

Chapter 9 - Conclusions

Moving forward

This thesis was undertaken to address research needs and gaps relating to Inuit sea ice expertise. It also aims to contribute to improving research relationships between Inuit communities and northern researchers. We have much to learn from the long-term experiences and accumulated knowledge that elders and hunters have gained regarding sea ice (and the complex links with wind, weather, and tidal conditions). Different underlying epistemologies, methods of knowledge acquisition, and goals for use/investigation render Inuit and scientific knowledge as potentially an ideal complement (Laidler, 2006a). Therefore, gaining insight into local characterizations of the importance of sea ice processes, use, and change are an important beginning. Without this initial foundation it is difficult to move forward to facilitating research relationships. And yet, it is not the only component of enhancing collaborative research. Much work still needs to be done (from both sides) to refine appropriate research methods, modes of communication, and means of knowledge representation to more effectively link the two forms of expertise. Therefore, based on experiences in this research, the identification of future research directions aims to move towards more comprehensive inclusion of Inuit expertise in assessments and decisions that directly affect their lives.

9.1 The importance of sea ice processes, use, and change

In addressing the first thesis objective, sea ice has been shown to be equally important in Cape Dorset, Igloolik, and Pangnirtung, Nunavut, as a means of traveling and hunting, and sustaining marine wildlife. As an inherent part of Inuit culture, local ice conditions are intertwined with daily activities. The importance reflects localized differences in ice conditions, terminology, and use, while similarities in these characteristics serve to tie communities together from across Baffin Island.

In order for people to effectively travel and hunt on the sea ice, they have to become knowledgeable about the complexity and dynamism of the oceanic environment. This was elucidated through detailed explanations of local ice conditions, seasonal processes, and Inuktitut terminology. In each community they account for near-shore and open water freezing, as well as several stages of sea ice thickening. Variations in these descriptions highlight some of the unique geographical influences related to temperature and speed of freezing, as well as localized wind and current direction. In addition, local dialects or specific local sea ice uses also influence the degree to which processes are described. For example, Cape Dorset and Pangnirtung focus more on shoreline processes due to the prominent tidal variations in these areas, while in Igloodik they focus more on sea ice thickening and the establishment of the floe edge. Inuit elders and hunters skillfully incorporate the multiple influences of weather, winds, currents, and season in their explanations of sea ice formation or decay processes, which also includes the formation of tidal cracks, floe edges, and polynyas. These are all important hunting destinations, although methods for hunting and target animals may vary somewhat according to local practices. For example, Igloodik's focus on moving ice, and extensive terminology for the interface between the floe edge and moving ice, is directly linked to their walrus hunting techniques that necessitate venturing onto moving ice pans. Melt processes around each community were described as beginning with various stages of snowmelt. However, these stages also varied according to regional texture differences and patterns of spring sea ice use. As water accumulates, and the ice deteriorates towards break-up, many of the major transition stages are commonly emphasized between communities. But again, varying emphases reflect the processes that most affect sea ice travel and access to hunting grounds. Temperature alone is not a key focus for Inuit descriptions of ice processes, but rather the combined effects of winds, weather, and currents (or lack thereof) are considered the most influential forces on ice conditions.

Consistent with many of the changes being experienced across Nunavut (NTI, 2001; Nickels *et al.*, 2005), elders and hunters in Cape Dorset, Igloolik, and Pangnirtung are noticing, and feeling the effects of, sea ice change. They relate these occurrences to the pattern of long-term climate change at broader scales. Key indicators (i.e. the floe edge, weather predictability, ice thickness, the timing of freeze-up and break-up, wildlife, and moving/multi-year ice) are employed within a local context to evaluate change over the past four decades. The shifts occurring in Pangnirtung seem most drastic (i.e. shifts in the timing of freeze-up and break-up, thinning sea ice, reduction of moving/multi-year ice, and reduced sea ice extent), while in Igloolik inter-annual variability is the focus more than long-term change. In contrast, with the least ice extent, Cape Dorset's changes may be the smallest but may have the largest impacts if cumulative change reduces access beyond the island.

9.2 The relevance of sea ice to human and animal activity

In addressing the second thesis objective, it may be concluded that the preeminent dangers associated with sea ice travel relate to: i) variable conditions along the floe edge or polynyas (influenced by winds and currents); ii) navigating sea ice during transition periods; iii) traveling on sea ice after fresh snowfall; and/or, iv) the tidal cycle at a particular time of day or month. All these factors are taken into account during sea ice travel or hunting, and yet no one person can ever know everything about the sea ice. Even the most experienced hunters have accidents. Therefore, methods for evaluating ice safety are continuously stressed, along with a healthy dose of caution. Because the most dangerous areas of sea ice are often the main destinations for hunting purposes, the management of risk is paramount in peoples' evaluation of danger. Preparedness, combined with years of experience, can minimize mishaps and enhance the chances of hunting success.

