

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



*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 Igloolik.*

*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.*

**“Sea ice, even though landfast, moving, free-floating, [I’m] constantly using it. If it wasn’t for ice anywhere [I] probably wouldn’t be where [I] am right now. It assists [me] in getting about, it assists [me] in hunting. [I] can be hunting either on landfast ice, moving ice, or free-floating ice, so [I] use all types of ice. Even in the summer, when [I] cannot get about on the landfast ice [I] still hunt on ice which is again free-floating ice.” (Jaipiti Palluq)**

### The importance of sea ice

**“[I]t’s very useful to [me]...[I] have used the ice in the past, [for] survival. [I] was born in 1943, the only source of heat was from what [we] caught, the only food source [we] got was from the sea. So therefore, [we] were using sea as much [we] did, as [we] do today. Again today [we] hunt constantly even though [we’re] not using seal fat as much for a heating source, [we’re] still using the meat to the same extent. So therefore, the use of the sea again, was always for hunting, and it’s still used for hunting.”  
(Maurice Arnatsiaq)**

#### *Sea ice for travel*

- ❖ Sea ice is important to elders and hunters in Igloolik because it is so useful.
- ❖ Sea ice is an essential hunting platform, without which hunters cannot go hunting (e.g. seal hunting is mainly conducted at polynyas, or through tidal cracks).
- ❖ The frozen ocean surface also decreases travel time between destinations.
- ❖ Once the ice has formed solidly it is like a shortcut, whereby following the coastline to get to camps would take much longer than the direct back-and-forth paths enabled by the sea ice.
- ❖ But sea ice travel is not typically undertaken just for the sake of travel, it is mainly for the purpose of hunting, or reaching hunting grounds.

#### *Sea ice for hunting*

- ❖ Sea ice is used more often than the land for reaching important marine mammal hunting grounds (e.g. for polar bear, walrus, seals), and it also enables travel across Fury and Hecla Strait (*Ikiq*) to access terrestrial hunting grounds (e.g. Baffin Island caribou hunting and fishing, Melville Peninsula fishing).
- ❖ Therefore, people are relatively stranded on the island of Igloolik during transition periods where the ice is too thick to boat, but not thick enough to travel on –in these times hunting access is limited, and hunters look forward to its formation to enable key transportation.
- ❖ The moving ice was frequently emphasized as being important to the community of Igloolik – moving ice hunting was critical for the survival of families in the past, yet marine mammals remain important in community diets and lifestyles today.
- ❖ Some people described sea ice travel and hunting as enjoyable and fun, rendering the pursuit of marine mammals more than simply a harvesting activity, but a type of leisure engagement as well.

**“[T] ice is very useful in that, especially moving ice, that’s the only place where you can get walrus in the winter, and walrus is one of the mainstays of Igloolik, and Hall Beach as well. So therefore moving ice, travel on moving ice was practiced, and it’s still practiced today because it’s crucial for hunting walrus.” (Abraham Ulayuruluk)**

## Freezing and Melting Processes

The general order of freezing and melting processes in Igloodik, 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*

- ❖ *qaingu* – sea ice that has formed along the tidal zone, at the edge of the shoreline, in the early process of freezing; it freezes during low tide after being covered with water at high tide

### *Open water freezing*

- ❖ *qinu* – early ice formation that is not solid, it is slush-like in the water; can also be caused by ice grinding together and granules of ice falling into the water; dangerous for travel and difficult to distinguish from safe ice when it is covered by snow [variations: *qinuaq*]
- ❖ *quvviquat* – smooth, narrow formations (striations) on open water that follow the direction of the wind; very thin ice that has formed on the open water, but is not noticeable without a bit of wind creating little waves in the water, highlighting the smooth areas; they often form downwind from points of land [variations: *quvviquarniit*, *qinnualuqtuq*; not used frequently in recent times]

### *Sea ice thickening*

- ❖ *sikuvalliajuq* – the process of the ocean freezing over
- ❖ *aggurtipaliajuq* – the process of ice freezing upwind, usually forming from where free-floating ice becomes stuck to the sea floor, a reef, or rock, because it is no longer moving the ice freezes/accumulates towards the wind; meaning “it’s progressing towards the wind” [variations: *nuamitti*]
- ❖ *sikuaq* – early stage of ice formation; new, very thin ice that is still moving, but continuous cover; still possible to break through it with a boat; useful for hunting because it creates a smooth cover for the water if there is any wind
- ❖ *nigajutait* – small pockets of open water that remain as the ice is freezing up; kept open by wind, wave, or current action, where there is more water movement so it takes longer to freeze; seals tend to congregate in these areas
- ❖ *nigajutaviniq* – a former *nigajutaq*, “it used to be a *nigajutaq*”; a *nigajutaq* that has frozen over
- ❖ *sikuriaq* – sea ice that is thicker than *sikuaq*, but it still has some give; it is possible to walk on, but it moves as you walk on it, it can be punctured with a harpoon; you cannot drive a dog team or snowmobile on it; approximately 1.5 inches thick
- ❖ *sikuqaq* – relatively new ice that has formed over a few days; thicker than *sikuriaq*; young ice
- ❖ *quasalimajuq* – ice that has frozen smoothly without any snowfall, “it is slippery”
- ❖ *niuma* – little lumps of “snow” on the ice; it looks like snow but it is not; it occurs in overcast conditions during the freezing process, due to condensation of water vapour on the ice; white crystallization on sea ice that is blotchy, if it is easy to remove then the sea ice is not very frozen and is still dangerous [variations: *patuuti*]
- ❖ *niumakjuaq* – “big *niuma*”; found more often on *uiguaviniq*
- ❖ *puimajuq* – slushy, wet ice surface caused by snowfall on new ice, water seeps through and soaks the snow; also an early stage of snowmelt in the spring where the surface of the ice becomes wet; when snow is melting the ice due to its insulating properties; makes travel difficult and/or dangerous
- ❖ *sikusaaq* – newly formed landfast ice, thick enough for travel [variations: *sikurisijuq*]
- ❖ *tuvaruajjuqtuq* – sea ice that is becoming solid landfast ice; “it is now partly *tuvaq*”; no snow has accumulated on this ice; approximately 6 – 7 inches thick
- ❖ *siku* – general term for sea ice, solid and travelable but snow has not accumulated and it is still thickening
- ❖ *sikuvik* – general term for solid ice that is travelable, and some snow has accumulated; approximately 1 foot thick (could refer to landfast or moving ice); ideal for hunting walrus because they can no longer penetrate through the ice
- ❖ *tuvaq* – solid, thick landfast ice that is no longer moving; snow can accumulate without causing ice thinning; relatively smooth ice



- ❖ *apulliq* – accumulation of snow on sea ice; “it has snow on top” [variations: *apusiniq*]
- ❖ *aputaittuq* – no snow has accumulated on the sea ice; “it does not have any snow”

