



**NOAA
FISHERIES**

Alaska Fisheries Science Center

Protected Species Science Program Review

Theme 5: Small Cetacean Science

Cook Inlet Beluga Whales



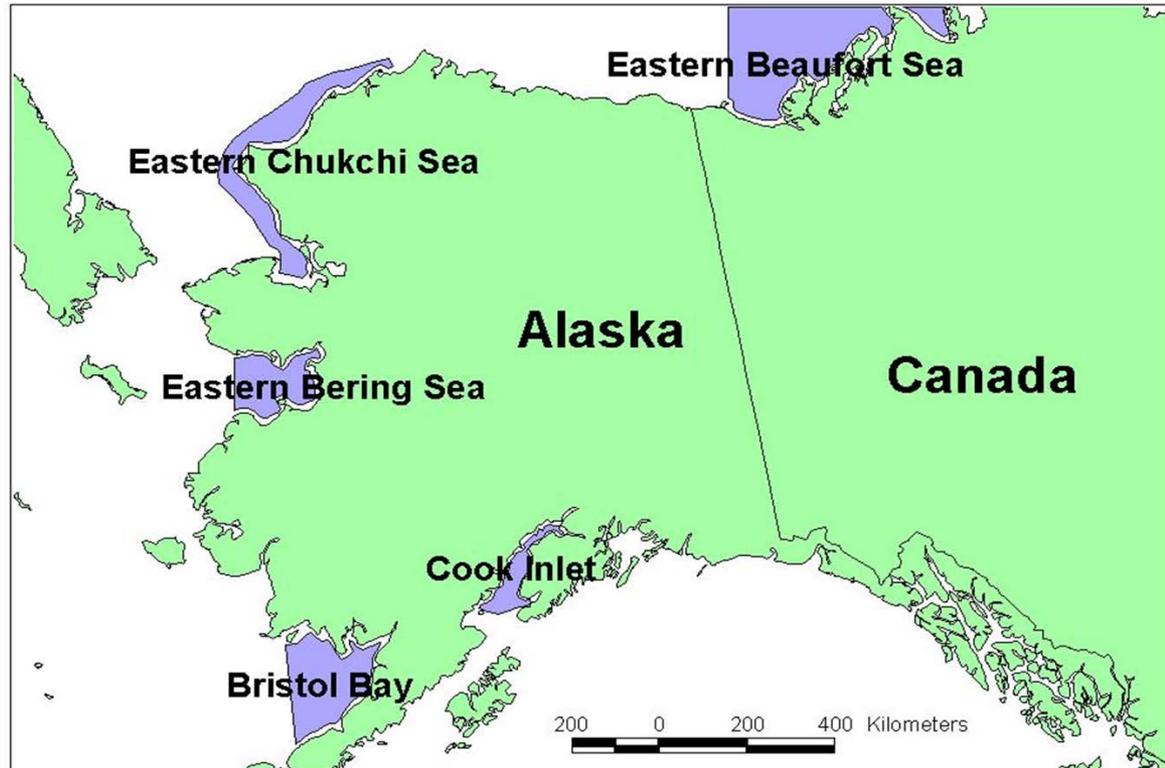
Cetacean Assessment and Ecology Program

Rod Hobbs, Beluga Project Leader

16-20 March 2015



Beluga (*Delphinapterus leucas*)

