CHC-NSC 2018

www.chc-nsc2018.ca

Victoria, B.C.
March 26-29, 2018

Victoria, C.B.
26 au 29 mars 2018

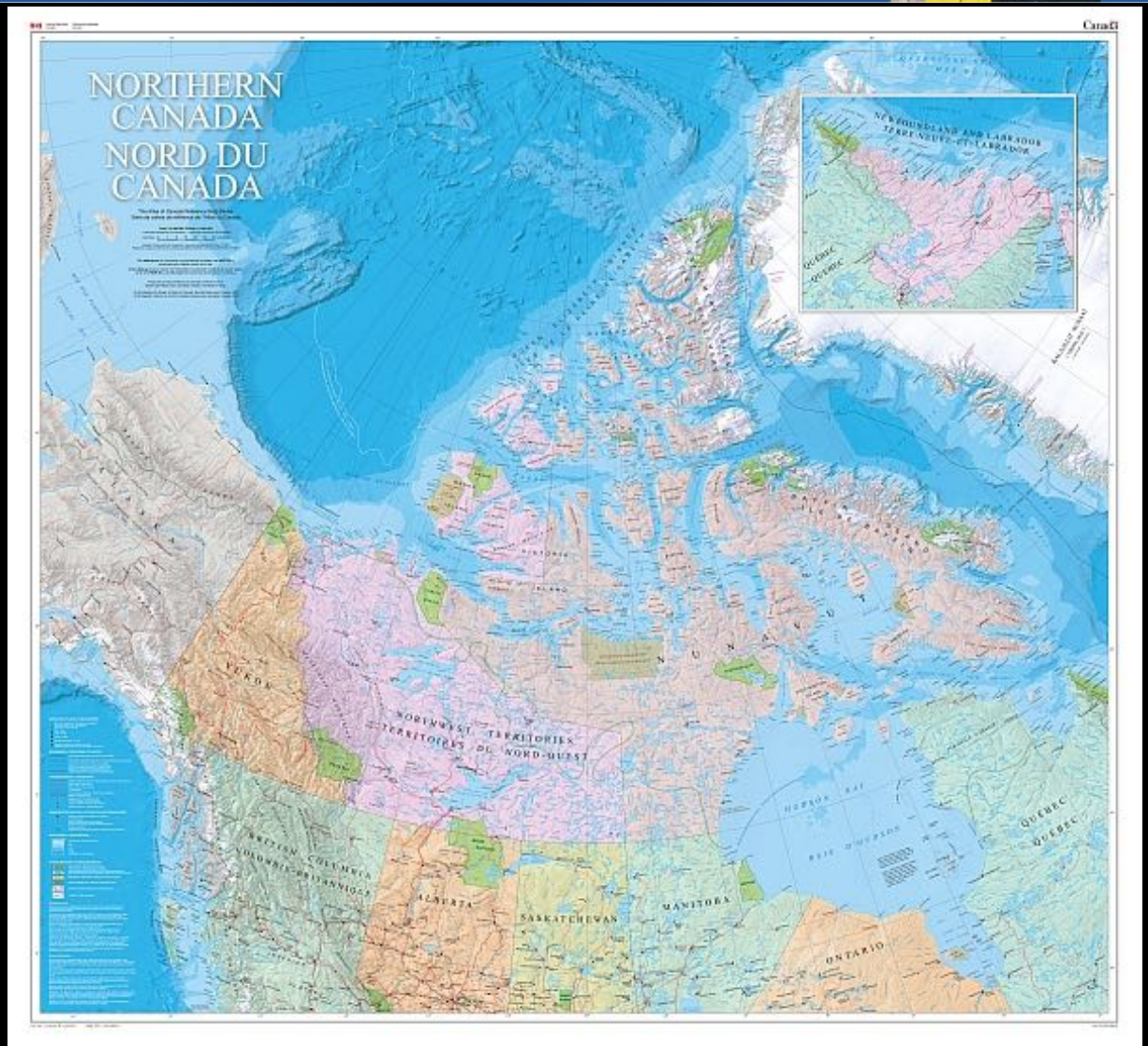
Land and Sea Shaping the World
Terre et Mer Façonnant le Monde

