.

Chapter 8 Research and Monitoring Recommendations

1. Assess seabird parameters for their utility as ecosystem indicators.
2. Identify and prioritize the most effective parameters and seabird species for use as samplers.
3. Investigate associations between seabird productivity (or other parameters) and forage fish condition and biomass. Attempt to develop predictive models based on this information.
4. Investigate relationships between seabird species and commercial fish species that forage on the same prey species (e.g., chinook salmon) and attempt to develop predictive models based on this information.
5. Investigate the use of seabird diet for developing fisheries recruitment indices (e.g., the Multivariate Rockfish Index); integrate seabird data with traditional methods to study these organisms.
6. Examine quantitative data on the local distribution, timing and magnitude of prey abundance in relation to variability in seabird reproductive and other life history parameters.

Chapter 8 Conservation and Management Recommendations

1. Encourage the use of seabird-derived information (i.e. diet and reproductive parameters) in fishery management plans and fishery stock assessments.
2. Educate fisheries managers about the utility of seabird-based predictive models of fisheries and fish body condition.

Chapter 9 Summary

CURRENT AND HISTORIC SEABIRD RESEARCH

The Pacific Ocean hosts a wide variety and great abundance of marine birds which collectively require a complex range of habitats throughout the year. Long-term studies at colonies and at sea are highly valuable for determining changes in seabird populations and communities in these habitats. Seabird studies may also be useful for monitoring ecosystem variability.

Chapter 9 of the CCS Plan reviews some of the important seabird research and monitoring programs conducted at colonies and at sea in the CCS since 1970. This chapter considers the general goals and objectives of various programs and provides recommendations for future directions.

For a full version of Chapter 9 please visit www.prbo.org/conservationplanning. Provided below is a summary of recommendations from Chapter 9 of the CCS Plan.



Photo: David Gardner

Brandt's Cormorant adults & juveniles.
Año Nuevo Island, CA.

Chapter 9 Research and Monitoring Recommendations

Marine Ecosystem:

1. Identify areas of special significance for seabird foraging in the CCS (e.g., downstream for upwelling centers).
2. Determine how seabirds can be used as indicators of environmental variability on multiple time scales.
3. Initiate more detailed and broader dietary studies to determine differences in prey selection and consumption within the CCS.
4. Utilize telemetry on a wide variety of species to more accurately evaluate foraging habitats throughout the year, and age and sex differences in foraging.

Population Monitoring:

1. Develop standardized survey methods to determine population size, distribution, and trends. Due to environmental variation, multiple annual censuses may be needed to detect population changes.
2. Quantify population estimate discrepancies between aerial photographic and ground-based surveys; examine and calibrate surveys of seabirds developed by radar and other new techniques.
3. Establish a database of professionally reviewed and accepted techniques for seabird research. For example, telemetry attachment methods, blood collection, morphometric measurements, capture methods, etc.
4. Establish a regional database of banding and marking data and make this available to the public.
5. Establish coordinated, long-term demographic studies of seabird populations to determine status, dynamics and trends of populations; use genetic studies to investigate movements between populations and describe population structure.
6. Establish stronger collaborative relationships between Canadian, U.S., and Mexican researchers and others monitoring seabird populations in the CCS.
7. Lobby the National Science Foundation and other agencies (e.g., NOAA) to allocate more resources to seabird research and monitoring.
8. Increase resources to U.S. Fish and Wildlife Service for seabird research and monitoring.

Chapter 10 Summary

EDUCATION AND OUTREACH

Scientific efforts for conservation have little impact without support of the general public. To build understanding and support, research, management, and conservation programs must share their findings and involve community groups, individuals, and partners through education and outreach.

Education and outreach activities focusing on the CCS should take an ecosystem approach—from zooplankton to humans - and teach key concepts about the CCS ecosystem, threats, and conservation approaches.

The goals of chapter 10 of the CCS plan are to outline key concepts for seabird conservation in the CCS for education and outreach, to identify stakeholder groups, and to highlight examples of educational opportunities and resources for educators in the CCS.

A summary of the key concepts for seabird conservation outreach and education in the CCS are listed below. For a more detailed discussion of these concepts please view the full version of Chapter 10, available at www.prbo.org/conservationplanning.

Key Concepts for Seabird Education and Outreach in the CCS.

1. To adequately support seabirds and other marine life, we must not overexploit the marine resources that seabirds depend upon.
2. To sustain healthy populations, seabirds must be able to evade predators, find food, and mate in disturbance free environments.
3. Seabirds possess special adaptations that allow them to thrive in the variable CCS marine environment—often in harsh conditions, and during periods of food scarcity.
4. Seabirds depend on habitats that are diverse in structure, flora, and fauna, and are worth protecting.
5. Non-native plants and wildlife and an overabundance of native predators can upset the dynamic balance of seabird habitats.
6. Seabirds are most vulnerable to disturbance from humans during the nesting cycle, or when they occur in large aggregations at sea.



