

Canadian Ocean Science Priorities under the Galway Statement on Atlantic Ocean Cooperation

**Report of a workshop of the
Canadian Galway Marine Working Group**

Ottawa, Ontario

July 10, 2014

Summary:

A workshop of the Canadian Galway Marine Working Group was held on July 10, 2014 to develop a broadly-based list of potential Areas of Research Cooperation in the context of the Trans-Atlantic Ocean Research Alliance (TAORA) and the Galway Statement. The areas to be brought forward for discussion with the EU are;

- Ocean Health and Stressors,
- Ocean Observation and Prediction,
- Characterization of the Seafloor and the Sub-surface,
- Aquaculture, and
- Information Management and Dissemination.

It is envisioned that within each of these areas of research, subsequent steps in the process will map current knowledge and activities, identify gaps, and prioritize activities for future collaborative work under the Agreement. Further discussion will be afforded to the question of what changes to this list are needed to serve a similar discussion with the US.

Introduction:

The Trans-Atlantic Ocean Research Alliance (TAORA) was created when the Galway Statement was signed in May 2013. The Galway Statement commits Canada, US and EU to collaborate on comprehensive science programming for an indefinite period going forward to better understand the North Atlantic Ocean basin. While this Agreement was signed at the political level, it is supported by a science-based planning and implementation structure and process that started at the original Conference at Galway, Ireland, and has since developed.

In the spring of 2014, implementation of the Galway Statement was taken up in earnest by the three signator States, and there are now several key governance structures in place. These include a tri-lateral Implementation Committee, bi-lateral Working Groups for US-EU and Canada-EU and consideration of a matching Canada-US WG. General vision is established by the Galway Statement itself (annex 1) and its supporting workshop report. The documents that will provide a more elaborated and focused agenda for cooperation are to be bi-lateral Statements of Purpose (SoP), and subsequently a tri-lateral Statement of Purpose. These SoPs will outline a number of broad Areas of Research Cooperation for the initial implementation period of the Galway Statement. Thereafter, each Area of Research Cooperation will in turn be the basis of a detailed thematic exploration and analysis to map what has been completed and what is currently being done in each jurisdiction and elsewhere, to identify the gaps, and then to prioritize those gaps for the purpose of informing future research planning and allocation processes. This three-step process will help identify the most important activities to be completed with available funding in the coming period, and/or to inform the desired shape and focus of future funding programs for ocean science that are to come.

In Canada, ocean science and research activities are undertaken mainly by the Federal government, and by academic and by non-government organizations. The focus of the various parties' activities is heavily influenced by factors such as mandate, available base funding, and by the charge of funding agencies for specified outcomes. Collectively, the current portfolio of ocean science activities in Canada is substantial, albeit not well coordinated nor the product of an overall sense of priority or design (CCA, 2013). Moreover, in the context of the Galway Statement, available Canadian funding for ocean science activities is focused largely on achieving domestic outcomes. There is, however, considerable advantage in seeking congruence of domestic needs for science with those at a broader scale such as for the Atlantic basin. Thus for Canada, participation in Galway-related projects and programs means aligning (or re-aligning) available funding so as to incorporate international collaborative opportunities while meeting domestic needs.

This would be generally true for all Galway partners. However, European ocean science providers have the benefit at the moment of applying to EU Horizon 2020 funding program, which in some of its early calls is specifically favoring work called for in the Galway Statement. There are substantial opportunities being generated for Canadian (and American) science organizations to become affiliated with H2020 proposals, albeit at their own expense.

The European Commission and the United States have signed a preliminary bi-lateral Statement of Purpose (annex 2). Canada and the EU have committed to use this as a general model and seek to agree on broad bi-lateral Areas of Research Cooperation.

Thus, the purpose of this workshop was to stimulate the identification of Canadian priority areas of research cooperation under the Galway Statement on Atlantic Ocean Cooperation. These would be the basis for subsequent discussions with European and American colleagues under the Galway banner to arrive at agreed bi-lateral and ultimately tri-lateral Areas of Research Cooperation for Galway implementation.

