Update on Pacific Arctic Group (PAG) activities

Jaccqueline Grebmeier\textsuperscript{1} and Sung-Ho Kang\textsuperscript{2}

\textsuperscript{1}Member, PAG Executive Committee, Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, Maryland, USA

\textsuperscript{2}Chair, Pacific Arctic Group, Division of Polar Ocean Sciences, Korea Polar Research Institute (KOPRI), Incheon, Republic of Korea

FARO Meeting-ASSW 2015
April 25, 2015
Toyama, Japan

http://pag.arcticportal.org/
Pacific Arctic Group

- The Pacific Arctic Group (PAG) is an informal group of organizations and individuals having a Pacific perspective on Arctic science. Originally organized under the International Arctic Science Committee (IASC), the PAG is now an independent affiliate of the IASC and has as its mission to serve as a Pacific Arctic regional partnership to plan, coordinate and collaborate on science activities of mutual interest. The PAG has established five objectives:

  - To identify gaps in knowledge and priority research needs across the Pacific Arctic Region and seek means to implement programs and activities that address them.

  - To facilitate and coordinate science operations among PAG member countries.

  - To promote and facilitate data accessibility and integrated data bases for the region.

  - To serve as a forum for information exchange on Pacific Arctic Region (PAR) science programs.

  - To establish and maintain a direct link between PAG and other relevant science organizations.
Linking Physics to Biology: the Distributed Biological Observatory (DBO)

- DBO sites serve as a change detection array for consistent monitoring of biophysical responses

Abbreviations: IASC, International Arctic Science Committee; RUSALCA, Russian-American Long-term Census of the Arctic; RAS, Russian Academy of Sciences; UMCES, University of Maryland Center for Environmental Science; DFO, Fisheries and Oceans Canada
Examples of DBO Data Products

**Top Left:** Integrated Chlorophyll $a$ during annual DBO cruise

**Bottom left:** Phytoplankton taxonomy, with dominance by diatoms in western side maintained by nutrient rich Anadyr and Bering Shelf waters

**Bottom right:** nitrate/nitrite (top panel) and ammonium (bottom panel) ($\mu$M)

Sample collection in cooperation Diana Varela, University of Victoria; Analysis by Jozef Wiktor Polish Academy of Sciences
Green stations are underway UCTD to 400 m.

Red stations are DBO sampling stations along all 5 DBO lines (CTD/ADCP, water column and sediment parameters, seabird and marine mammal surveys.
Japanese research vessel cruise in 2015

R/V Mirai Arctic cruise in September-October 2015

“Observational Studies on the Arctic Ocean Climate and Ecosystem Variability”

PI: Dr. S. Nishino (JAMSTEC)

[ Tentative cruise plan ]

August 25: Hachinohe (JAPAN)
September 4: Bering Str.

October 3: Bering Str.
October 6: Dutch Harbor (in)
October 9: Dutch Harbor (out)
October 21: Hachinohe (JAPAN)

R/V Mirai (JAMSTEC)

Large warm-core eddy & its impact to marine ecosystem
Kawaguchi et al. [2012]
Nishino et al. [2011b]

Intensive obs. of eddy & shelf-break jet by CTD/LADCP/ water sampling and TurboMAP

Impact from Siberian shelf water & the inter-annual variability
Nishino et al. [2008, 2013]

Observations in the Arctic Ocean

Courtesy from Dr. Nishino (JAMSTEC)
Plan of 2015 Araon Arctic Cruise

Target areas

1. Northern Bering strait → DBO line3

2. Chukchi Borderland → 2 TUMST Moorings → 1 KOPRI Mooring

3. East Siberian Sea & Mendeleev Ridge → 1 KOPRI Mooring → Sea ice dynamics → Sediment coring
- Moorings-national and international

- Accoustic (Passive listening)-Kate Stafford, Cahterine Berchok

- Working on combining US and international mooring locations into one figure, with location table
# 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=Beaufort Sea Central

