Canadian Marine Science Plans 2017

Pacific Arctic Waters

Pacific Arctic Group Meeting, April 2

Arctic Science Summit Week, Fairbanks, Alaska

Humfrey Melling, Fisheries and Oceans Canada

CCGS Sir Wilfrid Laurier

Sustained Observation of the Beaufort-Chukchi

Scientists at DFO's Institute of Ocean Sciences, Pacific Region, Sidney BC

Humfrey Melling, Bill Williams, Svein Vagle

Continuous observations at some locations for more than a quarter century

Field work supported by Canadian Coast Guard ships on annual Arctic Patrols

Resources provided by:

DFO, PERD, ESRF, Imperial Oil, Shell Oil, NSF(USA), NOAA(USA), BOEM(USA)

Collaborators in 2017 include:

ArcticNet Inc, Geological Survey of Canada, Woods Hole Oceanographic Institute, US National Marine Mammals Lab, U Maryland Center for Environmental Studies,

ASL Environmental Sciences Inc., Environment Canada, APL-UW

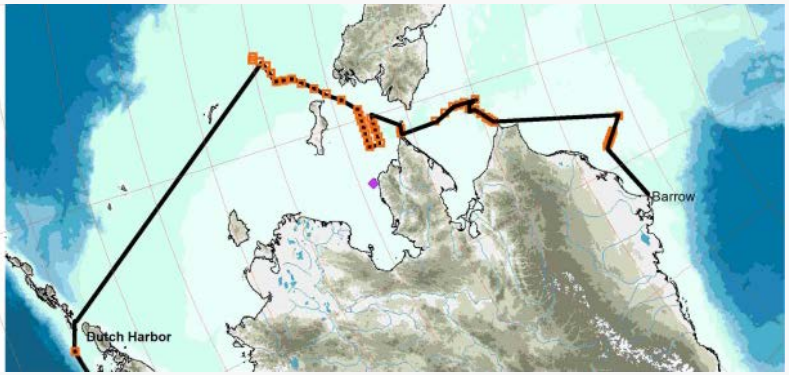
Projects supported:

Canada's 3 Oceans, Beaufort Marine Hazards (BMH), Beaufort Marine Geohazards, MARES, Integrated Beaufort Observatory (IBO),

Arctic Ice Monitoring (AIM), Joint Ocean Ice Studies (JOIS),

Distributed Biological Observatory (DBO)

Transit to the Arctic across the NE Pacific: C3O, DBO



2-23 July 2017 – 15 scientists

Transit plus, 6 days for science,

- U-CTD & X-CTDs during transit
- CTD/Rosette casts across the Gulf of Alaska.
- Underway seawater sampling
- Bird observations
- Deployment of Argo floats, moorings

Stop at Dutch Harbor, board 12 scientists for DBO

- Sediment sampling using VanVeen grabs & Happs corer in the Bering & Chukchi Seas
- CTD & geochemical sampling with the rosette
- Plankton samples with vertically towed bongos.

Return to the Pacific from the Arctic

During the homebound transit (Leg 3) of Sir Wilfrid Laurier, after crew change in late September2017.

Board at Kugluktuk NU. Disembark at Nome AK

13 days of ship time dedicated to an oceanographic mooring programme in the Beaufort and Chukchi Seas – 22 sites.

Science complement of 14-15.

DBO-8 & DBO-4 reference sections – CTDs with DO, fluorescence, transmissivity, PAR.

Targeted sampling of water for geochemical analysis – no ocean sections

Underway measurement of seawater temperature, salinity & fluorescence (intake at 5.5 m depth)

CCGS Sir Wilfrid Laurier servicing long-term observing sites during autumn 2017

Sites serviced by
Louis S St-Laurent

76 N°
70 N°
68 N°
170 W°
166 W°
162 W°
158 W°
154 W°
150 W°
146 W°
142 W°
138 W°
134 W°
130 W°
126 W°
124 W°
AIM
DBO4
S7
Deadhorse
Bering Strait
BR-3
CA-5
CA-8
DBO8
CB
BR-G
Site 2
BR-K
Site 1
BR-1
M4 - M1
Site 9
Site 11

Year-round observations from submerged moorings reveal the natural range of conditions, norms & extremes, trends, …

Sea ice

- Thickness, drift speed & direction , hazardous features

Sea surface

- Storm waves, storm surge

Ocean current – surface to seabed

- Speed & direction, ocean eddies, intensified flow at the seabed, pathways for water movement (e.g. marine pollutant dispersal) at all depths

