

# Welcome to *PolarConnect*

with Dr. Steve Okkonen

ED 593: Integrated Life and Earth Sciences  
in the Context of the Polar Regions

**Wednesday, 16 October 2013**

3pm AKDT

[4pm PDT, 5pm MDT, 6pm CDT, 7pm EDT]

Slides will be shown here

Exit the presentation

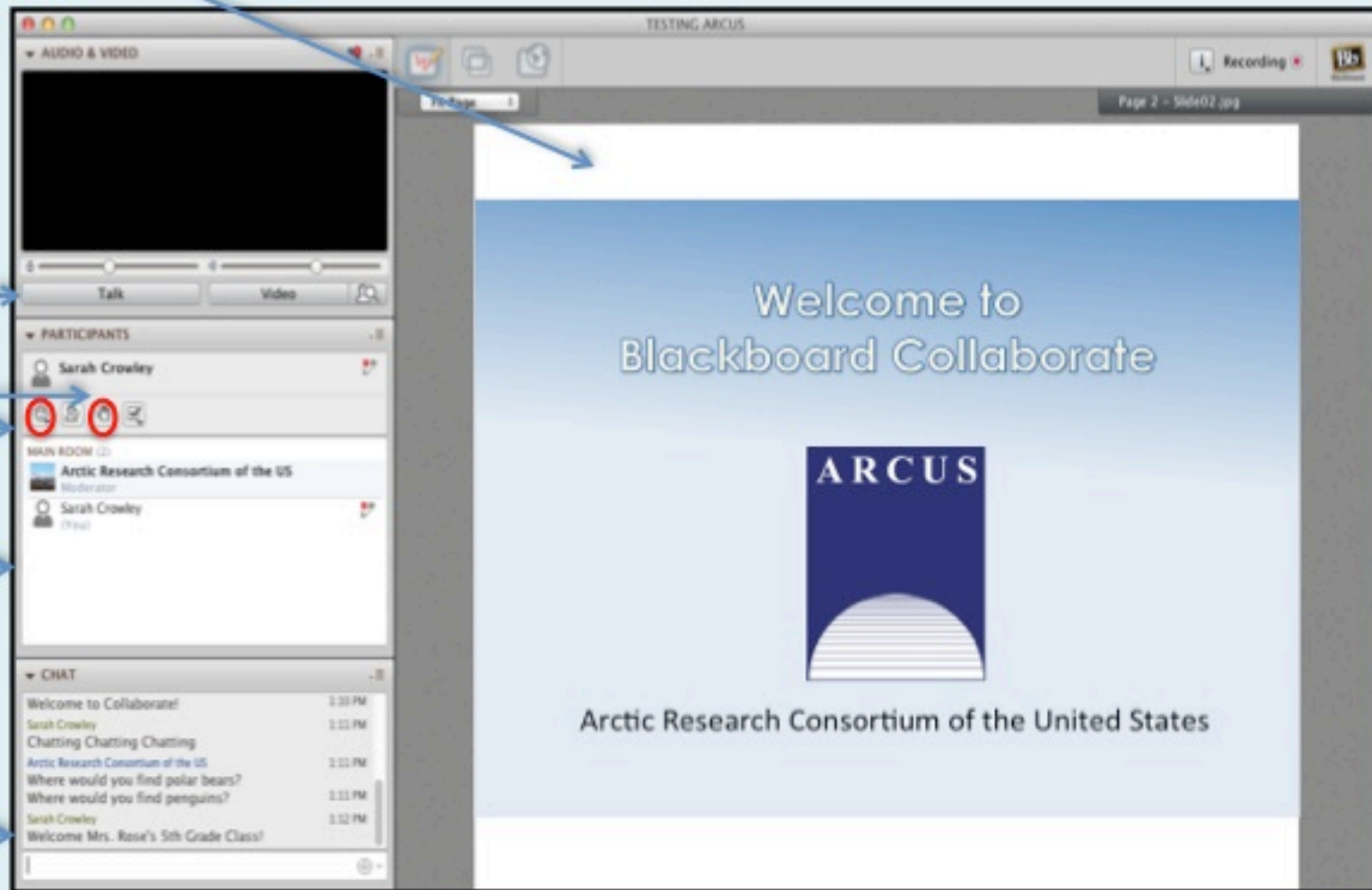
Click to Talk,  
Unclick to finish talking

Raise your hand to ask a question

Share with emoticons

List of all participants

Chat with one person or the entire group



The screenshot displays the Blackboard Collaborate interface. The main window shows a presentation slide titled "Welcome to Blackboard Collaborate" with the ARCUS logo and the text "Arctic Research Consortium of the United States". The sidebar on the left contains several sections: "AUDIO & VIDEO" with a "Talk" button and a "Video" button; "PARTICIPANTS" with a list of participants including Sarah Crowley and Arctic Research Consortium of the US; "MAIN ROOM" with a list of participants including Arctic Research Consortium of the US and Sarah Crowley; and "CHAT" with a list of chat messages including "Welcome to Collaborate!", "Sarah Crowley Chatting Chatting", "Arctic Research Consortium of the US Where would you find polar bears?", "Arctic Research Consortium of the US Where would you find penguins?", "Sarah Crowley Welcome Mrs. Rose's 5th Grade Class?", and "Welcome Mrs. Rose's 5th Grade Class?".

## Please Note:

- Participants using the telephone can mute/unmute by **pressing \*6** on the phone.
- Today's event will be recorded and archived.

# Participant Introductions

**When called, please state your:**

- ✓ Name
- ✓ School / Institution
- ✓ The number of students and adults participating with you in the same location

# What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers for 2-6 week research experiences in the polar regions.

From 2010-2013, nearly 50 teachers from around the United States will join scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.

# Questions

## During the Presentation:

- Type your question in the text chat box

## At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

**Click on the Talk button to speak.**

**Unclick when you are done.**

**Bowhead Whale Feeding in the Western Beaufort Sea:  
Oceanographic Conditions, Whale Prey Distributions, Whale Feeding  
and Foraging Behavior**

**Steve Okkonen**  
**[okkonen@alaska.net](mailto:okkonen@alaska.net)**



**Photos: Phil Alatalo unless otherwise noted**

Broadly speaking, our **project goal** has been **to identify the environmental conditions that promote efficient feeding and foraging by bowhead whales in the Barrow area.**

In addition to meeting this general goal, results from this project have

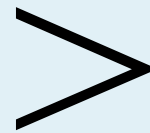
- improved our understanding of the shelf environment of the western Beaufort Sea,
- have provided important ground truth for numerical modeling

# Project Background

Collaborative (multi-institution) and interdisciplinary

Sample Oceanographic Conditions and Whale Prey  
during mid-August to mid-September

- Coarse ( $\sim 1000 \text{ km}^2$ ) Scale
- Fine ( $\sim 100 \text{ km}^2$ ) Scale



