

Welcome to *PolarConnect*



Upwelling and Ecology In The Beaufort Sea!

With PolarTREC Teacher Lisa Seff

Chief Scientist Dr. Carin Ashjian and the entire team of research scientists!

September 14, 2017

Getting to Know Adobe Connect

Slides will be shown here

Exit presentation

Mute your speakers

Raise your hand

List of all participants

Follow the chat

Find out more about the presentation

Chat here



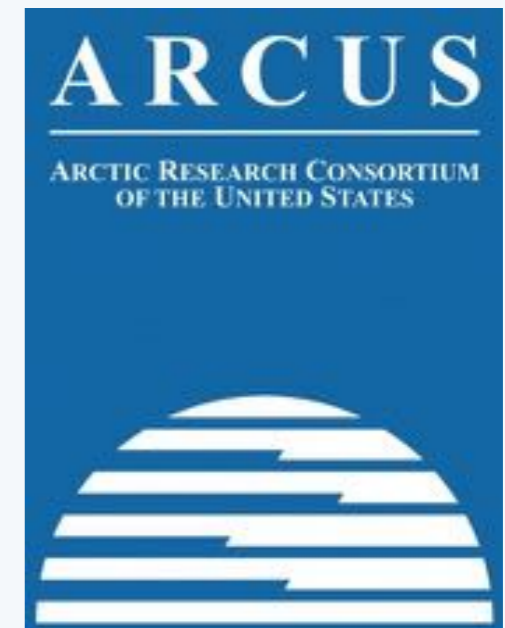
Participant Introductions

In the Chat box, please introduce yourself by typing in your:

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

What is PolarTREC?

- Since 2004, the Arctic Research Consortium of the United States (ARCUS), a non-profit organization, has been administering the PolarTREC Program.
- PolarTREC is professional development for K-12 teachers. They are paired with researchers for 2-6 week research experiences in the polar regions.
- Over 150 teachers from around the United States have joined 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.



25 Years of Connecting Arctic Research
www.arcus.org

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation, two options:

1. Type your question in the text chat box, or
 2. Raise your hand with the “hand button”.
- PolarTREC staff will call on you and activate your microphone.
 - Speak loud and clear, directly into the computer microphone or the phone to ask your question.

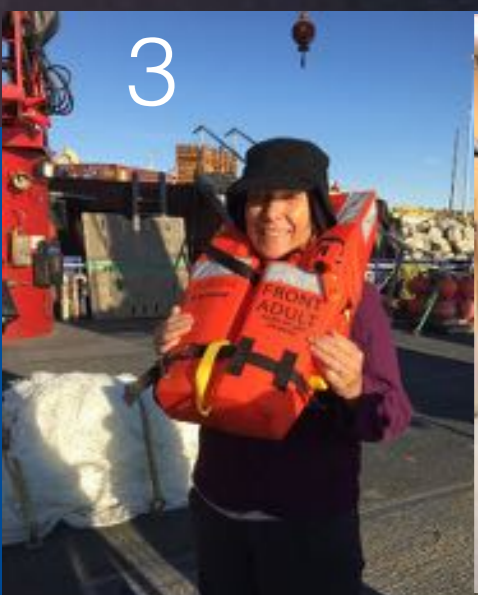


National Science Foundation
WHERE DISCOVERIES BEGIN



Upwelling and Ecology in the Beaufort Sea!







Chief Scientist
Dr. Carin Ashjian



Meet a few members of the R/V Sikuliaq team as we research upwelling and the ecology of the Beaufort Sea Shelf near the top of the world!

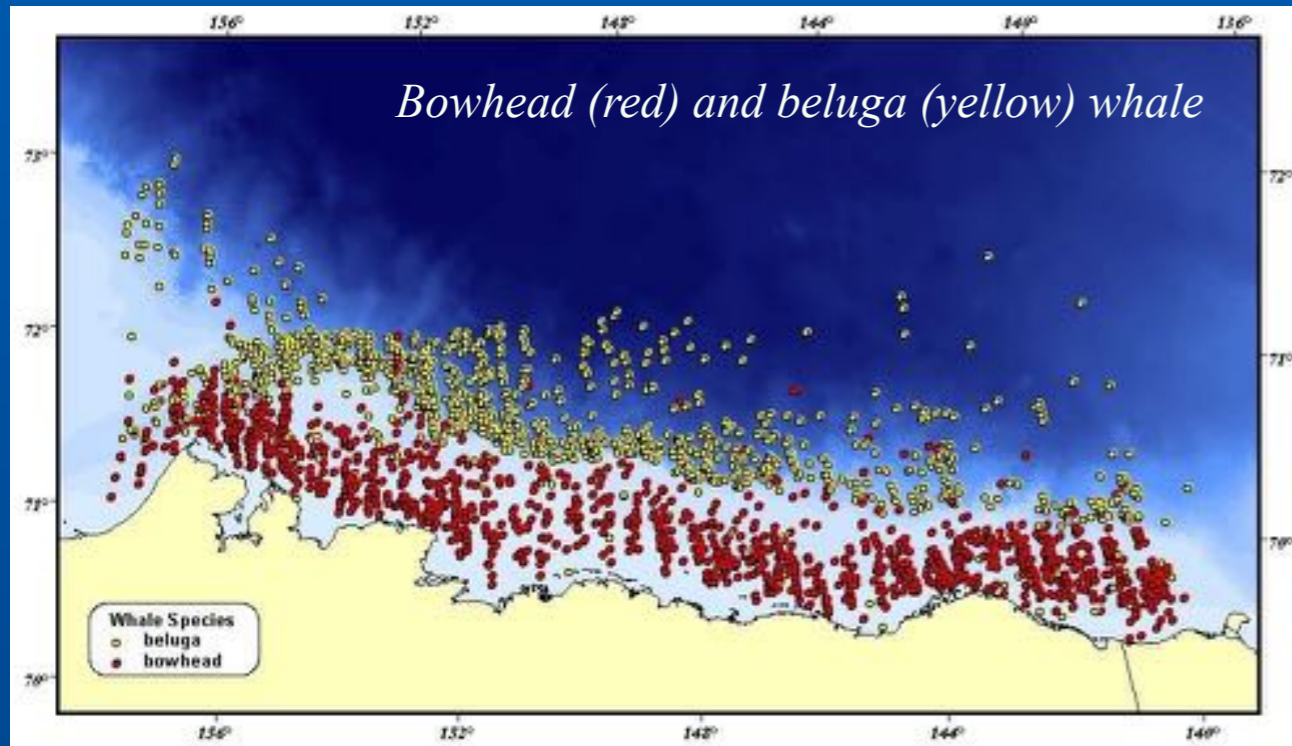


Questions:

Why are beluga whales often found at the transition from shallow to deep water (shelf break) in the Beaufort Sea?



Dr. Carin Ashjian



Bowhead (red) and beluga (yellow) whale

Is it because Beluga can find many of their Arctic cod prey there?

Why would there be high numbers of Arctic cod at the Beaufort Sea Shelf break?

What do we hope to learn?

- With east winds increasing on the Beaufort Shelf. We would like to know if this will affect where Beluga whales are found.
- If beluga whales will still be numerous on the shelf break in the future.
- To understand this, we need to be able to describe the ocean conditions at the shelf break that make it attractive to beluga whales



Dr. Carin Ashjian

Questions:

Why are beluga whales often found at the transition from shallow to deep water (shelf break) in the Beaufort Sea?

We think belugas are seen at the shelf break because high numbers of their Arctic cod prey are there.

The food chain we want to study:

Plankton
(Krill, Copepods)



