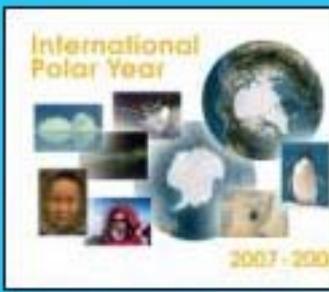


IPY 2007–2008 and Indigenous People

Local Knowledge Contributes to the Study of Arctic Change



Igor Krupnik,
Smithsonian Institution
NOAA, April 15, 2009



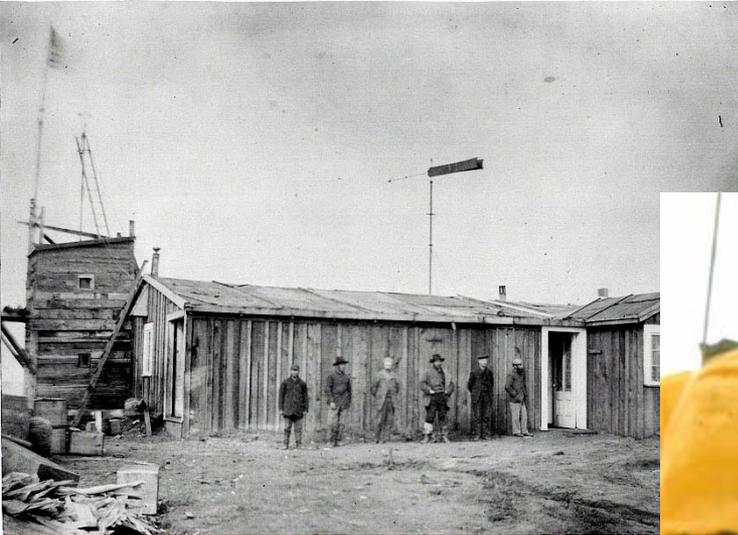
For decades polar science was seen as the domain of tough white men standing on top of polar ice sheets or the deck of an icebreaker.

Photo by Fritz Goro, 1956



Researchers in the polar regions now interact with a new generation of educated and politically astute local residents interested in science and technology.

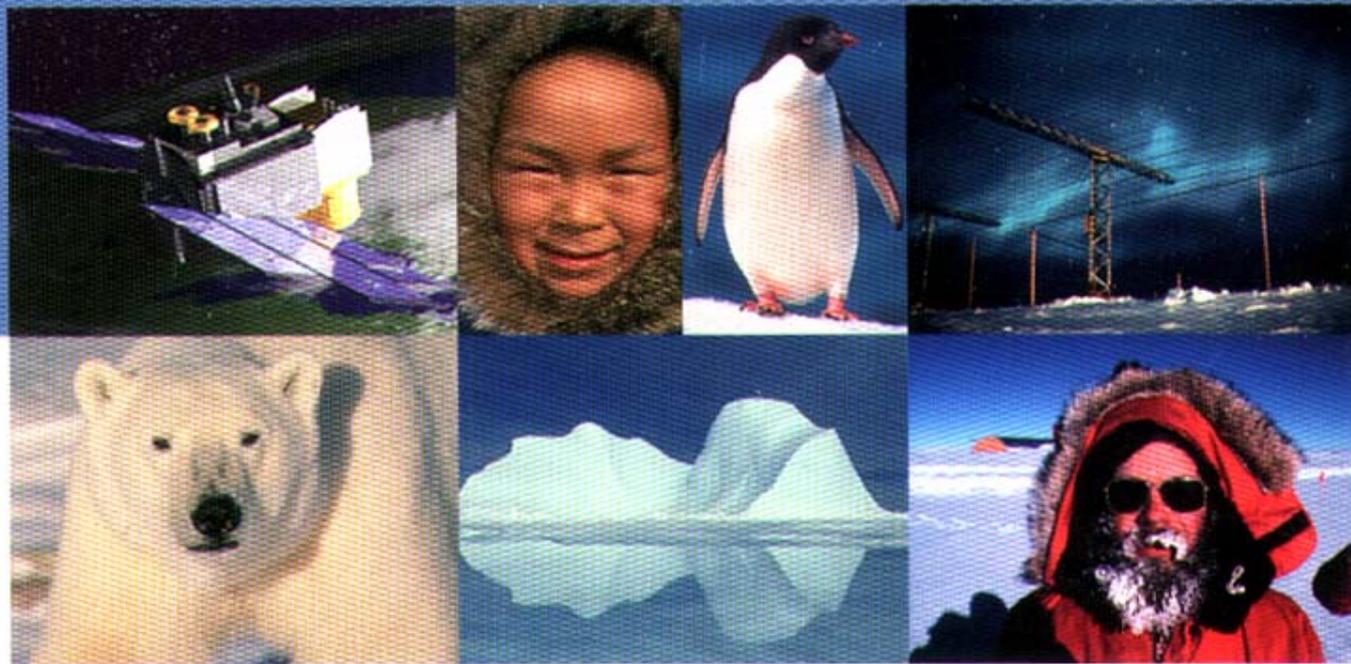
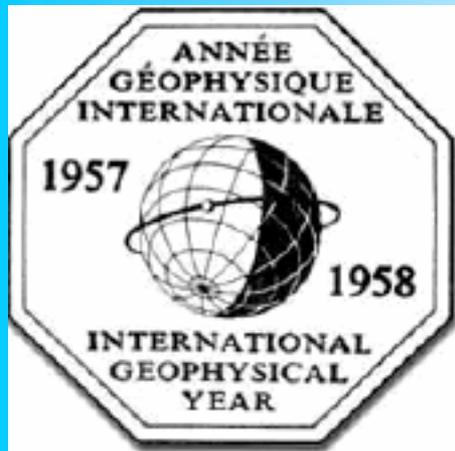
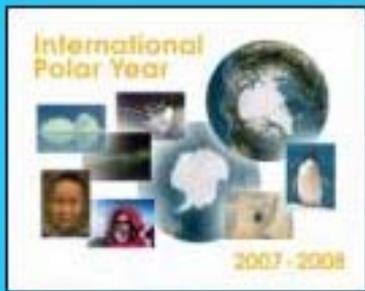
Photographer, Claudio Aporta



