



# Arctic Research and Monitoring Workshop Toward a Strategy for the Chukchi and Beaufort Seas

## *A Final Report on the January 23, 2009 Workshop*

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*This report summarizes the presentations and participant input from a one-day workshop sponsored by the Alaska Ocean Observing System (AOOS) and the North Pacific Research Board (NPRB) on Arctic Research and Monitoring held in conjunction with the 2009 Alaska Marine Science Symposium. A draft was circulated for additional comment via the Arctic Info list serve. The report includes additional analysis by Dr. Craig Dorman. This analysis and the views of the participants included in this report do not necessarily represent the views of AOOS or NPRB. Rather, they are intended to stimulate further discussion and dialogue which will hopefully lead to a broader consensus on developing a more comprehensive research and monitoring plan for the Chukchi and Beaufort Seas.*

### **1. Introduction.**

The Alaska Ocean Observing System (AOOS) and the North Pacific Research Board (NPRB) sponsored a one-day workshop on Arctic Research and Monitoring at the end of the 2009 Alaska Marine Science Symposium, January 23, 2009. The workshop followed an initial Arctic Research and Monitoring Collaboration Roundtable held in the summer of 2008. The goal was “to share information and promote collaboration among the many entities with increasing activities in marine research and monitoring in the Alaska maritime Arctic (specifically the Chukchi and



Beaufort Seas for this workshop), including the oil and gas industry, local, state and federal agencies, and non-governmental and academic organizations.”

One hundred forty-five individuals from more than 60 organizations attended the workshop. Sessions included summaries from each of the principal research and monitoring sponsors and programs, panel discussions on data user and provider issues and needs, and synthesis presentations on past efforts and major gaps in knowledge and plans. The presentations were followed by a facilitated action group to discuss plans and recommendations for data management, logistics, synthesis, and gap analysis and a road map. The agenda, participant list, and draft action plan updated with the suggestions from the meeting are attached and are available, along with viewgraphs from all presentations, at <http://www.aos.org>.

The history of research and monitoring in the Chukchi and Beaufort Sea regions by the international science community dates back to the late 19<sup>th</sup> century. The first research station at Barrow was established during the first International Polar Year, 1882-1883. The Navy’s Arctic Research Lab was established at a Barrow oil exploration camp in 1947 and, after several iterations in management, the community remains a focal point for Arctic research with the new Barrow Arctic Research Center and long term monitoring stations run by the National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE), and others.

At sea, initial exploratory cruises in the late 19<sup>th</sup> and early 20<sup>th</sup> century yielded to more focused efforts in the 1970s; one of the major programs was NOAA and Minerals Management Service’s (MMS) Outer Continental Shelf Environmental Assessment Program (OCSEAP, 1975–1985), inspired by North Slope and offshore oil and gas potential. MMS’s environmental studies program continues to conduct research to support decisions with regard to offshore oil and gas leasing, at the level of some 50 ongoing projects in any year. U.S. investigators have maintained year-round moorings in the Bering Straits since 1990, yielding an almost 20 year climate time series. The National Science Foundation (NSF) and the Office of Naval Research (ONR) have continued to fund interdisciplinary cruises in the area, notably the recent Shelf-Basin Interactions (SBI) program. NOAA and the Department of the Interior have supported joint research cruises with Russia through the Bering-Pacific (BERPAC) cruises of the 1980s, and more recently the Russian-American Long-term Census of the Arctic (RUSALCA) program.

Ice stations, ice mounted buoys, moorings, and numerous polar orbiting satellites contribute to monitoring in the region. University, federal and state agency, North Slope Borough, and oil and gas industry scientists have conducted, and continue to conduct, literally hundreds of research projects in the Beaufort and Chukchi seas and along the coasts. The local inhabitants, in some 15

villages along the coast, possess extensive traditional knowledge and continue to study the marine as well as terrestrial environment as an essential component of their subsistence activities.

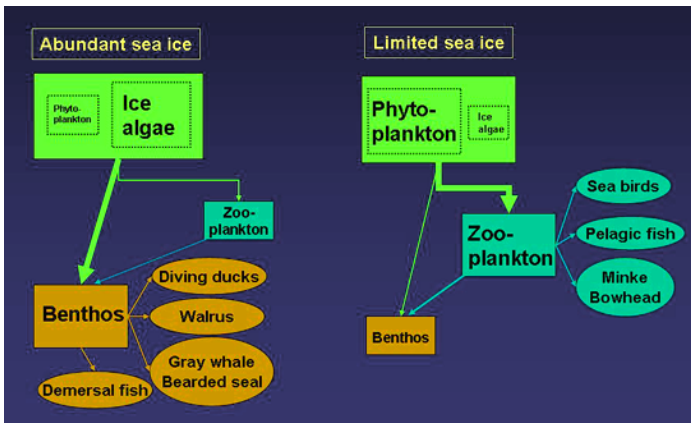
## 2. The Challenges of Change in the Chukchi and Beaufort.

The intent of this brief and obviously very incomplete litany is simply to note that there is a large if unsystematic and mostly un-integrated body of available information about and knowledge of the area, as well as many continuing programs to study it. It is reasonable to ask, therefore – as this workshop did—what if anything has changed to suggest that a different approach to arctic research and monitoring is needed; and if it is, what are the appropriate actions.

There would appear to be at least four major interacting forces that together imply that much more than a ‘business as usual’ approach to the U.S. maritime Arctic is needed:

### a. Climate Change.

While this is a well-appreciated global issue, the changes in the Chukchi, Beaufort and surrounding regions appear to be larger, earlier, and more consequential than those in many other regions. The major physical manifestations are significantly reduced sea ice and thawing permafrost. These in turn have major impacts on other components of the environment, from rapid erosion which is already a severe problem for coastal communities, to loss of substrate and habitat for ice-dependent animals to changes in transportation patterns. The chain, or web, of impacts from these primary and readily visible manifestations is extensive, and includes feedback to the global climate system. As just one example, while marine shipping for commerce, supply, exploration and tourism may be easier, subsistence activities are disrupted and endangered. Another



striking change is the shift from a ‘benthic’ to ‘pelagic’ dominated ecosystem structure—already documented in the northern Bering Sea—as depicted in this figure, from the Workshop synthesis presentation by Dr. Russ Hopcroft<sup>1</sup>.

