

3rd DBO WORKSHOP: Data Synthesis and 10-year plan

March 9-10, 2016

PMEL/NOAA, Bldg. 3, Oceanographer Room
7600 Sand Point Way NE, Seattle, Washington, USA

Workshop Overview

46 participants, 5 countries, all career levels of scientists

3 objectives for this workshop

- Present results from the 2010-2015 DBO field program and commit to multidisciplinary papers to showcase results of the DBO international effort
- Evaluate the DBO data submission effort through the EOL DBO Metadata site and linkage to other national archives
- Overview of US-IARPC Draft DBO Implementation Plan + International 10-year future efforts

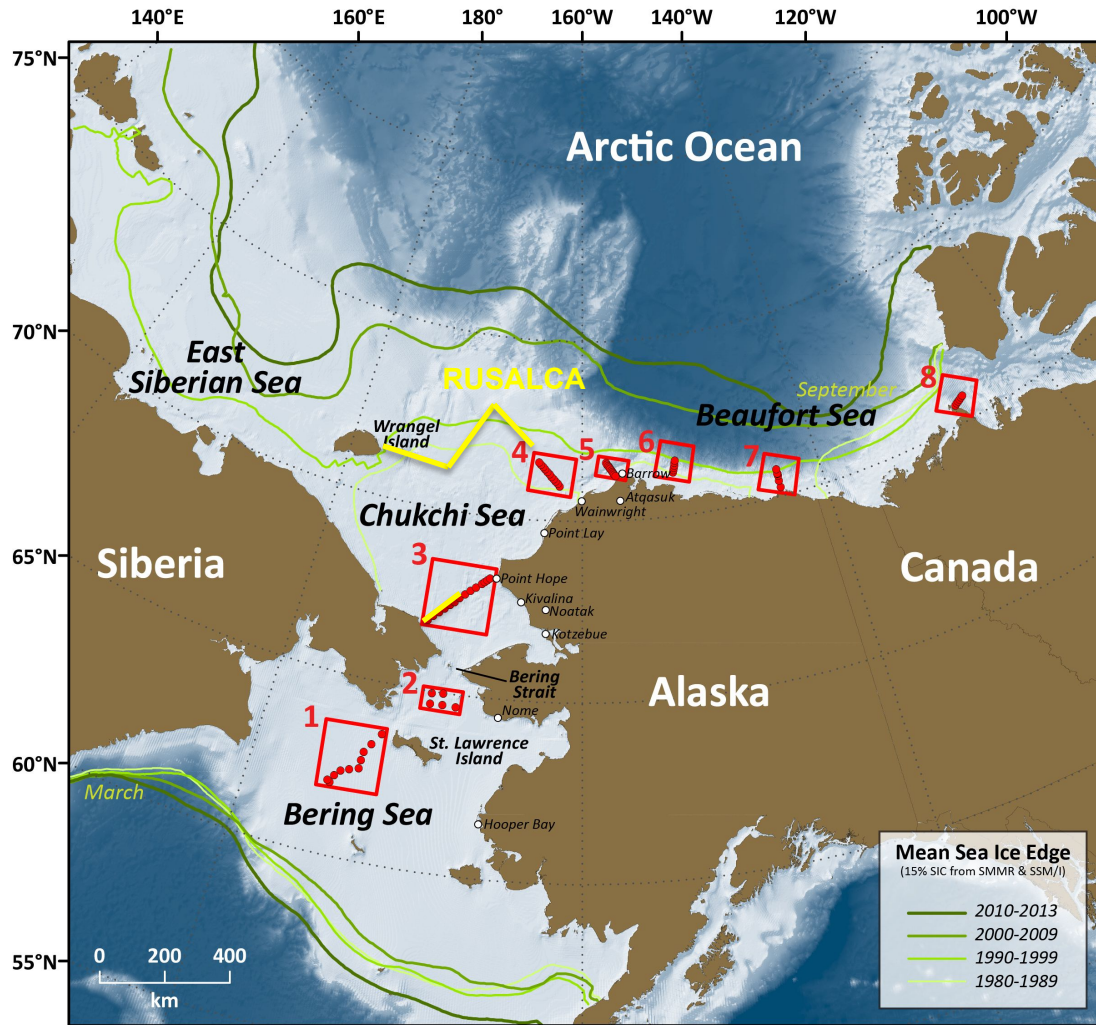
March 9, 2015 – Wednesday

- 0900 Welcome and Logistics: **Chris Sabine, PMEL Director**, and **Sue Moore**
- 0910 Meeting Objectives and Overview of the DBO: **Jackie Grebmeier**
- 0930 Highlights of DBO2010-2015 data time series (~20 min/each; **BOLD is discussion Lead**)
- Physical oceanography: **Bob Pickart**
 - Mooring data results: **Phyllis Stabeno**
 - Biochemical oceanography and export production: **Lee Cooper**
- 10:30 Coffee Break
- 11:00 Continue Morning Highlight Presentations
- Biological oceanography
 - Lower trophics: **Jackie Grebmeier**
 - Upper trophics: **Catherine Berchok**
 - Remote Sensing: sea Ice, SST, chl-a: **Grebmeier** (Karen Frey slide or call-in), NASA website connection
 - Modeling: **S. Moore**/J. Grebmeier for Muyin Wang; others?
- 1220 Lunch (NOAA Cafeteria, no host)