### Tidal cracks

- ❖ *nagguti* – tidal crack that opens once or twice monthly (influenced by new and full moons, and thus stronger currents) and re-freezes; forms within the *tuvaq*, usually from points of land to other points of land; usually form in the same locations annually; useful for hunting seals because the seals will use the thinner ice where it had re-frozen to make breathing holes
- ❖ *napakkuti* – a crack that forms in *tuvaq*, it originates from a point of land or multi-year ice lodged into the *tuvaq* and ends at the *sinaaq*, otherwise it has similar properties to a *nagguti*; a crack that goes from land to sea [variations: *napata*]
- ❖ *quglukniq* – a *nagguti* that has opened, and frozen over, and the crack will suddenly close together, hitting the other side of the ice with so much force that the ice is forced upwards; this action forms a type of peak over the crack; it can be open underneath this type of crack formation
- ❖ *pilagiatimniq* – a *nagguti* that stops and starts/continues in a different location
- ❖ *aajuraq* – a *nagguti* that opens in the spring and does not re-freeze
- ❖ *quppirmi* – a crack that forms in moving ice (plural *quppirmiit*); meaning “it opens” or “it parts”; created by moving ice hitting land, the *sinaaq*, or a reef and causing part of it to open, usually in line with points of land; they are narrow, and they do have a beginning and end within the ice [variations: *quppirtirniq*]

### Floe edge

- ❖ *sinaaq* – the edge of the *tuvaq*, bordering on open water or moving ice; the floe edge; meaning “the edge”
- ❖ *uiguaq* – any ice forming, “adding on to”, the *sinaaq*; it can form out a fair distance, up to 75m or so; generally thin, smooth ice because it is newly formed; used for seal hunting
- ❖ *atirriaruti* – the very first narrow portion of new sea ice forming along the *sinaaq*, before the formation of *uiguaq*; extending approximately 5 – 10 feet from the *sinaaq* [variations: *uigutarniq*]
- ❖ *sinaaviniq* – “it used to be a *sinaaq*”; an old *sinaaq*; delineated because of its roughness, caused by ice moving back and forth all the time; where the *sinaaq* froze over
- ❖ *uiguaviniq* – “it used to be *uiguaq*”; older *uiguaq*, no longer the leading edge at the *sinaaq*; more solid ice than *uiguaq*
- ❖ *qangusirsimajuq* – smooth ice formation with no snow or ice crystallization (*qanguti*) on the ice
- ❖ *qanguti* – crystallization on the ice, very thin compact layer of snow; can be used for making a shelter in an emergency
- ❖ *niumakjuaq* – “big *niuma*”; found more often on *uiguaviniq*

### Moving ice

- ❖ *puktaaq* – a free-floating piece of ice; “it’s floating”, could refer to almost anything floating
- ❖ *aulajuq* – the whole collection/process of moving ice; the moving ice far into the main waters (i.e. not close to the *sinaaq*) that never stabilizes [variations: *aurajuq*]
- ❖ *aulaniq* – the area of moving ice that is constantly grinding, piling, moving, and opening at the *sinaaq*; the edge of the moving ice; used to hunt walrus [variations: *auraniq*]
- ❖ *qaattuuq* – the action of *aulaniq* moving away from the *sinaaq*; ice breaks away from where the *sinaaq* had been
- ❖ *uukkaqtuuq* – the action of breaking off; “it breaks off”; when part of the *sinaaq* breaks off – *tuvaq* or *uiguaq* – but usually referring to thicker ice breaking off
- ❖ *uukkaruti* – relatively large piece of *tuvaq* that has *uukkaqtuuq* from the *sinaaq*, becomes free-floating ice; used for safety when stranded on *aulaniq*, for stability and drinking water (because of snow accumulation)
- ❖ *nipititaaq* – where *aulaniq* piles up on the *sinaaq* and becomes stuck/frozen in; rough ice that is left behind on the *sinaaq* after *uukkaqtuuq*; hard to travel over
- ❖ *uukkaqtaqtuuq* – the ice is constantly breaking off the *sinaaq*; cycle of freezing over and breaking off throughout the winter
- ❖ *tatijaujuq* – ice that becomes dislodged as the *aulaniq* moves out, broken off from the *aulaniq* and carried out

- ❖ *ukkuartinniq* – when part of the *aulaniq* is temporarily stable, touching the *sinaaq*; can be used to cross from the *aulaniq* to the *sinaaq*
- ❖ *sanimuangniq* – the action of ice grinding along the *sinaaq*; ice moving sideways along the *sinaaq*
- ❖ *qaangajuq* – the process of *aulaniq* stopping at the *sinaaq*, when it is sustained touching the *sinaaq* by winds for several days, resulting in no open water at the *sinaaq*
- ❖ *minuirmi* – ground ice left behind by the continual motion and grinding of the *aulaniq* against the *sinaaq* or the edge of land; unstable ice created from constant motion, can lead to the formation of *qinu*
- ❖ *sikutuq* – old ice that does not melt completely in the summer; “it has been ice for some time”; this ice comes from elsewhere, usually further north; salt has drained from this ice due to its age, so it can be used as a source of freshwater
- ❖ *piqalujaq* – glacial iceberg, comes from further north and usually only seen in the Gulf of Boothia, does not usually come through Labrador Narrows because it is too shallow

### **Snowmelt**

- ❖ *qinallatut* – early melt stage when the snow begins to soften, semi-melting
- ❖ *nanirlijuk* – the snow thinning on top of the ice in early melt stages; the process of the snow cover shrinking
- ❖ *nilaruqtuq* – a thin film of crystallized snow/ice that is created on top of the melting snow as the water seeps down to the surface of the sea ice
- ❖ *ijaruwaujat* – crystallized ice formed into a little ball, meaning “the likeness of an eyeball”
- ❖ *manguqtuq* – the process of the snow softening and evening out in early melt stages; the beginning of snowmelt; snow gives way when walked on
- ❖ *puimajuq* – slushy, wet ice surface caused by snowfall on new ice, water seeps through and soaks the snow; also an early stage of snowmelt in the spring where the surface of the ice becomes wet; when snow is melting the ice due to its insulating properties; makes travel difficult and/or dangerous
- ❖ *qirsuqqaq* – snow that freezes smooth and solid temporarily (with cooler conditions) after melting has begun, usually only for a week or two, after which the melt stages continue until break-up; a snow condition that is very hard and good for traveling

