

## 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 km<sup>2</sup> 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

We continued to track seals via satellite-linked transmitters attached to the hind flippers of 11 ringed seals and 2 bearded seals. The seals were tagged at Peard Bay, Alaska. The seals generally remained close to their original capture sites until the first week of July when the fast ice broke up. They subsequently moved north and east of Barrow, one going nearly 1,000 km to the east in to the Canadian Beaufort Sea. At freeze up in early October, at least six of the ringed seals returned to their tagging sites in Peard Bay, strong evidence of interannual fidelity to breeding sites.

We are developing GIS layers to display the seals' movements, sea ice conditions, and bathymetry.

### Haulout patterns

Preliminary analysis from tagged seals indicated that they hauled out for the majority of most days until the ice broke up in early July (Figure 1). They hauled out rarely in the summer and early fall but began more frequent haul outs at freeze up in early October. These haulout patterns are the first ever collected for ringed seals during fall and winter months.

### Population genetics

We have analyzed DNA at 8 microsatellite loci for 67 ringed seals sampled in their breeding locations. The DNA was extracted from skin samples collected from live animals captured for the tagging study and from molted skin picked up from the ice. The focus of this portion of the study was to test the feasibility of extracting and amplifying DNA collected from molted skin, and the approach proved highly successful. The protocol we developed for sampling DNA from shed skin will allow expansion of the genetic portion of the study and will permit us to obtain large samples from many locations without disturbing seals.

We analyzed the samples using the program STRUCTURE even though sample size was adequate only for the Peard Bay site (Table 1). STRUCTURE indicated that our samples most likely came from two (probability = 0.47) or three genetic populations (probability = 0.51). With the Chukchi Sea (Peard Bay and Pt. Barrow), the Western Beaufort Sea (Prudhoe Bay), and the Eastern Beaufort Sea (Inuvik region) as putative populations, the assignment test assigned the majority of animals (91%) their population of capture (Table 1). It must be emphasized, however, that these results have low statistical power given the small samples at all but one sampling site.

Table 1. Results of an assignment test for ringed seal genetic samples. Seals were assigned to birth locations based on 8 microsatellite loci, and the birth locations are tabulated for each sampling location.

|                             |                 | Population of birth |                 |                 |
|-----------------------------|-----------------|---------------------|-----------------|-----------------|
|                             |                 | Chukchi Sea         | W. Beaufort Sea | E. Beaufort Sea |
| Population<br>of<br>capture | Chukchi Sea     | 30                  | 4               | 0               |
|                             | W. Beaufort Sea | 0                   | 15              | 0               |
|                             | E. Beaufort Sea | 1                   | 1               | 16              |

### Outreach

Results of this study were presented at 6 meetings during between July and December 2005:

20 July 2005 - Alaska Native Ice Seal Committee - Fairbanks

28-29 July 2005 - Climate Change workshop with the Clean Air Alliance and climate researchers from the University of Washington, the University of Alaska, and Columbia University - Seattle

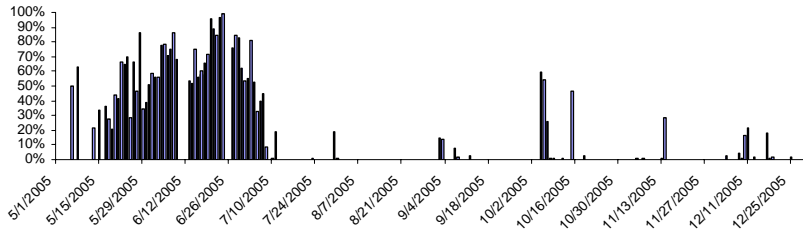
6 September 2005 – Juneau Rotary Club – Juneau

13 October 2005 – Marine Mammal Commission meeting – Anchorage

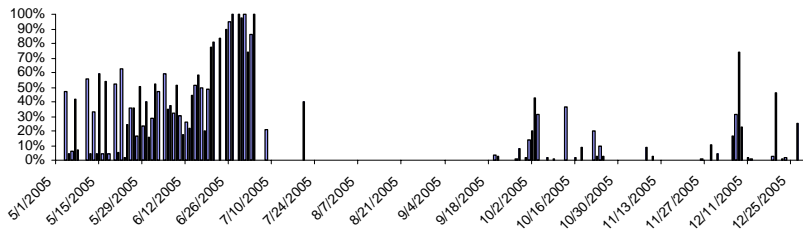
28 October 2005 – U. S. Arctic Research Commission – Portland

11 November 2005 – International Committee on Arctic Research Planning II - Copenhagen

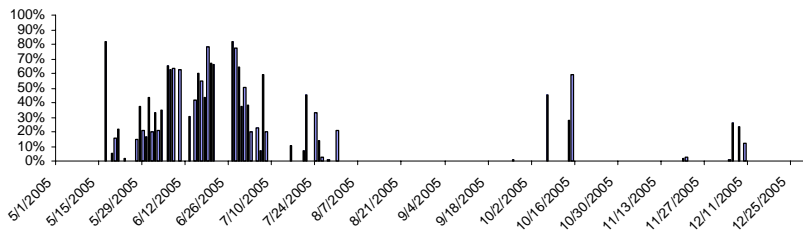
**Adult female**



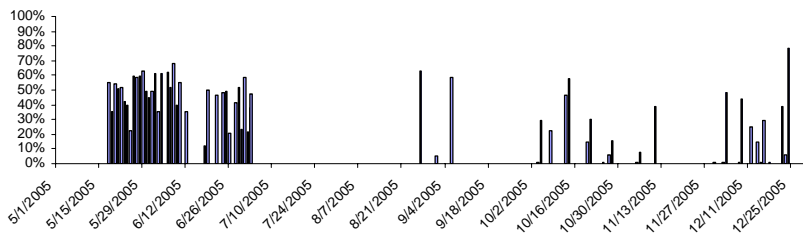
**Adult female**



**Adult male**



**Adult male**



**Adult male**