- 1330 Papers for DBO Special Issue: Outlines & Figures, by Lead Authors
- 1500 Coffee break
- 1530 Continue Presentations Lead Authors for DBO Special Issue (if needed)
- 1630 Discussion & wrap up
- 1700 End day and van transport to hotel - **Group Dinner (7 pm)**

March 10, 2015 - Thursday

- 0900 Overview of Day 1 (draft papers cont, then summary) and plan for Day 2 (data issues and 10-y implementation plan); transition of WHOI DBO PO data archive to EOL (**Carolina Nobre**)
- 0930 DBO Data Archive – EOL DBO Metafile (**Don Stott/Jim Moore**)
- 1030 Coffee break
- 1100 National and International Data Access: RUSALCA (**Grebmeier**), JAMSTEC, KOPRI (**Cho, Kim**), PRIC, Canada (C3O), others?
- 1200 Lunch (NOAA Cafeteria, no host)
- 1330 Sustained DBO sampling: National & International/Pan-Arctic colleagues, e.g. Norway (**Grebmeier** provide update), US-IARPC DBO CT and Draft Implementation Plan (**S. Moore**),
-possibility for break-out discussions on paper, other topics up to break
- 1500 Coffee break
- 1530 Overview of 10-y DBO Sampling & Data Access Plan: IARPC + Other National plans
- 1600 Action Items & Timeline: DBO Special Issue, future plans, 2017 Gordon Research Conference “*Understanding Ecosystem Change through Time Series Observations, Technological Advances, and Biophysical Coupled Models*” (March 26-31, 2017) (**Grebmeier GRC 2017 Chair**), with prior Gordon Research Seminar (early career) (March 25-26, 2017)
- 1630 End day and van transport to hotel

