Mapping capelin demersal spawning habitat off northeast Newfoundland

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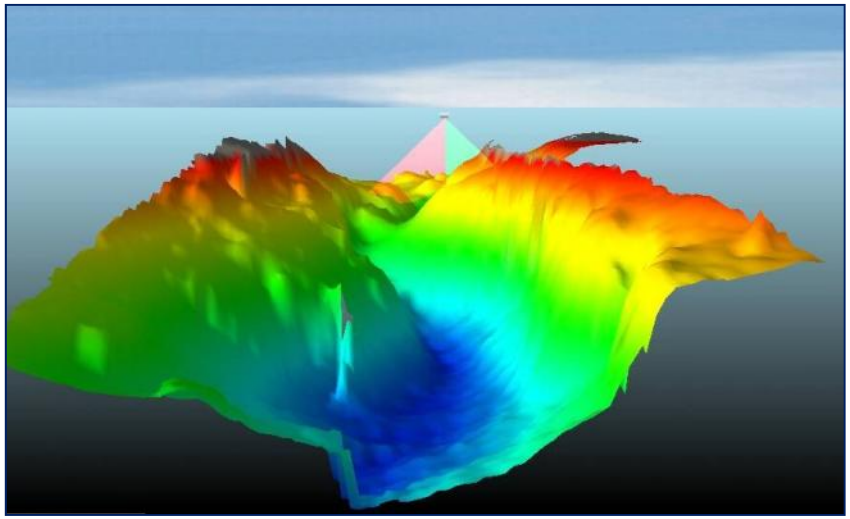
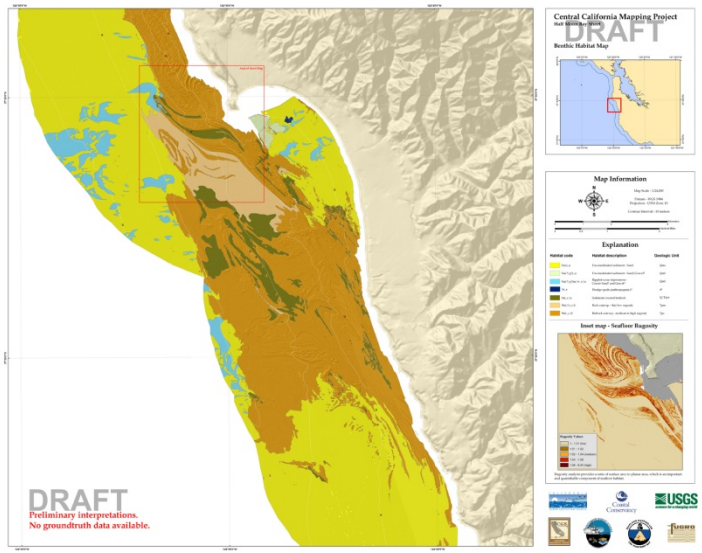
MEMORIAL UNIVERSITY
Newfoundland & Labrador, Canada

Marine Habitat Mapping

Source: www.nwfsc.noaa.gov



Source: www.irl.cri.nz



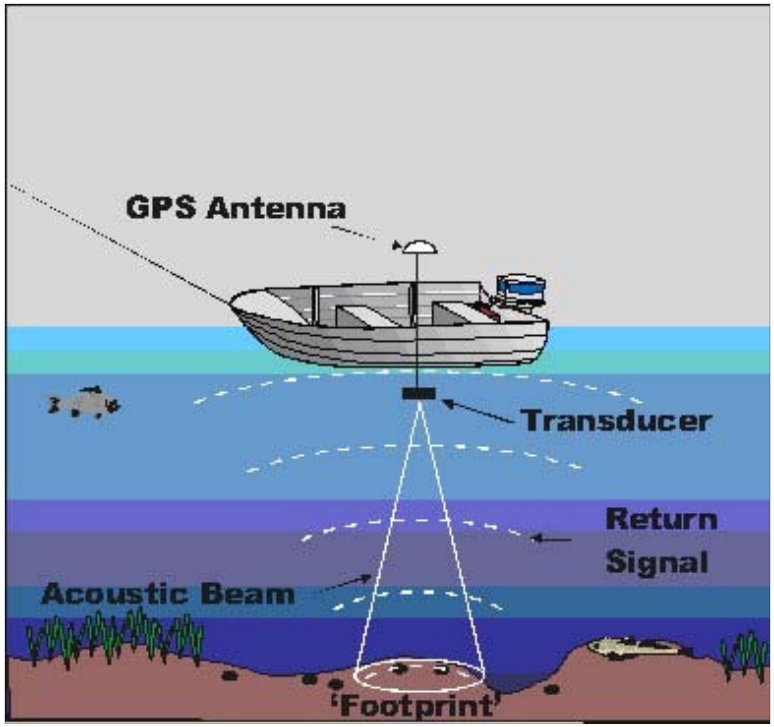
Source: USGC

Proper management of marine resources and environment requires relevant knowledge.

Marine Habitat Mapping

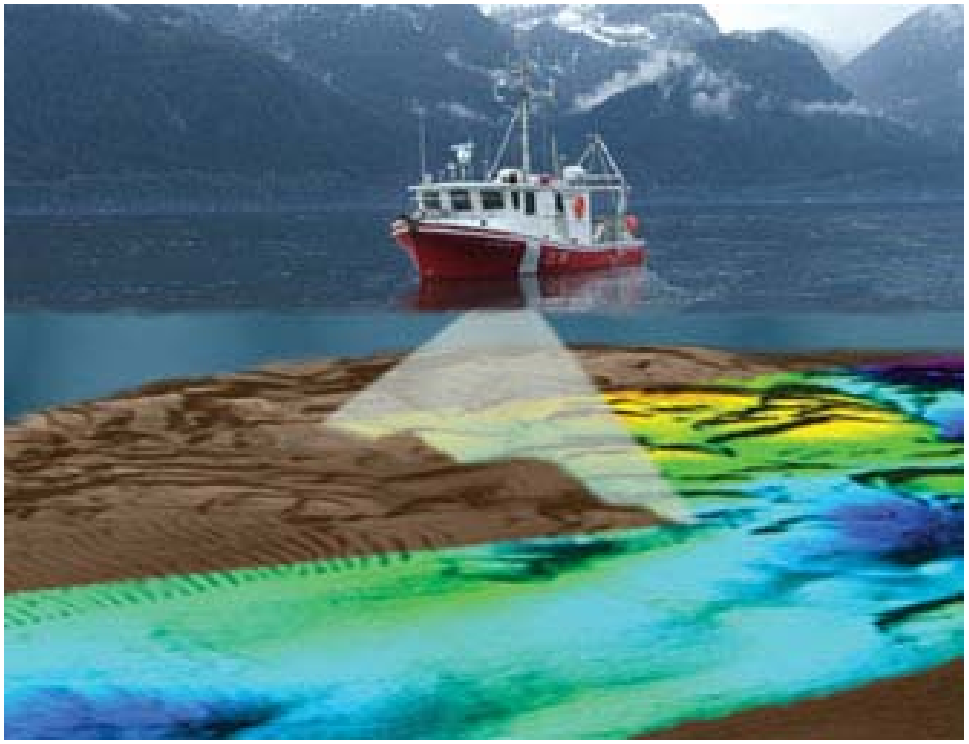
ACOUSTIC SURVEY

Single Beam



Source: www.ozcoasts.org

Multibeam



Source: DFO

Product From Acoustic Survey

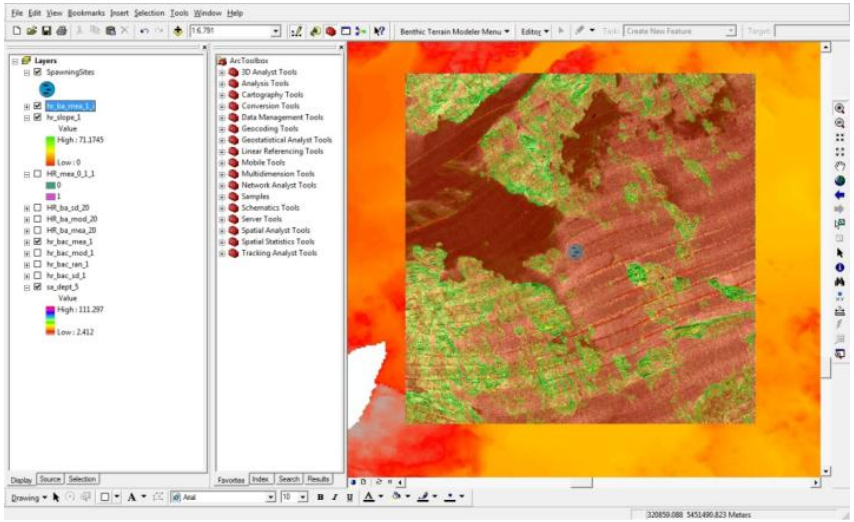
Seabed Habitat Mapping from Bottom Classification