### **Water accumulation and drainage**

- ❖ *aktinniq* – an area in the sea ice that wears out early, and quickly, due to an influx of freshwater, found near river and stream outlets where they reach the ocean
- ❖ *immaktittuq* – the process of water accumulating on sea ice due to snowmelt; “water has accumulated”
- ❖ *immaktinniit* – the water that accumulates on the sea ice due to snowmelt; puddles of water on the sea ice
- ❖ *puktailaq* – the white, relatively “dry” sections of snow that can be seen above *immaktinniit* that have accumulated on the sea ice
- ❖ *patikjuqtuq* – the process of melt water seeping through the ice underneath the snow; very thin ice underneath the snow where this process occurs, very dangerous and hard to identify
- ❖ *tikpaqtuq* – the process of meltwater draining (through *aajurait* or *aggluit*) and the ice becoming smooth, without water [variations: *tikpaqsimajuq*]
- ❖ *saluraq* – where meltwater had drained quickly and more ice/snow is visible than water; similar to *puktailaq* but can be more extensive
- ❖ *immaktipaliajuk* – the second stage of *immaktittuq*, when the water accumulation is caused by the melting of the sea ice itself
- ❖ *itisiuraq* – deep sections created in the ice once it begins to melt, after *immaktipaliajuk*, prior to *killait* forming; makes traveling difficult
- ❖ *killaq* – a hole formed in the ice where it had melted right through; holes in the ice caused by wear, usually where *itisiuraq* had formed

### **Break-up**

- ❖ *tuvarliqtuq* – the process of *tuvaq* wearing out, deteriorating
- ❖ *siruttiq* – the ice is “breaking up” [variations: *sirumittuq*]

- ❖ *tuvaiaqtuq* – the *tuvaq* is breaking off
- ❖ *tuvaiautiit* – pieces of *tuvaq* that broke off and are now free-floating [variations: *tuvaaviniq*]

### The influences of winds on sea ice

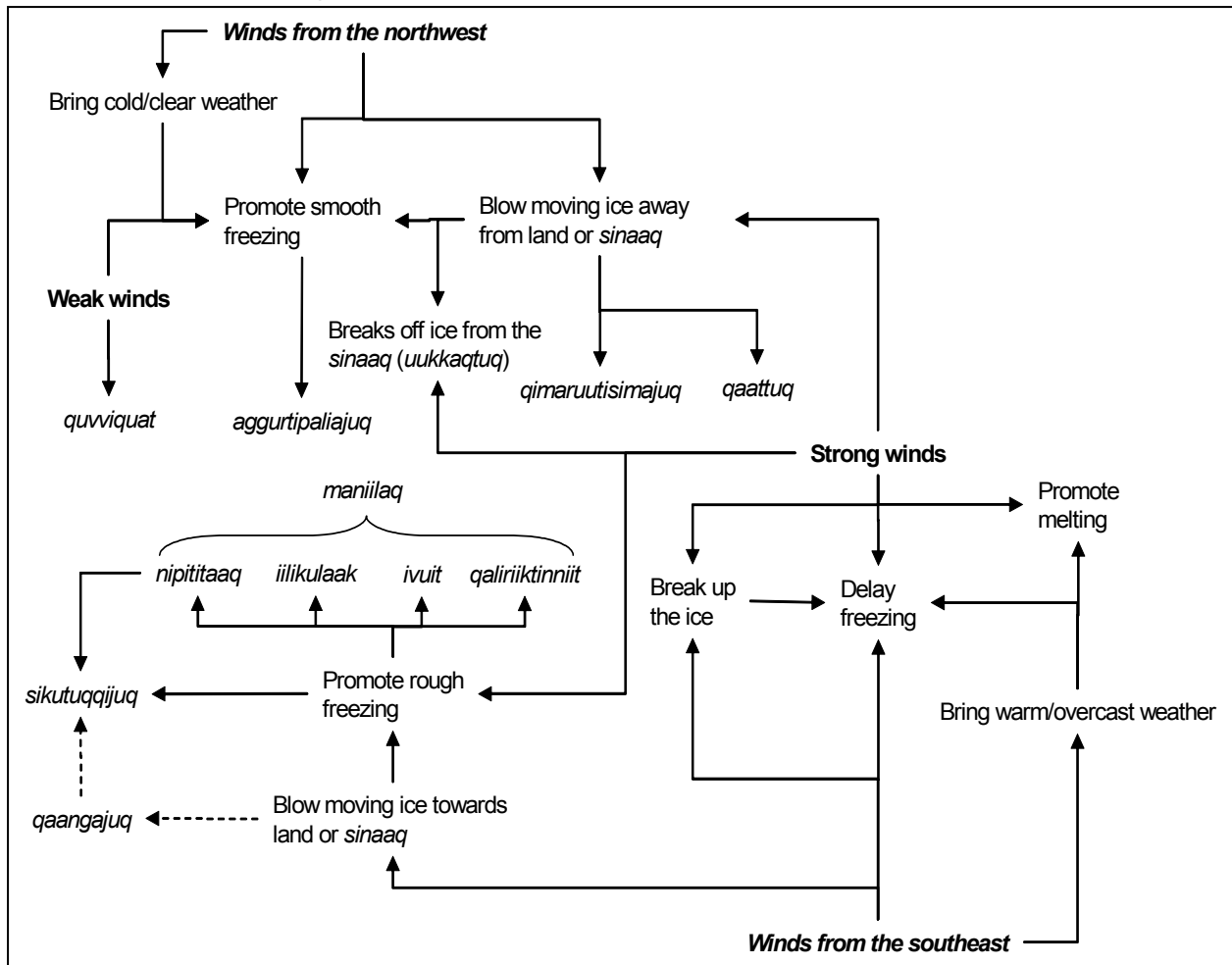
Summary of predominant directional and seasonal winds around Igloolik, and their related influences on sea ice

Direction	Season	Ice influence
West	<ul style="list-style-type: none"> <li>• brings a change in weather</li> </ul>	
NW	<ul style="list-style-type: none"> <li>• predominant</li> <li>• brings clear, cold weather</li> </ul>	<ul style="list-style-type: none"> <li>• blows ice out</li> <li>• contributes to smoother freezing</li> <li>• ice breaks off at the floe edge</li> </ul>
North	<ul style="list-style-type: none"> <li>• predominant</li> </ul>	
NE	<ul style="list-style-type: none"> <li>• fall</li> <li>• not common</li> </ul>	<ul style="list-style-type: none"> <li>• blows ice out</li> <li>• contributes to smoother freezing</li> <li>• becomes stronger further east from Igloolik (pushes the ice into solid ice)</li> </ul>
SE	<ul style="list-style-type: none"> <li>• opposes the NW wind</li> <li>• second most predominant</li> <li>• warmer, overcast weather</li> </ul>	<ul style="list-style-type: none"> <li>• moving ice is blown towards land, or the floe edge</li> <li>• ice temporarily sticks to the floe edge</li> <li>• contributes to rougher freezing</li> </ul>
SW	<ul style="list-style-type: none"> <li>• not common</li> <li>• spring and summer</li> </ul>	

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.

