

What Are We Losing in the Ice-Diminishing Arctic?

A Humanist's perspective



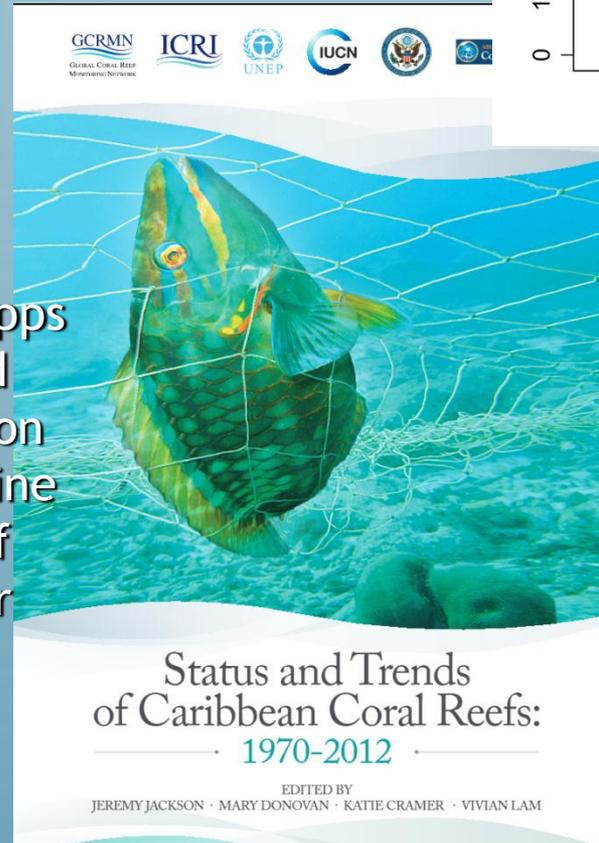
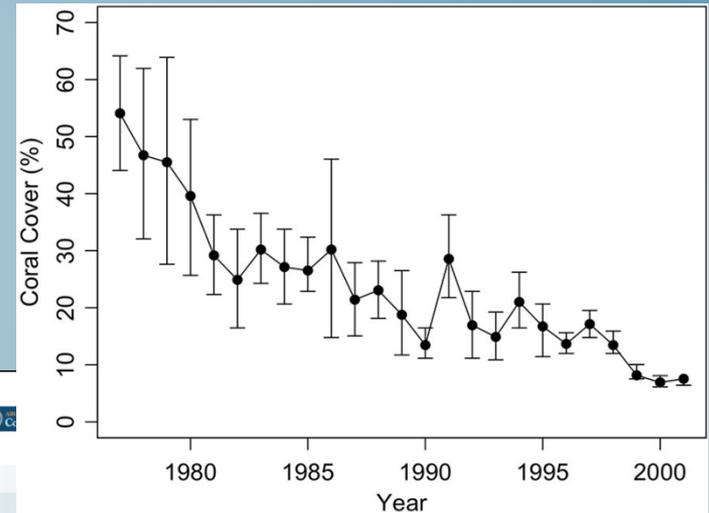
Igor Krupnik,
Smithsonian Institution

6th Symposium on the Impacts of
an Ice-Diminishing Arctic
on Naval and Maritime Operations,
July 16, 2015

Coral reefs' story of decline



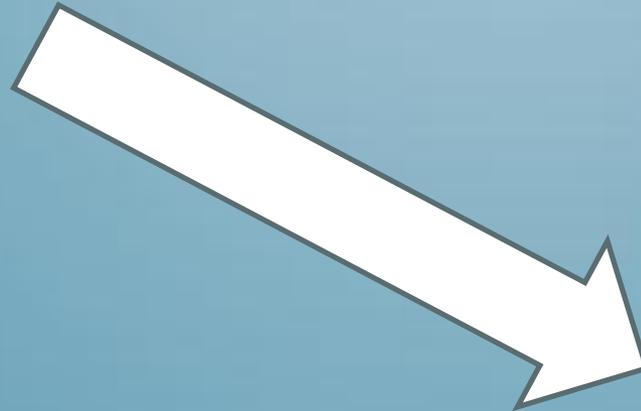
Jeremy Jackson from the Scripps Institute of Oceanography and the cover page of the Report on the Caribbean coral reef decline (2014); top right: Estimates of annual percent coral cover for the entire Caribbean region



1975



Corals on shallow fore-reefs at Discovery Bay, Jamaica, 1975



2013



The same location in 2013, with the phase shift from dominance by corals to dominance by macroalgae (Status and Trends Report, 2014, 13).



