



International Community-Based Environmental Observation Alliance for the Arctic Observing Network

# Bering Sea Sub-Network

Sharing Knowledge – Improving Understanding

## Pilot Phase Final Report

CAFF Monitoring Series Report Nr. 2



ARCTIC COUNCIL



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The **Bering Sea Sub-Network: International Community-Based Environmental Observation Alliance for the Arctic Observing Network**, known as BSSN, is a 2008–09 International Polar Year project implemented by the Aleut International Association in collaboration with the University of Alaska, United Nations Environment Programme/GRID-Arendal and Alaska Native Science Commission under the auspices of the Conservation of Arctic Flora and Fauna working group of the Arctic Council. BSSN is funded by the United States National Science Foundation under the Cooperative Agreement ARC – 0634079. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF)



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# 1. Executive Summary



## 1.1 Background

The Bering Sea Sub-Network: International Community-Based Environmental Observation Alliance for the Arctic Observing Network, known as BSSN, is a 2008-09 International Polar Year project implemented by the Aleut International Association in collaboration with the University of Alaska, United Nations Environment Programme – Global Resource Databank Arendal and the Alaska Native Science Commission under the auspices of the Conservation of Arctic Flora and Fauna working group of the Arctic Council. BSSN is funded by the United States National Science Foundation under the Cooperative Agreement ARC – 0634079 and 0856774. The project began as a pilot in 2007 (Phase I) and received an award for a five-year continuation in 2009 (Phase II).

This report provides an overview of the BSSN concept, its history, and the pilot project results. It informs the broader community of scientists, governments, and Arctic residents about the project's findings and shares the lessons learned.

## 1.2 Project History

The first concept of a community-based monitoring net-

1. The Arctic Council (AC) is an international, intergovernmental circumpolar organization with eight member states (Canada, Denmark, Finland, Iceland, Norway, Russian Federation, Sweden, and the United States) and six Indigenous Peoples' organizations, which are known as Permanent Participants (The Aleut International Association (AIA), The Athabaskan Arctic Council (AAC), the Gwich'in Council International (GCI), the Inuit Circumpolar Council (ICC), the Russian Association of Indigenous Peoples of the North (RAIPON), and the Saami Council (SC). The Arctic Council provides a mechanism to address common concerns and challenges faced by Arctic residents through scientific research, program implementation, and the development of policy recommendations.

work developed by the Aleut International Association in 2003-2004 was in response to the findings of the Arctic Climate Impact Assessment (ACIA), 2004, an Arctic Council report highlighting environmental changes occurring as a result of climate change. A key ACIA recommendation for future Arctic research was the improvement of long-term monitoring, extending it to year-round data collection and expanding it spatially (Hassol 2004, p. 122).

ACIA was also one of the first significant scientific reports that included observations of local and indigenous peoples, as case studies, to support and enhance scientific findings and to understand the impacts of climate change on a more personal level (Huntington and Fox 2005). A striking convergence of community-based observations with scientific data helped validate local observations and elevated them from "anecdotal evidence", a term commonly applied to identify such information in scientific research, to indispensable building blocks of a holistic understanding of the Arctic environment (Gofman 2009, 2010). However, case studies can only convey personal perspectives. They may provide the basis for discussion and scientific inquiry, but they do not provide aggregate statistics or general trends (Huntington and Fox 2005). The BSSN pilot was designed to test methods that could produce aggregated statistics and general trends.

This work led to an increased interest in local knowledge and community-based monitoring that was amplified even more during the International Polar Year 2007-2008. The Aleut International Association recognized this tremendous opportunity and developed a concept that evolved into the Bering Sea Sub-Network: International Community-Based Environmental Observation Alliance, which IPY 2007-2008 Joint Committee endorsed, along with several other innovative projects in this field, and the U.S. National Science Foundations funded in 2007. The Arctic Council also welcomed BSSN, and it was included in the project portfolio of the Conservation of Flora and Fauna working group.

Coastal villages representing six indigenous cultures: three in the Russian Federation (Kanchalan — Chukchi, Tymlat — Koryak, and Nikolskoye — Western Aleut/Unangas) and three in the United States (Gambell — St. Lawrence Island Yupik, Togiak — Central Yup'ik, and Sand Point — Eastern Aleut/Unangan) formed the network.

All villages, except Tymlat, have seen a substantial in-

terest from the research community in the recent years (See Appendix 2.), which suggests that scientists have a growing concern over the changes occurring in the environment thus posing risks to areas of cultural significance and rich biodiversity (Grebmeier, 2006). Improving the understanding of the processes occurring in this region is crucial to sustainable resource stewardship and the wellbeing of local communities (ARCUS 2008).

## 1.3 BSSN Purpose

The overall goal of the Bering Sea Sub Network (BSSN) is to advance knowledge of the environmental changes that are of significance to understanding pan-arctic processes thereby enabling scientists, arctic communities and governments to predict, plan and respond to these changes. This may also help to enhance community resilience under conditions of rapid environmental and social change (Alessa et al 2007).

This project created a structured framework that provides the means for the systematic collection of information about the environmental and socioeconomic conditions based on the perceptions of local residents. The network also provides for the efficient management of data gathered from community-based observations.

The pilot phase demonstrated that such an international network of indigenous communities can be organized and can produce usable data sets based on local observations.

## 1.4 Brief outline of project activities

While the grant period began in 2007, the initial project activities took place in 2005 and 2006. Two international workshops were organized in Anchorage for representatives of several Bering Sea communities with the purpose of identifying potential project goals (2005), the scope of work and participating communities (2006). This pre-grant time work was particularly valuable because it provided a venue for communities to express their opinions on what should be monitored and where. In addition, early community involvement in the project led to stronger connections and mutual respect between researchers and the residents of the villages.

The first project year (June 2007 – May 2008) involved extensive travel to the participating villages and included meetings with individuals and communities involved in BSSN, efforts to establish and formalize international partnerships, and the development of the survey instrument that was designed utilizing sociological methods, drawing in particular on cognitive interviewing techniques. The BSSN team developed a uniform protocol for interviewing residents in all participating villages about their observations of environmental conditions and marine resources vital for subsistence. Local resi-

dents were hired to conduct interviews and were trained in the interviewing methods and techniques.

In the second project year (June 2008 – August 2009), the expanded BSSN team, which grew to nearly 20 researchers, coordinators, and assistants, was busy interviewing hunters and fishermen and processing the collected data. Despite extensive preparation activities, not all nuances of working in remote villages could have been predicted, and a fair amount of troubleshooting was required. In some villages, additional training of newly hired research assistants was arranged, in others – project management needed adjustments. These issues were successfully resolved thanks to extensive support from BSSN villages' leaders and local partners.

## 1.5 Project Data

Over 600 interviews were conducted in six villages. Approximately 300 hunters and fishermen participated. This information was organized in two data sets using broadly available software: NVivo 8 for the qualitative data and SPSS 16 for the quantitative data. Both data bases are stored at the BSSN Secretariat co-located with the Aleut International Association office in Anchorage and are available at [www.bssn.net](http://www.bssn.net) for other users.

The BSSN research team and community representatives discussed data ownership issues at length. While it is possible to have a distributed database with individual community data stored at the villages, it was recognized that most of them do not have capacities to maintain such data bases. Until such capacities are developed, the BSSN communities agreed to keep all project data at a centralized place, the BSSN Secretariat, while preserving appropriate data ownership rights.

These pilot data are not statistically representative of the participating communities and should be approached with caution when attempting to draw conclusions or to interpret meaning, and while this may be considered a limitation of their use, these findings do point to some compelling trends that need to be investigated further in Phase II of this project and other research.

The BSSN research team recognizes the challenges of assuring reliability and credibility of the data based solely on human observations that are inherently subjective and biased (Shiffman et al 1997). This should not preclude from using the wealth of collective memory of humans in the Arctic that holds information about past environmental conditions that extends beyond the knowledge acquired by science in recent decades. By using a combination of survey methods, such as cognitive interviewing techniques, standard semi-structured questionnaires, and increasing sample sizes, it is possible to successfully extrapolate objective information from what people can remember and recall. Local resi-

dents observing their environment on a regular basis are capable of detecting events indicating that the system is operating unusually (Dasgupta and Attoch-Okine 1997).

1.6 Summary of selected survey results

Although the analyzed sample size is not sufficient to be called representative, it is larger than many similar social science studies in which only a few residents have been interviewed. The research in BSSN pilot yielded compelling findings. The BSSN community in this survey is represented by 246 people, the gender of participants is balanced with over 65 percent male and almost 35 percent female. The majority has lived in the area for more than 30 years (over 70%). Over 42 percent have also harvested in the same area for more than 30 years. Thus the majority of participants have accumulated several decades of observations of the local environment and harvests.

The survey section about the environment asks questions about observations of meteorological, geophysical, and oceanographic conditions. In respect to important subsistence species, the survey captures information on a number of them, such as bowhead whale (*Balaena mysticeti*), walrus (*Odobenus rosmarus*), seal (families *Phocidae* & *Otariidae*), emperor geese (*Chen canagica*), silver salmon (*Oncorhynchus kisutch*), red salmon (*Oncorhynchus nerka*), pink salmon (*Oncorhynchus gorbuscha*), arctic char (*Salvelinus alpinus*), pacific cod (*Gadus macrocephalus*), halibut (*Hippoglossus pleuronectidae*), plaice (*Pleuronectes quadrituberculatus*), Atka mackerel (*Pleurogrammus monopterygius*), smelt (*Thaleichthys pacificus*), broad whitefish (*Coregonus nasus*), arctic grayling (*Thymallus arcticus*), trout (family *Salmoninae*), and pike (*Esox Lucius*).

These species are essential for subsistence in many Bering Sea villages. Some are indicators of the status and trends of ecosystem change, e.g., harbor seal, fur seal, and bearded seal, (Hare and Mantua 2000; Livingstone et al 2005). Many of them, such as pink salmon, are also important commercial species. An increasing competition for such species, coupled with environmental changes, may have a negative impact on communities that depend on the marine biological resources for their well being and survival. The study participants showed a serious concern for the health of the sea and the fish, and they shared their observations in considerable detail. One person concludes, “The sea is sick, and the fish are sick, too”, stressing the interrelation between habitat and species.

The survey instrument consists of two questionnaires that contain close-ended, open-ended and multiple-choice questions and that allows ample room for additional comments. These comments add specific context for statistics that may improve understanding and visualization of the gathered data by researchers and potential user. The voices of local hunters and fishermen add a human dimension to the results of the survey.

1.7 Observed Trends

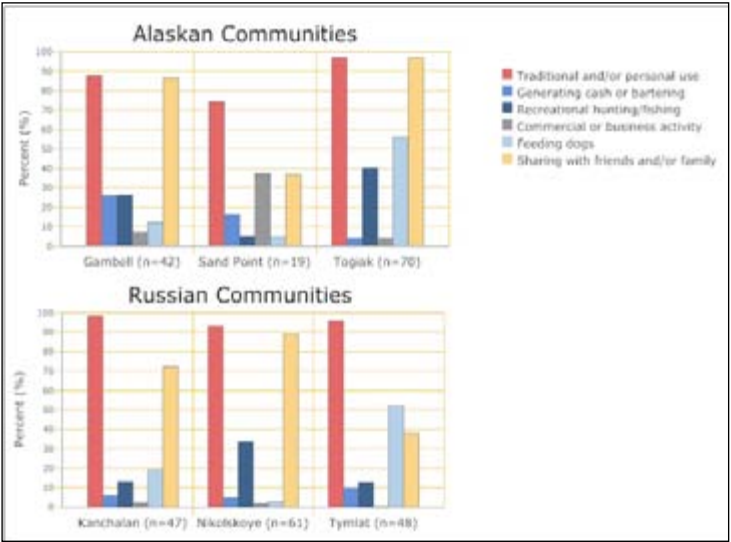
Socio-economic importance of fishing and hunting for the wellbeing of residents

The pattern of harvest use is very uniform in all communities (See Figure 1.) Traditional and personal uses, including sharing, are the primary use in all communities. This pattern reconfirms the fact that coastal communities depend on the Bering Sea’s bio resources for providing food to their families. The results clearly point to the importance of biological resources for coastal villages as a matter of food security.

Changes observed in environmental conditions

The survey participants shared their observations about the status and changes in environmental, seasonal, and meteorological conditions (See Figure 2), the so called

Figure 1. Socio-economic importance of fishing and hunting for wellbeing of residents.

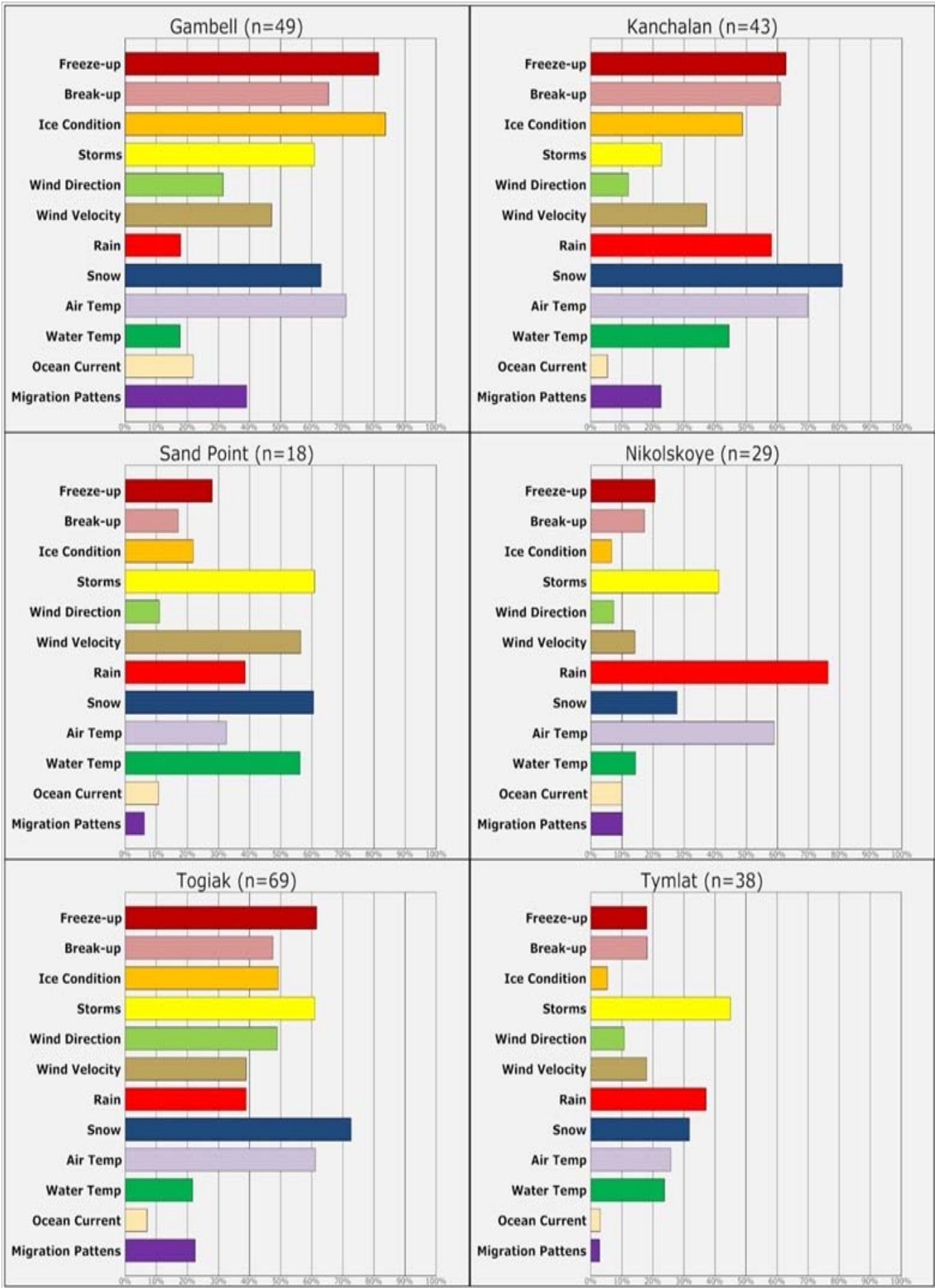


“markers of climate change”. Based on the limited pilot data, no clear trends showing consistent change of any parameter could be identified, but there appeared to be

a trend towards increasing variability in response. There was also a clear difference in the frequency of changes observed in the sea-ice dependent communities, such as Gambell, in comparison with non-ice dependent communities, such as Tymlat. The perceptions of local residents reflected in their comments provided during the interview support this statement. A Gambell resident, for example, points out that “There is less ice each year and it is getting thinner. It comes very late, and goes really early in the spring. Weather conditions have changed too. We used to have northerly winds. Now, in that season, we get more southerly wind. The wind is stronger and changes all the time. I’ve never seen this before in my life.”

Conditions of harvested species

Figure 2. Observed changes in environmental conditions.





A summary of the significant observations with respect to animal conditions and harvests shows that the Russian communities report high incidences of disease in fish (See Figure 3). The most significant observations point to a high rate of disease in red salmon and pacific cod in Nikolskoye, whitefish and chum salmon in Kanchalan, and pink salmon in Tymlat.

The reported conditions are evidence of fish hit by sludge ice, and common occurrences of sores, ulcers, spots, worm infestations and unusually small fish with abnormal reproductive organs.

The Alaskan participating communities highlight the changes in abundance of harvested species and sightings of rare or new species. In Gambell, hunters report observing the decline of seal and walrus harvests, as well as marine mammals being farther out. The appearance of white king salmon is also noted. In Sand Point, fishermen see more whales and even the mating of humpback whales. Togiak residents report fewer trout, smelt and ptarmigan.

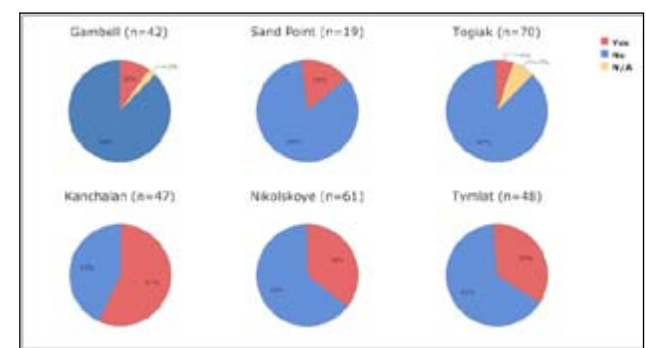


Figure 3. Percentage of respondents stating the previous harvest contained any fish or animal with visible disease

## 1.8 Conclusion

The Bering Sea Sub Network is intended as a mechanism for gathering data. While documenting status and change is a crucial task in its own right, it is necessary that potential users apply the data in further research and resource management. BSSN is community-based, and it strives to serve the member-communities by providing them with additional tools to undertake much needed planning for adaptation to life in a changing social and natural environment.

As a network, BSSN encourages cultural connections between groups of people who have diverse cultures, but share similar concerns. It builds a sense of collective stewardship of the common region. "It does not matter if we're Russian or American; we are part of a family that lives off the same resource, and we simply have to cooperate," said Svetlana Petrosyan, BSSN Community

Research Assistant (CRA) from Tymlat.

It would be challenging to find better words to express what BSSN means to the communities than what BSSN Community Research Assistants say about the project. Below are key points that BSSN CRAs made at the workshop concluding the pilot phase of BSSN in August of 2009 in Anchorage, Alaska, U.S.

### Capturing traditional knowledge from Elders

Esther Fayer, CRA and BSSN Steering Committee Member from Togiak, talks about the elder whose photo was taken during the interview, "We just lost him this past spring. He went out hunting with his son, and his son's snow machine made it across the river but the old man did not and went through the ice, he has not been found to this day. He was an elder, and he understood the ice, but things are changing, and he was lost. That was hard for me, but that is our everyday life." Capturing traditional knowledge during the BSSN interview with that Elder now takes on a momentous meaning.



Esther Fayer & Olia Sutton Interview Togiak Elder George Smith Sr

Her colleague in Togiak, Olia Sutton, continues, "Our elders were hesitant at first, they wondered why we were doing this [interviewing] and they held back. It is hard for elders to open up, but when they understood what we were trying to do and that we wanted to know about changes in the climate and environment, they would get interested, sometimes the interviews would go on for more than an hour. It is a two-way street for me: I learn from them and they learn from me. My grandma taught me, and the interviewee teaches me something new." Svetlana Petrosyan, CRA, Tymlat, was surprised to learn so much during her interviews: "I find it amazing that I've learned some things I never knew before, like how to fish in the dark, you cannot see the line, but you can feel it!"

### Using indigenous languages

Most of the interviews in Togiak and many in Gambell, Alaska, U.S., were conducted in their native tongues, Central Yup'ik and St. Laurence Island Yupik. This presents both challenges and opportunities. Antonia Penayah, CRA from Gambell, draws attention to the importance of accurate translation. She says, "Another factor we have to deal with is translations, in my language it is easy to get lost, some words have a dual meaning, and some do not have any English meaning." Olia Sutton who is a strong supporter of using indigenous languages, gives another excellent reason why it is essential: "I like to interview in my Yup'ik language because then it comes from my heart."

### Identifying problems that require rapid response

Olga Gerasimova, Ph.D., a Russian biologist who led the study in Chukotka, notes that "Many people are noticing that the ice is breaking earlier and developing later, and people have noticed lower levels in the rivers and lakes along with more weeds or water plants in the river. Also, the water is more turbid and some fishermen are saying that the main channel is changing. All of that is leading to a change in the fish species observed: there are more pike and sometimes the chum salmon do not come at all. The most troubling development is that a lot of fish that go up the rivers to feed in the lakes cannot leave the lakes because the water level is too low. When the winter comes they die. Also there have been a lot of diseased fish observed, some people say this is because of the mining which is taking place up the river." As a biologist, Olga would like to see local government taking immediate actions, such as taking water samples, to address these problems: "In a way, it was really hard to interview people because I wanted to take action right away and try to find solutions to these problems and even thought about taking samples of water and fish."

### Bringing people from different communities together to learn from each other

Iver Campbell, CRA and BSSN Steering Committee Member from Gambell, is especially grateful about the opportunities that the project provides for learning about what other communities observe: "I think this project is very important because it allows us to be in touch with other partner communities, even the ones in Russia." Arlene Gundersen, BSSN Steering Committee Member from Sand Point, says: "For us, observations begin at home. People who go out hunting and fishing have the knowledge to understand the conditions at any given time, and so we learn about changes in the environment from the people who are out in it. I've learned like this from my father, like about passes where boats used to be able to go through, but cannot any more. Getting people together to talk about these things is an excellent way to record the knowledge of the community and finding about things that are happening can lead to action."

### Raising awareness about the value of traditional ways of life

Revitalization of traditional ways of life is crucial for improving stewardship of the environment. Svetlana Petrosyan emphasizes this idea in her comments: "This project is very interesting, but also very difficult because you cannot expect people to provide answers immediately. You have to be patient and establish trust. Now people in the village like the project, and they want to know how to deal with our government to help preserve our traditional ways of life. Most respondents have similar values to share: live in agreement with your environment; do not take more than you need from the land. Despite the difficult economy in Russia, especially in our region, people still want to live in the traditional ways."

### Documenting the importance of the marine biological resources for food security of the coastal communities

Having access to sufficient subsistence resources is vital for all communities, but some depend on them to a greater degree than others. Iver Campbell reminds that "Jobs are very scarce in Gambell, and so we mostly hunt for marine mammals, with a little bit of fishing. When most city people go grocery shopping they get a week's worth of food, but when we are subsistence hunting we're trying to get food for a whole year."

### Witnessing change: providing valuable observations about the environment

The need to document observations about the environment was one of the drivers for the development of BSSN. The gathered information shows a detailed account of what people are witnessing. Not all communities appear to be experiencing the same rate of change. Gambell is one place where rapid change is occurring. Iver Campbell describes what people observe there: "Now we've been noticing things like the winds changing, we used to have consistent winds from the North or Northeast, but now we get South winds all the time. In Gambell, even when our elders are not harvesters anymore they still play in a big role in hunting. They observe the weather and ice, so if there is a storm coming or the ice is changing they can call the hunters on the radio and tell them. We also have travelers who talk about the changes they see around the island. For instance, people have told me about new plants they've observed for the first time recently. There are so many things on our island that we can use to observe changes, like the way the birds fly to a different place before the weather changes. We are witnessing global changes now. Maybe we cannot stop it, but maybe we can slow it down, and interviewing people helps us to learn about these



changes in the environment.”

Antonia Penayah is also concerned about the changes: “Talking to our hunters and elders has made me realize that we live on the edge every day and people want to talk about what they’ve seen so we’re finding out lots of information about hunting and weather changes. I do not know if we can stop these changes that are happening in the environment, but maybe what we’re doing can make a difference.”

It is likely that climate change will result in both risk and opportunity for Arctic residents. Potential risks include a reduction in summer sea ice that might threaten several ice-dependent species, including seals and walrus, not to mention the humans that depend upon them. Opportunities include better access to marine resources, potential opening of the Arctic for year-round shipping, and shifts in populations of species that could present new economic opportunities. (ACIA, 2004, AMSA 2009). This new paradigm requires arctic communities to have the means to communicate their knowledge and concerns to scientists, policy makers, and the public. BSSN provides such an opportunity, and this may increase a com-

munity’s ability to prepare and plan for the occurring and future changes, thus leading to better adaptability and resilience. BSSN is not a circumpolar project, but the sheer diversity of participants, the range of the collected data, and a multidisciplinary approach make this model replicable and potentially useful in other regions. While many other studies in the region used similar methods (See Appendix 2), the model designed for BSSN may present a better opportunity for creating a systematic observatory and generating new knowledge. This assumption will have to be proven in the upcoming project years.

In the next five years, BSSN will be expanded to include other communities. The established network may become a springboard for many other research activities in the region and may provide a framework for other regional networks. Developing collaborative relationships with other initiatives will be critical to the future sustainability of BSSN. By creating an organized community-based monitoring network, BSSN will ultimately serve as a valuable partner in the international effort to expand integrated observations in the Arctic.

## 2. Introduction

### 2.1 Background

Indigenous peoples around the Bering Sea region have come together for a project that monitors environmental changes in the region. The Bering Sea Sub-Network (BSSN) provides a mechanism for remote indigenous villages to communicate their observations from their own perspective – a viewpoint that is based on their knowledge and a keen understanding of the local environment – in order to improve management of Bering Sea resources. In addition, BSSN improves our understanding of the social, cultural, and economic impacts of environmental changes on these communities. The project assesses large-scale environmental change and its impact.

The Bering Sea is one of the most productive seas in the world and is of economic importance to both the United States and Russia, but this vast marine ecosystem is experiencing widespread environmental changes – changes that alarm scientists and coastal residents alike. Declines in sea ice extent, the northward movement of southern species, alterations in the distribution and abundance of fish and marine mammals, modified weather patterns, and a myriad of changes to Arctic ecosystems present serious challenges for indigenous peoples.