Oceanography Team

- Very fine ( $\sim 10 \text{ km}^2$ ) Scale

Short-term Tagging Team

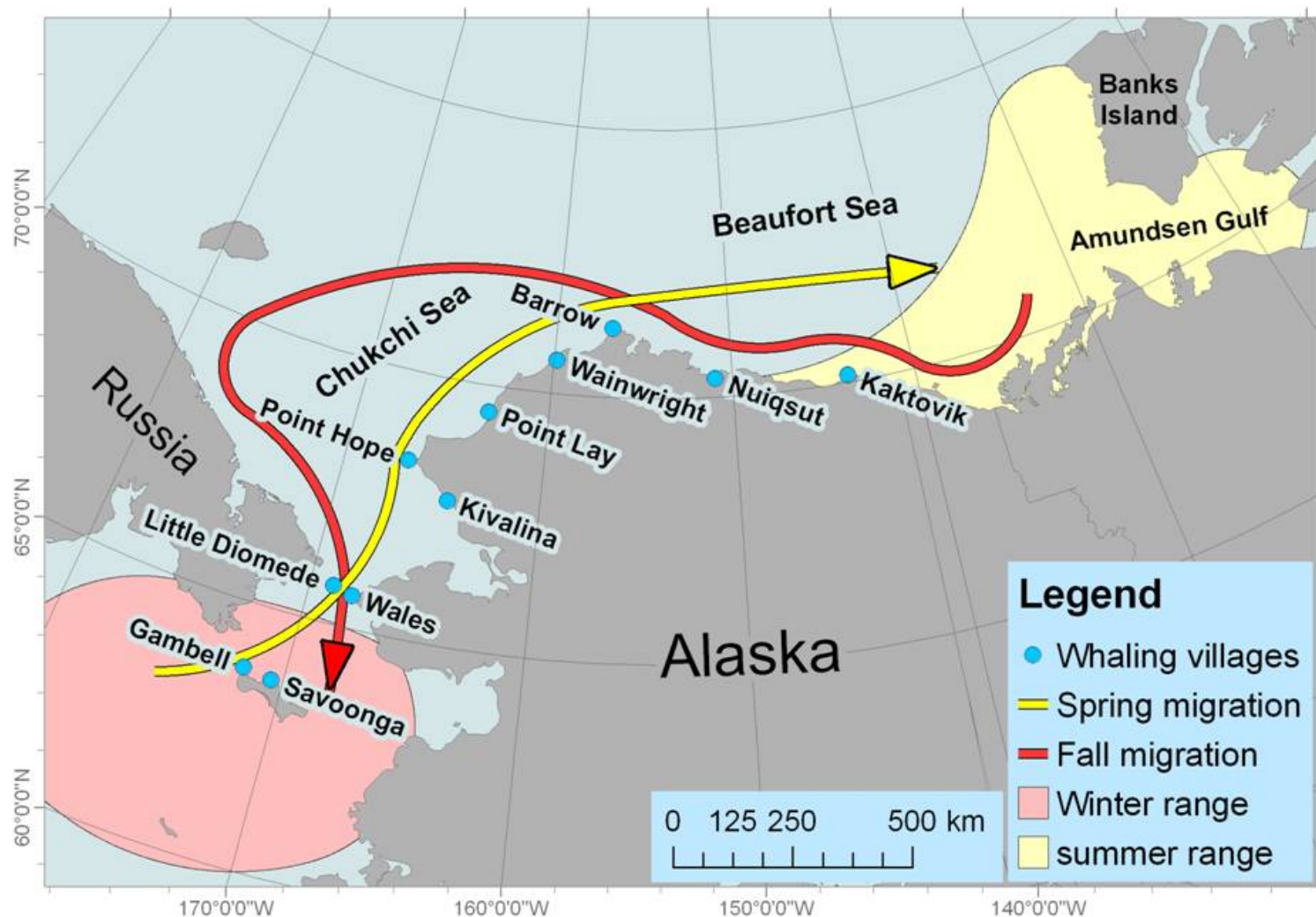
- Coarse Scale

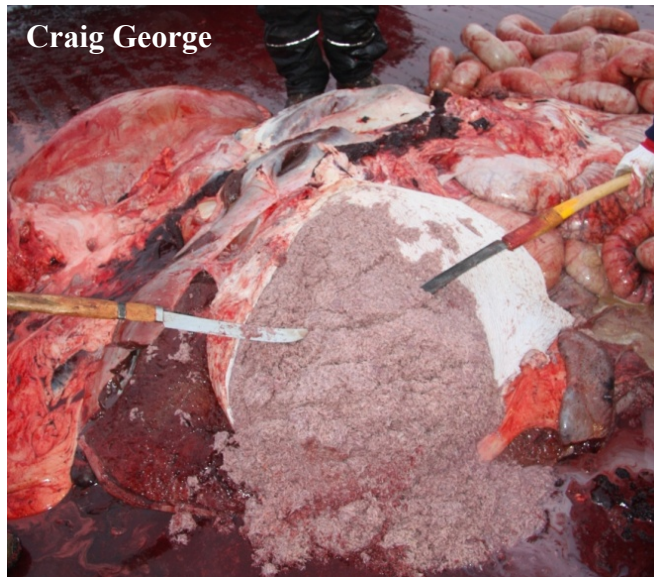
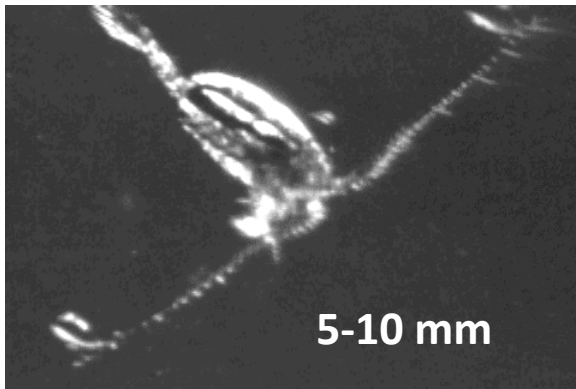
Aerial Team



# Bowhead Whale Migration

Bowhead whales recurrently feed near Barrow during their fall migration from the Canadian Arctic to their wintering grounds in the Bering Sea.



