US Country Report

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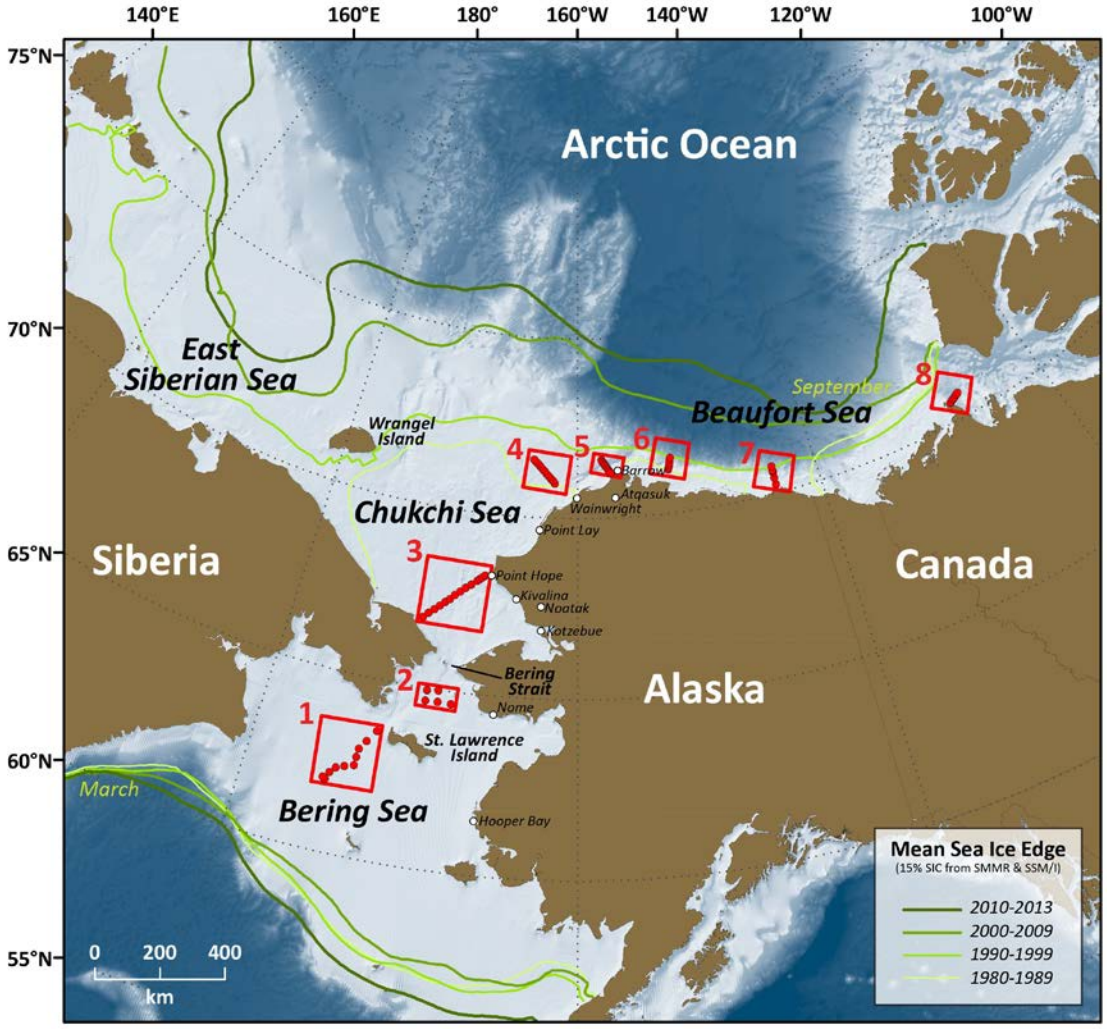
Pacific Arctic Group Meeting
April 2, 2017
Arctic Science Summit Week 2017
Prague, Czech Republic

http://pag.arcticportal.org/

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



[updated by Karen Frey from Grebmeier et al. 2010, EOS 91]

- **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 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**

2017 PAG and DBO Field Plan-Draft 3/31/17

2017 PAG and DBO Field Season (version 02_28_17_v3): Sampling Contributors. Projects Key: AON=US Arctic Observing Network (National Science Foundation); ArCS=Arctic Challenge for Sustainability; ArcticEIS2=Arctic Ecosystem Integrated Survey, ASGARD=Arctic Shelf Growth, Advection, Respiration and Deposition Rate Experiment, C30=Canada's Three Oceans; CHINARE=Chinese Arctic Research Expedition; DBO=Distributed Biological Observatory, JAMSTEC= Japan Agency for Marine-Earth Science and Technology; KOPRI = Korea Polar Research Institute; NOAA=National Oceanic and Atmospheric Administration; Office of Naval Research (ONR) Marginal Ice Zone (MIZ) project; PMEL=Pacific Marine Environmental Laboratory; RUSALCA=Russian-American Long-term Census of the Arctic. **DBO Region Key**: DBO1=So. St. Lawrence Is., DBO2=Chirikov Basin, DBO3=So Chukchi Sea, DBO4=NE Chukchi Sea, DBO5=Barrow Canyon, DBO6=East Beaufort Sea, DBO7-Beaufort Sea Central, DBO8=Bathurst polynya region.

Dates (Port calls)	Ship	DBO Region	Projects	PAG contact	Chief Scientist
June 9-28 (Nome-Nome)	Sikuliaq	2, 3	ASGARD	Seth Danielson sldanielson@alaska.edu	Seth Danielson sldanielson@alaska.edu
July (Nome-Nome)	**Norseman II**	**3**	**Bering Strait Mooring Project/AON**	**Rebecca Woodgate woodgate@apl.washington.edu**	**Rebecca Woodgate woodgate@apl.washington.edu**
July 6-14 (Dutch Harbor-Nome); July 16-Aug 2 (Nome-Japan)	Oshoro-maru	-	Hokkaido University	Toru Hirawake hirawake@salmon.fish.hokudai.ac.jp	Atsushi Ooki ooki@fish.hokudai.ac.jp
July 10-22 (Dutch-Barrow)	**Sir Wilfrid Laurier**	**1,2,3,4,5**	**C30/DBO (AON)**	**Jackie Grebmeier jgrebmei@umces.edu**	**Svein Vagle Svein.Vagle@dfo-mpo.gc.ca**
Aug 7-27 (Nome-Barrow	Araon	3+Chukchi Borderland+ East Siberian Sea	Korean Expedition (KOPRI) ocean and Sea-ice researches	Sung-Ho Kang shkang@kopri.re.kr	Sung-Ho Kang shkang@kopri.re.kr
July 31-Aug 24 (Dutch-Nome-Dutch)	TBD	**3,5,6**	**ArcticEIS2**	**Ed. Farley@noaa.gov**	**Multiple legs: Farley, Cieciela, Voillenwieder (all NOAA)**
Aug 4-27 (Nome-Nome)	Norseman II	3,4	AMBON	Jackie Grebmeier jgrebmei@umces.edu	Katrin Iken kbiken@alaska.edu
Aug 9-23	**Sikuliaq**	**3,4,6**	**Arctic Productivity** **Arctic Nitrogen Fixation**	**Renee Crain rcrain@nsf.gov** -same as above	**Laura Juranek ljuranek@coas.oregonstate.edu** **Rachel Sipler sipler@vims.edu**
Aug 23-Sept 24 (Dutch-Nome)	Mirai	3,5+Arctic Basin	Japanese ArCS	Takashi Kikuchi takashik@jamstec.go.jp	Shigeto Nishino nishinos@jamstec.go.jp
Aug 26-Sept 14 (Dutch-Nome)	**Healy**	**3,4,5**	**DBO-NCIS**	**Jackie Grebmeier jgrebmei@umces.edu**	**Robert Pickart rpickart@whoi.edu**
Aug 27-Sept 10	Sikuliaq	-	Shelf Break Ecology	Renee Crain rcrain@nsf.gov	Carin Ashjian cashjian@whoi.edu
Sept 18-Oct 16	**Healy**	-	**Navy**	**Renee Crain rcrain@nsf.gov**	**Navy**
Oct 3-11	Sir Wilfrid Laurier	4,8	C30	Bill.Williams@dfo-mpo.gc.ca	Humfrey.Melling@dfo-mpo.gc.ca

