CANADIAN HYDROGRAPHIC SERVICE

Surveying and Charting Canada's Waters Since 1883

Ilulisat Maritime Workshop 2017

The Importance and Need for Hydrography

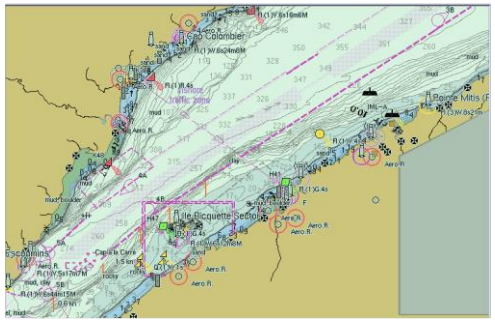
Pêches et Océans Canada | Fisheries and Oceans Canada

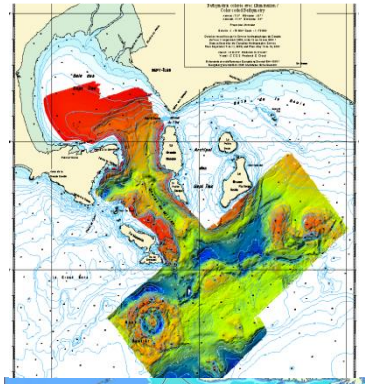
Denis Hains, Hydrographer General of Canada & Director General

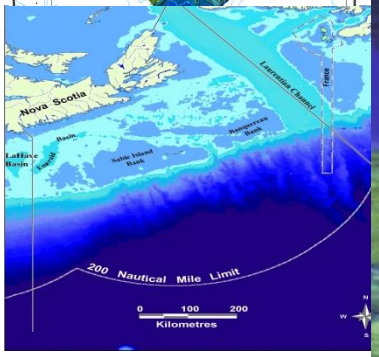
Canadian Hydrographic Service (CHS)

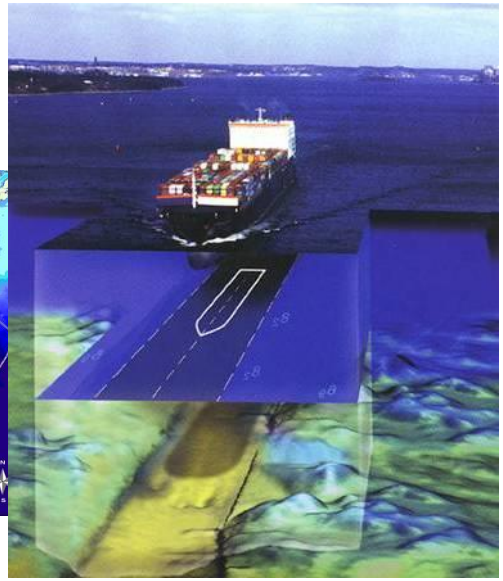
Ilulisat, Grenland - 22 August, 2017

Canada









Purpose

Present the:

- **Canadian Hydrographic Service (CHS)**
- **Canadian Arctic Challenges**
- **Status & Existing Data**
- **Canadian Ocean Protection Plan**
- **Marine Spatial Data Infrastructure**
- **Crowd-Source Bathymetry**
- **Satellite-Derived Bathymetry**
- **Canadian Ocean Mapping research & Education Network (COMREN)**

Definition

Hydrography is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation and in support of all other marine activities, including economic development, security and defence, scientific research, and environmental protection.