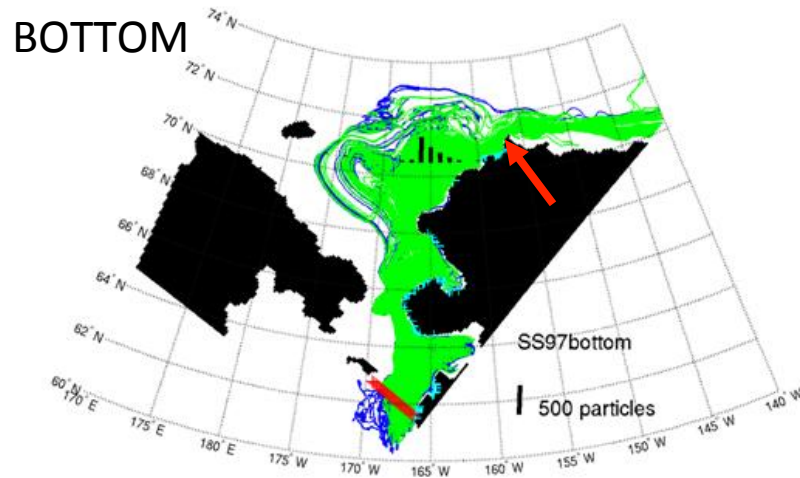
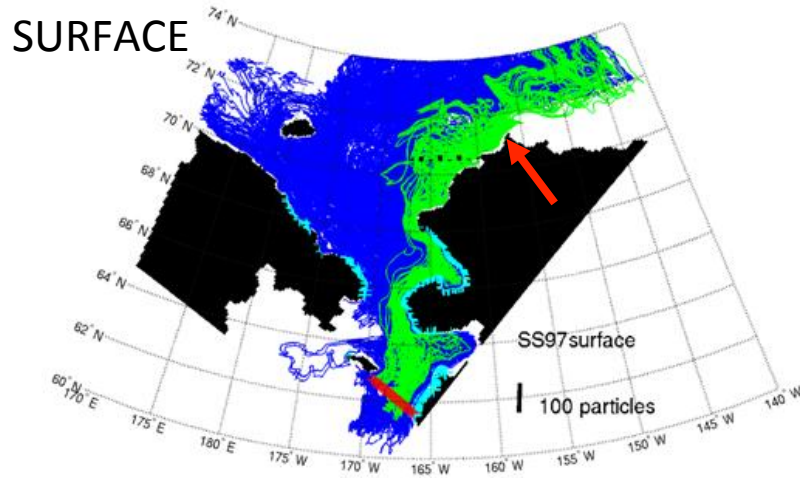


## What do bowhead whales eat?

Bowhead whales eat both copepods and euphausiids (krill). Copepods are the predominant prey in Canadian waters whereas krill are typically the predominant prey near Barrow.

Efficient feeding is possible when and where bowhead whales encounter dense aggregations of prey.

# Where do the krill near Barrow come from?



GREEN = REACHED BARROW

Ocean currents carry krill from the Bering Sea to the Barrow area

