Eastern Bering Sea Ice Edge ‘06

April 12 - May 13, 2006

Goals

NOAA Mission Goal - ***Understand climate variability, its impact on ecosystems in order to enhance society's ability to plan and respond.***

Understand the linkages between higher trophic levels (birds, fish and mammals) and oceanographic processes. Conduct research on climate variability and ecosystem response in the North Pacific, focusing initially on the productive waters of the eastern Bering Sea and western Gulf of Alaska.

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Measure variability in ocean temperature, salinity, nutrients and plankton at the marginal ice edge.

Investigate how the four species of seals use the unique habitat of ice edge.

Examine the distribution of fish at the ice edge.

Explore the number and species of marine birds using this habitat and their spatial patterns.

Freeman

(April 12-May 6 : Kodiak to Dutch Harbor)

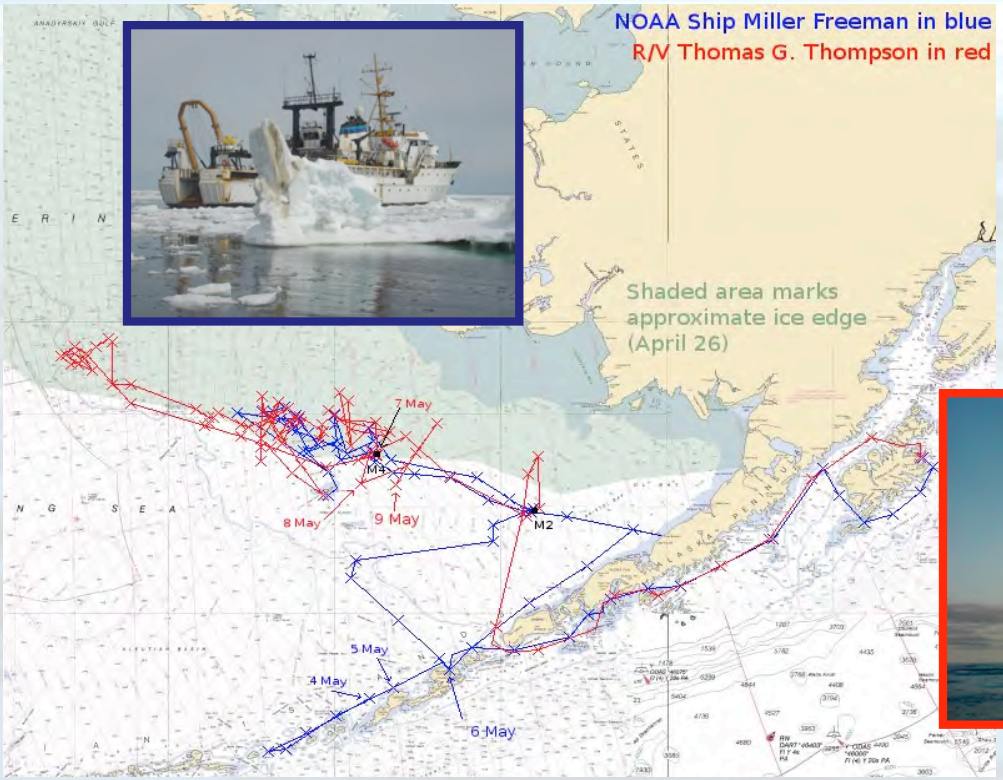
Recover and deploy moorings

Collect hydrographic measurements along the 70m isobath

Hydroaccoustic survey

Sample water column using the Towed Vehicle

Divers along the ice edge



Thompson

(April 12-April 26 : Kodiak to St. Paul)
(April 26 - May 13: St. Paul to Seward)

Sample around M2 and M4

Collect cores from ice flows (T, S, nutrients, chlorophyll, plankton)

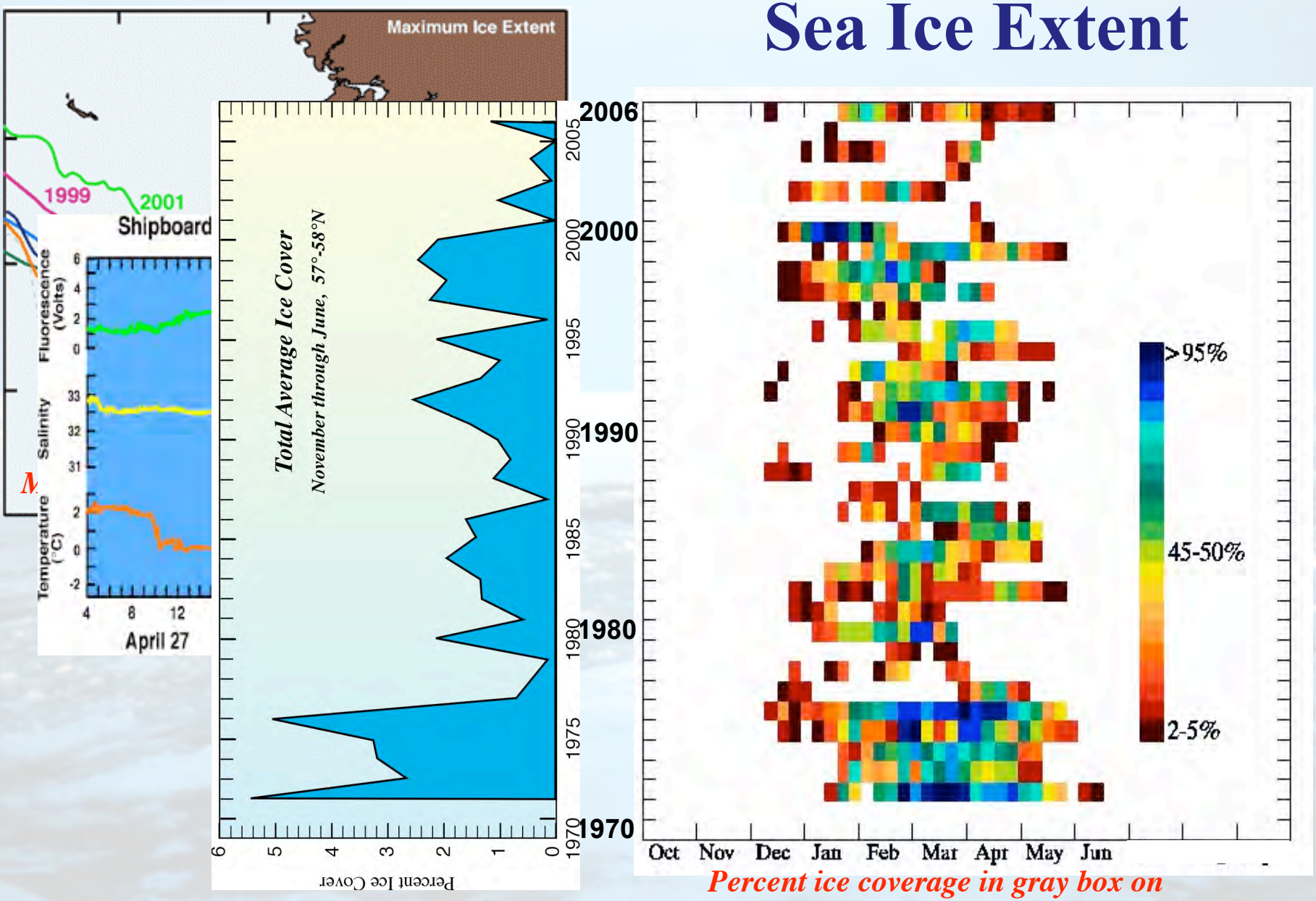
Sample water column around ice and the away from the ice (T, S, oxygen, nutrients, fluorescence, chlorophyll, plankton)

