Arctic Observatory & Knowledge Hub (A-OK) Workshop Summary

JULY 23, 2015

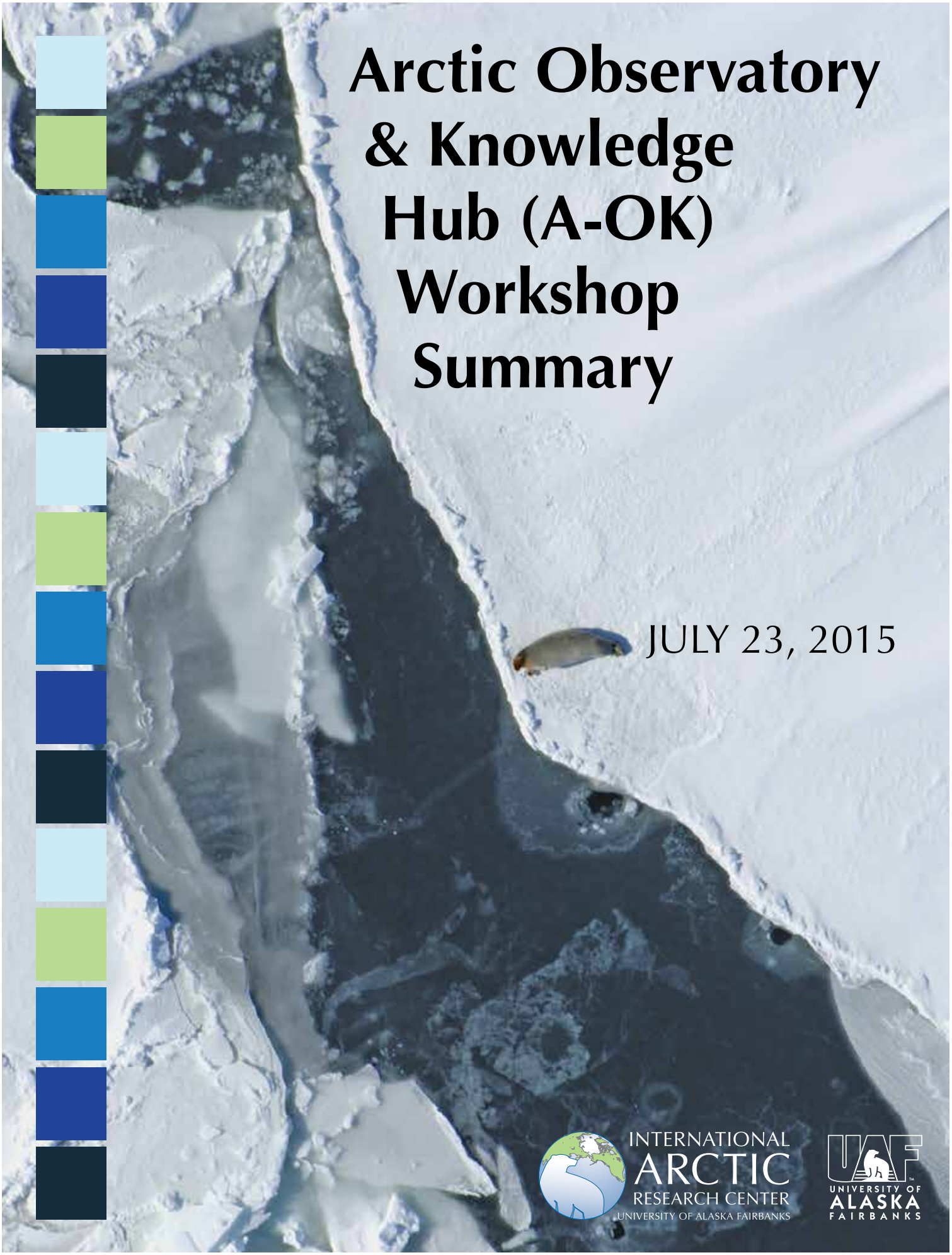

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Photo: ARCUS

Introduction

In December 2014 the University of Alaska Fairbanks (UAF) along with several other organizations received community service payments made by a corporate defendant convicted of federal environmental and maritime crimes. This support allowed for the creation of the Alaska Observatory and Knowledge Hub (A-OK). A-OK is meant to support information exchange and environmental observations by Iñupiaq experts in coastal communities.

The A-OK planning workshop was hosted by the International Arctic Research Center (IARC) at UAF as the first step in obtaining input and guidance from community and organizational leaders in Alaska's coastal Arctic about what specifically A-OK should focus on. Concerns and ideas identified during the workshop will become the starting point for developing specific goals and objectives for the A-OK project.

Tentative goals of the A-OK project identified prior to the planning workshop included, 1) expanding current community-based observing efforts to further support the integration of local knowledge in climate change observing networks (with changing permafrost, snow and ice as a center of attention) and 2) developing a collaborative framework among communities, organizations, and researchers that link scientific data with local and traditional knowledge in ways that might support North Slope communities in climate change adaptation.

Detailed projects objectives of the A-OK project had not been identified prior to the planning workshop in an effort to provide adequate flexibility in shaping the direction and focus on the project to fit the concerns of North Slope communities.

Focus questions for the A-OK planning workshop that guided the discussion and presentations included:

- How can the A-OK project strengthen and sustain an Iñupiaq snow & ice experts observing network?
- What key community concerns or hazards related to changes in snow, sea ice, permafrost or lake & river ice conditions should the A-OK project address such as impact on food security, access to subsistence resources, safety, etc.?
- Which of these identified concerns or hazards can be measured through the deployment of measuring packets to community snow and ice experts and users?
- How can the information that is collected and shared contribute to emergency response and search & rescue efforts?

