ORCA

Oceans Research in Canada Alliance

Creating a Culture of Successful Collaboration

Ocean Research in Canada Alliance 2018 Meeting

Ottawa, Ontario | Canada

April 24-25, 2018

Summary Report

Table of Contents

Executive Summary

The Oceans Research in Canada Alliance (ORCA) hosted a meeting in Ottawa, April 24-25, 2018 under the theme: ***Creating a Culture of Successful Collaboration.*** The meeting hosted a wide ranging series of key note and challenge area presentations and discussions that engaged over two hundred and fifty members from across the ORCA community. There was a wealth of information shared across diverse participants from over one hundred and ten different organizations including government departments, academic institutions, and private sector and Indigenous organizations. The opportunity to network amongst such a cross-section of members of the Canadian ocean science and technology (OST) community was unprecedented in Canada. The meeting was successful in enabling new potential partners to get to know one another and to discuss common challenges and opportunities. The creation of a successful culture of collaboration is based on factors such as trust, respect and the common belief that collaboration will achieve much more than by working individually - all of which were encouraged over the two-day meeting.

Photo credit: ORCA Secretariat

Building on the first ORCA workshop that took place in 2017, and efforts over the past twelve months, break-out sessions were held to advance progress towards six challenge areas within Canadian oceans science and technology (OST). The meeting included presentations and discussions on the challenges and opportunities to advance efforts in each challenge area. The identified challenge areas are: Align Efforts, Plans and Funding Around Shared Priorities; Advance the Sharing of Infrastructure; Science in Support of Public Policy, Regulation and Decision-making; Encourage Innovation and the Commercialization of Knowledge and Technology; Work Towards a Cohesive Voice for the Ocean Science Community in International Fora; and Communicate Ocean Science and Technology.

The Paths Forward for each challenge area, outlined within this report, speak of new ways of collaborating to advance efforts. Amongst the outcomes was the identified need for the ORCA Community SharePoint Platform to be a critical piece in the forward actions of ORCA. The Platform has the potential to encourage the culture of collaboration and cooperation that would advance the alignment of efforts, plans and funding around shared priorities, and to share knowledge on international science priorities and potential partners.

New partnering opportunities emerged at the ORCA meeting and at the same time it was recognized that greater efforts need to be made to reach out to the Indigenous and local community levels to increase their participation in OST activities, such as the sharing of infrastructure and data. A diversity of science knowledge - natural, social and Indigenous knowledge - should be brought together in support of public policy, regulation and decision making in OST.

Creating a culture of collaboration is foundational to ORCA. Societal challenges surrounding global oceans are increasingly complex and require enhanced collaboration at the local, regional, national and international levels and across disciplines and sectors. The oceans science and technology needed to respond to these challenges must be multi-disciplinary and multi-sectoral. New partnerships are needed to achieve this and a new culture of collaboration must be encouraged across the OST community. The ORCA 2018 meeting was an opportunity to create a culture of successful collaboration in OST collaboration in Canada and to work towards addressing the gaps identified in the CCA reports regarding the coordination and alignment of the ocean science community.

The ORCA Council and community will continue to work towards achieving these goals through the implementation of recommended initiatives.

Introduction and Context

Background and Context

In June of 2016, Fisheries and Oceans Canada (DFO) announced the intent to work with Canada's ocean science and technology (OST)[1] community to establish an Oceans Research in Canada Alliance (ORCA). This Alliance of Canada's funders and performers of OST was envisioned as a means of institutionalizing co-operation to improve the coordination of research efforts, programming, and associated infrastructure so that new and on-going Canadian investments in OST could be leveraged for maximum benefit both domestically and abroad.

The beginning of the Alliance dates back to 2012, when the Council of Canadian Academies (CCA) convened a panel of experts to identify ocean science research priorities and assess Canada's capacities and infrastructure gaps associated with those priorities. They published two reports in 2012 and 2013 respectively: ***40 Priority Research Questions for Ocean Science in Canada***, and ***Ocean Science in Canada: Meeting the Challenge, Seizing the Opportunity.*** In addition to research priorities and major themes, the latter report identified three gaps in the coordination and alignment of the ocean science community in Canada that required action:

- The vision gap: In contrast to other countries, or other disciplines in Canada, no comprehensive national strategy or vision currently exists for ocean science in Canada. This makes it difficult to prioritize needs and comprehensively plan investments for ocean science.
- The coordination gap: Addressing the increasingly complex issues of ocean science requires enhanced collaboration at the local, regional, national, and international levels, and across disciplines and sectors. Despite the many instances of successful collaboration in Canada, coordination in key areas, such as ocean observation, is lacking. More generally, there is no effective national-level mechanism to coordinate resources and facilitate the sharing of infrastructure and knowledge among ocean scientists. This also hinders the sharing of resources and knowledge at the international level.
- The information gap: Limitations in access to, and availability and comparability of, information made it difficult to assess several categories of ocean science capacity (e.g., the number of active researchers, comprehensive data on research spending, or inventories of large instruments relevant to ocean science).

The two CCA reports represented an important turning point in Canadian OST. For the first time, national priority research questions had been identified together with the challenges and opportunities in Canada to respond to these priorities. In 2013, following the release of the CCA reports, the Canadian Consortium of Ocean Research Universities (CCORU) was instrumental in advancing initial efforts to develop a vision for a Canadian Alliance, what it would look like, how it would function, and its desired outcomes. Not only did CCORU and its members initiate these influential reports, but they also advanced the early stages of coordination within the Canadian ocean science community by hosting an ***Ocean Science Roundtable in 2014*** as well as other workshops, and commissioning the report, ***Investigating the Establishment of a Canadian Organization for the Coordination of Ocean Science Activities in Canada***.

[1] For the purposes of ORCA and this report, "ocean science and technology" is a very broad term that includes all scientific and practical fields related to the oceans, such as marine ecology, seafloor mapping, marine spatial planning, ocean literacy/education, aquaculture, oceanography, technological fields related to marine industries (e.g. glider design and development), fisheries management, etc.

In addition to the efforts of CCORU and the CCA, over recent years, there has been substantial growth in the collective capacity of Canada's OST community as a result of recent federal investments. This capacity presents opportunities for major Canadian scientific achievement to be realized through an integrated, coordinated approach to the management and conduct of OST, such as envisioned with the Alliance.

As momentum continued to build within the Canadian OST community to work together, DFO convened the first workshop of leaders from across the community under the theme of "*Building an Oceans Research in Canada Alliance*" on February 22 – 23, 2017. The Workshop was an important step forward with over ninety key members of the OST community coming together to discuss a common future. In building the new Alliance, a draft vision based on foundational principles was articulated at the Workshop and has since guided progress in developing the Alliance.