Measure light levels under the ice

Tag/observe ice seals

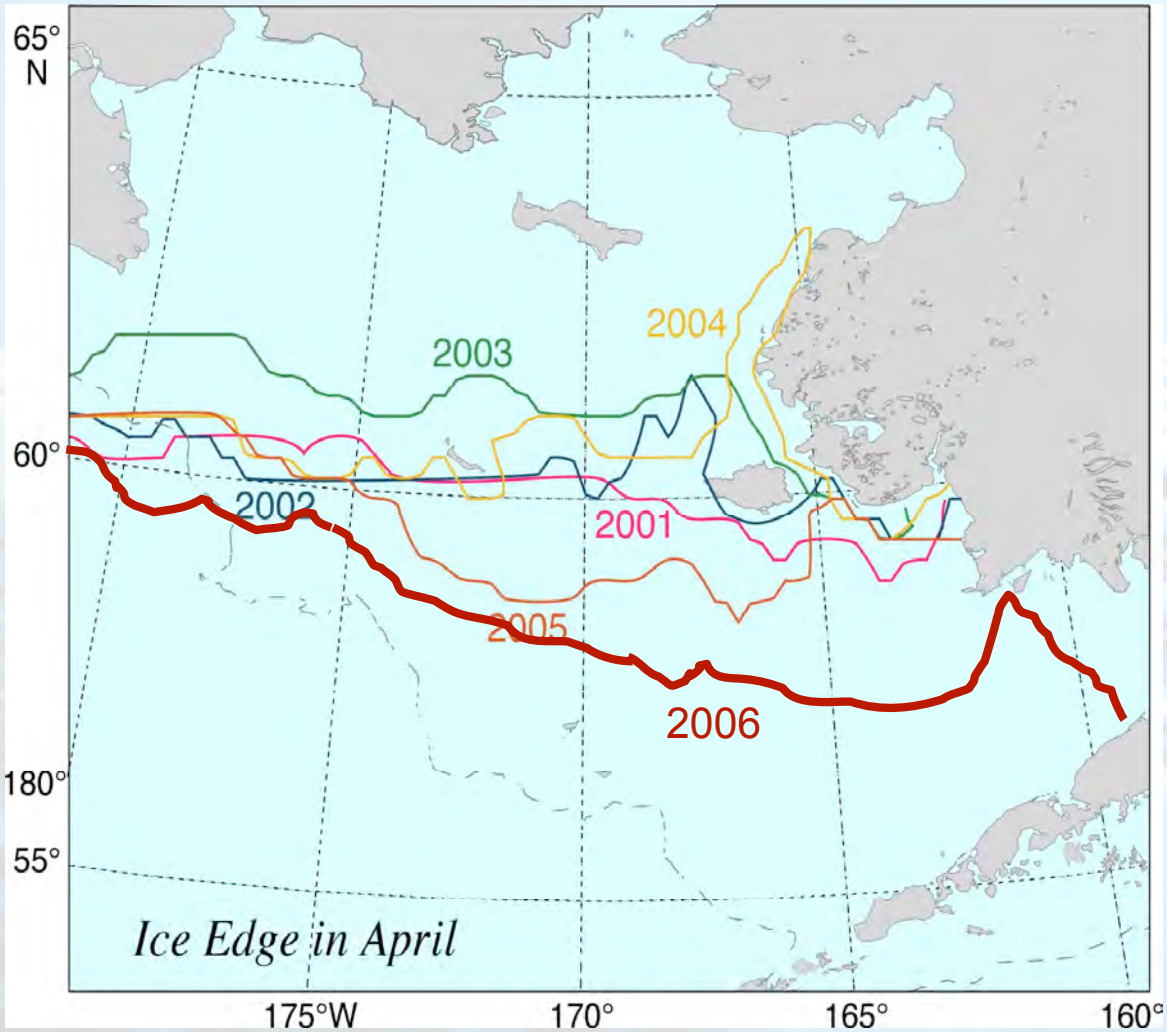
Bird and cetacean observations

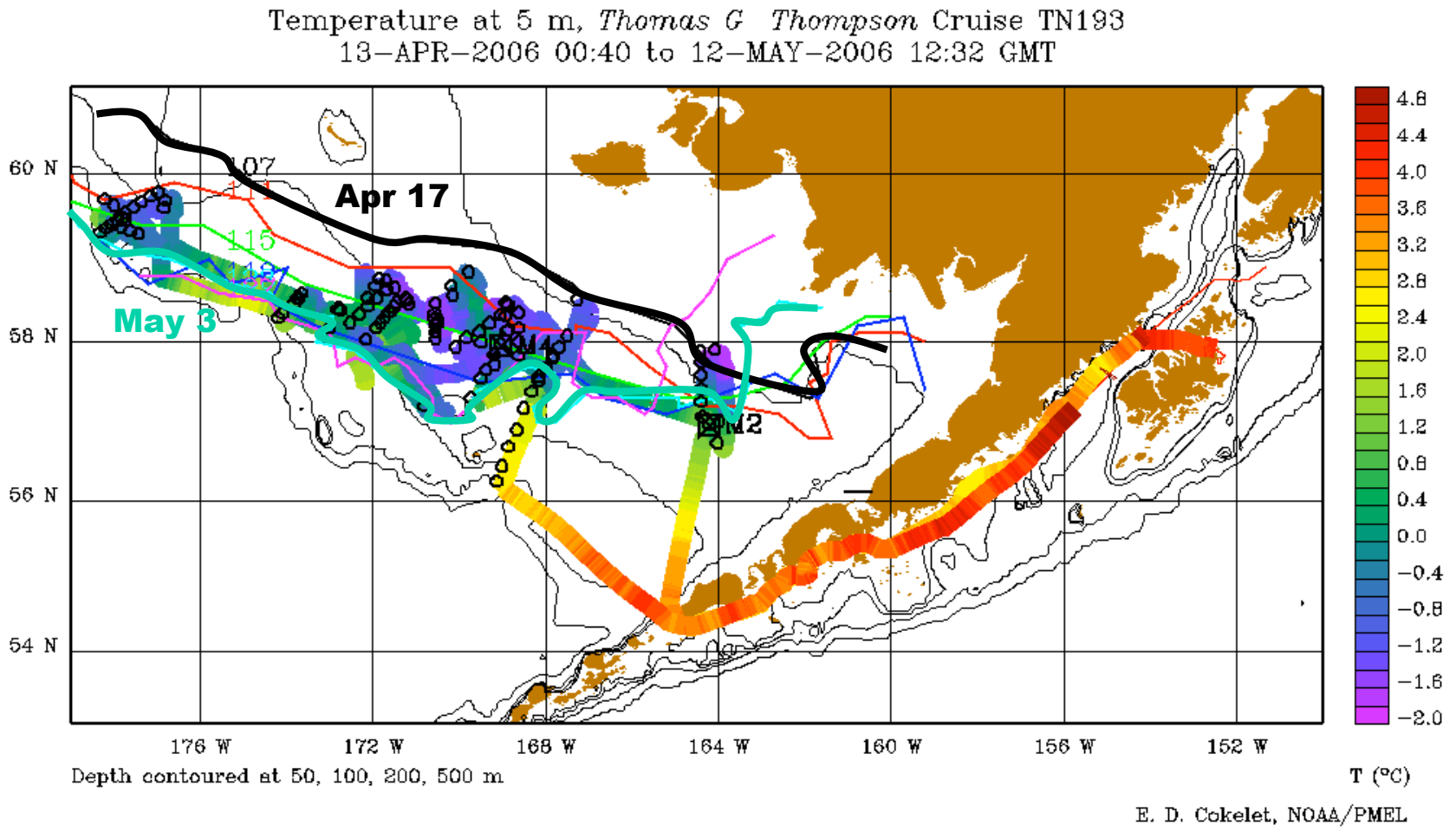
Sea Ice Extent



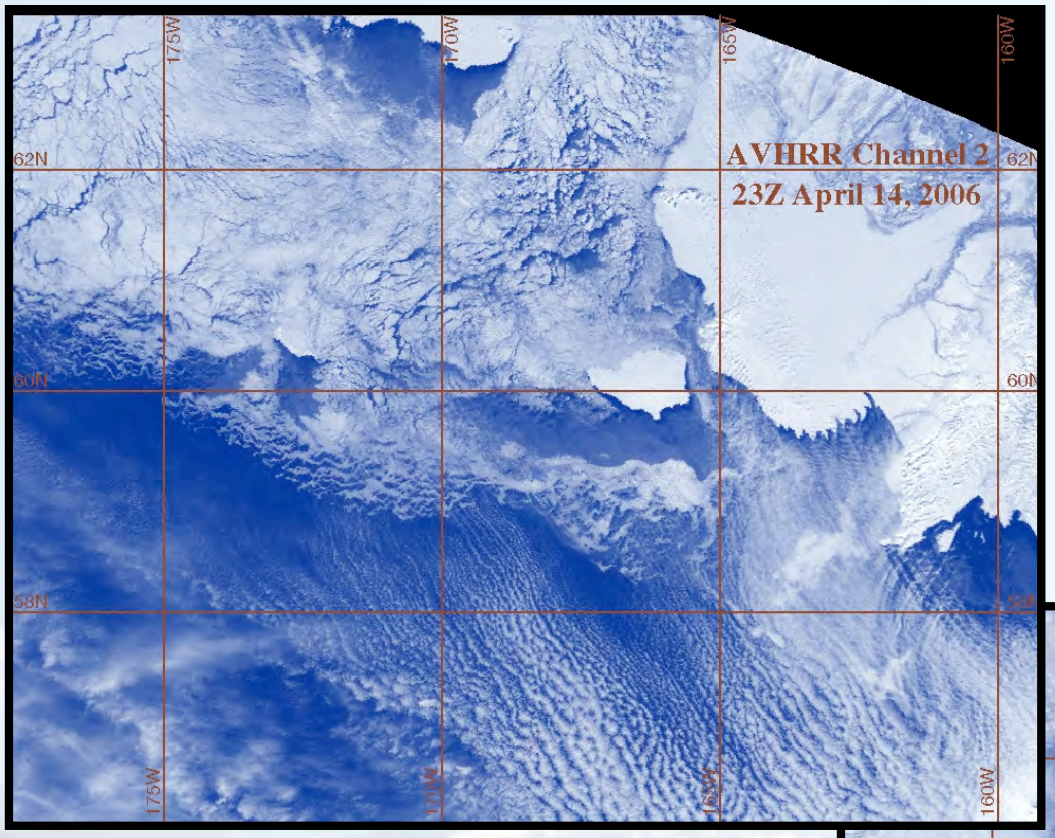
Percent ice coverage in gray box on map above left

Sea Ice Extent

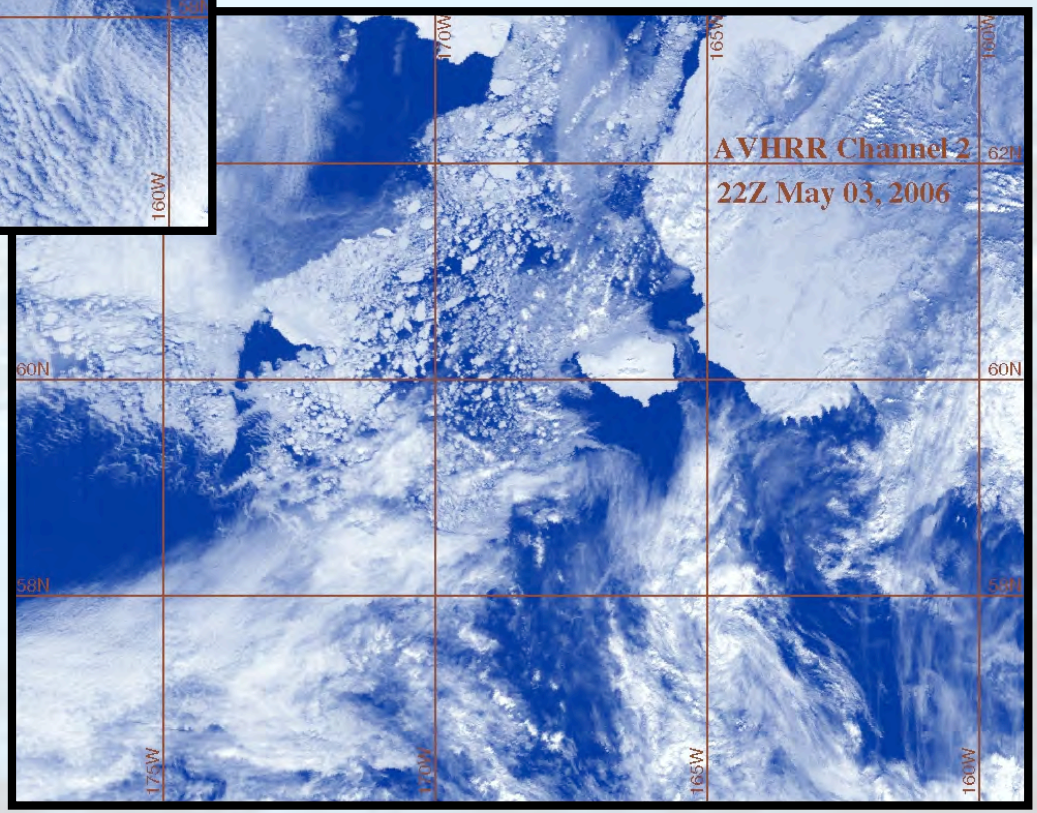



Temperature at 5 m, *Thomas G Thompson* Cruise TN193
13–APR–2006 00:40 to 12–MAY–2006 12:32 GMT
Apr 17
May 3
107
111
115
117
PM4
PM2
60 N
58 N
56 N
54 N
176 W
172 W
168 W
164 W
160 W
156 W
152 W
4.8
4.4
4.0
3.6
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
−0.4
−0.8
−1.2
−1.6
−2.0
Depth contoured at 50, 100, 200, 500 m
T (°C)
E. D. Cokelet, NOAA/PMEL