Photo: Tohru Saito

Summary of workshop program

Forty participants attended the morning and afternoon sessions of the A-OK planning workshop. The morning session included a series of presentations from the North Slope Borough Department of Wildlife Management (NSB DWM) University of Alaska Fairbanks (UAF) researchers, and from agencies and researchers involved with community based monitoring efforts in the Arctic.

The morning presentations highlighted a range of research efforts and projects where community based observations or local knowledge are an integral part of the information that is produced. These presentations provided a context for the type of efforts that A-OK might be best positioned to expand, partner with or develop. A full transcript of the morning and afternoon presentations and discussions is included in Appendix A.

While initial discussions focused on concerns related to changes in snow, sea ice, permafrost or lake & river ice, it became clear that it was changes in the seasonal cycle that have been the most impactful in maintaining a subsistence way of life for communities. With freeze-up occurring consistently later and ice melting faster and earlier than in the past, the timing of annual events has changed. Several workshop participants noted that by the time they were able to travel on rivers and lakes to access fishing cabins the fish had already spawned. Also noted was sea ice that seems to be thinner each year it has been necessary to seal hunt earlier. Unpredictable ice conditions have also increased safety concerns for those traveling on the ice.

> *Freeze up is coming later and melting earlier, in between the ice is more difficult to read.*
>
> HARRY BROWER

Understanding what is causing disease and shifting patterns of fish and wildlife important for subsistence was of particular concern. Workshop participants noted that fish mold has appeared in places not

Morning Presentations

Craig George, NSB DWM studies and projects

Robert Suydam, NSB DWM, Shell Baseline Committee projects

Qaiyaan Harcharek, NSB DWM, GPS hunter mapping project

Mark Johnson, UAF, Coastal currents in the Northeaster Chukchi Sea workshops in Barrow and Wainwright

Seth Danielson, UAF, Coastal Community Ocean Observers C2O2

Mette Kaufman, UAF, Seasonal Ice Zone Observing Network SIZONet

Todd Brinkman, UAF, Nuiqsut hunter project

Moses Tcheripanoff, ANTHC, Local Environmental Observer Program

Becki Heim, National Weather Service, Sea Ice for Walrus Outlook

Shari Gearheard, National Snow and Ice Center, Igliniit Project

Ken Dunton, University of Texas, Abundance of lagoon systems from the eastern Beaufort Sea

Molly McCammon, Alaska Ocean Observing System

Don Forbes, Geological Survey of Canada, Circumpolar Arctic Coastal Communities Observatory Network

seen before, and the caribou that have come through recently have carried carrion beetles and tapeworms. Different insect, fish, and wildlife species have been noticed that have not been seen before and the timing of appearance of animals like the polar bear and insects like the mosquito are shifting. In the Northwest Arctic Borough, without adequate snow cover ringed seals have been seen pupping on the ice, which seems to be linked to increased predation.

Another concern highlighted during the workshop was the increasing number of ice cellars that have collapsed or have been flooded. Identifying locations and construction methods for new ice cellars that are less vulnerable to collapse and flooding as well as strategies that keep existing ice cellars cool, is important for food security for individuals and communities in the region.

Conversations among participants highlighted the importance of A-OK developing research priorities that were responsive to community concerns while being aware of avoiding oversaturation from overlapping research initiatives. This led to discussions that considered how A-OK might better facilitate information sharing between existing research projects rather than developing new research. It was recognized that A-OK's potential role as a knowledge hub needs to enter into the planning from the start. As a hub, A-OK would take guidance from communities on relevant knowledge that should be shared and then works to develop ways in which this sharing can be done effectively. Serving as a hub may not only include serving as a knowledge broker but also as a facilitator to help reduce the burden on communities in dealing with information requests and duplication of research activities.

Ice is important for Ugruk hunting. The ice was a lot thinner this past year, so it is necessary to hunt earlier and earlier.