<table>
<thead>
<tr>
<th>Dates (Port calls)</th>
<th>Ship</th>
<th>DBO Region</th>
<th>Projects</th>
<th>PAG contact</th>
<th>Chief Scientist</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2-8 (Nome-Nome)</td>
<td>Norseman II</td>
<td>3</td>
<td>Bering Strait Mooring Project/AON?</td>
<td>Rebecca Woodgate <a href="mailto:woodgate@apl.washington.edu">woodgate@apl.washington.edu</a></td>
<td>Rebecca Woodgate <a href="mailto:woodgate@apl.washington.edu">woodgate@apl.washington.edu</a></td>
</tr>
<tr>
<td>July 11-22 (Nome-Nome)</td>
<td>Norseman II</td>
<td>-</td>
<td>USGS</td>
<td>Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a></td>
<td>USGS-walrus tagging?</td>
</tr>
<tr>
<td>July 4-25 (Victoria, BC-Barrow)</td>
<td>Sir Wilfrid Laurier</td>
<td>1, 2, 3, 4, 5; + moorings at 1, 3</td>
<td>C30/DBO, plus JAMSTEC DBO moorings</td>
<td>Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a></td>
<td>Svein Vagle <a href="mailto:svein.Vagle@dfo-mpo.gc.ca">svein.Vagle@dfo-mpo.gc.ca</a></td>
</tr>
<tr>
<td>July 30-Aug 5</td>
<td>Norseman II</td>
<td>DBO6, 7 (Beaufort)</td>
<td>ANIMIDA</td>
<td>Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a></td>
<td>Ken Dunton</td>
</tr>
<tr>
<td>August-Sept (Dutch-Barrow)</td>
<td>Healy</td>
<td>-</td>
<td>GEOTRACERS</td>
<td>TBD</td>
<td>David Kadko <a href="mailto:dkadko@fiu.edu">dkadko@fiu.edu</a></td>
</tr>
<tr>
<td>Aug 18-Sept 7 (Barrow-Barrow)</td>
<td>Annika Marie</td>
<td>5</td>
<td>AON</td>
<td>Carin Ashjian <a href="mailto:cashjian@whoi.edu">cashjian@whoi.edu</a></td>
<td>Carin Ashjian <a href="mailto:cashjian@whoi.edu">cashjian@whoi.edu</a></td>
</tr>
<tr>
<td>Aug-Sept</td>
<td>Alaska Explorer</td>
<td>1 and/or 2</td>
<td>Arctic Eis</td>
<td><a href="mailto:Ed.Farley@noaa.gov">Ed.Farley@noaa.gov</a></td>
<td>Franz Mueter <a href="mailto:mueter@alaska.edu">mueter@alaska.edu</a></td>
</tr>
<tr>
<td>Aug 6-Sept 2 (Prudhoe Bay-Wainwright)</td>
<td>Araon</td>
<td>3</td>
<td>Korean Expedition (KOPRI)</td>
<td>Sung-Ho Khang <a href="mailto:shkang@kopri.re.kr">shkang@kopri.re.kr</a></td>
<td>Eun Jin Yang <a href="mailto:ejyang@kopri.re.kr">ejyang@kopri.re.kr</a></td>
</tr>
<tr>
<td>Aug 9-Sept 2</td>
<td>Norseman II</td>
<td>3, 4</td>
<td>AMBON</td>
<td>Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a></td>
<td>Katrin <a href="mailto:Ikeniken@alaska.edu">Ikeniken@alaska.edu</a></td>
</tr>
<tr>
<td>Aug 20-28</td>
<td>Brown</td>
<td>3, 4, 5, 6</td>
<td>NOAA/PMEL</td>
<td><a href="mailto:Phyllis.Stabeno@noaa.gov">Phyllis.Stabeno@noaa.gov</a></td>
<td><a href="mailto:Phyllis.Stabeno@noaa.gov">Phyllis.Stabeno@noaa.gov</a></td>
</tr>
<tr>
<td>Sept (Anadyr-Anadyr)</td>
<td>Viktor Buynitsky</td>
<td>3</td>
<td>RUSALCA Bering Strait mooring</td>
<td><a href="mailto:Kathy.Crane@noaa.gov">Kathy.Crane@noaa.gov</a> <a href="mailto:Phyllis.Stabeno@noaa.gov">Phyllis.Stabeno@noaa.gov</a></td>
<td><a href="mailto:Kathy.Crane@noaa.gov">Kathy.Crane@noaa.gov</a></td>
</tr>
<tr>
<td>Sept 4-12</td>
<td>Norseman II</td>
<td>?4</td>
<td>Winsor gliders</td>
<td>Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a></td>
<td>Peter Winsor</td>
</tr>
<tr>
<td>Aug 15-Sept 10</td>
<td>Mirai</td>
<td>3, 5</td>
<td>JAMSTEC</td>
<td>Takashi Kikuchi <a href="mailto:takashik@jamstec.go.jp">takashik@jamstec.go.jp</a></td>
<td>Shigeto Nishino <a href="mailto:nishinos@jamstec.go.jp">nishinos@jamstec.go.jp</a></td>
</tr>
<tr>
<td>Sept-Oct</td>
<td>Louis S St-Laurent</td>
<td>-</td>
<td>JOIS</td>
<td>Bill Williams <a href="mailto:Bill.Williams@dfo-mpo.gc.ca">Bill.Williams@dfo-mpo.gc.ca</a></td>
<td>Bill Williams <a href="mailto:Bill.Williams@dfo-mpo.gc.ca">Bill.Williams@dfo-mpo.gc.ca</a></td>
</tr>
<tr>
<td>Sept-Oct</td>
<td>Sir Wilfrid Laurier</td>
<td>4</td>
<td></td>
<td>Bill Williams <a href="mailto:Bill.Williams@dfo-mpo.gc.ca">Bill.Williams@dfo-mpo.gc.ca</a></td>
<td><a href="mailto:Humfrey.Melling@dfo-mpo.gc.ca">Humfrey.Melling@dfo-mpo.gc.ca</a></td>
</tr>
</tbody>
</table>
In October 2014, the Pacific Arctic Group fall meeting focused on review of accomplishments during the previous summer and outlooks for the future research plans.

