Project Results Summary
for
Ice, Through Inuit Eyes
Characterizing the importance of sea ice processes, use, and change around Pangnirtung

This project was proposed and undertaken by
Gita J. Laidler
and was made possible through the support, feedback, and participation of community members in the Hamlet of Pangnirtung.

This report is intended to provide a summary of the sea ice knowledge and expertise shared by hunters and elders in your community. I have tried to put this together as accurately as possible, but I can never capture the true depth of knowledge and experience that were so kindly shared with me over the past few years. Please consider this summary a starting point. The contents can be changed and improved over time through contributions from community members or by expressing your comments to me directly.

Document translated from English to Inuktitut by Innirvik Support Services Ltd. (Iqaluit, Nunavut).
“To [me], not only to [me] but to the hunters, you have to have an association with the sea ice. To [me] it’s almost like a gift because you have to depend on the conditions of the ice, and depending on the conditions it will have an effect on how much you’re able to bring in terms of food on the table. So, it has an effect on how you live as a person, as a hunter. Because once we notice that the conditions start to deteriorate at any particular spot, the hunter doesn’t necessarily become totally helpless but he knows that he’s going to have more difficulty in trying to procure the animals that he needs to survive on. So you have to have that association with the ice.”

(Joanasie Maniapik)

The importance of sea ice

“It’s very very important to Inuit, because it’s our qaujiti, which means we were born to it and we’ve always lived in it...If the sea ice doesn’t form anymore, although we still get snow, our life would drastically change.” (Manasie Maniapik)

Sea ice for travel

- Because of Pangnirtung’s location in a fiord, surrounded by high mountains, sea ice has always been an important travel platform in order to leave the community since ice is smoother and faster than traveling on land.
- When the ocean starts freezing people are joyful to hear that the ice is becoming solid.
- Meanwhile, when news of ice deterioration is communicated in the spring hunters are unhappy, knowing that their time on the ice is limited.
- As long as a person knows where the areas of strong currents are, the dangerous zones, it is possible to travel nearly any time, anywhere on the ice.

Sea ice for hunting

- Sea ice is an essential hunting platform and provides important habitat for a variety of marine and migratory wildlife.
- Sea ice travel and hunting used to be one of the most important means of survival (i.e. to access food, clothing, and heat materials), and it remains an essential aspect of subsistence and commercial harvesting today.
- Sea ice supports marine mammal hunting (e.g. ringed seals, a community staple) and provides access across the fiord, or across Cumberland Sound, to reach inland Arctic char fishing lakes and caribou hunting grounds.
- In addition, the ice in Cumberland Sound supports an important economic endeavour in Pangnirtung, the commercial turbot fishery – fishermen require solid ice cover in order to employ their long-line fishing technique, as well as to access the desirable (deep) ocean areas that are most productive.

“[The ice is] part of the hunter’s life and it can have an effect on his livelihood. [With] the conditions that we have today, [I’m] just using you and [Eric] as an example, [you] have our own place where [you] work where [you] can make [your] money, just by sitting here. But as a hunter, [I] have to hunt out there, and [I] depend on the animals to bring in the food as subsistence and also the skins, depending on what kind of animal it is, to be able to make money off that. So it has already had an impact on how much a hunter, not only [myself] but other hunters, as to how much money [we] can bring into the family.” (Joanasie Qappik).
Freezing and Melting Processes

The general order of freezing and melting processes in Pangnirtung, as well as links to the floe edge and tidal cracks, is shown in a diagram on the next page. This diagram was created to help link different terms with different stages of freezing or melting, and the related terminology descriptions are provided in point form, according to the order shown in the diagram.

Near shore freezing

- qillirnisijuq – an early stage of ice formation, when ice begins forming along the edge of the shoreline, this will eventually become qainngu
- sikutaq – the first ice to form, covering bays, inlets, and the heads of fiords before the larger bodies of water begin to freeze; where seals congregate in the fall [variations: sikusirtuq]
- iluvaliajuq – the first film of ice that starts forming, extending over the tidal flats
- qainngu – the ice that “touches the land”, it is a type of flat ice ledge that is attached to the shoreline; used for travel to get around dangerous areas; created from tidal variations and water continually overflowing at the edge, and then re-freezing
- siija – shoreline ice (broader extent than qainngu) that is continually shifting with tidal movements, thus creating rough ice conditions; difficult for travel; seals like to make their dens in this ice where snow has accumulated between rough ice
- sikuvaliajuq – early process of ice formation when the ice is “starting to form well”; first layers of ice are starting to form [variations: sikuvalialiqtuq, sikurisivaliajuq, sikualuqtuq, sikusaluqtuq, sikuliqtuq]

Open water freezing

- quppirkuaq – very thin sheet of ice that looks like an oil slick on top of the water; they are easier to see when there is a slight breeze, they will look like flat dark spots on the water
- qinnuaq – the first time the ice begins to come together, in a slushy suspension in the water; can be formed from the ocean cooling with fall temperatures or from snow falling in the water; it is still very fluid and flexible; good for hunting because it is still possible to boat in these conditions, but also moderates the wave action
- sivaujanguq – ice that “looks like a cookie”, pans of new ice in circular shapes; a more modern term for sikuallaajuq (likened to pancake ice) [variations: kaikkuit]
- sikuallaajuq – a collection of sikuaq in places; big plates of new ice; more traditional term for sivaujanguq (likened to pancake ice) [variations: kaikkuit]

