SEABIRDS
Winged Indicators of Change
2002-2008 RESEARCH SUMMARY
The North Pacific Research Board (NPRB) was established by Congress in 1997 to develop a comprehensive science program of the highest caliber that provides a better understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems and their fisheries.

The NPRB carries out science planning, prioritizes pressing fishery management and ecosystem information needs, coordinates with other ocean science programs, competitively selects research projects, and communicates research results to diverse audiences.

Since its founding, the North Pacific Research Board has developed a comprehensive program of marine research. The Science Plan, developed with guidance from the National Research Council of the U.S. National Academies of Sciences, serves as the foundation for annual requests for proposals organized by major research themes, including:

- Lower Trophic Level Productivity
- Fish Habitat
- Fish and Invertebrates
- Marine Mammals
- Seabirds
- Humans
- Other Prominent Issues
- Integrated Ecosystem Research
- Other Research and Partnerships

The annual requests for proposals result in the majority of the funded projects, which are numbered by the year they were funded (e.g., #201 funded in 2002). The Board also supports integrated ecosystem research programs that look in-depth at Alaska’s major ocean ecosystems, with a program ongoing in the Bering Sea and in development for the Gulf of Alaska.

This research summary describes research funded from 2002 through 2008.
Alaska’s marine ecosystems support one of the world’s greatest concentrations of seabirds, with an estimated 100 million individuals of 75 species either breeding on the state’s coastlines and offshore islands or visiting Alaska’s waters in the summer. Seabirds influence, and are influenced by, commercially valuable fish populations, and, as widespread and numerous upper-trophic predators, seabirds play an important role in overall marine ecosystem dynamics. Seabirds are also vulnerable to direct fisheries interactions through bycatch, and are an important resource for people who rely on Alaska’s marine waters for subsistence harvests and cultural or recreational value. For all of these reasons, seabird studies have been an important priority for NPRB.

Seabird projects funded by the Board can be organized into six broad topics that address both marine ecosystem information needs and pressing fishery management issues:

- management tool development
- long-term climate change
- population dynamics
- foraging success
- marine habitat use
- fisheries interactions and population conservation

Through 2008, the Board funded 19 seabird-focused projects for a total of $3.4 million, of which seven have been completed. Projects fall within six of the research need categories, with two focused on long-term climate change, three on population dynamics, four on foraging success, five on marine habitat use, three on fisheries interactions, and two on management tool development, which cuts across all research categories. Fourteen of the studies have been process focused, and NPRB also funded three retrospective and two monitoring studies.
## SEABIRDS