Vision

- An entrenched forum for ocean science which serves as the foundation for advancing community interests
- The government, academic, non-governmental, Indigenous and private sector OST community is well networked and features a high degree of research mobility, with strong coordination in the sharing of research infrastructure and resources
- Decision-makers and funders have established or affirmed a long-term political commitment to ocean research, monitoring and conservation programming
- A cohesive and comprehensive approach to international engagement where Canada has affirmed its leadership role
- Open science and open data to the advantage of all science players at both the national and international level
- A more robust, comprehensive evidence base in support of decision-making on Canada's oceans

Principles

Alignment	Inclusivity	Resilience	Communication	Transparency & Open Data

The 2017 ORCA Workshop also identified six themes or challenge areas, for future collaborative work within ORCA, together with a "preferred future" statement articulated for each of the themes. Furthermore, specific concrete initiatives were identified by the Workshop participants that would help to attain these preferred futures. Recommendations from this first ORCA meeting are highlighted in the workshop report, entitled ***Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario***

In the year following the February 2017 Workshop, the ORCA community has worked together to advance specific initiatives from the Workshop that focused on building the Alliance. These actions have assisted in establishing a structure and a platform to enable coordination. For example, ORCA has established a Community of Practice (CoP) as a forum to network the wider OST community, share information, discuss priority issues and work collaboratively on initiatives related to OST in Canada. All members of the OST community are encouraged to engage. Three leaders of the CoP have been established from across Canada. These CoP leaders serve as lead advocates for coordination across the CoP OST.

A senior-level Council has been established, as another building block, to advance coordination efforts across sectors (i.e. university, government departments and agencies, non-governmental organizations, Indigenous organizations, private industry). The Council is co-chaired by two senior ocean science managers – one from DFO and the other from an academic institution and CCORU.

A secretariat has also been created within Fisheries and Oceans Canada. The ORCA Secretariat provides support to the ORCA Council and the CoP. The Secretariat also facilitates collaboration through the development of tools, such as the ORCA Community SharePoint Platform. This web-based platform is a space for the ORCA community to share information, coordinate activities and identify collaborative opportunities. Its content is highly relevant to OST in Canada, and it has a high degree of functionality: from identifying partners, to facilitating engagement in OST events, to providing members with a shared workspace.

Whilst the ORCA Secretariat is situated within DFO, the Department does not lead or coordinate ORCA; rather the Alliance is viewed as a coalition of the willing, established by the community for the community. The Alliance is a collective enterprise with shared leadership and ownership of the path forward and associated outcomes.

Purpose of the 2018 ORCA Meeting

The 2017 ORCA Workshop and the work conducted over the past twelve months focussed on building up the foundational components of an Alliance. The OST community determined that a subsequent meeting should be hosted in 2018 that would build on these foundational pieces, sustain the momentum that has emerged, and further develop a culture of collaboration amongst this emerging coordinated community (See Appendix A – ORCA 2018 Program).

The theme of ORCA 2018, held April 24-25, was ***Creating a Culture of Successful Collaboration.*** At this second meeting of ORCA, the number of participants grew to over two hundred and fifty participants from one hundred and ten organizations representing academia, governments, private sector, not-for-profit organizations and Indigenous organizations from across Canada (See Appendix B – ORCA 2018 Speakers and Participants). Over the two days of meetings, there were key note presentations that provided strategic direction, best practices and lessons learned on creating successful collaboration.

Photo credit: ORCA Secretariat

Several of the ORCA member organizations took the opportunity to showcase their work in the exhibit space provided at the meeting facility. The exhibits provided another venue for members to network with colleagues and learn of new possible collaborative opportunities.

Building on the 2017 Workshop outcomes, break-out sessions were held to advance progress against the "challenge areas", with focused presentations on specific challenges and opportunities to advance efforts in each area. The identified challenge areas are listed below.

ORCA 2018 Challenge Areas

1 - Align Efforts, Plans and Funding Around Shared Priorities
2 - Advance the Sharing of Infrastructure
3 - Science in Support of Public Policy, Regulation and Decision-making
4 - Encourage Innovation and the Commercialization of Knowledge and Technology
5 - Work Towards a Cohesive Voice for the Ocean Science Community in International Fora
6 - Communicate Ocean Science and Technology

Creating a culture of collaboration is foundational to ORCA. The building blocks to create the Alliance organization have been established and efforts now focus on strengthening collaboration amongst the scientists, science managers and science users in Canada that come from government, academia, not-for-profit, private sector and Indigenous organizations. It is recognized that diversity in science is a strength and that by collaborating together, improved solutions relating to OST will be found. Societal challenges surrounding global oceans are increasingly complex and require enhanced collaboration at the local, regional, national and international levels and across disciplines and sectors. The OST work needed in order to respond to these challenges must be multi-disciplinary and multi-sectoral. New partnerships are needed to achieve this and a new culture of collaboration must be encouraged across the OST community. The ORCA 2018 meeting was an opportunity to create a culture of successful collaboration in OST in Canada and to work towards addressing the gaps identified in the CCA reports regarding the coordination and alignment of the ocean science community.

Messages from Key Note Speakers

Key note addresses were delivered at the 2018 ORCA meeting from a cross-section of international and national partners who each reinforced the need, value and importance of collaborating to meet societal challenges within the oceans domain. Messaging from the key note speakers described factors that, based on their experience and perspective, would create a culture of successful collaboration.

Representing the Office of the European Union's Research and Innovation Directorate, Ms. Sigi Gruber spoke of the need to develop new partnerships that are based on trust, respect and the common belief that collaboration will achieve much more than by working individually. Ms. Gruber cited the Galway Statement that was signed in May 2013 between the European Union, the United States of America (USA) and Canada as an excellent example of collaboration that met all of these factors. The Galway Statement on Atlantic Ocean Cooperation launched the Atlantic Ocean Research Alliance (AORA) with the goal to work together in order to better understand and increase our knowledge of the Atlantic Ocean and its dynamic systems, and to promote the sustainable management of its resources. The achievements that have been reached over the past five years on AORA were described as outstanding and represent a new era on trans-Atlantic collaboration where individuals work openly together to reach solutions. In the past five years, over twenty scientific projects, have been funded under AORA bringing together research teams with individuals from across Europe, USA and Canada.

