

Population Dynamics

TO EFFECTIVELY MANAGE OCEAN WILDLIFE POPULATIONS, RESOURCE MANAGERS NEED TO UNDERSTAND WHY POPULATIONS INCREASE, DECREASE, OR REMAIN STABLE OVER TIME.

In the North Pacific, the populations of many marine mammal species have dramatically declined over the last several decades. For other species, researchers simply do not know whether they are thriving or not. To better understand the population dynamics of marine mammals in Alaska waters, especially those species important to subsistence communities, the Board has directed almost \$1.4 million to seven research projects looking at declining populations of harbor seals and sea otters, as well as the status of ice seals, bowhead whales, and Pacific walrus populations.

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Tracking Harbor Seals

Project 501

MONITORING THE SURVIVAL OF INDIVIDUAL ANIMALS within a wild, wide-ranging population can be extremely difficult, particularly for species lacking natural identification marks. To learn about the survival of young harbor seals in Prince William Sound, the Alaska Department of Fish and Game initiated a multi-year study using VHF radio transmitters implanted under the skin of individual animals. Researchers initially tracked the radio-tagged seals using vessels and airplanes, but these costly surveys are limited to periods of good weather in the late spring and summer. Project 501 established remote monitoring stations at six land-based haul-out locations in Prince William Sound that record the presence of the individual radio-tagged animals year-round.

Researchers hoped to more efficiently assess the presence and survival of radio-tagged harbor seals for up to five years. During the early phases of the project, investigators faced several technological difficulties and spent considerable effort ensuring that the signals from these remote monitoring stations reported true presence indicators. Once data-quality issues were resolved, scientists noted that the amount of remotely collected telemetry data far exceeded what would have been possible through traditional survey methods alone.



Gail Blundell

John Wells, Brian Epler, Tim Peltier, and Michael Conti (left to right) attaching solar panels to the datalogger tower on Little Green Island, Prince William Sound. The reef in the background is a harbor seal haulout.



Gail Blundell



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Health of Ice Seals

Project 312

BEARDED, RINGED, SPOTTED, AND RIBBON SEALS ARE called “ice seals” because they depend upon sea ice for feeding, resting, and pupping. Although these species are important subsistence resources for Alaskans and play an important role in the arctic marine ecosystem, we know little about their biology or population dynamics. They range widely, and conducting marine mammal surveys in remote, ice-covered waters poses serious logistical issues, making it difficult to predict or interpret the impacts of Arctic warming on the population dynamics of these species.



Elizabeth Labunski

Ribbon seal in the Bering Sea.

The Board funded Project 312 as a monitoring study to examine the health and status of the four ice seal species in the Bering and Chukchi seas. Working with subsistence hunters in eight coastal Alaska villages (Barrow, Point Hope, Shishmaref, Diomedes, Nome, Gambell, Savoonga, and Hooper Bay), researchers collected biological samples from more than 1,100 ice seals.

An analysis of these samples indicates that individuals of the ice seal populations in northern Alaska are in relatively good health. Contaminant levels found in the tissues of sampled individuals were lower than levels found in samples from the Canadian Arctic, and reproductive rates for all species were relatively high. Between 86-91% of adult females appeared to be reproductively active, with ribbon seals maturing as early as two to three years of age.

By comparing current data to information collected in the 1970s, researchers also found that ringed seals are larger at younger ages in the present population, possibly indicating that current environmental conditions are favorable and promote growth. Genetic analysis shows high levels of genetic diversity in all four species, suggesting that all species belonged to historically large populations.

To address the question of population trend, researchers questioned Native subsistence hunters regarding changes in the number and distribution of ice seals over time, and responses seemed to indicate that populations of these species are stable.

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Movements of Ringed Seals

Projects 515, 631

TO UNDERSTAND POPULATION DYNAMICS, WE NEED to understand population structure and how, or if, individuals move between, and breed with, different subpopulations, thus increasing the genetic variability and decreasing their vulnerability to extinction. Project 515 studied ringed seal movements throughout the year to find out if individuals return to the same location to breed each year or breed at different sites, and with different individuals, during their reproductive lifetime.

