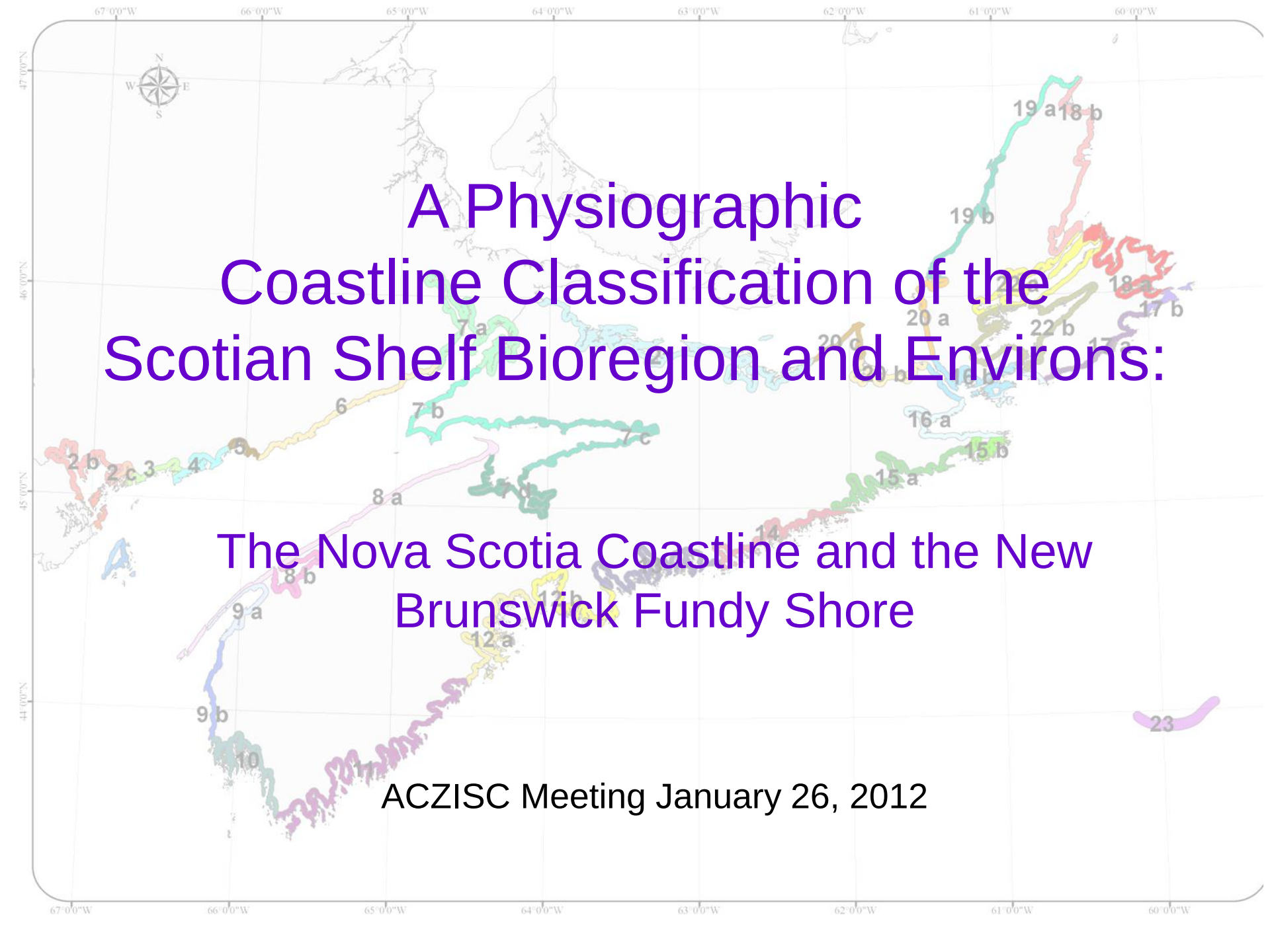


A Physiographic Coastline Classification of the Scotian Shelf Bioregion and Environs:

The Nova Scotia Coastline and the New Brunswick Fundy Shore

ACZISC Meeting January 26, 2012

Outline

- Introduction / Background
- Scope
- Scale
- Methods
- Data
- Preliminary Results
- Next Steps