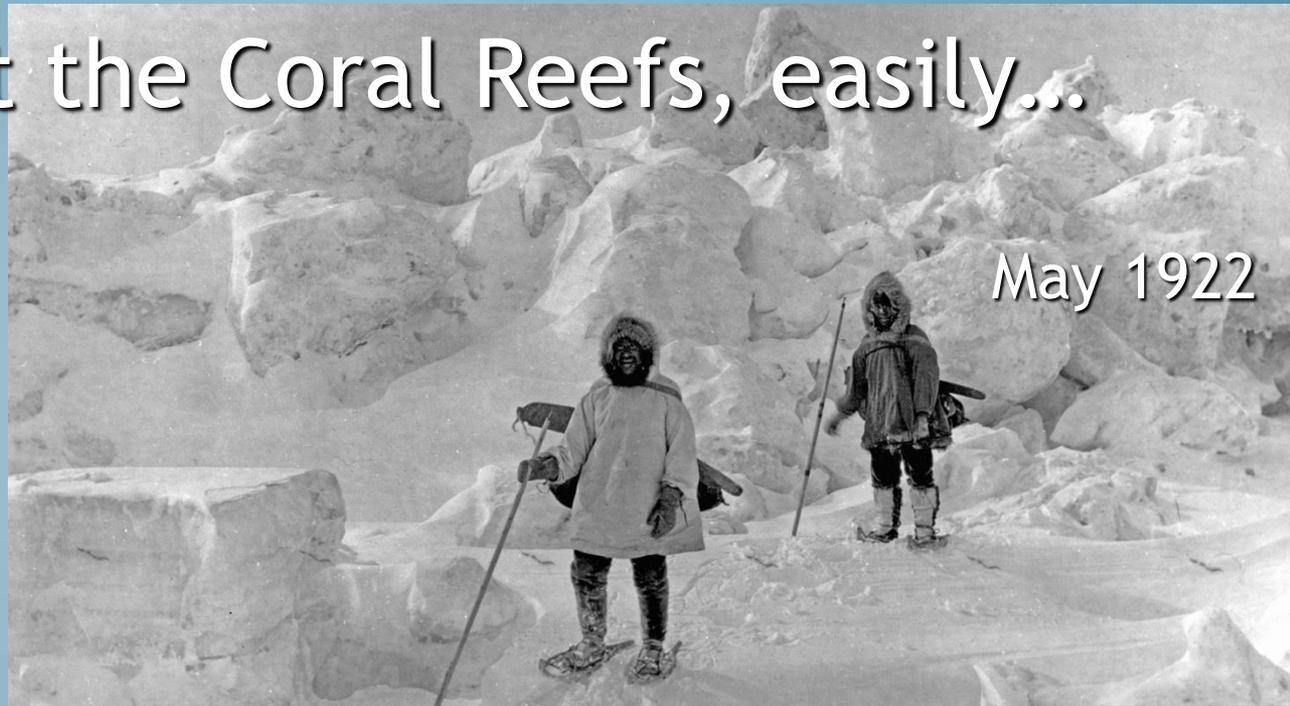
1950s



2010

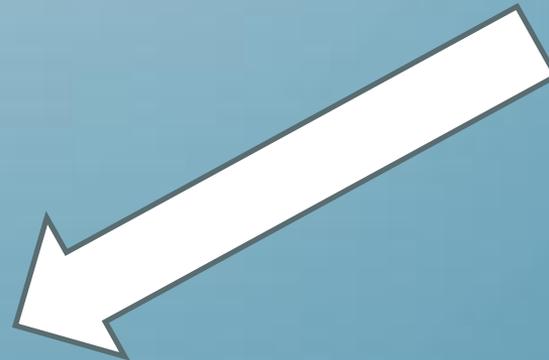
Decline in the composition and size of coral reef trophy fishing in the Florida Keys: from the 1950s to the present day (Status and Trends Report 2014, 18)

We can beat the Coral Reefs, easily...



May 1922

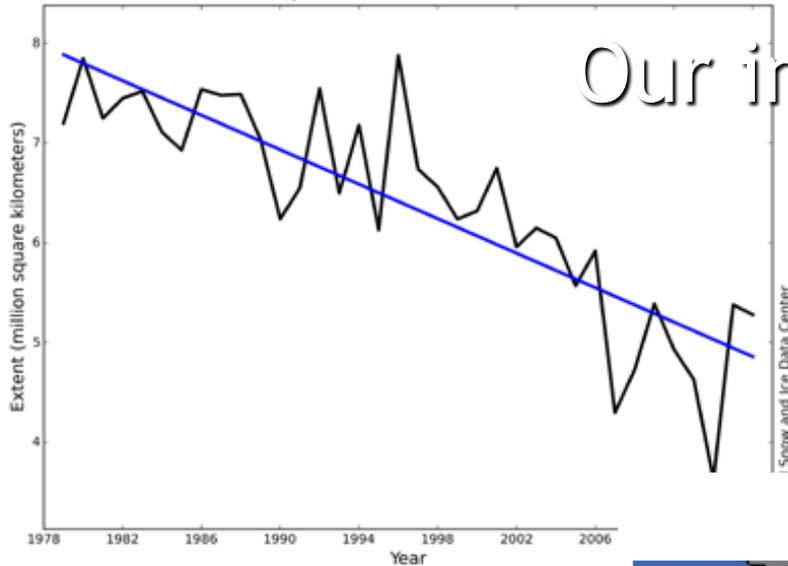
Wales, late May 1922. Photo by Alfred M. Bailey; original in the Denver Museum of Nature and Science (*Wales Inupiaq Sea Ice Dictionary* 2012).