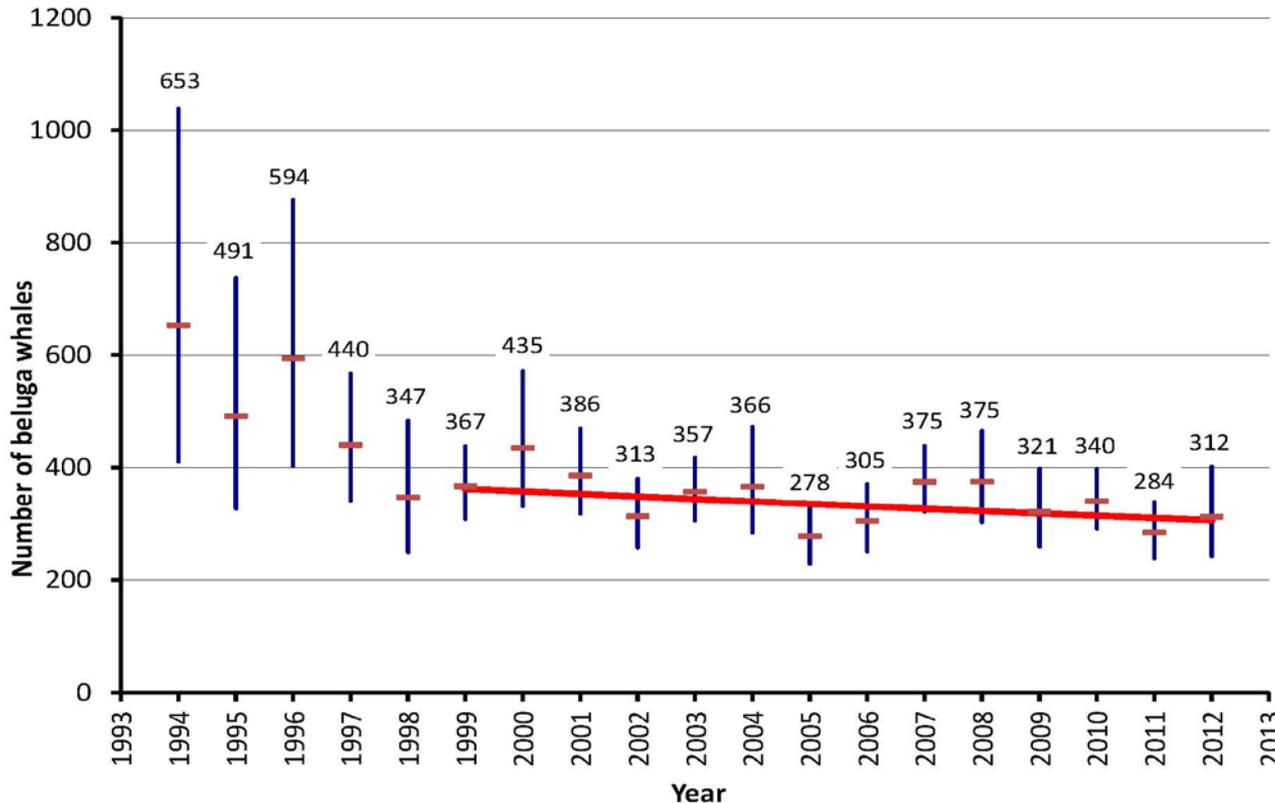


Beluga whale stocks in Alaska

- 5 stocks
- Most are stable or increasing
- Migratory vs. non-migratory



Beluga (*Delphinapterus leucas*) Cook Inlet Abundance and Trends



- June 2012 Abundance is 312, CV = 0.13
- 1994-1998 Unregulated subsistence hunt.
- Hunt regulated in 1999 and after.
- Trend since 1999 is -1.3% per year (SE = 0.8%).



Beluga (*Delphinapterus leucas*)



Legal status:

Cook Inlet is endangered under the ESA as a distinct population segment and depleted/strategic under the MMPA. Recovery Plan is in preparation.

Potential threats (all stocks):

1. Native subsistence hunt
2. Fishery interactions
3. Industrial development
4. Ship traffic
5. Climate change





Beluga (*Delphinapterus leucas*)

Overview of AFSC Research



Beluga whale stocks in Alaska

Cook Inlet:

1. Abundance & trend
2. Calving indices & other vital rates
3. Population Viability Analysis
4. Movement and Distribution
5. Habitat modeling
6. Acoustic monitoring
7. Photo identification

Bristol Bay:

1. Health Assessment
2. Movements and Habitat use

Chukchi Sea (BOEM funded):

1. Acoustic monitoring
2. Abundance and Distribution



Beluga (*Delphinapterus leucas*)

