



*US Naval Post Graduate School
Regional Security Education Program*

Arctic Voyages 2015 – 2018

*(Ice Navigator contracted by
Martech Polar Consulting Ltd.)*

RAdm Nigel S. Greenwood CMM, CD, RCN (Ret'd)
Master Mariner FRIN, FNI



Outline:

- 2015 MY EQUANIMITY 13 – 22 Sep
(Cambridge Bay – Dutch Harbor)
- 2016 RRS ERNEST SHACKLETON 6 Aug – 13 Sep
(St John's NF – Amundsen Gulf – St J's)
- 2017 MSV NORDICA 4-31 Jul
(Vancouver BC – Nuuk GL)
- 2017 RV XUE LONG 29 Aug – 23 Sep
(Nuuk GL – Nome AK)
- 2018 MV GOLDEN STRENGTH 22 Jul – 4 Oct
(Gibraltar – Baffin Is – Rotterdam & repeat)

Five Very Different Ships...

MY EQUANIMITY (2015)



Type: Super Yacht
LOA: 91.5m
Draft: 4m
Tonnage: 2998 GT
Power: 7.2 MW
Ice-Class: E (Type E) = Grey Ice < 0.15m

RSS ERNEST SHACKLETON (2016)



Type: Support Icebreaker/Research Vessel
LOA: 80m
Draft: 7.4m
Tonnage: 4028 GT
Power: 5.3 MW
Ice-Class: ICE-05 (Type B) = Thin FY < 0.7m

MSV NORDICA (2017)



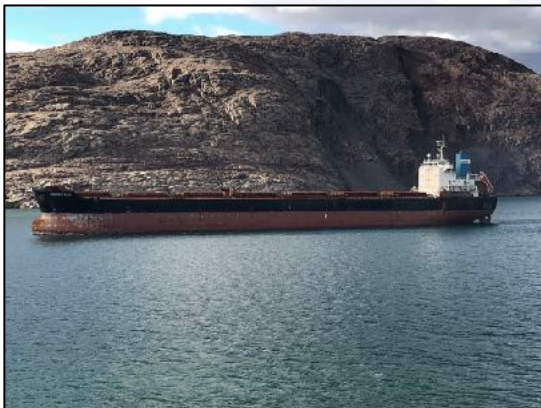
Type: Multi-role Support Vessel/Icebreaker
LOA: 116m
Draft: 8.4m
Tonnage: 9392 GT (12,800t Displ)
Power: 22.96 MW
Ice-Class: POLAR 10 (CAC4) = TFY < 1.2m

RV XUE LONG (2017)



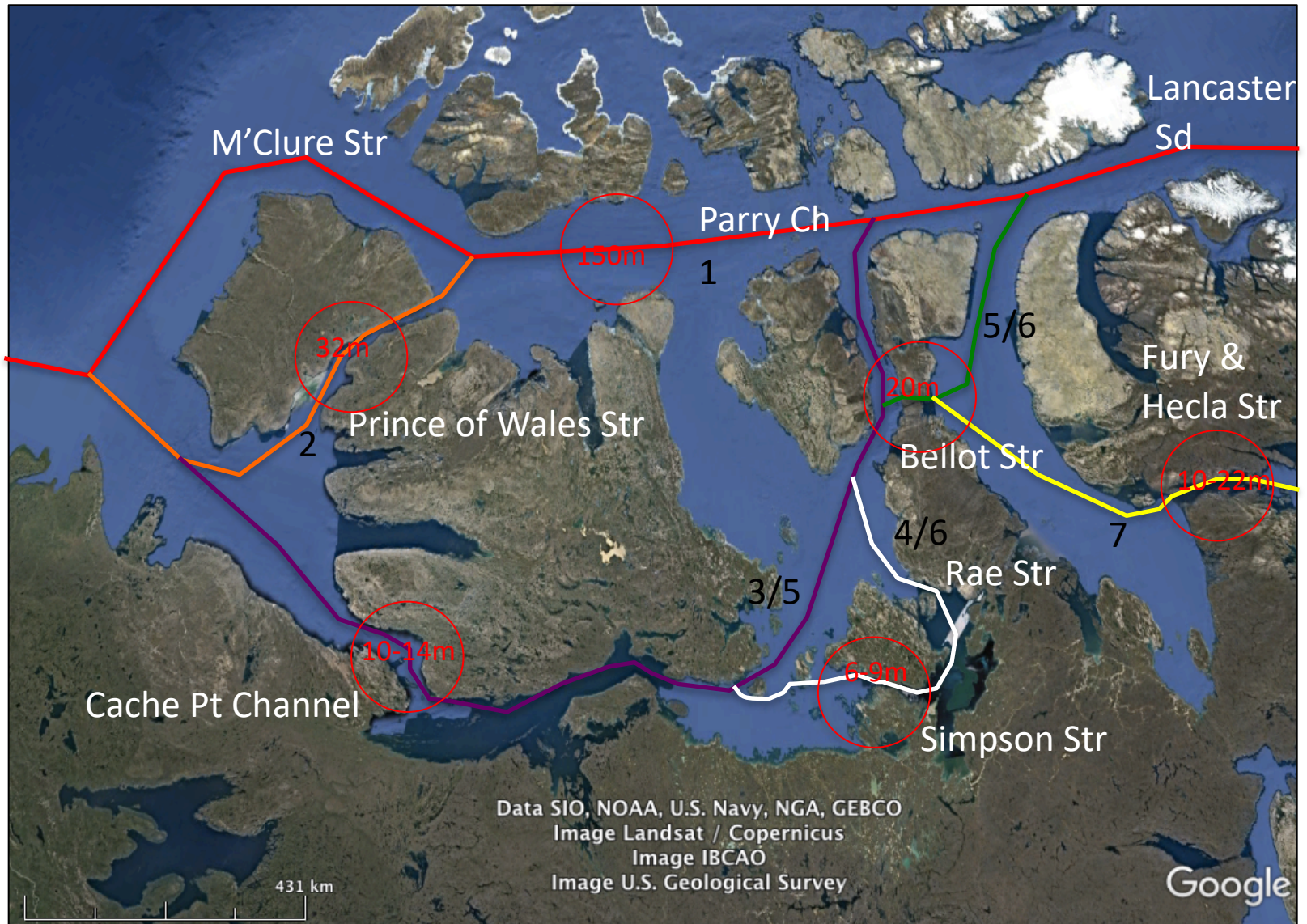
Type: Support Icebreaker/ Research Vessel
LOA: 166m
Draft: 8.7m
Tonnage: 15,352 GT (21,250t Displ)
Power: 13.2 MW
Ice-Class: B1* (Type A) = MFY 0.7-1.2m

MV GOLDEN STRENGTH (2018)



Type: Bulk Carrier
LOA: 225m
Draft: 14.2m
Tonnage: 41,655 GT (88,558t Displ)
Power: 11.3 MW
Ice-Class: FS 1C (Type D)
= FY 0.4m

Navigable routes through the Northwest Passage



NB: Numbering iaw SPRI; Route 6 is Bellot Str & Rae/Simpson Straits



10m

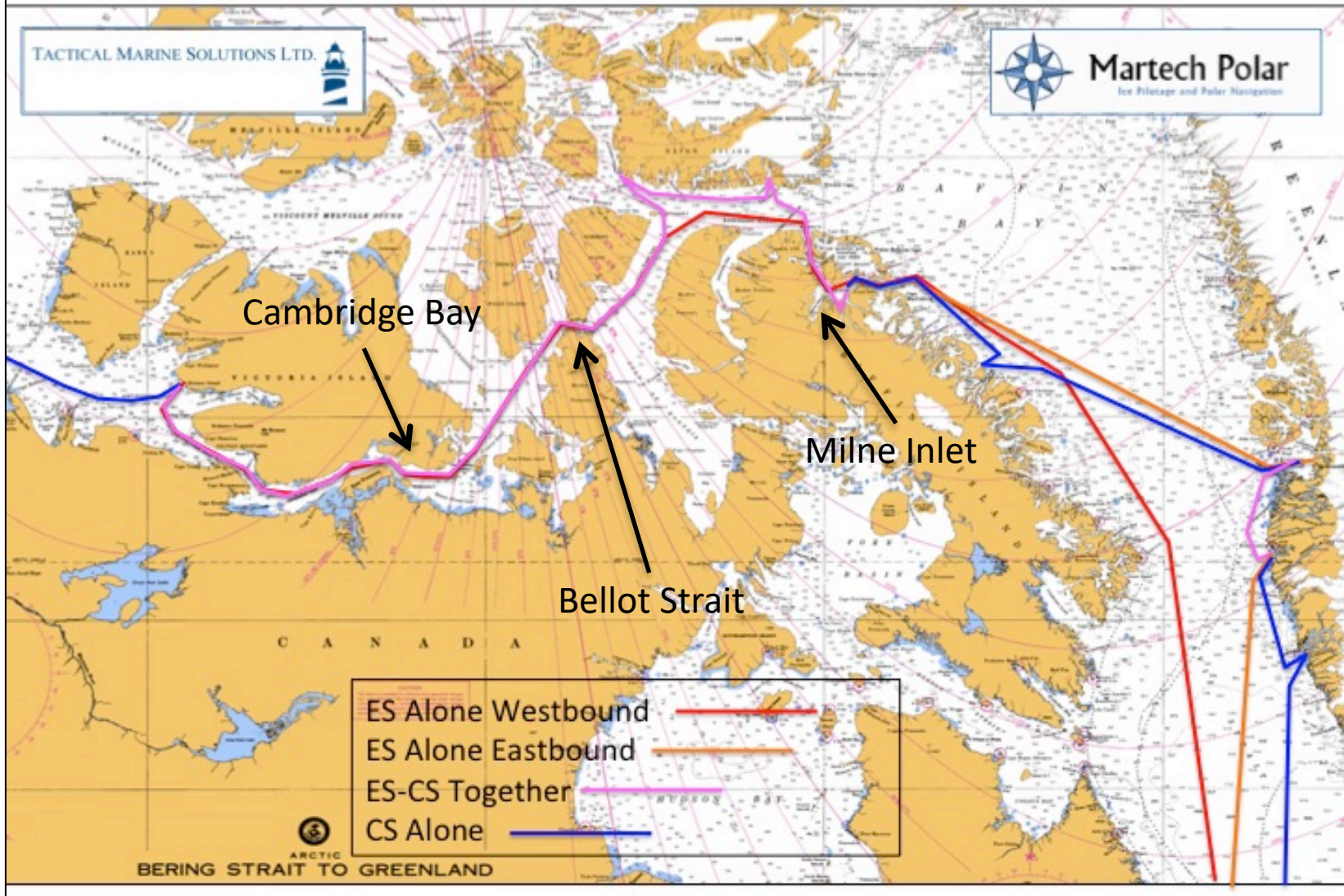
Limiting Drafts

3 – Route Numbers (SPRI)

