



Welcome to Live from IPY!

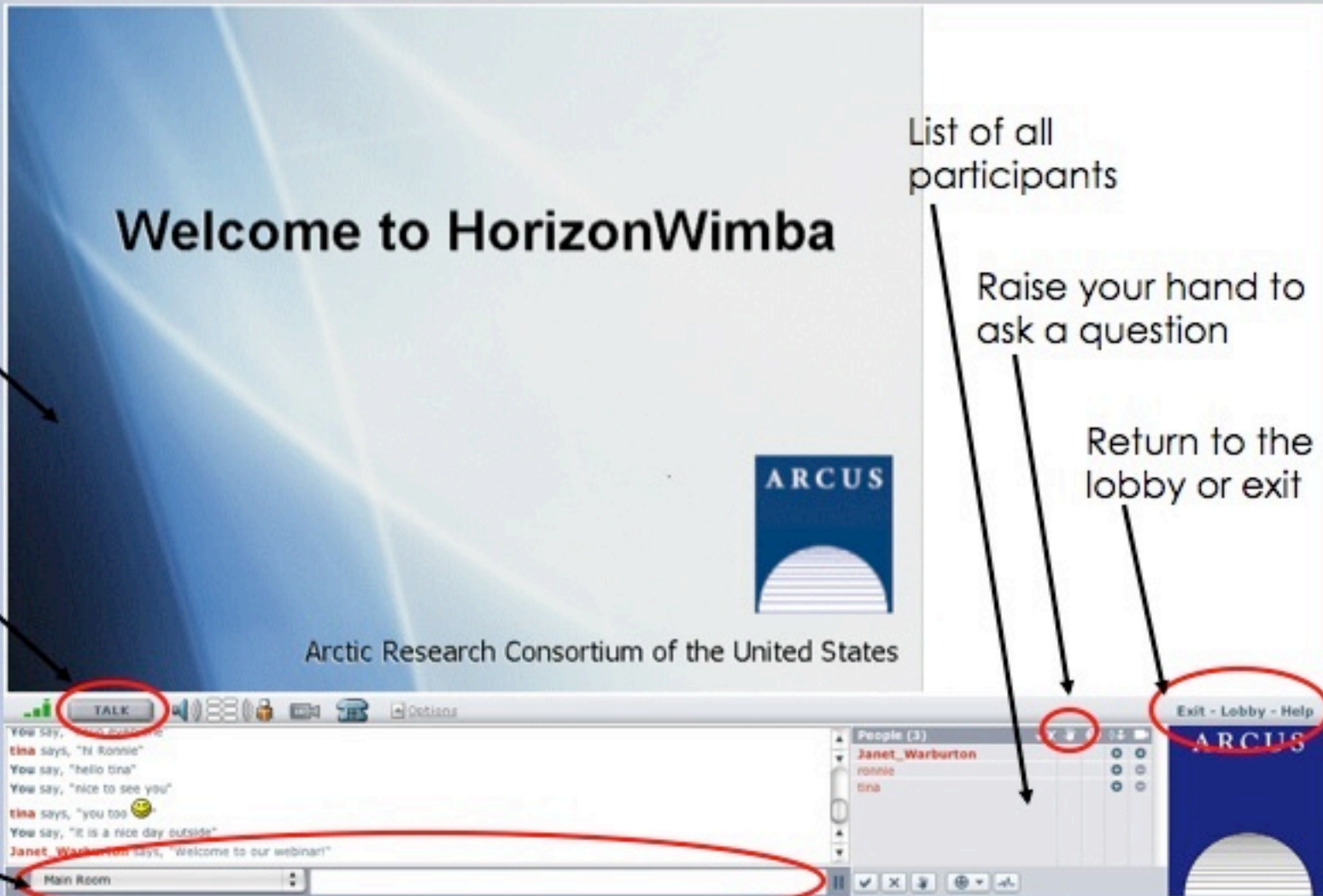
From plants to nutrients to the chemistry of it all!
Part two of the BEST/BSIERP Webinar Series

With Jillian Worssam & the
Bering Ecosystem Study '08
Team onboard the USCGC
Healy on the Bering Sea

July 28, 2008

10:00 AM Alaska Daylight Time [9:00 AM HDT, 11:00
AM PDT, 12:00 PM MDT, 1:00 PM CST, 2:00 PM EDT]





Slides will be shown here

If using VOIP, press here to talk

'Chat' with one person or the entire group

ARCUS
Arctic Research Consortium of the United States

List of all participants

Raise your hand to ask a question

Return to the lobby or exit

TALK

People (3)
Janet_Warburton
ronnie
tina

Exit - Lobby - Help

Please note: Today's event will be recorded and archived at www.polartrec.com.



What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers in authentic polar research experiences.

In the next three years, about 40 teachers from around the United States will join scientists in the Arctic and Antarctic in celebration of the International Polar Year!

www.polar trec.com

The PolarTREC Team



Wendy Warnick

PolarTREC PI
Executive Director



Helen Wiggins

Program Coordinator



Janet Warburton

PolarTREC
Project Manager



Kristin Timm

PolarTREC
Project Manager



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Web Developer



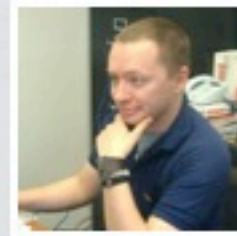
Ben Wade

Web Developer



Tina Buxbaum

Electronic Media
Project Manager



Zeb Polly

Systems Administrator



Joed Polly

Video Production

...with help from the
entire staff at ARCUS



International Polar Year (IPY)

2007-2009



The International Polar Year (2007-2009) is an exciting scientific campaign focusing on the world's polar regions!

IPY is a time for discovery, science, learning, and awareness about the polar regions with activities for youth, scientists, and the public.

www.ipy.org

Where is Ms. Worssam & the Team?





