Spatio-temporal Changes in Beluga Whale, *Delphinapterus leucas*, Distribution:

Results from Aerial Surveys (1977-2012), Opportunistic Sightings (1975-2012), and Satellite Tagging (1999-2003) in Cook Inlet, Alaska

Kim E. W. Shelden
National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA

Kimberly T. Goetz
National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA

David J. Rugh
National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA

Donald G. Calkins
North Pacific Wildlife Consulting LLC, Anchorage, AK

Barbara A. Mahoney
Alaska Regional Office, NOAA, NMFS, Anchorage, AK

Roderick C. Hobbs
National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA

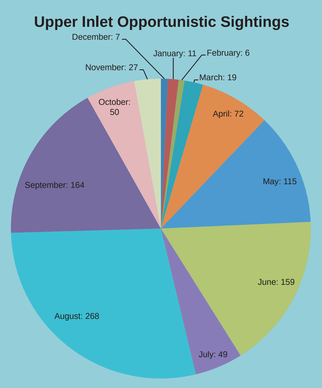
Abstract:

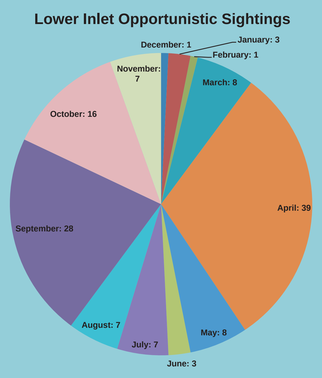
Cook Inlet, Alaska, is inhabited year-round by a small, distinct population of beluga whales, Delphinapterus leucas. This endangered population lives in close proximity to Anchorage, the largest city in Alaska, and waterways frequented by fishing fleets, container ships, oil and gas development, and military operations. The summer distribution of this population has been studied extensively, particularly in June, but little has been documented during other seasons of the year. This review includes results from aerial surveys, satellite tagging studies, and opportunistic sightings.

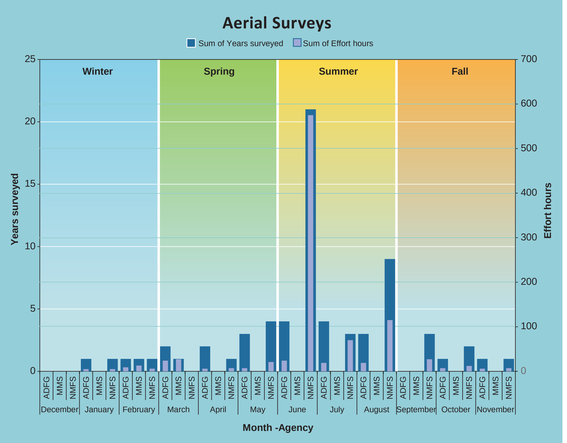
- Beluga whale sightings reported by the public, aircraft patrols, and other wildlife surveys have been collected by the National Marine Fisheries Service since 1975.
- Systematic aerial surveys documenting beluga distribution in Cook Inlet were conducted by the Alaska Department of Fish and Game (1977-1979, 1982-1983), Minerals Management Service (1997), and the National Marine Fisheries Service (1991, 1993-2012).
- Beluga whales were tagged with satellite-linked, time-depth recorders during each summer from 1999 to 2002.

Results from these datasets show that since the decline of this population in the 1990's, its range has contracted into the upper inlet (north of East and West Foreland) not only during June, but also during the later summer months and into fall. Dispersal of large numbers of whales into lower inlet waters in the fall was not evident in the later years of the NMFS surveys. Tagged whales still transmitting locations by the end of the fall had remained in or returned to the upper inlet. This differs markedly from surveys in the 1970's, when whales began to disperse into the lower inlet by midsummer.

The combination of poor sighting conditions (low light levels in winter and white whales among ice floes) and whale behavior (close association with ice, longer, deeper diving patterns, and smaller groups) made it difficult to ground truth or even detect groups during winter and early spring. Combining satellite-tagging with acoustic monitoring and aerial ground-truthing of real-time detections may be the best option for quantifying habitat use patterns during these seasons. Based on our review, additional studies are needed to better quantify habitat use patterns during seasons other than early summer.