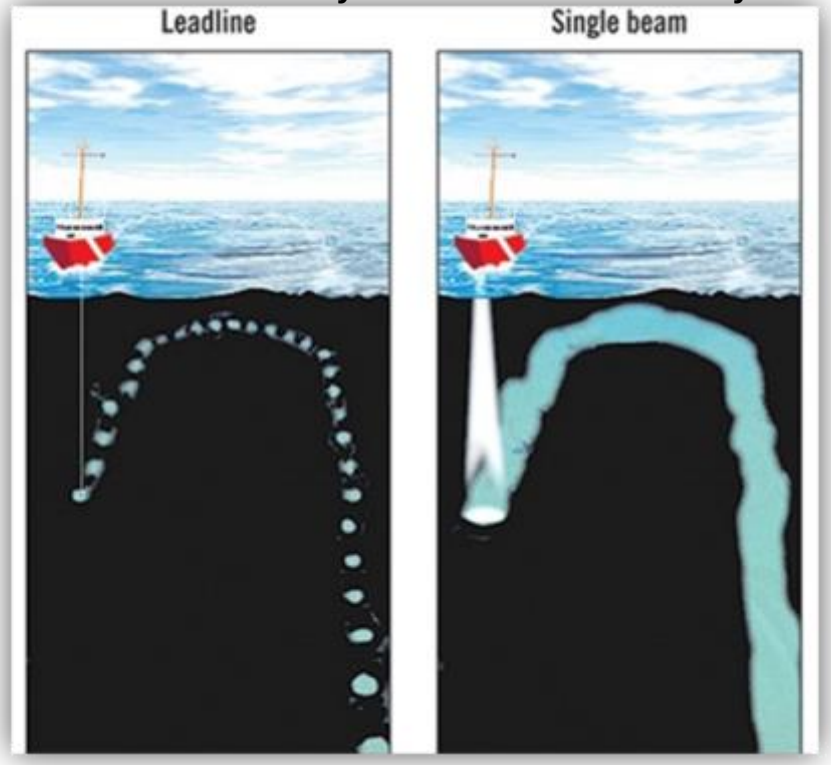
Source: International Hydrographic Organization

What is an Hydrographic Office?

- An organization which is devoted to acquiring and publishing hydrographic information for safe and efficient navigation.
- Main tasks:
  - hydrographic surveys
  - publication of official ‘’**Legal**’’ nautical charts (paper, digital equivalent and Electronic Navigational Charts)
- Many hydrographic offices produce other nautical publications, services & **data**:
  - Sailing Directions
  - lists of lights
  - tide tables and tidal atlases
  - Notice to Shipping & Notices to Mariners
  - Forecasted, observed or Real-Time Tides, currents and water levels

