Increasing Mobility of High Arctic Sea Ice Increases Marine Hazards off the East Coast of Newfoundland

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vEGU2021 – CR5.4 Risks from a changing cryosphere, and mountains under global change

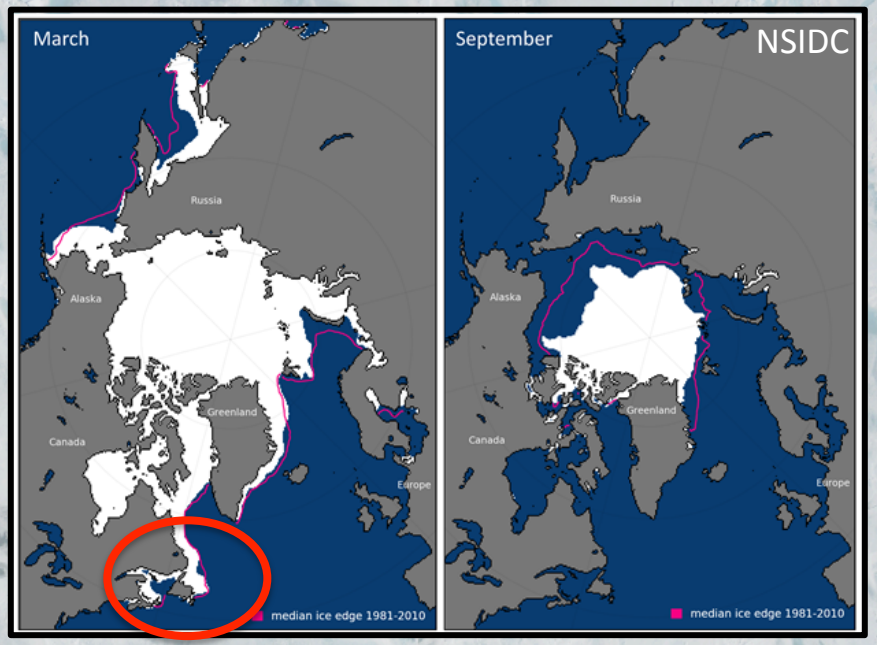
Available as Barber, Babb, et al., 2018, GRL.



University of Manitoba

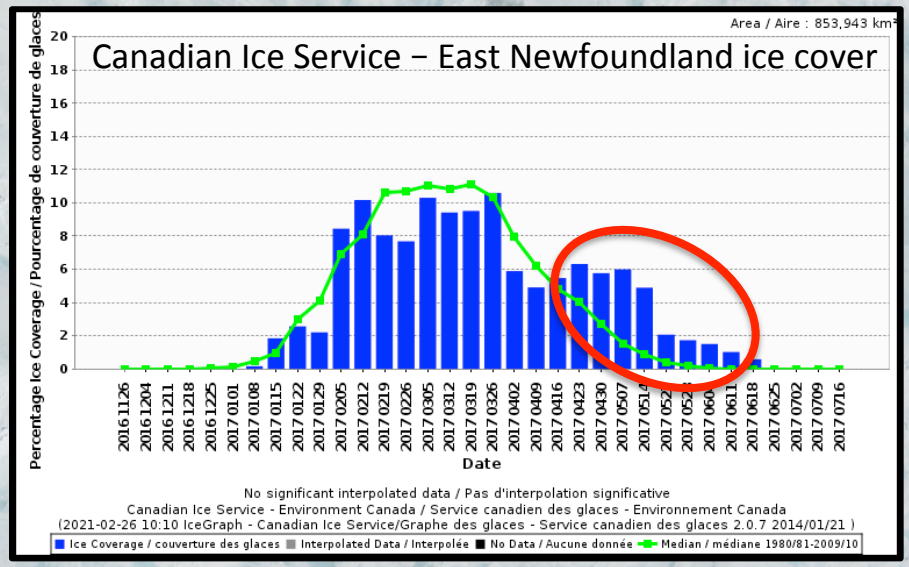
Typical ice conditions around Newfoundland

- Southern limit of Arctic sea ice
- Seasonally ice covered from January-May
- Typically a thin seasonal ice pack with thicker ice offshore



Ice conditions around Newfoundland in 2017

- The ice pack was anomalously thick and persisted into July.
- Overlapped with the start of the local fishery and seasonal ferry service to remote communities.



Hazardous ice conditions

- Several vessels became stuck, 2 fishing vessels sank.
- The CCGS Amundsen was diverted from its scientific mission to Hudson Bay to escort vessels and lead search and rescue efforts



- An ice breaker full of sea ice scientists stuck in anomalous sea ice….