Ocean water masses – key levels

- Temperature & salinity at key levels, identification of water-mass origin

Biological hotspots

- Upwelling of nutrient rich water, variation in zooplankton abundance

Settling & re-suspension of sediment

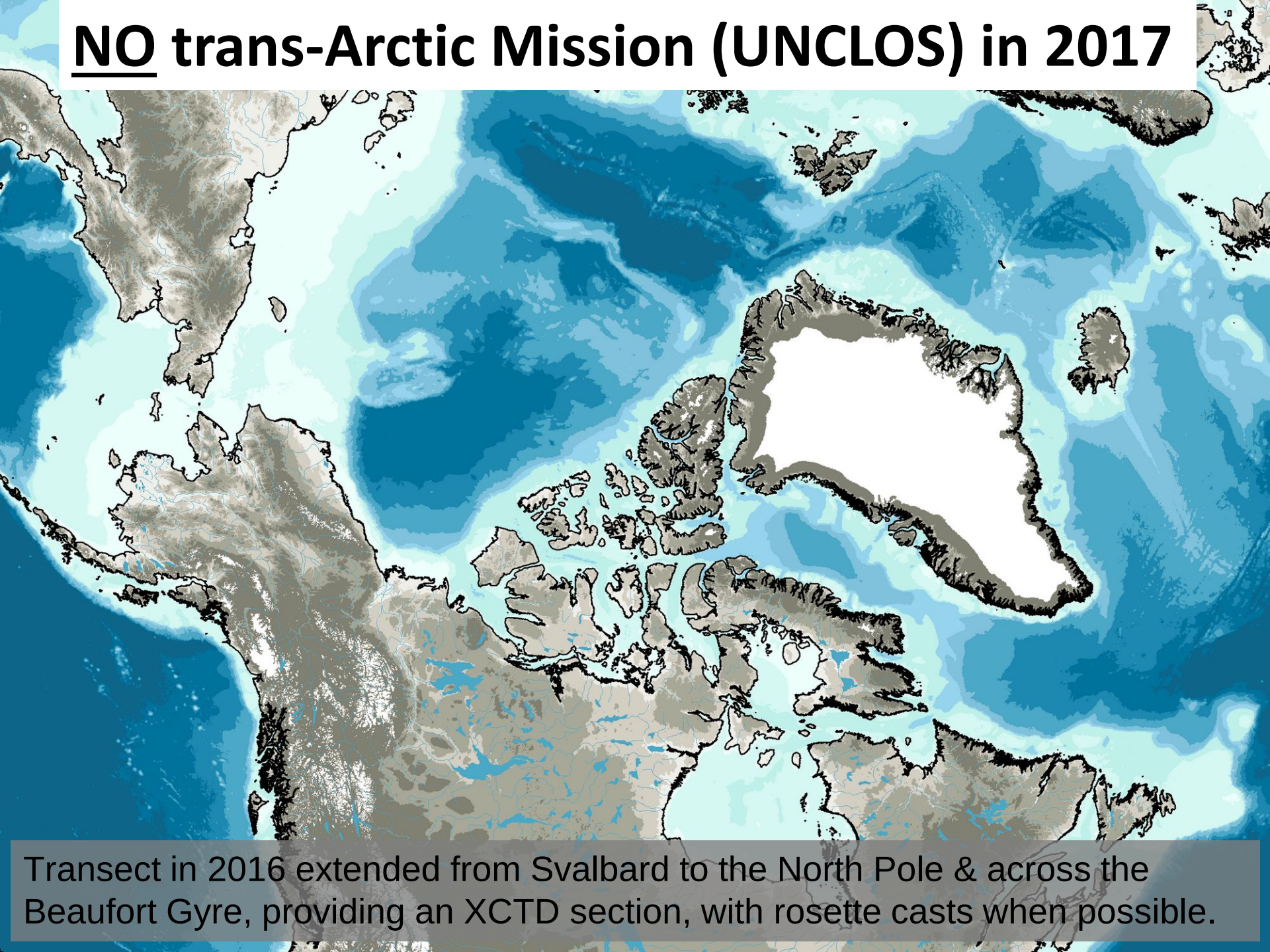
- Rate and variability of supply, plankton blooms, dispersal of eroded sediments

Ambient sound

- Mammal's vocalization, species presence, natural sound, seismic sound, ship noise

CCGS Louis S. St-Laurent

NO trans-Arctic Mission (UNCLOS) in 2017



Transect in 2016 extended from Svalbard to the North Pole & across the Beaufort Gyre, providing an XCTD section, with rosette casts when possible.

