Strong Seasonal Dynamics of Harbor Seals in Cook Inlet, Alaska

Peter Boveng, Josh London, Jay Ver Hoef, and Robert Montgomery

Alaska Fisheries Science Center, National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115 USA

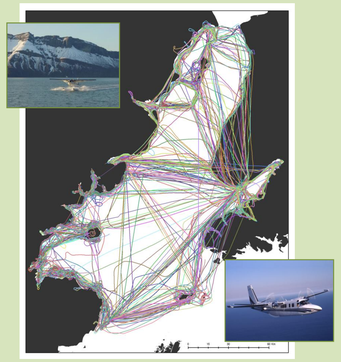
E-mail: peter.boveng@noaa.gov

An intensive study combining aerial surveys and satellite tracking revealed strong seasonal changes in the abundance, distribution, and marine habitat use of harbor seals in Cook Inlet, a major estuarine system in the Gulf of Alaska. We conducted a total of 12 surveys, each about 1 week in duration, in June of 2003-2005, August of 2003-2006, October of 2003-2005, and April of 2004-2005. We deployed satellite-linked dive recorders (SDRs) on a total of 76 seals in September, 2004, May and September, 2005, and May, 2006, to record movements, diving, and time spent ashore. The survey counts were highest in June and August, reflecting this species' well-known propensity to spend time ashore during the pupping and molting periods, respectively. During October and April, when the seals were not constrained by those shore-based life history events, the numbers ashore were only about 35% of the summer counts. These patterns were consistent with the behavior of the seals tagged with SDRs. The tagged seals spent less time ashore, and ranged much more widely at sea during the fall and winter months than during the spring and summer. The movements and haul-out timelines of the tagged seals provided a unique opportunity to account simultaneously for the proportion of seals hauled out and the numbers of seals moving into and out of the survey area as factors in the total abundance of about 15,000 seals, and in the seasonal variation of survey counts. For a coastal species like harbor seals, seasonal changes in abundance and distribution have important implications for predator-prey interactions and for management considerations, such as the risk of impacts from industrial activities and the assessment of impacts from mortality incidental to commercial fisheries.

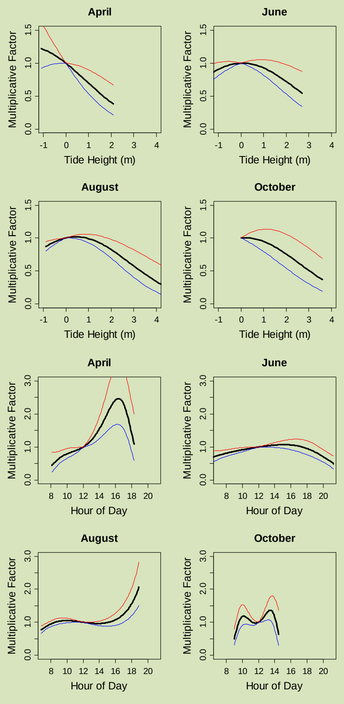
Study Area and Methods

Satellite Telemetry
- Argos geolocation
- 9 Deployment sites
- Sep 2004, May & Sep 2005, May 2006
- 77 seals (40 male, 37 Female)

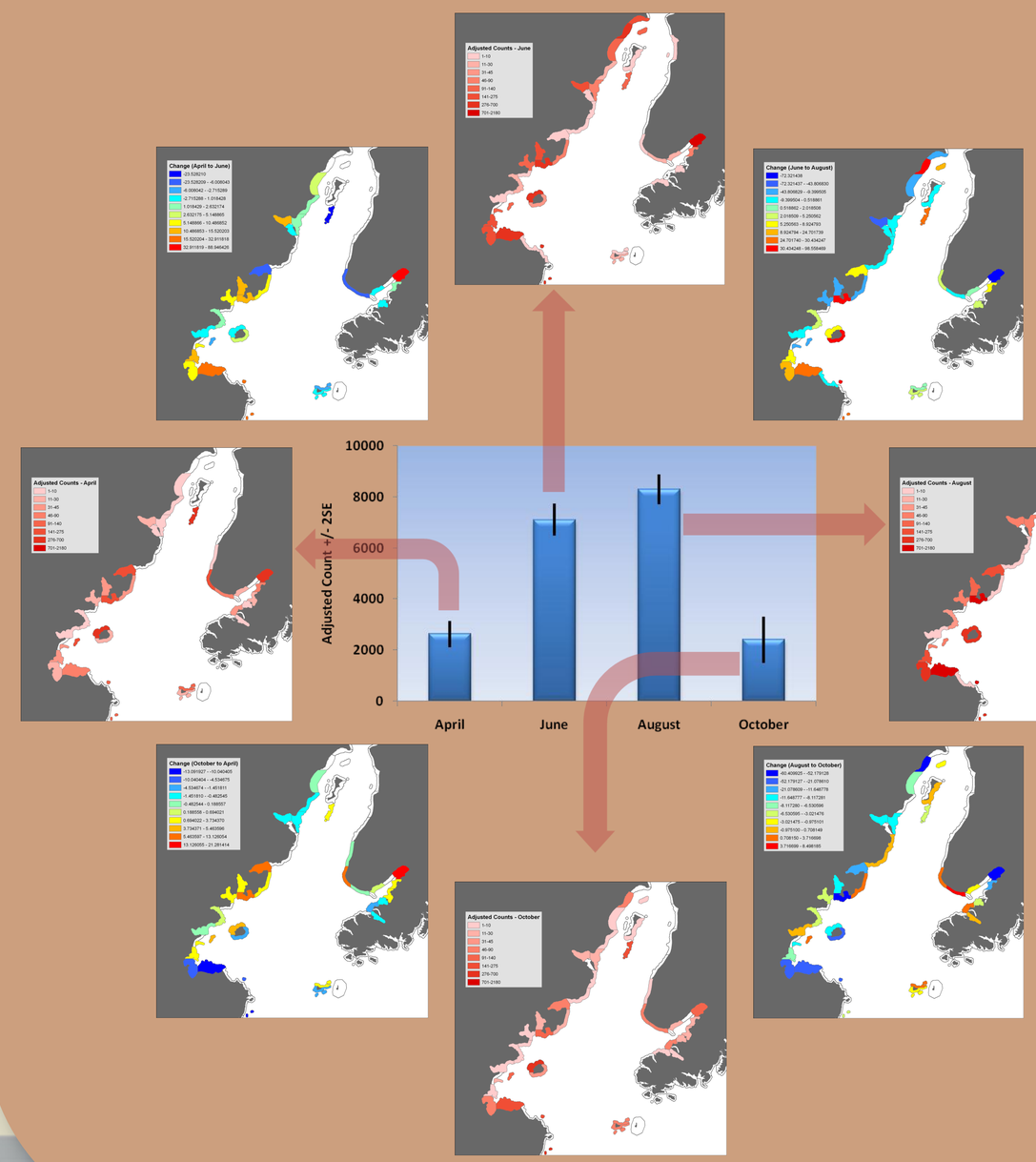
Aerial Surveys
- June, August, October & April
- June 2003 – October 2005
- ~1 week during diurnal low tides
- Daily replication