In so doing, it was recognized that the Canadian ocean sciences community is multi-tiered and complex, with engagement from the Federal government (several Ministries) and provincial governments, as well as academic-based organizations including NSERC Strategic Networks, Network Centres of Excellence, Canada Chairs and other structures with ocean science mandate and capacity. Thus the workshop was fully open to the WG membership which in turn is open to the growing community of interest in ocean science in Canada.

Canadian ocean-related industries are also an essential voice to be heard in relation to Galway, in that innovation in ocean industries and sustainable ocean-related economic activity/social license are big drivers for Galway signatory States. Accordingly, signators have agreed on the need to reach out to representatives of industry in our respective jurisdictions who are ocean knowledge users and/or ocean S&T innovators. This meets several important needs; (i) to incorporate industry's perspective in determining what should be the focus of our multi-national cooperative efforts in relation to broad ocean-scale research and (ii) to increase awareness of opportunities arising from Galway related activities among Canadian industry interests and promote the use of knowledge generated from these efforts. The DFO, on behalf of the WG, has recently reached out to Canadian ocean industry representatives and has invited those groups define their interest in the Galway process and contribute their views on the direction of implementation.

On July 10, a good representation of the Canadian Galway Marine WG (Annex 1) was present at the workshop. The workshop was hosted and chaired by Fisheries and Oceans Canada, and included a wide range of participants (Annex 2). To start the process, the Chair tabled a previously-circulated draft framework and the workshop took the form of participants in turn (see agenda, Annex 3) offering the views of their respective organizations and the framework was adjusted and modified through the day based on that input. Participants are of a consensus view that the draft framework produced through this process reflects the collective view of current Canadian areas of research cooperation under the Galway Statement on Atlantic Ocean Cooperation.

A Framework for Canadian Priorities in Ocean Science under the Galway Statement

The framework for Canadian priorities in ocean science under the Galway Statement is shown in Figure 1. The framework identifies broad societal outcomes that reflect the importance that is attached to the need to better understand oceans for the benefit of Canadians and others. To support achievement of these outcomes, Canada has identified five broad priority areas of ocean science where cooperation of

research activities at the scale of the Atlantic Basin will be fruitful. In turn, a sample of more specific research activities that may become priorities for collaboration with EU and American science systems is presented although at this stage only illustratively. Once Areas of Research Cooperation are agreed, subsequent work will be undertaken (probably thematically) to jointly elaborate priority research topics that are specific enough to shape funding proposals and/or influence available funding in the coming period.

Also shown on the framework are a series of strategic approaches that are considered important to improve the effectiveness of many or all cooperative activities to be undertaken under the Galway banner. These are not science activities per se, but are behaviors and methodological characteristics that will make collaborative efforts more effective and fruitful in general.

The community of interest at the Canadian Galway Marine Working Group is, to now, broadly representative of the natural sciences sector in Canada. However, as is intended by the Galway Statement, we realize that as important as it is to understand the natural world, it is also important to understand the social and economic context into which this knowledge must fit to effectively inform decision and policy-making. On this basis, the framework is deliberately intended to encompass all scientific activities that will be essential to inform decision-making related to the Atlantic Ocean basin.

The identified Areas of Research Cooperation are supported by the Canadian Galway Marine Working Group as being those with most utility at the moment and for the foreseeable future. However, this level of prioritization is to be considered an evergreen product that could and should be re-evaluated on occasion to reflect changes necessary in the future to maintain focus on the most relevant activities. The specific project activities would be expected to change on a regular basis as progress is made in delivery on those products.

Broad Outcomes

The Working Group has identified three principal outcomes related to Canada's oceans that should collectively drive the development of Areas for Research Cooperation and attendant specific research topics. It is essential that the framework and all discussions it will support make specific reference to outcomes that will resonate with Canadians and the programs that they will support. The identified outcomes are;

- Prosperity, through sustainable use and innovation
- Safe and secure oceans
- Education and public engagement