May 2015

Wales, May 23, 2015. Photo by Amox Oxereok from SIWO website

Average Monthly Arctic Sea Ice Extent
September 1979 - 2014

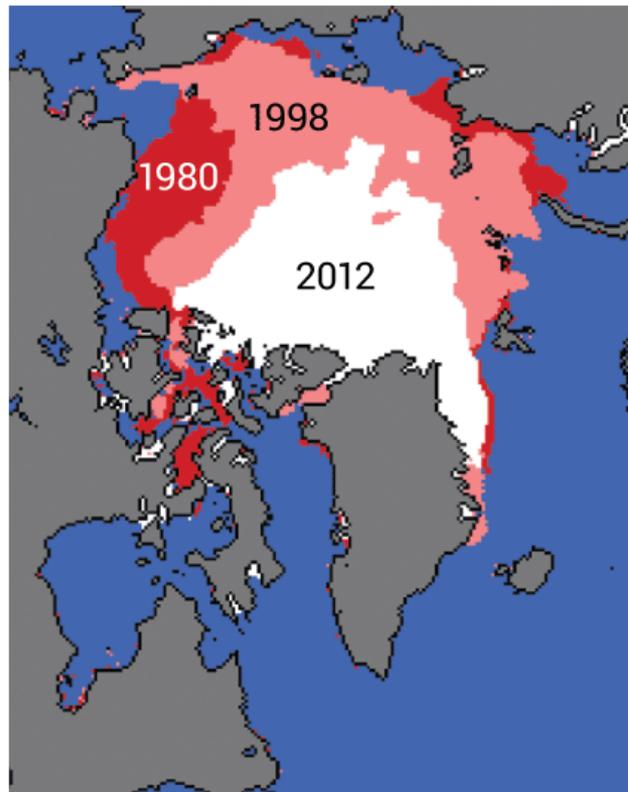


Our imagery is not very helpful...

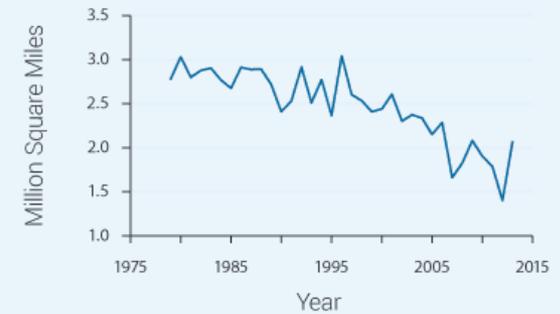


Arctic Sea Ice Loss

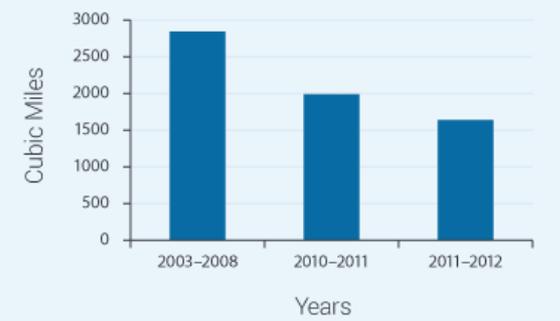
Typical illustrative language we use to describe the Arctic sea ice decline: (left) graphs of the shrinking summer sea ice extent; (bottom) charts featuring decrease of the summer ice area in the Arctic Ocean; (right top) polar bear stranded on a small ice floe in the middle of the ocean.