JOIS AON BGOS

CCGS Louis S. St-Laurent

Kugluktuk to Canada Basin, returning to Kugluktuk

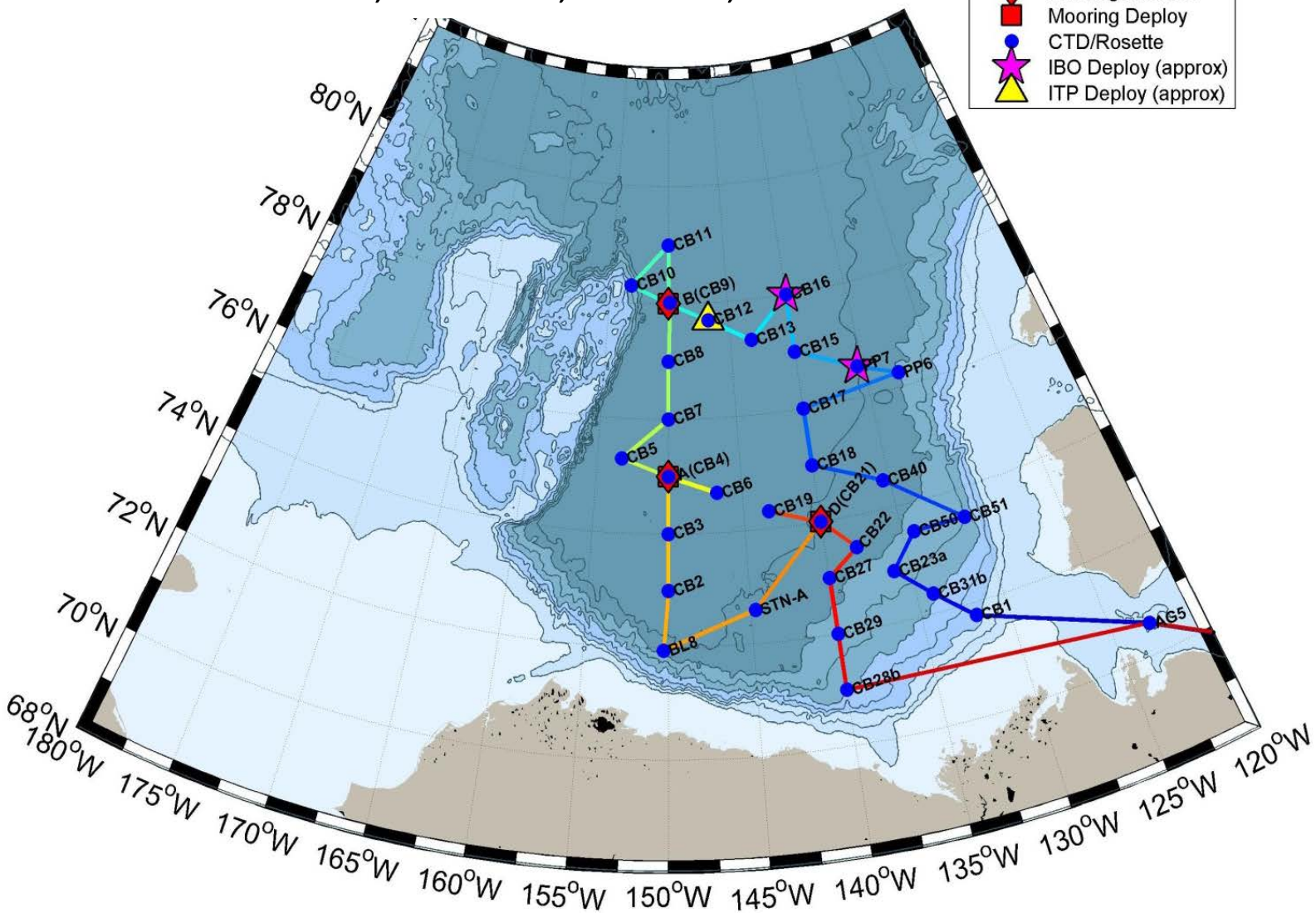
- 7 September – 2 October, 2017 (25 days – 2 less than in 2016)
- Science team of 35
- CTD/rosette profiling & biogeochemical sampling
- Vertical net tows
- Infill survey using XCTD & UCTD
- Recover & deploy 3 moorings (WHOI)
- Deploy 3-4 ice-tethered profilers
- Deply 2 ice-based observatories
- Underway measurements – intake at 10m depth
- Ice Observations (ship, ice & helicopter)