Changes in Sea Ice Extent

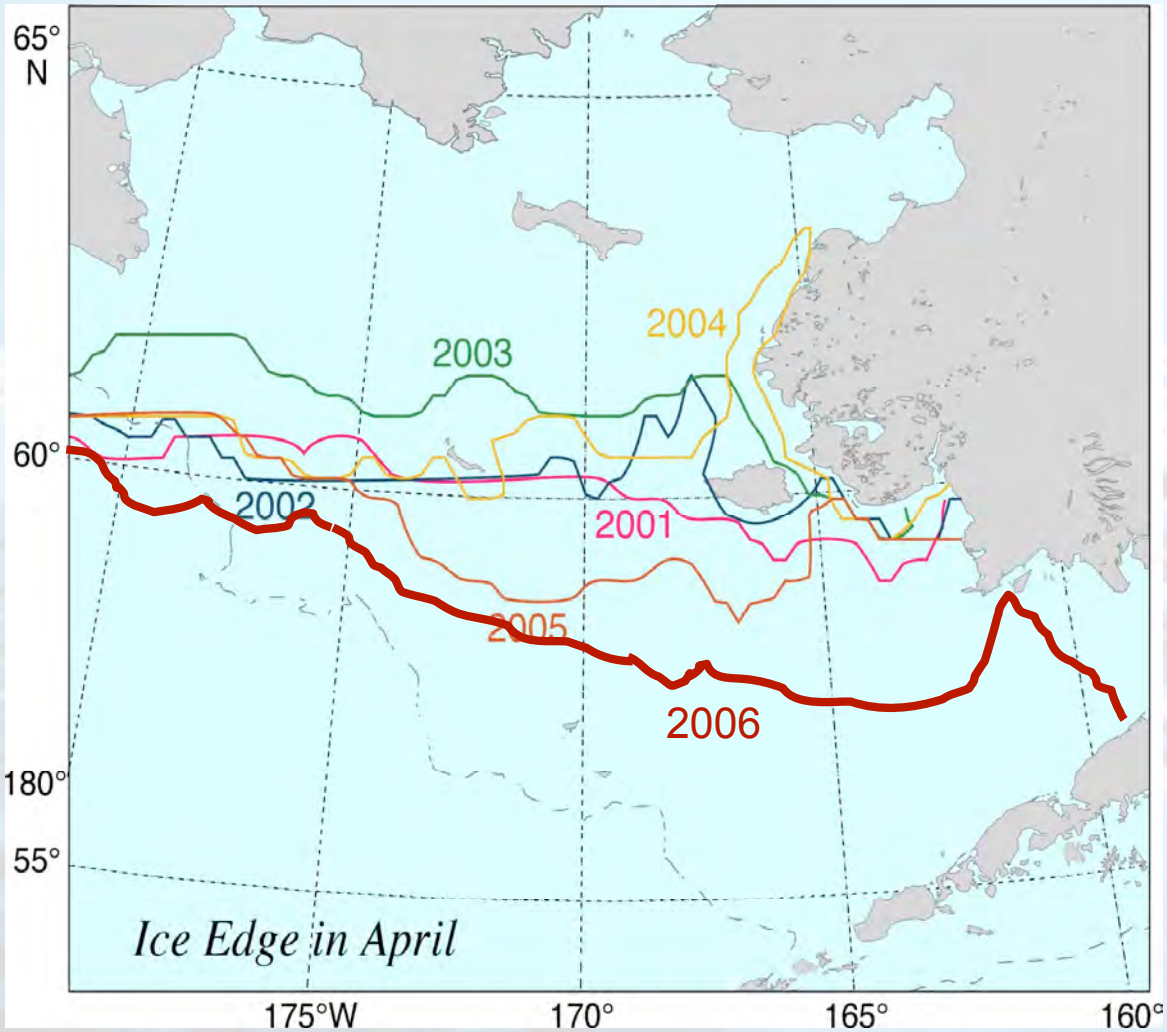


April 14

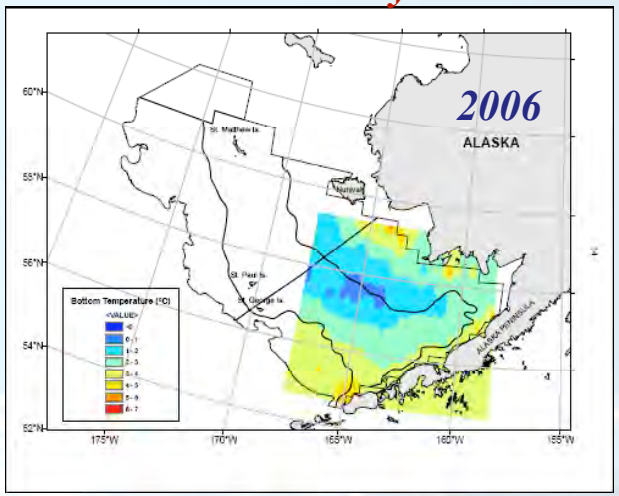


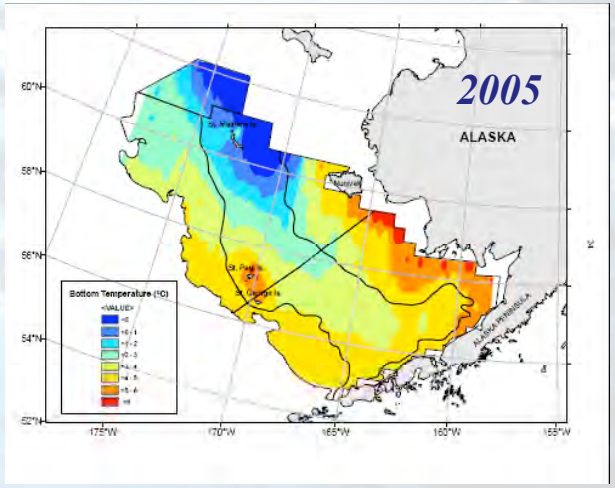
May 3

Sea Ice Extent

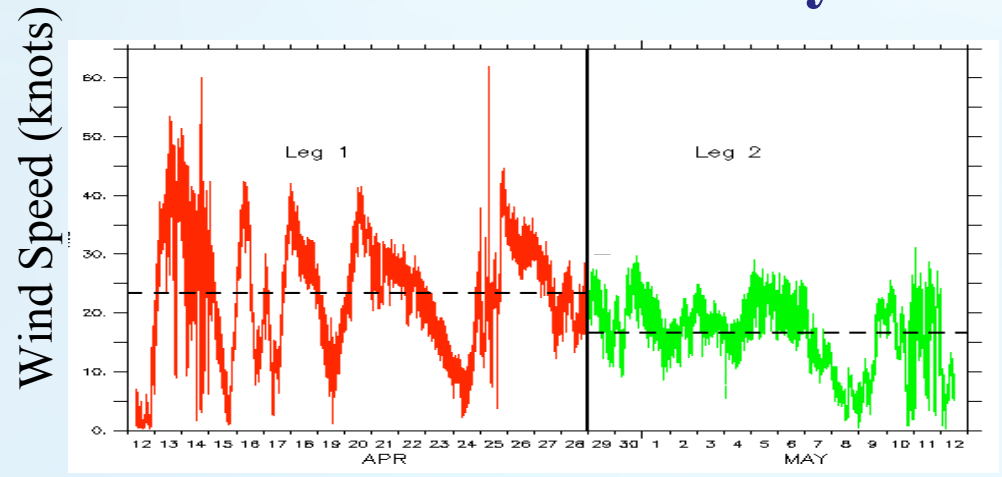


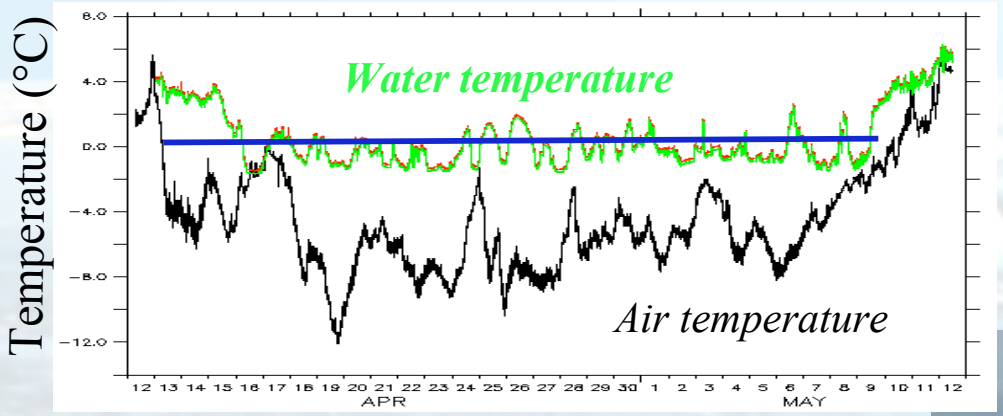
Bottom Temperatures from the AFSC-RACE Bottom Trawl Survey

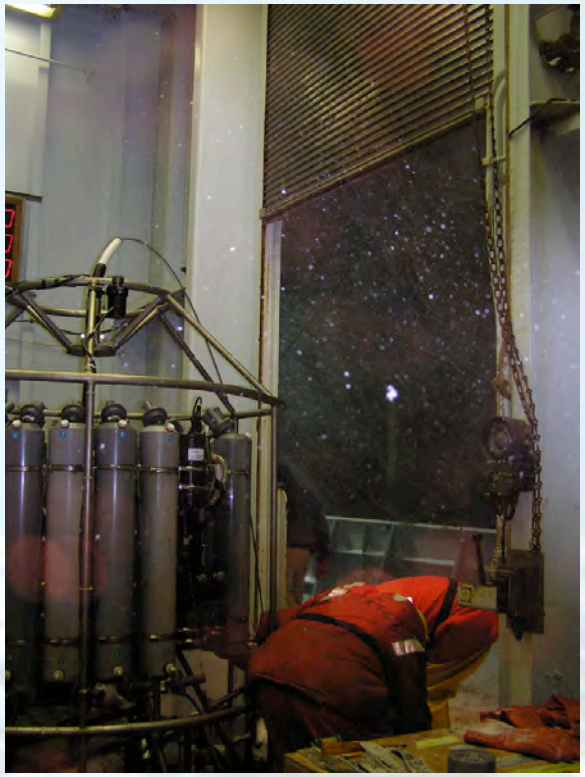




Cold and Stormy





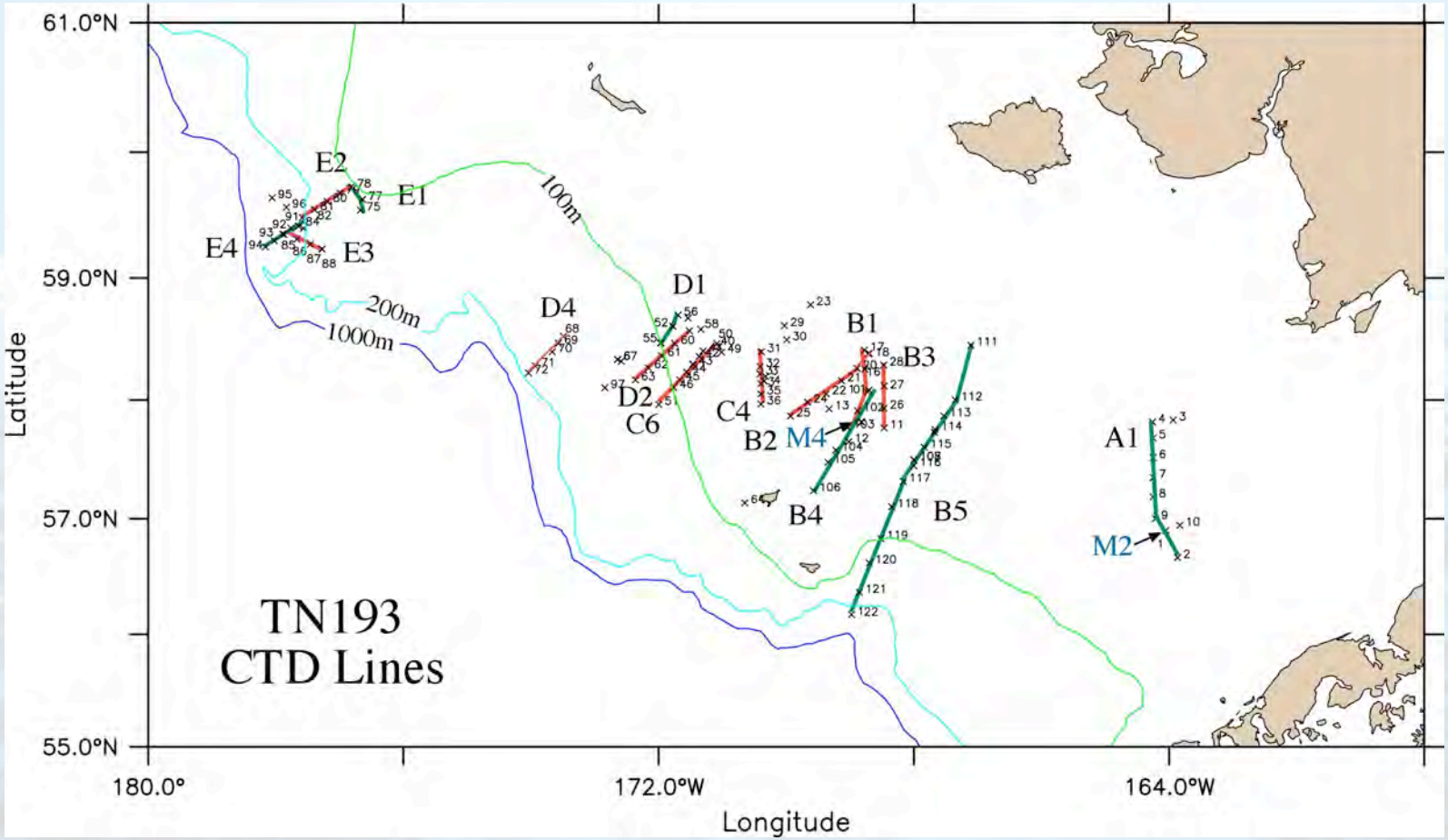


CTD and Water Samples

Ned Cokelet, Carol Dewitt, Lisa Eisner, Bill Floering, Tony Jenkins, David Kachel, Nancy Kachel, Carol Ladd, Calvin Mordy, Peter Proctor, Dylan Righi, *Phyllis Stabeno, Peggy Sullivan*

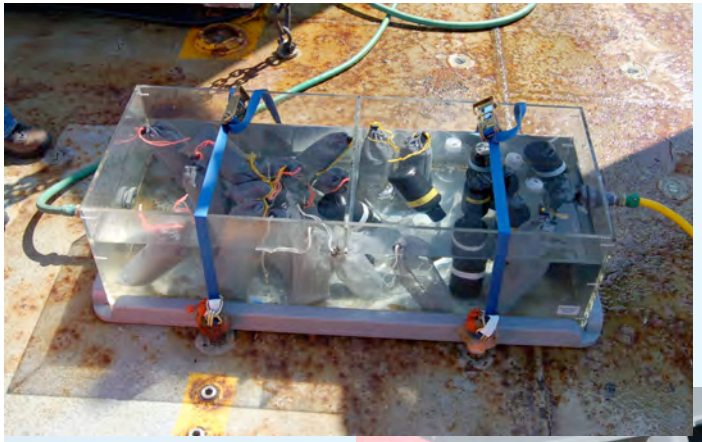
CTD	**122**	***Thompson***
CTD	**40**	***Freeman***

