

SPECIES in the SPOTLIGHT



FISHERIES

New research on Cook Inlet beluga whales from the Species in the Spotlight Initiative

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Research prior to Species in the Spotlight

- Biennial Aerial abundance survey (MML)
- Boat-based Photo ID (McGuire, LGL)
- Passive acoustics (Section 6 grant to ADF&G, Small and Castellote)



Stable Isotopes (ADE)



Why is the population not recovering?

Life History – fecundity, survival, or both?

Potential Causes



- Contaminants and pollution
 - Only primary treatment of sewage in Anchorage, discharge is directly in beluga travel corridor
- Noise and disturbance
 - Shipping traffic, pile driving at port
- Prey
 - Declines in chinook salmon in Cook Inlet, including closures in the Susitna River this year
- Inbreeding
 - A few birth defects seen in necropsies
- Social disruption from severe decline from over-hunting?

Species in the Spotlight

New and Expanded Research on Cook Inlet belugas

~ 17-19 new projects/analyses

- Analysis and design of the abundance surveys
 (2)
- Modeling projects (2)
- Acoustic monitoring (2-4)
- Biopsy project (5)
- Genetics projects (4)

• Hexacopter photogrammetry and photoidentification (2)

SPECIES in the SPOTLIGHT



Species in the Spotlight

New and Expanded Research on Cook Inlet belugas



• Analysis

- Charlotte Boyd has improved the group size estimation methods for the abundance surveys
- We are reviewing the survey design to make the abundance estimates more robust to assumptions experimenting a few days this summer with a new survey design

Modeling

- Individual based modeling for stock assessment (Eiren Jacobsen, funded by SAAM/S&T at NMFS)
- Individual based modeling for vital rates and and estimation of sample size (Charlotte Boyd, funded by Section 6 Grant to ADF&G, working with Tamara McGuire's photo-ID catalogue)
- Future work Individual based modeling incorporating physiology and prey

Biopsy sampling survey – many partners for analysis of samples (18 samples collected in 2016-17)



- SNPs genotyping for genetic ID of individuals, kinship studies, investigation of inbreeding
 - Kim Parsons, AFSC/NGOS
- Beluga genome project (Cook Inlet and Bristol Bay)
 - Teri Rowles, OPR, analyses done through NIST
- Epigenetic aging (NPRB funding to Scott Baker and Wade)
 - Post-doc Dr. Eleanor Bors (Hatfield/OSU), partnering with Simon Jarman and Steve Horvath
- Stable isotopes for prey preferences (Gina Ylitalo, NWFSC)
 - May be able to also do Fatty Acid Analysis

Biopsy sampling survey – many partners for analysis of samples (18 collected in 2016-17)



- Contaminants (Gina Ylitalo, NWFSC)
 - Emerging pollutants, including endocrine disruptors
 - Verena Gill (AK Region) has completed parallel study of water and fish in upper Cook Inlet
- Skin microbiome analysis (Amy Apprill and Amy Van Cise, WHOI)
 - Research on baleen whales has shown changes in microbes on skin between healthy and compromised whales
- Immune response via gene expression/RNA transcriptomics (Tracy Romano, Mystic Aquarium)
 - Comparison to Bristol Bay and Pt. Lay whales
- Hormone analysis for pregnancy, sexual maturity, stress (Nick Kellar, SWFSC)

2016 Hormone Results (Dr. Nick Keller, SWFSC, NOAA Fisheries)



DL-CIB16-36

DL-CIB16-35

60.00 50.00 40.00 30.00 20.00 10.00 0.00

DL-CIB16-32

DL-CIB16-31

DL-CIB16-34

Blubber Cortisol (ng/g tissue)

2017 CI Beluga Hexacopter Photogrammetry Survey



2017 CI Beluga Hexacopter Photogrammetry Survey





- Three-way Collaboration
 - NMFS AFSC Marine Mammal Lab
 Paul Wade
 - ADF&G provided the boat
 - Justin Jenniges and Tom Gage
 - NMFS SWFSC provided flight team and aircraft
 - John Durban (oversight)
 - Hollis Europe and Jacob Barboro (flight team)

- Aerial Imaging Solutions Hexacopter (APH-22) used for • the project Essentially a flying camera Laser altimeter
- •
- •

Primary areas of operation









CI Beluga photogrammetry study



- 1. Estimate absolute length of blowhole to dorsal ridge
 - Blowhole-to-dorsal fin has previously been shown to correlate linearly with total length in killer whales
- 2. Use paired measurements from other datasets to estimate total length (and age class)
 - Pt. Lay (Robert Suydam)
 - Aquarium whales (POC Tracy Romano at Mystic)
 - CI beluga strandings (added to protocols)
 - Possibly others (e.g. Gulf of St. Lawrence)
- 3. Products
 - Produce an annual calf production index for CI beluga
 - Full sample of age-structure available for model fitting

Age-Length Growth Curves

Gompertz Growth Curve Fit



Cook Inlet Beluga Whale Photo-ID Project run by Dr. Tamara McGuire.



The Cook Inlet Beluga Whale Photo-ID Project has been ongoing since 2005. The goals of the Cook Inlet Beluga Whale Photo-id Project are to promote research and education that contribute to the recovery and conservation of beluga whales in Cook Inlet and to provide information to help manage human activities that might affect the belugas. Using boat and shore-based surveys of Upper and Middle Cook Inlet the photo-id project photographically tracks individual beluga whales identified by natural markings. Over time, sighting histories are compiled for each known individual and researchers are able to learn more about the distribution, habitat use, social structure and reproduction of the Cook Inlet beluga whales.

Scroll down for more information

Collection oblique images simultaneously Matching to CI Beluga Photo-ID catalogue



2017 CI Beluga Hexacopter Photogrammetry Survey

- Aug 1 -8 and Aug 16- 24
- 10 days on the water



- 67 Hexacopter flights, 11 hours flight time, on 11 encounters
 - 16,016 hexacopter photos
 - 18,769 oblique photos
- Processing and matching of hexacopter photos to oblique photos done by Christy Sims and Janice Waite (MML)













2017 CI Beluga Hexacopter Photogrammetry Survey

- Preliminary results:
 - > 913 whales identified across all flights (many repeat individuals)
 - ~ 565 of those IDs also have photo suitable for measurement
 - ~ 462 of those hex IDs also have matched oblique photo
 - **Numbers will go down substantially after photo quality grading
- Should allow Tamara McGuire to link most of her left- and right-side catalogues