Arctic Cod

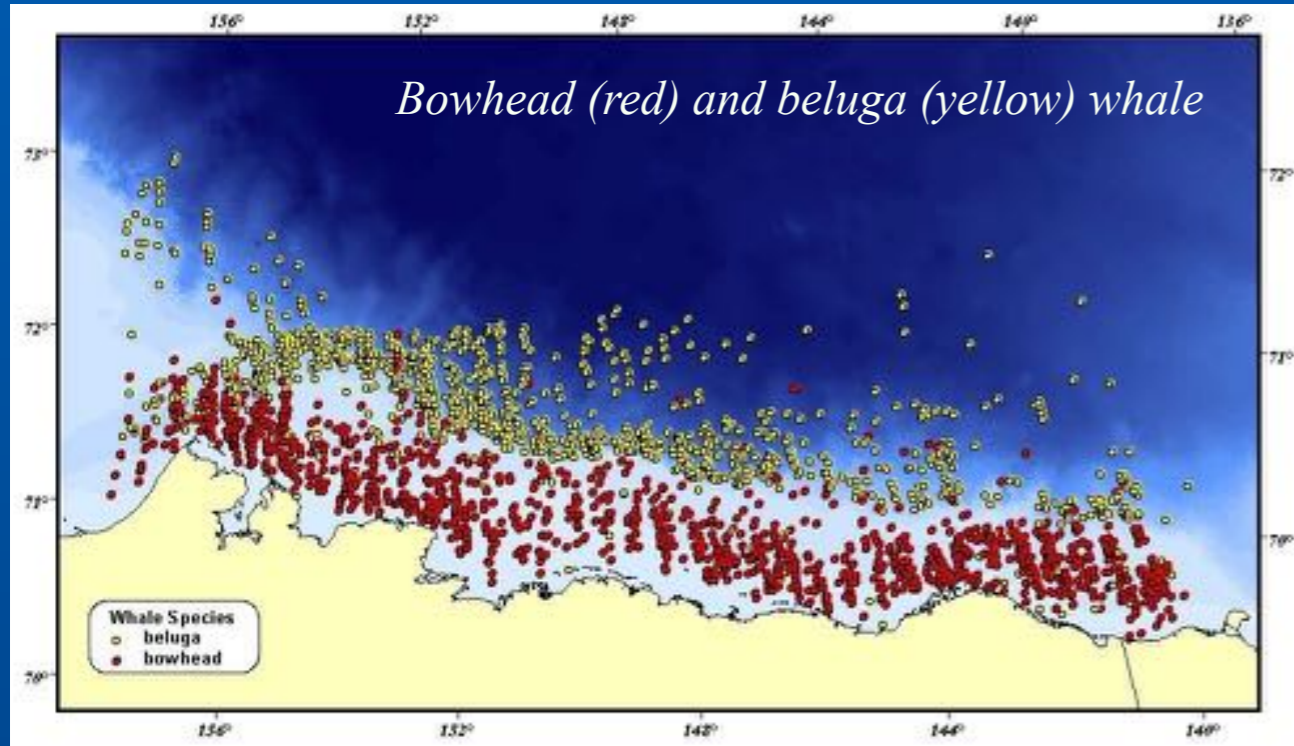


Belugas



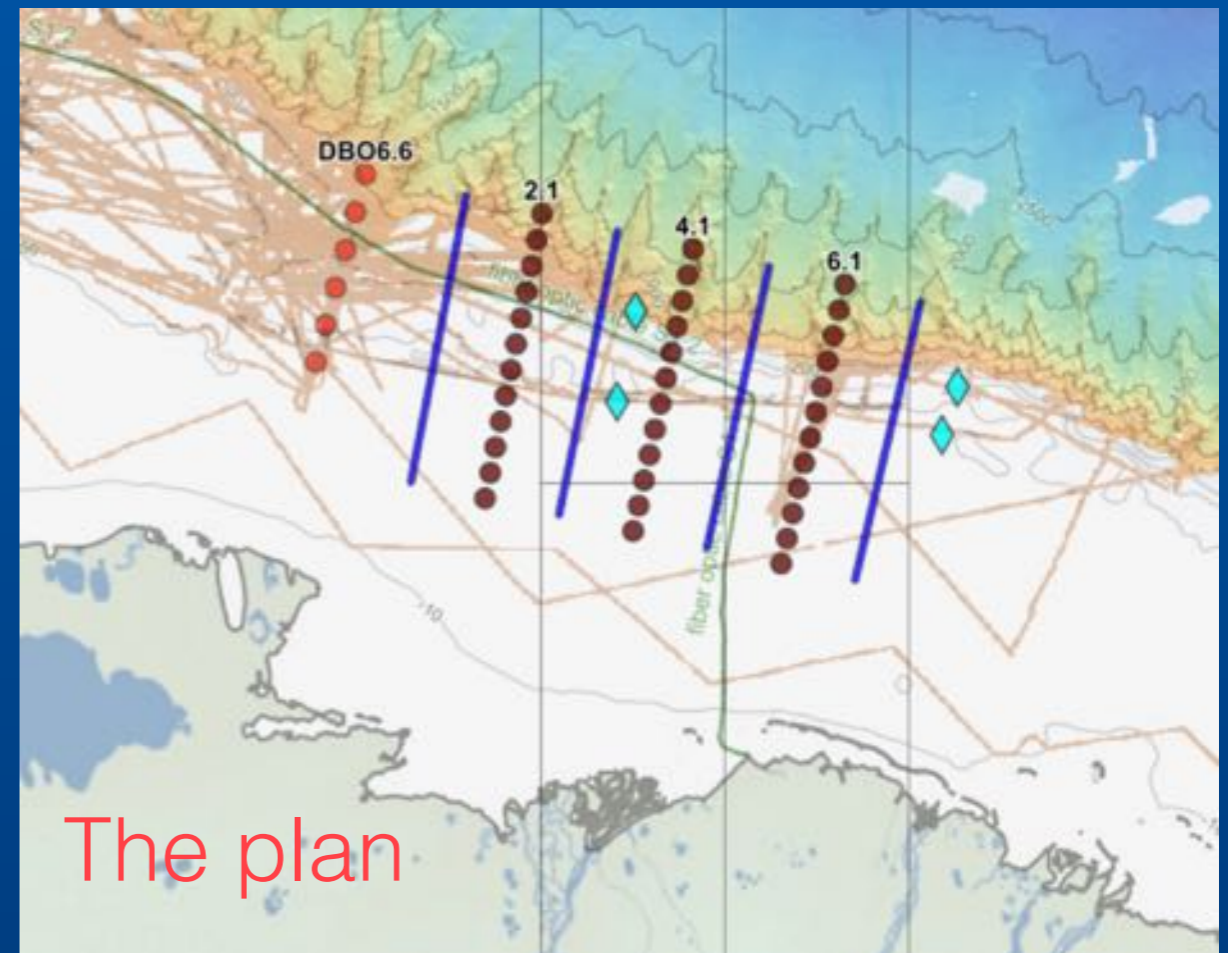
Images not to scale

Bowhead (red) and beluga (yellow) whale



Is it because beluga can find many of their Arctic cod prey there?

Why would there be high numbers of Arctic cod at the Beaufort Sea Shelf break?



The plan

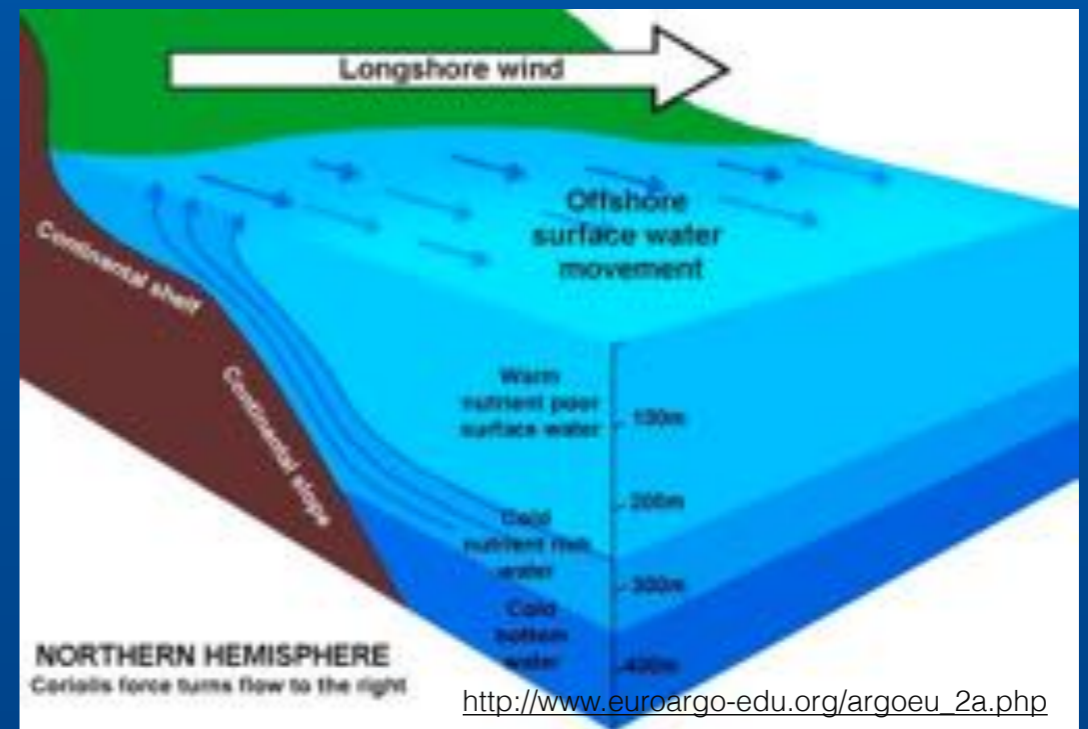


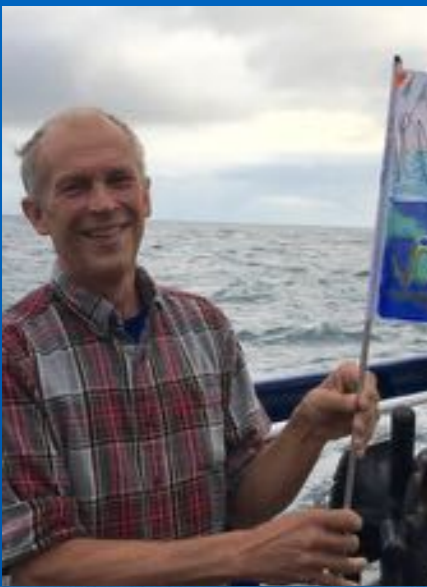
Dr. Steve Okkonen

Question: Based on the relative presence or absence of ocean animals including zooplankton, Arctic cod or beluga whales, on the Beaufort shelf break, "What is the relationship between the animals' presence, or lack of presence, with the changes in the physical setting of temperature, salinity or currents?"



