Collaborative Resource Management and Monitoring in the Arctic

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BACKGROUND

UArctic is a cooperative network of universities and other organizations concerned with education and research in and about the North. Thematic networks are a fundamental component of UArctic.

Thematic networks constitute network of 'experts' in specific areas. They can strengthen northern institutions by sharing expertise, carry out training, education, knowledge sharing and research cooperation. They operate independently and can serve as a gateway to reach expertise for other UArctic programs. Thematic networks are envisaged to reflect UArctic's principles and values, including the key role of Indigenous peoples in northern development. They use the UArctic identity in their work, following normal procedures.

The topic of this workshop is a new Thematic Network which aims to develop capacity in collaborative management and community monitoring. Capacity development can take many different forms. Collaborative management is about local stakeholders playing a central role in the decision-making process. Community monitoring is monitoring led, and undertaken by local stakeholders.

This workshop is part of a project funded by the Government of Denmark and the EU Horizon 2020 programme INTAROS project (Integrated Arctic Observing System Project). The project runs from Oct. 2018 – Oct 2019 (€ 67k). Other project activities include: a UArctic seminar in Berlin, developed as a side-event at the 2nd Arctic Science Ministerial and, in Oct. 2019, a training course in Greenland for government natural resource managers and Greenland-based students.

The seminar in Berlin in Oct. 2017 concluded that there are many different perspectives on collaborative management and monitoring. There was broad support for establishing a Thematic Network. Moreover, the seminar discussions contributed to getting collaborative approaches to resource management and monitoring into the 'Joint Agreement' that emanated from the Arctic Science Ministerial.

There are a range of different initiatives in the Arctic and this meeting may not cover them all. It was anticipated that this meeting would be the first step in developing opportunities to pursue collaborations in collaborative resource management and monitoring.

ROUND OF INTRODUCTIONS

We had a round of introductions, exchanging expectations of the meeting. Hiroyouki Enomoto stressed the need for more social connection to society from snow and ice research, and that he is looking for direction in this area. Jason Akearok considered collaborative management and monitoring as a new but important territory in which Inuit can be considered integral collaborative partners alongside scientists and that this can help make their 'voices' heard. Katsushi Iwamoto was looking forward to learning about international experiences of connecting communities and science. Naoya Kanna wanted to introduce his oceanographic research activities and to make new connections. Shin-Ichiro Tabata wanted to learn how

thematic networks run because colleagues might want to start new thematic networks. Several also mentioned the need to increase their cooperation with local people in research projects, and they were hoping to learn from this workshop. Natsuhiko Otsuka is working with Arctic shipping and environmental impact issues, and hoped to gain ideas on 'what the future Arctic would be like'.

Martin Enghoff was interested in discussing 'rights' in the Arctic with regard to resource use. In his view, defending community rights is essential to supporting resilience. He hoped to learn from others by synthesizing experiences and to strategize how to work with the Thematic Network in the future, as an example, to increase funding for communities' work with monitoring.

Yuka Oishi wanted to learn about other cases of co-management that she might be able to use in her research on co-management of freshwater resources in Western Siberia. Lene K. Holm has worked on climate change issues for a long time. She wanted to discuss experiences of how to use 'different ways of knowing' in order to manage change.

PRESENTATIONS AND DISCUSSIONS

International Experiences in Collaborative Resource Management and Monitoring By Finn Danielsen

Why is collaborative resource management and monitoring important? Adapting to global species re-distribution requires 'all hands on deck'. It requires respect, collaboration, exchange and cross-weaving of Indigenous, industry, community-based and formal/academic science. Moreover, it requires decision-making at the most appropriate level, and natural resource management that promotes local livelihoods within sustainable levels.

What do we mean by the various terms? We can define collaborative resource management as 'collaborative institutional arrangements among local communities and other stakeholders for managing or using resources'. Participation increases efficiency and equity in resource management. It is, however, a precondition that local people have their rights to access and use of resources recognized. The public can be engaged in decision-making in different ways: from being invited to submit written submissions on hearings to attending scenario workshops, engaging in advisory and co-management committees, participatory appraisals, consensus conferences and more.

Collaborative monitoring can be defined as 'a process of routinely observing the environment that is led and undertaken by community members'. There is a spectrum of monitoring approaches among natural resource monitoring programmes, with varying degrees of involvement from scientists and community members.