Chukchi Sea

Russia

Bering Strait

**Alaska
(USA)**

St. Lawrence Island

Anchorage

St. Matthew Island

Nunivak Island

Bering Sea

Gulf of Alaska

Dutch Harbor

Aleutian Islands

Pacific Ocean

*Map courtesy of
Wikipedia Commons*

Late-April ice edge

Most of the southeastern Bering Sea, where the major fisheries are concentrated, used to freeze every winter. Now, most of the fishing grounds remain ice-free year-around. This map shows the average extension of the ice in late April. This spring, the ice spread further south than the past several years, but melted away rapidly.



Source: ESI, NOAA/PMEL

MARK NOWLIN / THE SEATTLE TIMES

US Coast Guard Cutter Healy

Length: 420'0" (128 meters)

Beam: 82'0" (25 meters)

Draft, Full Load: 29'3" (8.9 meters)

Fuel Capacity: 1,220,915 GAL (4,621,000 liters)

Cruising Speed: 12 knots

Max Speed: 17 knots

Icebreaking Capability:

4.5 ft @ 3 knots (continuous)

8 ft (2.44 m) Backing and Ramming





Bering Ecosystem Study '08

Dates: **June 30 - August 2, 2008**

Location: **Bering Sea**

The team will conduct sampling along a series of transects over the eastern Bering Sea, with scientists documenting ocean conditions and the productivity of the Bering Sea ecosystem with measurements of the temperature, salinity, and nutrient content of the sea water, changes in sea ice cover, and the concentration of nutrients used and released by phytoplankton.

They will also conduct surveys of various marine organisms to assess the health of these populations, and give scientists an indication of the current status of the Bering Sea ecosystem and any changes that might affect the use of its resources, and the economic, social and cultural sustainability of the people who depend on it.



Who are we talking with today?



**ARMADA Teacher
John Karavias**



**PolarTREC / Teacher at Sea Teacher
Jillian Worssam**

Who are we talking with today?



Tom van Pelt

NPRB Assistant
Program Manager



**Diane
Stoecker**

University of
Maryland



David Shull

Western
Washington
University



Pat Kelly

University of
Rhode Island



**ENS Tara
Schendorf**

Public Affairs Officer
Assistant Marine
Science Officer
USCGC HEALY



Bering Sea



AN HISTORIC PARTNERSHIP BETWEEN THE NORTH PACIFIC RESEARCH BOARD AND THE NATIONAL SCIENCE FOUNDATION

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AT A GLANCE

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Third Healy Cruise: July 3-31, 2008



Above: The science team takes time out for a group photo aboard the Healy, in the Bering Sea. (Nicola Hillgraber)



NPRB Assistant Program Manager Tom Van Pelt (left) is aboard the Healy as a seabird observer, and is also providing regular updates in the Cruise Logbook. **Find out what he's doing on an icebreaker in the central Bering Sea in July.**

This BEST-BSIERP cruise follows two made earlier in 2008 that focused on conditions directly associated with the retreating ice edge.

Scientists will examine summer conditions on the eastern Bering Sea shelf. Although this region is ice-free in summer, ice earlier in the year influences the subsequent development



UPCOMING EVENTS

- **June-Sept** | Colony-based seabird studies, Pribilofs
- **July 3-31** | Healy Cruise #3
- **Oct 14-16** | BEST-BSIERP PI Meeting, Girdwood
 - [Draft Agenda](#)
 - [More Information](#)

2008 Calendar of Events

Cruise Calendar

PROGRAM UPDATES

- **Cruise Plan** now available for HLY0803 (third Healy Cruise)
- **Data Templates** now available
- **Best-Bizzerp WHAT?! Resources** (powerpoints, PDFs, photos) for explaining BEST-BSIERP are now available for download

