



**2021** United Nations Decade  
**2030** of Ocean Science  
for Sustainable Development

## **North Atlantic Regional Workshop (January 7-10, 2020; Halifax, Canada)**

### **Highlights Report**

Over 150 participants from 14 different countries and across the ocean community met in Halifax, Canada from January 6 – 10, 2020 to discuss priorities and identify actions for the North Atlantic Ocean that would support achieving the objectives of the UN Decade on Ocean Science for Sustainable Development (2021-2030). Organizers took efforts to have balanced participation across genders and engaged Indigenous and youth participants in all aspects of the workshop.

This Highlights Report presents an overview of the workshop discussions and will be followed by a more comprehensive Summary Report that provides further details of the topics discussed herein. These reports will inform the development of the Decade and ultimately its overall Implementation Plan.

The workshop started with a welcoming session, including a water ceremony and remarks from an Indigenous elder who reminded participants of the importance of water and the need for meaningful engagement with Indigenous partners in science and in decision-making processes. The opening plenary session then moved to set a vision for the UN Decade, outlined supporting regional activities and partnerships, and highlighted ongoing planning preparations. Youth ambassadors from the Atlantic Ocean Research Alliance (AORA) were featured in this session where they presented the various projects that they are leading around the North Atlantic Ocean region.

Following the structure of the 1<sup>st</sup> Global Planning Meeting and other regional workshops to date, participants were organized into six working groups that aligned with the UN Decade's societal outcomes. Each workshop participant was given the opportunity to engage in at least two working group sessions as well as all plenary discussions. In addition, workshop organizers identified five cross-cutting themes that are applicable across all six societal outcomes. These topics were discussed within the context of each working group and also during plenary

sessions. Highlights from the working groups and cross-cutting theme discussions are provided below.

### **Highlights - Cross-Cutting Themes**

Five cross-cutting themes were identified that would be relevant across all six societal outcomes of the UN Decade and were discussed in the corresponding working groups of the North Atlantic Regional Workshop discussions.

1. Capacity exchange and technology transfer;
2. Partnerships and financing;
3. Access to information, data and knowledge;
4. Awareness raising and inclusivity; and
5. Transdisciplinarity.

Working group discussions provided tangible concrete actions and ideas for each of the cross-cutting themes and they will be elaborated on in the Summary Report. However, there were priorities that emerged in the cross-cutting theme discussions that are applicable across all working groups:

- Advancing **gender equality** across all disciplines and among sectors throughout the UN Decade;
- Engaging with **early career ocean professionals** to ensure that the community hears different views and perspectives and to build capacity among these future leaders;
- Establishing **meaningful partnerships across multiple sectors** including those considered under-represented at the North Atlantic meeting (e.g. industry, regional fisheries management organizations, etc.);
- **Establishing partnerships with Indigenous communities**, organizations, and Nations in order to learn from and respect each other's ways of knowing;
- Ensuring the balanced consideration and integration of **different knowledge systems**;
- Ensuring the **inclusion of social sciences and humanities, as well as policymakers and stakeholders** early in discussions and committing to building these ideas into scientific activities to ensure the equal consideration and inclusion of (multi)disciplinary perspectives;
- Recognizing **ocean literacy's critical role** in supporting and facilitating active citizen engagement in the Decade; and
- Enhancing existing **governance approaches**, or developing new ones as required, that are fit-for-purpose for the complex ecosystem-based management decisions that will be faced in the coming decade and for collaborations across the Atlantic basin.

Further, the discussions emphasized the **strong existing collaborative science bodies within the North Atlantic Ocean community** (e.g. International Council for the Exploration of the Sea-ICES, AtlantOS, other regional bodies of GOOS and GEO, OSPAR, etc.) as well as some existing regional policy frameworks (e.g. Galway and Bélem Statements on Atlantic Ocean Cooperation and various other trans-Atlantic cooperation mechanisms).

### **Highlights - Knowledge Gaps and Science Priorities for the Decade**

#### **Working Group 1: A clean ocean whereby sources of pollution are identified, quantified and reduced and pollutants removed from the ocean**

The following were identified as science priorities for the North Atlantic Ocean Region: *carbon dioxide increase* and the associated impacts of ocean acidification, heating, and inundation or flooding; *chemical pollution* including endocrine disruptors, Persistent Organic Pollutants (POPs), Persistent, Bioaccumulative and Toxic (PBTs), Per- and Polyfluoroalkyl Substances (PFAS), pharmaceuticals, and biocides; *nutrient enrichment* and the associated impacts of eutrophication, deoxygenation, harmful algal blooms (HABs), and *Sargassum* seaweed; *plastics* (from nano to mega); *species transfer* (including pathogens and disease) associated with shipping and fisheries activities as well as associated multiple vectors; and *underwater noise and light*.

