Marine Mammals in the Bering/Chukchi Sea

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The National Marine Mammal Laboratory (NMML), Alaska Regional Office, and the Protected Resources Management Division are responsible for research on and management of 22 species of marine mammals that commonly occur in Alaska, including five endangered cetacean species (bowhead, fin, humpback, North Pacific right, and sperm whales); one pinniped species (Steller sea lion), which is threatened in one portion and endangered in another portion of its range; and two depleted species (Cook Inlet beluga whale and northern fur seal). Field research by the NMML staff on marine mammals off central and northern Alaska focused on two pinniped and six cetacean species during 2002 and 2003: Steller sea lions, harbor seals, Cook Inlet beluga whales, killer whales, and large cetaceans (fin, blue, humpback, and North Pacific right whales) in the Bering Sea.

Steller Sea Lions

NOAA is the lead agency responsible for the management and recovery of the endangered western and threatened eastern populations of Steller sea lions. The western population has declined by more than 80% in the last two decades, but it may have stabilized over much of its range during the last two years. Conversely the eastern population appears to be recovering from severely reduced levels in the early part of this century and has exhibited consistent growth over the past three decades. Factors hypothesized for the dramatic decline in the western population include reduced prey availability leading to nutritional stress, poor juvenile survival, and decreased reproduction; disease; pollution; predation by killer whales; incidental mortality in groundfish fisheries; and

Fin whale.

Feeding gray whale.

legal and illegal shooting. The Steller sea lion research program at the NMML conducts scientific research on each of the potential factors that could have contributed to the decline of the western population. The core research program includes vessel and aerial surveys to quantify abundance, molecular and genetic studies to elucidate stock structure, assessment of predator–prey dynamics and foraging distributions to determine foraging ecology, and individual identification and tracking to provide the foundation of mortality and life history.

Killer Whales

To investigate the potential role of killer whales in the decline of the western population of Steller sea lions, a vessel-based survey extending from the Kenai Fjords to the central Aleutian Islands was initiated in 2001. The DART (Distribution and Abundance of Residents and Transients) surveys are designed to estimate the abundance of killer whales by ecotype. Three killer whale ecotypes have been identified in Alaskan waters: the piscivorous (resident) ecotype; the mammal-eating (transient) ecotype; and the "offshore" ecotype, which apparently preys mostly on fish. Biopsy samples are taken whenever possible, to provide data for molecular genetic, prey isotopic, and fatty acid and contaminant analyses. When conditions permit, photographs and biopsies of sperm, fin, humpback, and Baird's beaked whales are also taken. These data augment sighting and biopsy sampling conducted in collaboration with the Alaska Fisheries Science Center's Resource Assessment and Conservation Engineering groundfish surveys.