Top – First US IPY station at Point Barrow, Alaska, 1881.
Bottom – Adm. Byrd and members of the US 'Deep-Freeze' Mission-I.
Photo by Fritz Goro, 1956

This transition has eventually transformed the face of polar science, long seen as an exclusively male and primarily geophysical domain

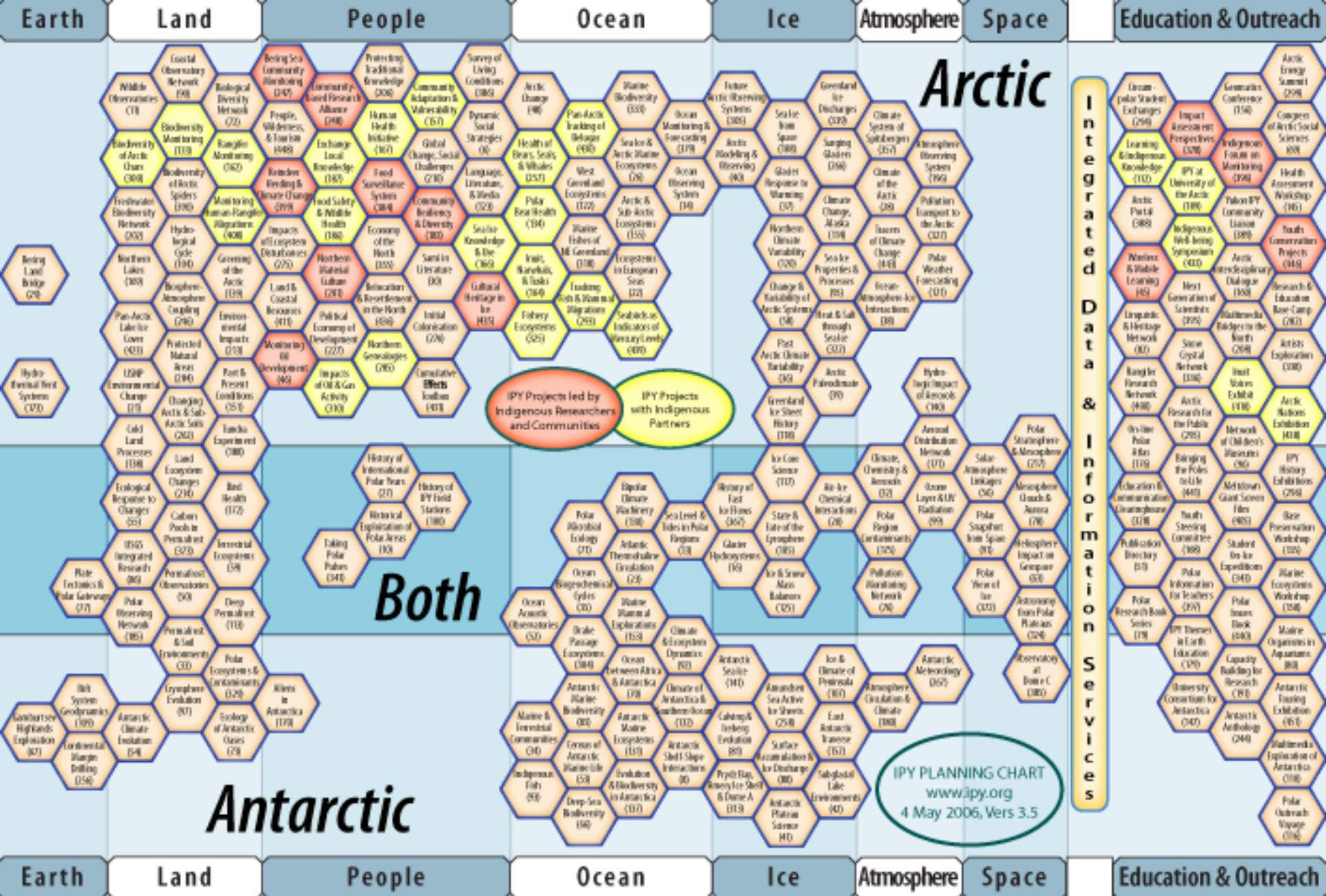
A Framework for the International Polar Year 2007-2008



