The Atlantic - A Shared Resource
Galway: 23rd May 2013

Session 2: Identification of Key Challenges

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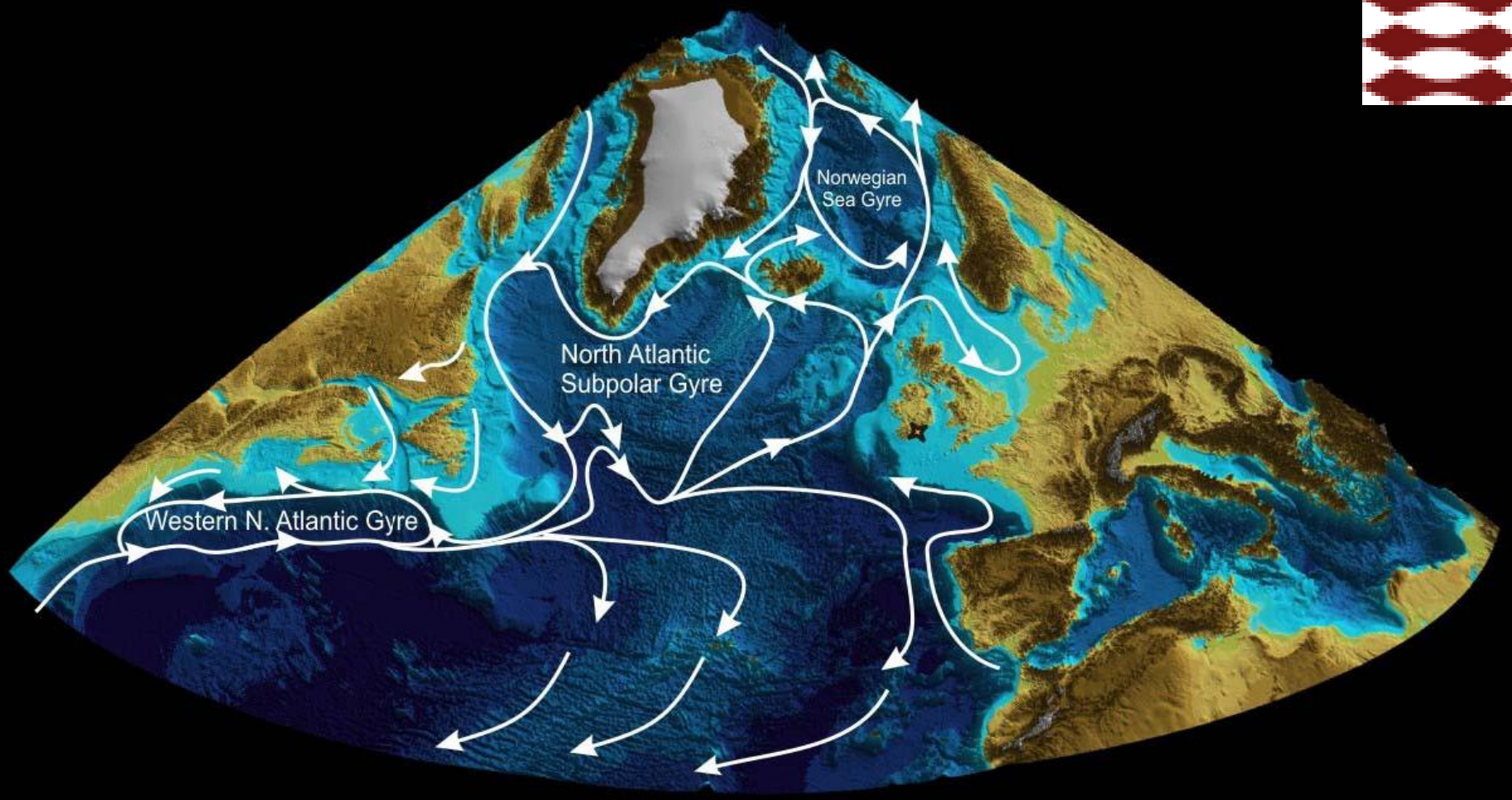
Research and Innovation