Mr. Craig McLean, Acting Chief Scientist of the USA National Oceanographic and Atmospheric Association (NOAA) acknowledged the outstanding progress that has been achieved under the trans-Atlantic collaboration of AORA and also drew parallels on the benefits of collaboration at the bi-national level. He stated that Canada and the USA share many similarities and that the two countries have successfully collaborated to address ocean challenges such as the protection of the North Atlantic Right Whale and also on the seafloor mapping work under the United Nations Law of the Sea. In these instances, Canadian and American scientists have worked side-by-side to understand the science and develop management solutions. Mr. McLean emphasized the different roles of academic and government science, and encouraged the value in reaching out and engaging with scientific partners from industry, communities and not-for-profit sectors. The importance of engaging with early career scientists was also reinforced as a means to bring in new scientific knowledge and vision. He stated that collaboration across all of the above scientific sectors was necessary to address the challenges that are facing society today.

Ms. Gruber also spoke on the emerging global challenge of ocean plastics, and specifically micro-plastics, as an example of a societal challenge that will need global collaboration to both successfully understand the science and develop local and global responses. The EUs mission-driven approach to a future plastic-free ocean will be a collaborative approach co-designed with multiple partners ranging from municipalities, regional and national governments, academia and private sector – all working together to understand and solve the challenge. The ultimate goal is for a new generation of sustainability where partners work openly together to develop common solutions.

Mr. McLean concluded by reminding participants that during the next two days of ORCA discussions, participants should be conscious to define and understand not only their own specific individual role in addressing ocean challenges but to also consider relations with others as future partners. He stated that we need to recognize the different purposes and mandates that partners bring to discussions. The diversity in partners enriches the scientific collaboration that is developed and this successful collaboration will address global ocean challenges.

Dr. Geoff Green, Founder and Executive Director of Students on Ice, delivered a key note address on oceans and ocean education. He referenced that our planet should really be called "Planet Ocean" given that over than 70% of the planet is covered by oceans that are all inter-connected into one global ocean. Dr. Green said that an oceans-centric society needs to be developed and that a key step in this direction is education. The education of youth has been the focus of Students on Ice since its formation in 1999. Over the past years, more than 3,200 youth from 55 countries have been engaged in ocean education focusing on the polar regions of the globe.


Photo credit: ORCA Secretariat

Dr. Green highlighted the very successful Canada C3, a signature event of the Canada's 150th anniversary in 2017 that was led by Students on Ice. Canada C3 was a 150 day expedition from Toronto to Victoria via the Northwest Passage that inspired a deeper understanding of Canada. It was described as a journey of sharing, learning, building trust and developing relationships – all key factors in successful collaboration efforts.

Mr. Natan Obed, President of the Inuit Tapiriit Kanatami (ITK) spoke on the value of working closely with Canada's Inuit in the conduct of research in northern regions. The ITK is the national body of more than 60,000 Inuit living in fifty-three communities across the northern reaches of Canada. Mr. Obed stated that the Inuit are a marine people with all their communities, except for two, located on the coast. Living on the margins of the northern seas, Inuit are experts on oceans as well as sea ice. Mr. Obed highlighted the development of the National Inuit Strategy on Research that was released earlier in 2018, targeting governments and research institutions. The Strategy identifies areas of partnership and action that can strengthen the impact and effectiveness of Inuit Nunangat research for Inuit. A key factor in the conduct of research is the recognition that all individuals, including scientists, bring different perspectives and that a wide diversity of perspectives is valuable and important. Mr. Obed emphasized that research in Canada's northern regions – both the identification of research priorities and the conduct of the research work – needs to include Inuit communities. Successful collaboration with Inuit will make outcomes more positive and rewarding for all involved partners. Mr. Obed stated that we all have different views and that there is not a right nor a wrong view - but that the diversity of views is most important in working successfully in collaborative efforts.

Challenge Areas

Photo credit: ORCA Secretariat

The larger community building sessions provided by the key note speakers were complemented in the program by smaller discussions targeting specific challenges and opportunities, seeking to advance initiatives within each of the six challenge areas. Discussions within each of the six challenge areas considered the "preferred future" statements developed at the ORCA 2017 workshop: the future the community would like to collectively work towards, in terms of the coordination on OST in Canada. The challenge area sessions were followed by a special panel session that focussed on discussions to advance initiatives and determine paths forward and these discussions were guided by three key questions:

- What were the key outcomes of the session discussions?
- What are the paths forward on these initiatives?
- How have the discussions in this challenge area advanced collaboration?

Leaders have stepped forward from within the ORCA community to lead efforts on the six challenge areas. These individuals serve as key contacts within the Canadian OST community for information on the challenge area and for efforts associated with its development.

1. Align Efforts, Plans, and Funding Around Shared Priorities

Preferred Future

"The OST community has rallied around a common, inclusive vision that is accepted by members and decision makers. Greater mutual understanding and alignment has facilitated the leveraging of assets. Funding mechanisms for research and infrastructure are more harmonized, and effectively support the sharing and use of infrastructure. Resources (e.g., information and facilities) and costs (e.g., maintenance) are shared. As ORCA facilitates communication and creates closer connections, funding agencies are putting more money into the sector, recognizing the value of increased collaboration. The coordination of research through ORCA, including national and international at-sea efforts, has increased Canada's credibility at international meetings. The public supports ORCA's forward-looking plans, as Canadians become more knowledgeable about the sustainability of our ocean"[2].

What were the Key Outcomes of the Session Discussions?

This challenge area hosted three panel discussions dealing with a diverse range of planning, funding and networking opportunities (see Appendix C for session abstracts) on the following topics:

[2] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

A. The Canadian Ocean Science Funding Seascape, Canada's Granting Councils and Agencies;
B. Canada's Science Enterprise Centres: Partnering for Tomorrow's Innovations; and
C. Networking the Networks: fostering collaboration and coordination among ocean research and management networks to meet Canadian and international priorities.

The opening session focused on discussions of the funding opportunities provided by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Science and Humanities Research Council of Canada (SSHRC), as well as the Canadian Foundation for Innovation (CFI). It was acknowledged that across Canada and around the world, universities and colleges are changing, adapting and actively seeking to shape the evolving nature and scope of scientific research. Within the universities and outside, more researchers and research users find that cross-sectoral collaborations, inter-agency and inter-departmental collaborations are increasingly essential to success and are, arguably, the new normal. The CFI provided an overview of key CFI investments in infrastructure and Operating and Maintenance costs of ocean research projects and facilities, highlighting collaborations and networks (national and international).