NOAH NAYLOR

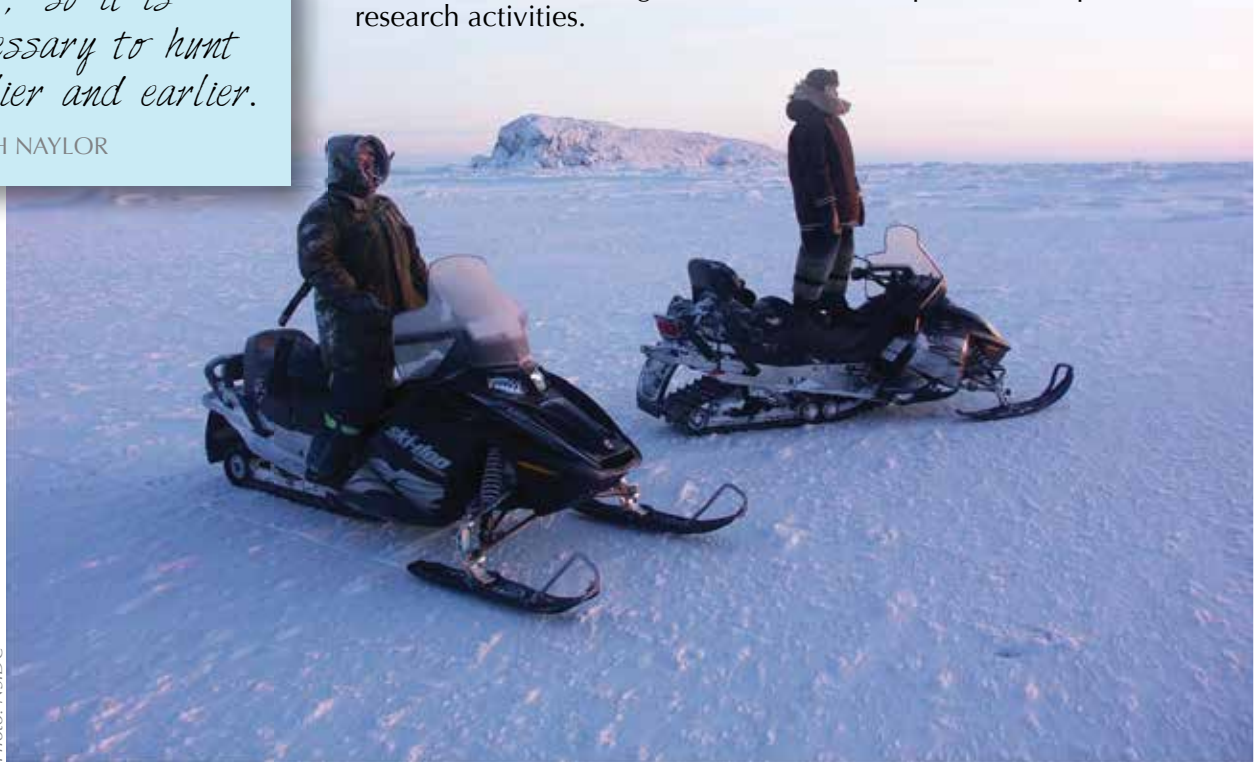


Photo: NSIDC

Can this project find tools that can help us with real problems, what is real about this project? We depend on resources that use the cryosphere, but the cryosphere is too narrow, maybe add something to do with biology? HARRY BROWER

Next Steps

The A-OK planning workshop provided important direction on how the project might focus future efforts. Based on the concerns and suggestions shared during the workshop several project summaries are being developed which will be distributed for feedback and review. The themes currently being developed into project summaries include:

Photo: Tohru Saito

- A seasonal cycle calendar that brings together local observations of change, climate data and other relevant information such as that obtained from remote sensing.
- Ice trails safety project integrating annual measurements of river and lake ice thickness with expanded range of radar imagery.
- Ice cellar information exchange of best practices for building and maintaining ice cellars under different climatic and permafrost conditions.
- Information from community experts and university researchers that can address community concerns on regulation relevant for subsistence harvests.
- Develop an outline of how A-OK would serve as a knowledge hub, gathering and sharing existing knowledge and information that addresses community priorities and concerns
- Changes in the cryosphere and their impact on subsistence species, such as the effects of changing snow conditions on seal health and reproduction.

> *Research that could help explain what is causing problems with subsistence animals would be helpful.* BILLY ADAMS

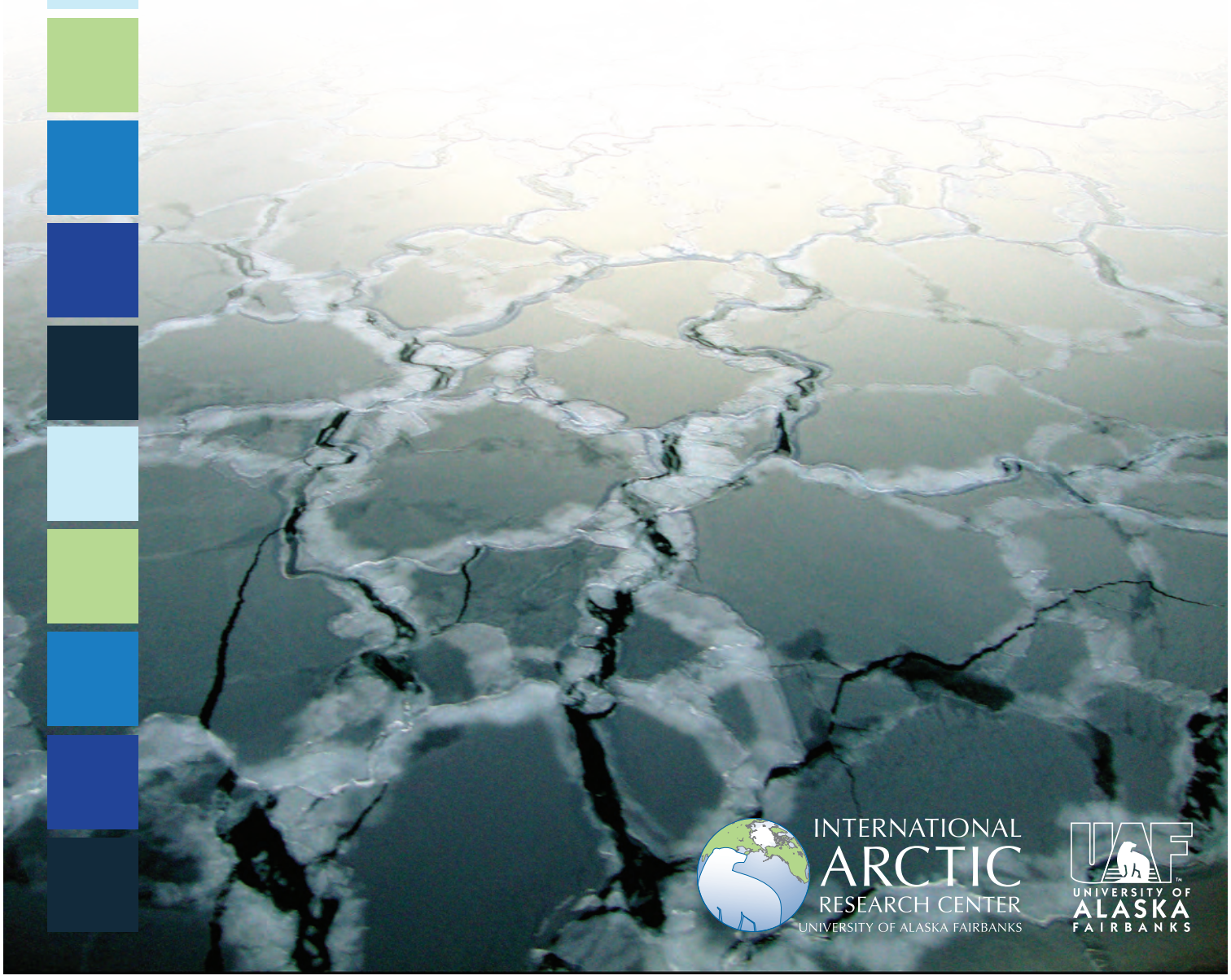
Acknowledgments

Thank you to Henry Huntington, who facilitated the workshop discussions. We also thank Christine Butler, Hajo Eicken, Mette Kauffman and Rebecca Rolph, who served as note-takers. Their notes are collected in the Workshop Transcript (Appendix).