Objective 1: Abundance & Trend

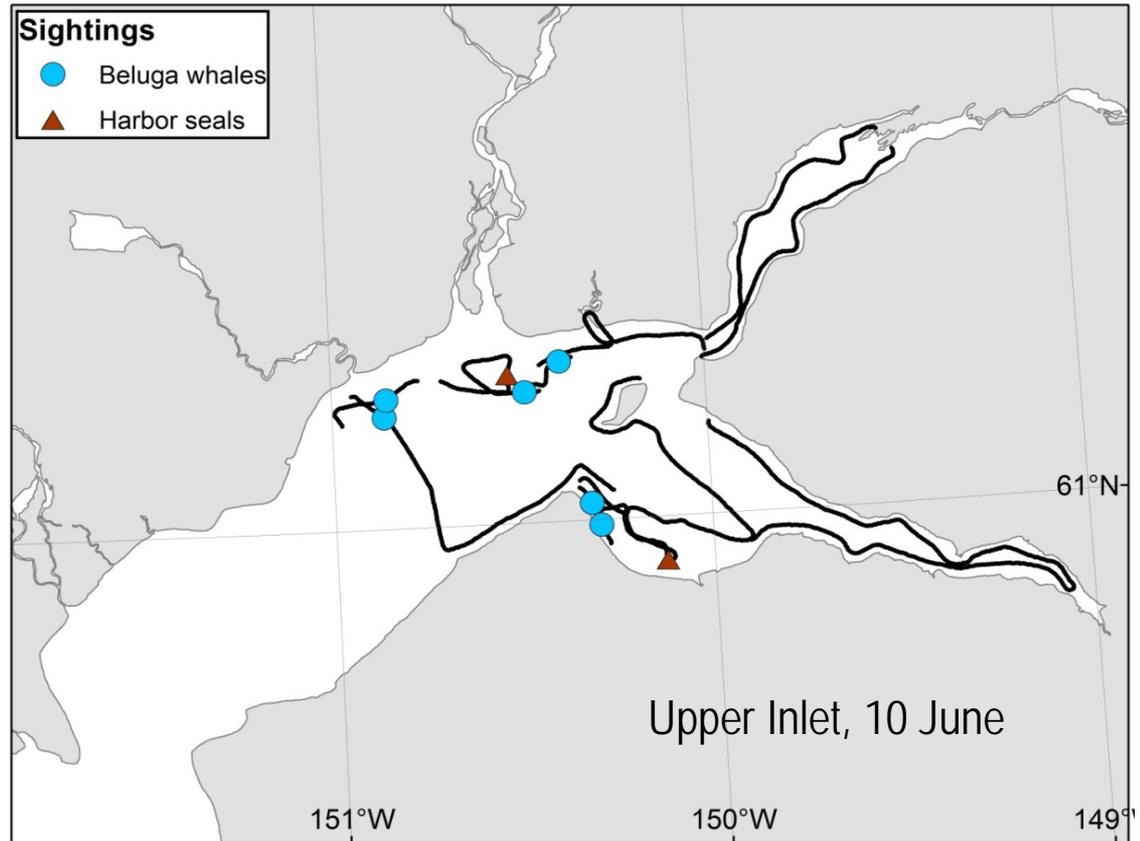
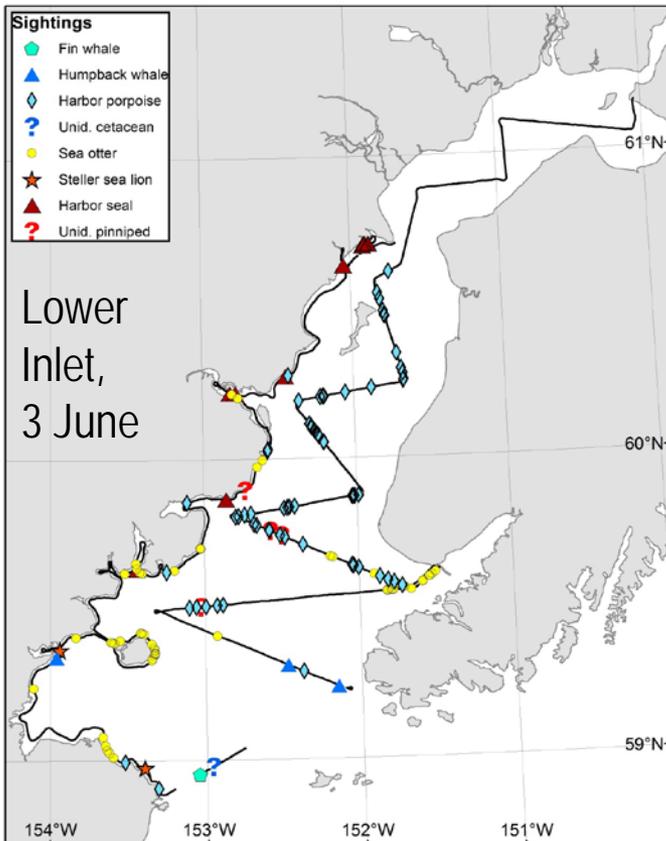
- Biennial aerial survey of Cook Inlet beluga whales.
- Monitors abundance of population.
- Provides consistent independent estimates suitable for trend analysis.
- Ten year trend required for management of hunt.
- 20 year trend proposed as recovery criterion.
- Partners: NMFS-AKR, JBER