A number of studies have compared reports by community members with professional scientists' reports. Finn gave some examples. The scale of decision-making and implementation time differ. Without the involvement of local people, monitoring may

sometimes be isolated, academic exercises with limited impacts in the 'real' world. Collaborative monitoring can document local knowledge, encourage local discussion, and it can shorten the time from observation to making decisions. Collaborative monitoring is often possible to sustain because the community members are present all year round.

Across the Arctic and Sub-Arctic, there are differences in approaches and achievements with regard to collaborative resource management and monitoring. Everywhere, however, there is limited capacity for collaborative approaches among government staff, decision-makers, scientists and community members. Capacity development is therefore crucial.

Japanese Research in the Ice-Covered Water and Relationships with Community
By Hiroyuki Enomoto

There are enormous seasonal differences in Okhotsk Sea. The sea is located close to Siberia and cold winds blow from that direction. In winter, there is sea-ice even as low as at 44N. This is the most southerly location of regular sea-ice on the planet.

Visual observations have been made of the winter sea-ice along the coastline of the Sea of Okhotsk for more than 100 years. In the past, the significance of sea-ice among communities in Hokkaido was largely connected to accidents and limitations on fishery opportunities. Recently, however, there has been increased attention on the advantages of sea-ice in terms of marine productivity. Seafood production is closely related to sea-ice, and seafood is important for the tourism industry. The IPCC has linked the decrease in productivity of the Sea of Okhotsk in recent years with the decline in sea-ice and ice algae (IPCC 2001, Impact of global warming to Japan and Asia, Summary by Ministry of Environment, Japan).

Sea-ice radar measurements in the Okhotsk Sea began with the work of a professor at Hokkaido University, initially primarily for research purposes. Ice radar images were published in the daily newspaper, and this information became increasingly valued by the local communities due to concerns regarding safety in the ice-covered sea. With the era of satellite monitoring, most sea-ice monitoring has now become automatic. The automatic RADARSAT images from the government are, however, too coarse a resolution for community interests. The community members needed a coastal ice radar.

Local communities are mainly interested in the sea-ice in the nearby area, within about 10 km of the shore. They are particularly interested in (near to) real-time information.

The funding of the sea-ice radar has been a topic of concern. As the radar is no longer being used for research, the university does not want to fund it and has asked the local community and the government for support, but no one is interested. It has become a challenge to transfer responsibility for the sea-ice radar from the university to the broader society.

Ten years ago, Hokkaido University installed a new radar system in Mombetsu city, and today the city authorities support the maintenance of the radar as a service to the communities. Local observations are needed to verify the images. The local communities are contributing important data on the sea-ice. Unfortunately, however, the indigenous Ainu of Hokkaido traditionally had no written language so it is difficult to track their fishery knowledge a long way back.

Most Okhotsk sea-ice is <1 m unless deformation occurs, which allows for areas >1 m thick. There is very dynamic ice movement. The sea-ice can move large distances in a day but no landfast ice forms.

The Amur River has a strong influence on marine productivity of the Okhotsk Sea. Fishermen using coastal and pelagic resources report that most of the 13 fish stocks have decreased in size. In the past, 50% of total fish stocks were sardines but today sardines have mostly disappeared. More warm water fish species are now seen. Commercial fisheries are changing

drastically. Local records of fish stocks are provided by the Fisheries Union. The municipality collects the information and publishes it annually.

In the past, there was an oil spill in the Okhotsk Sea resulting in the deaths of 6,000 birds. The source of the oil spill remains unknown. The Amur River may also constitute a potential source of pollution e.g. radioactive pollutants from rare earth mineral mining in the catchment area.

Lene commented that the Inuit only obtained a writing system when visitors came from elsewhere but that they can still contribute knowledge dating back centuries. The Ainu might have such knowledge, too. She felt this was important to bear in mind.

Cooperation between Scientists and Mombetsu Local Community
By Katsushi Iwamoto

Thirty years ago, sea-ice was recognized as a 'white devil', a troublemaker that led to disasters and marine accidents. The sea-ice interrupted the fishing and it destroyed fishing equipment and port facilities.