Left: Climate change scenarios in the Arctic: Changes in sea ice cover

<sup>1</sup> Arctic Ocean Synthesis: Analysis of Climate Change Impacts in the Chukchi and Beaufort Seas with Strategies for Future Research, Hopcroft, Bluhm and Grading (Eds), available at [www.aooos.org](http://www.aooos.org); see also the NPRB-sponsored report on which the presentation was based, same title, December 2008, NPRB Project #503 available at [www.nprb.org](http://www.nprb.org)

A new piece of information was presented at the workshop by Dr. John Walsh, who extended the climate projections of the UAF Scenarios Network for Alaska Planning project ([www.snap.uaf.edu](http://www.snap.uaf.edu)) to the offshore Chukchi. The results indicate not only continued warming, especially in ice-free regions, but shifts in mean sea level pressure with resultant increases in winds from the south and accompanying increased inflow from the Bering Sea into the Arctic. The main point from both presenters is that although the anthropogenic and natural forces driving climate change in the Chukchi and Beaufort largely come from outside the area the impacts have already started, will be large, fundamental, and irreversible, will require more precise coupling of models (atmosphere, snow, sea ice and ecosystem) and will necessitate significant adaptation by virtually all trophic levels in the ecosystem, from microbes to man.

**b. Economic Activities.**

The Arctic is attracting increased interest in oil and gas activities, tourism, and marine shipping, all of which can have immediate impacts through increased vessel traffic. The Arctic Council's Protection of the Arctic Marine Environment (PAME) working group recently conducted an Arctic Marine Shipping Assessment, which was released at this spring's Arctic Council's ministerial meeting. The report indicates the likelihood of significantly increased activity, even if the Northwest Passage and Northern Sea Route don't become major shipping routes. One significant component of increased offshore activity in the Chukchi and Beaufort Seas is likely to be continued oil and gas exploration, which picked up following the 2008 lease sales. Eventually, pending resolution of court cases, it is expected that the oceanographic and environmental research of MMS and the industry will likely lead to exploratory drilling and then production. In the interim the drive to develop the baseline data required for permitting brings many more research projects into the region. Exploratory drilling and production will obviously involve more permanent facilities, plus supply voyages and pipeline or other facility installations.

These activities in turn, along with likely increased tourism, will require the development of enhanced safety infrastructure, from vessel tracking and management systems to Coast Guard patrols. The recently adopted Arctic Fishery Management Plan (FMP) states that "except for Pacific Salmon and Pacific Halibut, commercial fishing for those fish described in the FMP is prohibited in the Arctic Management Area under this FMP until sufficient information exists to authorize a sustainable fisheries management program", so that other than survey cruises fishing is not expected to contribute to increased ship traffic. Nonetheless, the overall increases in shipping and other offshore activity will

interact with traditional subsistence activities, themselves often displaced or modified by changes in ice conditions.

**c. National Policy.**

On January 9, 2009, NSPD 66/HSPD 25, Arctic Region Policy, was signed by President Bush. It cites homeland security and defense, climate change and increased activity in the region, the work of the Arctic Council, and ‘growing awareness that the Arctic region is both fragile and rich in resources’ as rationale for the update of the 1994 PDD 26. One of the main drivers is the provision in the UN Convention on the Law of the Sea (UNCLOS) for sovereign national claims for an extended continental shelf (ECS). Other arctic nations are exerting such claims under UNCLOS, and it is expected that the U.S. will soon accede to the convention and do the same; exploratory cruises have already commenced. The policy document also notes the unresolved boundary between the U.S. and Canada in the Beaufort Sea, which is in an area of expected significant oil and gas resources. Overall, the policy discussed and directed implementation measures in national and homeland security, international governance, the ECS and boundary issues, international scientific cooperation, maritime transportation, economic issues including energy, and environmental protection and conservation. Essentially all the Executive Departments and many federal agencies now have additional charges that will require their attention to, and actions in, the Chukchi and Beaufort Seas.

**d. Cumulative Impacts.**

All of the expected changes will inevitably have a significant impact on the way of life and culture of the local population. Although the oil and gas developments in and around Prudhoe Bay, and the Red Dog Mine, have inevitably influenced life in the region, they are somewhat separated geographically from most Alaska Native villages, and predominantly involve terrestrial and nearshore activity. The substantive changes expected in the coastal and offshore regions—both environmentally and human induced—are likely to be more directly intrusive, both in terms of infrastructure development and interference with culturally and socio-economically critical subsistence activities. The major concern is that the combination of activities may create immitigable impacts on subsistence activities.

Finally, although not a ‘change’ per se, the international connections of the Chukchi and Beaufort - with Russia to the west and Canada to the east - contribute to the challenges of research and monitoring. Neither the ocean currents nor marine life pay any attention to borders or EEZs, so a thorough understanding of the region can be gained only through cooperation with both our neighbors and interested researchers from other nations.

### **3. Responding to Change: Needs, Issues, and Initial Actions.**

Following presentations at the workshop by several of the agencies and organizations with research and monitoring programs in the Arctic<sup>2</sup>, panelists from the resource management community, industry, the communities and NGOs discussed their issues and data needs. Although expressed in many ways, there was remarkable consistency in core requirements. First and foremost is the need for a sound baseline of environmental and ecological conditions on which to base decisions and anticipate the impacts likely to be caused by the major forces for change. Although as noted above there is a long history of research and a large body of data and information, coverage is incomplete, much of what is available hasn't been synthesized or integrated, and secure long term funding for many of the key monitoring efforts (such as the Bering Strait moorings) has not been established. Examples of major gaps that were cited include accurate bathymetry, population abundance and dynamics of key species and in particular marine mammals, background noise levels, and contaminants.