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>206</td>
<td>Integration of marine bird and mammal observations with the continuous plankton recorder program</td>
<td>D. Hyrenbach, W. Sydeman</td>
</tr>
<tr>
<td>320</td>
<td>Regime forcing and ecosystem response in the Bering Sea (ReFER): Phase II</td>
<td>S. Iver Son, A. KitaySKy, A. Springer</td>
</tr>
<tr>
<td>322</td>
<td>Spatial and temporal interactions between endangered short-tailed albatross and North Pacific commercial fisheries</td>
<td>G. Balogh, J. McNeil, G. Robertson, R. Suryan</td>
</tr>
<tr>
<td>409</td>
<td>Integration of marine bird and mammal observations with the Pacific continuous plankton recorder (CPR) program: Temporal variability in ecosystem structure across three basins</td>
<td>D. Hyrenbach, W. Sydeman</td>
</tr>
<tr>
<td>413</td>
<td>Tufted puffins as biological indicators of forage fish availability in the western Gulf of Alaska</td>
<td>C. L. Buck, C. Williams</td>
</tr>
<tr>
<td>516</td>
<td>Seabirds as indicators of marine ecosystems</td>
<td>A. Springer, W. Sydeman</td>
</tr>
<tr>
<td>532</td>
<td>Albatross habitat and fisheries interaction</td>
<td>G. Balogh, R. Suryan</td>
</tr>
<tr>
<td>609</td>
<td>Is the pelagic distribution of seabirds in the Bering Sea driven by climate change? A retrospective analysis</td>
<td>J. Parrish</td>
</tr>
<tr>
<td>611</td>
<td>Spatio-temporal variability in North Pacific meso-marine ecosystem (MME) structure: Basin-wide responses to a cooling transition</td>
<td>W. Sydeman</td>
</tr>
<tr>
<td>612</td>
<td>COASST-Alaska: A comprehensive monitoring program for coastal ecosystem health and change</td>
<td>J. Parrish</td>
</tr>
<tr>
<td>637</td>
<td>North Pacific pelagic seabird observer program</td>
<td>D. Irons, K. Kuletz</td>
</tr>
<tr>
<td>638</td>
<td>Relationships among climate variability, ocean productivity and demography of Aleutian populations of three planktivorous seabirds: least (Aethia pusilla), crested (A. cristatella) and whiskered aukslets (A. pygmea)</td>
<td>I. Jones</td>
</tr>
<tr>
<td>722</td>
<td>North Pacific seabird diet database: A public archival diet information system</td>
<td>D. Irons, D. Irons, D. Irons</td>
</tr>
<tr>
<td>723</td>
<td>Increasing short-tailed albatross population growth and stability through translocation of post guard chicks</td>
<td>G. Balogh, T. Degnan, R. Oden, R. Suryan</td>
</tr>
<tr>
<td>724</td>
<td>Estimating diets of two species of threatened sea ducks, the Steller’s eider (Polysticta stelleri) and the spectacled eider (Somateria fischeri): Validation of novel diet assessment techniques and identification of benthic resource use</td>
<td>T. Hollmen, S. Iver Son</td>
</tr>
<tr>
<td>732</td>
<td>COASST - Alaska: A beached bird monitoring program</td>
<td>J. Parrish</td>
</tr>
<tr>
<td>801</td>
<td>Seabird and marine mammals combined with CPR</td>
<td>W. Sydeman</td>
</tr>
<tr>
<td>819</td>
<td>Body condition of marbled murrelets: Consequences for overwinter survival during a period of collapsed herring stocks</td>
<td>M. Bishop, N. Dawson</td>
</tr>
<tr>
<td>820</td>
<td>Measuring and modeling habitat use by spectacled eiders wintering in the Bering Sea</td>
<td>J. Lovvorn</td>
</tr>
</tbody>
</table>
Seabirds are often pointed to as “indicators” of marine conditions, and their role as indicators, both in pure research and applied management contexts, has been a very active and fruitful area of endeavor worldwide. To improve the communication and coordination among researchers and managers interested in seabirds as indicators in the North Pacific, the Board funded an international workshop on this topic that focused on developing specific recommendations for future NPRB-funded research. One of those recommendations was to learn more about what seabirds eat; the Board subsequently funded development of a seabird diet database to compile, centralize, and disseminate a broad range of seabird diet information.

Researchers convened a special symposium at the 2006 Pacific Seabird Group conference, with dozens of invited experts from around the world. Beginning with a summary of the main issues of concern to science and management organizations in the North Pacific and of the status of seabirds in the region, the investigators and workshop participants reviewed the utility of seabirds as indicators of change in the marine environment and then integrated all of the workshop outputs to make recommendations to the NPRB on a strategy for the study of seabirds in Alaska.

The report produced by Project 516 shaped further NPRB-funded seabird research by prioritizing the study of seabird diets, among other recommendations. A number of large data sets, yet to be synthesized, contain detailed information on the diets of seabirds in Alaska and elsewhere in the North Pacific. In a collaborative effort between the U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries, and several academic institutions, Project 722 is compiling pertinent seabird diet data sets, developing tools for analyzing and mapping the data, and creating web-based products for dissemination of the data to scientists, resource managers, and the general public. This Seabird Diet Database, to be maintained by the USFWS, links to the North Pacific Seabird Colony Database, the North Pacific Pelagic Seabird Database, the North Pacific Seabird Monitoring Database, and NOAA Fisheries’ Groundfish Diet Database. Investigators are also preparing an “Implementation Plan for Sampling Seabird Diets in Alaska,” which sets priorities for augmentation of existing datasets for future at-sea and colony-based sampling programs.
Long-Term Climate Change

SINCE THE COMPLETION OF THE NPRB SCIENCE PLAN IN 2005, CLIMATE CHANGE HAS INCREASINGLY BECOME A KEY ISSUE IN STUDIES OF ECOSYSTEM PROCESSES IN ALASKA WATERS.