Beyond caribou and arctic char, the key staples of northern diets rely on the sea ice as their habitat (i.e. ringed seal, walrus, polar bear, narwhal, etc.). Because of the importance of

marine wildlife to sustain community members (historically for heat, light and equipment, and continuing to the present for food and financial gain), learning about sea ice is implicit in hunters' efforts to characterize the behaviour and habitat of wildlife. Sea ice expertise is also essential to be able to access this wildlife. For these reasons hunters have specific hunting areas where they are most familiar with ice conditions, dangers, and travel routes.

9.3 Collaborative research

Learning about sea ice "through Inuit eyes" required close collaboration with local interpreters and community members. This afforded many opportunities to reflect upon the benefits and challenges of working across cultures. A collaborative research approach proved effective overall, but in addressing the third thesis objective important considerations were highlighted to facilitate future research relationships.

9.3.1 Working together

Evaluating the effectiveness of working together collaboratively in a northern context, and employing multiple research methods, serves to inform other research efforts in Inuit communities - even in different disciplines. Undertaking preliminary research visits were critical to overall research success, as they laid the initial interpersonal and logistical groundwork necessary to refine subsequent research phases. When conducting field research, semi-directed interviews were valuable in gaining detailed insights into local sea ice expertise. However, conducted indoors, outside of the practical context of sea ice use, there were constraints to the types of descriptions provided. The inclusion of participatory mapping in interviews helped to bridge the worlds of experience and description, as the interview focus was shifted onto spatial representations of sea ice. This elicited richer interview responses while also alleviating some of the potential tension in a direct question-answer session. Experiential sea ice trips filled in gaps by providing invaluable practical context, as well as opportunities to capture visual representations of sea ice with video and photography. Both

the interviews and sea ice trips were complemented by focus groups. These helped refine my own interpretations, as well as link terminology and sea ice descriptions to the visual references. These methods had to be somewhat tailored to the individual community and current events, yet it is hoped that reflections in Section 8.1 contribute to ongoing (re)evaluations of the utility of conventional social scientific methods to learn across cultures.

Also critical to the collaborative research approach was the maintenance of ongoing, effective communication. This required considerable effort, along with the need for continued assessment of what types of communication were most appropriate. Different mediums for providing information, updates, or encouraging feedback/involvement vary by person, community, culture, and discipline. Each method has their own strengths and weaknesses depending on the research stage, purpose, and community context. Therefore, it is recommended that a combination of methods is the most effective way to ensure that information is passed along to those who are interested. This must be conducted alongside concerted efforts to incorporate feedback into ongoing assessments and alterations of the research methods and communication strategy. By learning from previous experiences, and building towards long-term research relationships, researchers can enhance practical efforts to link Inuit and scientific knowledge.

As summarized in Laidler (2006a), collaborative research that aims to represent both Inuit and scientific perspectives can be facilitated by:

1. starting early to establish the feasibility of community-researcher collaboration;
2. investigating topics of interest to both Inuit and scientific communities;
3. involving community members in all research stages (from proposal to analysis) at a mutually desirable level;
4. engaging in a variety of participatory research methods; and,
5. maintaining ongoing communication.

Admittedly, considerable practical and methodological challenges remain in attempting to intersect different knowledge systems. Nevertheless, possibilities for a positive enhancement

of both Inuit and scientific expertise on sea ice are proposed to outweigh the perceived barriers to such collaborative efforts (Laidler, 2006a).

9.3.2 Linking Inuit and scientific expertise

Sea ice use will not halt in a changing climate, but as conditions become more unpredictable community members and scientists alike are concerned about the potential physical and cultural impacts of such change. As seen in examples from Cape Dorset, Igloodik, and Pangnirtung, similar types of sea ice change can have different local implications. Inuit elders and hunters are the experts on local ice conditions, and are most knowledgeable of how such changes might affect community lifestyles or livelihoods. In addition, there are climate and cryosphere scientists investigating trends in sea ice freeze-up and break-up timing, ice thickness and extent, and long-term temperature changes (and related atmospheric influences) on regional and global levels (e.g. Wang *et al.*, 1994a; Wang *et al.*, 1994b; Mysak *et al.*, 1996; Gough and Allakhverdova, 1999; Parkinson *et al.*, 1999; Gough and Houser, 2005). Thus, documenting and understanding Inuit expertise on sea ice processes and change can enhance community and researcher capacity to converge their methods and goals for climate change research by:

1. gaining local scale expertise;
2. expanding climate history and baseline data;
3. formulating research hypotheses;
4. providing insights into community adaptation; and,
5. reflecting cumulative, local monitoring systems (Riedlinger and Berkes, 2001).