- ❖ *qimaruutisimajuq* – when the *aulaniq* has moved away from the *sinaaq* a bit, usually caused by winds; “the moving ice has moved away a bit”
- ❖ *qaattuuq* – the action of *aulaniq* moving away from the *sinaaq*; ice breaks away from where the *sinaaq* had been
- ❖ *uukkaqtuuq* – the action of breaking off; “it breaks off”; when part of the *sinaaq* breaks off – *tuvaq* or *uiguaq* – but usually referring to thicker ice breaking off
- ❖ *qaangajuq* – the process of *aulaniq* stopping at the *sinaaq*, when it is sustained touching the *sinaaq* by winds for several days, resulting in no open water at the *sinaaq*
- ❖ *sikutuqqijuuq* – when parts of the *aulaniq* become frozen into the *sinaaq* because they were pushed in by winds; “the ice has grown old”; rough ice condition which prevents travel; bad for walrus hunting because the animals move out to where there is more open water
- ❖ *nipititaaq* – where *aulaniq* piles up on the *sinaaq* and becomes stuck/frozen in; rough ice that is left behind on the *sinaaq* after *uukkaqtuuq*; hard to travel over
- ❖ *quvviquat* – smooth, narrow formations (striations) on open water that follow the direction of the wind; very thin ice that has formed on the open water, but is not noticeable without a bit of wind creating little waves in the water, highlighting the smooth areas; they often form downwind from points of land [variations: *quvviquarniit*, *qinnualuqtuuq*; not used frequently in recent times]
- ❖ *aggurtipaliajuq* – the process of ice freezing upwind, usually forming from where free-floating ice becomes stuck to the sea floor, a reef, or rock, because it is no longer moving the ice freezes/accumulates towards the wind; meaning “it’s progressing towards the wind” [variations: *nuamitti*]
- ❖ *iilikulaak* – when the ice is thin and it stands upright after hitting other ice; ice condition that has piled up more vertically (i.e. jagged) than horizontally (i.e. overlapping); can be caused by wind or current influence; it is noticeable when traveling, but still possible to travel over; low, small rough ice
- ❖ *maniilaq* – a general term for rough ice
- ❖ *ivuit* – pressure ridges caused by the process of *ivujuq* [variations: *ivuniku*]
- ❖ *ivujuq* – the creation of *ivuit* from ice being pushed into other ice, and piling up
- ❖ *qaliriktinniit* – ice that has been forced on top of other ice by wind or current forces, and is overlapping (horizontal piling)

Conceptual model of the influences of winds on sea ice formation, movement, or decay based on interviews conducted in Igloodik.



“And then the ice would be temporarily stuck to the floe edge, that moving ice, and then if it breaks off, just with that rough ice remaining onto the landfast ice...[it would be called] *nipititaaq*, the ice, the rough ice that was created by the southeasterly wind. If some of it is left behind and it breaks off, that’s what they call *nipititaaq*.”

(Anthony Qrunnut)

“And this year, the conditions are that the southeast wind has been blowing a lot in the last couple weeks, and due to that it might look like this is all safe, but there can be spots, let’s say in between the ice, the rough ice, in between that snow had accumulated very quickly, even before the ice had become solid. So therefore, the ice is not frozen, therefore you can get your harpoon shaft and just go through the snow and then it’s soft all the way through...If it had frozen over at the same time without the rough ice, all of it wouldn’t be dangerous at all, it would be solid all the way. And as long as snowfall hadn’t fallen, that ice would have been safe right through the winter, right through the forming stage to the end. But as it is right now with the snowfall having fallen, there’s some spots that are dangerous to travel on.” (Herve Paniaq)

“And also the wind plays a factor in the formation of ice in that whenever it’s windy, quite often the ice tends to be rougher than when there is no wind. If there is no wind, with just the current being the only factor then it would have frozen over smoothly,

**and it would have frozen over quite well. But with the wind it keeps breaking it and piling it so therefore it becomes rough and the ice forms at a later date."**

**(Nathan Qamaniq)**

### **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.

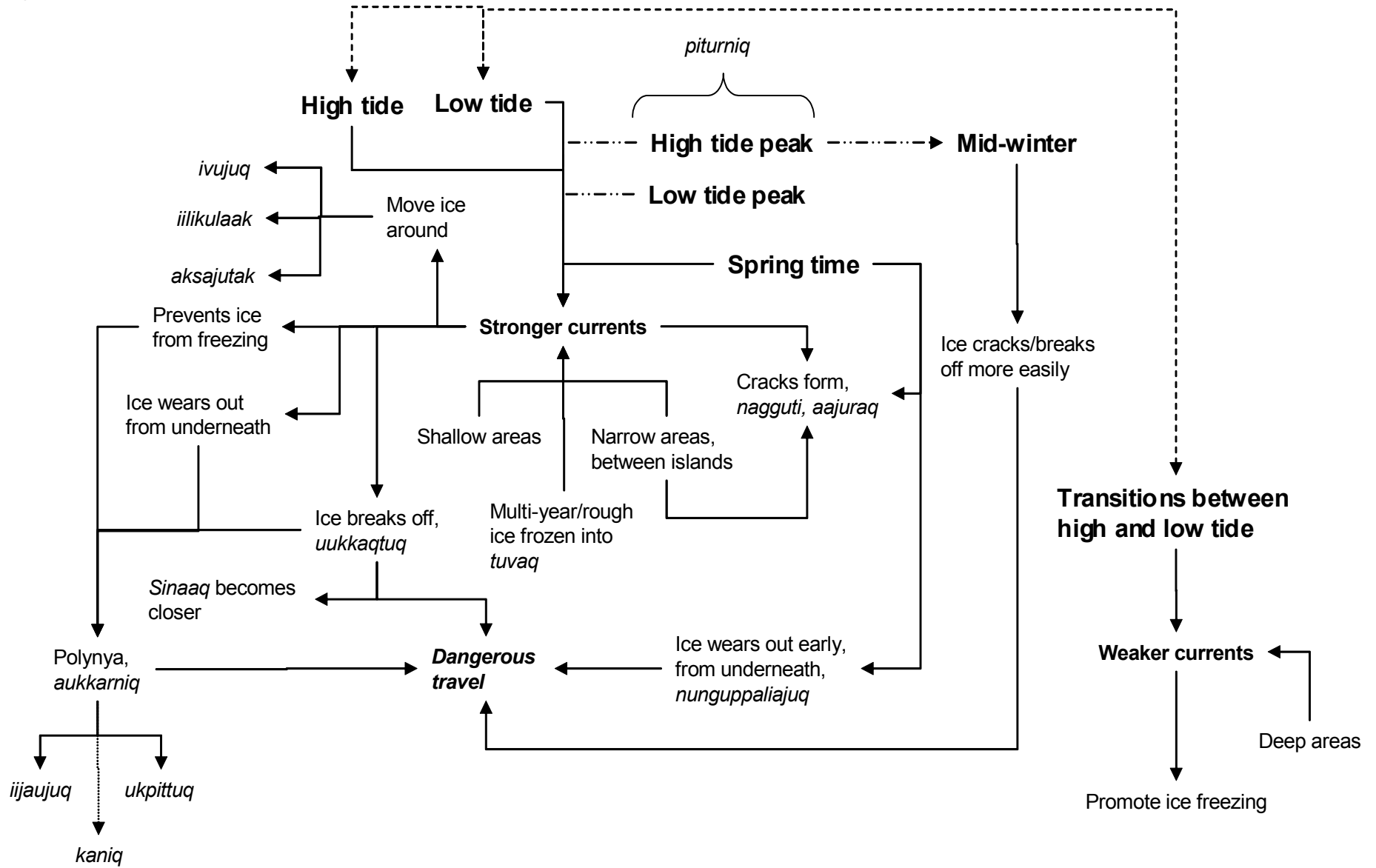
- ❖ *piturniq* – new/full moon period, when the currents are strongest as influenced by the moon
- ❖ *aukkarniq* – area of open water that lasts throughout the winter; it is created and maintained by strong currents; sea ice wears away from underneath due to strong currents; can temporarily freeze over depending on current strength
- ❖ *ivujuq* – the creation of *ivuit* from ice being pushed into other ice, and piling up
- ❖ *iilikulaak* – when the ice is thin and it stands upright after hitting other ice; ice condition that has piled up more vertically (i.e. jagged) than horizontally (i.e. overlapping); can be caused by wind or current influence; it is noticeable when traveling, but still possible to travel over; low, small rough ice
- ❖ *aksajutak* – circular ice pans formed by movements in open water, usually where the current is stronger, where the edges are rough and the middle is smooth; the rim is rougher due to constant contact with other ice pans or solid ice [variations: *maniqqarikuq*]
- ❖ *uukkaqtuq* – the action of breaking off; "it breaks off"; when part of the *sinaaq* breaks off – *tuvaq* or *uiguaq* – but usually referring to thicker ice breaking off
- ❖ *ukpittuq* – the process of ice being pushed into the edge of an *aukkarniq*, when it hits some of the ice breaks off and is pulled underneath by the weight of the water going on top
- ❖ *iijaujuq* – the process of ice vanishing underneath the edge of an *aukkarniq*; the ice is "swallowed" by the current, but this can also create thicker edges around the *aukkarniq*
- ❖ *kaniq* – a mound of sea ice created at one end of an *aukkarniq* due to sea ice accumulation underneath the ice cover, pushing it upwards; does not form solidly and is thus dangerous to travel on or around; rises gradually and so is hard to identify
- ❖ *nunguppaliajuq* – sea ice wearing out from the action of currents underneath without any surface melting; can also be created by overcast conditions