Introduction / Background

- Physiographic coastline classifications have been developed at varied scales for a number of different management purposes.
- They can be used to predict spatial patterns in biological populations and communities when relevant data are absent.
- An ecosystem/habitat classification is required for MPA network planning within the Scotian Shelf / Bay of Fundy bioregion.
- A federal-provincial working group, the Coastal Protected Areas of Nova Scotia (CPANS) working group suggested a sub-group form to review what exists and make recommendations for moving forward → the Nova Scotia Coastal Classification Working Group (NS CCWG)
- The NS CCWG determined that existing coastal classifications in NS are primarily terrestrial and created using varying approaches, often for a single or narrow management application.
- A sufficient representative classification of the coastal zone of Nova Scotia does not exist.

Purpose

- To establish a regional coastal representative classification to serve as an input layer for MPA network planning and broader ecosystem-based management.
- Ensure an agreed-upon classification by all experts/departmental representatives involved.

Participants

NS CCWG:

- **NS DNR** (3): Dan Utting, geologist; Sean Basquill, ecologist; Art Lynds, beaches ecologist
- **NS Environment** (1): Dave MacKinnon, protected area systems planner
- **Geological Survey of Canada** (2): Bob Taylor, coastal geomorphologist; Don Forbes, research scientist
- **DFO Science** (1): Michelle Greenlaw, biologist and representation expert
- **Dalhousie Oceanography** (1): Jon Grant, oceanographer
- **DFO Oceans and Coastal Management Division** (2): Aimee Gromack and Jennifer Hackett

New Brunswick:

- **NB DNR** (2): Dominique Bérubé (Coastal Zone Unit) and Kevin Connor (Fish and Wildlife Branch)
- Other were invited but could not make it

Others provided input (DFO Habitat, DFO Science, DFO Gulf Region, NS Nature Trust, etc.).

Scope

The NS CCWG decided that 2 interconnected classifications are required:

- Sub-tidal coastal zone (DFO-led)
  - Inshore limit = LWM, seaward limit = approx. 100m depth (extent of trawl survey)
  - Covers the Scotian Shelf / Bay of Fundy Bioregion
- Coastline (collaborative)
  - Landward limit = the limit of marine waters, sediment and saline influences
  - Seaward limit = LWM
  - Scotian Shelf / Bay of Fundy Bioregion + rest of NS (Gulf Coast)

Classification Scales

Province
- Temperate North Atlantic (Spalding et al. 2007)

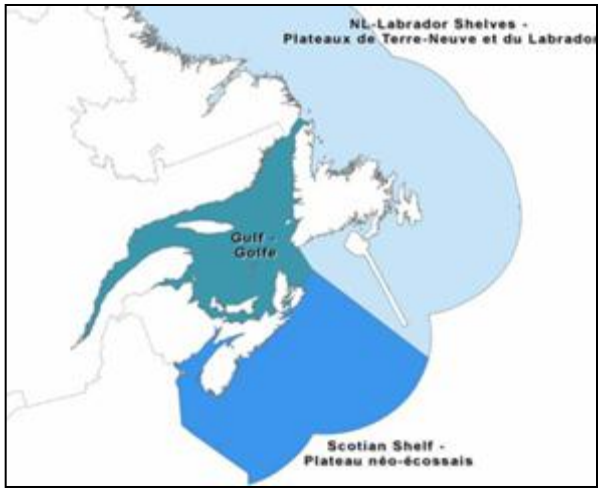
Bioregion
- Scotian Shelf/Bay of Fundy (DFO)
- Gulf of Maine/Bay of Fundy (Spalding et al. 2007)
- Gulf of St. Lawrence-Eastern Scotian Shelf (Spalding et al. 2007)