Wind provides the force that changes the physical setting of temperature, salinity and ocean currents.





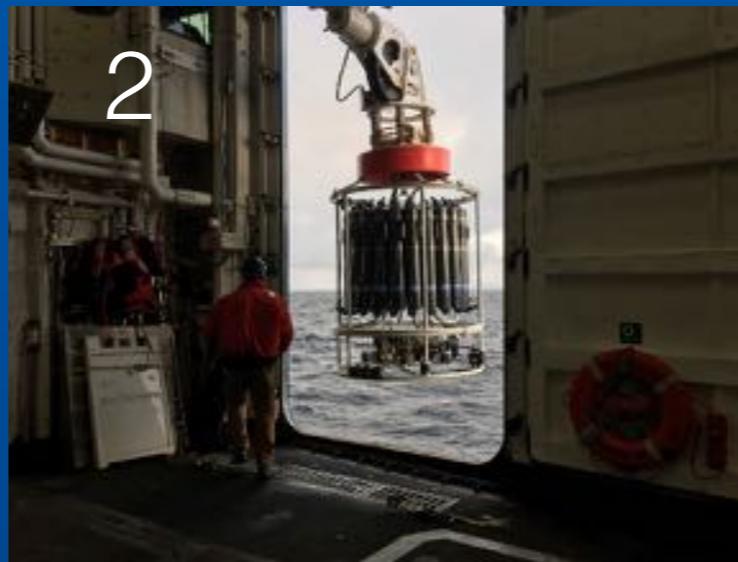
Dr. Steve Okkonen

Hypothesis: In interdisciplinary oceanography, an implicit hypothesis is that the physical environment of a region such as the Beaufort sea, salinity, temperature and currents, organize the biological environment (zooplankton, Arctic cod and beluga whales).

I collect the physical ocean data while the other members of the team collect the biological data. We put the data together to see what possible relationships exist between salinity, temperature and ocean currents and animal behaviors.



Photo from NOAA Ocean Explorer Website August 2012.



The CTD.

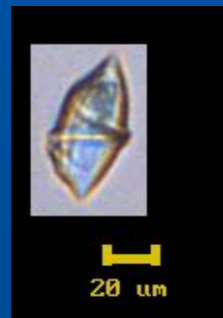
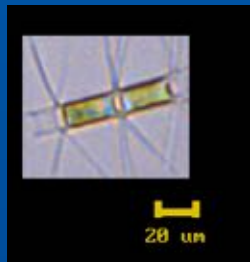
The acoustic Doppler current profiler (ADCP)



Dr. Kate Lowry

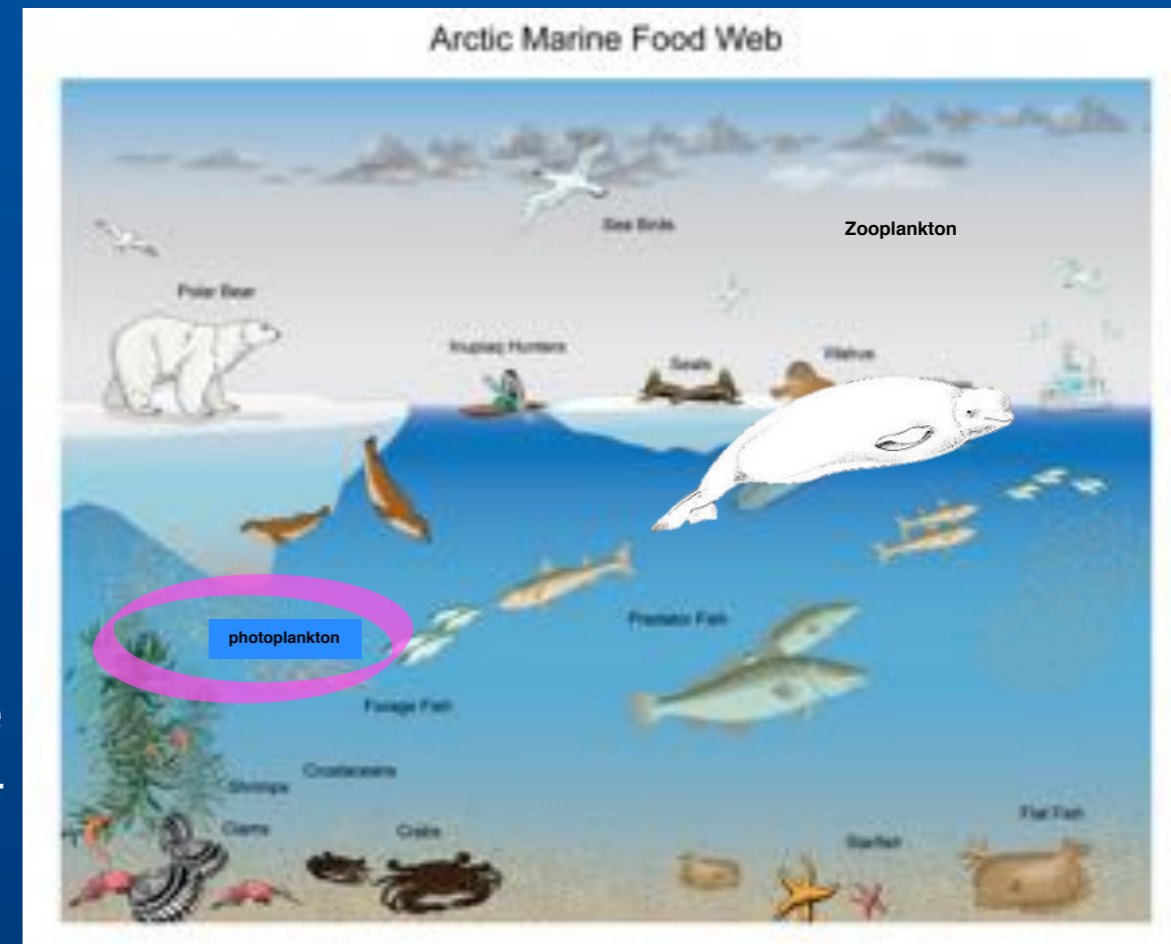
Phytoplankton

are mostly microscopic organisms that are found throughout the worlds oceans, including in the Arctic region and the Beaufort Sea! Phytoplankton float along with the ocean currents. These tiny organisms provide at least 50% of the oxygen in our atmosphere!



many phytoplankton are smaller in diameter than a human hair!

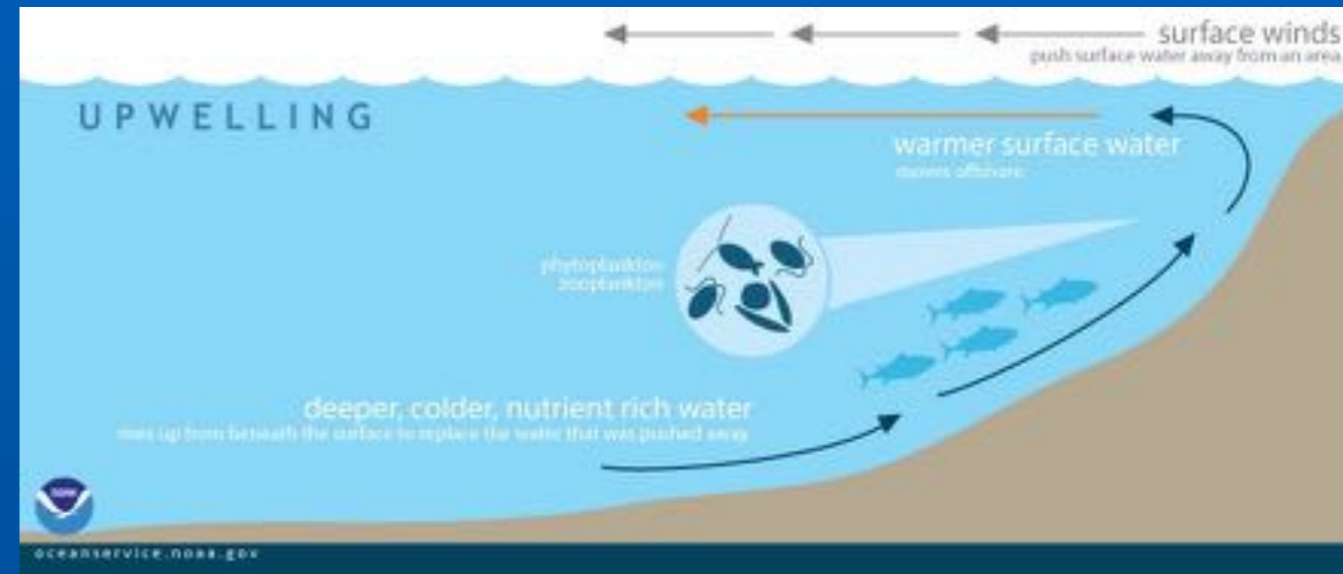
Phytoplankton are at the base of the ocean food web and are considered the primary producers, harnessing the sun's energy to make food. These organisms make life in the oceans possible for upper trophic level organisms.