**"A full moon and a new moon creates these, when the current gets stronger the ice cracks because the ice moves a lot. It has to have a certain give, it can stretch, salt water ice can stretch so much and then it breaks. So therefore these cracks are created let's say at a new moon and a full moon. So every two weeks, at about every 2 weeks a new crack, the same crack is opened up and then it adds, it opens up about that much and it freezes over." (Theo Ikummaq)**

**"There is a time when in the winter, when this gets ice-covered, let's say when the tide is going this way it gets ice covered, and then all of a sudden the tide shifts and the ice is now moving the other way and it gets eaten by the current, under the ice. Therefore, it stops underneath the ice here and creates this mound from underneath [*kaniq*]. As the ice is packing, it's constantly packing whenever the tide is going in. So therefore, it piles up, becomes a big mound, and then at the rim of this mound there can be cracks, but being snow-covered you wouldn't be able to know that there's a crack there. And then at that crack it would be soft all the way to the bottom. It's not frozen, it's ice but it's not frozen at all...It's ice that's forming on, and also ice that breaks off here as well, so whatever ice breaks off it just gets under the ice and then it stops here because this is hardly any current at all. This is strong in current, but the current stops here, there's hardly any in Murray Maxwell Bay."**

**(Maurice Arnatsiaq)**

Conceptual model depicting the influences of currents and tides on sea ice formation, movement, or decay based on interviews conducted in Igloolik.



Where: — = general process direction    - - - - = daily cycle    - · - · = monthly cycle

## 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 this page**. Some additional suggestions for safety are included in the following **quotes**.

### **Summary of sea ice-related exposure and associated risks for community members in Igloodik, including some methods of minimizing these risks**

Type of Exposure	Associated Risks	Actions to minimize risk
Tidal stages, strongest currents associated with new and full moons	<ul style="list-style-type: none"> <li>➤ wears the ice away from underneath</li> <li>➤ cause ice to break off, or pile on, the floe edge</li> </ul>	<ul style="list-style-type: none"> <li>➤ avoid polynyas or areas of thin ice between islands, or at full and new moons</li> <li>➤ avoid areas with strong currents after snowfall</li> <li>➤ note and understand the daily and monthly tidal cycles to minimize risks around the floe edge when attempting to get onto moving ice</li> </ul>
Polynyas ( <i>aukkarniit</i> )	<ul style="list-style-type: none"> <li>➤ travel near or around the <i>kaniq</i> in Murray Maxwell Bay, especially where cracks have formed</li> <li>➤ <i>ukpittuq</i>, at the edge of <i>aukkarniit</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ avoid travel around polynyas after snowfall</li> <li>➤ avoid travel around polynyas when currents are strongest (full and new moon)</li> </ul>
Floe edge ( <i>sinaaq</i> )	<ul style="list-style-type: none"> <li>➤ a smooth, flat, extensive floe edge is more likely to break off</li> <li>➤ during the coldest winter months, ice is more brittle and there is enhanced likelihood of break-off events</li> <li>➤ during full or new moon, more likely to be piling or breaking</li> </ul>	<ul style="list-style-type: none"> <li>➤ note the amount of MYI piling on the three key reefs – rougher conditions decrease the likelihood of a break-off event</li> <li>➤ understand the seasonal dangers of floe edge travel to better evaluate safety</li> </ul>
Moving ice ( <i>aulaniq</i> )	<ul style="list-style-type: none"> <li>➤ always the potential to get stranded on moving ice if it is pushed out due to winds or currents</li> <li>➤ dynamic conditions change very quickly, and can be hard to avoid</li> </ul>	<ul style="list-style-type: none"> <li>➤ dog teams can be more effective, and helpful, during moving ice travel</li> <li>➤ understand the influence of winds and currents on the motion and direction of moving ice</li> <li>➤ know where the key reefs or moving ice grounding points are to ensure safe crossings to the solid ice or land</li> </ul>
Snowfall	<ul style="list-style-type: none"> <li>➤ overcast conditions that typically lead to snow are warmer than clear days, causing ice to thin or melt</li> <li>➤ new snowfall on thin ice insulates the ice and allows it to wear away from underneath (especially with areas of strong currents)</li> </ul>	<ul style="list-style-type: none"> <li>➤ avoid travel after a fresh snowfall, especially during early freezing processes, in areas with thin ice, or around polynyas</li> <li>➤ avoid snow that has accumulated around rough ice</li> </ul>
Freeze-up	<ul style="list-style-type: none"> <li>➤ non-uniform freezing conditions</li> <li>➤ wind direction and strength affects the stability, and roughness, of ice as it freezes</li> </ul>	<ul style="list-style-type: none"> <li>➤ alter routes based on ice conditions and speed of formation</li> <li>➤ detours to cross to Baffin Island or Melville Peninsula</li> <li>➤ avoid areas with strong currents</li> <li>➤ recall wind conditions during freezing process</li> </ul>
Break-up	<ul style="list-style-type: none"> <li>➤ uneven ice deterioration, some areas wear out more quickly than others</li> <li>➤ areas with snow cover can hide the conditions underneath</li> <li>➤ cracks can widen considerably</li> </ul>	<ul style="list-style-type: none"> <li>➤ avoid travel near polynyas, areas of strong currents, or near new ice formations (e.g. <i>uiguaq</i>), even in early melt stages</li> <li>➤ beware of areas where water has drained but snow remains on top of the ice (<i>patikjiuqtuq</i>)</li> <li>➤ note the width of cracks before crossing <i>ajurait</i></li> </ul>