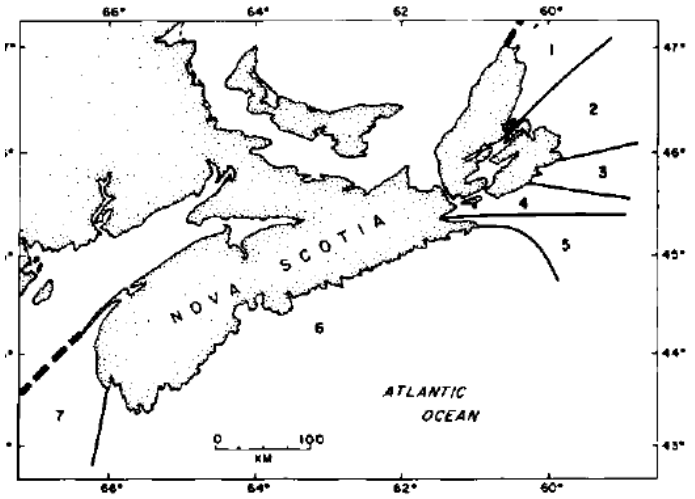
Regional Classification
- Ecoregion: Separate into Coastal and Offshore
  - Scotian Shelf (Spalding et al 2007)
  - Gulf of Maine/Bay of Fundy (Spalding et al. 2007)
  - Gulf of St. Lawrence-Eastern Scotian Shelf (Spalding et al. 2007)

Geomorphic Units
- Inlets
- Banks and Basins
- Areas of similar substrate and geomorphology

Primary Habitats
- Substrate-based units together with their associated biological communities

Biological Facies
- Suites of species used as a surrogate for a community e.g. seagrass beds, hard corals, sponges, oyster beds





Owens and Bowen 1977

Regional Scale Classification

- ***Physiographically distinct coastline classes*** were identified at two levels within the regional scale
  - Level 1: “coastline environments” (Atlantic Coast, Bay of Fundy, Gulf of Saint Lawrence)
  - Level 2: “coastline segments” & “coastline segment variants”
- We started from the bottom up:

  “coastline segment variants” → “coastline segments” → “coastline environments”

Methods

Environmental variables used to create the coastline classification were primarily chosen based on two criteria:

1) Primary drivers for species diversity and distribution patterns at a regional scale (Roff & Zacharias 2011)

2) Data available region-wide

Factors
Geological Character
Intertidal and backshore substrate
Shoreline direction
Topography
Landforms
Turbidity
Wave Exposure
Freshwater/Salinity
Temperature
Tidal Range
Ice Presence

Methods (cont.)

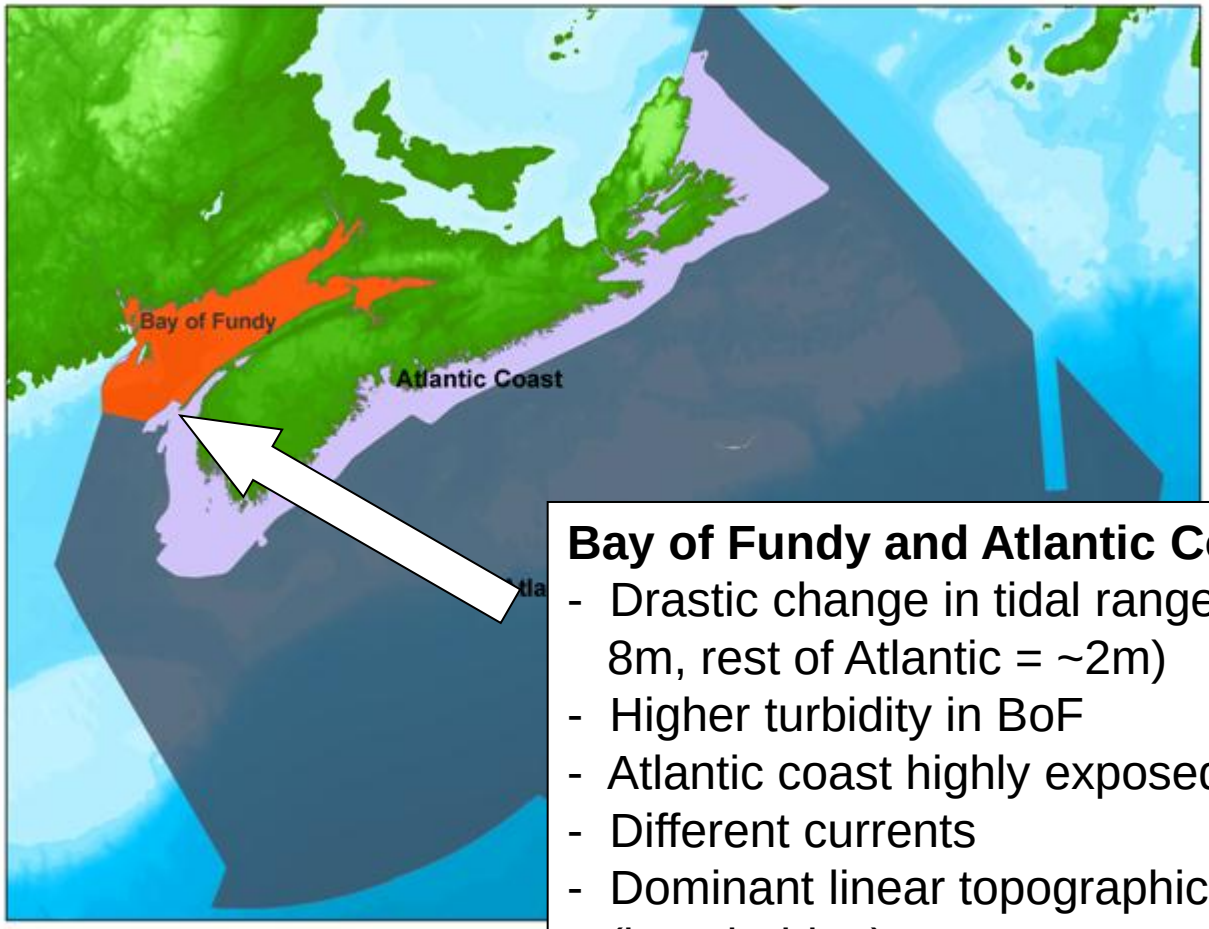
- Acquired spatial data available on a regional scale
- NS CCWG met several times to examine spatial data layers to determine patterns and break points
- Break points were made when one or multiple variables clearly broke their pattern
- NS CCWG decided that bays should be kept in the same class to preserve influences from the watershed and embayment including nutrient runoff, sedimentation and current patterns