Acoustic data acquisition

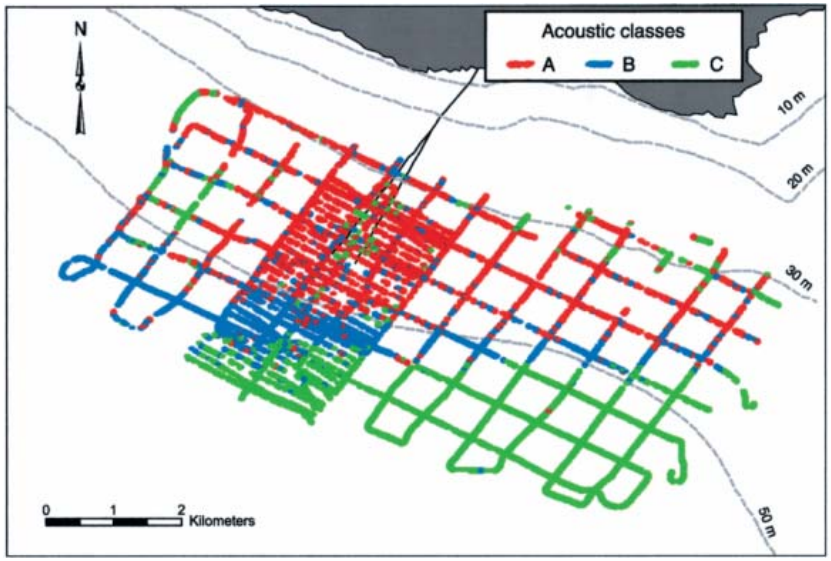
Classification of bottom type from characteristics of interest

Mapping of Supervised Classification

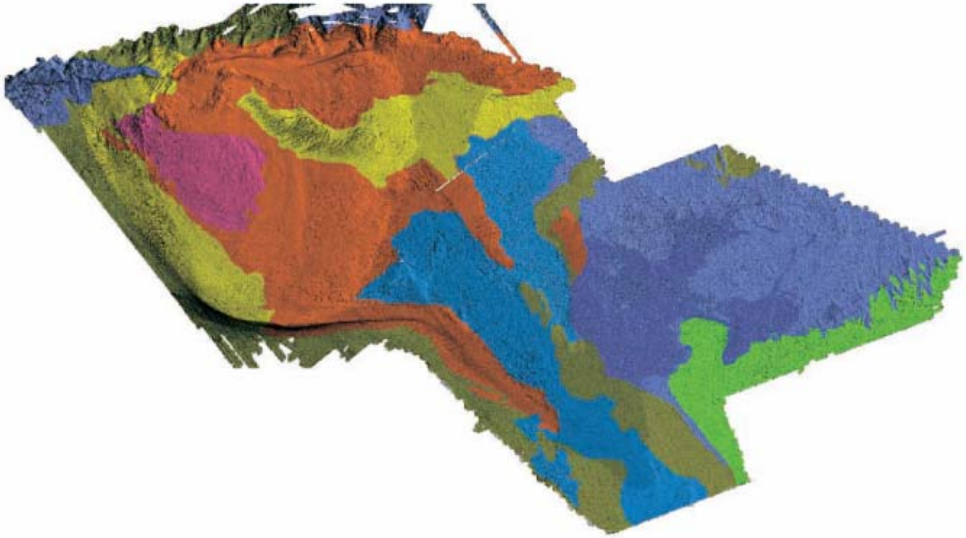
Bottom Grabs



Examples of Acoustic Benthic Classification

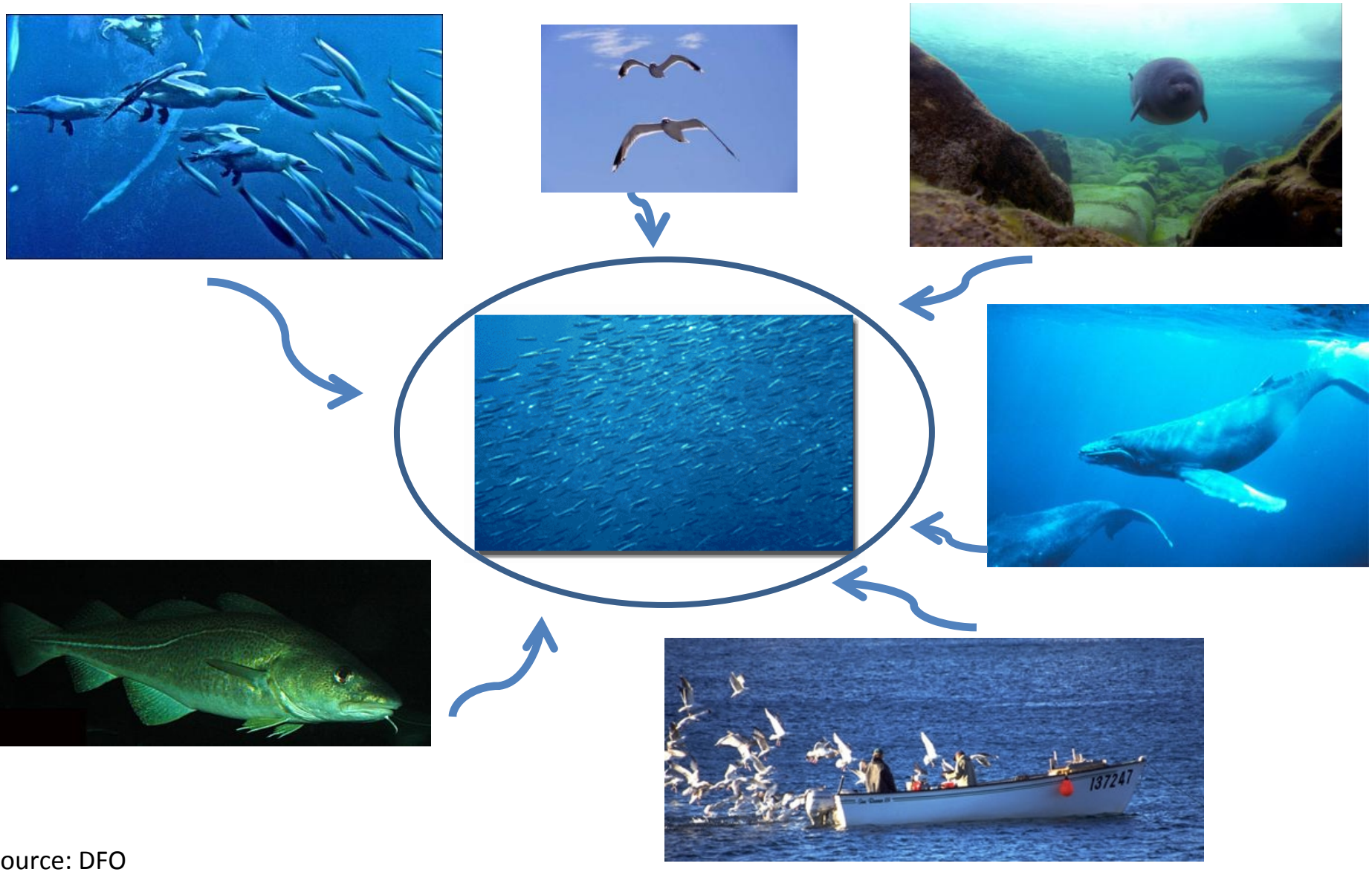


Benthic Habitat classification, Portugal.
Source : Freitas et al., 2003



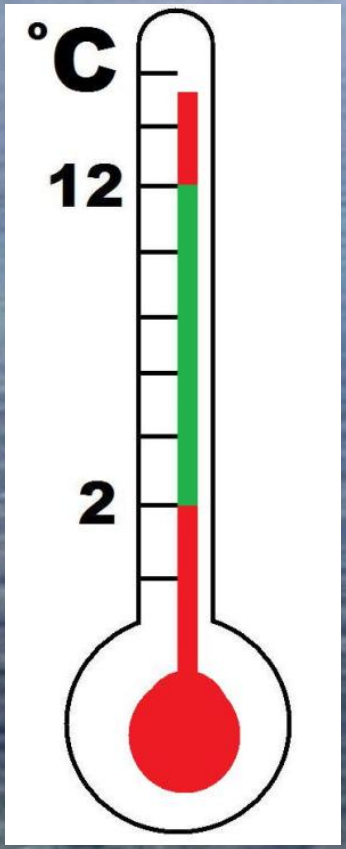
Benthic Habitat classification on Browns bank NS.
Source: Kostylev et al., 2001

