

**North Pacific Research Board Progress Report
July – December, 2007**

Project #: 632

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

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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 walrus, 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 walrus over large geographic areas, and remotely-deployed satellite tags to measure the haul-out behavior of free-ranging walrus. In addition, the survey supported collection of benthic samples for a University of Alaska Fairbanks (UAF) study in an important walrus foraging area. This project examines 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 examines relationships between walrus haul-out and movement behaviors and their sea ice environment. The third study component determines 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 (Suzann Speckman, USFWS, 907-786-3479, suzann_speckman@fws.gov)

All processing of the U.S. thermal imagery and photographs has been completed. To improve the ability to detect and classify walrus signatures, a new method was developed that divided the original image into a series of 200 x 200 pixel “tiles.” The temperature histogram of each tile was examined for three characteristics that are descriptive of walrus signatures, and most walrus groups occurred in tiles that exhibited all three characteristics. Once the tiles that likely contained walrus signatures were identified, a cluster analysis was used to identify the pixels that belonged to each walrus group. The new method classified additional pixels in 80% of the 40 walrus groups identified using the original method. An additional 27 walrus groups were identified that had previously been missed. The smallest group size detected went from 16 to 7, and the largest group missed went from 93 to 20. Groups of 20 walruses were detected 25% of the time with the original method, but the new method detected groups of 20 walruses 80% of the time. Although this new method only detected 54% of the photographed walrus groups, these accounted for 85% of the total number of walruses.

In addition to improvement in detection of walrus groups in thermal imagery, the new method does a better job of quantifying the thermal signatures by calculating the thermal index relative to the predominant temperature of the ice present in the tile where the walrus group was located. This approach, which helps account for changes in walrus skin temperatures and the effects of pixel averaging when the ambient temperature is extremely cold, results in a regression equation that better fits the data.

Statistical analyses are ongoing for both the U.S. and Russian data sets. A preliminary combined Russia – U.S. population estimate with variance is expected in June 2008. The next coordination meeting for the U.S. and Russian walrus survey teams is scheduled for June 2008, so that preliminary results can be discussed. A rigorous internal and external review process will be undertaken before the walrus population estimate will be made available to the public. It is hoped that the estimate will be available in late 2008.

Walrus-Sea Ice Relationships in the Bering Sea: Understanding the Importance of Sea Ice as a Foraging Platform (Chadwick Jay, USGS, 907-786-7414, chad_jay@usgs.gov)

Relations between walrus haul-out state and meteorological variables.

Further refinements have been made to input data and the model of walrus haul-out status as a response to weather and time of day. The model uses meteorological data that became available at the beginning of this reporting period, which has finer temporal and spatial resolution than data previously used. The final model, integrated into a full population estimate, will be presented during the coordination meeting for the U.S. and Russian walrus survey teams in June 2008 in St. Petersburg, Russia.

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. Since the last reporting period, a contract was finalized with NASA’s Jet Propulsion Laboratory (JPL) to process relevant RADARSAT ice images with the RADARSAT Geophysical Processor System (RGPS). The contract calls for JPL to identify all images that are less than 12 hrs from available walrus locations, use those walrus locations as the starting point (on those images) for computation of ice displacements, pair with images that have time separations of at least 1 day, track common features where available at the point or within the vicinity (~50 km) of the point, and deliver the ice motion products to USGS for statistical analysis. These tasks have been completed and USGS will review the product and begin a statistical analysis in February, 2008.

Evaluation of Walrus Foraging Grounds in the Bering Sea: a Spatial and Temporal Comparison (Brenda Konar, UAF, 907-474-5028, bkonar@guru.uaf.edu)

Benthic sampling occurred at seven stations south of St. Lawrence Island (61.8° to 63.0° N, -171.4° to -174.0°) from 23 to 30 March 2006. All sample replicates from each station have been sorted and all groups identified to the family level, abundances tabulated, and damp weight determined. Benthic biomass and abundance have been compared to historical data. Significant increases in benthic biomass and abundance from 1970-1974 were found, mainly due to an abundance of Nuculidae. These findings will be presented orally at the 2008 Alaska Marine Science Symposium. Manuscript preparation of this thesis chapter is currently underway in anticipation of publication in the journal, *Polar Biology*.

Stomach samples also were harvested from Savoonga and Gambell in May 2007 by native hunters. Of the 34 walrus taken, only 7 had contents in their stomachs. These stomachs have been sorted and organisms identified, counted and weighed. No significant differences have been found between these samples and historical data (1980s) in terms of frequency, counts or weights of prey items (Fay et al. 1989, Fay and Stoker 1982a, b). However, a significantly higher proportion of walrus sampled in 2007 had empty stomachs compared to the 1980's. This was likely an artifact of selective harvesting and probably not suggestive of food limitation. These results will likely be presented orally at the 2008 Annual Eskimo Walrus Commission Meeting. A draft of this thesis chapter is currently being prepared.

It is anticipated that the graduate student, Tracie Merrill, will defend in Spring 08.

References:

- Fay, F.H., Hills, S. and Quakenbush, L.T. 1989. Determination of the age of walrus taken in the Alaskan subsistence catch, 1985-1987, together with the analysis of reproductive organs and stomach contents from the 1985 sample. Final Report, contract 70181-13097-87. U.S. Fish and Wildlife Service, Anchorage, AK. 81 pp.
- Fay, F.H. and Stoker, S.W. 1982a. Analysis of reproductive organs and stomach contents from walrus taken in the Alaskan harvest, spring 1980. Final report, contract 14-16-007-81-5216. U.S. Fish and Wildlife Service, Anchorage, AK. 86 pp.
- Fay, F.H. and Stoker, S.W. 1982b. Reproductive success and feeding habits of walrus taken in the 1982 spring harvest, with comparisons from previous years. Final report. Eskimo Walrus Commission, Nome, AK. 91 pp.