The second major need is better understanding of the key interactions, both natural and human related, with a critical issue being bowhead whale reaction to the noise and installations associated with oil and gas exploration and other marine activity.

Third is better (higher resolution, more timely and frequent) reporting and forecasts on conditions which impact human activity, be it subsistence related, industrial, or research itself. Ice and weather are at the top of this list, followed closely by information on the activities themselves—who is doing what and where, both for safety and to avoid redundancy and conflict. The basic contention is that those who live and work in the region now need at least the same level of 'service' as routinely provided in more heavily populated areas, and in many cases require even more detailed information because of the inherent dangers of the environment. From the Alaska Native perspective, change has already been great enough that traditional knowledge, while essential, is no longer sufficient for safety and successful subsistence, and they need information on a very local, 'human' scale.

While it's relatively easy to outline needs at this very general level, it's equally difficult to prioritize specific requirements—e.g., which time series to collect, which trophic levels to focus on, which 'hot spots' to study in detail, which models to develop—and then to translate such specifics into actual programs. Such activities are of course conducted by each of the research and monitoring sponsors as part of their own planning and budgeting processes. The problem is

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<sup>2</sup> Their viewgraphs are on the AOOS web site. Current projects will soon be available through the Alaska Marine Information System, jointly developed by AOOS and NPRB, and available soon on their websites.

always that the interests, mandates, and procedures of the sponsors and their performers don't necessarily match up well, and the sum of the effort will thus continue to be incomplete in terms of the topical, temporal, and spatial coverage that a systematic, top-down, long term approach to understanding these two Large Marine Ecosystems as a 'system' would entail. Workshops such as the present one provide impetus toward coordination and suggestions for action plans, but they are episodic and infrequent at best, and sponsors are not empowered to implement many if any of the well meaning recommendations they develop.

In this case, however, there are a couple of specific actions in support of better collaboration that were being planned before the workshop and received additional guidance during the action planning session. The most significant is the development and evolution of the Alaska Marine Information System (AMIS) sponsored by the Alaska Ocean Observing System (AOOS) with support from NPRB. In addition to providing a significant amount of new information of use to managers and users on AMIS<sup>3</sup>, AOOS is collaborating with the North Slope Science Initiative (NSSI) to develop a common project tracking data base that should significantly help sponsors and researchers better coordinate their plans and efforts. NSSI's data base is being managed by the Geographical Information Network for Alaska (GINA), where it is combined with other mapping tools and satellite data capture and display. AMIS and GINA are both managed and operated at the University of Alaska Fairbanks, and the two programs are increasing their collaboration to better support both terrestrial and marine users.

Other aspects of information sharing and data management that were discussed included the need for a ready source of information on upcoming meetings and workshops, ship schedules and availability (this is always a hard problem to solve), and coordination and timeliness of requests for information from or approval to work in or near arctic communities to minimize the burdens on the people and ensure that the protocols of the local organizations are followed. The desirability of improving access to industry data and reports was raised frequently, and it was suggested that the Alaska Oil and Gas Association (AOGA) work with its 16 member organizations to serve as an interface to other users. The attached Action Plan Draft includes additional ideas.

Minerals Management Service continues to coordinate and fund multilateral research projects with NOAA/National Marine Fisheries Service, USGS Biological Resources Division, UAF Coastal Marine Institute, and the North Slope Borough's Science Division. Two additional relatively new coordination mechanisms were mentioned, although not stressed, at the workshop.

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<sup>3</sup> AMIS is still in development, but you can learn more about it and give it a trial at [www.aos.org](http://www.aos.org). You are urged to try it and comment.

The first is the NOAA's Integrated Service Plan, developed by its Alaska Regional Collaboration Team (ARCTic). NOAA's new emphasis on regional coordination and planning holds great promise for providing more integrated, timely, and precise information in support of the third major need mentioned above, as well as enhanced contributions to the baseline. Similarly, USGS now has an Alaska Regional Science Officer to help integrate and coordinate the efforts of its biology, geology, geography and water programs in its Alaska Integrated Science Center and other DOI research units.

#### **4. Longer Term Actions and Plans: Baselines, Syntheses, Processes, and Models.**

If indeed, as workshop participants agreed, a sound baseline is essential to support the decisions that are so critical to economic development and simultaneous preservation of the subsistence based lifestyle of the area's residents, then the process must start with a synthesis of available information. There have been three recent efforts to develop such a synthesis. The first, presented publicly for the first time at the Workshop, is the "Arctic Ocean Synthesis: Analysis of Climate Change Impacts in the Chukchi and Beaufort Seas with Strategies for Future Research", Hopcroft, Bluhm and Gradinger (Eds), December 2008, NPRB Project #503, discussed above. This report, based on workshops among principally academic researchers in 2006, describes the physical and chemical oceanography of the region and then focuses upon ecology, describing what is and isn't known about various trophic levels from microbes to marine mammals. Not covered in this report are geology, contaminants, acoustics, and humans. The viewgraphs from Prof. Hopcroft's presentation outline the major conclusions—the increasing impact of Pacific waters and species, the shift of the ecosystem structure from benthic to pelagic dominated, threats to taxa that range from loss of sea ice to predator-prey mismatches and potentially lethal temperatures—and major deficiencies in our baseline knowledge, including the lack of adequate knowledge, despite massive effort, about marine mammal population sizes and major aspects of their population dynamics.