In consideration of the stressors and contaminants identified above, key knowledge gaps were identified relating to the need for:

- Understanding individual impacts on biota and human health to identify acceptable level thresholds;
- Risk assessment methods for understanding impacts on biota and human health under climate change and interactive/multiple stressors;
- Quantifying risks/benefits of interventions and replacement substances;
- Evaluation of trade-offs for different management actions; and,
- Full assessment of socio-economic costs of degraded ecosystems.

**Working Group 2: A healthy and resilient ocean whereby marine ecosystems are mapped and protected, multiple impacts, including climate change, are measured and reduced, and provision of ocean ecosystem services is maintained**

This working group proposed future-looking societal outcome goals for the end of the UN Decade:

- Governments will have implemented science-based, effective Marine Spatial Planning and Ecosystem Based Management systems to maintain/restore/strengthen ecosystem resilience in the face of competing ocean uses;
- The science community will have gained an understanding of the mechanisms that drive marine ecosystem structure and function in order to maintain (or restore) a healthy and resilient ocean; and
- Society will have gained significantly enhanced institutional capacity for sustainable ocean use by encouraging broad participation in understanding and resolving tradeoffs among ocean uses.

To achieve this future, theme participants identified the following science priorities:

- Evaluate ecosystem resilience to ecological regime shifts;
- Understand the ocean structure and function (and loss) needed to maintain or restore a healthy and resilient ocean; and
- Quantify socio-ecological trade-offs of human activities through enhanced institutional capacity for sustainable ocean use by encouraging broad participation in understanding and resolving trade-offs among ocean users.

**Working Group 3: A predicted ocean whereby society has the capacity to understand current and future ocean conditions, and forecast their change and impact on human well-being and livelihoods**

Transformative objectives were developed for the entire decadal period 2021-2030 that would serve as aspirational guideposts for the four major issues/research areas identified for ‘A Predicted Ocean.’ The four research areas are:

- Observe in order to characterize the state of the ocean now, its use, and human interactions, and initialize models as the basis for mechanistic understanding;
- Understand ocean processes to improve models for robust predictions, including risk assessment and uncertainty analysis;
- Predict how to provide information to users about future conditions, as adequate models need to be initialised by adequate observations; and

- Provide data and generate information and provide it to people that need it, when they need it.

To achieve transformational objectives within the four major issue/research areas, some of the research gaps include:

- Current ocean observation systems poorly address many key issues, from physics to ecology to societal dimensions, with many geographic gaps (e.g. coastal areas, the deep basin), and are not presently sustainably funded;
- Coupled models, across disciplines and domains, are still developing and the use and communication of model results remains a challenge;
- Model inter-comparison activities (e.g. Ocean Model Intercomparison Project - OMIP, Coupled Model Intercomparison Project - CMIP, Ice Sheet Model Intercomparison Project - ISMIP) should be created to improve modelling across disciplines, from physics, to biology and society; oervingand
- Our ability to transform data to information and knowledge is limited by the absence of linkages across data sets and the need for new approaches to communicate the information and knowledge.

Among the transformative objectives, and common to all research areas, is the need for an international “partnership”. This partnership should build an integrative approach across the Atlantic basin and across disciplines and domains so as to improve understanding of key processes, advance modelling capabilities, feature fit-for-purpose information and interconnection with society. An optimal framework for such a partnership could be the establishment of an integrated Atlantic Ocean observing, predicting and information system.

#### **Working Group 4: A safe ocean whereby human communities are protected from ocean hazards and where the safety of operations at sea and on the coast is ensured**

Risk profiles of activities in the ocean and offshore are changing rapidly, and the associated governance and activities may not be adapting quickly enough. The changing risk profile is driven by the following factors: a rapidly changing environment; increasing interconnectedness (e.g. communications, trade), intensity and changing patterns of activities (e.g. shipping, offshore oil and gas and renewable energy, growth in coastal tourism); locations and timing of activities changing in response to environmental change (e.g. fishing); new technology-enabled activities (e.g. autonomous technologies, seafloor mining); changing patterns of vulnerability (e.g. coastal population rise and concentration); possibility of cascading risks, where one risk triggers another with knock-on impacts (e.g. changing climate relocates marine traffic or marine mammals, such as North Atlantic Right Whales, and puts them in conflict). Risk has traditionally been looked at locally and within sectors, and there has been inadequate effort conducted at the ocean basin scale to conduct an integrated examination of existing and changing hazards and interlinked risks.