Cetaceans

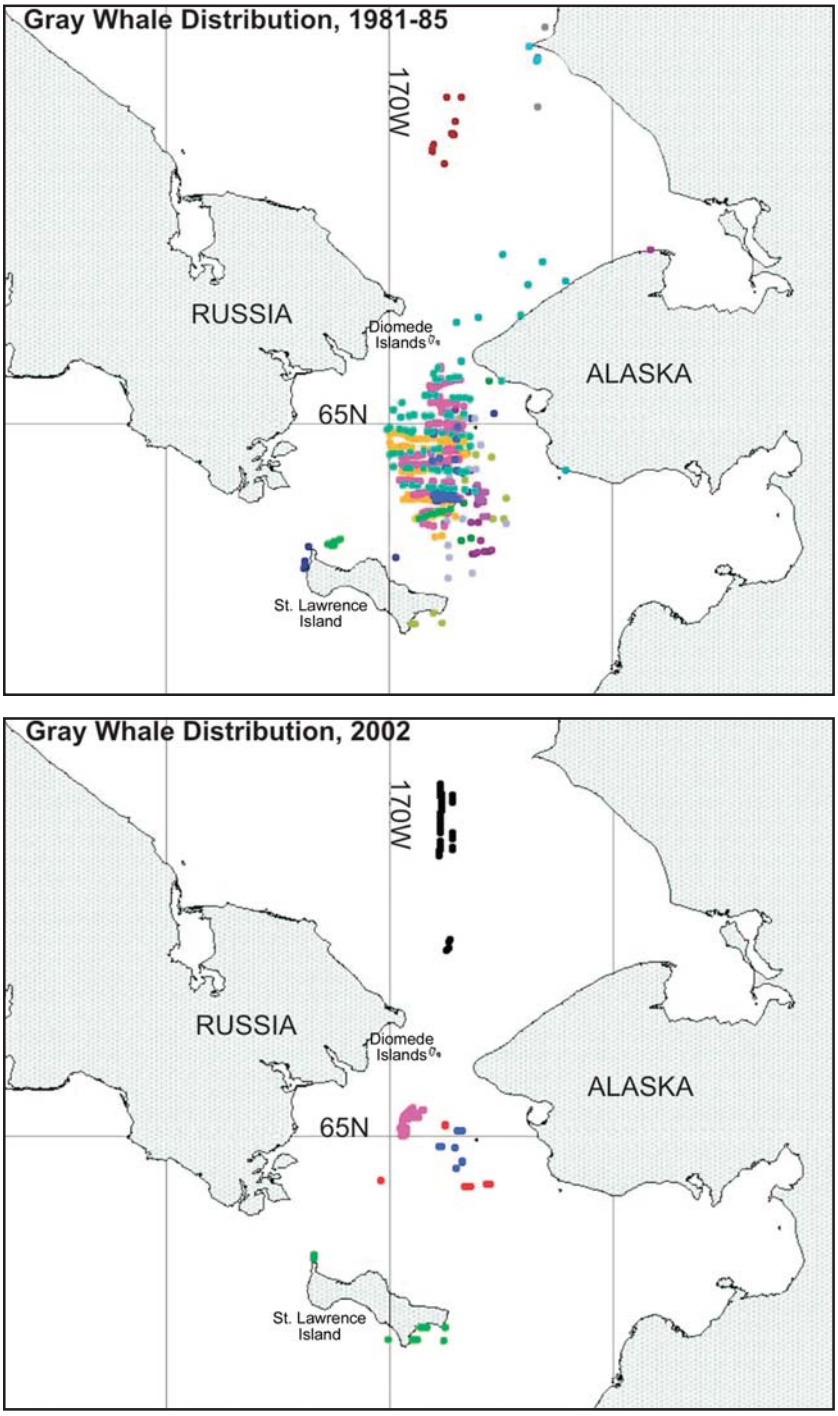
Research on the Cook Inlet beluga whale stock has been conducted annually since 1993. This stock was designated as depleted under the Marine Mammal Protection Act in 2000. Scientists from NMML, in cooperation with the Alaska Beluga Whale Committee, the Cook Inlet Marine Mammal Council, the Alaska Native Marine Mammal Native Hunters Committee, the Alaska Department of Fish and Game, and NMFS's Alaska Regional Office, have estimated the abundance of this relatively small and isolated population each year since 1994. Analysis of sighting data from aerial surveys indicated that the abundance of Cook Inlet beluga whales declined by nearly 50% between 1994 and 1998. Distribution and abundance estimates from annual aerial surveys in 2002 and 2003 indicated that the population was stable but low in number. In 2002, research was directed toward catching whales and outfitting them with radio and satellite tags to determine seasonal movement patterns and correction factors for aerial surveys. A Cook Inlet beluga habitat model, which is in development, is based on satellite tracking data and fatty acids analyses of blubber samples used to determine diet and contaminant burdens.

Since 1999, line-transect surveys for cetaceans have been conducted periodically in the southeast Bering Sea in association with the AFSC/RACE groundfish stock assessment survey. Provisional estimates indicate that fin whales are the most common large whale and that Dall's porpoises are the most common small cetacean in these waters. Fin whales are common on the Middle Shelf (50–100 m) and Outer Shelf (100–200 m) domains of the southeastern Bering Sea, with large feeding aggregations noted near canyons along the Bering Sea slope. Dall's porpoises, too, are most abundant along the Bering Sea slope. Cetaceans are generally good indicators of oceanographic productivity because to feed efficiently they must locate dense prey aggregations. Thus, baleen whale harvests during the commercial whaling era have been used to document hydrographic patterns associated with areas of zooplankton and forage fish abundance. Alternatively, odontocete distribution likely reflects patterns of higher-order productivity associated with nektonic prey. Overall, the distribution and abundance estimates available from the line-transect surveys in the southeastern Bering Sea suggest that baleen whales are reoccupying productive hydrographic zones in patterns similar

to those depicted in summaries of commercial whaling harvests. Observations of cetacean distribution and estimates of cetacean abundance from surveys completed to date offer a beginning for the incorporation of whales and porpoises in ecosystem-based research plans for the Bering Sea.