Sea ice thickening

- sikuaq – new, thin, brittle sheet of ice; the first continuous layer of ice to form
- sikuutaq – the process of sikuaq forming, the water is starting to freeze over
- sikurataaq – sea ice that has just recently formed; it is possible to walk on it if checking the ice with a harpoon
- atuqsaraqtuq – when the ice is thick enough for a person to walk on it; “it is strong enough to hold a person”; the ice is safe to walk on, but a harpoon should be used to test the ice; the ice is travelable [variations: atuqsauluqtuq]
- nutaaminig – newly formed ice in the fall, before snow has fallen on it; “it used to be new”, it is about a week old; generally flat and large expanses of ice; good for allu hunting
- nipittuq – when the ice “locks up”, it stops moving around because it becomes stuck to the land
- sikijuq – the water has frozen over, the ice has joined together and there is no more open water
- qanngut – a snow-like crystallization that occurs on new or thin ice; caused by the exchange of moisture between the ocean and air [variations: qanngutilliq]
- apputtattuq – when snow falls on newly formed, thin ice; it prevents the ice from thickening and this ice stays dangerous for a long time [variations: apittautigijumiq, apijuq]
- ittanilapaat – wet spots on the snow where water has seeped up from underneath
- kiviniq – ice condition created by wet snow accumulation on the sea ice, which then melts and sinks into the ice (literally referring to “the sunken”), becoming part of the sea ice and actually strengthening it
Conceptual diagram of freeze-thaw processes, interactions, and terminology based on interviews conducted in Pangnirtung.

Where: _____ = general process direction    - - - - = cyclical process direction
- **sikurinittuq** – areas of sea ice that are thinner due to winds or snowfall; softer consistency than the surrounding sea ice; can apply to any soft ice condition regardless of ice thickness
- **nigajutaq** – areas in the ice that take longer to freeze, which can create soft spots where they do start freezing over; the last spots of open water during freeze-up, associated with the influence of winds or currents; areas where seals can be hunted as the ice is freezing over
- **sikwialluuti** – the first ice that forms and stays until the following year
- **siku** – a general term for sea ice; used for ice that is travelable and solid in areas that have frozen over
- **tuwapalliniujq** – sea ice is getting thicker, “it is turning into tuvaq”
- **tuvaq** – solid, thick ice that is attached to the land; referring to a foundation, and staying thick for a long time; safe to travel almost anywhere
- **sikutiqtuq** – solid, well formed sea ice; “the ice has formed properly”
- **apputaniuliqtuq** – when the snow has formed on top of the sea ice; “there’s a good amount of snow there now”, the snow has been there for a while
- **tuwallariuliqtuq** – solid sea ice, maximum thickness; it is safe to travel anywhere

**Tidal cracks**
- **nuttaq** – general term for a crack, but it does not open like a naggut
- **naggut** – a crack that forms in solid ice, due to tidal variations, and re-freezes after it opens; usually forms at points of land, and runs from land to land; usually forms in the same place from year to year; used to set seal or fishing nets, or to follow looking for alluit [variations: naggut]
- **naggutiminiq** – an old naggut, “it used to be a naggut”, that has frozen over and will not re-open with the tides until the ice begins melting [variations: naggutituqaq]
- **aijuq** – a crack that forms within a crack; where a naggut has formed already it will re-crack and re-freeze within the original crack; also common around pressure ridges
- **aajuraq** – a naggut that has opened in the spring, and does not re-freeze; there is open water within the crack
- **ikirniq** – the area of open water within an aajuraq; the area of open water between two moving ice pans; a crack formed in a moving ice pan [variations: nuttniq]

**Floe edge**
- **sinaaq** – the edge of the tuvaq that borders on open water; the floe edge
- **uiguaq** – new ice that forms along the sinaaq; “an addition”
- **uiguatuqaq** – old uiguaq
- **uukkaqtuq** – when a piece of tuvaq breaks off from the sinaaq, usually caused by the influence of winds or currents
- **nunniq** – when Cumberland Sound freezes over and the floe edge is far away; the ice extent would cover nearly all of Cumberland Sound that was shown in the maps used in interviews

**Snowmelt**
- **auttuq** – general term for melting [variations: ajuq]
- **aukkavaaliujut** – early stage of melting, when the sea ice is first starting to melt and become dangerous in certain areas
- **aukkaturilut** – areas in the sea ice that open up (melt) earlier than surrounding sea ice in the spring, usually associated with areas of strong currents, at the mouth of a fiord, or near a saqvaq; aukkaturilik is the singular version [variations: auksarniit]
- **apputailiqqaqtuq** – when the snow is melting on the ice in the spring
- **manguqtuq** – the process of the snow softening, and beginning to melt; it can be manguqtaaliquq during the day and then qirusaaqtaaq when it hardens again at night [variations: mangumajuq]
- **manguqtaaqtuq** – early stage of snowmelt in the spring, where the snow becomes the consistency that it will stick together and it would be possible to make snowballs
- **qipsuaaqtaaq** – the process of snow freezing/hardening during the evening/night in the spring; part of the process of manguqtaq; excellent for traveling in the spring [variations: qisqirqangajjuq]
- **masaq** – wet snow with a mushy consistency and darker spots within it
- **auumajisijuq** – when there is underneath the snow, but on top of the ice
Water accumulation and drainage

