

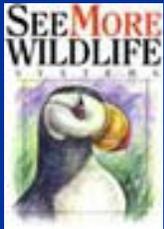
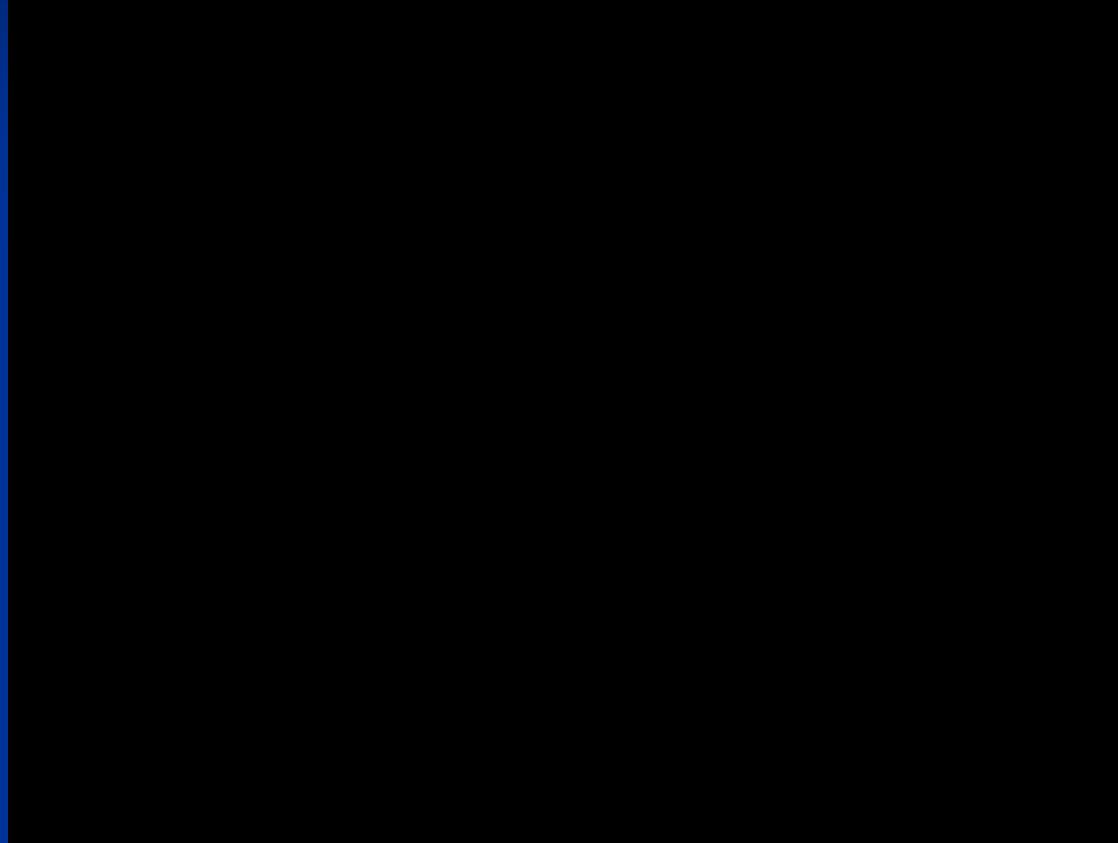
Harbor Seals: Long-term Monitoring in the Kenai Fjords



Anne Hoover-Miller



Harbor Seals on Ice



Monitoring: a platform for research

Effects of Climate Change on Tidewater Glaciers and Fjord Ecology:

How do physical features and the presence of glaciers affect marine habitats and seasonal distribution and abundance of associated marine organisms?



ASLC Remote Video Monitoring



1 The camera site overlooking Aialik glacier views both harbor seal abundance and changing ice conditions.



2 A remote video camera at the Seal Rocks site views resting sea lions.



3 The control tower at Chiswell Island processes the audio and video signals and sends them back to ASLC. All camera and repeater sites are powered by solar and wind generation.



4 Recently installed cameras on an islet near Cape Resurrection await the seasonal arrival of Steller sea lions.



5 At the Alaska SeaLife Center researchers view seals and sea lions in real-time and record their activities on desktop computers and VHS and DVD recorders.



Image Nasa
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe

Base image courtesy Google Earth™ mapping service

 Camera Site(s)

 Repeater Site

 Signal Transmission

Figure 2. A network of remote signals is transmitted through a hub on Chiswell Island. Audio and video of harbor seals and Steller sea lions are beamed from Chiswell Island through a repeater in Resurrection Bay and back to the Alaska SeaLife Center, where researchers control the cameras and record their observations in real-time from the comfort and convenience of an office setting.