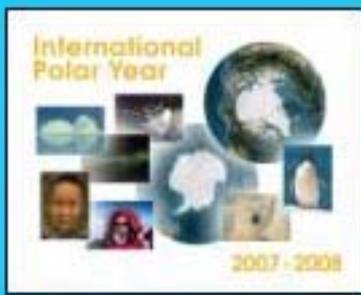
Produced by the ICSU IPY 2007-2008 Planning Group



New IPY 2007–2008 cannot be more different from its predecessors, as seen from the combination of symbolic images on its logo

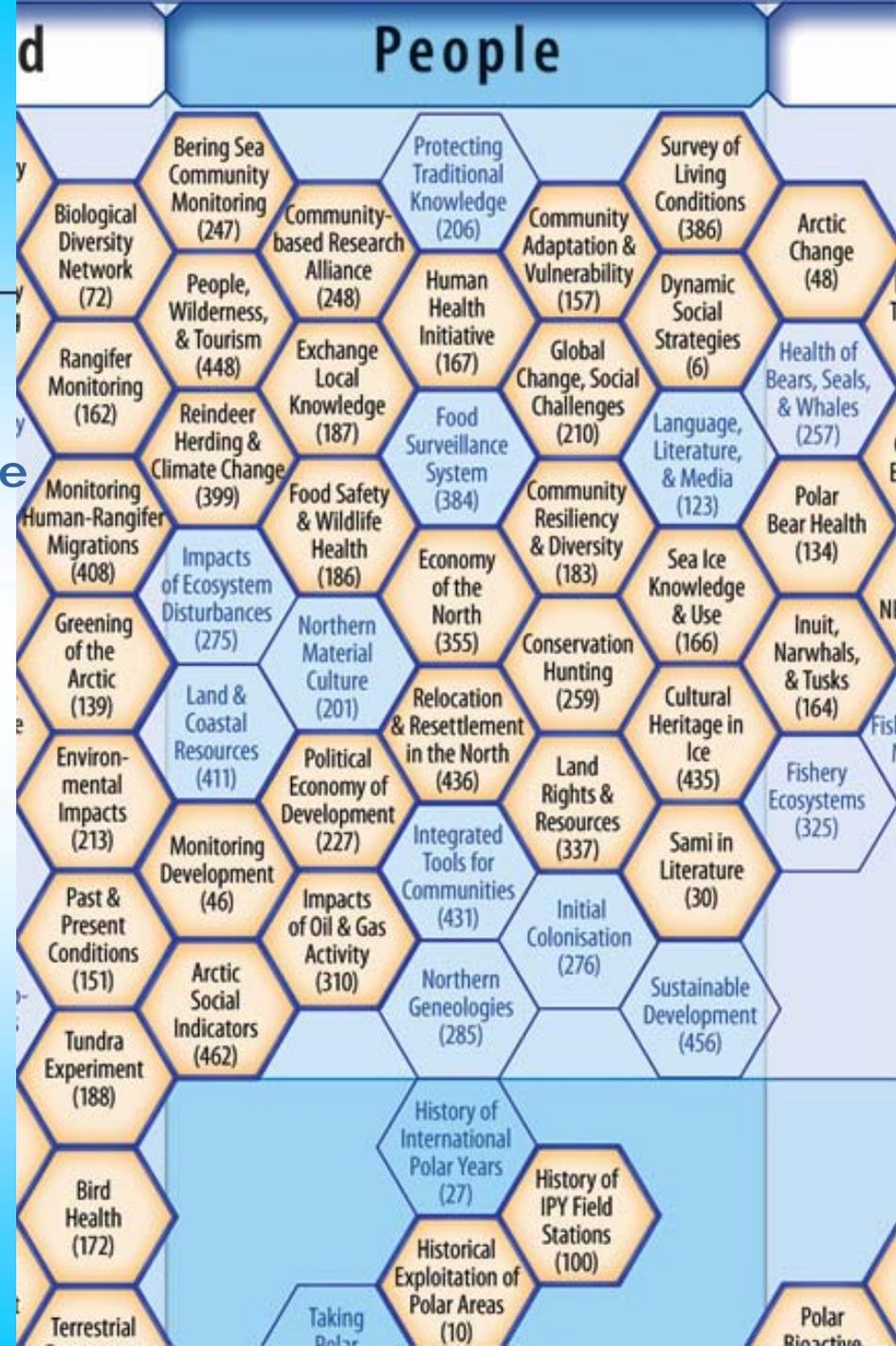


IPY 'honey-comb' chart showing projects with significant contribution by polar indigenous people (prepared by David Carlson)



IPY Projects Studying Indigenous Ecological Knowledge

- #151 Past and Present Conditions (PPS Arctic)
- #162 Circum-Arctic Rangifer Monitoring and Assessment (CARMA)
- #164 Inuit, Narwhals, and Tusks
- #166 Sea Ice Knowledge and Use (SIKU)
- #187 Exchange for Local Observations and Knowledge (ELOKA)
- #247 Bering Sea Community-Based Monitoring (BSSN)
- #399 Reindeer Herders Vulnerability Study (EALAT)
- #408 Monitoring Human-Rangifer Link (NOMAD)



Conrad Oozeva, Chester Noongwook, George Noongwook, Christina Aloua, and Igor Krupnik

Watching Ice and Weather Our Way



Sikumengllu Eslamengllu Esghapalleghput
Akalki, Tapghaghmi, Mangtaaquli, Sunqaanga, Igor Krupnik



THUNDER ON THE TUNDRA