Dr. Kate Lowry

Question: How does the phytoplankton community composition change, both across the continental shelf break, from deep offshore waters to shallow near shore waters, and in response to upwelling?



Hypothesis: Upwelling brings nutrients that support richer phytoplankton communities with bigger phytoplankton. I would expect that with more nutrients available, the phytoplankton are doing better, and there would be an increase in larger sized phytoplankton like Diatoms. Bigger phytoplankton could be a richer food source for organisms such as zooplankton.



Zooplankton

are animals that live all or part of their life suspended and floating with the ocean's currents. They can be very small or large with soft bodies (like jellyfish) and are weak swimmers. Zooplankton, such as copepod and krill, eat phytoplankton and are the link between phytoplankton and larger ocean organisms such as Arctic cod.



Dr. Bob Campbell



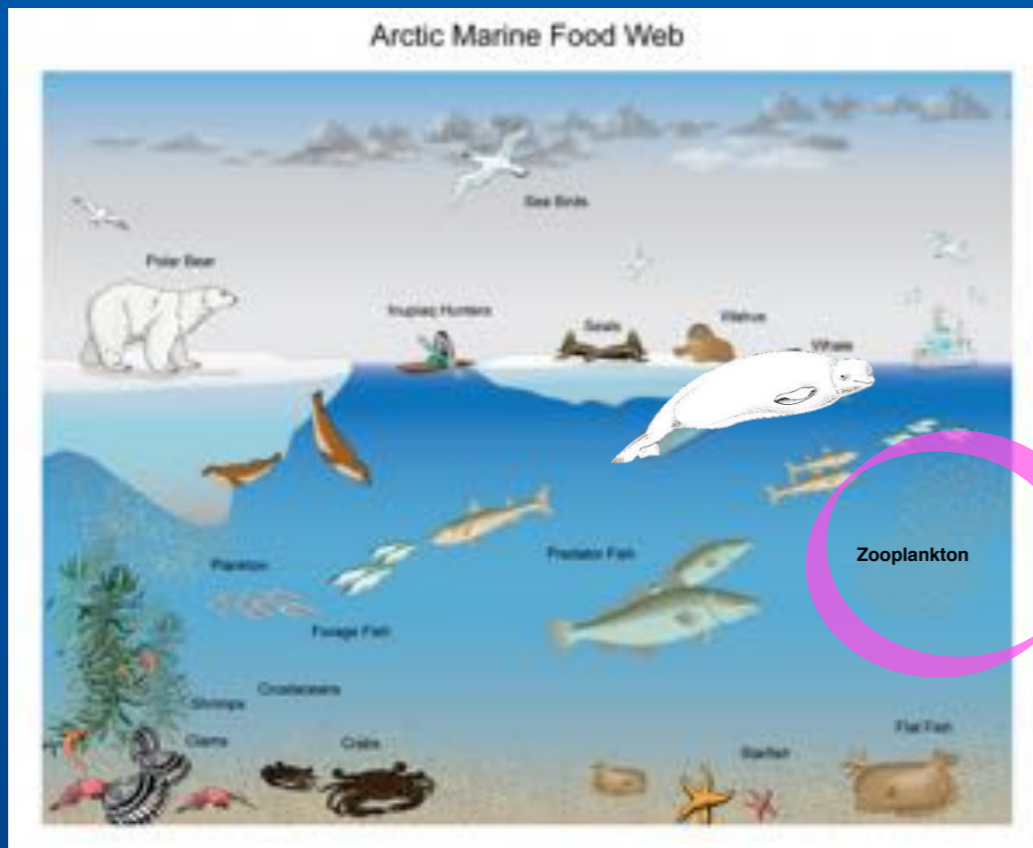
Dr. Kristina Kvile



Celia Gelfman



Phil Alatalo



<http://www.globalchange.gov/browse/multimedia/arctic-marine-food-web>

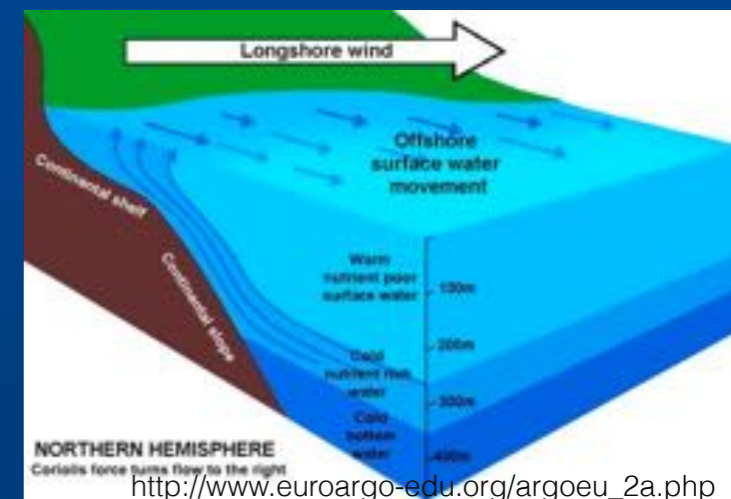
Question: How does upwelling on the Beaufort Sea Shelf impact the quality of the zooplankton food availability for upper trophic level animals on the shelf?



Copepod



Krill

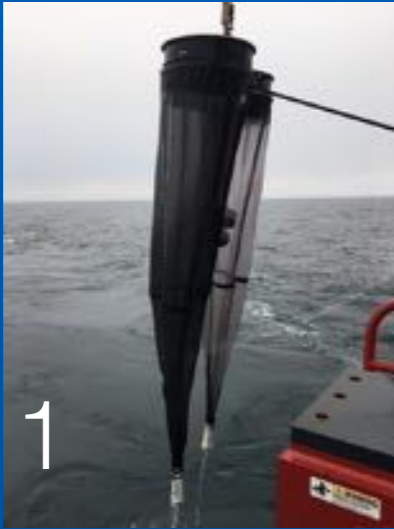


http://www.euroargo-edu.org/argoeu_2a.php

Hypothesis: Upwelling on the Beaufort Sea Shelf brings offshore zooplankton, which contain lots of lipids (fats), onto the Beaufort Sea Shelf. This can provide higher quality food opportunities for upper trophic level animals on the shelf, including the Arctic cod.



Dr. Bob Campbell



1



2



Dr. Kristina Kvile



5



6

Copepod
Calanus glacialis



Celia Gelfman



3



Krill
Thysanoessa inermis



Phil Alatalo



4

What Data Are We Collecting?

Arctic Cod

are an abundant fish in the Arctic Ocean and the Beaufort Sea. They are an important consumer in the ocean food web because they provide an “energy bridge” between organisms in lower trophic levels to organisms in higher trophic levels. Zooplankton, including copepod and krill are eaten by Arctic cod. Arctic cod are eaten by larger, higher trophic level organisms such as the beluga whale and sea birds.



Dr. Joel Llopiz



Dr. Mike Lowe



Jennifer Johnson

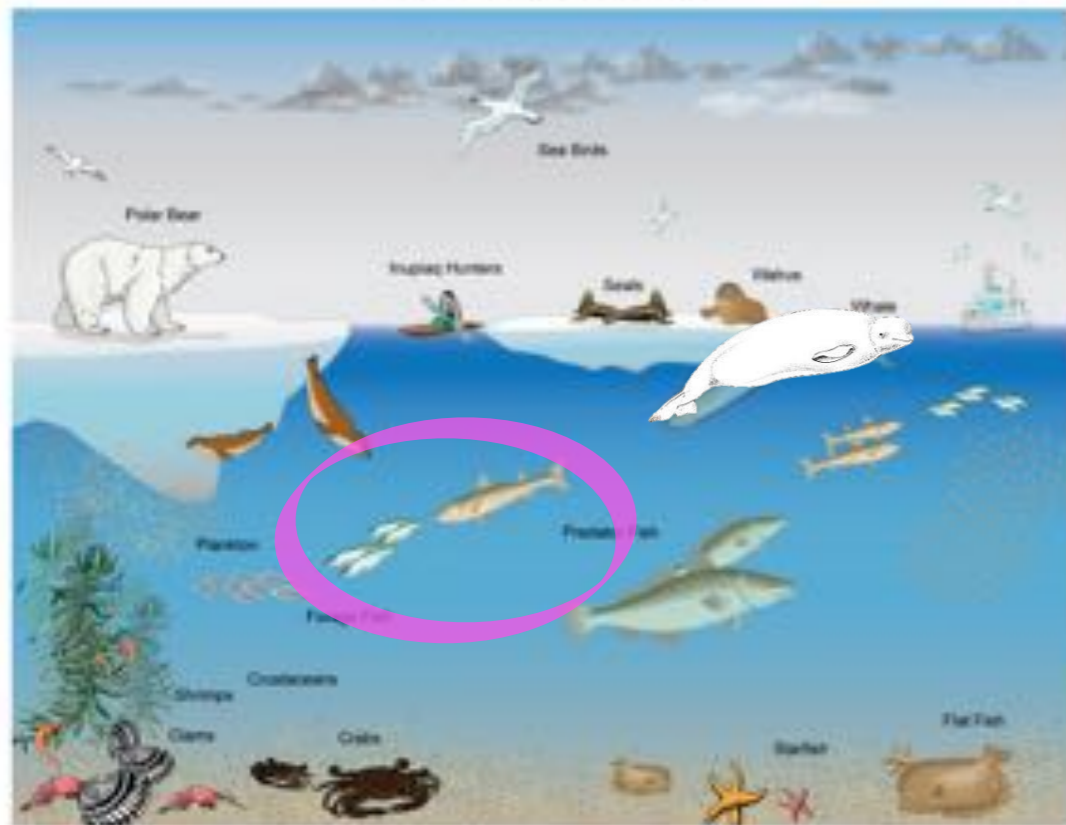


Chrissy Hernandez



Justin Suca

Arctic Marine Food Web





Dr. Joel Llopiz



Dr. Mike Lowe

Question: How does upwelling on the Beaufort shelf affect what the fish are eating and how well they are eating?