Comparison of Bathymetric Data Collection technologies

Insufficient Surveys

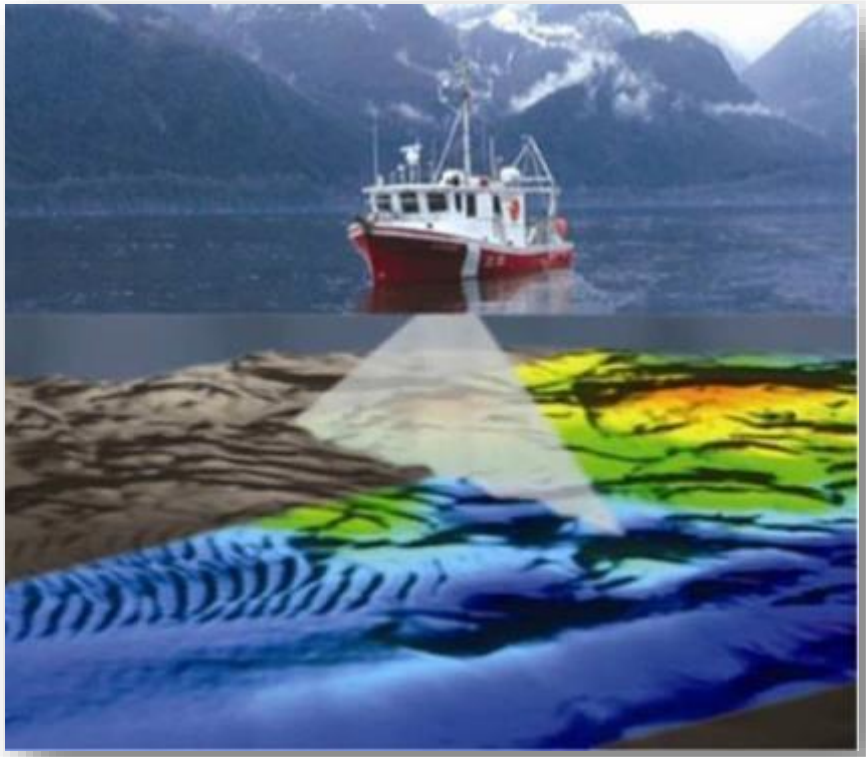


Pre-1940
1-2,000 spot soundings / survey

Sufficient Surveys

1940 - 1998
500,000 – 750,000 profile soundings / survey

MODERN Surveys Multi-beam



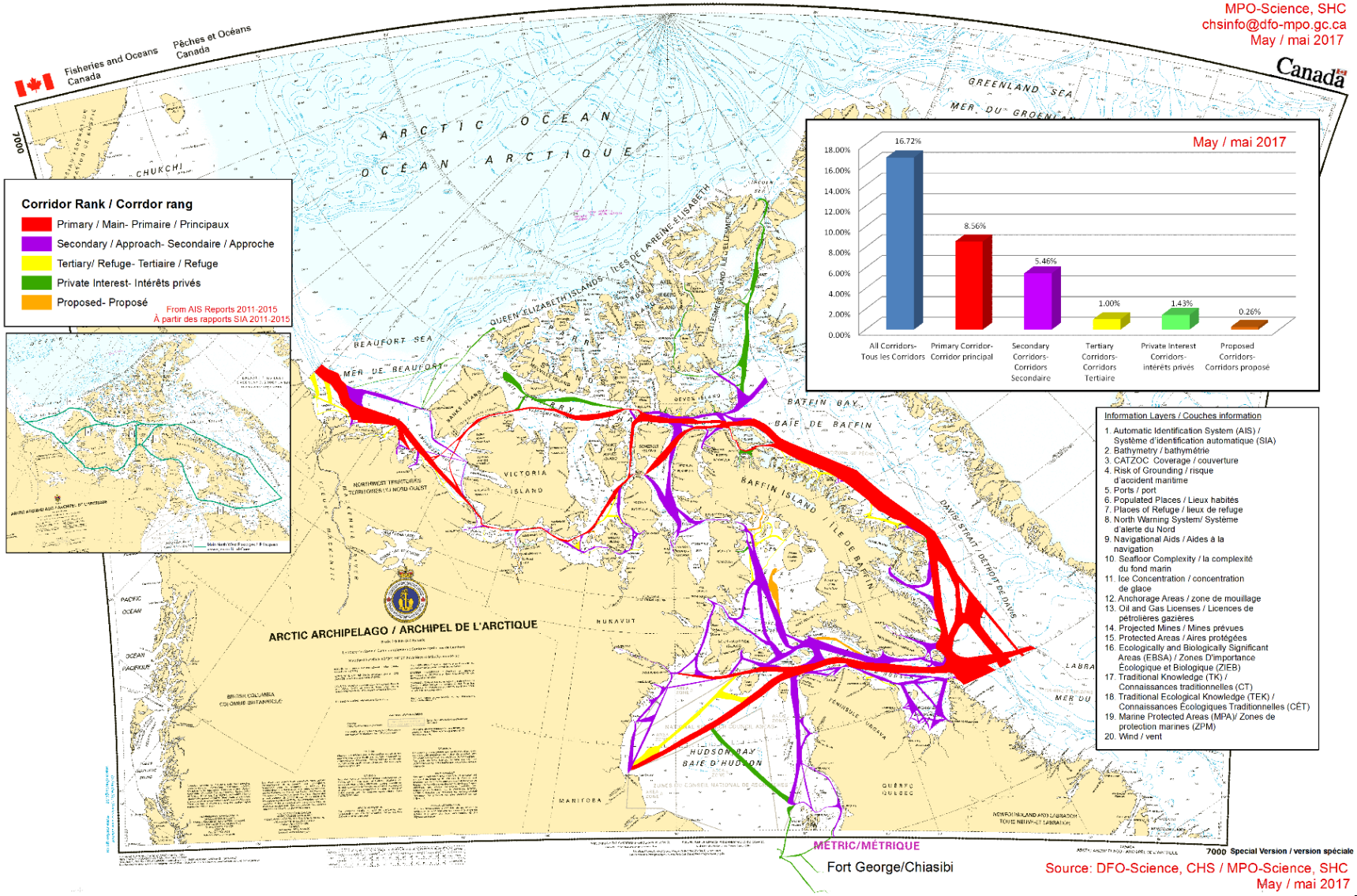
1998 to Present
4,000,000 – 100,000,000 soundings / survey (Terabytes)

Northern Low Impact Shipping Corridors / Corridors de navigation nordiques à faible impact

