

# **Pacific Arctic Group (PAG) Meeting**

## **US Ship operations**

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22 April 2012

PAG Meeting

Montreal, BC, Canada

# Timeline 2012 Activities-USA

## July

- C30, Canada and USA
- RUSALCA-Leg 1, Bering Strait moorings

## August:

- COMIDA Hanna Shoal (BOEM) (HLY1201)
- NOAA (CHAOZ, Fish surveys, marine mammal surveys)
- RUSALCA-Leg 2
- CSEP (Chukchi Sea Environmental Program (Conoco-Phillips/Shell/StatOil))

## September

- AON-BOWFEST
- RUSALCA (above)
- UNCLOS (Mayer, Healy 1202) 26 Aug/26 Sept Barrow-Dutch Harbor-Mayer/UNH (HLY1202)

## October

- AON-Pickart/WHOI (HLY1203)

Plus other US cruises

# Timeline 2012 Activities-USA (+PAG DBO effort)

## July

- C30 and **DBO**, Canada and USA
- RUSALCA-Leg 1, Bering Strait moorings (**DBO**)

## August:

- COMIDA Hanna Shoal (BOEM) (HLY1201) (**DBO**)
- NOAA (CHAOZ, Fish surveys, marine mammal surveys (**DBO**)
- RUSALCA-Leg 2 (**DBO**)
- CSEP (Chukchi Sea Environmental Program (Conoco-Phillips/Shell/StatOil) (**DBO**)

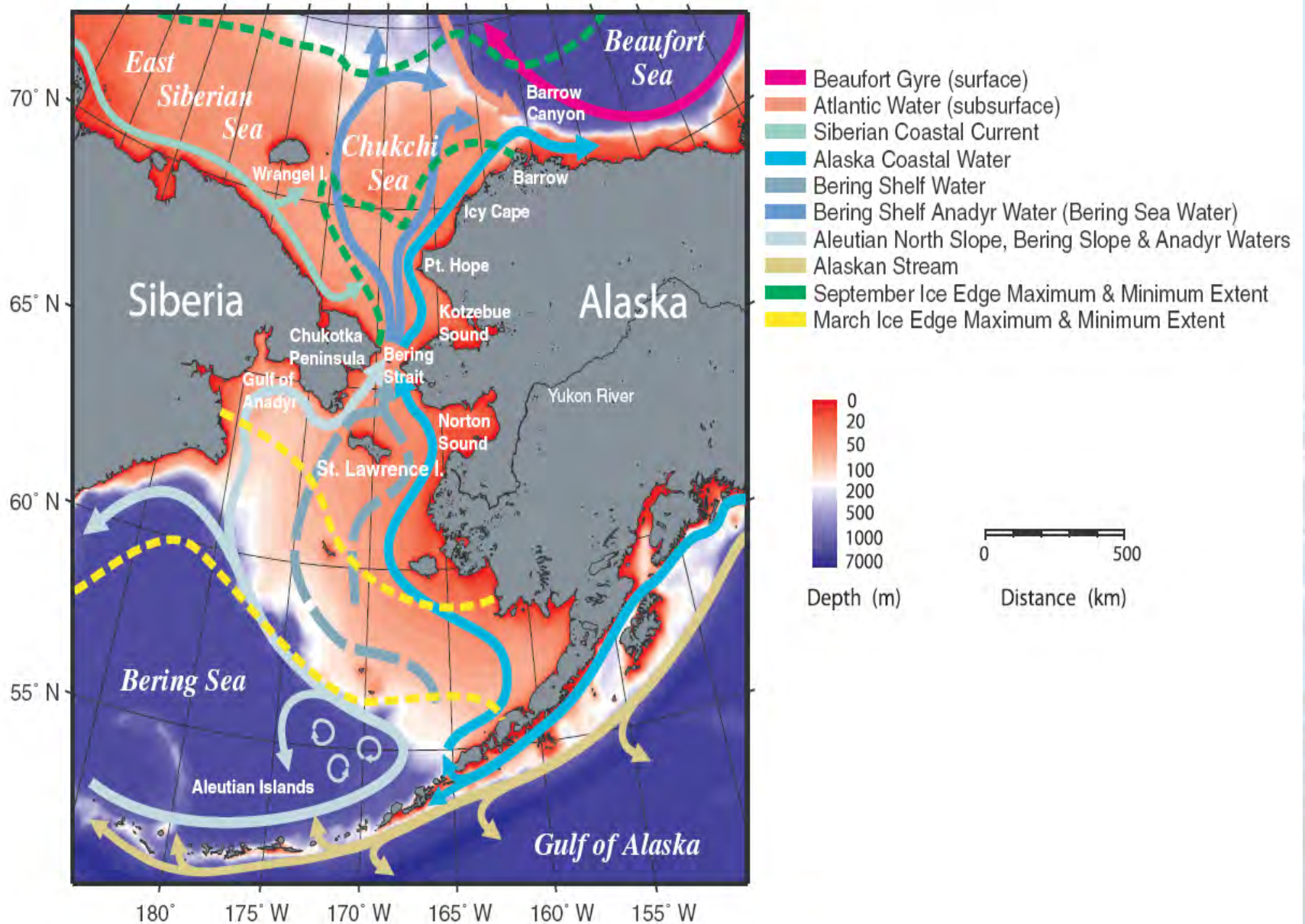
## September

- AON-BOWFEST(**DBO**)
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## October

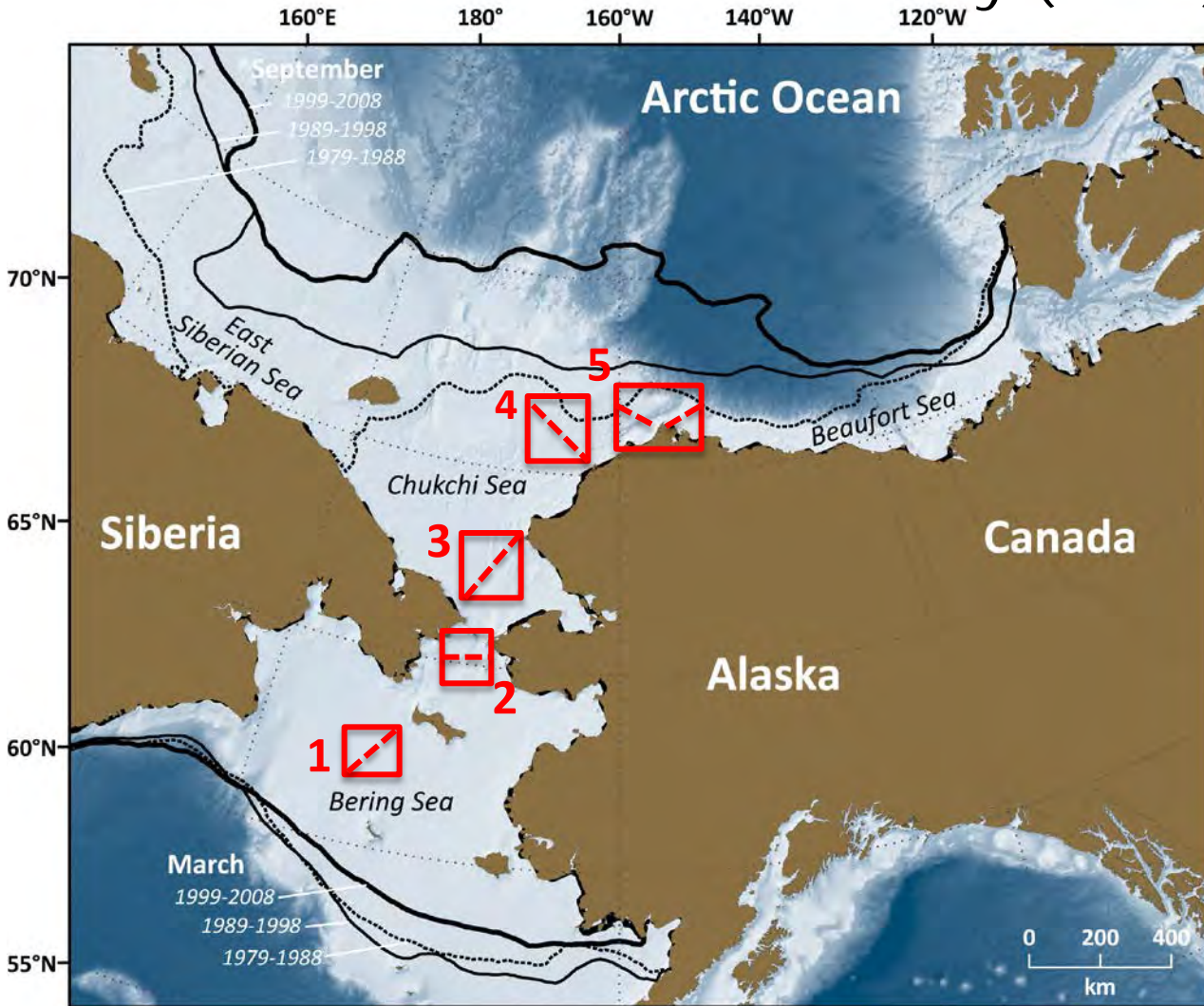
- AON-Pickart/WHOI (HLY1203) (**DBO**)
- Plus other US cruises (**some DBO collaboration**)