Important Factors Determining Class Breaks

Different factors were important for determining breaks at different scales:

- Level 1: “coastline environments” (Atlantic Coast, Bay of Fundy, Gulf of Saint Lawrence)
  - Major oceanographic changes AND
  - Major topographic and geologic changes

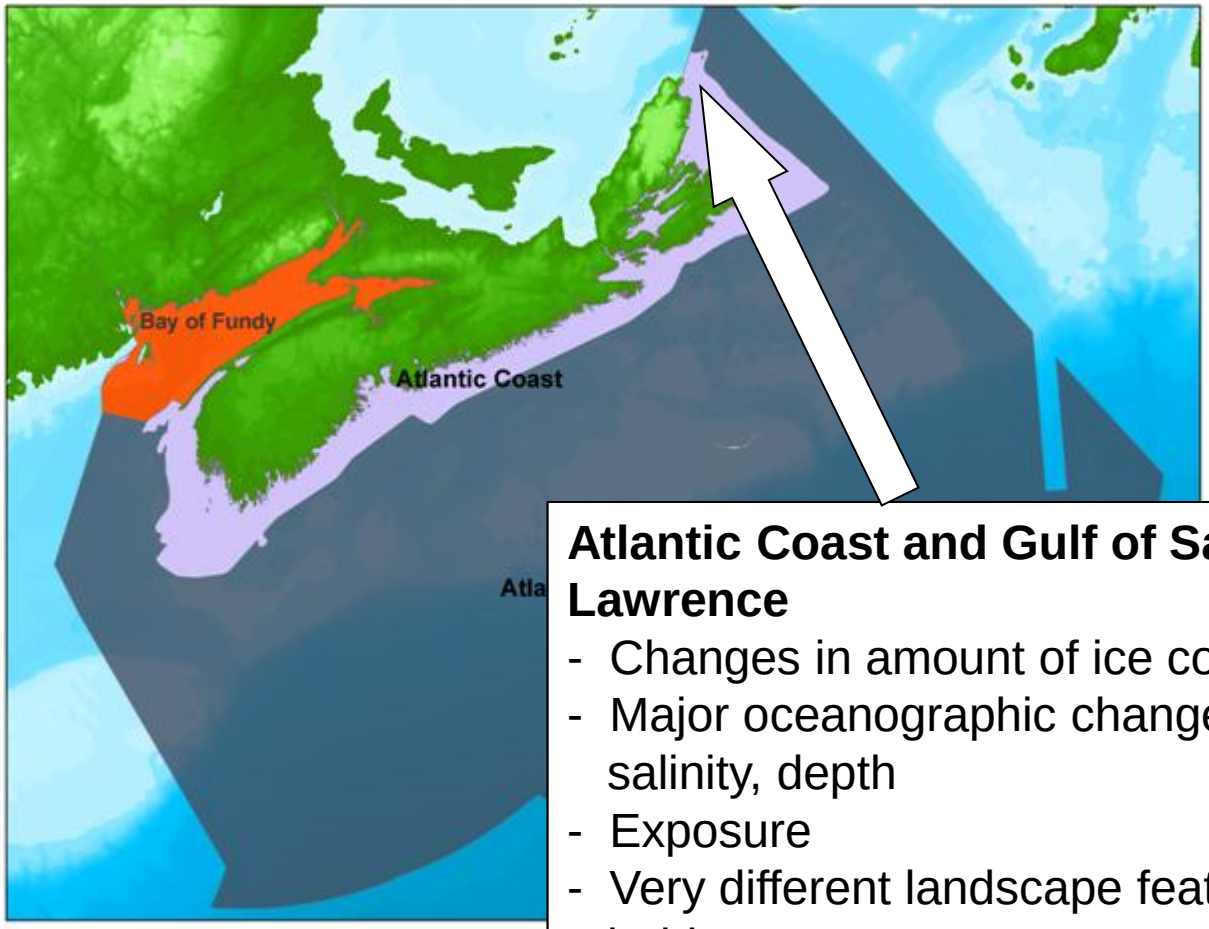
Coastal Environments (Level 1)



