



# Understanding change — Tidewater glacier habitats: what can harbor seals tell us?

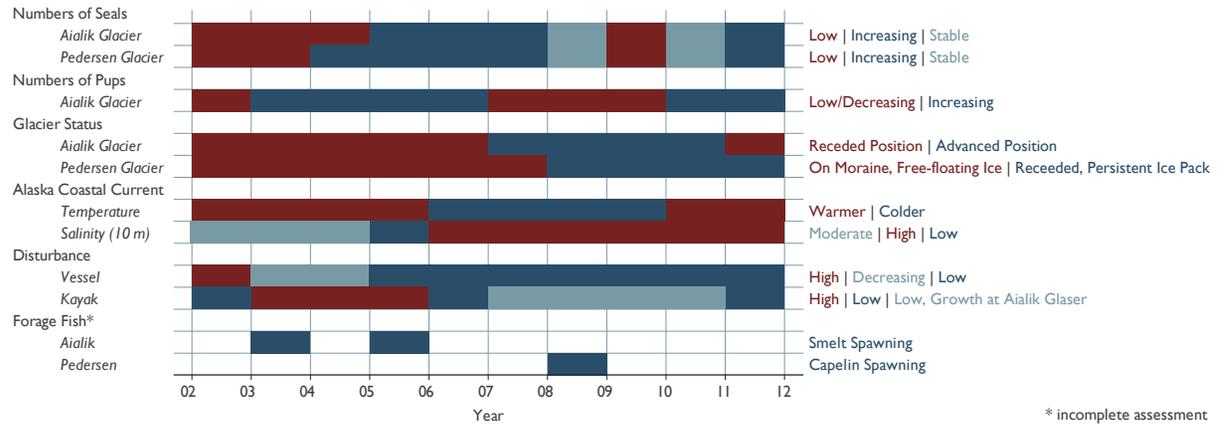


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## Abstract

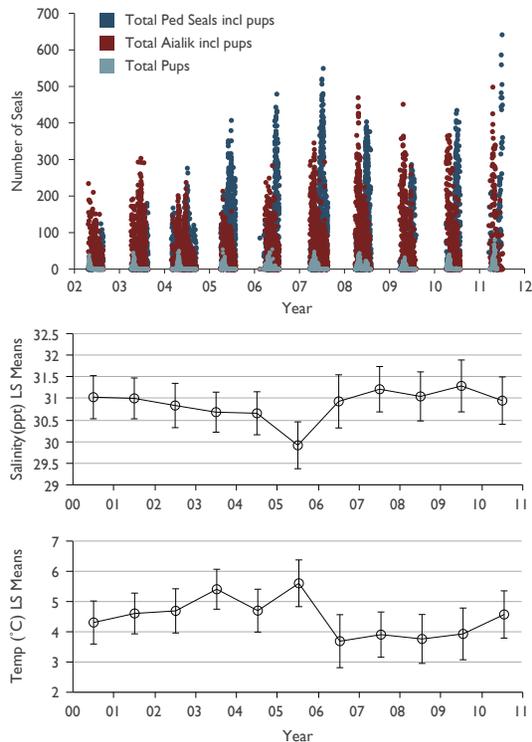
Harbor seals are being monitored to evaluate and distinguish effects of environmental change and human impacts in tidewater glacier fjord habitats. Long-term monitoring in Aialik Bay (Kenai Fjords National Park), has documented a persistent decline in numbers of seals and pups near Aialik Glacier from 1983-2009. Examination of finer scale variability indicates short-term changes in trends that may reflect responses to ecosystem change.

Since 2002, research in Aialik Bay has used remotely controlled video cameras to track numbers of harbor seals, glacier status and activity, ice conditions, and human activities near Aialik and Pedersen glaciers in Aialik Bay. Results suggest seals alter haulout and, perhaps, pupping locations in response to changing environmental conditions more frequently than seals at land haulouts. Results are being evaluated to identify natural and anthropogenic influences that may positively and negatively affect seals in order to better understand the integrity of tidewater glacier environments in Alaska relative to climate change and human activities.