Long-term climate change in the marine habitat, causing reduced ice cover in the Bering Sea and Arctic Ocean, is altering the distribution and availability of prey species, which may in turn affect the behavior and population dynamics of breeding or migrating seabirds. A clearer understanding of long-term climate change impacts on seabirds will have many benefits. For example, seabird populations of particular concern, such as threatened or endangered species like the spectacled eider, or species of particular subsistence or cultural value like common and thick-billed murres, can be better managed if predictions about climate change impacts can be modeled and tested. Also, integrated models of ecosystem dynamics, such as our Bering Sea Integrated Ecosystem Research Program, will be strengthened if the interaction of climate change and seabird foraging and population dynamics is better understood.

The Board has invested in two projects that address the impacts of long-term climate change on seabird prey availability and demographic consequences.

Seabirds, Climate Change and the Bering Sea

Project 609

PROJECT 609 BUILDS ON THE NORTH PACIFIC PELAGIC Seabird Database (NPPSD) in a retrospective study that investigates whether the pelagic distribution of seabirds in the Bering Sea is driven by climate change. Researchers are incorporating additional pelagic seabird data collected by George Hunt and others in the southeastern Bering Sea during the 1980s and 1990s into the recently developed NPPSD, and then using the expanded database to map the distribution of seabirds in the eastern Bering Sea. To move beyond observed data, investigators are using characteristics of seabird marine habitats to produce a predictive model of seabird distribution relative to fixed physical characteristics over the entire study area. They’re analyzing changes in pelagic seabird communities in the Bering Sea related to climate indices, and looking at annual deviations from the distribution patterns predicted by the model to detect how seabird distribution reacts to climate change.

Black-legged kittiwakes feed on small fish.
BY EXAMINING THE TEMPORAL AND GEOGRAPHIC PATTERNS OF SURVIVAL in least auklets, crested auklets, and whiskered auklets, researchers participating in Project 638 are examining the relationship between variability in climate and ocean productivity. Auklets consume copepods and euphausiid zooplankton, and are more closely linked to oceanic primary productivity than other fish-eating or mixed-diet seabird species. Auklets can also be captured and individually marked, letting investigators determine survival rates relatively easily. Scientists in this study want to determine whether region-wide climate conditions or local conditions (e.g. oceanography, climate, predators, etc.) near breeding colonies are the main drivers in explaining auklet survival.

Unfortunately, the usual challenges of fieldwork were dramatically increased at one of the field sites when the Kasatochi volcano unexpectedly erupted on August 7, 2008 (http://www.avo.alaska.edu/activity/Kasatochi.php) and the field crew had to immediately evacuate the island.
Population Dynamics

Breeding success, survival rate, and movement between colonies are among the factors researchers study to determine the expansion, contraction, or stability of seabird populations.

Regular monitoring of beaches offers a way to assess large-scale patterns of adult seabird mortality at sea, and is one of the only ways to detect episodic mortality events that often occur outside the breeding season, and are frequently caused by a lack of food. Surveying beaches for dead birds provides a cost-effective method for tracking mortality rates—a key dimension of seabird population dynamics—and can also provide insight into causes of death.

SEABIRDS :: Population Dynamics

COASST

Project 612

Beach monitoring programs in Alaska have historically been launched in response to oil spills, large-scale die-offs, or other notable events. The Coastal Observation and Seabird Survey Team (COASST) is a Washington-based program established in 1998 to gather information on beach-cast birds, human use of beaches, and beach oiling. A citizen-science program, COASST relies on a large network of volunteer beach surveyors, and has been very successful in the Washington-Oregon area, with hundreds of volunteers surveying thousands of kilometers of beaches.

