

# Glacier Bay Harbor Seal Foraging Ecology Research

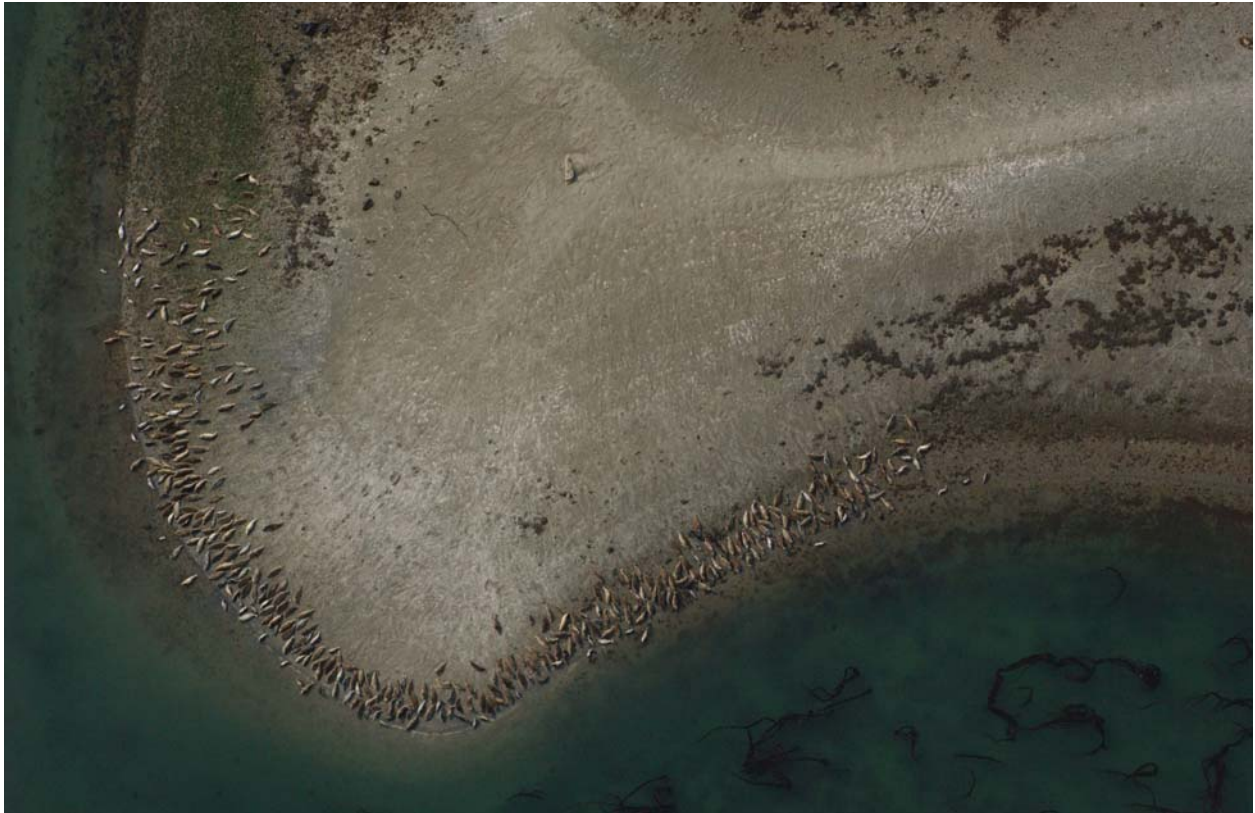
## 2005 Field Season Progress Report

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Harbor seals hauled out at Spider Reef Complex on August 8, 2005 during aerial trend surveys.

## **Background and Objectives**

Glacier Bay National Park has historically supported one of the largest breeding populations of harbor seals in Alaska. Harbor seals are an important apex predator and the most numerous marine mammal in the park. However, harbor seals have declined by more than 70% in the park since 1992 (Mathews and Pendleton *in review*). A multi-agency collaborative study between the National Park Service (NPS), Alaska Department of Fish and Game (ADF&G), and Alaska Fisheries Science Center-Auke Bay Laboratory (AFSC-ABL) began in 2004, aimed at addressing hypotheses relating harbor seal declines in Glacier Bay. The objectives of this report are to provide a brief summary of the 2005 field season focusing specifically upon the harbor seal foraging ecology portion of the study.

## **Harbor Seal Captures and VHF Telemetry and Relocation Efforts**

During April 2005, 30 harbor seals were captured and fitted with VHF headmounts with a subset of those animals also fitted with Time Depth Recorders ( $n = 11$ ). Of the 30 fitted with headmount transmitters, 18 were captured in Johns Hopkins Inlet (3 males, 15 females) and 12 from the Beardslee Islands (7 males, 5 females). Specifically, our objectives were (1) to determine foraging areas of seals captured in glacial ice and terrestrial habitats and (2) to determine prey availability in areas where seals forage.