(Photo: Jeffrey Cha

JOIS AON BGOS

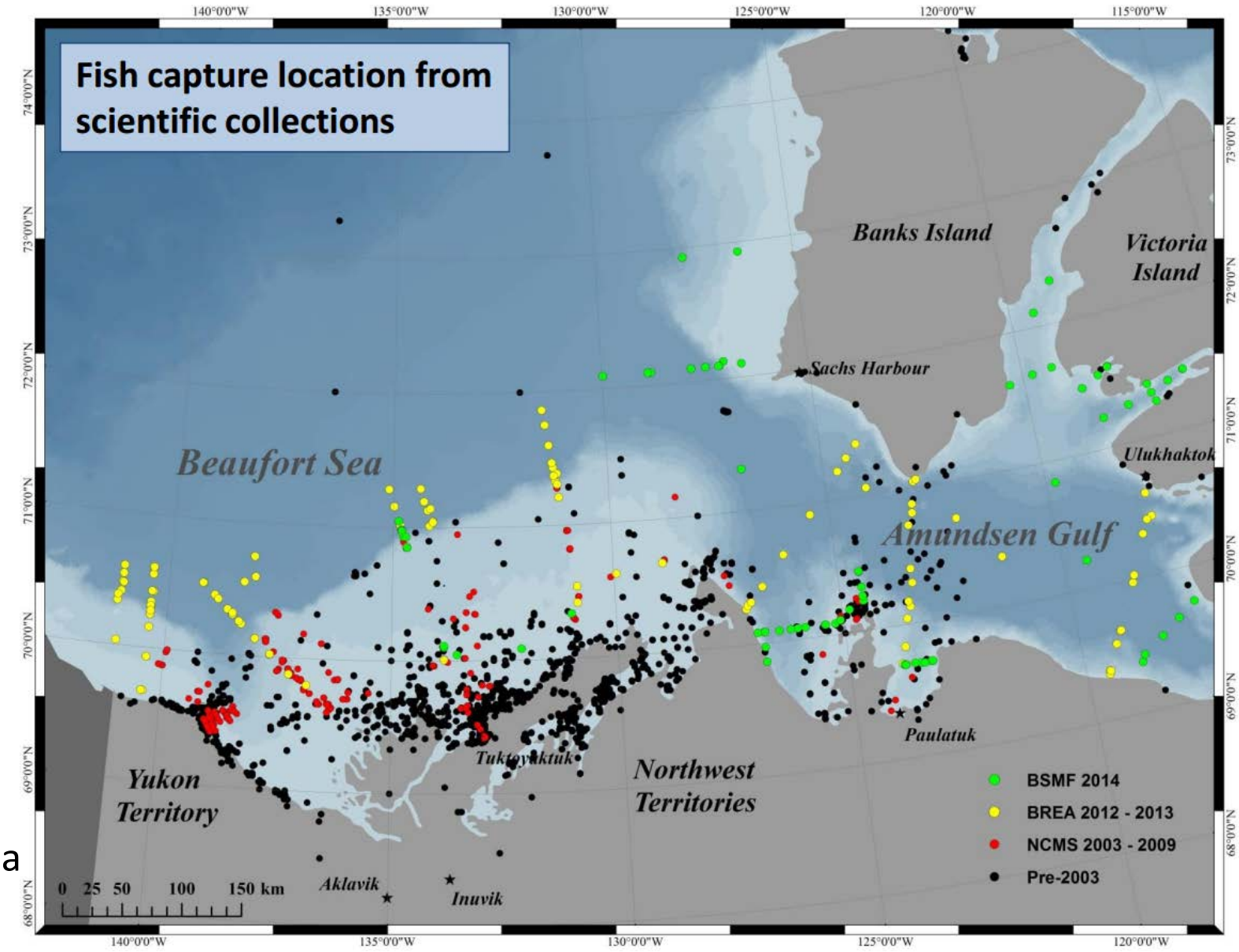
Chief Scientist: Bill Williams

Collaborations: WHOI, JAMSTEC, TUMSAT, …



F/V Frosti

Mid-depth Trawl Surveys of 2012-14 will be repeated in 2017



Sea

Offshore Marine Fishes Project – Goals

Fish Population Census

- Establish baselines for diversity, relative abundance & geographic preferences of offshore marine fishes