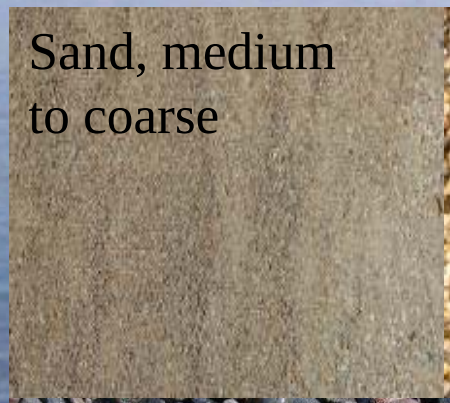
So many depend on Capelin

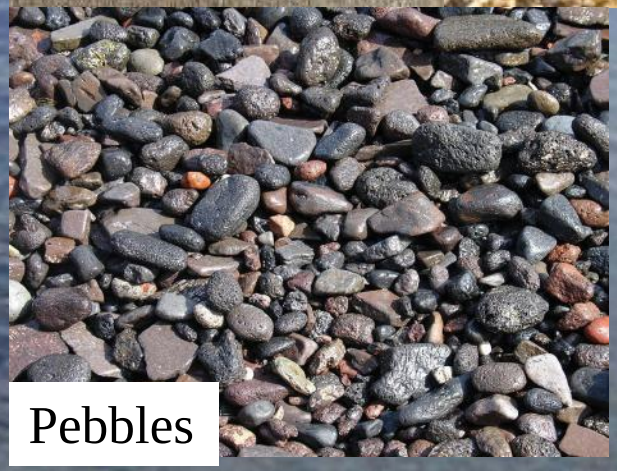


Source: DFO

Capelin Spawning Conceptual Model







GRAIN SIZE From 0.3mm to 3cm

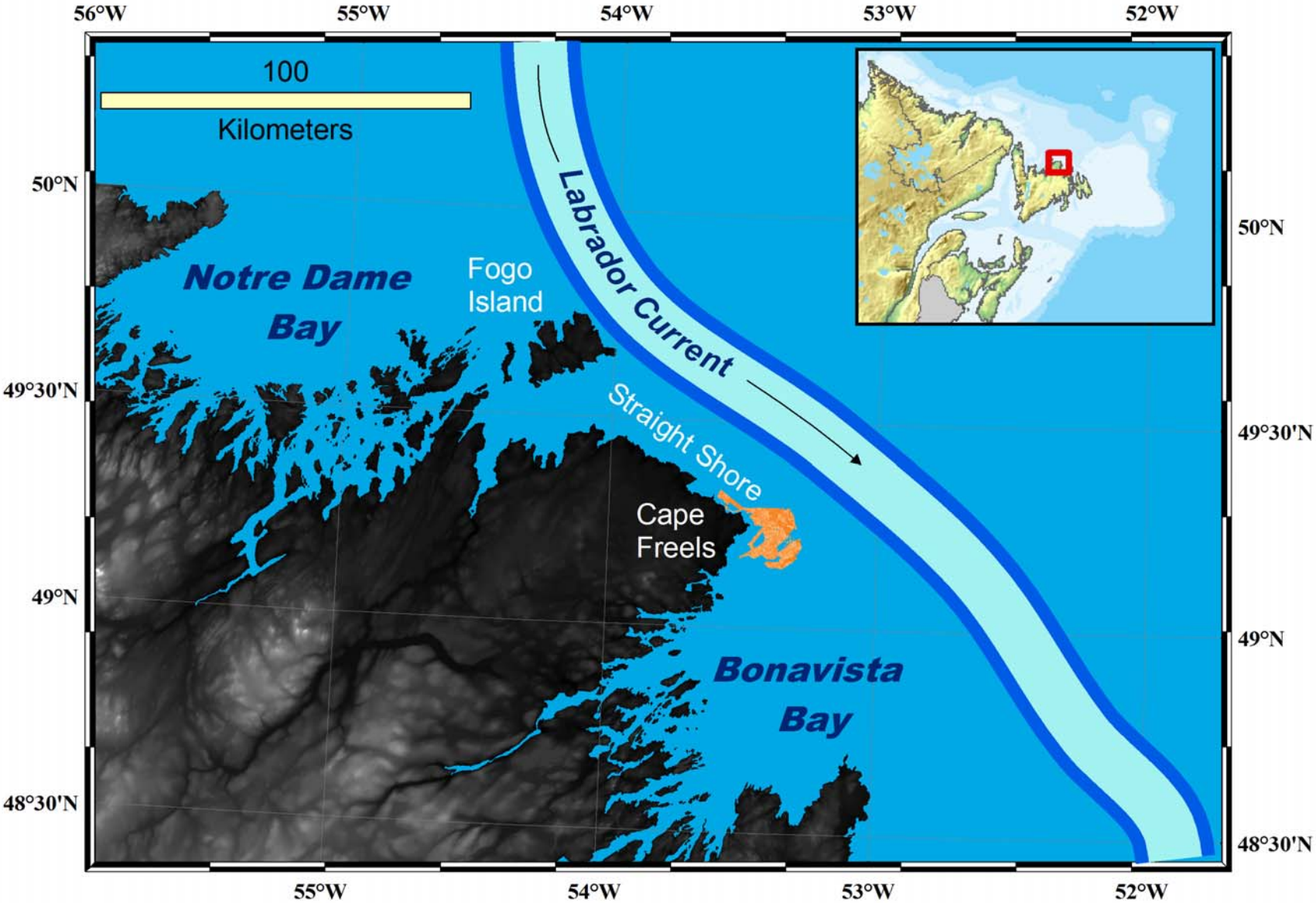
Source: shutterstock.com

Research Questions

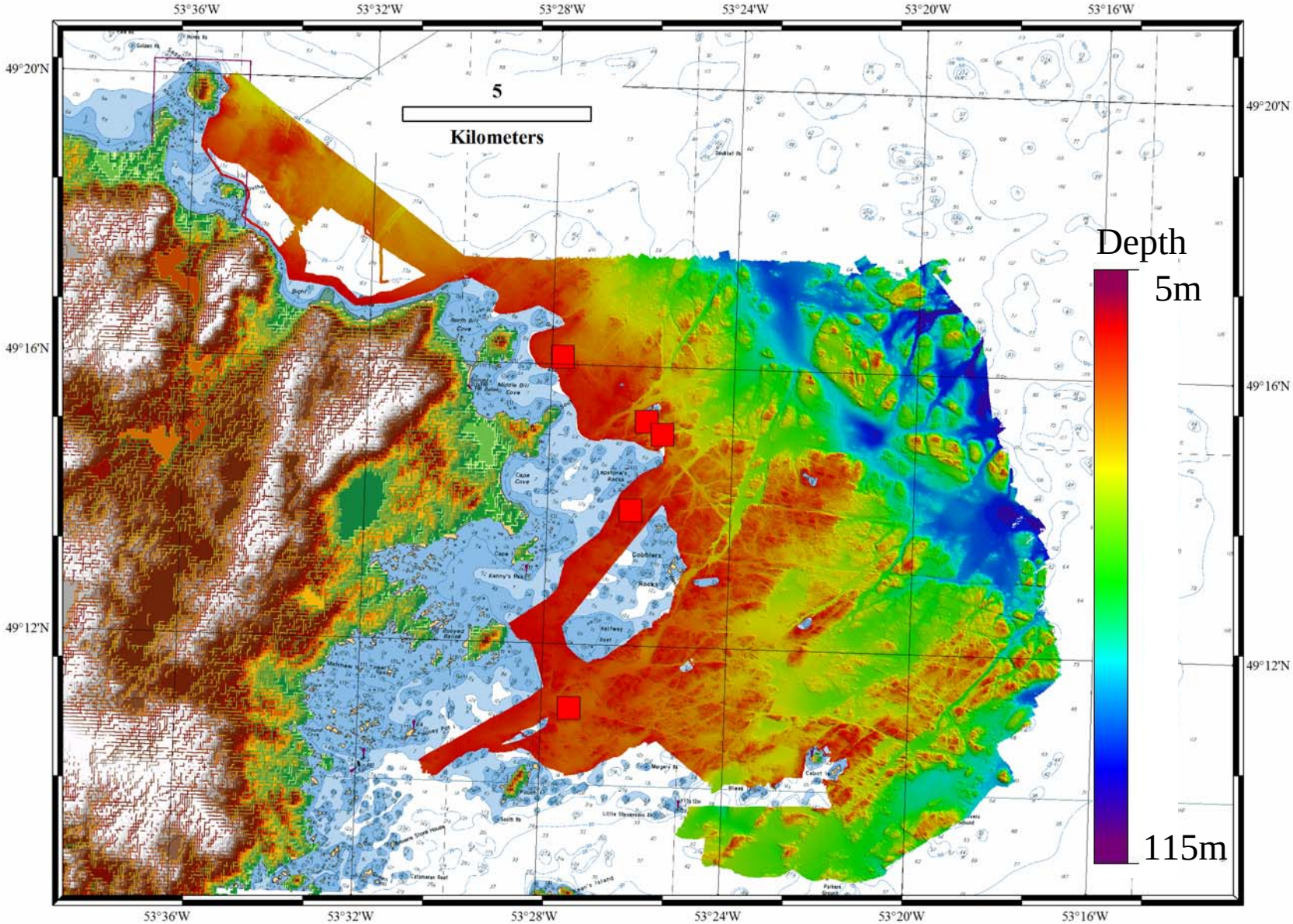
- **Can capelin spawning sites be classified from multibeam data?**

- **Can potential capelin spawning sites be identified from the interpretation of a multibeam dataset?**