In support of 'A Safe Ocean,' the following knowledge gaps were identified:

- Generate a risk map of the North Atlantic Ocean basin that includes coastal and offshore areas (including hazards and physical and social vulnerabilities) and provides the framework for action and informs the design of multi-hazard warning systems;
- Link specific hazards to risk and resilience concerns in order to guide mitigation strategies (e.g. sea-level rise and coastal resilience; extreme North Atlantic weather; autonomous shipping; and seabed mapping/safety perspectives);
- Establish a robust ocean safety evaluation system that includes developing an inventory of initiatives and networks that aim to improve ocean safety and include metrics of success;
- Identify what kind of governance structures are needed to be able to foresee, adapt and respond to events to achieve a safer ocean for all groups including the most vulnerable; and,
- Develop a multi-hazard warning system that incorporates physical, biological and social data as well as new technologies.

#### **Working Group 5: A sustainably harvested ocean ensuring the provision of food supply and ocean resources**

An overarching objective was developed for 'A Sustainably Harvested Ocean' in which "an evidence-based sustainably productive ocean economy in the face of increasing anthropogenic pressure should be achieved."

To achieve this objective, outcomes will need to be industry-specific, including sustainable fishery practices that maintain or improve socioeconomic value, sustainable aquaculture growth, sustainable marine technologies (e.g. biotech/genetic, minerals, deep-sea mining), new and emerging energy sources, and other sustainable ocean economy activities (e.g. tourism and transport).

Research gaps to support the aforementioned objective were:

- The need to link inclusive integrated ecosystem assessments with marine spatial planning to manage the diverse and changing demands on ocean space;
- The need for a comprehensive social science approach to more effectively implement scientific advice into policy action;
- Innovations to reduce fisheries impacts on the ecosystem to support sustainable fisheries;

- Additional research to support sustainable aquaculture (e.g. alternative feeds, non-fed aquaculture species, health and husbandry science, and innovative methodologies); and
- Advance the development of sustainable or low-impact marine technologies relating to biotech/genetic resources, minerals and deep sea mining, alternative energy, transport, and tourism.

**Working Group 6: A transparent ocean whereby all nations, stakeholders and citizens have access to ocean data and information technologies and have the capacities to inform their decisions**

A vision statement for ‘A Transparent and Accessible Ocean,’ described as “Atlantic Ocean 5D,” was developed that would see rapid, standardised, and credited sharing of data, information, and knowledge through a distributed digital commons where material is findable, accessible, interoperable, and reusable (FAIR). In addition, it would allow harvesting all the data to visualize and query the information against societal issues of interest (i.e. the 5<sup>th</sup> dimension such as fish abundance, storm surge risk exposure, fishing potential, acidity, etc.).

Three sub-themes were identified relating to ocean literacy; data accessibility and technology transfer; and best practices, shared facilities and capacity exchange (rather than the commonly-used term capacity building).

Knowledge gaps to support this vision and sub-themes include:

- Increase capacity and capability by twinning between communities and across dimensions such as technical capability, disciplines or societal actors (e.g. small island states, marine and informatics communities, scientist and policy makers, research and education);
- Build an inclusive digital ecosystem, linking digital resources including social media streams, and the knowledge of local experts (e.g. fish harvesters) and Indigenous communities;
- Use data and information stored in accessible data systems to visualise many aspects of the ocean to support ocean literacy and education initiatives;
- Create at minimum, a set of standards (e.g. metadata) for data of all types that will also facilitate and optimize machine-to-machine readability;
- Use frameworks such as GOOS, GEO, and AtlantOS to share equipment, implementation plans and join strategies to grow and sustain observing systems;
- Build on what already exists, develop easy-to-use tools to contribute and access data which would greatly democratize sharing and accessing;
- Build a conversation around Best Practices in ocean research;

- Fully implement the FAIR (Findable, Accessible, Interoperable, and Reusable) principle and recognize the CARE (Collective benefit, Authority to control, Responsibility and Ethics) principles applying to Indigenous sourced data; and
- Through the existing AORA and AANChOR ocean literacy working groups, establish an ocean literacy research program to better understand the different dimensions of ocean literacy (knowledge, values, and actions), to identify baseline levels of ocean literacy at the start of the UN Decade and how those levels change (or not) over the 10 years.

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