The North Atlantic

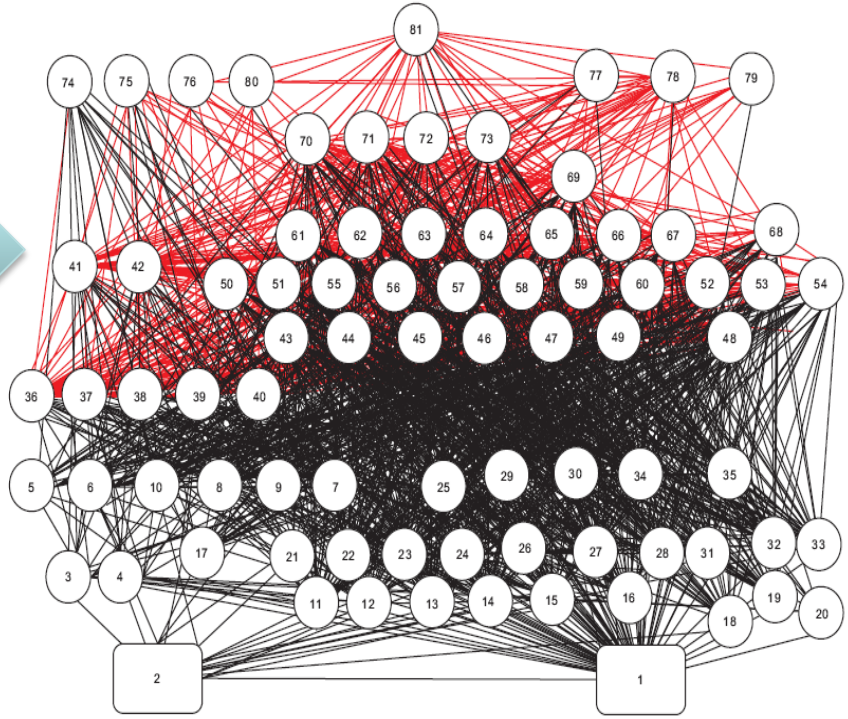


EURO-BASIN
BASIN SCALE ANALYSIS, SYNTHESIS AND INTEGRATION

The North Atlantic ecosystem is a Complex Adaptive System, its emergent features are the result of interactions within the system and external stressors

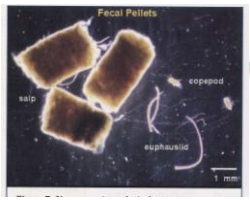
Fish Stock Dynamics, Biodiversity , HABS

Physics & Chemistry



Regime Shifts

Carbon Flux



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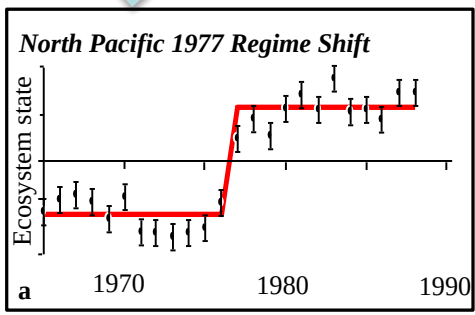

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Session 2 Objectives:

- *Identify the key research and innovation challenges necessary to improve our shared understanding of North Atlantic ecosystem dynamics;*

- *Identify critical research gaps needed to improve our understanding of North Atlantic ecosystem funcioning;*

- *Make recommendations for future joint trans Atlantic collaborations to address identified challenges.*

Some of the Source Documents

- *Council of Canadian Academies (2012). 40 Priority Research Questions for Ocean Science in Canada. Ottawa, ON: CCA: The Core Group on Ocean Science in Canada.*
- *Action Plan for a Maritime Strategy in the Atlantic Area: Delivering smart, sustainable and inclusive growth. Brussels 13.5/2013 COM 92013) 279 final. .*
- *Science for an Ocean Nation: Update of the Ocean Research Priorities Plan (2013). Subcommittee on Ocean Science and Technology, National Science and Technology Council*
- *SEAS-ERA: Towards a strategic research agenda / marine research plan for the European Atlantic Sea Basin (2013) Summary Report prepared for Atlantic Forum Workshop: 04/03/2013.*
- *Towards European Integrated Ocean Observation, Final Report of Expert Group on Marine Research Infrastructures (2013). ISBN: 978-92-79-27319-3.*

Identifying Key Research and Management Challenges

Taking note of the critical issues and challenges identified in the reports and in discussion with the scientific community, a number of key issues emerge. These include;

1. *Providing the basic knowledge required for responding to climate change*
2. *Defining and implementing the Ecosystem Approach*
3. *Reducing uncertainty of predictions generated by observations and modelling*
4. *Improving safety at sea*
5. *Developing a pro-active management approach for mitigating the impacts of climate change*
6. *Fostering the technology developments needed to support research and management*
7. *Sharing data for research, governance and policy*

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Questions to the Workshop

- *Are these the key challenges?*

- *What specific aspects of these challenges could best be addressed as part of a collaborative research initiative?*

- *What are the gaps?*

1A) Knowledge required for responding to climate change

- *Develop ecosystem models capable of evolution and adaptation thereby providing the ability to assess and predict system evolution under global change*

- *Identify the effects of single and multiple stressors induced by climate change (e.g. temperature, ocean acidification transport) on*