The second major synthesis is Chapter 3, Existing Environment, of the MMS Draft Environmental Impact Statement for the Beaufort and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217 and 221 (OCS EIA/EA MMS 2008-0055 of November 2008). Appendix C, Petroleum Geology of Arctic Alaska Offshore, contains additional baseline information. While the MMS Planning Areas are not contiguous with the Large Marine Ecosystem boundaries, and MMS is concerned primarily with Federal waters thus leaving a three-mile nearshore gap, this draft report extends the synthesis to climate and meteorology, water quality, geology, sound, terrestrial mammals, and the social systems of the North Slope, as well as oceanography and marine ecology.

The third is the North Pacific Fisheries Management Council's "Public Review Draft Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for the Arctic Fishery Management Plan and Amendment 29 to the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs" of January 2009. In support of the alternatives considered by the Council, this draft provides background information on the ecosystems and fish habitat as well as synthesized information on marine mammals and birds as well as fish.

Because all three of these documents are so new, no attempt has been made to 'synthesize the syntheses', and make an overall evaluation of the gaps in the information they contain. Further, as noted by Hopcroft, there are large volumes of additional historical data that have not yet been mined. There is little doubt however that some of his conclusions and recommendations—e.g. the need for long time series, year round and in particular winter data, filling the trophic and process gaps briefly mentioned above, and identifying and filling important geographic gaps (e.g. Herald Valley, the Beaufort Sea Slope, Long Strait)—would be sustained even after the three reports have been integrated and additional available data incorporated in the baseline assessment. While there will always be debate on how much is enough, the workshop participants were generally in agreement that what we know is far from adequate for sound decision making.

What might be a way forward to develop a current and comprehensive baseline that would meet the needs of the multiple stakeholders for the Chukchi and Beaufort Seas? One promising opportunity is offered by the long-awaited arrival of the NSF-funded Alaska Region Research Vessel (ARRV) to be built under the management of and operated by UAF. Having already passed its final review, and with funding secured through the economic stimulus package, the ship could be commissioned and ready to operate in 3 years. It is ice-strengthened (capable of breaking 0.7m of ice continuously) and designed to operate year-round in the Bering Sea, and more seasonally in the Beaufort and Chukchi Seas where ice is thicker. It will be fully outfitted for the whole range of oceanographic research. With a modicum of assistance from U.S. Coast Guard icebreakers, a carefully designed suite of in-situ sensors, and the assumption that ice conditions will remain about as they have been for the last few years, it would appear that a dedicated effort focused around ARRV cruises for approximately 4–5 years could provide enough temporal and spatial coverage to both fill in many gaps and significantly extend our knowledge.

What would it take to make this happen? First of course, NSF must be convinced that it is in the interests of science as well as the nation to formulate a dedicated strategic long term cruise plan that concentrates on the U.S. Arctic for the ARRV's first few years of operation. This is not at all illogical given the intent of the ship, and the fact that it could support several Arctic Observing Network (AON) projects (e.g., Beaufort Gyre) and the Bering Sea and Bering Strait initiatives as

well as adequately covering the Chukchi and Beaufort. Because the ship will not be available for several years, there is adequate time to obtain the necessary funding commitments from federal agencies, ‘synthesize the syntheses’ and augment them with newly mined and developed data, and then involve communities, agencies, industries and academic researchers in focused workshops to specify in detail the gaps and develop cruise plans as well as recommendations for moorings, ice and bottom mounted sensors, aircraft and unmanned aerial vehicle (UAV) flights, glider and autonomous underwater vehicle (AUV) surveys, etc. to accompany the ships. In the interim, ongoing research and monitoring such as described at the workshop (as well as better ‘services’ through NOAA’s ARCTic) could be better coordinated by the sort of science steering committee and working group structure that would be required to oversee the synthesis development and develop the ARRV ‘campaign plan’. Certainly this approach is feasible; at issue is whether the community believes it is justified by the anticipated results and is willing to dedicate funds and staff to make it happen.

An enhanced baseline will be most useful if it is accompanied by the sort of process studies and modeling that enable projections. John Walsh’s presentation provided a glimpse at what can be done, now, in the area of climate related parameters; Henry Huntington provided a much more sobering picture of our challenges in dealing with the socioeconomic and human dimension aspects of change.

While there are a number of fundamental mechanistic questions that can best be answered by dedicated research in the Chukchi and Beaufort or neighboring regions (as just one example, the benthic-pelagic switch), many of the important processes are global or pan-Arctic in nature, so that local and regional efforts should be ‘nested’ within the larger body of ongoing global and arctic-wide programs. The workshop did not address this issue, albeit the connections are implicit in that the sponsor AOOS is one of 11 regional programs within the larger U.S. Integrated Ocean Observing System (IOOS) program, which itself is a component of the Global Ocean Observing System (GOOS) and Integrated Earth Observing System (IEOS), which themselves feed into Global Earth Observing System of Systems (GEOSS; see <http://ioos.noaa.gov/partners/global.html>). There is a similarly dizzying string of acronyms for global climate studies, see for example <http://wcrp.wmo.int/wcrp-index.html>. On the arctic level the main U.S. climate research program is the interagency Study of Environmental Arctic Change (SEARCH), which drives AON and couples into European and international efforts such as the International Study of Arctic Change (ISAC), Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies (DAMOCLES) and SEARCH for DAMOCLES (S4D), as well as neighboring programs in Canada such as the Canadian Arctic Shelf Exchange Study (CASES) and Canada’s Three Oceans (C3O). Similarly, there are a host of satellite programs of NASA, NOAA, USGS and their international counterparts which come

together in GEOSS but have particular relevance to the U.S. Arctic because of the large number of passes of polar orbiting satellites that cover the region. An additional effort of particular interest that is spinning up is the Arctic System Model<sup>4</sup>. Further, a Science Ice Exercises (SCICEX) Phase II science plan is in review to justify scientific use of submarines in the Arctic, and the periodic Navy ice camps offer excellent opportunities for process studies.

