

Using multibeam angular range analysis coupled with “underway” ground-truthing technology for benthic habitat mapping

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Overview

- **Drivers for effective marine management programs**
- **Challenges in Marine Habitat Spatial Mapping**
- **The benefits of backscatter – new tools**
- **Proof of Concept – Bay of Fundy**
- **Issues with multi-source MBES data sets**
- **Preliminary Results**



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Population Density

Population Distribution within 100 km of Coastlines



Map Projection: Geographic

Citation: World Resources Institute - PAGE, 2000

Notes:

40% within 100km of coastline



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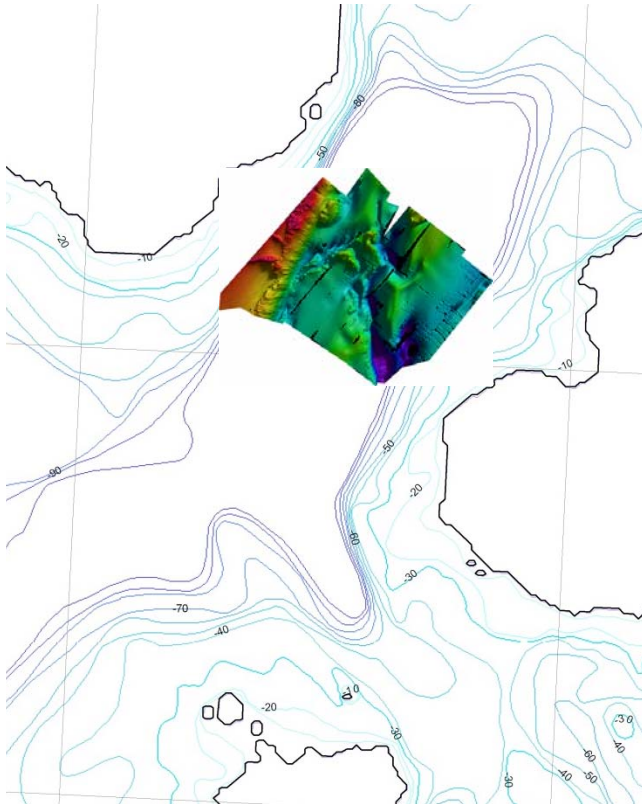


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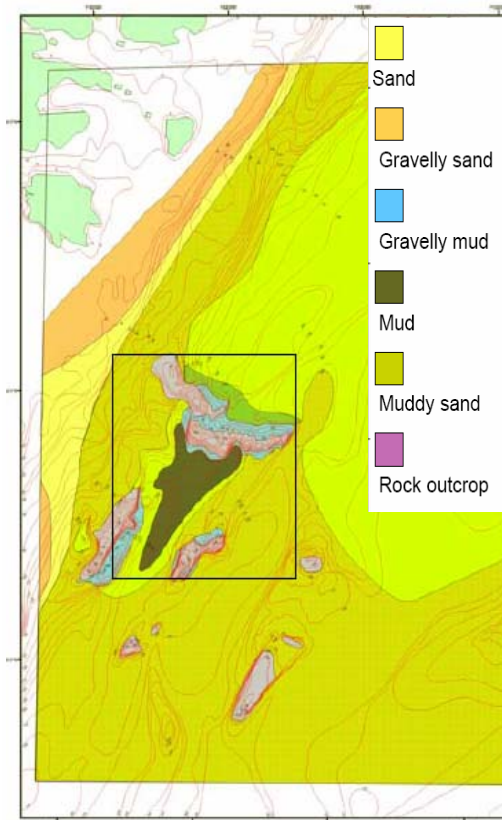
Applications of MBES data

6km

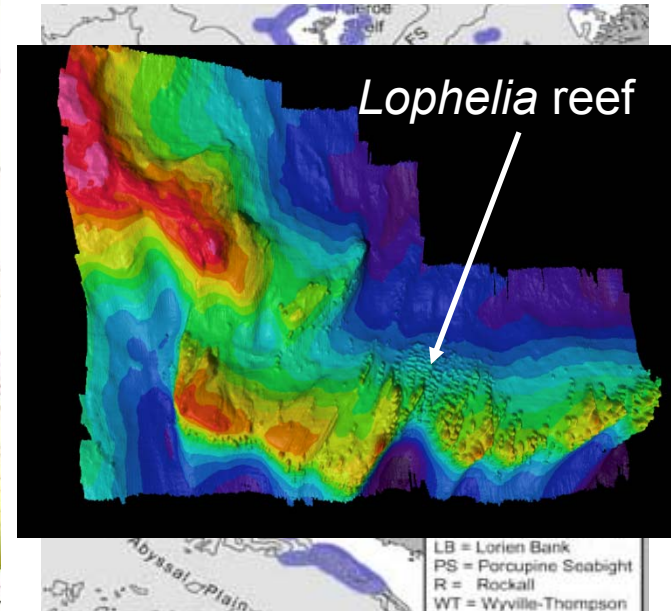


Navigation

10km



Geology



Biology



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Remote sensing for ecological study

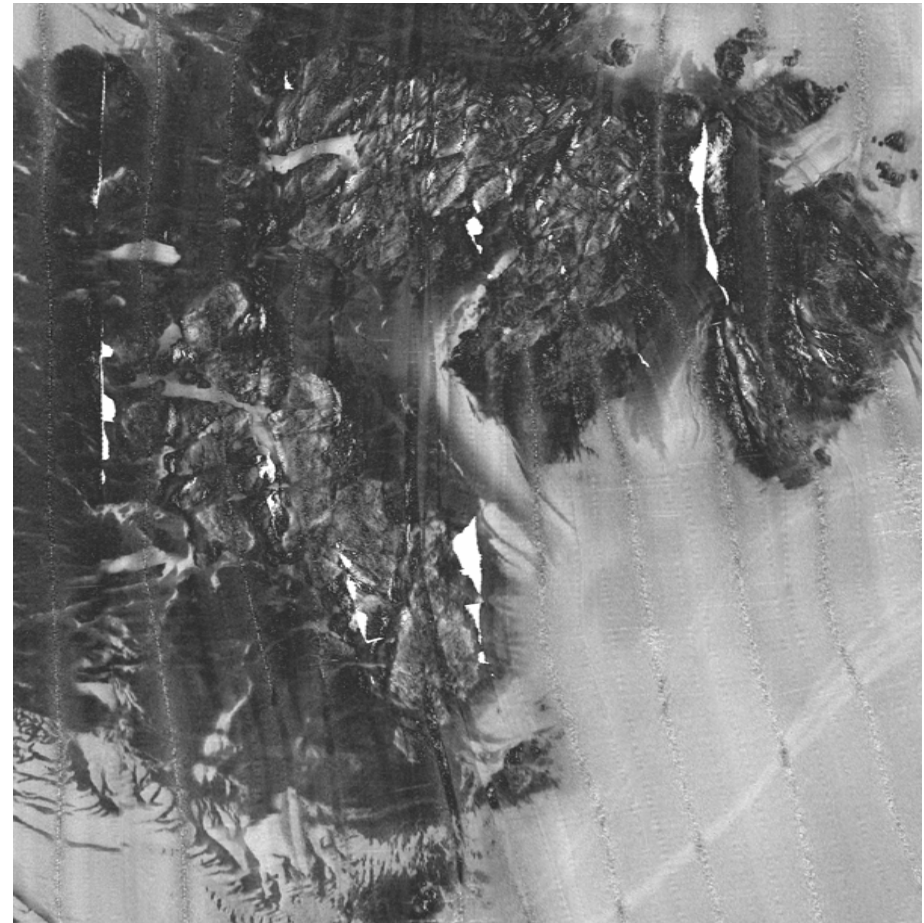
(spatial ecology – a landscape-scale approach)