A crowdsource approach for capacity building in North Canada

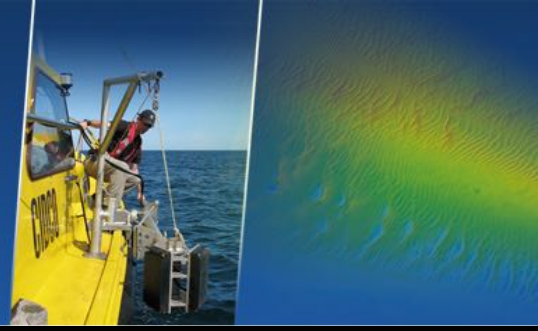
Julien Desrochers

#chcnsc2018

The Canadian Arctic

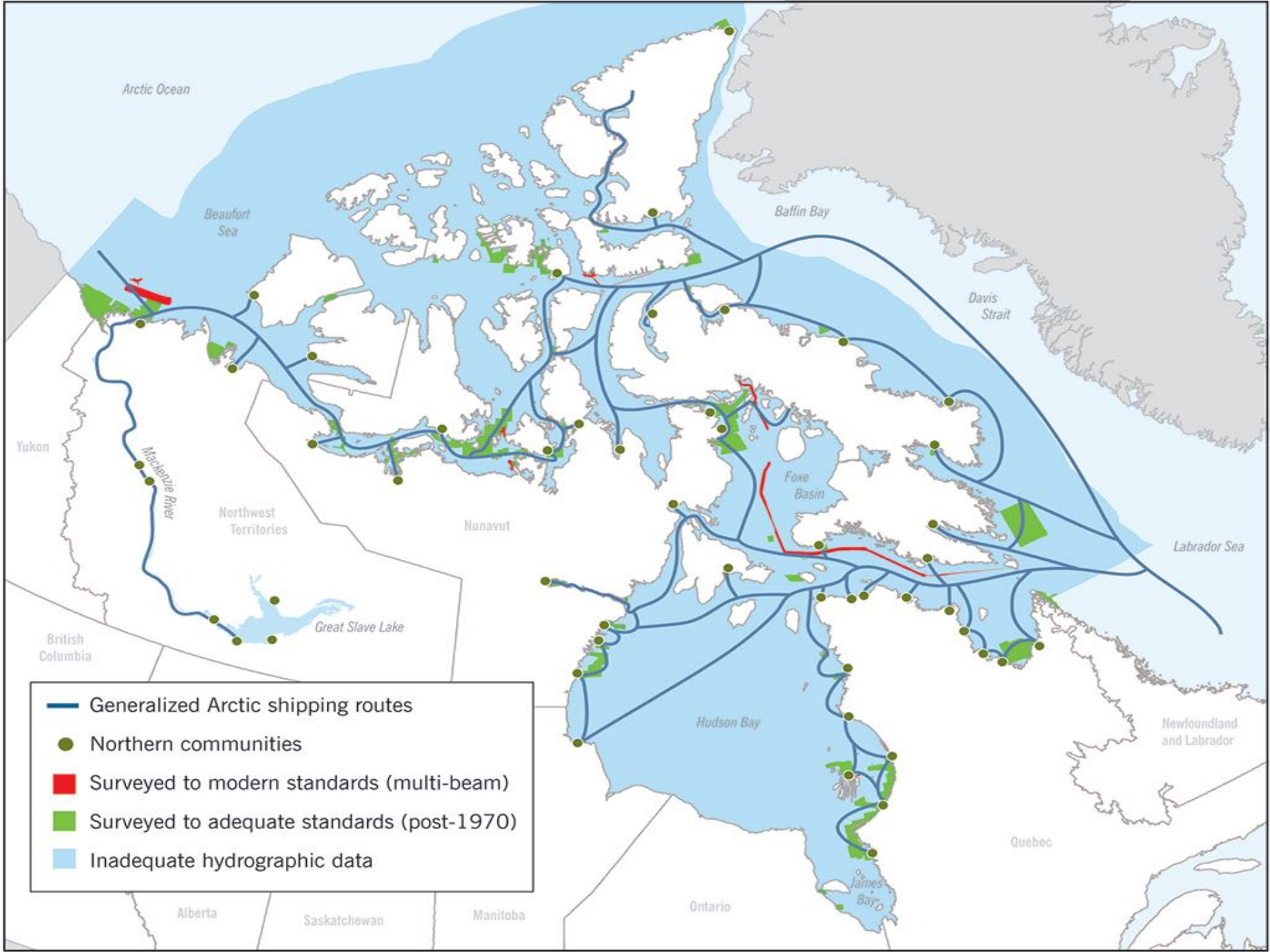


A vast territory

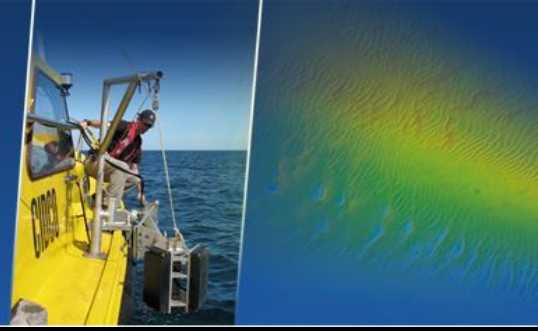


4.4 million square kilometers (47% underwater):

- ~ 10 % of Canada's Arctic water's are adequately surveyed
  - 1% surveyed to modern standards
- ~ 32 % of the Arctic's marine corridors are adquately surveyed
  - 3% surveyed to modern standards


Arctic Ocean
Beaufort Sea
Baffin Bay
Davis Strait
Yukon
Mackenzie River
Northwest Territories
Nunavut
Foxe Basin
Labrador Sea
Great Slave Lake
British Columbia
Hudson Bay
Newfoundland and Labrador
Quebec
James Bay
Ontario
Alberta
Saskatchewan
Manitoba
Generalized Arctic shipping routes
Northern communities