Analysis of survey counts
- Quasi-Poisson GLMM regression
- Tide height, time of day, month
- Interactions with month
- Counts adjusted to low tide at noon

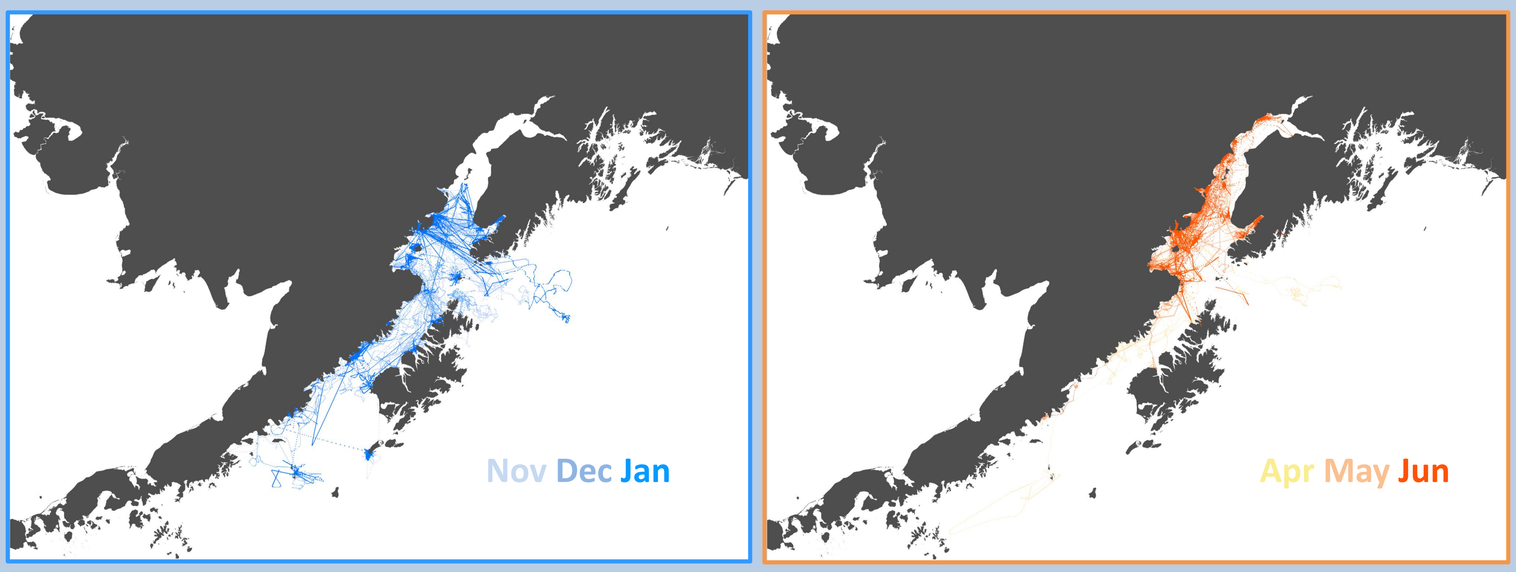


Seasonal Changes in Abundance and Distribution Ashore



Abundance was dramatically lower in April and October than in June and August, the peak periods of breeding and molting. Distribution changed seasonally, though a few areas with the greatest seal concentrations remained important throughout the year.

Seasonal Changes in Foraging Ranges



The tagged seals ranged much more widely at sea during the fall and winter months than during the spring and summer. Many seals left the Cook Inlet survey region to forage in Shelikof Strait during fall and winter. In the spring, especially during June when breeding occurs, movements were restricted to smaller areas surrounding the Cook Inlet haul-out sites.

Conclusions & Implications

- The lower numbers of seals ashore in October & April reflect movements out of the forage area as well as less time spent hauled out (not shown here).
- Detailed information on the seasonal changes in abundance, distribution, and movements can provide the basis for assessing the potential impacts of industrial activities and accidents in Cook Inlet, which is an active region of petroleum development and production.

Alaska Fisheries Science Center
NATIONAL MARINE FISHERIES SERVICE – NOAA FISHERIES

U.S. Department of the Interior

Major funding provided by Minerals Management Service, Alaska OCS Region

MMS