Photo credit: ORCA Secretariat

The second session in this challenge area focussed on the new multi-partner Science Enterprise Centres at two DFO facilities: the Gulf Fisheries Centre in Moncton, New Brunswick and the Centre for Aquaculture and Environmental Research in West Vancouver, British Columbia. These Science Enterprise Centres are becoming innovative, collaborative research hubs fostering partnerships between the scientific and academic communities, Indigenous peoples, business groups, government partners, non-government organizations and the public.

The final session provided examples of Canada's existing ocean networks, and shared ideas on opportunities for better alignment and coordination of these networks. It is increasingly recognized that nations are turning to large multi-disciplinary networks that unite researchers from the natural and social sciences and draw on academia, industry, government, indigenous groups and local communities as a means to provide evidence for policy and decision making. Canada has invested in a number of world-class ocean networks that provide integrated knowledge about key interests and greatly build on existing strengths. These networks – even when pan-Canadian or globally reaching – address specialized and well-defined problems and collect different types of data. Yet they may also overlap: in geographic areas, equipment used, and in analytical approaches that would benefit from better collaborations and new alignments among the networks. The unique needs and approaches from Aboriginal communities were highlighted as they develop research projects based on communities' needs and work towards self-determination. In addition, the importance of sharing information and data, both on infrastructure and research, was reinforced.

Discussions examined the opportunities, as well as the challenges, presented by these diverse initiatives and how the Canadian OST community could respond in a manner that increases collaboration around shared priorities.

What are the Paths Forward?

- The ORCA Community SharePoint Platform was seen as a critical piece in the forward actions of ORCA. The Platform has the potential to encourage the culture of collaboration and cooperation that would advance the alignment of efforts, plans and funding around shared priorities. The Platform should be expanded to include:
    - Information on the mandates of OST-based federal government departments and other agencies. This would be an opportunity to share knowledge and experiences and enlighten others on the work that is being performed.
    - Details on ocean-related activities that would engage the ORCA community, increase the awareness of actions and initiatives that are being undertaken so as to share and promote opportunities of collaboration. Discussions linked to the challenge area on communication of OST.
    - The new Science Enterprise Centres (SEC) represent a new space for collaboration in Canada. The two pilot SEC projects currently underway represent new collaboration approaches with local stakeholders (e.g. mayors, schools and local levels of government). The efforts of the SECs should be shared on the ORCA Platform to profile the lessons learned and experiences gained so that the whole community can benefit from these.
    - An OST funding database could be created for Canada to assemble relevant information on all ocean science-specific funding opportunities in one location. Information could include funding programs from granting agencies, government, etc. Timelines, eligibility criteria and other important information could be included. This would make the information more accessible to all community members, and encourage further alignment of efforts.
    - It is important that momentum from this ORCA meeting should carry forward over the coming months and not wait for another meeting one year from now. The ORCA Platform could host discussion groups or forums that could be used to advance efforts during the year for further discussion at another face-to-face ORCA meeting.

- An Implementation Working Group could be created within ORCA that will advance the work and efforts of the ORCA Council. The Implementation Working Group could be a working and networking group that would facilitate coordination within ORCA and would advance efforts between annual ORCA meetings.

- In the longer-term, as this challenge area looked to the more distant future, it was recommended that the development of a National Ocean Science Strategy should be an objective for Canada. A Canadian National Ocean Strategy could set and identify common science priorities across Canada and have enable the OST community to work collaboratively towards common objectives.

2. Advance the Sharing of Infrastructure

Preferred Future

"Canada has a long-term plan for world-class ocean infrastructure[3] that is resilient, looking beyond short-term government and political priorities.

A better collaborative process for priority setting, issue identification, and research planning serves to identify infrastructure needs. With new ships on board, the community manages infrastructure in a collective manner. There are shared ocean resources and infrastructure, such as the Canadian High Arctic Research Station (CHARS) opened by Polar Knowledge Canada in 2017. Stakeholders have a clear understanding of partners' inventories and capacity, and there are effective mechanisms to manage, share and store data. The sharing of infrastructure has triggered productive partnerships. Low cost, creative solutions to infrastructure maximize the value of existing capacity, while continuing to look for improved ways to build new capacity" [4].

What were the Key Outcomes of the Session Discussions?

This challenge area hosted five panel discussions dealing with sharing of infrastructure (see Appendix C for session abstracts) on the following topics:

A. Coordinated and Collaborative Ocean Observation;
B. Increasing Vessel Capacity for Canadian At-Sea Research – Part 1: Collaborative Initiatives;
C. Increasing Vessel Capacity for Canadian At-Sea Research – Part 2: Strategic Approaches;
D. Infrastructure for the Future; and
E. Pan-Canadian Issues in Research Data Management.

The opening session discussed the benefits and challenges of coordinated and collaborative ocean observing. It was acknowledged that Canada has many ocean observation activities and infrastructure, but these are loosely-aligned and many are not sustainable. On a national scale, programs need coordination to bring together the data from many sources: buoys measuring wind and waves, ships surveying fish stocks, and satellites providing the view from above. The investment in ocean observing will pay off in greater amounts with better coordination and collaboration which requires an integrative, ambitious approach.

The second and third sessions addressed the challenges of increasing vessel capacity for at-sea research at a time when new demands for scientific observations and advice are coinciding with declining infrastructure capacity. Discussions examined the existing situation and prognosis, then discussed plans and opportunities for new approaches to increasing research vessel capacity with a special focus on vessels that can support multidisciplinary research and complex deployments in Canada's Arctic and offshore. The situation reinforces the need for a national-level mechanism to better coordinate access to existing research vessels across ocean research organizations and for a shared strategic vision for the operation of current and new infrastructure. Infrastructure

[3] Infrastructure in this context is understood to include land-based and ocean-based facilities (e.g., research vessels, laboratories, buildings, pilot plants), and data-sharing infrastructure (e.g., specialized equipment and communication networks).
[4] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

coordination and sharing is not new – key examples of how ocean science communities have come together to pool resources and work collaboratively were presented.


Photo credit: ORCA Secretariat

The fourth session examined observation infrastructure, noting that the ability to make ocean measurements has greatly expanded over the past several decades. New platforms have emerged with sensors that can now reach beyond temperature and salinity to chlorophyll, nutrients and other biogeochemical and biological properties. Discussions concluded that in Canada, scientists must work together to better share the systems that are in place but which are spread across the geography and the institutions whether it be governmental, private or academic sectors. The panelists also reviewed the present capability for fixed and mobile measurements, considered some of the sensors presently under development and the opportunities for the future.