# Pacific Arctic Region



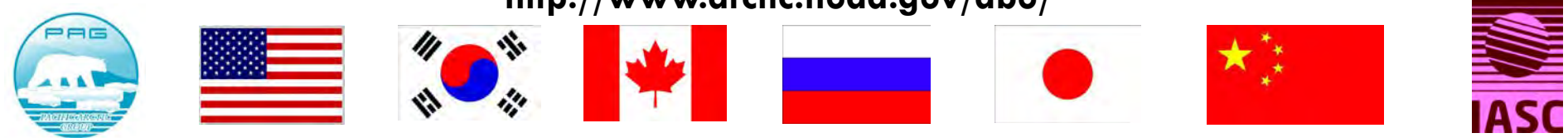


# Linking Physics to Biology: the Distributed Biological Observatory (DBO)

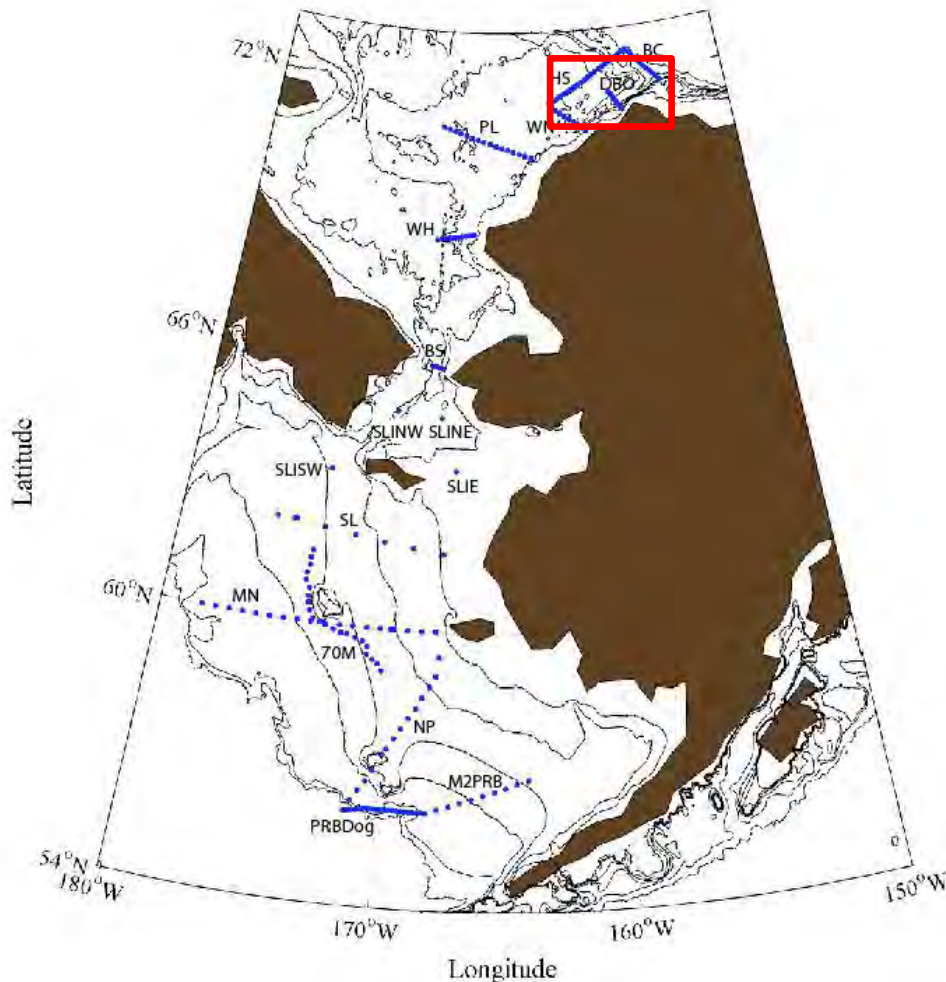


- DBO sites (red boxes) are regional “hotspot” transect lines and stations located along a latitudinal gradient
- DBO sites are considered to exhibit high productivity, biodiversity, and overall rates of change
- DBO sites will serve as a change detection array for the identification and consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan

[modified by Karen Frey from Grebmeier et al. 2010, EOS 91]  
<http://www.arctic.noaa.gov/dbo/>



**Nov 7 – Dec 2011, Seward AK to Dutch Harbor AK.  
“Early Winter Oceanography in the Bering and Chukchi Seas” Chief Scientist Carin Ashjian (cashjian@whoi.edu)**



- This cruise will collect some of the first information on early winter biology and physics of these seas. The cruise will work along a set of key cross-shelf-slope transects and will conduct physical (water temperature, salinity, circulation), chemical (nutrients), and biological (phytoplankton, zooplankton) sampling.
- primarily in the Bering and Chukchi Seas but hope to sample the western Beaufort as well, ice depending

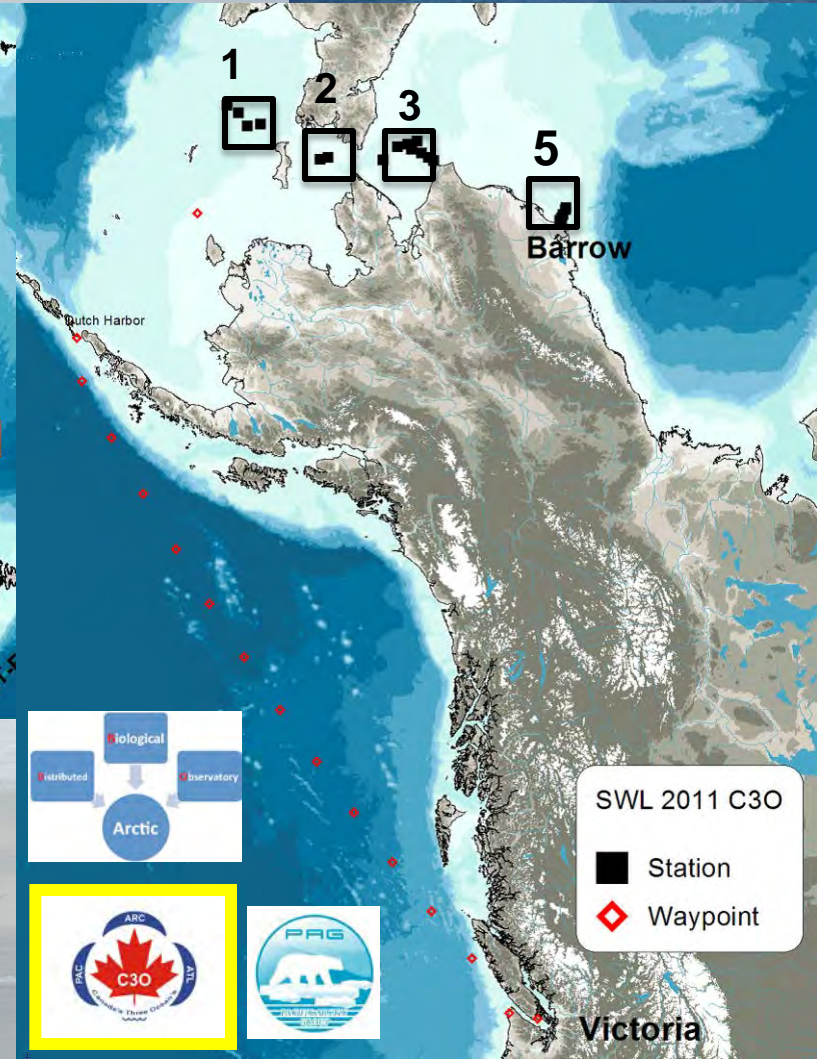
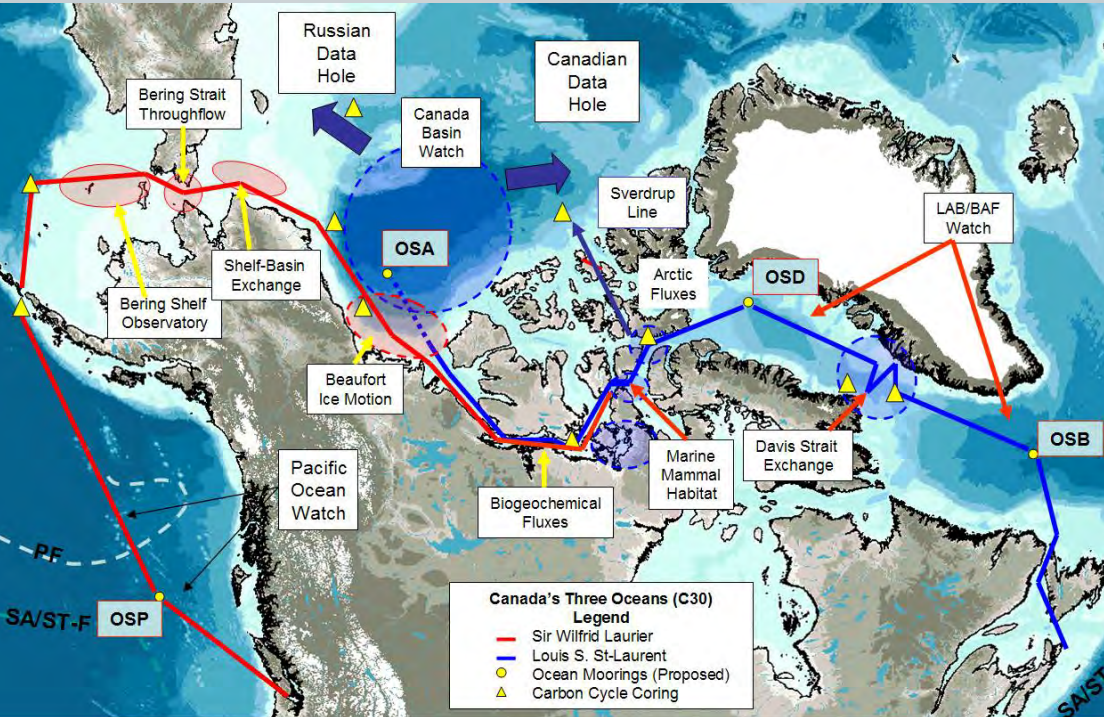