The health, economic well-being, and ways of life of the indigenous and non-indigenous peoples around the Bering Sea are all inextricably linked to the sea itself and to the natural resources it provides. The socioeconomic development of coastal villages around the Bering Sea depends on maintaining ecologically sustainable conditions in the region.

In 2003, the Aleut International Association (AIA) began exploring the possibility of a network for community-based monitoring in the Arctic. The BSSN concept emerged as a response to the findings of the Arctic Climate Impacts Assessment (ACIA), a report released by the Arctic Council in 2004, which demonstrated a clear need for large-scale networks to record local observations of environmental change. ACIA was also one of the first significant scientific reports that included observations of local and indigenous peoples, as case studies, to support and enhance scientific findings and to give a human face to some of the impacts of climate change (Huntington and Fox 2005). A striking convergence of community-based observations with scientific data helped validate local observations and elevated them from “anecdotal evidence”, a term commonly applied to identifying such information in scientific research, to indispensable building blocks of a holistic understanding of the Arctic environment (Gofman 2009, 2010). However, case studies can only convey personal perspectives. They may provide the basis for discussion and scientific inquiry, but they do not provide aggregate statistics or general trends (Huntington and Fox 2005). The BSSN

pilot was designed to test methods that could produce aggregate statistics and general trends.

The recognition of the validity of local observations that was coupled with the need for on-going monitoring created an excellent opportunity for a surge in interest in various forms of community-based monitoring. The opportunity was amplified by the International Polar Year (IPY) 2007-2008. The Aleut International Association was among the first applicants from the social and human studies field that responded to the call for IPY 2007-2008 projects in winter 2004 and had submitted its concept for an IPY 2007-2008 activity under the name “International Network of Arctic Indigenous Community-Based Environmental Monitoring & Information Stations” to the ICSU Planning Group. That concept was included in the ‘Initial Outline Science Plan’ for IPY 2007-2008 in April 2004 and was received with keen interest. Over the next two years, numerous discussions at workshops, meetings with stakeholders, and consultations with scientists helped refine the concept. That work led to the development of the full proposal, entitled the Bering Sea Sub-Network: International Community-Based Environmental Observation Alliance (BSSN, IPY #247) that became an endorsed IPY 2007-2008 project and was subsequently funded by the U.S. National Science Foundation (NSF) under the Arctic Observing Network (AON) funding initiative.

BSSN became one of the projects in a small group of innovative IPY activities involving indigenous and local residents in Arctic research. It set sail in uncharted waters of community based monitoring along such projects as EALAT (IPY project # 399), MODIL-NAO (IPY project # 47), SIKU (IPY project # 47), and others (See Appendix 2). These projects are science initiatives, and as such, are required to follow clear milestones, guidelines, and established criteria for assessment. The challenge is that none of these are clearly defined for the field commonly called “community-base monitoring”. All projects contribute to local capacity building, resident training, and community empowerment in addressing adaptation to environmental and subsequent socio-economic changes, but the scientific contribution of such projects is more elusive and will require time to evolve.

BSSN has emerged as an observing network that connects people bound by a common geographic area who share similar traditions, values, and ideals. It is devised to gather and record observations regarding Bering Sea marine resources and environmental changes in and around the Bering Sea. It began from six coastal villages representing six indigenous cultures: three in the Russian Federation (Kanchalan — Chukchi, Tymlat — Koryak, and Nikolskoye — Western Aleut/Unangas) and three in the United States (Gambell — St. Laurence Island Yupik, Togiak — Central Yup’ik, and Sand Point—



Gathering dried fish near Tymlat, Russian Federation



Figure 4. Pilot phase communities



Eastern Aleut/Unangan). Several other Alaskan villages will be able to join the network during Phase II that runs from 2009 to 2014.

## 2.2 BSSN member communities

BSSN communities span across the Bering Sea and extend into the upper reaches of the North Pacific.

### Gambell

The village of Gambell is located on the northwest cape of Saint Lawrence Island, at the base of Sevuokuk Mountain. At 58 km (36 miles) from the Chukchi Peninsula in the Russian Far East, this island is nearer to Russia than it is to mainland Alaska. Saint Lawrence Island is about 145 km (90 miles) long and 13–36 km (8–22 miles) wide, and is thought to be a remnant of the Bering Land Bridge.

#### Village facts:

- The population is about 649 (2002 Census), more than 95% Yup'ik (621)
- Residents speak St. Lawrence Island Yupik
- The self-governing authority is the Native Village of Gambell
- Access is by plane and by boat
- The traditional harvest includes bowhead and gray whale, seals, walrus, geese and other birds, and a

small amount of fish.

- St. Lawrence Island has no trees, only the woody Arctic Willow which grow no taller than 30 cm (1 foot) high.
- Sivuqaq is the Yupik name for St. Lawrence Island and for Gambell

### Kanchalan

Kanchalan is located 70 kilometers (45 miles) northwest of the regional capital, Anadyr, in Russia's Far East on the Kanchalan River. The village is in the Chukotsk Autonomous Region of the Russian Federation.

#### Village facts:

- The population is about 635 (2004, source: regional government), more than 90% Chukchi
- The Russian name "Chukchi", which is also the language, comes from the Chukchi word "chauchu" which means, "rich in reindeer"
- The community has a locally elected administrator and is part of the Chukotka Autonomous Okrug
- There are three travel options, helicopter, boat or by caterpillar all-terrain vehicle
- Traditional harvest includes reindeer, fish, birds, marine mammals, berries and mushrooms
- Chukotka's landscape is primarily tundra with some low mountains

### Nikolskoye

The village of Nikolskoye is located in the Kamchatsky Region of the Russian Federation on Bering Island. Bering Island, at 90 kilometers (56 miles) long and 24 kilometers (15 miles) wide, is the largest of the Commander Islands and is located to the east of the Kamchatka Peninsula in the Bering Sea.

#### Village facts:

- The population is about 667 (2008, source: regional government), 300 of them Aleut
- The native language is Western Aleut/Unangas but only a few speakers are left
- Nikolskoye village is the administrative center and the district's only settlement
- Access is by weekly flights between Petropavlovsk-Kamchatsky and Nikolskoye and by boat
- Traditional harvest includes fish, salmon caviar, fur seal, birds and eggs, marine invertebrates, seaweed, and mushrooms
- Aleuts were relocated to the Commander Islands from Atka and Attu in Alaska by the Russian-American Company in the early 19th century to hunt fur seals.
- Nikolskoye has a kindergarten, a school, a district hospital, and a cultural center

### Sand Point

Sand Point is located on the northwest coast of Popof Island. Popof Island is in the Shumagin Island group located south of the Alaska Peninsula and is near the entrance to the Bering Sea. The island is 16 km (10 miles) long, and is 8 km (5 miles) wide.

#### Village facts:

- The population is around 952 (2002 Census), about half of which are Aleut (403).
- The native language is Eastern Aleut/Unangan but there are no fluent speakers left in Sand Point
- Sand Point has an elected city government and is home to 3 tribal organizations, Pauloff Harbor Tribe, Qagan Tayagungin Tribe, and Unga Tribe.
- Access is by air and by boat
- Traditional harvest includes fish, marine mammals, terrestrial mammals, marine invertebrates, birds and eggs, edible plants.
- Qagan Tayagungin is the Aleut name for Sand Point.
- Sand Point has one of the largest commercial fishing fleets in the Aleutians.

### Togiak

Togiak is located 67 miles west of Dillingham at the head of Togiak Bay, and is in the Togiak National Wildlife Refuge- gateway to Walrus Island Game Sanctuary.

#### Village facts:

- The population is around 809 (2002 Census), more than 86% Central Yup'ik (698).
- The predominant language spoken is Central Yup'ik
- Togiak has an elected city government as well as a Tribal Traditional Council
- Access is primarily by air.
- Traditional harvest includes salmon, herring, herring roe, seal, sea lion, walrus and whale.
- 48 marine and terrestrial mammal species and more than 150,000 caribou from two herds inhabit the Togiak Refuge.

### Tymlat

Tymlat is located in the Russian Far East on the Tymlat River that flows into the Bering Sea. The village is in the Koryak Autonomous Okrug in the Karaginskiy District of the Kamchatka Region of the Russian Federation.

#### Village facts:

- Tymlat's population is around 874 (2008, source: regional government), about 70% Koryak
- The native language is Koryak with very few speakers left
- The local government consists of an elected village administrator who oversees small staff.
- Access is by air or boat; in the winter the village can also be accessed by dogsled.
- Traditional harvest includes salmon, navaga - a member of the cod family, herring, caviar, reindeer, marine mammals
- Kamchatka's climate ranges from temperate to sub-arctic



Fishing on Bering Island, Russian Federation



## 2.3 Research Team

The BSSN research team is comprised of more than 20 people, representing academia, non-profit organizations, and local communities. This collaboration made BSSN a reality.

### Principals



**Victoria Gofman**  
Aleut International Association, Anchorage, U.S. (Principle Investigator)  
victoriag@alaska.net

Ms. Gofman is the Executive Director of the Aleut International Association (AIA). In addition to her administrative responsibilities, she leads the development of research projects and AIA's representation in the Arctic Council, where AIA is a permanent participant. Over the years, she has contributed to the major Arctic Council reports, such as the Arctic Climate Impact Assessment (2004), the Arctic Human Development Report (2004), and the Arctic Marine Shipping Assessment (2009). She is actively involved in the conceptual development of the community-based monitoring in the Arctic under the auspices of the Arctic Council working groups. Her work in the Conservation of Arctic Flora and Fauna working group lead to the development of the Community-Based Monitoring Hand Book: Lessons from the Arctic and beyond, which is currently in print. She was a strong supporter of the inclusion of human dimensions and especially indigenous peoples in the International Polar Year (2007-08). She holds a Master's Degree in Education and Linguistics from the Pedagogical University of Khabarovsk, Russia.



**Patricia Cochran**  
Alaska Native Science Commission, Anchorage, U.S. (Co-Principle Investigator)  
pcochran@aknsc.org

Ms. Cochran was born and raised in traditional Inupiat ways in Nome, Alaska. She served as Chair of the Inuit Circumpolar Council, and she also served as Chair of the Indigenous Peoples' Secretariat to the Arctic Council. Ms. Cochran is the Executive Director of the Alaska Native Science Commission, a non-profit organization created to bring together research and science in partnership with Alaska Native communi-

ties.

Ms. Cochran has served earlier as Principal Investigator or Co-Principal Investigator on numerous projects throughout the Arctic, including the Survey of Living Conditions in the Arctic, the Traditional Knowledge and Contaminants Project, the Traditional Lifeways and Subsistence Project, and the Indigenous Knowledge Systems Research Colloquium. She has also served in numerous other positions in various boards and institutions around the Arctic.



**Lilian Na'ia Alessa**  
University of Alaska, Anchorage, U.S. (Co-Principle Investigator)  
afia@uaa.alaska.edu

Dr. Alessa is a Professor of Biological Sciences at the University of Alaska Anchorage. She heads the Resilience and Adaptive Management Group at UAA, and has served on the board of the Arctic Research Consortium of the United States. She currently conducts extensive research on human adaptation to climate change, funded by the National Science Foundation, including International Polar Year projects such as the Indigenous Arctic Observing Network. Canadian-born and raised, Alessa holds a Ph.D. in cell biology from the University of British Columbia and has extensive training in cognitive psychology. Her studies of cellular organization greatly inform her current approaches to social ecological complexity. Her expertise is in the conceptual development and application of complex systems thinking, and development of research strategies.



**Joan Eamer**  
UNEP/GRID-Arendal, Norway (Co-Principle Investigator)  
joan.eamer@grida.no

Ms. Joan Eamer, editor of the Global Outlook for Ice and Snow, was the manager of the Polar Programme at UNEP/GRID-Arendal in Norway. She has an MSc degree in zoology from the University of British Columbia, Canada. Prior to joining UNEP/GRID-Arendal in 2005 she worked as a scientist and a program manager in northern Canada for industry and government. Her experience includes work on Arctic climate change science, environmental impact assessment, natural resource management, state of the environment reporting, and development of ecological and community-based monitoring and research networks in Canada's Arctic.

### Senior Research Staff



**Andrew (Anaru) Kliskey**  
University of Alaska, Anchorage, U.S (Senior Researcher)  
afadk@uaa.alaska.edu

Dr. Andrew (Anaru) Kliskey comes from Aotearoa / New Zealand. He is trained as a land surveyor (BSurv), resource planner (MRRP), and gained a PhD degree in geography that integrated geographic information systems, behavioral geography, and resource management. He was a postdoctoral researcher at the University of British Columbia, BC and at the Arctic Institute of North America's Kluane Lake Field Station in Yukon Territory, Canada. He is currently Associate Professor in Biology and Geography & Environmental Studies and co-leader of the Resilience and Adaptive Management (RAM) Group at the University of Alaska Anchorage. Dr. Kliskey has spent the last five years working with people in Inupiat communities in Northwestern Alaska to understand their perception of environmental change. Dr. Kliskey's expertise is in the application and integration of questionnaire surveys, in-person interviews, GIS, and agent based modeling.



**Maryann Smith**  
BSSN Survey Manager  
maryann@bssn.net

Ms. Smith was born and raised in Anchorage, Alaska and holds a Master's Degree in Environmental Science from Alaska Pacific University. In the past she has done qualitative research on perceptions of wilderness, and mapping of recreational use and sensitive marine wildlife overlap.



**Uliana Fleener**  
BSSN Senior Project Coordinator  
uliana@bssn.net

Ms. Fleener was born and raised in Russia. She holds a Bachelor's degree in Linguistics and International Communication from Chelyabinsk Institute of Economics and Law. In the past she worked closely with Language Interpreter Center, Alaska Immigration Justice Project as an interpreter and translator.

### Community Research Assistants



**Iver Campbell**  
BSSN Steering Committee Member  
Gambell, Alaska, U.S.



**Esther Fayer**  
BSSN Steering Committee Member  
Togiak, Alaska, U.S.



**Antonia Penayah**  
Gambell, Alaska, U.S.

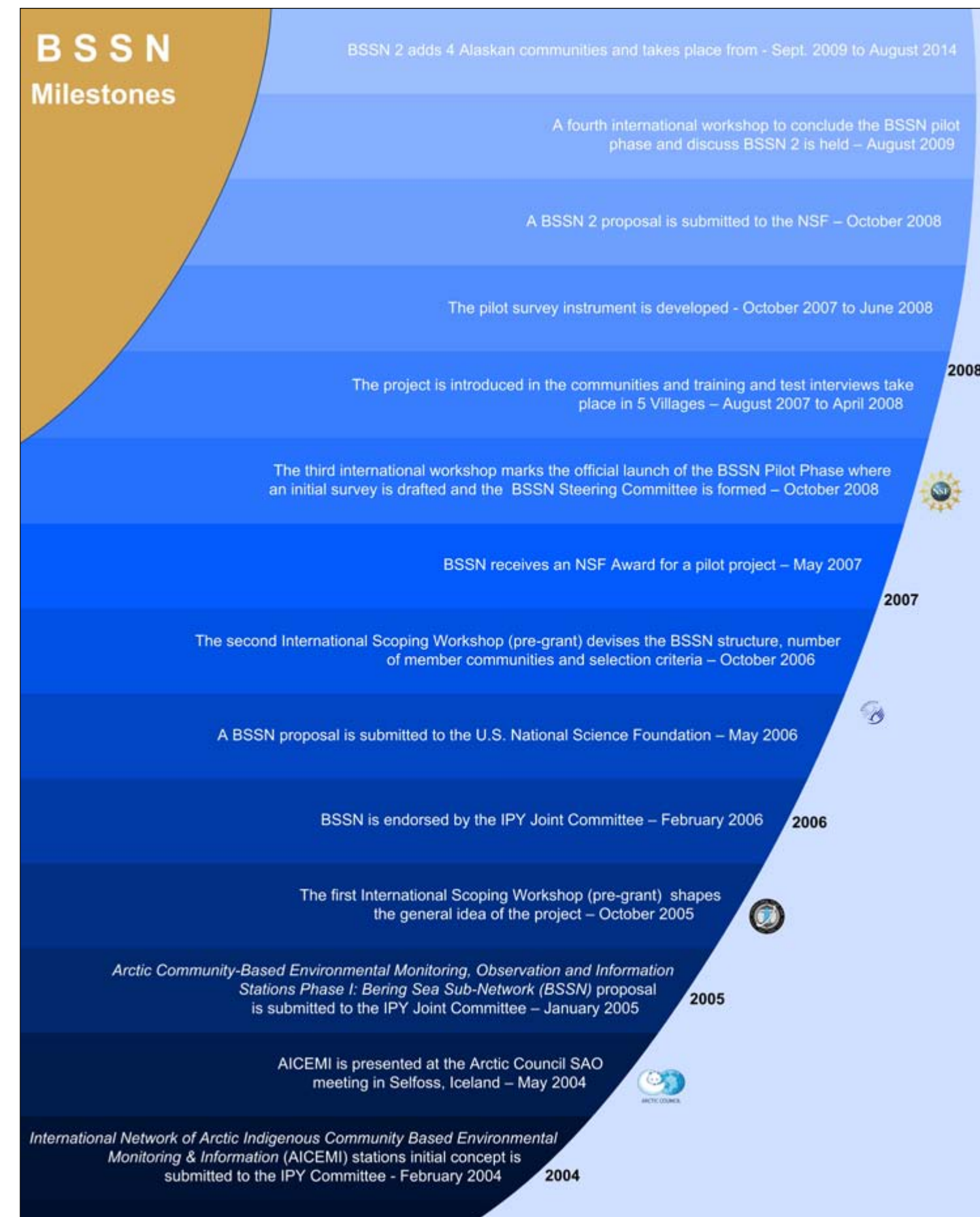


**Olia Sutton**  
Togiak, Alaska, U.S.



## 2.4. Project milestones

The table below summarizes the main project tasks and their progress



**Olga Gerasimova**  
Kanchalan, Chukotka, Russia



**Svetlana Petrosyan**  
BSSN Steering Committee Member  
Tymlat, Koryakia, Russia

### Former Community Research Assistants

**Ludmila Kulchiskaya**  
Kanchalan, Chukotka, Russia

**Valentina Petrova**  
Kanchalan, Chukotka, Russia

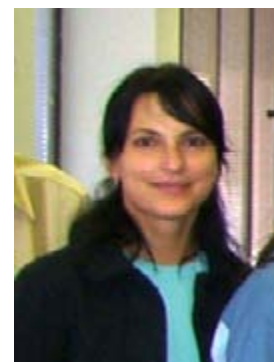
**Natalia Tatarenkova**  
Nikolskoye, Kamchatka, Russia

**Eileen Dushkin**  
Sand Point, Alaska, U.S.

**Connie Kochuten**  
Sand Point, Alaska, U.S.

**Nina Kiyaikina**  
Nikolskoye, Kamchatka, Russia

### Organizational Support



**Olga Chernenko**  
Razvitiye Center  
Petropavlovsk-Kamchatsky, Russia  
Sub-award Manager



**Arlene Gundersen**  
Pauloff Harbor Tribe  
BSSN Steering Committee Member  
AIA Board President  
Sand Point, Alaska, U.S.



**Jim Gamble**  
Aleut International Assoc.  
Anchorage, Alaska, U.S.  
Project Administrative Support



**Ida Ruchina**  
Chukotka Business Center  
Anadyr, Chukotka, Russia  
Sub-award Manager



# 3. Pilot Project Overview

## 3.1. Project Goals

The Bering Sea Sub Network is a regional initiative of community-based organizations in Western Alaska and Northeastern Russia. It operates as a distributed network which uses humans as individual, coordinated sensors for local environmental observations throughout the year. The overall goal of the Bering Sea Sub Network (BSSN) is to improve knowledge of the environmental changes occurring in the Bering Sea that enables scientists, arctic communities and governments to predict, plan and respond to these changes.

The objective of the pilot phase was to develop a framework to enable residents in remote and diverse Arctic communities to systematically document observations of physical and social changes occurring in their region and to organize the gathered data in standardized data sets so that potential users (academia, natural resource managers and local residents) could discover them and apply this knowledge in their research and management.

*BSSN addresses Scientific Questions about:*

- The historical and current distribution and properties of economic and subsistence species, as derived from collective indigenous and traditional knowledge.
- Types of major variables and indicators that can be correlated with western science to develop predictive models based on indigenous and traditional knowledge
- Spatial and temporal convergence and divergence of community-derived data and western science.

*BSSN contributes to the following broader issues:*

- Social awareness in the broader community around the Bering Sea
- Investments in community-based research and observations
- Communities' resilience and adaptation to change
- A more prominent role for indigenous and traditional knowledge in modern science

## 3.2. Scope of Work

The pilot phase operated from 2007 to 2009. The main tasks included:

- Formation of the network components
- Formalizing agreements with participating communities
- Developing a survey instrument and refining survey methodology
- Setting up a system for data processing

- Developing a communication plan
- Conducting interviews in the villages
- Processing completed questionnaires
- Summarizing data
- Delivering data summary reports to participating communities

### 3.2.1. Network Components

BSSN Secretariat is co-located with AIA's offices. It provides a central location for coordination of all project activities and safe storage of data. The staff consists of the Survey Manager who oversees all aspects of survey administration and data organization and the Senior Project Coordinator who is responsible for communication with village personnel, logistics, and for providing assistance to the communities.

Figure 5. BSSN structure.



BSSN Steering Committee (SC), made up of one member from each community, was created to advise the research team on the issues that may be sensitive for their respective villages and on the community relations. These individuals were nominated by community self-governing bodies and have such authorities as signing off the release of BSSN reports containing data from their communities. In the future, BSSN SC members will be reviewing outside requests for access to the data from their communities.

Community Research Assistants (CRA) were local residents hired to conduct interviews. They received training and ongoing support from the BSSN Secretariat. In Alaska, CRAs are often active harvesters and not employed in other fields. In Russia, most of the CRA are professionals who are long-term residents in the communities.

### 3.2.2. Agreements with participating communities

In Alaska, BSSN sub-awardees were local Tribal organi-

zations that administered the pilot project in their respective villages by providing logistical support that allowed for the use of office space and bookkeeping services and facilitated necessary staff hiring.

In Russia, the agreements were signed with two non-profit organizations located in regional centers, one in Petropavlovsk-Kamchatsky and one in Anadyr, to provide overall project activities management in the villages and to serve as fiscal agents for the project in Russia.

### 3.2.3. Survey instrument and methodology

The survey utilized semi-structured interviews. Sampling was purposive and non-random. Survey questionnaires contained open-ended, close-ended and multiple choice questions. All surveys were administered in the interview format. Whenever permission was granted, the interviews were recorded using a digital voice recorder. Questionnaires were filled out by local interviewers to capture exact answers. An electronic version of each interview was sent to the Survey Manager at the BSSN Secretariat, who enters information in the original language, English or Russian, with English translation into the data management programs. Monthly teleconferences with local interviewers are used to provide feedback and to address any problems to assure quality control.

*The survey questionnaire was designed to capture:*

- Changes in climate and environmental conditions
- The abundance and quality of the resource
- Changes in migration patterns and habitat
- The effect of changes on the availability of resources, on food supply, and on the livelihood of communities
- The local knowledge base associated with marine resources:
  - \* Resource availability
  - \* Quality of the catch
  - \* Quality at the time of preparation
  - \* Quality at the time of consumption
  - \* Environmental change
  - \* Shifts or changes in harvesting locations
  - \* Comparisons between past and present
- Any observations of unusual occurrences

The survey focused on harvesting events. The survey instrument, entitled "The Bering Sea Coastal Community Observations of Traditional Hunting and Fishing", consisted of a pre-event questionnaire, post-event questionnaire, and a Manual for Community Research Assistants.

In addition, a short questionnaire was designed specifically for Elders. About 30 elders were interviewed but these interviews are not part of the main sample contained in the BSSN pilot phase data bases. These in-

terviews will be used for a deeper analysis of the gathered data during the second phase of the project. Elders retain long memories of local environmental conditions and through extensive land schooling, so their information may paint stronger image of the changes that have occurred (Alessa et al 2007).

The survey questionnaires are products of collaborative efforts by the research team and community representatives. The drafts were developed at the October 2007 workshop and, after gaining approval from network members, they underwent extensive expert review by consultants at Westat, Maryland, U.S. Cognitive test interviews were conducted in all villages. Three test interviews per village, eighteen totals, were analyzed for comprehensibility of the questions. The final version of the questionnaire in English and Russian was completed and sent to villages in April, 2008.

### 3.2.4 Survey Data Management

Data management is a key component of this project. The data are being physically entered and stored at the BSSN Secretariat until the time when communities have the capacity to manage and distribute the database.

Confidentiality is one of the main concerns. Sensitive data, such as exact locations of hunting and fishing sites, are safeguarded. Tracking sheets are utilized to disassociate names from surveys. Completed surveys are kept confidential and secure. All data and survey results are the property of BSSN member communities. BSSN will retain full control of the data to the extent permissible by law. The BSSN Steering Committee is charged with handling data access issues on behalf of the communities surveyed.

The BSSN research team and community representatives discussed data ownership issues at length. While it is possible to have a distributed database with individual community data stored at the villages, it was recognized that most of them do not have capacities to maintain such data bases. Until such capacities are developed, the BSSN communities agreed to keep all project data at a centralized place, the BSSN Secretariat, while retaining appropriate data ownership rights.

The data products of the pilot phase of BSSN can be divided into the following categories. The rights of outside agencies and individuals to access these products will vary and are discussed in relation to each category:

1. Overall Data Summary – This "summary of summaries" consists of the Survey Results Summary shown in Section 6.2 This summary will be widely distributed and has already been presented in various international forums, such as the Arctic Council. Access to this summary has no restrictions.



2. Community Data Summaries – These summaries are for data specific to each community (Section 6.3.) and as such contain more information about the communities themselves. For this reason each community was requested to review its data report prior to freely disseminating these summaries. As of July 2010 the community data summaries have been reviewed and approved for release to the public by all BSSN pilot phase communities.
3. Project Databases – The databases of information entered into the SPSS and Nvivo software programs, as well as these databases converted into CSV (Comma Separated Values) format, will be made available only upon formal request and review by the BSSN Steering Committee. This request will consist of identification of the individual or agency making the request, a synopsis of the project that data will be used for, an explanation of how BSSN data will be used, and a description of what data products are expected to be produced. The request will be forwarded to all community representatives of the BSSN Steering Committee whose data will potentially be used and only upon review from each community will the databases be released for use. Requests can be sent to aia@alaska.net and BSSN staff will facilitate the process.
4. Survey Forms – Paper and electronic versions of the individual survey forms in Microsoft Word, PDF, or RTF (Rich Text) format will be available after a formal request using the procedure outlined above. However, any documents which associate the name of an individual with a particular survey will not be made available at any time.