The fifth session within the challenge area focussed on ocean science data. Ocean science increasingly relies on sophisticated sensing technologies producing large volumes of data that needs to be standardized, quality controlled, discoverable, and accessible. The session covered the case for harmonized national approaches to ocean data management, coordination and communication aspects of research data management, international standards and Canadian leadership, and the potential for university- industry-government partnership in ocean data science. The need to facilitate Indigenous organizations in sharing ocean data was also acknowledged as valuable.

Over the five sessions, the discussions highlighted that while there is a strong impetus to move forward on sharing of infrastructure, there is currently some inertia that must be addressed. In the short-term, it was recognized that there should be some smaller scale initiatives that would help build momentum together with some longer-term objectives and goals that this community could rally around. Infrastructure was described as the great “convenor” as discussions on infrastructure brought together expertise relating to vessels, OST equipment, laboratories and data as well.

In moving forward, discussions noted that there are best practices in existence that can be tapped into to build and increase capacity within Canada. It was also recognized that newly emerging global ocean opportunities – for example, the G7 focus on oceans and ocean observing – are opportunities that should be leveraged within the Canadian OST community. Finally, the Community of Practice campaign approach was seen as a reasonable approach that can move forward by building on manageable pieces of work that build success.

What are the Paths Forward?

- A collaborative inventory of infrastructure utilized by the Canadian OST community should be compiled, including equipment. This inventory should be shared across the ORCA community to promote increased collaboration surrounding the assets available in the county.

- ORCA should work with the newly emerging Canadian Integrated Ocean Observing System (CIOOS). CIOOS will be built through a public, private and academic partnership that will bring together and leverage existing Canadian and International ocean observation data/programs/projects. The initiative is built on similar principles as ORCA – sharing, collaboration and coordination. As CIOOS evolves, it will generate value-added data products on an open web-based platform that maximizes utility to end-users, and provide timely access to a broad range of environmental information. This is an initiative in which ORCA could promote and participate.

- Efforts need to be made to reach out to the Indigenous and local community levels to increase their participation in the sharing of both infrastructure and data. The OST community in these areas is large and very diverse in Canada with all sectors and levels of government having different assets. This makes sharing and collaboration challenging; however, efforts need to be made to be inclusive of others who have valuable assets to contribute.

- The status quo for research vessels in Canada is not sustainable. Canada is faced with aging research fleet and increasing demands on limited infrastructure. This is a priority area for ORCA to address both within and external to the ORCA community. ORCA could enable the OST community to speak with one voice, to develop and to present solutions.

3. Science in Support of Public Policy, Regulation, and Decision Making

Preferred Future

"Government uses ocean science results generated outside of Government as part of its evidence base, and departments have a strategy to internalize how external OST is used to inform policy. Relationships and networks contribute to effective collaborative work and integration between government and external agencies. The Canadian Ice Service (CIS) and the Canadian Space Agency (CSA) relationship is an example of this, where CSA acts as a conduit through which the entire space industry/knowledge domain is accessed. In the future, knowledge sharing mechanisms and efficiencies that already exist between government, industry and the academic sector will be leveraged fully, resulting in high levels of cooperation and trust. University academics also ensure that their research fits within DFO priority areas; that it is aligned with public policy considerations, and the requirements of users from both industry and government. Robust communication systems that include collaborative discussion on priorities, and standards for data access and management, are in place to facilitate community engagement, and the coordination of research needs"[5].

[5] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

What were the Key Outcomes of the Session Discussions?

This challenge area hosted four panel discussions dealing with science in support of public policy, regulation and decision making (see Appendix C for session abstracts) on the following topics:

A. Government of Canada Priorities Requiring Ocean Science and Technology Advice;
B. Arctic Ocean Science: Forward Looking Requirements;
C. Integrating Seabed Geoscience into Marine Spatial Planning; and
D. Better Decision by Linking Natural and Social Sciences.

The first panel presented a series of federal government departments which make use of OST research products as the underpinning for their policy and decision making. It was agreed that more effective collaboration across the entirety of the Canadian ocean science ecosystem will be to improve the overall alignment between the products of research programming produced by ocean science practitioners, and the information and advice required by managers and policy-makers in support of regulations and decision-making.

The second panel in this challenge area explored the emerging knowledge gaps, the policy questions, and research requirements and challenges for the Arctic Ocean, from the perspectives of northerners and other Arctic Ocean knowledge experts. As the climate warms and open water in the Arctic Ocean becomes more prevalent, new challenges emerge, and the policy and regulatory environments need to keep pace. Issues related to potential future activities in the Arctic Ocean were highlighted and assessed, and key knowledge gaps explored.

The third panel brought together geological, physical and biological oceanographers, as well as ocean managers to discuss the issues related to integrating seabed geological mapping into marine spatial planning initiatives. It was agreed that integrating geological information into marine spatial planning and issues management requires a culture of collaboration that is presently only partially developed at the local level, but is not systematically supported by public policy.

The fourth panel in this Session focussed on achieving better decision making by linking natural and social sciences. It was reinforced that decisions about the ocean, its uses and its future cannot be made without knowledge both of natural sciences and of the human dimensions (economic, social, cultural, institutional, legal, and other aspects). While the federal government has little capability at present to provide the knowledge needed on the human dimensions of the ocean, there is strong expertise in Canadian educational institutions and many Indigenous and NGO organizations. Discussions acknowledged the challenges of initiating and sustaining linkages of natural sciences and social sciences, as well as the role of the humanities, and the role of Indigenous, local and ocean user knowledge sources. In addition, education/outreach was also mentioned in this session as being important to increase uptake of science.

Over the course of the panel discussions in this challenge area, several key points emerged. The first related to the need to encourage awareness and to inform sharing of data and of knowledge, ranging from the local, to regional, to national and international scales. It can be overwhelming to understand the diversity of data, knowledge and ways of knowing that exist within Canada but it needs to be brought together into a synthesis. The need for Indigenous communities to be engaged in science in support of public policy, regulation and decision-making needs to be emphasized and encouraged.

Many Canadian communities, and particularly those in northern Canada, are coastal (on the ocean – land interface) and their science needs must be addressed.

A second point arising from this challenge area was the need to encourage a more inclusive approach of generating science in support of public policy. This inclusive approach should focus on spending more time listening to the needs of users, including Indigenous people. It is acknowledged that there is a great diversity across the three coasts of Canada but at the same time there are commonalities such as the rapid rate of change in all of Canada's oceans. Understanding the needs of Canadians will help ensure that the correct questions and issues are being addressed by the science. This is how new knowledge is created for better policies and decisions and ultimately will serve Canadians better.