Total area of water inside the NORDREG: 3,749,856km²
Superficie totale de l'eau dans la zone NORDREG : 3,749,856km²

Corridor Coverage: 453,638 km² (12.10%)
Couverture des corridors: 453,638 km² (12.10%)

Source: DFO-Science, CHS / MPO-Science, SHC
chsinfo@dfo-mpo.gc.ca
May / mai 2017



Corridor Rank / Corrdor rang

- Primary / Main- Primaire / Principaux
- Secondary / Approach- Secondaire / Approche
- Tertiary/ Refuge- Tertiaire / Refuge
- Private Interest- Intérêts privés
- Proposed- Proposé

From AIS Reports 2011-2015
À partir des rapports SIA 2011-2015

Information Layers / Couches information

1. Automatic Identification System (AIS) / Système d'identification automatique (SIA)
2. Bathymetry / bathymétrie
3. CATZOC Coverage / couverture
4. Risk of Grounding / risque d'accident maritime
5. Ports / port
6. Populated Places / Lieux habités
7. Places of Refuge / lieux de refuge
8. North Warning System/ Système d'alerte du Nord
9. Navigational Aids / Aides à la navigation
10. Seafloor Complexity / la complexité du fond marin
11. Ice Concentration / concentration de glace
12. Anchorage Areas / zone de mouillage
13. Oil and Gas Licenses / Licences de pétrolières gazières
14. Projected Mines / Mines prévues
15. Protected Areas / Aires protégées
16. Ecologically and Biologically Significant Areas (EBSA) / Zones D'importance Écologique et Biologique (ZIEB)
17. Traditional Knowledge (TK) / Connaissances traditionnelles (CT)
18. Traditional Ecological Knowledge (TEK) / Connaissances Écologiques Traditionnelles (CÉT)
19. Marine Protected Areas (MPA)/ Zones de protection marines (ZPM)
20. Wind / vent