**Numerical simulations indicate that:**

Few of the krill in the surface waters reach Barrow

Most of the krill in the bottom waters reach Barrow

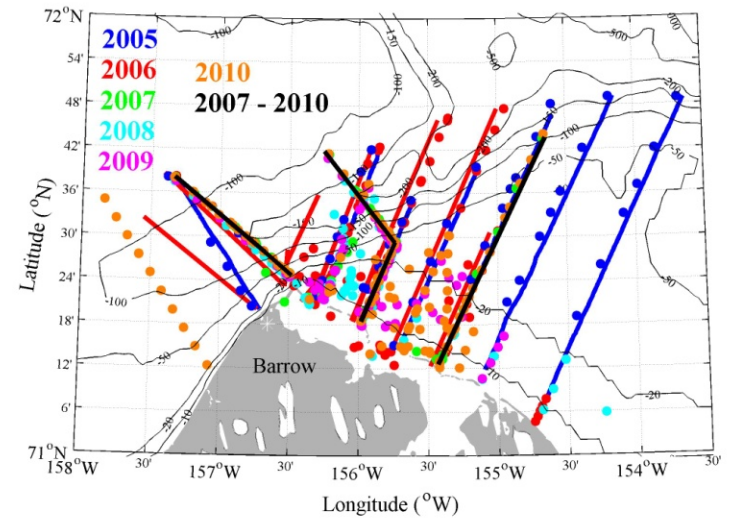
Krill entering the Chukchi Sea in spring can easily make it to Barrow by fall, coinciding with the westward migration of the whales

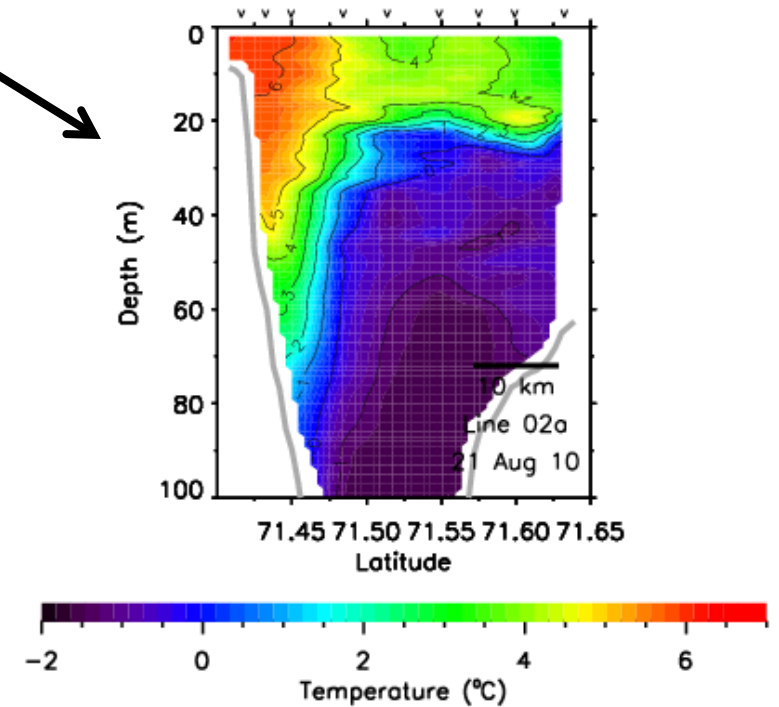
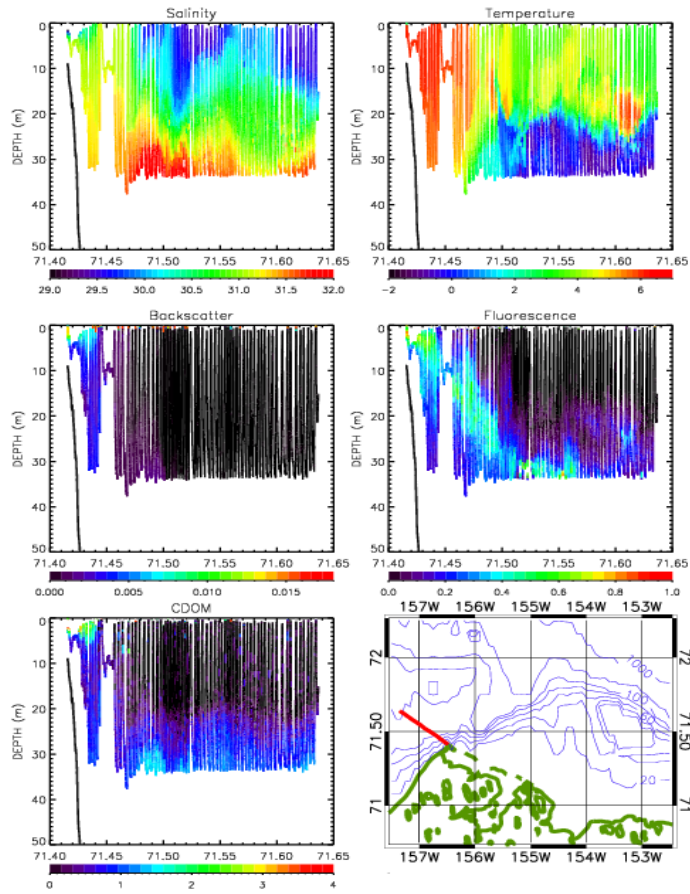
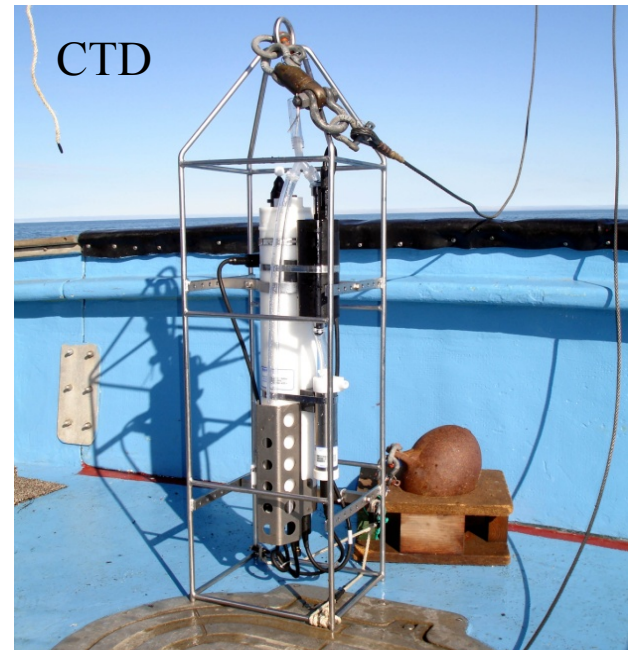
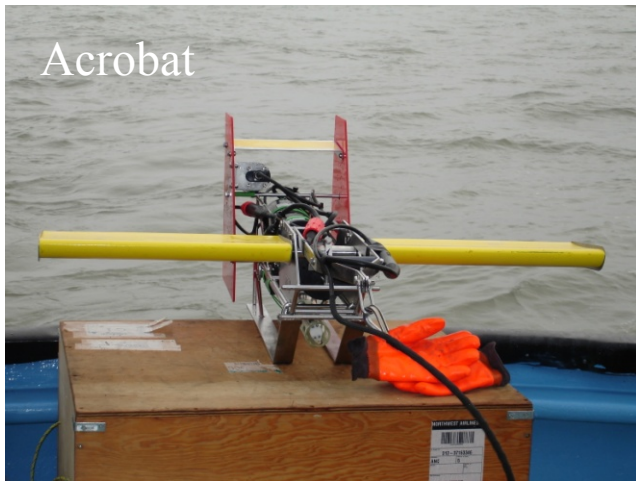