Average Extent in September

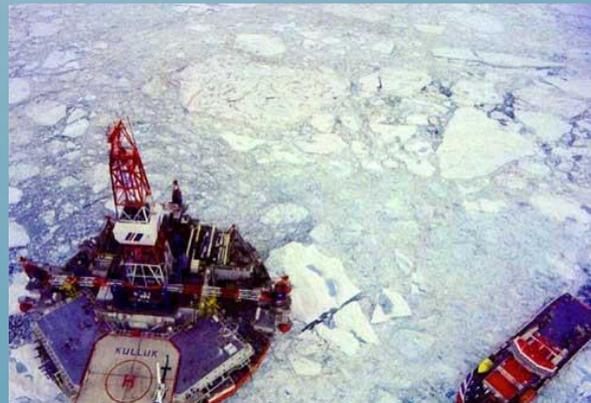


Average Volume

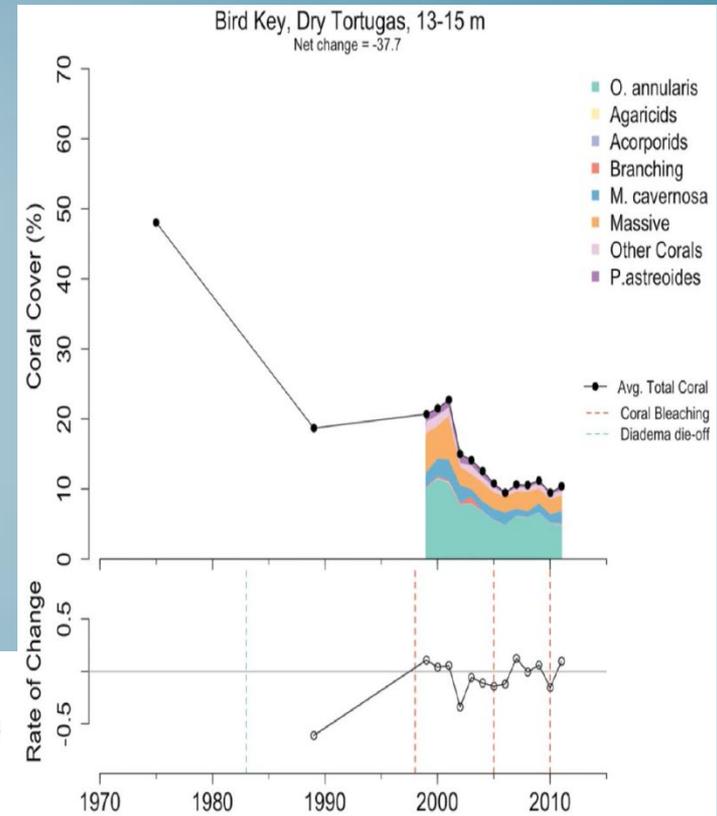
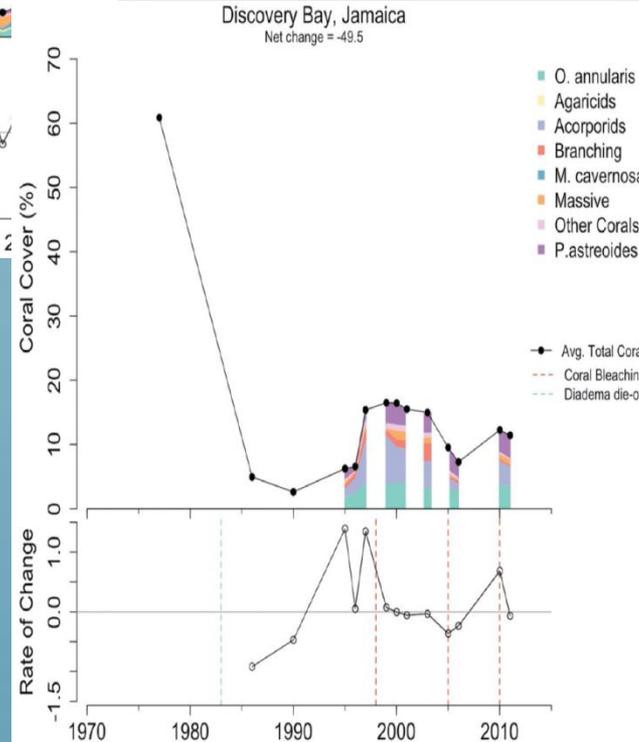
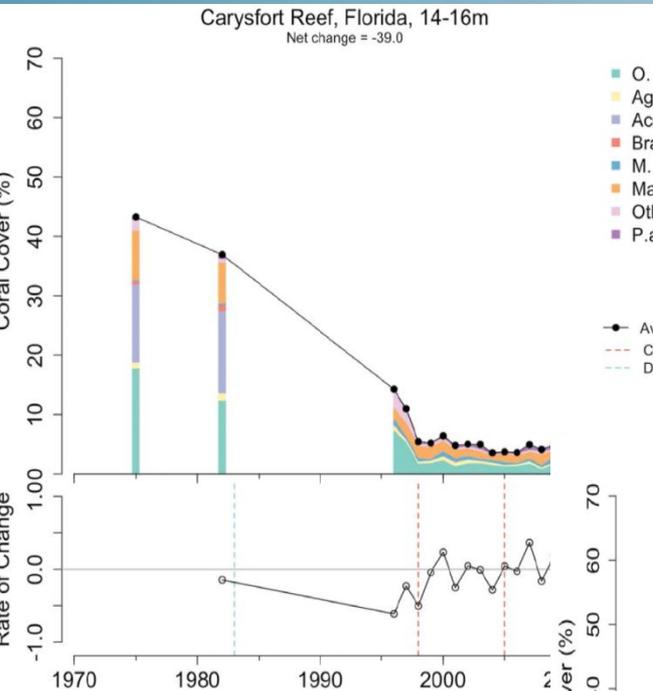




New anxious players in the Ice-Diminishing Arctic:



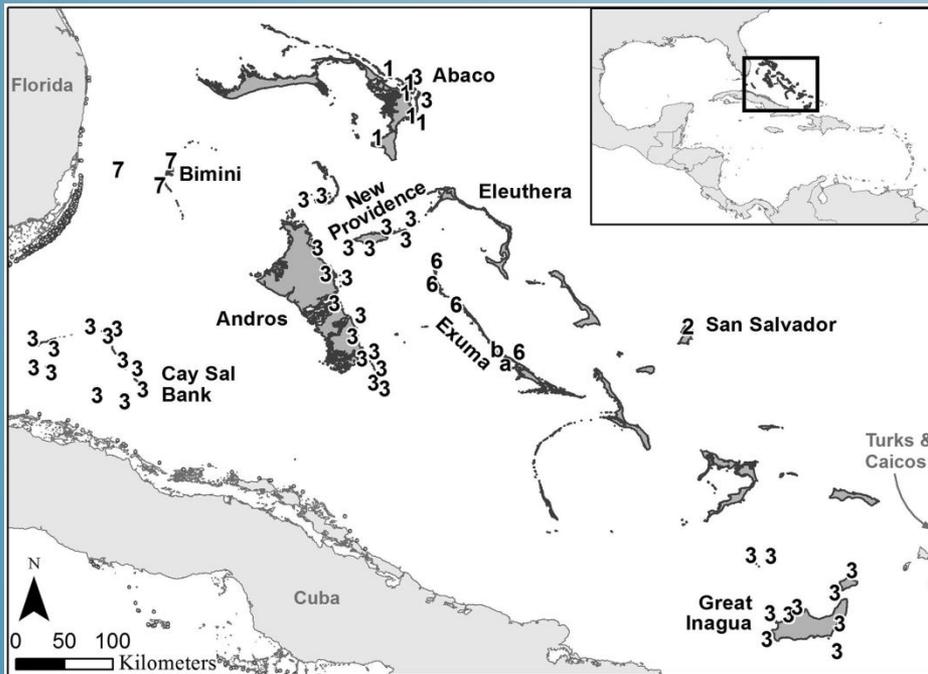
Caribbean Coral Reef Decline: Sounds Familiar?



Sample graphs illustrating individual coral reef habitats' decline across the Caribbean (from the 'Status and Trends' Report, 2014). We do not have anything comparable at local scale for individual Arctic communities.

Bahamas Islands Coral Reef Timeline

- 950-1500: Fishing by dugout canoe using spears, nets, hook and line and traps
- 1890-1930s: First coral reef studies of Andros Island
- 1950: Development of mass tourism on New Providence
- 1958-1959: Exuma Cays Land and Sea Park and Bahamas National Trust established
- 1968-1969: Minor coral bleaching on Andros Island, causing ~8% coral mortality, significant coral disease observed at Andros Island
- 1970s: Fleshy macroalgae common on some Andros Island fore reefs
- 1972: Pelican Cays Land and Sea Park established
- 1983: Bleaching event at Gingerbread Grounds, Grand Bahama Bank
- 1984: Mass die-off of *Diadema antillarum*
- 1985: White band disease recorded



On Andros Island, Lee Stocking Island

with reef coral cover 13%

at San Salvador: coral cover 9.6%, algal cover 17.5%

and coral bleaching: On Andros reefs, 10-80% of corals

declined nearly 50% on some reefs after 1998

island coral cover since 1970s

with five no-take fisheries reserves

in the National Park System, including Walker's Cay National Park,

located on Andros, West Side National Park, and Little Inagua

bleached reefs in Exuma Cays (Bahamas

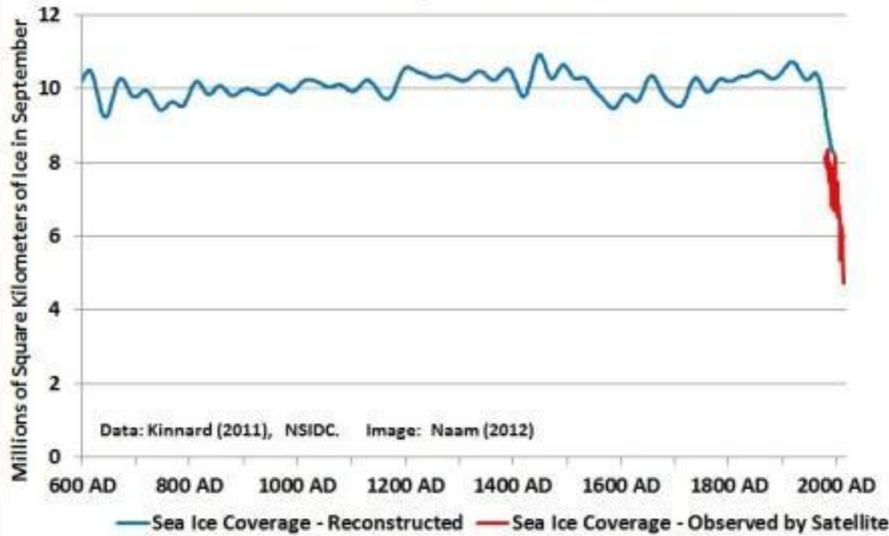
and severely damaged Abaco reefs; Lee Stocking Island