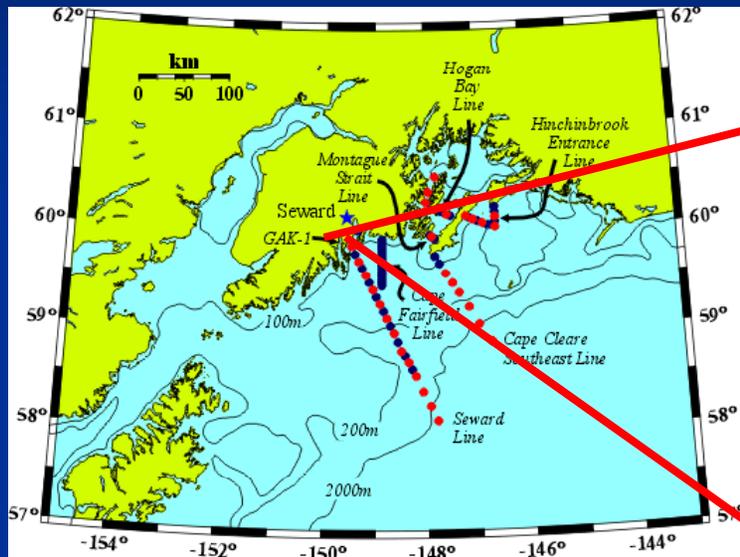
Monitoring: a platform for research

Marine Conditions:

How do physical features of the fjord and the presence of glaciers affect marine habitats and seasonal distribution and abundance of marine organisms?



Oceanographic Sampling



- ❖ Oceanographic sampling conducted irregularly since 1980; seasonal sampling conducted by J. Piatt USGS and this program since 2006.
- ❖ Contrast with long-term records of Alaska coastal current measured at the GAK 1 station since 1970.



Monitoring: a platform for research

Climate Change and Weather:

Icefields generate local high pressure systems, and weather conditions that affects distribution and dispersal of ice.

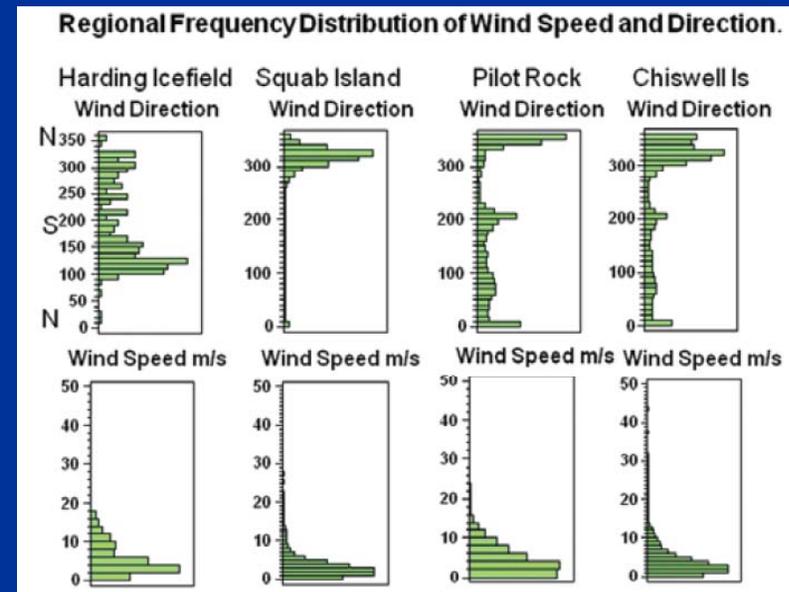
- ❖ How do fjords, regional weather, and the presence of glaciers affect marine habitats and seasonal distribution and abundance of marine organisms?

Regional Weather

A Weather station on Squab Island since 2005 measures temperature, pressure, wind speed & direction at the head of the glacial fjord.

Contrast with:

- ❖ ASLC Chiswell Island
- ❖ NOAA Pilot Rock
- ❖ NWS Seward
- ❖ NPS Harding Icefield

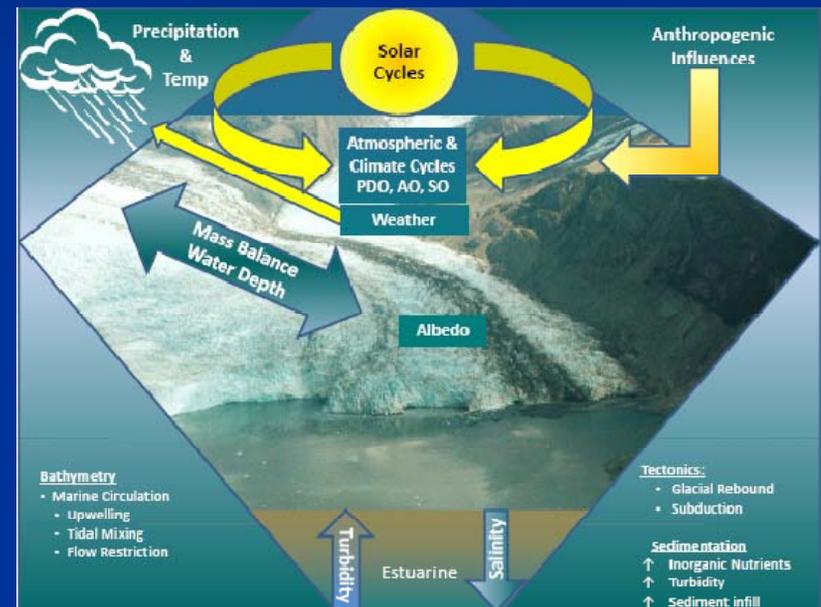


Monitoring: a platform for research

Glaciers:

Glacier growth and retreat is influenced by fjord bathymetry, glacial melt & precipitation

How do Aialik and Pedersen glaciers respond to short and long term variation in climate?