Terrestrial spatial data

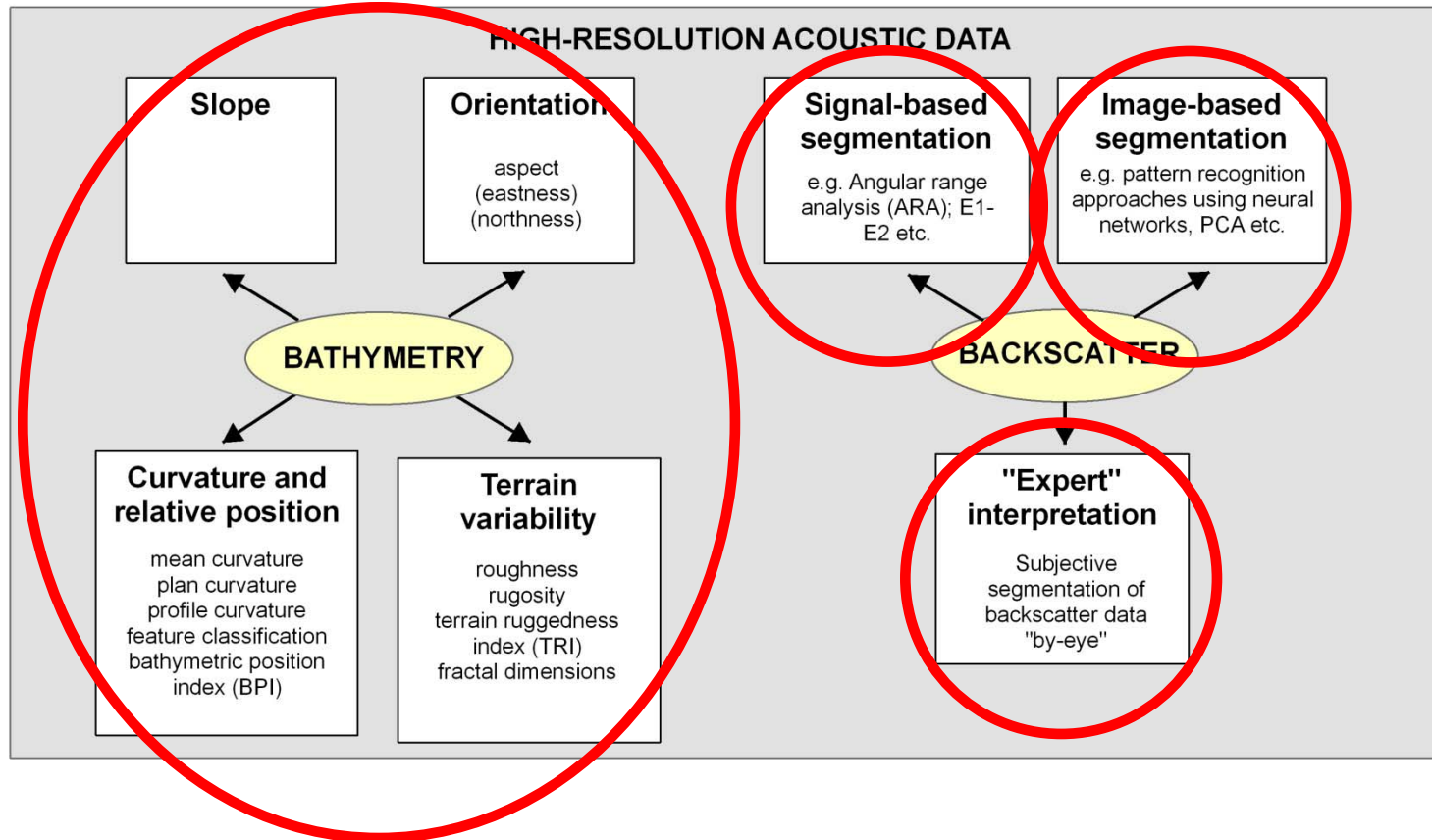


Example from the NI countryside survey

Marine spatial data –
BENTHOSCAPE...?

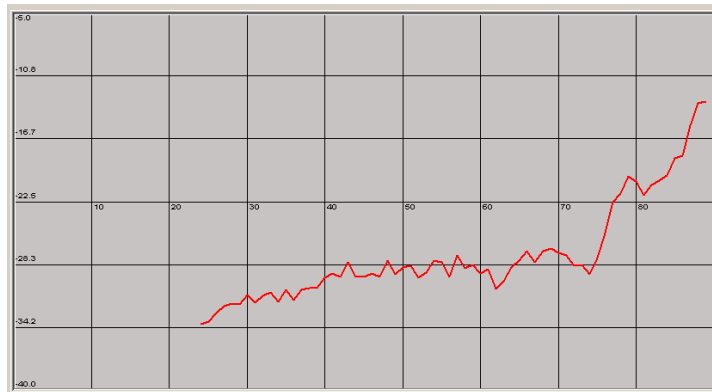


Remote sensing for ecological study: THE BENTHOSCAPE APPROACH

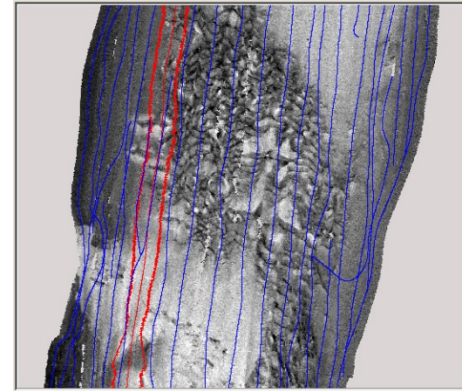


Geocoder analysis of MBES Backscatter

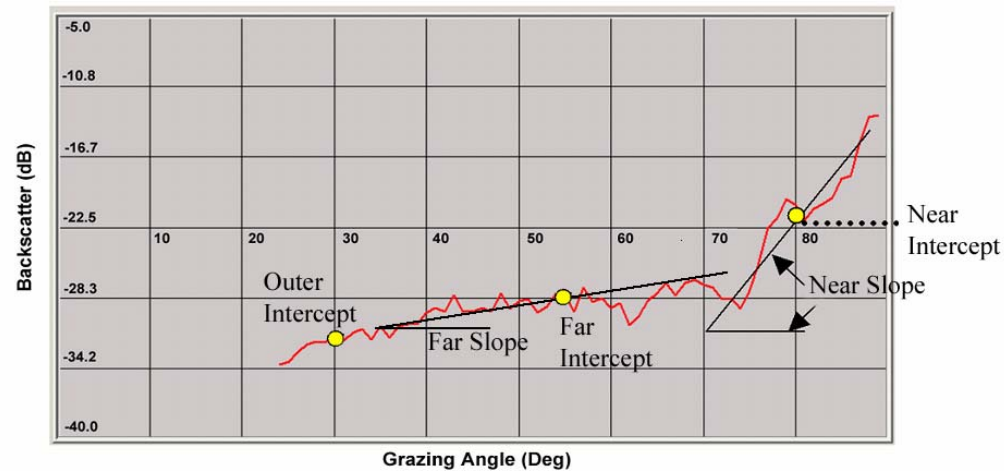
Corrected for Radiometric and Geometric Distortions