All data products mentioned above are hosted at the offices of the BSSN Secretariat co-located with the Aleut International Association in Anchorage, Alaska, and are available at [www.bssn.net](http://www.bssn.net). This storage consists of back-ups on multiple servers, including offsite servers, in the case of electronic data, and secure storage in the case of paper forms. This storage of data will continue for the life of the project and beyond for the foreseeable future. In addition, discussions are currently underway with data management initiatives, such as Exchange for Local Observations and Knowledge of the Arctic (ELOKA) and Cooperative Arctic Data and Information Service (CADIS) for long term hosting/preservation of BSSN electronic data. However, any requests for access to data hosted at ELOKA or CADIS will be made through and will be subject to the same protocols as the data hosted at the BSSN offices. When BSSN member communities develop capacities to host their data sets the current arrangement can be converted to a distributed network.

To make BSSN data discoverable metadata records are being submitted to the following:

- ELOKA
- CADIS
- International Polar Year Data and Information Service (IPYDIS)

These metadata records will link with freely available data stored at [www.bssn.net](http://www.bssn.net), ELOKA, CADIS and to the protocols for the request of other data.

BSSN is committed to making its data available in for-

mats which provide the greatest benefit to the largest number of users. Towards this end BSSN will remain open to new technologies, such as open source formats, and will provide them as they are developed and where applicable to the data produced by BSSN.

### 3.2.5. Communication Plan

Project communication operates on many levels simultaneously, both external and internal.

#### Internal communication

With a project as geographically far reaching as BSSN it is essential that project staff in the communities have close communication with the BSSN Secretariat and with their counterparts in other locations. This allows the Community Research Assistants to share successes, discuss problems, and realize that they are part of an international team. This close communication is facilitated by modern electronic communication methods such as, email and Skype, as well as monthly teleconferences between village staff and BSSN personnel in Anchorage. The teleconferences are held separately for Alaskan and Russian village staff to avoid difficulties related to interpreting. Teleconferences notes are then translated into English and Russian and circulated to all BSSN team members.

As has been previously stated, an important principal of BSSN is that participating communities are kept informed about project activities and progress. This is brought about by maintaining close communication with tribal and community organizations that had begun before the project started and continues today and into the foreseeable future. Trips to each community are planned to coincide with meetings of tribal or village administrations whenever possible. This provides opportunities for presentations and progress reports. Each BSSN village has received multiple project updates presented during community meetings. BSSN has also produced printed brochures designed for distribution in the communities in an effort to reach as many residents as possible.

#### External communication

Informing the international scientific community at large about the network is also important, and a number of presentations about the project have been made at numerous forums including the following:

- Arctic Council Meeting, Selfoss, Iceland, May 2004
- Arctic Council Meeting, Syktyvkar, Russia, April 2006
- Arctic Observing Network (AON), Boulder, CO USA, March 2007
- Arctic Observing Network (AON) Meeting, New York, NY, USA, March 2008

- Berengia Days, Anadyr, Russia, September 2007
- PAME I, St. Johns, Newfoundland, Canada, June 2008
- SCAR/IASC Open Science Conference, St Petersburg, Russia, July 2008
- CAFF, Akureiri, Iceland, September 2009
- AON PI Meeting, Boulder, CO USA, November 2009
- Arctic Council Meeting, Copenhagen, Denmark, November 2009
- Oslo IPY Science Conference, Oslo, Norway, June 2010

### 3.2.6. Survey administration

Each participating community had an opportunity to review the questionnaires and provide feedback. Village governing bodies – Tribal Councils in Alaska and local Administrations in Russia – gave their approval prior to the beginning of interviews.

The survey targeted experienced harvesters. Respondents were offered compensation for their time, the amount of which is decided by each community. Each interview took about an hour.

Survey interviews took place before and after a harvesting event or fishing season. Trained Community Research Assistants administered individual interviews at a location and time convenient for respondents. Most respondents preferred to be interviewed in an office or other neutral environment. Interviews were recorded (with respondent's approval) using digital voice recorders, while Community Research Assistants recorded answers in writing.

The project languages are English and Russian. Indigenous languages speakers are accommodated through bilingual Community Research Assistants. Four out of six BSSN villages have people speaking indigenous languages on a daily basis.

### 3.2.7. Data processing

The Bering Sea Sub-Network Survey Manager oversees the organization of the survey data coming in from the participating villages and prepares them for analysis. Because the surveys contain both closed and open-ended questions, the data are managed using research software designed to handle both quantitative and qualitative information.

Community Research Assistants enter written responses into electronic survey forms which are sent, along with the electronic voice recording files, to the BSSN Secretariat office in Anchorage, Alaska. Hard-copy survey originals are mailed to the BSSN office for secure storage. A BSSN Survey Manager receives all survey materials, and then enters all information into an electronic database and files in a secure cabinet.



Survey Manager Maryann Smith & Togiak CRA Olia Sutton



The answers to the closed-ended and multiple choice questions are entered into an SPSS 16 database, a statistical package widely used in the social sciences and business for managing quantitative data. For the analysis and coding of open-ended questions, the popular qualitative research software NVivo 8 is utilized. Respondents' open-ended answers are coded by using a version of the Delphi method. Drawing on the expertise of the project principles, the knowledge of other researchers involved in the project, and the input of outside experts on socio-environmental research, BSSN has developed a protocol for how to categorize and code the qualitative information contained in the surveys. In this work, particular attention is paid to instances in which the respondents' answers yield information about socio-cultural phenomena such as:

- Expectations about what should exist in the natural environment
- The populations' ability to adapt to changing harvesting conditions and develop flexible responses
- Individuals' sensitivity to climate shifts and general perceptions about environmental conditions
- The sources of information that people rely on – for instance, personal observations, radio and television news, community elders – for their knowledge of environmental conditions
- The impact of economy – for example, rising fuel prices – on harvesters' ability to reach the locations where they hunt or fish.



Gambell CRA Antonia Penayah conducts an interview

### 3.2.8. Reporting to the Communities

At the conclusion of the field work, all questionnaires are compiled for analysis. The resulting data are both qualitative (narratives) and quantitative including graphs and charts. The reports provide detailed data summaries by the community. The results are presented to the community governing bodies. In Alaska, presentations are made at the Tribal Council meetings, in Russia reports are delivered to the Heads of local Administrations.

BSSN team realize that delivering a report on the study results to the communities involves more than mailing a paper copy or making a Power Point presentation. It is crucial to be able to demonstrate how the results can be applied to decision making and problem solving at a community level. In the pilot phase of BSSN, the limited time frame prevented the team from developing a strategy for communicating the results to the communities, but this strategy will be devised in the second phase of BSSN. Collaboration with village authorities is essential because the researchers need a clear understanding of issues and concerns that locally, to make proper recommendations. A successful collaboration necessitates a deep mutual trust. BSSN is a relatively long-term project (seven years for two phases) and is in a good position to achieve this level of trust.

## 4. Lessons Learned

The pilot phase is intended to test the BSSN concept and the methods employed. In regards to the overall concept of the network, there is no doubt that the concept has proved itself:

- A systematic collection of local observations can be organized across national borders, diverse cultures, and across a large geographical area.
- Perceptions of local residents provide an accurate reflection of status and changes occurring in the social and natural environment and can be correlated with other types of data.
- Sociological methods of survey utilized to gather local observations enable data aggregation and analysis.

As expected, a number of changes in the project administration and execution have been recommended by the BSSN team after the completion of the pilot phase. These recommendations are discussed below, along with the project accomplishments.

### 4.1 Survey Design

One of the significant accomplishments of the survey question design, which occurred through extensive discussions between the communities and researchers, is in the reduction of "filtering" by respondents. This can be achieved by focusing on actual events and individual life experiences while extracting information on various physical and natural phenomena. Special attention is paid to avoiding "driving" respondents to any "well-known" facts or media-publicized conclusions. This approach increases objectivity in respect to assessments based on the observations of local residents. Of equal importance is the improvement of data accuracy since questionnaire entries are entered in their original languages, English and Russian.

The pilot phase questionnaire is very long, and interviews were tiring for respondents. It is challenging to structure questions relevant and applicable to all respondents in all locations in all possible situations while accommodating community wishes and research requirements. The pilot phase questionnaire became overcomplicated and confusing, and that led to a high rate of missed questions and other problems with the survey administration. The concept of interviewing harvesters before and after harvesting events proved to be ineffective as hunters and fishermen are very busy, and it is difficult to complete both the pre and post-event questionnaires because of the problems with scheduling for the post-event interview. There were also difficulties with data organization because the questionnaire has two parts, harvest and environmental observations, that would have been better administered separately.

To respond to these issues, the survey instrument has

been adjusted and redesigned to include a suite of short questionnaires: Harvest Locations (Baseline data), Seasonal Harvesting (Observations about species harvested in the previous six month), and Environmental Conditions Survey (Observations about the state of physical and natural environment in the last 15 years or more). Each questionnaire has a map where respondents can draw the locations. This information is used for GIS mapping. The new questionnaires are being successfully used in Phase II of BSSN.

### 4.2 Training

Training and face to face meetings for Community Research Assistants (CRA) are essential. In the pilot phase, the funds, budgeted for travel to the villages, were insufficient. The emphasis was on the use of a BSSN Survey Manual that was written for CRAs. A training session was held at the seminar in Anchorage in 2007, but it was the on-site training in each community that proved to be the most efficient. The training period for community coordinators needs to be extended in order to better equip them to cope independently with the variability inherent in the interviewing and technical questions regarding the documenting process. In Russia, the situation was even more challenging due to logistical issues.

The above issues are being addressed in BSSN Phase II. The budget allows for up to three trips per village per year in Alaska. Survey Manager and Senior Project Coordinator are in daily contact with village staff. The Russia based sub-award manager is trained in the survey methods for on-site training and prompt response to any issues that may arise in the Russian communities. The manager also reviews all completed questionnaires for quality control.

### 4.3 Communication

Utilizing emerging communication tools is essential for this project. Despite the distances between the Anchorage-based staff and member communities, extensive communications were possible due to the use of digital tools, such as Skype, to supplement scheduled teleconferences where possible. These tools allow real time audio and visual interactions on a daily basis and enable a distributed, coordinated network to function smoothly and acquire systematic data reliably. The use of emergent communication and data acquisition tools can drastically increase the effectiveness of this type of project.

Other challenges encountered by project managers range from the difficulties with retaining staff in remote locations and training new people to unpredictable weather conditions that affect travel and high cost of transportation. Such challenges are not unique to BSSN; they are common for any research projects based in remote arctic regions.



# 5. Conclusion

The Bering Sea Sub-Network is community-based. At the very core of BSSN is the idea that the participating communities should be involved at every level of planning and development of the network and the BSSN project. A community member in Gambell eloquently summarized why he likes the project: “I like this project because you are not researching us – you are doing research with us”.

## 5.1 Benefits to Communities

- By employing community members, especially younger people, the project provides modern opportunities to facilitate traditional knowledge transfer.
- In communities where cash earning opportunities are scarce, BSSN provides additional income.
- Community members are afforded an opportunity to learn new skills, such as interviewing techniques, advanced computer skills, GIS mapping that are transferable to other research or employment opportunities leading to the improved individual and collective adaptability.
- Community leaders have a direct access to the project management and can influence how the project is conducted in their communities, as well as consult the research team on the best ways to handle community concerns.

The information garnered by this survey and presented in this report may be a useful tool in the hands of communities as they seek to improve resource management in order to preserve and continue their indigenous way of life. The project data may contribute to local decisions regarding resource management and may enhance communities’ understanding of what is happening in and around the whole of the Bering Sea. The BSSN team will work with communities on identifying the best venues for application of the survey results in everyday local decision making.

As a network, BSSN encourages cultural connections and communication between groups of people who have diverse cultures, but who share similar concerns. As a project, BSSN empowers communities in their resource management endeavors and contributes to their ability to plan for and adapt to environmental and social change.

These data may be useful in helping communities plan for the future, for example they may need to develop several ‘plans of action’ to be able to adapt to the occurring changes. A picture of the impacts of environmental changes on arctic communities is often painted with a broad brush stroke without understanding what is happening at a local level. BSSN data show a range of impacts experienced by local residents in different participating communities. Processes of arctic change are heterogeneous and this heterogeneity is more pro-

nounced at local levels (Jenssen 2006). It is crucially important that mitigation and adaptation plans don’t address the ‘wrong’ issues (i.e., those that communities do not observe or experience). The BSSN data are especially valuable in ensuring this. For example, pilot phase data from BSSN provide insight to the constraints on adaptation: individuals in Alaskan communities are far more mobile than those in Russian communities, through freedom and means (i.e., access to fuel, personal transportation) to move, leading to greater options to respond to change, particularly those affecting local scales. Residents of Kanchalan overwhelmingly were pointing to the changes in the river and some raised concerns about mining activities in the area. As local communities in Russia have fewer opportunities to influence decision making regarding large scale resource exploration, such as mining, than their Alaskan counterparts, their adaptation strategies should be different.

## 5.2 Benefits to Society

Broader societal benefits of BSSN are in its contribution to the scientific research in the Arctic. A significant contribution of the pilot phase is the development of a model for community-based observing network. While BSSN is not a circumpolar project, the sheer diversity of participants, the range of the collected data and a multi-disciplinary approach make this model replicable and potentially applicable in other regions.

BSSN addresses scientific questions of the variations in environmental and socio-economic conditions that have a meaningful impact on everyday life in indigenous communities in the Arctic; the evolution of past and present consequences of change and potential strategies for communities’ capacity to adapt and interactions and feedback between biophysical and social systems.

Climate change and its effects are likely to pose a threat to the food security of subsistence cultures (Ford 2009). However, the most effective way to deal with these changes is not fully understood (Smit et al. 2008). Subsistence harvesters are likely to be observant of environmental changes directly affecting subsistence activity since their ability to secure food is dependent on understanding these conditions. By examining environmental conditions from the perspectives of local residents, it will be possible to better understand what changes most affect subsistence. This will help decision makers focus mitigation efforts in order to better ensure food security. Observed changes in environmental conditions from the pilot phase are numerous and varied (see Figure 7) and show some correlations with western science (Alessa et al 2008)). In this way local knowledge can be calibrated with western science and be used, for example, as an early warning system for environmental change.

The socio-economic importance of subsistence is clear.



Future leaders of Gambell, Alaska

Across all communities majorities use their harvest for traditional purposes and sharing (see Figure 10). The family’s need for food was a primary driver for the timing of the next trip for all communities but one (see Figure 11). This pattern reconfirms the fact that coastal communities depend on the Bering Sea’s bio resources for providing food to their families. These results clearly point to the importance of biological resources for coastal villages as a matter of food security.

Russian communities stand out as more likely to report catching at least one fish/animal with visible disease (see Figure 12). The most significant observations point to a high rate of disease in red salmon and pacific cod in Nikolskoye, whitefish and chum salmon in Kanchalan, and pink salmon in Tymlat. Reasons for this need further investigation, but participants frequently cited pollutants associated with mining and military activity as the cause.

Climate change will continue to be a significant issue in the Arctic for the foreseeable future, with Bering Sea

communities continuing to experience its effects for many decades to come. Climate change is making Arctic waters and resources more accessible. An increase in human activities in the Arctic, driven by the greater accessibility of resources and the emergence of more economical shipping routes, will present new challenges and, hopefully, more opportunities for the Bering Sea coastal communities. BSSN increases a community’s ability to convey their observations and concerns to scientists, policy makers, and the public. It may also help them better prepare and plan for the changes taking place.

In the next five years, BSSN will be expanded to include other communities. The established network may become a springboard for many other research activities in the region, and may provide a model for other regional networks. Developing collaborative relationships with other projects is vital to the future sustainability of BSSN. These partnerships will also increase opportunities for local communities to meet their research needs.



# 6. Pilot Data Summaries

## 6.1 Introduction

Sampling was purposeful, and intended to capture frequent harvesters. Peer referral was used by asking Community Research Assistants and Steering Committee members from each community to identify and interview experienced harvesters. These data are not representative and thus, the following summaries do not include tests of statistical significance.

Two surveys were administered, a pre-harvest and a post-harvest. Because of difficulties in the administration of the post-harvest survey only the results from the pre-harvest survey are presented.

The pre-harvest survey consisted of two portions, one focused on aspects of a specific harvest event, the other focused on observed environmental changes. A respondent could fill out the harvest section of the survey more than once for each species he/she harvested. The environmental portion could only be filled out once, thus there are different sample sizes for each subject. Due to the nature of the project, and community-based research in general, some data were unusable and some surveys had missing answers. Quantitative and qualitative methods were employed which may also result in different sample sizes for specific responses. An explanation is provided for each circumstance that varies from the sample sizes presented below (see Table 1).

Different parameters are sometimes presented for different communities. This is a result of different species harvested (i.e. non-fish harvesting communities were not asked about the timing of fish runs) and different trends in the data. Predominant trends are presented. Complete data will be made available upon request. These data summaries are synopses of the survey results. They are not interpretative analyses and thus do

not contain conclusions or make generalizations about the meaning of the results.

Average age for participants from all communities was 45 (see Table 2) and participants were predominately male (see Table 3).

## 6.2 Survey Results Summaries

### 6.2.1 The Sample

The BSSN community in this survey is represented by 246 people. Different age groups are represented (see Table 2). The gender of participants is balanced with 65.3 percent male and 34.7 percent female (see Table 3). Harvested species are summarized in Table 4 for each community. The majority have lived in the area for more than 30 years (70.5 %). 42.5 percent have also harvested in the same area for more than 30 years. Thus the majority of participants have accumulated several decades of observations of the local environment.



Ice fishing near Tymlat, Russian Federation

Table 1. Sample sizes from each community for two different portions of the survey

Village	Overall sample	Harvest	Environmental	% of overall sample with 11 years or more harvesting experience
Gambell	49	42	49	94%
Kanchalan	43	47	43	82%
Nikolskoye	29	61	29	90%
Sand Point	18	19	18	78%
Togiak	69	70	69	89%
Tymlat	38	48	38	80%
Total Sample	246	287	246	86%

Table 2. Age of Participants from each community

Villages	Gambell	Kanchalan	Nikolskoye	Sand Point	Togiak	Tymlat	All villages
18-25	5 (10%)	1 (2%)	0 (0%)	5(28%)	5 (7%)	1 (2%)	17 (8%)
26-35	8 (16%)	2 (5%)	5 (17%)	5 (28%)	17 (25%)	11 (29%)	48 (20%)
36-45	16 (33%)	18 (42%)	6 (21%)	2 (11%)	18 (26%)	13 (34%)	73 (28%)
46-55	14 (29%)	14 (33%)	8 (28%)	5 (28%)	12 (17%)	4 (11%)	57 (24%)
56-65	5 (10%)	7 (16%)	4 (14%)	1 (6%)	15 (22%)	5 (13%)	37 (14%)
Over 65	1 (2%)	1 (2%)	6 (21%)	0 (0%)	2 (3%)	4 (11%)	14 (7%)
Total	49 (100%)	43 (100%)	29 (100%)	18 (100%)	69 (100%)	38 (100%)	246 (101%)*
Average Age	46	48	51	37	43	45	45

\*due to rounding

Table 3. Gender of participants

Villages	Gambell	Kanchalan	Nikolskoye	Sand Point	Togiak	Tymlat	All villages
Gender							
M	71%	72%	79%	61%	57%	52%	65%
F	29%	28%	21%	39%	43%	48%	35%

Table 4. Composition of sampled harvests

Species caught:	G a m - bell	Kancha- lan	N i k o l - skoye	S a n d Point	Togiak	Tymlat
Bowhead Whale ( <i>Balaena mysticeti</i> )	✓					
Walrus ( <i>Odobenus rosmarus</i> ), Seal ( <i>Phocidae</i> & <i>Otariidae</i> )	✓				✓	
Emperor Geese ( <i>Chen canagica</i> )	✓					
Shee Fish ( <i>Stenodus leucichthys</i> )	✓					
Salmon unspecified ( <i>Oncorhynchus</i> )	✓			✓	✓	
Silver Salmon ( <i>Oncorhynchus Kisutch</i> )			✓			✓
Red Salmon ( <i>Oncorhynchus nerka</i> )			✓	✓		
Pink Salmon ( <i>Oncorhynchus gorbuscha</i> )			✓			✓
Chum Salmon ( <i>Oncorhynchus keta</i> )		✓				✓
Arctic Char ( <i>Salvelinus alpinus</i> )			✓			
Pacific Cod ( <i>Gadus macrocephalus</i> )			✓	✓		
Halibut ( <i>Hippoglossus pleuronectidae</i> )			✓	✓		
Plaice ( <i>Pleuronectes quadrituberculatus</i> )			✓			
Atka Mackerel ( <i>Pleurogrammus monopterygius</i> )			✓			
Smelt ( <i>Thaleichthys pacificus</i> )					✓	✓
Broad Whitefish ( <i>Coregonus nasus</i> )		✓				
Arctic Grayling ( <i>Thymallus arcticus</i> )		✓				
Trout ( <i>Salmoninae</i> )					✓	
Pike ( <i>Esox Lucius</i> )					✓	
Crab ( <i>Decapoda</i> )	✓					
Shellfish ( <i>Mollusca</i> )				✓		
Other	✓				✓	✓



A. Changing Environmental Conditions

Environmental and climatic changes in the Bering Sea can have direct impacts on major food webs that result in disturbances for subsistence dependent communities (Grebmeier, 2006). By examining environmental changes from the perspective of residents we can gather clues about local changes that may indirectly affect subsistence through changes in the food web and examine changes directly impacting subsistence activity. Changes directly impacting subsistence may include an increase in storm frequency that restricts travel, or thinner ice that results in difficulties butchering whale. These changes are likely to be understood at an intuitive level by the harvester who relies on certain conditions to obtain food.

Figure 6 displays the percent of participants that noticed some change in environmental conditions across all communities. Some trends are apparent. Respondents in Gambell noticed more environmental changes than any other community. A large majority (84%) noticed some change in ice condition. Residents may be especially aware of changing ice conditions due to the ice-dependant nature of the harvest. Hunting for seal, walrus and whale is directly affected by sea ice. Satellite data

from the National Snow and Ice Data Center confirm sea ice has changed drastically in the past 50 years (Fetterer et al. 2009, NSIDS)(see Figure 7).

Figure 8 presents trends in air temperature change from the ACIA and BSSN communities. When percentages of all environmental observations among communities are compared to trends in ambient temperature change, some correlations are evident. In Gambell the highest average percentage noticed changes (50%) and relative to other sites Gambell showed the greatest change in air temperature (Figure 8. Observed surface air temperature changes: 1954-2003). The average percent of people noticing change in Togiak and Kanchalan were both 44%, followed by Sand Point (33%), Nikolskoye (25%) and Tymlat (20%). Interestingly Tymlat observed the fewest changes in environmental conditions and real data confirms that Tymlat is not experiencing a change in air temperature.

The previous two examples represent the calibration of local knowledge with Western scientific data. Although sample size was small, there were significant, positive correlations observed in the pilot phase, and these trends need further examination.