Beluga (*Delphinapterus leucas*)

Objective 1: Abundance & Trend : Methods and Data Quality

8-10 aerial survey days , single survey of lower inlet (2 days) multiple independent surveys of upper inlet.

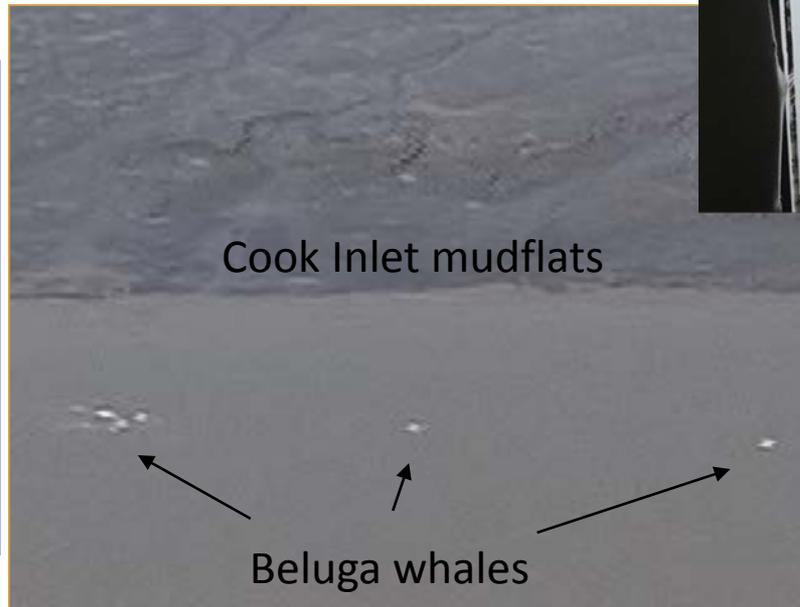




Beluga (*Delphinapterus leucas*)

Objective 1: Abundance & Trend : Methods and Data Quality

- Video data and observer counts are used to determine corrections for availability and perception and to estimate group sizes which are summed and averaged to estimate abundance.
- CV's of abundance estimates range between 8% and 13%

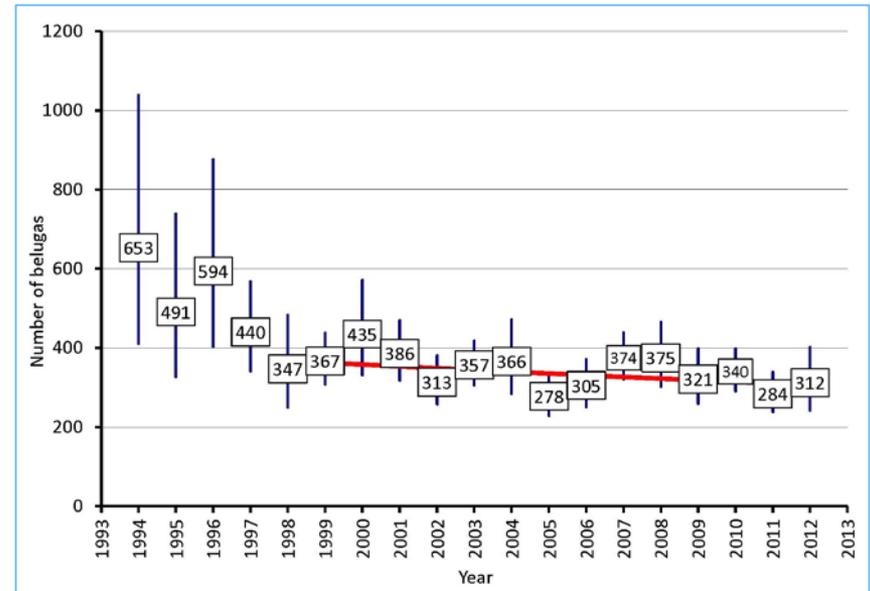




Beluga (*Delphinapterus leucas*)

Objective 1: Abundance & Trend : Strengths and Weaknesses

- Frequent surveys allow measurement of losses from catastrophic events.
- High precision allows precise trend estimation and identification of small changes in trend over 10 to 20 year time interval.
- High precision supports inference from analysis of time series to test hypotheses regarding mechanisms affecting population growth or decline.