Establishing joint interests, and developing an appreciation for the complementary nature of Inuit and scientific knowledge of sea ice is one thing, but efforts must still be expended to overcome skepticism and misunderstandings that linger between Inuit and scientists. Furthermore, local concerns for collaboration with researchers must be addressed in order to work towards practical intersections of the two forms of expertise. In so doing, effective communication is essential, along with the selection of an appropriate research topic and an

effort to maintain rigorous research processes. Neither Inuit nor scientific knowledge can be accepted uncritically, but at the same time it is imperative to better understand what types of knowledge are valued in each epistemology, and why.

Through this thesis, substantial groundwork has been laid to facilitate intersections between Inuit and scientific expertise. Without gaining detailed insights into how Inuit characterize, use, and value ice conditions, practical linkages would not be possible. There are emerging studies that focus on the complementary nature of these different types of information in an applied manner (Norton and Gaylord, 2004; Meier *et al.*, in press; Tremblay *et al.*, in press), but continued and concerted efforts to develop reciprocal research partnerships are necessitated to begin working collaboratively from the outset of a project. Therefore, it is essential to characterize efforts to link disparate knowledge systems as a long-term process. Moving in this direction may encourage the evolution of a new generation of interdisciplinary researchers that specialize in interpreting/linking different ways of knowing (Laidler, 2006a). An equal evolution of Inuit involvement in/control over research that affects their lives would be required to parallel developments in academic arenas, if the capacity and interest in collaborative research is to be fostered.

9.4 Future research directions

As discussed above, scientists are actively exploring topics that are of interest to Inuit. Therefore, in addressing the fourth thesis objective, new research directions are identified according to their importance for Nunavut communities. They focus on intersecting the research/monitoring needs of both Inuit and scientists, and provide the impetus for future research to jointly investigate:

- ocean temperature characteristics and change, to identify potential correlations with ice conditions and change;
- current and ocean circulation at a regional and local scale, to identify potential correlations with ice conditions and change;

- wind directions and strength, to determine the consistency or direction of wind shifts along with links to weather patterns and ice conditions
- the social and cultural implications of a changing sea ice environment, especially combined with social and cultural changes in Inuit lifestyles
- how community members are currently adapting to variable or changed ice conditions, or how they anticipate community responses under a given future circumstance
- the influence of shipping and submarine activity on marine wildlife movements and health
- pollution of oceanic and hydrologic systems, specific local concerns with visible contamination of ice, snow, and water
- effective ways of communicating with northern communities
- effective ways of representing Inuit knowledge so as to minimally detract from the original meaning or context
- spatial delineations of Inuit sea ice expertise to contribute to real-time monitoring, change assessments, or interpretation of remote observations at coarser resolutions
- the evolving nature and context of community-researcher relationships
- ice thickness monitoring
- the size and position of polynyas, and how they are represented at various scales
- the position, shape, and variability of local and regional floe edge delineations
- wildlife health indicators
- the number and causes of sea ice accidents
- how to increasingly involve youth in research, and improve connections between youth and elders
- local economic implications of a changing sea ice environment
- methods of communicating both scientific and Inuit expertise to policy- and decision-makers at various levels of government

Therefore, my longer term research goals include contributions to:

- a) comparing – and linking – results of Inuit and community-based monitoring to the current state of scientific knowledge on ice trends and cycles in the vicinity of local observations;
- b) refining the representation of sea ice dynamics and Inuit expertise through spatial delineations or multi-media; and,
- c) expanding collaborative research partnerships with northern community members to direct, and apply, sea ice/climate change research.

These are already underway in a preliminary manner through my involvement in International Polar Year (IPY, 2007-2008) project proposals such as: i) SIKU (Sea Ice Knowledge and Use); ii) ISIUOP (Inuit Sea Ice Use and Occupancy Project); and, iii) Variability and Change in the Canadian Cryosphere. However, these efforts will be continued throughout an academic career that seeks to build on the foundations created in this research.

Inuit can provide local scale expertise, and ongoing sea ice use, that contributes to change assessments in a way that complements scientific observations and modeling exercises (Laidler and Elee, in press). Through the identification of commonly employed environmental, social, or cultural indicators Inuit and scientists have a shared starting point from which to develop research of mutual interest. Along with ongoing communication, collaborative research is most likely to succeed when both groups are directly involved from the outset. In so doing, research relationships, and the degree of local or scientific involvement, can be negotiated throughout various research stages (ITK and NRI, in press). In building these connections more effective assessments of community vulnerability or resilience to climate, and resulting sea ice, change may be undertaken. This would contribute to the development of appropriate adaptive strategies for the populations most affected by climatic change.