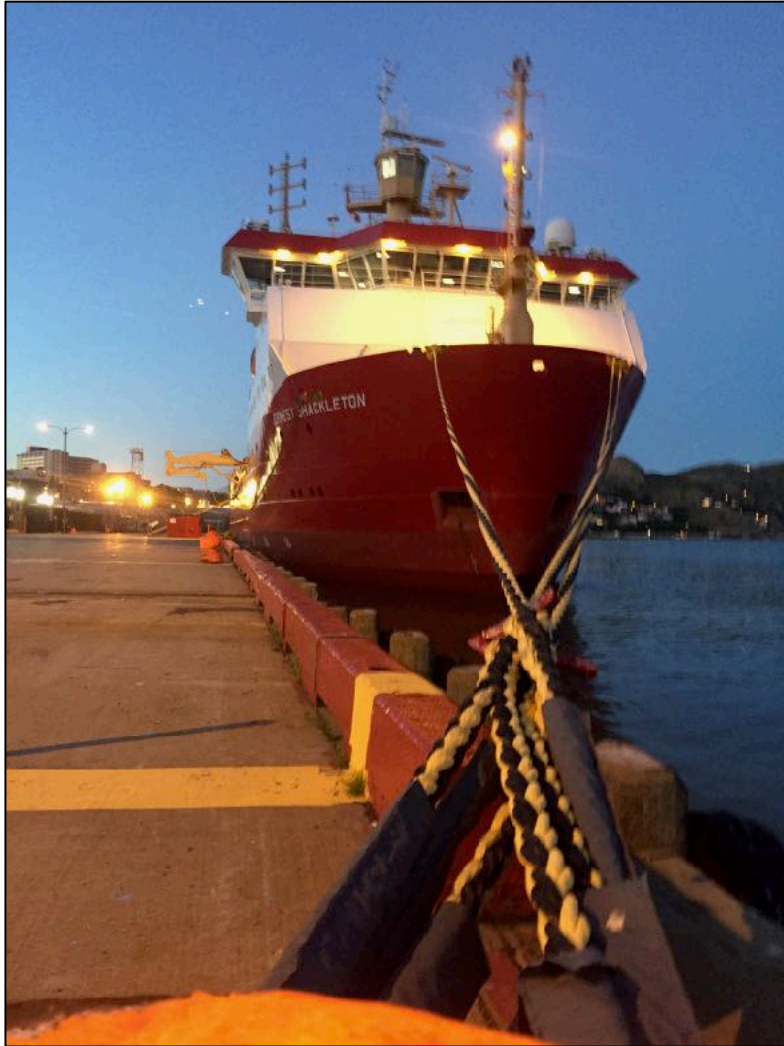


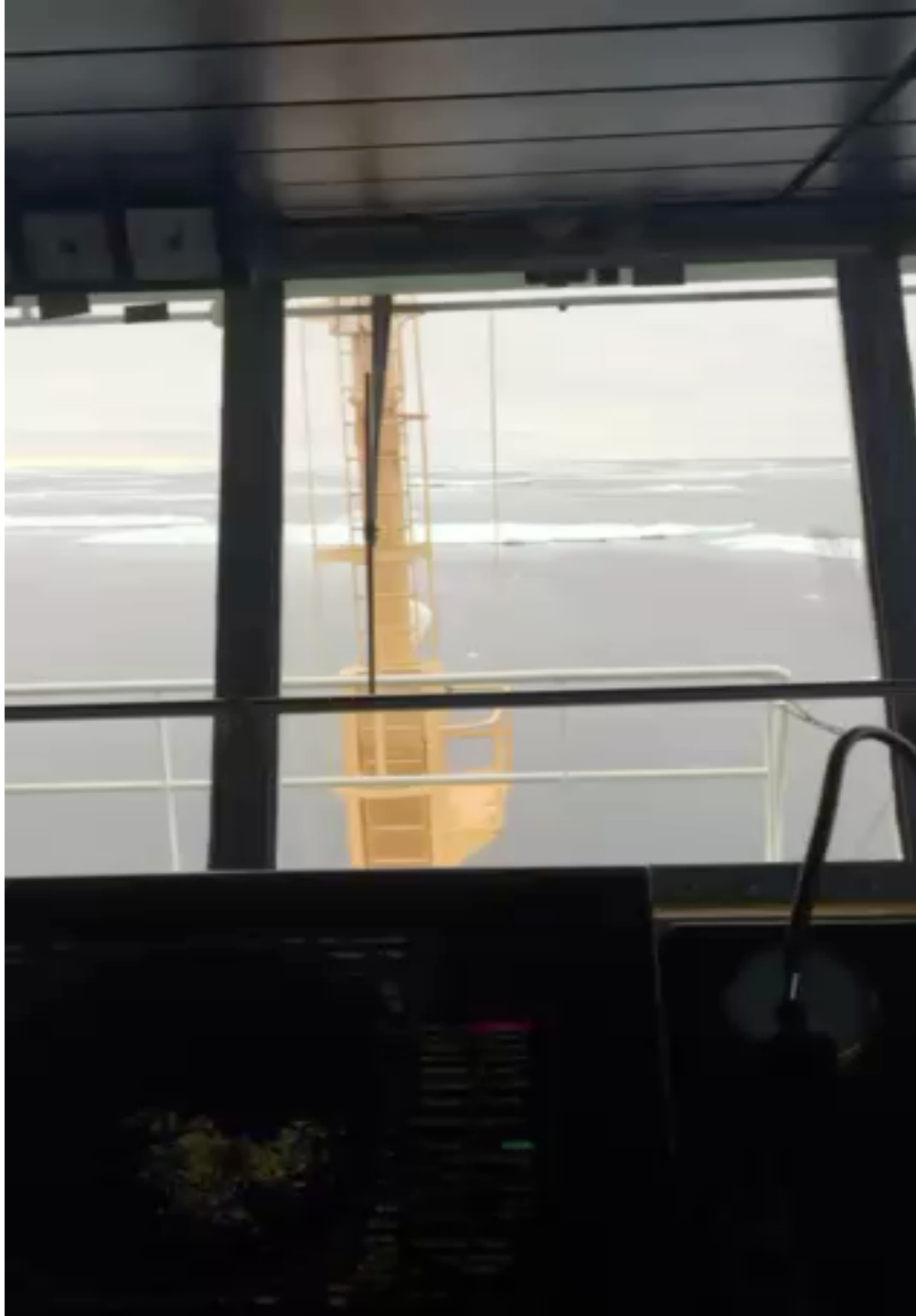


Inaugural Crystal Cruises NWP 2016 – MV Crystal Serenity and RRS Ernest Shackleton



RSS ERNEST SHACKLETON





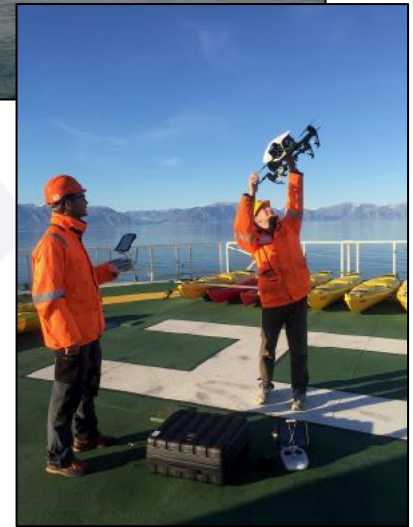
RSS ERNEST SHACKLETON

...in 2-3/10 FY ice east of
Baffin Island





Critical Mission Equipment



Mission Specialists



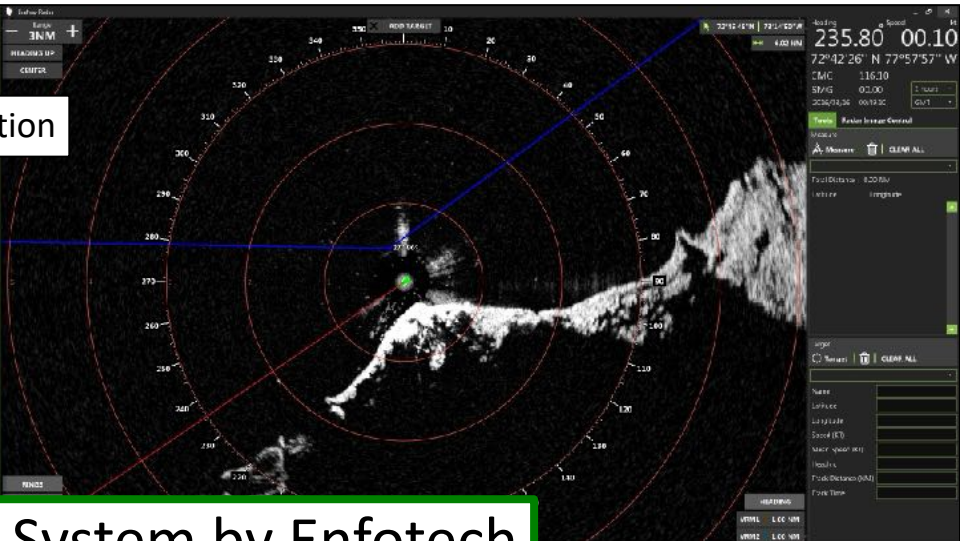
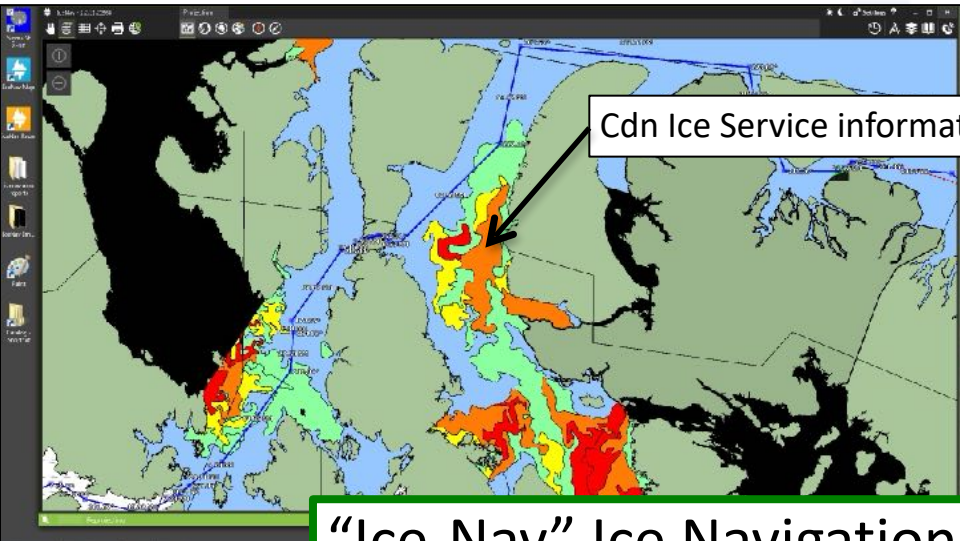