Hypothesis: Upwelling events can cause concentrations of zooplankton, the main food of the Arctic cod, and when you get conditions that allow for concentrated food, the fish eat better and if they eat better they are more nutritious for the beluga whales.



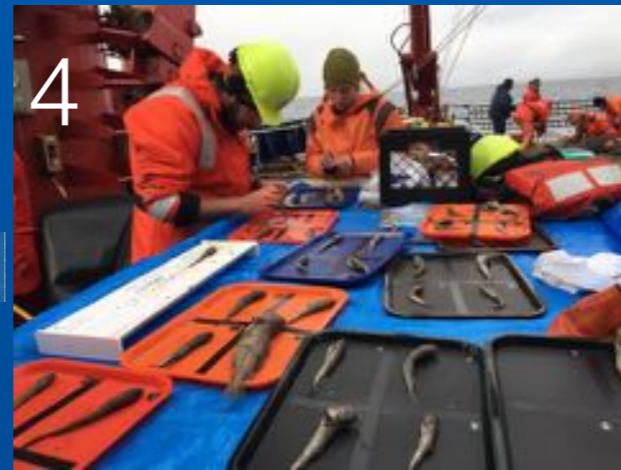
Jennifer Johnson



Chrissy Hernandez



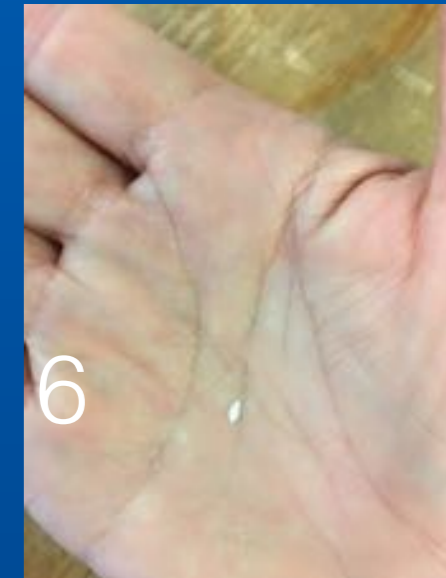
Justin Suca



4



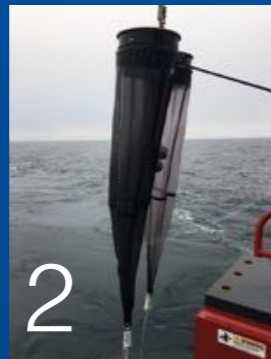
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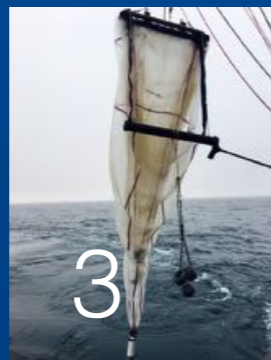
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1



2



3

What Data Are We Looking Collecting?

- *Where the fish are located in the water column before and after upwelling events.
- *stomach contents
- *tissues samples
- *fat content
- *otoliths, small "earstones"

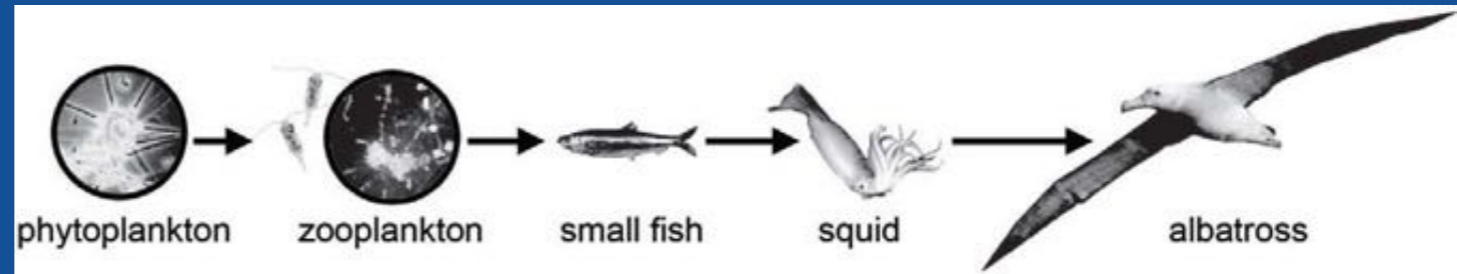


Tamara Zeller



Seabirds in the Ocean

Seabirds are some of the top predators of the ocean food web and feed on a variety of smaller organisms like fish and zooplankton.

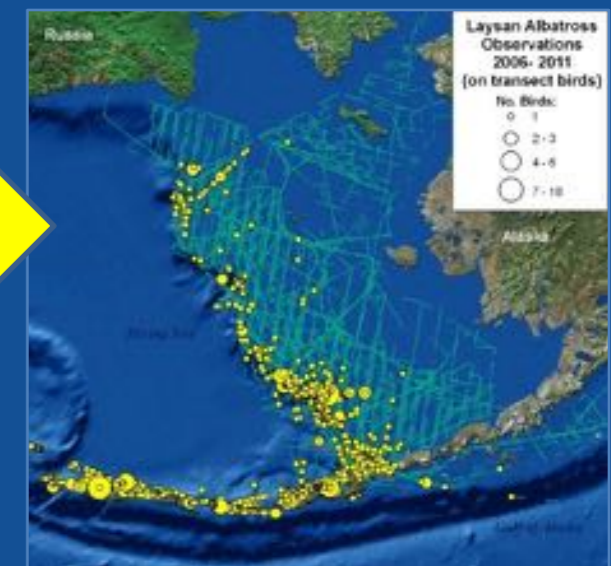
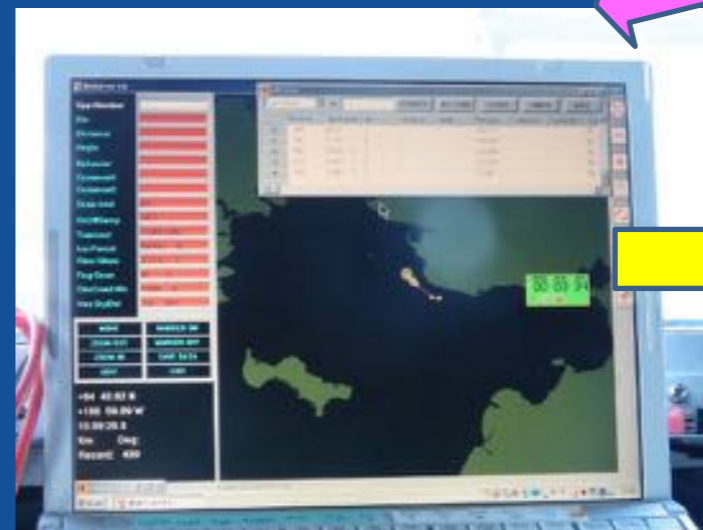


Question:

- How many, and what kind of seabirds are we seeing in the ocean and how is this related to food availability?

Hypothesis:

- Seabird numbers will increase in areas where there is an abundance of zooplankton and fish present, and at depths at which the seabirds can capture this prey.



Beluga whales

have teeth, unlike the Bowhead Whales which have baleen and only eat plankton. Arctic cod are one of Beluga whales main prey. Beluga are born dark gray in color and change to white as they mature.

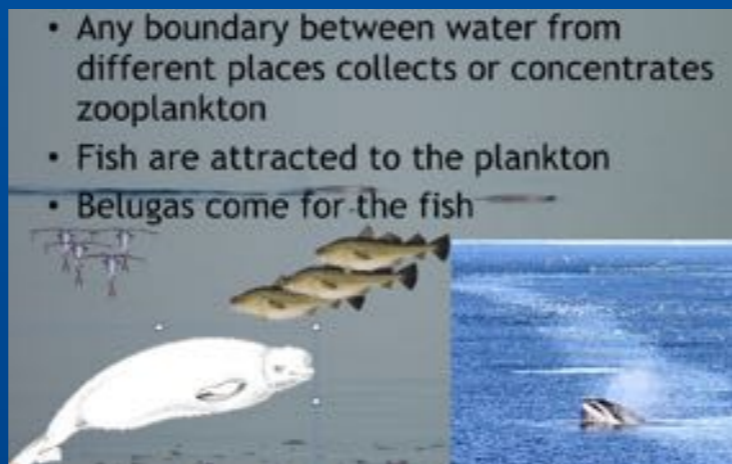
They have a distinctive bump, called a melon on their forehead which is believed to aid in echolocation. Echolocation is a process in which animals make sounds and use the echoes of their calls to locate and identify objects. These sounds to locate prey like Arctic cod.