Study Area

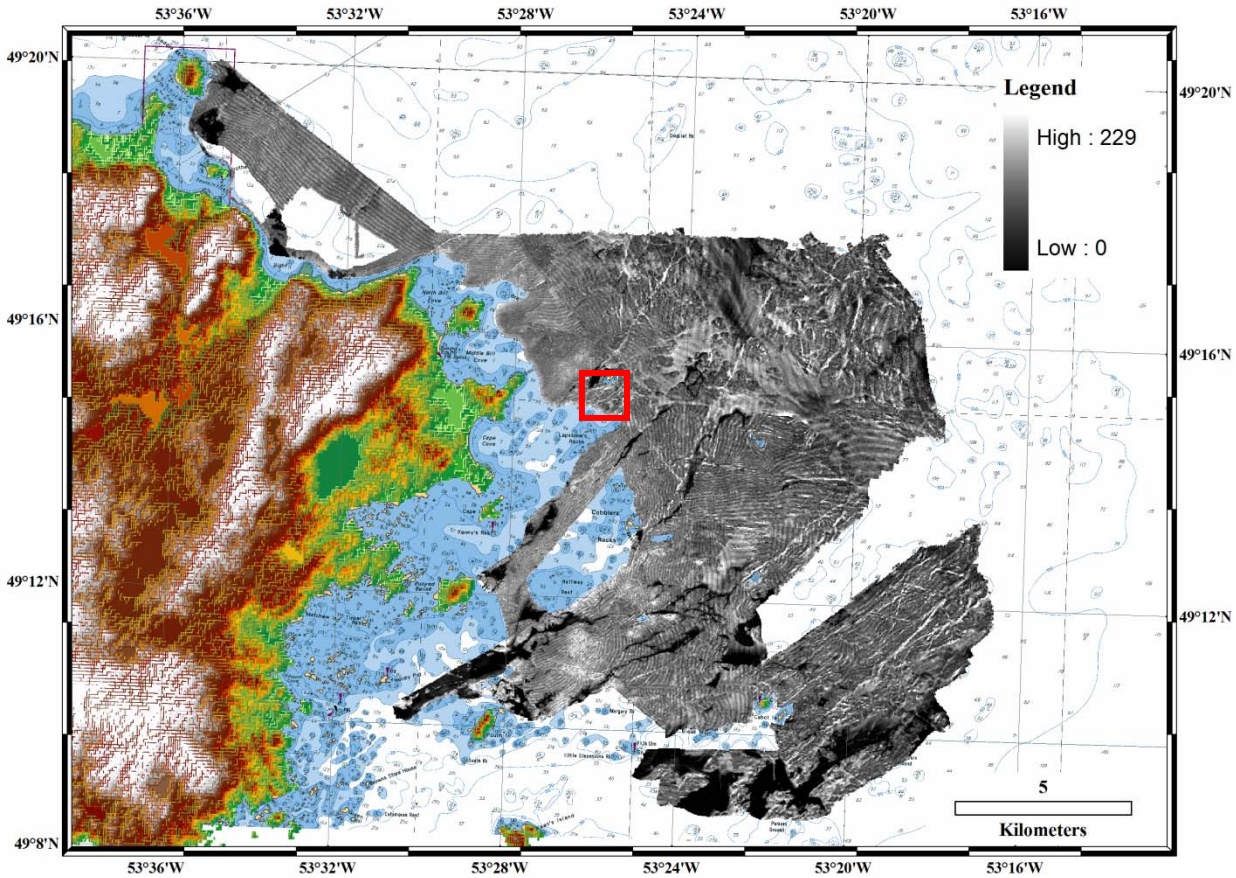

56°W
55°W
54°W
53°W
52°W
100
Kilometers
50°N
49°30'N
49°N
48°30'N
Notre Dame Bay
Fogo Island
Labrador Current
Straight Shore
Cape Freels
Bonavista Bay