Arctic Observatory & Knowledge Hub (A-OK) Workshop

APPENDIX

Agenda
Participant List
Workshop Transcript



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Alaska Arctic Observatory & Knowledge Hub (A-OK)
Initial Planning Meeting Agenda
IARC Conference Room 401
930 N Koyukuk Drive, Fairbanks AK 99775
July 23, 2015

Meeting purpose is to develop the scope and specific goals of the A-OK project. The project focus is to support community observations and information sharing in a changing cryosphere (sea ice, lake and river ice, snow cover, and permafrost).

9:00	**Welcome**
9:05	**Overview of A-OK** Hajo Eicken
9:20	**Preview of the day** Henry Huntington
9:25	**North Slope Borough Overview of current and related projects** **Qaiyaan Harcharek** Subsistence Research Coordinator for North Slope Borough **Craig George**–Wildlife Biologist for North Slope Borough **Robert Suydam** Wildlife Biologist North Slope Borough
9:55	**Discussion about community interest and priorities**
10:25	**Break**
10:40	**UAF Overview of related projects past and present** *Five-minute presentations each* **Mark Johnson** UAF Professor of Physical Oceanography **Seth Danielson** Research Assistant Professor of Physical Oceanography **Mette Kaufman** UAF Research Technician, Sea Ice Ecology **Todd Brinkman** Assistant Professor of Arctic Biology
11:00	**Questions & Discussion** **Connecting community-based efforts with expertise, capacity, and interest.** *Five-minute presentations each* **Moses Tcheripanoff** ANTHC Local Environmental Observer (LEO) Program Manager **Becki Heim** National Weather Service (NOAA) Sea Ice Forecaster and contributor to the Sea Ice for Walrus Outlook **Shari Gearheard** Research scientist for University of Colorado's National Snow and Ice Data Center **Ken Dunton** University of Texas Professor, Aquatic Plant Ecology, Coastal Ecosystem Processes **Molly McCammon** Executive Director of Alaska Ocean Observing System AOOS **Don Forbes**–Senior Research Scientist, Geological Survey of Canada Circumpolar Arctic Coastal Communities Observatory Network (CACCON)
11:40	**Questions & Discussion**
12:00	**Lunch**
1:00–4:30	**A-OK: How should we begin?** *Group brainstorming, discussion, and prioritization* *Key questions:* Based what you have learned through your work or your personal experience, what key community questions related to changes in the cryosphere (sea ice, snow coverage, river & lake ice, permafrost) should the A-OK project address?
4:30–5:00	**Summary and Wrap-up**: Hajo Eicken - Next steps - Steering Committee - Science lead

Participant List

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Workshop Transcript

A-OK Overview & Introduction

Hajo Eicken, Alaska Arctic Observatory & Knowledge Hub

Eicken provided background information on the funding for the A-OK project and goals of the planning workshop. Funding for A-OK came through the Community Service Payments made by a corporate defendant that was convicted of federal environmental and maritime crimes in December of 2014. The project duration is five years between 2015–2020. Eicken summarized initial goals of the A-OK project which might shape the direction that the A-OK project could take which included supporting community-based observations of the cryosphere, developing a cooperative framework for sustained observations, and providing scientific datasets of importance to communities.

Workshop Presentation Summaries

North Slope Borough Department of Wildlife

Craig George, Wildlife Biologist for North Slope Borough

George summarized the compilation of work he has been involved with over the past 35 years and highlighted which studies and records have proven significant over the long-term. Many years of bowhead abundance work meant spending a lot of time learning from the elders, and working with communities on the North Slope. Over the past 30 years there has been a noticeable warming trend corroborated by the freeze up and break up dates. Fall fishing has a later start and earlier finish and the whales are coming earlier. George noted a strong correlation between wind speed and east wind direction and harvest success, and almost perfect match between when sea birds lay their first eggs and snow melt and emphasized keeping records of everything especially Local and Traditional knowledge, you never know what you will discover. Things that George has found to be useful and worth continued investment are SAR maps of ice trails, ice radar.

Robert Suydam, Wildlife Biologist for North Slope Borough

Suydam emphasized the importance of focusing research on what communities' are interested in. Focusing research on topics related to subsistence is important to ensure that the research is relevant to community concerns. If the research focus is on ice, it should focus on how ice affects access or how it affects access to subsistence species. For example, based on the reasoning that ringed seal need deformation of sea ice, formation of ice, and sufficient snow cover, the Fish and Wildlife Service justifies the restriction of ringed seal take. This would be a useful and relevant area of research.

Qaiyaan Harcharek, Subsistence Research Coordinator for North Slope Borough

Harcharek discussed working with North Slope hunters to document the subsistence harvest and tracking the subsistence use areas. Currently Harcharek is working with 34 hunters that are primarily based in the Barrow area. Hunters participating in the project use GPS tracks to record their trails. Special consideration is given in how the data is used. The primary purpose for the records being to protect the subsistence areas that are heavily used from future oil and gas development. Roughly 94,000 miles have been recorded. Along with the GPS logs, hunters sometimes record specific observations such as wind speed, temperature, and snow condition although this information is irregularly captured.