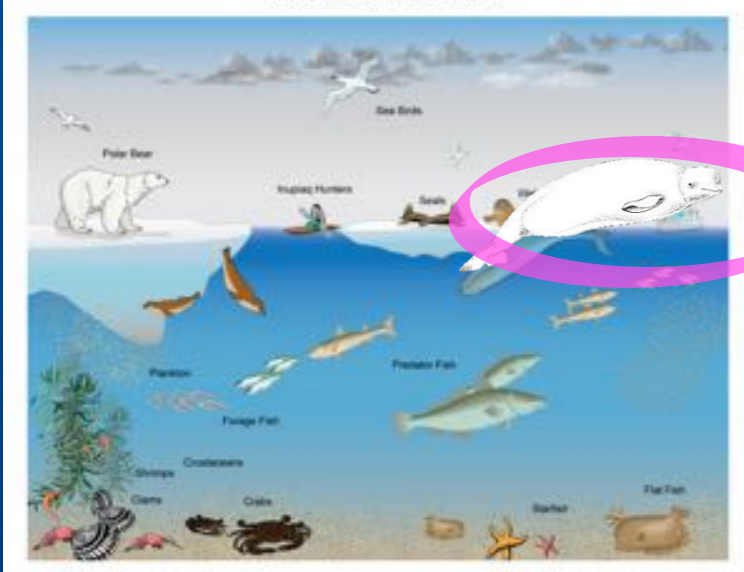
Dr. Kate Stafford



Jenny Stern



Arctic Marine Food Web



Beluga whales make lots of sounds

- Echolocation clicks
 - Used to navigate and find food
- Whistles
 - Used while socializing and during feeding
 - We can hear these sounds
 - These are too high pitched for humans to hear
- To study beluga whales, we eavesdrop on them
 - We can listen year-round in heavy ice, dark and rough weather

photos and diagrams courtesy of Dr. Kate Stafford

- Beluga occurrence – as seen from aerial surveys and heard from whale sound recorders – is influenced by wind speed and direction. So in essence they're like the windsock.



Dr. Kate Stafford

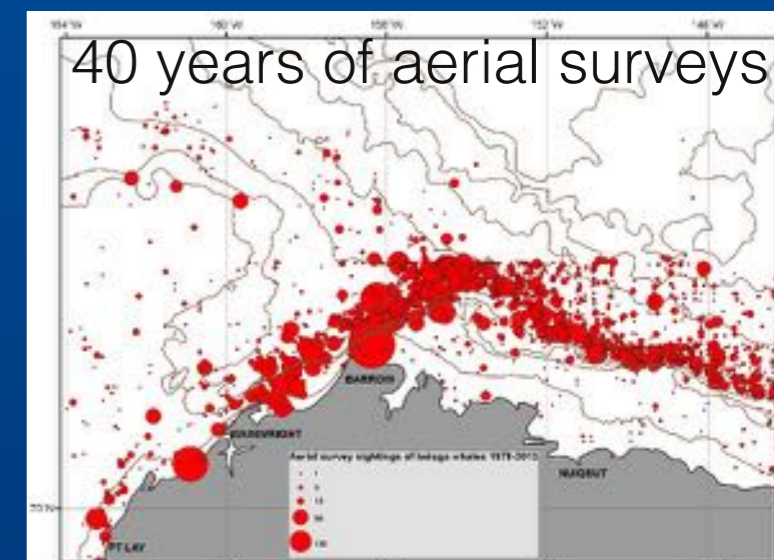


Jenny Stern



So our question about beluga whales comes back full circle to Dr. Carin Ashjian's first slide:

Question: How does the speed and direction of the wind change the physical structure of the ecosystem and how does that then change the distribution and the abundance of prey that the belugas rely on, which is the arctic cod. And to understand how the Arctic cod are influenced we need to understand how it impacts their prey, the zooplankton and the zooplankton's food, which includes the phytoplankton.



Community Observer

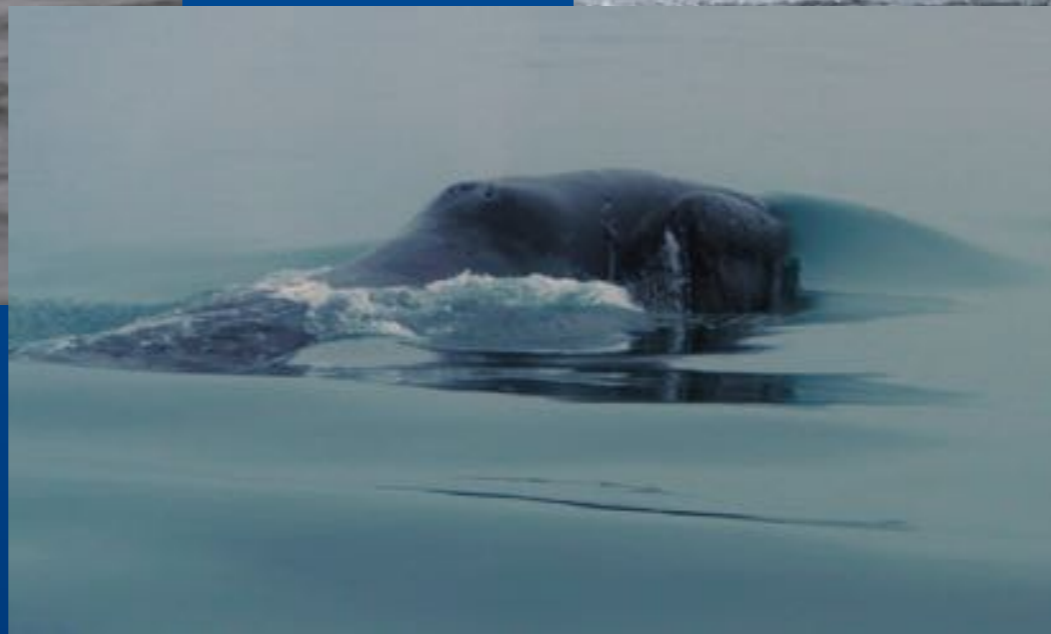
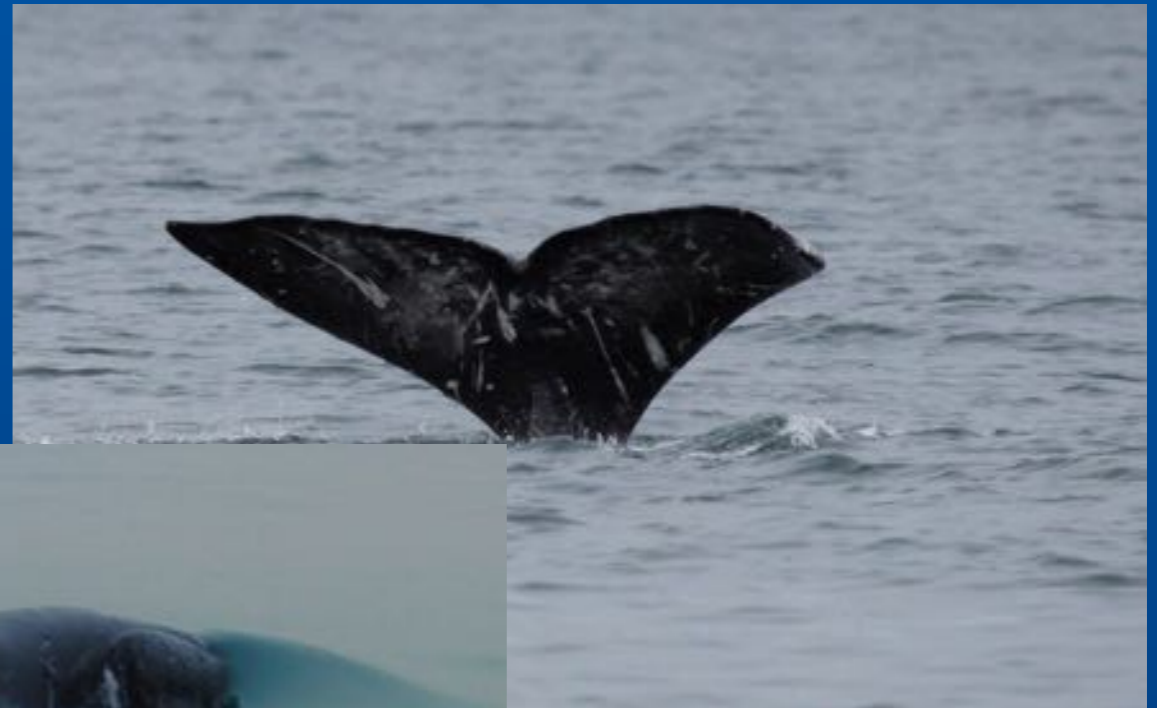
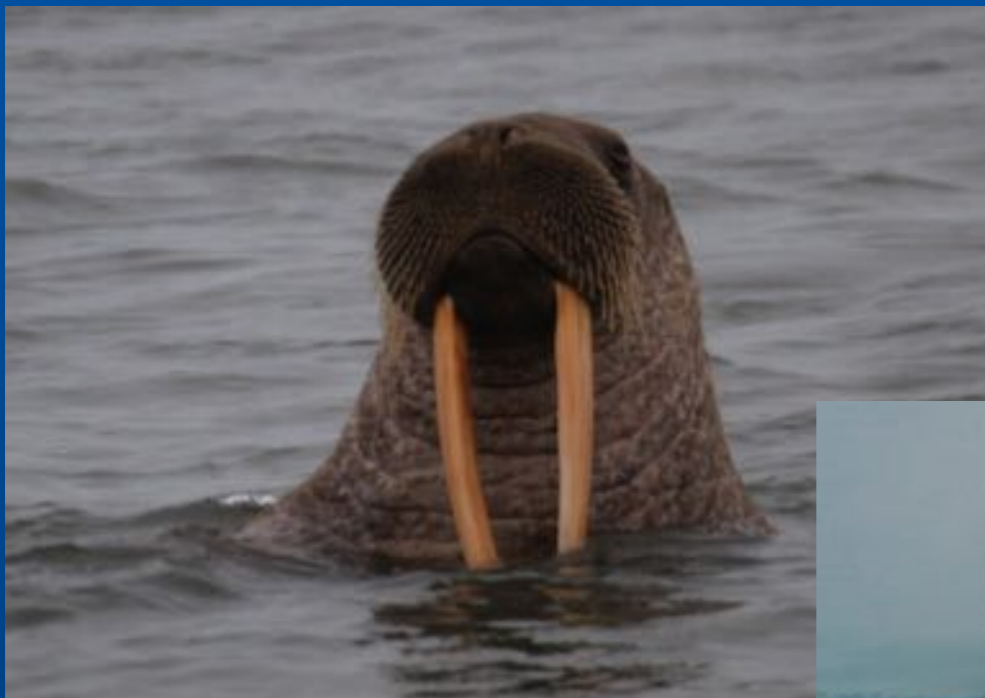
My primary, overall role is to provide communications between research scientists and the local communities in Alaska where scientific research activities are occurring.