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

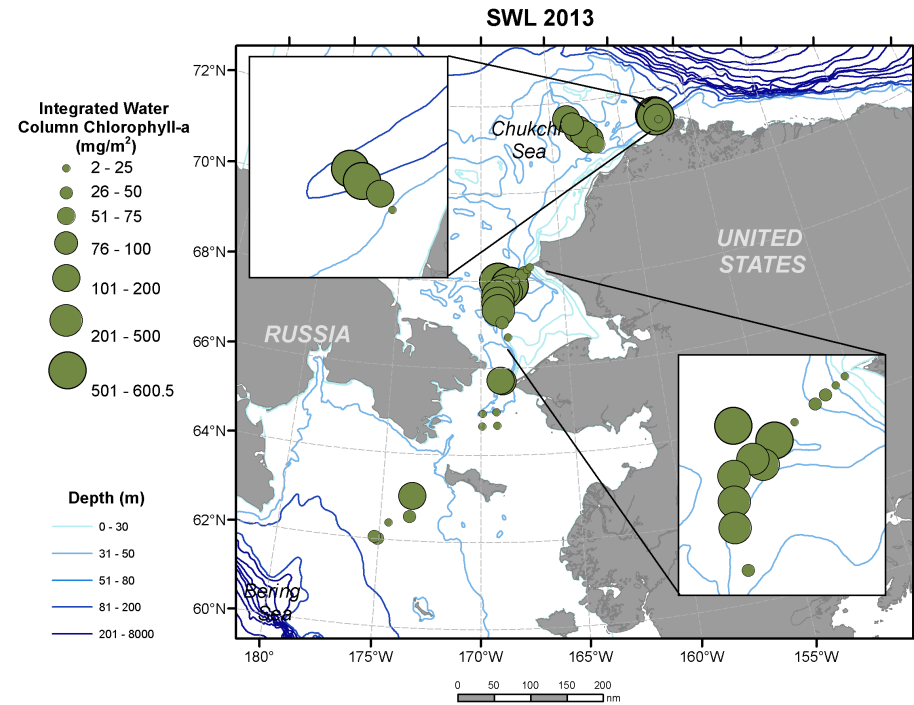
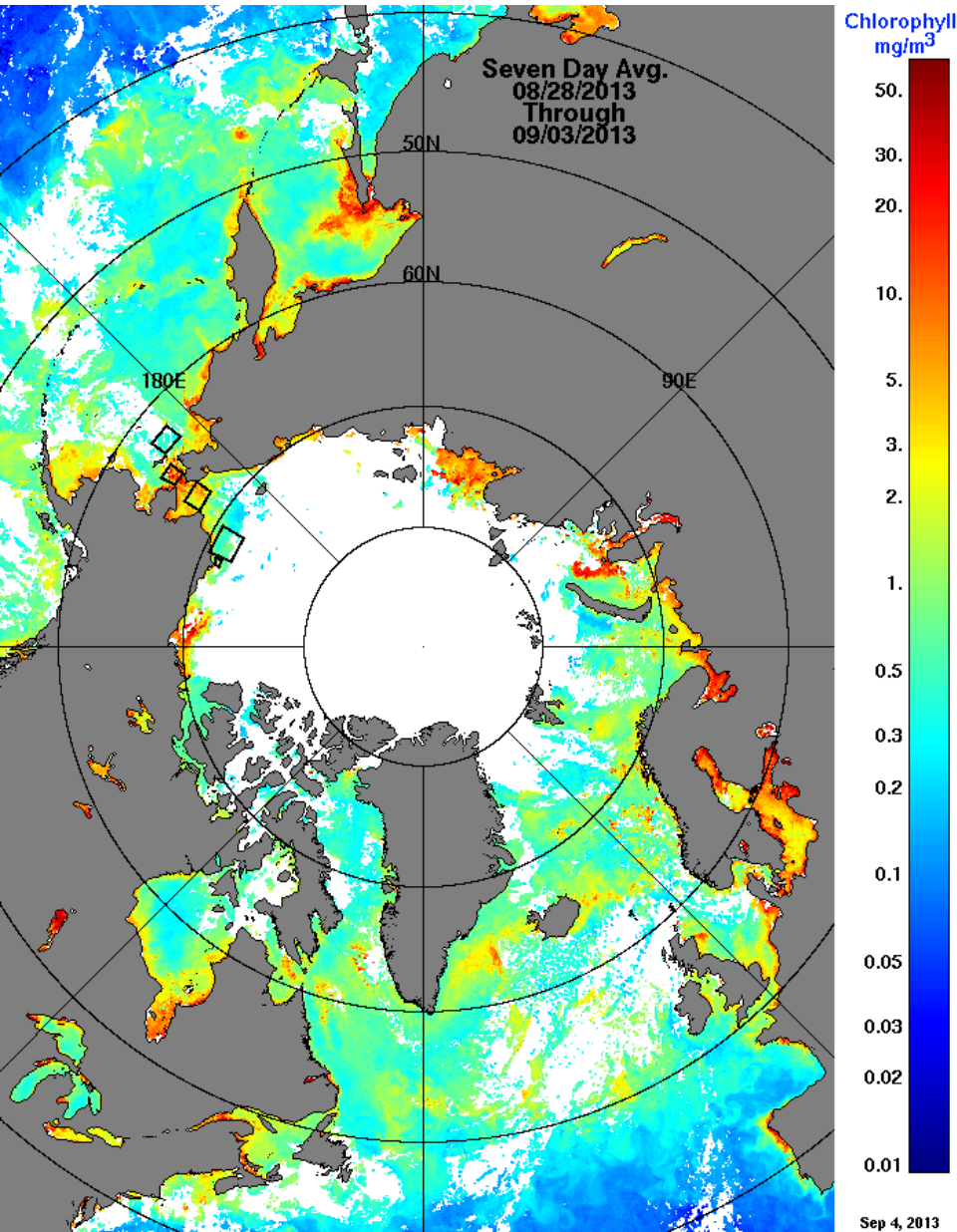