Spring 2017
Sampling the anomalous ice cover

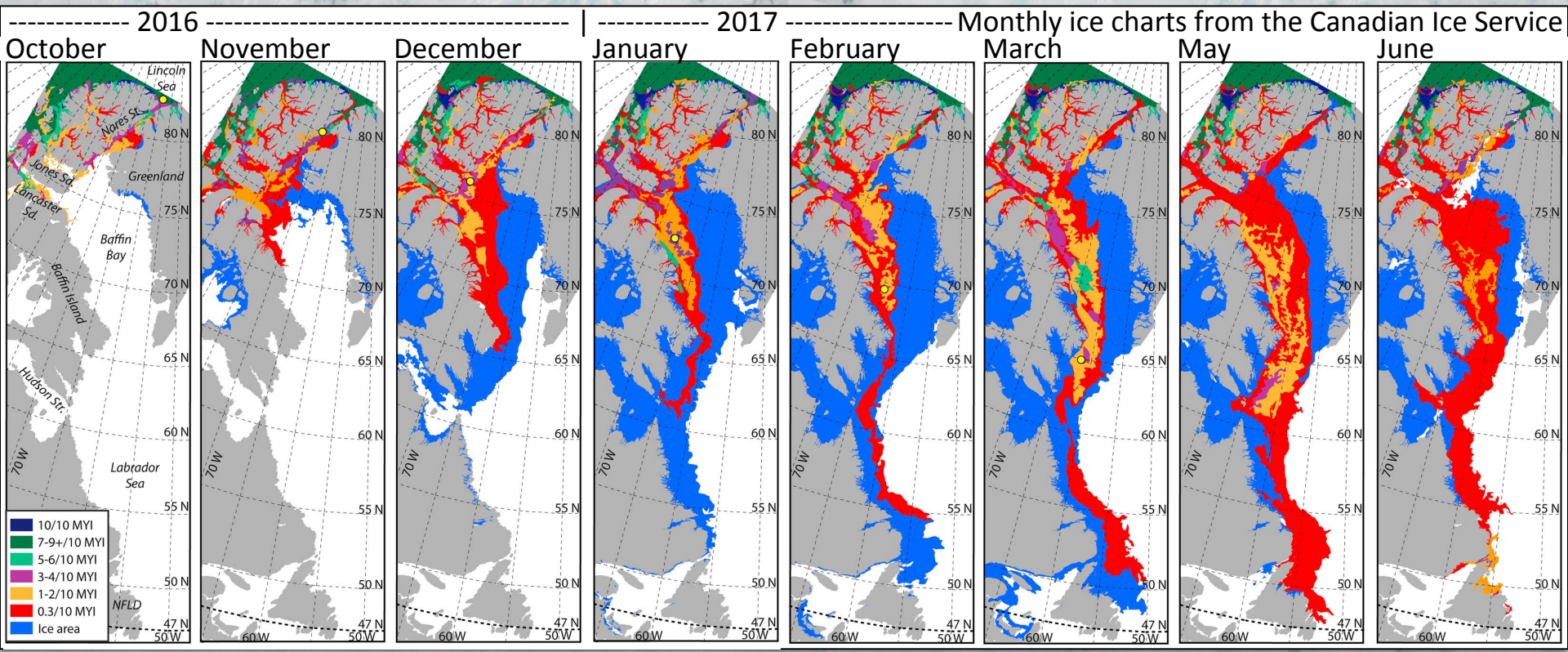
- Sampled 3 floes between coast guard operations.
- Physical ice cores, drone surveys and ship-based radar measurements
- Determined that they were 5+ m thick multiyear sea ice floes.
  - Very different from the seasonal ice that typically forms around Newfoundland.





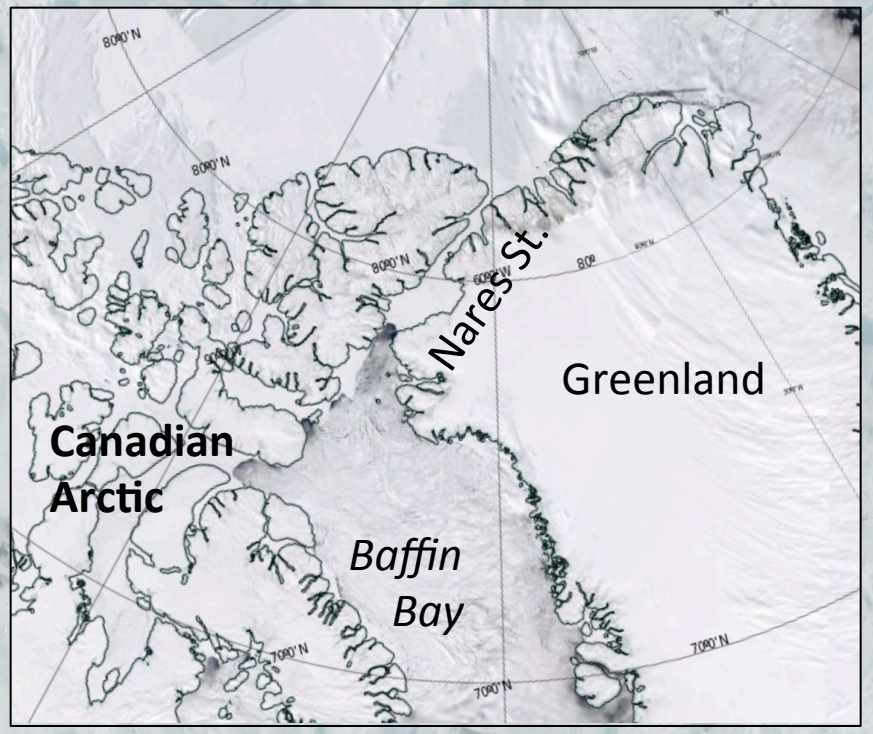
Spring 2017
Tracking the multiyear sea ice