Now sea-ice is recognized as a 'resource' that is useful for tourism and critical for a biologically rich ocean. Important factors that have affected this change in feelings among communities in Hokkaido include, for example, sea-ice paintings, the drift-ice festival, sea-ice studies, and the Mombetsu international symposium. This symposium is organized by the city of Mombetsu in partnership with citizens and the private sector and is held in February every year. The symposium tracks scientist involvement but not that of the public or stakeholders.

Sea-ice influences algae and kelp resources by the action of ice scouring the sea floor. This provides a substrate for algae to grow on the sea bed.

At one point, total allowable catch (TAC) was more than total fish stocks but, with declining stocks, the fishermen agreed to a lower TAC. Scallop aquaculture in the region is now a highly lucrative business. Some fishery corporations deploy their own instruments in the ocean to measure conditions. These fisheries corporations have money to do their own research.

Research and Capacity Development in Collaborative Resource Management and Monitoring in Alaska

By Olivia Lee

Collaborative management of many marine resources in Alaska is supported within existing institutional frameworks for species co-management. For example, there are a number of co-management bodies in Arctic coastal Alaska such as:

- Ice Seal Commission
- Eskimo Walrus Commission
- Beluga Whale Commission
- Eskimo Whaling Commission
- Polar Bear Commission

This framework for community involvement in managing subsistence species includes federally funded support of community participation in co-management bodies. This is important for sustained engagement with all communities that utilize the managed marine resources. Some of the funding is used to pay for travel for in-person meetings for representatives from the coastal communities to meet with researchers and management agencies to discuss current knowledge and future information needs. Separate from co-management activities, are research focused community based observing programmes in Alaska which provide long-term, community-relevant information on environmental and biological change. Examples include the Sea-Ice for Walrus Outlook and the Alaska Arctic Observatory and Knowledge Hub -AAOKH (which continues some of the CBM efforts from a previous project, known as SIZONet). These two programs have a focus on documenting sea ice change, and observations of marine mammals, fish and birds from a community use perspective. The information from these observing programs are archived online, with different levels of detail that are accessible to the public.

There is increasing recognition of the importance of, and need to include Indigenous knowledge in decision-making. Currently, however, there is no formal pathway for data from community-based monitoring programmes to be used for management purposes by resource management agencies or co-management bodies. There is a great need for further community capacity development and for further recognition of local experts' knowledge.

Some of the challenges facing capacity development include the high cost of travel to build relationships in communities, internet and phone cost and availability in remote Alaska, and limited training opportunities for coastal observers, e.g. in using instrumentation and smart phone apps to record observations.

Research and Capacity Development in Collaborative Resource Management and Monitoring in Greenland

By Lene K. Holm

Indigenous peoples' knowledge cannot be separated from the lives of the Indigenous people. If our knowledge disappears, a large part of our culture disappears as well. Indigenous and local communities are the people who are actually living in the Arctic.

Policymakers are often interested in bringing natural and social science perspectives together. Indigenous and local knowledge can contribute to that important process. Community members are sometimes seen as 'in situ sensors'. Linguistic skills are important to understand the community members' universe.

Transdisciplinary approaches hold great potential. Even if you do not have an academic background you still have important contributions to make. When monitoring living resources, both scientific knowledge and Indigenous and local knowledge are important. It is impossible and inappropriate to translate one kind of knowledge into the other. Both kinds of knowledge must be considered equally important. Knowledge holders should be involved in the research process, right from the conception of a research idea through to analysis and results. Central tenets are trust, relationship building and capacity development. There is a need for a paradigm shift in how we are monitoring, doing research and working together. Education and training of researchers and communities is crucial. Elders should pass their knowledge on to the younger generations.

Communities need to be partners in research projects. They should be consulted even before a project starts. There needs to be funding made available for the communities' participation in research projects. Many want to have ownership and leadership of their projects and to conduct their own research. This can contribute to 'de-colonizing' science.

Community-based monitoring is not about scientists employing locals. They should be equal partners but this often requires two-way capacity development. Scientists need to learn how to work together with the communities. Research projects should be sustained on a long-term basis to the future benefit of the locals, beyond the lifetime of typical research projects.

Information and data need to be accessible to community members. Moreover, the information and data also need to be useful outside of the community. It is important to follow principles of Free, Prior and Informed Consent (FPIC). Communities have a right to say 'no' to a project. There are internationally ratified conventions which serve to protect Indigenous knowledge and cultural heritage. Yet, there is a need to develop methodologies that meet the interests of us all.