What are the Paths Forward?

- A diversity of science knowledge - natural, social and Indigenous knowledge- should be brought together in support of public policy, regulation and decision making in OST. There is a need in Canada to build capacity on how to work collaboratively together and to provide improved science advice. This capacity could be developed by ORCA with tangible actions, such as collaborative training and workshops that would bring governments, academia and local communities together from across the diversity of sciences.

- The timelines to develop science support for policy making can be lengthy (time needed to monitor, research and extrapolate findings) and does not necessarily align with the often-times shorter political and financial timelines. It is, therefore, important for policy to be adaptive to accommodate changing science. ORCA could work to bridge this science-policy gap with workshops and training so that science and policy makers could better understand one another and better coordinate activities that would lead to improved regulations and decisions.

- One proposed initiative from the 2017 ORCA workshop was the hosting of an annual ORCA conference to present government priorities along with advances in ocean research. This 2018 meeting of ORCA represents a good step forward on this initiative and similar meetings should continue on an annual basis.

4. Encourage Innovation and the Commercialization of Knowledge and Technology

Preferred Future

"Canada remains a world leader in collecting ocean data. Data is made public in real time; and people are trained to use ocean science data. Open data helps to tackle the commercialization issue, by helping to nurture private enterprises that want to conduct research and generate commercial activity in the sector. New technologies deliver advances in science, and create global opportunities for Canadian ocean technology. Industry connects more quickly to researchers with the ability to create knowledge that can be commercialized.

Identified key players in the commercialization of knowledge and technology find creative ways to increase market potential. The engagement and involvement of communities and users of OST have

brought resilience to the system. A more resilient ocean science innovation system has also brought new investments. Commercialization to larger markets cycles back to support research and technology in a positive feedback loop.

Enhanced communications and integrated networks that link government departments, provinces, Indigenous organizations, and small and medium enterprises (SMEs) across the country bring attention to national challenges, make better use of existing experts, and also create new career opportunities in OST" [6].

What were the Key Outcomes of the Session Discussions?

This challenge area hosted three panel discussions dealing with innovation and commercialization of knowledge and technology (see Appendix C for session abstracts) on the following topics:

A. Opportunities for Collaboration among Ocean Technology Organizations and Initiatives;
B. National Challenges in Marine Technology Development; and
C. Ocean Technology Opportunities in Canada.

Some of the major new initiatives in Canada that will provide significant opportunities for collaboration in the ocean technology sector nationally were presented in the first panel. New initiatives included The Ocean Technology Alliance of Canada, Canada's Ocean Supercluster and the Oceans Protection Plan. Discussions then examined opportunities presented by these initiatives for collaboration between industry, academic and government organizations.

The second panel looked at the challenges in marine technology development in Canada, focussing on gaining a better understanding of some of the issues which can be addressed to enhance the commercialization of ocean knowledge and technology. Aspects of the discussions included improved communication and coordination mechanisms among Canadian Ocean S&T enterprises.

The third panel examined ocean technology opportunities in Canada. Ocean technology is inherent in a number of classical vertical sectors such as marine defence and security, ocean observation, marine energy (both renewables and extractive), marine transportation, marine tourism, capture fisheries and aquaculture. As such, a number of specific supply chains can be identified in these vertical sectors; offshore oil and subsea, defence surveillance, ocean science, shipbuilding and onboard systems, biotechnology, and fisheries and aquaculture.

Discussions in this challenge area highlighted the need for communication and working together to address the current programs that exist now and to better understand the capabilities of different groups. The Oceans Technology Alliance of Canada (OTAC) has stepped forward and self-identified as a leader to work with other sectors of government and academia to increase collaboration specifically with the industry sector.

The need for prioritization and coordination was also reported as valuable, given that sectors in oceans technology have different drivers – government has mandated responsibilities including some financial assistance programs, while industry has competitiveness as their driver. It is important to understand how to access funding opportunities as new programs continually emerge.

[6] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

Finally, the recent creation of the Oceans Supercluster is seen as an opportunity for the advancement of oceans innovation and commercialization. As the Supercluster evolves over the coming months, it could play a significant role in increasing coordination.

What are the Paths Forward?

- Knowledge mobilization plans and strategies are now required by all organizations receiving funding from any of the tri-council agencies. These knowledge mobilization plans represent an opportunity to bring diverse sectors together, including the various sectors within the OST community, including governments, academia, technology and private sectors, not-for-profit organizations, Indigenous governments and local coastal communities. New working groups could be formed within ORCA with the mandate to further develop how this knowledge mobilization focus could be advanced with the OST community. Knowledge mobilization plans and strategies could be the central theme for future meetings.

- ORCA should work with the regional development agencies to encourage innovation and commercialization of OST. The regional development agencies (e.g. Atlantic Canada Opportunities Agency, Canadian Northern Economic Development Agency and others) serve as a hub for bringing the industry sector together with government and academia. ORCA could co-host meetings and events with the development agencies, as a step in increasing understanding and collaboration of various perspectives.

5. Work Towards a Cohesive Voice for the Ocean Science Community in International Fora

Preferred Future

"Canada is well represented by experts at key international fora, and speaks with one voice that represents the vision of the ocean community. Opportunities to participate in conferences and meetings are identified, prioritized, and coordinated. ORCA engages with other groups within Canada and with Global Affairs Canada to identify entry points into a few select meetings, and ensure optimal representation. Canadian ocean research priorities inform and shape international engagements (i.e. with networks like the International Council for the Exploration of the Sea (ICES) and the North Pacific Marine Science Organization (PICES)).

ORCA plays a leadership role to coordinate national participation in the international Our Ocean conferences. Knowledge gained by sending delegates to conferences internationally is disseminated in Canada. A key to this success is properly funded research priorities and well established connections with the SME community in Canada. Canadians continue to be sought after as global leaders and partners in international projects. ORCA works with leaders from both developed and developing nations to develop shared resources on big-ticket research initiatives"[7].

[7] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

What were the Key Outcomes of the Session Discussions?

This challenge area hosted three panel discussions dealing with international fora (see Appendix C for session abstracts) on the following topics:

A. Horizon 2020 – the European Union Framework Programme for Research and Innovation – an Ocean of Opportunity for Collaboration;
B. Breaking down the silo mentality is key to advancing the goals of the United Nations Decade of Ocean Sciences; and
C. Challenges and Opportunities for Canadian Engagement in International Ocean Science.