UAF overview of related projects past and present

Mark Johnson, UAF Professor of Physical Oceanography

Johnson provided an overview of workshops held in Barrow and Wainwright that focused on sea ice and currents of the Chukchi Coast. One of the outcomes

of the workshop was a list of recommendations for agencies. Johnson emphasized that the collaborative learning process took a tremendous amount of pre-planning and time to ensure that the right people were in the room. Listening attentively, and keeping in mind the language differences was important to ensure the right understanding came across. Having specific questions prepared beforehand was helpful as well as long-term communication.

Seth Danielson*, Research Assistant Professor of Physical Oceanography*

Danielson summarized the Coastal Community Ocean Observer C2o2 program facilitates the collection of oceanographic measurements for long term monitoring of environmental conditions. Currently Old Harbor, St. Paul Island, and Kaktovik are all participating communities. Philosophy of C2o2 is to collect scientifically valuable data in a consistent, simple manner that taken by anyone and can be compared between multiple locations that is consistent with GAK-1. Danielson noted the importance community input in guiding the sample, keeping the science flexible enough to address ideas and concerns, and to compensate partners and communities for their time and effort. Returning the data to the community through school visits and public presentations is also very important. Danielson recommended ensuring that the benefits of research were coordinated to minimize oversaturation (science fatigue), not to underestimate the time commitment that is needed, and to remain adaptable.

Mette Kaufman, UAF Research Technician, Sea Ice Observing Network (SIZONet)

Since 2006 there have been over 5,000 observation reports that focus primarily on sea ice conditions, events and hazards. All observations are coded and stored and protected through Exchange for Local Observations and Knowledge of the Arctic (ELOKA). In addition to observation photos can be stored and video capability will be added in the future. Kaufman highlighted the importance of community observations in guiding research questions, design, and field research, also emphasizing the importance of finding easy to use, responsive, and fun methods for sharing and disseminating data and information.

Todd Brinkman*, Assistant Professor of Arctic Biology*

Brinkman provided an overview of his research in Wainwright and Kaktovik that looks at the effects of climate change on subsistence. While it was found that climate change impacted abundance, what was significant was the impact of climate change on access to subsistence resources. This has lead to a second project in partnership with the community of Nuiqsut. Hunters participating in the research project take GPS units with cameras and record disturbances that are affecting access. The photo logs, become an important reference for areas of concern. Local knowledge together with scientific data is a pretty powerful resource.

Karen Brewster, Oral Historian

Brewster highlighted Project Jukebox that records oral history, specifically the Northern Alaska Sea Ice Project that records stories and narratives about changes in ice conditions. Transcripts date back to the early as 1970's and provide context for the changes that people are seeing.

Connecting community-based efforts with expertise, capacity, and interest

Moses Tcheripanoff , ANTHC Local Environmental Observer (LEO) Program Manager

Over 200 communities are participating in the ANTHC LEO program. The program has recently expanded beyond Alaska and now includes observations from communities in Canada. Information that is collected about climate change, things like observations of new species, and occurrences of extreme weather events such as flooding, fire, and drought that affect food and water security. The LEO database is a clearinghouse of community observations that can help raise questions that are important for mitigation and community adaptation. It is also has become a valuable communication tool for communities and is used for. The Environmental Protection Agency, Indian General Assistance Program is an important element in keeping the LEO program sustainable.

Becki Heim*, National Weather Service (NOAA) Sea Ice Forecaster and contributor to the Sea Ice for Walrus Outlook (SIWO)*

SIWO began in 2010 as an activity of the SEARCH Sea Ice Outlook. SIWO is a resource for Alaska Native subsistence hunters and others that are interested in sea ice. Through SIWO, weekly reports are generated April through June that describe sea ice conditions and stability that are relevant to walrus in the northern Bering Sea and southern Chukchi Sea. SIWO focuses on weather forecasting for a 1-10 day time frame that looks at wind direction and speed, sea ice location, and if pieces of ice are colliding or breaking off from shore fast ice. Magnified satellite images of sea ice are also sometimes included. There are three zoomed in forecasts for Bering Strait, St. Lawrence Island, and Wales to Shishmaref. In addition to the forecasting tools are observations, photos, and comments from coastal communities that combined, create the Sea Ice for Walrus Outlook.

Shari Gearheard, Research scientist for University of Colorado's National Snow and Ice Data Center

Gearheard provided an overview of research she has been involved with from her home base in Clyde River, Baffin Island. Through the Igliniit Project, Inukitut computers that record weather and include GPS units travel with hunters in dog sleds recording changes in the landscape. The weather monitoring is compared with traditional weather forecasting. Gearheard emphasized that communities are doing a lot of interesting things and research and that it's important that these efforts are supported. It's important to consider what community based means, and that it is not just community placed. Supporting communities means thinking of funding, technology, and services. Projects like ELOKA provide data management services for local community knowledge and custom platforms for sharing knowledge.

Ken Dunton*, University of Texas Professor, Aquatic Plant Ecology, Coastal Ecosystem Processes*

Dunton's research focuses on the changing physical dynamics and biological seasonality of lagoons in the Beaufort Sea, and the linkages to food webs and carbon resources. Questions considered as part of this research include the effects of rapid coastal erosion and temperature changes that are impacting biological environments. Biological environments which impact the subsistence resources those communities are reliant on. Much of the research's success has been due to local knowledge provided through people like Robert Thompson from Kaktovik, and focusing on questions that are important to people. Involving high school and middle school students also has been an important part of Dunton's research.