Community structure

- Establish what species live together, their habitat associations

Ecosystem Linkages

- Food webs
- Energy pathways
- Movements between habitats

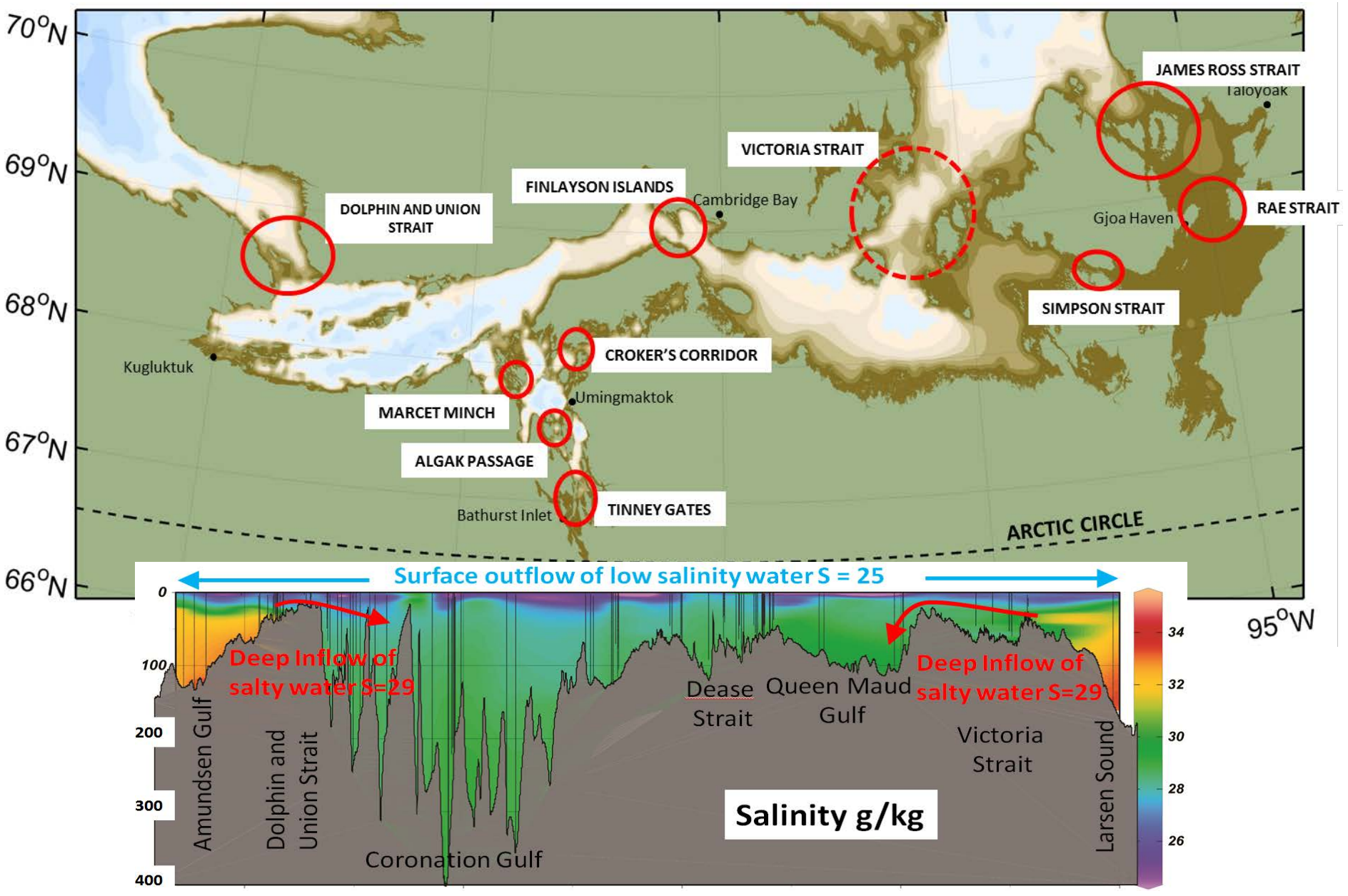
Associated Environmental Conditions

- Water depth
- Water masses
- Benthic attributes

R/V Martin Bergmann

19-m fishing trawler, reconfigured for coastal ocean science, 6 scientists

The Kitikmeot Sea



Ecological Research & Monitoring the Kitikmeot Sea

Vessel's home base is Cambridge Bay

- Operated by the non-profit Arctic Research Foundation
- Northern anchorage permits immediate start when local ice clears in late July
- Supports initiatives of DFO, ONC, OTN, PolarKnowledge, UVic, WHOI, UAF, AUN

Ocean moorings

- Submerged instruments monitor ocean current, salinity, temperature, PAR, DO, etc., year-round operation by DFO & U Manitoba
- Submerged listening stations track charr during summer feeding at sea operated by Ocean Tracking Network (OTN)

Cabled observing station in Cambridge Bay

- Operated as a test-bed cabled observatory by Ocean Networks Canada (ONC)