decline appears to be due to 1998 bleaching event,

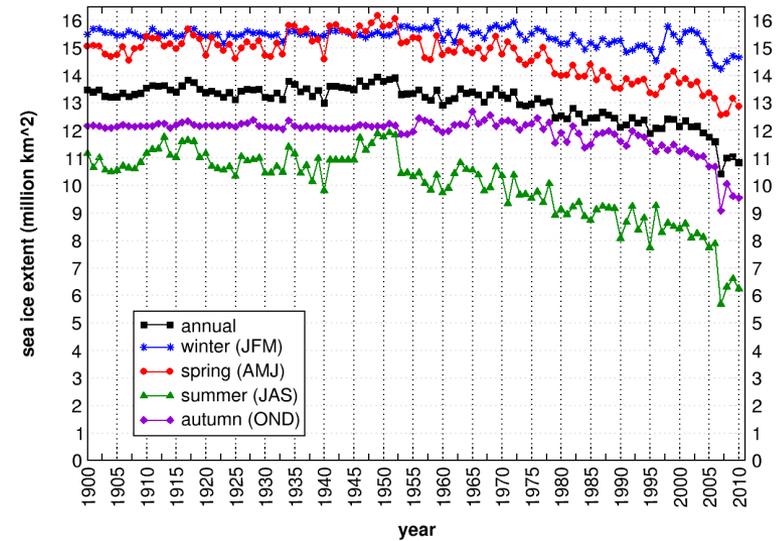
bioerosion, and hurricanes (Pante et al. 2007)

- 2008: The Bahamas launched the Caribbean Challenge with other Caribbean

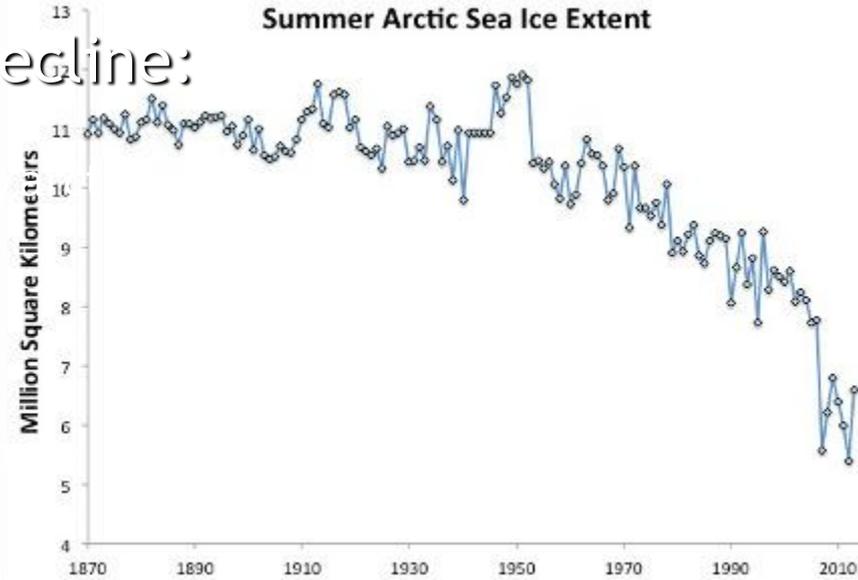
Sea Ice Area in August: Last 1400+ Years



Northern Hemisphere Sea Ice Extent



Summer Arctic Sea Ice Extent



Examples of various graphs used to illustrate historical Arctic sea ice decline:

<http://blogs.scientificamerican.com/guest-blog/ice-what-why-and-what-next/>

<http://arctic.atmos.uiuc.edu/cryosphere/>

<http://www.theguardian.com/environment/climate-consensus-97-percent/2013/sep/19/climate-change-arctic-ice-sixth-lowest-in-millennia>

Indigenous ice 'calendars':

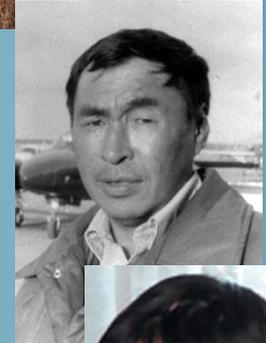


Leonard Apangalook, Sr. (Piitkaq)
1939-2012

“Thanksgiving Day (November 23rd, 2006), with no ice in the ocean. Normally would have ice and hunt walrus on Thanksgiving Day, but not anymore. (8 days later) ...The walrus have not showed up at all so far. Normally we would catch walrus by Thanksgiving every year, but the run is getting later every year” (Leonard Apangalook, Sr. /Piitkaq, Gambell, Alaska, 2006)

Knowledge sits in places...

Russian *SIKU*-IPY Project Participants: scientists and local observers from coastal Chukotka communities



Community Sea Ice Watch



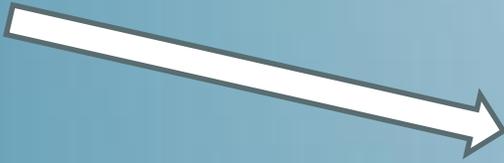
I took my grandchildren down to school about 9 in the morning and I looked for water and ice near the school site at the store - whether there is any open water out there, far at sea. ...I stayed at the store for some time to get information from other people, who were there earlier in the morning.