Inuit Qaujijmajuqangit of the Bathurst Caribou



Natasha Thorpe, Naikak Hakongak, Sandra Eyegetok, a

When the Weather is Uggianaqtuq

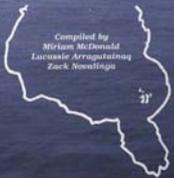
Inuit observations of environmental change



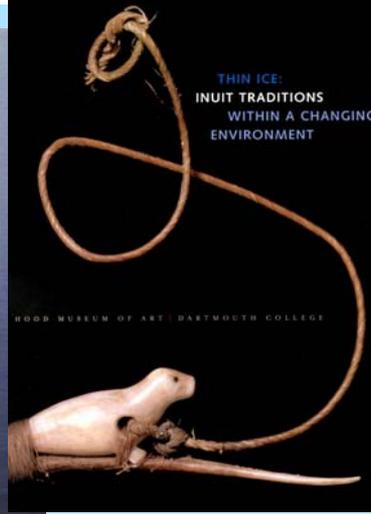
CIRCS NSIDC
© Shari Fox, 2003
Produced at the University of Colorado, Lab

Traditional Ecological Knowledge
of Inuit and Cree
in the Hudson Bay Bioregion

Voices from the Bay



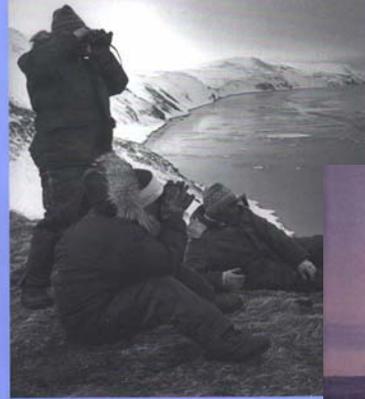
Canadian Arctic Resources Committee
Environmental Committee of Municipality of Nanikluang



THIN ICE:
INUIT TRADITIONS
WITHIN A CHANGING
ENVIRONMENT

HOOD MUSEUM OF ART, DARTMOUTH COLLEGE

The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change



Edited by Igor Krupnik and Dyanna Jolly

Kinikmi Sigum Qanuq Ilitaavut



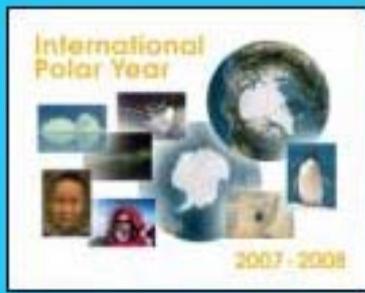
Wales Inupiaq Sea-Ice Dictionary

Snowscapes, Dreamscapes

Snowchange Book on
Community Voices of Change



Over the past decade, the study of indigenous knowledge of climate change has emerged as a booming field...