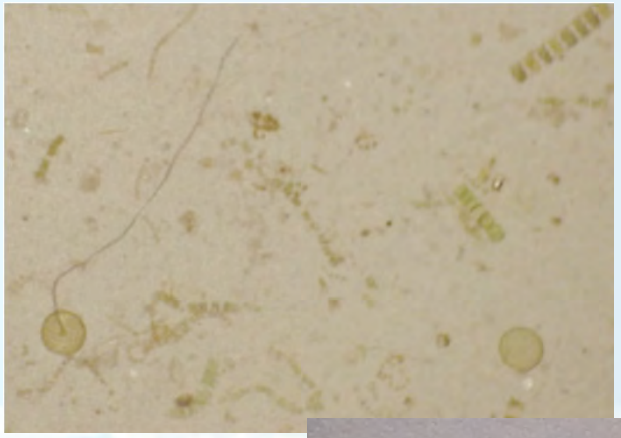
CTD and Water Samples

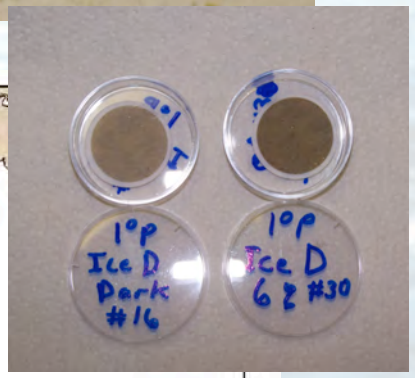


Primary Production and Phytoplankton

Lisa Eisner







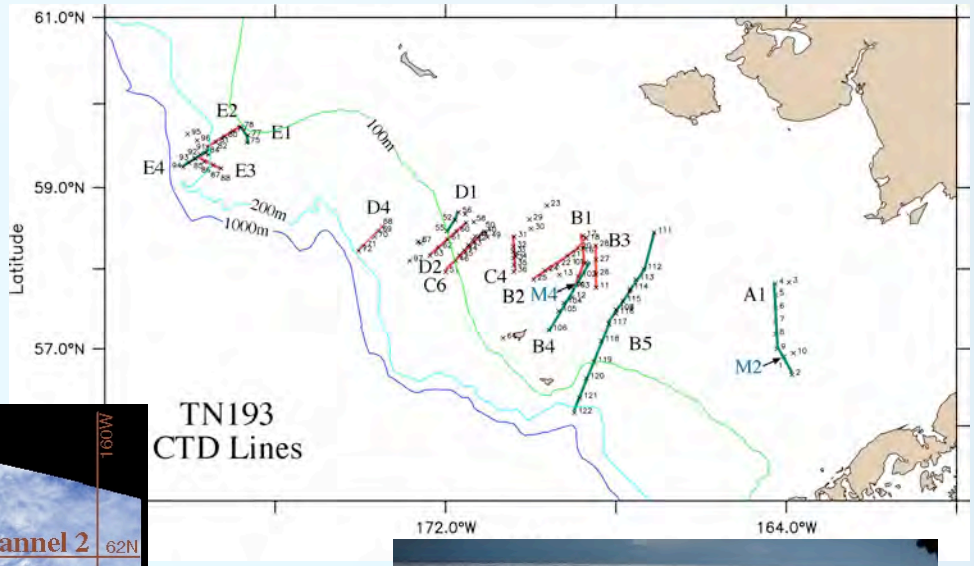
Nutrients, Alkalinity, DIC

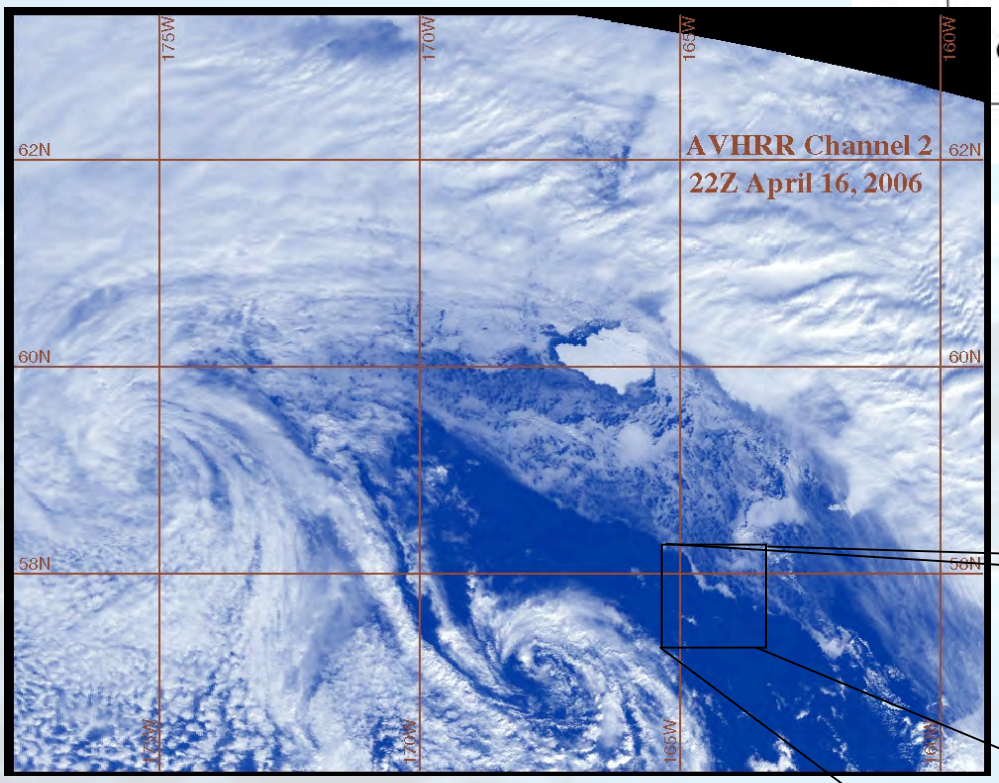
Calvin Mordy, Peter Proctor

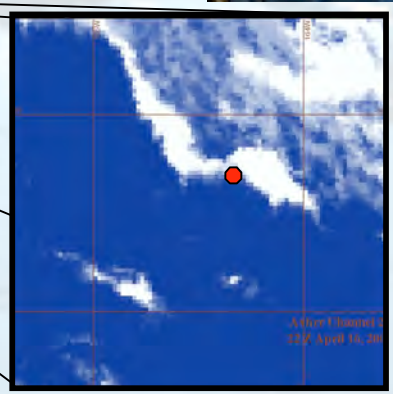
- *1162 (951, 211) samples analyzed for dissolved nutrients;*
- *NAS-3X nitrate meter installed as part of underway instruments*
- *Samples were collected at 22 stations (126 samples) to measure alkalinity and at 14 stations (78 samples) to measure dissolved inorganic carbon (for Melissa Chierci, Sweden)*

A1

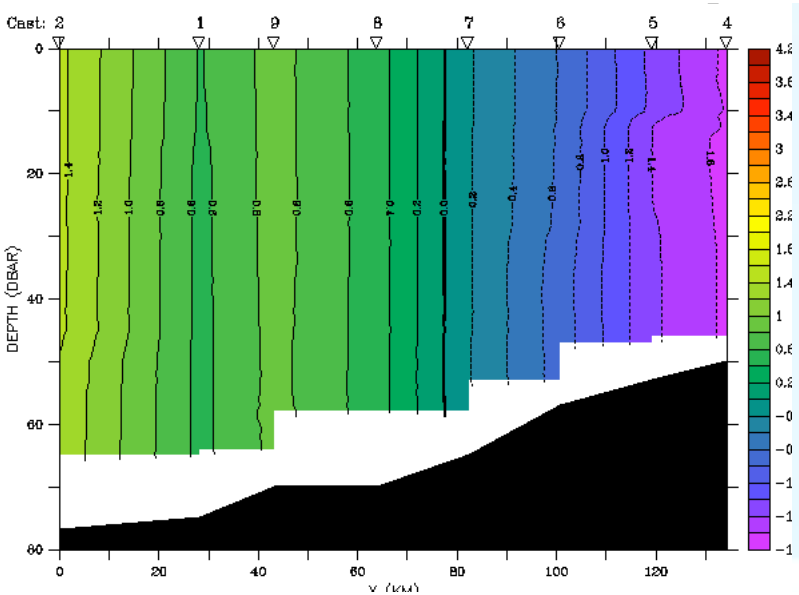
April 16


61.0°N
59.0°N
57.0°N
Latitude
172.0°W
164.0°W
E1
E2
E3
E4
D1
D2
D4
C4
C6
B1
B2
B3
B4
B5
M4
A1
M2
100m
200m
1000m
TN193
CTD Lines

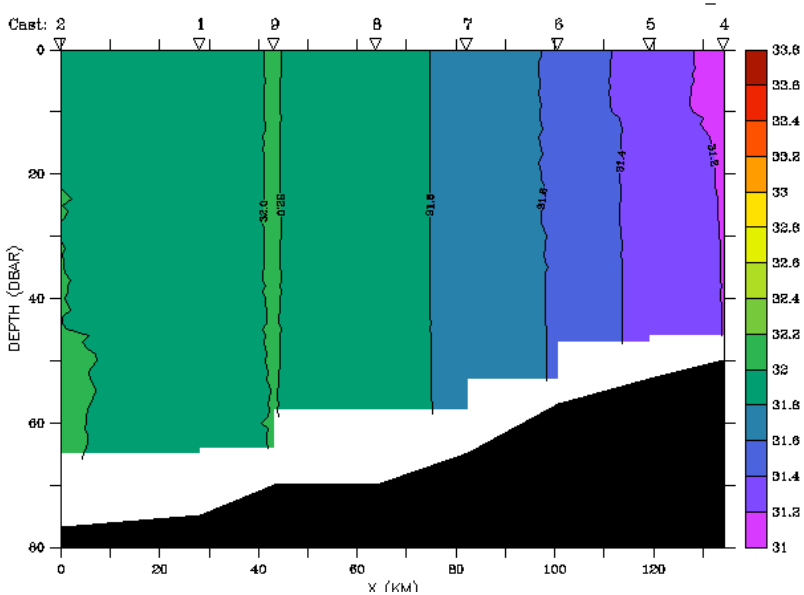

AVHRR Channel 2
22Z April 16, 2006
62N
60N
58N
175W
170W
165W
160W



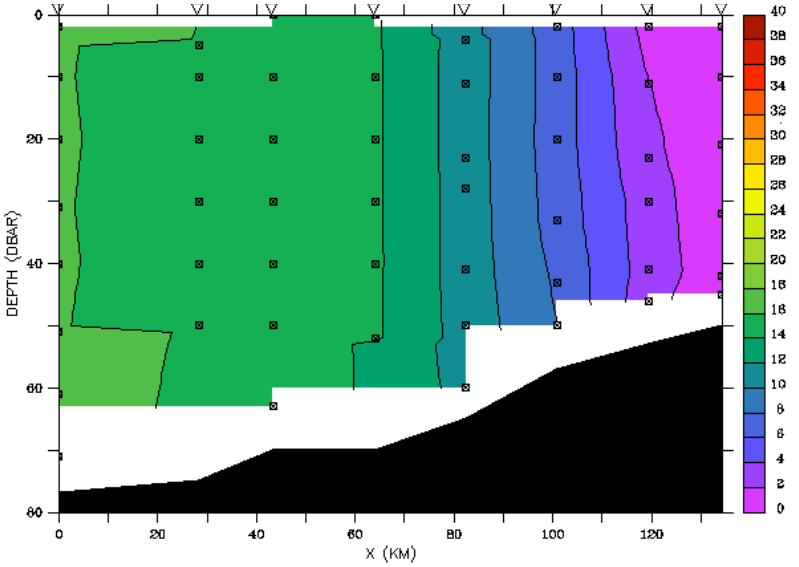
A1 Line, 16-17 April 2006



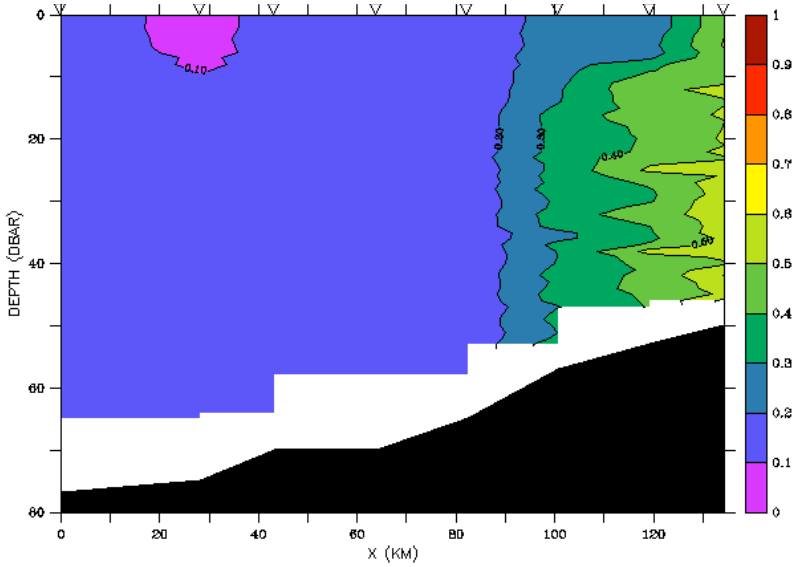
Temperature (°C)



Salinity (psu)



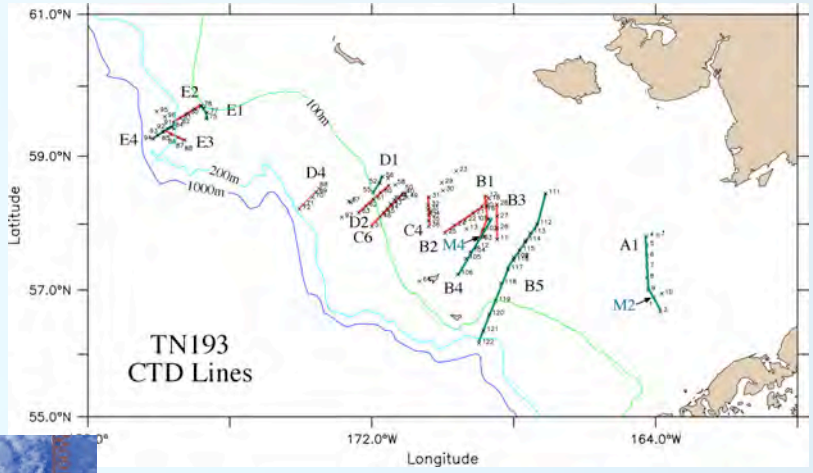
Nitrate (µM)