- Monitoring does not provide the biological data necessary to resolve mechanisms of decline.
- Distribution data limited to a few weeks of the year.



Beluga (*Delphinapterus leucas*)

Objective 2: Population Biology

- Measuring vital rates such as calving and survival and assessing population health are first steps to identifying mechanisms contributing to the decline of this population.
- Changes in vital rates, health and condition precede changes in trends of a population allowing earlier determination of impending recovery or further decline.
- Measures of health and condition in wild belugas are not well established thus techniques developed or calibrated for these projects provide valuable tools for study of Cook Inlet belugas as well as other small cetaceans.



Beluga (*Delphinapterus leucas*)

Objective 2: Population Biology -- Partners

NMFS Alaska Regional Office

Northwest and Alaska Fish. Science Ctr.

NMFS Office of Protected Resources

NMFS Beaufort Laboratory

National Inst. Standards and Technology

Alaska Beluga Whale Committee

Bristol Bay Native Association

North Slope Borough

Alaska Sea Life Center

Alaska Department of Fish and Game

Alaska Veterinary Pathology Services

Georgia Aquarium

Mystic Aquarium

Shedd Aquarium

Utresh Aquarium

Department of Fisheries and Oceans Canada

Alaska Pacific University

Florida Atlantic University

Marine Med

LGL Alaska



Beluga (*Delphinapterus leucas*)

Objective 2: Population Biology: Calving Index

- From 2006 to 2012, August calf surveys were conducted in Cook Inlet following the procedures of the June survey



- The calf index is estimated from a zoomed video subsample of each beluga group looking for newborns and yearlings.



Beluga (*Delphinapterus leucas*)

Objective 2: Population Biology, Population health assessment

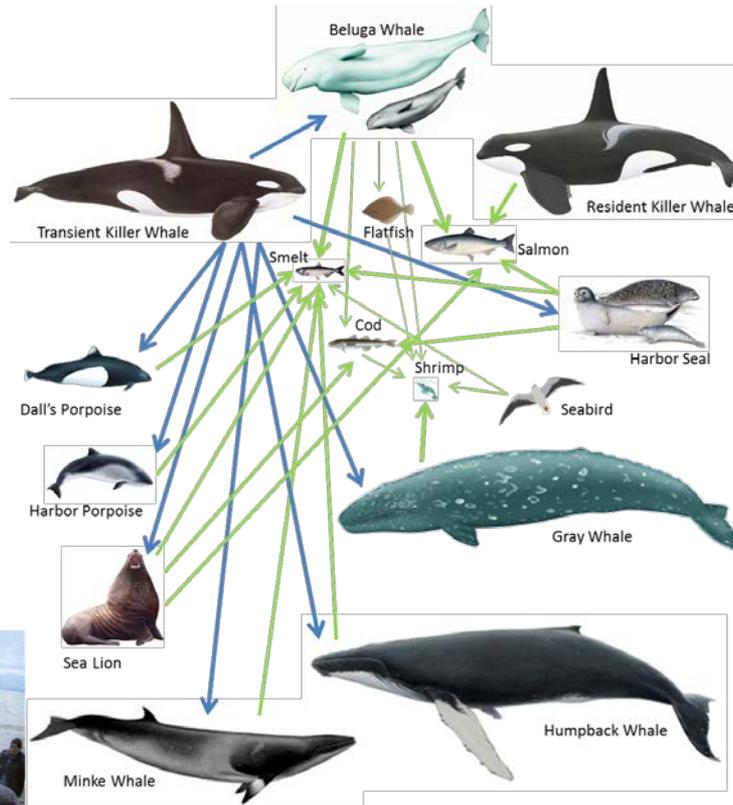
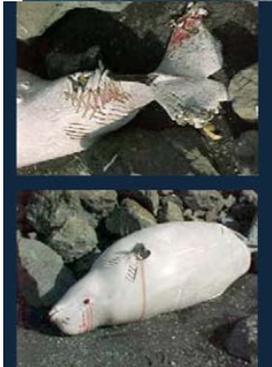
Bristol Bay beluga health assessment captures up to 10 whales per year in Bristol Bay and draws blood, collects skin, blubber, blow, gastric, urine and fecal samples, measures hearing and attaches a satellite transmitter.