Molly McCammon, Executive Director of Alaska Ocean Observing System AOOS

McCammon provided an abbreviated overview AOOS which is national Integrated Ocean Observing System. AOOS maintains a network of coastal observations providing a platform for easy access to information and data through visual platforms built for diverse audiences. One of the primary products of AOOS is the Arctic data portal (STAMP). Other services include facilitation of working groups and the development of stakeholder driven tools like the mobile apps or "lite apps" for those with limited bandwidth.

Don Forbes, Senior Research Scientist, Geological Survey of Canada Circumpolar Arctic Coastal Communities Observatory Network (CACCON)

Forbes provided an overview of CACCON which aims at developing a network of knowledge hubs that facilitates the sharing of solutions oriented knowledge. In building this knowledge hub it's important that it includes appropriate knowledge for decision making, which is achieved by being co-designed and co-produced with the people who can apply information to decision making. The purpose of the knowledge hub is to inform actionable, proactive adaptation policies for Arctic coastal communities. Forbes also highlighted the SmartICE project, which monitors sea ice providing real time information of coastal environments.

Morning Discussion about community interest and priorities

Harry Brower — Freeze up is coming later and melting is coming earlier. In between is the reaction of the freeze up, the ice is hard to read, and melts very rapidly. Access to hunting places is very limited in spring and fall and are at different time s then they used to be. It was always possible to rely fish during times of famine we could always fish. But now, we can't ice fish when we used to be able to, but they time the ice is thick enough the spawn has already happened and they're not as good which has major affects on our ability to get to these animals.

Qaiyaan Harcharek — Ice fishing used to begin between September 12-16, now we're lucky to start in October. By the time the river is safe the fish have already spawned.

Willard Neakok — I started noticing small changes over the years, freeze up coming later, the fish are coming at the wrong time, the time that we go to our fishing cabins is later. In 1998 people would leave for their fishing cabins in late August or early September, now it is as late as the end of November beginning of December. The sea ice has changed too it's thinner and melts a lot faster. We are seeing many changes but we are adaptable. Maybe the earth will fix itself, but what information could we provide using this project to help us with adaptations?

Harry Brower — We have to be resilient and adaptable to adjust to changes that we are seeing throughout the whole year. We have to change our lifestyle so that we can be sustainable for the whole year. With the current way regulations are imposed on us it is not possible to conduct hunting and subsistence activities in a changing environment. To be successful in this lifetime we have to change, it's like our freezer has been unplugged. We need to have good storage to have our food throughout the whole year. Our ice cellars are no longer working. New technologies are having to be used and thought put into how to keep the ground frozen to keep our resources frozen. It costs money, and we need money to keep ourselves going, this is different than how it used to be.

Lewis Brower — What do I think we need? Food costs are so high in rural communities. Focusing on alternative fuel sources and travel methods that use less fuel. It costs money to go hunting, a lot of fuel is needed. How much fuel did hunters take on these long treks that we have heard about today? It is well over a thousand dollars in gas to go hunting. Technology is improving but also is expensive. Is there a way to provide something that would fix this? Fuel is a large concern of mine. The oil industry probably doesn't want to hear this, but we need to envision new ways of doing things, and quickly make them available and affordable to hunters. Hover boards maybe?

Noah Naylor — Ice is really important for ugruk hunting. This year the ice was a lot thinner and the wind pushed a lot of the ice in our area resulting in ridges during freeze-up and the outer ice took off so less ice was available to hunt on. We are having to hunt earlier and earlier.

Austin Ahmasuk — Dramatic changes seem to have started in the early 70s. Willows are now intruding into the area bring with them different animals like beaver. We recently had the first reported case of beaver fever in our region. Now the shore fast ice has little or no snow. Ringed seals are pupping on the snow-free ice which makes them vulnerable to predation. There are different migration patterns, for example walrus came in the later part of May, which was very unusual. We are getting used to the frequent changes.

Lee Kayotuk — There is lots of erosion happening in my area (Kaktovik). Permafrost is melting and the ocean is just wiping the north of the island out. The storms are so bad that we're lucky no one has died. People got scared. Climate change is severe, and scary. We are seeing ice melting, boating season is a week early. It's been difficult to get waterfowl because we can't access the areas they're located. The water channels are closed off [from bank erosion] and so we can't access them anymore. We camp and hunt in certain places. We don't have snow in the mountains anymore, we have been changing how we cool the snow machines, before we could

just run them into the snow to cool them off. We have also been seeing mosquitoes in May which is very unusual. There are crevices on the island, we can also see where the tundra has dropped. We can't use our ice cellars anymore because they're flooded, we have had to make new ones and use other things to keep food cool.

Afternoon Discussion

Billy Adams — Scientists can get information for all the wrong reasons. Sometimes information that is gathered is used against us. I was invited to speak at a conference, but animal rights people stopped the discussion as soon as I started talking. The health of the animals are there, its' the timing that is changing. I started doing observations for Hajo and this spring was very different. The waves came through the ice in June rather than August, mosquitoes are gone already when they should be coming out right now. The autumn colors already changing. The caribou came very early, people are hunting seals before the blanket toss, which we used to do after the blanket toss. We had caribou come by last month with carrion beetles and tapeworms. Fish mold appeared in places that it hasn't been before. We had to remove parts of the animals. I don't like to waste food. There are only a few of us here that represent thousands of others. It is difficult to represent everyone. I just try to live a simple life but when something changes around me, I have got to speak up. It's important not to change the context of remarks made in this meeting. Maybe think of research that could help explain to local residents what is causing problems with subsistence animals might be helpful.

Henry Huntington — With the afternoon session we should think about A-OK in terms of stories instead of data or specific observations. What are the things that are affecting people such as loss of life through the ice and not being able to fish until after the fish have spawned? People and animals are used to adjusting, what information can let people do what they need to do more safely and effectively? What story should we tell and how should we tell it?