In 2006, the Board supported Project 612, a pilot study to extend the successful COASST monitoring model to Alaska. The project sought to track seabird mortality in Alaska and develop a citizen-science program for nearshore monitoring. COASST conducted over a dozen training sessions, recruiting more than 55 participants and successfully implementing beached bird data collection on 51 beaches, from Sitka to the Aleutians. The project established partnerships with 14 agency, tribal, and nongovernmental organizations, and also demonstrated the use of COASST data in science and natural resource management. This pilot effort concluded that creating and sustaining a community of data collection participants are definitely possible in Alaska.

SEABIRDS :: Population Dynamics

Citizen Science in Alaska

Project 732

Following the success of the pilot COASST beach monitoring project in Alaska, the Board funded Project 732, which seeks to enhance the development and maintain the momentum of this citizen-science program in Alaska. The project plans to stabilize and strengthen the Alaska program by adapting and enhancing its field guide and protocol for Alaska and by maintaining and expanding partnerships. The program will also expand data collection at current and new sites and disseminate program information through area-specific materials. By the end of 2008, the COASST program had conducted more than 1,100 surveys on 63 beaches, involving over 100 participants.
PROJECT 819 ALSO SEeks TO UNDERSTAND FACTORS affecting seabird survival probability, but with a focus on marbled murrelets, a species of conservation concern in Alaska. Working closely with the Exxon Valdez Oil Spill Trustee Council, Prince William Sound Science Center, and USFWS studies on juvenile Pacific herring and seabird predation on herring, researchers aim to better understand the survival of marbled murrelets within the ecological context of collapsed herring stocks.

Juvenile herring are a critical part of the diet of marbled murrelets. Previous research showed that summer weights of murrelets have been declining, meaning that the birds are entering winter in less than optimal body condition, which could be further compromised by a decline in juvenile herring. By assessing the variation in body condition and stress levels of marbled murrelets in Prince William Sound during winter, using the hormone corticosterone as an indicator of dietary stress, and by describing the winter diet of marbled murrelets, the project team seeks to link marbled murrelet condition and diet to the probability of survival.
Foraging Success

Foraging success can be critical to the overall health of seabird species and populations. Our science plan highlighted the need for research that identifies and clarifies the dominant energy pathways in Alaska’s marine ecosystems.

Considering the overlap between the food that both seabirds and commercial fishes eat, or in some cases, the importance of juvenile commercial fish in seabird diets, this category of research brings together the two overall NPRB missions of pressing fishery management issues and marine ecosystem information needs. Through 2008, the Board funded $1.35 million for four projects in this category.

Foraging behavior, diet, and habitat use by seabirds can have direct links to management actions and the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act. In 2007, the North Pacific Fishery Management Council established the Northern Bering Sea Research Area, which is closed to bottom trawling until a fishery management plan is developed. Part of the rationale behind this conservative approach stems from concerns about potential adverse effects of non-pelagic bottom trawling on threatened species, including seabirds. Funding seabird foraging studies enables more informed decisions on the delineation of protected habitat in the northern Bering Sea, and improves fishery managers’ opportunity to build resilience into fishery management planning.

SEABIRDS :: Foraging Success

Diets of Tufted Puffins
Project 413

Project 413 is a more focused study that set out to improve our understanding of how the diets of tufted puffins change seasonally and annually. Tufted puffins feed on a variety of species, and so give us a glimpse of the abundance of marine forage fish in an area. Because they carry whole fish from the sea to their nesting burrow to feed to their chicks, scientists can easily observe “bill-loads” of fish. However, we know little about what adults eat, which scientists think differs from the food fed to chicks.

