

Semiannual Progress Report

Project #: F0515
Title: Ice Seal Movements and Stock Structure in a Changing Cryosphere

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Project Summary:

Ice seasonally covers 14,000,000 km² of northern seas and supports an ecosystem that includes spotted, ribbon, ringed, and bearded seals. These ice-associated seals are the main prey of polar bears and have been vital to the subsistence economy of northern people for thousands of years. The sea ice ecosystem and subsistence economies in the arctic are threatened by decreases in sea ice cover associated with climate change. Assessing the impacts on the ice-associated seals requires knowledge of their movement patterns and population biology. Understanding the population structure of ice-associated seals will help the NMFS and Alaska Natives to manage and protect these important components of “the ecologically diverse marine ecosystems of the North Pacific, and provide long-term, sustained benefits to local communities and the nation,” a research goal of the NPRB. A primary need is to understand the vulnerability of local subpopulations of seals to extinction. If immigration occurs from other populations, vulnerability is low, but if immigration is absent or very rare, the potential for local extinction is high. We are using satellite-linked transmitters to determine whether ringed seals return to the same breeding locations in successive breeding seasons, an indication that immigration rates are low. We also have begun to collect and analyze DNA samples as a further indication of the frequency of immigration.

Progress Summary:

Tracking seal movements

During the second half of 2006, we continued to track ringed seals tagged with satellite-linked transmitters in 2005 (13) and in 2006 (12). Seals were tagged near Peard Bay, Alaska in collaboration with the Alaska Ice Seal Committee and the North Slope Borough’s Department of Wildlife Management and north of the Mackenzie River Delta in collaboration with the Department of Fisheries and Oceans (Canada) and hunters from Inuvik, Tuktoyaktok, and Holman Island. To date, all records are consistent with our hypothesis that ringed seals move widely during the open water season, ranging over 1,000 or more kilometers and return to the same breeding locations for the ice-bound season.

Population genetics

To test our hypothesis that ringed seals return to their own birth sites to breed, we have focused our genetic analyses on samples collected during the breeding season. Our field sampling in 2005 and 2006 yielded 151 samples from six locations (Peard Bay and Prudhoe Bay, Alaska; Inuvuk, Tuktoyaktuk, and Holman Island, Canada; and the Bay of Bothnia in the Baltic Sea). Those samples were comprised of skin collected from harvested seals and from molting sites on the ice.

We reviewed data from the specimen catalog for the University of Alaska Museum of the North and identified 1,437 ringed seals specimens collected in Alaskan and Russian waters during the breeding season. In August 2006, we extracted cheek teeth from 162 of those specimens, and we have successfully recovered DNA from those samples. Currently, we are analyzing micro satellite DNA from samples processed at the Applied Technology in Conservation Genetics Laboratory (Central Michigan University) and mtDNA in Dr. David Tallmon's laboratory (University of Alaska Southeast).

Outreach

Results of this study were presented at 13 meetings between July and December 2006:

Research Experiences for Undergraduates seminar, University of Alaska Southeast – 9 August 2006
Video interview with Ron Meyer (documentary film on climate change) – 11 September 2006
Strengthening Our Cities: Mayors Responding to Global Climate Change, Girdwood – 16-18 Sep. 2006
Began mentoring Juneau high school student, Emily Johnson in Science Fair project – 21 September 2006
Wildlife Society, 13th Annual Conference, Anchorage, Alaska – 23 – 27 September 2006
Video interview with Flying Fast Productions (documentary film on climate change) – 11 October 2006
Ice Seal Committee meeting, Anchorage, Alaska – 24 October 2006
NOAA EPP Workshop, Florida A&M University, Tallahassee, Florida – 30 October - 1 November 2006
Climate Camp: Alaska - 30 October – 1 November 2006
Collaborations on Climate Change Research, University Alaska Faculty Workshop – 10 November 2006
Carnivores 2006: Habitats, Challenges and Opportunities, St. Petersburg, Florida – 12-15 November 2006
Municipal League of Alaska (keynote address), Juneau, Alaska – 15 November 2006
North Slope Borough Fish and Game Committee, Barrow – 20 December 2006

This project also is contributing to the education of students. Stephanie Sell has assisted the project in the laboratory and the field as an undergraduate student at the University of Alaska Southeast and - since August 2006 - as a graduate student at Central Michigan University analyzing ringed seal micro satellite DNA. Micaela Ponce, an undergraduate student at the University of Alaska Southeast participated in the 2006 data collection and is contributing to the analysis of satellite tracking data and of mtDNA. Emily Johnson, a student at Juneau Douglas High School, is analyzing satellite tracking data from this study for her science fair project.

Project Personnel and Assistance

Dr. Bradley Swanson, Central Michigan University, is overseeing the extraction and analysis of micro satellite DNA markers. Dr. David Tallmon, University of Alaska Southeast, is overseeing the extraction and analysis of mtDNA. John Moran has taken a researcher biologist position with the Auke Bay Laboratory of NOAA. He continues to participate in data analysis and reporting. Josh London of the National Marine Mammal Laboratory is assisting in the production and display of satellite tracking data. On 15 January 2007, Brendan Kelly will begin a two year assignment (Intergovernmental Personnel Act) as Program Director for Arctic Biology in the Office of Polar Programs, National Science Foundation. The NSF has encouraged him to continue his involvement in ringed seal research.