Bay of Fundy and Atlantic Coast

- Drastic change in tidal range (BoF = 8m, rest of Atlantic = ~2m)
- Higher turbidity in BoF
- Atlantic coast highly exposed
- Different currents
- Dominant linear topographic feature (basalt ridge)

Coastal Environments (Level 1)



Atlantic Coast and Gulf of Saint Lawrence

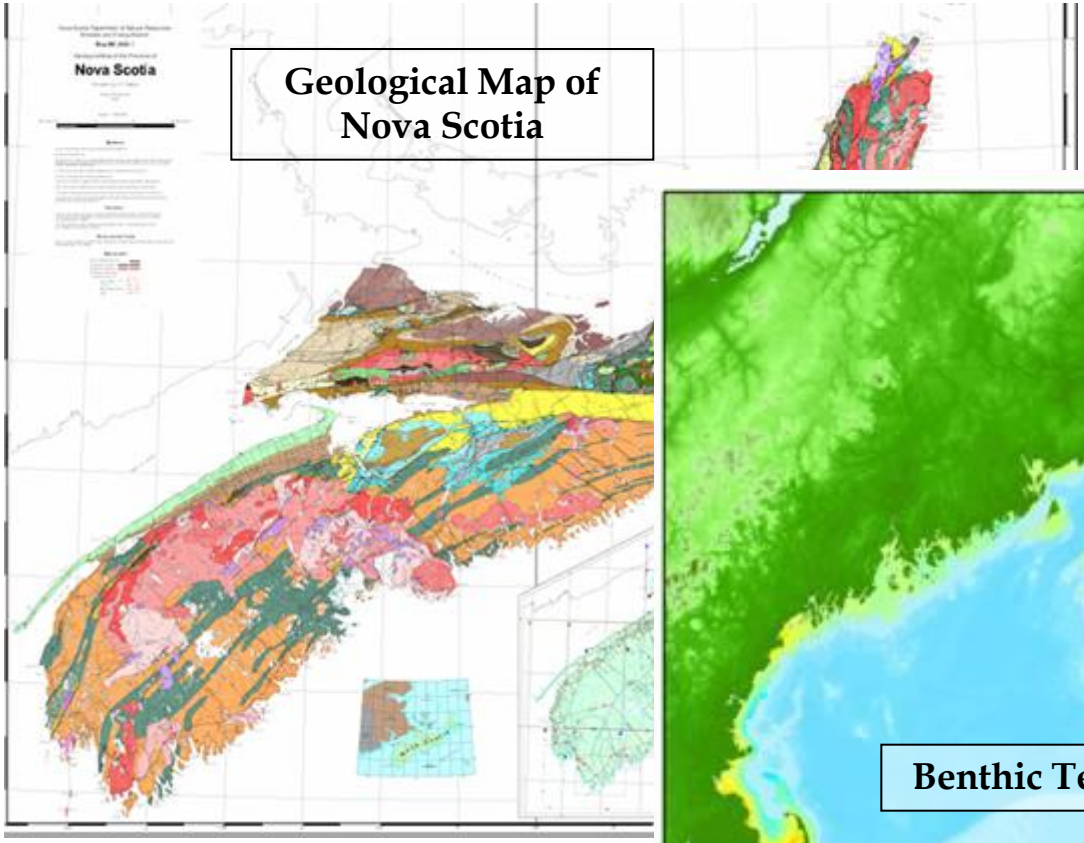
- Changes in amount of ice coverage
- Major oceanographic changes: temp, salinity, depth
- Exposure
- Very different landscape features and habitats
- Major geological changes