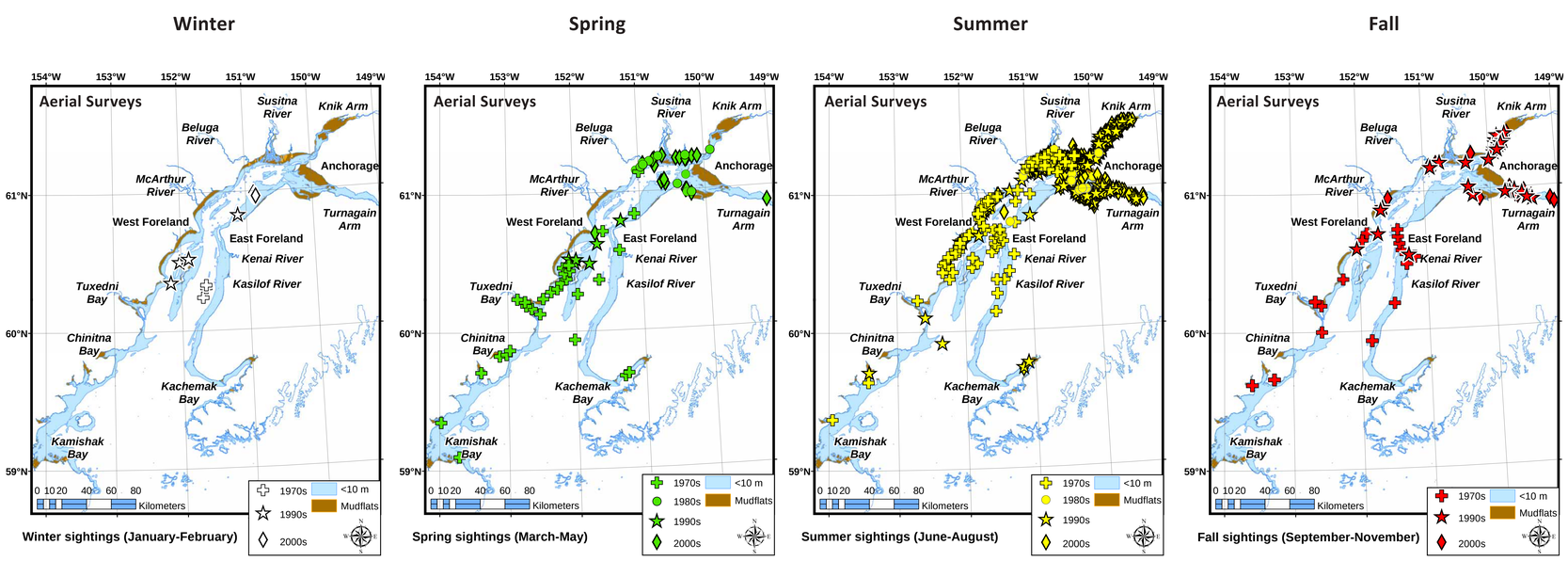


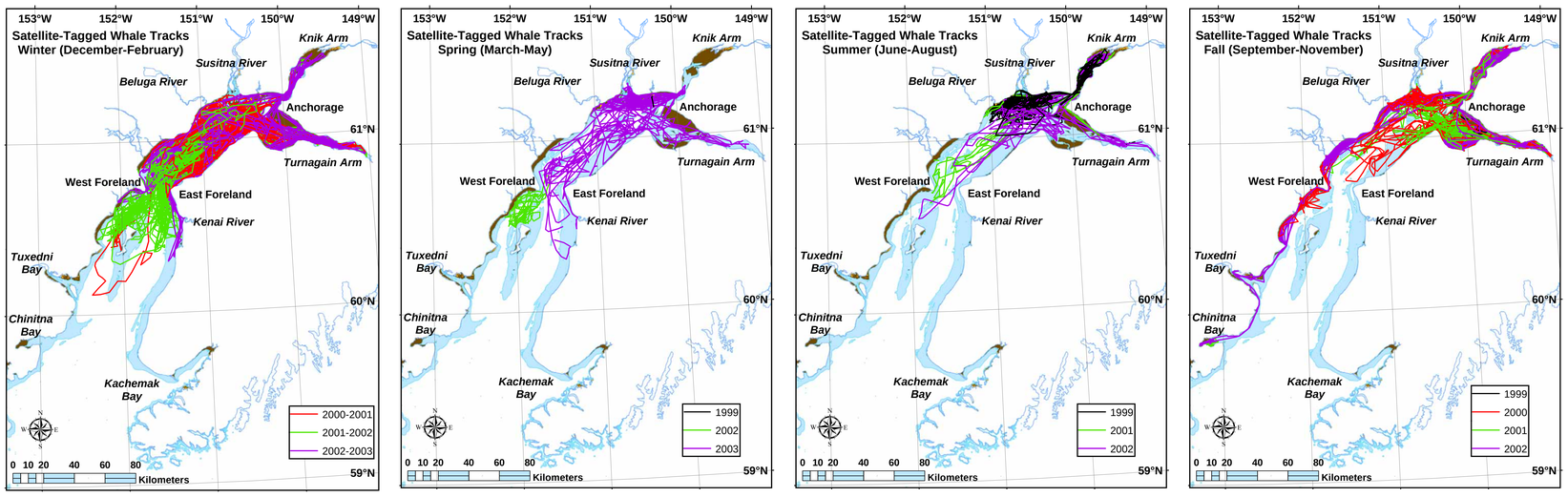


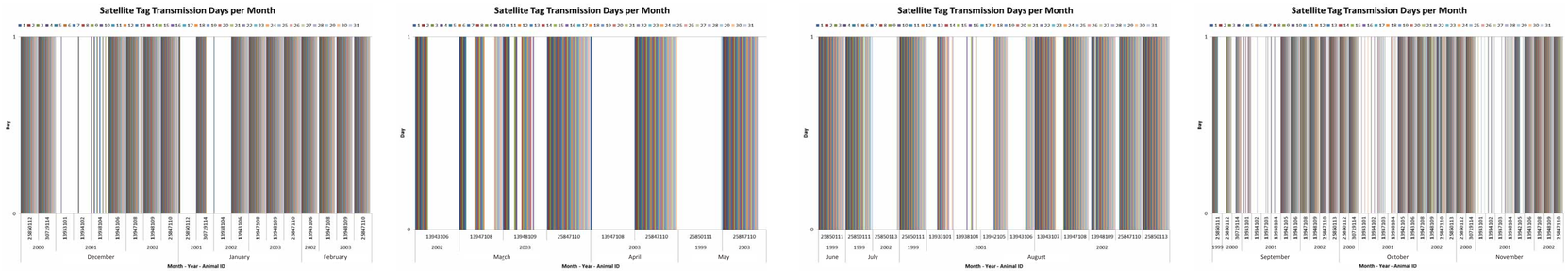
Conclusions:

Although belugas do inhabit mid inlet waters and bays in the lower inlet, sightings south of the Forelands have been relatively rare in the past two decades. This contraction in range was observed not only during the summer months but also into the fall during the later period of this seasonal study.

It is unknown if this contracted distribution is a result of changing habitat, prey concentration, or predator avoidance, or can simply be explained as the contraction of a reduced population into a small number of preferred habitat areas. Habitat associations during the early summer period have been studied, and note negative associations with sources of anthropogenic disturbance and positive associations with fish availability, and access to tidal flats and sandy substrate. The apparent shift to remaining in the upper inlet exposes beluga whales to potential natural and anthropogenic threats such as ice entrapment, stranding, vessel traffic, coastal development projects, dredging, and increased proximity to urban runoff and waste from the largest city in Alaska.







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BOEM Bureau of Ocean Energy Management

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