- **immatittuq** – the process of melt ponds forming as the snow melts on the sea ice
- **immatinniit** – melt puddles formed by melting snow on top of the ice; the ice becomes slushy on top, and it is hard to travel
- **ikiartirtuq** – melt water forming in the spring will sometimes re-freeze at night creating a thin, brittle layer of ice over *immatinniit*; this condition will make cracking sounds when walked on, it will break easily over the water or air underneath, but there will usually still be solid ice further below
- **kujjirtuq** – water that accumulates into little melt rivers, and is flowing into *qillait*; literally “it’s creating drainages”
- **killait** – holes that have melted all the way through the sea ice, usually where water has accumulated in *immatinniit*; water from melting snow or ice drains through these holes; they can quickly become large in the spring, and can be dangerous [variations: *killaaniq, qillait*]
- **puttaijuq** – when all the snow has melted on top of the ice at the same time and the ice is covered in water [variations: *immatirutarajuq*]

Break-up

- **maujaraq** – when the ice along the shore breaks up, and it is possible to jump from cake to cake of ice
- **tikpaqtuq** – the water-free ice after all the *immatinniit* have drained into *ajurait* or *killait* [variations: *kinirijuaq, suluraruqtuq, tijjurtuq*]
- **immatillarittuq** - melt puddles formed by the sea ice melting, the second stage of *immatinniit* forming; “really *immatittuq*”; the ice itself is wearing out and is thus more dangerous [variations: *immatilliqittuq*]
- **tuvarluqtuq** – *tuvaq* is deteriorating, thinning; becoming “bad” ice; becoming dangerous [variations: *tuvarlurlituq*]
- **surattuq** – sea ice break-up in the spring (“it’s broken”), due to the influence of winds [variations: *siqummai, surappuq*]
- **tuwaialijituq** – the process of *tuvaq* deteriorating and coming off [variations: *tuvaluapalajiutuq, tuvaisatuq, tuwaajungirtuq*]
- **tuwaminiq** – ice that “used to be *tuvaq*”, once *tuvaq* has broken off and is floating in the water
- **sijjaijaliqtuq** – the process of *sijja* becoming detached from the land; the old pressure ridges along the tidal flats start to go in the spring
- **sijjaminiq** – the *sijja* has broken off and is floating in the water, “it used to be *sijja*”
- **qainnguijaliqtuq** – the *qaingu* is becoming detached from the land

The influences of winds on sea ice

The diagram on the next page shows the linkages between wind direction and ice formation, decay, or movement. Terminology is described in the relative order shown in the diagram.

- **uukkaqtuq** – when a piece of *tuvaq* breaks off from the *sinaaq*, usually caused by the influence of winds or currents
- **isirsangaq** – winds that come from the mouth of a fiord, or from Cumberland Sound in towards the fiord
- **maniiilaq** – general term referring to rough ice [variations: *maniliaaqtuq*]
- **aggutittuq** – the action of the wind breaking up the ice and piling it in another location; rough ice condition
- **qalliriittipalliajuq** – when the wind forces thin ice to go under one another, forming overlapping layers; these layers thicken faster and can become travelable sooner than thin ice formations (multiple layers vs. one layer)
- **ivujuq** – the action that occurs when winds or currents force solid ice on top of other ice, can create pressure ridges where pans of ice collide; common occurrence near the *sinaaq*; creates rough ice where the ice meets or is forced over top of other ice; *ivu*, “to go on top”
“And it never fails, you know remember I said there’s a breeze comes in in the afternoon, it never fails. And it never fails, come early evening, it just calms up, there’s no wind to be heard of anywhere. It’s just real flat and you see ice in the water, it’s just marvelous, just beautiful...And it never fails, you would see, or even think that it’s strange that you see people getting ready to go when it’s windy, in Pangnirtung. You know, you’d find it kind of strange, people getting ready to go out boating when it’s really rough in the fiord. But we know that it’s going to be calm, early evening, so you just get ready in the afternoon and then shove off early evening. Because you know it’s going to calm up, calm out in the evening.” (Joanasie Maniapik)
<table>
<thead>
<tr>
<th>Direction</th>
<th>Season</th>
<th>Ice influence</th>
</tr>
</thead>
</table>
| West      | prominent in Pangnirtung Fiord | • not good wind  
• blows ice into the fiord from Cumberland Sound  
• melts the ice and snow in the fiords |
| NW        | • prevailing in fall and winter | • can cause the ice to break off at the floe edge  
• pushes loose ice out  
• can also bring moving ice into Cumberland Sound from Davis Strait  
• brings good clear weather  
• freezes smoothly  
• freezes quickly |
| North     | • prominent in Cumberland Sound | • can cause the ice to break off at the floe edge  
• pushes loose ice out  
• can also bring moving ice into Cumberland Sound from Davis Strait  
• ice thickens faster |
| NE        | • prominent in Pangnirtung Fiord | • brings good weather |
| East      | • strongest winds come off Mount Duval | • melts the snow on top of the ice  
• can break up the ice  
• floe edge comes closer to town  
• ‘spits’ the ice out of the fiord |
| SE        | • prevailing in summer | • dangerous when strong  
• creates cracks in the ice  
• breaks up the sea ice  
• pushes moving or multi-year ice in  
• creates rough ice formations |
| South     | • prominent in Cumberland Sound | • breaks up the sea ice  
• dangerous when strong  
• floe edge comes closer to town  
• pushes moving or multi-year ice in  
• more open water in Cumberland Sound |