Surveyed to modern standards (multi-beam)
Surveyed to adequate standards (post-1970)
Inadequate hydrographic data

Increase of maritime traffic



Commercial ships:

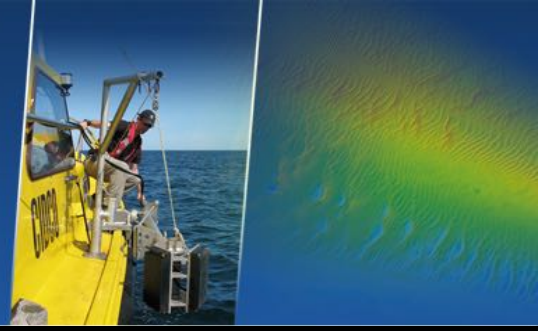
- 2005: 119
- 2010: 220

Fishing ships:

- 2005: 30
- 2010: 220

How to avoid this situation??

How to map such a vast territory?

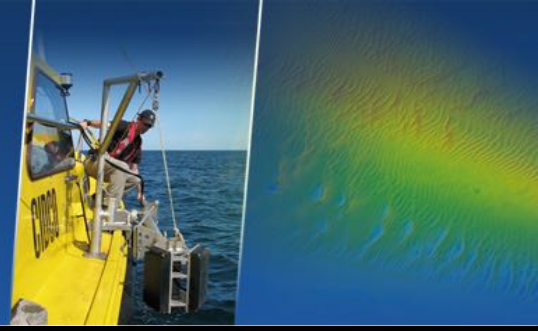


The crowdsourced bathymetry approach :

- Pre-qualified measurement systems (HydroBall / HydroBox)
- Local people from the communities (Inuits)
- Automatic data processing and dissemination

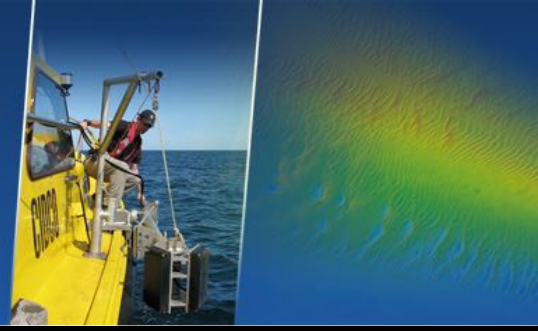
More reactive and cost effective than
- Survey teams from the South
- Conventional hydrographic tools

Presentation agenda



- Project overview
- Pre-qualified systems
- Community workshops
- Lessons learned
- Capacity building possibilities