To build a more complete understanding of factors affecting tufted puffin diets, this project used stable isotope analysis to learn the trophic level at which the birds are feeding, and fatty acid analysis to estimate the species the birds ate in the weeks prior to sampling. From this, scientists infer annual and seasonal shifts in the diets of tufted puffins on Kodiak Island.

Raising captive chicks on a known diet, researchers found that adult puffins ate mostly invertebrates before laying eggs, gradually transitioning to fish while rearing chicks. Compared to their chicks, adults concurrently fed at the same trophic level but appeared to eat a different array of prey species. By showing that nestling puffin diets don’t match adult diets, this study helps refine efforts to use seabird diets to establish links between changes in oceanographic conditions and seabird reproductive success.

Researchers in the field take a tufted puffin’s “head-bill” measurement to help determine body condition.
SEABIRDS :: Foraging Success

Changes in Bering Sea Seabird Diets
Project 320

PROJECT 320 BUILDS ON TWO KEY OBSERVATIONS linking seabird populations and their prey. First, some populations of fish-eating seabirds that feed on the shallow, continental shelf ecoregion of the Pribilof Islands are in decline, contrasted with increases in populations of the same species in the deep, oceanic ecoregion of the Aleutian Islands.

Second, on the continental shelf, changes in the breeding biology of fish-eating seabirds were the opposite of changes observed in the plankton-feeding species.

Project 320 looks at how pelagic food webs are organized and provides insights into patterns of food web productivity at several trophic levels—from zooplankton to forage fish to birds—between habitats and over time. The investigators work on a suite of ten seabird species, representing both fish and zooplankton specialists, at three primary sites in the Bering Sea with distinct oceanographic characteristics: Buldir Island (deep ocean basin); St. George Island (continental shelf edge); and St. Paul Island (continental shelf).

Relying on chemical analyses that can be linked to diets, as well as direct measurements of the prey items, investigators first measure concentrations of the stress hormone corticosterone in seabirds to assess seasonal and annual dynamics of food availability. They also analyze stomach contents, which directly reveal what the birds are eating and use fatty acid analysis to indirectly estimate what the birds were eating during the weeks prior to capture and sampling.

Next, they collect samples of what the birds are eating to compare seasonal and interannual changes in both the continental shelf and oceanic habitats. Finally, investigators are assessing how the reproductive performance of seabirds relates to the biological changes and physical variability of continental shelf and oceanic habitats. Bringing these four elements together should improve our understanding of the factors that affect seabird diets, and population productivity.

Foraging Behavior of Eiders
Project 724

THE DIETS OF TWO THREATENED SEA DUCK SPECIES, THE STELLER’S EIDER AND THE SPECTACLED EIDER, ARE THE focus of Project 724. Investigators are studying captive eiders in a controlled experimental setting to validate the use of fatty acid analysis for diet assessment for these species in the wild. The validation involves captive eider feeding trials with minimally invasive, biopsy sampling for fatty acid tissue. Results to date reveal that fatty acid analysis accurately estimates diet and diet switches in captive eiders over a month-long period, rather than only providing information on current diet, as would be the case with stomach content analysis. This validation study should provide the basis for characterizing diet patterns in eider species, which could be used in future studies to better understand benthic habitat requirements.

The relationship between productivity and nutritional stress (year/colony/species specific values for both measures) in auklets, murres, and kittiwakes breeding in the Aleutian Islands and Bering Sea regions during 1999-2005.
Marine Habitat Use

MARINE RESOURCE MANAGEMENT IS INCREASINGLY MOVING TOWARD ECOSYSTEM-BASED APPROACHES. BOTH THE U.S. COMMISSION ON OCEAN POLICY AND THE NPRB SCIENCE PLAN HIGHLIGHT THE NEED FOR INFORMATION THAT UNDERPINS ECOSYSTEM-BASED DECISION-MAKING.

We currently have little information about how seabirds use marine habitats at regional or basin scales, which limits the opportunity to build seabird habitat use into large-scale ecosystem-based, management planning.