- What's the story?
- What do we know?
- Who can fill in the story and how?
- How do we tell the story and spark a conversation with different audiences?
- Is the story important to communities?

Willard Neakok — There are different wildlife coming into our area that we've never seen before. What is this from, warmer air and water temperatures? I saw a ribbon seal, black cormorant, and various insects that are new to the area. Is climate change destroying the waters?

Robert Suydam — A-OK seems to be really focused on snow and ice, but creating a project that has the flexibility to look into changes in biology that are happening because of changes in snow and ice might be more appropriate. We need to look at how this research benefits the community and what are important questions for researchers as well so the project is sustainable.

Ted Rockwell — How can we tell a joint story, not just from a single perspective?

Harry Brower — What is the end goal of this project? It needs definitions of what you want to accomplish. Focusing on the cryosphere seems too narrow, we depend on resources that use the cryosphere, so maybe biology is something that we need to add to the project. The ice cellars are thawing, that's a real problem. There is moisture and water no matter how often you clean it out, it's still useless. Can we find tools that would help these real problems? Always observations, observations, observations, we need real problem solving. If we keep increasing the amount of research we have, to what end? What about the impact of research on resources? Maybe narrow the scope. What information am I going to bring back to the community? You need better definitions if you want the communities to be involved.

Henry Huntington — At this point A-OK is seeking input.

Kenji Yoshikawa — Currently we are looking at permafrost in 200 communities around Alaska, Canada, and Russia. We are expanding and testing thermistors on ice cellars. We have gathered a lot of information on different ways to construct ice cellars, but the challenge is trying to share this infor-

mation among different places in different locations. Different locations have different ice cellar designs. Some regions are having to make new ones, and it would be good to share how to keep cellars frozen, maybe this could be a possibility for this project, sharing local knowledge of ice cellar design.

Billy Adams — I'm satisfied with how the conversation is going now, science takes a while to catch up with the word, that's how it works, but its good to talk about what different places are doing and how they do things differently. Local observations are different from technology — I found ice that doesn't show up in the radar images that Molly was showing me from 13 miles out a few weeks ago. We need to makes sure we're not considering only technology and not local observations, you shouldn't make regulations without seeing and knowing what is actually out there. Some agencies will only use satellite images saying that there is no ice, and not allow us to hunt. It seems there is both good research and not so good research based on how data is collected. Sometimes how data is collected can change the results.

Molly McCammon — When I think if sustainability I think if funding for 20 to 30 years, would it be easier to think of shorter term issues and attempting to solve shorter term things as we go. Maybe it's not the stories, but the decisions made because of the stories that is what is really valuable from observations that are from a shorter period of time. It might be an easier way to look at it.

Ted Rockwell — Observations should be applicable across knowledge types, it should be an example that covers many disciplines. It could inform a hydrologist as wells as those studying the cryosphere.

Craig George — I think the problem should drive the knowledge. Identify the problem, then figure out the research. Sea ice safety is always an issue, what can we do to help make accidents happen less. There are lots of calls for where the sea ice is, maybe real time SAR imagery, better weather prediction that specifically address the issues that repeatedly pop up. The thaw depth is becoming a serious problem house pilings are failing. State the problem and then design the questions that need to be asked.

Matthew Barkdull — What makes A-OK different, what's it's philosophy? If we could narrow it down to what it is and what it isn't that would be helpful. Perhaps using large scale stories can be the starting point and from there design more specific projects to solve the issues.

Hajo Eicken — We want to enough focus that the project is doable, but we also want to make sure it is relevant. I think we are on the right track in talking about the broader context and teasing out what seems most relevant to communities. Potentially A-OK could be able to make more of a difference if we focus on tying together existing research rather than doing more research.

Mark Johnson – I propose we focus the project by taking measurements of lakes and lagoons when they freeze and thaw. We can relate the dates of the freeze thaw with other parts of the seasonal cycle and when subsistence activities occur.

Lewis Brower — There are big seasonal change in coastal ice, some of the most dynamic ice conditions are in Barrow. No two seasons are the same. It's important to look at how we are going to hunt. What is worrisome is the man made freshwater discharge from the lagoons into the rivers which speeds up the breakup in spring and makes the ice conditions more unstable and dangerous. The water is released in the middle of the hunt. How we hunt on the sea ice now is not the way it used to be. We used to be able to wait until specific types of whales came to us, now sometimes we have to go them or we see different things are what is right in front of us. We used to be able to get 4-5 bearded seals, this year we only got one with ice less persistent. I have 6 ice cellars within 80 miles of Barrow, I am aware of two ice cellars collapsing. High river water flooded twice in two years at Chip 9. If you want to do research on cellars, don't make the soundings near the cellars to measure permafrost because the water will seep in and eventually flood the cellar ruining it.

Moses Tcheripanoff — In asking what the story is I think number one is food and water security. It is the most important story. There has already been a lot of research done to answer questions about what we know or need to know. Maybe having a town -hall meeting to bring a community together

for conversation from different audiences on what story is important to tell. ANTHC has done a ice cellar project using glycol. Look it up on the ANTHC website, **www.anthc.org/chs/ces/climate/bbs/climateandhealthreports.cfm**

Becki Heim — One idea is to set up a timeline for each community to show when different things are happening such as when certain animals show up, when the ice goes out, things that could be compared. Then once a year have a meeting with all the communities and a few scientist to look at the storyline and the patterns that are emerging.

Billy Adams — In April one spring, the shore fast ice broke off. The webcam and radar were really helpful in the rescue. You could see where the people were even though the weather wouldn't allow a visual or immediate rescue. I wonder if that radar could have an expanded range, maybe from Pt. Barrow to Monument? There are several areas that are just outside of the range that are important for hunting.