Why indigenous knowledge?

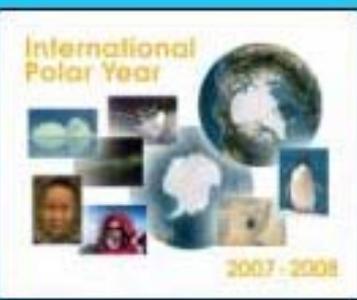
- Last 'untapped' resource of detailed information
- Primarily oral records; hardly anything exists in writing
- Successful use of other similar types of 'local knowledge' (Icelandic Sagas, Skippers' pilot books)
- Generations of sea ice observations at hundreds of strategically positioned polar sites
- Highly valuable scale and resolution



How did we learn it?

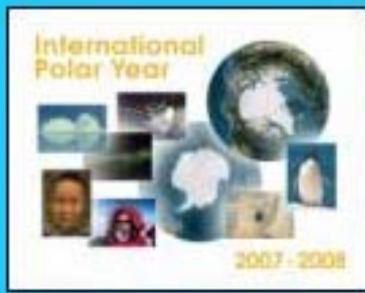
- Interviews with elders, tape- and video-recording
- Joint sessions and science symposia
- Written daily records by local observers from northern communities
- Community meetings
- Locally-based projects initiated by communities





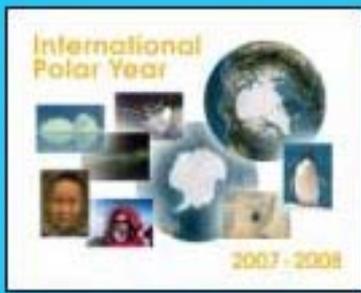
Major blocks of indigenous knowledge:

- Observation
- Detailed Terminology (Indigenous nomenclatures of ice, snow, weather, winds, etc.)
- Interpretation
- Historical Record
- Risk Assessment



Indigenous Observations:

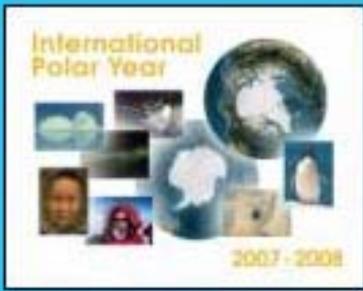
- Arctic residents are very astute observers
- Northern communities are normally on a 24/7 weather watch
- Any northern village can beat a good-size university
- Hunters go on ice year after year after year...



Indigenous people are inquisitive monitors:

- All unusual things or signals are commonly checked with others
- Hunters track conditions along many parameters
- People carefully examine animals, birds, and fishes they harvest
- They look for several indicators of health and body status

Photographer, G. Carleton Ray



SEA ICE

Dictionary

How Many Ways Can You Say Ice?

The languages of Arctic peoples reflect the importance of sea ice to them.

Yupik-speaking Eskimos, for example, have some 100 terms for sea ice and ice formations. New terms are added to describe new ice conditions as they develop.

How many words for snow and ice can you think of?

Smithsonian scientists and many of their colleagues are carefully documenting Arctic people's knowledge of sea ice conditions and how they're changing across the polar region.



Photo: Igor Krupnik © Smithsonian Institution
Vadin Yanan (right) consults with community elder Chester Noongwook (left) for illustrating the Yupik "Sea Ice Dictionary." More than 90 terms were compiled by another elder, Conrad Oozeva, and then illustrated by Yanan following Noongwook's explanations. Selected drawings are below.



The site of the "Sea Ice Dictionary" project, the Yupik community of Gambrell, St. Lawrence Island, Alaska.



Siku
The main term for ice. Also, the ice-covered Bering Sea.



Siinguraq
Stream of dense ice carried by north or south current or pushed by low tide. Dangerous to walk on.



Ughuun
Melting ice in spring that has started to develop holes.



Analghu
Floating pressure ice ridge. Ice piled higher than neighboring ones. (Pressure ridges form where two pieces of sea ice push together.)



Sigiin
New ice formed within cracks in an ice floe. Good to walk on.