### The influences of tides and currents on sea ice

The diagram on the next page shows the linkages between wind direction and ice formation, decay, or movement. Terminology is described in the relative order shown in the diagram.

- **piturniq** – the effect of the full moon on tides (much higher and lower than daily tides) and current strength (much stronger than regular ocean circulation); with a new or full moon cracks open up wider, ice thins where the currents are strongest, saqvaqs get larger, more ice is moved around; a monthly cycle/effect on the sea ice
- **aukkaturliit** – areas in the sea ice that open up (melt) earlier than surrounding sea ice in the spring, usually associated with areas of strong currents, at the mouth of a fiord, or near a saqvaq [variations: aukkarniit]
- **nigajutaq** – areas in the ice that take longer to freeze, which can create soft spots where they do start freezing over; the last spots of open water during freeze-up, associated with the influence of winds or currents; areas where seals can be hunted as the ice is freezing over
- **saqvaq** – an area of open water surrounded by sea ice, created and maintained by the movement of water, usually in areas with strong currents (refers to “where there are currents”); it can occasionally freeze over in the winter in areas or times when currents are weaker; popular areas for hunting seals; can be dangerous to travel around; surrounding sea ice tends to wear out earlier and faster in the spring than solid ice [variations: sijujuittuq, also sometimes referred to as aukkarniq depending on dialect]
- **saqvalariq** – a saqvaq where the ice will never freeze; it is possible to hunt at the edge of a saqvalariq and not be in too much danger
Conceptual model depicting the influences of currents and tides on sea ice formation, movement, or decay based on interviews conducted in Pangnirtung.

Where: 
- = general process direction
- - - = daily cycle
- - - - = monthly cycle
- titirtuq – an ice condition created by snow absorbing water around a saqvaq, or area where currents are wearing away ice from underneath, which re-freezes into a crust that can be safe to travel on.
- qattuattinniq – the edge of a saqvaq that is made thicker because of water continuously splashing over the edge and re-freezing
- qanguituq – during the strongest tides, in the spring, the water can force the ice along the land upwards, prying it off from the land as water gets underneath; this process can break off the qaingu
- maniilaq – general term referring to rough ice [variations: maniilaqtuq]
- ivujuq – the action that occurs when winds or currents force solid ice on top of other ice, can create pressure ridges where pans of ice collide; common occurrence near the sinaaq; creates rough ice where the ice meets or is forced over top of other ice; ivu, “to go on top”
- qalliriittipalliajuq – when the wind forces thin ice to go under one another, forming overlapping layers; these layers thicken faster and can become travelable sooner than thin ice formations (multiple layers vs. one layer)

“On top of the daily tides there are three other different types of tides, levels of tides, piturniq occurs once a month where the water level rises a little higher than normal. And then, ok let’s say it’s January we get a piturniq which is just a regular very high tide, at one point in the month. You know, if you ever look at a tide table, at certain times of the month the tide gets really really high, and then it’ll taper off, and then it’ll get really really high again, and then it’ll taper off. Let’s say in January there’ll be a big, there’ll be an ordinary piturniq, and then in February there would be like a piturnirusiq, which is not as high as the piturniq. However, a couple of times a year, piturnivijjuaq, which is really really high tide and really really low tide at that same day. It’s both ways, it works both ways, if we’re in a piturniq period the water will be like up to 20 feet, but the low tide during that day will be like, I don’t know, -20 feet. But in regular days, it will be like 15 feet, and then 15 feet. It sort of goes like this in the month.” (Enoosie Nashalik)

A few key terms associated with moving, or multi-year ice, include:
- aulajuaq – a general term for moving ice
- kavvaq – large, thick (high) pans of multi-year ice that come from further north, they are clear blue colour and relatively flat
- killiminiq – moving, multi-year ice that “used to be an edge”, they are rougher and not usually as thick as kavvaq
- piqalujat – icebergs that are floating in the ocean after having calved off a glacier
- tuvaminiq – tuvaq that has broken off from the sinaaq and is moving around freely

Sea ice travel
Sea ice travel and hunting are nearly inseparable components of Inuit sea ice use because travel on the sea ice is mainly for the purpose of hunting or accessing hunting grounds. However, for the purpose of this write-up, travel and hunting are discussed separately. The dangers involved with sea ice travel, and some ways to minimize the risks involved with sea ice travel, have been summarized in the table on the next page. Some additional suggestions for safety are included in the following quotes.