River of Ice

- ❖ Response of Aialik and Pedersen glaciers to long & short term variation in weather and marine conditions
 - ❖ Timing and frequency of calving
 - ❖ Distribution and abundance of ice
 - ❖ Persistence of ice relative to habitat, weather, season, and marine conditions.



Glacier Face: May 2003-2007



May 2003



May 2004



May 2005



May 2006



May 2007

Monitoring: a platform for research

Humans:

Humans have lived in and visited the fjords for thousands of years.

How are humans currently affecting the ecology of the fjords?

Harbor Seals – So what?

- ❖ Integral component of nearshore ecosystems
- ❖ In the north Pacific, Alaska is the only location that harbor seals use tidewater glacier haulouts
- ❖ Are harbor seals that use glacial ice environments, run-of-the mill harbor seals?
- ❖ What advantages and disadvantages does glacier ice provide to harbor seals?
- ❖ What do harbor seals do when glaciers retreat onshore?



DW Miller

Haulout Use

❖ Haulout Use

- ❖ Resting
- ❖ Giving birth, nursing
- ❖ Molting

❖ Haulout locations

- ❖ Traditional
- ❖ Diverse substrates
- ❖ Protected
 - ❖ Weather, surf
 - ❖ Predators



Food

Extensive dietary overlap among resident marine mammals

- ❖ Steller sea lion
- ❖ Harbor seal
- ❖ Harbor porpoise
- ❖ Dall's porpoise
- ❖ Humpback whale
- ❖ Minke whale
- ❖ Walleye pollock
- ❖ other cods
- ❖ Herring
- ❖ Sandlance
- ❖ Eulachon
- ❖ Capelin
- ❖ Other smelts
- ❖ Salmon
- ❖ Flatfish
- ❖ Squid
- ❖ Octopus



Expanding Habitat

Pedersen Glacier:

1961 to 2005

44 Years

Aialik Glacier:



Glacial Ice - Benefits

- ❖ Floating – haulour availability not tidally influenced
- ❖ Many access points onto ice
 - ❖ Reduced over-crowding
 - ❖ Reduced aggression
- ❖ Provide ability to aggregate - and maintain vigilance
- ❖ Isolated from land predators
- ❖ Restricts access of marine predators
- ❖ Dampens wave action



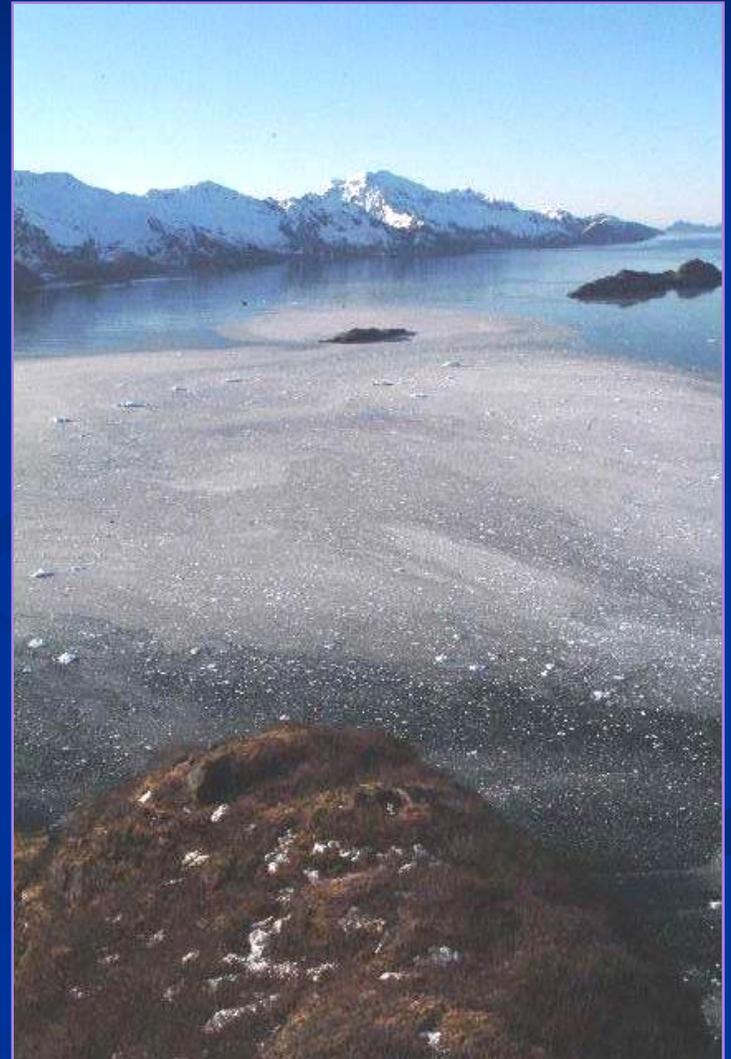
Glacial Ice - Problems

- ❖ Can be disbursed by winds
- ❖ Dependent on glacial activity and status of glacier
- ❖ Reduced ice availability increases accessibility to humans and predators