**“[W]hen the first snowfall occurs after the ice has formed, there’s a layer between the ice and snow where the snow starts melting and then you have that thin layer of liquid, what looks like liquid, that’s the saltwater that’s not frozen. And when**

you have that then the dangerous areas are present, in that any place with a stronger current is dangerous. But after that initial snowfall and then it snows later, then that water doesn't form, [so] now [we] would know it is safe, pretty well safe to go anywhere. And [we] use that little bit of water on the ice, under the snow, after the first snowfall, as an indicator of if it can be dangerous in most places." (Zacharias Aqiaruq)

"If at first [I] get to new ice, if [I'm] traveling where people have been traveling on, then [I] know it's safe. But then if [I] get to newer ice, [I] don't know off hand just by looking at it if it's safe or not, so [I] would take a harpoon shaft and check for thickness. If [I] find that it's safe to be traveling, [I] keep what [I] saw in mind as [I'm] traveling. Anytime [I] can see the same kind of ice it's safe to travel on. If the ice blackens, then [I] would know that it's thinner, so therefore [I] would check it again to see if it's safe, again using the harpoon shaft. And then, and then [I] would find that even when it's thinner, you can't drive on it." (Augustine Taqqaugak)

"One thing, for example this piece of ice that had broken off, once it gets somewhere down here, hunters that go out walrus hunting would eventually run into that. And if they get stranded they can use it for source of water as well. And this one they call *uukkarut*... And because this has snow, the one that was broken off here, at one time [we] were hunting on the moving ice, and then [we] spent some time overnight on that ice and then [we] went back because [we] couldn't get onto landfast ice. So, [we] went right back to that same place knowing that that's where it won't break up. It has water so it's a place for safety as well." (Daniel Qattalik)

### Sea ice hunting

Walrus and ringed seals are the marine staples for the community of Igloodik, with bearded seals also being hunted when feasible. Harp seal, harbour seal, narwhal, beluga, and bowhead were also mentioned as being occasionally hunted. Polar bears are sought after, but because of the imposed quota system they are not hunted often. The sea ice is also used to access Baffin Island or Melville Peninsula hunting grounds to reach caribou, to fish for Arctic char or lake trout, to trap foxes, or to hunt the occasional wolf or wolverine.

"The reason why it was so enjoyable when it had first, when the cracks had first opened and the ice became ideal for seals to have established their breathing holes, [is that] it's thick enough that they wouldn't be able to make other breathing holes easily. And that's why [I] find it so enjoyable, in that [we] are pretty much guaranteed seal when [we are] hunting through those." (David Aqiaruq)

### *Seals*

- ❖ When the ice is first forming seals can be hunted at *nigajutait*, in bays, and at points of land.
- ❖ As the ice thickens, seals concentrate more at polynyas, and then at *naggutiit* (they have an easier time making breathing holes here).
- ❖ Once the *tuvaq* is well formed and snow has accumulated on the ice, hunters tend to seek seals at the floe edge (younger seals usually move towards the floe edge) → breathing holes are easier to identify in *uiguaq*.
- ❖ Once the darkness of the winter months comes seals are hunted more at *naggutiit* → it is harder to hunt at *qugluknniit* because seals can breathe in the air pockets underneath without being seen.
- ❖ In the spring, baby seals basking on the ice are the primary target.

- ❖ Bearded seals are known to travel towards moving ice as the ice thickens because they prefer open water, then they usually move back in towards the *uiguaq* and establish breathing holes there (when the sun comes back around mid- to late-January).
- ❖ Bearded seals are hunted seasonally, mainly in the spring and summer, only a handful are secured in the winter through breathing holes.

### **Walrus**

- ❖ Moving ice is the only place to find walrus in the winter, so they are mainly hunted on moving ice.
- ❖ Because the moving ice is a very dangerous and dynamic walrus are hunted after the sun rises again around the third week of January.
- ❖ The ideal hunting circumstance would be when the winds are from the east, southeast, or south, and the tide is coming in – meaning that the ice will stay close to land and solid ice.
- ❖ Hunters are warned never to hunt walrus on moving ice when there is a northwesterly wind, because the ice can move out very easily, making it too dangerous.

### **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.

### **Seals**

- ❖ Ringed seals especially, use the ice more than any other marine mammal.
- ❖ Younger seals seem to prefer newer ice to older ice, and so they follow the ice as it progresses in freezing – but once the floe edge is established, they seem to move back into the landfast ice.
- ❖ The older seals remain more stationary, and thus seek out particular polynyas as the ice extends, instead of following the progression to newer ice.
- ❖ Seals create birth layers under the snow on top of the ice, usually where snow has accumulated on or near rough ice (e.g. pressure ridges) → they maintain nearby breathing holes, which become interconnected into a large network by the end of the winter.
- ❖ Bearded seals tend to remain near the floe edge, or around moving ice, they do not stick around landfast ice once it has solidified.
- ❖ Bearded seals can be found almost anywhere in the spring and summer, but as the ice starts forming they stay near polynyas and then move out towards moving ice as the *tuvoaq* thickens.
- ❖ Sometimes young bearded seals are found around tidal cracks or stranded at their feeding places.
- ❖ Some do make breathing holes along the floe edge in *uiguaq*, but not commonly within landfast ice.
- ❖ Bearded seals seem to vanish for some time during the winter, but they return to the floe edge when the sun is returning in mid- to late-January – they even have their young on moving ice around March or April.
- ❖ As the ice starts breaking up they move towards the landfast ice, and can use the ringed seal breathing holes as they become enlarged.

### **Walrus**

- ❖ Walrus habitat is predominantly on moving ice, with plenty of access to open water.
- ❖ They are hauled up on the ice all through the winter, although they will also haul out on land if there is not enough sea ice (e.g. in the summer) → *ugliit* is used to refer to the places that walrus haul out, but specific areas will have particular names (e.g. *Uglikuluk*, *Uglirlarjuq*, *Ugliarjuq*).
- ❖ As the ice begins to form in the fall, they travel towards the edge and they move farther and farther as it thickens.
- ❖ On a few occasions the walrus have not moved out soon enough, and have been stranded on solid ice or at a polynya – in such cases, they actually walk on their flippers back to open water, or in a very rare case they would remain throughout the winter.
- ❖ Walrus tend to travel upwind to ensure that they always travel towards open water (e.g. if the NW wind is blowing the ice moves out and the walrus will move closer to the floe edge). Vice versa, if

the SE wind is blowing the ice will be pushed in and walrus will move away from the floe edge to access open water.