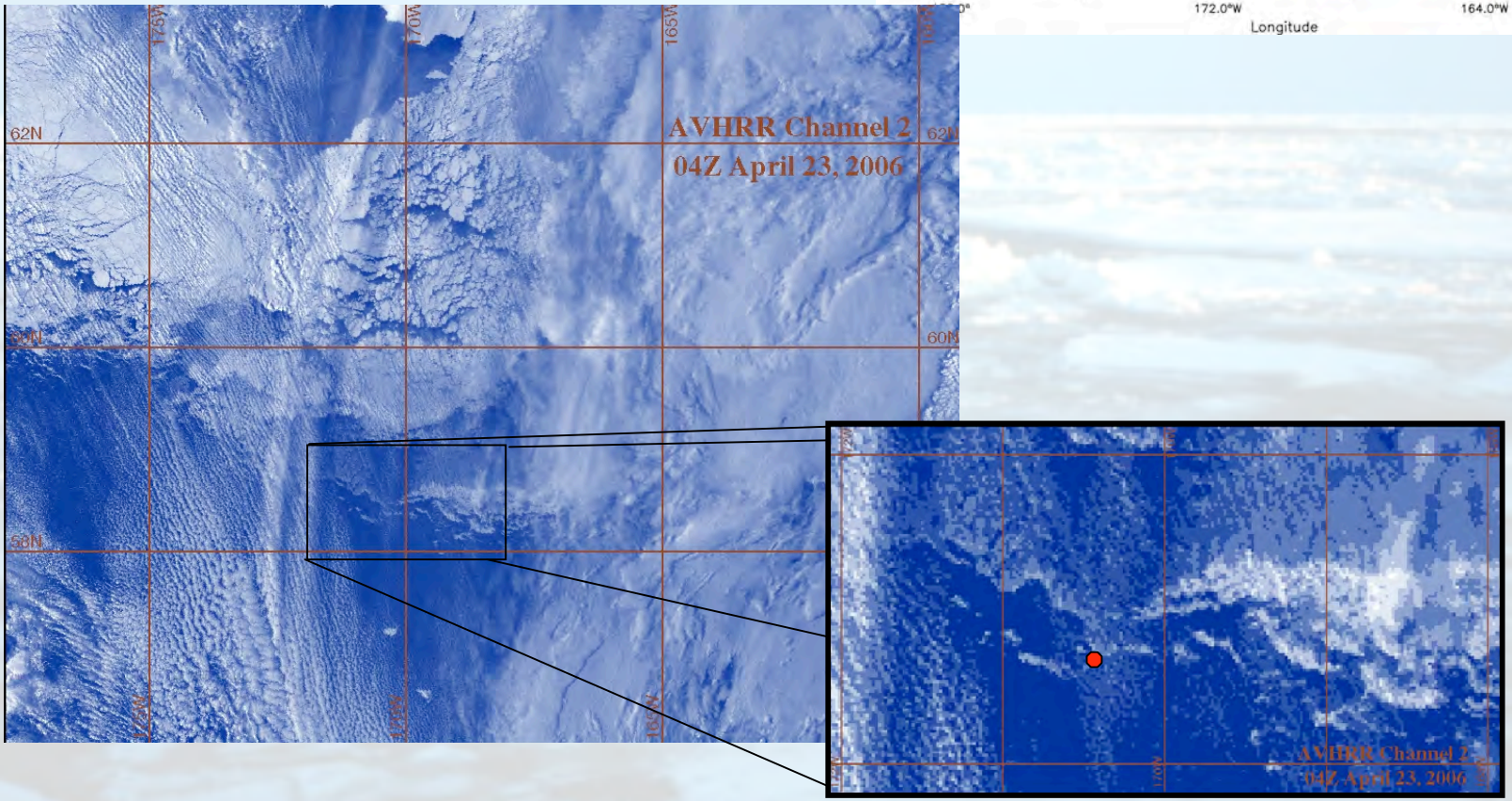


Fluorescence (V)

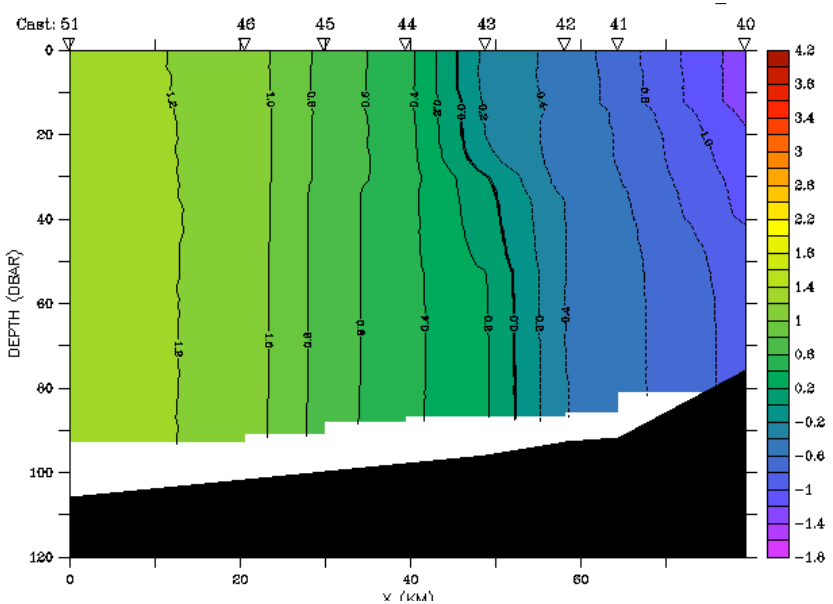
C6

April 24

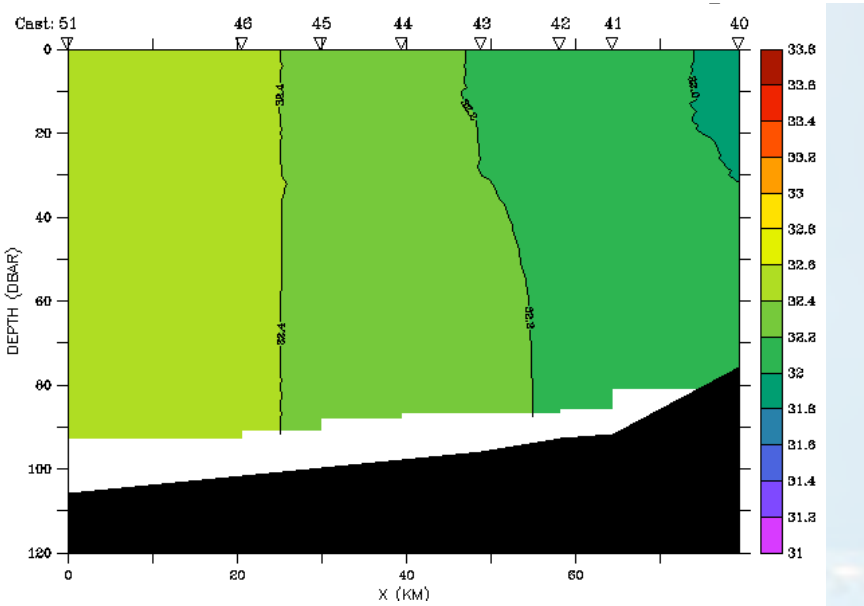

61.0°N
59.0°N
57.0°N
55.0°N
Latitude
172.0°W
164.0°W
Longitude
E2
E1
E4
E3
100m
200m
1000m
D4
D1
D2
C6
C4
B1
B3
B2
M4
B4
B5
A1
M2
TN193
CTD Lines


AVHRR Channel 2
04Z April 23, 2006
62N
60N
58N
175W
170W
165W
AVHRR Channel 2
04Z April 23, 2006

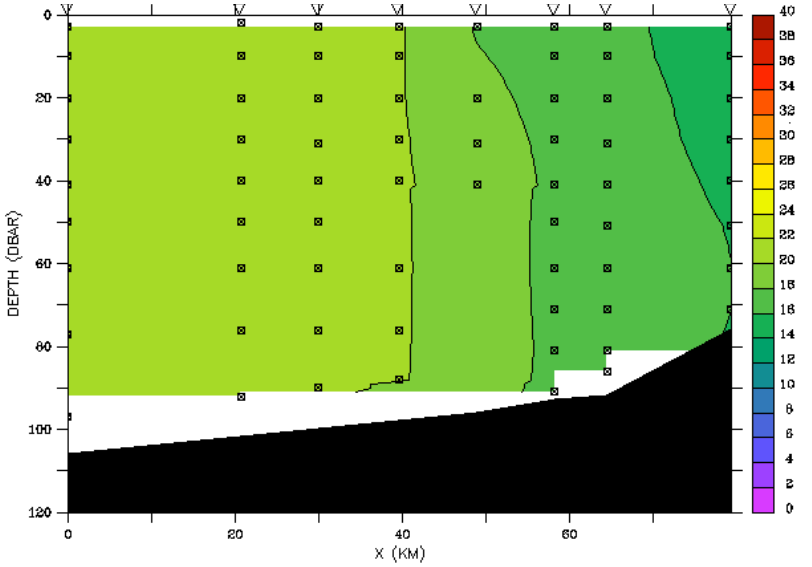
C6 Line, 24 April 2006



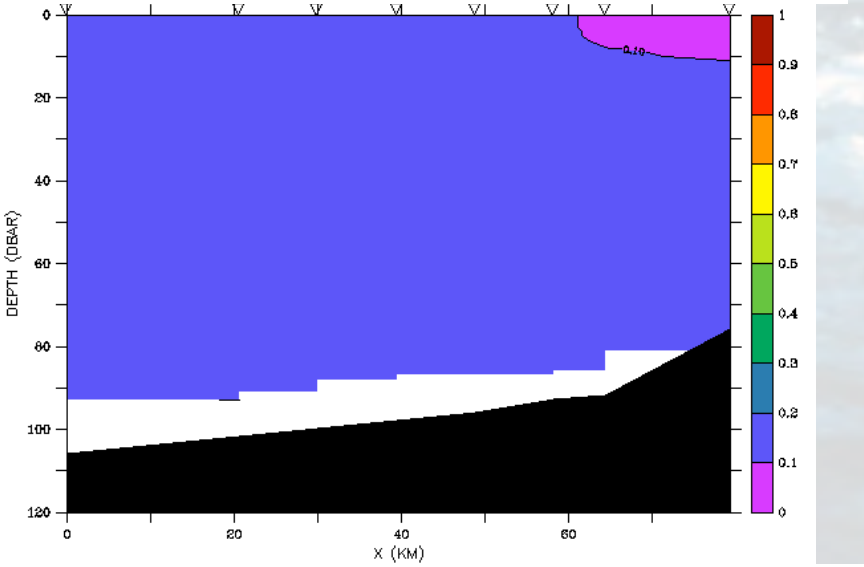
Temperature (°C)



Salinity (psu)



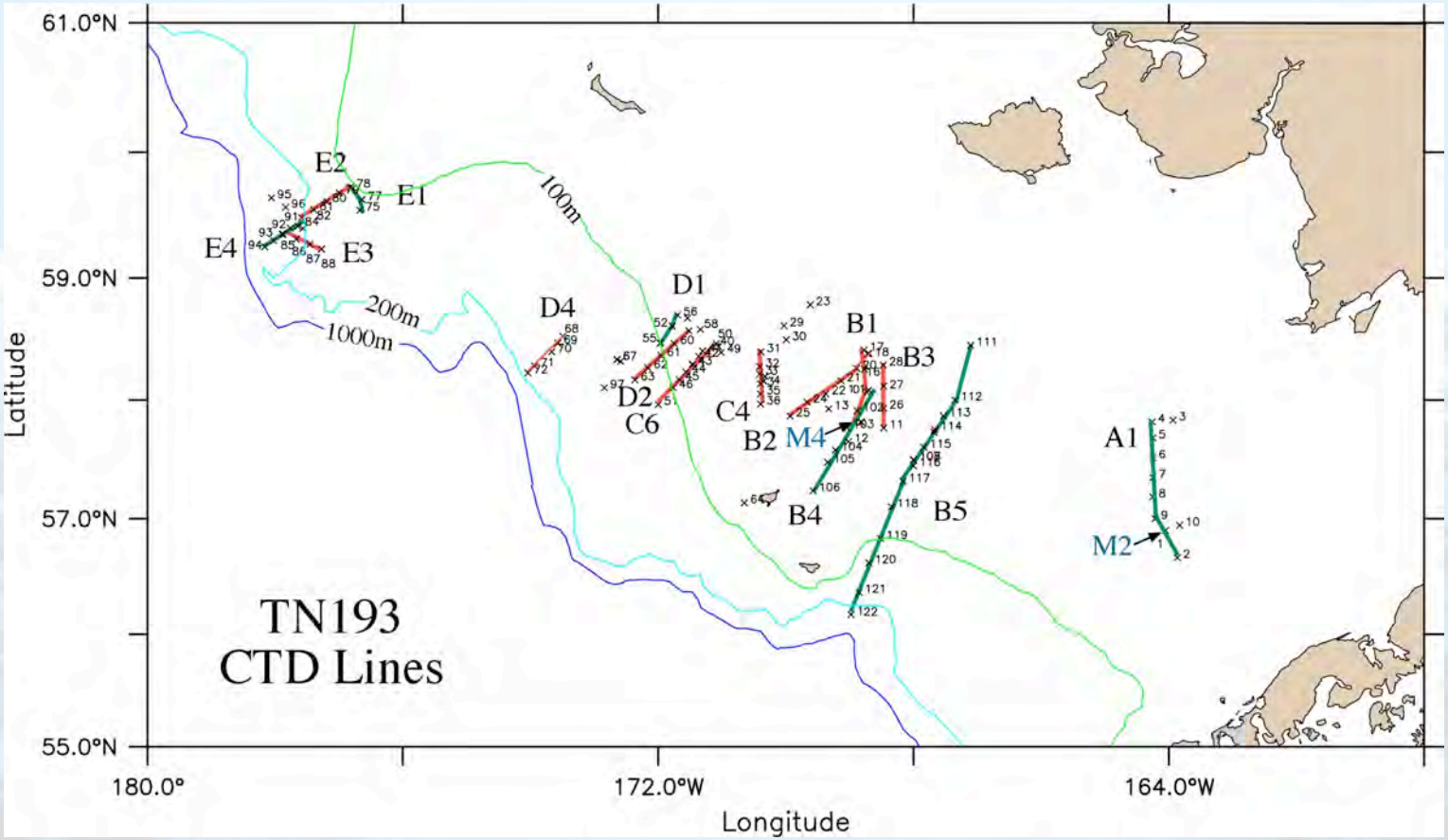
Nitrate (μM)