We always have a few people of my age gathering at the store, the side that faces the water and the beach. They just stay there for some time, watch the weather and ice, and talk”

Chester Noongwook, Savoonga, December 2001

Early baselines: 1980s

Upstreaming: Life well-remembered and easy to recall



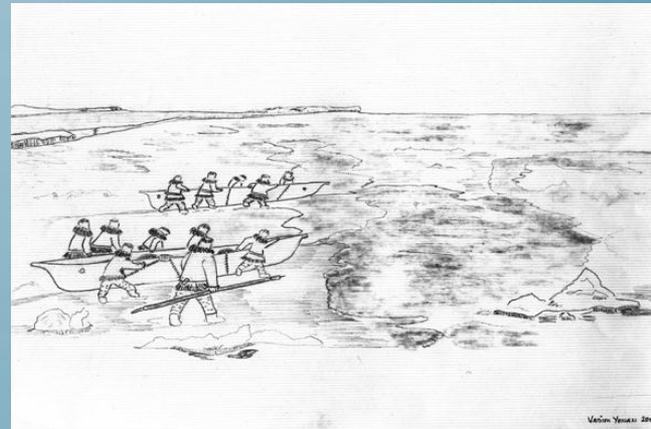
Communities of the 'pre-climate change' era

Early Baselines: 1960s

“They usually launch the boats from the west side. The ice was plentiful back then when we pulled our boats over the ice. You could go anywhere once you could go out offshore. We had good ice, good solid ice back then too. Some of it was much thicker; but it’s the smooth young ice where you take your boats. That used to be fun when we were young. Just run with your boat over the ice. We used to go over the horizon from where you can’t see the houses (in Gambell). [...] So, I figure we were more than eight miles away from here, so that we could not see the houses of the village anymore” (February 15, 2008).



Leonard Apangalook, Sr. (Pitkaq)
1939-2012



Winter hunting with skin-boat as described by Apangalook and illustrated by Vadim Yenan (2007 - in the middle). No one dares to go on the thin young ice off Gambell in February 2008 (bottom).

Early Baselines: 1960s



George Noongwook (born 1948),
Savoonga, Alaska, 2001

“My most clear memory of ‘extreme weather’ was that of winter of 1962. This has been a really exceptional winter. It was in the month of January and then a lot of snow melted... just melted down to the bare ground. And during that same year, in the fall there were very high winds blowing from the southeast. It was strange, because it’s normally blowing from north-northeast all the time. ...Not very many people were able to bring back walruses or seals or other animals. It was so bad that they had to fly in dried fish and to drop it down from the airplanes, because back then we did not have an airstrip in our village.

...It was pretty scary these days, I remember. No returning birds, nothing. There was almost no hunting because of these extremely dangerous conditions. We could probably go anywhere and get almost nothing. I do not think it was safe to go out because there was still some ice at sea. It was scary” (George Noongwook, February 2000)



Early Baselines: 1930s



Conrad Oozeva, Gambell
(December 2001)

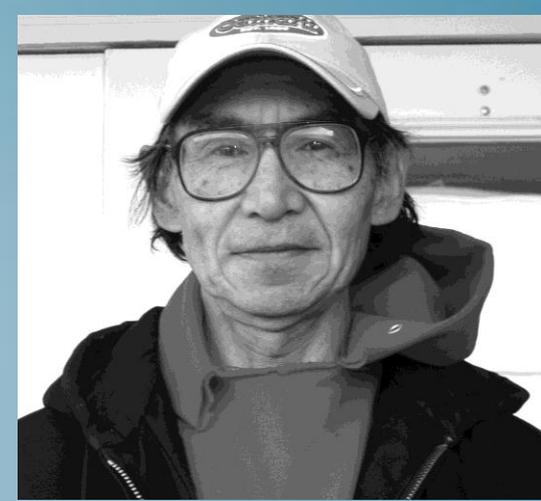
“First time it happened in my memory, I was a little boy. Maybe, it was in the mid-1930s, because the men like Wamquun, Mangtaaqli, and my Dad were still very active hunters. That year we did have very much the same weather as we had this last year. This is the first time I remember it happening (early-winter ice break-up). This unusual weather lasted until the first week of January. Boat hunting was good when the weather would subside. On the west side the *sighuneq* (the build-up of the slush ice) was formed about 15 feet high or more. Later that year the weather became quite normal” (December 2001)



Tommy Koonooka of Gambell, local women and children watch the Fourth of July event in 1931
(Photo: Anchorage Museum of History and Art)

Early Baselines: 1920s

“This is late June?! Wow! That is pretty late still to have pack ice compared to now. By late June in recent years there’s been no ice at all to speak of. That looks like the way it was yesterday and the day before [May 20, 2007]. Flat, calm, plenty of ice around. We call it *sigu* - ice, pack ice. But this ice looks pretty low. No high, no big bergs. Low ice.