Photo: David Gardner

Brandt's Cormorant adult. Alcatraz Island, CA.

Chapter 11 Summary

SEABIRD CONSERVATION STRATEGIES AND NEEDS

Chapter 11 of the CCS Plan discusses five major conservation strategies for seabirds of the CCS. A summary of these strategies is provided below. For a full version, download CCS Plan Chapter 11 at www.prbo.org/conservationplanning.

Mitigation and elimination of bycatch:

It is essential that injury and mortality from fisheries bycatch is reduced or eliminated. As long as fisheries using gill nets or long-lines exist, bycatch will be of concern. However, there are certain measures that wildlife managers and fishers can take to reduce the risk of seabird entanglement in fishing gear. These measures include (1) observer programs to identify problems, where problems exist and which species are affected, and (2) mitigation measures and cooperation with fishing communities to reduce bycatch (e.g., bird scaring lines). Destructive fishing gear should be eliminated.

Protecting food webs—marine reserves and minimizing fisheries prey depletion:

Estimates show that more than 40% of the world's fish are fully exploited, with an additional 25% over-exploited, exhausted or recovering. Fully protected marine reserves are an emerging tool in marine conservation. By protecting geographical areas, the food webs upon which seabirds depend may be protected. Areas downstream from upwelling cells in the CCS may be particularly important foraging sites for seabirds. Localized protected areas around colonies may also be useful to protecting seabird food resources.

Restoration:

Seabird communities and populations in the CCS have been subjected to numerous anthropogenic impacts. Restoration is becoming an effective management tool to counteract these effects and aid in the recovery of seabird populations. Successful restoration plans aim to return populations and communities to the level and function that would have occurred had the disturbance not taken place.

Coastal Development:

Effective conservation of seabirds must aim to protect not only the terrestrial habitats important for breeding and roosting, but also the marine habitats of seabirds. Coastal development places pressures on nearshore marine environments that may affect seabirds. Future development should be evaluated based, in part, on potential effects on local seabird populations.

Climate Change:

The affects of humans on seabirds in the CCS should be evaluated in relation climate variability and change. Climate change is the ecological backdrop of seabird conservation, and must be included in assessing mitigation and restoration measures for seabird of the CCS.



Photo: David Gardner

Common Murre two adults. Southeast Farallon Island, CA

Chapter 12 Summary

A “CALIFORNIA CURRENT JOINT VENTURE”: AN IMPLEMENTATION STRATEGY FOR THE CCS PLAN

Effective management of the CCS ecosystem requires comprehensive cross-jurisdictional coordination, innovative tools, and novel partnerships. Implementation and success of the CCS Plan will require involvement and collaboration of regulatory authorities at local, state, national and international levels, as well as the participation of academic institutions, coastal communities and interested individuals.

In terrestrial ecosystems, joint ventures have been successful in bringing together diverse constituents to implement conservation goals and objectives. Joint ventures are voluntary public-private partnerships among those seeking to achieve conservation objectives in a specific geographic region. Comprised of individuals, corporations, conservation organizations, and local, state, provincial, and federal agencies, joint venture partners accomplish together what is often difficult or impossible to do individually.

A California Current Joint Venture (CCJV) is proposed as a venue for implementing the CCS Plan. The overarching function of the CCJV will be to coordinate capabilities of many partners to effect conservation of the California Current System and its seabirds.

For a full discussion of a potential CCJV, please download Chapter 12 of the CCS Plan, available at www.prbo.org/conservationplanning.

Potential goals of a CCJV will be to:

- recognize and protect the food webs and habitats that support marine predators, including seabirds, whales, dolphins, turtles, swordfish, tuna, sharks, and many valuable fish;
- ensure that biodiversity conservation and fisheries health is promoted;
- recognize that fish are an integral part of the food web, and hence must be managed as such;
- implement science-based, multi-species adaptive conservation plans;
- seek to protect and support our marine economy.

Potential benefits of a joint venture partnership include:

- long-term, programmatic conservation approach vs. individual, disconnected projects;
- creation of beneficial partnerships with business, particularly the fishing industry;
- leveraging funds to execute research and conservation projects;
- increased accountability on conservation dollars spent.
- elevating ecosystem based management and top predator issues within management agencies;
- meeting jurisdictional realities while enhancing cross-border and cross-jurisdictional cooperation;