CSB project overview

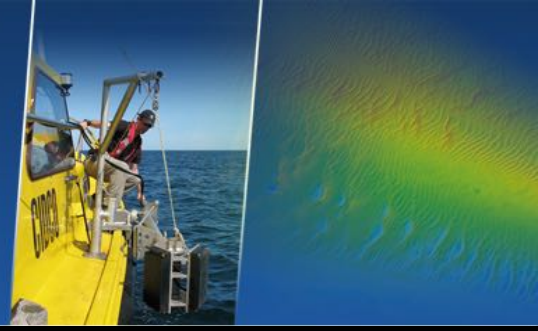


1. WP1: Use and integrate **Hydrographic systems** for **non-specialists** in Northern Canada. (CIDCO)
2. WP2: Conduct **workshops** with Inuits. (MI/CIDCO)
3. WP3: **Data-processing**. (UNB/CIDCO)
4. WP4**: Data post-processing** and **data dissemination**. (YORK)

COMREN
Canadian Ocean Research & Education Network

RéCREH
Réseau Canadien de Recherche et d'Enseignement en Hydrographie

Pre-qualified single-beam system: HydroBall™

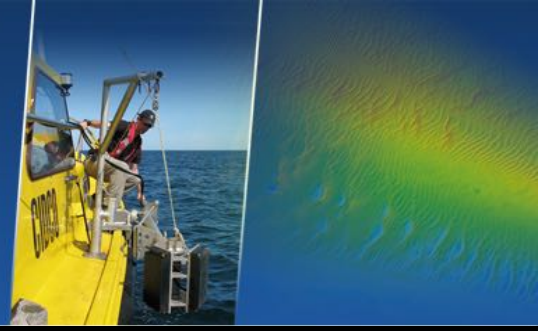


A robust shell of spherical shape (13kg – 40cm diam) which contains :

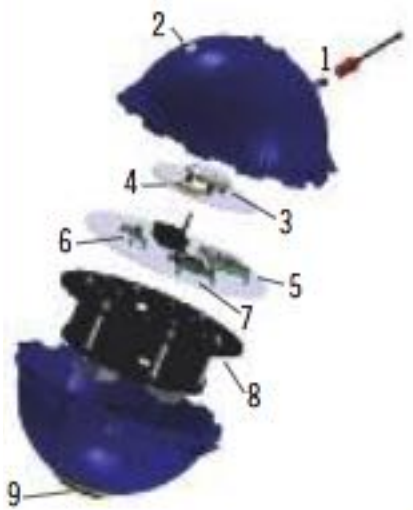
- Echosounder (depth measurement)
- GNSS receiver (position)
- Inclinometer (roll and pitch)

* Autonomous, easy to use

The HydroBall™ system:

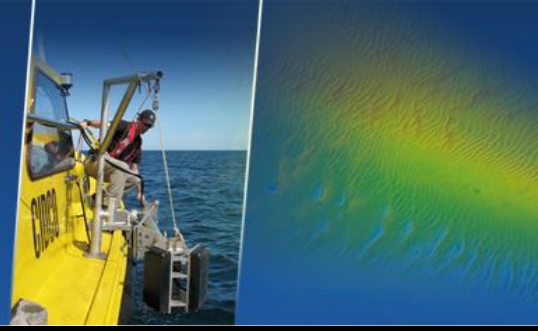


GPS	**Standalone mode** 2.5m (95%) **DGPS (SBAS) mode** 0.6m (95%) **Post-Processed (PPK) mode** 0.02m (95%) Update Rate: 1Hz -> 10Hz	
DIGITAL COMPASS	**Heading** Tilt < ±20°: 0.5 **Pitch, Roll** Tilt < ±20°: 0.4° Tilt > ±20°: 06° Update rate: 10Hz	
DEPTH SOUNDER	**Shallow to mid-range model** Frequency : 675kHz Beam width : 10° Range : 0.50m – 50.0m Range resolution : 20mm Update rate : 1Hz -> 10Hz	**Ultra-shallow model** Frequency : 500kHz Beam width : 6° Range : 0.10m – 10.0m Range resolution : 0.025% of range Update rate : 10Hz



1-Switch
2-Light indicator (LED)
3-GNSS antenna
4-Iridium (option)
5-GNSS receiver
6-Digital compass
7-ME processor and datalogger
8-Rechargeable batteries
9-Depth sounder

Pre-qualified black-box systems

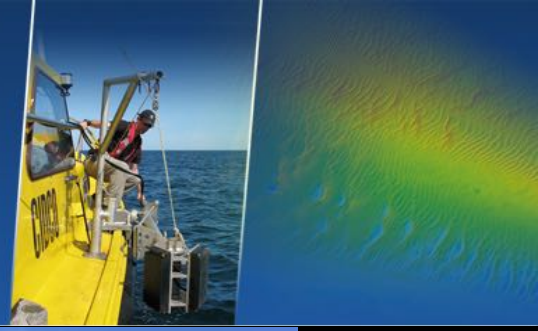


HydroBox:

- Installation on opportunity vessels
  - includes same components as the HydroBall except for :
    sonar component which comes directly from the vessel.