Five Known Spawning Sites

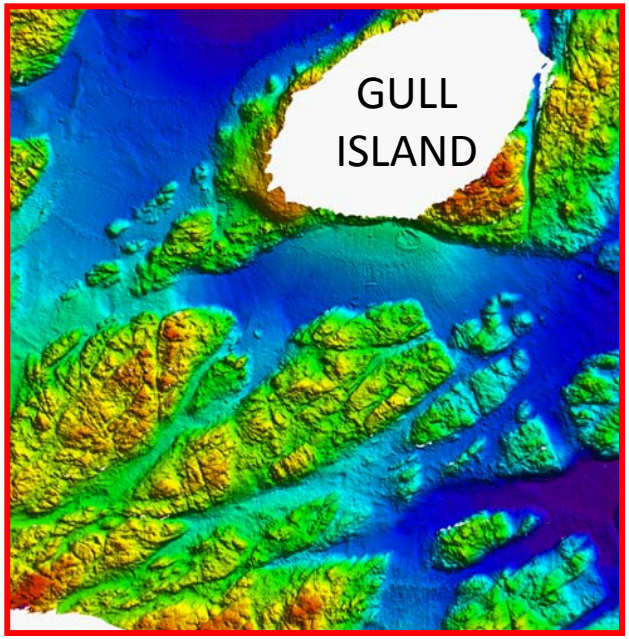


Known Spawning Sites

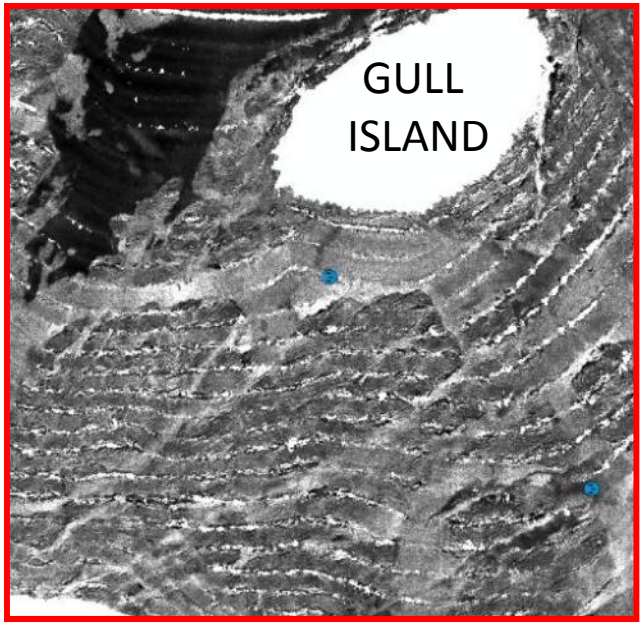
Imagery From Multibeam Echosounder



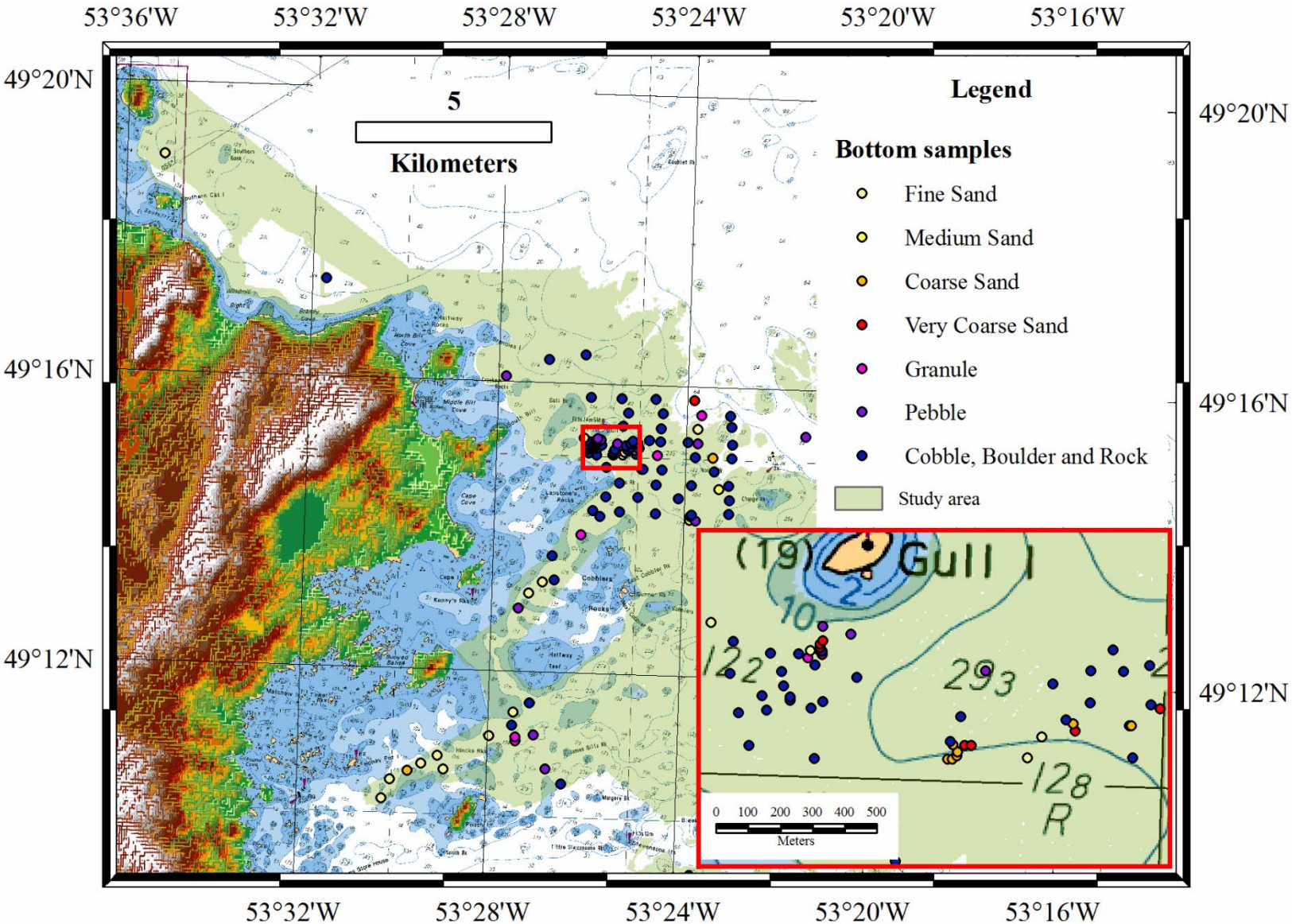
Bathymetry



Backscatter



Bottom Samples for Supervised Classification



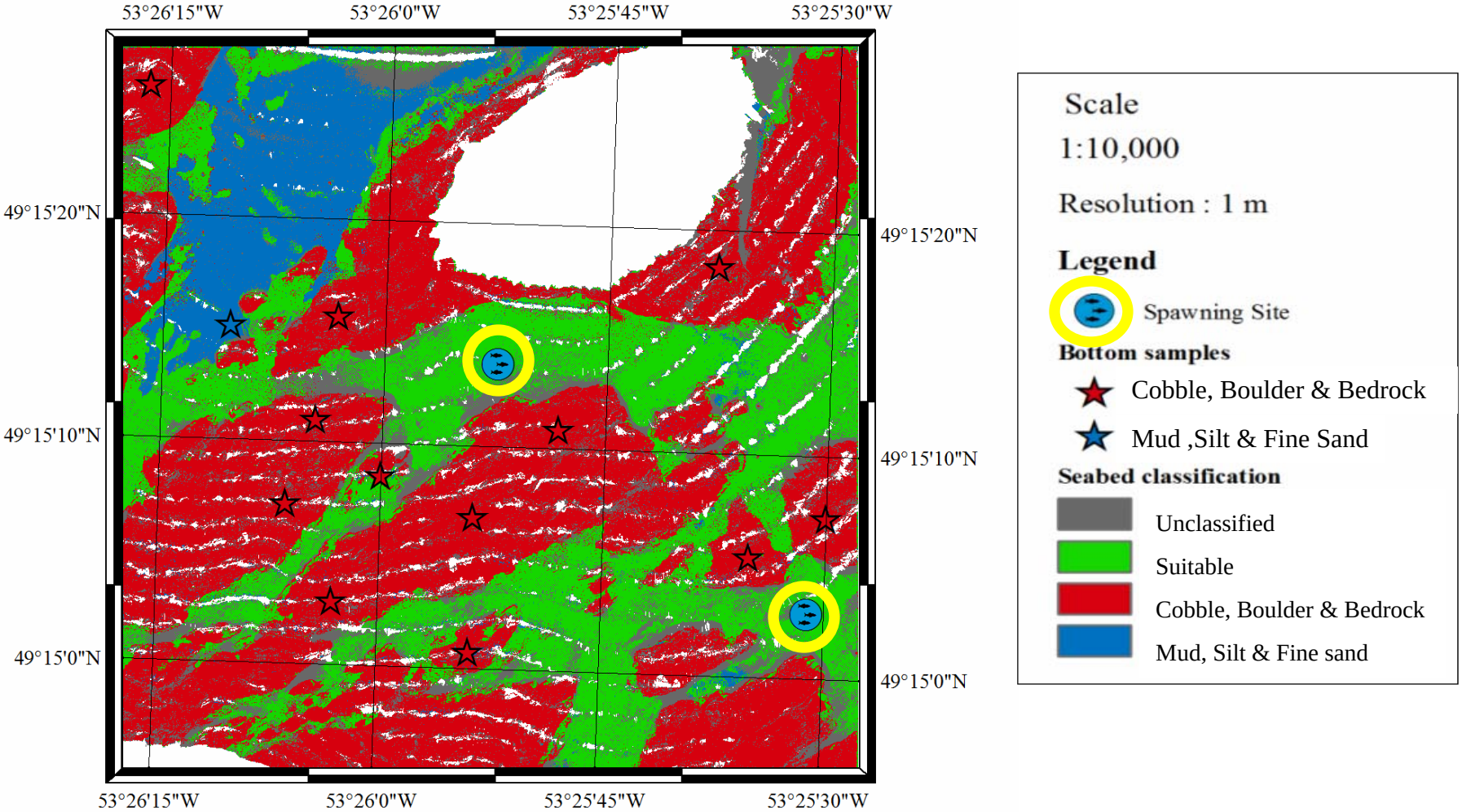
Acoustic Data

- Bathymetric
  - Slope
  - Aspect
  - Curvature
  - Roughness
  - Bathymetric Position Index
- Backscatter
  - Grain size proxy
  - Backscatter variance