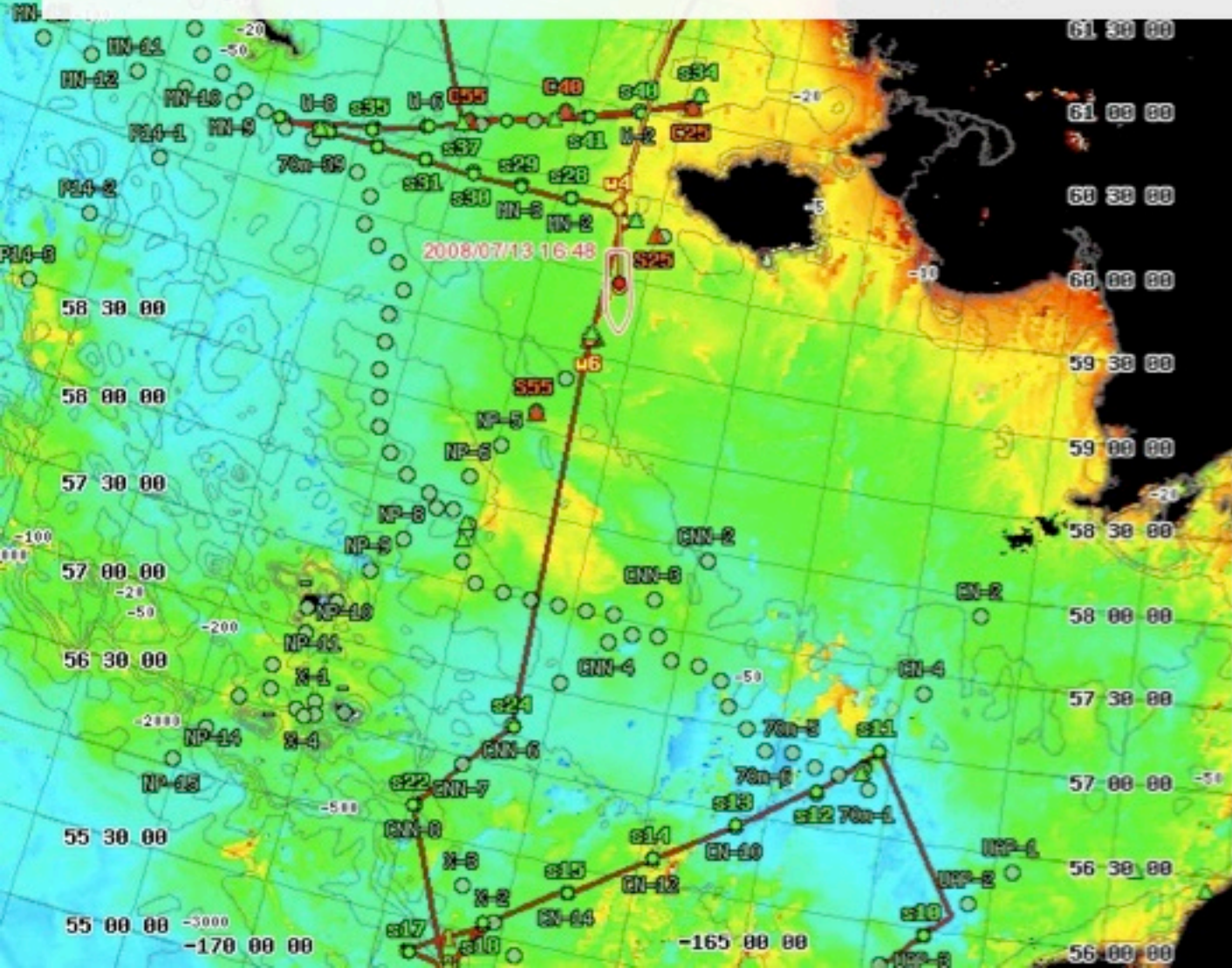
BERING SEA BITS

- **Jim Lovvorn interview** with the BBC on spectacled elders

NOAA SST 2008/07/06... 2008/07/06... -166.15.00 -163.45.00

61 30 00
61 00 00
60 30 00

Phytoplankton are the primary producers at the base of the Bering Sea food web. The green plant pigment chlorophyll is used to estimate phytoplankton abundance. Satellite pictures show that phytoplankton biomass is patchy in the Bering Sea during summer.



**Chlorophyll
(Phytoplankton)
abundance in
the Bering Sea:**

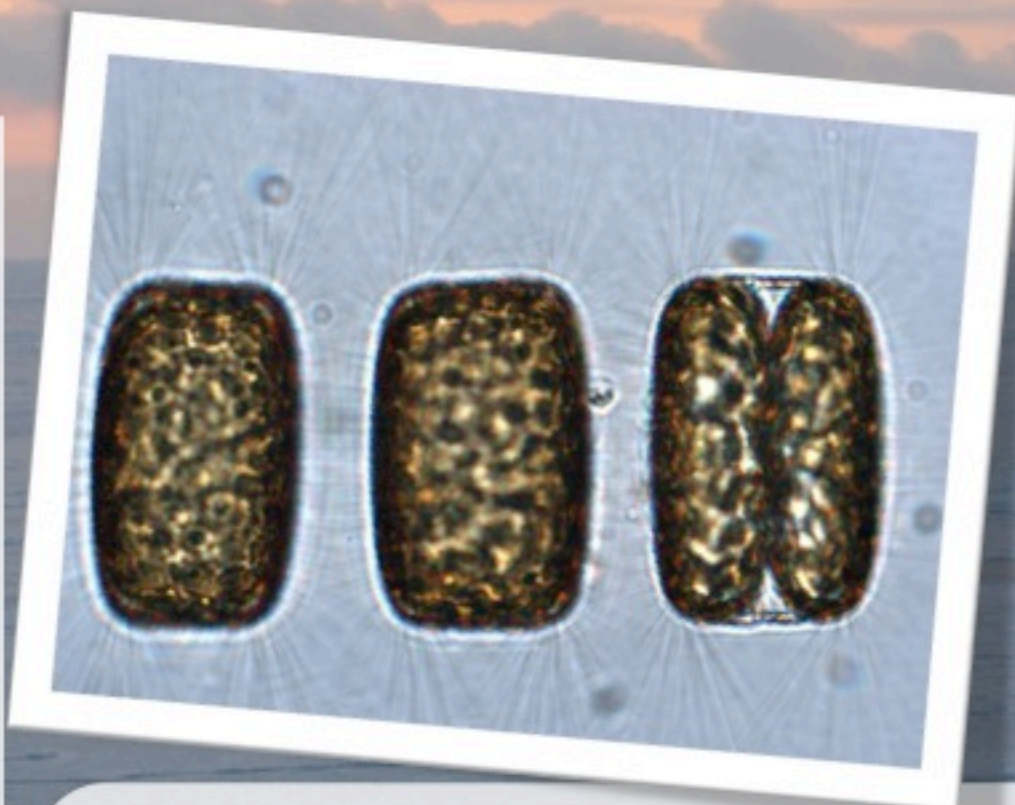
**Blue=low
chlorophyll**

**Green=medium
phytoplankton**

**Yellow=high
phytoplankton**

Phytoplankton & Role in the Bering Sea Ecosystem

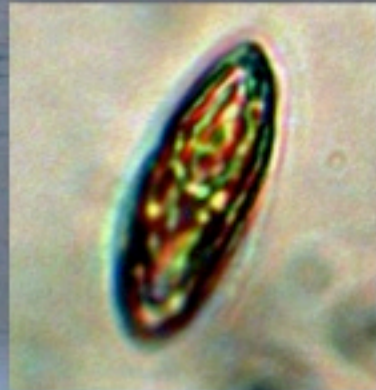
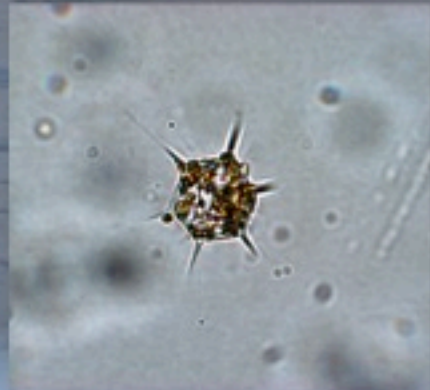
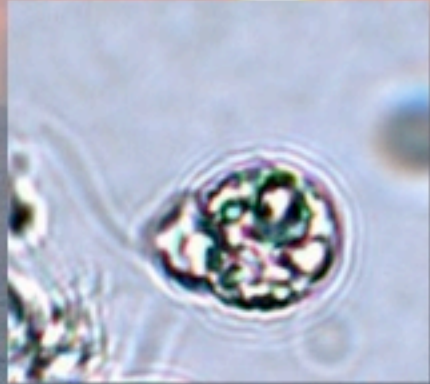
Phytoplankton are one-celled photosynthetic organisms (microalgae). They include large diatoms as well as many types of smaller cells. Large diatoms dominate when nutrients and light are abundant in the Bering Sea. When nutrients are limiting in summer, small photosynthetic cells are dominant.