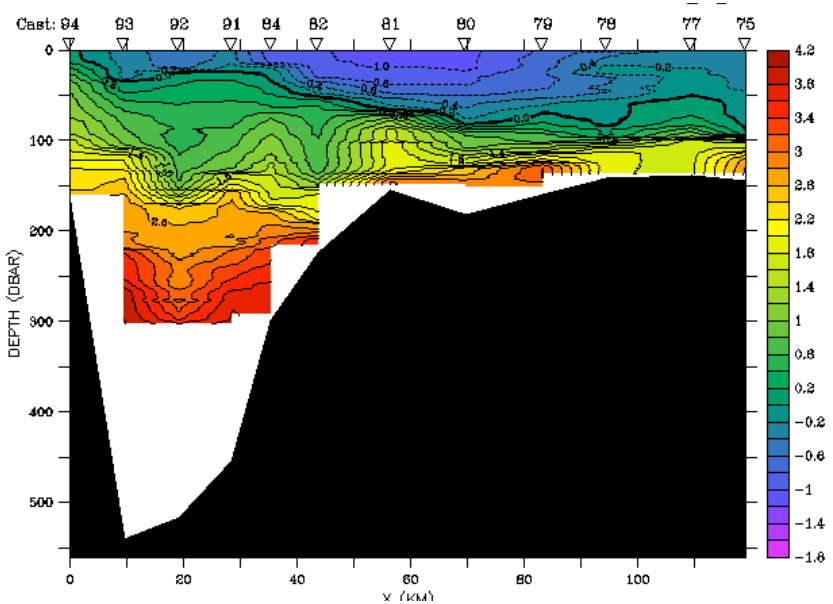
Fluorescence (V)

E2

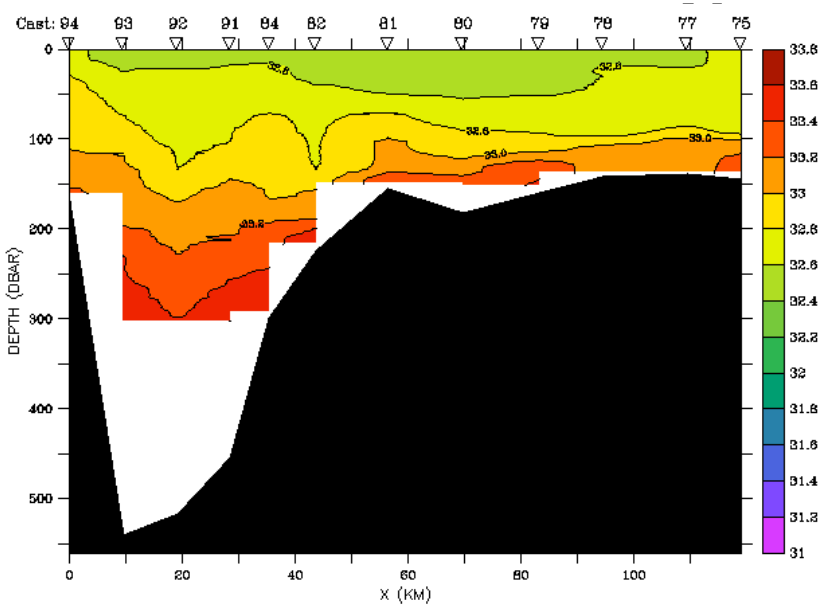
May 2


61.0°N
59.0°N
57.0°N
55.0°N
180.0°
172.0°W
164.0°W
Latitude
Longitude
E2
E1
E4
E3
100m
200m
1000m
D4
D1
D2
C6
C4
B1
B3
B2
M4
B4
B5
A1
M2
TN193
CTD Lines

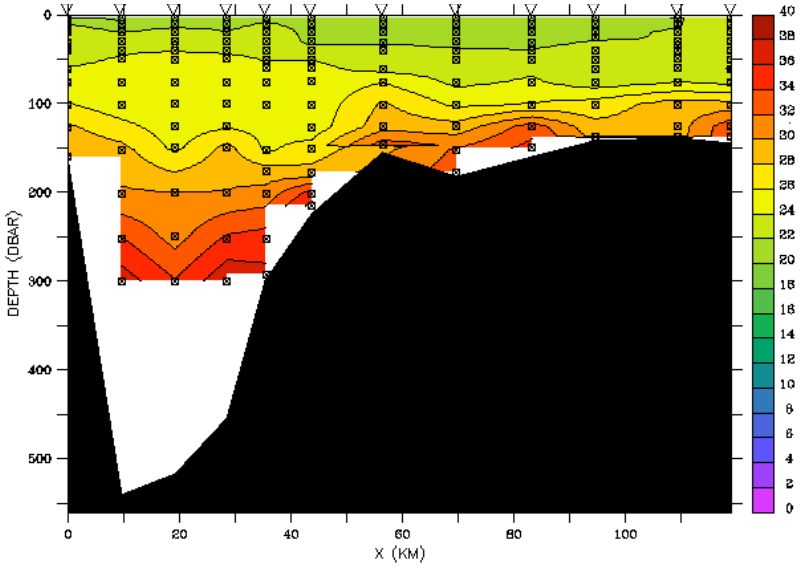
E2 Line, 2 May 2006



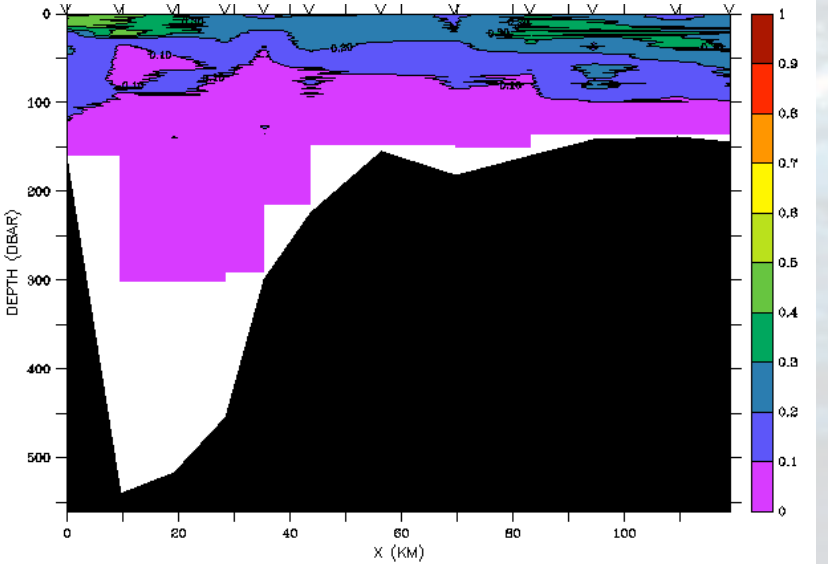
Temperature (°C)



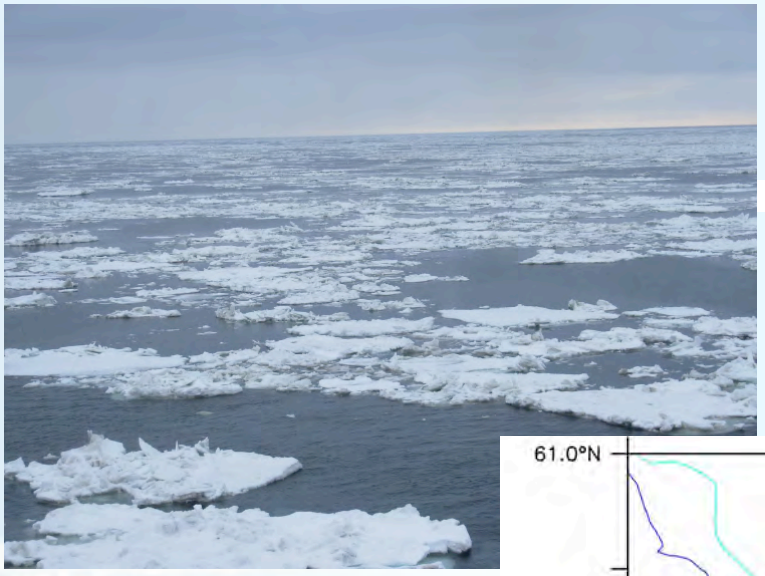
Salinity (psu)



Nitrate (µM)

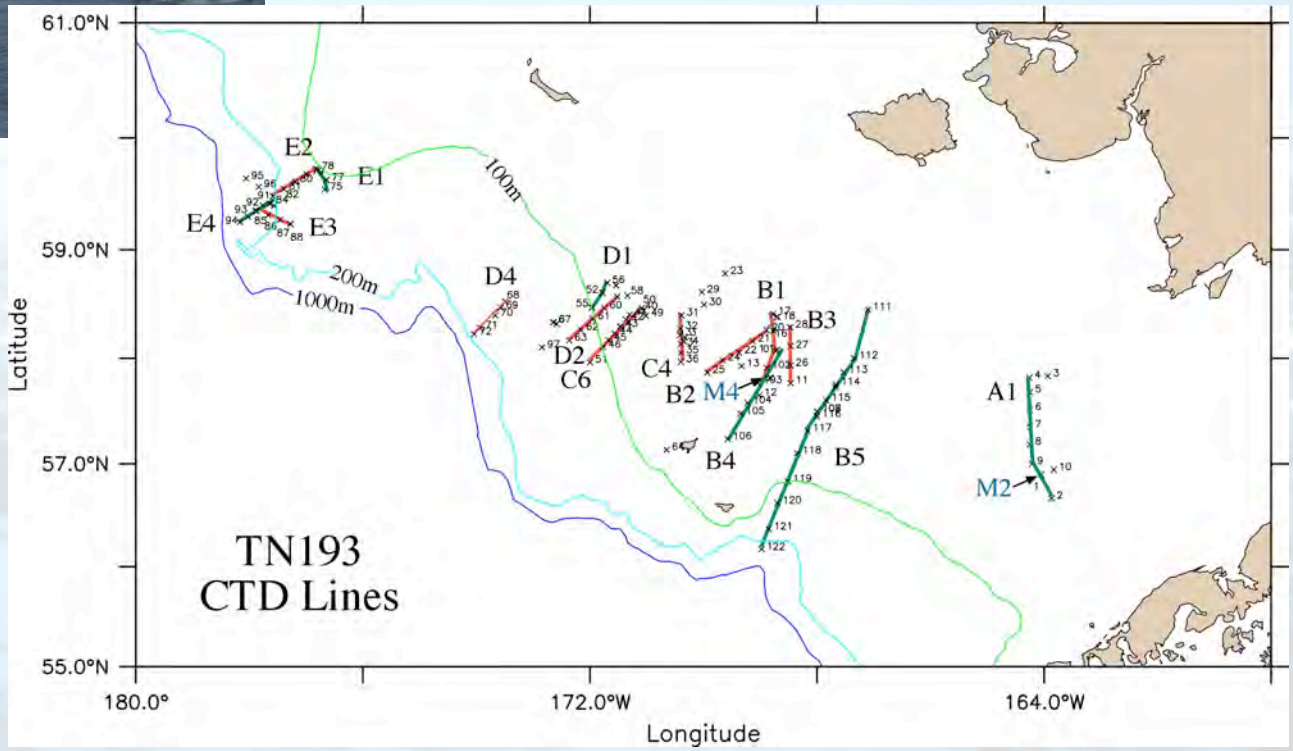


Fluorescence (V)