Winton Weyapuk, Jr.,
Wales, Alaska (2007)

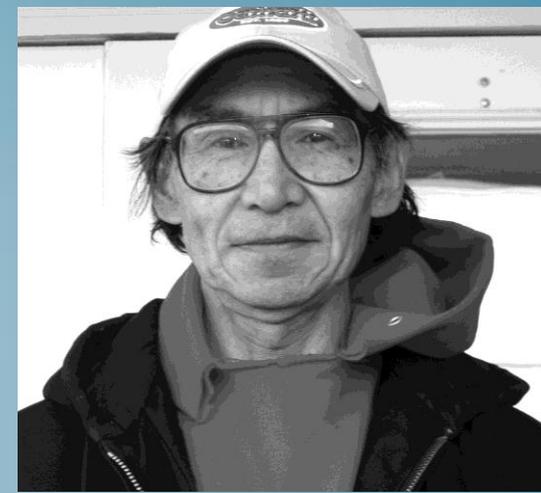


Skinning walrus on ice.
Wales, late June 1922.
Photo by Alfred Bailey,
DMNS, Denver

Early Baselines: 1920s



“Umiak, men and oogrook on a floe, June 1922”
(Wales hunters butchering two killed bearded seals). Photo: Alfred M. Bailey, - Denver Museum of Nature and Science



Winton Weyapuk, Jr., Wales,
Alaska (2007)

“Compared to now, that looks like about a month late in conditions and activities. These guys have waterproof covers on, probably to protect from sea spray. The ice surface still looks it’s covered in snow.

I am trying to see whether they have a darting gun in the boat... The darting guns would only be used for whale hunting; so, perhaps these guys were also prepared to hunt whales”
Winton Weyapuk, Jr., May 2007

Early Baselines: 1890s



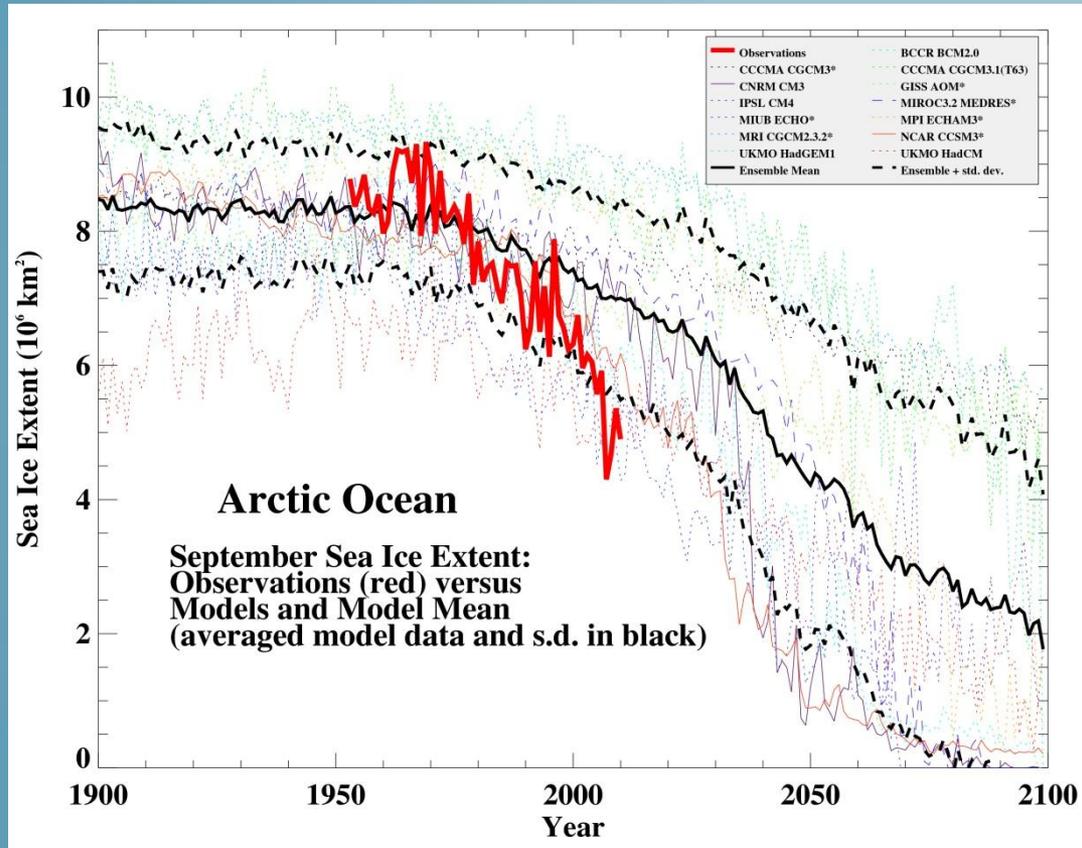
Conrad Oozeva, Gambell
(December 2001)

While looking over Gambell teachers' records from 1899-1901:

“Them people getting their first whales in 1899 in early April is exactly like we do it today. We may even had some whales killed in the last days of March. But we are now getting whales much earlier than in my earlier years. ...Besides, in the old years, they used to hunt with big whaleboats. They need more open water, and that is why they probably started later. ...So, we can start whaling earlier even with the same ice they had.

The year 1901, with their three whales killed in the end of May, seems also quite normal. Frank Oktokiuyk used to say that if there are more whales seen in Pugughileq in spring, we could see these whales around Gambell as late as in July”

Do we want our memory curve to echo this chart?



Thank you !