Chain forming diatoms from Bering Sea, these are readily eaten by copepods and krill (zooplankton). During the summer, these large cells are most abundant below the surface mixed layer.

Bering Ecosystem Study '08
www.polarrec.com

In summer, nutrients (mostly nitrate) get used up and small phytoplankton dominate in surface waters on the Bering Sea Shelf.



We are finding on our cruise that-

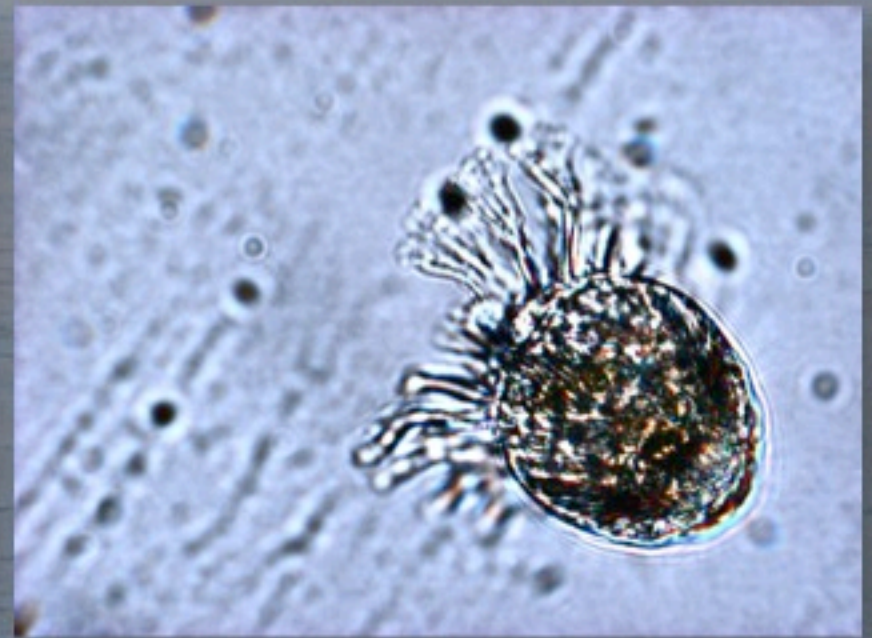
- About 87% of the phytoplankton are small (<20 microns)
- Most of these phytoplankton are too small to be readily eaten by copepods and krill
- Many of these phytoplankton have flagella and swim

Small phytoplankton are eaten by micro-zooplankton (microscopic, mostly one-celled organisms).

We are finding that **64-95% of the phytoplankton production** is eaten by **micro-zooplankton** in surface waters of the Bering Sea during summer