# US-Canada collaboration as part of the C30 and DBO efforts

## July 6-22, 2012 and onwards



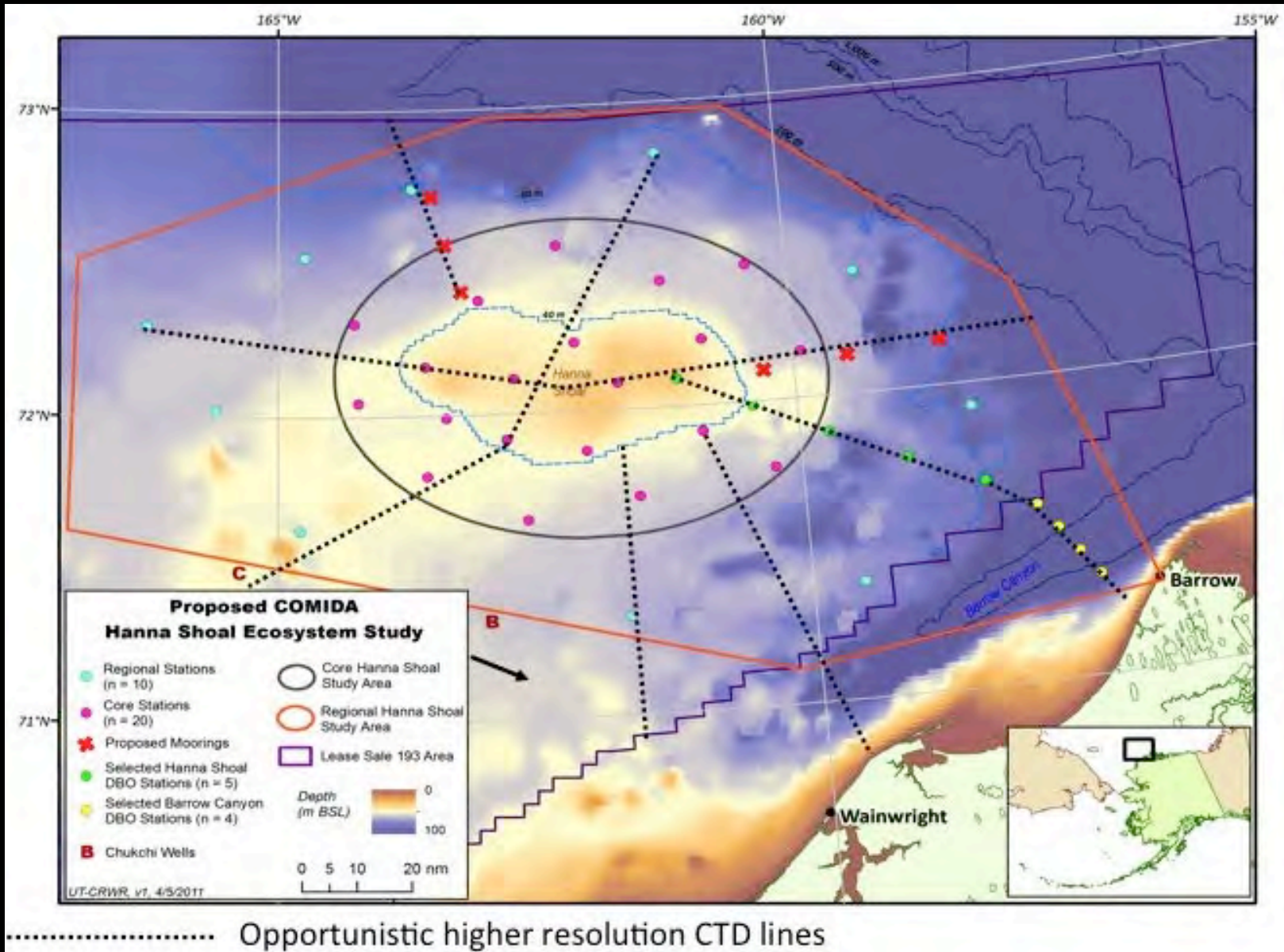
CCGS Sir Wilfrid Laurier  
Pacific C30



- Interdisciplinary
- Distributed, latitudinal mode of observations in Pacific sector
- Samples nearly same day in July as CCGS Sir Wilfrid Laurier transits to Canadian Arctic



# Draft ampling sites COMIDA HS August 5-25, 2012 (USCGC Healy1201)



Moorings will be deployed on roughly the 35, 50, and 60 m isobaths

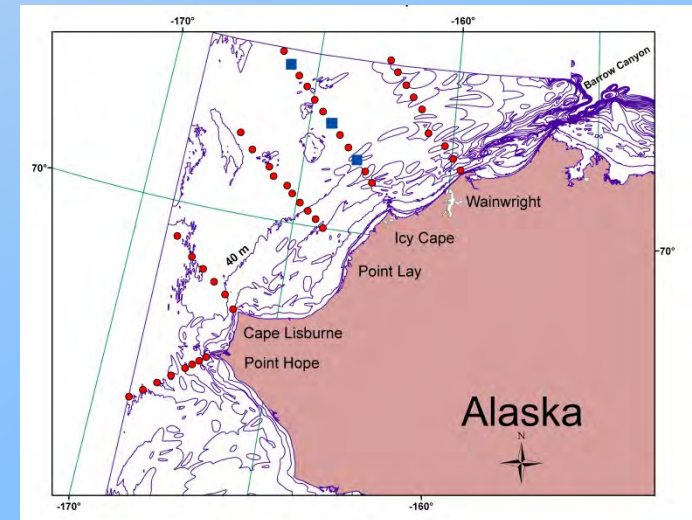


# CHukchi Acoustics, Oceanography, and Zooplankton (CHAOZ) Study II: FY10-FY15

- Location: Bering Strait to Point Barrow, Alaska
- Funding Source: BOEMRE
- Funding amount: \$2,042.0 K
- Program lead: Phyllis Stabeno
- Research focus: 1. examine the changing Chukchi Sea ecosystem using biophysical moorings, shipboard observations and climate numerical models, and 2. link these data to the distribution and behavior of cetaceans to provide an integrated look at how changing regional and local conditions are affecting protected species.
- Principal Investigators: S. Moore (NMFS S&T), J. Napp (AFSC), J. Overland (PMEL), P. Stabeno (PMEL)

<http://gos2.geodata.gov/wps/portal/gos>

[http://www.pmel.noaa.gov/foci/operations/2010/1AE10/CHAOZ2010\\_CruiseReport.pdf](http://www.pmel.noaa.gov/foci/operations/2010/1AE10/CHAOZ2010_CruiseReport.pdf)

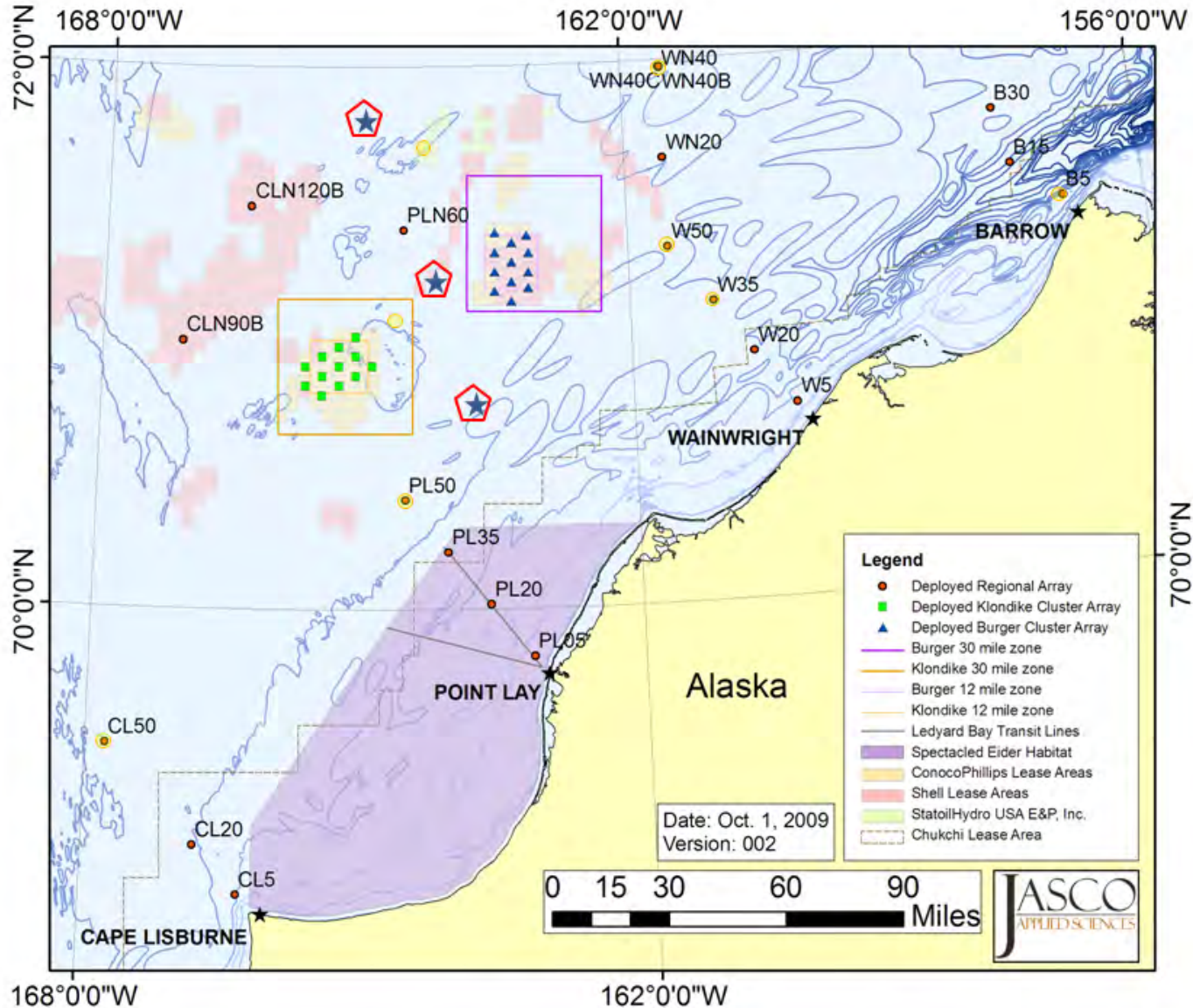


Stations occupied in FY10.