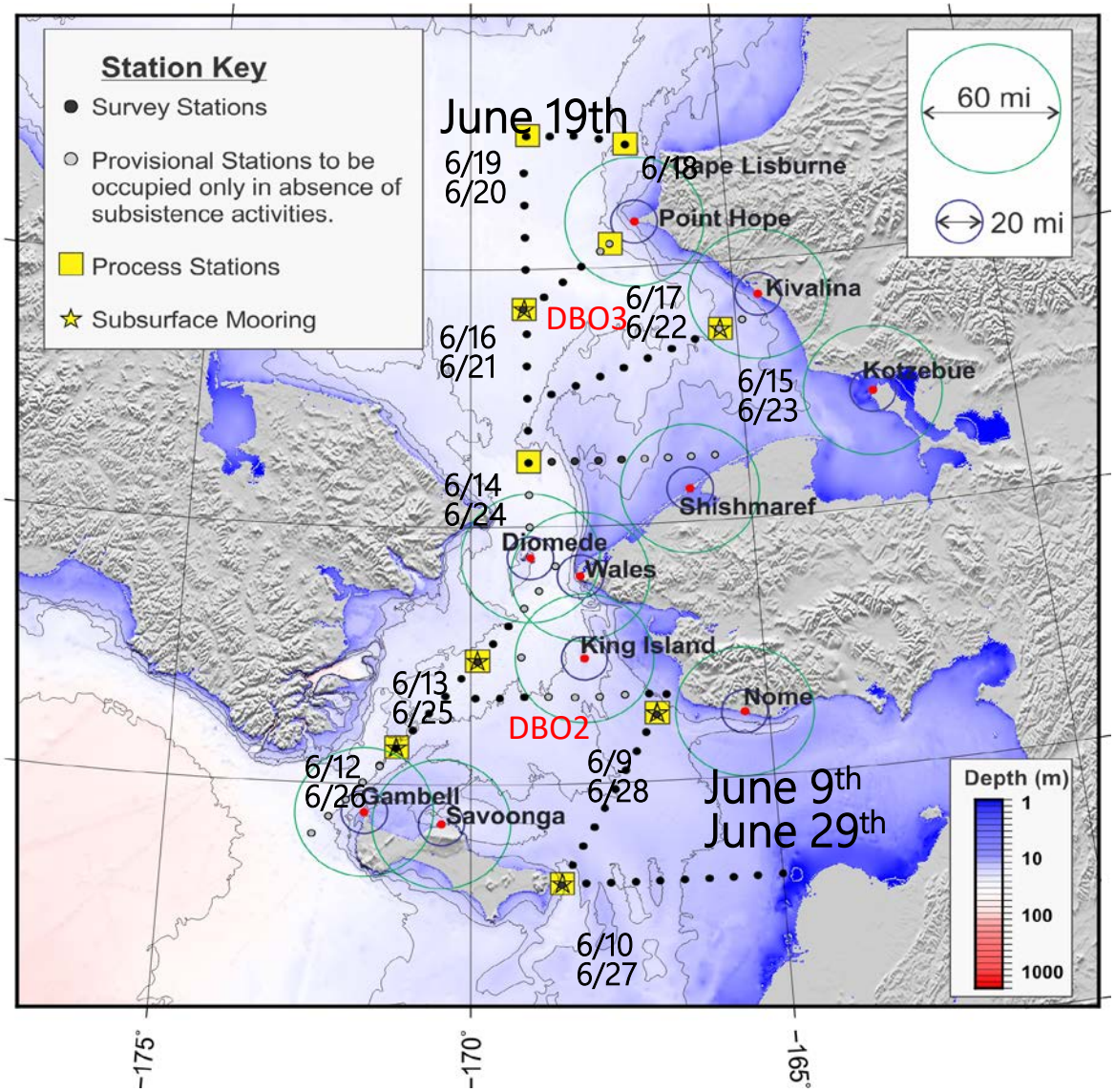
ASGARD Project 2017

1st: Process Studies

Set up experiments that require multi-day incubations. Deploy moorings. Epibenthic fish sampling.

2nd: Synoptic Surveys

Multi-station transects that cross biogeographical domains. More fishing.

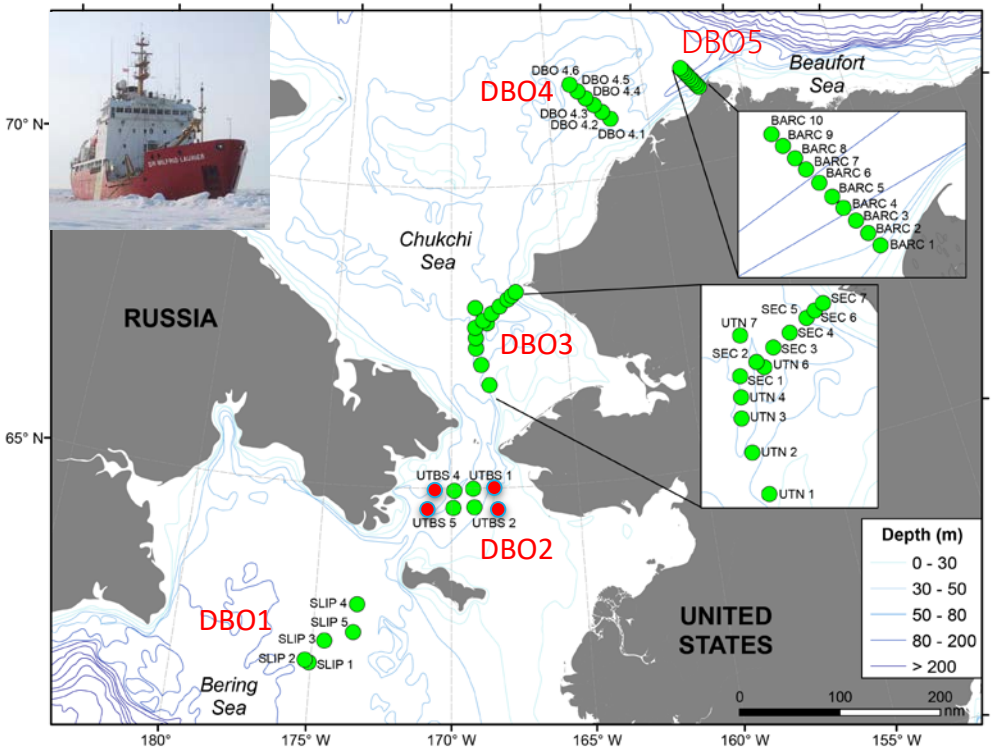


- June 2017 & 2018 on R/V Sikuliaq
- 2017/18 and 2018/19 moorings

[Seth Danielson, UAF]

Canada's Three Oceans (C30) and the Distributed Biological Observatory (DBO): *CCGS Sir Wilfrid Laurier*, July 10-22, 2017

Focus: sampling along latitudinal transect lines developed as a "change detection array" for consistent monitoring of biophysical responses to changing environmental conditions



Estimated Timeline:

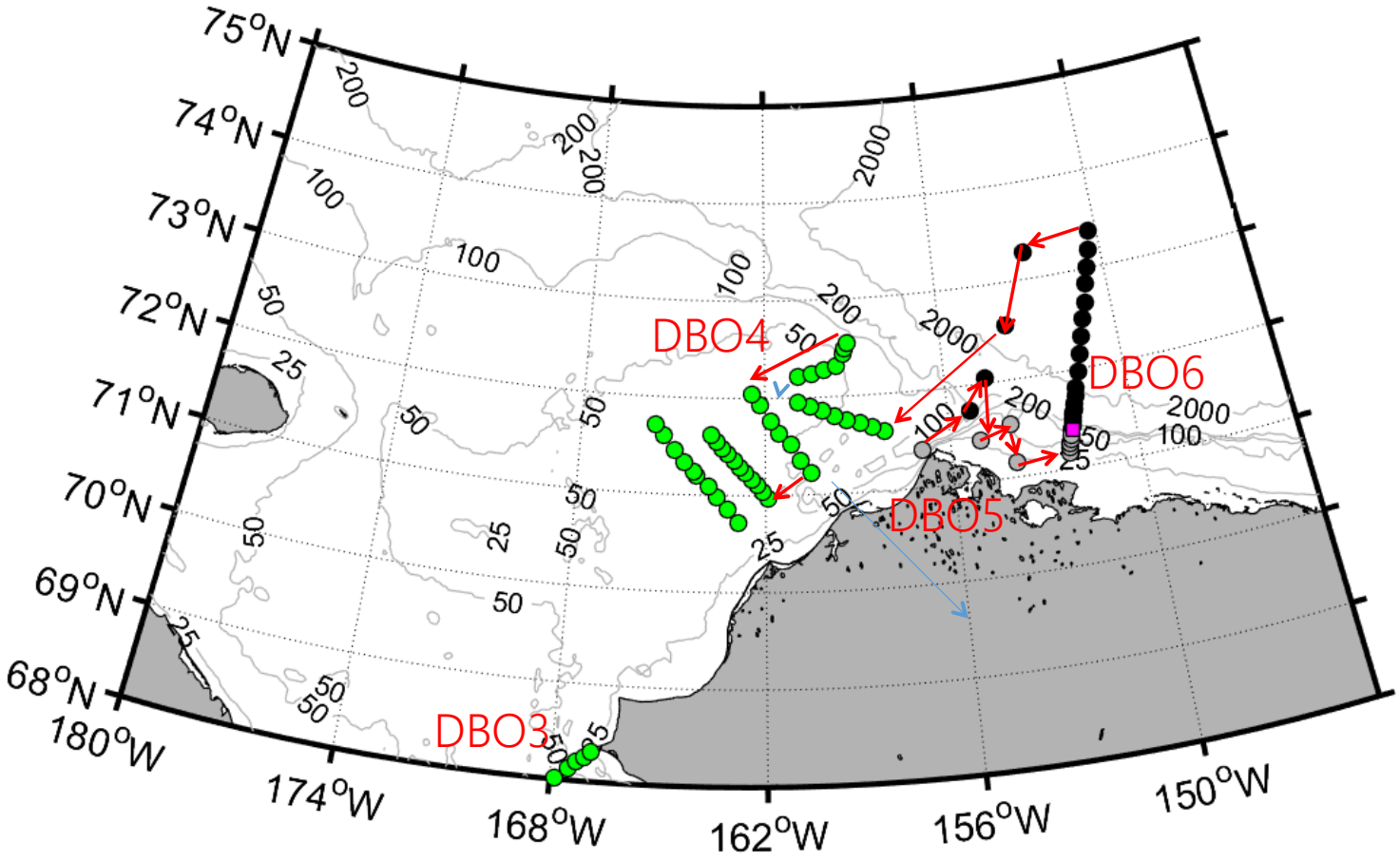
- July 14-south St. Lawrence Island (DBO1) (5 process, 4 CTD only)
- July 15-Chirikov Basin (DBO2)-8 stations (all CTD, but only 4 with full sampling)
- July 17: SE Chukchi Sea (DBO3)-closest station 5 nm from coast, estimate time within 12 nm to be 2 hrs
- July 19: NE Chukchi Sea off Wainwright (DBO4)-closest station 30 nm offshore
- July 20: off Barrow (DBO5)-closest station 5 nm from coast, estimate time within 12 nm to be 2 hrs

DBO data collections

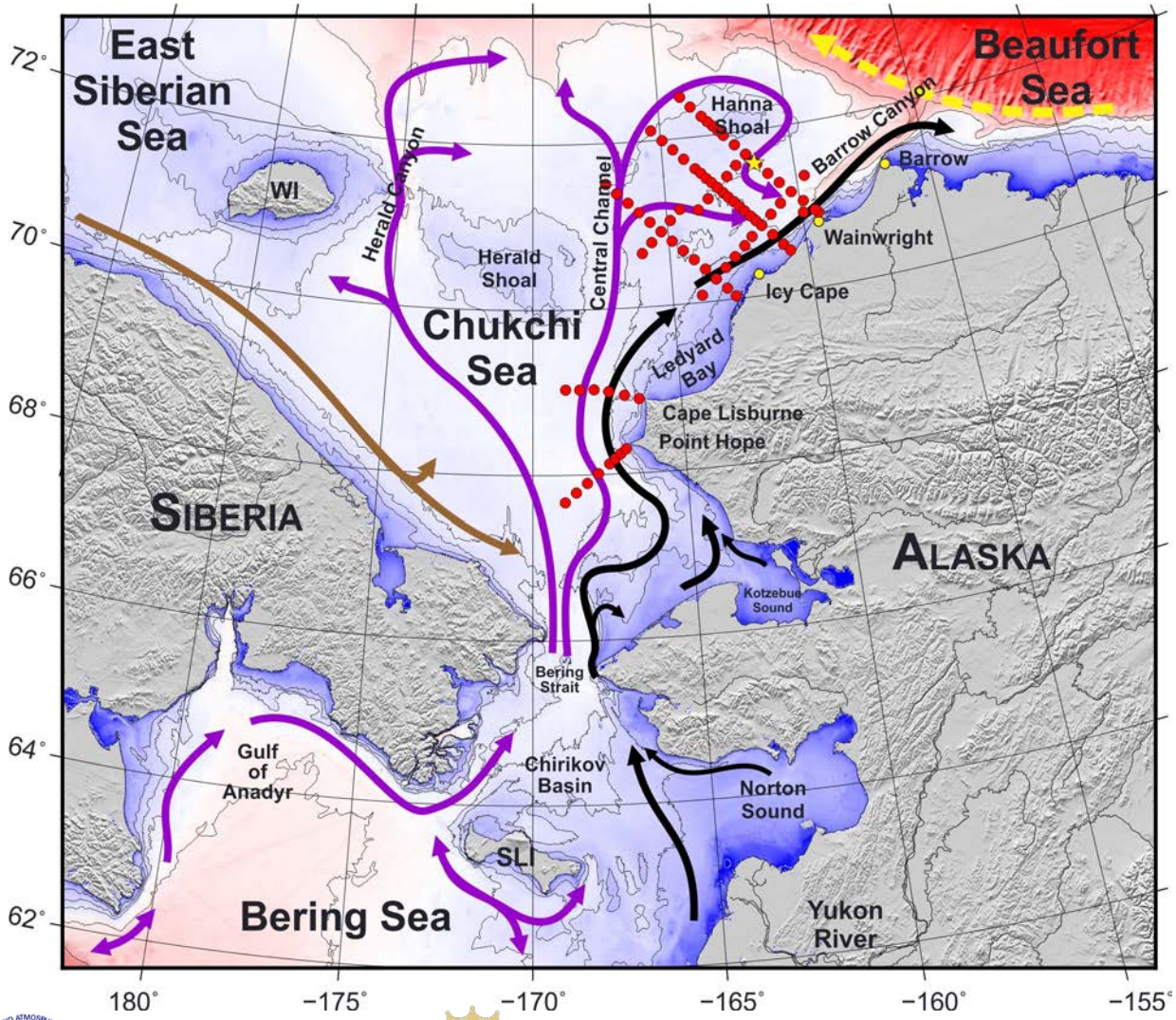
- Seawater temperature and salinity; velocity measurements
- Nutrients, chlorophyll, carbon products, CDOM
- Phytoplankton, zooplankton and macrobenthic abundance, biomass, community structure
- Marine mammal and seabird surveys

Contact: Dr. Svein Vagle, Canadian Chief Scientist, Jackie Grebmeier, UMCES and PAG, jgrebmei@umces.edu

Laura Juranek (OSU) August 9-23, 2017 cruise (DBO 3,4,5,6)



Arctic Marine Biodiversity Observing Network (AMBON); NOAA/BOEM/Shell August 2017 (either Sikuliaq or Norseman II)-occupy DBO3 and 4



[from S. Danielsen map 2015]

- Lead Katrin Iken (UAF);Co-PIs: Seth Danielson, Eric Collins, Russ Hopcroft, Franz Mueter
- co-PIS: Jackie Grebmeier, Lee Cooper (CBL/UMCES
- Sue Moore (NOAA), Kathy Kuletz (USFWS)
- T/S
- Chlorophyll, nutrients
- Phytoplankton and zooplankton composition
- Macrofauna and epifauna
- Fishes
- Marine mammal and seabird survers

NE CHUKCHI ECOSYSTEM OBSERVATORY (CEO) 2015-2016 MEASUREMENTS:

Pressure, Temperature, Salinity

Significant Wave Height & Direction

Directional Wave Spectra

Ice Draft (level ice thickness & keels)

Passive acoustic recordings

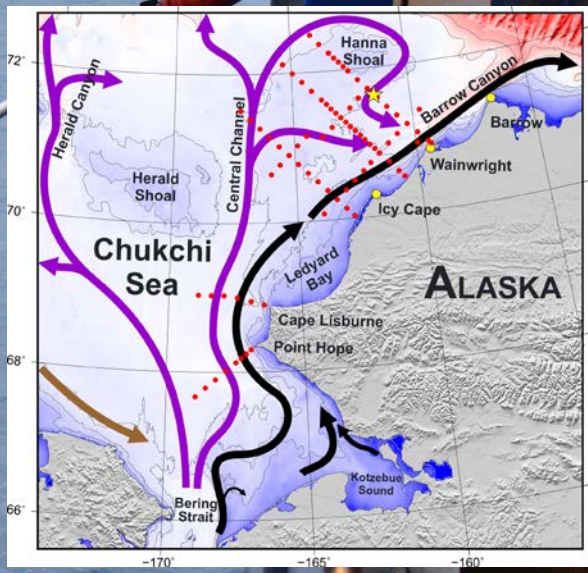
Acoustic Backscatter: 38, 125, 200 & 455 KHz