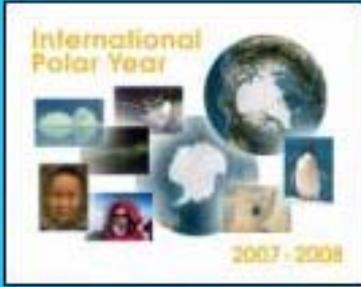
Qivalluk
Large pressure ridge. Must be climbed up and down when going through it. Hard to walk on.

Indigenous Terminologies

How Many Words for Sea Ice?

Most local indigenous languages and dialects have 70 to 120 different terms for various types of sea ice and ice-related phenomena

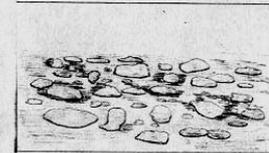
A panel from the Smithsonian exhibit, *Arctic: A Friend Acting Strangely* (2006), illustrates Yupik Eskimo knowledge of ice on St. Lawrence Island, Alaska.



Sikum Un'Gum Aatqusluga

1. Allungelquq

Sikuyuwhaaghem sikungi, angqaperugmelnguut aangenghinguut. Uzimun iiwling uvitangi taakwegkut salin umughrellghinguut meraaghinaat kiyang qenuluni anuqem ulimakayugukangi tamaakut salin aqlaghpagilluku.



Small cakes of ice formed by ocean waves; safe to walk on but dangerous (CO). The first of any developing ice that is formed when freeze-up starts. It is made of small, oval cakes of ice, with edges that are not yet thickened enough and may still consist of water. It is usually formed when the young ice is blown together, but the wind is low and the temperature is not too cold (G,S).

2. Alqimiin

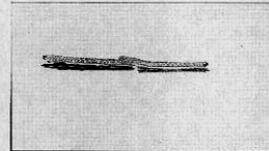
Anigut sikungi ifkaghyugalghiit kiyang esnemi anigut piizngalghiit, tuuskumeng ifkaghyugalghiit. Meghmun ifkaannalghiit.



Overhanging snow on the edge of ice; dangerous spot (CO). Ice formed from pressured snow, usually by snow banks, cliffs, or at the ice edge. It is thin or hollow with no bottom, and it is usually sticking out, easy to fall off. It is very dangerous to walk on. If you step on it, you may fall through into the water (G,S).

3. Amaghllaq

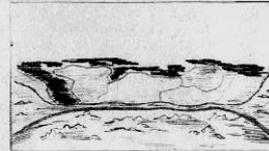
Siku vuuluni qaspighutkat amaghllleghuut. Kiyang saallget amaghtekayugii.



Ice over the ice in long cracks; safe to walk on but dangerous (CO). Ice built in long cracks in older, more solid ice (G). Usually formed from young, thin ice when the current pushes it from any direction to force the ice to ride over itself making a double layer (S).

4. Amiin

Eltughneghet qutmun taakwnangi sikut sikullghet amiitnguut.



Ice that stretches from the edge of *kulusiq* (small iceberg – see below) that is stuck to the bottom of the ocean (G) or from a floating iceberg (S), or from a small island (S,G). The ice formed this way may become quite thick.

SEA ICE TERMS

29

Conrad Oozeva, Chester Noongwook, George Noongwook, Christina Alowa, and Igor Krupnik

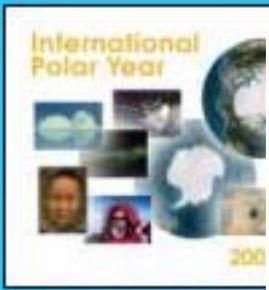
Watching Ice and Weather Our Way



Sikumengllu Eslamengllu Esghapalleghput

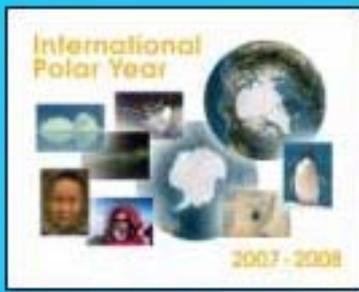
Akulki, Tapgbagbmii, Mangtaaqui, Sunqaanga, Igor Krupnik

First page of the bilingual Yupik-English dictionary of 99 types of sea ice identified by the hunters on St. Lawrence Island, Alaska (2004). The islanders have over 100 terms for various types of sea ice and ice-related phenomena in their native Yupik language.