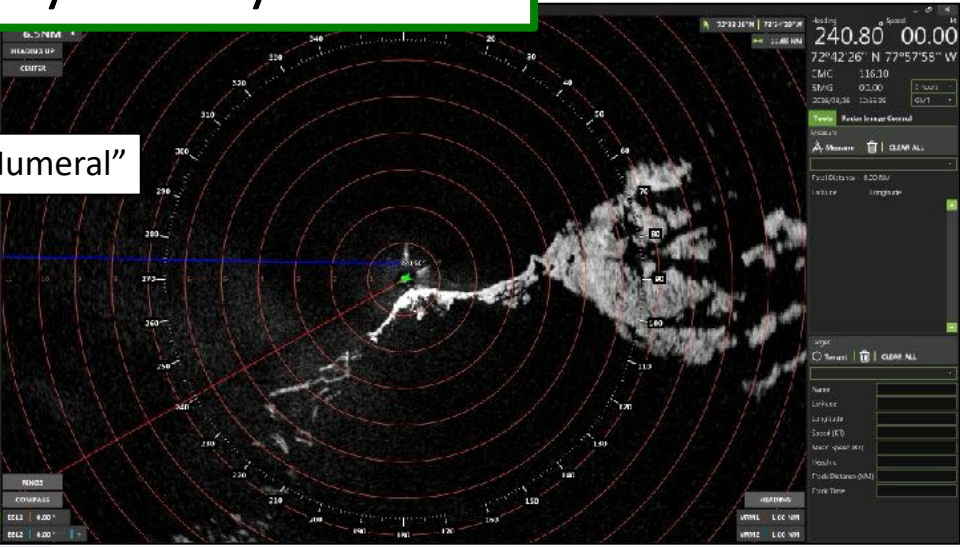
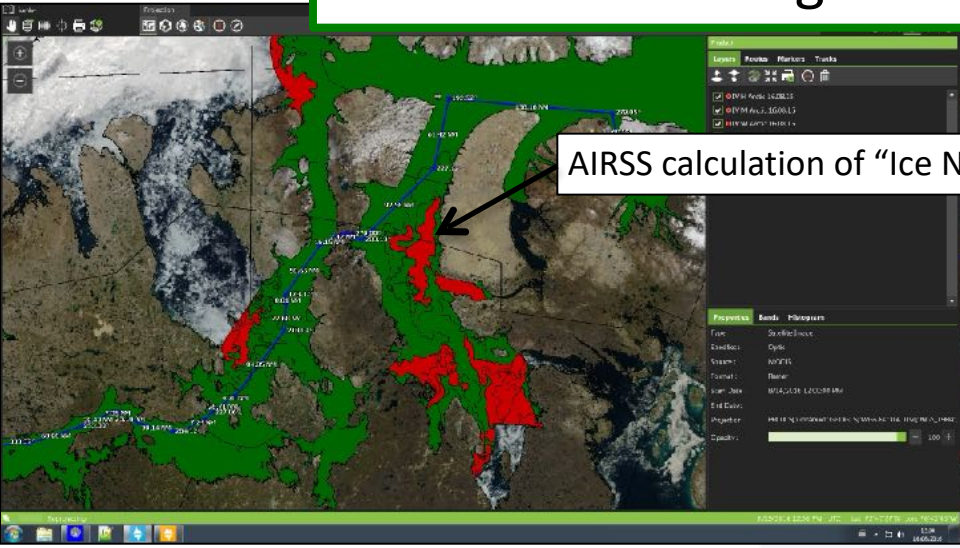
Community interactions need to be carefully planned
for sustainable impact
Ulukhaktok (Holman), west side of Victoria Island



Arctic Ice Regime Shipping System (AIRSS)



"Ice-Nav" Ice Navigation System by Enfotech



IN = Sum weighted calculation of ice type/concentration x ship ice class
- Postive # = GO (green); Negative # = NO GO (red)

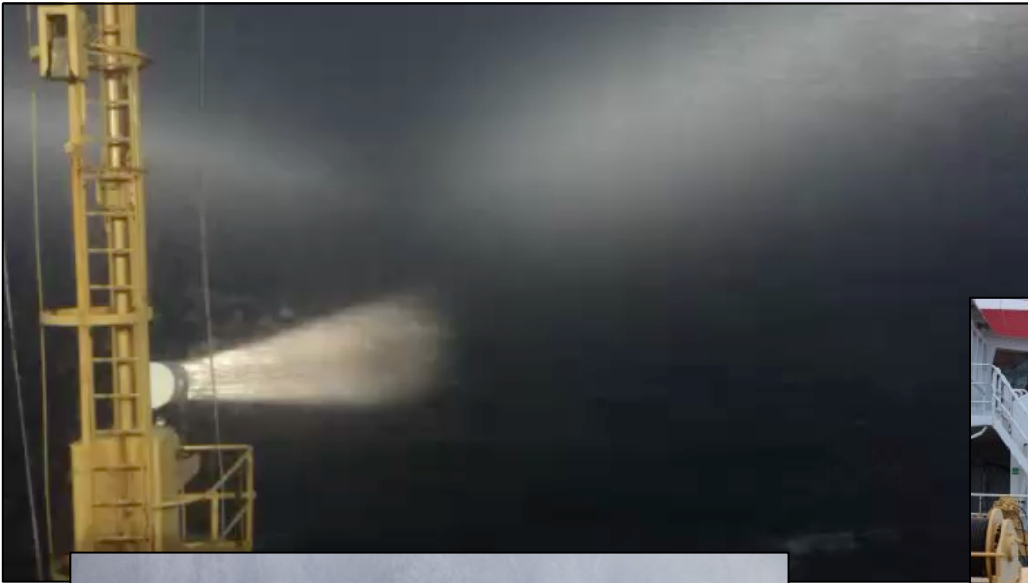




The Main Objective!



Croker Bay, Lancaster Sound and Tay Inlet



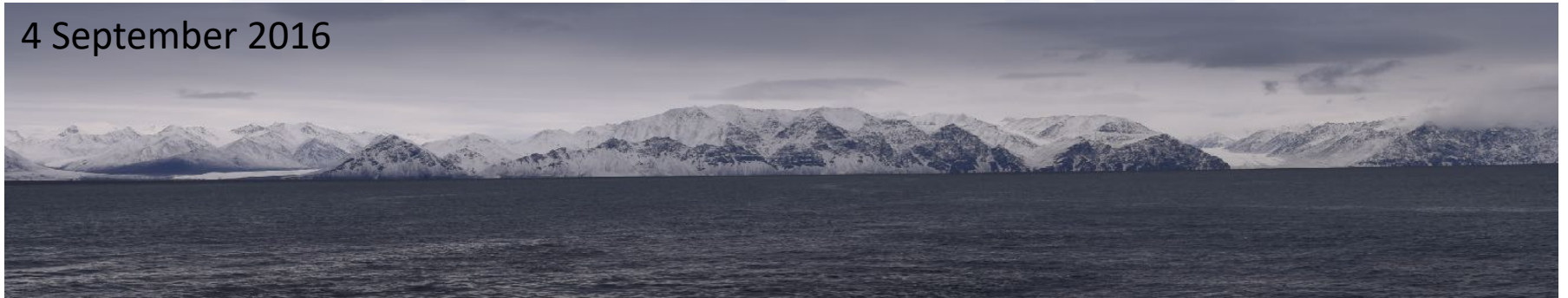
Different views of Pond Inlet

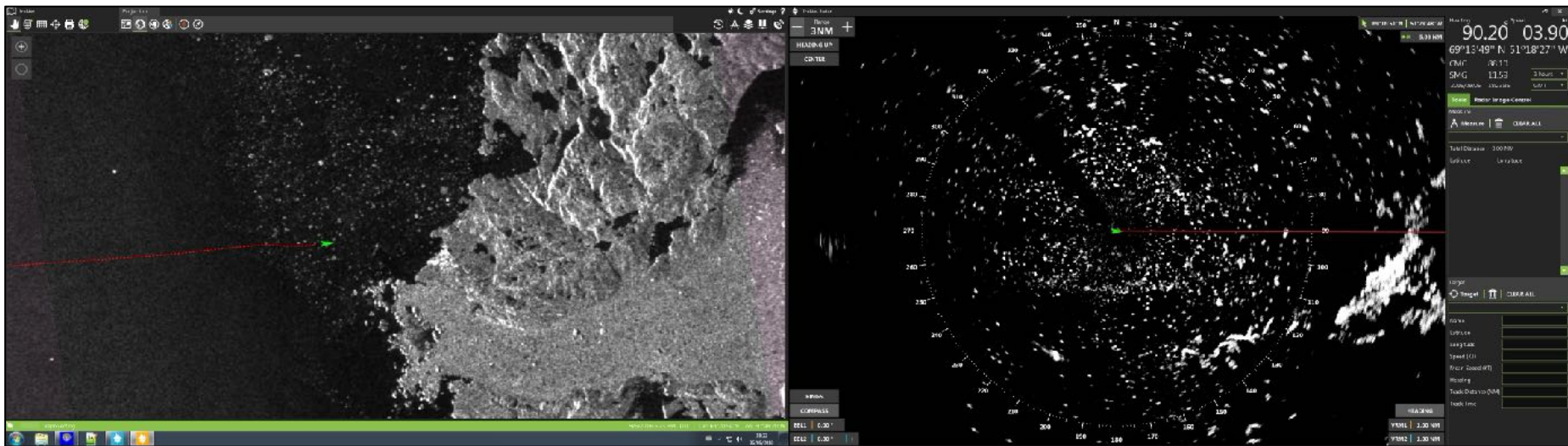


16 August 2016



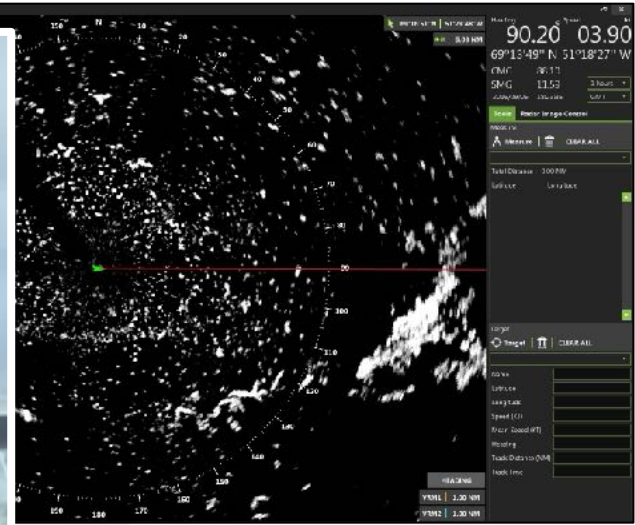
4 September 2016





Disko Bay, GL (Ilulissat)