Chlorophyll a fluorescence

Optical Backscatter, PAR

CDOM, NO3, DO

Webcam



- **24-bottle Sediment Trap (Catherine Lalande, Canada):**
  - **Chlorophyll a**
  - **Phytoplankton identification**
  - **Total particulate matter (dry weight)**
  - **Particulate organic carbon**
  - **Particulate nitrogen**
  - **Zooplankton species**
  - **Zooplankton fecal pellets**

[AOOS support]

[Seth Danielson, UAF}

BEAUFORT SHELF BREAK ECOLOGY – PLANKTON, FISH, AND BELUGAS (Sept 2017)

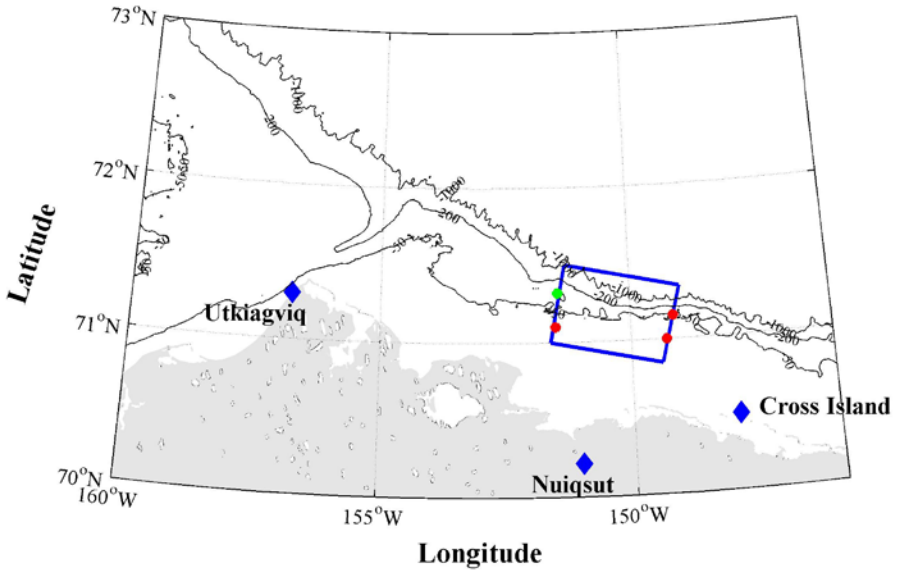
PIs and Collaborators: Carin Ashjian, Robert Campbell (URI), Steve Okkonen, Kate Stafford, Joel Llopiz, Mike Jech, Mike Lowe, Jinlun Zhang, Kathy Kuletz

Questions: carin@whoi.edu

Plankton (Krill, Copepods) → Arctic Cod → Belugas

Images not to scale

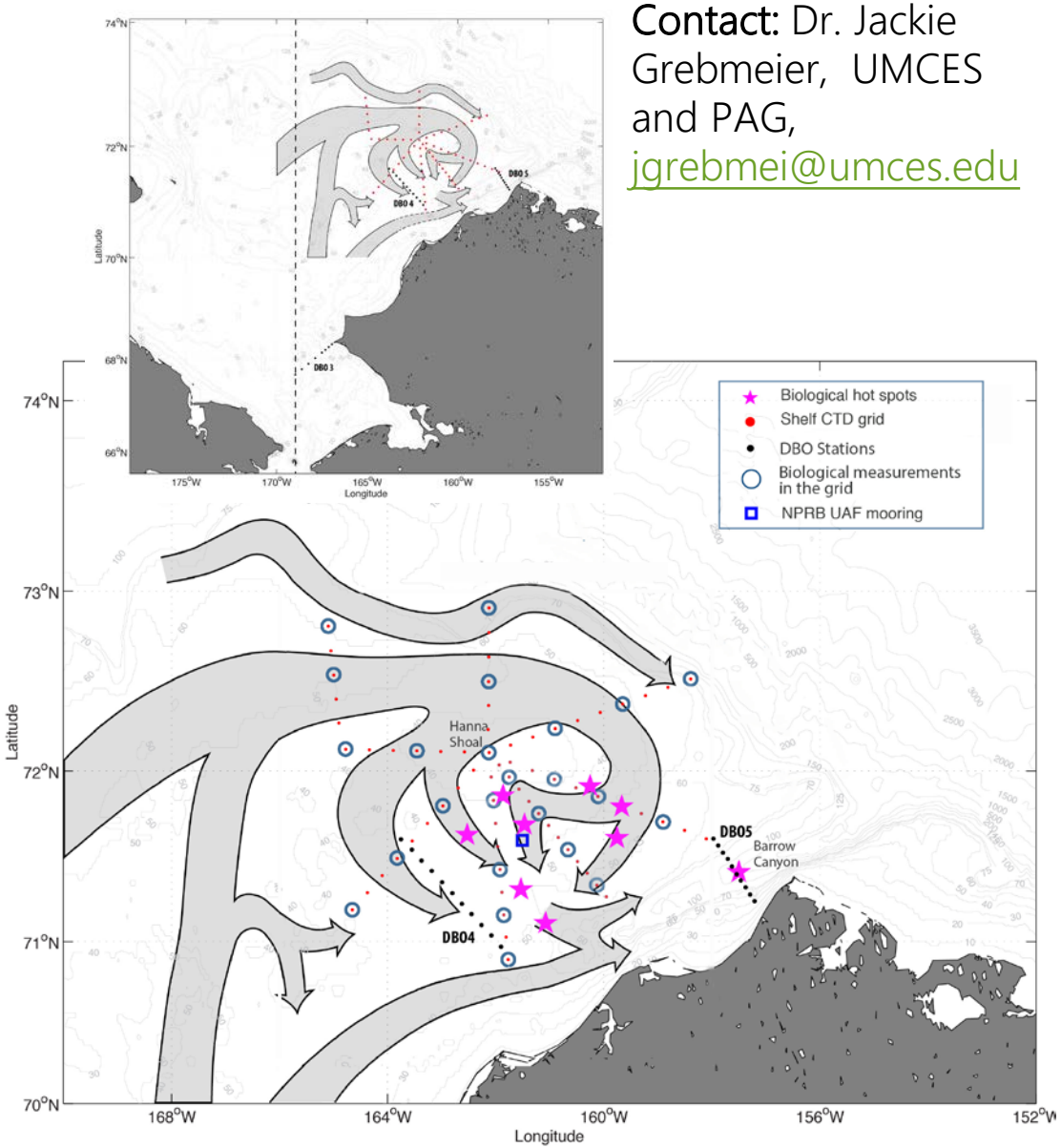
R/V Sikuliaq
August 23–September 18, 2017
Nome–Nome



- Four year–round moorings with CTDs including one equipped with AZFP (green star) and three with ADCSPs and Aural acoustic recorders
- Fish and zooplankton distributions using bioacoustics (EK60) and nets
- Hydrography using CTD and Acrobat surveys
- Marine mammal and bird visual observations
- Zooplankton and fish diet

2017 DBO-NCIS (Northern Chukchi Sea Integrated Study)
NOAA Arctic Research Program (WHOI, UMCES and NOAA PMEL)
Aug 28 Aug-Sept 13, 2017 (Dutch-Dutch, Alaska)