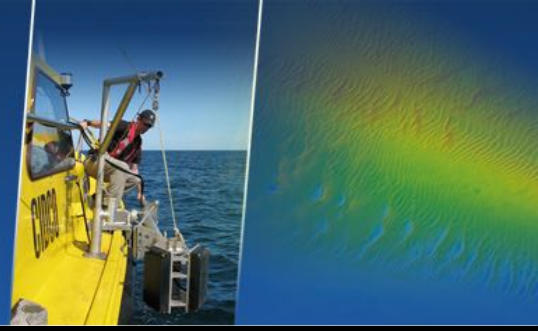
* HydroBox is equipped with a GNSS L1/L2 receiver capable of logging raw data.

HydroBox as a single-beam system



* Measurement of lever arm between GNSS and sonar needed to geo-reference the soundings.

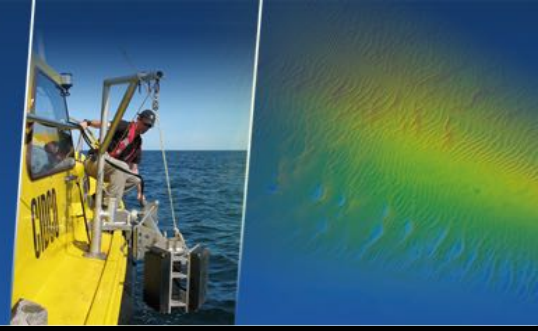
HydroBox as a GNSS base station



HydroBox can be used as a GNSS base station:

- Offset between marker and GNSS APC pre-calibrated

Community workshops



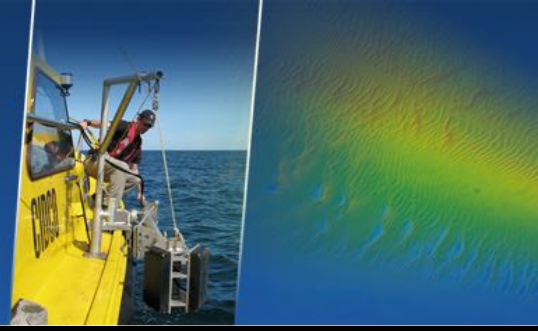
Kuujjuaarapik (Inuit/Cree)

- Population: ~ 1300

Quaqtaq (Inuit)

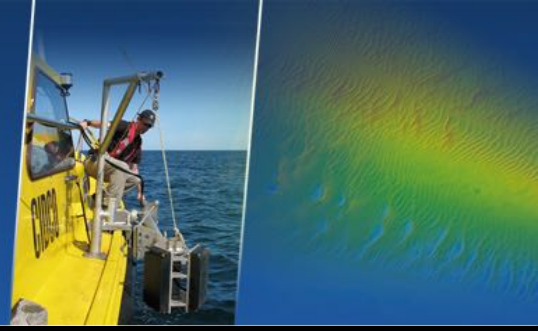
- Population: ~ 400

Kuujjuaarapik



Kuujjuaarapik a village in SE Hudson Bay

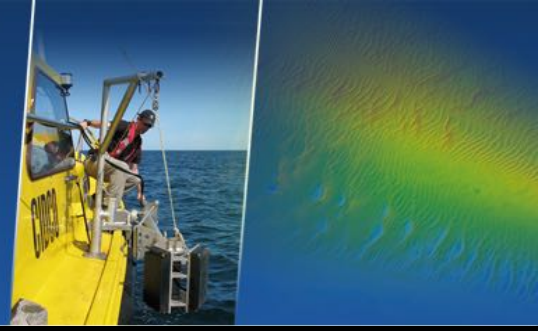
Consulting the community



General feedback:

- Don’t use charts to navigate
- Don’t feel the need for better knowledge of bathymetry
  - Not many areas present a danger to navigation
- Members of the community are open to the project as it can bring jobs to the community