9.5 Community vulnerability or resilience?

Sea ice travel is hazardous in any season, yet experienced hunters are skilled in managing the associated risks. However, sea ice changes may exacerbate risks associated with sea ice travel, which could increase community sensitivity to the long-term implications of change. Sea ice change can affect local health, lifestyle, well-being, and culture, and is thus necessarily implicated in the broader context of assessing community vulnerability or resilience to change.

Adapting to yearly variations in sea ice cycles and conditions is incorporated in Inuit sea ice knowledge, and their respective use of the sea ice environment (Nelson, 1969; Freeman, 1984; Riewe, 1991; Aporta, 2002). Plans to hunt, travel, or camp at particular times/locations are continually altered according to conditions at the time, but these are not consciously delineated adaptations to change. They are a reflection of Inuit flexibility and skill in dealing with the variable and extreme nature of the arctic ecological system (Jolly *et al.*, 2002; Nichols *et al.*, 2004; Ford, 2005; Ford *et al.*, 2006b). Local coping mechanisms are effective within a certain

range of expected climatic or sea ice variability, but when the conditions exceed expectations (i.e. going beyond coping ability) is when people may become vulnerable (Ford, 2005). It is also under this pretense that people can become resilient.

Characterizing a population's vulnerability to climatic, or related, change has become an important element of the UNFCCC, IPCC, ACIA, IPY, and other large international efforts to understand or characterize the influence of climate change on human systems (Smit *et al.*, 2000; Ford and Smit, 2004; McCarthy *et al.*, 2005). Therefore, assessing community vulnerability to sea ice change becomes implicated in politics, research, economics, and environmental change at every level from global to local. In order to address vulnerability within a local context, Ford and Smit (2004) outline a useful framework for vulnerability assessment. It begins locally to identify the environmental or socio-economic conditions to which a community is most vulnerable - or adaptive. Therefore, the vulnerability of a community is a cumulative function of both local exposure (i.e. environmental factors) and adaptive capacity (i.e. human factors) under current, and future, circumstances (Ford and Smit, 2004). In employing this concept, vulnerability assessments begin at the community level to identify the factors of most pertinence. It can then be expanded to incorporate the larger biophysical and socio-economic elements that influence these local scale factors (Ford and Smit, 2004). Therefore, the concept of resilience can be used to characterize areas in which a community has a high adaptive capacity. As such, the importance of incorporating social and lifestyle elements into vulnerability assessments cannot be over-emphasized. This thesis can contribute to evaluations of local sea ice exposure, and to some degree adaptive capacity, but much additional work would be required to elucidate determinants of community response to changes (i.e. population characteristics, community economics, and local adaptive capacity (Duerden, 2004)). These play heavily into a community's ability to work with changes (i.e. resilient), or to be negatively impacted by changes (i.e. vulnerable). In addition to

individualized adaptation, there is also adaptation as a policy option or response strategy (Smit *et al.*, 2000). Therefore, the complexity of assessing community vulnerability is compounded by the types of change, local responses, and national and international policies to mitigate change/foster adaptation.

Ultimately, vulnerability assessments that incorporate community perspectives need to first understand the importance of a particular environmental phenomenon, as well as how community members understand and use that phenomenon. This thesis has focused on sea ice as a means to better understand the feasibility of collaborative research, and to contribute an essential element to climate change vulnerability assessment in northern latitudes. Detailed local expertise is not easily accessible to a scientific audience, and it must be incorporated into evaluations of current and future exposure. This work can complement other studies being conducted on the physical, cultural, and socio-economic aspects of vulnerability assessment. Granted, there are many more pressing issues facing northern communities than climate change (Duerden, 2004). However, because sea ice has direct implications for multiple aspects of Inuit community health, safety, and well-being there is strong local interest in communicating their expertise on this subject. Through my own experiences I also hope to have contributed to efforts in refining collaborative ways of working with Inuit communities. I am still a long way from where I aimed to be at the conclusion of my thesis, but the importance of understanding Inuit sea ice expertise and working collaboratively remained my priority throughout. Perhaps if I had worked with only one community for the duration of the research I would be farther along with the practical linkages. Yet the insights gained through regional comparisons would have been lost. Furthermore, individual community dynamics would not have informed my evaluations of the participatory methods and communication strategy. There is still much to learn, but least we are one step closer.