The Science Plan also encourages cross-cutting and integrated research projects. Projects previously described in the Lower Trophic Level research theme (302, 536, and 601) quantify the abundance of plankton at basin scales in the North Pacific using ships of opportunity to tow a continuous plankton recorder (CPR). To gather data on top predators whose feeding and distribution patterns are linked either directly or indirectly to plankton, the Board supported four linked projects (206, 409, 611, and 801) focused on marine mammal and bird surveys that coordinate and integrate with the CPR surveys.

SEABIRDS :: Foraging Success

World Population of Spectacled Eiders

Project 820

IN ALASKA WATERS, ONE OF THE KEY THREATENED SPECIES IS THE spectacled eider, whose world population winters in small areas of open water among the ice of the northern Bering Sea. Project 820 looks at spectacled eider distribution, abundance, and diet, while making concurrent surveys of benthic prey in collaboration with other NPRB and NSF projects in the Bering Sea Integrated Ecosystem Research Program. Investigators are testing and refining a model predicting where eiders can maintain positive energy balance, and where they have enough food to survive, giving resource managers vital information for delineating protected habitat in the northern Bering Sea.
**Surveying Seabirds at Sea**

**Projects 206, 409, 611, 801**

**PROJECT 206 FIRST ESTABLISHED STANDARDIZED**

methods for surveying marine birds and mammals from the large container ships used in the CPR program described on page 36. The project then carried out six surveys across a 7500 kilometer swath of ocean, from British Columbia to Japan. Data on oceanographic variables were also collected underway, using satellite remote sensing. Project 409 extended this time series, allowing for yearly variability in seabird and marine mammal distributions relative to CPR-derived plankton communities and satellite-sensed temperature and chlorophyll measurements. Results of the two combined projects allowed the investigators to define ten distinct “meso-marine ecosystems” in the North Pacific and southern Bering Sea study area. Project 611 further extended the survey dataset, crossing into what appears to be a transition to a cold-water regime, increasing the investigators’ ability to connect plankton, bird, and mammal diversity and abundance with oceanographic variables at large spatial scales. Project 801 provides additional funding to support integrated analyses of seabird, zooplankton, phytoplankton, and physical oceanographic measurements with specific focus on the Gulf of Alaska ecosystem.

**Shipbased Seabird Observers**

**Project 637**

**THE CPR-MARINE BIRD AND MAMMAL PROJECTS HIGHLIGHT the value of combining surveys of predators, prey, and habitat characteristics.** Project 637 is a separate but related study that increased the coverage of the North Pacific Pelagic Seabird Database (NPPSD), a USGS-USFWS project to consolidate data on seabirds at sea.

Most of the data in the NPPSD were collected in the 1970s and 1980s. Since then, many bird populations have declined, and oceanic regimes, seabird prey, fisheries, and marine traffic have changed, affecting the foraging patterns and habitat use of seabirds at sea. Project 637 supported a marine bird observer program, placing observers on selected vessels of opportunity, in collaboration with NOAA, projects funded by the NSF and NPRB, the USFWS, and the Canadian Wildlife Service. The project placed observers on 25 cruises, surveying 46,373 kilometers of pelagic Alaska waters from the Arctic Ocean to the northern Gulf of Alaska. These surveys improved distributional data for a variety of species, especially during spring and fall months. All the data were contributed to the NPPSD, strengthening the database’s ability to provide insights into the broad-scale patterns of distribution and abundance for apex predators in Alaska’s pelagic waters. Continued support for seabird-at-sea surveys is being provided through the Bering Sea Integrated Ecosystem Research Project.

---

Spatial distribution of survey effort by season, from March 2006 through March 2008. Seasons were defined as winter (A; February-March), spring (B; April-May), summer (C; June-July), and fall (D; August-October).
Short-tailed albatross have been killed in commercial fishing gear in Alaska, and the longline and trawl fisheries operate under “incidental-take” limits for this species under the Endangered Species Act. The commercial fishing fleet in Alaska has taken admirable measures to avoid incidental take of short-tailed albatross, implementing requirements for “streamer line” avoidance measures for the hook-and-line groundfish and halibut fisheries.