Through a combination of boat (R/V Capelin) and aerial surveys during May-August 100% of the tagged harbor seals with headmounts were re-located ( $n = 30$ ). Relocations occurred throughout the park, and in Icy Strait.

## **Real-time VHF Tracking and Focal Animal Observations of Harbor Seals**

Foraging areas of harbor seals were determined by conducting real-time VHF-tracking of seals from the R/V Capelin (Figure 1). A total of forty one focal animal observations occurred during 2005. A subset of those observations ( $n = 15$ ) also included fine-scale information obtained from hydro-acoustic prey transects in the areas where the tagged harbor seals were foraging.

Preliminary data analyses suggests that harbor seals captured in Johns Hopkins Inlet traveled farther to foraging areas than harbor seals captured at terrestrial sites in the Beardslee Islands. In some cases, seals traveled over 100 km from JHI to Sitakaday Narrows and Icy Strait to forage. Although several of the harbor seals traveled outside of Johns Hopkins Inlet to forage, one subadult female was found repeatedly foraging near the face of Johns Hopkins and Gilman Glaciers. Some harbor seals were repeatedly located in the same foraging areas on several occasions. For example, a female captured in Johns Hopkins Inlet was repeatedly located foraging in Tidal Inlet (Figure 2), and a male captured at Spider Island Reef Complex repeatedly foraged just south of Spider Island. Three harbor seals (1 adult male, and 2 subadult females) that were captured in Johns Hopkins Inlet, were found foraging in Tarr Inlet. In particular, one male was found foraging in Tarr Inlet near the face of the Grand Pacific Glacier, an area of known high-productivity. **Ultimately, the locations of harbor seal foraging areas will be integrated with data from the TDRs (dive depth) and hydro-acoustic prey surveys and will provide fine-scale foraging ecology information for harbor seals in Glacier Bay.**

### **Harbor Seal Time-Depth Recorder (TDR) Retrieval**

Eleven TDR's (MK9 Archival Tags) were attached to harbor seals in April. The TDR's are archival tags that measure depth, temperature, and light-level every 2 seconds and thus provide a detailed diving record of the seal. To date, seven of the TDR's have been retrieved using both air and boat support. Two TDR's are currently still attached to 2 male adult harbor seals that have been regularly using Spider Island Reef. We expected these TDR's to fall off later in the season as adult males typically molt later than all other sex and age classes of harbor seals. We will continue to closely monitor for the TDR's using air support. During 2004, nine of the 10 TDR's were retrieved. Data analyses are currently ongoing with 2004 TDR data. **TDR data will provide detailed information on dive times and dive depths of harbor seals and will be integrated with foraging locations and prey availability data.**

### **Harbor Seal Hydro-Acoustic Prey Availability Surveys**

In cooperation with Dr. Michael Sigler (AFSC-ABL), we established large-scale hydro-acoustic transects in the Beardslee Entrance and in Johns Hopkins Inlet to determine seasonal prey availability to harbor seals in those areas. Hydro-acoustic transects were conducted each month from the R/V Capelin using a portable Simrad Ek60 echo-integration system. Surveys were conducted at each site from May-August with three replicate transects per month at each site. Preliminary observations indicate that there are diffuse layers of fish available in Johns Hopkins Inlet at starting at about 60-75 meters. In contrast, we have observed dense aggregations of prey as shallow as 11 meters, likely small schooling fishes along the Beardslee Entrance transect. **The large-scale hydro-acoustic transects will provide information related to seasonal prey availability and prey density available to harbor seals which is central to understanding the foraging ecology of harbor seals.**

### **Harbor Seal Trend Surveys**

Aerial photographic surveys were conducted on August 4, 7, and 8, 2005 at 36 sites including all known terrestrial haulout sites and one glacial ice site at McBride Inlet. The largest concentrations of harbor seals at terrestrial sites in Glacier Bay during August trend surveys were at Spider Island Reef Complex, Flapjack Island, and Adams Inlet. Harbor seals were also documented at the Wachusetts outwash (~36 seals on Aug 4). The number of harbor seals on glacial ice in McBride Inlet was highly variable with only 13 harbor seals observed on August 5<sup>th</sup>, ~ 85 seals on August 7<sup>th</sup>, and ~190-200 seals on August 8 (Figure 3), emphasizing the importance of multiple surveys under different conditions (tidal height, time of day, etc). Smaller concentrations (<25 seals) of harbor seals were also observed at Boulder Island, Leland Island, Geikie Inlet, Scidmore Bay, and Queen Inlet outwash. No seals were seen at Kidney Reef, Hutchins Reef, or upper Muir Inlet during August trend surveys. **The harbor seal trend survey data will provide trend data for abundance monitoring of harbor seals in Glacier Bay in relation to other areas in SEAK.**