Figure 6. Observed environmental changes among all BSSN communities

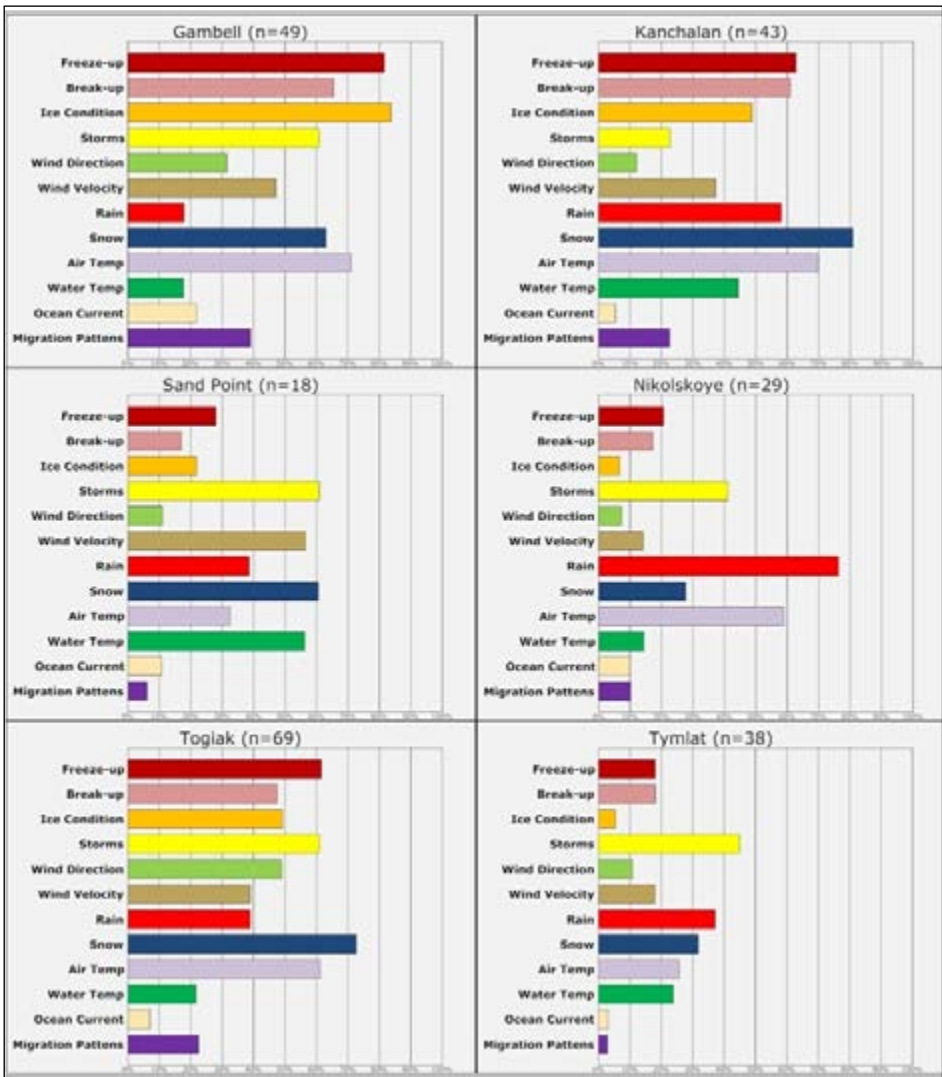


Figure 7. Trends in sea ice extent

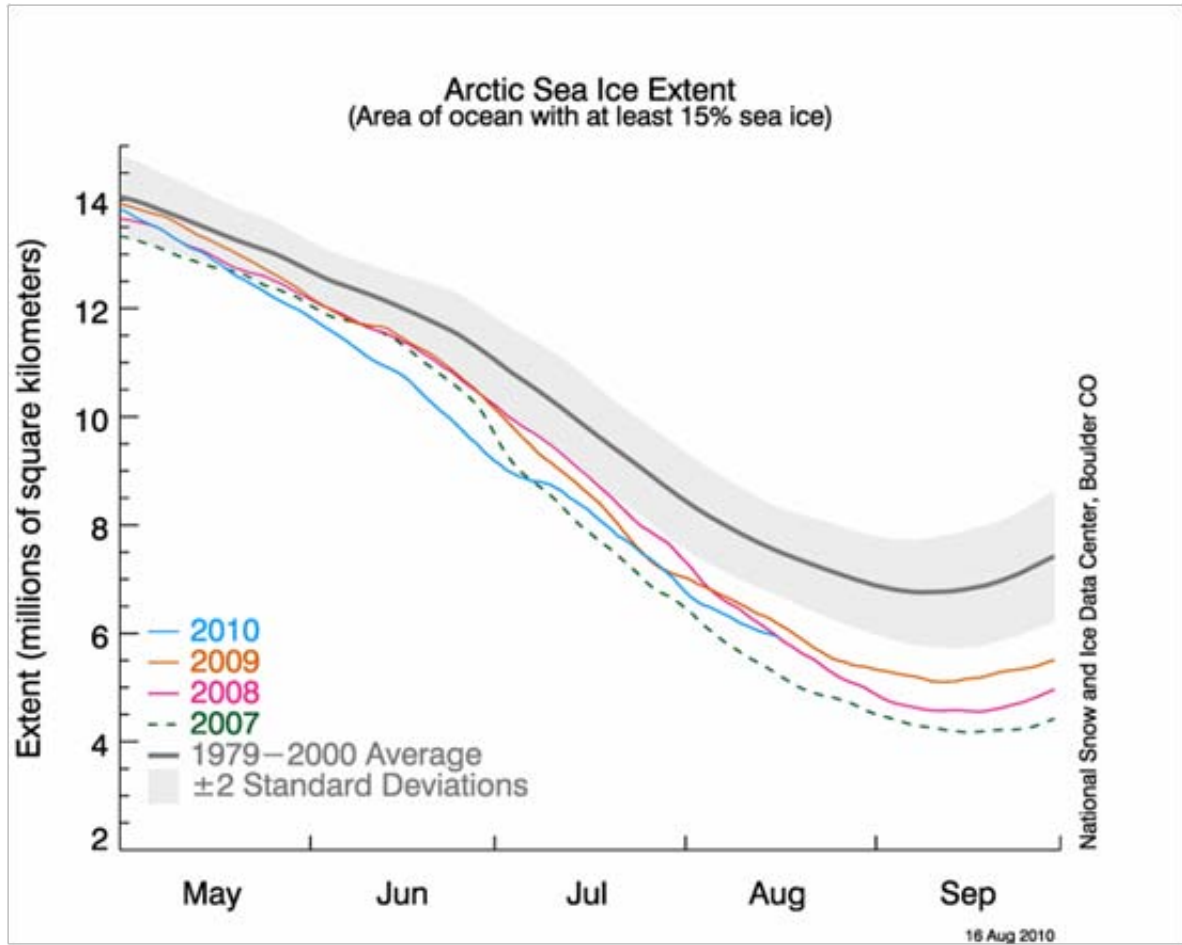
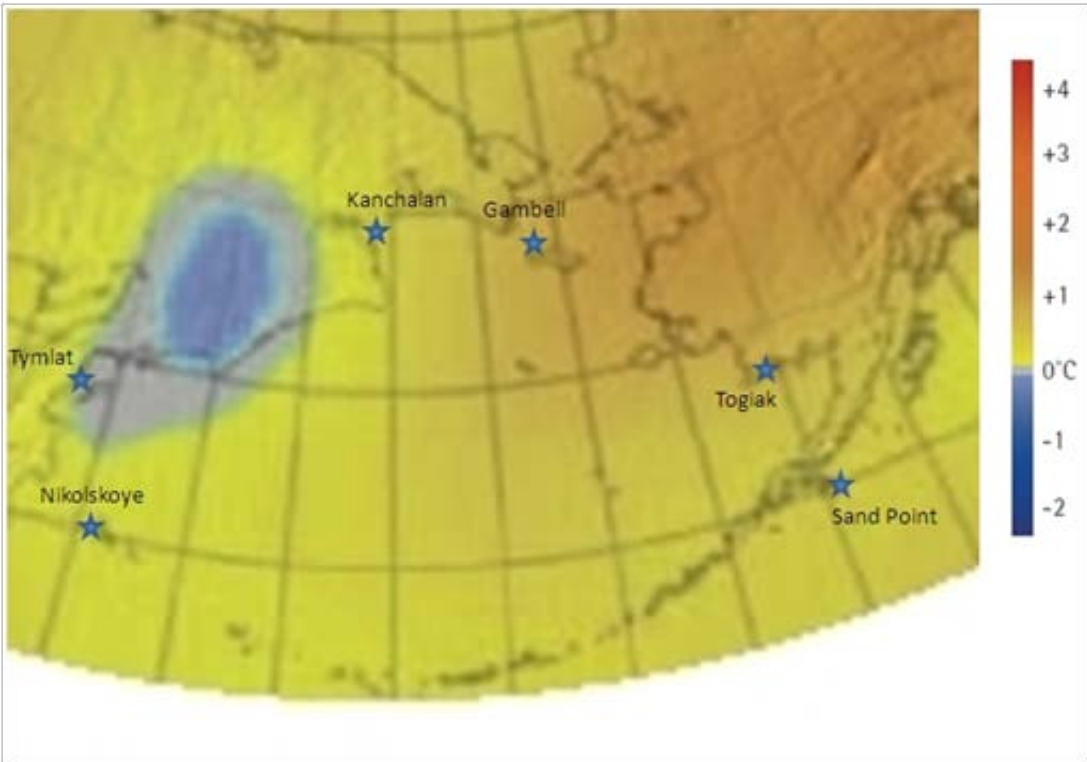


Figure 8. Observed surface air temperature changes: 1954-2003 (Annual degrees celcius) with BSSN communities, from ACIA 2004, Clifford Grabhorn





B. Importance of Subsistence Harvest

Subsistence harvests are an important traditional and community food resource for the respondents. When asked, “What was your last harvest used for?” the overwhelmingly response was that it was used for traditional or personal use (see Figure 9). Sharing with friends and family also stand out as a predominant use in most communities. Supporting other community members through food sharing was a commonly discussed theme in open-ended responses for all communities.

- “Да, хватало рыбы. Взаимосвязь стариков и молодежи всегда. Старики смотрели, где сколько всего нужно. Передавали опыт молодым постоянно. Если много рыбы, раздавали.”
- “Yes, there was enough fish. There was always interconnection between elders and youth. Elders were watching where what is needed. They transferred their knowledge to the younger ones all the time. If there were a lot of fish they gave them away.”
- “Как всегда. Раздаем всем, кто пришел на пирс встречать бот.”
- “Like always. We share with all those who came to the pier to meet the boat.”
- “(The catch was used) to eat and for others that can’t go fishing- sick and elders at home.”

In Gambell, approximately 26% reported using their catch for ‘generating cash or bartering’ and 7% reported using it for ‘commercial or business activity’. Two respondents elaborated saying this was done by carving and selling ivory.

In Sand Point, harvests are frequently used for generating cash, which is probably a result of the commercial fishing activity in the area. Harvests were used for generating cash or bartering by 16%, and another 37% report using the catches for commercial or business activity.

In Nikolskoye, very little of the harvest is used for generating cash or commercial activity. This could be due to the permit system in place there, which in open-ended responses 12% reported difficulties with (mostly in terms of the small size of the limit).

- “Но лимит очень маленький, продавать нечего”  
“The limit is really small. There’s nothing [left over] to sell.”

In both Togiak and Tymlat, many respondents agreed that at least a portion of the harvest was used for feeding dogs.

Recreational hunting/fishing were important in Togiak and Nikolskoye, with many open-ended responses discussing the importance of subsistence to ones well being and as a connection culture.

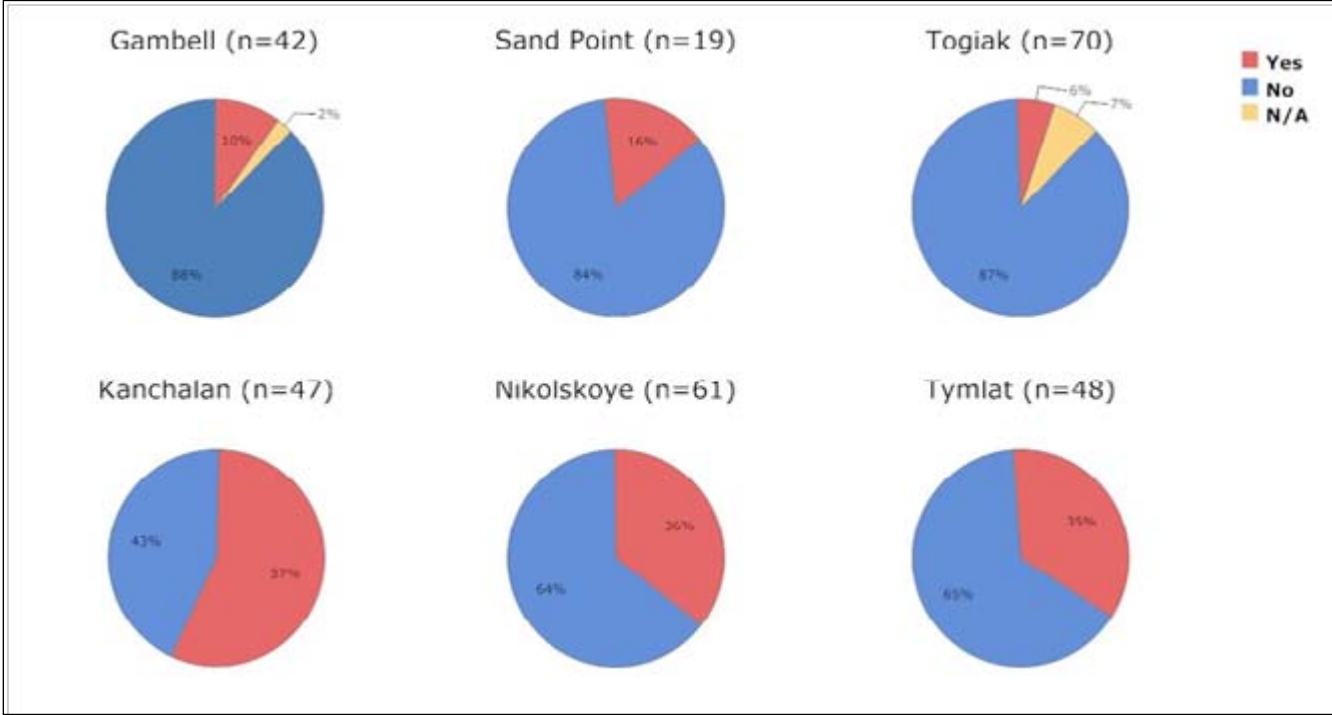
- “Вполне, без рыбы не сидели. С детства и вообще из поколения в поколение привычны рыбой питаться.”
- “Entirely, we have never been without fish. From childhood and generally from generation to generation fish is the customary food.”
- “Близко находится море, забываются бытовые проблемы, внутренне отдыхаешь.”
- “The sea is nearby. Our everyday petty troubles are forgotten, and we can rest.”

When asked about the reasons for the timing of the next harvest many replied that it was driven by the family’s need for food. In all communities but Sand Point the family’s need for food was the most frequently mentioned reason for the timing of the next trip. This is likely due to the influence of commercial fishing in Sand Point. Respondents are likely to combine subsistence activities with commercial fishing. Weather was also a significant factor determining the timing of the next trip, which

is interesting because of the frequent reports of increasing storms with greater intensity.

The legal season opening was not a major factor in Gambell because only the whale hunt is confined by seasonal regulations. Subsistence in Togiak is not subject to regulated seasons, while in other villages a regulated season for at least one species harvested is in place.

Figure 10. Whether or not the last harvest contained any fish or animal with visible disease.



C. Disease in all communities

When asked, ‘During your last hunting/fishing trip, did you catch any (species harvested) with visible disease?’ Russian communities stand out as more likely to report catching at least one fish/animal with visible disease (see Figure 10). The most significant observations point to a high rate of disease in red salmon and pacific cod in Nikolskoye, whitefish and chum salmon in Kanchalan, and pink salmon in Tymlat. Reasons for this need further investigation, but participants frequently cited pollutants associated with mining and military activity as the cause.

D. Access to harvest location

Access to hunting and fishing locations probably affects the ability of harvesters to secure food for themselves and others. Thus it is important to examine distances traveled to harvest locations and any difficulties encountered during travel, especially as changing environmen-

tal conditions may affect travel routes.

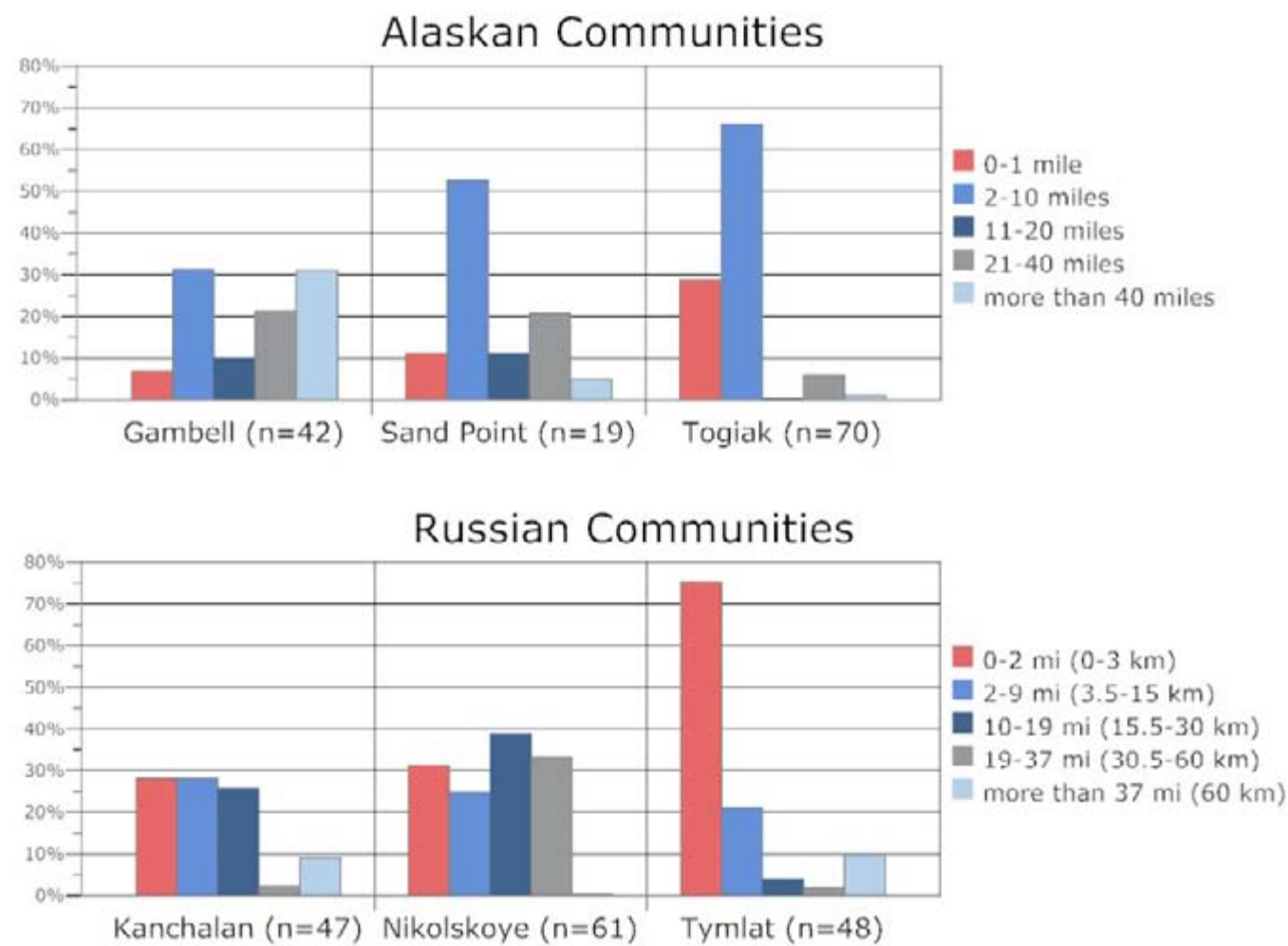
3 to 15 kilometers (2 to 10 miles) was the most frequently cited distance traveled in all Alaskan communities (see Figure 11). Gambell stands out in that respondents traveled farther, with 31% traveling over 65 kilometers (40 miles). In Russia, people tended to stay closer to home, with the exception being Nikolskoye where 15 to 30 kilometers (10 to 20 miles) was the most frequently cited distance traveled. There are some issues with interpretation here because Russian respondents were given multiple choice answers in kilometers and in Alaska they were given in miles, and they don’t translate directly (3 km = 1.9 mi), thus these trends need further examination.

Figure 9. Responses to the question ‘What was your last harvest used for? Mark all that apply for all communities.





Figure 11. Distances traveled to the previous harvest location for all BSSN communities



In Gambell, when asked if it was easier, more difficult or about the same to get to the location of the previous harvest trip, 47% replied it was about the same, while equal percentages (26%) reported it was either more difficult or easier to get to the location. Of those reporting that it was more difficult to get to the location 77% attributed the difficulty to poor environmental conditions (ice, bad weather). The second most frequently cited reason was economic (62%) including high gas prices and equipment.

In Sand Point 0% reported that the location was more difficult to get to than in other years; 6% reported it was easier, while 94% said it was about the same as usual.

Travel to the harvest location was reported as more difficult than usual by 7% of Togiak respondents. Poor environmental conditions were most frequently cited as the reason for the difficulty. Poor road conditions followed by economics were also mentioned.

In Kanchalan, difficulties getting to the location were reported by 33% of the respondents. Of those reporting

difficulty, the most common reasons cited were economics (including fuel and equipment), followed equally by poor road conditions and poor environmental conditions.

Difficulties getting to the location of the previous trip were reported by 15% in Nikolskoye. Of those reporting difficulties a majority (77%) blamed poor road conditions. Lack of transportation followed with 33% citing this as a problem.

In Tymlat 24% encountered difficulties getting to the location of their previous harvest. Economics was the most frequently cited reason, followed by poor environmental conditions.

- “То вездеход на ремонте, то топлива на него нет, дорого. То погода плохая. Весной половодье, реки становятся - большие, глубокие.”
- “Sometimes the all-terrain vehicle needs repair, sometimes there is no fuel for it. It is expensive. Sometimes the weather is bad. In spring there are floods, rivers become big, deep.”

The most frequent hardship cited for travel to the harvest location for Alaskan villages was environmental conditions, while in Russia it was economic followed by poor road conditions.

**D. Time spent to harvest**

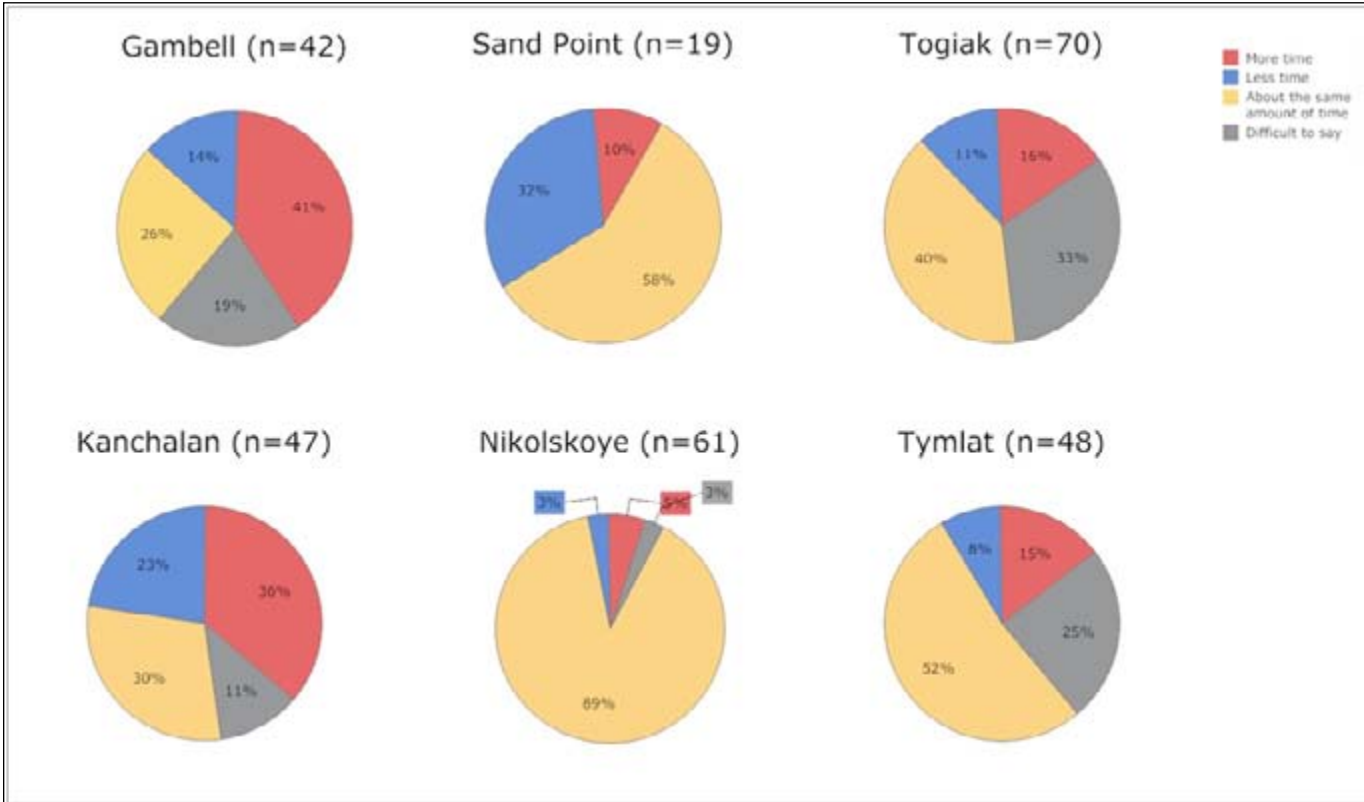
The amount of time spent to harvest compared to previous years may indicate change in environmental conditions, animal populations and dynamics. Gambell and Kanchalan stand out as communities where the time spent to harvest may be increasing (see

Figure 12).

Of the respondents in Gambell, 41% reported that more time was spent in harvesting. According to harvesters, the size of the harvest, the amount of time it took to catch and their resulting level of satisfaction were often affected by the amount of available game and changes in animals' migration patterns.

- “Some game is going farther out because of the sound of snow machines – Honda. And probably the light affects [them too]. They go farther out.”
- “I know that some [game] are off season – left behind due to

Figure 12. Time spent to harvest compared to the previous 5-10 years for all BSSN communities



**E. Needs Satisfaction and Expectations**

When discussing the previous harvest the survey inquires, “On your last hunting/fishing trip, did you catch enough to satisfy all your needs?”

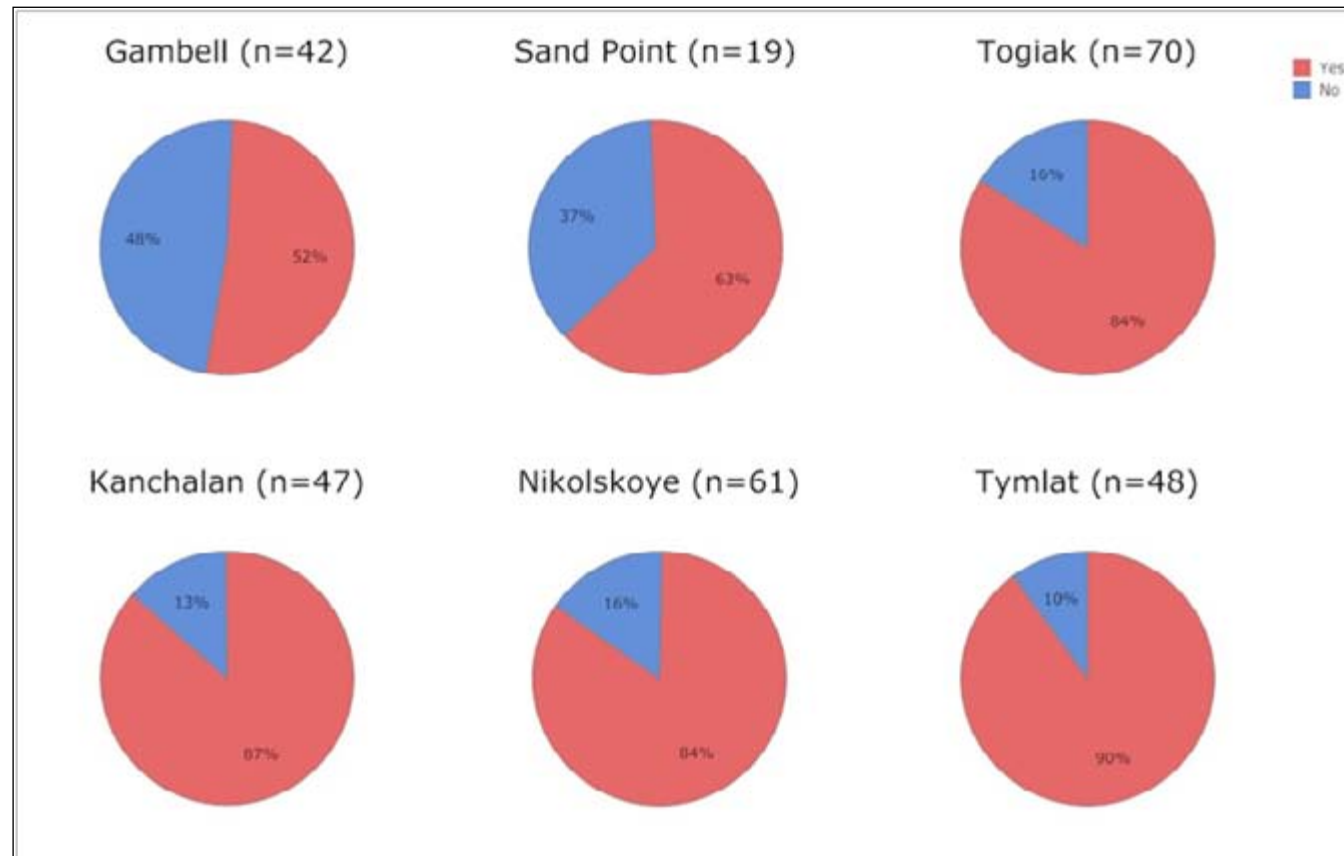
Gambell, the community that observed the most environmental changes, stands out as the community where needs are least likely to be met (48%) (see Figure 13). This may be due to greater variability in hunting success for marine mammals than fish. Sand Point, a fishing community, follows as the second most likely place where needs were not met. The participants in Gambell harvest the greatest proportion of marine mammals (71%) compared to the other community in which marine mammals are harvested (Togiak 5%).

In response to open-ended questions Gambell residents discussed what needs were not met. They included:

- “Need more meat. Not enough walrus around. Seal was primary catch.”
- “Didn’t catch enough to feed my family for a year.”
- “Because I could of used more for the family.”



Figure 13. On your last hunting/fishing trip, did you catch enough to satisfy all your needs?