The Board has supported two linked projects that use satellite telemetry to measure albatross habitat use, combined with satellite remote-sensing measurements of habitat characteristics, chemical analyses of albatross diet, and NOAA fisheries effort and seabird bycatch data. Despite recent population increases, short-tailed albatross remain exceptionally vulnerable, in large part because they nest on only two small, unstable islands. The short-tailed albatross recovery team determined that the establishment of additional colonies is of utmost importance to the recovery of this species, so NPRB funded a study of translocation to more stable islands.

TO GIVE US MORE INSIGHTS INTO THE OVERLAP between short-tailed albatross marine habitat and commercial fisheries, and to increase short-tailed albatross population growth and stability, NPRB funded Project 723, which translocates chicks to less vulnerable breeding sites than on active volcanoes.

Volcanically active Torishima supports 85% of the breeding population, while the other 15% breed on Minami-Kojima Island (Senkaku Islands group), whose ownership is disputed by Japan, China, and Taiwan.

The investigators, a collaborative team of U.S. and Japanese scientists, remove a small number of chicks from Torishima Island and carry them via helicopter to Mukojima Island, an uninhabited, non-volcanic, and politically stable Japanese island. The translocation itself is a relatively small part of the work. Afterwards, the chicks must be hand-reared for three months until they reach fledging age.

The investigators are measuring several variables of both normally reared chicks at Torishima Island and hand-reared chicks at Mukojima Island to allow them to quantify the success of the translocations, and are using satellite transmitters to evaluate the range and habitat choices of both populations.
TO HELP WITH FISHERIES MANAGEMENT AND SPECIES CONSERVATION, Project 322 sought to better understand short-tailed albatross distribution and marine habitat use. The investigators captured short-tailed albatross, both at sea and at their breeding colony off Japan, and attached satellite transmitters. Data from the satellite-tracked birds showed that short-tailed albatross had the greatest potential overlap with the sablefish fishery and others occurring on the continental shelf break and slope habitats in the Bering Sea and the Gulf of Alaska. Some birds also travelled onto the Bering Sea shelf, suggesting potential (although more limited) interactions with the walleye pollock and Pacific cod fisheries. This project also highlighted the need for more widespread use of longline seabird deterrent devices among regions and nations sharing responsibility for conservation of this imperiled species.

Albatrosses and Regional Fisheries
Using the same suite of research techniques, Project 532 extended the success of Project 322 to encompass all three albatross species commonly found in Alaska marine waters: short-tailed, black-footed, and Laysan albatross.

Albatross species showed important differences in foraging niches and habitat associations. Short-tailed albatross had the strongest association with continental shelf break and slope regions, although juveniles also frequented on-shelf habitats. Black-footed albatross were the most varied in habitat use, using all three depth domains of the continental shelf region to equal degrees but spending less time in oceanic waters, whereas Laysan albatross most often used oceanic habitats well off the continental slope.

The Bering Sea walleye pollock and Pacific cod fisheries had the greatest overlap with short-tailed albatross, whereas all three albatross species overlapped with the Aleutian Islands sablefish and Pacific halibut fisheries. Black-footed and juvenile short-tailed albatross had the greatest overlap with Gulf of Alaska fisheries and West Coast Pacific halibut and sablefish fisheries, and overlapped with a portion of the high seas tuna fishery. Overall, Laysan albatross had the least spatial overlap with North Pacific fisheries, spending the majority of time in areas devoid of fishing activities. Taken together, the results of Projects 322 and 532 provide an improved understanding of ecological relationships among North Pacific albatrosses and inter-specific differences in potential interactions with regional fisheries.
Mission
NPRB supports research to build a clear understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems that enables effective management and sustainable use of marine resources.

Seabirds is one in a series of publications produced by the North Pacific Research Board in support the 2005 Science Plan developed with guidance from the National Research Council of the U.S. National Academies of Sciences.