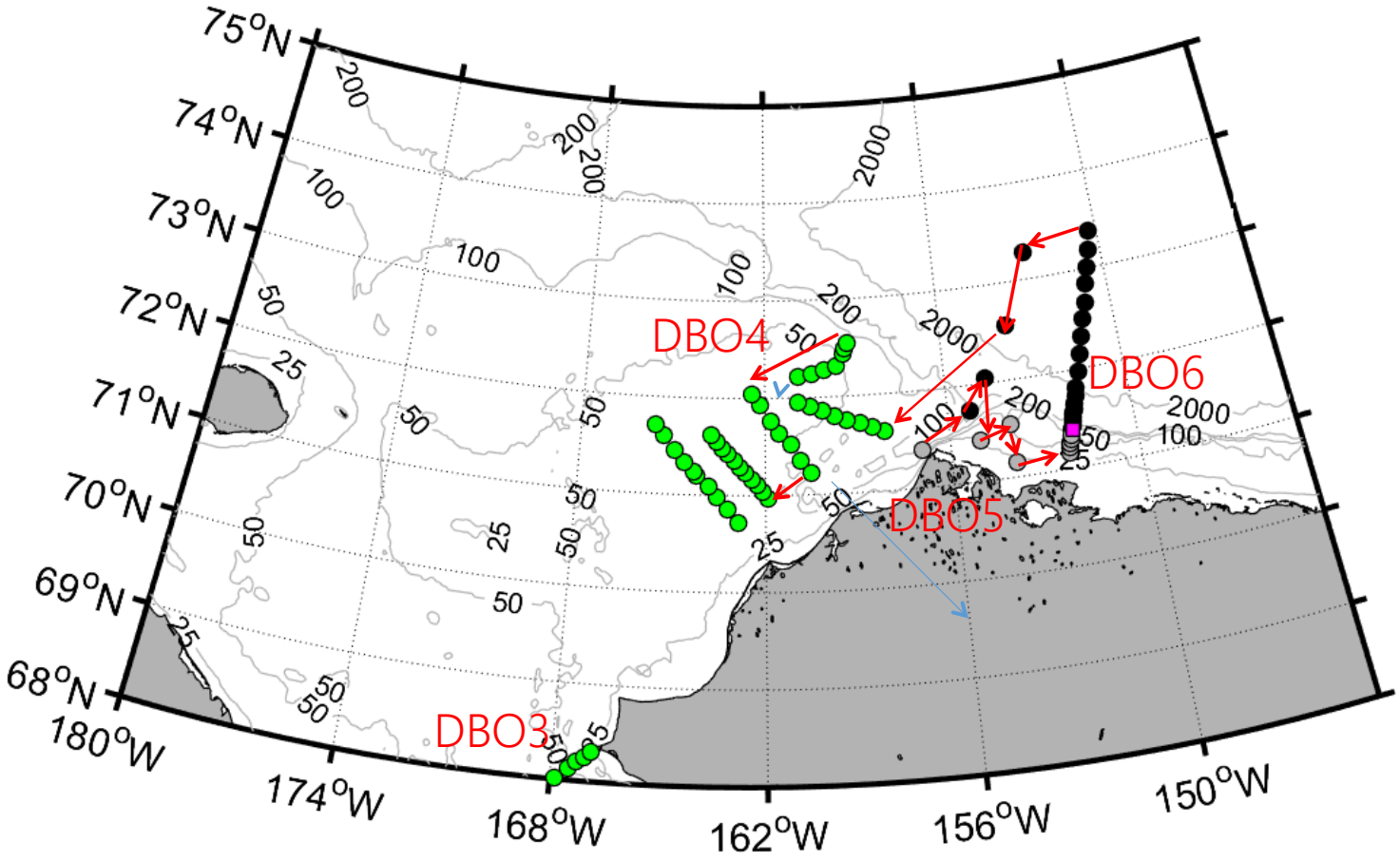
Contact: Dr. Jackie Grebmeier, UMCES and PAG, jgrebmei@umces.edu



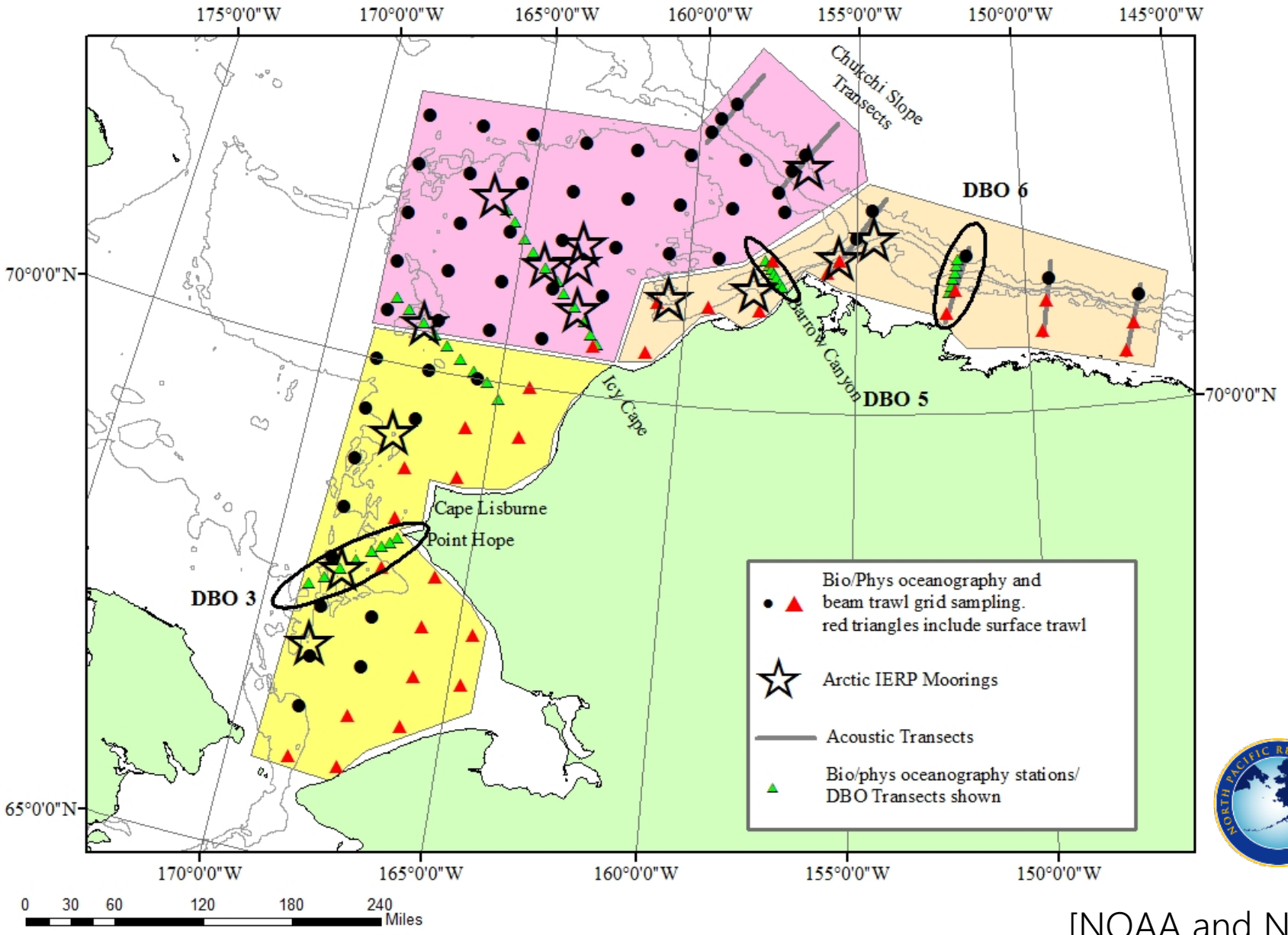
Field Measurements:
Standard DBO measurements and process studies (DBO 3,4, and 5) and focused process stuy NE Chukchi Sea

- Physical: CTD and lowered ADCP
- Chemical: nutrients, oxygen-18, chlorophyll-a (Chl a), carbon components
- Biological: Zooplankton abundance and biomass
- Benthos: macrobenthos abundance, biomass and population structure,
- Sediment: organic carbon/nitrogen content, chl a content, grain size, radioisotopes
- Benthic oxygen uptake and nutrient exchange
- Upper trophic levels: marine mammal shipboard surveys

Laura Juranek (OSU) 2017 August 9-23, 2017 cruise (DBO 3,4,5,6)