Sarah Bartholow — It's important to think about how to tell a story that sparks conversation, this process itself can be a model of how to have a conversation around the problem definition. My audience is youth, I want to be able to share information that is important, making it available. The technology will change for how information is shared in the future, so it's important to think about the message or conversations that you want people to be having in 10-15 years.

Lee Kayotuk — We have ice conditions that are thawing so fast that we don't see white anymore, it skips right to blue. Polar bears are coming in much earlier to Kaktovik. Mid August rather than September because there is no ice to get a ride on shore.

Karen Brewster — There seems to be a disconnect between stories that I am hearing in communities and the research that is being done. How is just doing observations going to help communities? What do communities want from researchers that would be useful? Communities can already see that changes are happening, what could the research community give back that would be helpful for adaptation?

Harry Brower — How can you bring information for example thermosyphons back to communities. How do you install them, is this a good option for communities? There are concerns about costs associated with maintaining a piece of equipment like this .

Lewis Brower — Karen said something that perked my ears, what are my options from research organizations, what are the options you can give to my community? Options are good.

Ice Cellar Story

What's the story?

Kenji Yoshikawa — North Slope Borough permafrost is colder than other places. Learning from communities that have warmer permafrost about how they keep their cellars from falling in and flooding could be helpful. Communication will help solve challenges.

Billy Adams — Cellars need to be completely emptied and cleaned out in fall. The whale during the fall hunt comes to you when you make a clean place for it to rest.

Harry Brower — Climate change just keeps going, people cause this, how do we change this problem?

Lewis Brower — Ice cellars are used to age the whale at a specific temperature to get a preferred taste. It improves meat quality, tastes better. The majority of the elders we feed it to can tell by looking at it and at first taste, what the quality is. I have never seen my dad mix whale and fish, or whale and walrus. Only the meat my dad puts in with the whales is caribou meat. There are different cellars for fish.

Billy Adams – How much we can tackle? All around homes are falling into the ocean. No snow on the ice, seals are born on the ice, very important things. Happening very fast.

What do we know? What's missing?

Matthew Sturm — We don't know a lot about the permafrost. Is the problem one big problem or a series of individual problems? Are they all threatened by the same thing? Is the permafrost there the same thing? Is it salt-water inundation, or just melting?

Henry Huntington — What do they do in different places? How do thermosiphons work? Where is Barrow's situation compared to other villages?

Harry Brower — Ice cellar placement is important. Ice wedges, next to lakes, where permafrost is very deep. Every place is different. Storing ice blocks of ice from winter to keep cellar floor frozen is important.

Harry Brower — What's real about this discussion? Can we look forward to something we can value? What's missing? What's been missing from previous information? Communication is lacking. It's a good idea to bring into the school system to get information back and forth. Prepare kids to go from grade school to high school. Will this be a program or a project? A program goes on and on and a project has an end.

Henry Huntington — That's a good point, accountability is important.

Kenji Yoshikawa — In Barrow there is a lot of brine in permafrost. You also have to consider ice logistics, is it easy to dig? Contraction cracks in winter leads to water in cellar, the same thing happens in Wainwright.

Joe Leavitt — Brine is coming in so people are using pea gravel. Most of the cellars close to the beach are filling up right to the pea gravel. Cellar on high ground are better.

Seth Danielson — Maybe we can use the science to anticipate where good locations for ice cellars might be in the future.

Austin Ahmasuk — I have heard the term "rapid change" used throughout the day. The speed of winter into summer is changing very quickly and has implications for physical and biological consequences. Don't be overconfident that you can predict good sites in 10 years … it might be closer to 2–5 years as rapidly as things are changing.

Information sharing & communication tools

Moses Tcheripanoff — How do we tell story and how to spark conversation? Social media is a powerful tool. Community to community conversation as well as sharing research with communities is important.

Sarah Bartholow — Instead of defining what the opportunities are, what's important is helping youth engage in a project that will allow them to utilize whatever tools are available to them at a future time. Engaged kids will find the opportunities.

Henry to Harry — You've said this is a good start but more conversation needs to take place in Barrow and other villages?

Harry Brower — A program is long term, a project has an end point. How much information do we need, how will it benefit community? Pt. Lay is talking about having to move … that should be part of this discussion.

Henry Huntington — Those of you with the baseline studies program. Do you feel like you have ownership of that program? If so, how did that happen?

Lewis Brower — Social media is powerful form of communication. How do you give it to the community, how do you give ownership?

Olivia Lee — How to get communities more interested, take ownership, and contribute? Make the topic and presentation inspiring and focused on what is important! Photos can be a good tool.

Austin Ahmasuk — Most successful partnerships have been when there is full disclosure and active participation.

Sarah Bartholow — Maybe we need a new community made up of both sides with equal ownership. Consider using tools like those developed through the University of Kansas, Community Toolbox.

Seth Danielson — We as researchers can't say what's important—but we can provide useful returns and use the science to help anticipate where the good places for cellars in the future are. We could provide information because rapid changes are happening. Not only is the season coming earlier, but it's changing from one to the other rapidly which affects the harvesting.

Moses Tcheripanoff — To researchers: be personable rather than more technical. You'll get more interest.

Next Steps

Hajo Eicken — In the next two to three months we will take what we have heard today and turn it into half a dozen or so projects that will include a brief outline of how it might look. This will provide an opportunity for people to comment, and help guide how it should go. We may want to share these outlines by possibly visiting communities and online. We have heard that it's important for us to figure out a way to share what is already going on in research with communities and what is already out there that is relevant from a research and community perspective.

These are projects that have a five-year lifetime, but hopefully there will be an opportunity to turn existing projects that are related to what we've talked about into programs that are turned into things that are driven by communities. We would like to tie into existing frameworks to see how we can build something that is more sustainable but can be adaptable over time.

I strongly encourage you to share any input so that we can take our next steps.