Corrected
Backscatter (half) Swath



1) Mapping and Mosaicking



2) Seafloor Characterization -ARA Analysis

Fonseca, 2006 Backscatter workshop



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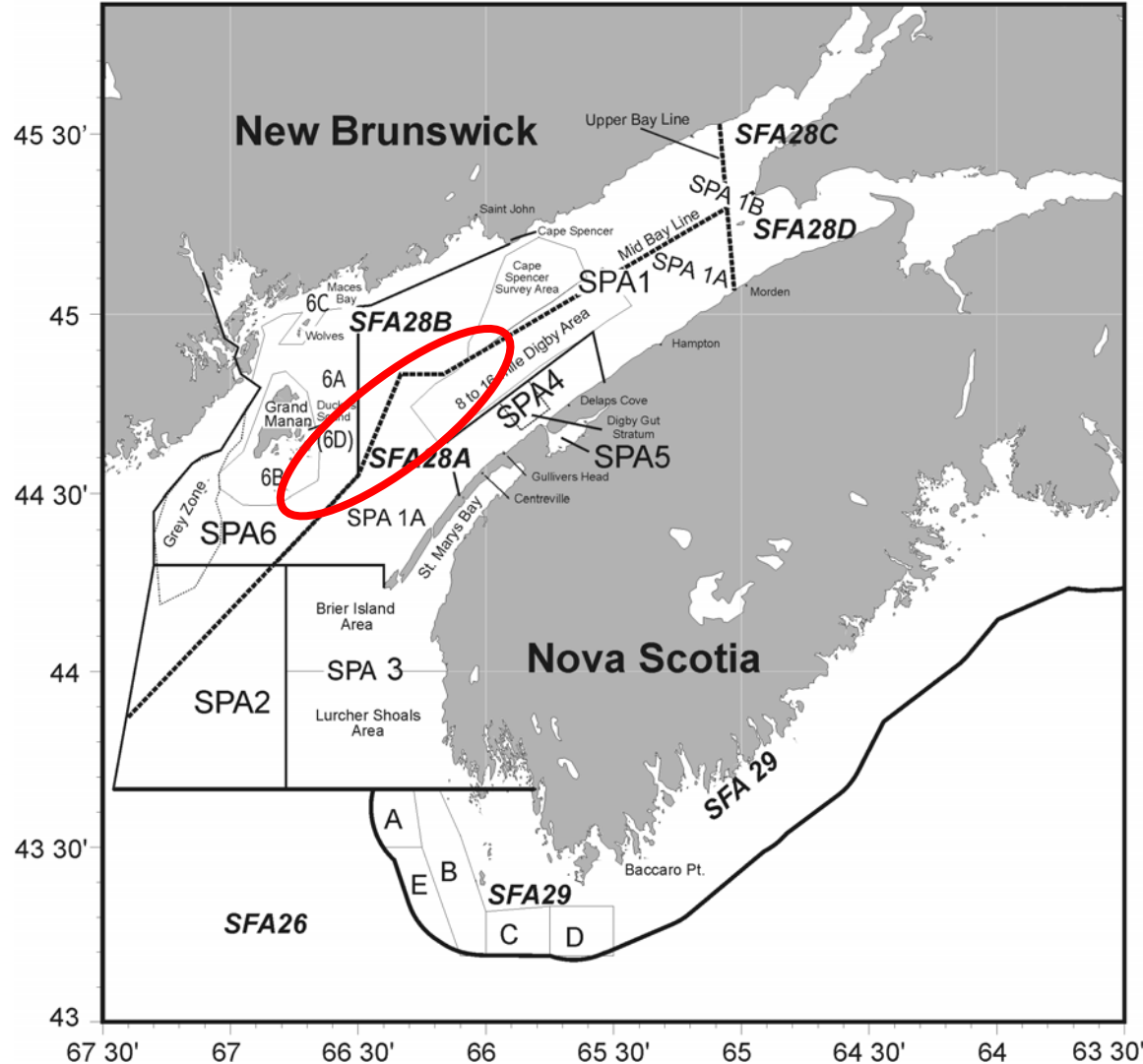
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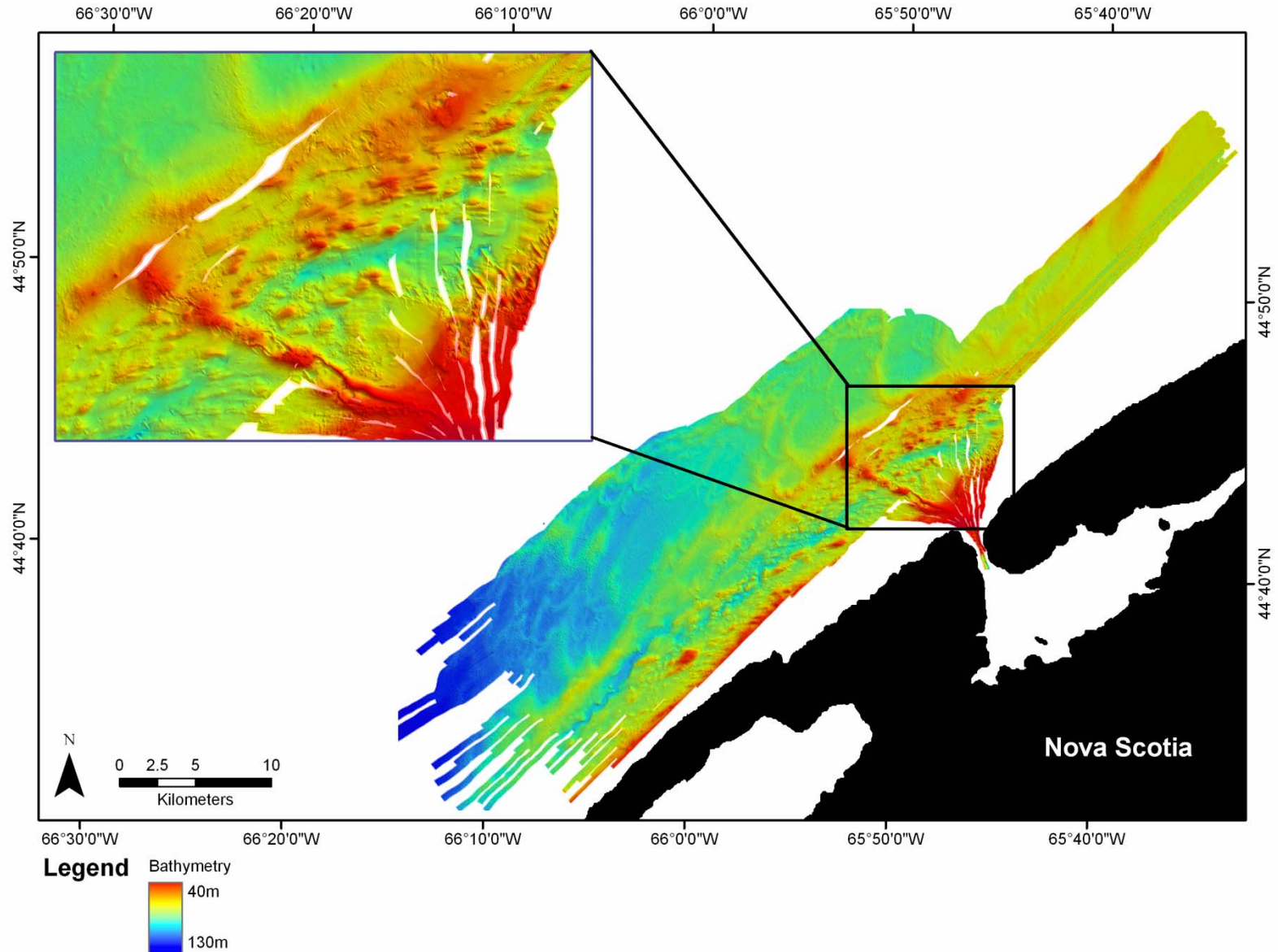
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Benthoscape: Proof of concept areas