“When the tide is going up, the current is moving up that way [northwards], so if you’re hunting along the floe edge it’s safer to be hunting at the floe edge when the tide is coming in. So you have to be aware of what time the tides will be coming in and what time the tides will be going out. So like if, when the tide changes and it starts to go out, any chunk can be let go, and the tide will carry it out, and you’ll be on it.” (Levi Evic)
Summary of sea ice-related exposure and associated risks for community members in Pangnirtung, including some methods of minimizing these risks

<table>
<thead>
<tr>
<th>Type of Exposure</th>
<th>Associated Risks</th>
<th>Actions to minimize risk</th>
</tr>
</thead>
</table>
| Tidal stages, strongest currents associated with piturniq | ➢ delay freezing or cause early melting  
➢ keep areas open all winter (saqvaq)  
➢ cause ice on tidal flats to vary in stability with the tidal cycle  
➢ cause naggutiit to open or widen | ➢ use extra caution traveling around the mouth of Pangnirtung fiord (and other fiords) in the spring – it becomes dangerous quickly  
➢ travel on tidal flats at low tide  
➢ avoid naggutiit with newly formed ice in the middle of the crack, or naggutiit that are close to the sinaaq  
➢ avoid traveling near saqvait or the sinaaq during piturniq |
| Polynyas (saqvait) | ➢ created by stronger currents, and thus involved risks associated with tidal stages as indicated above  
➢ at high tide water comes over the edge, making it unstable and dangerous  
➢ become aukkaturliit in the spring | ➢ use extra caution traveling around saqvait, especially during piturniq or in the spring when melting has begun  
➢ it is safer to travel around these areas of open water at low tide, or after high tide when water has re-frozen along the edges  
➢ well defined saqvaq edges are safer than thinner, less defined edges |
| Floe edge (sinaaq) | ➢ always potentially dangerous where the uiguaq has formed  
➢ where naggutiit form or widen the sinaaq is prone to uukkanitaq  
➢ straight sinaaq is more prone to uukkanitaq than a rounded edge | ➢ avoid traveling on uiguaq, especially where it is newly formed (e.g. after uukkanitaq)  
➢ avoid traveling at the sinaaq during piturniq, near cracks, or when there are high winds  
➢ avoid traveling where the sinaaq has formed in a fairly straight line |
| Snowfall | ➢ snow on newly formed, or thin, ice makes it dangerous because it insulates the ice and allows it to melt from underneath  
➢ delays the freezing, thickening process of sea ice  
➢ snow covers dangerous conditions, making them hard to identify by sight | ➢ avoid traveling after a recent snowfall in the fall, when ice is still thin  
➢ avoid traveling on or near uiguaq after a snowfall  
➢ avoid traveling near saqvait after a snowfall  
➢ use extra caution when traveling on sea ice with thick snow, check with a harpoon if unsure about ice conditions under the snow |
| Freeze-up | ➢ ice can freeze unevenly in the fall, due to influence of winds, currents, and snowfall | ➢ test the ice for thickness and stability before traveling on it, or traveling in certain areas  
➢ avoid traveling near nigajutait  
➢ avoid traveling in areas with qanngut, especially if the crystallized flower formations are large and fluffy |
| Break-up | ➢ some areas open earlier than others (aukkaturliit), ice thins unevenly  
➢ fiords melt very quickly from the head of the fiord due to freshwater snow and river runoff  
➢ naggutiit widen and become aajurait | ➢ avoid traveling near the mouths of rivers, especially silty rivers  
➢ use extra caution traveling in fiords, they wear out very quickly  
➢ avoid wide aajurait, and aukkaturliit  
➢ use extra caution around immatinniit |

“It used to be scary in the thin ice areas but not as scary as today because you had two different groups that were looking at the thin ice in the old days, like the dogs would be looking and the person would be looking. But it’s entirely up to the person now, with the snowmobile.” (Mosesee Keyuajuk)

“It’s very, well it’s sort of a requirement, like if [I] travel through this area and [I] finds that it’s not quite safe then [I] make sure that everybody knows so that whoever the next person is going to go there is aware of the unsafe ice conditions. It’s a requirement, you have to tell people...Like for example if [I] was traveling alone by snowmobile and [I] was going along here and [I] find that
this area is not safe and it’s really thin, and [I] know that there are people hunting down there, [I] would make sure that these people get the word that ‘don’t use this area, make sure that you skirt that area.’ It’s very important, because most hunters will follow the skidoo tracks of another hunter. And if a hunter is going into thin ice then the next hunter is going to go along the same ‘railroad track’ into the same problem, so that’s why you have to advise other people...It’s the sort of gung-ho young new polar bear hunters that [we]’re really worried about, that’s why [we]’re going to go on the radio at lunch time to make sure that people are aware of these dangerous areas and to keep reminding them that there are dangerous areas down there. Because with machines nowadays it doesn’t take any time at all for a person to leave Pang and then be down there in just a few hours.” (Mosesee Nuvaqiq)

Sea ice hunting

Sea ice is an essential platform for hunting many of the marine birds and mammals important to community members in Pangnirtung; however, it is also an important means of accessing other staple animals such as inland Arctic char fishing lakes, caribou feeding grounds or migration routes, ptarmigan nesting/feeding areas, and fox trapping trails. Sea ice is also integral to the commercial turbot fishery.