# Oceanography

Carin Ashjian	WHOI - Lead
Phil Alatalo	WHOI
Bob Campbell	URI
Steve Okkonen	UAF
Bill Kopplin	Boat Captain

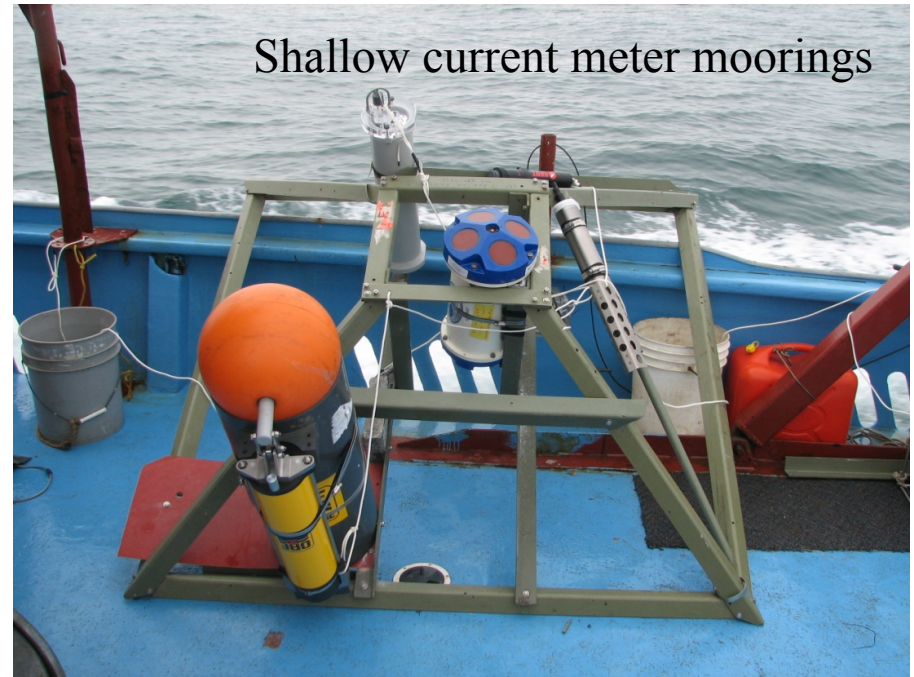




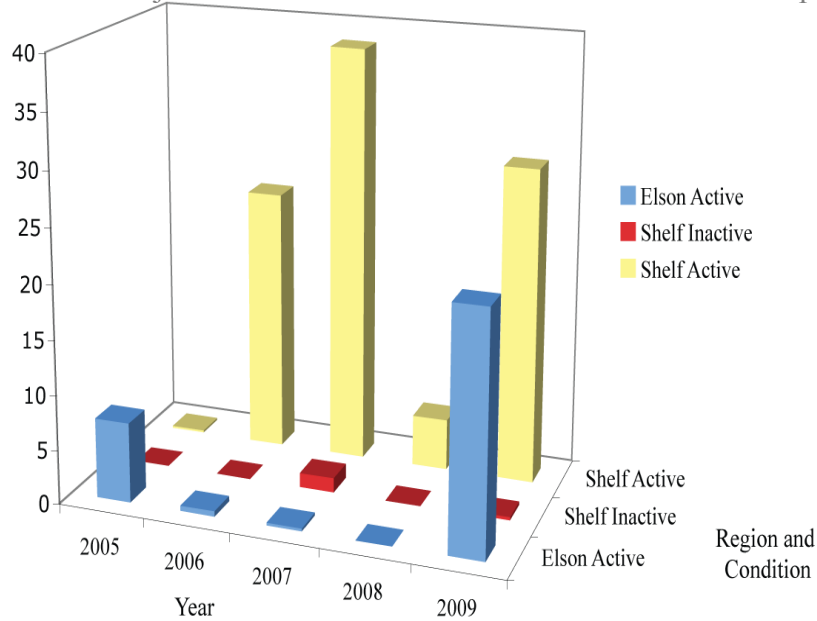
Nets



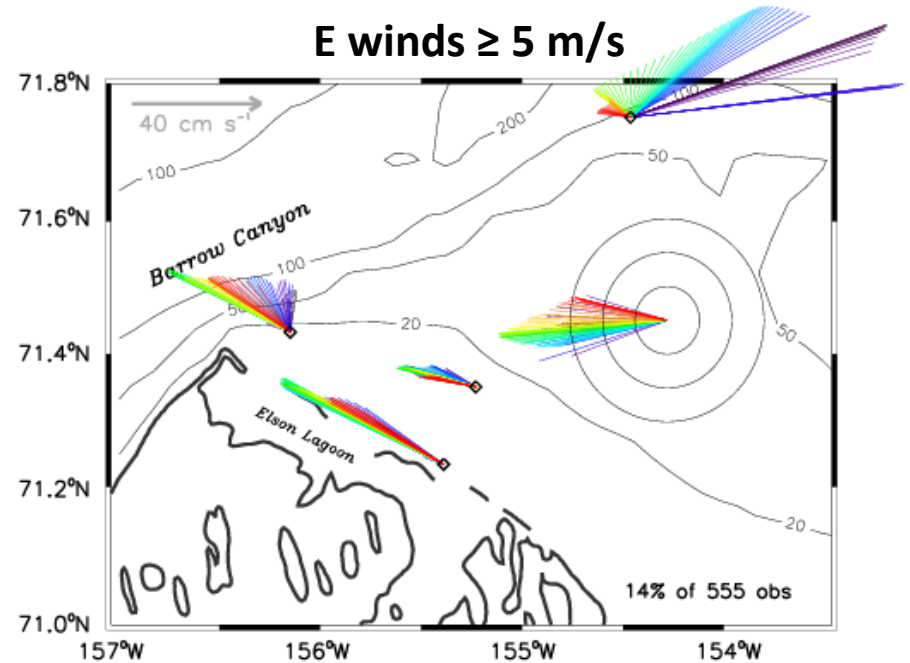
Shallow current meter moorings



Abundances of juvenile and adult krill for active/inactive 'krill trap'



