

North Pacific Research Board Progress Report - July 2007

Project #: 632

Title: Distribution, Abundance, and Ecology of Pacific Walruses in the Bering Sea

Principal Investigator(s) and Recipient Organization(s):

Rosa Meehan
U.S. Fish and Wildlife Service
Marine Mammals Management
1011 East Tudor Road
Anchorage, Alaska 99503
rosa_meehan@fws.gov

Chadwick V. Jay, Ph.D.
U.S. Geological Survey
Alaska Science Center
4230 University Drive, Suite 201
Anchorage, Alaska 99508
chad_jay@usgs.gov

Brenda Konar, Ph.D.
School of Fish. & Ocean Sci.
University of Alaska Fairbanks
Fairbanks, Alaska
bkonar@guru.uaf.edu

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Lead Author of Report: S.G. Speckman, C.V. Jay, and B. Konar

Project Summary:

The Pacific walrus (*Odobenus rosmarus divergens*) is a sea ice-dependent pinniped that faces an uncertain future. Little information exists to allow prediction or interpretation of the impacts of Arctic warming on Pacific walruses, their sea ice habitats, or their benthic prey. The U.S. Fish and Wildlife Service (USFWS), in collaboration with the U.S. Geological Survey (USGS) and Russian scientists from GiproRybFlot and ChukotTINRO, carried out a range-wide survey of the Pacific walrus in March and April of 2006, with the primary goal of estimating the size of the population. The survey was unique in that it utilized thermal scanners to enumerate walruses over large geographic areas, and remotely-deployed satellite tags to measure the haul-out behavior of free-ranging walruses. In addition, the survey supported collection of benthic samples for a University of Alaska Fairbanks (UAF) study in an important walrus foraging area. This proposal seeks financial support to examine aspects of Pacific walrus population biology and ecology using data resulting from this complex and highly collaborative field study. The first study component involves collaboration with Russian scientists to integrate survey data collected in U.S. and Russian territories, standardize data analysis, and derive a population estimate of the Pacific walrus. The second study component will examine relationships between walrus haul-out and movement behaviors and their sea ice environment. The third study component will determine whether benthic walrus prey composition, abundance, and biomass within an area of the St. Lawrence Polynya have significantly changed in the past 20+ years.

Progress Summary:

Distribution and Abundance of Pacific Walruses in the Bering Sea

From 30 April to 03 May 2007, the U.S. and Russian walrus survey teams met in Anchorage, Alaska, to further coordinate data processing and analysis that will lead to a single population estimate for the Pacific walrus. Presentations established the current status of data analysis for

the Russian and U.S. teams, and a timetable was determined for the next phase of data analysis that will lead to a preliminary population estimate. The Russian aerial survey team members have processed all thermal data and completed detection of walrus groups. Their survey covered 17% of all ice habitats and 25% of the area around two high-density aggregations of walruses. Groups of two or more walruses were detected by the thermal scanner. They also have completed counting walrus numbers in all photographed groups. A calibration model with an r^2 value of 0.93 was developed that uses 82 walrus groups with matching thermal signatures and photographic counts. Walrus numbers for all thermal hotspots have been estimated. The Russian dataset from the aerial survey in final format has been received by the U.S. team for further statistical analysis. The U.S. aerial survey team developed an improved method for detecting walrus groups in thermal imagery. The new method detects nearly 50% more walrus groups than the original method, including smaller groups under colder environmental conditions. The U.S. team plans to have all thermal imagery and photographic data re-processed and analyzed by 30 September 2007. This goal includes detection of walrus groups in the thermal imagery, counting of walruses in photographs, matching of thermal signatures and photographic counts, and configuration of the dataset into final format. All processing of the tagging data has been completed by the U.S. tagging team, and the final haulout model will be completed by 01 August 2007. A preliminary population estimate without variance of the Russian data will be completed by 01 October 2007, and a preliminary population estimate without variance of the U.S. data will be completed by 01 February 2008. This will require estimation of haul-out probability for all detected groups, estimation of detection probability for the US dataset, and calibration models for both the US and Russian data sets. The next coordination meeting for the U.S. and Russian walrus survey teams is scheduled for early 2008.

Walrus-Sea Ice Relationships in the Bering Sea: Understanding the Importance of Sea Ice as a Foraging Platform

Relations between walrus haul-out state and meteorological variables.

Since the last reporting period, a newer set of meteorological data, at finer temporal and spatial resolution, became available. These data have been downloaded from NOAA's National Center for Environmental Prediction (NCEP), matched with walrus locations, and included in revisions of a generalized linear mixed effects model of walrus haul-out status as a response to weather and time of day. In the 2007 U.S. and Russian walrus survey teams meeting in Anchorage, a timeline was set for implementing the model into the survey's walrus abundance estimate. Further revisions to the model are underway and will be presented to Russian colleagues during the next coordination meeting in 2008.

Relations between walrus movements and sea ice drift.

Walrus movement and haul-out status coincident with sea ice motion data will be used to assess relations between walrus movements and sea ice drift. The walrus data have been compiled. Several conference calls have been made with collaborators of the project to discuss an approach for the analysis. The project requires merging three sets of data: walrus locations, walrus haul-out status, and pending ice motion data processed with the RADARSAT Geophysical Processor System (RGPS) at NASA's Jet Propulsion Laboratory in California. Relevant available RADARSAT acquisition times have been matched to walrus location data to determine approximate sample sizes that might be expected using different merging strategies. A number of data merging strategies have been identified and we will reach a consensus on an analysis approach by end of July 2007.

Evaluation of Walrus Foraging Grounds in the Bering Sea: a Spatial and Temporal Comparison

Benthic biomass and abundance of dominant groups from processed benthic samples collected in 2006 will be compared (within the next 2 months) to Sam Stoker's data collected between 1970-1974 at 9 stations that fall within a similar benthic community as my stations. Preliminary benthic data was presented at the Alaska Marine Science Symposium in Anchorage Alaska in January 2007. The poster was entitled "Prey availability and diet in Pacific walrus (*Odobenus rosmarus divergens*) around St. Lawrence Island". The authors were Tracie Merrill and Brenda Konar. This was our only outreach effort during this time. Stomach samples were also harvested from Savoonga and Gambell in May 2007 during a two week period by native hunters. A total of 34 walrus were taken, but only 7 of them had actual stomach contents in their stomachs. For those walrus which had stomach contents, approximately 5 lb sub-samples of these contents were collected in 1 gallon jars and frozen. These samples are currently being analyzed. At UAF, each sample was defrosted and drained in a paint strainer bag. Each sample was then sieved through 3 and 2 mm sieves. Materials and organisms caught in the sieves were then sorted to the lowest taxonomic distinction. These samples should be completed by the end of July 2007. The frequency, abundance and biomass of prey items is being determined and will be compared to historical stomach data collected from St. Lawrence Island (Fay et al. 1977, 1984, 1989, Fay and Stoker 1982a, b, Sheffield 1997). Since there is no overlap in the 2006 benthic community data and the 2007 harvested walrus stomach data, benthic data will not be compared to stomach data.

Expenses and purchases to date: Funds have been spent to purchase necessary equipment and preservatives for sampling and processing stomach samples (plastic jars, paint strainer bags, Formaldehyde and Isopropyl). Funds have also been spent on contractual services, which consisted of getting stomach samples to UAF from Savoonga and Gambell and to compensate native hunters for their participation in sampling.