Tracking records of ringed seals indicated that animals had small home ranges between ice freeze up and break up, most less than three square kilometers. In some parts of the species' range, this can last up to nine months and encompass the breeding period when ringed seals give birth and mate. During ice-free periods, individuals ranged much farther, about 200 square kilometers, but returned to the same breeding sites the following year.

Fidelity to breeding sites raises the possibility that ringed seals may be subdivided into many demographically distinct subpopulations. Researchers developed a new molecular technique to collect, preserve, and extract DNA from molted skin left on the ice next to breathing holes during the breeding season.

In a follow-up study, Project 631, investigators are using this method to examine and estimate rates of gene flow and determine the structure of ringed seal populations. With the help of a trained dog and local hunters, scientists collected many samples in 2007 and 2008. Analyses of these samples, and the population structure they might reveal, are ongoing.



Brendan Kelly

A Labrador retriever locates a seal hole.

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Pacific Walrus Populations

Project 632

PACIFIC WALRUS DEPEND ON SEA ICE FOR THEIR survival and face an uncertain future as the Arctic warms and sea ice diminishes. Walrus range across the international boundaries of the United States and Russia, and both nations share common interests in the conservation and management of this species. Walrus are currently managed as a single stock of animals that inhabits the continental shelf waters of the Bering and Chukchi seas.



Bradley Benier

Although recent subsistence walrus harvests of approximately 5,000 animals a year in the U.S. and Russia combined are lower than historical highs of as many as 16,000 animals a year, our lack of information about population size or trends prevents any assessment of the sustainability of current harvest levels. NPRB funded Project 632 to examine Pacific walrus population biology and ecology using data from a range-wide survey carried out by the U.S. Fish and Wildlife Service, U.S. Geological Survey, and Russian scientists in 2006.

Specifically, scientists from both countries are working together to integrate and standardize survey data collected in U.S. and Russian territories to estimate the size of the Pacific walrus population. Researchers are using haul out and movement data from tagged walrus to model the behavior of individual animals relative to meteorological conditions and patterns of sea ice drift. They are also looking at whether benthic walrus prey composition, abundance, and biomass within an area of the St. Lawrence polynya have significantly changed in the past 20 years and how future changes may impact the Pacific walrus population.



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Bowhead Whale DNA

Project 634

NEW MOLECULAR TECHNIQUES ARE ALSO BEING USED TO EXAMINE GENETIC STOCK STRUCTURE IN ARCTIC cetaceans to determine how vulnerable local populations of bowhead whales may be to changes in their environment and to subsistence harvesting. Project 634 is investigating the population structure of bowhead whales by studying historical samples of baleen and bone from subsistence hunted bowheads from St. Lawrence Island and Barrow, Alaska. Using a technique called single nucleotide polymorphisms (SNP), researchers are amplifying and genotyping DNA from low quality and quantity samples extracted from the ancient bones and baleen of bowhead whales.

Data from this project will complement ongoing studies by the International Whaling Commission on bowhead whale population structure based on modern day samples collected from subsistence hunters.

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Declining Sea Otters

Project 717

ALTHOUGH SEA OTTER POPULATIONS IN ALASKA successfully recovered from intense harvesting for their pelts during the Russian and American fur trade of the 19th and 20th centuries, the numbers of otters in southwestern Alaska dramatically declined in the early 1990s. Alaska Natives still harvest sea otters as a subsistence resource, but that does not appear to account for the decline in southwest Alaska.

Project 717 is examining why otters are not thriving by studying local population density, food availability, and net energy gain of foraging sea otters at 13 sites along the geographical range of southwestern sea otters. Researchers are also surveying the beaches at each of these sites for sea otter carcasses to help determine causes of death. They hope to determine the eastern extent of the sea otter decline, currently thought to be somewhere between the Shumigan Islands and Kodiak Island, where sea otter densities remain stable.

As part of the study, investigators are evaluating the role of killer whale predation as a consistent cause of decline throughout southwestern Alaska and are looking at disease and other factors that may be constraining the recovery of the population.



Sampling locations for summer 2008.