New ice is being formed from the chunks of floating ice and newly formed slush ice. There are terms for every single type of ice in this photo and for many more in the St. Lawrence Island Yupik language

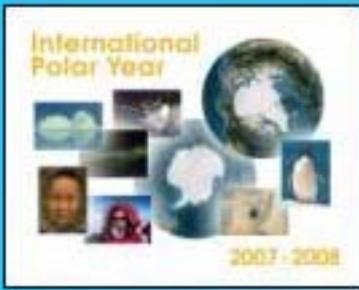
Photograph by Chester Noongwook, St. Lawrence Island, 2000



Local observations:

“Normally we used to have what we call *kulusik*, drifting ice chunks that were in the forefront of the main ice pack. Every year, we saw *kulusiit* coming and being washed ashore by the end of October. When the lake-freeze is over and that’s when the *kulusiit* will come. The main ice pack, thick ice, *sikupik* used to come in right, after the *kulusiit* arrived. Certainly, by mid-November we would see the main ice pack here. Today, we do not see *kulusik* ice anymore. Now, all we see, it begins to *qenu*, the slash ice raising from the icicles at sea bed to the top of the sea. Today we do not see the main ice pack arriving until last part of December or even in January. But when it arrives, we noticed that it is not the same ice pack, as before. It is thinner; you can clearly see that it is thin, because it is darker and you can see the bottom, the water right through that ice. We know that this must be the slush ice that has formed somewhere in a bay or a sound. When it gets here, we still call it “ice,” though to us it is not *sikupik* to us

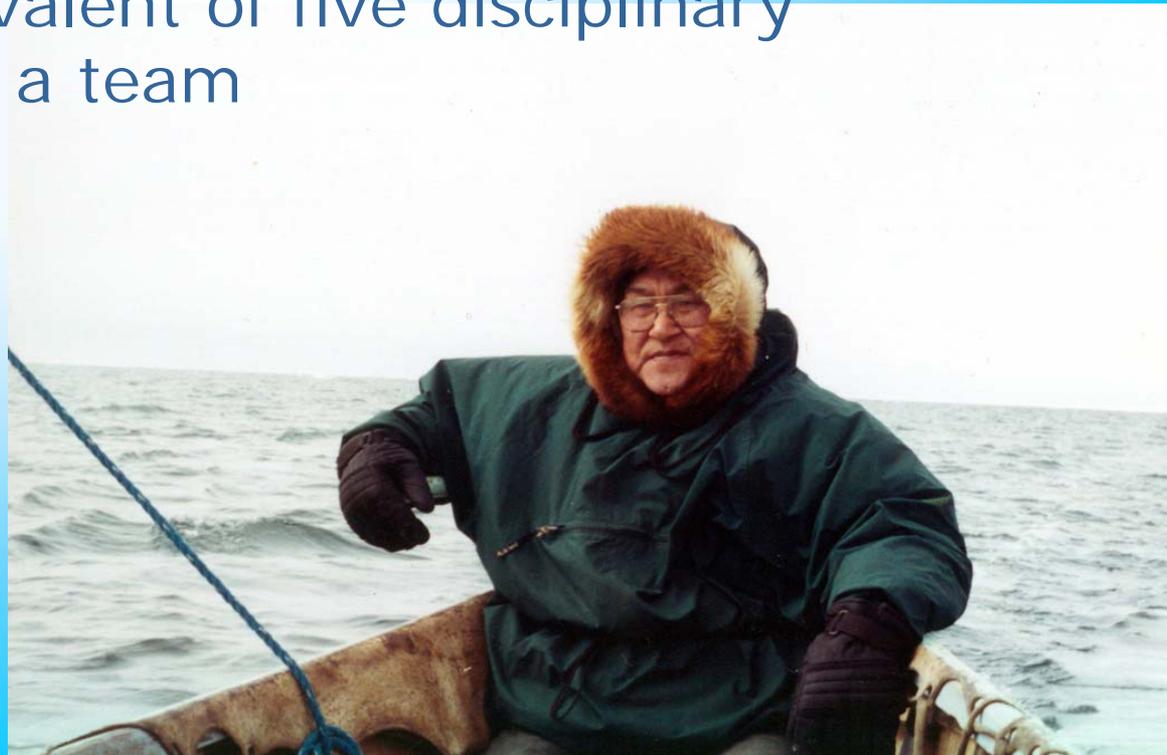
Branson Tungyan, Gambell, Alaska, 2003

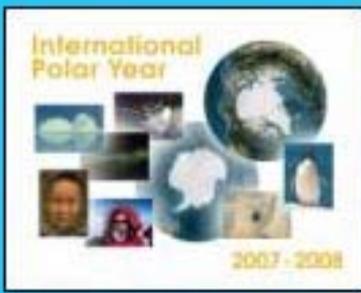


Indigenous integration

Each experienced hunter combines decade-long knowledge of sea ice, weather, marine mammal behavior, subsistence hunting, ice safety and risks. This is an equivalent of five disciplinary scientists working as a team