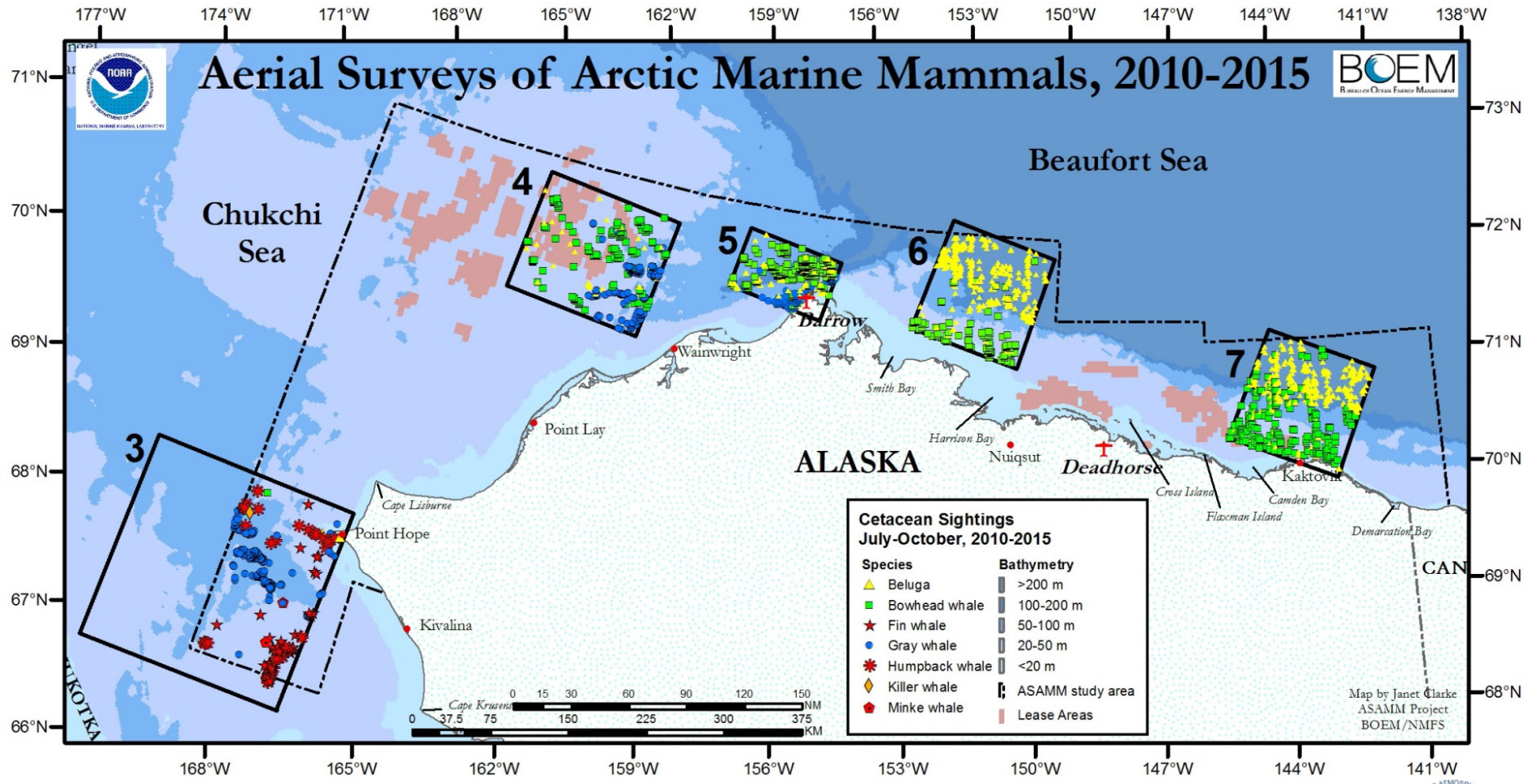


Arctic Ecosystem Integrated Survey: ArcticEIS2 (NOAA)-August/Sept 2017 and



[NOAA and NPRB

DBO 3, 4, 5, 6, and 7



DBO-3 – gray whale hot spot, subarctic cetaceans

DBO-4 and DBO-5 – bowhead whales, gray whales, belugas

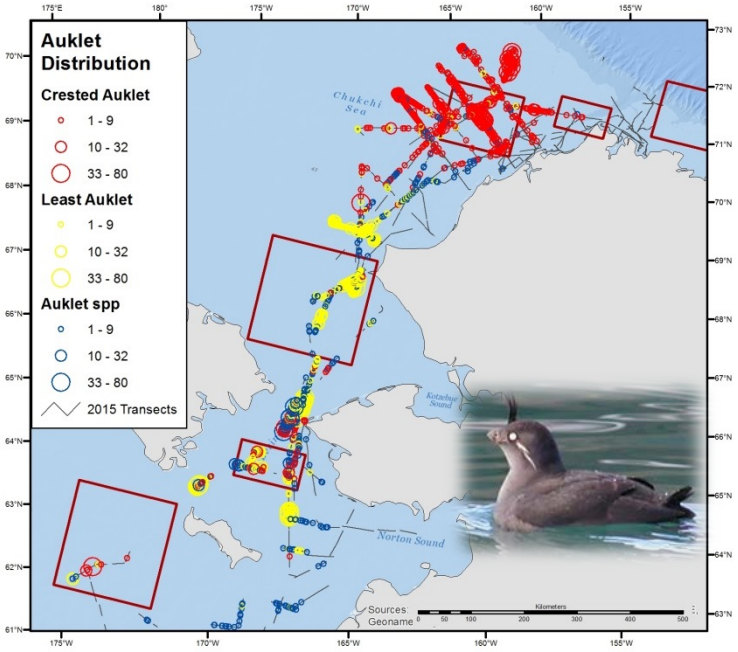
DBO-6 and DBO-7 – bowhead whales, belugas

http://www.afsc.noaa.gov/NMML/cetacean/bwasp/

[Janet Clark]

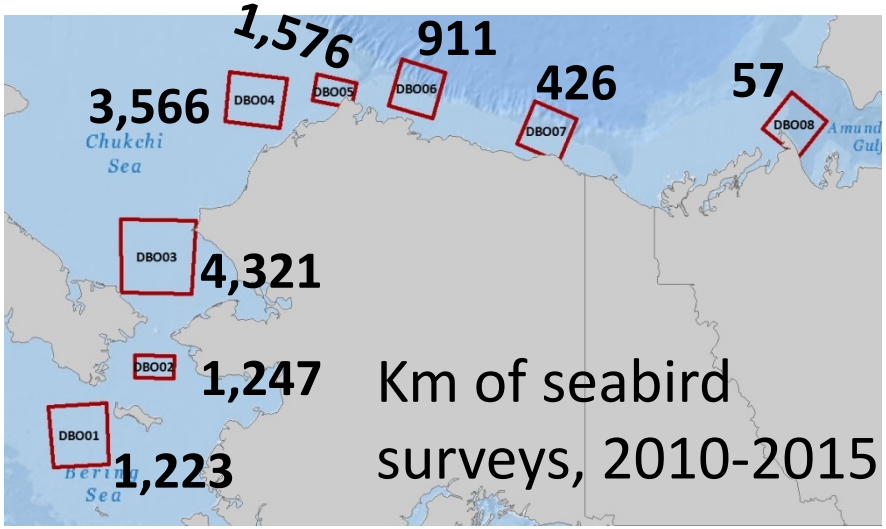
Seabird Surveys

PI: Kathy Kuletz (USFWS)
Funding: BOEM, NPRB, USFWS
Collaborators:
NOAA, U.Alaska, U.Mass, USCG, Environment Canada, ABR Inc., others



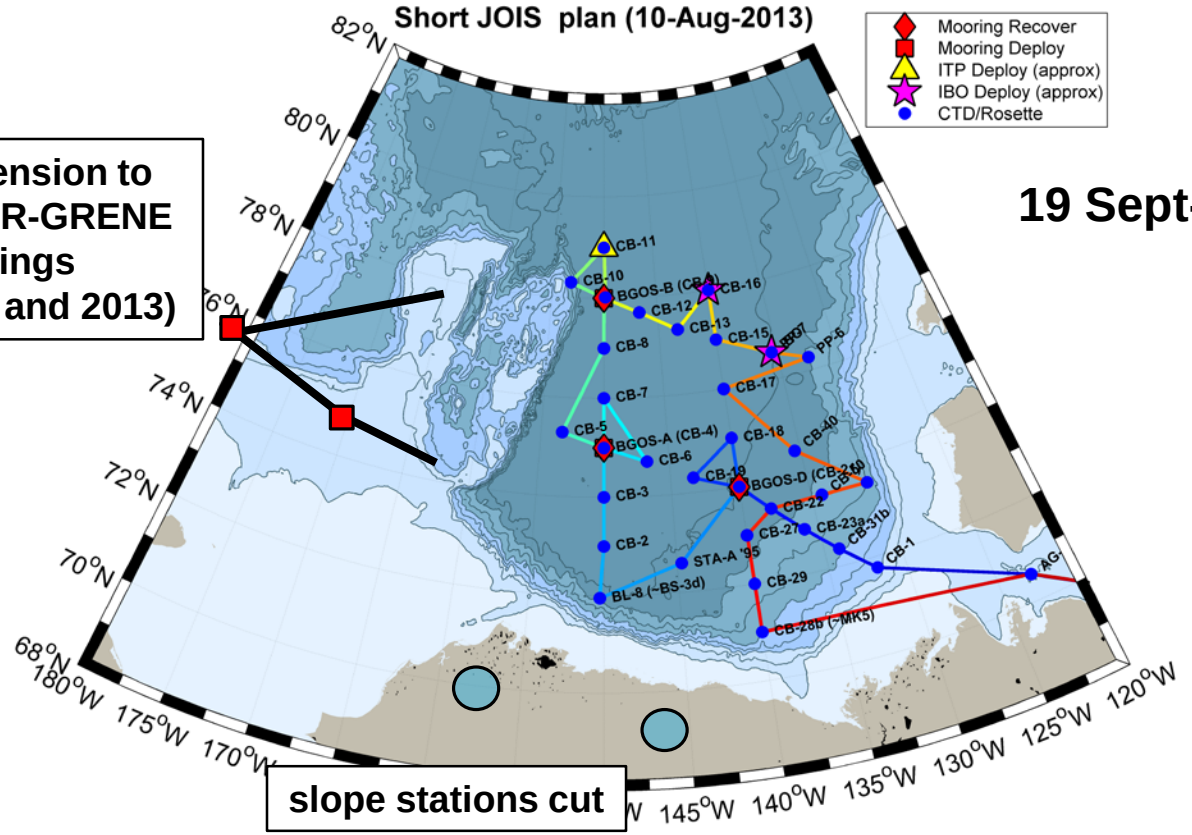
Example:
2015 Transects
Auklet distribution