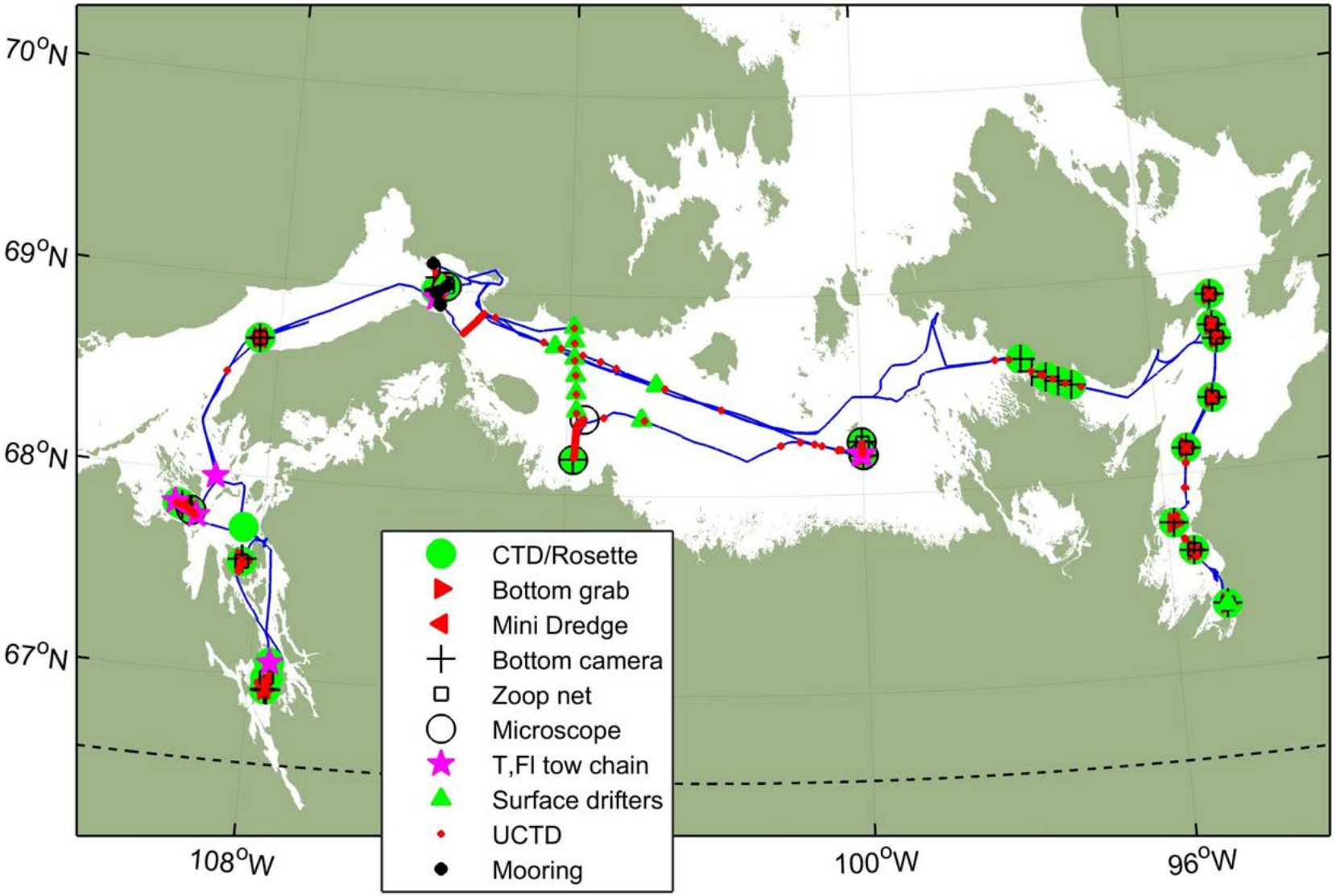
Reference oceanographic transects

- Temperature, salinity, fluorescence, DO, turbidity, etc., measured from R/V Martin Bergmann in August & from the ice surface in March by the Canadian Rangers (CROW)