“The ice is very important to [me] because it provides [me] with food, that [we] can go hunting and get seals, beautiful seals, and also baby seals. And then there are seals that are a little bit older than baby seals that are able to be sitting on the ice. Right from when they are babies until they are able to sit on the ice on their own, it’s good for hunting those kind of seals.” (Manasa Evic)

Seals

- The early winter is preferred for hunting ringed seals at their breathing holes, because with less snow accumulation it is easier to find the seal hole that looks like “a little volcano” on the ice – once the snow falls after January it is much harder to identify alluit.
- In mid-winter, areas with open water are desirable destinations for seal hunting, as the seals can access air (pujji) more easily where the ice is thinner – areas with strong currents or saqvait are popular seal hunting grounds.
- Seal nets are set in naggutiit during the darker months, usually at points of land, or naggutiit will be followed (atuagaq) looking for alluit in the thinner ice.
- In the spring, seal pup hunting is the preferred activity, as they are basking on the ice (uttuq) in the long days of sunshine.

Walrus

- Walrus hunting is more often conducted in the summer by boat, where walrus can be found sunning themselves on moving ice that has collected due to currents.
- Hunting for walrus typically requires traveling towards the mouth of Cumberland Sound.
- Walrus hunting is safer when they are on top of ice pans, as they can be more dangerous when swimming in the water.

Beluga

- Beluga are spotted by waiting on high hills and lookouts from islands in Cumberland Sound, and then are usually hunted from the sinaaq.
- Beluga used to be hunted in the spring near their calving grounds in Clearwater Fiord, but the community of Pangnirtung has stopped this practice in order to protect the beluga populations.
**Polar bears**
- For polar bears, people have to travel far down towards the mouth of Cumberland Sound, as the bears tend to stay closer to where there is open water and moving ice.
- They are also found in fiords or at the sinaaq.

**Commercial fishing**
- The commercial turbot fishery based in Pangnirtung, but conducted in Cumberland Sound, is highly dependent on the formation of solid sea ice throughout the winter.
- The ice needs to form out a certain distance in order for the most desirable (i.e. deep, upwards of 300 fathoms) areas of the Sound to be accessible, because the turbot are deep water fish.

**Wildlife habitat**
- Beyond the importance of sea ice for travel and hunting, it is also habitat for many of the wildlife already mentioned. Arctic animals are uniquely adapted to the cold climate as well as to the cold and frozen seas. A full description of sea ice use by different species is beyond the scope of this project. However, statements of sea ice as habitat frequently entered interview discussions and are thus included here.

- The spring floe edge and saqvait attract a variety of marine and migratory birds (e.g. mittiq (King eider)), where they spend their time waiting for the snow to melt on land so they can nest – when the ice is receding in the spring there is a lot of food for them at the sinaaq, and thus the reason for their congregation at the ice edge.
- Rabbits also use sea ice to travel between islands, foxes prowl the ice in the spring as they are avid baby seal hunters, and caribou use the ice to cross fiords, or between islands.

**Seals**
- Ringed seals maintain alluit throughout the winter when the sea ice is at its thickest, but they prefer where the ice is thinner, and thus will often use naguttiit to maintain their alluit or they will stick closer to saqvait and the sinaaq.
- Seals depend on the sea ice to bear their young – they create dens on top of the ice under the snow, usually in areas of rough ice where snow accumulates more readily (but adult males and other young seals also make dens).
- The time spent basking on the ice (uttuq) in the spring time is essential for the seals to molt, to get rid of old fur and allow new fur to grow in – specifically for baby seals, this allows them to rid themselves of their white fur, and for the new black fur to come in (becoming nattiaminiq).
- Seals move with the receding ice, into the fiords in later spring (pulattuq) and will also congregate in fiords on the sikutaq as ice is first forming in the fall.

**Walrus**
- Walrus prefer to be around floating ice pans in open water, but they will sometimes come into Cumberland Sound on multi-year ice from further north.
- Even in the winter, where the ice has broken up it is possible to find walrus basking on the ice pans (uttuq); therefore, walrus are often found closer to the mouth of Cumberland Sound.

**Polar bears**
- Polar bears can be found almost anywhere on sea ice, although they tend to prefer being near open water or moving ice.
- They seek their food on the sea ice, especially baby seals in their dens or on the ice in the spring, so polar bears spend a lot of time near points of land where the siijia is rough and where seal dens are more commonly found. They also harvest seals through their breathing holes or at the sinaaq.
Observations of change

Community members in Pangnirtung have observed, and are experiencing, considerable change in their local climatic and sea ice conditions.

- Observations of change have been noted mainly in the last few years (indicated as approximately 2000 – present), where unique ice conditions in the spring and fall of 2004 were frequently highlighted (one of the worst years for ice conditions to date due to different melt processes and a late freeze-up. In the last 5 – 10 years shifts in freeze-up and break-up timing, recession of the floe edge position, shortened turbot fishing seasons, and thinner sea ice were also mentioned.

- Changes are evaluated in comparison to conditions in the 1980s, but timeframes from the 1930s to 1960s were also used as a baseline reference for expected freeze-up timing and processes, as well as floe edge location (usually contingent on the age of elders or hunters interviewed).