- Join 3-8 cruises / year in Arctic
- Goals:
- Describe spatial/seasonal distribution & spp composition
- Influence of physical & biological factors on seabird distribution & abundance



Best focus for analysis:
Aug-Sept, DBOs 2,3,4,5

SCIENCE-BASIN JOIS/AON BGOS (CANADA-USA-JAPAN)



4 day extension to deploy NIPR-GRENE moorings (as in 2012 and 2013)

19 Sept-15 Oct

slope stations cut

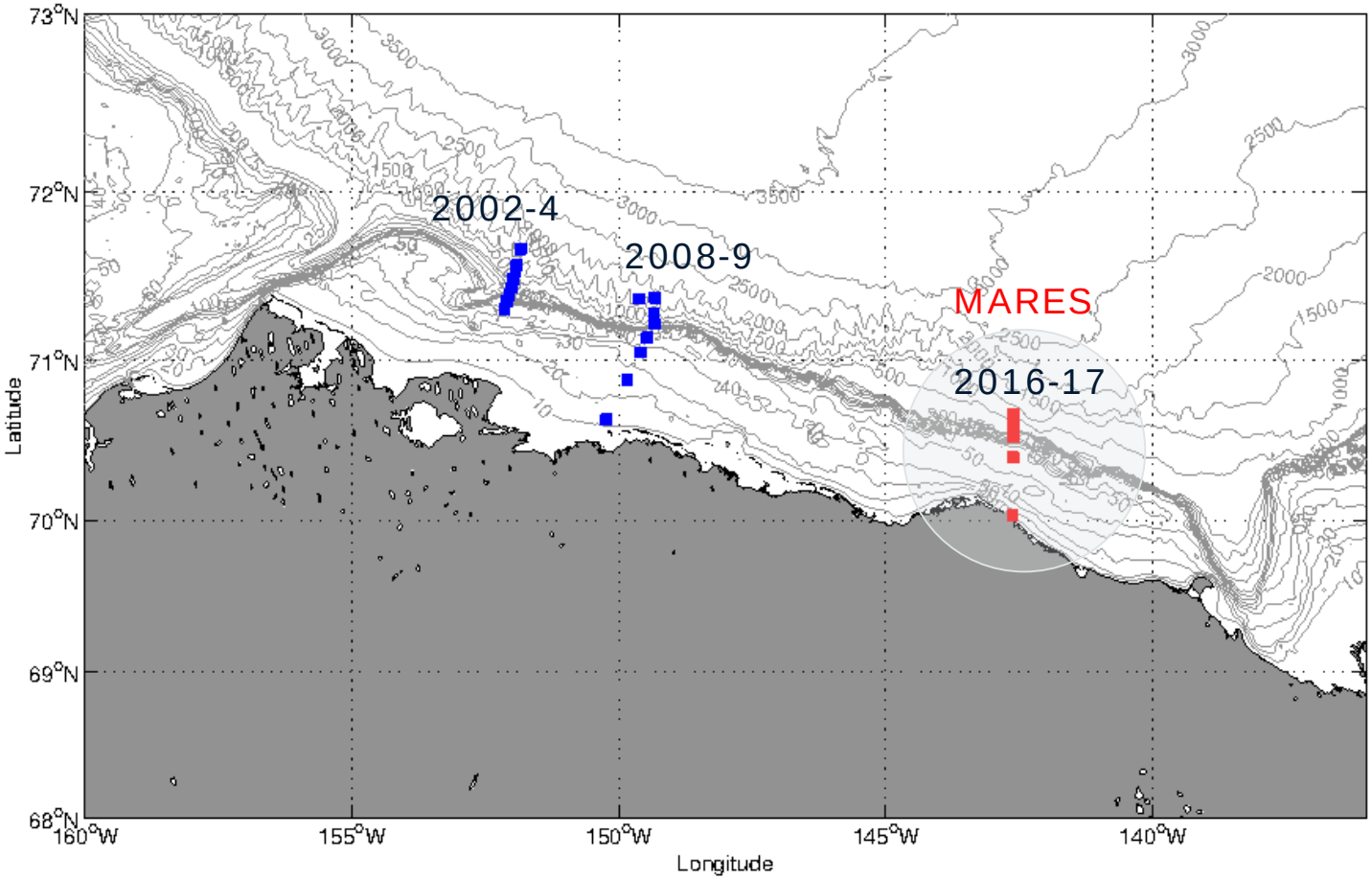
JOIS=Joint Ocean-Ice Study; AON=Arctic Observing Network; BGOS=Beaufort Gyre Observing System

(courtesy Bill Williams, IOS)

Mooring component of MARES

To better understand the relationship between the physical forcing (ocean, ice, atmosphere) and the trophic structure and function of the marine ecosystem in the Canadian Beaufort Sea