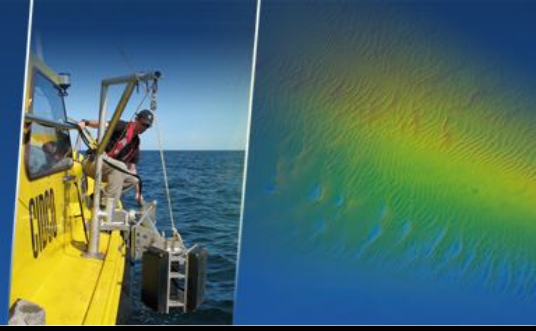
Workshops with community members



Trained Inuits/ Crees in Kuujjuarapik:

- Jimmy-Paul Angatookalook
- Charlie Angatookalook
- Richard Petagumskum
- Caleb Noura Jr
- Jordan Kronenburg

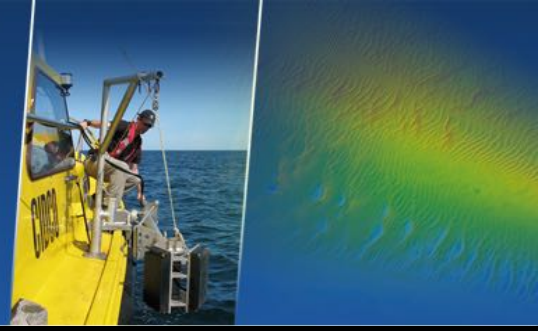
Workshop with community members



Operating the systems at sea:

Workshop with community members

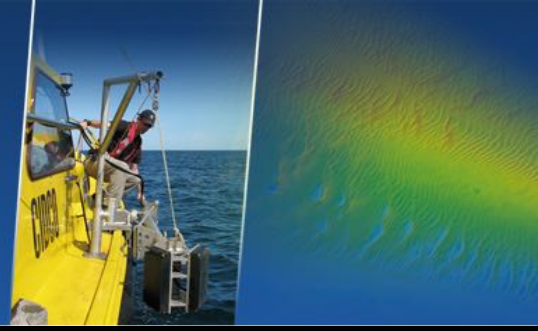
Workshop results



Kuujjuarapik:

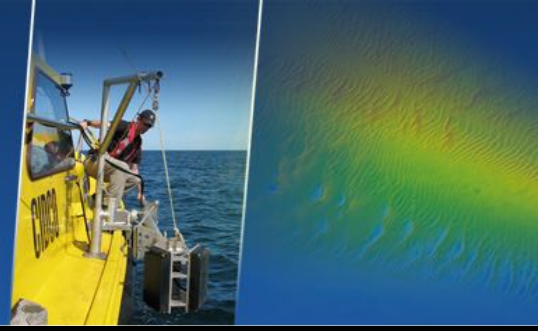
- Results varied depending on the users:
  - Some had a good understanding of the systems and how to collect quality bathymetric data
  - Some did not have a good understanding on how to operate the systems and needed to be guided through the whole process
  - The younger age group (16-22) were difficult to motivate
- Most people consulted were not convinced on the beneficial impact of this project.

Quaqtaq



A village in NW Ungava Bay :

Consultation with village leaders

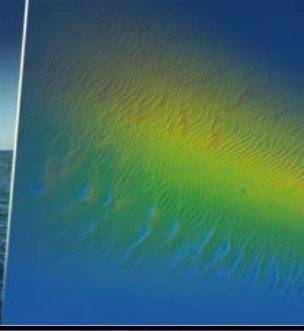


- Mayor : Robert Deer
- General manager: Johnny Oovaut
- Hunter support: Philippe Bigonesse

They are willing to:

- Find candidates motivated for the job
- Hire people with the required skill set
- Hire people who are reliable

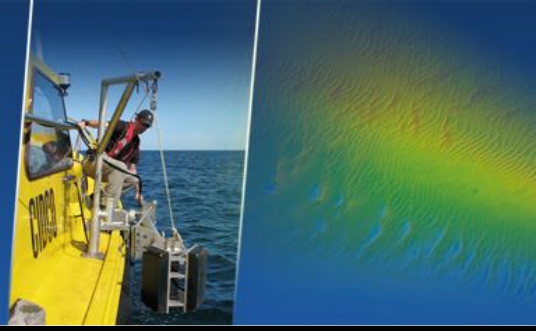
Quaqtaq: survey zones



To motivate community:

Pre-selection of zones to be surveyed

Project coordinator

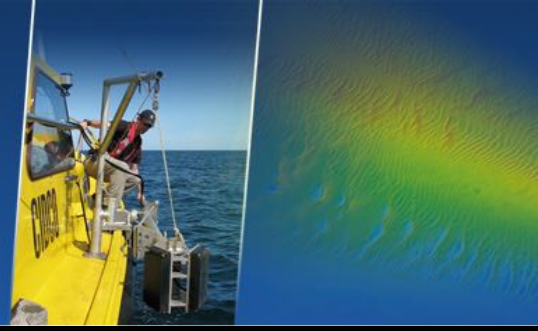


Project coordinator : Philippe Bigonese

Project coordinator tasks:

- Maintaining equipment and ensure its proper use
- Hiring / training / paying the different boat captains
- Extracting and sending the data over to the CSB project server after each survey day

Consulting general community



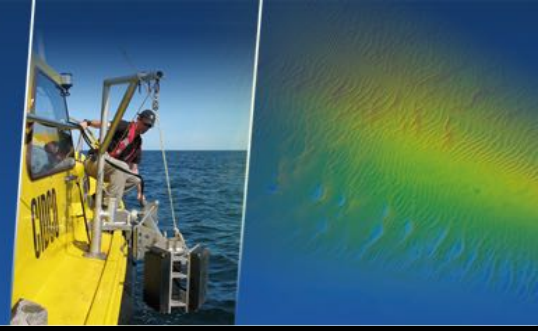
Older generation:

- Don’t use charts to navigate
- Don’t feel the need for better knowledge of bathymetry but mapping shoals seems like a good idea.

Younger generation:

- Not a good knowledge of bathymetry
- Feel the need for better knowledge of bathymetry :
  - Dangers to navigation
  - Morphology of seabed for presence of fish
- Interested in working with new technology

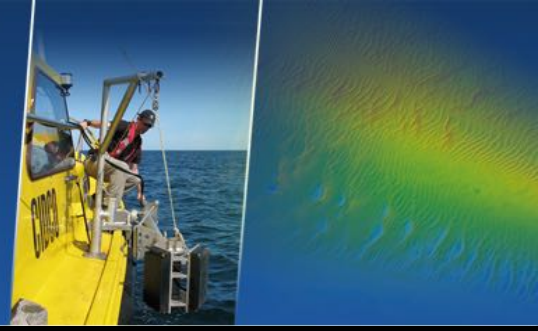
Consulting general community



General consensus:

- Project can bring jobs to the community
- Development of expertise within the community
- Contributing to safety of navigation

Workshop with community members



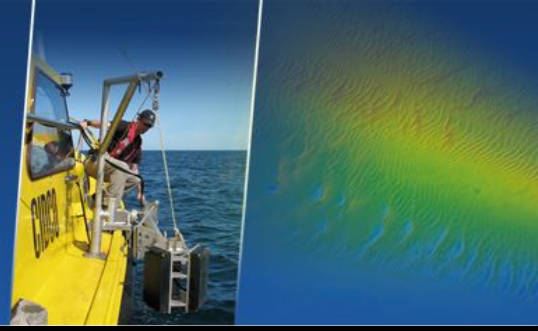
Two Inuits were trained in Quaqtaq:

- Paul Angnatuk
- Tuniq Ningiuruvik

Training sessions:

- How to operate the systems
- Operating the systems at sea

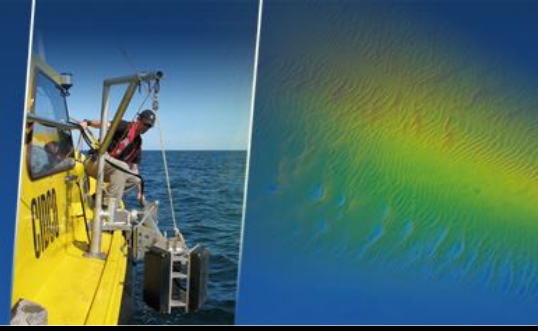
Workshop with community members



Operating the systems:

- Turn the system ON/OFF.
- Recording mode
- Verify the equipment status
- Charging the systems
- Extracting the data