The first panel illustrated why Canadian researchers, ocean stakeholders, and representatives from the public and private sector should engage in collaborative endeavours with Europe given the significant investments in the Horizon 2020 (H2020) Programme (the European Union's biggest Research and Innovation Framework Programme with nearly EUR 80 billion of funding available over 7 years). While there are no direct funds available to Canadians in H2020, it is possible to participate through "mirror projects" with some support actions available. In addition, the Canada - European Union - United States Atlantic Ocean Research Alliance (AORA), established by the Galway Statement on Atlantic Ocean Cooperation, was highlighted as a framework for creating opportunities across and along the Atlantic Ocean.

The second panel explored the upcoming Decade of Ocean Sciences for Sustainable Development that will be held from 2021 to 2030. This initiative was announced during the 72nd United Nations General Assembly with an intent to reverse the decline in ocean health by identifying actions that will ensure marine environments are developed in a sustainable way. The discussions examined ways in which an integrated and cooperative approach could be effective at resolving challenges to our oceans. Of note, potential major science breakthroughs of the UN Decade would be to achieve mapping of the entire oceans floor and to develop deep ocean observing systems. It was discussed that there needs to be a shift in the perspective on the ocean, to recognize that it is a single ocean system and that climate change has highlighted an enormous need to change the way in which oceans are observed. The need to engage with Indigenous communities was emphasized as crucial for realizing UN Decade goals. Indigenous communities have a large body of Indigenous Knowledge that is evolving, as is the Indigenous capacity to do collaborative research and management.

The third panel examined international fora where Canada is playing a leading role in the discussion of advancing oceans science and which represent key platforms for working together to advance oceans goals. These new initiatives are wide ranging and include Canada's G7 Presidency, a Youth Challenge on Oceans, and the Commonwealth Blue Charter to which Canada has committed to serve in the role of Champion. Canada's work towards achieving the UN 2030 Agenda goals – Sustainable Development Goal 14 – to conserve and sustainably use the oceans, seas and marine resources for sustainable development was also discussed.

Discussions noted that there is currently a wealth of opportunities for international OST collaboration; however, there needs to be greater clarity on the platforms and mechanisms available to Canada's OST community for engaging with the international community to address national and global OST challenges.

What are the Paths Forward?

- An inventory of international fora for OST should be created in order to prioritize and coordinate Canada's participation in, and sharing of information into and out of, these meetings. While the community would not be able to engage on all international initiatives, the community could review the inventory and together determine the greatest priority and focus on these efforts. The creation of a board or committee, with members from within ORCA could serve as a mechanism for coordinating input for international fora.

- The ORCA Platform has the potential to be an excellent tool to promote collaboration in OST and the community needs to learn how to effectively use it. Specific projects to be advanced on the ORCA Platform include the following:
    - Information on the Horizon 2020 funded projects and Canada's mirror projects, which could be shared across the Canadian community.
    - Summaries of meetings outcomes should be prepared and posted form when members of the Canadian oceans community attend international meetings. This will enable the broader OST community to be kept current and knowledgeable of recent developments and initiatives.

- ORCA should have a role to play in defining the scope of how Canadian OST engages with the diverse international oceans science and technology opportunities. The Ocean Frontier Institute offered to share their networks to help advance Canada's work towards the UN 2030 Sustainable Development Goals. The scope of international engagement needs to include both a youth and a gender lens. It was noted that not all engagement efforts need to be done at a national level; efforts at the sub-national level might be appropriate for some actions.

- The new Commonwealth Blue Charter is an unparalleled opportunity for Canada to be a global leader in oceans. In addition, the recent national investments in ocean related initiatives, including the Oceans Protection Plan, the Ocean Frontiers Institute, and the Oceans Supercluster, all represent tremendous opportunities to be built upon. ORCA should assist in bringing the diverse sectors of Canadian OST together to both drive and help leverage Canadian efforts on these international agenda.

6. Communicate Ocean Science and Technology

Preferred Future

"Establish regular communications between governments, Indigenous ocean science organizations, universities and non-governmental organizations to foster the integration of knowledge and skills of all stakeholders to support decision-making. An improved culture of communication would support the coordination of "big picture" innovation opportunities instead of piece-meal projects"[8].

[8] Final Summary Report – Building an Ocean Research in Canada Alliance Workshop, February 22-23, 2017, Ottawa, Ontario

What were the Key Outcomes of the Session Discussions?

The ORCA workshop in 2017 articulated challenges to collaboration on ocean science, and described a preferred future as stated above. One of the cross-cutting issues identified to reach this preferred future centred on communication and the challenge to find information about ocean science activities and to create a national forum to discuss ocean science.

Over the course of the 2018 ORCA meeting, this challenge area held three panel discussions dealing with communication (see Appendix C for session abstracts) on the following topics:

A. ORCA's Community Platform for Facilitating Communication and Collaboration;
B. Making sense of science for Canadians – improving science communications and engagement for great research impact; and
C. A National Roadmap for Ocean Literacy: A Critical Pathway for Mobilizing Ocean Science Knowledge.

In order for ORCA to successfully meet its goals, ORCA must be inclusive, resilient, open and transparent. In the first session, the ORCA Community SharePoint Platform was introduced. The Platform is OST community owned and driven (it is not a government website) and provides a high degree of functionality and relevance to advance ORCA's goals. This online tool can facilitate coordination and engagement, and improve communications and flow of information. The ORCA Community Platform goes well beyond document management: it is a rich platform that can enable collaborative efforts through tools such as the shared community calendar (tracking engagement on OST), the partnership wiki (identifying partnership opportunities) and the organization and members lists (connecting members). The ORCA Community Platform will be most effective if it continues to be relevant to the OST community (targeted and useful applications) and if it is easy-to-use (accessibility). To facilitate ease of use, both engagement of ORCA members and additional outreach will be necessary.

In the second panel in the challenge area, the discussion focused on how the Canadian OST community can collaborate to improve how scientific knowledge is shared with, and how to engage with, Canadians. It was recognized that knowledge brokers are important in the communication of science as they can act as connectors between research and public receptors. It is understandable that scientists have their own science efforts as top priority; however, communication of this science often lags too far behind. It is valuable to raise the profile of the need for science communications and provide training to scientists in this area. Another challenge that was flagged in this discussion was the need for ORCA to be Indigenous inclusive, including Northern Indigenous communities. It was

noted that fifty of the fifty-two communities in the Canada's Arctic are coastal communities with citizens having extensive knowledge of the ocean.