The essential point is that regional and local programs need to be coupled in some fashion to these larger efforts, if for no other reason than that they have major implications for funding and other resources, including the time and attention of investigators. At issue of course is how to keep track of the myriad programs at the agency, national and international level to take advantage of their contributions and leverage them toward attention to or coverage of the Chukchi and Beaufort.

## **5. Organization and Process.**

Three verbs heard frequently at the workshop, in presentations as well as at the action planning session, were ‘collaborate, cooperate, and communicate’. Certainly the recommendations in the action plan draft and this report need leadership and vision to make them happen. What is required to develop a baseline and an accompanying overall plan is a ‘community’ effort, where the term community includes all the stakeholders from villages to federal agencies and industry. The tried and true process for planning systematic, coordinated efforts like those envisaged is to establish an oversight or governance committee where via MOAs the interested parties commit to contribute and monitor progress and share data, plus an overall Scientific Steering Committee to guide the research and monitoring planning, with specific details and plans developed by a series of Working Groups.

Lacking such a structure, we can all meet annually at the Alaska Marine Science Symposium to exchange information, attend topical workshops as they appear to one or more of the agencies to be important to their interests, and hope that some entity with coordination and facilitation as part of its mission helps with collaboration. What’s at stake? In addition to the health of the ecosystem, the Chukchi and Beaufort are critical to the culture and subsistence lifestyle of the local Alaska Native population, the nation’s energy future, and the opportunity to significantly extend the nation’s territory and sovereign rights. It seems to many who attended the workshop that it’s well worth the effort to be serious about carrying out the charge of the workshop to develop “a more comprehensive monitoring and assessment plan, through which each

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<sup>4</sup> see [http://research.iarc.uaf.edu/presentations/ASM\\_08/ASM\\_Science\\_Plan\\_draft\\_02Dec08.doc](http://research.iarc.uaf.edu/presentations/ASM_08/ASM_Science_Plan_draft_02Dec08.doc)

participating organization can focus on projects to meet its particular goals while contributing to a larger data sharing and integration effort”.

My personal view is that AOOS is one entity that could be tasked with coordinating this initiative. AOOS was conceived as an umbrella regional organization to coordinate ocean observing efforts in Alaska’s three LMEs: the Gulf of Alaska, the Bering Sea, and the Arctic (combining the Chukchi and Beaufort LMEs for this purpose). Its Governance Committee has representatives from most of the interested parties, and its national program, IOOS, received authorization in Federal statute this session. AOOS has a significant demonstration project in Prince William Sound, enhances collaboration and data sharing through its web site and AMIS, and supports a number of research and monitoring projects (such as the Bering Sea Integrated Ecosystem Research Program), often in conjunction with the NPRB. Although AOOS currently has limited resources, it may well be the one organization—as the Workshop demonstrated—that has the reach and the structure needed to pull the parties together. The other organization with a broad reach, and significant resources, is the North Pacific Research Board. Coordinating research activities could fall within its scope, although thus far, the NPRB board has not embraced long-term coordination and facilitation activities as part of its mission. There may be other entities that could also take on this coordination role. A final recommendation of this report—implicit if not explicit in the output of action planning session—is that the AOOS and NPRB boards consider taking a larger role in facilitating a coordinated planning effort for the Chukchi and Beaufort Seas as suggested here and during the workshop.

## **6. Can We Pick Up the Pace?**

While there was apparent consensus among workshop participants about – to reiterate - the need for a ‘sound baseline of environmental and ecological conditions on which to base decisions and anticipate impacts’, my sense is that different stakeholders may not necessarily agree either on how complete that baseline needs to be, or on the timeliness with which it is needed. Adding a sense of urgency to this discussion are both the climate change impacts being realized in the arctic, as well as interest by the oil companies and MMS to commence exploratory drilling on their leases as soon as possible. On the other hand, many of the NGOs and area residents may well prefer a moratorium on any increased offshore activity – seismics, drilling, and increases in ship traffic as well as fishing – until the ‘sound baseline’ is exceedingly thorough and our ability to predict change is quite precise. The debates about such differences tend to go on indefinitely, with the decision often left to the courts. Perhaps that’s inevitable, but it may be worth asking if there isn’t some approach which can meet the major concerns of most interested parties, and simultaneously vastly improve our knowledge of some of the most critical parameters.

Let me suggest a straw man which might serve as a starting point for discussion by representatives of different viewpoints, perhaps facilitated by AOOS and NPRB as suggested above. This straw man would not replace a comprehensive Arctic research and monitoring plan, but rather, it would jump start our gathering the needed information to respond to issues generated by possible oil and gas development, and be included as part of a more comprehensive program.

First, let's assume that some of the earlier recommendations are implemented...e.g., AMIS is expanded, the NSSI/AOOS project data base is developed, the syntheses are synthesized, and the oceanographic community starts to develop an AARV campaign plan. It's safe to assume that the major climate research programs will continue, so the needed action there is to ensure that knowledge developed from them is closely followed, and applied in normal planning processes. Together with improved communication and coordination among ongoing research sponsors, these few steps would enhance our ability to sort out priorities. Next, let's try to reach consensus on the most critically important things we need to know in light of current and possible oil and gas activity in the region. I would propose four, and while they need to be more precisely stated, I believe they do cover what the conferees suggested are the major concerns:

- a. What are the patterns of bowhead whale migration and activity from the time they enter the Arctic until they leave – e.g. mean times and paths of spring and fall migration, and activity on summer feeding grounds - in the absence of significant additional offshore activity? What are the affects of noise (both natural and anthropogenic) on these migration paths and activities?
- b. What are the probable trajectories of oil spills from each of the leased sites to shore, during open water; and how would a spill in ice covered waters be handled? Answering this question would require substantial knowledge of ocean circulation and currents throughout the year, which is also crucial to understanding the entire ocean system and its productivity.
- c. What and where are the more critical ecological 'hot spots' that need to be avoided?
- d. Assuming that successful exploratory drilling will lead to multi-year production, what will be the general characteristics of the production platforms at some of the most promising leased sites, and how will the oil be brought ashore or transported to refineries?