  - the dynamics of marine food webs,
  - system resilience due to, changes in biodiversity,
  - key ecosystem and biogeochemical species ecology and dynamics biogeochemical processes such as carbon sequestration new and regenerated primary production, nitrogen fixation, nitrification, denitrification, etc).
  - Impacts on species of interest for aquaculture

1B) Knowledge required for responding to climate change (Cont)

- *Understand of the role of ocean–climate interactions in developing ecological and biogeochemical habitats and predict habitat evolution with climate change;*

- *Understand of the impact of climate variability and change on the biogeochemistry of the North Atlantic ocean, the implications for ocean ecosystems and resultant feedbacks to climate*

- *Improve and perform pelagic and demersal habitat mapping and develop classification systems to define habitat provinces for assessment of system dynamics*

1C) Knowledge required for responding to climate change

- *Assess the role of marine biodiversity in the maintenance of system resilience and function*

- *Identification of North Atlantic Biodiversity Hotspots and their contribution to ecosystem function*
  - Develop standardized sample and data protocols
  - Develop metagenomics/bioinformatic capabilities and capacities
  - Instrument and sensor development for biodiversity and habitat monitoring
  - Inclusion of biodiversity and geochemical measurements into observing platforms

2A) Furthering the Definition and Implemention of the Ecosystem Approach including the identification and modelling key ecosystem stressors

Development of understanding.

- *Provide a better understanding of the interactions and complexity of trophic webs and their interconnectedness based on observation as well as existing and new modelling approaches;*

- *Extension, comparison and evaluation of high-resolution physical-biogeochemical-ecosystem models to accelerate advances in operational modelling and hypothesis testing.*

- *Quantify the importance of changes in mesopelagic higher trophic levels as consequence of multiple stressors and the resultant effects on the vertical flux of C and its sequestration and hence feedbacks to climate;*

2B)Defining and Implementing the Ecosystem Approach, including the identification and modelling key ecosystem stressors (Cont)

- *Resolve the effects of multiple stressors on the dynamics of biogeochemical and biological processes and their importance for regional ecosystem dynamics, including living resources, biodiversity and carbon sequestration*
- *Identify and understand human-use patterns that influence resource stability and sustainability;*

Fostering Management Response:

- *Develop understanding of ocean climate ecosystem interactions to help project future ecosystem and develop adaptive management plans to mitigate the effects of climate change*
- *Develop adaptive resource management approaches sensitive to influence of climate change and exploitation patterns on renewable resources such as fisheries.*

3A) Reducing uncertainty of predictions generated by observations and modelling

- *Develop a better understanding of Ocean-Atmospheric interactions*

- *Quantify the ability of key biogeochemical and ecosystem species to adapt to influence of individual and multiple stressors*

- *Assess system current status and strengthen our ability to measure/detect change and forecast new states*

- *Identify key physical-chemical-biological parameters, including those for which there are currently no reliable in situ sensors*

3B) Reducing uncertainty of predictions generated by observations and modelling (cont)

- Improve parameterization of ocean circulation and ecosystem modelling

- Improve understanding of the response of coastal and marine systems to natural hazards and apply that understanding to assessment of future vulnerability to natural hazards, including that caused by climate change;

4) Improving safety at sea

- *Understand mechanisms initiating hazardous events and identify state status indicators to improve forecasts of the spatial temporal occurrence of hazard events.*

- *Develop multi-hazard risk assessments and support development of models, policies, and strategies for hazard mitigation.*

5) Technology Developments supporting Research

- *Identify new sensors and existing sensor technologies not at present modified for use in the ocean environment (physical, chemical, biological parameters) needed to support ocean observation, improved forecasting and prediction*

6) Sharing data for research, governance and policy

- *Improve the sharing of data , including real and near-real-time data, for research, governance and policy purposes*

- *Strengthen the role of the social sciences in the definition of priority research issues, data collection,analysis and dissemination.*

Some Recommendations for Joint Actions

A Key output of Session 2 is to propose recommendations for future joint actions to address identified challenges.

These might include, for example:

- *The establishment of a High Level Group of Experts (CAN-EU-USA) to prepare a Report on North Atlantic Research Priorities [i.e. similar to CCA Report: "40 Priority Research Questions for Ocean Science in Canada"].*

- *The establishment of a High-Level Group composed of key players from Canadian EU and USA funding agencies to*
  - Assess the findings of the high Level Group of experts and define areas where collaborative action will be most fruitful for the advancement of understanding and management of the resources of North Atlantic
  - Prepare, based on the assessment above a jointly funded and competitive research call (based on the
  - Belmont Forum Protocol) to address North Atlantic research issues of mutual interest.

- *Note: The Funding Agencies should seek to fund and implement two such calls during the period between 2014-2020.*