- = biophysical moorings;
- = hydrographic and plankton stations



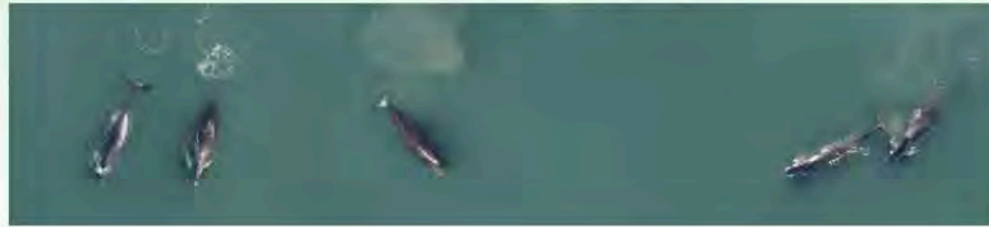
# CHAOZ 2011 and 2012: Chukchi Sea Acoustics, Oceanography, and Zooplankton cruise (Napp, Berchok, Moore, et al., NOAA/BOEMRE (August-Sept 2012) –will occupy DBO 4 and 5, too





# The Bowhead Whale Feeding Ecology Study (BOWFEST)

David Rugh • NMML, AFSC, NOAA Fisheries  
 Carin Ashjian • Woods Hole Oceanographic Institution  
 Mark Baumgartner • Woods Hole Oceanographic Institution  
 Catherine Berchok • NMML, AFSC, NOAA Fisheries  
 Bob Campbell • University of Rhode Island  
 Craig George • North Slope Borough Dept. Wildlife Management  
 Kimberly Goetz • NMML, AFSC, NOAA Fisheries  
 David Mellinger • Oregon State University  
 Julie Mocklin • NMML, AFSC, NOAA Fisheries  
 Steve Okkonen • University of Alaska Fairbanks  
 Gay Sheffield • ADFG/NSB Dept. Wildlife Management  
 Mari Smulter • Smolte Environmental Sciences  
 Kate Stafford • University of Washington/ Applied Physics Lab



## Aerial Surveys



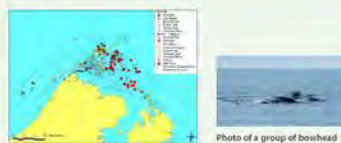
Aerial surveys were conducted on 5 days between 29 Aug and 18 Sept 2009. Totals of aerial sightings of bowheads were 16 in 2007, 56 in 2008, and 25 in 2009.

## Photo Analysis



Aerial photography provides images of bowheads used to identify individuals and measure their lengths.

## Boat-based Surveys



Boat-based surveys in 2009. Bowhead sightings are indicated with red marks.

Photo of a group of bowhead whales feeding at the sea surface.  
 Photo by Henry Litang.

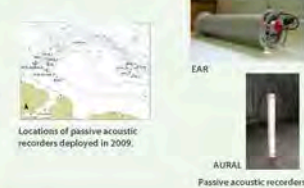
The Bowhead Whale Feeding Ecology Study (BOWFEST) was initiated in May 2007 through an Interagency Agreement between the Minerals Management Service (MMS) and the National Marine Mammal Lab (NMML, NOAA Fisheries Service). The study is being conducted through grants and contracts to scientists at eight institutions. Fieldwork is being coordinated with the North Slope Borough, Alaska Eskimo Whaling Commission, Barrow Whaling Captains' Association, Alaska Department of Fish and Game, and Minerals Management Service.

BOWFEST focuses on late summer oceanography and prey densities relative to bowhead whale (*Balaena mysticetus*) distribution north and east of Point Barrow between the Alaska coast and 72°N and between 152° and 157.5° west longitudes. Aerial surveys, boat-based surveys, and acoustic monitoring provide information on the spatial and temporal distribution of bowhead whales in the area. Oceanographic sampling helps:

1. identify off-shelf sources of zooplankton prey available to whales on the continental shelf
2. describe how oceanographic fronts and currents influence zooplankton aggregation
3. provide a context for interpreting whale feeding behavior.

Results of this research program show that in late summer (mid-August to mid-September), bowheads are generally on a westward feeding migration through the study area predominately along the 20-m isobath, and that most of the whales near Barrow are feeding on krill. Prey densities increase on the shelf after upwelling-favorable east winds are followed by weak and/or southerly winds. This "krill trap" likely contributes to the high proportion of feeding whales seen in this area. A good understanding of bowhead behavior and distribution, as exemplified by this study, is needed to minimize potential impacts from petroleum development activities, possible commercial fishing in the future, and anticipated increased vessel traffic associated with diminishing arctic sea ice.

## Passive Acoustics



Locations of passive acoustic recorders deployed in 2009.

Passive acoustic recorders.

## Stomach Content Analyses



This stomach contained fresh undigested euphausiid-like prey with very little fluid.

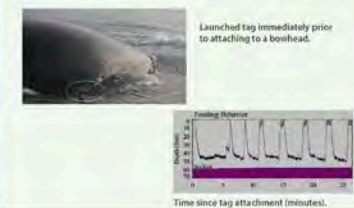
## Mooring and BROADSCALE Oceanography



The blue symbols are locations of stations with few krill, the red symbols are locations of stations with krill, and the green asterisks are locations of bowhead whales seen from the Anika Marie.

Anika Marie used for oceanography.

## Tagging and Fine Scale Oceanography



Launched tag immediately prior to attaching to a bowhead.

Feeding Behavior  
 Time since tag attachment (minutes).

## Acknowledgments

- Funding for this study was provided by the Minerals Management Service, with ongoing support from Chuck Monnett
- The National Marine Mammal Lab, AFSC, NOAA Fisheries, was the conduit of research funds to eight institutions (see the author list)
- Studies of bowhead whales were conducted under MMPA Research Permits 782-1719 and 369-1757-01
- Fieldwork has been coordinated with the North Slope Borough, Alaska Eskimo Whaling Commission, Barrow Whaling Captains' Association, and Alaska Department of Fish and Game.



# Bowhead Whale Feeding Ecology Study (BOWFEST) FY07-FY12 (ongoing)

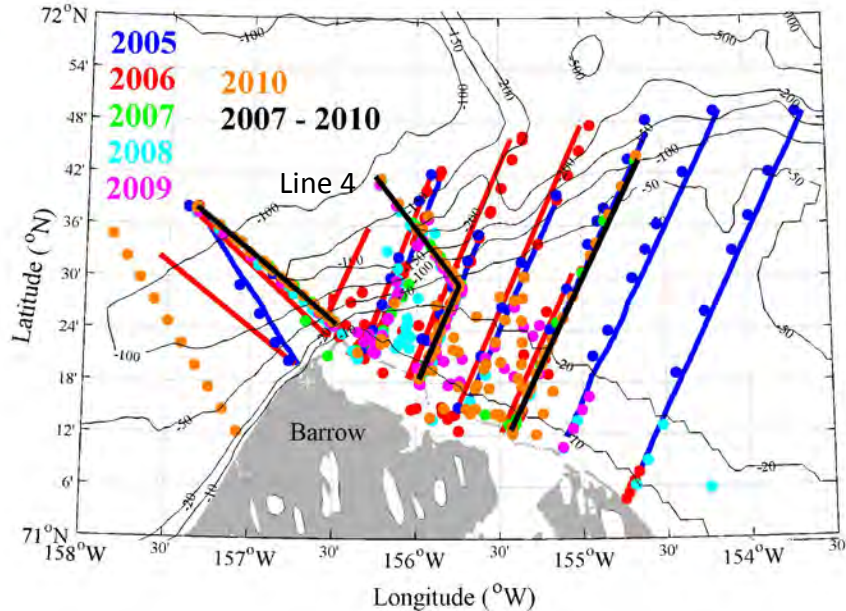


- Location: Northeast of Point Barrow, Alaska
- Funding Source: BOEMRE
- FY11 funding amount: \$1530K; total funding: \$8187.3K
- Program lead: Phillip Clapham, Kim Shelden
- This research is designed to describe the summer feeding ecology of bowhead whales in the Western Beaufort Sea.
- Whale distribution is documented through aerials surveys, boat-based observations, and acoustics. Moorings and transects document ecological parameters such as bathymetry, currents, temperature, and prey availability. Short-term tagging provides fine-scale tracking of whale behavior relative to oceanographic features.
- Results can be found in annual reports from NMML to BOEMRE and at <http://www.afsc.noaa.gov/nmml/cetacean/bwasp/index.php>
- Collaborators: WHOI, Univ. of Rhode Is., UAF, UW, Oregon State, New York State, New York Borough, Barrow Whaling Captains' Assoc., ADFG





# DBO Sampling from *R/V Annika Marie*



- Oceanographic sampling using the 43' *R/V Annika Marie* from mid-August to mid-September 2005-2011
- DBO sampling in 2010 and 2011, planned 2012
- Ring net equipped with 150  $\mu\text{m}$  mesh net, sampling from 0-near bottom
- We are able to sample an additional station inshore (11 stations) on the DBO transect
- Other cruises have sampled zooplankton (e.g., CHAOZ 2011-2012)