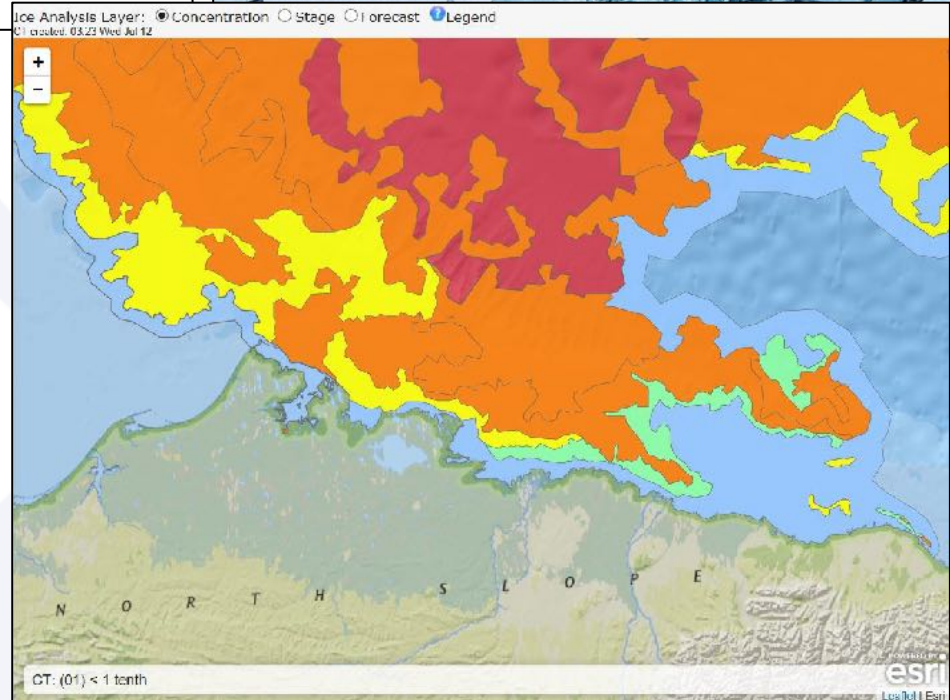
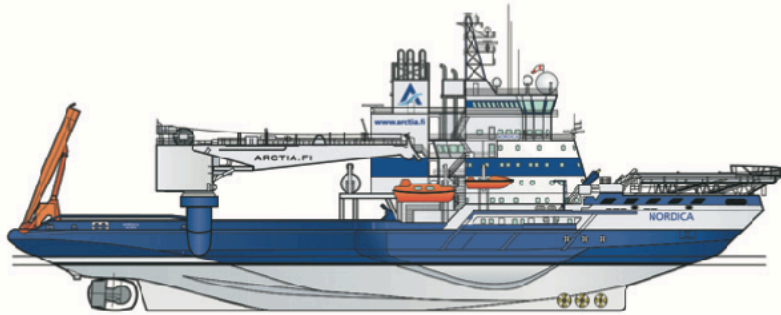




Disko Bay, GL
(Ilulissat)



MSV NORDICA



Dep Vancouver 5 July,
Passed Pt Barrow 16 July



Beaufort Sea and Victoria Strait



Ice-Nav displaying RADARSAT picture of Victoria Strait 18 July 2017

IceNav - 24.6.12515

Projection

Product

Layers Routes Markers Tracks

Route Nordica NWP 2017 Active
Route Nordica 1 NWP 2017
Route 37055

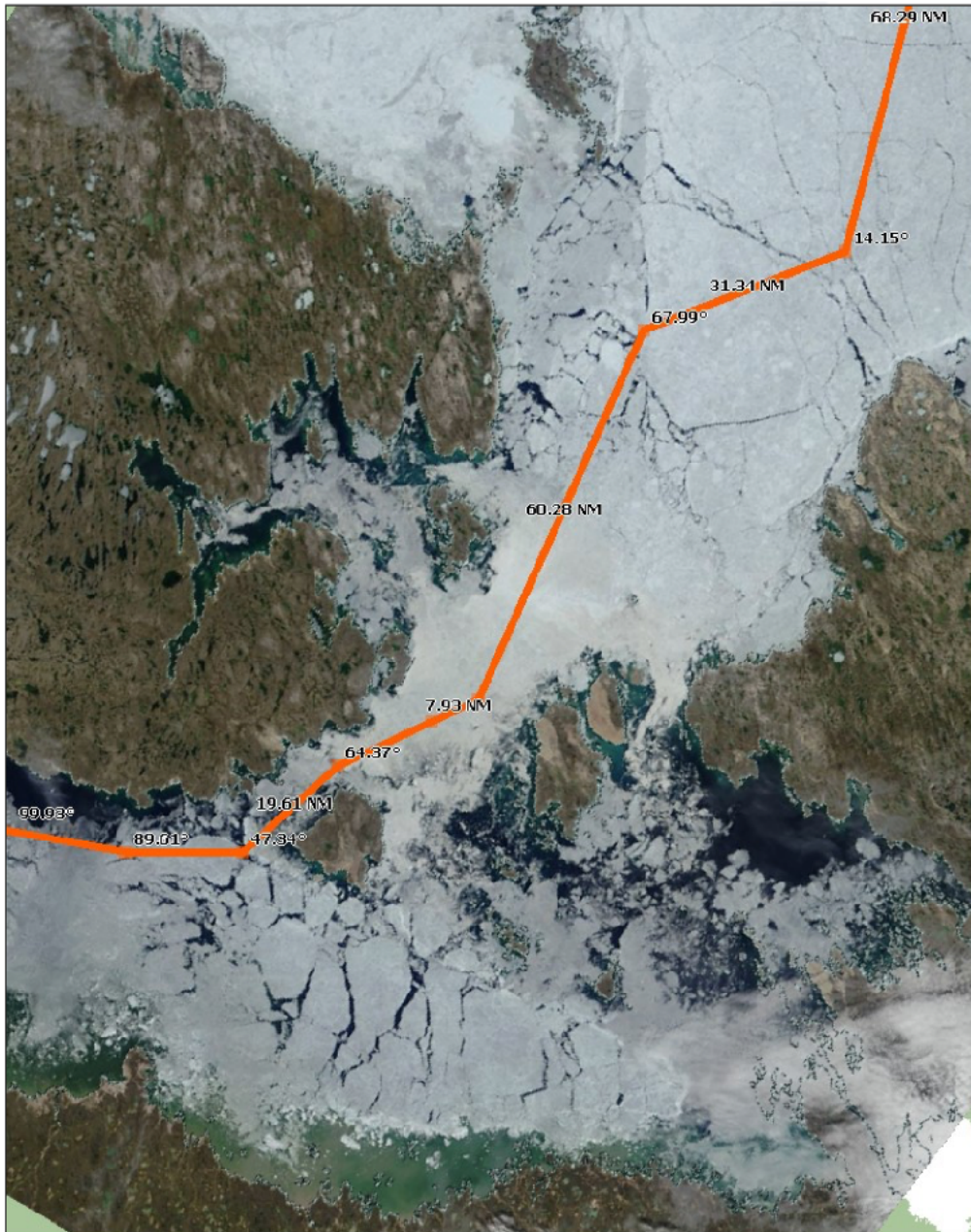
Color: [Color Selection]

Thickness: [Thickness Selection]

Latitude	Longitude	Heading	Distance (NM)
68°40'0" N	102°40'0" W	47.34 °	19.61 NM
68°53'12" N	102°0'0" W	64.37 °	15.91 NM
69°0'0" N	101°20'0" W	60.33 °	18.27 NM
69°8'59" N	100°35'11" W	15.72 °	14.22 NM
69°22'40" N	100°24'15" W	27.37 °	38.23 NM
69°56'28" N	99°33'3" W	47.65 °	17.14 NM
70°7'57" N	98°55'47" W	43.06 °	22.06 NM
70°21'28" N	98°14'11" W	30.06 °	26.64 NM
Total Distance:			1483.69 NM

7-18-2017 3:50 PM UTC Lat: 70°13'18" N Lon: 96°38'18" W

Victoria/Franklin Strait 10 July



What it actually looks like ...

10 July, still early in the navigation season

NORDICA holds records for *earliest* AND *latest*-ever transits of the NWP

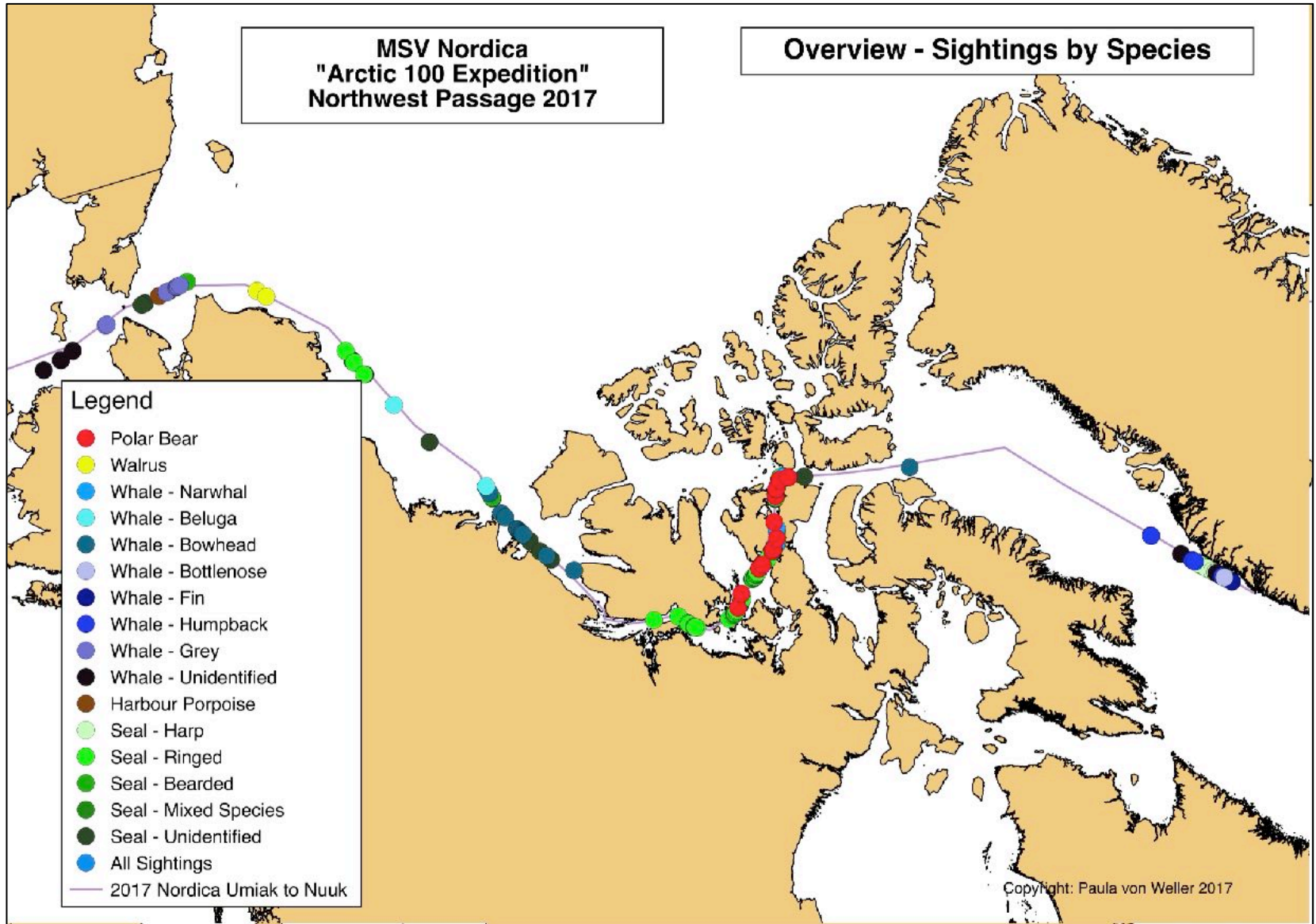
MODIS: Moderate Resolution Imaging Spectroradiometer