[modified by Karen Frey from Grebmeier et al. 2010, EOS 91]

- DBO sites (red boxes) are regional “hotspot” transect lines and stations located along a latitudinal gradient (DBO1-5) and longitudinally (DBO6-8)
- DBO sites exhibit high productivity, biodiversity, and/or overall rates of change
- DBO sites serve as a change detection array for consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan

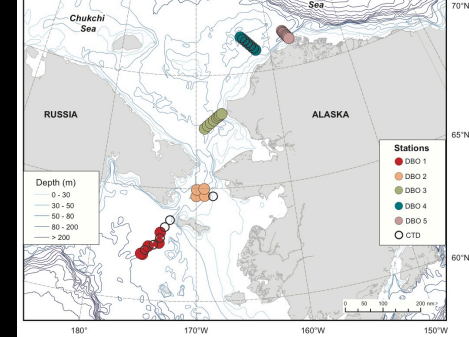


NASA DBO-surface chlorophyll and field collected integrated values



- Highest chl a via satellites and field data in Bering Strait and offshore SE Chukchi Sea DBO3 SE Chukchi Sea hotspot

A Climatology of the DBO Sites



Sea Surface Temperature (AVHRR)

Sea Ice Concentration (SMMR/SSM/I)

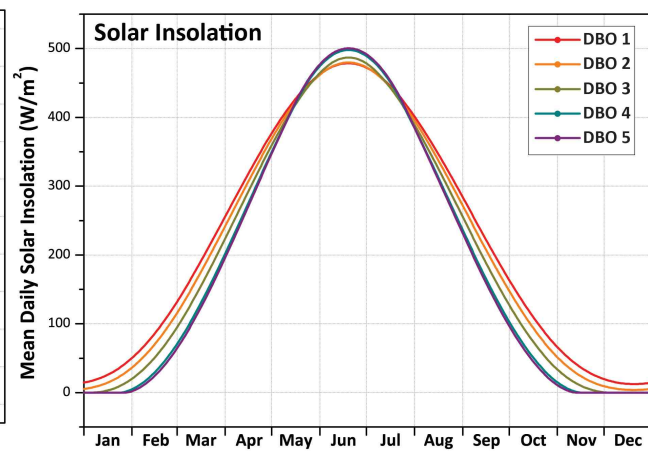
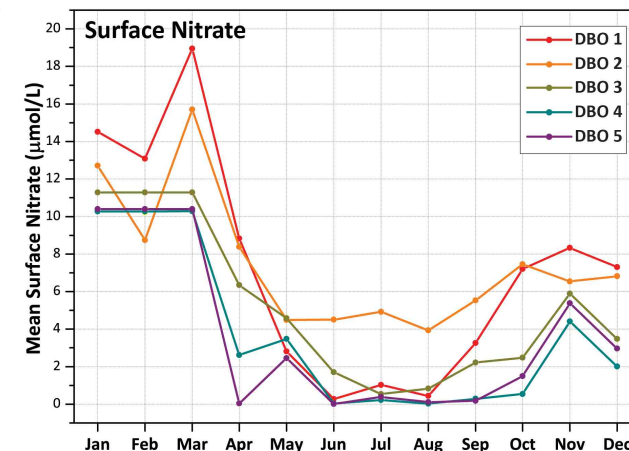
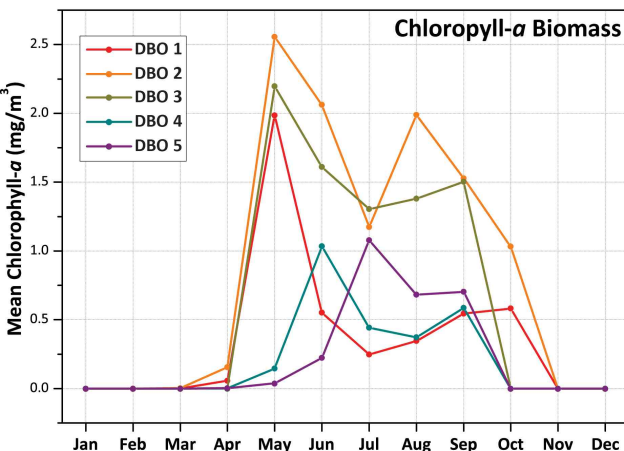
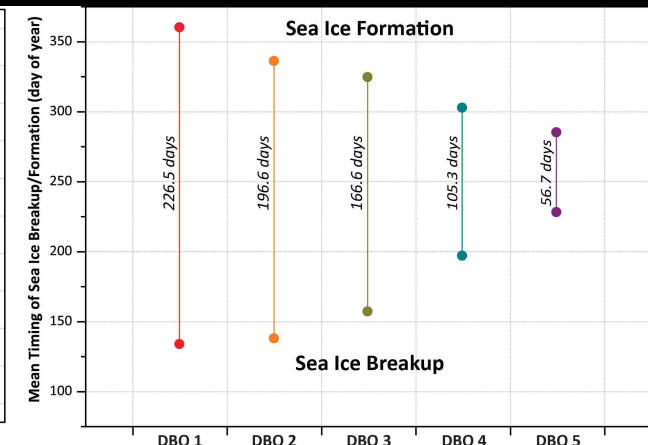
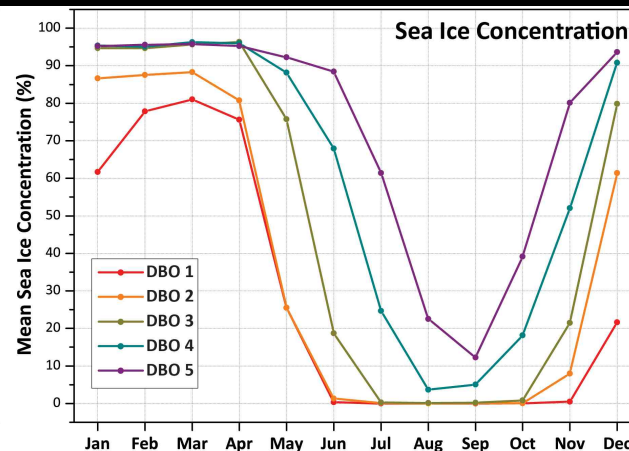
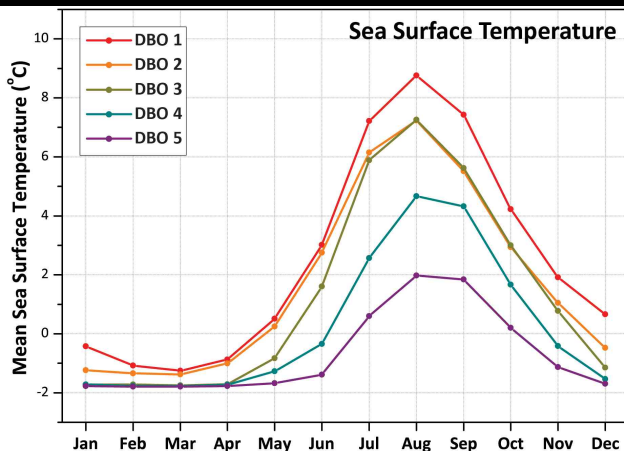
Sea Ice Breakup/Formation Timing (SMMR/SSM/I)