- ❖ The walrus seem to anticipate the wind direction and duration with their movements – if walrus begin to flee sideways then the hunter knows the ice is not going to stay for long.
- ❖ As the ice begins to break up in the spring, the walrus move out with the ice, so they are further from town in the spring and summer.
- ❖ Because walrus migrate with the cycles of freezing and thawing, they are very predictable.

### Observations of change

Community members in Igloolik have observed several kinds of 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 very unique ice conditions in the spring and fall of 2004 were frequently highlighted → melt stages in the spring were unique because of a lack of tidal cracks to ensure water drainage, and overcast, snowy, windy conditions in the fall lead to thinner, rougher ice conditions in the fall. In the last 5 – 10 years a progression towards later freeze-up, earlier break-up, and shifting wind and weather patterns have also been highlighted.
- ❖ Typically changes are compared to sea ice conditions and processes that occurred prior to 1965, although the early 1980s are also used in reference to expected wind and weather conditions. For the most part, elders used their childhood as a reference for expected sea ice conditions and weather patterns (i.e. 1930s – 1950s, estimated based on their birth dates).

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

Indicator	Change	# of Observations
Floe edge	a) Closer to town	a) 2
Weather	a) More unpredictable	a) 3
	b) More overcast in the fall	b) 4
	c) Warmer	c) 6
Freeze-up	a) Takes longer/freezes slower	a) 4
	b) Occurring later	b) 8
	c) Rougher	c) 6
	d) Different process	d) 4
Break-up	a) Melts/breaks up earlier	a) 2
	b) Melt stages happen faster	b) 3
Ice thickness	a) thinner	a) 2

### *Floe edge*

- ❖ The position of the floe edge around Igloolik is highly dependent on the piling of multi-year ice on three key reefs in *Ikiq*, between Melville Peninsula and Baffin Island → the position of the floe edge was generally estimated to be moving closer to town, but it is frequently mentioned in relation to the multi-year ice being grounded on the reefs.
- ❖ The floe edge is variable, changing from year to year, but multi-year ice does not seem to be piling up as much on the reefs as in the past, which leads to a floe edge that is closer to town.
- ❖ Furthermore, even when the reefs such as *Ivunirarjuq*, are stopping the ice and creating a floe edge the ice will still break off → so floe edge stability is more unpredictable.

**“When [the floe edge] is smooth all the way, that could be one of the factors in that the ice breaks easily, maybe the current is stronger in recent times. But it just breaks off. And then, *Ivunirarjuq*, this reef is *kikiak*, in that it nails the ice, *kikiak* meaning “a nail”. It stops this ice, so therefore once it freezes it stays there, because again this [reef] prevents it from breaking off. It might break off something like this every now and then, but it prevents it from breaking off all together. But in the last few years [I] notice that even though this [reef piling]**

**there, it breaks off here. And [I] don't really quite understand why it does that. It's not doing what it used to anymore." (Enuki Kunuk)**

### **Weather**

- ❖ Winters are generally becoming warmer, although some mentioned that the cold feels the same.
- ❖ Temperature change is gauged on freeze-up processes, as well as the physical signs of very cold weather (e.g. not as much ice fog forming).
- ❖ A possible explanation for the warmer than expected temperatures in the fall and early winter may be the increased overcast conditions during freeze-up, which leads to warmer weather, more snowfall, and delayed freeze-up processes.
- ❖ With less clear days, it is harder to determine the timing of freeze-up.
- ❖ Now the weather can also change very quickly, it may look clear and then it will suddenly change → previously employed indicators of weather pattern shifts are no longer applicable.

**"[I]t's very hard to predict the weather now. One good example is when [I] was a youth it was clear blue when the clouds were not, when it was not overcast. Even today, if it's not overcast there's always that haze that's present, it's not blue as it used to be...When [I] was a youth [I] used to notice that the weather change would come from the west, and it would travel from the west. If for example [I] saw clouds in the west, then they would come in. But in today's time the clouds come from everywhere, which is quite different than when [I] was a youth. Winds, weather, they come from anywhere now, but normally they were coming from the west in the past." (Louis Uttak)**

- ❖ The NW wind is consistently indicated as the prevailing wind of the past, with the SE wind being the main opposing wind → now they are relatively even in their prevalence, or SE winds may even be more common.
- ❖ Wind shifts between NW and SE are also now occurring via the West, which was uncommon in the past → the prevailing wind is nearly unidentifiable, and windy conditions are more prevalent.

### **Timing of freeze-up**

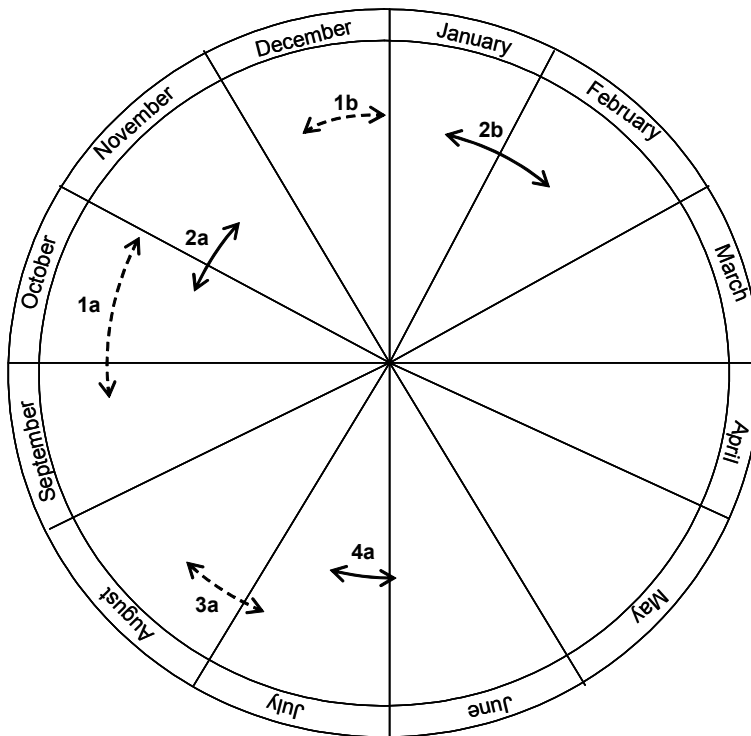
The changes in freeze-up timing are summarized in the **diagram on the next page**.