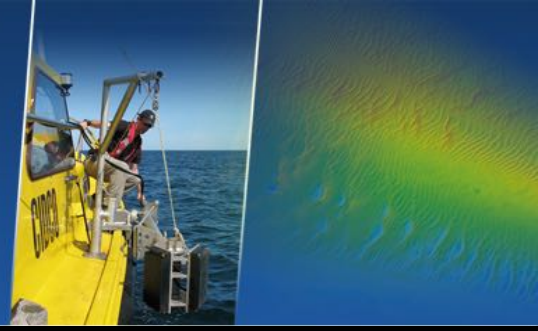
Workshop with community members



Operating the systems at sea:

- System setup validation
- Verification of system status and good practices

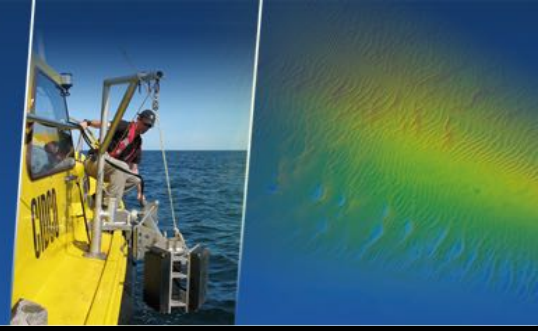
Workshop results



Quaqtaq:

- The two people trained had a good understanding of the procedure to acquire quality bathymetric data
- At sea, they were able to make the necessary adjusments to ensure the systems were working properly.
- They seemed interested and motivated to do this type of work in the future.

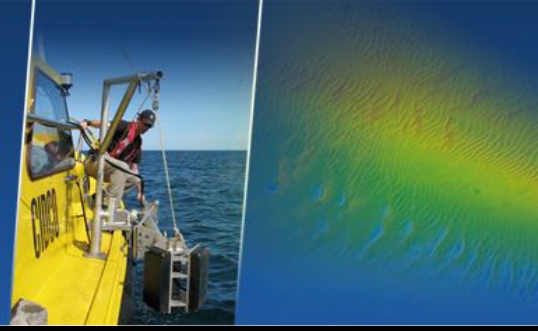
Lessons learned



Important considerations:

- Support from the village leaders is needed for a succesfull project
- A reliable project coordinator is mandatory
- The chosen candidates need to be motivated
- A limited number of boat captains (2) need to be trained to maximize the number of survey days (8-12 survey days per candidate)
- The community members need to be involved in the process of the different survey zones

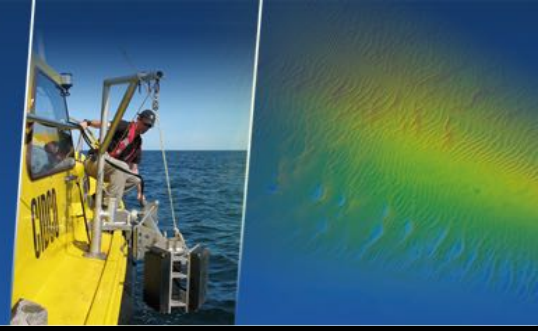
Mapping the Canadian North



How?
Crowd sourced bathymetry with members of Inuit communities

Why?
Maritime traffic = >>>>>>>>>>>
Population = >>>>>>>>>>>
Safety of navigation = IMPORTANT
Cost of data acquisition = <<<<<<<<<<<
Contribution to the development of Inuit communities

What's next???



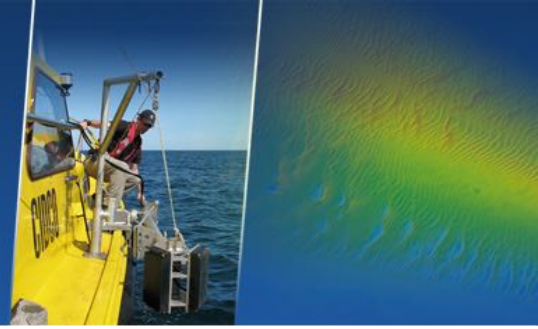
Generalization of this CSB scenario could contribute to :

IHO capacity building programmes

How??

- Using pre-qualified hydrographic systems
- Using processing tools developed during CSB project
- Using data post-processing and dissemination tools developed during CSB project

Project participants



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Thank you!

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