Ilulisat Maritime Workshop 2017
The Importance and Need for Hydrography
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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%)

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

From AIS Reports 2011-2015
A partir des rapports AIS 2011-2015

Information Layers / Couches d'information:
1. Automatic Identification System (AIS) / Système d'identification automatique (SIA)
2. Bathymetry / bathymétrie
3. LCDEO Coverage / couverture
4. Risk of Grounding / risque d'accident
5. Ports / ports
6. Populated Places / Lieux habités
7. Places of Refuge / lieux de refuge
8. Search and Rescue System / Système d'assistance
9. Navigational Aid / Aides à la navigation
10. Seabed 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 pétrole et gaz naturel
14. Proposed Areas / Aire proposée
15. Protected Areas / Aires protégées
16. Ecological and Biodiversity Significant Areas (EBBA) / Zones d'importance écologique et biodiversité (ZIÉB)
17. Traditional Knowledge (TK) / Connaissances traditionnelles (CT)
18. Traditional Ecological Knowledge (TEK) / Connaissances traditionnelles (CT)
19. Marine Protected Areas (MPA) / Zones de protection marine (ZPM)
20. Wind / vent

Source: DFO-Science, CHS / MPO-Science, SHC
chisinfo@dfo-mpo.gc.ca
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
chsinfodfo-mpo.gc.ca
May / mai 2017
**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)
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-shore areas.
HYDRO”SPATIAL” DIRECTIONS...

Marine Spatial Data Infrastructure
Crowd-Source Bathymetry (CSB)

CHS is committed to CSB:

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 Shackleton, 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.
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
CROWD-SOURCE
Bathymetry
in Northern area 2017 & 2018

1- Kuujjuaq & 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.
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!

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