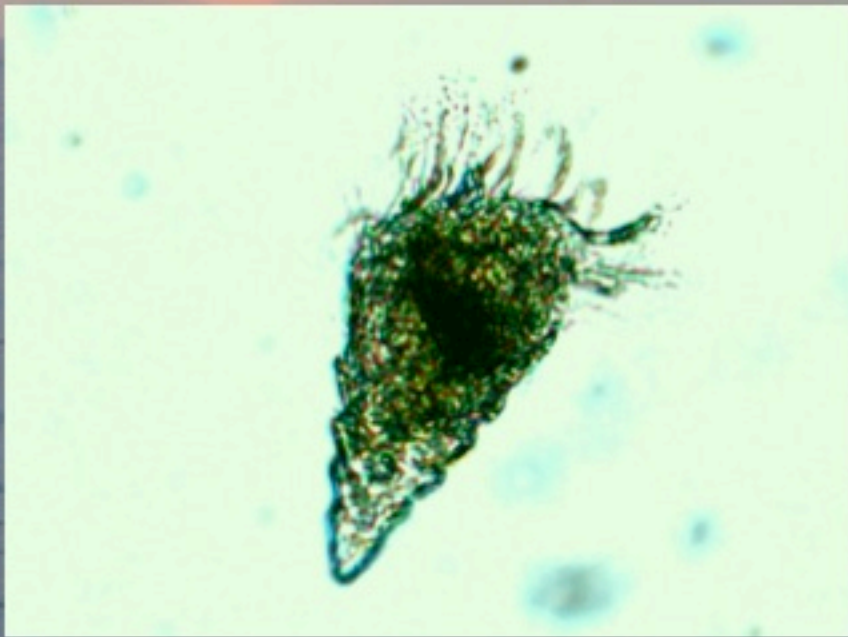


Heterotrophic dinoflagellate that eats phytoplankton

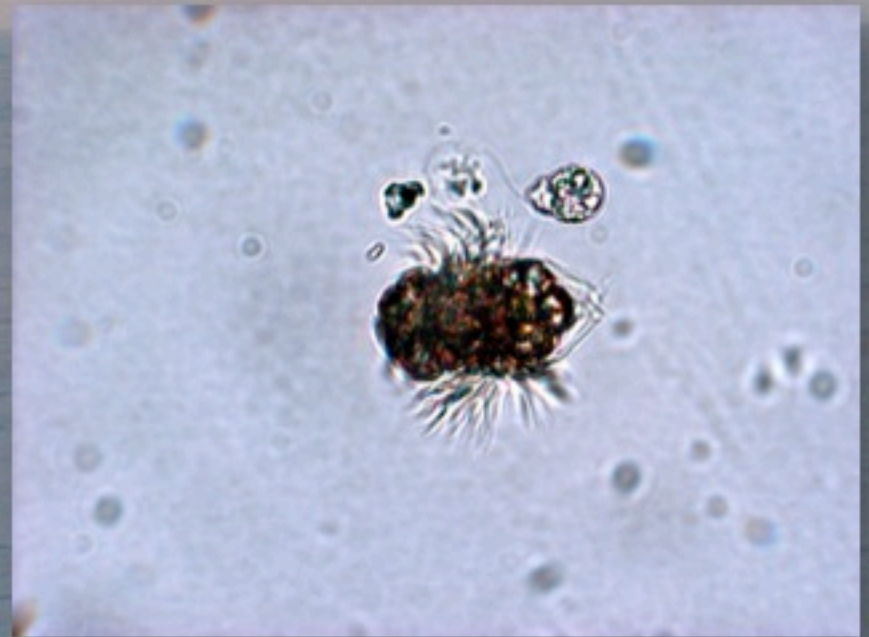


Ciliate that eats phytoplankton

Many of the larger one-celled plankton found in the Bering Sea during summer combine “animal-like” (they eat, they swim) and plant-like (they have chloroplasts and are photosynthetic) life styles.

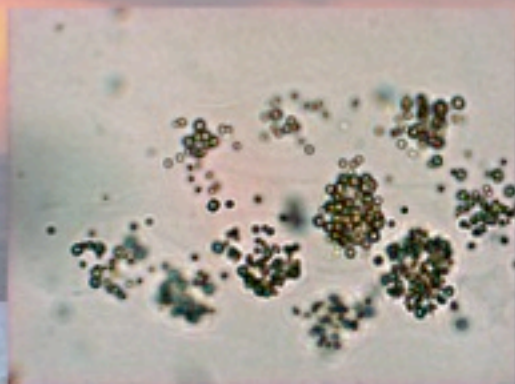


Laboea, a ciliate that looks like a green ice cream cone

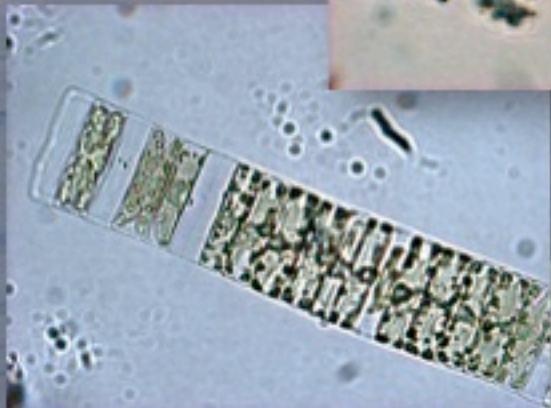


Myrionecta, a pink ciliate that “jumps” .

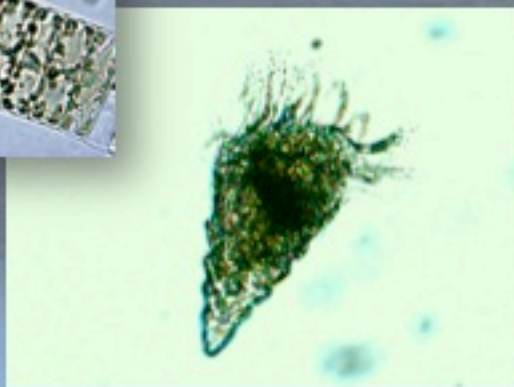
Phytoplankton and microzooplankton are food for copepods and krill (zooplankton)



Copepod



Diatom chain



A planktonic ciliate
(microzooplankton)



Zooplankton fecal pellet with
remains of a diatom

Collection of Sinking Particles During the Bering Sea Ecosystem Study

Roger P. Kelly - University of Rhode Island
John Karavias - Walt Whitman H.S. NY, (ARMADA Project)

Why are sinking particles important?

- Food source for benthic community
- Mechanism for removal of organic carbon from surface ocean

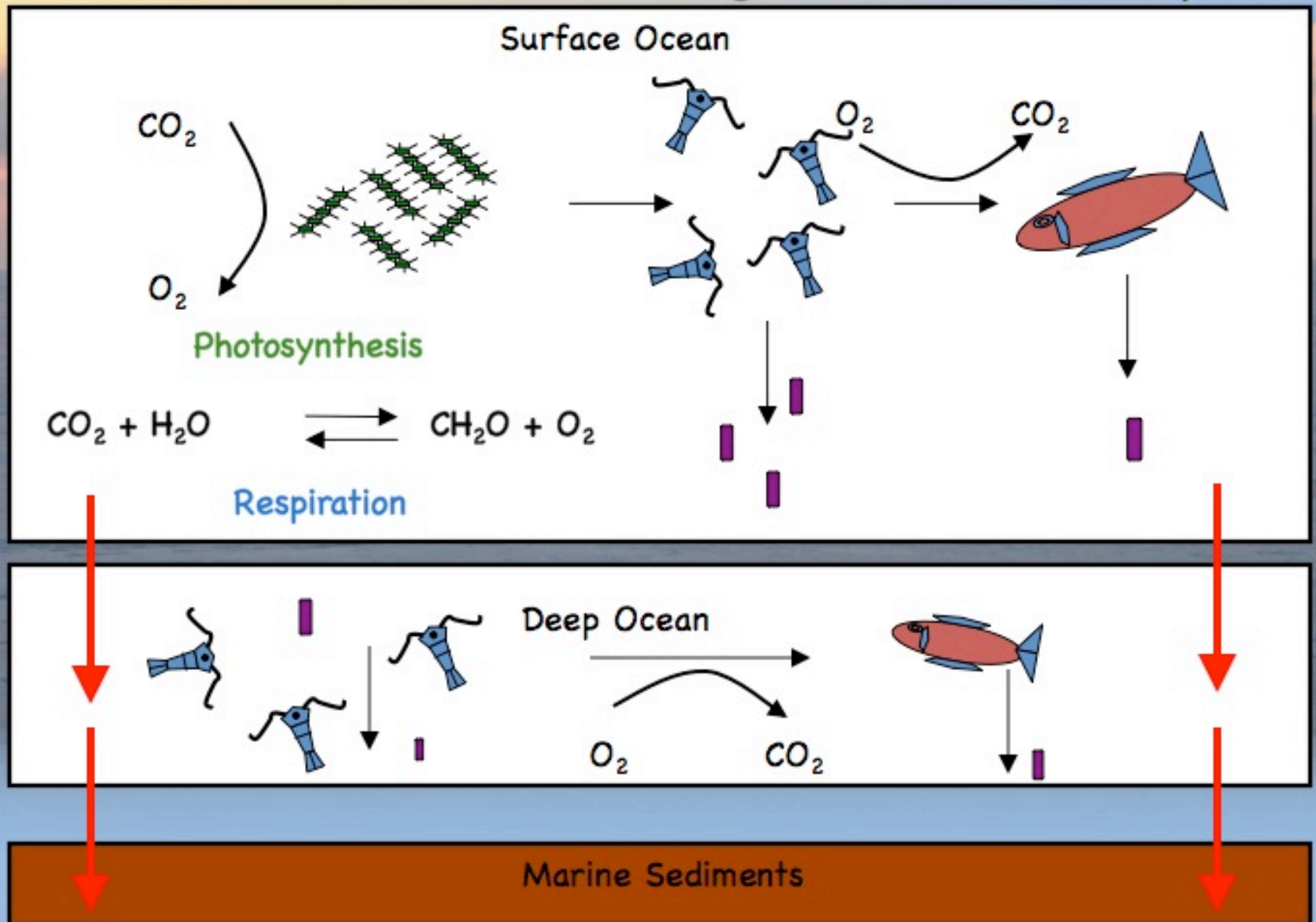
Where do particles come from?