Chlorophyll-*a* Biomass (Globcolour)

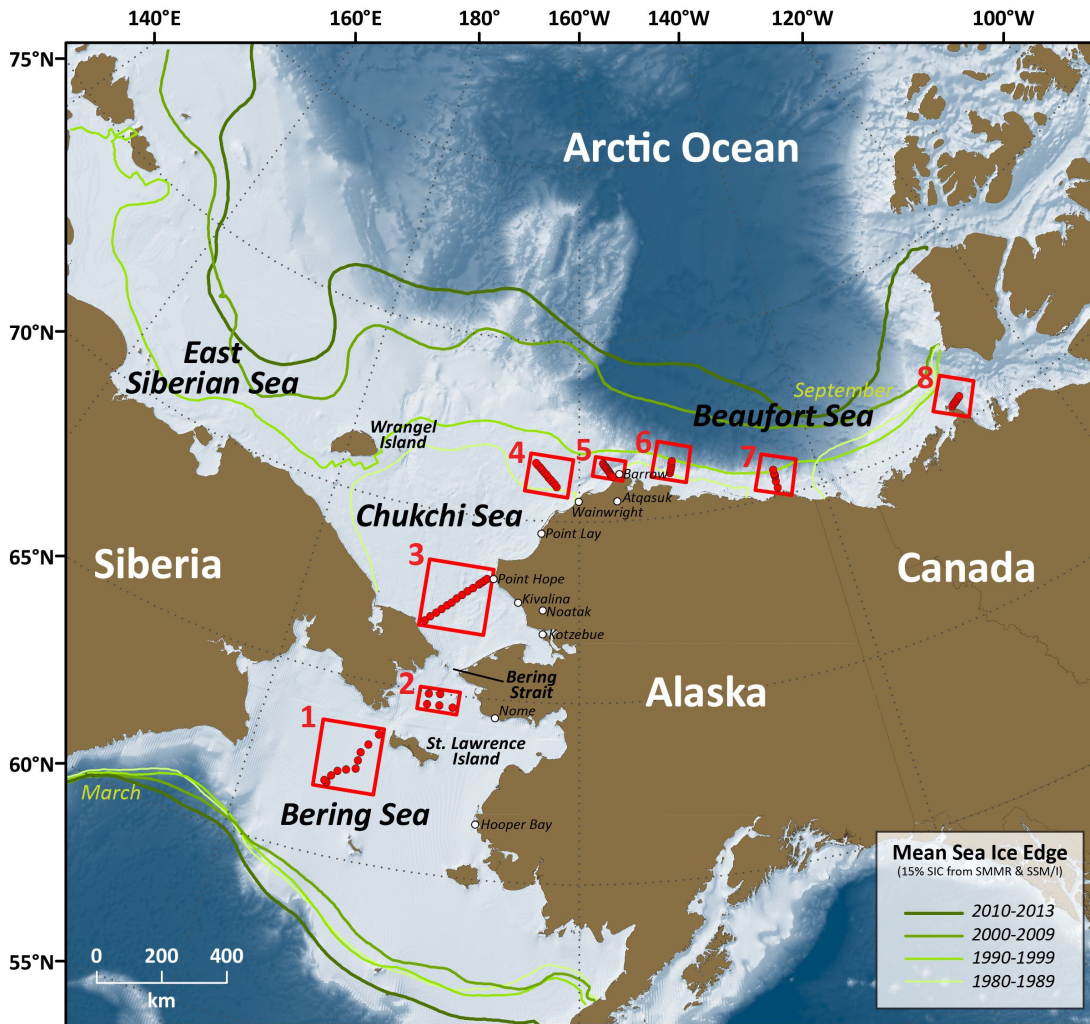
Surface Nitrate (World Ocean Atlas)

Solar Insolation (NASA)

[Karen Frey]



Implementation of the Distributed Biological Observatory (DBO)



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

- Data Sharing Site Established and Supported Through NSF at Earth Observations Laboratory, UCAR: dbo.eol.ucar.edu
- Data Policy Protocol Approved by International Partners. 2015 http://dbo.eol.ucar.edu/data_policy-dbo.html
- Collaboration Team chaired by Jackie Grebmeier and Sue Moore through US IARPC meets monthly and coordinates US agency efforts. <http://www.iarpccollaborations.org/teams/Distributed-Biological-Observatory>