B5

May 8-9


61.0°N
59.0°N
57.0°N
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Latitude
Longitude
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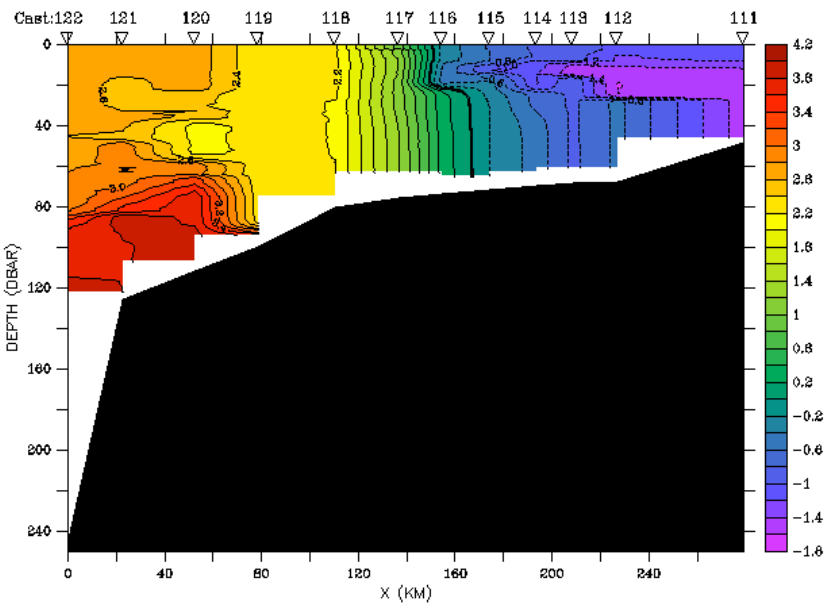
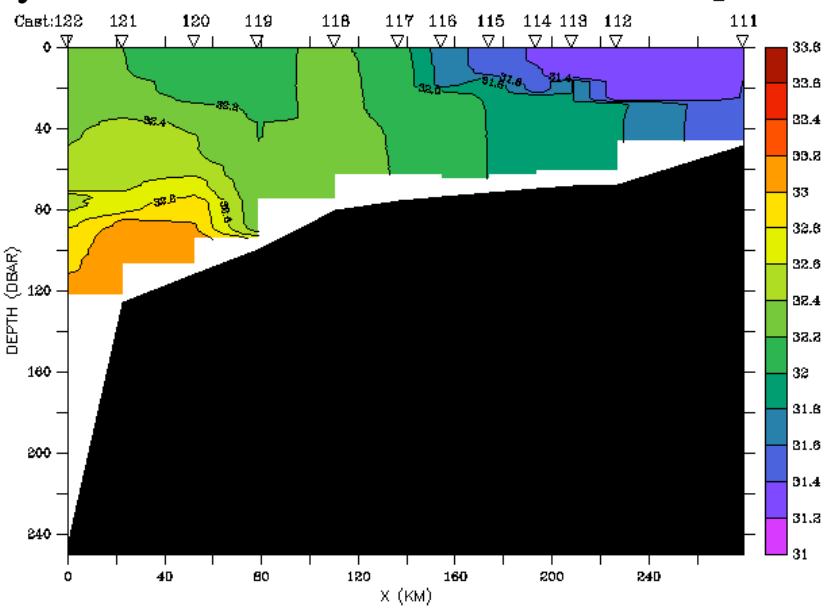
B5
M4
A1
M2
TN193
CTD Lines

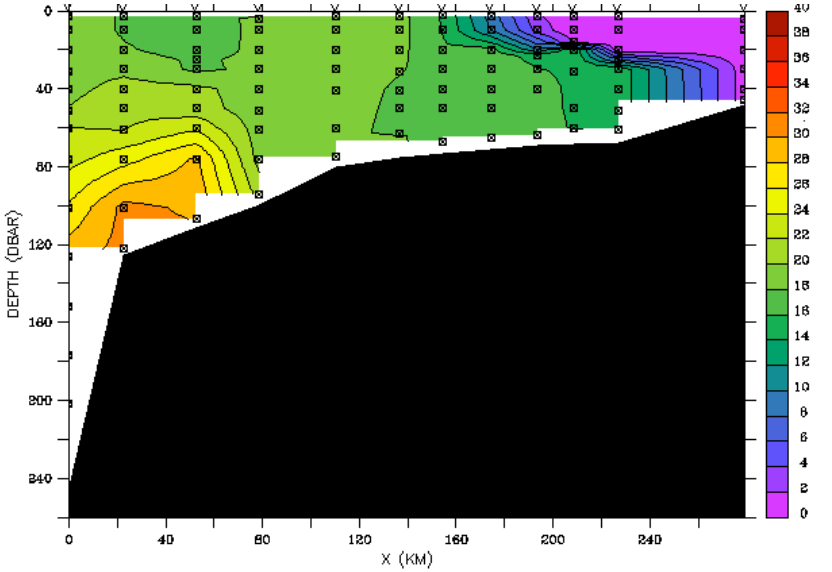
B5 Line, 8-9 May 2006



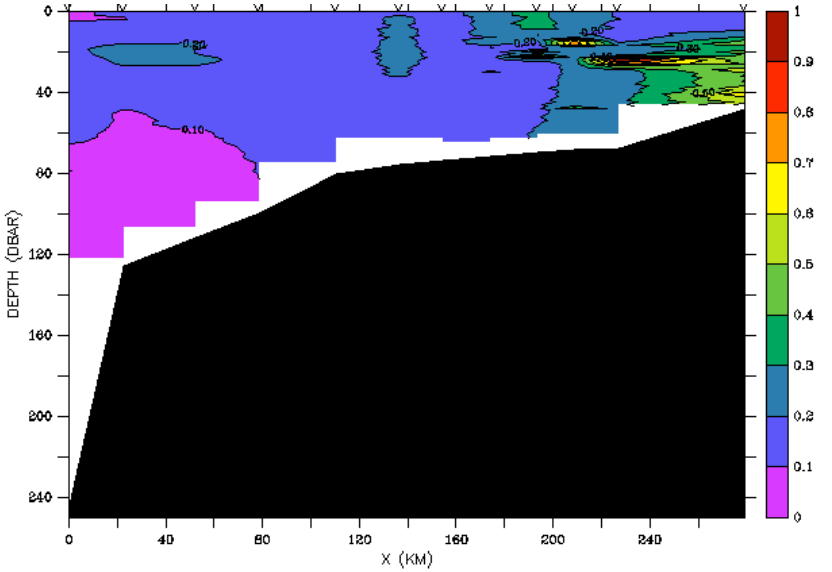
Temperature (°C)



Salinity (psu)



Nitrate (µM)

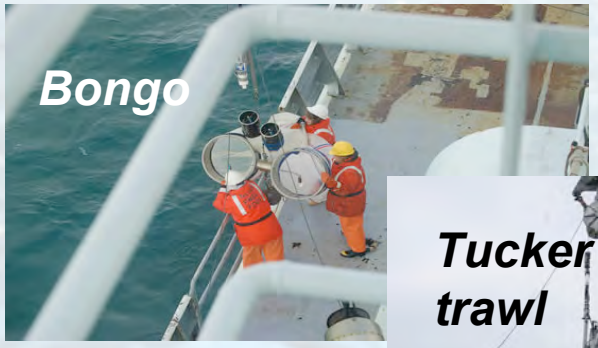


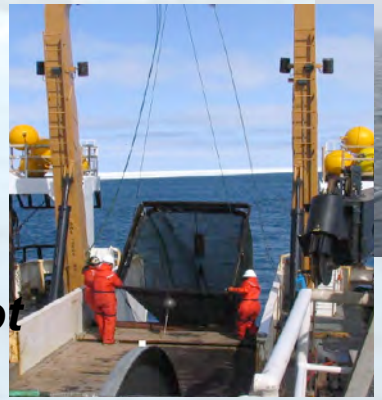
Fluorescence (V)

Nets

Morgan Busby, Rachael Cartwright, Alex DeRobertis, Colleen Harpold, Kathy Mier, Jeff Napp, Carolina Parada, Chris Wilson, Matt Wilson

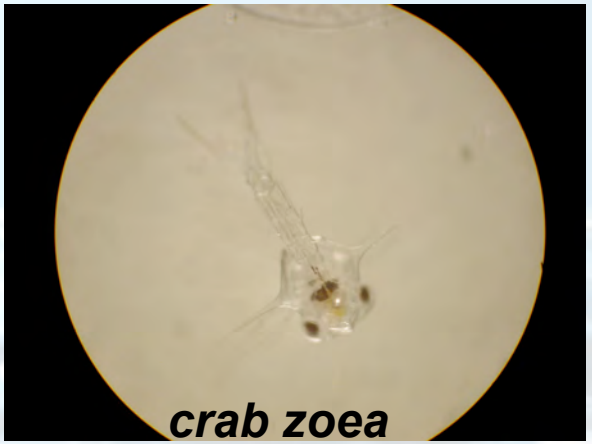
Bongos (20cm and 60cm)	**95**	***Thompson***
CalVET	**6**	
0.8 m diameter ring net	**12**	
Tucker trawl	**10**	
Methot Tow	**6**	***Freeman***
Hydroacoustic lines (km)	**~1000**	



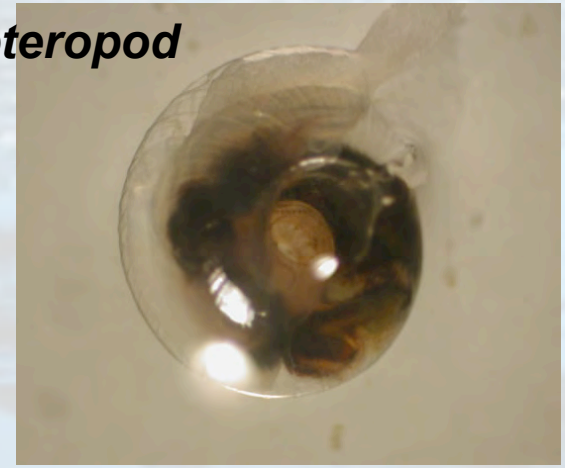


Observations

- *Outer shelf and slope organisms (copepods, euphausiids, etc.) found over the middle shelf (water depth < 100m);*
- *Large medusa found along the ice edge;*
- *Few fish larvae;*
- *"High" concentrations of larval snow crab;*
- *No acoustic signal of fish in the at the ice edge.*

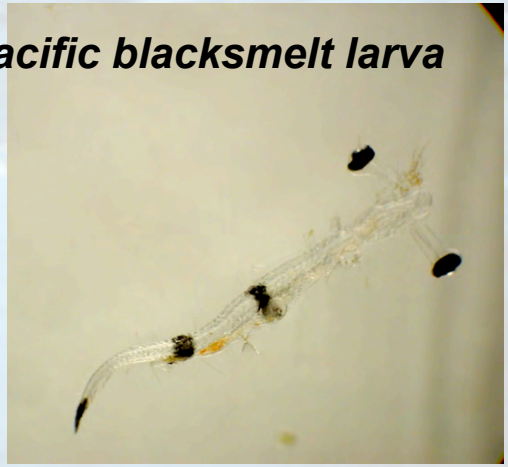

crab zoea

pteropod




euphausiid

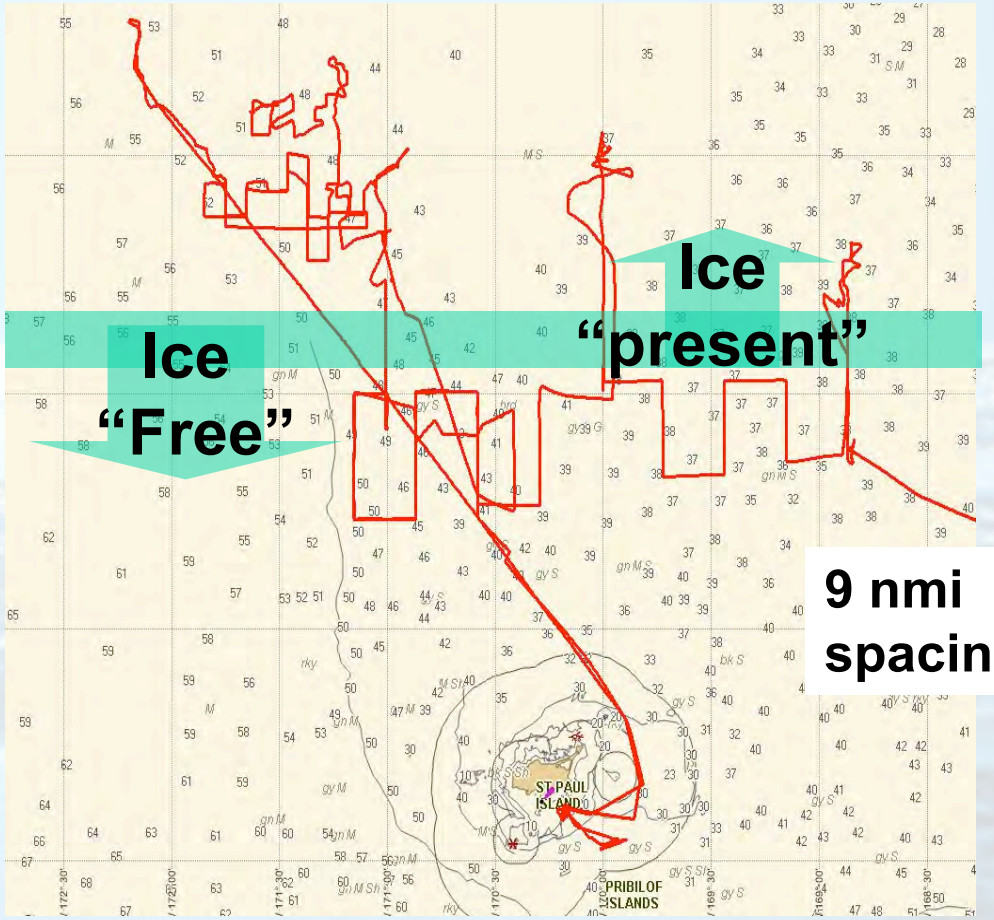
Pacific blacksmelt larva



Miller Freeman Ice Edge - Acoustic Effort (21 - 28 Apr)