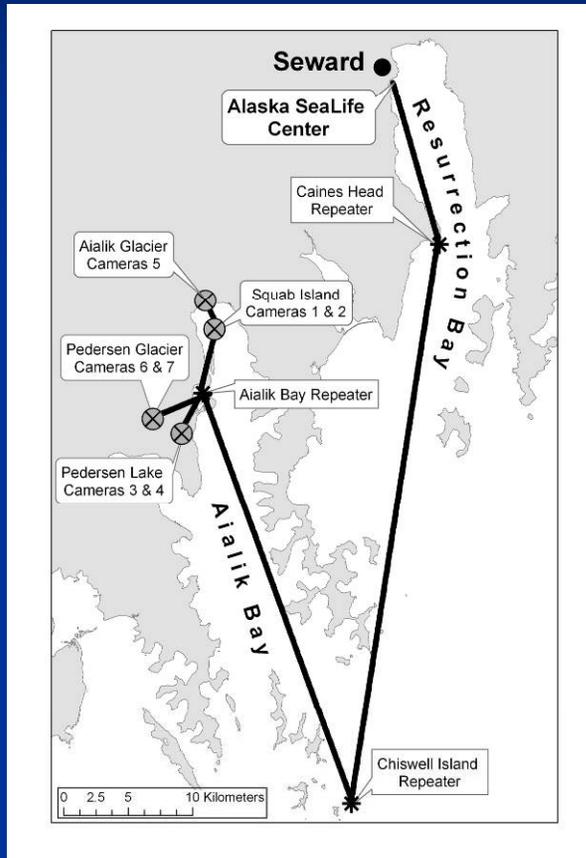


Glacial Ice - Unknowns

- ❖ Ecological changes
- ❖ Successional changes in marine communities?
- ❖ Are glacial ice harbor seals a distinct ecotype?
- ❖ What does ice have that seals need?
- ❖ What do seals do when glaciers recede?



Aialik Bay Camera Sites



Lower Pedersen Lake



Upper Pedersen Glacier Site



Squab Island



Aialik Glacier



Controlling Cameras

SeeMore Wildlife Systems
File Interface Settings Remote Site Admin Command From.>> Video Room: 73:3:2:16:11:0

5-11-2007
12:47:53

Camera Select
Lower Ped

Ped Lk 1
Ped Lk 3
Upper Ped
Squab
Aialik

Images

Control Connection OK.

1-8 9-16 17-24 25-32

1 2 3 4 5 6 7 8 9 10

7 (Ped Lk 3: 73:3:2:16:11:0:80:106:161:196)
Voltage is 13.5 Vols. (Reply time: 1.73 Sec.)

Data Management

HARBOR SEAL SURVEYS

HARBOR SEAL COUNTS AND OBSERVATIONS
Go to Main menu
Go to Vessel Interactions
EXIT

Survey ID: Date:

Observer1: Time: --

Observer2: Begin: End: Duration:

Survey Incomplete!
 Survey Interrupted!

Read Me!!

Don't miss the seals by the edge of Pederson Glacier

Change Message

WEATHER CONDITIONS

GENERAL

% Cloud Cover:

Precipitation:

Fog:

Winds:

SEA STATE

Ocean:

Beaufort Scale:

Ice Movement:

Aialik:

Pederson:

NOTES

WEATHER STATION:

Humidity:

Pressure (mbars):

Temp (C) / (F): /

WindVelocity (m/s) / (kts): /

Wind Direction:

View photographic examples:

Beaufort Scale:

Ice Movement:

HARBOR SEALS

	Seals w/o pups on ice	Females w/pups on ice	Seals in H2O	Seals w/o pups on land	Females w/pups on land	Unweaned lone pups	Weaned pups
Aialik:	<input type="text" value="0"/>						
Pederson:	<input type="text" value="0"/>						

SEA OTTERS:

Aialik:

	Aialik: Survey Quality	Observation Confidence	Pederson: Survey Quality	Observation Confidence
Excellent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fair	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horrible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments

CAMERA PERFORMANCE

Date	Time	Observer	Survey ID	Camera	Current Performance	Last Known Performance	Last Updated	Comments
1/15/2009				Squab Island 2:				
				Squab Island 3:				
				Aialik Glacier 2:				
				Pederson Lake 1:				
				Pederson Lake 3:				
				Pederson Glacier 2:				
				Pederson Glacier 3:				
				Wthr Transmitter:				

TIME LAPSE TAPE LOG / ASSOCIATED ACTIVITY LOG

TL TapeID	Start Date	Start Time	Projected End Date	End Date	End Time	Comments
HS-TL-08-01	5/8/2008	2:18:00 PM		5/17/2008	8:43	

TL TapeID	Date	Start Time	End Time	Duration	Observer1	Observer2	Camera	Area	Primary Activity	Secondary Activity	Notes
HS-TL-08-01	5/16/2008	17:16	17:17	0:01	JP		PL1	Peders	SU		
HS-TL-08-01	5/16/2008	15:54	17:16	1:22	JP		S2	Aialik	SU		
HS-TL-08-01	5/16/2008	15:25	15:54	0:29	JP		S2	Aialik	VI		"Kenai Star"
HS-TL-08-01	5/16/2008	15:14	15:25	0:11	JP		S2	Aialik	SU		