Each of the five broad Areas of Research Cooperation identified below serve these three outcomes. Progress in these Areas of Research Cooperation will contribute directly to the Government of Canada Outcomes related to an innovative and knowledge-based economy, a clean and healthy environment, strong economic growth, healthy Canadians, and a safe and secure Canada. To illustrate, a tri-partite focus on **prosperity through sustainable use and innovation** and the areas of research cooperation such as ocean health and stressors and ocean observation and prediction will inform management decisions so that the longer-term return on marine ecological capital and resulting services are maximized. This in turn

contributes to Government of Canada outcomes associated with strong economic growth, an innovative and knowledge-based economy and a clean and healthy environment. The results of research in areas of cooperation that advance **safe and secure oceans**, such as ocean forecasting and prediction of ocean state, and the characterization of the seafloor and the sub-surface, advances outcomes associated with both the health and safety of Canadians who use the oceans and secures the health and integrity of the ocean system for future generations. The third thematic outcome, **education and public engagement** contributes to outcomes associated with an innovative and knowledge based economy through addressing the need to provide future generations of Canadians with skilled professionals who can lead custodial management and public discourse in Canada about the ocean. Such professionals are needed to take the knowledge outputs across all priority areas and make them accessible in a way that improves Canadians understanding of the ocean's influence on their daily lives and their influence on the ocean. This outcome speaks directly to the need to improve literacy about oceans issues.

Reviewing and reporting results from specific research activities through the broad areas of cooperation to these broad outcomes will provide Canadians with the context to better understand the ocean science program and will foster support for continuing efforts.

Areas of Research Cooperation

The five broad Areas of Research Cooperation are listed below. They share the characteristic of being relevant for cooperative and collaborative research at the scale of the Atlantic Basin. Also provided are illustrative sub-areas that will help elaborate more fully what is included under each heading. That said, there are areas of overlap that can be used to associate some subareas with more than one research area.

Ocean Health and Stressors: Aims to contribute to better understanding of ecosystem function, environmental change, and the cumulative impacts from multiple stressors on ocean health and productivity. Examples of areas of effort include:

- Climate change (warming, acidification, hypoxia, stratification, sea level, etc.)
- Fisheries
- Vulnerable marine ecosystems
- Invasive species
- Habitat fragmentation and loss
- Energy development
- Contaminants
- Microbial degradation
- Risk assessments
- Effectiveness of management measures

Ocean Observation and Prediction: Observation systems, platforms, modelling and data management tools that can be shared and built upon over time and an increased availability of information and forecasts for ocean currents, temperature, salinity, sea levels, and other variables. Examples include:

- Forecasting and prediction
- Data standards
- Ocean processes and variables requiring global-scale monitoring
- Technology development, new applications

Characterization of the Seafloor and the Sub-surface: Seafloor or “benthic” ecosystems are essential components of Canada’s ocean environments. They are often areas of high marine biodiversity; providing habitat to diverse species of plants and animals that support complex food chains. Also, the physical characteristics of the seafloor, water depths, geohazards, and the structure and composition of the subsurface area is key to both secure development and innovation. Other examples include;

- Resource extraction (including subsea resources)
- Improved knowledge of extent and location of benthic habitat types, features, communities and species
- Exploration and technology development

Aquaculture: Understanding of the interactions of farmed and wild fish and shellfish, as well as the environment on which these species depend, for example:

- Fish health
- Environmental performance and interactions
- Aquatic invasive species management
- Effect of aquaculture on marine ecosystems
- Ecosystem carrying capacity for shellfish culture
- Monitoring deposition, re-suspension and transport of sediment and waste
- Parasite management and treatment effects

Information Management and Dissemination: Research and operational activities to improve the accessibility, and inter-operability of science information and data, as well as a concerted effort on improving the organization, preparation and delivery of science-based information to policy and decision-makers and the public in a manner that improves oceans literacy. Activities may include;

- Data standards and accessibility
- Integration of marine data streams across disciplines, time scales, and institutions
- High speed computing
- Geospatially-oriented data, tools and portals
- Outreach for the 21st century

Specific Research Topics

The Specific Research Topics shown on Figure 1 are illustrative at this point and meant to indicate that there are a host of actual and potential activities that will contribute to the Area of Research Cooperation and serve the broad outcomes shown. Once the Broad Outcomes and Areas of Research Cooperation are agreed, subsequent exercises will be required to further elaborate on what is currently done/being done, what are the gaps and to prioritize those for future action. It is in this column that the framework will translate into concrete collaborative initiatives. One such mapping exercise is underway in Canada, in the form of the white paper on Ocean Observations recent released by Wallace, et al. (2014).