Beluga (*Delphinapterus leucas*)

Objective 3: Population Viability Analysis



Cook Inlet Food Web





Beluga (*Delphinapterus leucas*)

Objective 3: Population Viability Analysis

- Uses a mathematical representation of the population to compare among different stressors, impacts and environmental variables on the population to determine which have the greater or lesser affect on the probability of recovery or further decline.
- AFSC has investigated a number of different mortality and reproductive models to estimate the current risk of extinction and probability of recovery as well as hypothetical population responses to changes in vital rates and single events such as disease outbreaks and toxic spills.



Beluga (*Delphinapterus leucas*)

Objective 4: Habitat Modeling

- Range Contraction:
based on historic and current aerial survey data, opportunistic sightings, and satellite-tagging data
- Preferred Summer Habitat:
based on NMFS aerial surveys in June
- Movement & Dive Behavior:
based on satellite-tagging data



Beluga (*Delphinapterus leucas*)

Objective 4: Habitat Modeling

- Range Contraction:
based on historic and current aerial survey data, opportunistic sightings, and satellite-tagging data
- Preferred Summer Habitat:
based on NMFS aerial surveys in June
- Movement & Dive Behavior:
based on satellite-tagging data



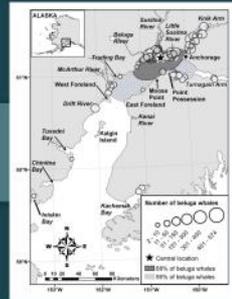
Beluga (*Delphinapterus leucas*)

Habitat Modeling: Range Contraction

Northward contraction in range



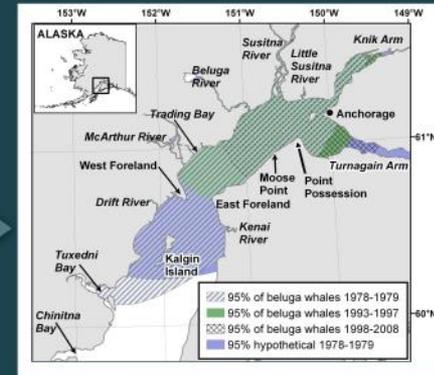
1978-1979
7,226 sq.km



1993-1997
3,715 sq.km



1998-2008
2,806 sq.km



Area used reduced from
100% to 51% to 39%

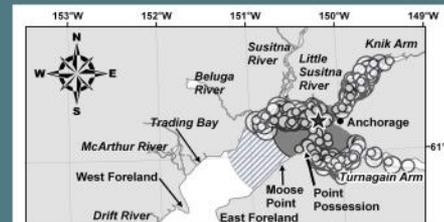
While Susitna delta density remains about the same