E winds  $\geq 5$  m/s



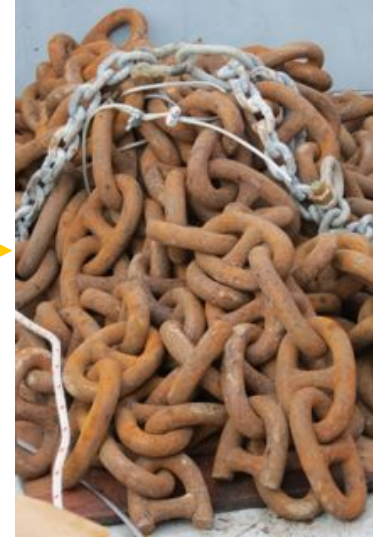
## Deep water, year-round mooring



buoy

ADCP

## Building the mooring



Chain  
anchor

Conductivity temperature  
sensor

Acoustic release



The mooring  
is ready to  
deploy



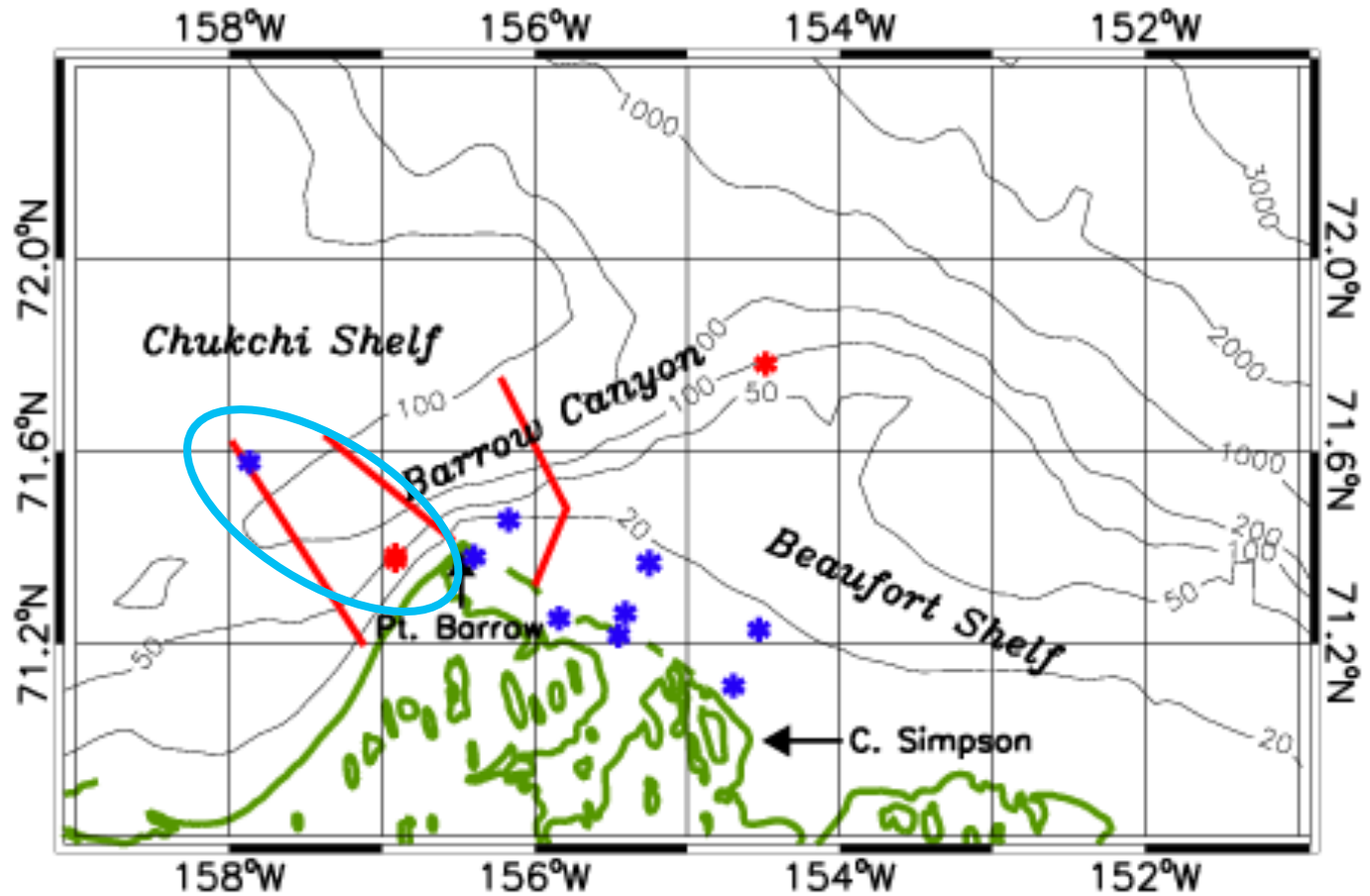
ADCP within float

Bowfest WBC: Sep 2010 – 2013

AON EBC: Aug 2010 - present

microcat

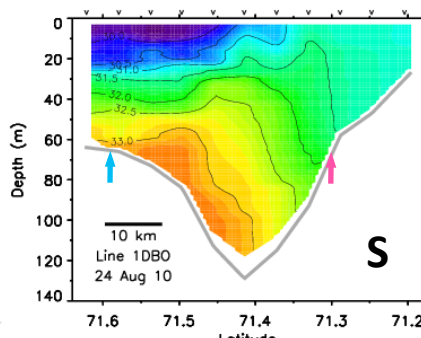
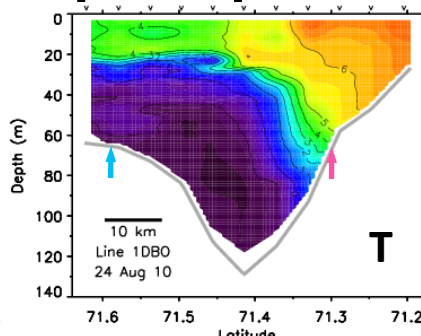
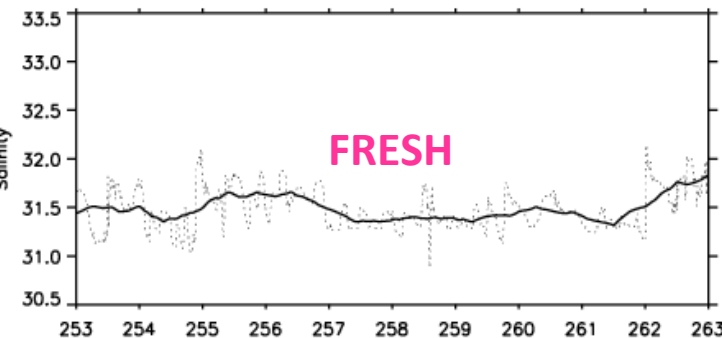
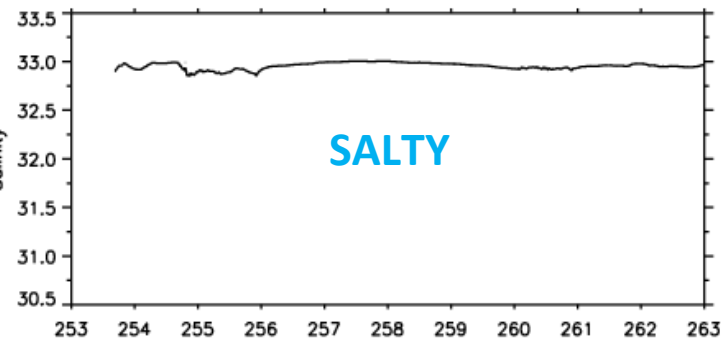
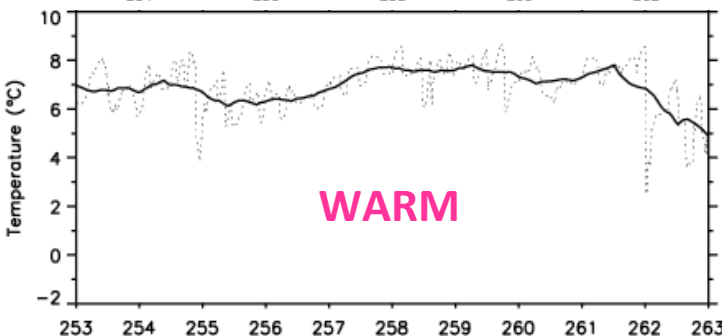
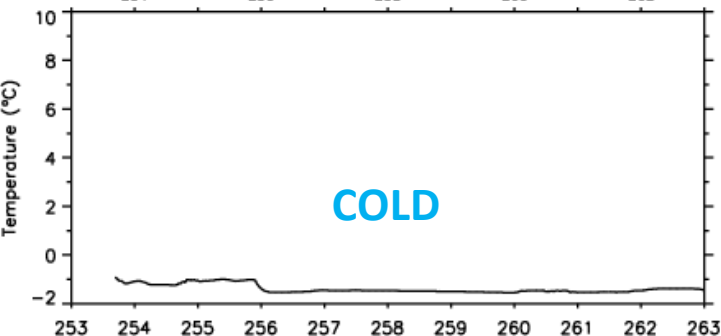
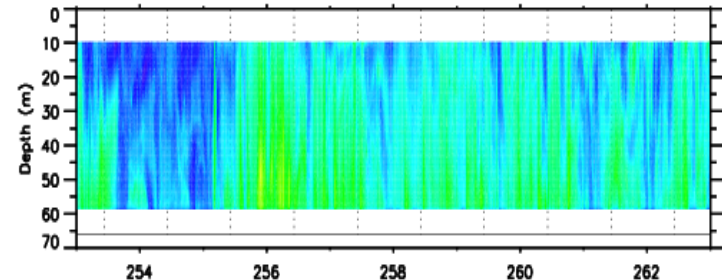
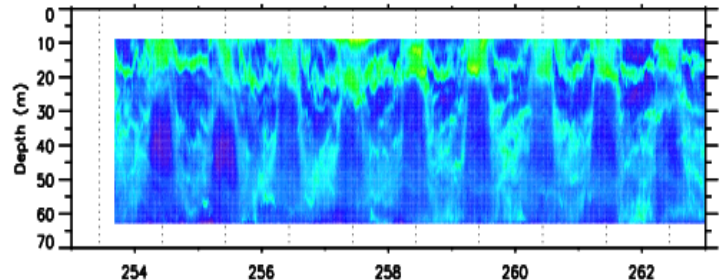
acoustic  
release