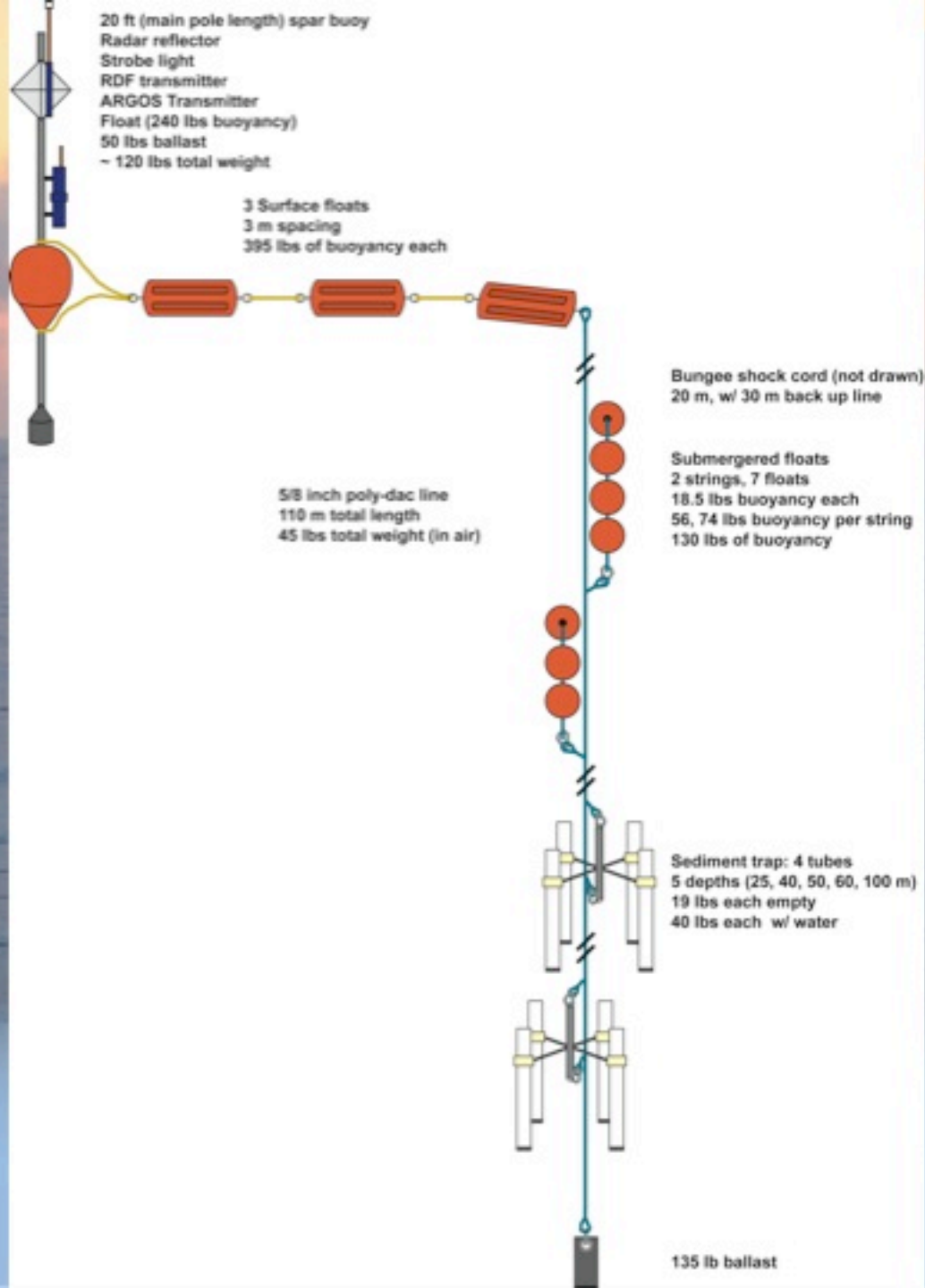
- Aggregation of dead phytoplankton
- Zooplankton, fish, whale waste
- River runoff and aerosol dust

Why study particle flux in the Bering Sea?