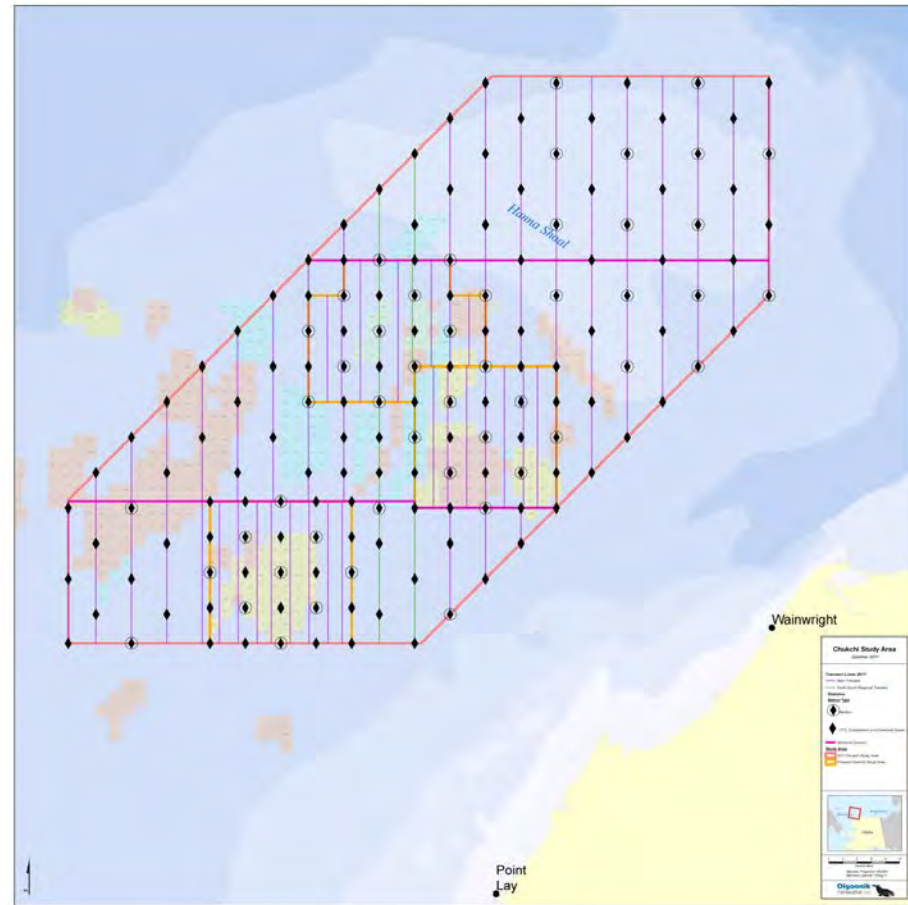
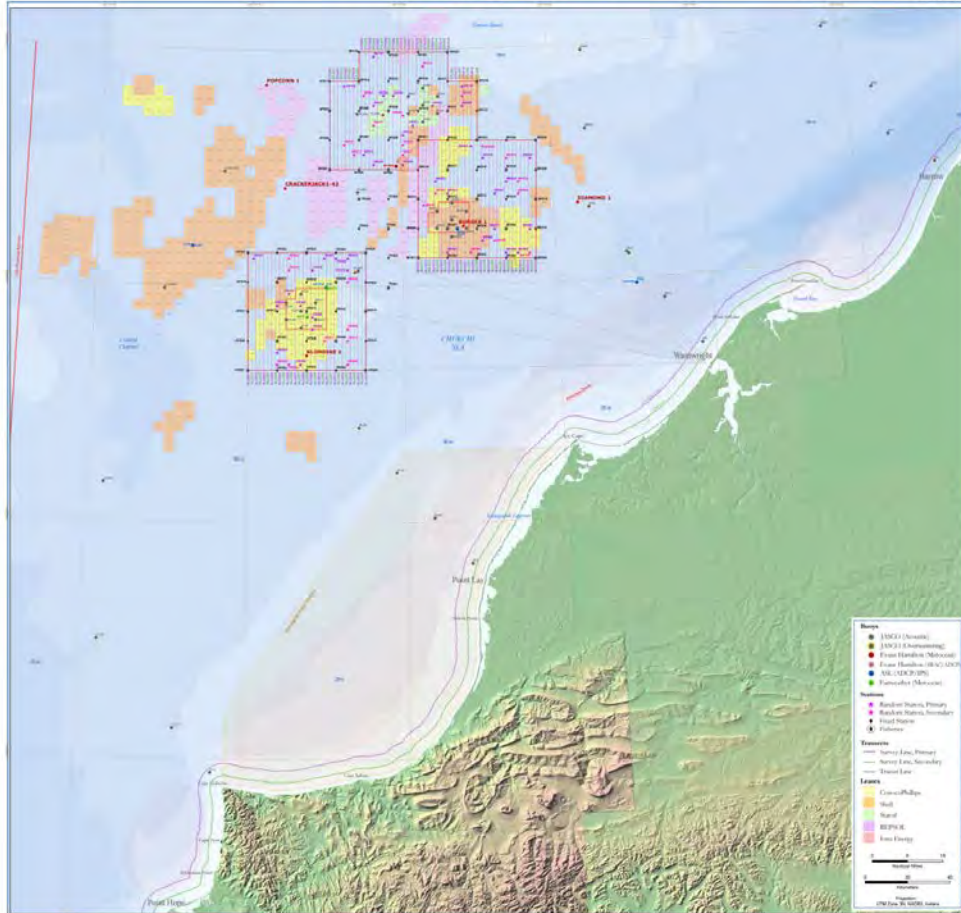
[Carin Ashjian (WHOI)]

# Shell-Conoco Phillips-StatOil 2010 (left panel) and 2011 (right panel) cruises-continue for 2012

2010 Chukchi Baseline Studies Program

As of July 17, 2010

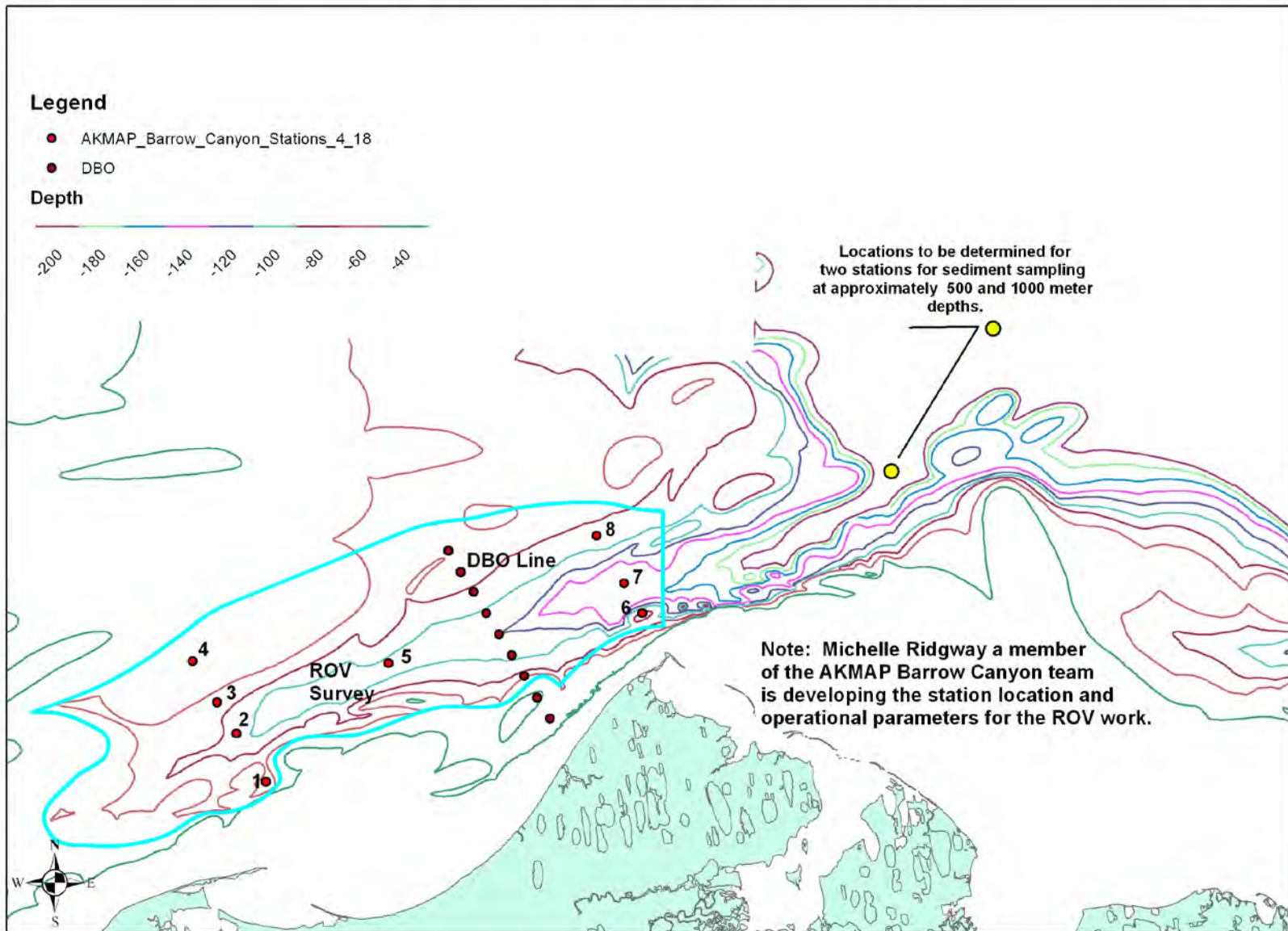
Olgoonik  
Fairweather LLC





# Alaska Monitoring and Assessment Program Barrow (AKMAP) Canyon Stations

(Note: NOAA Barrow Canyon DBO line also shown.)



DRAFT MAP 4/18/2012 - Alaska Department of Environmental Conservation and University of Alaska Institute of Marine Science. For 2011 AKMAP Barrow Canyon stations proposal to NOAA for RV Fairweather support.

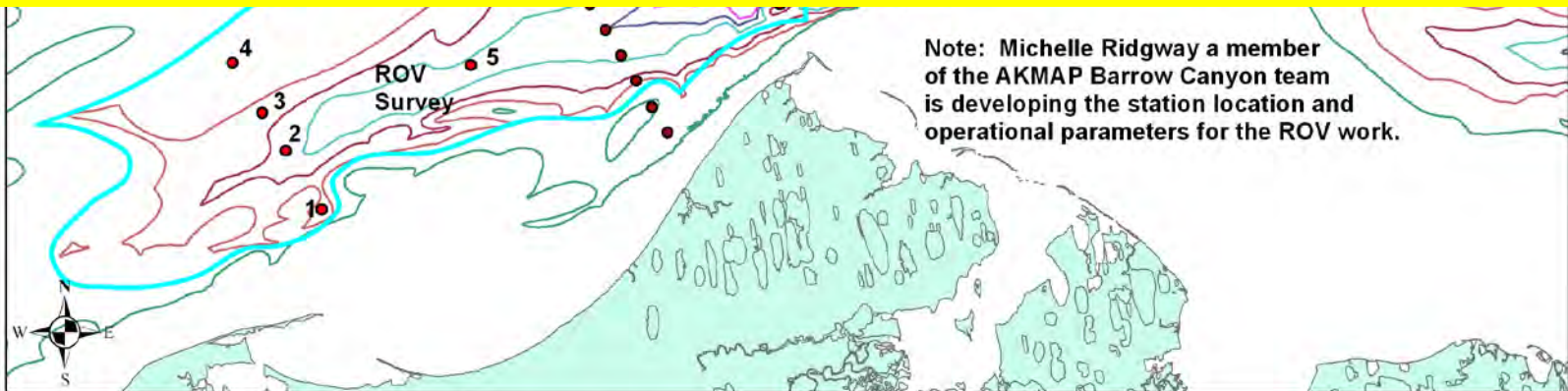
Alaska Monitoring and Assessment Program Barrow (AKMAP) Canyon Stations  
(Note: NOAA Barrow Canyon DBO line also shown.)