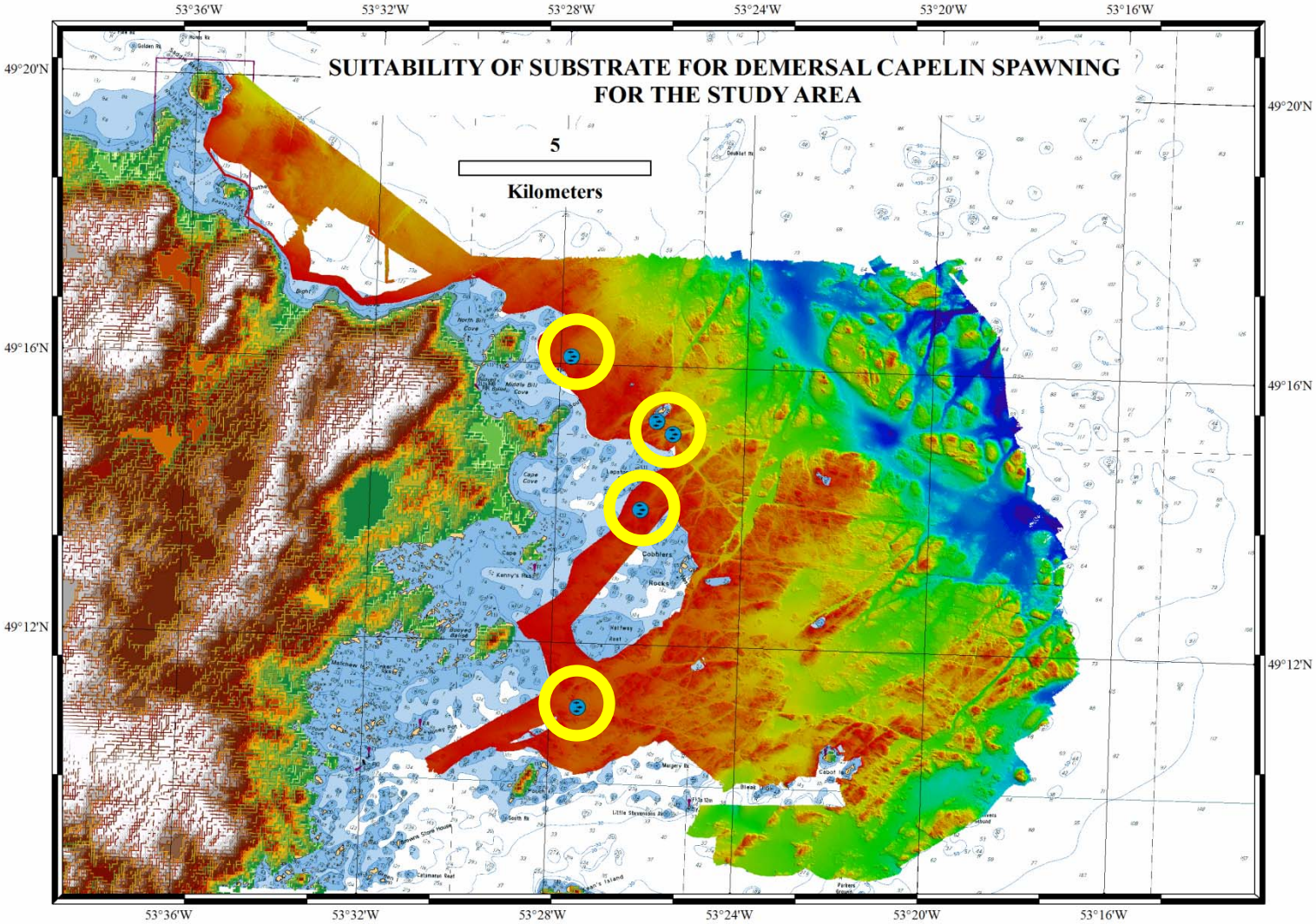
Supervised Classification

Supervised Classification

SUITABILITY OF SUBSTRATE
FOR DEMERSAL CAPELIN SPAWNING AT GULL ISLAND 2 SITE

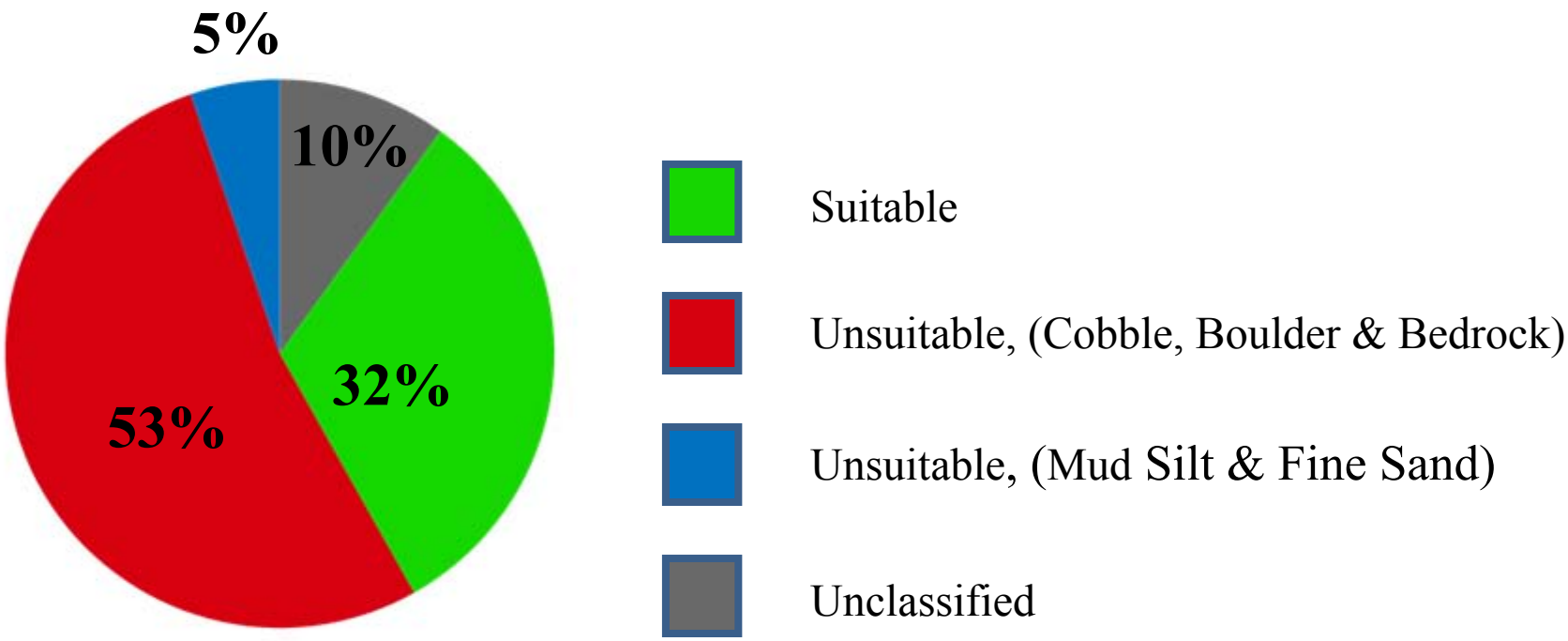


Supervised Classification,

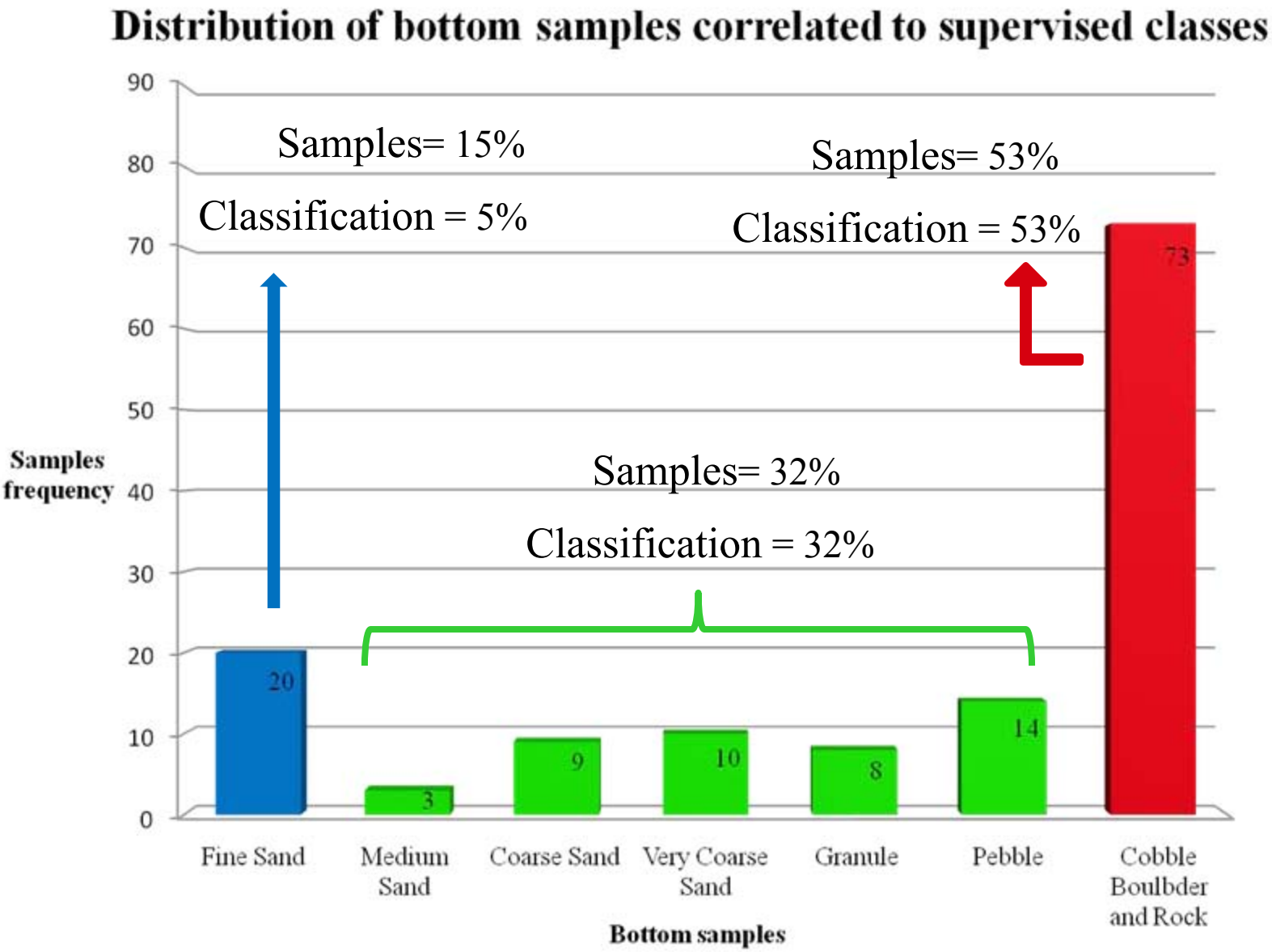


Classification Result

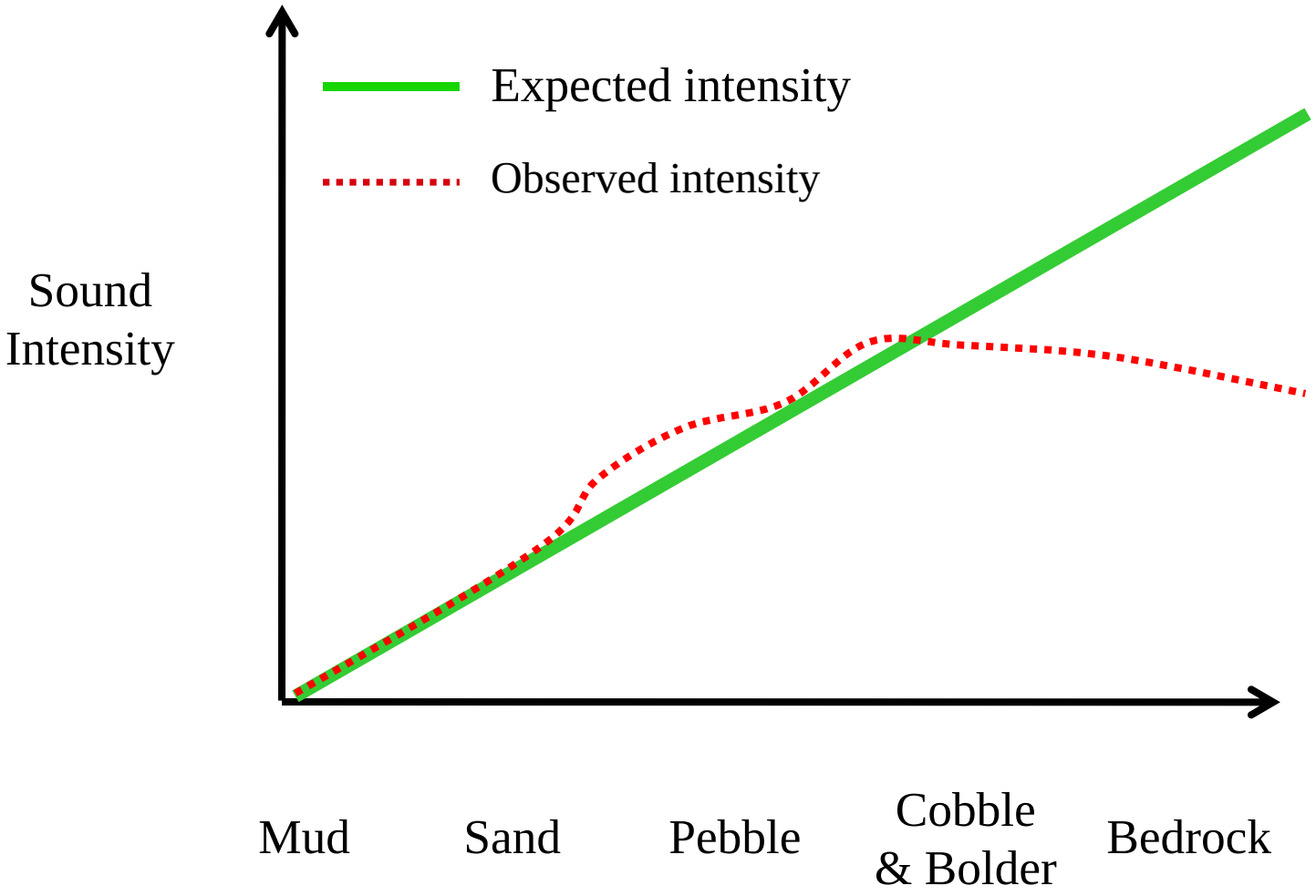
Classification values for the entire study area