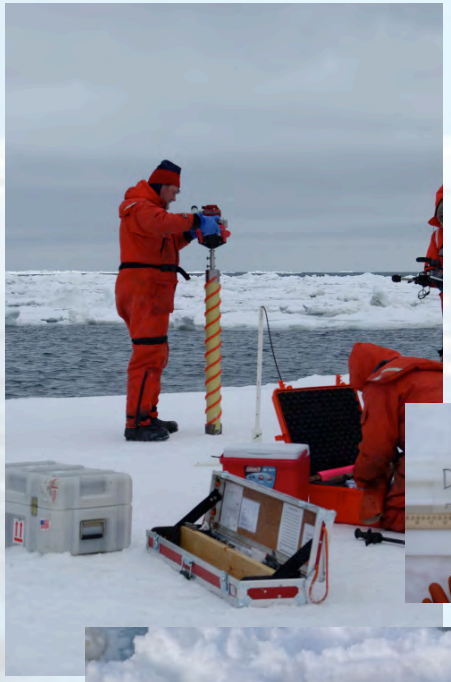
Preliminary Results

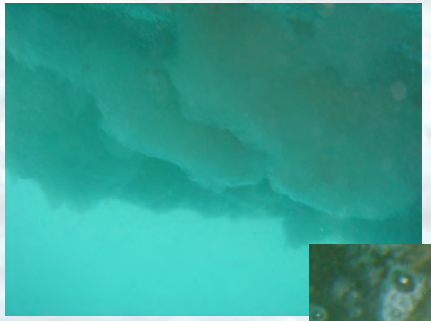
- Two zones: “Ice Free” & “Ice Present”
- ca. 1000 nmi of transects run (18, 38, 120, 200 kHz data collected)
- Methot hauls = 6
- Weak, persistent acoustic backscatter layer of euphausiids & gelatinous zooplankton (~ 50-80 m depth)
- Fish backscatter virtually absent

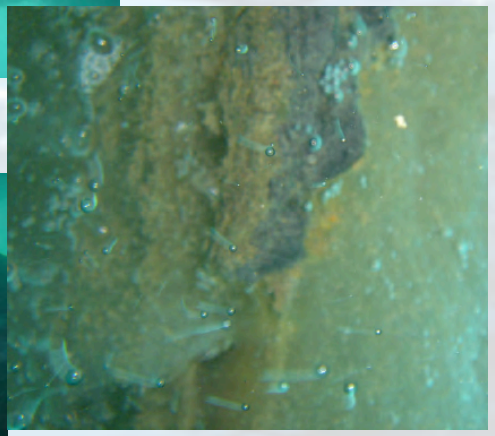


Ice Floes

Ice cores	**9**	***Thompson***
Brine holes	**3**	
Diving ops	**2**	***Freeman***



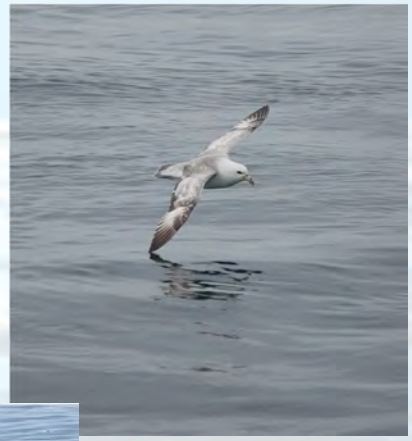




Seabirds and Cetaceans

George Hunt, Libby Logerwell, David Hyrenbach

Seabirds and Cetaceans lines (km)	**~3000**	***Thompson***
Seabirds and Cetaceans lines (km)	**~500**	***Freeman***



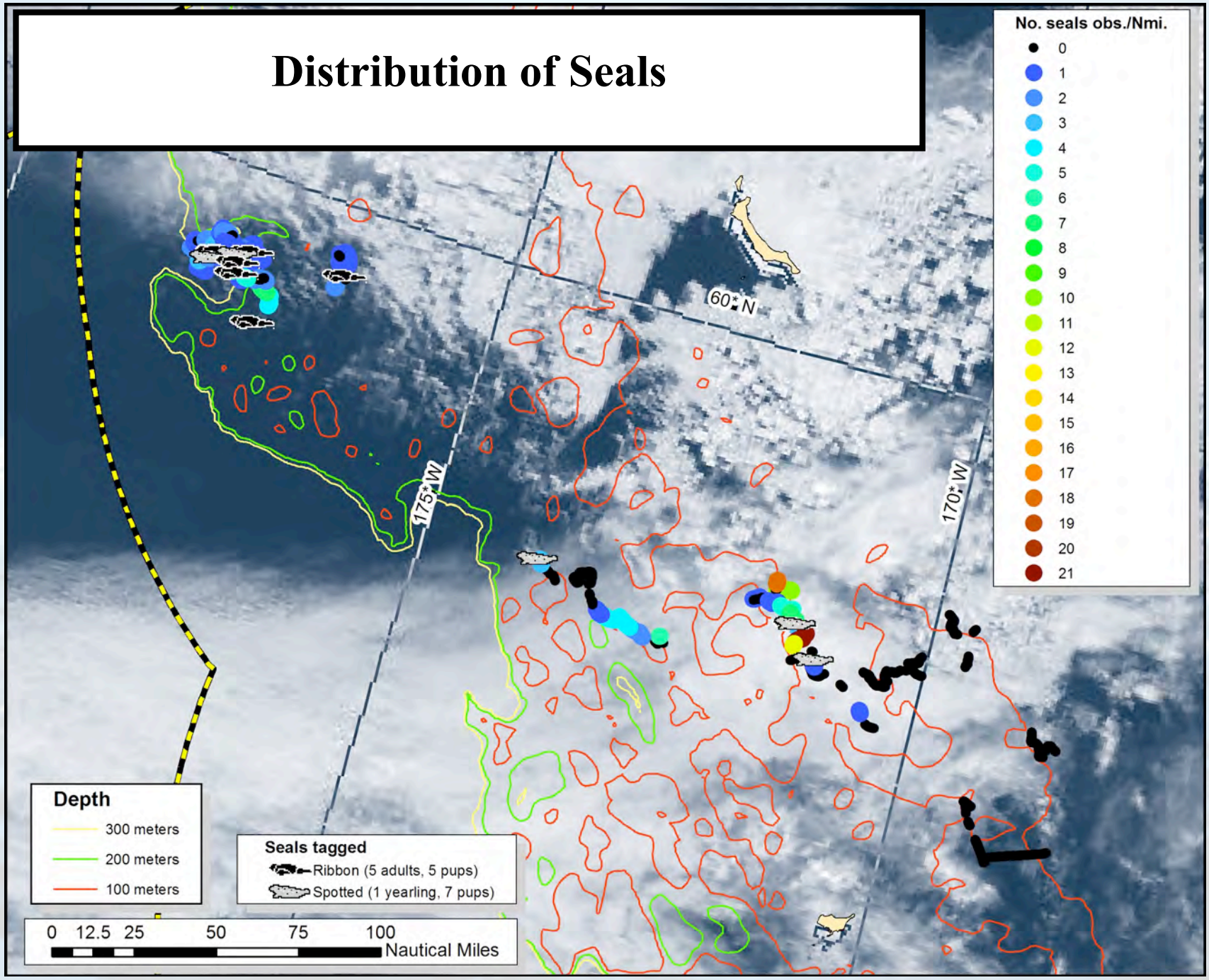
Seals

John Bengtson, Michael Carmeron, Shawn Dahle, John Goodwin, Beth Jenkinson, Evgeniy Mamev, Robert Montgomery, Charlie Saccheus

Ice seal lines (km)	**~1700**
Seals tagged	**18**

Thompson

Distribution of Seals



Next Steps

- **Complete analysis of samples collected this year;**
- **Identify other programs that will be in the Bering Sea and partner with them;**
- **Simultaneous surveys for fish (at least juvenile) in conjunction with lower trophic level cruises.**
- **Prepare for next years cruise (April 25 - May 15):**

    1. **Arrange to obtain better ice positions;**
    2. **Develop a hydrodynamic model that can be easily utilized during cruises;**
    3. **Maintain broad ecosystem cruise.**

Questions

How does ice impact the migration of birds, the distribution of seals, and as boundary to fish and shell fish larvae?

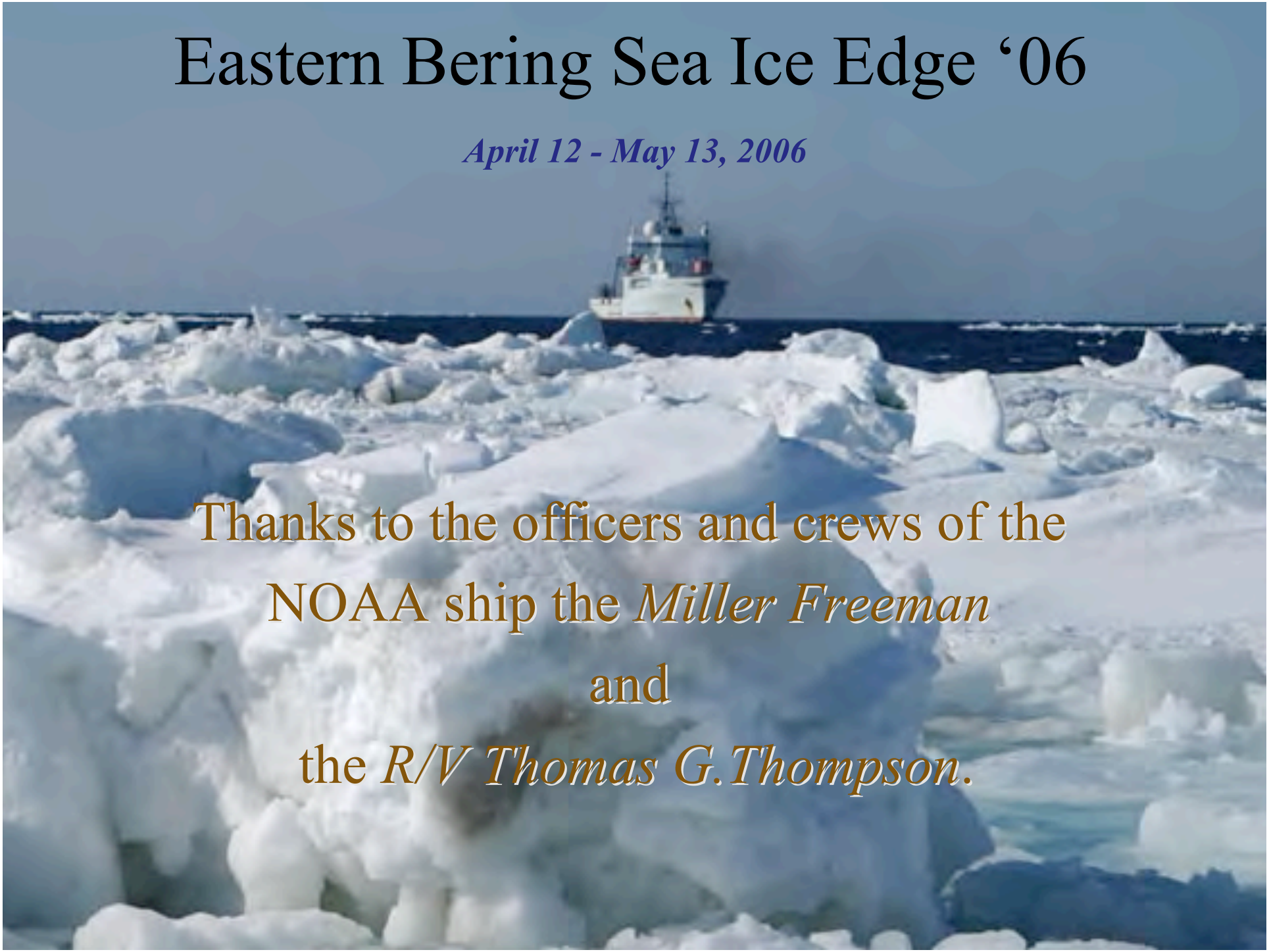
How will the late spring transition (both atmospheric and ice) this year impact recruitment of fish and shellfish?

How does the timing of ice retreat impact the intrusion of oceanic water (nutrients, salt, plankton) onto the shelf?

How long will the transition between the southern ("ice free") and northern regions persist?

Eastern Bering Sea Ice Edge '06

April 12 - May 13, 2006



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and
the *R/V Thomas G.Thompson*.