**Legend**

- AKMAP\_Barrow\_Canyon\_Stations\_4\_18
- DBO

**Depth**

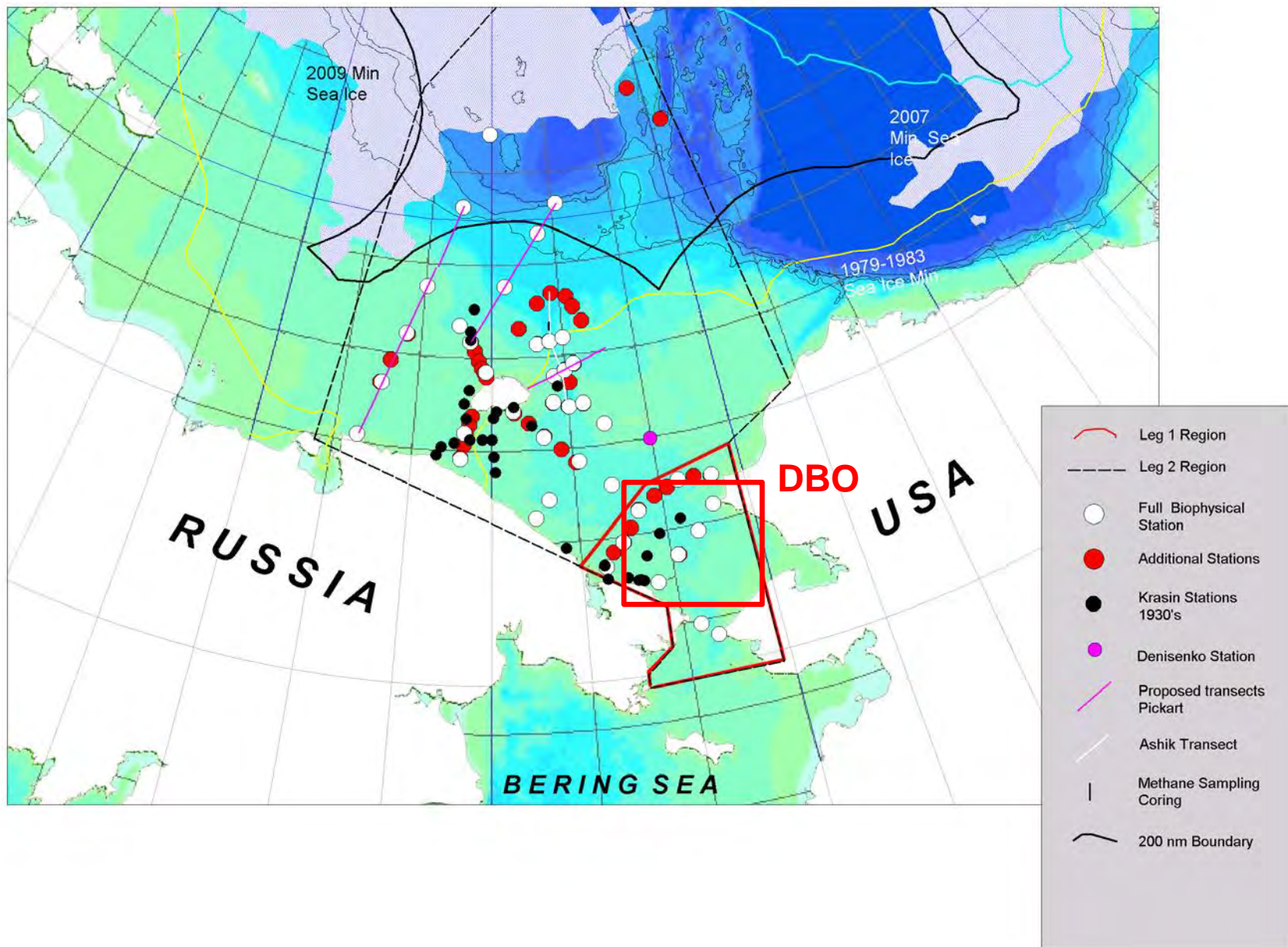
**In discussions with Greenpeace  
planning 2 man-submersible survey  
of hotspots in Chukchi Sea, including  
DBO sites and Barrow Canyon**



DRAFT MAP 4/18/2012 - Alaska Department of Environmental Conservation and University of Alaska Institute of Marine Science. For 2011 AKMAP Barrow Canyon stations proposal to NOAA for RV Fairweather support.



# 2012 Proposed RUSALCA Leg 2 Stations

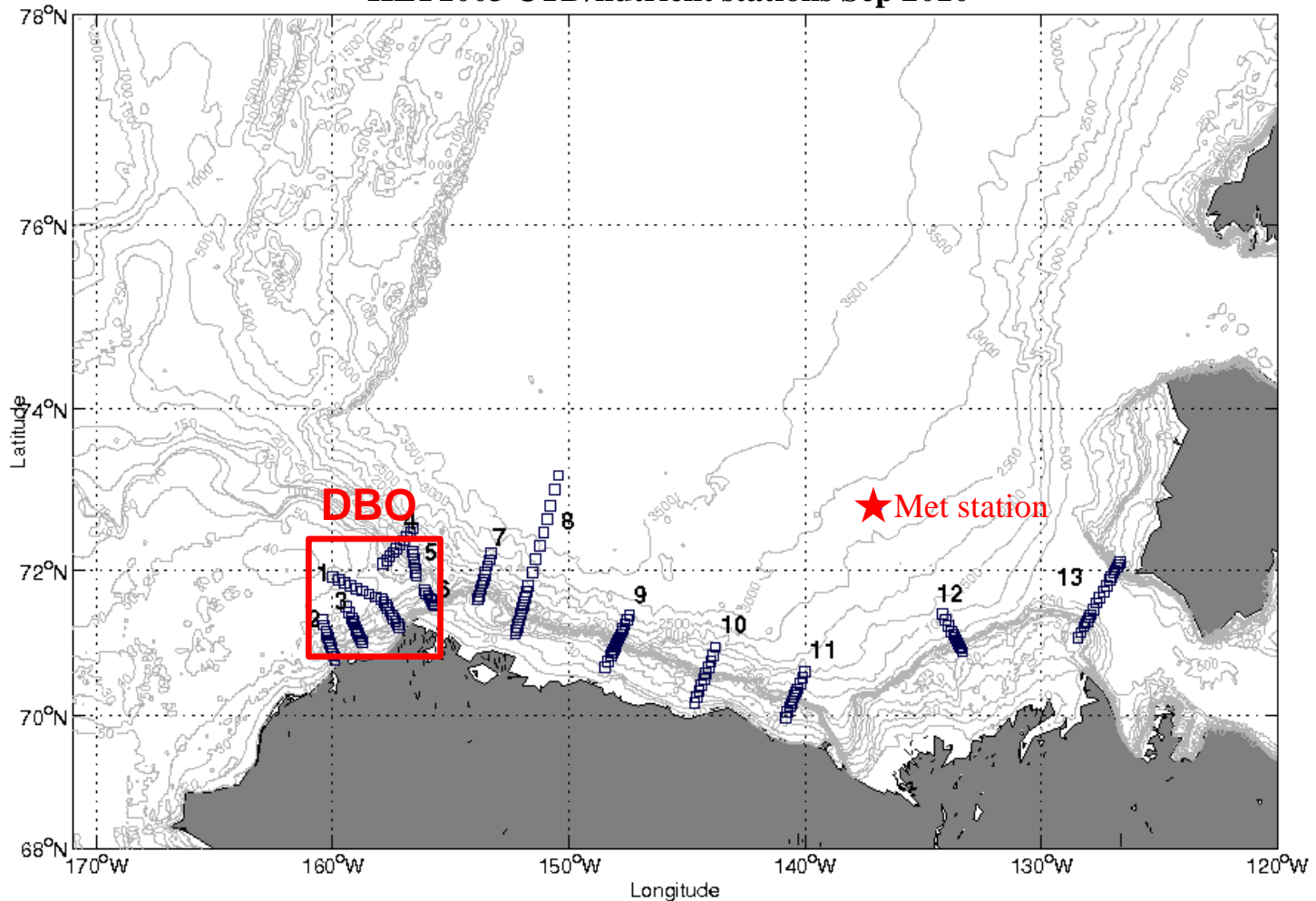




# HLY1203 Arctic Observing Network *(Assessing the Western Arctic boundary current and its role in the Arctic ecosystem and climate change)*

17 Oct/06 Aug Dutch Harbor/Barrow Pickart/NSF HLY1203

HLY1003 CTD/nutrient stations Sep 2010





# Arctic Ecosystem Integrated Survey

**When:** August / September 2012 & 2013

**Where:** Northern Bering Sea / Chukchi Sea

**Why:** Understand the distribution of marine fishes and shellfishes, and the plankton they depend upon for food, throughout the northern Bering Sea and Chukchi Sea

Knowledge and insights gained from these studies will help us to:

- evaluate effects of climate change on marine resources in the Alaskan Arctic
- protect marine resources in the region from potential effects of oil & gas development

**A collaboration between:**



**With funding from:**

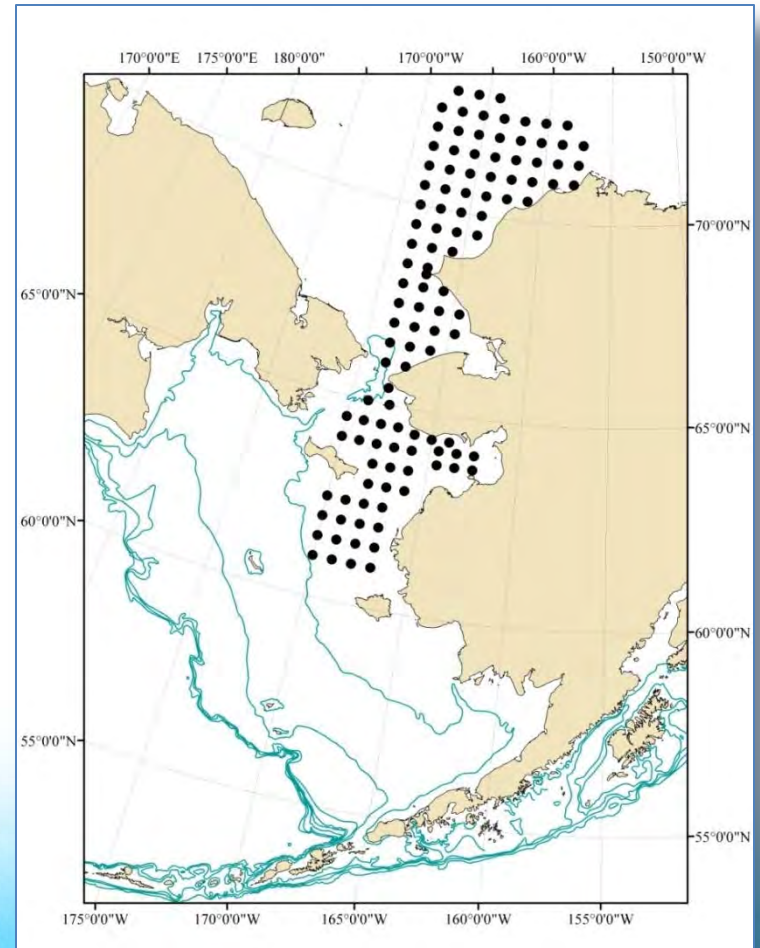


**Coastal Impact Assistance Program (CIAP)**



# A comprehensive ecosystem survey

- Ocean circulation & physics
- Ocean chemistry
- Plankton
- Surface, mid-water, and bottom fishes
- Biology of salmon, Arctic cod, saffron cod, snow crab, capelin, and other fish & invertebrates