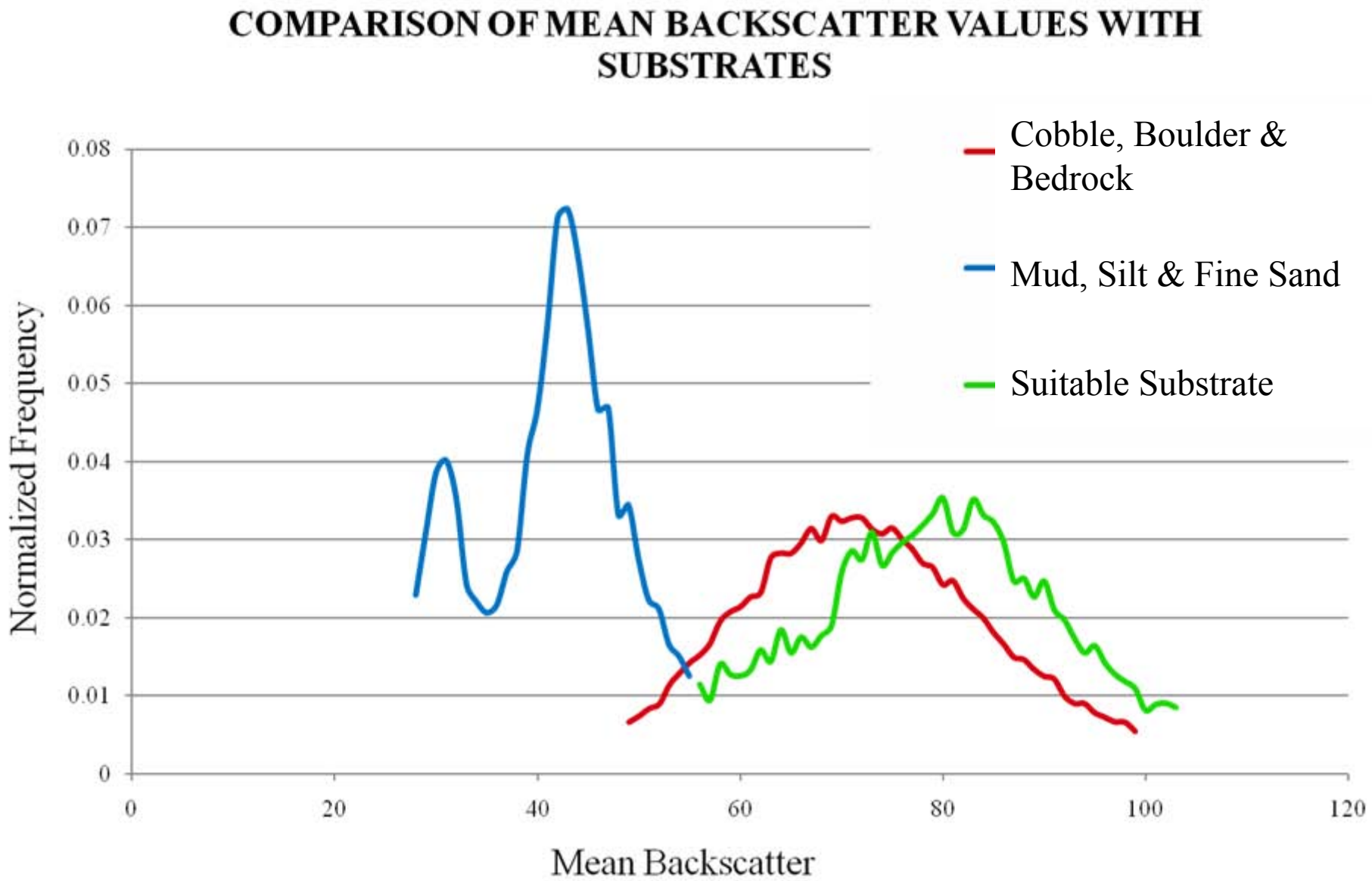
Classification Accuracy



Inconsistent Values of Backscatter for Cobble, Boulder and Bedrock



Backscatter Result



What We Learned

- Capelin spawn on very flat areas of the seafloor
- Area estimate of potential spawning ground
- Backscatter data could be influenced by environmental characteristics and deliver unexpected results

Acknowledgements

Special thanks to the Department of Fisheries and Oceans, for data, time and support.

Trevor Bell and John T. Anderson, And Rodolphe Devillers for their guidance.

Thank You!

?? QUESTION PERIOD ??

- REFERENCES

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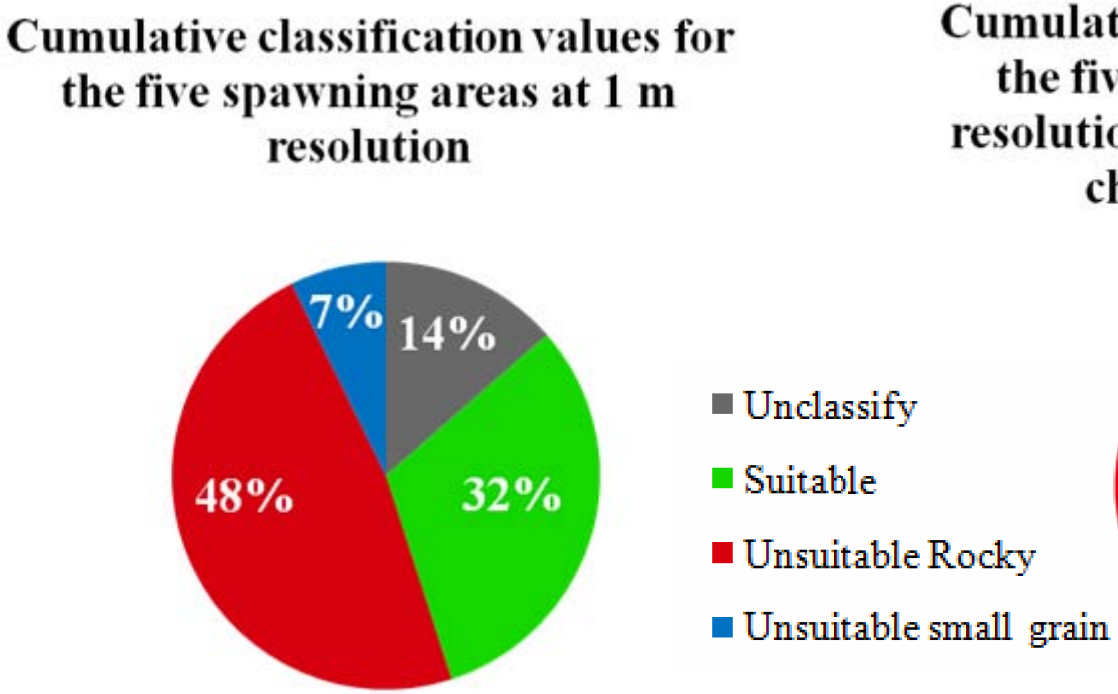
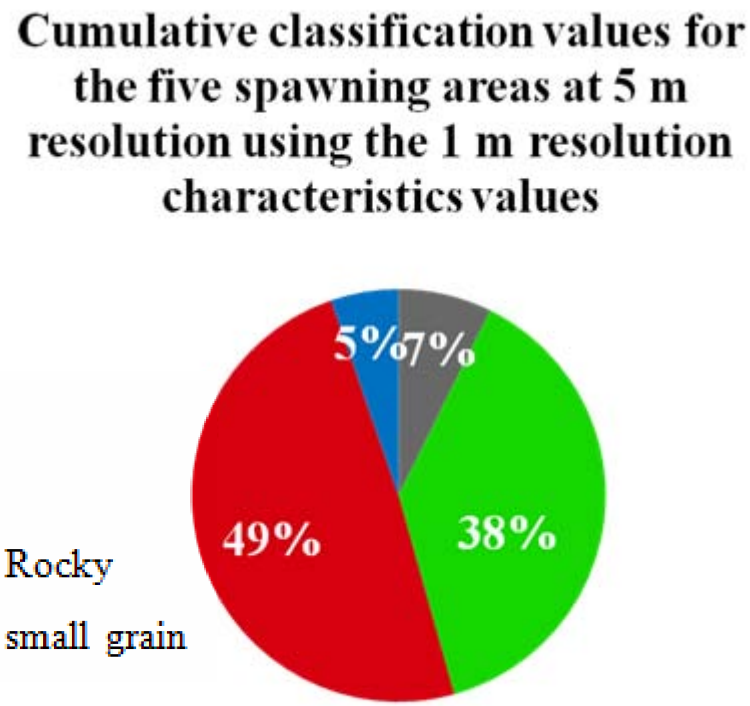
TOO MUCH DATA FOR YOUR COMPUTER!