Additionally I communicate with indigenous subsistence hunters in these local communities to help preserve traditional hunting grounds and marine mammal migrations.

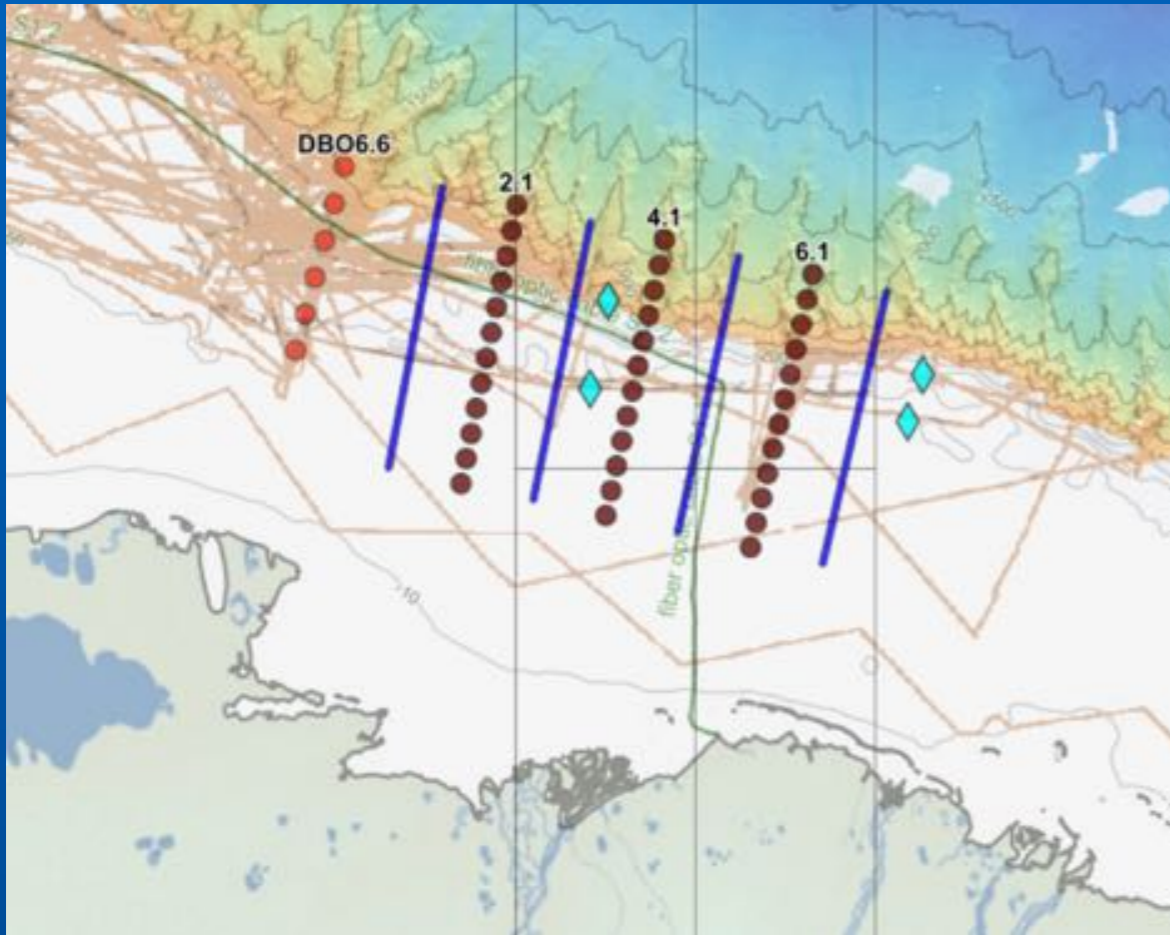
On a daily basis I make observations, keep surveys and journals documenting marine mammals and activities during science research activities in the region.



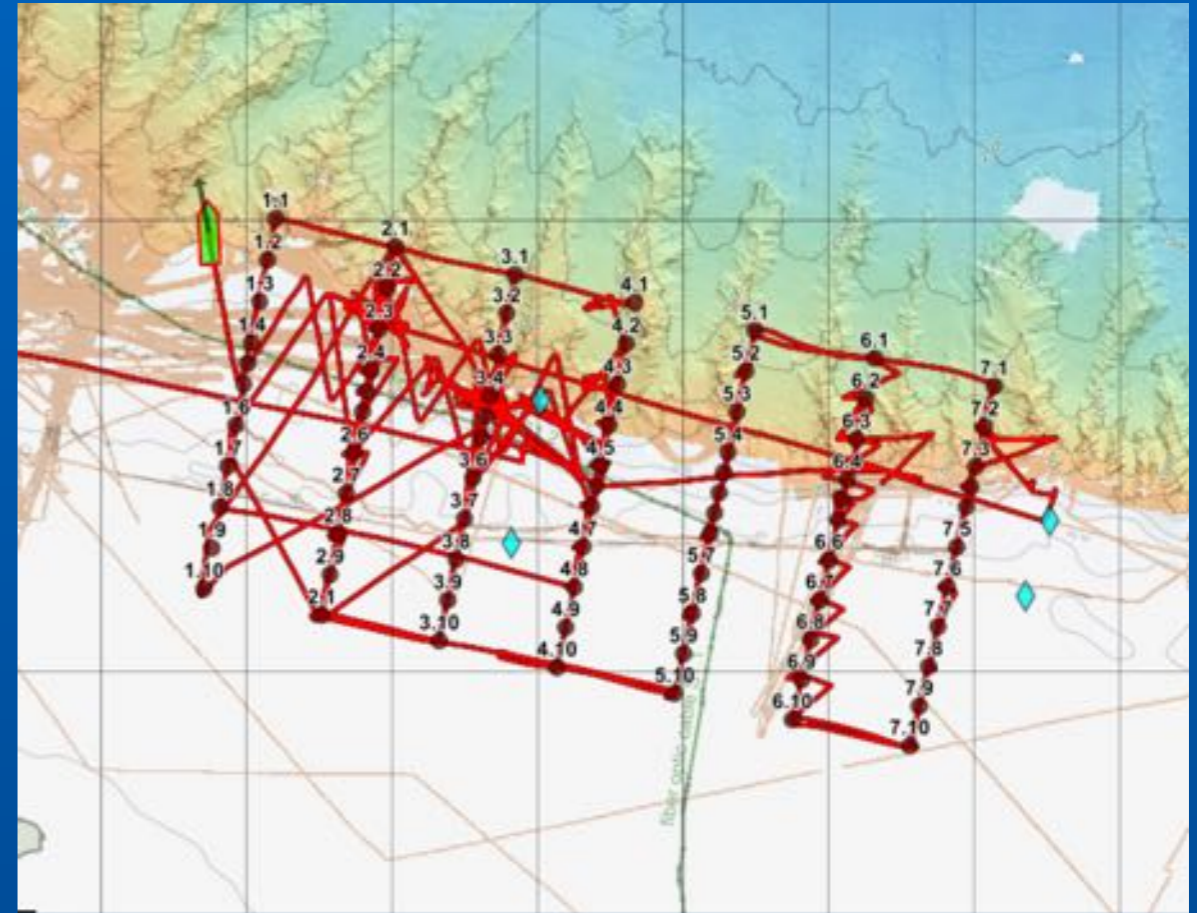
Britte Merculief



The plan.