MÉTRIC/MÉTRIQUE

Fort George/Chiasibi

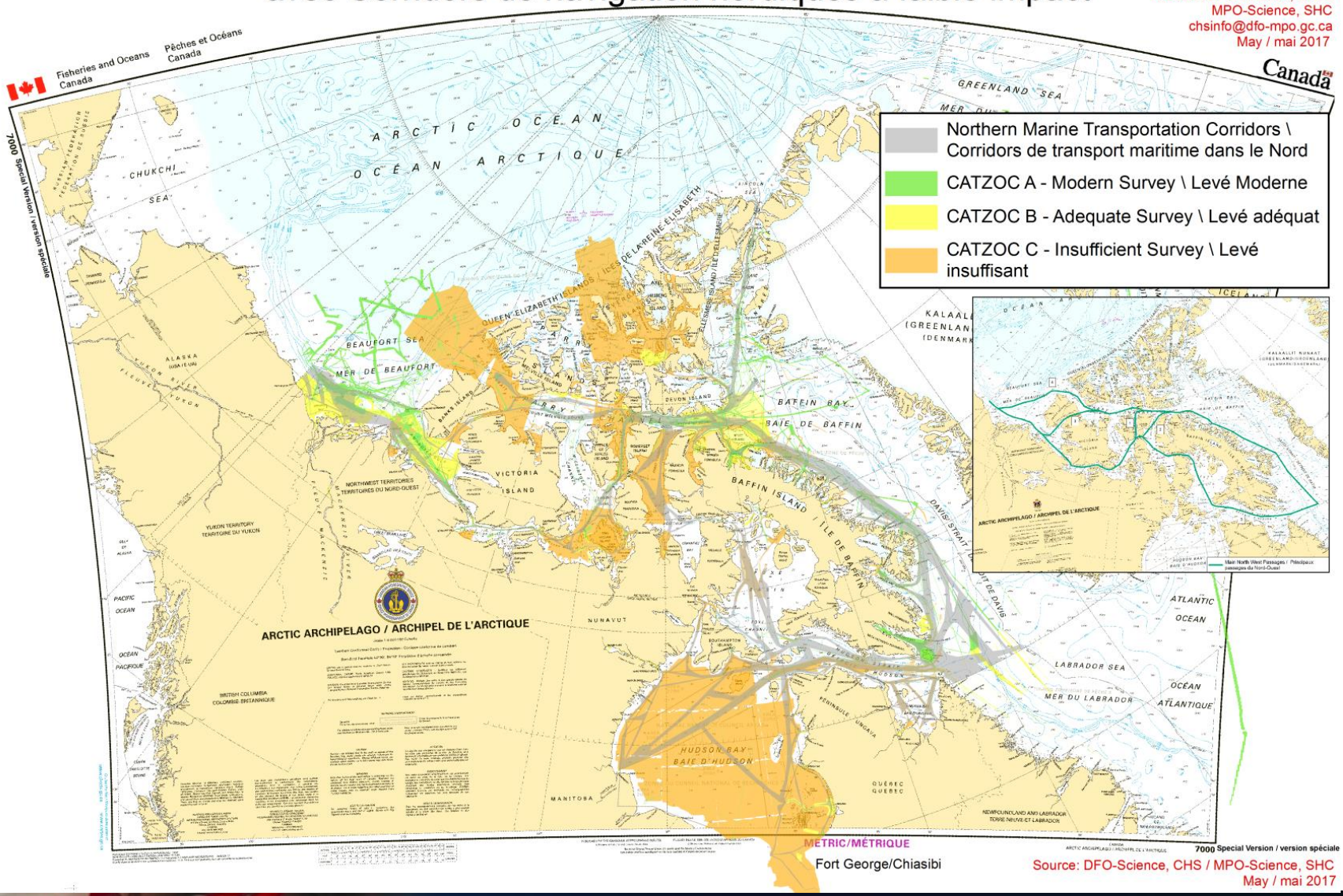
7000 Special Version / version spéciale

Source: DFO-Science, CHS / MPO-Science, SHC
May / mai 2017

Canada

Category Zone of Confidence (CATZOC) of Hydrographic Survey with Northern Low Impact Shipping Corridors
Qualité générale des données bathymétriques (CATZOC) avec Corridors de navigation nordiques à faible impact

Source: DFO-Science, CHS / MPO-Science, SHC
chsinfo@dfo-mpo.gc.ca
May / mai 2017



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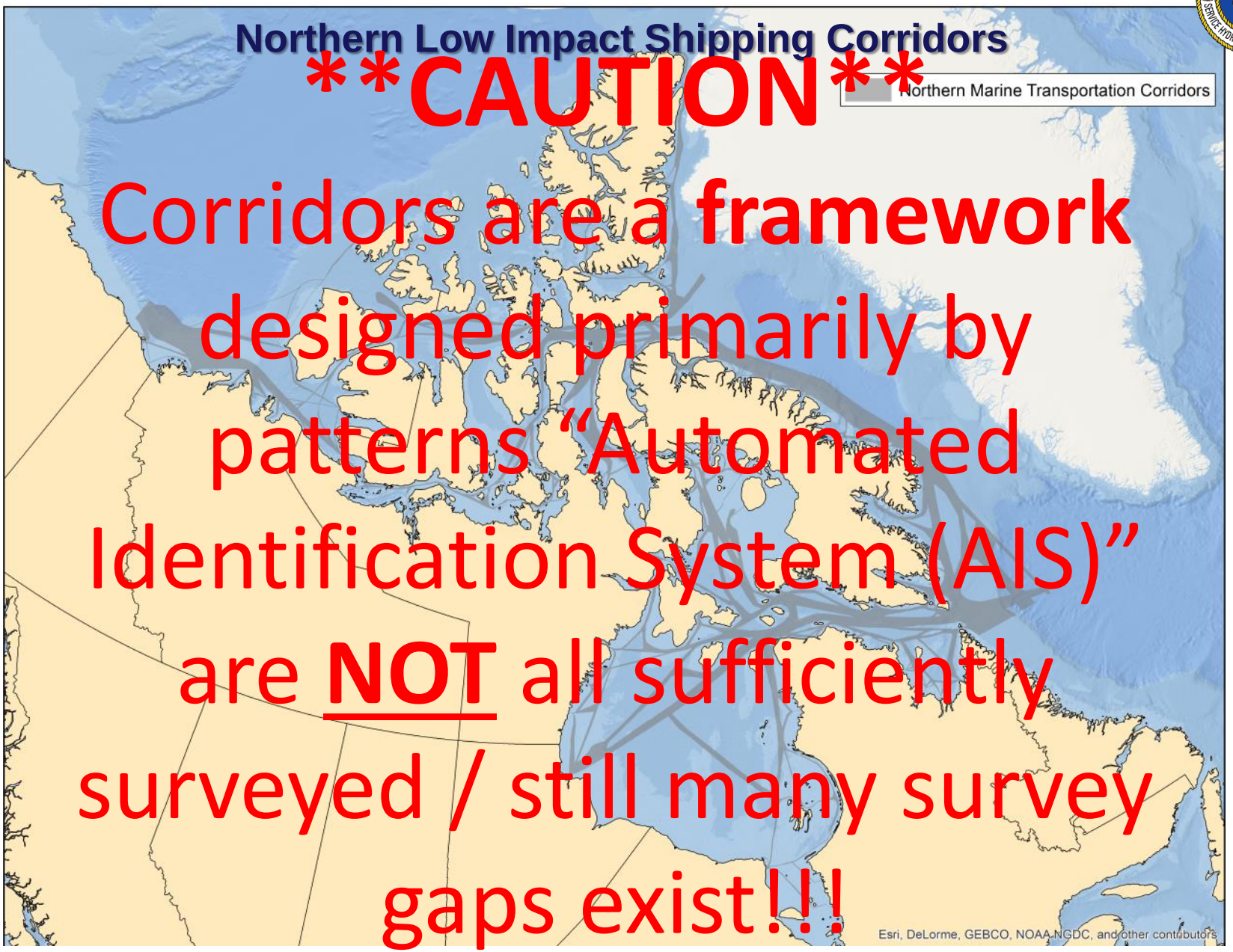