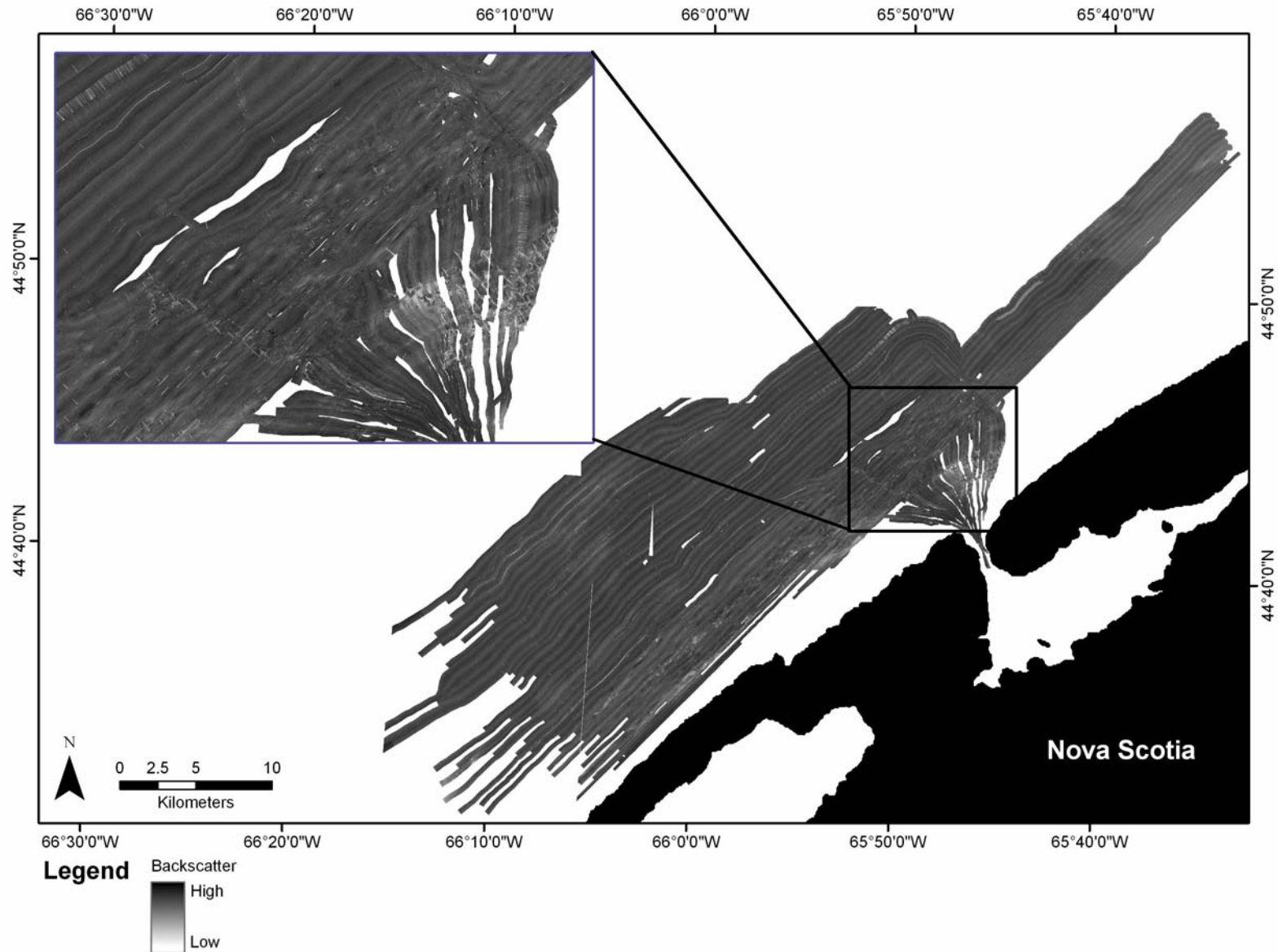


Bay of Fundy



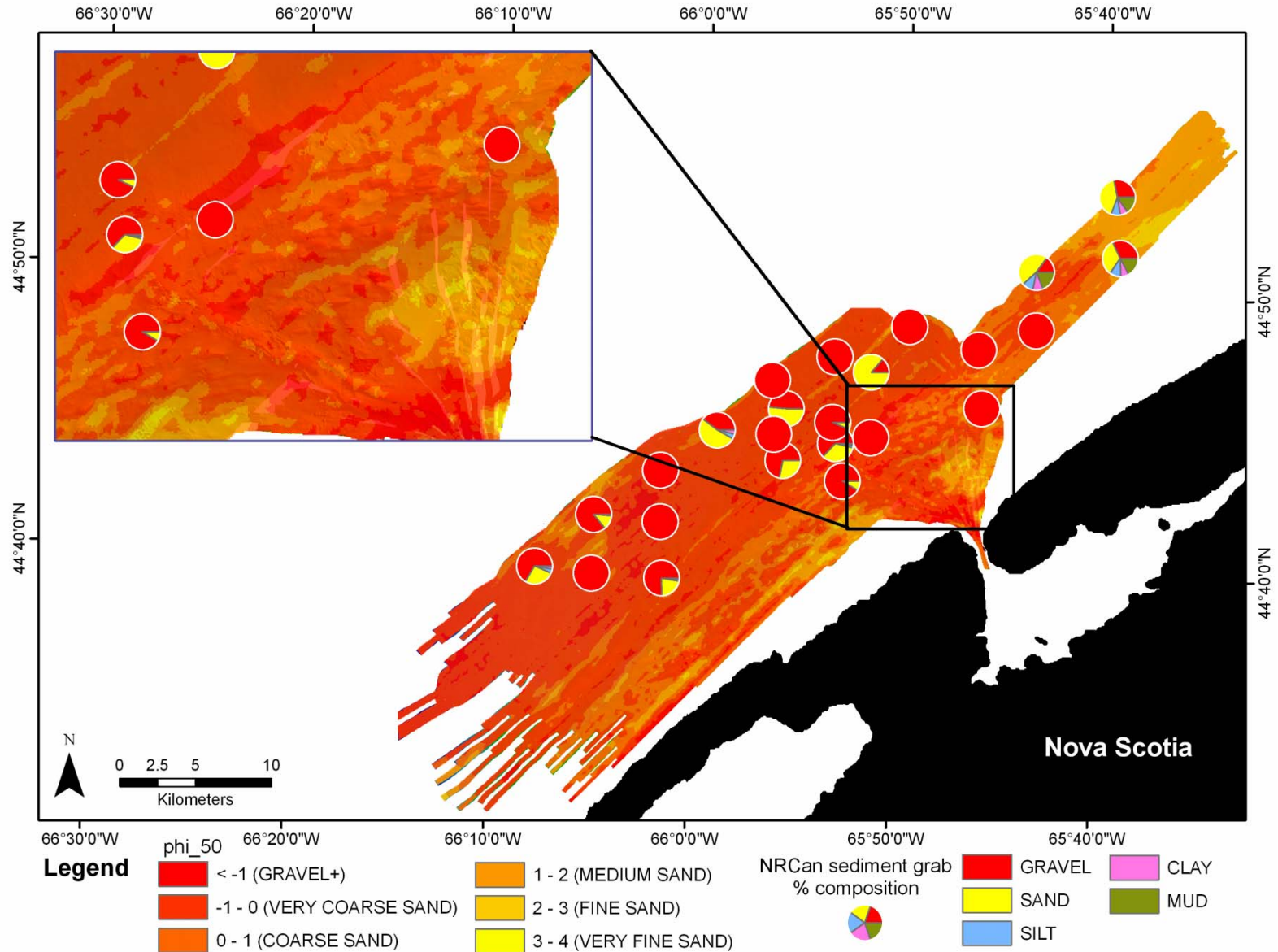
Brown et al. (2010). *Advances in seafloor habitat mapping: The application of multibeam backscatter data using CARIS tools for habitat discrimination*. CARIS 13th International User Group Conference, Miami, Florida, USA. March 22-25, 2010