Indigenous peoples' organizations are represented and have a 'voice' in the Arctic Council. However, the management of living resources in the Arctic is often dealt with by international management bodies outside of the Arctic Council. These include, for instance, the North Atlantic Marine Mammal Cooperation (NAMMCO), the International Whaling Commission (IWC) and the International Council for the Exploration of the Sea (ICES).

Governance Aspects in Collaborative Resource Management and Monitoring in the Arctic

By Martin Enghoff

Collaborative management cannot occur without community-based monitoring (CBM). There are many different types of CBM programmes. Information and knowledge in CBM programmes should not focus on esoteric topics but on the resources and conditions that are relevant to people, such as changes and trends in resources.

CBM programmes have the potential to include local-level information, analysis and proposed management actions. The programmes need to have strong local interest and support. CBM programmes largely build on volunteer participants and are often organized around a group of community members. Incentive structures and strong local coordination are important for the governance of CBM programmes.

Relations with decision-making bodies are crucial. It is important to know your voice is being heard. There are different ways of connecting CBM programmes to decision-making. In many parts of the Arctic, governance arrangements around resource utilization need to be further developed towards decision-making at the most appropriate level, which is often the local level.

Martin gave examples from Canada, Greenland and Russia. The structures in most places today are not well-suited to the use of Indigenous and local knowledge. It is important to create relationships with the management structures. Linking the information to decision-making is not straightforward, and how we do it depends on the management context.

For example, in Sakha Republic, Russia, CBM is organized by an Indigenous Peoples' organization, which influences the republic's decision-making, and the republic takes these ideas and demands up to the central level in Russia. White salmon, for example, are found deeper in Lena River and yet Russian federal laws on maximum net depth restrict their fishing.

There is great capacity for interpretation locally. The analysis is crucial because it empowers local people's intellectual capacity.

More is needed in terms of understanding the potential for CBM. More is likewise needed to get management agencies to accept the value of local knowledge and information.

Local Community Driven Activities for Preparedness Against Oil Spills in the Sea of Okhotsk

By Natsuhiko Otsuka

Oil spills in the Sea of Okhotsk is a major concern. In 1997, heavy fuel oil was spilled by a Russian tanker during an accident in the Japan Sea (Nakhodka Oil Spill Accident). In the cold water, the oil emulsified. The fisheries in the area were seriously damaged. People living in Hokkaido Island are deeply concerned that similar accidents could occur in the Okhotsk Sea.

In Russia, there is a large oil export terminal in the southern part of the Sakhalin peninsula, just 50 km north of Japan. Commercial production of oil began here in 1999, and the first shipment of oil from the terminal was undertaken in 2009.

Some minor accidents and oil spills have already happened in the area, involving small amounts of heavy fuel oil in 2004 and 2006. The Okhotsk Sea accounts for 10% of Japan's total fish catch value and 25% of Hokkaido's fish catch comes from this area. The seasonal sea-ice, sea foods, hot springs and wildlife attract many tourists to Hokkaido every year.

Concerned at the risk of further oil spills, a local newspaper owner lobbied for interdisciplinary cooperation between local communities, the municipality, scientists and the private sector. He has organized the 'Okhotsk Environmental Protection Network', known as OPEN.

OPEN shares knowledge of oil spills in ice-covered waters. It has established a public workshop with citizens, and facilitated the creation of a database on Okhotsk about, for example, the sites of oil spills and the ocean conditions. OPEN has also encouraged cooperation between city authorities, the coast guard, the municipality and the national marine disaster prevention centre. As a result of this work, an environmental sensitivity map was developed with inputs from social scientists and marine biologists, describing the coasts, ports, fishing grounds etc. Cooperation has also been established with Russian scientists and authorities and joint exercises have been undertaken with coast guards and oil recovery ships from Japan and Russia, and also involving the private company Sakhalin Energy.

If a major oil spill occurs in the Okhotsk Sea during winter, it could very seriously impact the fisheries, seafood production and tourism industry in Hokkaido. The effect on fisheries will depend on the species present and the time of year. Pelagic fish can move away whereas benthic fish such as scallops, oysters and crabs are more vulnerable.