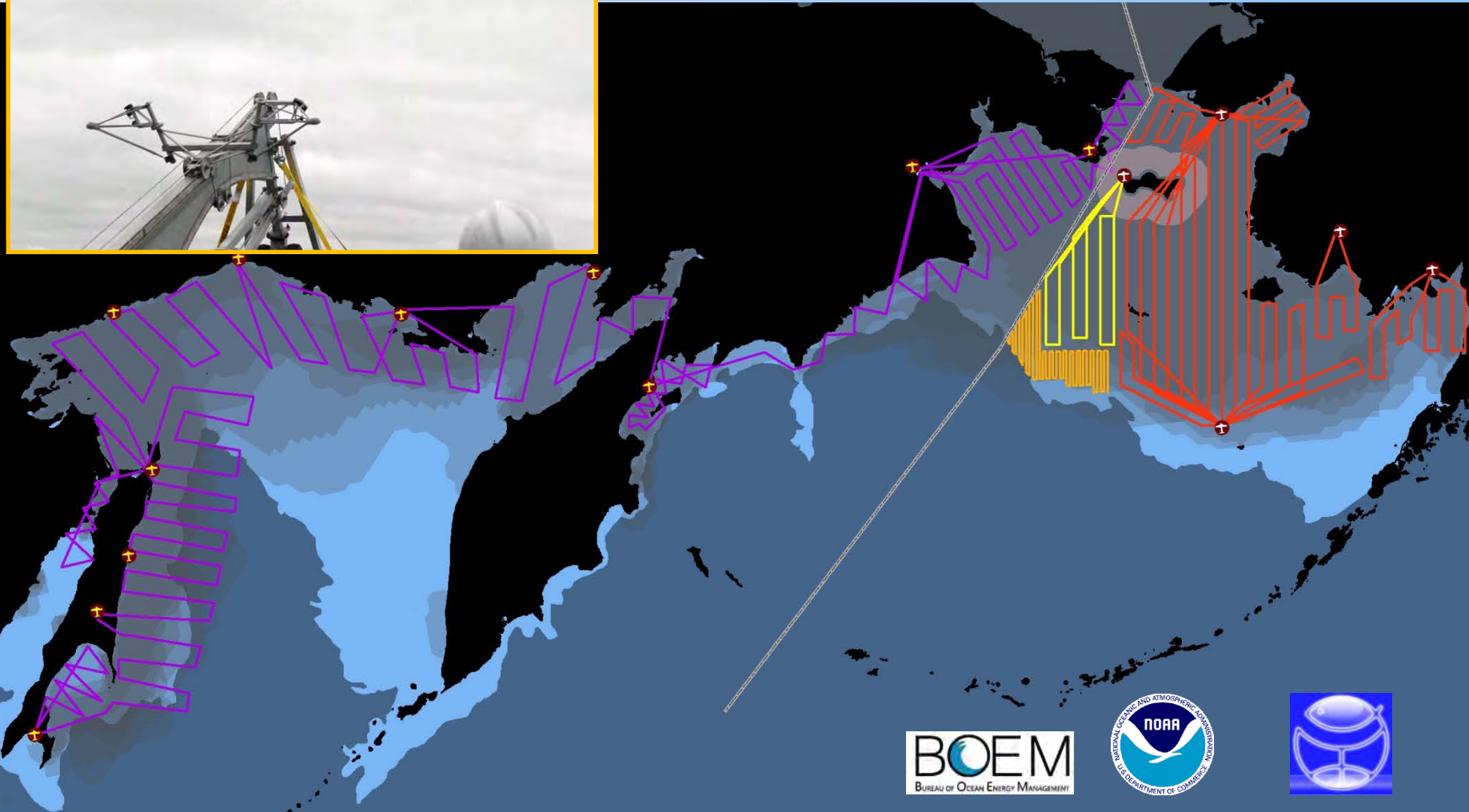


# Range-wide ice seal abundance estimate (2012-2013)

- Location: Bering Sea, Sea of Okhotsk
- Funding Source: NOAA/BOEM
- Funding amount: \$800K
- Bearded, ribbon, and spotted seals (at primary breeding areas)
- International effort to conduct aerial surveys of ice seals to develop abundance estimates
- Collaborators: Russian government



# Proposed track lines for the 2012-2013 April synoptic aerial surveys of the Bering and Okhotsk Seas



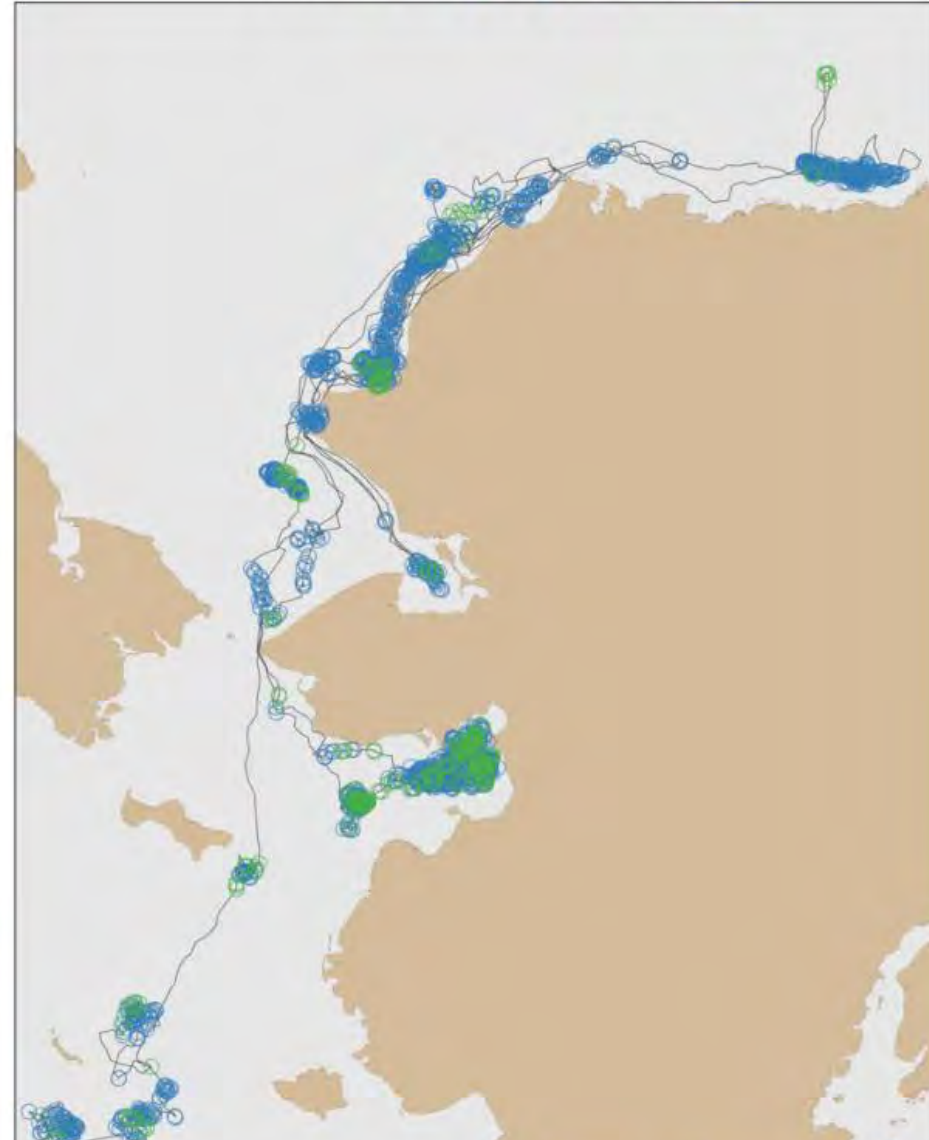


# Bearded seals in the Chukchi Sea



2009 Movements

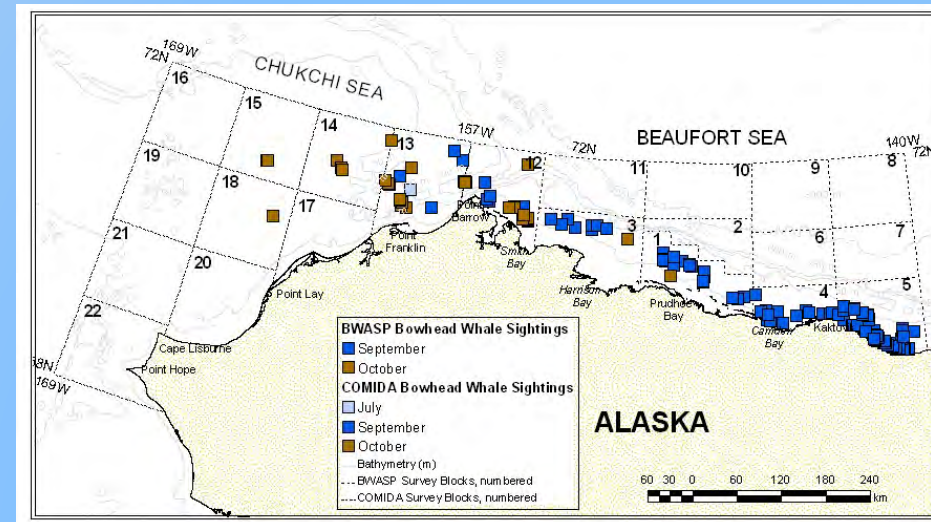
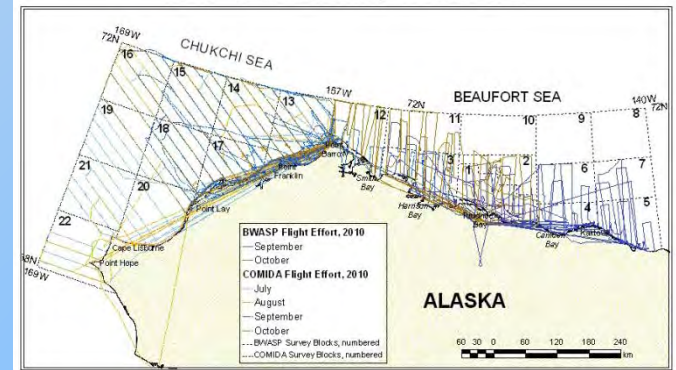
2009 Foraging/Resting