1978-1979
N = 251, 43% of belugas



1993-1997
N = 337, 58% of belugas

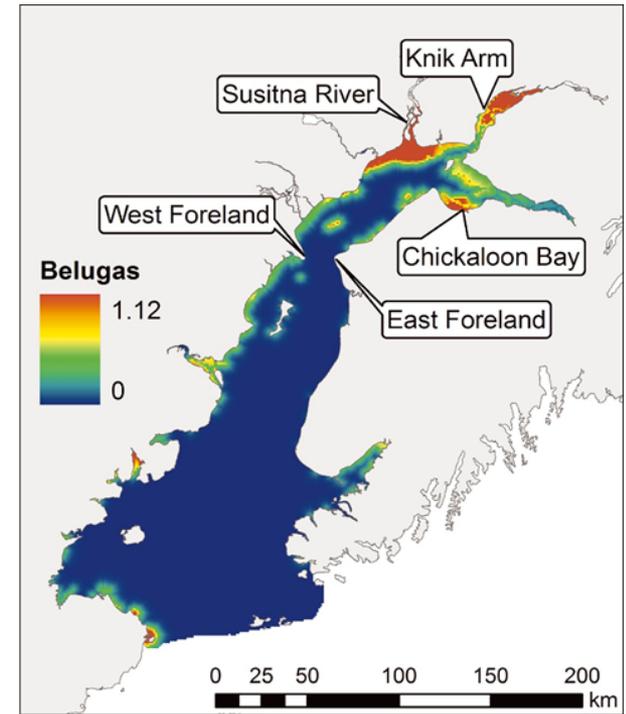
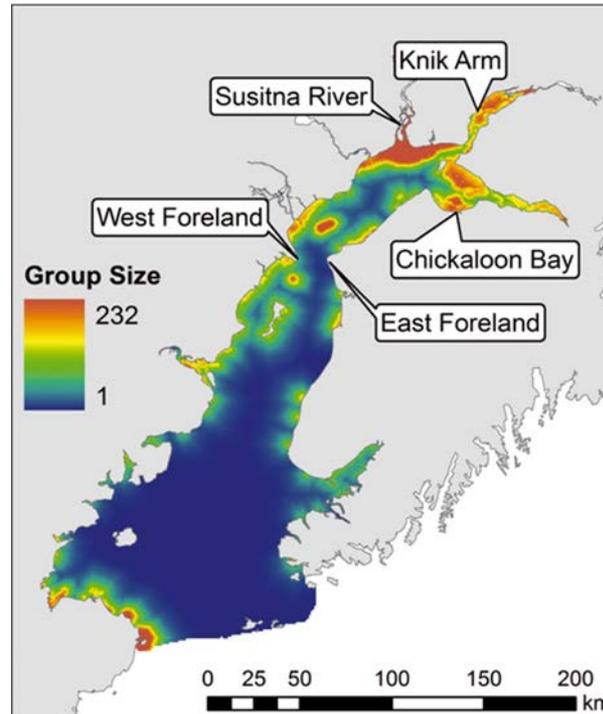
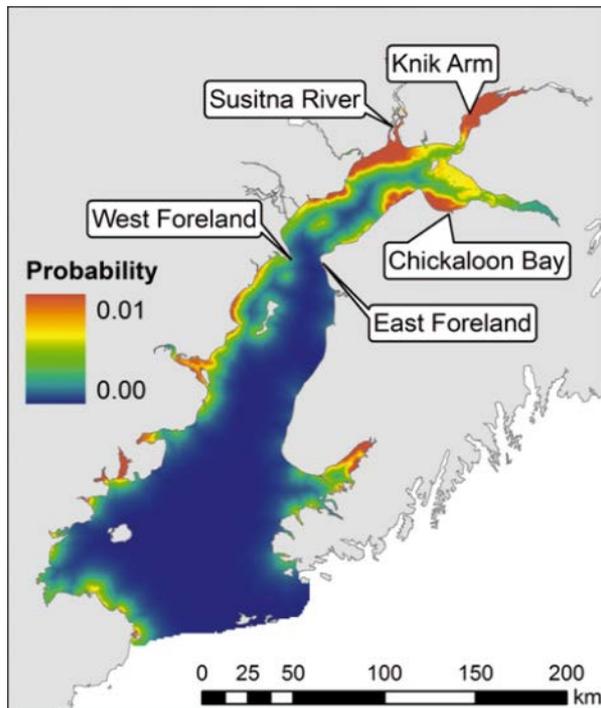


1998-2008
N = 172, 50% of belugas



Beluga (*Delphinapterus leucas*)