In addition, to the August trend surveys aerial photographic surveys were conducted every other week at terrestrial haulout sites in the lower bay to document seasonal distribution at terrestrial sites. The seasonal distribution surveys were conducted from May-August in 2004 and from

June – August in 2005. **The seasonal distribution surveys will provide insight into seasonal changes in distribution of harbor seals, as previous surveys prior to 2004 were only conducted in August.**

### **Additional Observations and Field Activities**

#### **Predation Event by Transient Killer Whales on Tagged Harbor Seal**

On June 27, 2005, killer whale researchers, Volker Deecke and Michael de Roos from the University of British Columbia (UBC) observed a possible predation event by transient killer whales on one of our radio-tagged harbor seals ~ 2 nautical miles NW of North Marble Island (58 41.295N, -136 07.665W). The radio-tagged seal was identified by the colors on its VHF-headmount and in digital images taken by the killer whaler researchers (Figure 4). It was identified as an adult male seal that was captured at Spider Island in April 2005. There were 4 transient killer whales, one of which was identified as T085. A humpback whale was also involved in the predation event and is a known whale (#1795) that has been documented in park and Icy Strait by NPS. The harbor seal was most recently observed diving in the nearshore area just east of the entrance to Secret Bay during the week of June 13-17, 2005. The UBC researchers were unable to confirm that the seal was actually killed and eaten; however, the researchers observed the killer whales repeatedly hitting the seal with their tail flukes making it unlikely that it survived. After the predation event we arrived on the scene and monitored the VHF frequency of the harbor seal for ~1 hour; however, we did not detect any signal. We have not relocated the harbor seal since the predation event.

#### **Dead harbor seal retrieved from Lester Island on August 2, 2005**

On August 2, 2005, a dead juvenile harbor seal was retrieved from the shore of Lester Island (58.45942N, -135.92424W) in Bartlett Cove and frozen for later examination. The harbor seal was freshly dead as evidenced by the lack of decomposition. The harbor seal was not marked or tagged. The only obvious external injuries were 2 holes along the each side of the mid-lateral surface on both the right and left side of the body ~ 2.5 cm up from the base of the tail. One hole was approximately 1.1 X 0.8 cm and the larger hole was 2.6 X 1.4 cm. The frozen harbor seal carcass was brought to Juneau and is now in the possession of Aleria Jensen-NMFS Marine Mammal Stranding Coordinator. A marine mammal stranding report was filed with NMFS and NPS. There are plans to conduct a post-mortem exam to determine the cause of death and obtain genetic, toxicology, and physiological samples. NPS-RM has requested that the skeleton of harbor seal be made available to NPS for education and outreach.

*Videography with the Ocean Alaska Science and Learning Center and Alaska Sea Life Center*

From July 6-9, Kelly O'Brien, a videographer from the Alaska Sealife Center participated in field activities with the intent of creating an educational video regarding the harbor seal research in Glacier Bay. Kelly is working with Jim Pfeifferberger, the education coordinator at the Ocean Alaska Science and Learning Center (OASLC), located at Kenai Fjords National Park. The end product would be a video, approximately 5-25 minutes in length aimed at the general lay audience with an interest in wildlife and National Parks. Distribution would include National Park Service visitor centers, Alaska public television, possibly the closed-circuit TV Systems on cruise lines, and other logical outlets. Segments of the video or narration may also be customized to target specific audiences, such as young elementary students, veterinary students, Parkneighbors, fund providers, or other groups that may require a more specialized message. Footage will be supplemented by other filming efforts during the next capture trip in fall and possibly with interviews of park and local staff (including Hoonah natives) this winter.

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Justin Smith (R/V Capelin) provided essential boat and logistical support for the project. Jacques Norvell (Tal Air) was instrumental in providing air support for TDR retrieval and aerial surveys. Dave Csepp provided hydro-acoustic expertise. Lewis Sharman and Susan Boudreau provided administrative support. Monica Becker, Carol Coyle, and Kevin White volunteered during harbor seal tracking trips and provided essential field support. Bill Eichenlaub and Chola Dick assisted with retrieval of a harbor seal carcass from Lester Island.



Figure 1. Jamie Womble using VHF telemetry to track tagged harbor seals in Johns Hopkins Inlet.



Figure 2. A female harbor seal that was captured in Johns Hopkins Inlet that was repeatedly observed diving in Tidal Inlet in June and July 2005.



Figure 3. Harbor seals hauled out on drifting glacial ice in McBride Inlet on August 8, 2005.





Figure 4. Killer whale predation event on VHF tagged adult male harbor seal ~2 nautical miles NW of North Marble Island on June 27, 2005. A humpback whale, identified as #1795 by NPS whale biologists, was also present during the event. Photo by Michael de Roos (UBC).