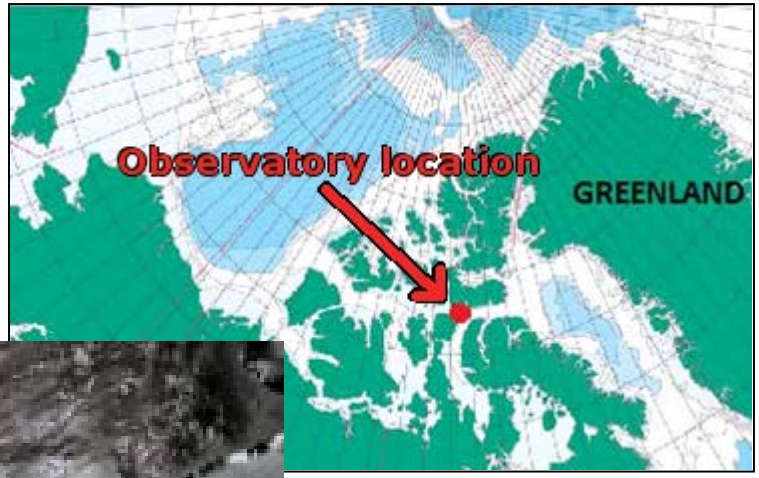
Biological hotspots

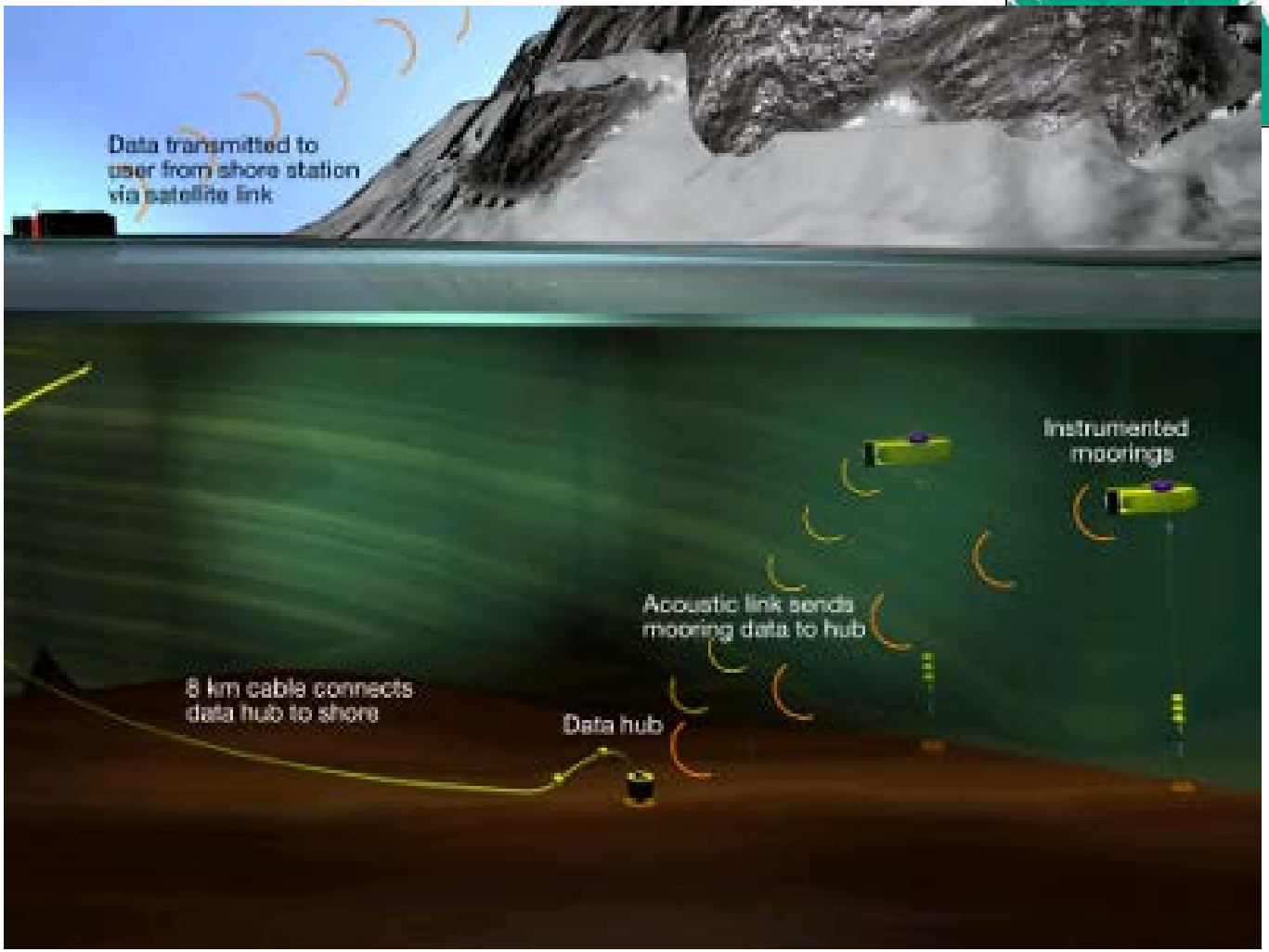
- Search for areas where upwelling brings nutrient rich water into the photic zone – traditional knowledge & science working together

R/V Martin Bergmann Ecological Survey
mid-August to mid-September 2017



Cabled Observatory in the NW Passage





Infrastructure for monitoring & reporting ocean data

Installation is 3 km off the coast of Devon Island in Lancaster Sound

- Operated jointly by DFO & Canada's Department of Defence
- Established in 2009
- Data from a field-test site in eastern Canada are presently available at:
- http://www.bio.gc.ca/science/newtech-technouvelles/observatory-observatoire-en.php#recent