What an experienced subsistence harvester hopes to harvest in a trip and how that compares with the actual outcome of the trip is likely to tell us a little about how harvests now compare to harvests in the past. This can also tell us about some of the challenges facing subsistence users in the Bering Sea.

In Gambell respondents were more likely to report they

harvested less than they had hoped for (48%) (see Figure 14). Sand Point follows with 32% of respondents reporting less than they had hoped for. Togiak residents are particularly satisfied, with 24% harvesting more than they had hoped for. In Nikolskoye and Tymlat, expectations and actual outcomes matched up better than the other communities.



Fishing near Sand Point, Alaska

## F. Note on Natural Variability

Natural variability in the environment was frequently brought up by respondents. An attempt was made to focus participants on long term changes by inquiring about changes in environmental conditions in the previous 10 to 25 years, but many seemed to accept changes as natural. In Tymlat, responses included 33 references to the idea of a 'fish year' where fish are abundant, and a 'non-fish year' where fish are scarce. The variability in fish runs from year to year seems to be a common understanding. There were many other references to natural variability.

- "But this year is a non-fish year. There are few fish. There's no run. Next year there will be."
- "This year is not a fish year. Fish years vary." "Этот год нерыбный. Год рыбный, по-разному идет."
- "(There is) different weather every year."
- "Everything changes, even land...as our land is very old."
- "Weather is always changing, no matter which way the wind is blowing, we go fishing."
- "The river didn't freeze right away, but every year is different with weather."
- "The weather is always different each year."

Based on this acceptance of change in the environment it can be difficult to define 'the norm'. What are nor-

mal environmental conditions in an environment that is always changing? This is likely to add an element of personal variability in what is considered 'unusual', or changing.

The natural variability present in the system has shaped past generations and residents into adaptable people. For generations people in these areas have adapted to changing conditions. This acceptance of change and strong community ties in these communities are evidence of great adaptive capacity.

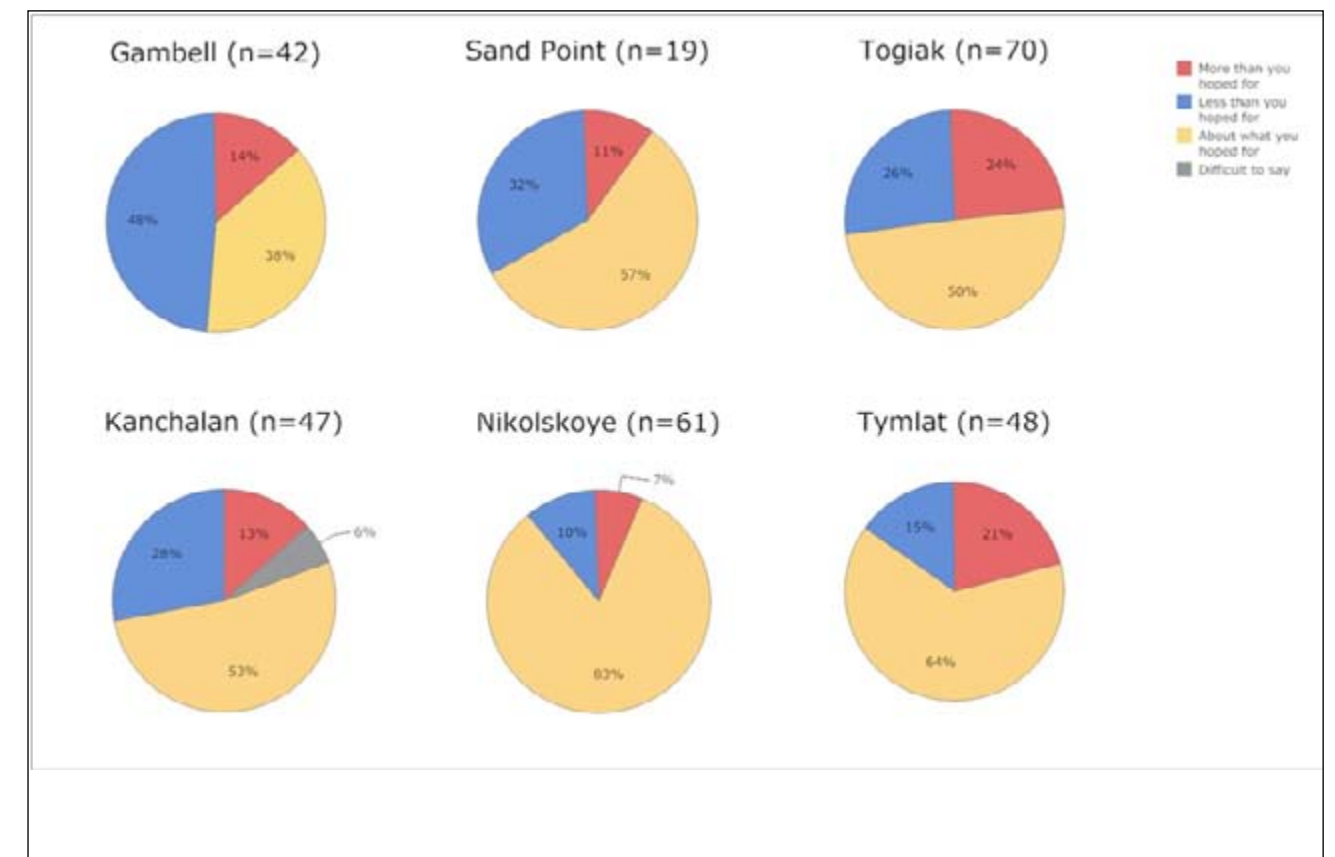
## 6.3 Survey Results Summary by Village

### 6.3.1 Gambell

#### A. Gambell Sample Profile (n=49)

In Gambell, interviews were conducted from July 2008 to February 2009. The sample was primarily comprised of males (see Table 3), 62% of which were between the ages of 36 and 55 (see Table 2). The respondents were generally long-time residents that possessed many years of harvesting experience. A majority (77%) have lived in the area for more than 30 years (see Table 5) and 76% have hunted or fished in the area for more than 21 years (see Table 6). When asked to describe how

Figure 14. Expectations/hopes for harvest compared to actual outcome





frequently they visited the location 74% reported going to the location 'often' or 'very often'. Of the respondents, 84% reported they were not employed at the time.

Table 5. Years of residence in the community (n=49)

Length of Time	Frequency	Percent
11-20 years	4	8%
21-30 years	7	14%
more than 30	38	77%
Total	49	

Table 6. Years hunted/fished in the area (n=49)

Length of Time	Frequency	Percent
0-5 years	2	4%
6-10 years	1	2%
11-20 years	9	18%
21-30 years	13	27%
More than 30 years	24	49%
Total	49	

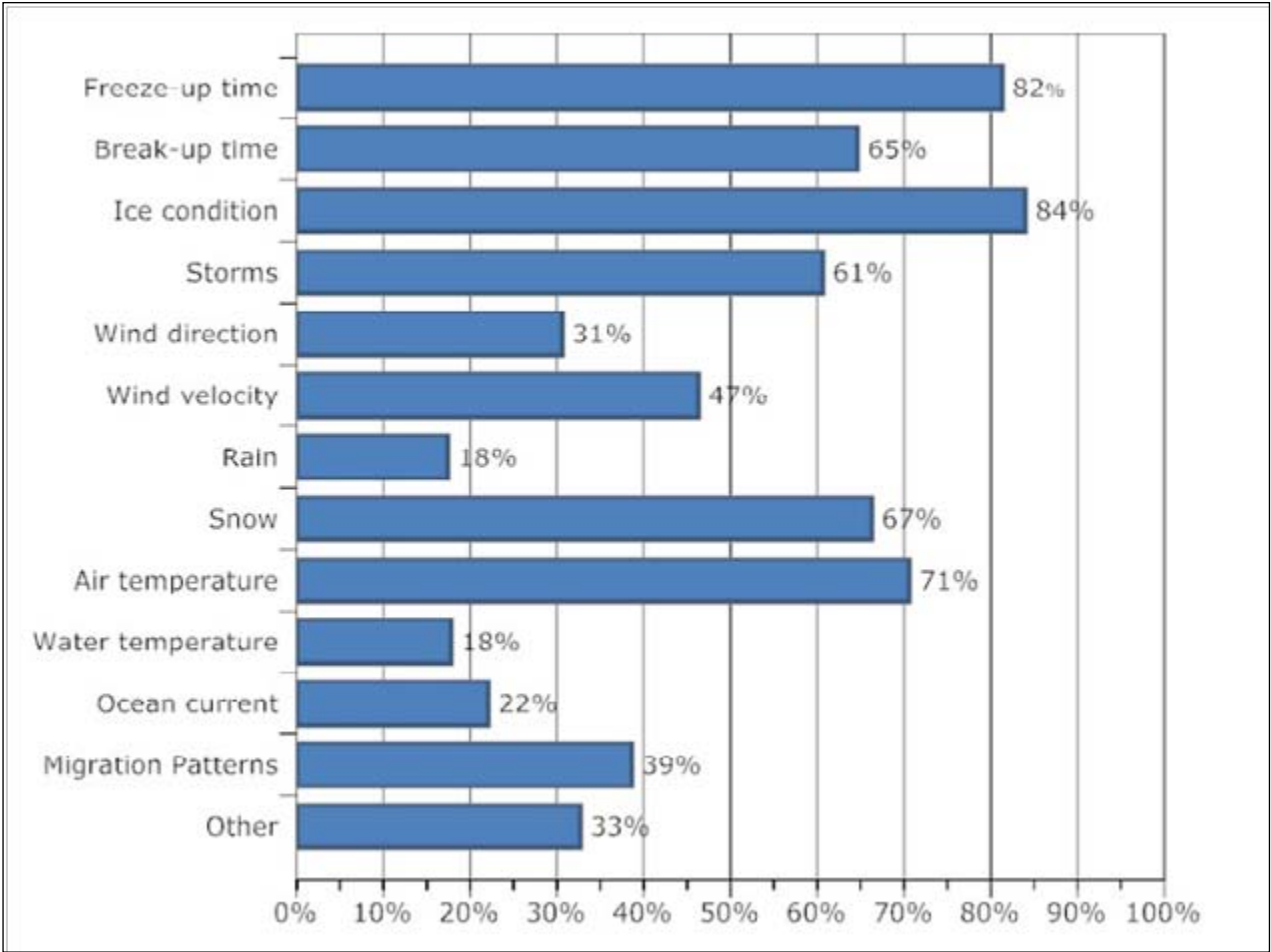
B. Observed Changes in Environmental Conditions (n=49)

Observed changes in environmental conditions in the Gambell area were numerous and varied. Respondents were first asked if they had observed anything 'unusual or rare in the environment' at the location of their previous hunting/fishing trip. Then they were asked if they had noticed changes in specific categories of environmental conditions in the previous 10-25 years and to describe those changes in an open-ended format.

Of the respondents, 41% agreed that they had observed something 'unusual or rare' in the environment in the past 5 to 10 years at the specific location of their previous hunting/fishing trip.

In Gambell, many respondents had observed specific environmental changes in the previous 10-25 years. From most frequently mentioned to least, 84% noticed a change in ice conditions, 82% noticed a change in the timing of freeze-up, 71% noticed a change in air temperature, 67% noticed a change in snow, 65% noticed a change in the timing of break-up, and 61% noticed a

Figure 15. Percent of Gambell respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=49)



change in storms (see Figure 15).

Specific observed changes in each category of environmental conditions varied somewhat, but some trends were apparent. The largest percentage of observed change was in ice conditions (84%). Gambell is ice-locked during the winter months. Hunting for marine mammals, including whale, is affected by ice conditions, so it is not surprising that many respondents detected a change in ice conditions.

The following percentages are responses to open-ended questions, which state, 'How has it (the environmental condition) changed?' They are percentages of the whole sample (n=49) and because a person may note more than one change in an environmental condition (thin ice and less shore fast ice) the percentages don't total the whole portion of observers of a given change.

Much detail was given about specific changes in ice condition. Of the respondents 49% reported less ice, 33% reported thinner ice, 16% reported unreliable or dangerous ice, and 12% reported change in shore fast ice. Other observations included rotten ice, an increasing predominance of young ice, unpredictable ice flows, and scattering of ice into smaller sheets.

- "There's less ice each year and it is getting thinner. It comes very late in the fall and goes out real early in the spring. Weather conditions have changed too. We used to have northerly winds. Now, in that season, we get more southerly wind. The wind is stronger and changes all the time. I've never seen this before in my life."

In Gambell a majority (76%) reported freeze-up was later than usual, while 65% reported break-up as earlier. Many reported a change in air temperature with 76% describing it as warmer, while 8% noted greater fluctuation in air temperature.

Observations of snow conditions included less snow (47%), and 12% noted that there was less snow on the ground because it is blowing away. Of the respondents 16% noticed an increase in storm frequency, while 14% noticed an increase in the strength of storms.

Many respondents (33%) reported other changes that were not specifically addressed in the survey. These changes included erosion, melting permafrost, generally



Walrus meat drying, Gambell Alaska



erratic and unpredictable weather, changes in the timing of seasons, early growing and dying of greens, fewer berries and changes in the magnetic north pole.

- “There’s beach erosion. About 0 to 50 feet or more. The permafrost is melting. I’ve noticed this from the early ‘90s to the present.”

#### C. Abundance and Quality of Subsistence Resource (n=42)

In Gambell, a majority of respondents (69%) harvested seal and/or walrus (see Table 7). Salmon, bowhead whale, crab, tom cod, emperor geese and sheefish were also harvested by the respondents.

Table 7. Species of Fish/Marine Mammal Harvested (n=42)

Species	Frequency	Percent
Salmon	1	2%
Walrus, Seals	29	69%
Bowhead Whale	1	2%
Crab	2	5%
Tom cod	1	2%
Emperor geese	1	2%
Multiple species	6	14%
Sheefish	1	2%
Total	42	

Answers to open-ended questions revealed that many respondents (30%) believe there are fewer walrus and/or seals in the area.

- “There are less game every year”
- “There are less seals. From time to time marine mammals change their habitats depending on food source, noise pollution.”
- “There were more seals ten years ago”

Many (26%) also noted the animals were farther out and/or harder to get to.

- “The hunt has arrived later and left earlier, so we have less time to hunt.”
- “There are big changes. It’s warmer. Next month should be real cold. The seals are leaving early because the ice goes out early. They’re going up north. Used to be able to hunt till June.”
- “The walrus [migration pattern has changed]. They’re getting farther and farther away. They hang out on the ice pack.”

The harvests overwhelmingly yielded healthy looking animals/fish. When asked if the previous harvest trip yielded any animals/fish with visible disease 88% replied that it did not. The reports of diseased animals included:

- Walrus catch:
- “Green color under the skin, looked

- sick.”
- Walrus/seal catch
- “Some animals are skinny”
- “Rotten teeth. Some had less weight.”
- Seal catch:
- “Bump on the seal’s back”

In Gambell, locations of the previous harvest trip were described as reliable by 86% of respondents. The reliability of these locations is reflected in responses to a question about future harvest events. Of the respondents, 76% reported that they would return to the same location to harvest the same species on future trips, although 98% reported that they had no idea how much they may catch.

#### 6.3.2 Kanchalan

##### A. Kanchalan Sample Profile (n=43)

In Kanchalan, interviews occurred between July 2008 and September 2009. The sample was predominately male (72%), and the majority fell between the ages of 36 and 55 years old (see Table 2). The majority (77%) have lived in the community for more than 30 years (see Table 8). The sample represents many years of hunting and fishing experience with 82% having 11 years or more experience harvesting in the area (see Table 9). At the time of the interview, 26% reported they were unemployed.

Table 8. Years of residence in the community (n=43)

Length of Time	Frequency	Percent
0-5 years	1	2%
11-20 years	2	5%
21-30 years	7	16%
Total	43	



Camp near Kanchalan, Russian Federation

Photo: V. Karabanova

Figure 16. Percent of Kanchalan respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=43)

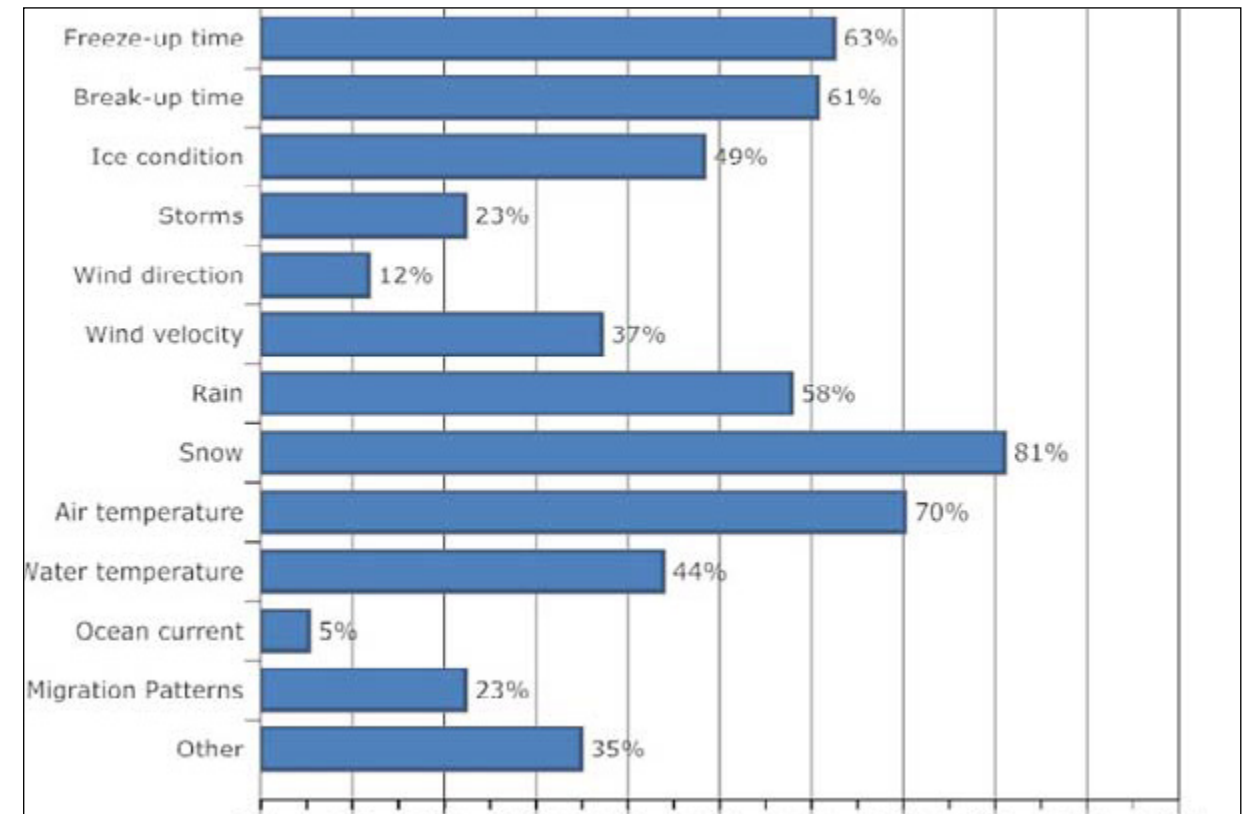
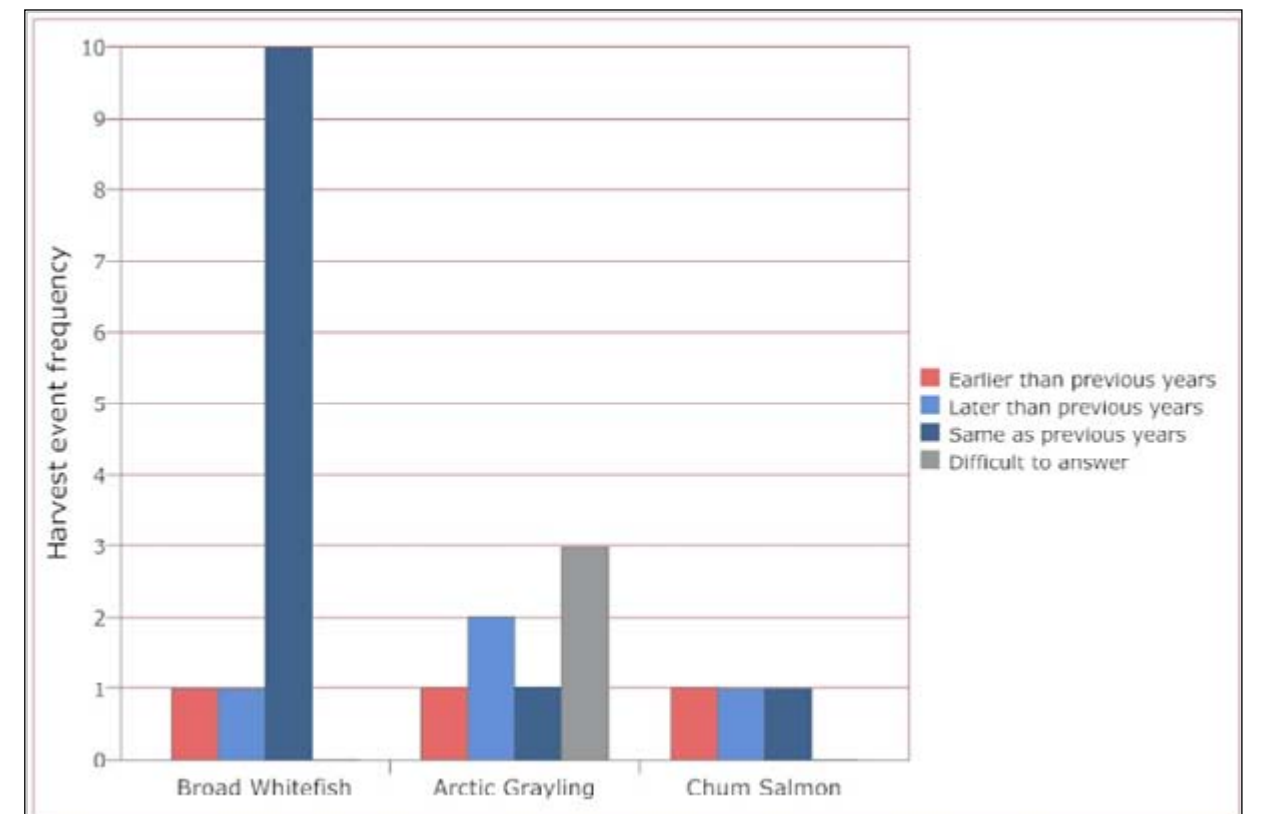


Figure 17. Timing of fish runs in Kanchalan compared to previous 5-10 years by species (n=22\*)



\* Those harvested species that had begun their seasonal migration at the time of the interview



Length of Time	Frequency	Percent
More than 30 years	33	77%
Total	43	

Table 9. Years hunted/fished in the area (n=43)

Length of Time	Frequency	Percent
0-5 years	3	7%
6-10 years	5	12%
11-20 years	11	26%
21-30 years	8	19%
More than 30 years	16	37%
Total	43	

B. Observed Changes in Environmental Conditions (n=43)

Kanchalan respondents noticed many changes in environmental conditions. When asked if they had noticed anything ‘unusual or rare’ in the environment at the specific location of the previous fishing trip in the past 5 to 10 years, a majority (56%) agreed they had.

When asked in a ‘yes or no’ format whether they had noticed a change in specific environmental conditions within the last 10 to 25 years, many replied that they had. Of the environmental changes 81% noticed a change in snow condition, 70% noticed a change in air temperature, 63% noticed a change in the timing of freeze-up, and 61% noticed a change in the timing of break-up (see Figure 16).

By examining the open-ended responses addressing what changes were observed for each environmental condition some trends were revealed. The most frequently observed change is in snow conditions (81%).

There appeared to be a near consensus that there was less snow (79%). Only one respondent noticed more snow. The change in snow conditions was thought to have an effect on the reindeer herds by some respondents.

- “Снежный покров стал тоньше: за зиму вымерзла пушица – самый ранний корм оленей.”
- “The snow cover has gotten thinner. The cotton grass – the earliest food for the reindeer -- froze through over the course of the winter.”

Although many observed a change in air temperature (70%) there was a lack of consensus as to how it was changing. Some believed it was becoming warmer (44%), while others believed it was getting cooler (35%).

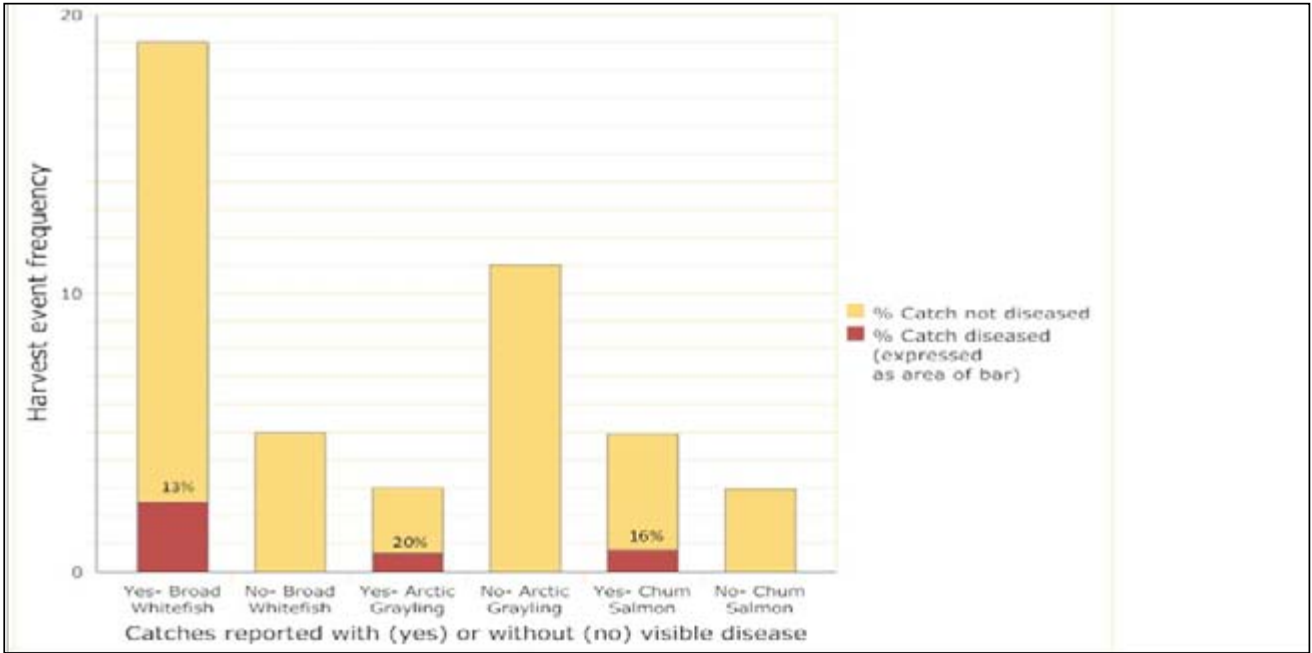
Many agreed that freeze-up time was late (56%), and a few believed it to be early (7%).