From 1m to 5m resolution

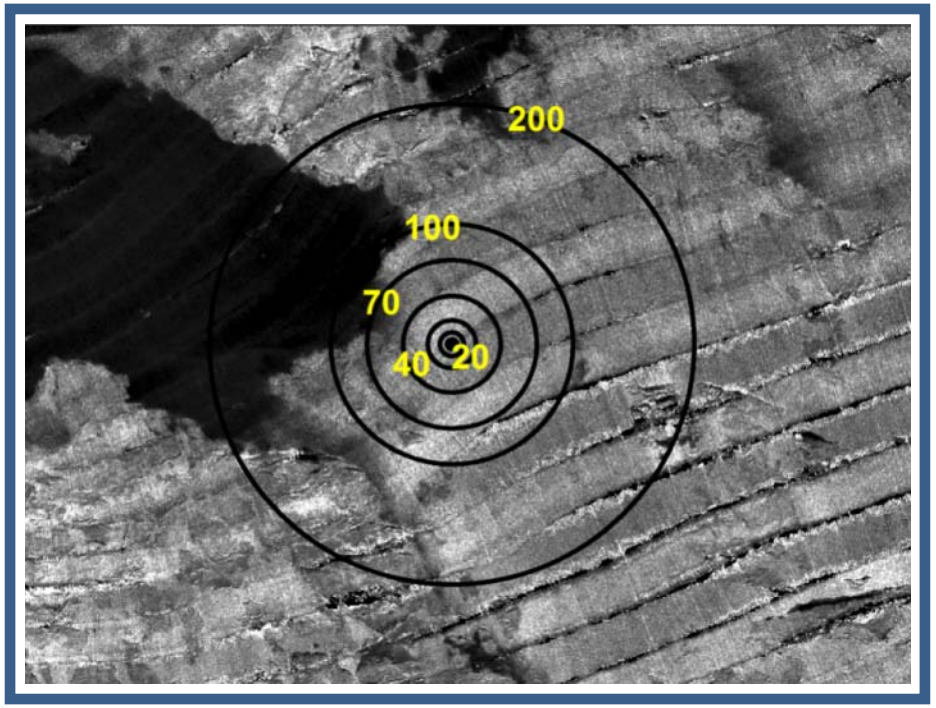
From 1 km^2 to entire study areas



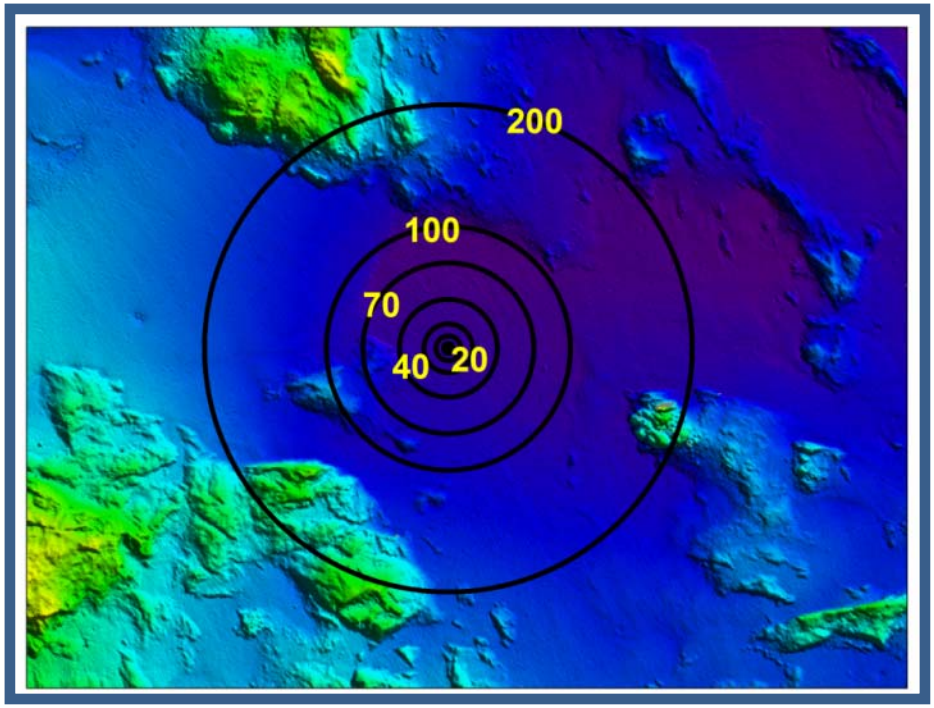


Spatial Scale of a Spawning Site Sample

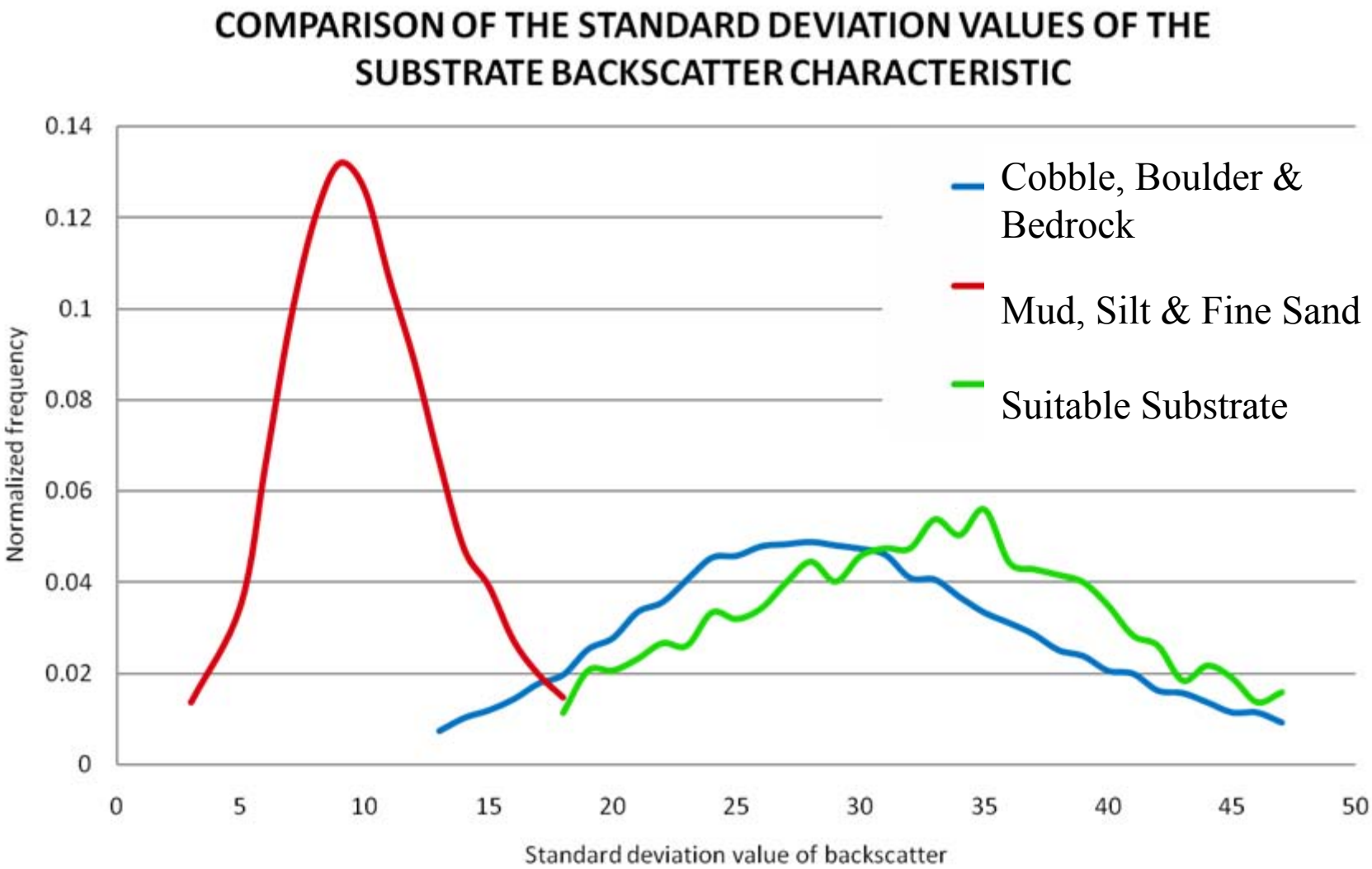
Backscatter



Bathymetry



Backscatter Results



Observing and Measuring what we can't see.

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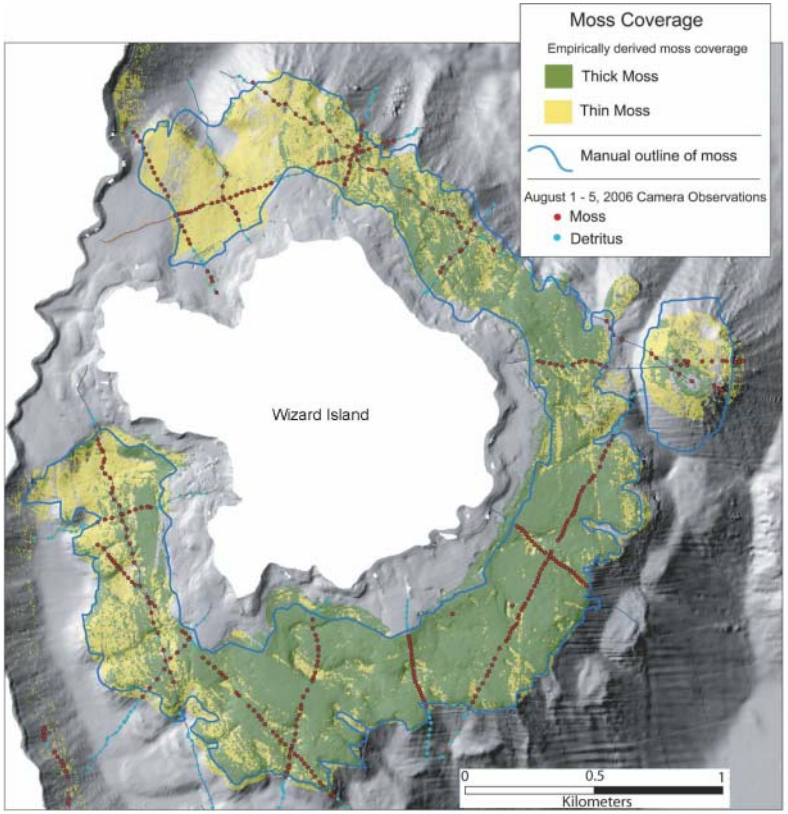
re for the air.



Mapping of a Submerged Bryophyte Mat in Crater Lake, Oregon. Source: USGC

How many acoustic classes are needed to describe demersal capelin spawning sites?

What is the variation of gain size within a spawning site?

What are the morphologic characteristics of spawning site?

What is the area of the seafloor that have the necessary characteristics for demersal capelin spawning, within the study area?

Further Research

- Survey more demersal spawning site
- Coastal water temperature variation model
- Explanation of low backscatter over rock outcrop.