Implementation of the DBO (continued)



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

- Pacific Marine Arctic Regional Synthesis (PacMARS) project (Shell and ConocoPhillips funding via NPRB funding) facilitated public sharing of annual Sir Wilfrid Laurier cruise data from 2000-present. Posted at EOL site
- DBO discussions at annual PAG meetings (Incheon, Korea in Oct 2015 and Fairbanks AK in Mar 2016); also data meeting in Seattle USA in Mar 2016 sponsored by Pacific Arctic Group and NOAA to share past and upcoming data collections and to coordinate
- Expansion of DBO efforts by Canada and European Union



Distributed Biological Observatory Standardized Sampling Protocols



Core ship-based sampling:

- CTD and ADCP
- Chlorophyll
- Nutrients
- Ice algae/Phytoplankton (size, biomass and composition)
- Zooplankton (size, biomass and composition)
- Benthos (size, biomass and composition)
- Seabird surveys (standard transects)
- Marine mammal surveys (standard transects)

Second tier ship-based sampling:

- Fishery acoustics (less effort than standardized bottom trawling)
- Bottom trawling (every 3-5 years)

DBO sampling by national & international science programs

2015 PAG and DBO Field Season: Sampling Contributors. Projects Key: AON=US Arctic Observing Network; ARCWEST=Arctic Whale Ecology Study; C30=Canada's Three Oceans; JAMSTEC= Japan Agency for Marine-Earth Science and Technology; KOPRI = Korea Polar Research Institute. 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-Central Beaufort Sea, DBO8=Bathurst Polynya region

Dates (Port calls)	Ship	DBO Region	Projects	PAG contact	Chief Scientist
July 2-8 (Nome-Nome)	Norseman II	3	Bering Strait Mooring Project/AON	Rebecca Woodgate woodgate@apl.washington.edu	Rebecca Woodgate woodgate@apl.washington.edu
July 11-22 (Nome-Nome)	Norseman II	2,3,4	USGS	Jackie Grebmeier jgrebmei@umces.edu	Chad Jay cjay@uscg.gov
July 4-25 (Victoria, BC-Barrow)	Sir Wilfrid Laurier	1,2,3,4,5	C30/DBO	Jackie Grebmeier jgrebmei@umces.edu	Svein Vagle Svein.Vagle@dfo-mpo.gc.ca
July 27-14 Aug	Fairweather	2, 3	CTD sampling	Sue Moore sue.moore@noaa.gov	Noaa.Ship.Fairweather@noaa.gov
July 30-Aug 5 (Prudhoe-Prudhoe)	Norseman II	DBO6,7	ANIMIDA	Jackie Grebmeier jgrebmei@umces.edu	Jeremy Kasper jkasper@alaska.edu
August-Sept (Dutch-Barrow)	Healy	-	GEOTRACES	Jackie Grebmeier jgrebmei@umces.edu	David Kadko dkadko@fiu.edu
Aug 6-Sept 2	Araon	3	Korean Expedition (KOPRI)	Sung-Ho Khang shkang@kopri.re.kr	Eun Jin Yang ejyang@kopri.re.kr
Aug 9-Sept 2 (Prudhoe-Wainwright)	Norseman II	3, 4	AMBON	Jackie Grebmeier jgrebmei@umces.edu	Katrin Iken lken@alaska.edu
Aug 18-Sept 7 (Barrow-Barrow)	Annika Marie	5	AON	Carin Ashjian cashjian@whoi.edu	Carin Ashjian cashjian@whoi.edu
Aug 6-Sept 4 (Kodiak-Dutch Harbor)	Brown	3,4,5	NOAA/PMEL	Phyllis Stabeno Phyllis.Stabeno@noaa.gov	Nancy Kachel Nancy.Kachel@noaa.gov
Aug 25-Oct 6 (Hachinohe, Japan-Dutch Harbor)	Mirai	3,5	JAMSTEC; DBO moorings 3 and 5	Takashi Kikuchi takashik@jamstec.go.jp	Shigeto Nishino nishinos@jamstec.go.jp
mid-October (Anadyr-Anadyr)	Viktor Buynitsky	3	RUSALCA Bering Strait mooring	Kathy Crane Kathy.Crane@noaa.gov Phyllis.Stabeno@noaa.gov	Kathy.Crane@noaa.gov
Sept 4-12 (Wainwright-Wainwright)	Norseman II	4	Winsor gliders	Jackie Grebmeier jgrebmei@umces.edu	Peter Winsor pwinsor@alaska.edu
Sept-Oct	Louis S St-Laurent	-	JOIS	Bill Williams Bill.Williams@dfo-mpo.gc.ca	Bill Williams Bill.Williams@dfo-mpo.gc.ca
Sept-Oct	Sir Wilfrid Laurier	4, 8	C30/DBO	Bill Williams Bill.Williams@dfo-mpo.gc.ca	Humfrey Melling Humfrey.Melling@dfo-mpo.gc.ca
Oct	USCG ship	-	MARES	Robert Pickart rpickart@whoi.edu	Robert Pickart rpickart@whoi.edu