Patterns of habitat change in the northern Bering and Chukchi seas have been investigated for gray and bowhead whales. In the 1980s the Chirikov Basin north of Saint Lawrence Island in the northern Bering Sea was considered a prime gray whale feeding area, but an unusual mortality event in this species in 1999–2000 precipitated concern that this area no longer supported a viable benthic forage community. In 2002 a provisional five-day survey for gray whales revealed restricted distribution in the basin and a 3- to 17-fold decline in sight rates. To put these data in context, a retrospective summary of gray whale and benthic fauna distribution was undertaken. Available measures of biomass suggest a downturn in productivity from 1983 to 2000, when estimates of gray whale population size suggested that the population began to expand. Sighting rates for gray whales were highest north of Bering Strait during the 2002 survey, suggesting the whales may simply be moving north following prey availability.

Bowhead whales are ice-adapted baleen whales, the only species endemic to Arctic waters. To examine how sea ice changes may be affecting bowhead whale habitat, trends in sea ice cover were examined over a 24-year period (1979–2002) in habitats identified as important to migration, feeding, and over-wintering. Significant increases in open-water areas were identified for small regions associated with feeding opportunities but not in areas used during migration and over-wintering. High interannual variability, together with consistent shifts to earlier and longer (i.e., June to November) ice-free or light-ice conditions, may alter foraging opportunities or prey availability. The evaluation of sea ice cover at spatial and temporal scales linked to bowhead whale natural history provides a first step towards developing conservation insights regarding the potential effects of climate change on this pagophilic species.



Gray whale distribution in the northern Bering and Chukchi Seas in the early 1980s and in 2002. The colors indicate different days and years of aerial surveys.

Pinnipeds

Five species of pinnipeds are associated with sea ice in Alaskan waters, including walruses and four species of "ice seals"—bearded, ringed, spotted, and ribbon. NOAA has management responsibility for the ice seals, each species of which depends at least in part on sea ice to rest, give birth, and molt. Ribbon and spotted seals are thought to prefer the loose ice in the Marginal Ice Zone (MIZ), which occurs between nearly solid floes and open sea water. Conversely, bearded seals, ringed seals, and walruses are commonly found in zones where ice covers over 50% of the sea surface.

Bowhead whales.

Results of aerial surveys conducted south of St. Lawrence Island found that both ringed seals and walruses preferred large ice floes (larger than 48 m in diameter), while spotted seals were found on smaller ice floes (smaller than 20 m in diameter) near the MIZ. Ringed seals were found in areas with more than 90% sea ice cover and bearded seals preferred 70–90% ice cover. All species, except spotted seals, were associated with a region where benthic biomass was especially high.

Bearded seal.

In recent decades, Alaska harbor seals have declined dramatically in some regions, while their numbers have increased in some other regions. The primary objectives of NMML's research on this species are to obtain data on the abundance of the species throughout Alaska and to collect information on haulout patterns that can be used to better interpret abundance information. In 2002 and 2003 the NMML produced peer-reviewed papers describing the abundance of harbor seals in the Gulf of Alaska and the stability of harbor seal haul-out patterns. In addition, research was undertaken to determine the response of harbor seals to cruise ships and to determine the genetic relatedness of harbor seals via molecular genetic techniques. Obtaining information on Alaska harbor seals is critical, as they are an important component of the Alaska Native subsistence harvest. A co-management agreement, signed by the Alaska Native Harbor Seal Commission and NMFS, has charged the Harbor Seal Co-management Committee to prepare an Annual Action Plan for this culturally important species.