Factors for Identifying Coastal Segment Variants (Level 2)

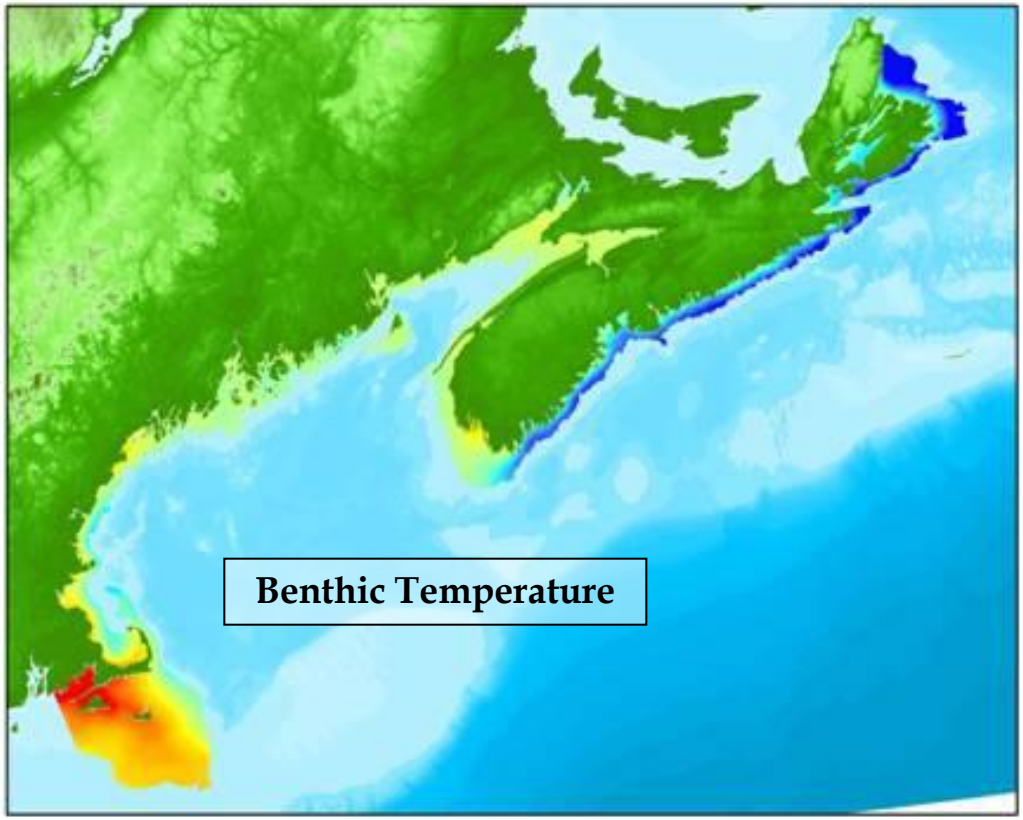
- Factors of primary importance
  - Topography (relief and shoreline complexity)
  - Substrate (grain size more influential but also considered geologic origin)
  - Exposure / change in shoreline direction
  - Dominance of coastal landscape features (e.g. beaches, dunes, tidal flats, etc.)
  - Geology (bedrock and surficial)

- Factors of secondary importance
  - Tidal range
  - Meso-scale temperature and salinity
  - Turbidity
  - Ice presence
  - Current/frictional velocity