Summary of observed indicators and associated changes around Pangnirtung. The number of observations refers to the number of people that mentioned this change.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Change</th>
<th># of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floe edge</td>
<td>a) Closer to town</td>
<td>a) 13</td>
</tr>
<tr>
<td></td>
<td>b) Breaks off more frequently</td>
<td>b) 3</td>
</tr>
<tr>
<td>Weather</td>
<td>a) More unpredictable</td>
<td>a) 4</td>
</tr>
<tr>
<td></td>
<td>b) More windy</td>
<td>b) 3</td>
</tr>
<tr>
<td></td>
<td>c) Warmer</td>
<td>c) 8</td>
</tr>
<tr>
<td>Freeze-up</td>
<td>a) Takes longer/freezes slower</td>
<td>a) 3</td>
</tr>
<tr>
<td></td>
<td>b) Occurring later</td>
<td>b) 8</td>
</tr>
<tr>
<td></td>
<td>c) Different consistency(soften)</td>
<td>c) 6</td>
</tr>
<tr>
<td>Break-up</td>
<td>a) Melts/breaks up earlier</td>
<td>a) 12</td>
</tr>
<tr>
<td></td>
<td>b) Melt stages happen faster</td>
<td>b) 8</td>
</tr>
<tr>
<td>Ice thickness</td>
<td>a) thinner</td>
<td>a) 7</td>
</tr>
</tbody>
</table>

Floe edge

- While the position of the floe edge varies from year to year in Cumberland Sound, there were consistent descriptions of the floe edge forming increasingly closer to the mouth of Pangnirtung Fiord in winter and spring.

- One of the furthest floe edges was indicated as being in the mid 1980s, around 1984 (potentially associated with weather currents that year) – but it is rare these days for Cumberland Sound to become nunniq, and even the ‘definition’ of nunniq has been altered due to this infrequent occurrence. This means there is more open water in Cumberland Sound and it is harder to access the desirable fishing areas for the commercial fishery.

- Because the floe edge is not established properly in recent years, certain areas are more prone to breaking off.

“When it’s a nunniq period it would be normally here and here [demonstrating], like when it becomes called nunniq, these would be frozen over, like the floe edge would be here or here, and that would be called nunniq. And out here would be like very nunniq...Normally [now] it’s even closer, hunters describe it as the floe edge being far away when it’s like this close, because normally it’s even closer now...So if a hunter says the floe edge is far, it’s only over there.”

(Peterosie Qappik)

Weather

- Just as the ice varies from year to year, so too does the weather – but various observations were presented that suggest a general warming trend is shortening the winter season and lengthening the summer:
there is a shorter ice season;
- snowmobiling season has shortened;
- there is a lack of ice fog during the fall, or at the floe edge;
- it is not necessary (i.e. not cold enough) to wear a caribou skin parka anymore;
- canvas tents are now adequate shelter in January and February, whereas an igloo was a necessity in the past;
- there is a longer open water season; and,
- the transitional period between ice-covered and ice-free (or vice versa) has lengthened.

- Elders and active hunters find it more difficult to predict weather patterns because some commonly used indicators of weather condition, or change, are no longer applicable (e.g. the types of weather associated with particular cloud formations or colourations), or have become confusing.

- Beautiful clear, calm weather was also more common, for longer periods of time (i.e. days at a time), in previous years.

- In the past, NW winds were prevalent in the winter, and more SE winds in the summer; however, currently the winds seem to blow from any direction regardless of season.

- With warming weather there is concern that these predominant winds will switch, along with the uncertainty of their effects.

- In general, windy conditions seem more common, also contributing to the challenges of weather prediction.

- Despite some comments on general warming of the weather, there were also several suggestions that it is the ocean – and not the air – that may in fact be warming. Part of this may relate to the cold water layer in the ocean now being much deeper, and thus surface waters being warmer.

“And what we have today is that in just observing the clouds, even in dead of winter you can see those black clouds which would normally tell you that it’s going to be a warm spot, you know for the day or two. But it doesn’t come, so these are the type of things that aren’t coming, as normally in the past you’d be able to predict what it’s going to be like. But you can’t today, because [the clouds] are coming, but they’re not saying it’s going to be a warm spot, it’s just an ordinary black cloud. Because it’s not coming out to the type of weather that [we] would normally associate with the clouds’ formations in the past. So it may not be even a warm spell, but you’ll still see those clouds.”

(Mosesee Keyuajuk)

**Timing of freeze-up**

The changes in freeze-up timing are summarized in the diagram on the next page.

- Changing winds are potentially linked to later freeze-up dates, as more windy conditions prevent the ice from freezing due to wave action, or the winds blow the new ice out. Furthermore, some of the freezing processes seem to be altered, such as:
  - *sikuvaalluuti* does not form properly, or stay until the next year;
  - *uiguaq* breaks off much easier, and more frequently;
  - areas with strong currents are not freezing over where they used to, new polynyas forming; and,
  - some points are thin/dangerous where they used to be solid.