- “Раньше в начале сентября уже был прочный лед на лужах, на реке – забереги. Сейчас конец сентября, льда нигде нет.”
- “Before there was already thick ice on the puddles on the river. It was up to the banks by the beginning of September, but now there’s no ice anywhere by the end of the September.”

The timing of break-up was believed to be earlier by 30% of respondents, while 26% believed it was later. Rain was considered to be less frequent by 40% of respondents.

Other environmental changes found in open-ended responses included lower water levels in the rivers (30%) and an increase in underwater vegetation (14%). Unusual observations included the appearance of beluga whales at the fishing location and the increase of willow and alder, resulting in the appearance of sparrows and ravens.

Figure 18. Frequency of respondents in Kanchalan reporting their harvest included fish with visible signs of disease and average percentages of the catch reported to be diseased (n=46)



- “Несмотря на то, что идут дожди, воды в реке не прибавляется, река мельчает.”
- “Despite the fact that it rains, the water in the river doesn’t increase. The river gets shallower.”
- “В поселке появились воробьи, в тундре много воронов, все зарастает ольхой и ивой.”
- “Sparrows have appeared in the village. On the tundra there are a lot of ravens. Everything is overgrowing with willows and alders.”

When asked about the timing of the fish runs that had begun at the time of the interview, reports were split as to whether the fish runs were early or late (see Figure 17). Although a majority of those harvesting broad whitefish (83%) agreed that the timing of the seasonal migration was the same as previous years.

C. Abundance and quality of subsistence resource (n=47)

The harvest events in the sample included broad whitefish (53%), arctic grayling (30%) and chum salmon (17%).

In responses to open-ended questions, 37% of the sample referred to declining fish stock in some manner. Broad whitefish were said to be decreasing by 19% of respondents, and arctic grayling were also reported as decreasing (14%); 12% reported more pike in the area. Reasons cited for declining fish populations included decreased water levels, increases underwater vegetation and nearby mining activity.

- “В местах обитания чира появилась водная растительность, стало больше щук, уровень воды понизился, чира стало меньше.”
- “Underwater vegetation has appeared in the Broad whitefish’s habitat. There are more pike. The water level has gone down. There are less Broad whitefish.”
- “Летом в реках стало меньше воды, рыба уходит вниз по реке. Гибнет много мальков из-за пересыхания проток.”
- “This summer there was less water in the river. The fish went downstream. A lot of fry are dying due to the drying up of the channels.”
- “Муть в реке из-за работы мелиораторов или прииска Валунистого может помешать рыбе добраться до мест нереста.”
- “Dregs in the water from the land-reclamation work, or maybe it’s the Valnitsky mine, interferes with the fish getting to the spawning ground.”

Reports of diseased fish were fairly common in the sample. A majority (57%) of harvest events yielded at least one fish with visible disease (see Figure 18). Catches of broad whitefish were more frequently reported with visible disease (76%). Sores, ulcers, spots, and/or pimples were the most common forms of disease reported in broad whitefish.

- “Красные пятна на спине и боках рыбы.”
- “Red spots are on the spines and sides of the fish.”

- “На голове и спине рыб были язвы.”
- “There were ulcers on the head and spine of the fish.”
- “Пятна на теле в области головы, иногда с плесенью.”
- “There are spots on the body in the area of the head, sometimes with mold,”
- “Капсулы в мягких тканях и глазах, язвы на боках.”
- “There are capsules in the soft tissue and eyes, [along with] lesions on the side.”
- “Кишки с шишечками.”
- “Guts are with bumps.”
- “Особь с белыми точками на печени и на желудке.”
- “Some fish are with white spots on the liver and the stomach.”
- “Язвочки на теле у брюшных плавников.”
- “Sores are on the body of the abdominal fins.”

Reported disease of chum salmon included:

- “Попадались рыбы, зараженные плоскими червями (мякоть спинной части).”
- “Some caught fish were infected with flat worms in the spinal tissue.”
- “Рыбы-уродцы с искривлением позвоночника, с непропорционально крупной головой; пиявки на коже, рядом с жабрами.”
- “Freak-fish with crooked spines, disproportionately large heads, and leeches on the skin nearby the gills”
- “Рыбы, внутри которых были личинки.”
- “Fish that were infested with maggots.”
- “На спине рыб были белые пятна (шишки).”
- “There were white spots (bumps) on the fish spine.”

The location of the previous fishing trip was described as reliable by 89% of the respondents, which is reflected in the fact that 86% planned to return to the same place on their next fishing trip for the same species. For those going to a different location, most intended to stay, again, within a 15 kilometer range. Harvesters seemed generally confident that they could predict the size of their next catches, and 62% said they had an idea of what their next catches would be.

6.3.3 Nikolskoye

A. Nikolskoye Sample Profile (n=29)

In Nikolskoye, interviews were conducted from May 2008 to August 2008. The sample was predominantly male (79%) and comprised of varied age groups (see Table 2). The majority are long-time residents (see Table 10) with 66% having lived in the area for more than 30 years. Individuals with more than two decades worth of experience harvesting in and around Nikolskoye made up 80% of respondents (see Table 11). In Nikolskoye, 55% described visiting the location of their last harvest either often or very often.



Figure 19. Percent of Nikolskoye respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=29)

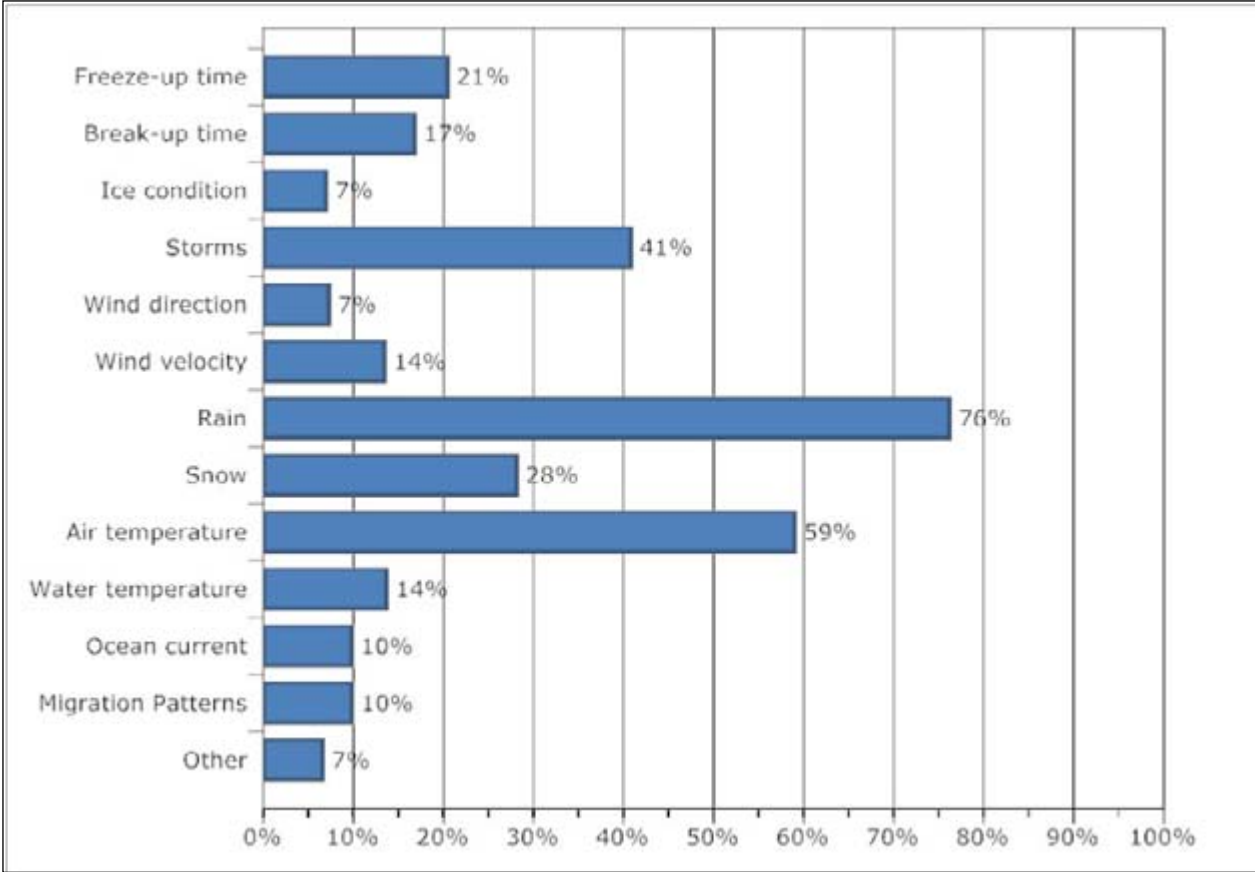
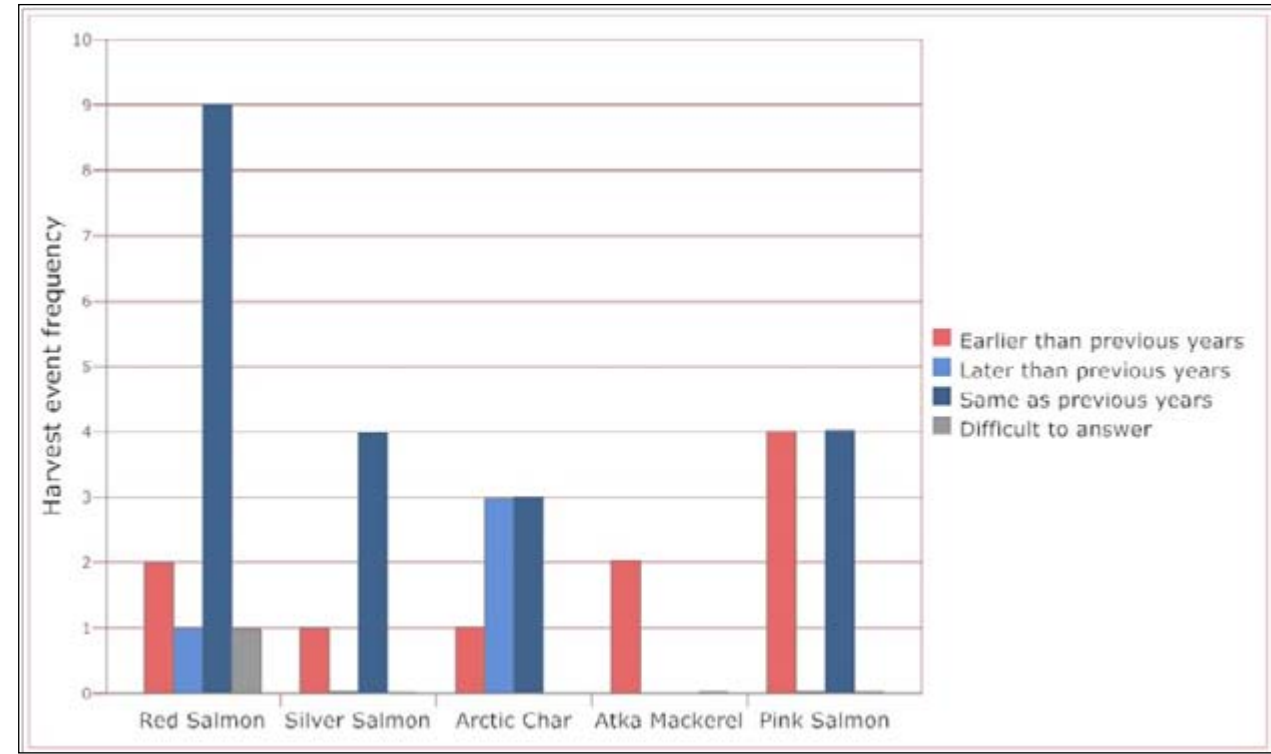


Figure 20. Timing of fish runs in Nikolskoye compared to previous 5-10 years by species (n=35\*)



\*Those harvesting species which had begun their seasonal migration at the time of the interview

Table 10. Years of residence in the community (n=29)

Length of Time	Frequency	Percent
0-5 years	2	7%
11-20 years	3	10%
21-30 years	5	17%
More than 30 years	19	66%
Total	29	

Table 11. Years hunted or fished in the area (n=29)

Length of Time	Frequency	Percent
0-5 years	1	3%
6-10 years	2	7%
11-20 years	3	10%
21-30 years	8	28%
More than 30 years	15	52%
Total	29	

B. Observed Changes in Environmental Conditions

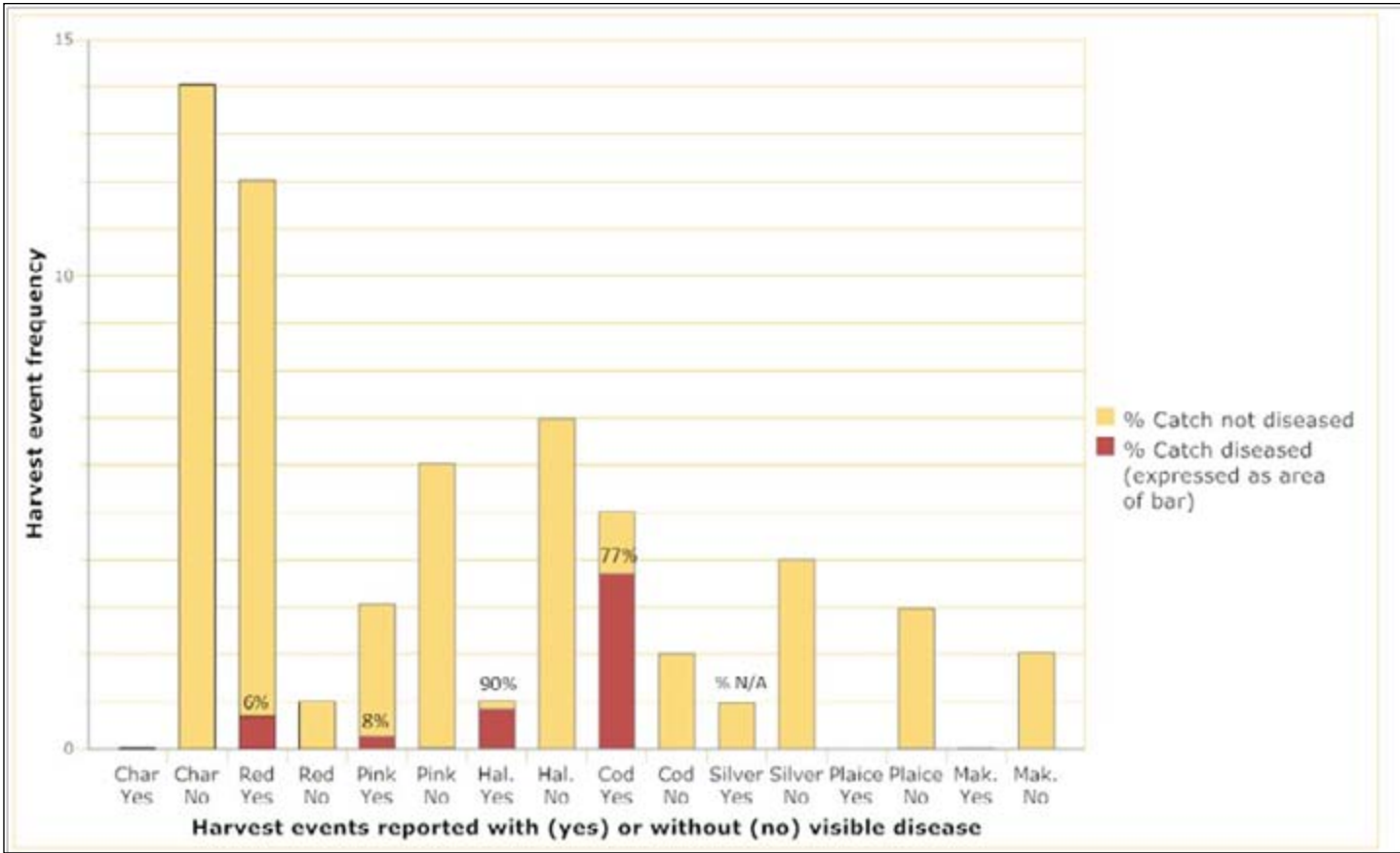
Observed environmental changes in Nikolskoye were noted at the location of the previous harvest and in re-

sponses about specific environmental conditions.

Location specific changes were noted by 66% of respondents at the location of the previous harvest. The most frequently mentioned location-specific change was in the river banks, channels, and underwater vegetation (45%). Other changes included pollution, fewer fish, and more organic matter in the water.

- “Помельчали реки, зарастают понемногу травой.”
- “The streams have gotten smaller, gradually getting overgrown with grass.”
- “Сравнивая с днями моего детства и молодости, обмелела речка, замыло песком старое русло, исчезла береговая растительность вдоль берега в холмах.”
- “Comparing with the days of my childhood and youth, the river has gotten shallower; the old riverbed washed out with sand, bank vegetation disappeared along the banks in hills.”
- “Теперь это грязное место: текло горячее, каустик, канализация. И просто шторма меняют берег – все меняется.”
- “Now, this place is dirty; there’s pollution, caustic soda, sewage. And the storms are affecting the shores. Everything is changing.”
- “Изменился состав водорослей, возможно,

Figure 21. Number of harvest events yielding diseased fish and average percentage of catch reported as diseased in Nikolskoye (n=61)







Fishing near Nikolskoye, Russian Federation

- поднялся океанический уровень воды (опустился берег), стала накапливаться черная гниющая органика, рыба измельчала.”
- “The composition of underwater vegetation has changed. Perhaps, the ocean water levels increased (sinking the banks). Black organic material has started to accumulate. Organic matter is accumulating.”

When asked about changes in specific environmental conditions observed in the past 10 to 25 years, rain, air temperature and storms were most frequently mentioned (see Figure 19). A change in rain was observed by 76% of respondents, all of which reported there to be less rain. Air temperature was also observed to be changing by 59% of respondents, although there was lack of consensus as to how it was changing. From the open-ended portion of the survey, 54% believed it was warmer, while 21% believed it to be cooler. Storm conditions were observed to be changing by 41% of respondents, but again there was lack of consensus as to how they were changing. Decreased frequency and/or intensity of storms was observed by 17%, while 10% believed they were increasing in frequency and 7% believed them to be increasing in intensity.

The timing of migrating fish was also examined for those runs that had begun at the time of the interview. This included 35 harvest events in which at least one type of migrating fish (red salmon, silver salmon, pink salmon, arctic char, atka mackerel) was harvested. When asked about the timing of the seasonal migration 29% reported earlier seasonal runs, 11% reported later seasonal runs, 57% reported that the run was the same as previous years and 3% had difficulty answering the question (see Figure 20).

#### C. Abundance and Quality of Subsistence Resource (n=61)

In Nikolskoye, the participants harvested (from most frequently harvested to least) arctic char, red salmon, pink salmon, halibut, pacific cod, silver salmon, plaice, and atka mackerel (see Table 12).

In answers to opened-ended questions, 17% of respondents reported that there were fewer fish.

- “Стало меньше рыбы, обмелела речка, меняется русло, меняются старицы”
- “There are fewer fish, the river got shallow, the riverbed is changing, the old riverbed is changing.”

When asked if they had caught any fish with visible disease on the previous trip, 36% reported they had. Of those harvesting red salmon (13 respondents), 92% reported that their catch included at least one fish with visible disease. Of those that harvested pacific cod (7 respondents), 71% reported that their harvest included at least one diseased fish. On average, a large portion (77%) of the pacific cod catch was reported with some type of disease (see Figure 21).

Eight out of the 12 that reported a catch of red salmon with disease discussed the condition as bites from marine mammals, which is not unusual. In pink salmon, one harvester noticed an unusually small fish (30cm) with fully developed reproductive organs. Pacific cod diseases included worm infestations and ulcerations. Other reports of disease included flesh/skin infestations (6 harvesters observed this), sores and ulcers (6 harvesters observed this), and one case of a fish with underdeveloped sperm sacks.

Table 12. Species harvested by respondents (n=61)

Species	Frequency	Percent
Halibut	8	13%
Red salmon	13	21%
Silver salmon	5	8%
Arctic char	14	23%
Atka mackerel	2	3%
Pink salmon	9	15%
Plaice	3	5%
Pacific cod	7	12%
Total	61	

A majority (93%) describe the locations of the previous trip as reliable. An identical percentage (93%) planned to return to the same location for the same species on the following trip. A majority (84%) reported having an idea of how much they would catch on their next trip while 16% reported having no idea.

#### 6.3.4 Sand Point

##### A. Sand Point Sample Profile (n=18)

In Sand Point, interviews occurred between May 2008 and October 2008. The sample was slightly younger with 56% between the ages of 18 and 35 (see Table 2). Again, the sample was predominately male (61%). Participants who have spent more than two decades in the community comprised a majority of the sample (84%) (see Table 13) and most have harvested in the area for more 11 or more years (78%), (see Table 14). At the

Figure 22. Percent of Sand Point respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=18)

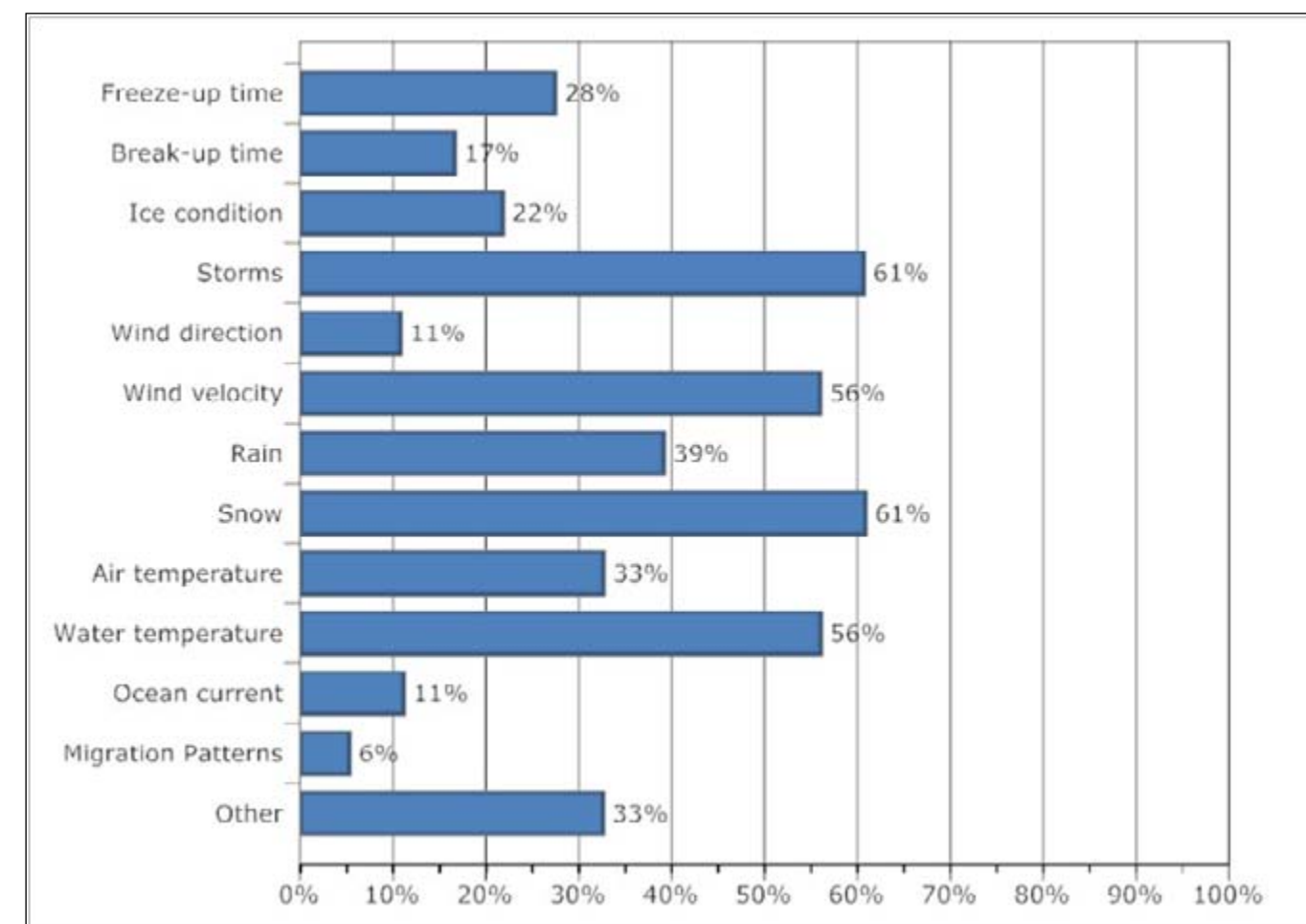
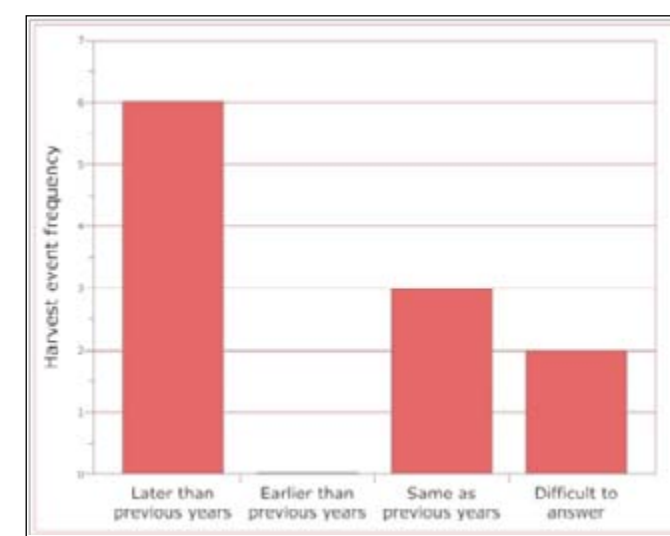


Figure 23. Timing of fish runs in Sand Point compared to previous 5-10 years (n=11\*)



\*Salmon harvesters

time of the interview 37% report being unemployed.

Table 13. Years of residence in the community (n=18)

Length of Time	Frequency	Percent
6-10 years	3	17%
21-30 years	5	28%
More than 30 years	10	56%
Total	18	

\*due to rounding

Table 14. Years hunted/fished in the area (n=18)

Length of Time	Frequency	Percent
0-5 years	1	6%
6-10 years	3	17%
11-20 years	7	39%
21-30 years	1	6%
More than 30 years	6	33%
Total	18	

\*due to rounding





The Cumberland Family fishing near Sand Point, Alaska

#### B. Observed Changes in Environmental Conditions (n=18)

When respondents were asked specifically about any changes observed at the location of the previous hunting/fishing trip 33% indicated that they had observed some type of change within the previous 5 to 10 years.

The survey also queried about changes in specific environmental conditions during the previous 10 to 25 years. Changes in storms and snow conditions were most frequently noticed (61%), followed closely by observed changes in water temperature (56%) and wind velocity (56%) (see Figure 22).

Observed changes in storms included increased frequency (33%) and increased strength (22%).