The first of these is the central issue for North Slope subsistence users, and bounds on an answer would provide guidance on times and locations where activity should be precluded or minimized. The second provides some assurance that we understand 'worst case' scenarios. The third helps define research priorities and provides guidance for regulation. The fourth will eventually have

to be addressed in detail, but early insight is needed to help all parties understand the implications of successful exploration, which is obviously the intent of the leases in the first place.

How hard might it be to get ‘reasonably bounded’ answers to these questions, and how long might it take? Allowing for some disagreement on what constitutes ‘reasonable’, it seems to me that we already know enough to identify the top several ‘hot spots’; a week-long workshop could develop a list for review by some appropriately knowledgeable and impartial group from the National Research Council. The oil companies should be able to give some basic answers about likely production scenarios, since they must have already given it some considerable thought. Further, while management of spills in ice is admittedly problematic, at least it should be possible to get the responsible parties (including Coast Guard) to state what they would do if one did occur, and perhaps even run a couple of drills to help enlighten opportunities for improvement.

Field programs are certainly needed to address the issues of whale activity and spill trajectories. Whale activity and migration patterns are best studied with a combination of acoustics and tags. A coordinated, multi-agency plus industry program could be developed to place acoustic sensors across the Beaufort and Chukchi, instead of focusing on localized activity around a few select sites. The acoustic technology is available and has been demonstrated – as has the viability and value of tagging with the assistance of the whaling captains. The challenge may be to the research on the key questions. A truly coordinated, area-wide effort, planned by experts in acoustics, may not be much more expensive than the localized efforts that have gone on in the past and seem to be planned for continuation.

Oil spill trajectory estimation would benefit from improved physical oceanographic and meteorological information; again, the technology is available, and the data would be very helpful for a range of other purposes as well. How long would the field program take? Again, a lot depends on how one defines ‘reasonable bounds’, but 2-3 good field years ought to be able to provide some very solid information.

There already is a mechanism or forum available for the sort of coordinated planning that would be needed; it’s called the National Oceanographic Partnership Program. What would be required is a decision that the US Arctic is a priority area for coordinated research.

Moving forward quickly with these suggested actions may not be either easy or complete, but the alternative seems to be a delay of a decade or longer, or hashing it out in court with little more than we already know.

## **Arctic Research and Monitoring**

### ***Draft Action Plan***

***January 23, 2009***

*Note: The concepts included in this draft plan were developed in the discussion segment of the Arctic Research and Monitoring Workshop hosted by the Alaska Ocean Observing System and the North Pacific Research Board in Anchorage January 23, 2009. These ideas were not endorsed by the group as a whole, but rather, are included in this document to promote discussion and further dialogue on how to increase coordination and collaboration among the community of stakeholders interested in Arctic research and monitoring. The presentation segments of the workshop were attended by approximately 140 people. About 75 people attended the action discussion segment.*

#### **Data management**

- Project Tracking Database
  - AMIS & NSSI efforts are merging
  - Circulate format, get additional input
  - How to organize – what key words, trophic levels, GIS based?
    - Make key words simple. - Consider adding field of “end user” and field for data center repository.
    - Look to NASA GCM global dictionary for key words.
  - How to keep up to date?
    - Have annual call for projects to submit into AMIS.
    - Use 2 entry points: distributed (seamlessly tie into large agency project databases) and individual submission.
    - Great Lakes International Commission – good model. Email reply when you submit.
  - Metadata – any issues?
  - Data
    - Sharing among parties – MOAs; high level agreement; what types of data, scales, timelines?
    - Have major AK data committees meet to ensure coordination, collaboration, interoperability
    - Data mining \$\$ is critical
    - Need for statewide data archive?
    - Most end users want information products, and those that are species specific.
  - Coordinating the data coordination
    - Proliferation of data bases, role of NODC? AOOS? AON’s CADIS?

#### **Logistics**

- Sharing ship time, cruises
- Who take lead?
  - Need plan for funding, maintenance
- Website to post opportunities
  - yes, good outreach tool to communities

- Ice breakers
  - lag time for requesting ship time; no cruise lists due to security; check AICC website (per Carin); ice flow web (Coast Guard & UNOLS)
- Industry vessels
  - need early coordination. Key is personal contacts/relationships.
  - Check out ARMAP – NSF website – maintained by CH2MHill – Polar Sea
  - NOAA ship trackers
- Share UAS, submersible, gliders, other?
  - How to influence design of moorings to add additional sensors
- Use ArcticInfo to advertise opportunities; MARMAM (?) other list servs? ArcticNet (Canada); ARCUS maintained Directory of Arctic Researchers
- Coordinate community outreach activities? Lead?
- Website with community contacts/Native organizations.
- Post pertinent research protocols. Hire regional liaisons.
- Use EPA's IGAP program – they look for new tasks; training. Not all tribes have IGAP
- Highlight best practices
- Alaska Beluga Whale Commission successful: continuity, accountability, can make decisions & focus priorities
- How to make contact with tribe, city, and Native corporation?
- Information transfer
- Meeting schedules on Arctic issues to increase cross-communication & overall project awareness in communities
- Consider changing AMSS week to avoid conflict with Arctic Frontiers week
- MMS considering incorporating Information Transfer Meetings (ITMs) to merge with AMSS
- What about Arctic Observing Network and other Arctic meetings?
- How to keep state of information up to date? Annual meeting? How to add international component?