Record: of 635

Form View NUM

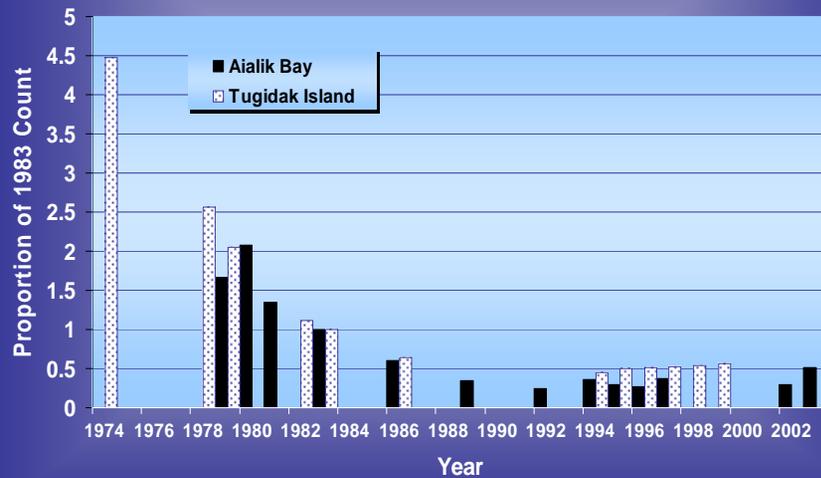
Advantages of Video Monitoring

- ❖ **Ability to revisit observations**
 - ❖ **Digitizing time-lapse tapes**
 - ❖ **Expand database to linked records with digital time-lapse video and ecological data from other sources**



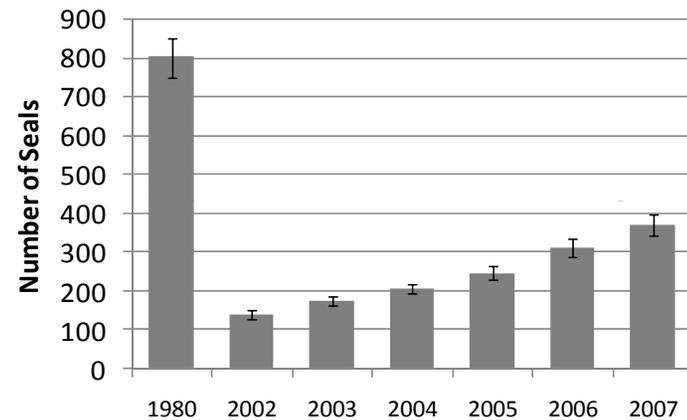
Population Trends

Proportion of Harbor Seals Relative to 1983 at Aialik Bay and Tugidak Island, central Gulf of Alaska

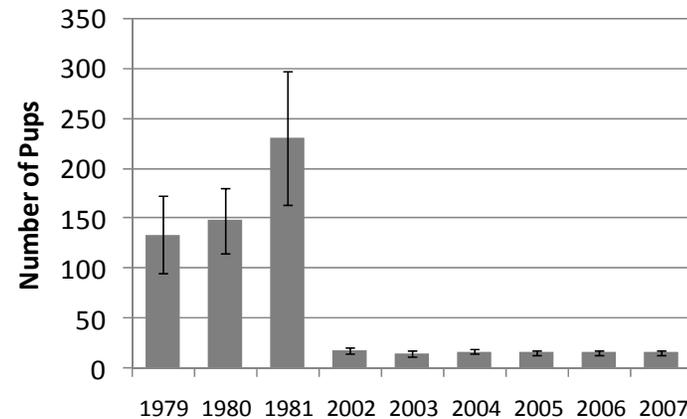


Why are pups not recovering?

Molt



Pups



Population Trends

Population data indicate:

- ❖ **Stable but low pup counts**
 - ❖ **Poor Reproductive Success**
 - ❖ **High Predation Rates**
 - ❖ **Relocation to Better Pupping Habitats**
- ❖ **Increased attendance during molt**
 - ❖ **Movements of Molting Seals into the Region?**
 - ❖ **Improved foraging**
 - ❖ **Seclusion from vessels & large predators (Pedersen Lake)**
 - ❖ **Changes in haulout behavior (more leisure time on ice)**