# West Barrow Canyon

10-20 Sept 2010

# East Barrow Canyon

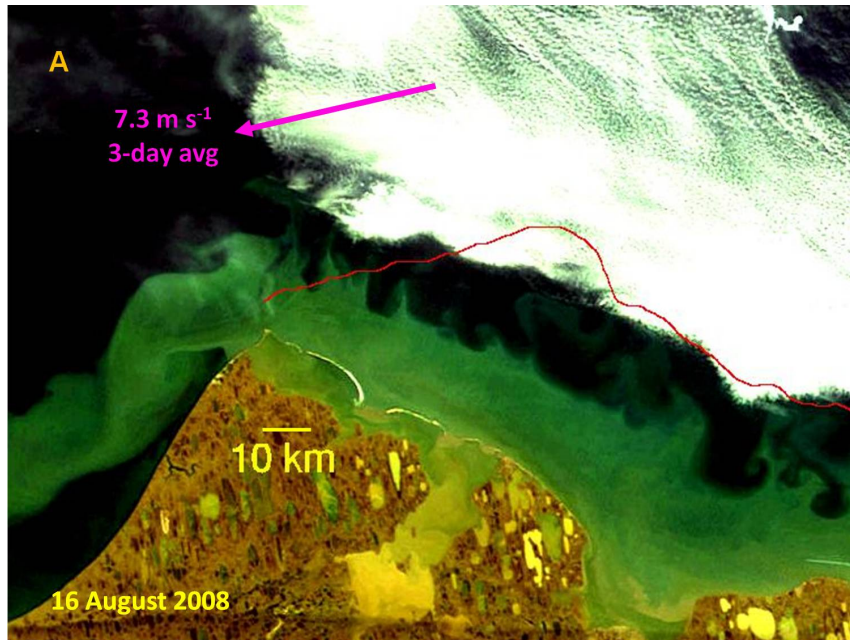


**Pacific Winter Water**

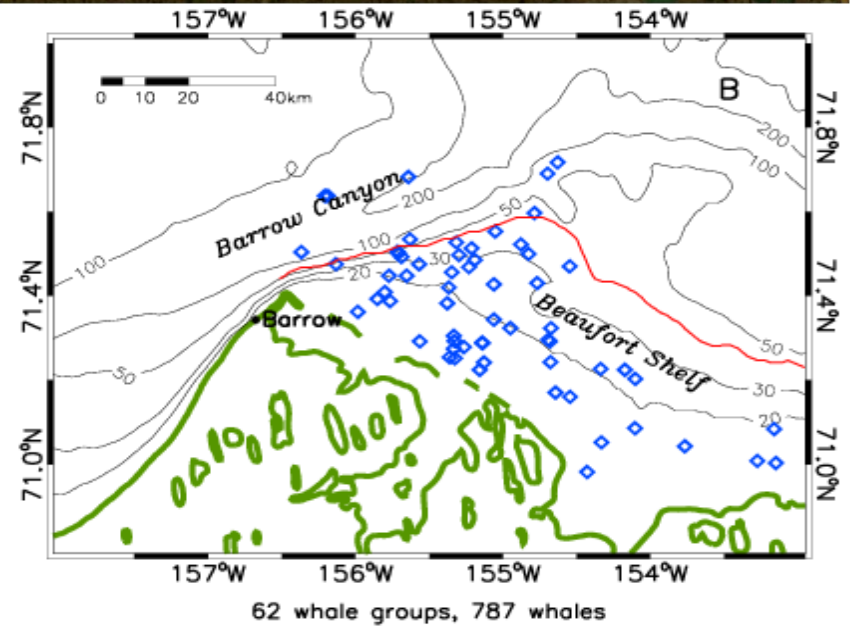
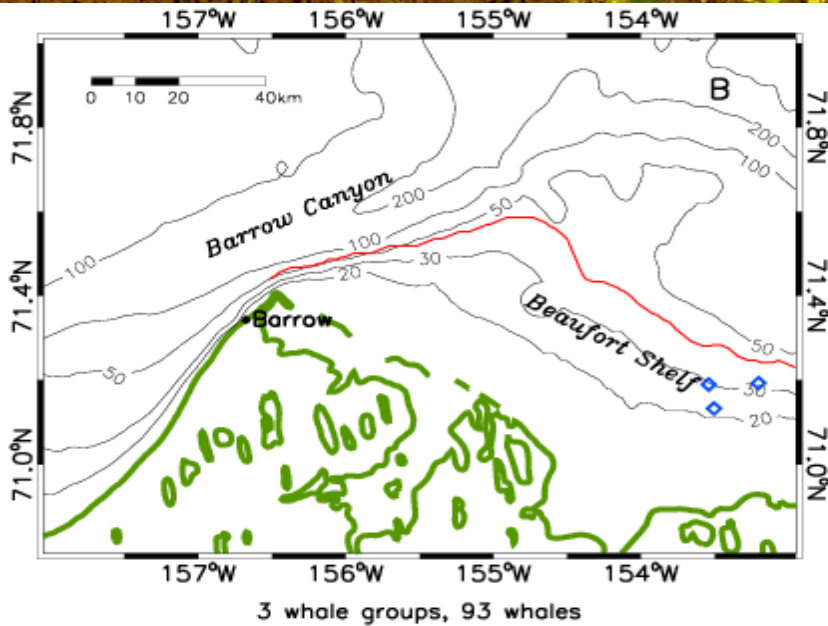
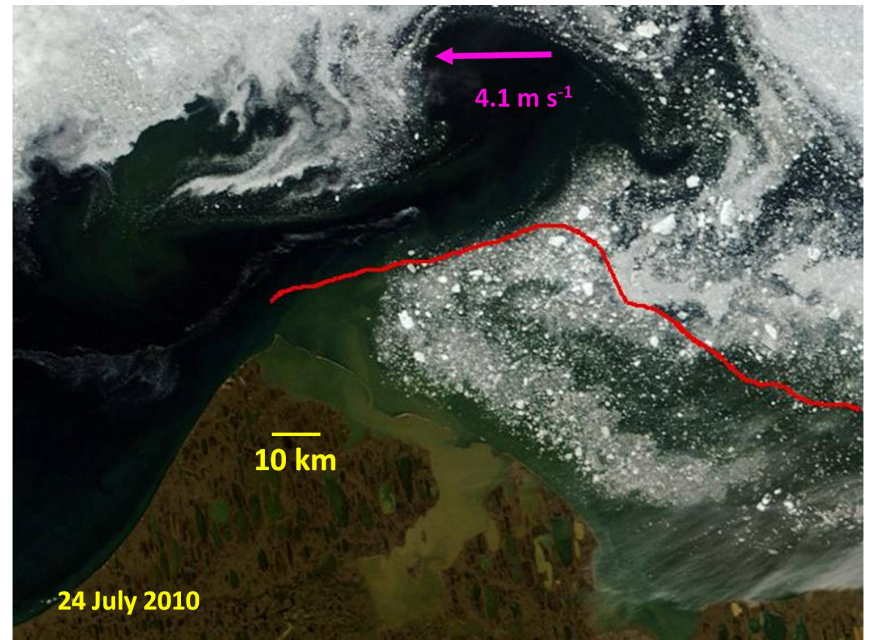
**Alaska Coastal Water**

**Krill reside in PWW**

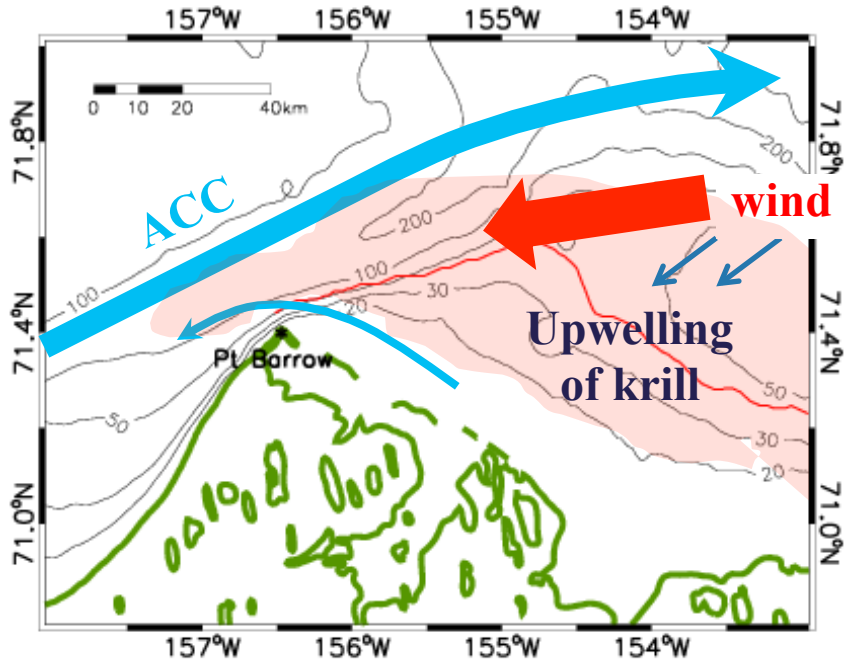
# Winds from east $> 5 \text{ m s}^{-1}$