### **Follow-up road map**

- Workshop report
  - Synthesis summary
  - Follow-up action items
  - Additional review steps?
- Next steps
  - MOAs?
  - Draft “umbrella” Arctic strategy
  - Committee to keep on planning strategies to address gaps? Who take lead?
  - Follow-up workshop(s)
  - How to incorporate “State of Arctic” and “State of Sea Ice” initiatives
  - Advocate for requirement of publication to have a “data accession number”.

## Synthesis & gap analysis

- Develop an overall Arctic research and monitoring plan
  - Robert Suydam (North Slope Borough) – this could be one of the best things to happen for the region
  - Use Hopcroft report as start. Include gray literature reports at ARLIS.
  - Brendan Kelly (NSF) – start w/SEARCH plan & others
  - Define user needs & integrative structure
  - Use final, peer reviewed publication data.
  - How to incorporate current & planned projects?
  - What about historical data?
  - Can we define set of common information goals? Can we agree on what is a gap?
  - Define key geographic areas (if any); key processes to be investigated based on needs/wants; key temporal coverage
  - Data gaps are in the eye of the beholder, can be based on policy needs, regulation & permit needs, overall scientific understanding
- Key themes that arose from presentations
  - Sea ice, weather, acoustics (noise), bathymetry, species of primary interest
- Geographic gaps
  - Beaufort & Chukchi – repeat OCSEAP cross shelf transects, would give 30 year comparison
  - Nearshore bathymetry, shore to 20 miles out
- Temporal gaps
  - winter & year round observations
- Trophic level gaps
  - Water & air quality ground & across Beaufort & Chukchi seas
  - AON marine – mainly physical, need more bio & chemical sensors; add acoustic recorders
  - currents under ice/broken ice and throughout water column
  - tide data
  - ocean acidification
- Trophic level gaps
  - Function & change of social-ecological systems
  - Human dimension studies
  - Animal adaptation: molecular, chemical/physical
  - Overwintering mechanisms – little known
  - How do processes scale with change in temperature?
  - Ecological adaptations: we focus on potential declines, but many species will adapt, but how?
  - Population level – need to know food, migration



## Arctic Research and Monitoring Workshop

### Agenda

Friday, January 23, 2009

Hotel Captain Cook, Anchorage, Alaska

#### Purpose

The goal of this workshop is to share information and promote collaboration among the many entities with increasing activities in marine research and monitoring in the region, including the oil and gas industry, local, state, and federal agencies, and non-governmental and academic organizations. The workshop will include panel discussions of data user and provider issues and needs in the region. This workshop is an initial step toward a longer term development of a more comprehensive monitoring and assessment plan, through which each participating organization can focus on projects to meet its particular goals while contributing to a larger data sharing and integration effort.

#### Desired Outcomes

- Development of a searchable database of current Arctic research projects
- A geographic depiction of where projects are occurring
- Synthesis of Arctic syntheses
- Preliminary Identification of gaps and needs in Arctic research and monitoring
- Strategies for further coordination and collaboration
- Workshop report that will go out for additional review and input and will then be submitted for consideration by a number of entities: NSSI, NPRB, AOOS, etc.

8-8:05 am Welcome, introduction to workshop, purpose, desired outcomes – Molly McCammon

8:05-10:15 am Arctic research programmatic summaries: Who's doing what where

#### Broad mission programs

Alaska Ocean Observing System – Molly McCammon (5 min)

North Pacific Research Board – Francis Wiese (5 min)

US Arctic Research Commission – Michele Longo Eder (5 min)

North Slope Science Initiative – John Payne (5 min)

#### State and local agencies

Alaska Department of Fish & Game – Lori Quakenbush (10 min)

North Slope Borough – Cheryl Rosa (10 min)

Alaska Department of Environmental Conservation – Doug Dasher (5 min)

Federal agencies

Minerals Management Service – Dee Williams (15 min)

USGS – Mark Shasby (10 min)

US Fish and Wildlife Service – Doug Burn (10 min)

NOAA – Amy Holman (10 min)

National Science Foundation – Alison York, ARCUS (10 min)

Oil & Gas Industry

BP – Diane Sanzone (10 min)

Conoco-Phillips – Caryn Rea (10 min)

Shell – Michael Macrander (10 min)

**10:15–10:30 am Break**

10:30 am – 12:00 Arctic data user and provider issues & needs. 5 min presentations, then discussion. Each panel approx 30 min. Facilitated by Henry Huntington.

Resource manager panel:

USFWS: Doug Burn

NOAA: Bill Wilson, NPFMC

ADF&G: Lori Quakenbush

ADEC: Doug Dasher

US Coast Guard: CDR Shane Montoya

Industry panel:

Oil and gas: Sami Glascott, AOGA

Shipping: Bruce Harland, Crowley

Commercial fisheries: Bill Wilson, NPFMC

Large mines: (Helvi Sandvik invited)

NGO/Community/subsistence panel:

North Slope Borough: Robert Suydam

Barrow subsistence user: Billy Adams

Eskimo Walrus Commission: Vera Metcalf

The Nature Conservancy: Steve MacLean

**12 – 1:00 pm Lunch provided**

1:00 – 2:30 pm Synthesis presentations analysis of what’s been done (past synthesis reports, existing resources), what folks are proposing, preliminary identification of big gaps. Facilitated by Dr. Craig Dorman

Dr. Russ Hopcroft (marine ecosystem) – 30 min

Dr. John Walsh (climate, weather) – 15 min

Dr. Henry Huntington (LTK, socio-economic, human dimension) – 15 min

Facilitated discussion – 30 min

**2:30 – 3 pm  
afternoon** **Adjourn to Quarter Deck (10<sup>th</sup> floor, Tower 1) for break and remainder of**

3-5 pm Action group: Where do go from here; what are big gaps & needs. Develop action plan. Facilitated by Francis Wiese and Molly McCammon