Local community-driven cooperation for preparedness against oil spills in the Okhotsk Sea is a good example of how to provide scientific input into local contexts to solve problems of great importance to the local communities. In Denmark, the frequency of stranded birds with oil on their plumage is monitored every winter to track oil spills and mobilize awareness of marine pollution. Beached bird surveys are not undertaken in Japan, but researchers are tracking the species abundance and environmental conditions at the Mombetsu underwater tower. Moreover, fishermen report oil spills they see at sea through the use of a simple form.

Co-Working with Local Community on Glacier Change, Ice-Ocean Interaction, and their impacts on Human Society in Qaanaaq
By Naoya Kanna

In Qaanaaq, Greenland, Japanese scientists have for a number of years cooperated closely with local hunters to study the impact of climate change and sea-ice decline. Rapid shrinkage of glaciers and a switch from productive marine glaciers to land glaciers is having an impact on the environment and the local communities who depend on marine resources for their livelihood.

The scientists have collected samples of seawater to analyse the chemical components, temperature, salinity, speed of currents and plankton composition. The local hunters have prepared bathymetric maps. With the decline in sea-ice, there are changes in the fishing and hunting activities in communities. For instance, one often cannot travel on ice and landslides are increasingly occurring. A workshop was held to learn from the locals, report on the activities and discuss future sustainability. The local communities were mostly interested in the bathymetry of the fjords so that they could know where to fish for Greenland halibut. A sonar was provided to the communities and they determined themselves where to make depth measurements. The equipment is still in use today. The researchers collect the data and create maps for communities to use. The results will be presented at Greenland Science Week in Nuuk in Dec. 2019.

Development of Scallop Aquaculture Support System of Saroma Lagoon along the Okhotsk Sea Coast
By Katsushi Iwamoto

The city of Mombetsu on the island of Hokkaido, Japan, has a population of 22,000 people. The main industries are fisheries, aquaculture and tourism. Scallop production is a major success story. Scallop fisheries hardly existed in the 1970s. Today, this provides 50% of the fish catch value in Hokkaido.

Scallops are produced in two ways: through sowing culture on the sandy sea bottom in the Okhotsk Sea and through hanging culture on the rocky bottom in the Japan Sea. Sowing aquaculture in the Okhotsk Sea is a newly-developed technique. Young larvae are secured, sorted, caged, fed and the bivalves released at about one year of age at 50m depth on a 4 year rotation. At this depth illegal fishing of the scallops is impossible. Starfish in the area are dredged before the release of the young scallops. The fishermen use GPS to find the locations again. Scallop, crab and other fish grounds are all differentiated. Small 50m long ships of less than 5 tonnes are used to harvest the scallops. Fishermen need to be members of the Scallop Union where agreements are made on cooperation and division of the catches.

Fisheries management bodies help to determine stocks and guide the harvesting. Larval monitoring is undertaken by the Fisheries Technical Guidance Office and the City of Mombetsu, particularly when deciding spat fall timing. They collect floating materials using a plankton net, then clean the materials, and extract the bivalve larvae.

Perception Gaps between Local Inhabitants and Scientists on the Decrease in the Population of Fish in Western Siberia
By Yuka Oishi

Yuka presented experiences from multi-annual cultural anthropological research on the decrease in whitefish *Coregonus peled* in Western Siberia, undertaken by the National Museum of Ethnology in Osaka, Japan. This work focused on Khanty and Nenets living along Synia River and in Synia Khanty, Yamal Nenets Autonomous Region, Russia. There is generally a rather top-down approach to the management of fish and other natural resources, and Yuka explored the perception gaps as to the reasons for the decline in whitefish, and tried to understand why it is difficult for the communities and the government to cooperate on managing the fisheries.

Across Western Siberia, the stock of whitefish has declined over the last decades. Both rural and urban communities rely on fish and the fisheries industry. Could the reasons for the decline in whitefish numbers be poaching, a lack of oxygen in spring, industrial pollution, ecological cycle or climatic challenges?

Recent restrictions were imposed on the local fisheries. The government has established a *zakasnik* or 'no fishing area' and this has had detrimental effects on the local Khanty people. Whitefish move up-river during August, lay eggs during August –November and swim back to the Ob River to remain there during the winter months. The main purpose of the *zakasnik* is to preserve the fish spawning grounds. Fishing with nets, gear and traps is entirely banned in the area from mid-August to the end of November.