What we did!



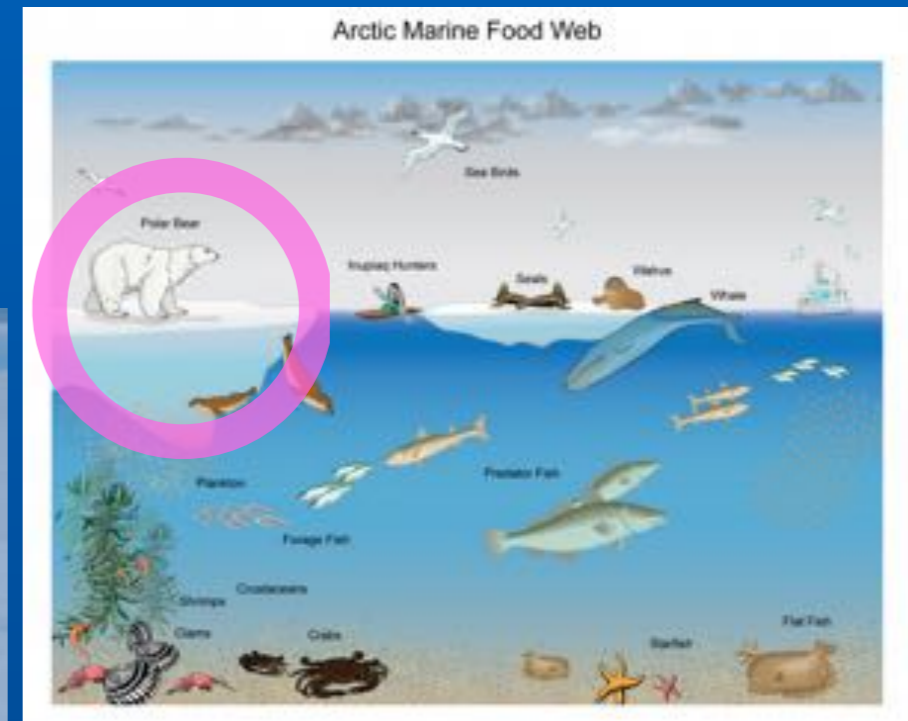
<http://realtime.sikuliaq.alaska.edu/realtime/map/skq.html>

	Total operations as of 9-12-17
Mooring Deployment	4
Acrobat Profiler	8
CTD	165
Bongo Net	34
Tucker Trawl	55
Ring Net	2
Midwater Fish Net Trawl	13
Glider Recovery	1
Survey Line	1

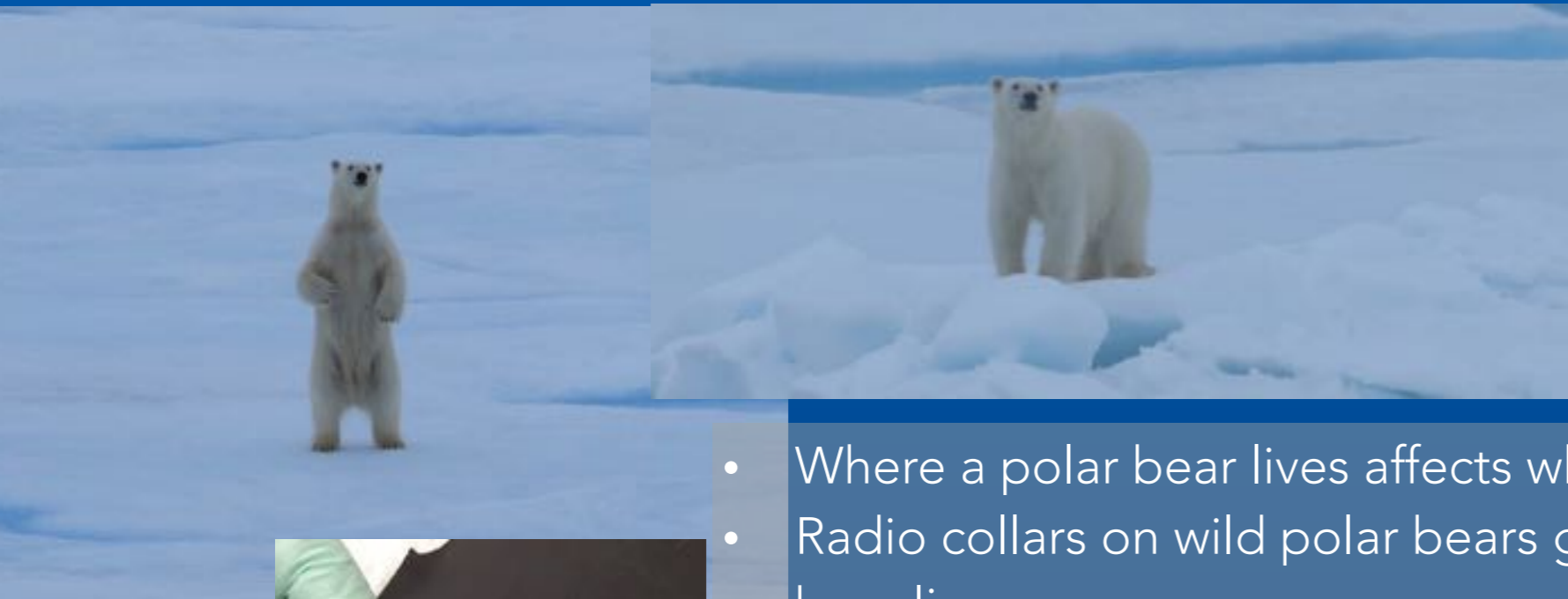
Jenny is here on the R/V Sikuliaq working with Dr. Kate Stafford's project which focuses on the Beluga whales. However Jenny's own Masters Thesis work is focused on STUDYING the POLAR BEAR DIET, which is pretty awesome, so we thought she should tell you about it!



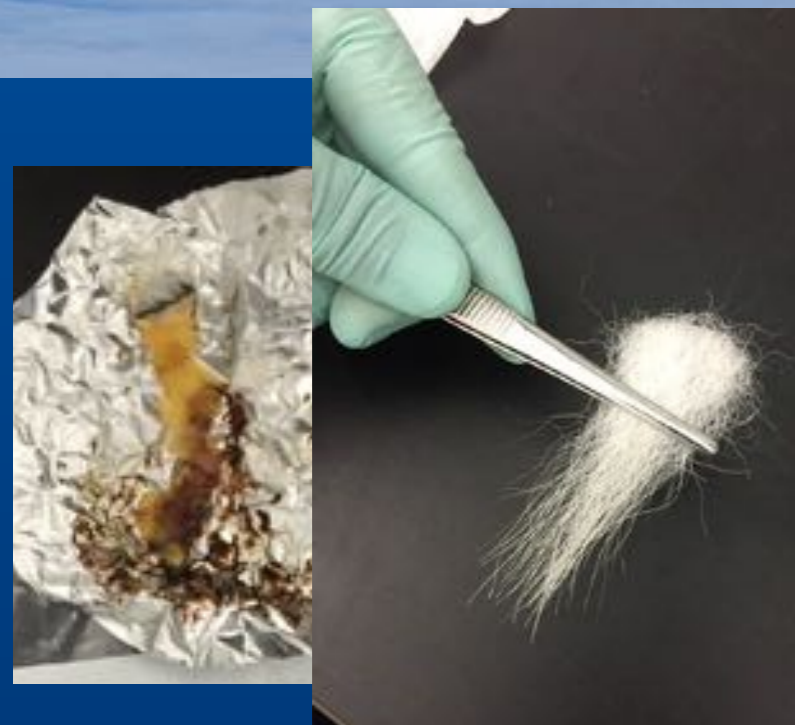
Jenny Stern



<http://www.globalchange.gov/browse/multimedia/arctic-marine-food-web>



- Where a polar bear lives affects what kind of food it eats.
- Radio collars on wild polar bears give us information on where the polar bear lives.
 - Some polar bears live on glaciers throughout the year.
 - Other polar bears move across the pack ice in the ocean during the year.
- Using certain types of chemistry, we can look at samples of their fat and hair to figure out what they have been eating.
 - Fat samples give information on the diet of the past month. Hair samples give information of the diet for the past year.



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Thank You!

An archive of the event will be available shortly.

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



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