## Participant List

First	Last	Organization
Billy	Adams	
Maggie	Ahmaogak	Ahmaogak & Assoc.
Robyn	Angliss	NOAA
Carin	Ashjian	WHOI
Michael	Baffrey	DOI
Amy	Blanchard	UAF
Justin	Blank	CPAI
Brian	Bornhold	Coastal and Oceans
Melanie	Brown	NOAA
Jay	Brueggeman	Canyon Creek Consulting
Doug	Burn	USFWS
John	Calder	NOAA
Michael	Cameron	NOAA
Judy	Caminer	NPS
Robert	Campbell	
Scott	Carr	JASCO
Laura	Chartier	TNC
David	Christie	UAF
Janet	Clarke	SAIC
Mary	Cody	MMS
Heather	Collins-Ballot	Conoco-Phillips
John	Cologgi	Conoco-Phillips
Cathy	Coon	MMS
Lee	Cooper	Univ of Maryland
Amalie	Couvillon	The Nature Conservancy
Cleve	Cowles	MMS
Doug	Dasher	ADEC
Randall	Davis	
Robert	Day	ABR, Inc.
Nora	Deans	AOOS/NPRB
Deborah	Dennis	Cornell Lab of Ornithology
Nancy	Deschu	MMS
Craig	Dorman	
Ken	Dunton	University of Texas
Gregory	Durell	Batelle
Michele	Eder	Arctic Research Commission
Cindy	Eick	ConocoPhillips
Lisa	Eisner	NOAA
Kenneth	Eisses	USACOE
Betsy	Elkinton	Sidwell Friends School
Dick	Feely	NOAA
Megan	Ferguson	NOAA
Dale	Funk	LGL Alaska
Adrian	Gall	ABR, Inc.
Allison	Gaylord	BAID
Alison	Gaylord	Nuna Technologies
Craig	George	North Slope Borough
Mike	Gill	Environment Canada

<b>First</b>	<b>Last</b>	<b>Organization</b>
Sami	Glascott	AOGA
Kim	Goetz	NOAA
John	Goll	MMS
Steve	Grabacki	Graystar
Jesse	Grunblatt	GINA/NSSI
Jesse	Grunblatt	GINA/NSSI
David	Hannay	JASCO
Lynne	Harden	UC Santa Cruz
Meg	Harden	Chapel Hill, NC
Bruce	Harland	Crowley
John	Harper	Coastal & Ocean Resources
Ian	Hartwell	NOAA
Tom	Heinrichs	GINA
Brenda	Holden	Information Insights
Brenda	Holladay	UAF
Amy	Holman	NOAA
Russ	Hopcroft	UAF
Warren	Horowitz	MMS
Henry	Huntington	
Kaili	Jackson	NOAA
Carliane	Johnson (report)	Environmental Consulting
Brendan	Kelly	NSF
Bill	Kopplin	
Bill	Koski	LGL
Kathy	Kuletz	USFWS
Jana	Lage	ASRC
Denny	Lassuy	NSSI
Greg	LeBeau	Alaska Maritime
Dick	Lefebvre	ADNR
Julie	Lina	Pioneer
Libby	Logerwell	NOAA
Andres	Lopez (report)	UAF
Steve	MacLean	TNC
Michael	Macrander	Shell
Ellen	Martinson	NOAA
Molly	McCammon	AOOS
Colleen	McCarthy	Conoco-Phillips
Rosa	Meehan	USFWS
Vera	Metcalf	Eskimo Walrus Commission
Julie	Mocklin	NOAA
Charles	Monnett	MMS
Shane	Montoya	USCG
Sue	Moore	NOAA
Phil	Mundy (report)	NOAA
John	Nelson	Univ of Victoria
Tom	Newberry	MMS
Jennifer	Nielsen	USGS
Karen	Oakley	USGS
Steve	Okkonen	UAF
Gleb	Pantelev	IARC

<b>First</b>	<b>Last</b>	<b>Organization</b>
Sandra	Parker-Stetter	Univ of Washington
John	Payne	NSSI
Lori	Polasek	UAF & ASLC
Pam	Pope	BP
Jackie	Poston	ADEC
Dick	Prentki	MMS
Lori	Quakenbush	ADF&G
Caryn	Rea	ConocoPhillips
Tom	Reuter	Alaska Maritime
Jennifer	Reynolds	
Theodore	Rockwell	EPA
Cheryl	Rosa	North Slope Borough
Dave	Roseneau	USFWS
David	Rugh	NOAA whale surveys
Diane	Sanzone	BP
Susan	Saupe	CIRCAC
Kate	Savage	NOAA
Danielle	Savarese	LGL
Mark	Savoie	Kinnetic Labs
Stan	Senner	Audubon
Mark	Shasby	USGS
Gay	Sheffield	ADF&G
Jeff	Short	Oceana
Bob	Small	ADF&G
Melanie	Smith	Audubon
Brad	Smith	NMFS
Kate	Stafford	Applied Physics Lab UW
Quentin	Stedman	
Dale	Stotts	UIC Oil Field Services
Bill	Streever	BP
Robert	Suydam	North Slope Borough
Laura	Thomas	Iilisagvik College, Barrow
Saree	Timmons	ADNR
Dick	Tremaine	NSEDC
Tatyana	Venegas	BP
Vanessa	von Biela	USGS
John	Walsh	UAF
Kate	Wedemeyer	MMS
Erling	Westlien	Shell
Terry	Whitledge	UAF
Francis	Wiese	NPRB
Dee	Williams	MMS
Jerry	Wilson	Fugro Pelagos, Inc
Fred	Wilson	
Bill	Wilson	NPFMC
Sheyna	Wisdom	URS Corp
Alison	York	ARCUS