Yuka attended a village meeting in Ovgort in March 2016. The communities live a 'traditional' nomadic lifestyle and, at the meeting, some of the community members were shouting at the government staff. There was clearly very minimal collaboration. Afterwards, some community members filed a complaint with the government. The communities' subsistence livelihood strategies are very complex. Many community members barter fish for reindeer meat and fur. Biologists from Ekaterinburg monitor the fish populations and write reports for the government on their findings.

The Role of Collaborative Resource Management and Monitoring in Japans Arctic Research Priorities Today and in the Future
By Hiroyuki Enomoto

Hiroyuki described the role of collaborative resource management and monitoring in Japan's Arctic research priorities. He outlined key trends over time in Japan's Arctic research involvement. Prior to 2011, Japan had mainly individual research projects. Researchers from multiple natural science disciplines then combined their ideas into broader research programmes, including both interdisciplinary and transdisciplinary research. Since 2015, social scientists have been invited to join the projects. Only a few social scientists in Japan are working on the Arctic, however, perhaps just 5-10 persons.

With regard to stakeholder engagement in Japan's Arctic research programmes, initial efforts focused on documenting and obtaining an understanding of the stakeholders' perspectives. More recently, research is also beginning to be undertaken in close cooperation with the local stakeholders and contribute to management action. From an initial focus on data archiving, there is now more attention on data sharing, data dissemination and interpretation.

Hiroyuki also discussed how to connect local and global research activities, including the need to learn from good practice and co-designing research together with the local communities. Geographically, the focus is on Qaanaaq in Greenland and on the Russian Arctic. Some of the focus of the research has been on new technologies and instruments. With regard to Indigenous and Local Knowledge (ILK), Japan has had projects that have tried to connect scientific and ILK knowledge although a model case of this kind has yet to be found. There is broad interest in research in order to be prepared for 'never-experienced' extreme events such as the Fukushima tsunami, which actually has happened already, but which many young people have forgotten.

The overriding theme of Japan's research interest in the Arctic is climate change adaptation and mitigation. The Government of Japan has developed an Arctic Policy. Cooperation has initially been mainly sought from the Arctic Council but it has become increasingly clear that there are many other stakeholders in the Arctic too. In 2020, the Government of Japan will host the Third Arctic Science Ministerial. There are many unanswered questions about the future of Japan's research activities in the Arctic, such as what the focus should be, how the research should be undertaken, and by whom.

Experiences on Collaborative Resource Management and Monitoring in Nunavut By Jason Akearok

Nunavut Wildlife Management Board in Nunavut, Canada, has 9 members and 11 staff. Its work is guided by a Strategic Plan focused on connecting and collaborating. NWMB's Vision is to be a *"World-class model for the cooperative management of healthy wildlife populations".* The NWMB makes decisions on species management and monitoring, protecting habitats, and setting priorities for research. NWMB's work is based on the Nunavut Agreement, which is an agreement between Government and Nunavut Inuit. Collaboration efforts can involve workshops and public hearing processes. NWMB funds government research with approx. Can$1 million per year based, in part, on Inuit priorities and guided by NWMB. Collaborative instances could be through in-person and written public hearing processes for e.g. polar bear and caribou.

Many of the species cross inter-jurisdictional and international boundaries. This requires coordination and collaboration with our inter-jurisdictional and international partners.

For more than 10 years, NWMB has led a community-based monitoring network. It currently costs $350-$400 K Canadian per year. A great deal of work is focused on recruitment and training, for example, in the use of a mobile tablet, recording the occurrence of species and weather patterns and taking photos for documentation. Feedback to the communities is provided mainly through a public Facebook page. The programme has involved 80 harvesters from five communities (not all communities involved all the time). More than 50 species are

harvested in these communities. The NWMB is examining how it can utilized the information into their decision-making.

Challenges for the NWMB to meaningfully incorporate Inuit Knowledge into NWMB decision-making. The NWMB is often faced with competing government and Inuit information when making decisions. In addition, scientific information is often technical that can be difficult for the public in general, including government officials to understand. Despite this lack of understanding, government often rely on the technical information to base their decisions. The local and regional Inuit institutions in Nunavut need to have support to understand and interpret the technical information to be more meaningful collaborative partners in Nunavut's collaborative decision-making.