Mooring arrays across the Beaufort shelf/slope

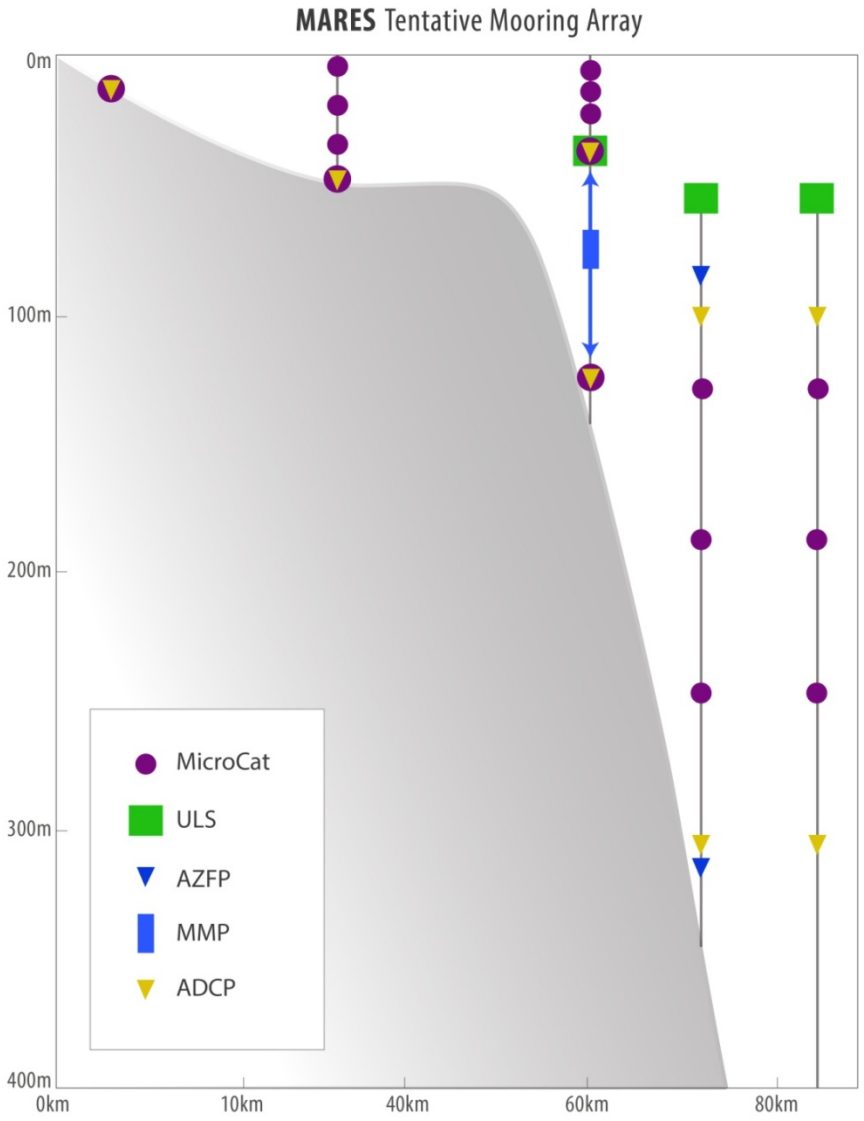


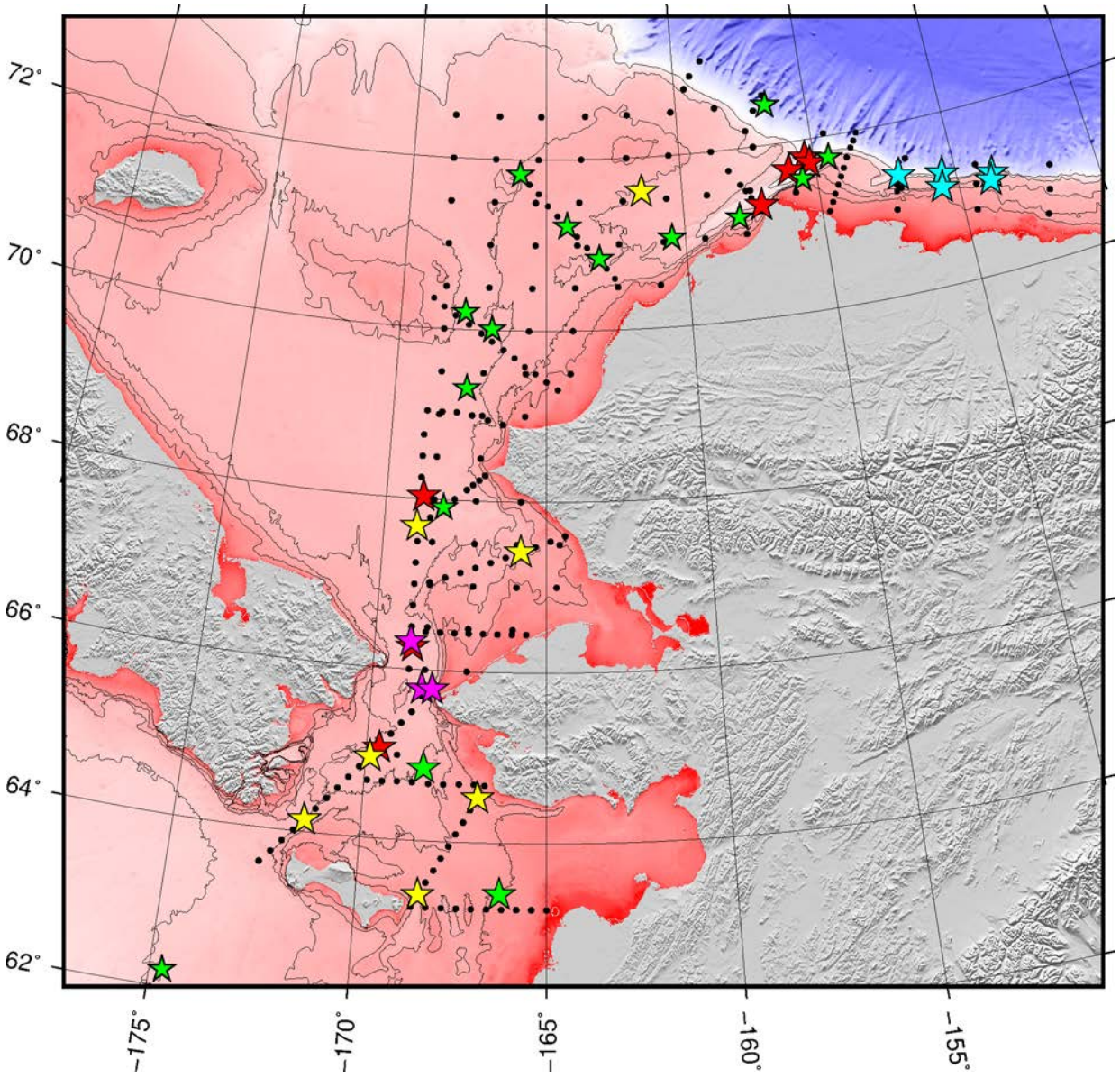
Cross-section view of the MARES array

Measured parameters

- Temperature
- Salinity
- Water column velocity
- Ice thickness
- Ice velocity
- Dissolved O2
- Turbidity
- Fluorescence
- PAR
- nitrate
- pCO2
- Acoustic backscatter (zooplankton, fish)
- Passive acoustics (marine mammals)

Lots of emphasis on biology and chemistry





AIERP & Other 2017-2018 Moorings

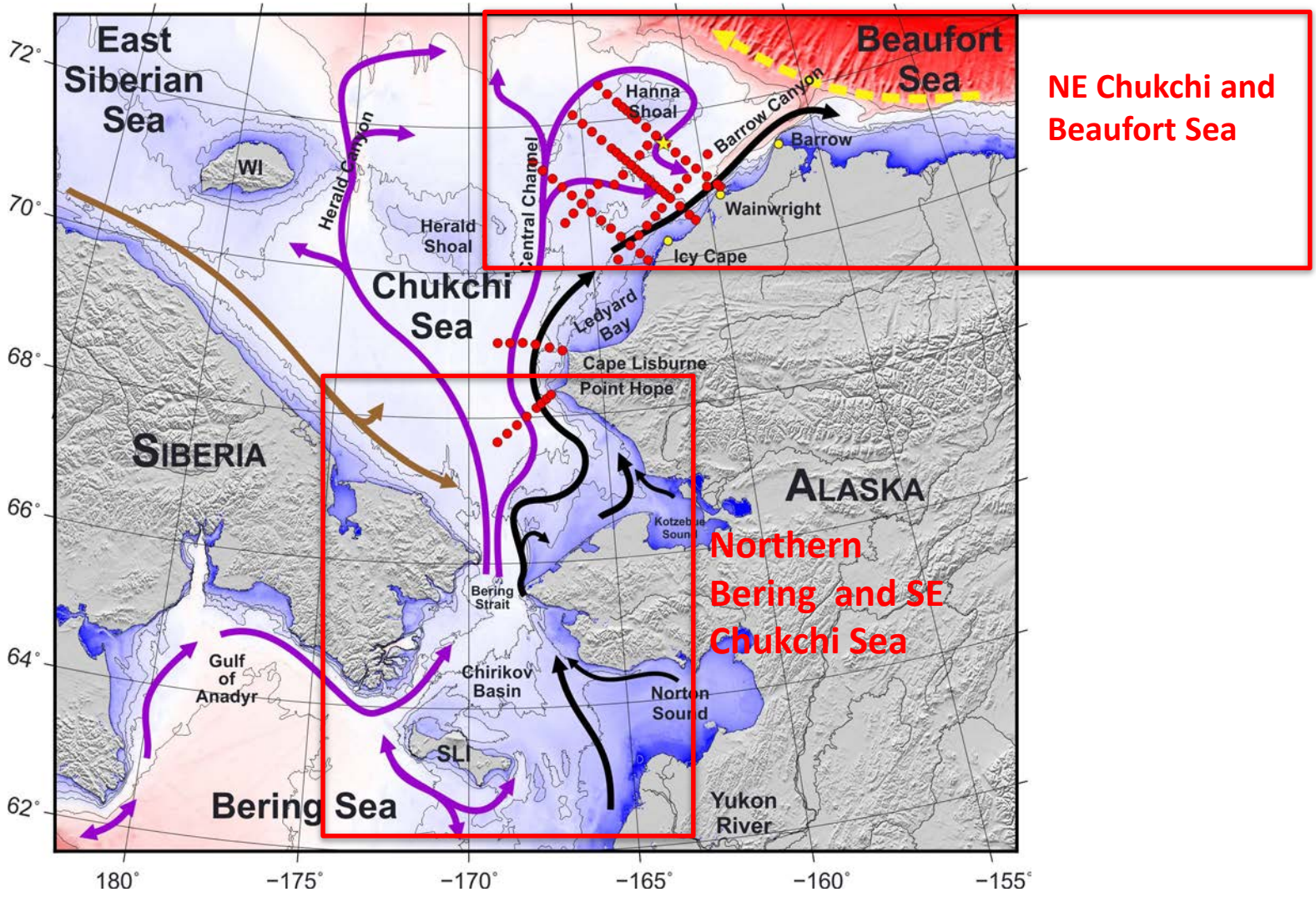
- UAF
- NOAA PMEL & NMML
- UW-APL
- ArCS & JAMSTEC
- WHOI & WHOI/UAF

[courtesy Seth Danielson/UAF]

NORTH PACIFIC RESEARCH BOARD
Arctic Program

Science access during subsistence whaling: April-May and Sept-Oct periods

-need to interface with coastal communities, contact Alaska Eskimo Whaling Commission, Eskimo Walrus Commission, and new Arctic Waterways Safety Committee



[modified from S. Danielsen map 2015]

Thank you for your attention.

Questions and comments?

Financial support from the international partners within the Pacific Arctic Group and US NSF, NOAA, BOEM, and USFWS