# Aerial Surveys of Arctic Marine Mammals FY11-FY15 (Continuation of BWASP & COMIDA)



- Location: Western Beaufort Sea & Northeastern Chukchi Sea
- Funding Source: BOEMRE
- FY11 funding: \$2.7 million
- Program leads: Megan Ferguson, Janet Clarke
- A 30-year time series. Provides real-time data on marine mammal distribution, relative abundance, habitat and behaviors in the Alaskan Arctic.
- Results can be found in annual reports from NMML to BOEMRE and at <http://www.afsc.noaa.gov/nmml/cetacean/bwasp/index.php>
- Collaborators: BOEMRE, NMFS



# Arctic Whale Ecology Study (ARCWEST)

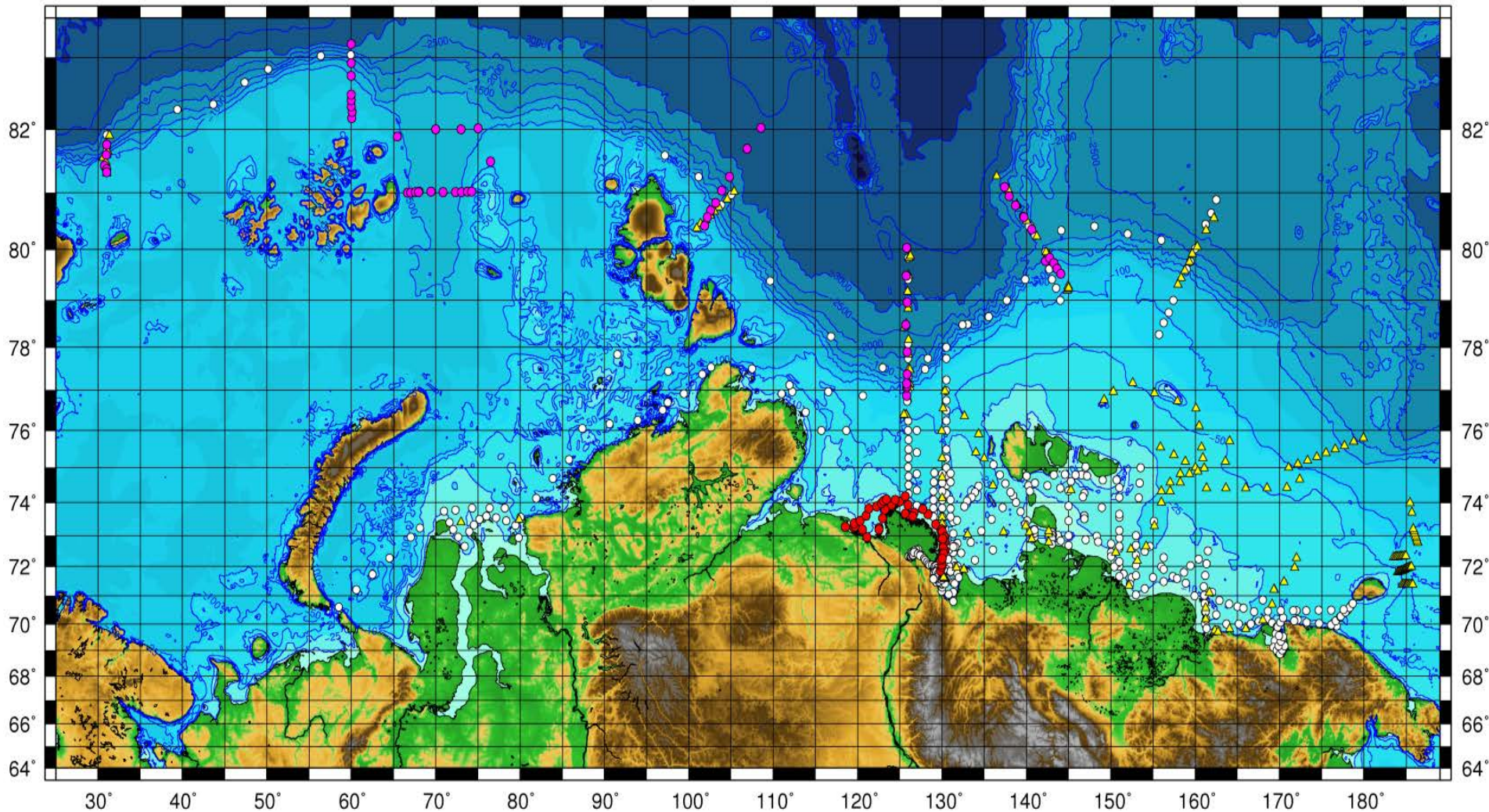
## FY12-16

- Location: eastern Chukchi Sea
- Funding Source: BOEM
- Funding amount: \$4,834K
- Bowhead and gray whales;  
fin and humpback whales
- Use passive acoustics, oceanography, satellite tagging,  
and visual surveys to investigate the source of cetacean  
prey and its influence on distribution and abundance.
- Collaborators: PMEL (NSB, WHOI on separate funding)





# Location of oceanographic stations accomplished with NOAA-support in (2003-2010)- interest put **DBO line in ESS**





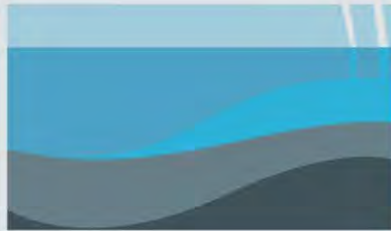


UNIVERSITY  
OF GOTHENBURG



Stockholm  
University

# The Swedish-Russian-US-Arctic Ocean Investigation of Climate-Cryosphere- Carbon Interactions (Leif Anderson lead)

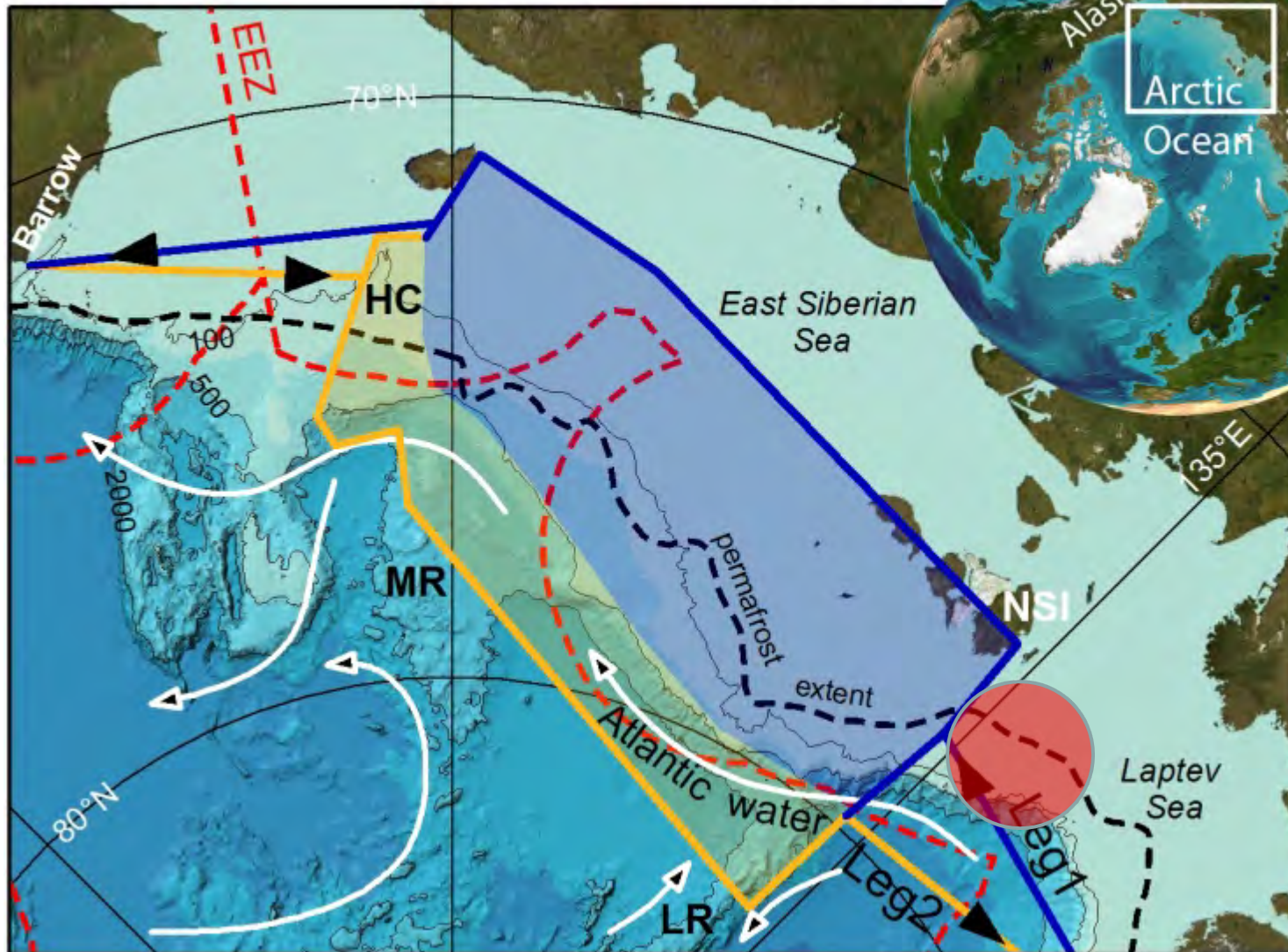


# SWERUS C3 2014



# SWERUS-C3 cruise plan and study area

Icebreaker Oden – summer season 2014  
two 45 day legs





# Comments and/or Questions?