Bay of Fundy



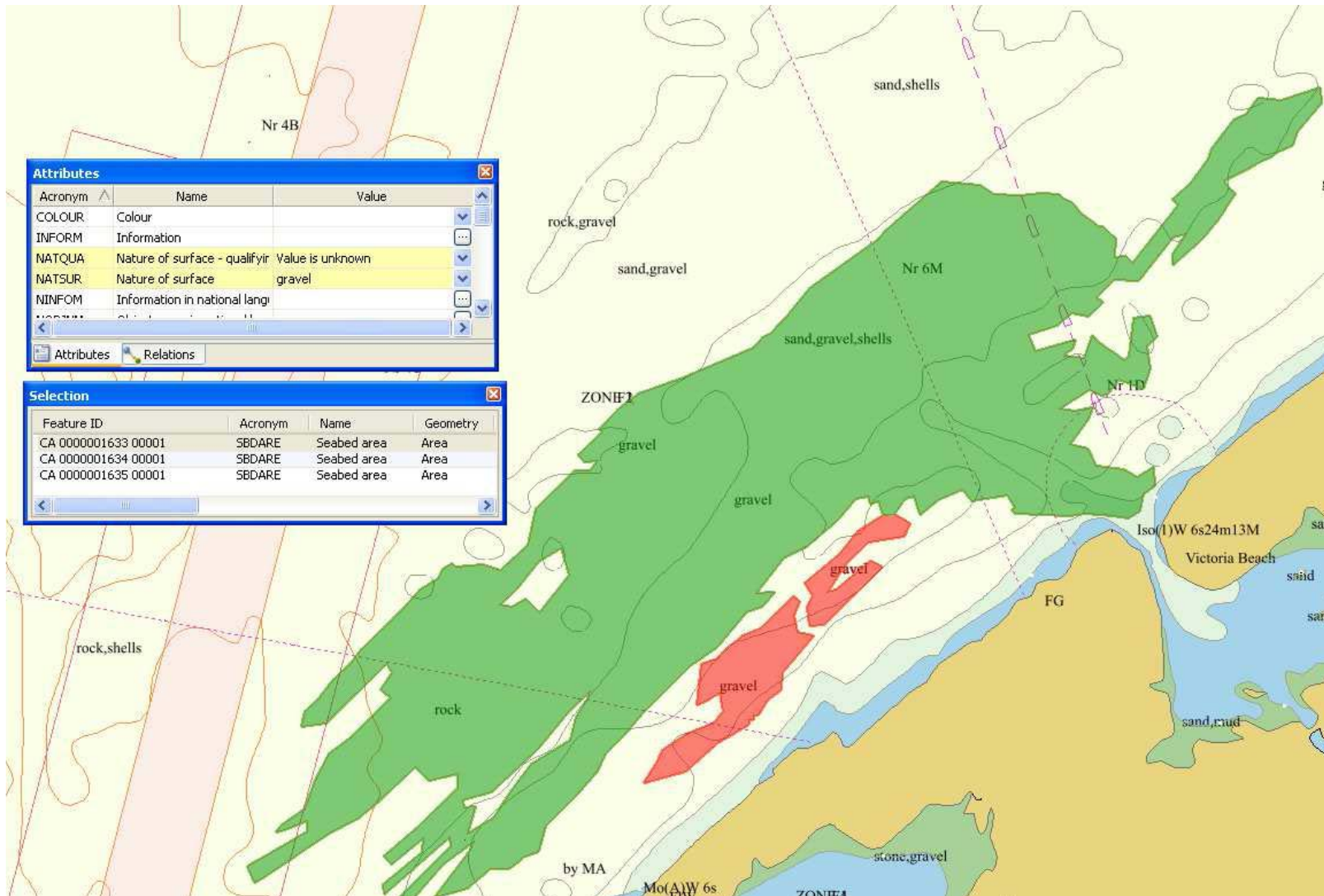
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Bay of Fundy



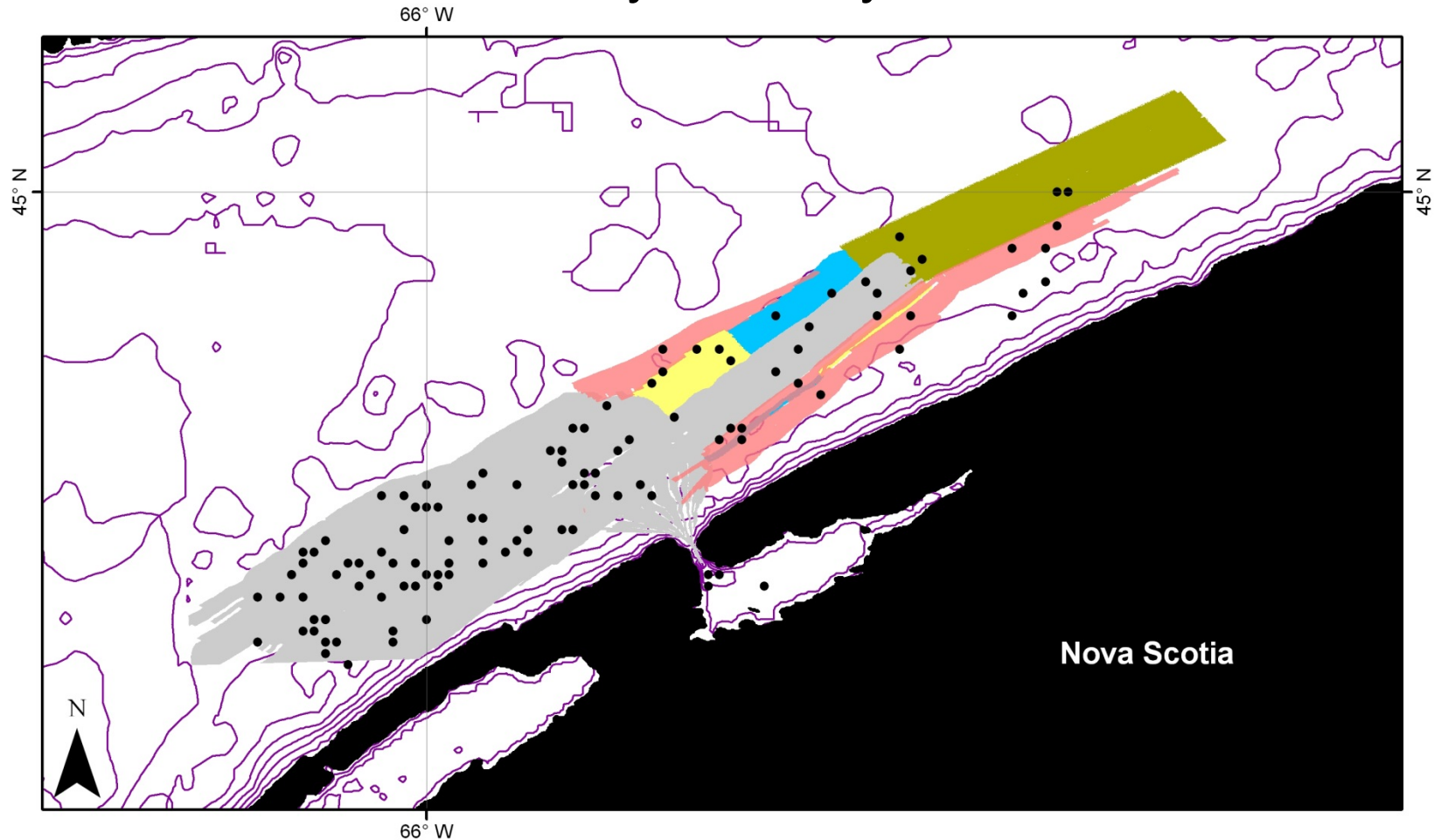
Brown et al. (2010). *Advances in seafloor habitat mapping: The application of multibeam backscatter data using CARIS tools for habitat discrimination*. CARIS 13th International User Group Conference, Miami, Florida, USA. March 22-25, 2010

S-57 application of Geocoder outputs



Brown et al. (2010). *Advances in seafloor habitat mapping: The application of multibeam backscatter data using CARIS tools for habitat discrimination*. CARIS 13th International User Group Conference, Miami, Florida, USA. March 22-25, 2010

Bay of Fundy



Legend

- EM710 - Matthew (2007)
- EM3002 - Pipit (2007)
- EM3002 - Plover (2007)
- EM1002 - Creed (2006)
- EM1000 - Creed (1999)
- Scallop tows
- GEBCO 20m contours