- Highly productive fishery
- Dramatic change between winter and summer particle production
- Sub-arctic ecosystems are sensitive to climate change

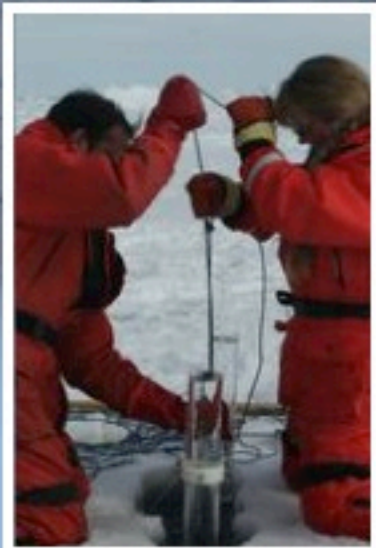
Marine Particulate Organic Carbon Cycle





Drifting Sediment Trap Array

Drifting Sediment Trap Deployment



Drifting Sediment Trap Recovery



Drifting Sediment Trap Recovery



Sediment Trap Particle Processing



Sinking particles are collected in a brine solution, which is separated from seawater.

Brine is then filtered to collect the particles.

Observations:

Most particles appear to be fecal pellets

More particles in deeper samples



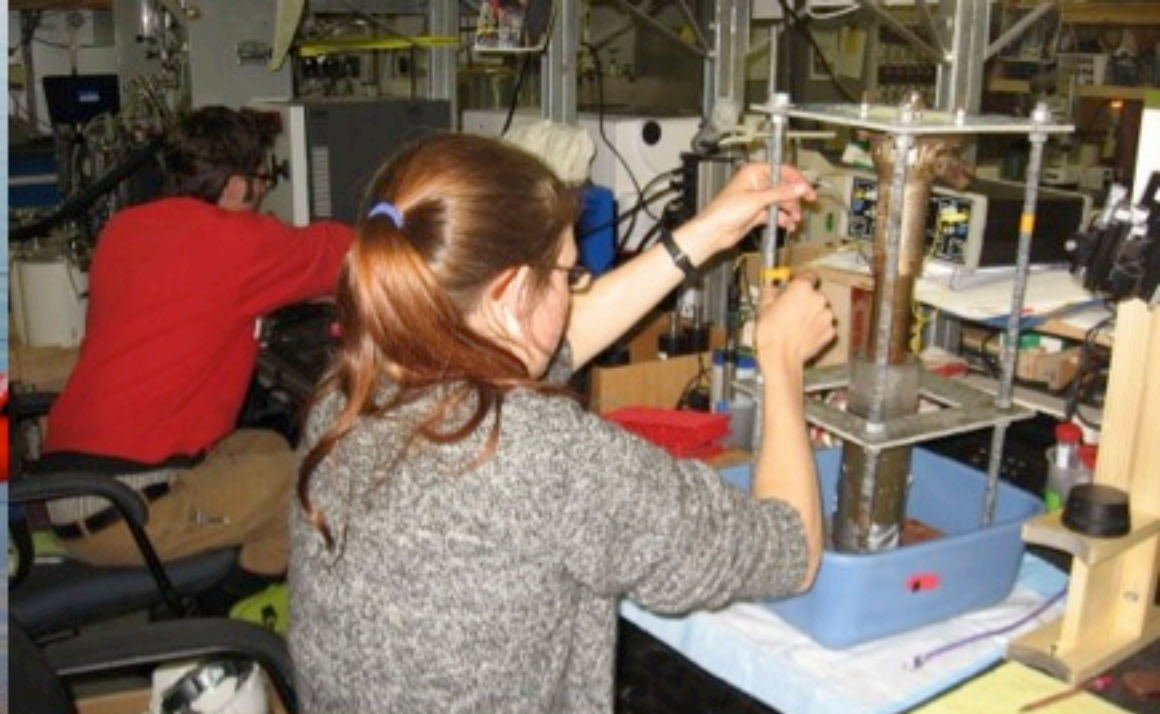
Production and fate of organic matter (food) and nutrients in the Bering Sea



Nutrients (nitrogen, phosphorus, iron, etc.)



Seafloor

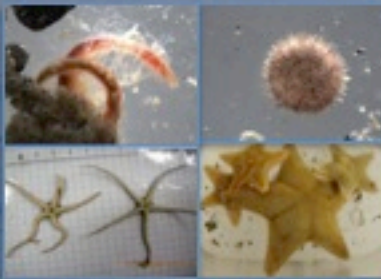


Sampling seafloor sediments

What are we learning about seafloor sediments?



- Organic matter from overlying water consumed in sediments



- Diverse assemblages of organisms supported



- Nutrients are recycled and returned to the overlying water

Coast Guard Careers Aboard HEALY





Captain Sommer



- **Graduated from CGA in 1985**
- **Polar Sea (North Pole and Antarctica)**
- **XO of Morro Bay**
- **CO of Neah Bay**
- **XO of Midgett**
- **CO of Healy**



LTJG Josh Smith

- **Graduated from Paraclete HS in Lancaster, CA**
- **Graduated from CGA in 2006**
- **Reported aboard Storis as a Deck Watch Officer**
- **Reported aboard Healy as a Student Engineer**
- **Went to Damage Control Assistant School**



CWO John Rose

- **Enlisted at the age of 22**
- **Went to the Hamilton out of Boot Camp**
- **Became a BM**
- **Station Noyo River as a Surfman**
- **XPO Station Morro Bay as a 1st Class**
- **Surfman Instructor at the National Motor Lifeboat School**
- **Healy**



MSTC Mark Rieg

- **Enlisted at the age of 25**
- **Campbell to QM "A" School back to Campbell**
- **MST "A" School**
- **Group LI Sound**
- **Instructor at MST "A" School**
- **Small Boat Station Paducah, KY**
- **LANT Area**
- **Healy**



DC2 Davion Redd

- **Enlisted in 1993**
- **Small Boat Station in Maine**
- **DC “A” School**
- **Thetis**
- **ISC Portsmouth**
- **Bahrain**
- **170 ft, San Diego**
- **Healy**



FS3 Robin Baldwin

- **Enlisted at the age of 22**
- **Straight to FS “A” School**
- **Small Boat Station in Brookings, OR**
- **Healy**





Questions?