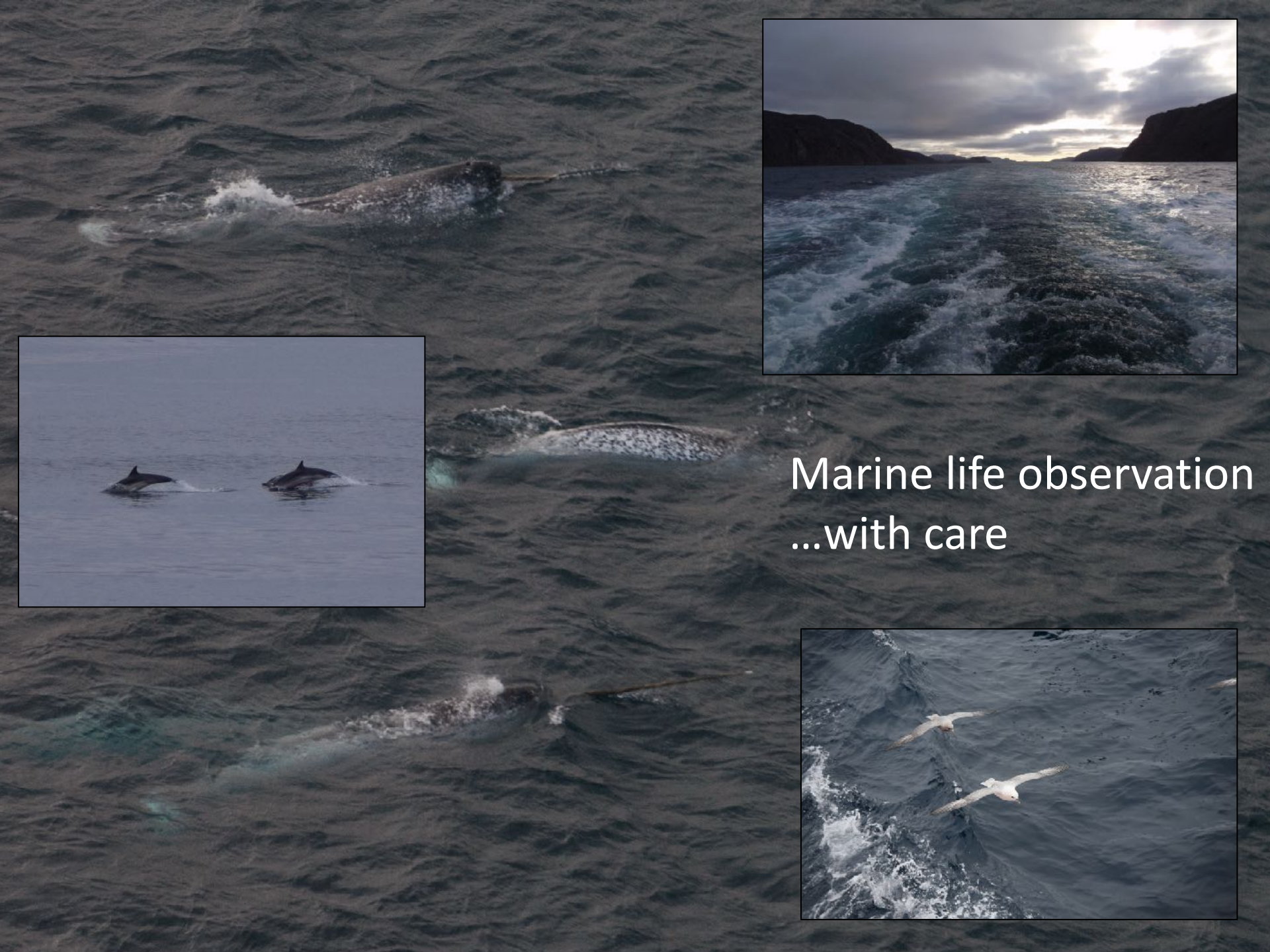
NORDICA
breaking Thick
First Year ice in
Victoria Strait