- In general, the ice was described as being a different consistency, softer (more *sikurinittuq*) and not as strong as before – it doesn’t chip off as easily when it’s not hard and brittle.
Summary of the changes in freeze-up and break-up timing observed in Pangnirtung.

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**Timing of break-up**

The changes in break-up timing are summarized in the diagram above on this page.

- Earlier break-up, and faster deterioration of the sea ice, is linked to thinner and weaker (i.e. softer consistency) ice conditions.
- More storms in the spring time are melting the ice all at once, instead of the gradual melting effects of the sun.
- Even certain melt processes are being skipped, also contributing to the increased speed of ice deterioration in the spring.

“That’s because...after the snow melts, remember it became puttaijuq, [I] called it puttaijuq when all you could see was water after the snow melts? This part of the process is being skipped now. That no longer happens...The first process where the snow [melts] still occurs, but this never happens anymore where it all melts at the same time...After all the snow has melted on the ice it’s supposed to be very good to travel on, like it used to be very good to travel on. However, when it becomes immatinniq, the immatinniit go right down through the ice now, these days, very fast, like they don’t just stay as a puddle for a few days, for a long time. They’re melting right through really fast, so that part of the process is being skipped now too.” (Peterosie Qappik)
**Ice thickness**

- Sea ice was consistently described as being thinner than in the past, based upon a few key indicators:
  - seal breathing holes are no longer as deep or tunnel-like
  - melt holes are no longer as deep or tunnel-like
  - ice is thinner in comparison to personal height when chipping away a hole
  - a fishing spear (more than 10 feet long) is no longer necessary to retrieve seals from their breathing holes (now only about 1.5 feet thick)
  - **tuvaq** is thinner

- Thinner ice conditions are linked to later freeze-up due to the diminished amount of time for the ice to thicken, and also contribute to earlier break-up because it deteriorates faster in the spring, and is worn away more easily by currents from underneath.

**Wildlife**

- First, polar bears are affected by shorted ice seasons → bears were sighted infrequently in the past, but now they are increasingly seen in Cumberland Sound and around the community (which may be linked to changing ice conditions or the implementation of the quota system).
- The fur of ringed seals is being affected by the shorter ice seasons because they are not getting enough time to bask on the ice in the spring so they cannot molt properly. Some seals have even begun to give birth earlier in the year (normally this occurs in March), and fewer ringed seals were seen in Cumberland Sound in the fall of 2004, but more harp seals were observed.
- Beluga seem to stay closer to Pangnirtung year-round, since there are much longer periods of open water. They are also more accessible with the closer position of the floe edge.
- The turbot in Cumberland Sound may not be themselves influenced by changing ice conditions, but the ability for fishermen to access desirable fishing spots was mentioned frequently. This is linked to changes in floe edge position, freeze-up timing, break-up timing, and ice thickness throughout the year.

> “This was a very important seal denning area, it’s gone. And if that continues those seals, the seal babies or pups are going to be too small when they’re forced into the water. [I] know baby seals don’t have much fat on them, and whenever they don’t have much fat on them they last only a few minutes in the water.” (Paulosie Veevee)

**Multi-year ice**

- Because of its mountainous and fiord location, community members in Pangnirtung are used to having icebergs around (that have calved from nearby glaciers), as well as multi-year that is blown into Cumberland Sound from further north, via Davis Strait. Recently, fewer icebergs have been noted in and around the fiord, which leads to warmer summer water temperatures and potentially later freeze-up timing.
- Much less **qapraq** has been coming into Cumberland Sound, and when it does come in the MYI melts a lot faster than previously.

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> “And because of that the older hunters, older than [myself], you know having that knowledge of the formation of the ice and the conditions within [Cumberland] Sound, or around Pangnirtung, in knowing how the ice formation and also knowing how quickly it’s starting to go, or melt, now the elders are really concerned about that. What they’re doing is informing younger hunters like [myself] or even younger hunters like [Eric] to inform them of the dangers of where the ice conditions are bad or better in some areas, and where not to travel. So [I’m] also involved in trying to inform younger people to be more observant and not to use particular areas, while they’re out hunting.” (Mosesee Nuvaqiq)
THANK YOU to all the people who participated in interviews between April, 2004 and May, 2005 (in alphabetical order left to right, based on last name):

Alivaktuk, Joavee
Ishulutak, Jaco
Keyuajuk, Mosesee
Mike, Jamesie
Nowdlak, Jackie
Papatsie, Joeelie
Soulduapik, Joopa
Evic, Levi
Isulutak, Lazarusie
Maniapik, Joanasie
Nashalik, Enosie
Nowyook, Lootie
Qappik, Joanasie
Veevee, Paulosie
Evic, Manasa
Kisa, Michael
Maniapik, Manasie
Noah, Manasie
Nuvaqqi, Mosesee
Qappik, Peterosie
And one hunter who wished to remain anonymous.

Interviews were translated by: Andrew Dialla and Eric Joamie

Please note that all original audio and video tapes, transcripts, and full glossary have been deposited at the Angmarlik Visitor Centre. They are available to anyone who is interested in getting more details about this project.

Maps and posters will also be placed in the Hunters and Trappers Association office and Attagoyuk High School.

If you have any comments, questions, or suggestions, please contact Gita Laidler at:
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