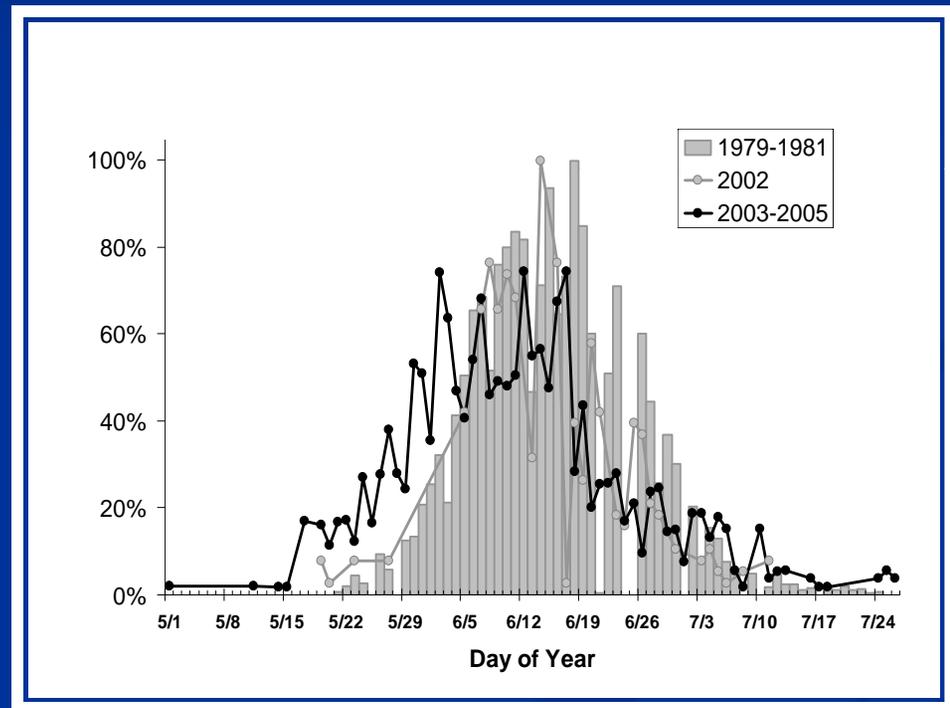


Changes in Pupping Phenology

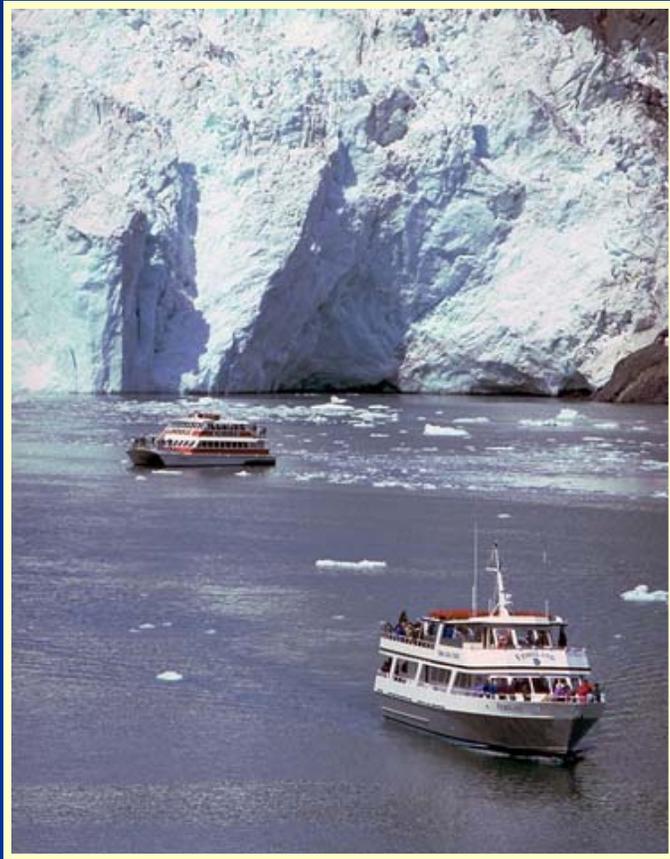
Since 2003, pupping has occurred approximately 5 days earlier than previous years.

Earlier pupping associated with better body condition the previous fall and age of females

Why are numbers of pups not increasing?



Interactions with Humans: Vessels



- ❖ **Current Frequency and types of vessel traffic**
- ❖ **Response of seals to vessels**
 - **Size of vessel**
 - **Approach characteristics**
- ❖ **Normal Undisturbed Behavior**