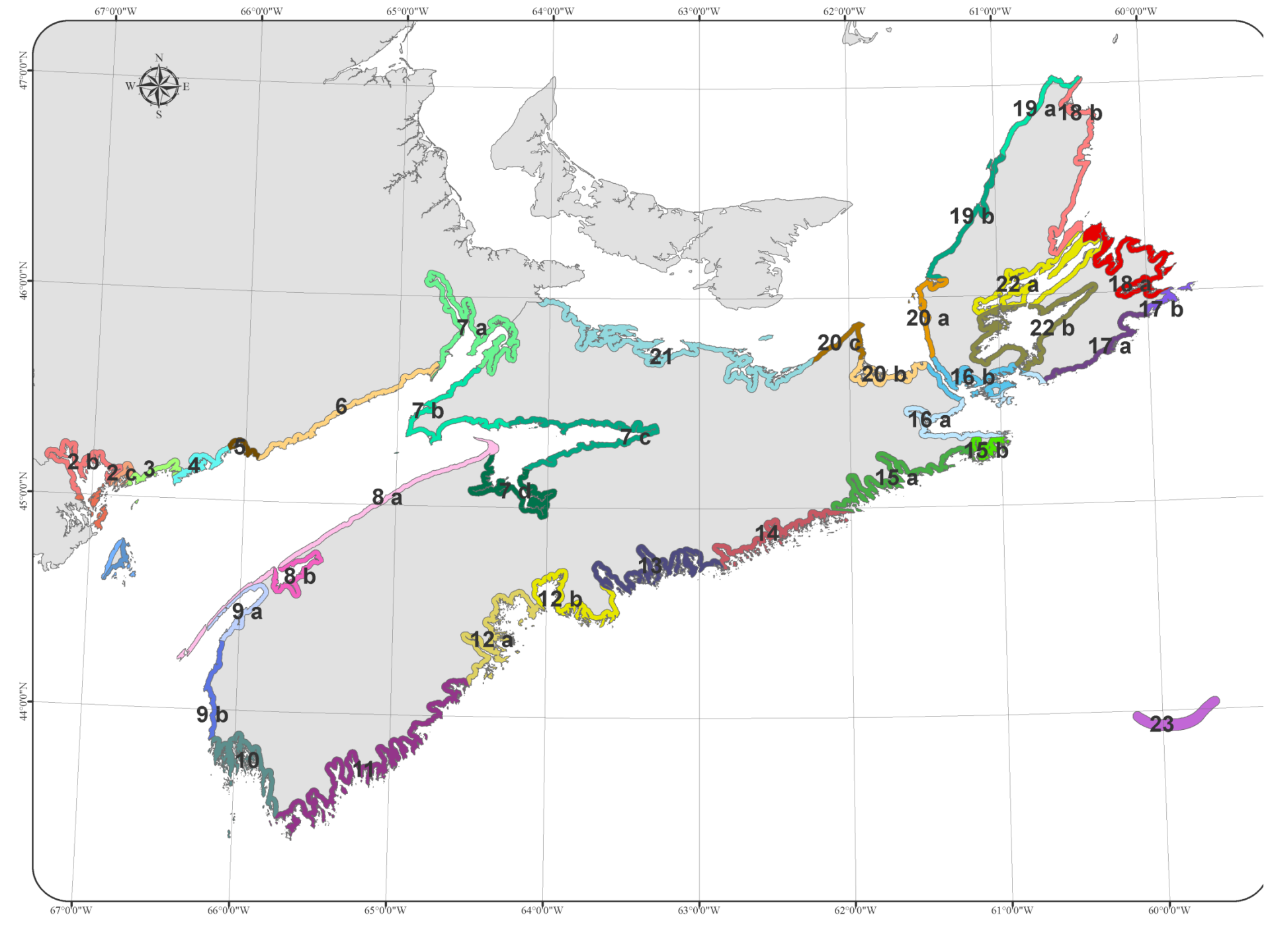
Data



Geological Map of Nova Scotia



Benthic Temperature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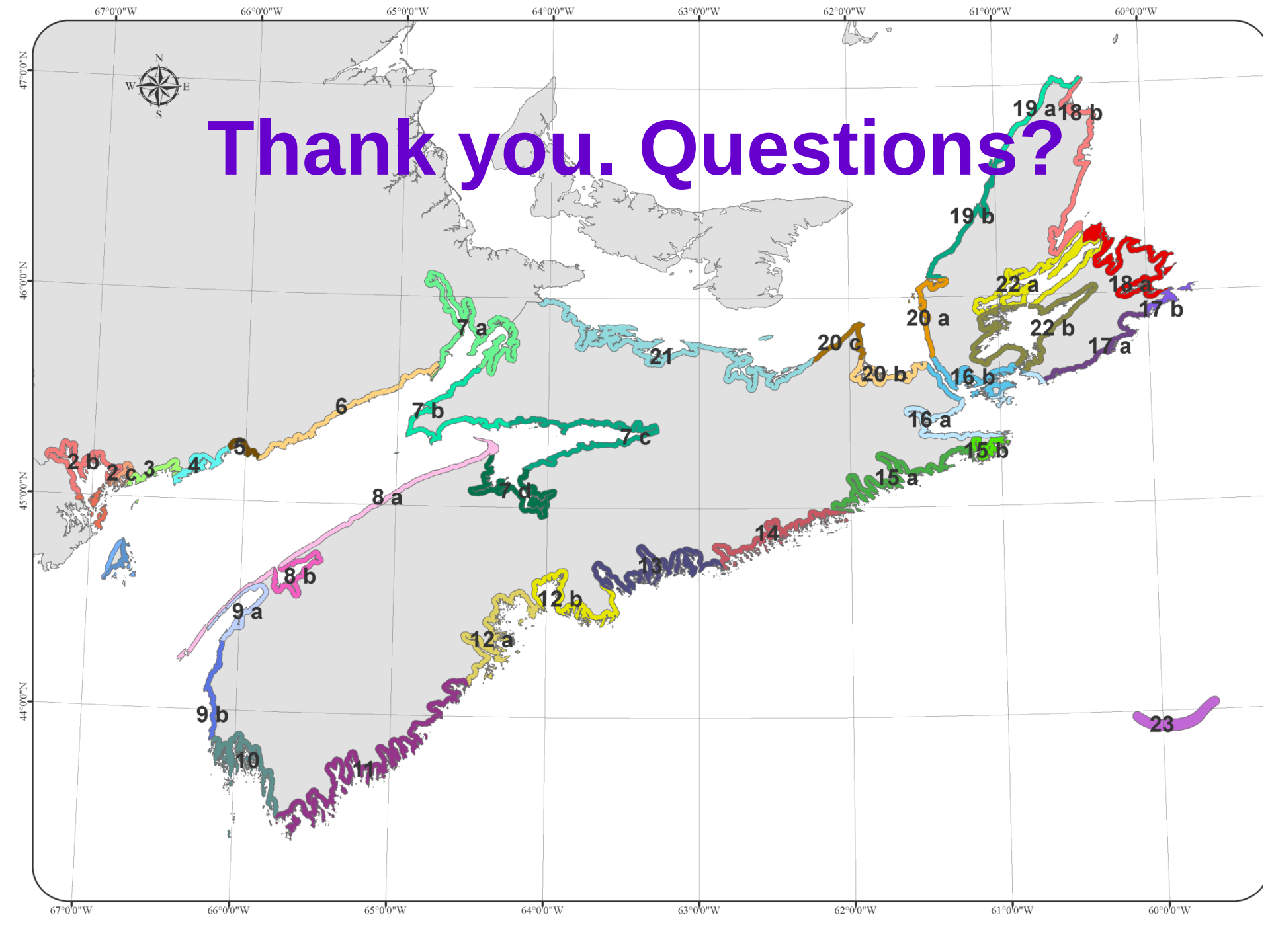
Next Steps

Short-term:

- Others in NB need to review, meeting in Fredericton will be planned in near future
- Finish publication (CSAS Research Document) by end of February
- Presentation of results at upcoming CSAS RAP on MPA Network in March
- Multi-variate analysis to quantitatively determine similarities between classes
- Complete sub-tidal classification

Long-term (wish list):

- Compare with biological data
- Other publications including scientific journals and public outreach materials
- A lot of interest in continuing this classification for the rest of NB, PEI and maybe even Newfoundland…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