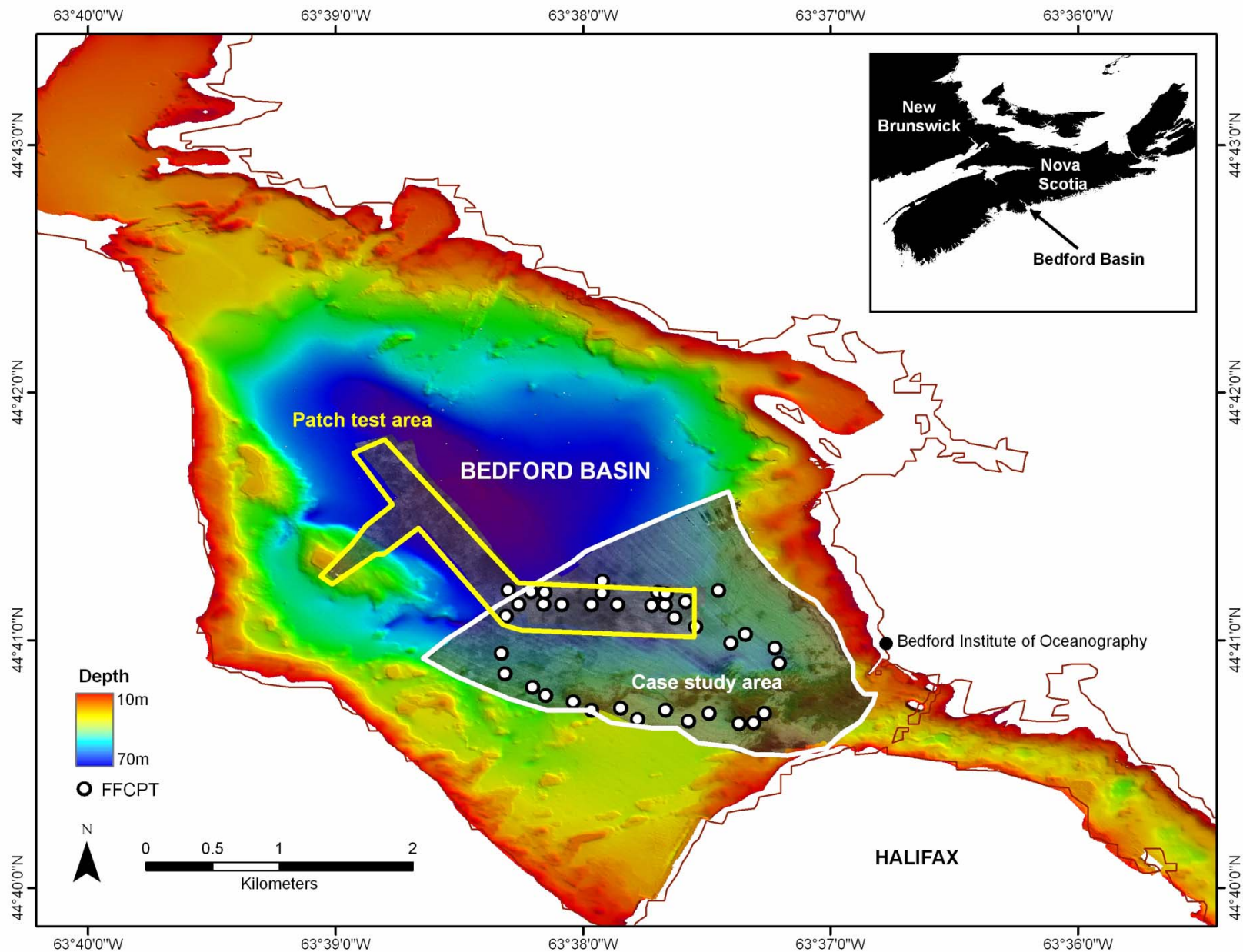
Dealing with multisource MBES backscatter data sets?

Objectives

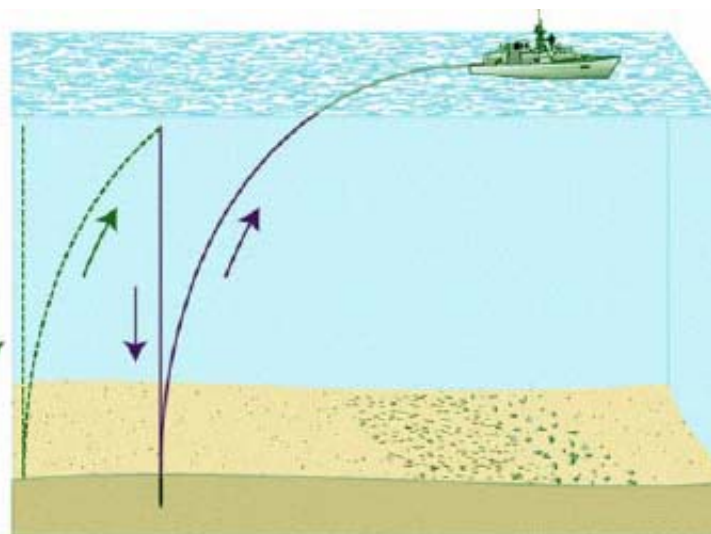
- Use **Bedford Basin patch test multibeam data** spanning several years with FFCPT in-situ sediment data and sediment grain size (grab) sample data to compare and calibrate Angular Range Analysis performed by *Geocoder*
- Investigate the **effect of MBES data acquisition parameters** (e.g. Pulse length, gain settings, mode of operation, etc) on seafloor feature recognition
- **Test *Geocoder* performance analysis/classification** between data sets collected at selected small-area case study sites
- **Compare the results against other processing methods**



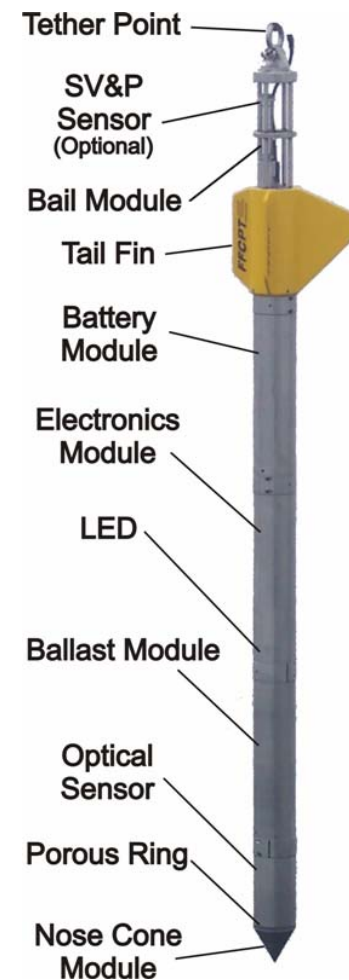
Study sites



Free Fall Cone Penetrometer (FFCPT)



Conceptual drawing of use of FFCPT & MVP for Military Oceanography and seabed classification.