Strategic Approaches

In discussions, the workshop identified a number of broad behaviors and approaches that were felt to be important to the successful implementation of a collaborative framework of this nature. These are:

Support attendant social science activities: To most effectively influence ocean-related policy and decision-making by regulators and States, it is essential to promote, conduct, and integrate social science studies and understandings with those of the natural sciences. It is necessary to have sound and technically strong scientific data and knowledge about the oceans and ocean systems on which to support innovation, safety and security, and public engagement. The effect of this knowledge will be enhanced if there is an attendant understanding of the social and economic context in which this information will be used. Social science studies that can help understand how to relate natural science results to users, communities and governments should be actively pursued as part of any integrated approach to ocean science under the Galway banner.

Engage with ocean industries: Ocean industries play a key role in realizing the economic benefits from ocean resources and systems, in assuring that development and use is sustainable, and in applying new ocean needs and knowledge in innovative ways leading to technological development and further economic activities. It will be important to build and maintain a broad engagement of ocean industries in the Galway process, through outreach and direct involvement in research activities. It is already well recognized that ocean industries offer a major potential for platforms of opportunity (see below). Fulsome engagement of ocean knowledge users and innovators will further foster support for ocean science.

Maintain a strong 'platform of opportunity' program: Platforms of opportunity, for example vessels that can support data collection opportunistically, are well recognized as an efficient initiative. In a broader context, such 'platforms' can as well be other organized research activities where certain research activities might be piggy-backed upon existing research programs/infrastructures, or industrial installations. This should be given maximum effect by an explicit step in research planning and funding that would look for such opportunities in a dedicated manner.

Encourage discovery and exploration: In an era when resources for science are highly prioritized, there is a natural tendency to favour science activities that serve immediate information needs in support operational decision-making and policy requirements. It is necessary that States feel confident that funded activities are meeting these needs. In a healthy science system, it is also necessary to ensure that there is recognition of the importance of exploratory and fundamental science activities. These advance the frontiers of science and provide novel methodologies, providing new science directions and maximizing our capabilities to respond flexibly to unforeseen circumstances.

Maintain flexibility in the program: The Galway initiative is envisioned as a long-term, ongoing commitment between States to cooperate and collaborate in ocean science. Strong prioritization and planning processes will be encouraged to maximize the effect of work to be undertaken. It is necessary as well to recognize that circumstances do change and evolve over time (or even revolve at times). Firm commitments to plans must be balanced with a willingness to adjust plans to changing demands and requirements, as well as changes in the natural systems that we seek to study and understand.

Foster a culture of open data: Consistent with current open data directives of many governments, including the EU, Canada, and United States, collaboration under the Galway Statement will promote and advance the open access and inter-operability of ocean data. Existing directives will be operationalized in a way that respects intellectual property and patent requirements, and builds on progress to date by harmonizing the individual efforts of each state.

Use of the Framework

The principal focus of the discussion at the workshop was to prepare for an immediate discussion with European Commission colleagues about the bi-lateral Statement of Purpose for the Canada – EU Working Group. There is also the need to similarly settle on Areas of Research Cooperation for a parallel document with the US. Workshop attendees felt that much of the product of our discussion would be equally applicable to the cooperative relationship with the US. However, the fact that the US is spatially in a different juxtaposition than is Europe led participants to allow that a slightly different package might be more appropriate for a US – Canada SoP. In particular, bi-lateral science related to shared fish populations is a much more prevalent issue between US and Canada, as is the matter of marine spatial management and the supporting science necessary for its implementation. It was agreed to hold further discussions and possibly modify this product for use in discussions with the Americans.

There was also a brief discussion of the approach taken by this workshop and the resultant product, and the possibility that it may serve as a model for more broad discussions about domestic coordination and cooperation in ocean science within Canada. Participants agreed there was, as pointed out by the Council of Canadian Academies (CCA 2013), a need for such an initiative. It was suggested that this product and the process that produced it be brought forward in those separate discussions.

References:

CCA (Council of Canadian Academies). (2013). Ocean Science in Canada: Meeting the Challenge, Seizing the Opportunity. Ottawa (ON): CCA.CCA report 2013
Wallace, et al. 2014. A Canadian Contribution to an Integrated Atlantic Ocean Observing System (IAOOS).