Leonard Apangalook, Sr., a boat captain and community leader from the Yupik village of Gambell, St. Lawrence Island, Alaska, a proud participant of IPY 2007–2008





SIKU – “**S**ea **I**ce **K**nowledge and **U**se” (IPY #166)

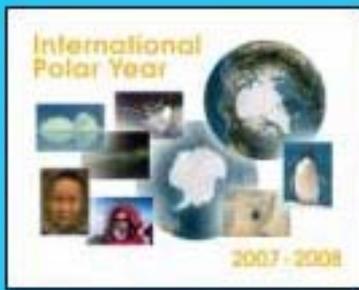
The acronym for the project title, *SIKU*, is also the most general word for sea ice in all Inuit (Eskimo) languages from Bering Strait to Greenland.



What did we learn?

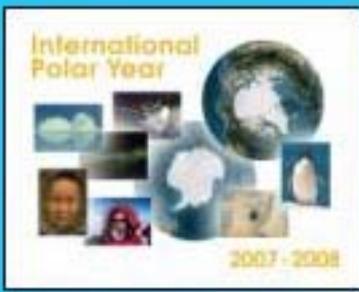
What we already knew from other sources:

- Indigenous people document *consistent pattern* of ice and weather change in the northern Bering Sea
- The Bering Sea regime shift (Grebmeier et al. 2006) is real
- The Bering Sea has lost its multi-year ice
- Most of the ice cover is made of the locally-formed first-year ice
- Timing and patterns of fall ice formation (freeze-up) and spring ice disintegration have changed dramatically
- The ice is thinning
- Marine mammal distribution and behavior are changing, due to the sea ice reduction and change



What we did NOT know from other sources:

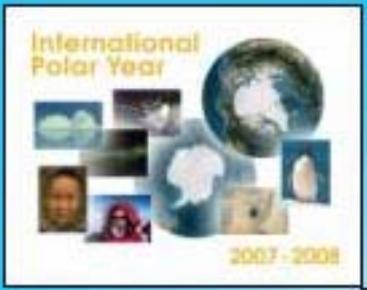
- There is not enough 'cold' in the system to build solid ice in wintertime
- Former distribution of major ice habitats has been radically transformed
- Mismatches in the system have increased
- Local-scale ice patterns and phenomena are not there anymore
- It is more risky and dangerous to use today's ice
- Many common ice types and ice habitats are 'endangered'
- Several break-up episodes, with little or no ice, may occur each winter
- 'Thin ice' is a new phenomena; it can be easily broken by winds, storms, waves, currents
- Marine mammals are avoiding many forms of unstable first-year ice



Ecosystem 'mismatches'

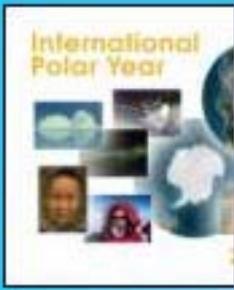


Apangalook: "A few years back when the polar pack ice did not reach our area anymore, we sighted bowhead whales in our area sporadically in the middle of winter. Back when our seasons were normal, we saw whales in the fall going south for the winter and didn't see any in mid-winter, until they start coming back in mid-March-April and May. Now, with more whales in our area in mid-winter we know that they are (mostly) wintering in our area and (are) not migrating further south. Without polar pack ice we had suspected that some of the whales stopped that migration north of our island and are not going further south anymore. ...We know today that their wintering area is further north." (March 6, 2007).)



Traditional way of winter hunting on solid sea ice illustrated by this historical photograph (1928) has all but disappeared

Photographer, Aleksandr Forshtein. MAE-Kunstkamera, St. Petersburg, Russia

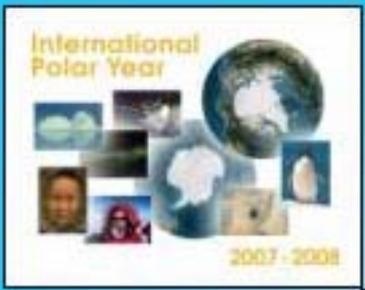


People of St. Lawrence Island now rely upon boat hunting for seals and walrus in the dense floating ice, which is a typical activity in Gambell in winter time. 100 years ago, boat hunting did not start until late March.

Photographer, G. Carleton Ray

Conclusions:

- *Northern residents document consistent pattern of ice and weather regime change in many parts of the Arctic*
- *Polar ecosystem 'shift' (Grebmeier et al. 2006) is real*
- *Indigenous concerns about new risks are justified*
- *Local observers should be an active part of any systematic 'Arctic Observing Network' built for the IPY years and beyond*



Thank you!