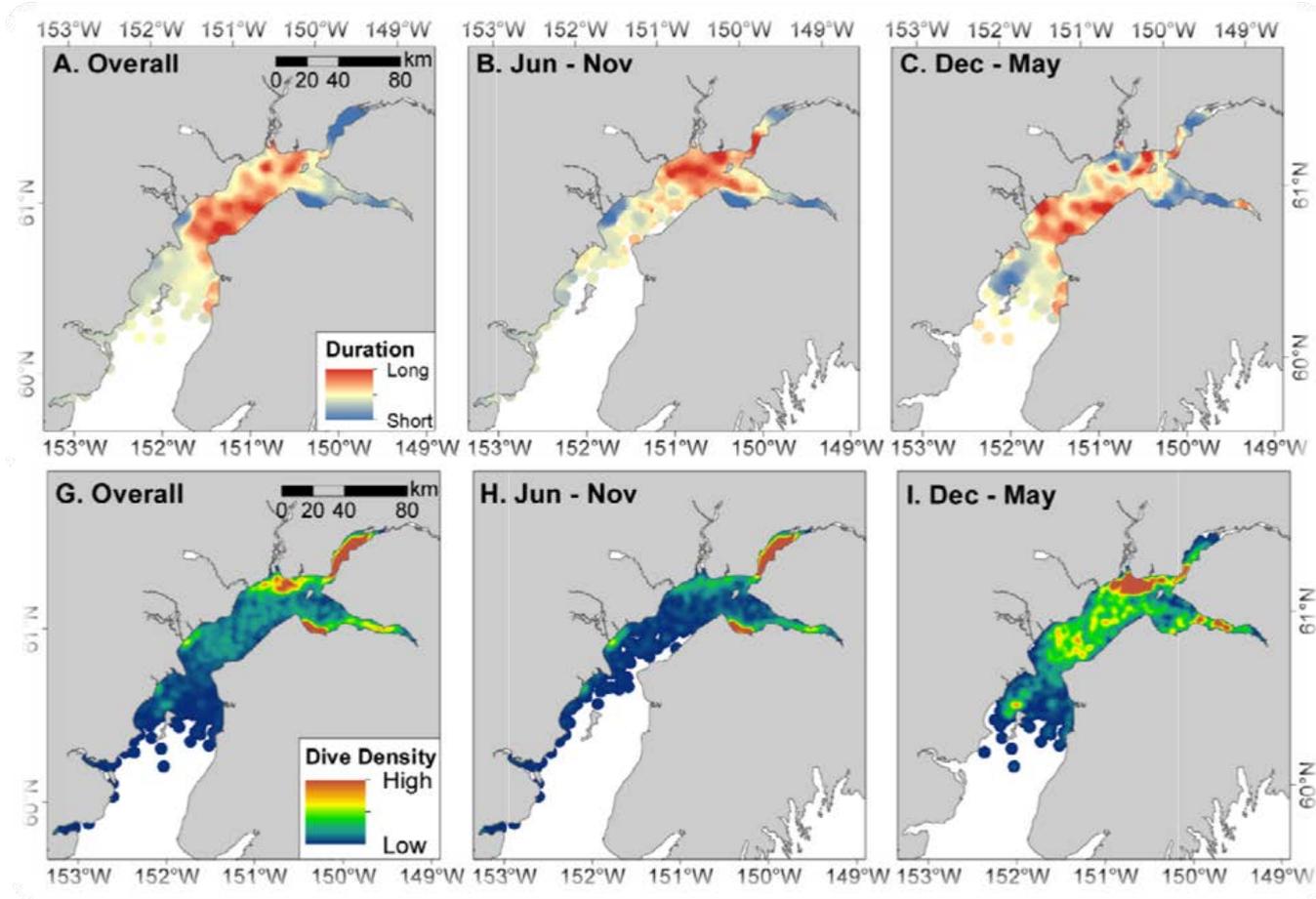
Habitat Modeling: Preferred Summer Habitat





Beluga (*Delphinapterus leucas*)

Habitat Modeling: Satellite-tagging data





Beluga (*Delphinapterus leucas*)

Communication

- Publications:
Marine Fisheries Review special issue on belugas.
- Conferences & Workshops:
AMSS, SMM, Biopsy Wkshp, CI Public Outreach Mtg., ABWC.
- Section 7 & IHA Consultations, BiOps, Recovery Plan, Co-management Agreements:
Maps & data provided to AKR.



Beluga (*Delphinapterus leucas*)

Access

- Data:

Currently raw data is not available. Subsets by area and time as well as analytical results are made available in response to requests.

- Analysis:

Methods and results are available in processed reports and peer reviewed publications. Density grids will be available on line and data with appropriate analysis software will be made available eventually.



Beluga (*Delphinapterus leucas*)

Recommendations

- Expand research beyond monitoring surveys

Efforts to identify and quantify threats are limited by research funding. Current funding only covers the cost of monitoring survey.

- Begin biopsy survey of CIB:

A biopsy survey of the Cook Inlet beluga to determine pregnancy rates and collect other individual data has been discussed since 2010. Funding has been and continues to be the major limitation.