One major outcome of the meeting was to engage in an expert-level discussion of observing needs in the higher Pacific Arctic that could provide valuable data to forecasters and modelers of climate change impacts on and surrounding the Arctic reaching to the mid-latitudes.

The area of observing interest includes the outer shelf of the East Siberian and Chukchi Seas northwards to 80°N and extending from the Makarov Basin in the West to the Canada Basin in the East.
ICARP3 Process 2015

Pacific Arctic Group

TUMSAT, Tokyo, April 21-22, 2015
The workshop goals were to investigate and refine the following key future observing objectives and to develop an implementation plan for action:

- To study the evolution, structure, and variability of Pacific Arctic upper ocean water masses, including heat transport of Atlantic Water and its interaction with northward flowing Pacific Water.

- To carry out atmospheric, sea ice and upper ocean observations to understand the rapid sea ice loss in the region and its impact on the local and global climate and regional ecosystems. This effort will also incorporate atmospheric observations to support the WMO’s Polar Prediction Project (PPP).

- To carry out a repeat census of the trophic components of the ecosystem, identify key species, their relationship to physical forcing and biogeochemical conditions including their changes through time and space.

- To carry out time-series observations from long-term moorings to reveal annual and inter-annual variability.

- To coordinate this work with the vessels of our respective countries from 2015-2020 and beyond, which will provide a unique suite of synoptically collected data made available for joint analysis and assessment via the mechanisms already set up within the Pacific Arctic Group. www.pag.arcticportal.org
The PAG participants agree to collaborate on the development and implementation of this Pacific Arctic climate integrated-ecosystem Observing Network.

**B2: Current and Future Observing Strategies for Understanding the Evolving Arctic Climate and Ecological System**

**April 28, 2015 (Tuesday), Room 203**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:45-12:15</td>
<td>B02-O11</td>
<td>ARCTIC OCEAN BOUNDARY ARRAY: CORNERSTONE OF ARCTIC MONITORING</td>
<td>S. Bacon*, T. Tsubouchi, Y. Aksenov</td>
</tr>
<tr>
<td>10:45-11:03</td>
<td>B02-O12</td>
<td>THE DISTRIBUTED BIOLOGICAL OBSERVATORY: A LATITUDINAL DETECTION ARRAY FOR TRACKING ECOSYSTEM CHANGE IN THE PACIFIC ARCTIC</td>
<td>J. M. Grebmeier*, L. W. Cooper, K. E. Frey, T. Kikuchi, S. E. Moore, S. Vagle</td>
</tr>
<tr>
<td>11:03-11:21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thank you for your attention.

Any questions?