- “Storms are warmed and more intense over a span of years.”
- “Storms are worse in the past 5 years.”
- “[During storms] there’s more wind. It seems like it blows hard for longer periods of time.”
- “More storms towards the end of the season this year. Summer was late this year.”
- “More rain and more storms these last couple of years, it seems like.”

Snowfall was reported to be occurring earlier in the year (33%). More snow was reported by 28%, while 11% believed there was less snow.

There was lack of consensus as to how water temperature was changing with 11% saying it is warmer and 33% saying it had become colder.

A majority (89%) of those who noted a change in wind velocity believed that it had increased in strength.

- “There’s more wind. It blows harder for longer periods of time, it seems like.”
- “There are higher winds for longer times.”

Other unusual sightings included more alder, less seals, more krill (and whales associated with the krill) and humpback whales staying in the area longer than usual and even mating there (this usually occurs in warmer waters to the south).

- “Greater abundance of krill and whales than in previous years. Noticed this happening around the turn of the century (21st century). Whales are sticking around longer and not leaving for the winter.”
- “Humpbacked whales mating. Never heard of that happening at these locations before. I even asked ‘old timers’, and none of them had heard of it either, if that tells you something. There are way more whales than when I was a kid. And some aren’t even leaving for the winter.”
- “There are less seals out there now. You used to be able to take 2 shells (shotgun shells) with you and get 2 seals, and now you have to take a whole box of shells and you’re lucky to get 2 seals. They seem to be a lot more skittish. You can’t get close to them anymore.”

For those harvesting salmon (n=11), a majority (6) believed the run was later than usual, while 3 respondents believed it was the same as in previous years; 2 had difficulty answering the question (see Figure 23).

#### C. Abundance and Quality of Subsistence Resource (n=19)

In Sand Point, all participants harvested fish, and a majority (58%) harvested salmon (see Table 15).

Table 15. Distribution of species harvested (n=19)

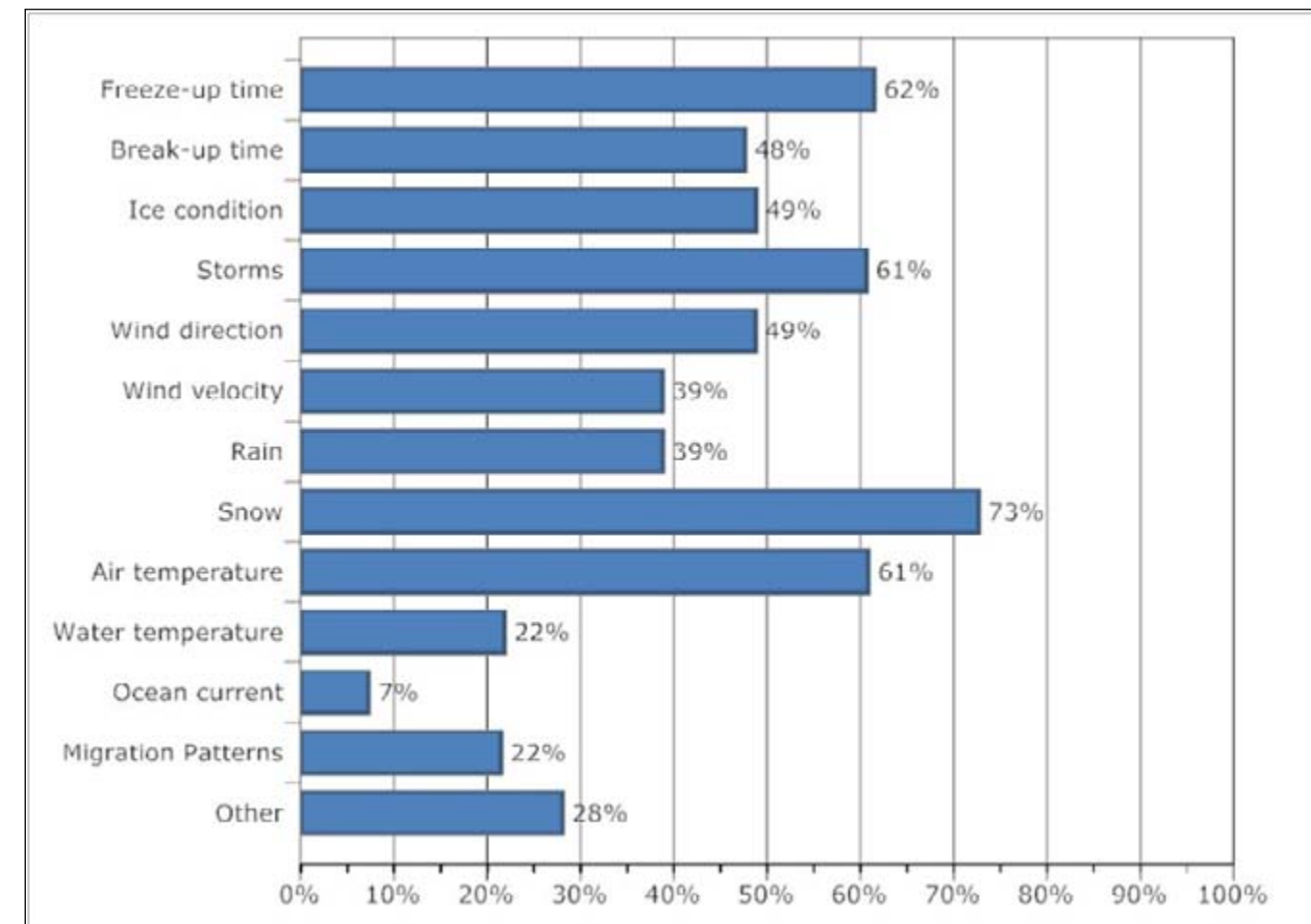
Species	Frequency	Percent
Salmon	6	32%
Halibut	5	26%
Red salmon	5	26%
Cod	2	11%
Clams	1	5%
Total	19	

In responses to open-ended questions, 27% of those harvesting salmon reported there were less salmon and 20% reported there were less halibut available. Two participants reported more pink salmon (a lower commercial value salmon). One participant elaborated discussing how the ratio of red salmon to pink salmon had changed.

- “More pinks in the last 2-3 years. Never used to catch so many pinks here. The reds haven’t changed, just the pinks. It is a 60-70% pink ratio now. It used to be a steady 40% pink ratio.”

There were three reports (16%) of catches that included at least one fish with visible disease. In all cases the percentage reported of the catch with visible disease was very small (<1%) or not quantifiable.

Figure 24. Percent of Togiak respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=69)



Locations of the previous harvest were described as reliable by 90% of participants and 68% planned on returning to the same location on the next trip to harvest for the same species. However, the reliability of these locations seems to be limited in that 95% reported that they could not estimate how much they would catch on their next trip.

#### 6.3.5 Togiak

##### A. Togiak Sample Profile

In Togiak interviews were conducted from December 2008 to March 2009. The sample consisted of 57% males, with a relatively even spread across age groups (see Table 2). A majority were long-time residents, with 73% having lived in the area for more than 30 years (see Table 16). Many years of harvesting experience were represented (see Table 17). A majority (77%) had over two decades of experience harvesting in the area. At the time of the interview 78% reported being unemployed.

Table 16. Years of residence in the community (n=69)

Length of Time	Frequency	Percent
0-10 years	6	8%
11-20 years	4	6%
21-30 years	9	13%
More than 30 years	50	73%
Total	69	

Table 17. Years hunted/fished in the area (n=69)

Length of Time	Frequency	Percent
0-10 years	8	12%
11-20 years	8	12%
21-30 years	17	25%
More than 30 years	36	52%
Total	69	

\*due to rounding

#### B. Observed Changes in Environmental Conditions (n=69)

When asked about the location of the previous harvest



trip, 32% reported changes at that location. Figure 24 displays answers to more specific questions about changes in environmental conditions. Frequently observed changes included a change in snow condition (73%), freeze-up time (62%), air temperature (61%), and storms (61%).

Observed changes in snow conditions included less snow (38%) and more snow (12%). Although there is lack of consensus as to how snow conditions are changing, half of those who observed more snow made it clear that they were talking about this year in comparison to prior years. Thus, they might agree with the more common observation of less snow as a general trend. The late arrival of snowfall was observed by 7%.

- “Long ago there was lots of snow, and when it got cold it stayed cold. We used to dig up doors below. Our homes used to be covered and it was good insulation for our home. Now winters come late.”
- “Long time ago there used to be lots of snow and blizzards.”

Many agreed that freeze-up time was later (25%), while only 7% reported it was earlier. Greater variation in the timing of freeze-up was observed by 16% of respondents.

- “Freeze up of the bay and river took longer than expected. And it has even rained in December, making it harder to travel with snow machine.”
- “Freezes-up very early some years, very late the next year. Freeze up is not constant anymore.”

Observed changes in air temperature included unusual fluctuation in air temperature (35%), warmer air temperature (33%), and a few reported that the air temperature was cooler (15%).

- “Our weather will be zero one day and then we’ll wake up to rain the next.”

Observed changes in storm patterns included increased strength and longer storms (22%), while 13% noticed an increase in the frequency of storms.

- “60 mile-65 mile per hour winds during storms. This is recent – within the last 10 years.”
- “Big storms with high winds. This is very different for January.”

Other observed changes included lower water levels in the Togiak River (9%), fish changing locations (7%), erosion and water pollution. Four respondents said that the Earth appears to have tilted, based on an unusual position of the stars or unexpected location of sunrise/sunset. Two individuals reported catching unusual fish.

- “Second Creek changed; lots of mud, the ocean shores are flat and shallow. When I stayed down by the ocean line (beach) the land is sinking down.”
- “The water is dirty because of the Togiak River

Lodge – tourism. We have to travel further up for cleaner water.”

- “I think it has to do with global warming. Different fish caught like white fish closer by the mouth of the river.”

Data related to the timing of the fish run in Togiak was not used because of confusion about the meaning of the term ‘run’, perhaps due to the misunderstanding of the English word.

#### C. Abundance and Quality of Subsistence Resource (n=70)

A majority (88%) of harvest events consisted of trout and smelt (see Table 18). Seals, pike, salmon and common eider were also harvested by respondents. In responses to open-ended questions, 10% believed there were less fish or animals than there used to be.

- “There isn’t much fish anymore. It’s not like it was a long time ago. Now some people even catch baby trout.”
- “We’re not catching as much smelt”

Table 18. Species of fish/marine mammal harvested (n=70)

Species	Frequency	Percent
Salmon	2	2%
Trout	38	54%
Smelt	24	34%
Pike	2	3%
Seals	3	4%
Total	70	



Togiak CRA Olia Sutton shows off her bounty

Figure 25. Percent of Tymlat respondents who have observed some change in environmental conditions within the previous 10 to 25 years (n=38)

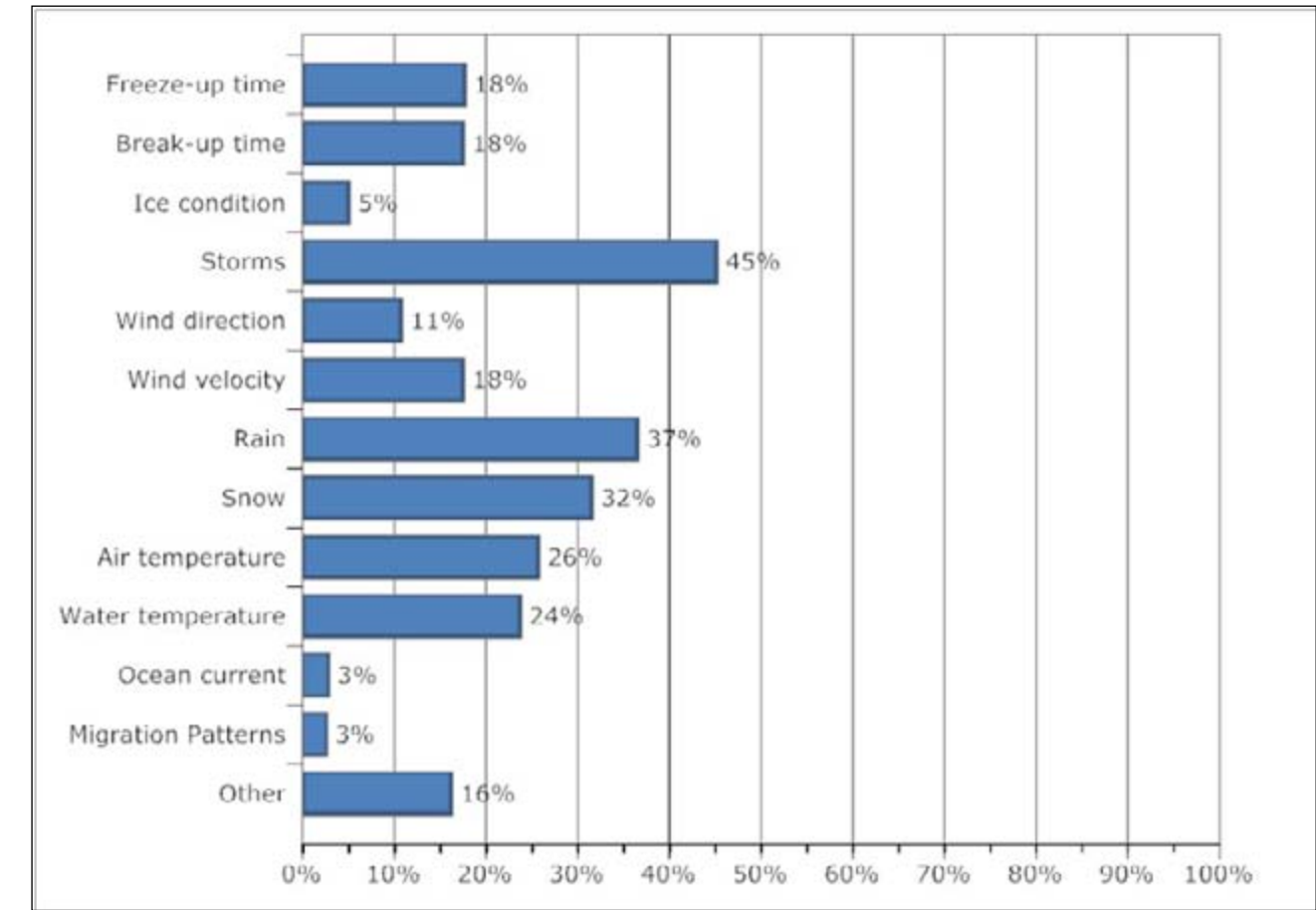
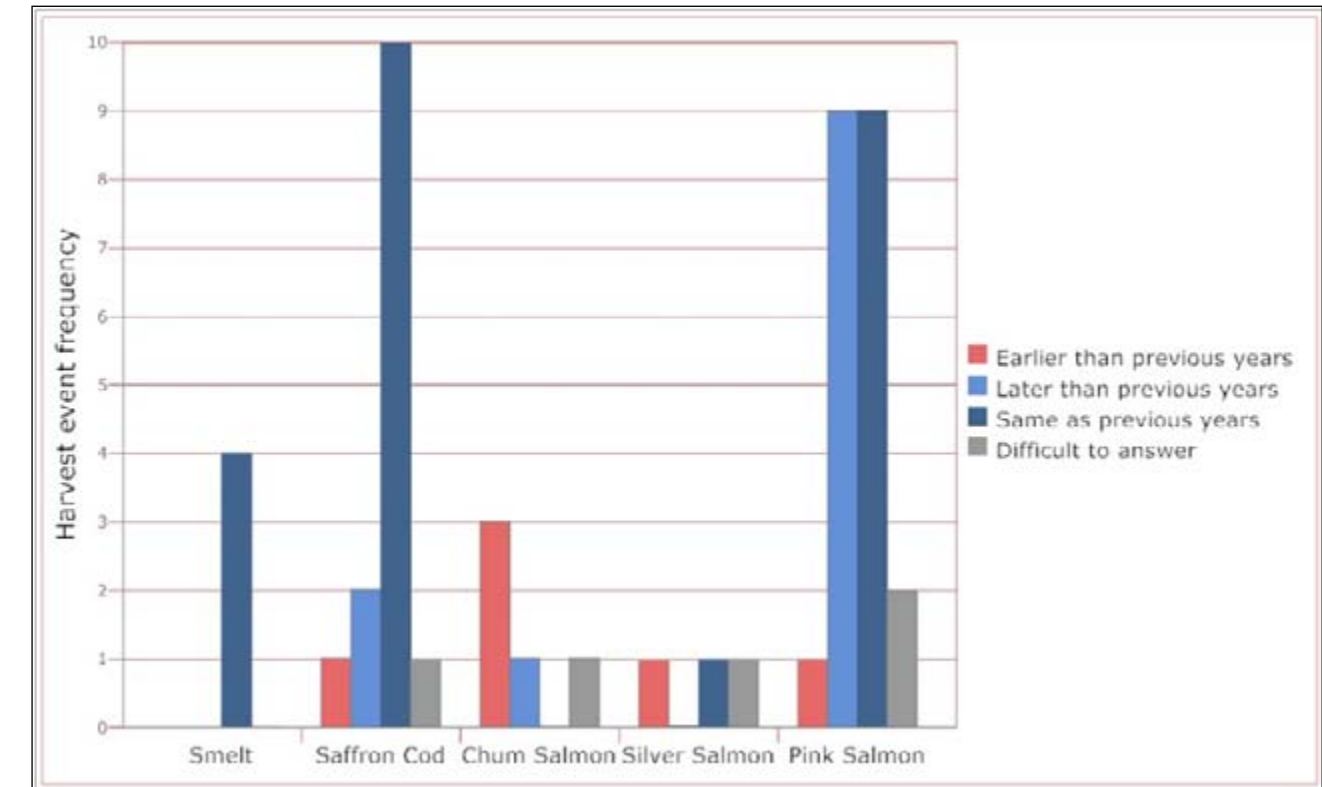


Figure 26. Timing of fish runs in Tymlat compared to previous 5-10 years by species (n=47\*)



\*Respondents harvesting these species



Species	Frequency	Percent
Seals and Common eider	1	1%
Total	70	

\*Due to rounding

Only 6% of harvests yielded animals with visible signs of disease. The four cases in which harvesters reported ill fish included: smelt with “lumps” and other deformities, including a “crooked mouth”, a trout with “green colored meat”, and bites from marine mammals. White spots were found, in singular instances, on a trout and a Silver salmon.

Locations of the previous harvest were described as reliable by 99% of respondents, although 89% report having no idea of what the next harvest might yield.

### 6.3.6 Tymlat

#### A. Tymlat Sample Profile (n=38)

In Tymlat, interviews occurred between December 2008 and March 2009. The average age of the sample was 45 (see Table 2), and nearly equal portions of men and women were represented (see Table 3). Long-time resi-

dents comprised the majority of the sample with 74% having lived in Tymlat for over 30 years (see Table 19), and 80% have harvested in the community for 11 years or more (see Table 20). At the time of the interview, 68% reported they were unemployed.

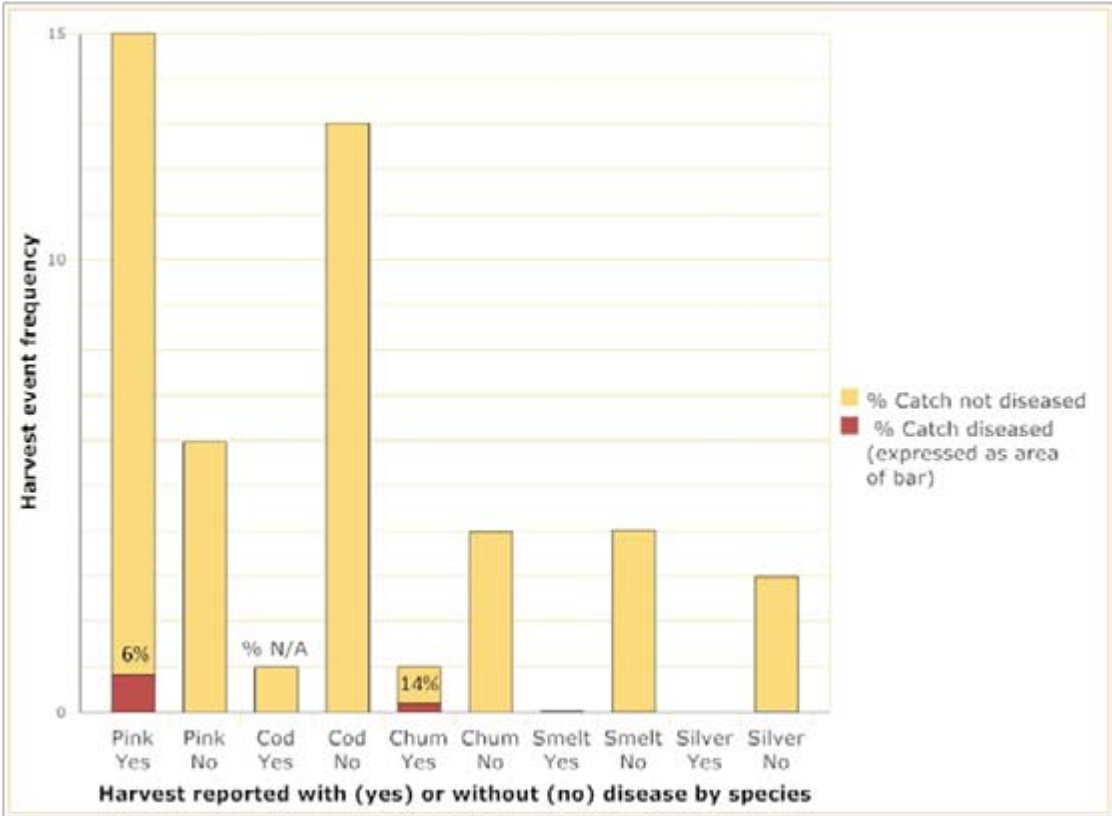
Table 19. Years of residence in community (n=38)

Length of Time	Frequency	Percent
0-5 years	0	0%
6-10 years	2	5%
11-20 years	1	3%
21-30 years	7	18%
More than 30 years	28	74%
Total	38	

Table 20. Years harvested in community (n=38)

Length of Time	Frequency	Percent
0-5 years	1	3%
6-10 years	7	18%
11-20 years	12	32%
21-30 years	6	16%
More than 30 years	12	32%
Total	38	

Figure 27. Number of harvest events yielding diseased fish and average percentage of catch reported as diseased in Tymlat (n=48)



Due to rounding

#### B. Observed Changes in Environmental Conditions

Respondents in Tymlat noticed fewer changes in environmental conditions than residents in other communities. Very few (5%) noticed a change at the location of the previous fishing trip. Figure 25 displays observed changes in specific environmental conditions over the past 10 to 25 years. Storms were the most frequently cited change (45%), followed by changes in rain (37%), snow (32%) and air temperature (26%).

A substantial portion noticed changes in storms. Many (26%) reported an increased frequency of storms. Increasing strength was also frequently mentioned by 13%. Hail in association with storms was cited as occurring more frequently by 18%.

- “С 2005 года уже началось больше штормов. И с каждым годом сильнее и больше. И ветра и дожди.”
- “Since 2005 there’s started to be more storms. And they are stronger and bigger with every year, and there are winds and rains.”
- “В этом году штормов очень много было. Чуть ли не неделями сидели дома. Раньше такого не было. Летом стало холодно.”
- “This year there were a lot of storms. We stayed at home for weeks. There was nothing like this before. Summers have gotten colder.”
- “Стало в этом году больше гроз, даже град

шел. Раньше, года два назад, такого не было.”

- “There are more thunderstorms this year, we even had hail. Two years back we did not have such things.”

In responses to open-ended questions, 45% observed more rain than in the past. There was not a single report of less rain. Flooding was discussed in association with the increase in rain.

- “Дождь почти все лето лил, даже в декабре был дождь со снегом ночью. Днем мороз и гололед. Раньше такого не было.”
- “The rain poured almost the whole summer, even in December there was rain mixed with snow at night. In the day time, frost and glazed frost. There was no such thing before.”
- “В 2001 году осенью был сильный шторм, большие накаты. Затопило рыбозавод, унесло с завода пластмассовую посуду. От шторма навага валялась на берегу. Мы ее собирали собакам.”
- “In 2001 in the fall, there was a big storm, big waves. It flooded the fish-processing plant; it took plastic kitchenware from the plant. After the storm, there were cod along the shore. We collected them for the dogs.”

A change in air temperature was observed by 26%. Responses to open-ended questions revealed that



Fishing on Bering Island, Russian Federation



34% believe the air temperature is becoming colder in the summer and fall, while 13% reported warmer winters.

The most frequent observation that fell into the ‘other’ category was an increase in pollution (11%). Observations included fuel wastes from gold mining, impacts from explosions associated with mining activity, oil spills in the ocean and dirty ice.

- “Еще помню, что в верховьях реки, что -то взрывали (люди говорили). Река стала рыжая и рыба дохлая попадалась, мы как раз в это время на устьях рыбачили. Говорят, что это золотодобытчики в верховьях что-то делали.”
- “I remember that in the upstream of the river something blew up (people were saying). The river became rusty and dead fish were being caught, we were fishing in the delta at that time. They say the gold miners upstream were doing something.”
- “[Лёд] изменился из-за выбросов горючих отходов в небо, раньше лед употребляли для питья, чай пили. А сейчас его ни за что нельзя употребить. Его растопишь, а вода сверху грязная.”
- “[Ice conditions] have changed because of the fuel emissions [possible black carbon] into the sky. We used to use ice for drinking, made tea. And now there is no way you can use it for anything. When you melt it, the water on top is dirty.”

Changes were also reported in the timing of fish runs. Of those harvesting chum salmon, 60% reported that the harvest seemed earlier, while 43% of those harvesting pink salmon reported that the run seemed later (see Figure 26).

C. Abundance and Quality of Subsistence Resource

A variety of fish were harvested on the previous trip by respondents (see Table 21) with pink salmon being the most frequently harvested.

Table 21. Species harvested

Species	Frequency	Percent
Smelt	4	8%
Saffron Cod	14	29%
Chum salmon	5	10%
Silver salmon	3	6%
Multiple species	1	2%
Pink salmon	21	44%
Total	48	

\*Due to rounding

A majority of harvests yielded healthy appearing fish, however 35% of the harvest events yielded at least one fish with visible disease (see Figure 27). The quantity of the catch reported with disease was relatively small.

Pink salmon were most frequently reported with disease. Diseases included boiled-like fish, deformities and growths, strange coating on the skin, soars, ulcers, and spots. Five individuals attributed the diseases in the fish they caught to various kinds of industrial pollution, including oil and diesel spills in the ocean and rivers, radiation from rocket testing, and the dumping of radioactive waste into the sea by the US government. Interestingly, many reported they would not eat these fish.