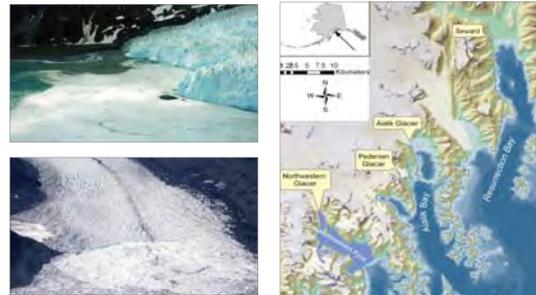


## Harbor seals abundance & marine conditions

Top: Counts of seals and pups near Aialik and Pedersen Glaciers  
Middle: Changes in Salinity over time (data from UAF, IMS, GAKI station)  
Bottom: Changes in Alaska Coastal Current temperature (data from UAF, IMS)



## Study Sites



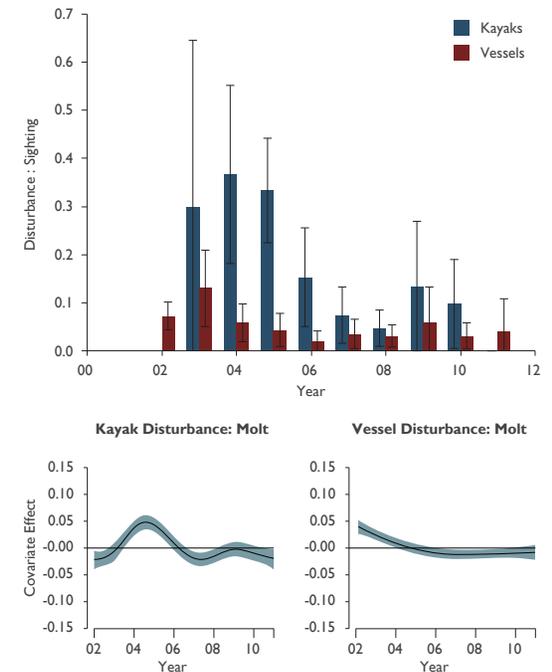
Aialik Glacier (top), Pedersen Glacier (bottom), Kenai Fjords (map)

## Summary & Conclusion:

- Glaciers and interrelated marine habitats are highly dynamic, requiring associated organisms to rapidly accommodate to environmental change being altered by climate change.
- Harbor seals can adapt to environmental change by altering use of haulout locations; but specific events altering seal behavior remains obscure. In this study:
  - Low numbers of seals and pups (2002-2004) were associated with warm water temperatures, higher levels of disturbance, and glacial thinning
  - Increasing numbers of seals (2005-2007), greatest near Pedersen Glacier, continued despite more frequent interactions with kayakers and an abrupt transition from warming, fresher waters to cool, saltier, waters in 2006.
  - Stable to diminished numbers of seals (2008-2010) were associated with sustained cool, saltier, waters and persistent packed ice near receding Pedersen Glacier.
  - Return to the 2005-2007 trend in 2011 was associated with elevated water temperatures and improved ice conditions at Aialik and Pedersen glaciers.
- Remotely controlled video cameras have proven to be valuable tools for obtaining detailed information about harbor seals, dynamic attributes of glacial environments, and changes in impacts humans have on seals.
- Continued observations, telemetry studies and hydroacoustic are needed to document movements between glaciers within and outside Aialik Bay, and to evaluate relationships between preferred haulouts and foraging areas.

## Disturbances (Motor Vessel & Kayak)

Top: Changes in the proportion of sightings resulting in disturbance over time.  
Bottom: Generalized additive model: relative frequency of disturbance over time



## Acknowledgements

I thank the numerous staff who have participated in this study. I also am grateful for funding from the Ocean Alaska Science and Learning Center, the National Park Service, the Exxon/Vulcan Trustee Council, and National Marine Fisheries Service. Research was authorized under the following permits: NPSFS General Authorization for Scientific Research Letter of Confirmation No. 881-1473 and 881-1918; National Park Service Scientific Research Permit KEFJ-2004-SCL-0001 and KEFJ-2008-SCL-0001; Fort Graham Corporation MOLL US Fish and Wildlife Service Special Use Permit 74500-03-045 and 10-001; Department of Natural Resources Permit 09-KA-698.