Effects of Kayakers on Harbor Seals near Pedersen Glacier

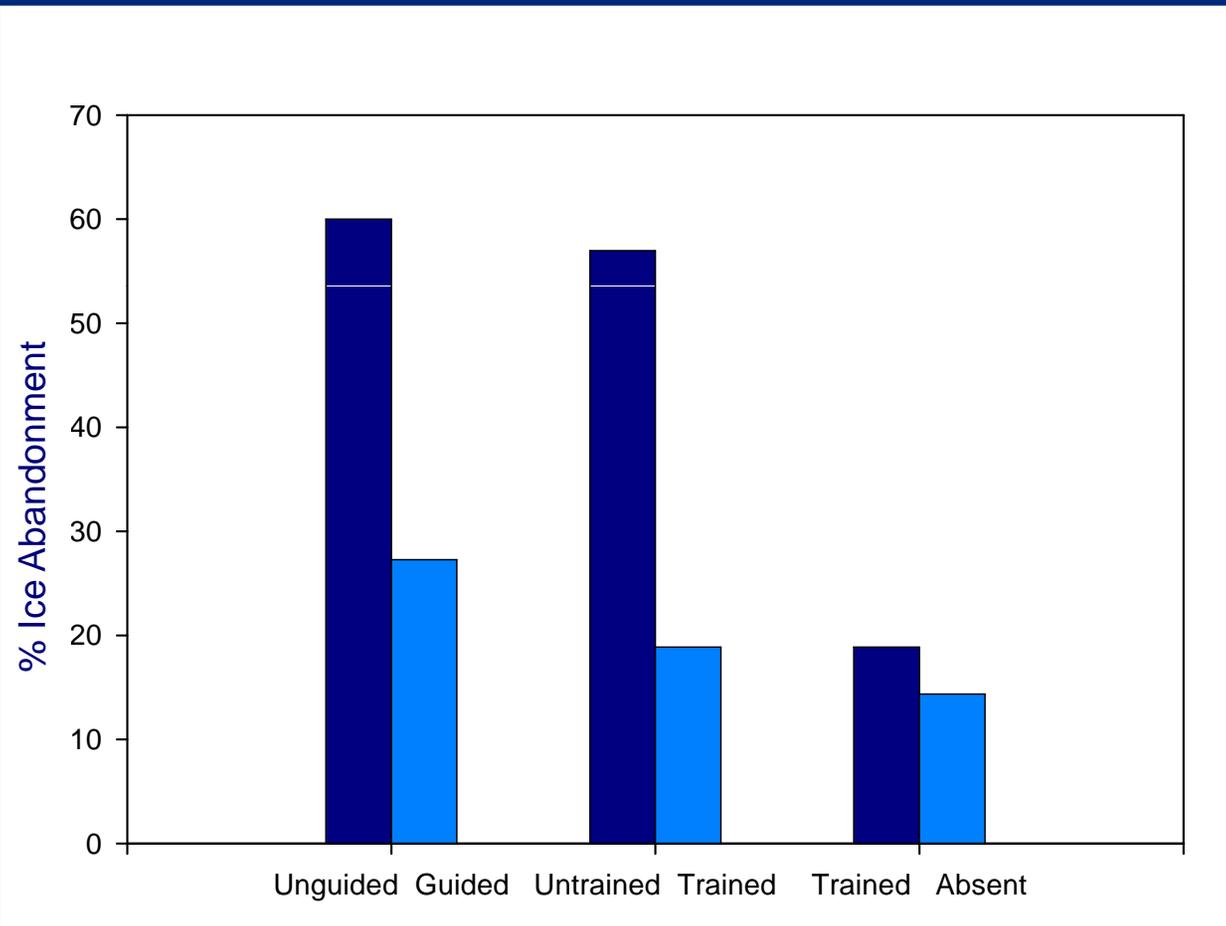


Photo: Backcountry Safaris

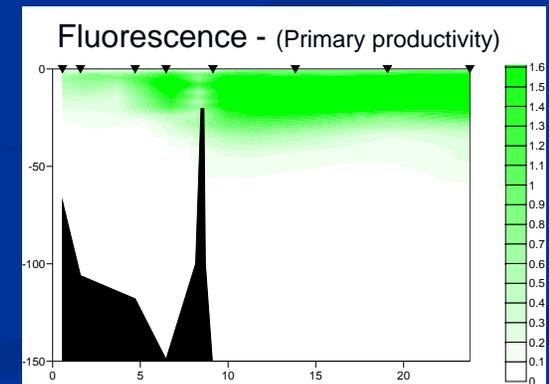
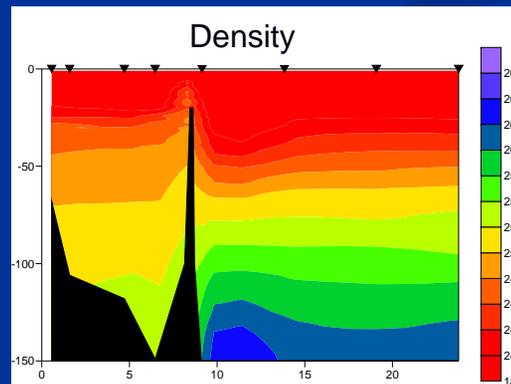
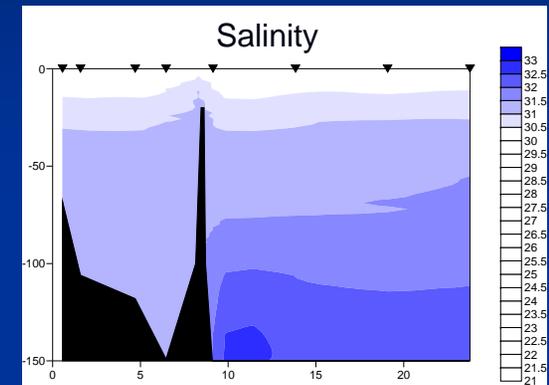
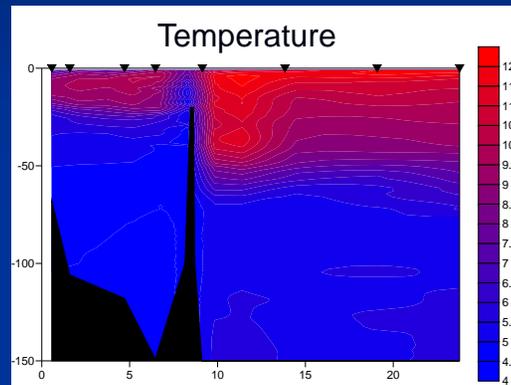
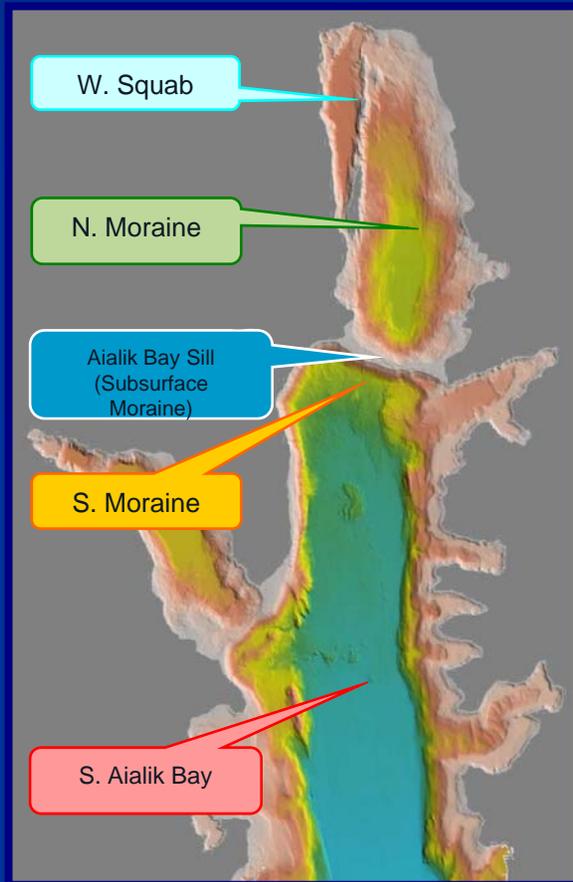
**The Impact of Education
on Eco-tourists and
Harbor Seal Behavior**