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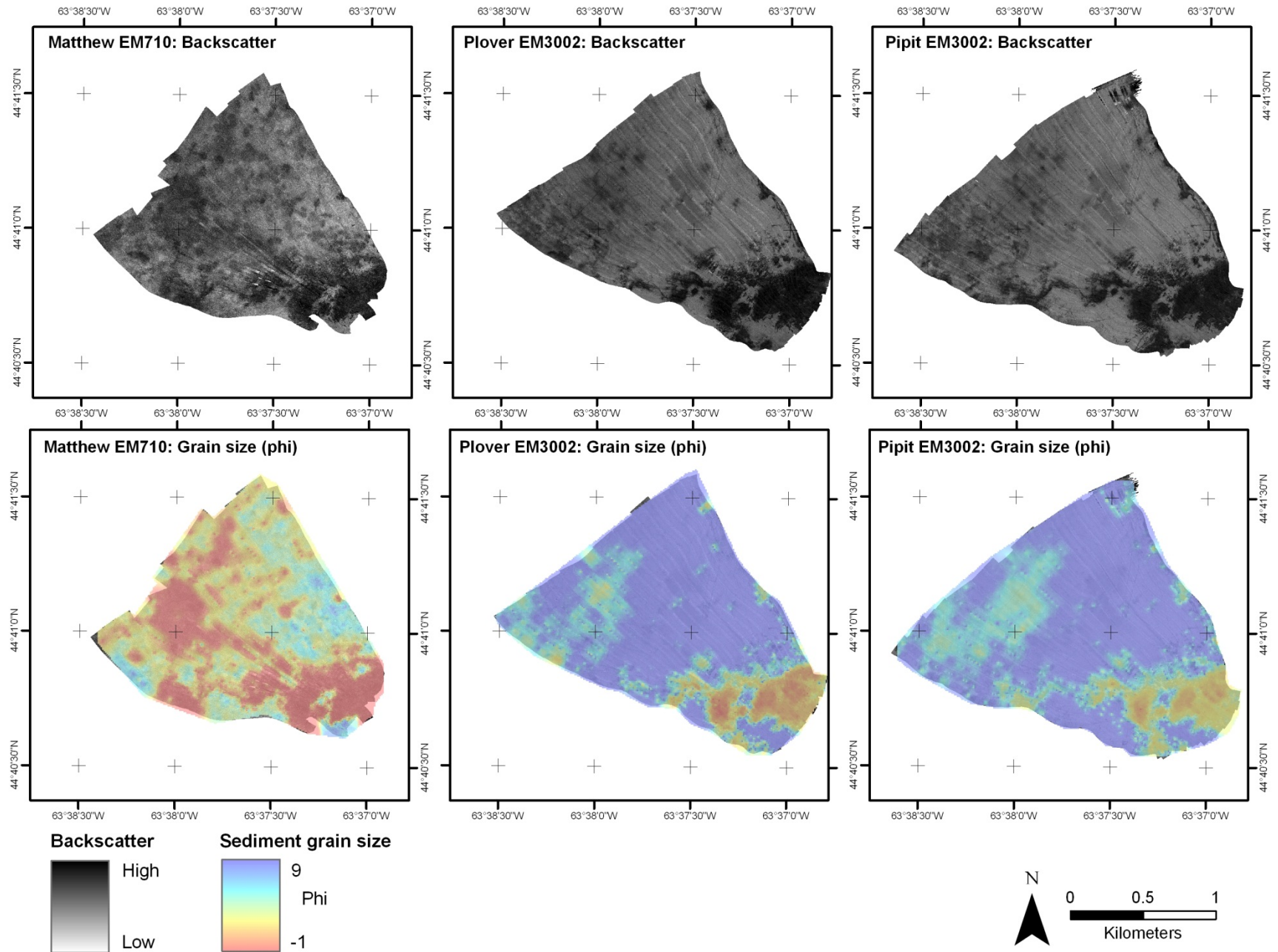
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Preliminary Results