**MSV Nordica
"Arctic 100 Expedition"
Northwest Passage 2017**

Overview - Sightings by Species



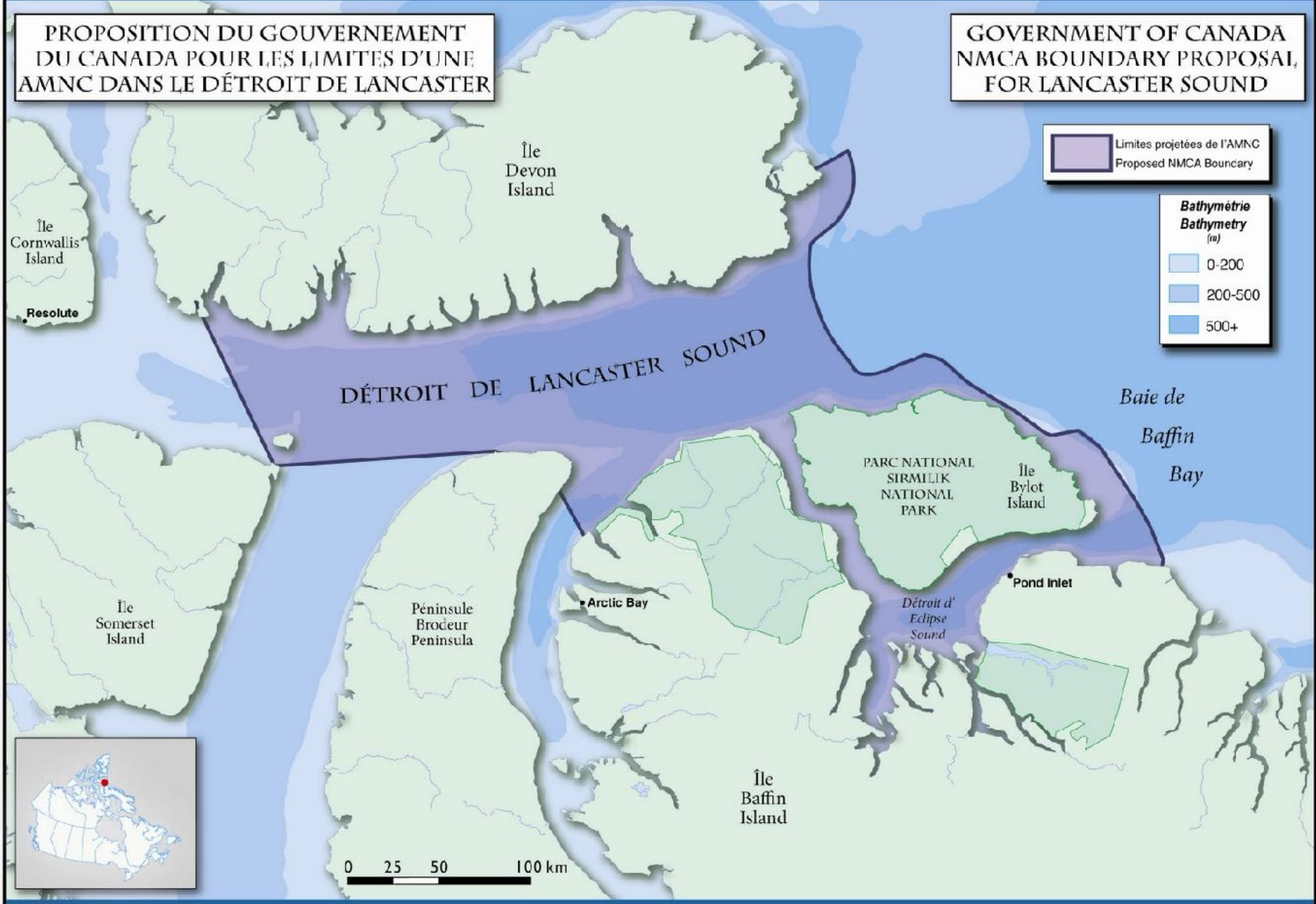


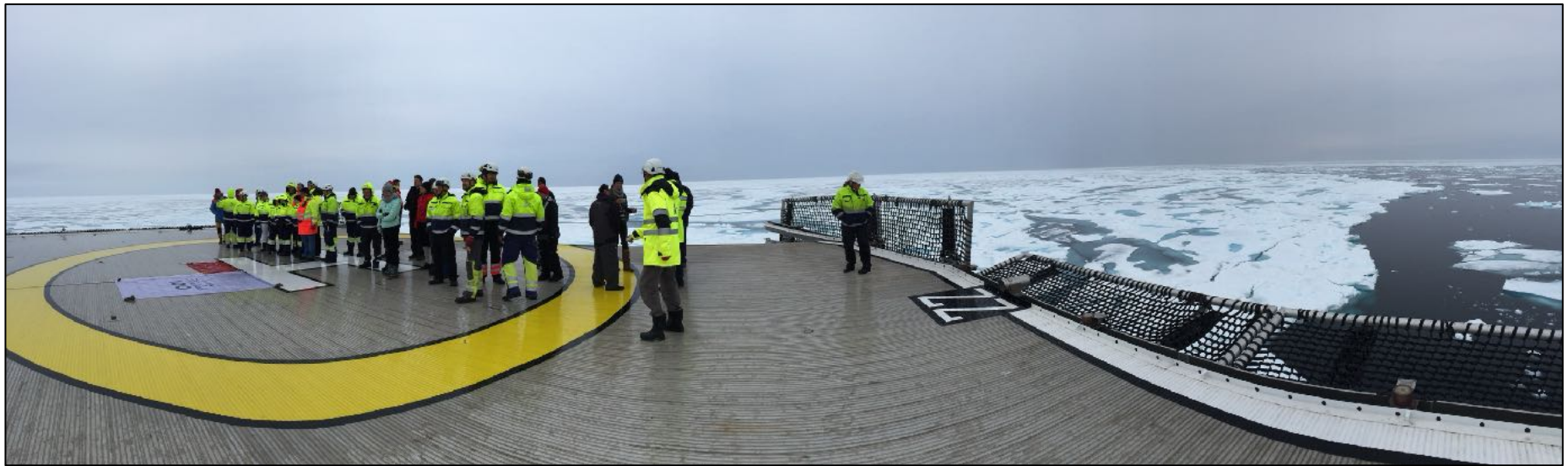
Marine life observation
...with care



PROPOSITION DU GOUVERNEMENT
DU CANADA POUR LES LIMITES D'UNE
AMNC DANS LE DÉTROIT DE LANCASTER

GOVERNMENT OF CANADA
NMCA BOUNDARY PROPOSAL,
FOR LANCASTER SOUND





Lancaster Sound photo-op, celebrating Finland 100/ Canada 150 Anniversaries

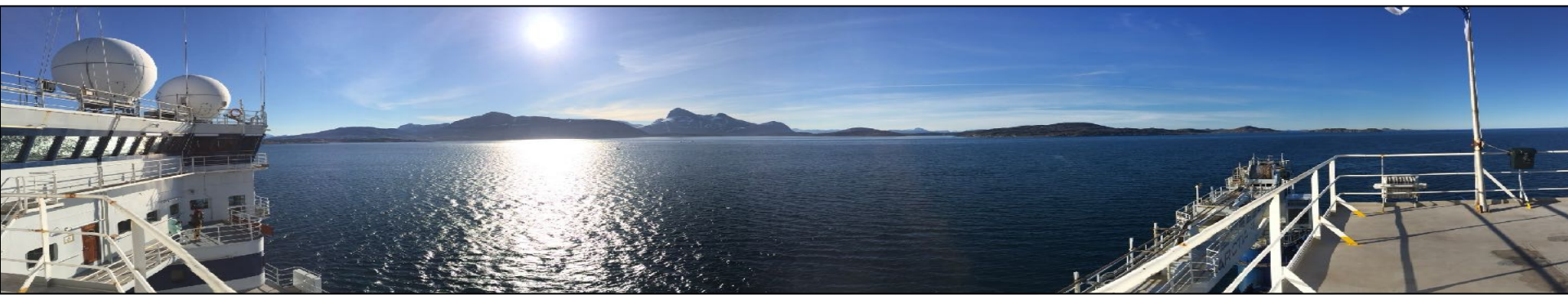


Fine weather in Baffin Bay, approaching Nuuk 29 July 2017



Journey's end: Nuuk and Kangerlussuaq





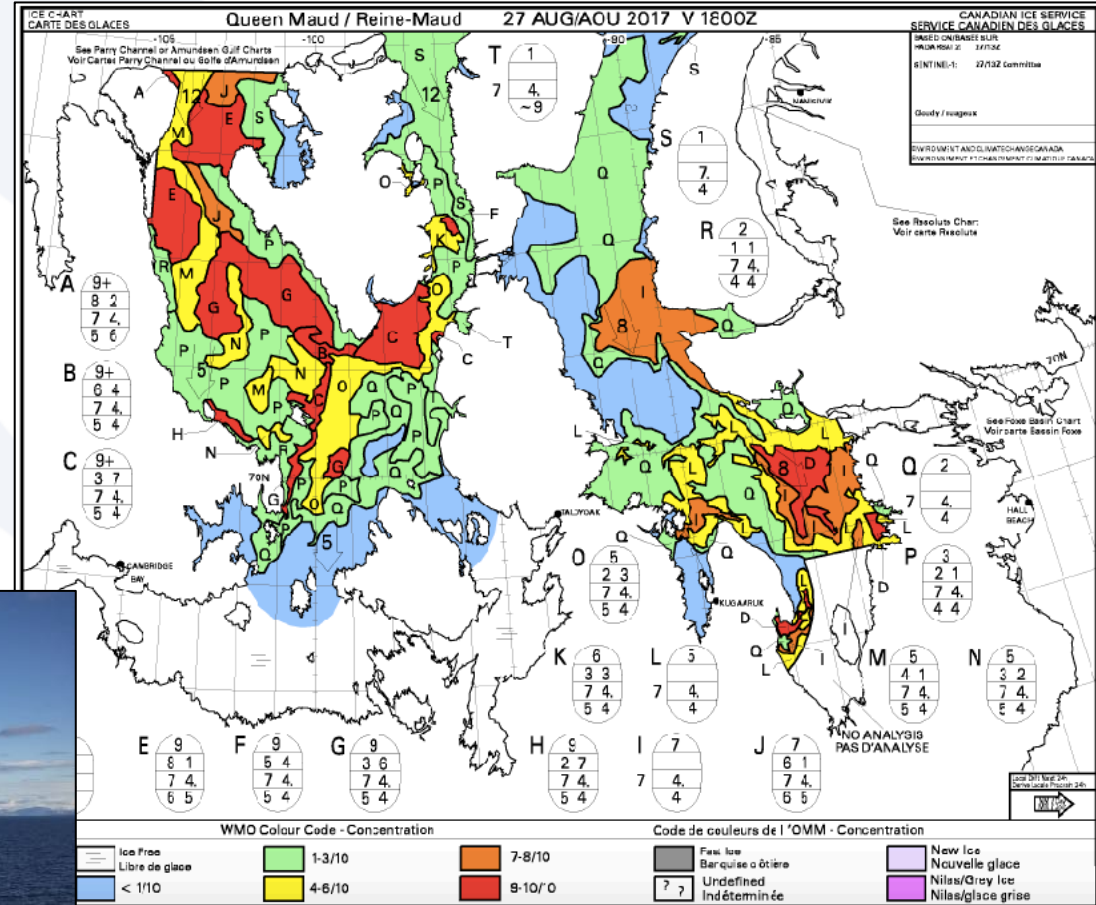
Arr Nuuk 29 July... and back there by 29 August 2017 to join RV XUE LONG



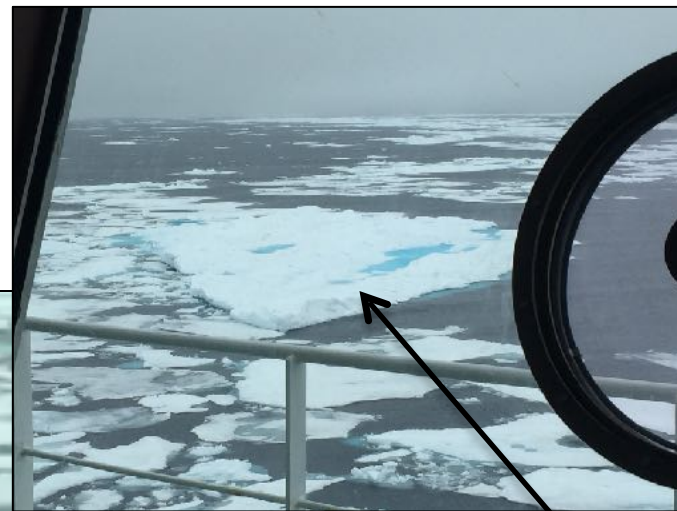
RV XUE LONG Circumpolar voyage completion through NWP



From Open Water in Lancaster Sd to 6-8/10th in Victoria Strait



RV XUE LONG in Victoria Strait



Old
Ice

**Multiple Seasons: Weekly Ice Coverage for the seasons
2016 and 2017, Weeks: 0514-1015**

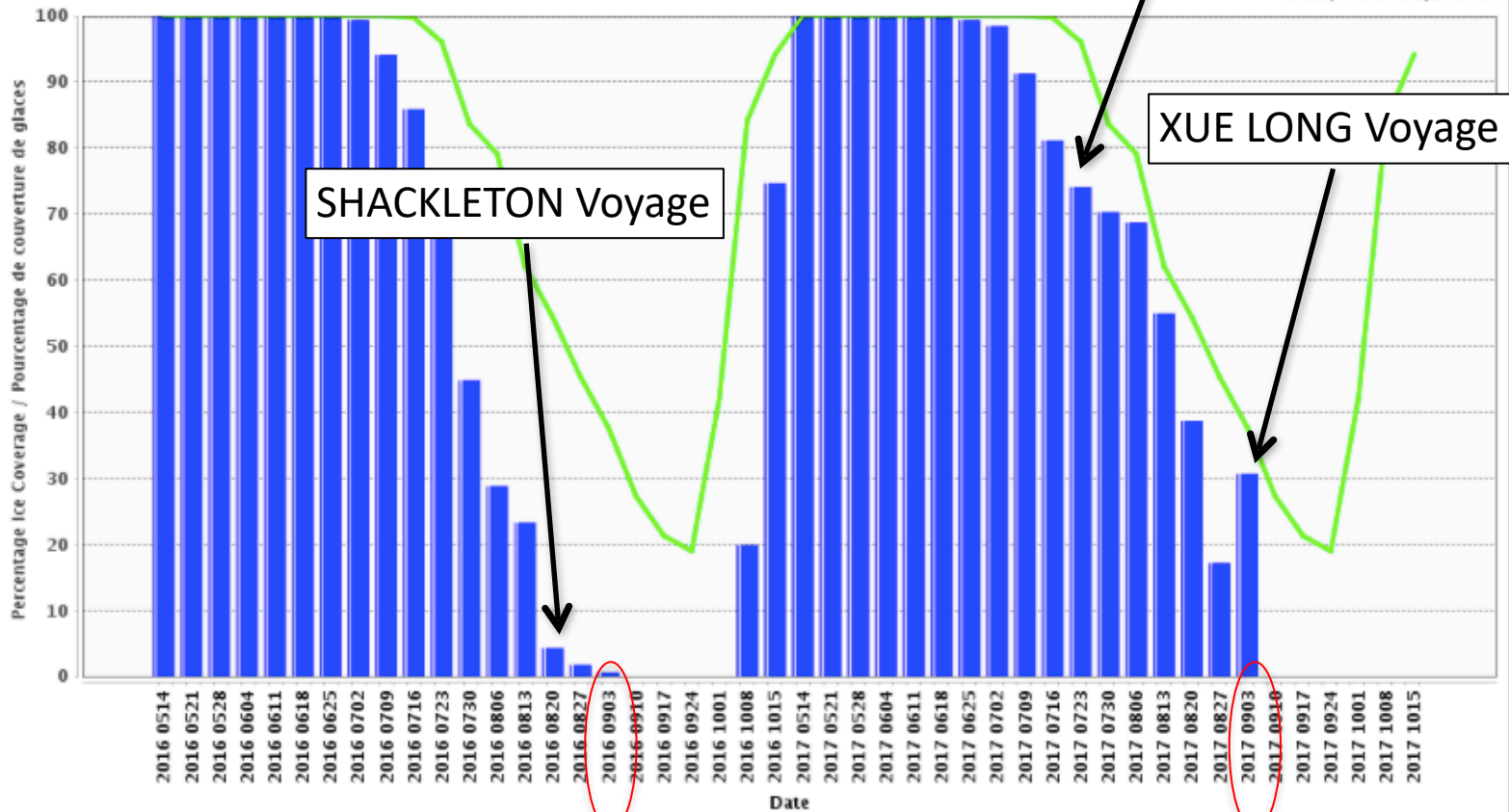
**Plusieurs saisons: Couverture des glaces hebdomadaire
pour les saisons 2016 et 2017, Semaines: 0514-1015**