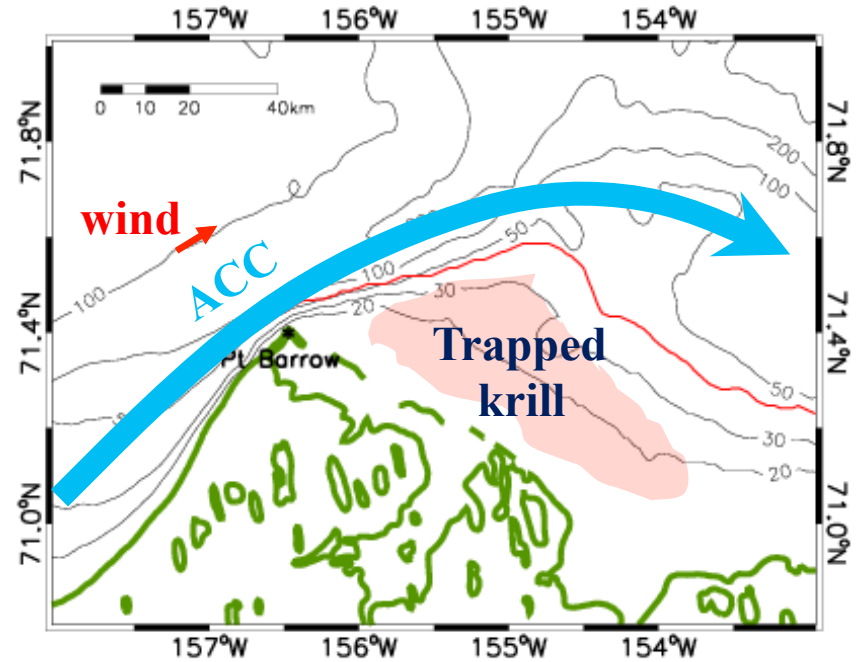
# Weak winds $< 5 \text{ m s}^{-1}$



# Formation of the 'Krill Trap'



Moderate-to-strong winds from the eastern quadrant promote upwelling of krill onto the shallow western Beaufort shelf. However, prolonged winds from the east will move the ACC to the west and drive shelf currents and krill into Barrow Canyon.



Weak winds from any direction or from the southwestern quadrant allow the ACC to flow along the southern flank of Barrow Canyon thereby trapping krill on the western Beaufort shelf.



# A Year in the Life of Bowhead Whales

## An Educational Outreach Product in Calendar Format

**The big picture: tracking bowheads from satellites**

**January | Siqiḥaatchiaq 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

*A Year in the Life of Bowhead Whales*

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**ACKNOWLEDGMENTS**  
Support was provided by the Bureau of Ocean Energy Management and the Cooperative Institute For Alaska Research. Thanks to Rachel Potter (UAF) for processing the MODIS chlorophyll image.

**Tracking bowhead whales from airplanes**

**February | Siqiḥaasugruk 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

*A Year in the Life of Bowhead Whales*

**Bowheads live a really long time**

**March | Paniqqiivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

*A Year in the Life of Bowhead Whales*

**Bowhead food in the Beaufort Sea: Alaska grown**

**April | Qargilligvik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

*A Year in the Life of Bowhead Whales*

**The bowhead census shows a growing population**

**May | Sivvigvik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

*A Year in the Life of Bowhead Whales*

**One-ton baby bowheads gain a ton per month**

**June | Igḥivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

*A Year in the Life of Bowhead Whales*

**Summer picnic: copepods eat algae, bowheads eat copepods**

**July | Makkusaivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

*A Year in the Life of Bowhead Whales*

**"Tags" help us observe whale feeding behavior**

**August | Amigiqivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

*A Year in the Life of Bowhead Whales*

**Why Barrow is a bowhead feeding hotspot**

**September | Amigaiqivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

*A Year in the Life of Bowhead Whales*

**Copepods and krill - tiny prey for massive whales**

**October | Sikkuvik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

*A Year in the Life of Bowhead Whales*

**How much food does a bowhead eat?**

**November | Nippivik 2013**

MON	TUE	WED	THUR	FRI	SAT	SUN
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

*A Year in the Life of Bowhead Whales*

**What are bowhead whales eating?**

**December | Siqingijiaq 2013**

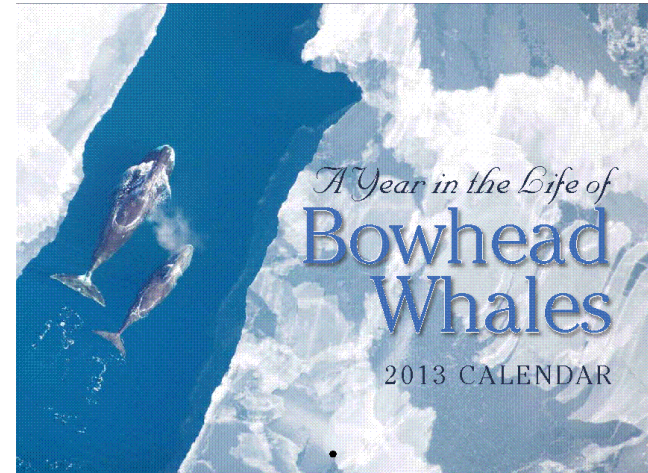
MON	TUE	WED	THUR	FRI	SAT	SUN
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

*A Year in the Life of Bowhead Whales*

**Coming in summer 2014**

# **Arctic Currents**

**A Year in the Life of the Bowhead Whale**



**An animated film based on the Bowhead Whales calendar**

Produced by the University of Alaska Museum of the North

Producer: Roger Topp

Animator: Hannah Foss

Inupiat, St. Lawrence Island Yupik, English language versions on DVD

**[arcticcurrents.wordpress.com](http://arcticcurrents.wordpress.com)**

<http://rapidfire.sci.gsfc.nasa.gov/subsets/?mosaic=Arctic>

<http://www.esrl.noaa.gov/psd/data/gridded/>

<http://oceancolor.gsfc.nasa.gov/>

<http://tidesonline.nos.noaa.gov/>

<http://www.arh.noaa.gov/>

<http://www.polartrec.com/member/lisa-seff>

<http://www.wunderground.com/US/AK/Barrow.html>

<http://www.ims.uaf.edu/hfradar/>

<http://www.oc.nps.edu/NAME/name.html>

<http://realclimate.org/>

<http://www.north-slope.org/departments/wildlife/studiesNresearch.php>



# Teachers: Join PolarTREC!

[www.polartrec.com/about/join](http://www.polartrec.com/about/join)

Every teacher can participate in different ways:

- **Following Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Take Online Professional Development Courses**
- **Become a PolarTREC Teacher!**



TEACHERS AND RESEARCHERS  
EXPLORING AND COLLABORATING

# Upcoming Events

Watch for and register for upcoming events at [www.polartrec.com](http://www.polartrec.com)!

# Thank You!

*An archive of the event will be available shortly.*

<http://www.polartrec.com/polar-connect/archive>