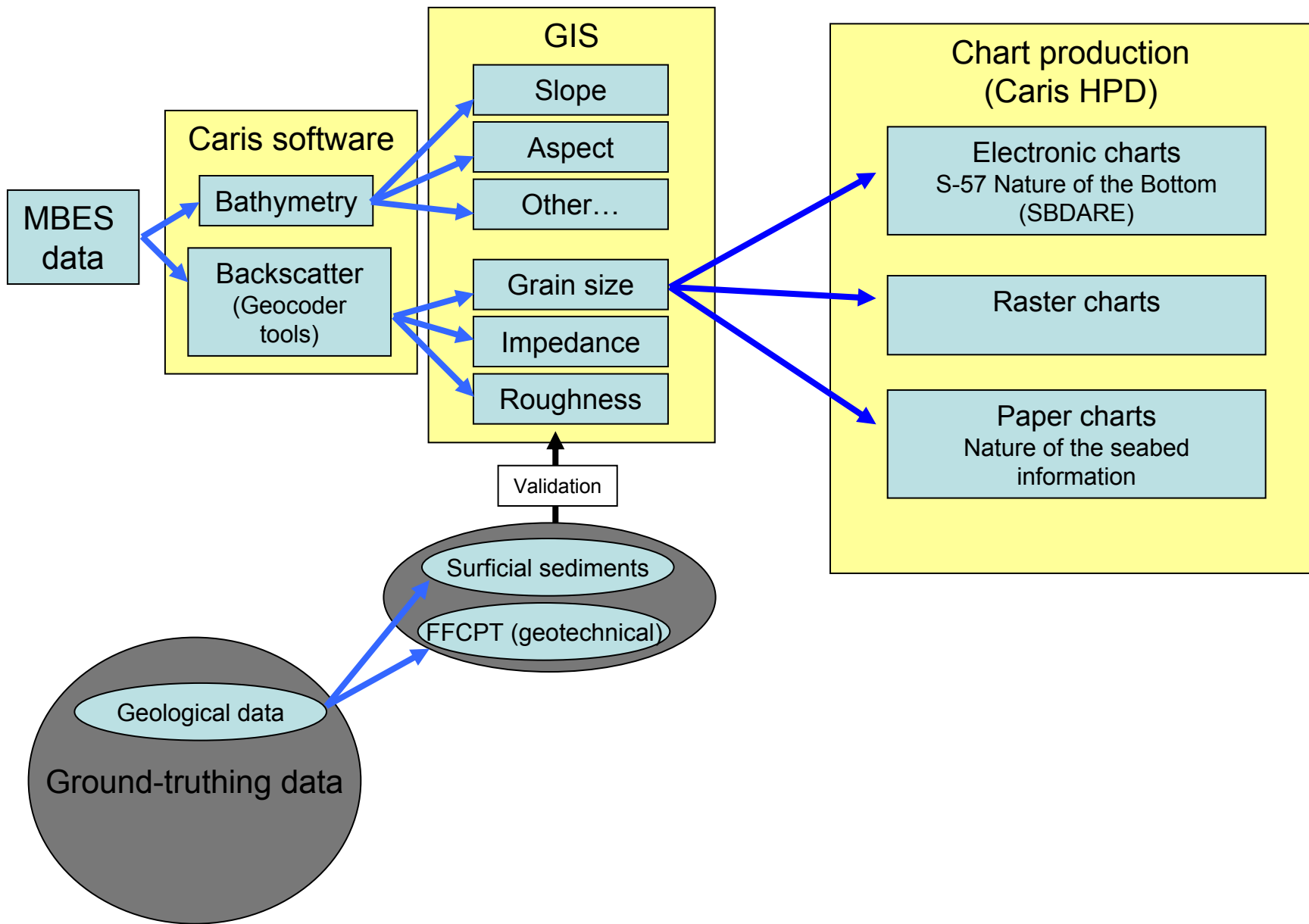


Future work

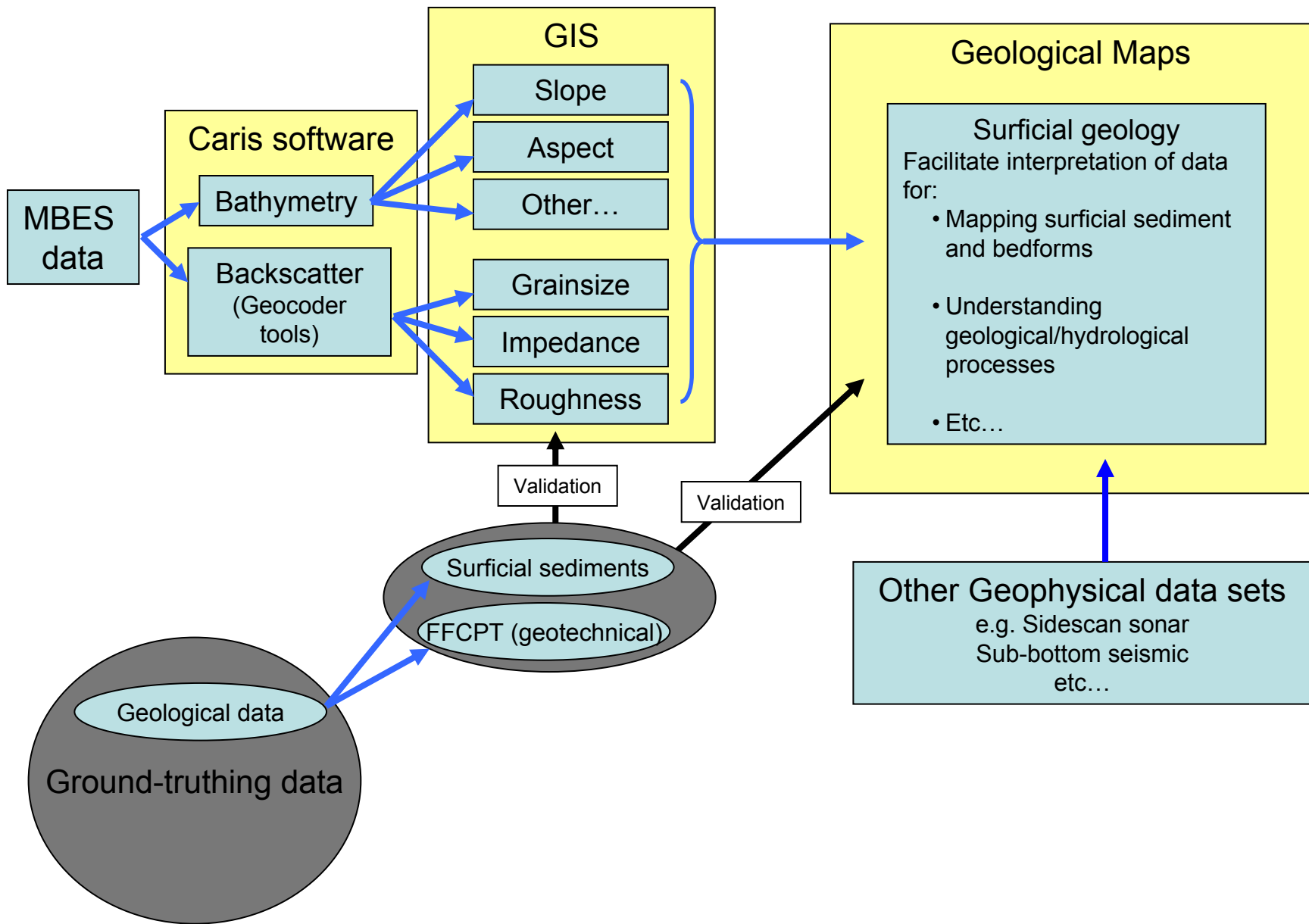
- Compare *Geocoder* backscatter mosaics (absolute dB values) and ARA outputs between MBES systems/platforms/years
- Collection of sediment grab samples from the patch test and case study areas within Bedford Basin – compare with ARA outputs and FFCPT data sets
- Explore calibration options using the *Geocoder* tools (i.e. beam pattern corrections) to align ARA outputs between MBES systems
- Compare the effects of backscatter acquisition parameters on the *Geocoder* backscatter outputs
- Devise a data acquisition and processing strategy to maximise the value of MBES backscatter data for multiple applications (chart production, geological mapping, biological/habitat mapping)



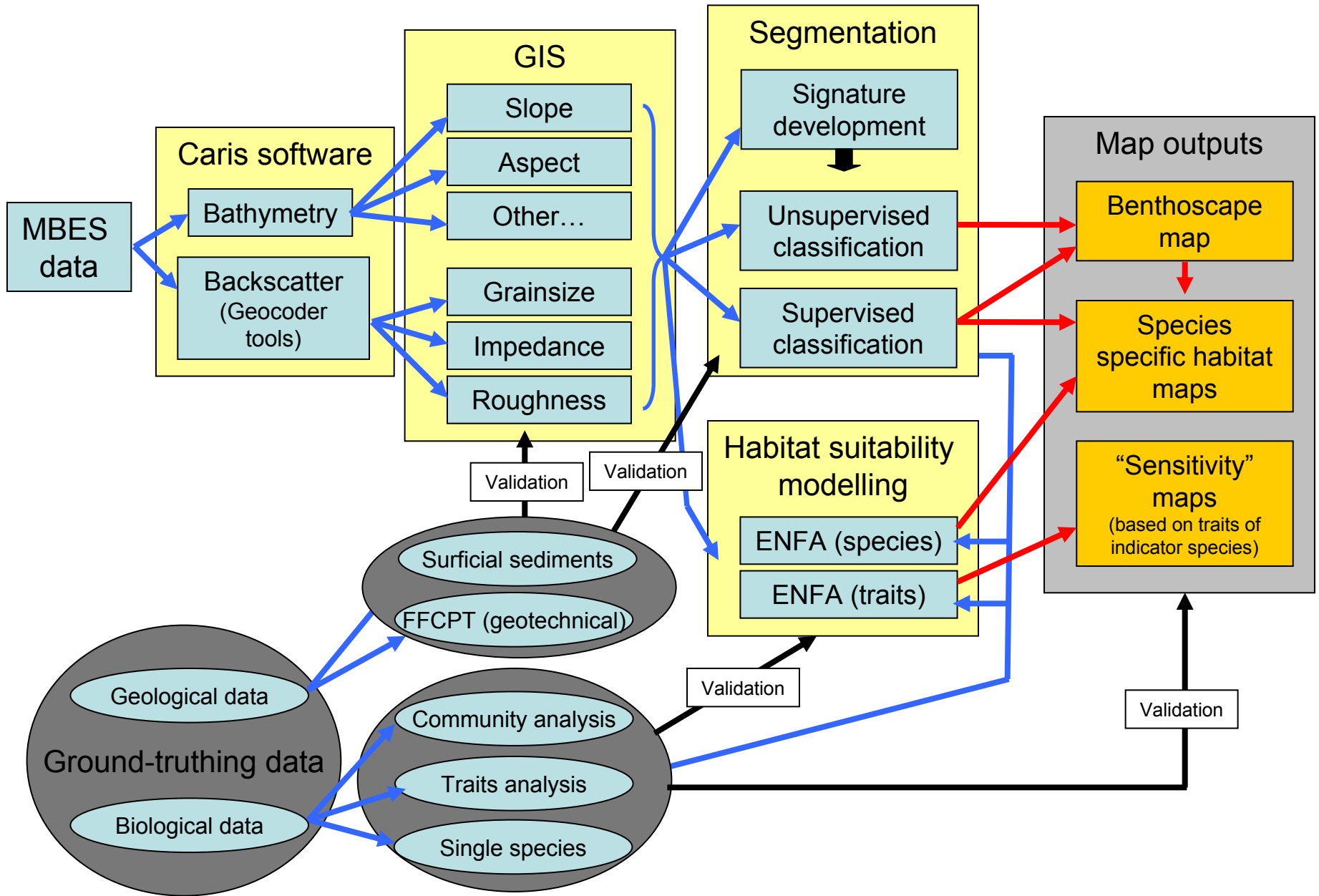
Geocoder applications: Navigation, Geology, and Habitat



Geocoder applications: Navigation, Geology, and Habitat



Geocoder applications: Navigation, Geology, and Habitat



Thank you!

Questions?

We thank:

- **The crew of the CCGS Matthew, CSL Plover, CSL Pipit; CHS and NRCan personnel involved in MBES data acquisition and processing**
- **Natural Resources Canada for provision of sediment grain size data**
- **The support of the MVP/FFCPT team at Rolls-Royce Naval Undersea Systems**
- **For input and suggestions we thank: Stephen Smith, Peter Lawton, Ellen Kenchington and Alain Vezina (DFO); Stephen Parsons, Herman Varma, Mike Lamplugh, Chris LeBlanc (CHS)**

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