****CAUTION****

Corridors are a **framework** designed primarily by patterns "Automated Identification System (AIS)" are **NOT** all sufficiently surveyed / still many survey gaps exist!!!

Generating Northern Low Impact Shipping Corridors

- CHS, with the support/collaboration of the Canadian Coast Guard and Transport Canada, has developed a Geospatial Model to position the corridors using the available following information Layers (much more can be added and weighted):
  - Automated Identification System (AIS) Traffic Data (Data from 2010-2015 provided by Transport Canada (TC), Department of National Defence (DND) and the Canadian Coast Guard (CCG))
  - Ports and Port Tonnage (Tonnage provided by TC)
  - Anchorage Areas / places of refuge
  - CHS and SIPA Navigational Aids
  - Water Depth and Seafloor Complexity
  - Ice Data (20 year average),
  - Wind Data
  - Tidal Windows
  - Category of Zone of Confidence in Data (CATZOC)
  - Communities
  - New and proposed natural resources developments (ie. Oil and gas developments, mines…)
  - North Warning System
  - Traditional & Ecological Knowledge, Marine Protected areas, Ice Model …
  - . . .
- Designing 5 classes of corridors:
  - **Primary** - Canadian Marine Traffic Highway
  - **Secondary**- Access for Community Re-supply
  - **Tertiary** - Access to Places of Refuge, including North Warning Sites
  - **Quaternary** - Access to Mining sites, Research Bases or other private interests
  - **Quinary** – Potential proposed future (mining, traffic improvement, other)

Canada's Oceans Protection Plan (OPP): Modern Hydrography & Charting in Key Areas