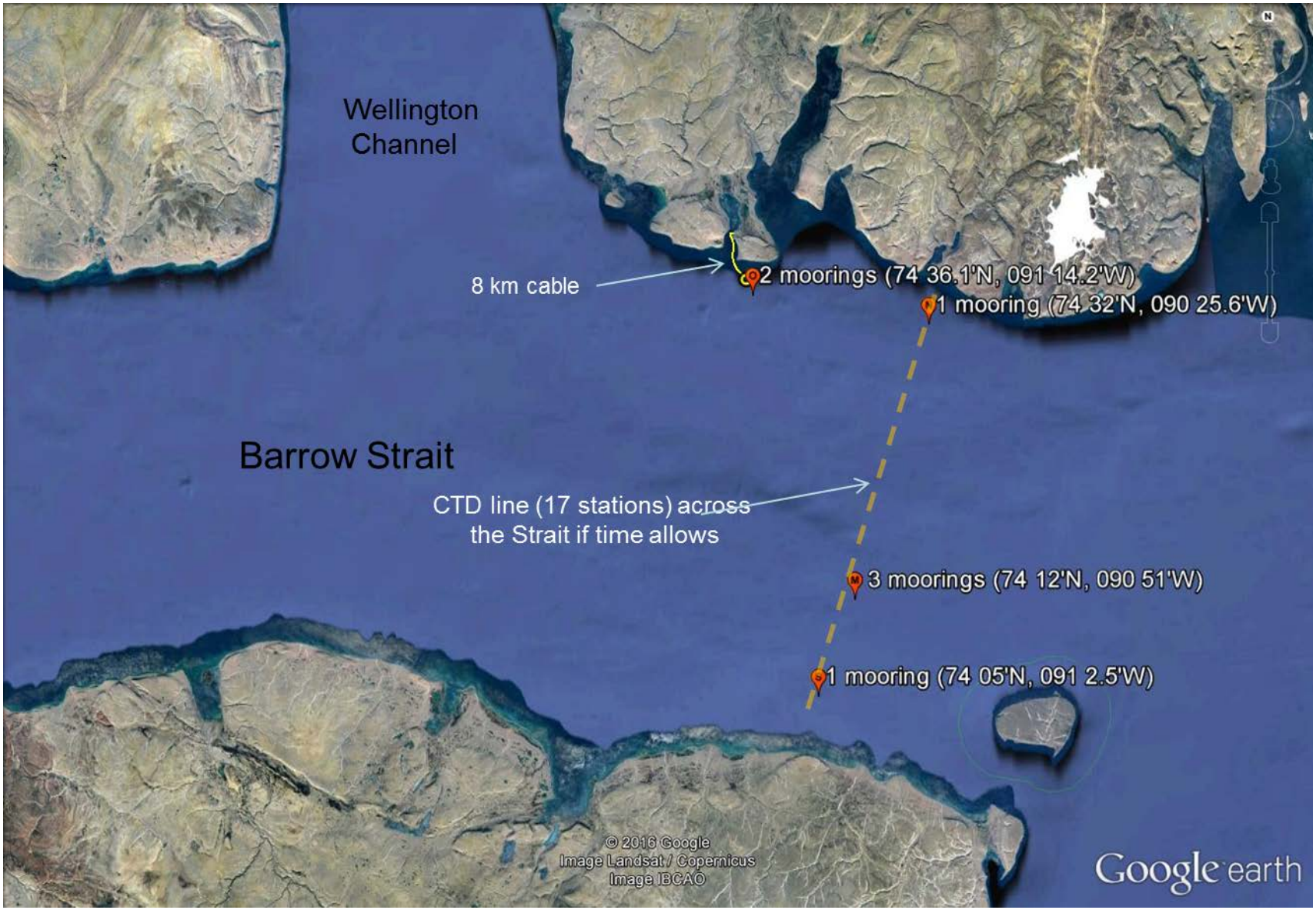
Ocean moorings

- Submerged instruments operated independently of the u/w cable
- Data are related to a node on the cable via an acoustic telemetry daisy chain
- Presently instrumented for ocean current, ice draft, temperature & salinity
- Scientific focus is the Canadian Arctic Through-flow (CAT)
- Upstream sills limit CAT primarily to Pacific-derived water

Activity in 2017

- A replacement underwater cable is to be installed this August to bring the Arctic observatory back on line

Infrastructure for monitoring & reporting ocean data



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AMUNDSEN

2017 *Amundsen* Expedition Overview

On 31 May, the CCGS *Amundsen* is scheduled to leave its homeport of Quebec City for a 133-day expedition to Hudson Bay and the Canadian Arctic in support of several research programs: ArcticNet's marine-based research program, BaySys, the Nunavik Inuit Health Survey, Sentinel North and the Kitikmeot Marine Region project, a collaboration between ArcticNet, The W. Garfield Weston Foundation and Parks Canada. Based on the science objectives, the expedition has been divided into six segments (4 legs):

- Leg 1: Quebec City to Churchill (31 May - 6 July)
- Leg 2a: Churchill to Iqaluit (6 - 13 July)
- Leg 2b: Iqaluit to Puvirnituq (13 July - 17 August)
- Leg 3: Puvirnituq to Kangiqsujuaq (17 August - 14 September)
- Leg 4a: Kangiqsujuaq to Kuujjuaq (14 September – 6 October)
- Leg 4b: Kuujjuaq to Quebec City (6 – 12 October)

2017 *Amundsen* Expedition – Overview