Caroline Jezierski

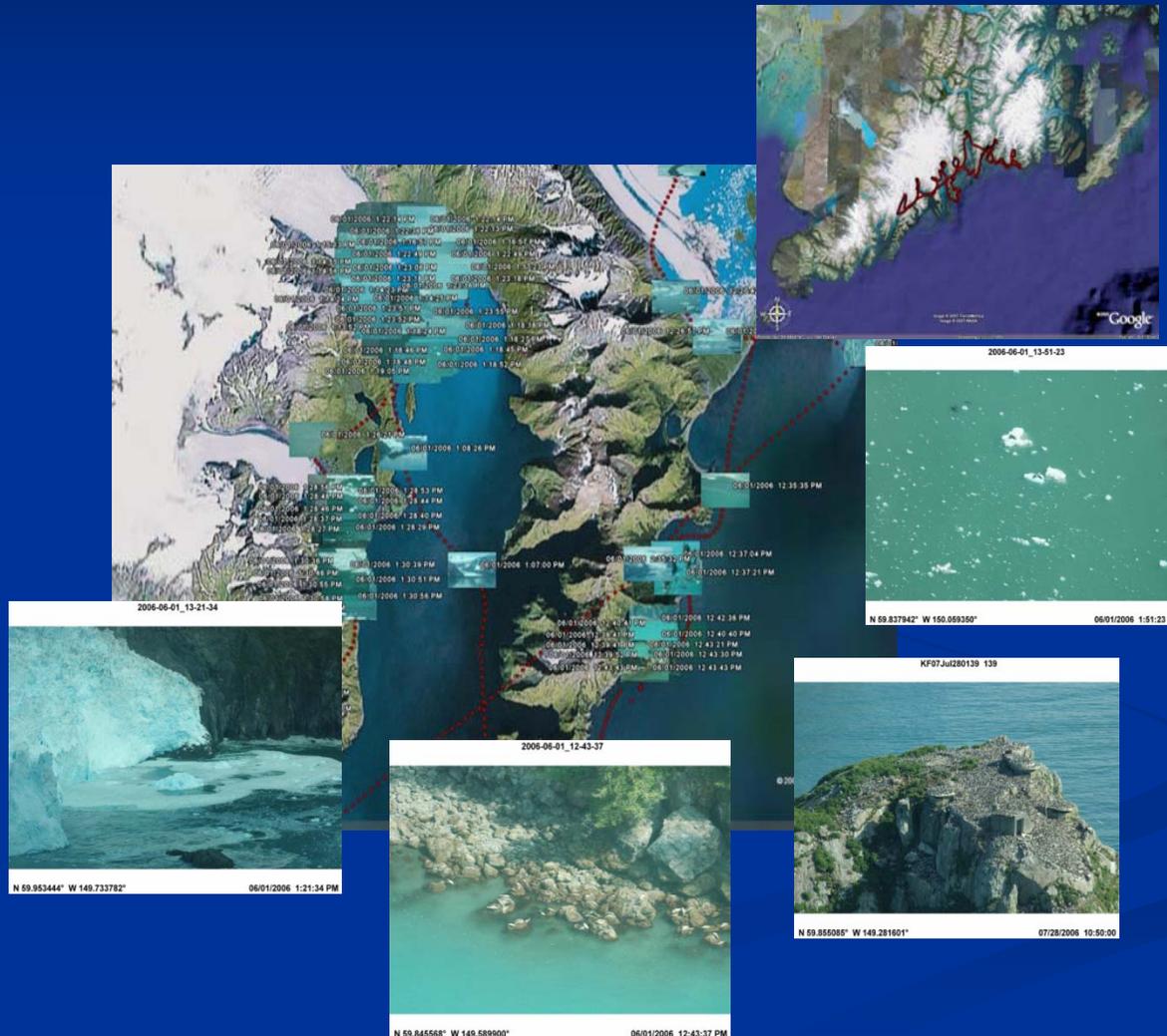
Effects of kayaker education and responsible behavior



Fjord Ecology: Oceanography



Aerial surveys: Interpretation within a larger region





Acknowledgements

Collaborators

- ❖ Ocean Alaska Science & Learning Center
- ❖ SeeMore Wildlife Inc.
- ❖ Port Graham Corporation
- ❖ U.S. Fish and Wildlife Service, National Maritime Wildlife Refuge System
- ❖ National Park Service
- ❖ EVOS Trustee Council
- ❖ National Marine Fisheries Service
- ❖ University of Alaska, Fairbanks



Questions?