Last Updated: May 18, 2017

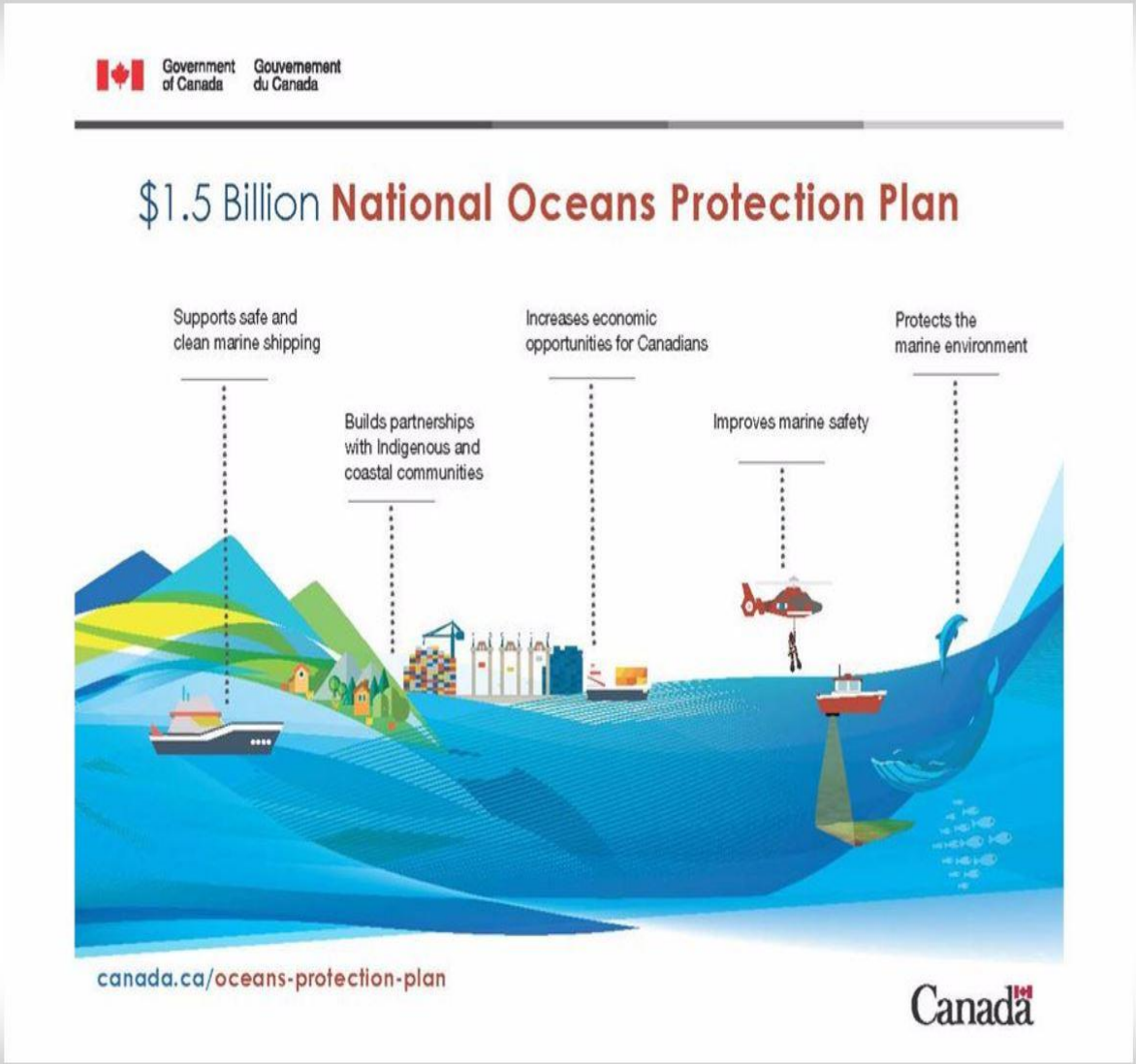
Pêches et Océans Canada | Fisheries and Oceans Canada | Canada

Over the next five years beginning 2017-18, the DFO Science Canadian Hydrographic Service efforts under the Oceans Protection Plan (OPP) aim to undertake modern hydrography and charting in key areas and to support key OPP initiatives under Areas Response Planning and Regional Response Planning through the development of a marine spatial data infrastructure (MSDI).

Modern Hydrography and Charting in Key Areas aims to:

·Conduct highly intensive modern hydrographic and charting activities to provide Electronic Navigation Charts (ENCs) for highly critical areas across the country, including Canada's 23 highest priority commercial ***ports*** and waterways (13 in B.C., 7 in Quebec, and 3 in Atlantic).