- ❖ Freeze-up is generally occurring later, but only a few people discussed this timing specifically.
- ❖ An important gauge of freeze-up timing is when it is possible to cross *Ikiq* to reach Baffin Island.
- ❖ The ice used to form all at the same rate, but it is now freezing section by section → this is influenced by changes in weather conditions where more overcast conditions in the fall render freeze-up slower and later.
- ❖ More southeasterly winds in the fall have meant that the ice is blown towards the shore, or floe edge → ice is piling up and freezing rougher than with the previously common northwesterly winds, and not moving out afterwards.
- ❖ This means that the ice is more commonly freezing upwind (*aggurtipaliajuq*), creating a different kind of ice, with less sturdy properties than *siku* and more like *qinu* - specifically between the rough ice areas.
- ❖ In addition, freezing used to begin from the land, whereas today even when the ground is frozen and snow has accumulated, the tidal zone is not always frozen → this *qaingu*, was used for traveling, but this is no longer possible as it is softer and thus harder to travel on.
- ❖ Some areas that used to freeze later in the fall are staying open all winter, forming new polynyas.

**"What [I] have noticed is more in the last five to eight years, where when it should be freezing up [I] have noticed that it becomes overcast, snow starts falling for a long period of time. So therefore, that affects freeze-up when it does that. In that, whenever it's overcast the temperature rises a bit, freeze-up doesn't occur as quickly, or it doesn't even occur at all at some times, when you**

have clouds and the wind working together, and it doesn't freeze up at all. It might pile up at places and then it disperses. So therefore, what [I] have noticed in the last 5-8 years is what has changed over the years. As opposed to other years where freeze-up was quite constant, it was the same year after year pretty much. But in the last few years is when it has become overcast when freeze-up should have taken place. So therefore, it clears up later, so freeze-up occurs a little later, in the last few years." (Maurice Arnatsiaq)

Summary of the changes in freeze-up and break-up timing observed in Igloodik.



----- Previous freeze-up

1a – used to start freezing by late September, early October

1b – Fury and Hecla Strait used to freeze over by Christmas

———— Recent freeze-up

2a – this year it froze a lot later than normal (early November)

2b – Fury and Hecla Strait not totally freezing until the end of January or early February

----- Previous break-up

3a – ice normally breaks off around August

———— Recent break-up

4a – this spring the ice broke off in early July

### Timing of break-up

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

- ❖ Break-up was discussed as occurring at a different time every year, although it was considered “normal” to break off around August whereas in the spring of 2004 the ice broke up in early July.
- ❖ Thinner ice tends to break up earlier, and break-up is occurring quicker despite the weather feeling just as cold as previously.
- ❖ Conditions during melt stages were described as being different (e.g. after meltwater has drained off the ice initially it is wearing out before the water becomes deep again).
- ❖ Some of the different melt stages were linked to a unique spring where tidal cracks that normally form in the spring were not present → this means the ice just melted away, instead of breaking up.

**“But this year [2004] for some odd reason, [the cracks never formed to create open leads]. And then you find that all of a sudden the ice wears out faster...[My]**

theory is that because the cracks are not there, the drainage doesn't take place, so therefore once the snow melted the water stayed on [the ice]. And again ice just wore out, it just melted, it didn't break up and go like in normal years. It just melted. And that could be a factor because of that film of water that's on the ice. Normally the stage would be first there's water, and then it drains along the tidal cracks or breathing holes, and then it gets deep. We didn't get to the deep stage this year. And because of the absence of these two cracks, it didn't get to the stage where it becomes deep and then there's ice and then there's deep. In that [I] remember this spring as being able to go back and forth and it was smooth all the way. And again, this was quite different from other years... This has occurred in the past, and the same thing happened when it did occur."  
 (Daniel Qattalik)

### *Ice thickness*

- ❖ General indications of ice thinning were mentioned in interviews, although most frequently in relation to dangerous ice conditions → the danger comes from snow accumulation on the ice, causing it to wear away from underneath.
- ❖ Seal breathing holes and open cracks are used to gauge ice thickness.
- ❖ The ice was estimated at about 3 feet of thickness currently, whereas it used to reach almost 6 feet.

### *Wildlife*

- ❖ Polar bears have been sighted more frequently, and seem to be more numerous than in the past → some possible reasons for these sightings include: a) polar bears are seen more often on landfast ice; b) bears are moving northwards because the ice is not forming properly in the south; c) the bears are more frequently going after cached meat (which they never used to do); or, d) polar bears can no longer be hunted freely due to the quota system, and thus may be becoming more numerous.
- ❖ Secondly, seals used to be more numerous in *Ikiq* and also had more fat on them → this change in numbers could be linked to changing ice conditions, but may also be caused by: i) increased numbers of killer whales in *Ikiq*; ii) earlier and more frequent hunting in Hooper Inlet; and, iii) seals moving to different areas to get away from all the snowmobile traffic.
- ❖ Finally, walrus are no longer found to be congregating in certain channels during freeze-up → they are not migrating to the floe edge through the same areas, and some previously common haul-out areas are also not being used. Walrus, as with other marine wildlife, may be avoiding high motor traffic areas and not necessarily changing their movements based on sea ice conditions.

### *Moving ice*

- ❖ Multi-year ice is now only concentrated in certain areas, they are also generally further from town and thus not as influential on summer temperatures (e.g. the yellowish-brownish 'dirty' multi-year ice - that comes from the south - has been later in moving towards town in the spring).
- ❖ The 'clean' multi-year ice - coming from the north - has been more common in recent years, which is potentially linked to the shifts in wind directions (i.e. not blown in from the NW as much).
- ❖ The moving ice is no longer as solid, there are more cracks present, and the ice pans are smaller/thinner.

\*\*\*

"And again, the knowledge that's acquired about moving ice, [I] feel that our youth need to know it. [My] little one, even though they are never going to be hunting there, they will never have the need to go hunting there, probably, seeing as how they don't use fat anymore, or dogs. They probably won't have the need to go down, but having the knowledge will help them, if at some point they have to use the moving ice." (David Irngaut)



Gita in Igloolik in Feb, 2004



View from Agiuppiniq in June, 2005



Alongside Aukarnarjuq in June, 2005



Theo Ikummaq testing thin ice , Nov, 2004

**THANK YOU to all the people who participated in interviews between October, 2004 and June, 2005 (in alphabetical order left to right, based on last name):**

Ammaq, Samuelie  
 Arnatsiaq, Maurice  
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 Ivalu, Arsene  
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 Qrunnut, Anthony  
 Taqqaugak, Augustine

Angutikjuaq, David  
 Aqiaruq, David  
 Ipkanak, Eugene  
 Kunuk, Enuki  
 Qattalik, Daniel  
 Qulaut, George Quviq  
 Ulayuruluk, Abraham

Arnatsiaq, John  
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 Irngaut, David  
 Palluq, Jaipiti  
 Qaunaq, Levi  
 Paniaq, Herve  
 Uttak, Louis

*Interviews were translated by: Theo Ikummaq*

***Please note that all original audio and video tapes, transcripts, and full glossary have been deposited at the Nunavut Research Institute (in the government guilding). 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 Ataguttaaluk High School.***

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

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