Remember, you can also ask questions to Jillian and the team at: **www.polartrec.com**

Check out and register for upcoming events!



5 August 2008—Frank Kelley and team in Barrow, Alaska

6 August 2008—Missy Holzer and team in Svalbard, Norway

Register for these events and watch for others at www.polartrec.com!

Thank You!



For more information, please
visit www.polartrec.com

Or Call 907-474-1600

Email: infr@polartrec.com



Why

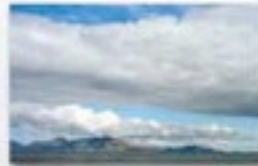
Why Study the Bering Sea?

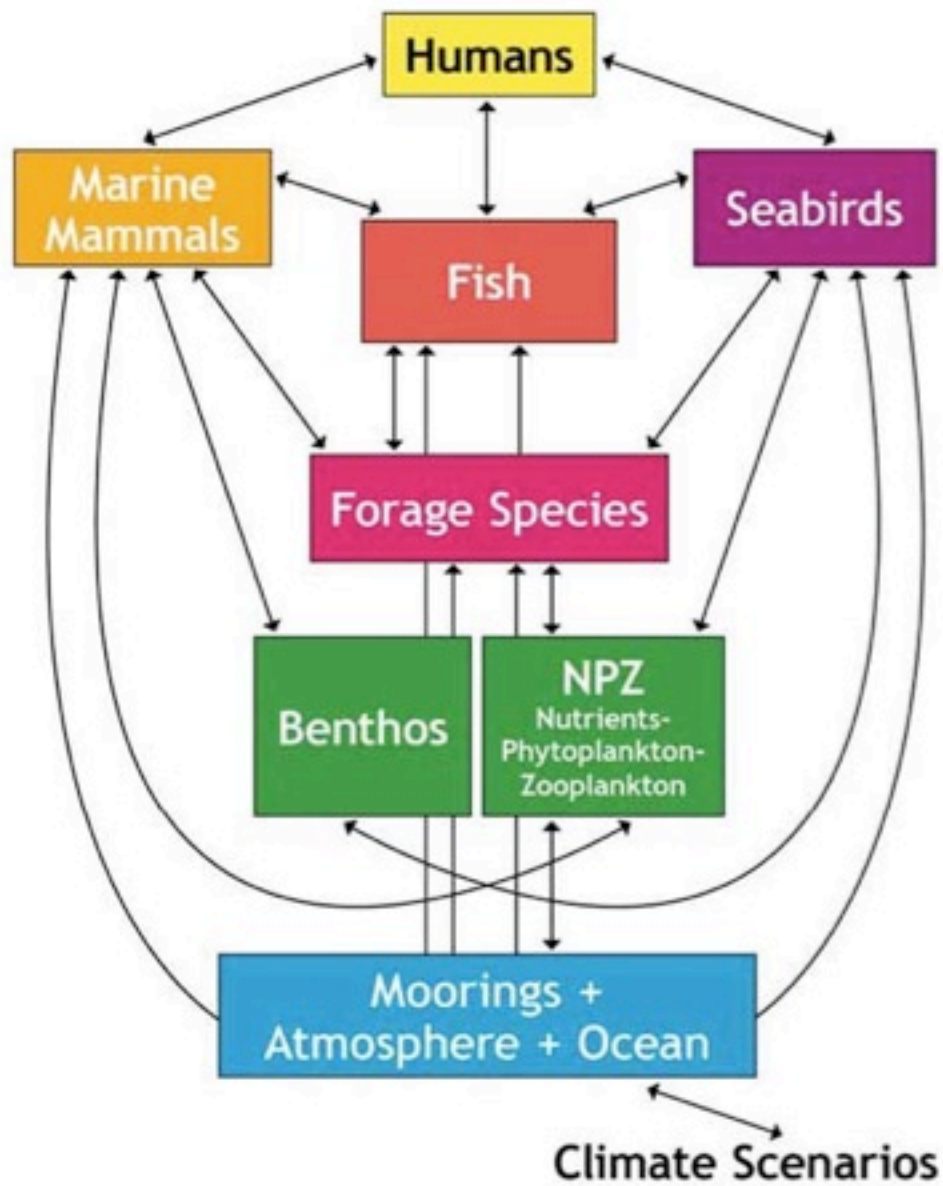
One of the most productive marine ecosystems in the world.

Produces \$1.7 billion in fish catch each year.

Supports an abundance of birds & marine mammals.

Supports an extensive local harvest.





Modeling

Data
Management

Education +
Outreach

1. Walrus and seals give birth on sea ice and use it as a platform for hunting, as do seabirds like spectacled eiders.



2. In early spring, algae bloom under the sea ice.



3. Because the water is still very cold, few tiny animals, like copepods, are around to eat the algae.



4. The algae dies and falls to the bottom, providing food for worms, crabs and other small creatures that in turn feed crabs, walrus, bottom fish and diving birds. Gray whales feed on shrimplike animals called amphipods, which thrive in icy waters.



1. When the water doesn't freeze, or the ice melts early, walrus and seals have fewer places to give birth. Forced into deeper waters further north where ice remains, walrus can't reach the bottom to forage for clams.



2. Without ice to provide a substrate, algae don't bloom until later in the spring.

3. In the warmer waters, zooplankton, including copepods, flourish, consuming the algae.

4. The zooplankton provide food for small fish, including juvenile pollock and cod, which also spread north as the pool of cold water shrinks; orca feed on the adult pollock and cod.

5. Less food reaches the bottom for crab and other bottom-feeders.



Yellowfin sole
Limanda aspera

Blue king crab
Paralithodes platypus

Snow crab
Chionoecetes opilio

Red king crab
Paralithodes camtschaticus

Amphipods
Thermista libellula

BERING SEA SHELF

Sources: "A Major Ecosystem Shift in the Northern Bering Sea," *Science*, vol. 312, March 10, 2006; "BES1: Bering Ecosystem Study Science Plan," Arctic Research Consortium of the United States (ARCUS), 2004