- “Иногда в коже глисты. Внутренности, кишки чистые. Но бывают с желтым налетом, типа слизи. Мы считали их больными. Бывало попадали одноглазые.(т.е.), у второго, с другой стороны, не было даже разреза глаз. Уродливые. Мы все ее разглядывали. Одна попала. Больные мы не брали, закапывали. Еще попадались пузырчатые (мякоть была белого цвета и прозрачные пузырьки в мякоти). Я даже их трогала, лопала, но они крепкие. Содержимое не брызгалось, а растекалось по руке. Попадались очень редко. У старика спрашивала, что это? А он не знает. Я думаю они зараженные от топлива, испытаний. А муж - ”
- “Sometimes there are sores in the skin. Inside, the intestines are clean. But some are with yellowish mucus. We consider them to be sick. Sometimes we caught one-eyed ones, without even a slit for an eye on the other side. Ugly ones. We all looked at it. We got one like that. We did not take the sick ones, we buried them. And also we got some with bubbles in the meat – the flesh was white and transparent bubbles in it. I even touched them, tried to burst them but they were firm. The contents did not splash but flowed out. These were caught very rarely. I asked my old man – what is it? He does not know. I think they were contaminated from fuel [diesel] [spills], from military tests. My husband was saying – the sea is sick and the fish are sick too.”
- “Рыба как будто в плесени. Такую рыбу мы выкидываем. Даже собакам не давали.”
- “It is like fish is covered with mold. Such fish we throw out. We don’t even give it to the dogs.”

Harvest location were described as reliable by 94%, and 65% reported that their next trip for the same species would occur in the same location. When asked if they had any idea how much they would catch on their next trip, only 19% reported that they did.

# 7. Acknowledgements

The Aleut International Association would like to acknowledge the commitment and involvement of the following people, agencies and organizations during the preparation of this project, as well as express its appreciation for the additional financial and in-kind support that it has received.

U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs  
Environment Canada  
UAF, International Arctic Research Center  
Alaska Conservation Foundation  
Bristol Bay Native Association, Alaska, U.S.  
Native Village of Gambell, Alaska, U.S.  
The City of Togiak, Alaska, U.S.  
Kamchatka Region Union of Tribal Fishermen, Kamchatka, Russia  
Chukotka Regional Association of Indigenous peoples of the North, Chukotka, Russia  
Administration of the village of Tymlat, Kamchatka Region, Russia

Administration of the village of Kanchalan, Chukotka, Russia  
Red Cross Chukotka  
Tymlat Fish Processing Plant, Chukotka  
The Government of Chukotka Region  
The Government of Kamchatka Region  
U.S. Fish and Wildlife Service, Alaska, U.S.  
Conservation of Arctic Flora and Fauna Working group of the Arctic Council  
UNEP/GRID-Arendal  
U.S. Arctic Research Commission  
David Atkinson  
Helen Chythlook  
Molly Chythlook  
Hanna Eklund  
Mike Gill  
Ann Gordon  
Julie Gourley  
Moses Kritz  
Special thanks to Igor Krupnick for his thoughtful review and helpful comments.



Wolf Jackson and Dick Jacobsen Fishing near Sand Point, Alaska

Photo: T. Jackson



# Appendix 1: BSSN Workshops

**An International Workshop on the Development of a Community-Based Research Network in Bering Sea Coastal Communities**  
**US Arctic Research Commission, 420 L Street, Suite 315, Anchorage, Alaska**  
**October 5, 2005**

The Aleut International Association conducted an initial workshop in October 2005 to discuss the creation of a network with regional representatives. The purpose of the meeting was to learn about current and past community-based research projects, to discuss common interests and concerns, and to explore potential funding opportunities.

The most important outcome of this workshop was the decision as to what observations the BSSN survey should capture. It came as no surprise that the availability and abundance of fish and marine mammals emerged as the most pressing issue for communities.

Learning and sharing experience from other relevant projects was another important outcome of the 2005 workshop. The list of reviewed projects included:

IGAP (Indian General Assistance Program) of U.S. EPA  
Native Village of Belkofski Environmental Office  
Snowchange  
Alaska-Chukotka Development Program  
Chukotka Native Information Center  
Commander Islands  
Pribilof Islands Stewardship Program  
Aleutian Pribilof Traditional Food Safety Program

What emerged from the discussion of this event were the common concerns of Alaskan and Russian Bering Sea villages: the availability and safety of traditional foods, local capacity building for monitoring projects' implementation, and the existence of an intricate connection between biological resources and the continuity of cultures. The outcome of this meeting was of significance for the work of BSSN, as it established the fact that the state of biological resources in the Bering Sea is important for evaluating the well-being of coastal communities.

## Meeting Agenda

October 5, 2005

9:00 AM – 12:00 PM

- Introductions
- Statement of the workshop goals and expected results
- Review of the existing and past models of community-based research projects focusing on the following points:
  - Goals
  - Organizational structure (Who, how and why initiated the project and how it is/was managed and funded)
  - Methodology (interviews, journals, targeted data collection, etc)
  - Quality assurance
  - Data management (digital format, access, property rights)

Possible projects for discussion (This list is not exclusive):

Title	Geographic area	Contact/Expert
ABC	Canada - Alaska	Joan Eamer/Gary Kofinas (presented by VG)
Polar Bears Commission projects	Alaska - Russia	Charlie Johnson
Whaling/walrus	Alaska - Russia	
Snowchange	Scandinavia- Russia	Tero Mustonen
Traditional Food Safety	Alaska	APIA

1:00 PM – 3:00 PM

- Current funding opportunities with NSF, NPRB, CAFF CBM, DEPA (Danish Environmental Protection Agency), IPY and projects under development (Presented by VG) (Facilitated discussion)
- What are common research needs of the Bering Sea communities and how they correlate with science needs?
- What are available capacities in the communities?
- What are the needs in capacities in the communities?

3:00 PM – 3:15 PM

Break

3:15 PM – 5:00 PM

- Collaboration for proposal(s)
- Commitment from organizations to:
- Endorse (a formal recognition of importance of the project)
- Support (an offer for some in-kind participation, such as sharing office facilities, helping with coordination using own staff etc.)
- Participate (the funding for participation is in the project budget)
- Partner (co-proposer on the project)
- Summary of the meeting, decisions and planning for the next step

5:00 PM Adjourn

## Participant List

Name	Organization
George Pletnikoff	Unalaska Native Fisherman's Association
Larry Merculieff	Alaska Native Science Commission
Karen Pletnikoff	Aleutian Pribilof Island Association
Olga Gogoleva	Alaska Chukotka Development Program
Vera Tymneraskova	Chukotuo Native Information Center
Karin Holser	Pribilof Islands Stewardship Program
Ivan Vozhikov	ASARKO/AIA Russia
Gennady Yakovlev	ASARKO Russia
Santina Gay	United States Environmental Protection Agency
Tatiana Samuelson	Native Village of Belkofski (E.P. Dept)
Tero Mustonen	Snowchange
Victoria Gofman	Aleut International Association



Left to Right: Victoria Gofman, Karen Pletnikoff, Karin Holser, Annelise Tschanen, Gennady Yakovlev, Ivan Vozhikov



**Bering Sea Sub-Network Implementation Workshop**  
**Hotel Captain Cook, “Adventure Room”, Anchorage, Alaska**  
**November 26, 2006**

In 2006, the International Polar Year (IPY) Joint Committee endorsed the concept of the Bering Sea Sub-Network. The cumulative result of the efforts of all participants was a successful proposal submitted to the National Science Foundation (NSF) in May 2006 under the title: Bering Sea Sub-Network, International Community-Based Observation Alliance for Arctic Observing Network (BSSN).

In October 2006, with the generous support of the U.S. State Department and Environment Canada, the second international scoping workshop was convened to obtain recommendations for a pilot project and develop an implementation plan including objectives for the pilot project, the number of villages, and criteria for participating communities.

The objectives of the BSSN pilot were proposed as:

- Establishing the BSSN infrastructure and policies
- Designing and implementing a pilot project to collect data on selected key variables and indicators across the network
- Establishing collaboration with SEARCH (Study of Environmental Arctic Change) and other International Polar Year (IPY) science projects on community-based research components
- Developing a mentorship program for younger people
- Planning for a final workshop to discuss optimal practices, lessons learned, the strengths of the project, and areas of improvement
- Publishing a paper on the pilot results

Representatives from Alaska and Russia agreed to limit the number of BSSN villages for the pilot project to six: three in the Russian Federation and three in the United States. The management and ownership of data was discussed in great detail. The participants wanted assurance that villages would have a say in how the data would be used and that sensitive data would be safeguarded. It was decided that a Steering Committee consisting of representatives



2006 BSSN Implementation Workshop

from all BSSN villages would be formed to address data ownership.

Villages were to be selected by respective local organizations and governments based on the following selection criteria developed at the 2005 Workshop:

- Geographic location — Village locations would cover North, Central, South Bering Sea ecosystem. Important factors to consider: sea ice, migration routes, breeding colonies/grounds.
- Capacities — A community would have the technological infrastructure and individuals qualified to work on the project.
- Community interest — A community would be able to engage interested individuals in the village to participate in the project.
- Needs — A community may have immediate ecological concerns regarding subsistence species.
- Previous experience — A community, where possible, would build on existing experience, knowledge, capacity and activities already ongoing in the community.
- Potential project contribution to the community — The project would benefit the community's existing programs and enhance indigenous knowledge.

Following workshop recommendations, AIA proceeded and the project officially commenced on June 1, 2007.

**Meeting Agenda**

- 8:00-8:30 AM Registration  
8:30 AM Opening Ceremony by a local Indigenous representative  
8:45 AM Introductions of the BSSN participants  
10:15 - 10:30 AM Coffee break  
10:30 AM BSSN: presentation of the proposed program
- History, overview, main elements (Victoria Gofman)
  - Science plan (Dr. Lillian Alessa)
  - Circumpolar Biodiversity Monitoring Programme as a vehicle for circum-Arctic collaboration (Mike Gill)
- 11:30 AM Comments and questions  
12:00 – 1:00 PM Lunch  
1:30 PM Presenters' answers and comments  
2:30 – 3:30 PM Coffee break  
3:30 PM Developing recommendations for BSSN set up and implementation (A moderated discussion)  
4:30 – 4:45 PM Break (A small drafting group edits recommendations and develops a draft)  
4:45 PM Presentation of the draft for final editing and approval  
5:00 PM Meeting Adjourn

**Participant List**

Name	Organization
Lillian Alessa	University of Alaska-Anchorage
David Atkinson	International Arctic Research Center, University of Alaska – Fairbanks
Alexy Drozdov	Tribal organization “Kam-Avva”, Kamchatka
Rose Fosdick	Kawerak, Inc.
Andy Kliskey	University of Alaska-Anchorage
Mike Gill	Environment Canada
Victoria Gofman	Aleut International Association
Maria Gunnarsdottir	CAFF, Executive Secretary
Ivan Gutorov	Kamchatka regional Association of the tribes of the Indigenous Peoples, Chair
Karin Holser	St. George Island Stewardship Program
Naomi Kashevarof	St. George Island Traditional Council, IGAP Coordinator
Clara Martin	



Name	Organization
Larry Merculieff	Seven Generations Consulting, meeting facilitator, Alaska Native Science Commission, Deputy Director
Kaisu Mustonen	Snowchange
Peggy Osterback	Aleut Marine Mammal Commission, Executive Director
Tatiana Vlasova	Russian Academy of Science
Bruce Wright	Aleutian Pribilof Islands Association/AIA, Science Advisor
Eduard Zdor	Chukotka Association of Marine Hunters, Executive Director
Gennady Zelensky	Chukotka Science Support Group, Executive Director

**Bering Sea Sub-Network Pilot Phase Implementation Workshop**  
**Aleut International Association**  
**333 W. 4th Ave, 3rd Floor, Anchorage, Alaska**  
**October 15 – 19, 2007**

This workshop has launched the BSSN survey process. The meeting successfully accomplished its stated goals: the formation of a steering committee, the approval of procedural guidelines, and the decision on governance to provide the necessary structure for BSSN to function effectively. Issues for steering committee consideration were defined and include data management, communications, and other program issues as they arise. The steering committee is also tasked with cultivating and maintaining network connections. Overall, this organizational structure will allow for the extension of the BSSN program and for future expansion of the network.

A great deal of time and energy was devoted to the development of the first draft of the survey instrument. This collaborative effort between community representatives and scientists resulted in a draft instrument that reflects and addresses members’ concerns.

The information garnered by this survey can be used by member communities as they seek better resource management to preserve and continue a traditional way of life.

This contributes to the long term goals of BSSN in that it will assist communities in their attempts to improve sustainability of resources. It may empower communities in their resource management endeavors and it will encourage cultural connections and communication between groups of people who share similar concerns.

Meeting Agenda

Monday October 15, 2007

10:00 AM – 1:00 PM      Plenary (Moderator: Andy Kliskey)

- Welcoming remarks
- Participants introductions
- 5-10 min. community presentations
- BSSN review

1:00 AM - 2:00 PM      Lunch

2:00 PM - 3:00 PM      Discussion: What kind of a network do we want to form? (Moderator: Lillian Alessa)

- Long-term goals
- Structure
- Opportunities and challenges
- Governance

3:00 PM - 3:20 PM      Break

3:20 PM – 5:00 PM      Discussion: What do we need to accomplish this week? (Moderator: Andy Kliskey)

- To formalize the network
- For the pilot research

5:00 PM – 5:30 PM      Closing remarks: (Moderator: Victoria Gofman)

- What are our goals for the week?
- Commentary from each participant about goals

5:30 PM      Meeting Adjourn

Tuesday October 16, 2007

9:00 AM – 10:00 PM      Discussion: Organizational structure of BSSN (Moderator: Patricia Cochran)

10:00 AM – 12:00 PM      Presentations and Discussion: Proposed survey process and data management (A. Kiskey, V. Gofman)

- What are the communities’ concerns about the proposed process?
- Is the proposed plan realistic for your community process?
- What can be done to improve it?

12:00 PM – 1:30 PM      Lunch

1:30 PM – 4:00 PM      Break out session- Russian speakers and English speakers (Moderators: P. Cochran, V. Gofman)

- What issues were identified in the morning session?
- What are recommendations to address those issues?

4:00 PM – 6:00 PM      Groups present their findings

6:00 PM      Meeting Adjourn

Wednesday October 17, 2007

Draft questionnaire and survey procedures development

9:30 AM – 11:00 PM      Discussion: (Moderator: Marty Waters)

Discuss promotional items

11:00 AM – 12:00      Review of draft questionnaire (Moderator: L. Alessa)

12:00 PM – 1:30 PM      Lunch

1:30 PM – 2:00 PM      Discussion: The use of language in the survey

2:00 PM – 5:30 PM      Review of draft questionnaire- break out session- Russian speakers and English speakers (Moderators: L. Alessa, V. Gofman)

Review of questions

5:30 PM      Meeting Adjourn



Front Row L to R: Victoria Gofman, Ludmila Kultchiskya, Arlene Gundersen, Molly Chythlook, Helen Chythlook  
 Back Row L to R: Moses Kritz, Iver Campbell, Marty Waters, Ivan Vozhikov, Natalia Tatarenkova, Svetlana Petrosyan, Jim Gamble

Thursday October 18, 2007



9:00 AM – 12:00 PM Discussion: Review of draft questionnaire

- Types of questions
- Open-ended
- Multiple choice
- Comparison of Russian and English versions
- Discussion: survey title

12:00 PM – 1:30 PM Lunch

1:30 PM – 5:00 PM Survey development (V. Gofman, N.Tatarenkova, A. Kliskey)

1:30 PM – 5:00 PM Discussion: Development of policies and procedures for BSSN (Moderator: Jim Gamble)

5:00 PM – 5:30 PM Distribution of questionnaire 1st draft for review

5:30 PM Meeting Adjourn

Friday October 19, 2007

9:00 AM – 12:00 PM Discussion: Discussion about questionnaire 1st draft (Moderator: V. Gofman)

- How best to introduce surveys in communities
- Survey title
- Translation into local languages
- Survey questions

12:00 PM – 1:30 PM Lunch

1:30 PM – 4:00 PM Discussion: Finalize BSSN policies and procedures (Moderator: P. Cochran)

- Procedural guidelines
- Education and outreach
- Conflict resolution
- Data management
- Internal communication
- Website
- Membership

4:00 PM Workshop adjourned

Participant List:

Name/Organization	Location
Lillian Alessa, PhD,Associate Professor of Biology, UAA, BSSN Co-PI	Anchorage, Alaska
Iver Campbell, Native Village of Gambell Council Member	Gambell, Alaska
Helen Chythlook, Marine Mammal Coordinator, Bristol Bay Native Assoc.	Dillingham, Alaska
Molly Chythlook, Natural Resources Dept. Director, Bristol Bay Native Assoc.	Dillingham, Alaska
Patricia Cochran, Executive Director, AK Native Science Com., BSSN Co-PI	Anchorage, Alaska
Jim Gamble, AIA Assistant Director	Anchorage, Alaska
Victoria Gofman, AIA Executive Director, BSSN PI	Anchorage, Alaska
Arlene Gundersen, Pauloff Harbor Tribe, Tribal Administrator	Sand Point, Alaska
Andy Kliskey, PhD, Associate Professor of Biology, UAA, BSSN Senior Researcher	Anchorage, Alaska
Moses Kritz, President of Togiak Tribal Council	Togiak, Alaska
Lyudmila Kulchitskaya, Kanchalan Administration	Kanchalan, Chukotka
Svetlana Petrosyan, Deputy Head,Tymlat Administration	Tymlat, Kamchatka
Natalya Tatarenkova, PhD Student, Biologist	Nikolskoye, Kamchatka
Ivan Vozhikov, Fisherman and hunter, AIA Board Member	Nikolskoye, Kamchatka
Janice Walton, AIA Project Assistant	Anchorage, Alaska

## Bering Sea Sub-Network Pilot Phase Conclusion Workshop

### Aleut International Association

333 W. 3rd Ave., 3rd Floor, Anchorage, Alaska

August 3-5, 2009

The goal of the workshop was to conclude the pilot phase of BSSN and to launch the continuation of the project with BSSN 2. Participants shared their experience in the pilot phase addressing challenges and accomplishments. The meeting was also a great opportunity for the project team to reconnect and meet with new members. The workshop included a training session for the Community Research Assistants (CRAs). On the first day of the workshop, CRAs were recognized for their special contribution and all received Certificates of Appreciation. The workshop was filmed by a videographer for a future film about BSSN.

Main outcomes:

- Participants expressed an overwhelming support for the project and saw it as beneficial to their community and to them personally.
- Challenges of the pilot phase survey design were discussed at length and a list of recommendations was developed.
- Special attention was paid to the training of CRAs.

Main recommendations:

- Questionnaires should be shorter and should be less complicated, so it would be easier to train CRAs. Questionnaires should be printed and sent to villages. A suite of three questionnaires targeting species harvest, harvest locations, and environmental observations was recommended.
- Russian project managers should be trained in all phases of survey administration so that they can provide training and trouble shooting in the Russian villages. Alaskan CRAs should be trained in the villages, so more travel by project staff to the village sis necessary.
- Respondent lists should be created with the assistance of local village or tribal administrations and approved by BSSN project management. Local staff should strictly adhere to the approved list.
- Participants expressed their appreciation for the opportunity to have a face-to-face meeting and stressed the importance of such interactions for all participants.

## Meeting Agenda

Monday, August 3, 2009 BSSN Pilot Conclusion Plenary Session

9.00 Introductions

9.30 BSSN Global Outlook  
Patricia Cochran, Alaska Native Science Commission, BSSN Co-PI

10.00 Pilot project overview  
Victoria Gofman, Executive Director, AIA, BSSN PI

10.30 Break

10.45 Preliminary results  
Survey process in the villages – What did we do?  
Presentations by village research assistants:

10.50 Esther Fayer and Olia Sutton, Togiak

11.05 Iver Campbell and Antonia Penayah, Gambell

11.20 Olga Gerasimova, Kanchalan

11.35 Svetlana Petrosyan , Tymlat

11.50 Olga Chernenko, Nikolskoye/Kamchatka

12.05 Q & A Facilitator: Andy Kliskey, RAM Group, UAA

12.30 Lunch

13.30 Preliminary results  
Data summary – What did we learn?  
Andrea Grant-Friedman, BSSN Survey Manager  
Interpretation – What does it mean?  
Lillian Alessa, RAM Group, UAA, BSSN Co-PI



15.00 Break  
 15.30 Q & A (Questions to the research team)  
 17.00 Adjourn for the day  
 17.30 Evening reception  
 BSSN Awards  
 Refreshments  
 19.30 Reception adjourns

#### Tuesday, August 4, 2009 BSSN Villages' Day (Round table)

9.00 Goals and objectives for the day  
 9.15 Presentations from BSSN communities  
 Personal accounts of project experiences (30 minutes per presentation)  
 Svetlana Petrosyan and Olga Chernenko, Tymlat and Nikolskoye  
 Esther Fayer and Olia Sutton, Togiak  
 Arlene Gundersen, Sand point  
 12.00 Lunch  
 13.00 Presentations from BSSN communities – Continued  
 Olga Gerasimova, Kanchalan  
 Iver Campbell and Antonia Penayah, Gambell  
 14.30 Discussion on recommendations for BSSN II  
 Break  
 15.30 How can communities utilize the results of scientific research?  
 Patricia Cochran  
 Andy Kliskey  
 17.00 Adjourn for the day

#### Wednesday, August 5, 2009 BSSN II (Round Table)

9.00 BSSN II Overview  
 Victoria Gofman  
 Lillian Alessa  
 10.00 Summary of recommendations from Day 2  
 Break  
 10.45 Discussion  
 Facilitator: Jim Gamble, Assistant Director, AIA  
 11.30 Finalize recommendations for BSSN II and for the pilot project results report  
 12.30 Lunch  
 13.30 Training session for village project staff  
 Interviewing methods and techniques  
 Break  
 14.30 Training session for village project staff  
 Interviewing methods and techniques continued  
 17.00 Adjourns for the day

Thursday and Friday are reserved for training Russian staff

#### Participant List

Name	Location
Lillian Alessa Ram Group, UAA	Anchorage, Alaska
Alexandr Blinov	Moscow, Russia
Iver Campbell, IRA Council Member	Gambell, Alaska
Olga Chernenko Center for Civic Initiatives	Petropvlovsk-Kamchatsky, Russia
Patricia Cochran, Alaska Native Science Commission	Anchorage, Alaska
Hanna Eklund, BSSN Project Assistant	Anchorage, Alaska
Kelly Eningowuk Inuit Circumpolar Council (ICC)	Anchorage, Alaska
James Fall Alaska Department of Fish & Game, Division of Subsistence	Anchorage, Alaska

Name	Location
Esther Fayer BSSN Community Research Assistant	Togiak, Alaska
Jim Gamble AIA Assistant Director	Anchorage, Alaska
Olga Gerasimova Community Research Assistant	Kanchalan, Russia
Victoria Gofman AIA Executive Director	Anchorage, Alaska
Arlene Gundersen Pauloff Harbor Tribe	Sand Point, Alaska
Andrew Kliskey RAM Group, UAA	Anchorage, Alaska
Antonia Penayah Community Research Assistant	Gambell, Alaska
Svetlana Petrosyan Community Research Assistant	Tymlat, Russia
Olia Sutton Community Research Assistant	Togiak, Alaska



Left to Right: Olga Gerasimova, Andy Kliskey, Olga Chernenko, Arlene Gundersen, Antonia Penayah, Svetlana Petrosyan, Esther Fayer, Patricia Cochran, Olia Sutton, Iver Campbell, Victoria Gofman



# Appendix 2: Selected Projects in the Bering Sea Region

**Gambell:**  
Alessa, L. (2009). Municipal Water Systems and the Resilience of Arctic Communities (University of Alaska, Anchorage, Department of Biological Sciences)

Yoshikawa, K (2010). Current Climate Changes over Eastern Siberia and Interior Alaska and their Impact on Permafrost Landscapes, Ecosystem Dynamics, and Hydrological Regime (University of Alaska, Fairbanks, Water and Environmental Research Center)

Ahmasuk, A; Trigg, E (2008). Bering Strait Region Local and Traditional Knowledge Pilot Project: A Comprehensive Subsistence Use Study of the Bering Strait Region (Kawerak, Inc.)

Harritt, R (1999). Whale Hunting Societies of the Western Arctic: A Regional Integration (Archaeology and Sociocultural Components) (University of Alaska, Anchorage, Environment and Natural Resources Institute)

Georgette, S; Coffing, M; Scott, C; and Utermohle, C (1998). The subsistence Harvest of Seals and Sea Lions by Alaska Natives in the Norton Sound – Bering Strait Region, Alaska, 1996-97 (Alaska Department of Fish and Game, Division of Subsistence) Technical Paper No. 242

**Kanchalan:**  
Howe, E. (2009). Salmon Harvests in Arctic Communities: Local Institutions, Risk, and Resilience (University of Alaska, Anchorage, Department of Economics/ISER)

**Nikolskoye:**  
Berge, A (2007). Aleut Linguistics, Language Teaching, and Program Development (University of Alaska, Fairbanks)

Gofman, V; Wright, B; and RaLonde, R. (2009). Response and Intervention System for Climate Change Induced Paralytic Shellfish Poisoning in Aleut Communities (Aleut International Association)

Crawford, M (2001). Collaborative Research: Origins of Aleut Populations: Molecular Perspectives (University of Kansas, Department of Anthropology)

**Sand Point:**  
Downs, M and Hartley, M (2008). Comprehensive Baseline Commercial Fishing Community Engagement Profiles: Adak, St. George, St. Paul, and Sand Point, Alaska (EDAW, Inc.)

Fall, J; Andersen, D; Brown, L; Coffing, M; Jennings, G; Mishler, C; Paige, A; Utermohle, C; and Vanek, V (1993). Noncommercial Harvest and Uses of Wild Resources in Sand Point, Alaska 1992 (Alaska Department of Fish and Game, Division of Subsistence) Technical Paper No. 226

**Togiak:**  
Hoffecker, J (2009). Human Response to Climate Change at Cape Espenberg AD 800-1400 (University of Colorado, Boulder, Institute of Arctic and Alpine Research)

Huntington, H; Andrews, E; Fall, J; Hunn, E; Noongwook, G; Scholz, A; Sepez, J; and Zavadil, P (2008) Subsistence Harvest, Users, and Local & Traditional Knowledge (LTK) Ecosystem Perspective (Huntington Consulting)

Kreig, T; Fall, J; Chythlook, M; La Vine, R; and Koster, D (2007). Sharing, Bartering and Cash Trade of Subsistence Resources in the Bristol Bay Area, Southwest Alaska (Alaska Department of Fish and Game, Division of Subsistence) Technical Paper No. 326

Coiley-Kenner, P; Kreig, T; Chythlook, M; and Jennings, G (2003). Wild Resource Harvests and Uses by Residents of Manokotak, Togiak, and Twin Hills (Alaska Department of Fish and Game, Division of Subsistence) Technical Paper No. 275

Fall, J; Chythlook, M; Schichnes, J; and Sinnott, R (1991). Walrus Hunting at Togiak, Bristol Bay, Southwest, Alaska (Alaska Department of Fish and Game, Division of Subsistence) Technical Paper No. 212

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# Bering Sea Sub-Network

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