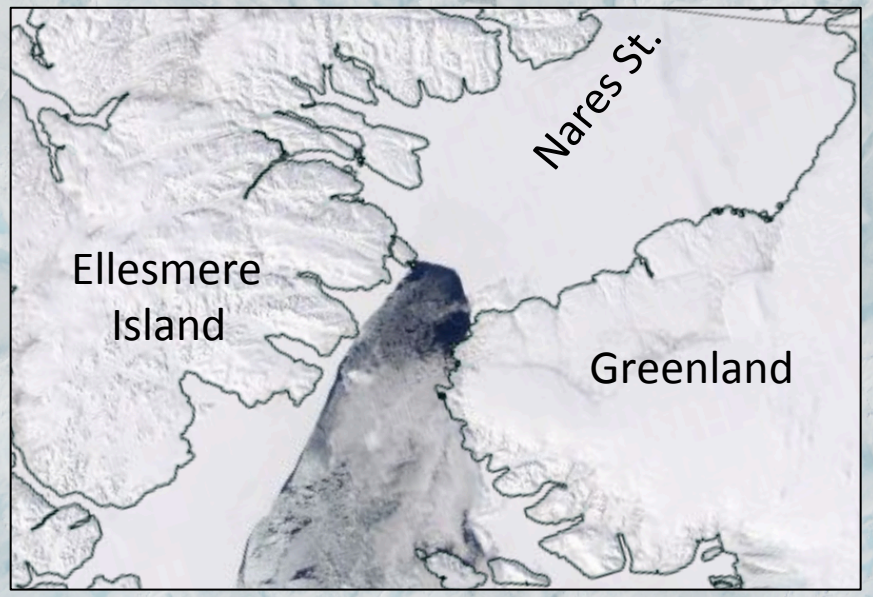
- The Eastern Canadian Arctic is ice free in October.
- **SEASONAL ICE** forms locally, while MULTIYEAR ICE is imported and transported
- The Multiyear ice tongue extends to Newfoundland, but is typically offshore.
- Storms in March/April 2017 compressed the Multiyear ice onshore.



The source of the anomalous multiyear sea ice

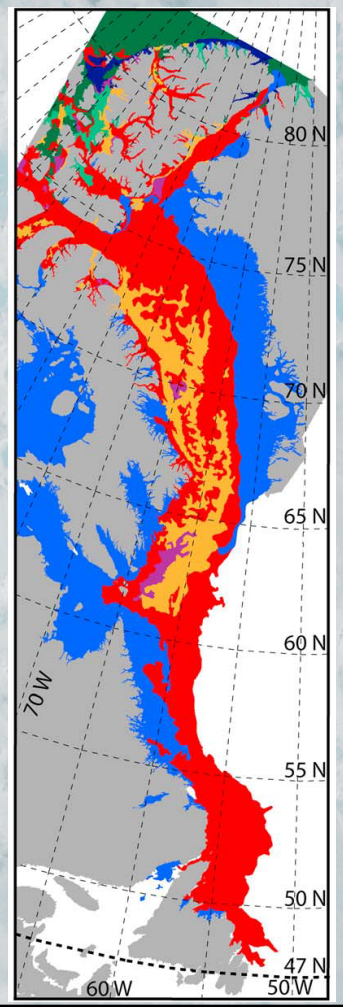
- The thickest and oldest sea ice in the Arctic is located along the northern coast of the Canadian Arctic Archipelago
- Historically the transport of this ice into Baffin Bay was limited by ice arches that would form across Nares Strait for up to 8 months per year.
- However, as the arctic ice pack has declined, it has become thinner and more mobile, and arches are less likely to form and are forming for shorter periods.
- Increasing multiyear ice export into Baffin Bay.





Summary − Barber et al., (2018) GRL

- An anomalously thick (5+ m) and persistent ice pack created hazardous conditions around Newfoundland during spring 2017.
- The ice pack contained pieces of MYI, which had been transported >3000 km from the central Arctic, through Nares Strait, Baffin Bay and the Labrador Sea to Newfoundland.
- Historically, the export of old, thick MYI from the central Arctic was limited by the formation of an ice arch in Nares Strait.
- However, as the arctic ice pack has declined in extent and thickness, it has become weaker and more mobile. Reducing the formation of the Nares Strait arch and increasing MYI export into Baffin Bay.
- Increasing the presence and risk posed by ice hazards in downstream areas such as Newfoundland.





This work exemplifies the counterintuitive notion that decreasing sea ice can actually increases ice hazards.