CIS WA Franklin: Larsen - Victoria /
CIS WA Franklin : Larsen - Victoria

NORDICA Voyage

Area / Aire : 33,240 km²

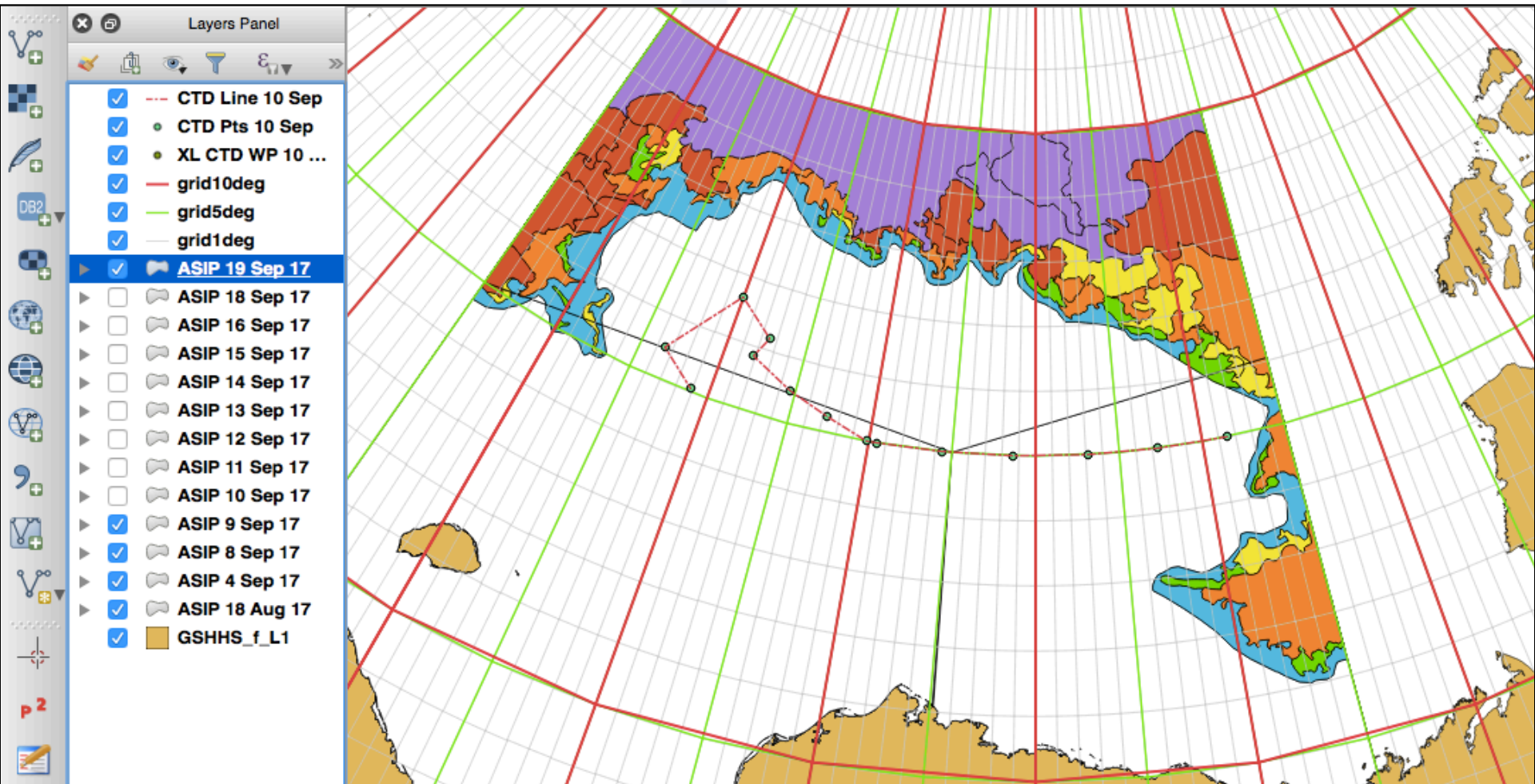


SHACKLETON Voyage

XUE LONG Voyage

No significant interpolated data / Pas d'interpolation significative
 Canadian Ice Service - Environment Canada / Service canadien des glaces - Environnement Canada
 (2017-09-09 14:28 IceGraph - Canadian Ice Service/Grappe des glaces - Service canadien des glaces 2.0.7 2014/01/21)
 ■ Ice Coverage / couverture des glaces ■ Interpolated Data / Interpolée ■ No Data / Aucune donnée ■ Median / médiane 1981-2010

Conditions in Beaufort/Chukchi Seas in 9-19 September 2017



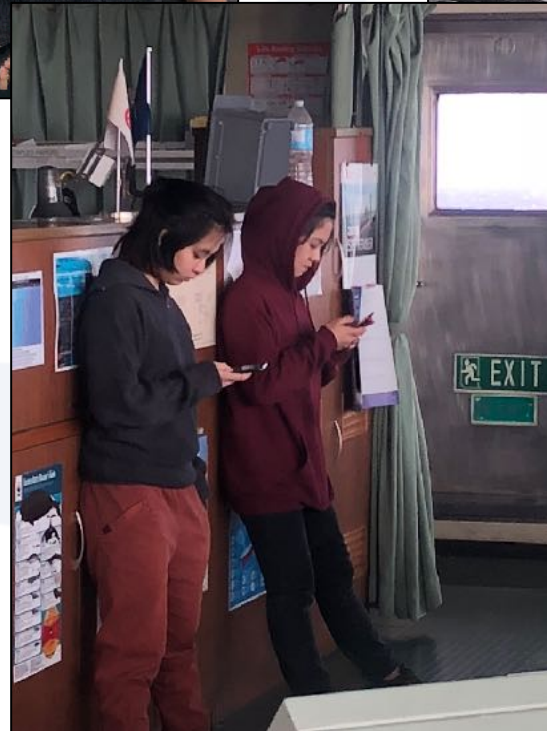
Much Open and Ice-Free Water, but still lots of mobile ice in eastern Beaufort



Boarding MV GOLDEN STRENGTH in Gibraltar 23 July 2018



MV GOLDEN STRENGTH Crew ...



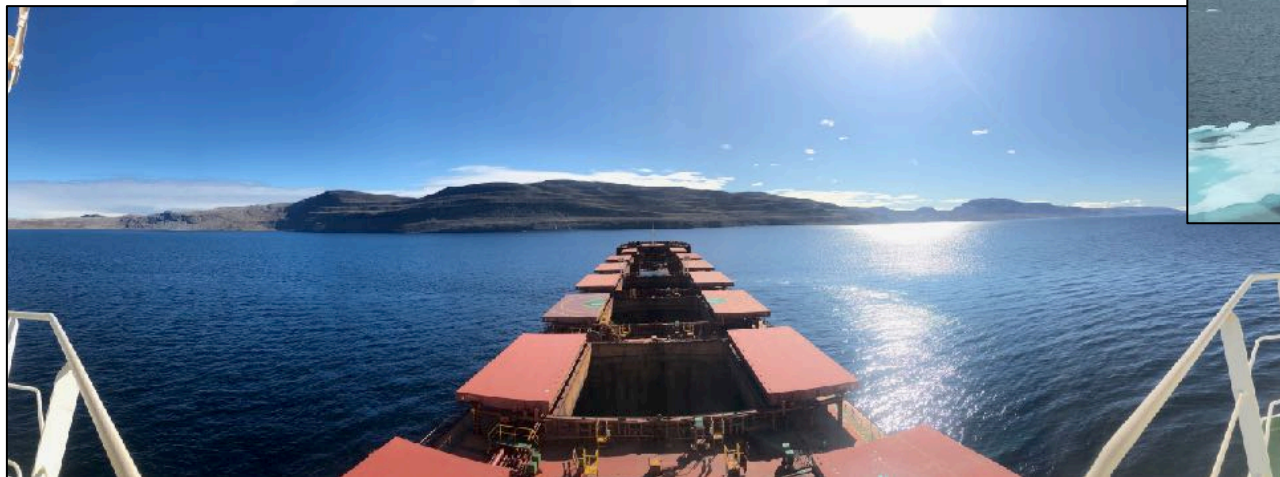
... Filipino (a!)

Adjusting to size
& culture...