DRAFT 2016 PAG and DBO Field Plan

Draft 2016 PAG and DBO Field Season: Sampling Contributors. Projects Key: AON=US Arctic Observing Network (National Science Foundation); ArCS=Arctic Challenge for Sustainability; 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
July 7-15 (Nome-Nome)	Norseman II	3	Bering Strait Mooring Project/AON	Rebecca Woodgate woodgate@apl.washington.edu	Rebecca Woodgate woodgate@apl.washington.edu
July 4-25 (Victoria, BC-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
July (Seward-Seward)	Healy	- (Arctic Basin)	NOAA Ocean Exploration	Russell Hopcroft rrhopcroft@alaska.edu	Russell Hopcroft rrhopcroft@alaska.edu
Aug-Sept	Araon	3+Chukchi Borderland	Korean Expedition (KOPRI)	Sung-Ho Khang shkang@kopri.re.kr	Eun-Jin Yang ejyang@kopri.re.kr
Aug 9-Sept 2	Xuelong	3, 5+Arctic Basin	CHINARE	Jianfeng He hejianfeng@pric.org.cn	Jianfeng He hejianfeng@pric.org.cn
Sept 4-12	TBD	4	Gliders	Jackie Grebmeier jgrebmei@umces.edu	Peter Winsor pwinsor@alaska.edu
Aug 15-Sept 25	Mirai	3,5+Arctic Basin	Japanese ArCS	Takashi Kikuchi takashik@jamstec.go.jp	Shigeto Nishino nishinos@jamstec.go.jp
Aug-Sept	TBD	3,4,5	NOAA/PMEL	Phyllis.Stabeno@noaa.gov	Phyllis.Stabeno@noaa.gov
Sept 10-30	Viktor Buynitsky	3,4	RUSALCA	Jackie Grebmeier jgrebmei@umces.edu	Robert Pickart rpickart@whoi.edu
Sept-Oct	Sir Wilfrid Laurier	4	C30	Bill Williams Bill.Williams@dfo-mpo.gc.ca	Humfrey.Melling@dfo-mpo.gc.ca
Oct	Healy	- (Arctic Basin)	ONR MIZ	Craig Lee craig@apl.washington.edu	TBD

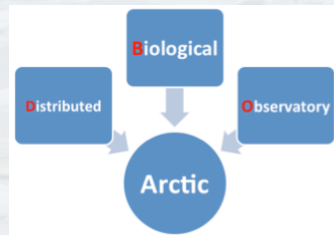
PAG=Pacific Arctic Group

DBO=Distributed Biological Observatory

Thank you for your attention.

Questions and comments?

Thank you to all DBO collaborators, field and laboratory technicians over the years for the time series efforts. Financial support for the science provided by the US NSF, NOAA, BOEM, NASA, and ongoing international science partners in the Pacific Arctic Group.



<http://www.arctic.noaa.gov/dbo/>