·Fill important gaps in high-resolution coastline and bathymetry in inter-tidal zones and ***near-shore*** *areas* to ensure the delivery of improved navigational charts and enhanced electronic navigational chart (ENC) in near-



HYDRO"*SPATIAL*" DIRECTIONS…

Marine
Spatial
Data
Infrastructure

Crowd-Source Bathymetry (CSB)

<u>CHS is committed to CSB</u>:

Open, Targeted & Trusted Crowd-Source Bathymetry:

- CHS as Vice Chair of the IHO-CSB WG;
- Arctic - Crystal Cruises & *Crystal Serenity* Ship:
  - 2016 Anchorage Alaska to New York City via the Canadian North West Passage;
  - 2016 Royal Research Ship (RRS) *Ernest Shackleton* private escort Icebreaker;
  - The operators of the RRS *Shackleton* provided 2016 Single Beam Bathymetric Data to UKHO and CHS;
  - 2017 via a collaborative agreement between the operator of the RSS *Shakleton*, the Marine Institute of Memorial University member of the Canadian Ocean Mapping Research & Education Network (COMREN) and CHS – a Portable MB is installed on a launch to collect MB data;
  - World Ocean Council (WOC) recent involvement.

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Canadian Ocean Mapping Research & Education Network (COMREN)

Independent Network – Academia Leadership

Membership:

- Memorial University - Marine Institute - St. John's NL - **Vice Chair** COMREN
- University of New Brunswick, Fredericton NB
- Nova Scotia Community College, Halifax, NS
- Centre Interdisciplinaire de Développement et de Cartographie des Océans (CIDCO), Rimouski, QC - **Chair** COMREN
- Université Laval, Québec QC
- Ottawa University, Ottawa ON
- York University, Toronto, ON
- British Colombia Institute of Technology (BCIT), Vancouver BC

Objectives:

- Design, develop and deliver Research &Education Programs in Canada and Internationally;
- Leverage on collaboration with Federal, Provincial and Territorial Government agencies – more specifically CHS;

New Project:

- Crowd-sourced bathymetry collection in Northern Communities

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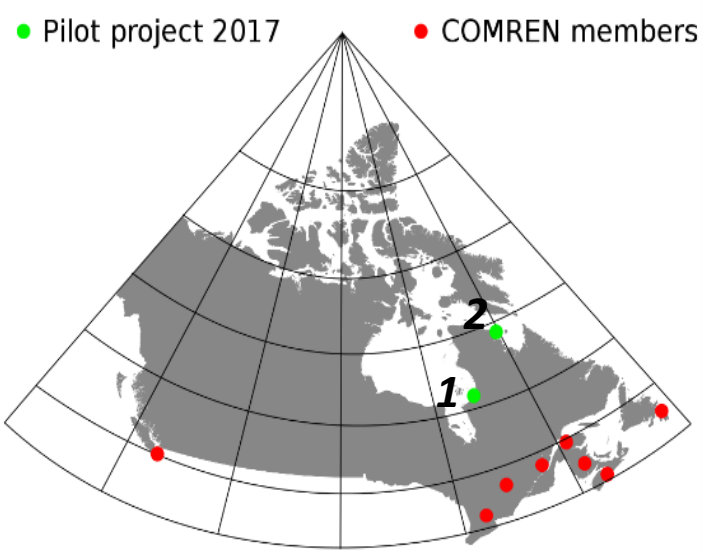
COMREN
Canadian Ocean Research & Education Network

RéCREH
Réseau Canadien de Recherche et d'Enseignement en Hydrographie



CROWD-SOURCE Bathymetry

in Northern area 2017 & 2018

1- Kuujjuarapik & 2- Quaqtaq

- **Data collection tools (integrated and pre-qualified systems);**
- **training of communities;**
- **design of data collection processes;**
- **data cross-validation tools;**
- **Marine Spatial Data Infrastructure (MSDI) access, dissemination and visualization tools.**

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Next Steps

The Canadian Hydrographic Service will increase…:

- … integrating feedback from Northern communities, in collaboration with Transport Canada and the Canadian Coast Guard to improve a « DYNAMIC » Low Impact Shipping Corridors (LISC)…
- … accessing more dedicated and opportunistic Ship time to survey and acquire hydrographic data;
- … using of **Crowd-Source Bathymetry**, Automated Vehicles, Airborne Hydrography (LiDAR) and Satellite-Derived; Bathymetry especially in the Canadian Arctic Remote Areas via collaboration;
- … accessing of authoritative and accurate hydrographic data via the Marine Spatial Data Infrastructure (MSDI).

Thank you!
Merci!

For further information & questions please contact:
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