Pond Inlet & Eclipse Sd ...waiting,
cargo hold cleaning, drying



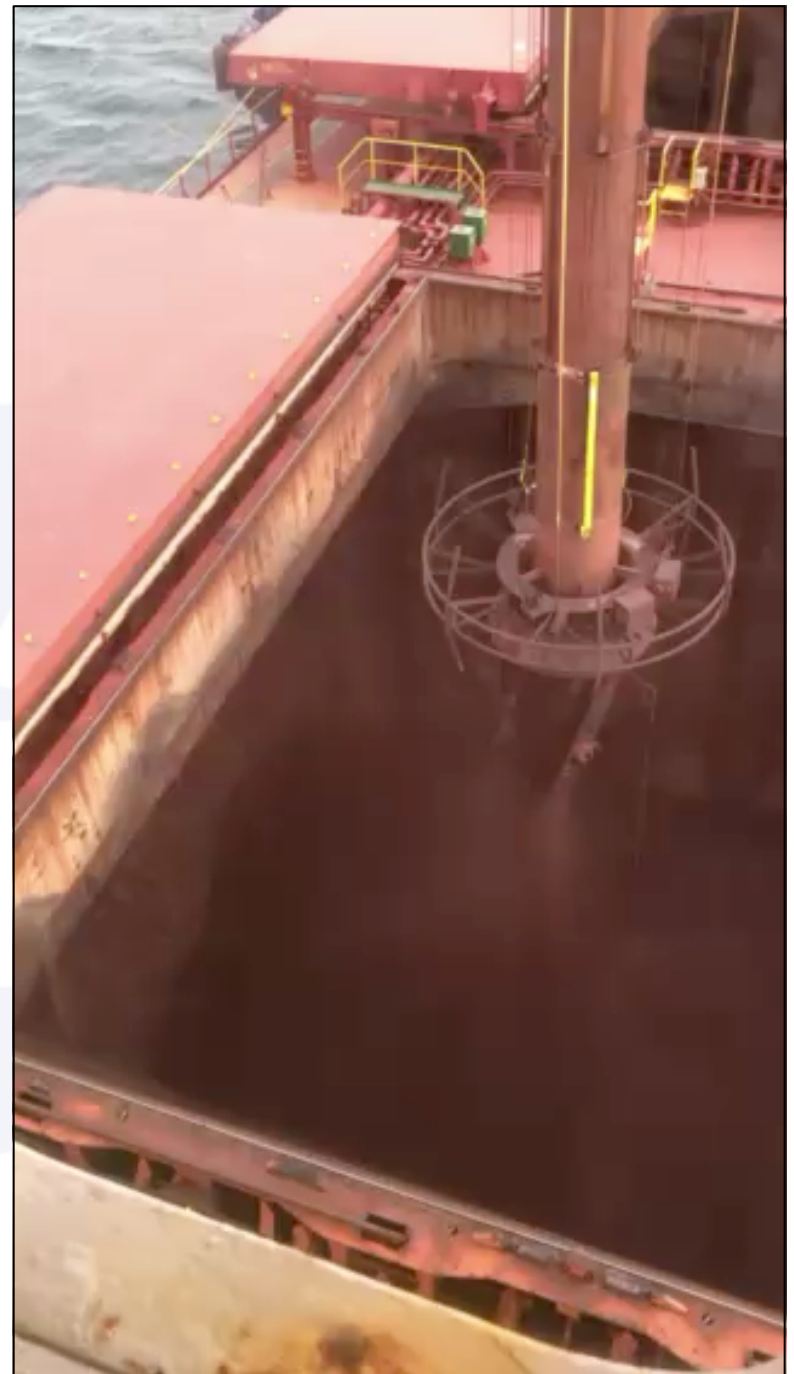
Lead-through by MSV Botnica, 10 Aug 2018



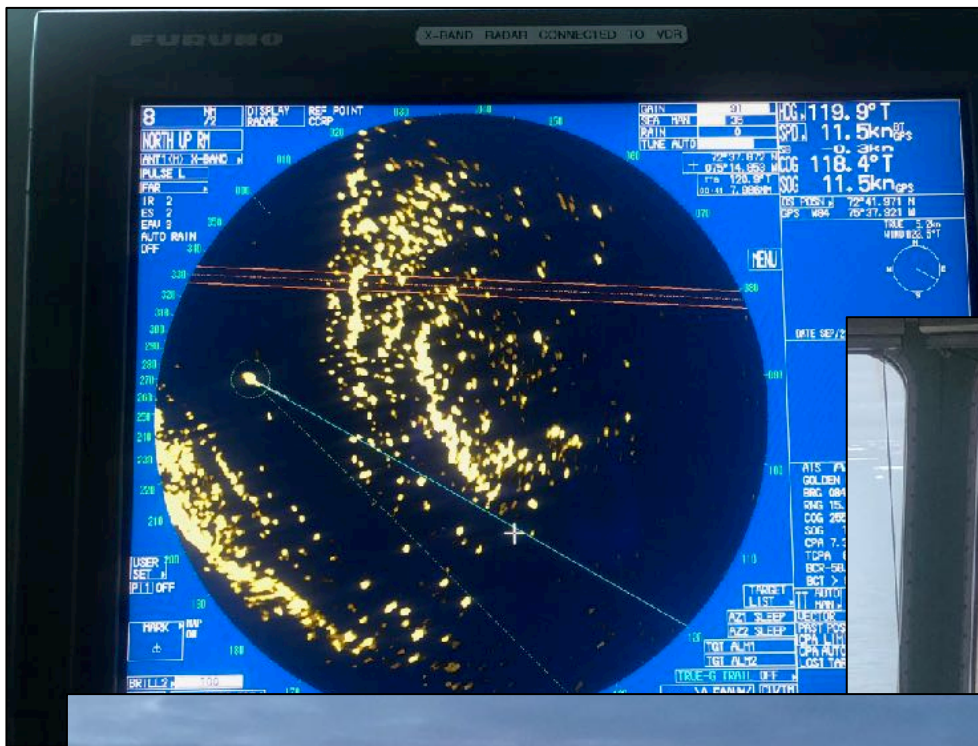
Loading 70%+ iron ore at Milne Inlet ... at 7000t/hr!



~72 shipments in the season, up to 75,000t/ship,
for total of ~5M mt from early Aug to mid-Oct

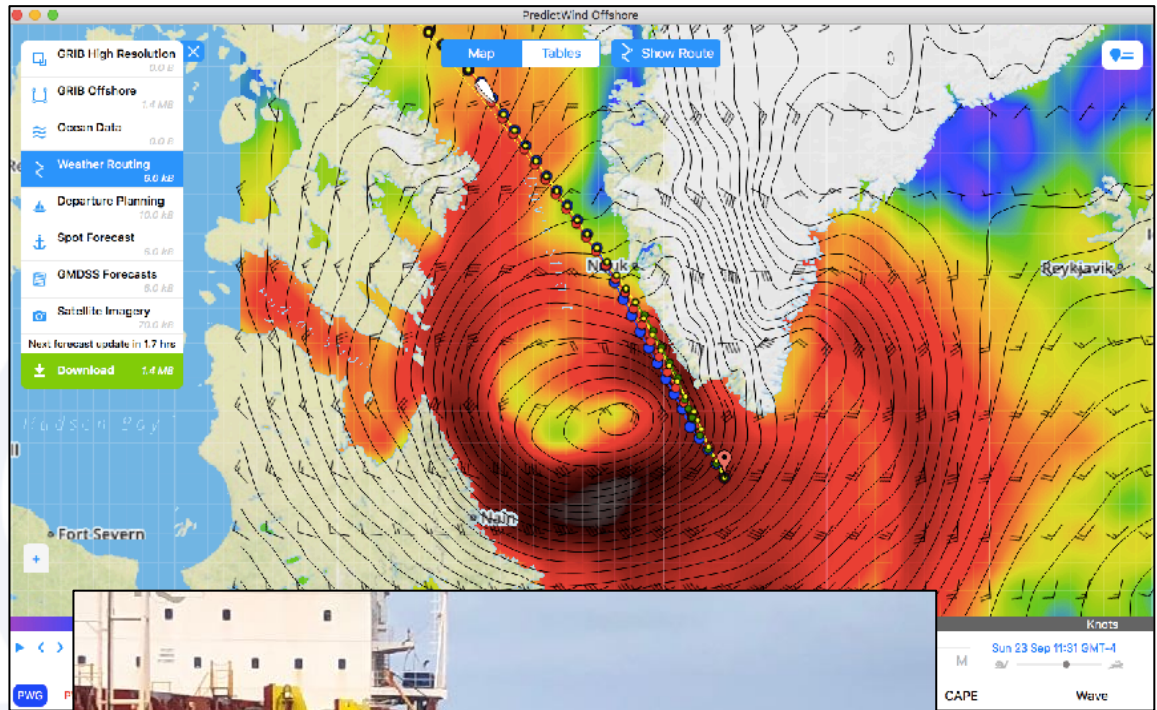


Exit Pond Inlet 22 Sep 2018 ... heaviest ice, outflow from Lancaster Sound



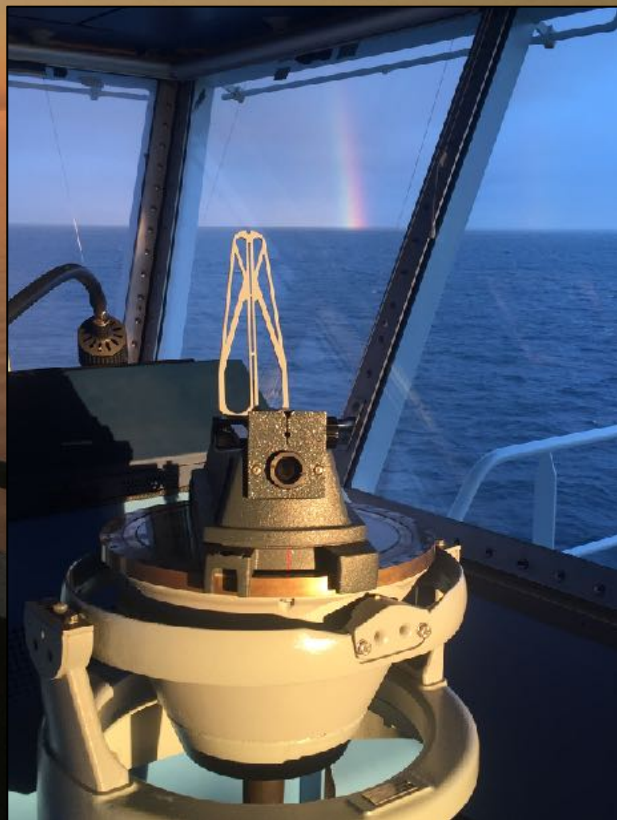
Just before freeze up begins

Rolling home to Rotterdam...



Summary:

- Highly variable ice conditions
- Long days ...shortening rapidly as the navigation season ends
- Mobile ice a key concern
- Vigilance by eye and radar essential
- Differentiation of FY and MY ice important
- Role of Ice Navigator to advise, augment watch-keeping crew
- Key ice-navigation tactic: Avoidance!!





Questions?



RAdm Nigel S. Greenwood CMM, CD, RCN (Ret'd)
Master Mariner **FRIN, FNI**

4022 Rainbow Hill Lane
Victoria, BC Canada V8X 0A6

1 (250) 507-8445
nsg@greenwoodmaritime.com

GreenwoodMaritime.com