Photo credit: ORCA Secretariat

The third panel in this challenge area focused on how to increase the effective communication of OST knowledge and how to collaborate across specific sectors of influence to find new ways to advance understanding of oceans by the general public. There was an opportunity to discuss the development of an Ocean Literacy Roadmap as a means to advance ocean literacy in Canada. The concept of ocean literacy ties together the scientific, socio- economic, and cultural dimensions of the human relationship with the ocean, and is strongly linked to ocean-positive behaviours and informed decision-making. Strategically developing ocean literacy activities in Canada, and around the world, is essential for making progress towards almost all UN Sustainable Development Goal 14 targets and for establishing a sustainable human-ocean dynamic.

Discussions in this challenge area of OST communication were dynamic and highly interactive. The breadth of participants and expertise in the discussions provided for several engagement strategies for building a culture of collaboration.

What are the Paths Forward?

- There is a need for the ORCA Community SharePoint Platform to grow and to become increasingly relevant and easy-to-use by the entire community. The following actions were identified in this regard.
    - The ORCA platform would benefit from an Engagement Strategy that will encourage new ideas to be added to the content and promote increased access. In addition to an Engagement Strategy, a Marketing Strategy is needed to develop marketing tools that are focussed and directed on OST.
    - Associated with an Engagement Strategy must be a training module for individuals to learn about how to most effectively use the ORCA platform. There is also a need to engage further with communities and Indigenous people across Canada in the co-production of knowledge and information for the ORCA platform.
    - A Working Group should be created, composed of ORCA community members, to build engagement in the development and use of web platforms, including the existing one and any future alternatives.
    - An inventory of best practice tools and templates for communicating science to the public should be created and made available to the Canadian OST community.

- A public website on ORCA should be developed that would be in addition to, and augment, the ORCA Community Platform. This website could be the public hub of OST in Canada and could increase the breadth of partners within ORCA and its public profile.

- An *Ocean Literacy Plan* should be advanced that would be applicable to all three coasts of Canada and would embrace knowledge holders from all sectors, including Indigenous peoples. One priority within this Plan would be to encourage a national coalition of champions. Several of the existing oceans networks are already working on aspects of the ocean literacy and that this work could be the basis for the national ORCA efforts.

- Knowledge mobilization and knowledge exchange should be considered as a possible theme for a future ORCA meeting. An event on knowledge exchange could include the need for effective communications and bring in expert science communicators from a broad and diverse perspective. There could be presentations on a suite of communication tools, and best practices that have emerged elsewhere including use of live streaming, FaceBook and other social media opportunities.

- ORCA should seek a means to capture public attention on oceans and to engage the public around a gateway topic such as ocean plastics which is currently garnering extensive international media attention.

- Training opportunities in communications should be offered to scientists to facilitate their ability to reach broader public audiences beyond their specific science community.

Creating a Culture of Collaboration

The ORCA 2018 meeting hosted a wide ranging series of key note and challenge area presentations and discussions that engaged over two hundred and fifty members from across the ORCA community. There was a wealth of information shared across diverse participants from over one hundred and twenty different government departments, academic institutions, and private sector and Indigenous organizations. The opportunity to network amongst such a cross-section of members of the Canadian OST community was unprecedented in Canada. The meeting was successful in enabling new potential partners to get to know one another and to discuss common challenges and opportunities. The creation of a successful culture of collaboration is based on factors such as trust, respect and the common belief that collaboration will achieve much more than by working individually - all of which were encouraged over the two-day ORCA 2018 meeting.

This emerging culture of collaboration that embraces the diversity of science and the science community in Canada, will be able to develop innovative solutions addressing the challenges and opportunities associated with the six specific challenge areas. The activities noted within the Paths Forward for each challenge area speak of new ways of collaborating to advance efforts in these key themes. The outcomes from the challenge areas highlighted the need for the ORCA Community Platform to be a critical piece in the forward actions of ORCA. The Platform has the potential to encourage the culture of collaboration and cooperation that would advance the alignment of efforts, plans and funding around shared priorities, and to share knowledge on international science priorities and potential partners.

New partnering opportunities emerged at the ORCA meeting and at the same time it was recognized that greater efforts need to be made to reach out to the Indigenous and local community levels to increase their participation in OST activities, such as the sharing of infrastructure and data. A diversity of science knowledge - natural, social and Indigenous knowledge- should be brought together in support of public policy, regulation and decision making in OST.

In reflecting back to the CCA Reports, the efforts that ORCA has undertaken are addressing the identified gaps relating to information and coordination of ocean science in Canada. These efforts will be achieved not just by individuals within Canada, but also within a new culture of collaboration that brings the diversity of the OST community together to address the challenges we face.

Next Steps

The recommended paths forward in each challenge area are proposed by the community as the key initiatives that must be undertaken to advance OST in Canada. Community members will actively engage on advancing the proposed initiatives, while using the ORCA Platform as a means to facilitate broad, cross-sectoral collaboration on these initiatives. Community members should keep the principles of ORCA in mind when working collaboratively on these initiatives.

The senior-level ORCA Council will work to advance coordination efforts across OST sectors and will continue to champion efforts across the six challenge areas that will advance a culture of collaboration within Canada.

The ORCA Secretariat will continue to support the community in its efforts to advance OST in Canada.

Contact Information

This summary report is not intended as a record of the proceedings of the ORCA 2018 meeting, but rather as a high-level summary of the main messages, the key discussions points and the primary outcomes.

Questions and comments relating to ORCA 2018 and to this report can be directed to the ORCA Secretariat at ORCA.AROC@dfo-mpo.gc.ca.

Appendix A – ORCA 2018 Program

ORCA 2018

Creating a Culture of Successful Collaboration

April 24-25, 2018
Shaw Centre,
Ottawa, Ontario | Canada
Program

Day 1

1. Registration (7:45 – 8:45)

(2nd floor, Rideau Canal Atrium)

2. Welcome to Algonquin Territory (9:00 – 9:15)

(Plenary – Room 205/206)

- Elder Verna McGregor

3. Opening Remarks (9:15 - 9:30)

(Plenary – Room 205/206)

- Catherine Blewett, Deputy Minister of Fisheries and Oceans Canada

4. Review of Program and Approach (9:30 – 9:45)

(Plenary – Room 205/206)

- Marc Valois, Lead Facilitator, Intersol Group

5. The Oceans Research in Canada Alliance (9:45 – 10:15)

(Plenary – Room 205/206)

Co-Chairs of the ORCA Council

- Arran McPherson, Acting Assistant Deputy Minister, Ecosystems and Oceans Science, Fisheries and Oceans Canada
- David Castle, Vice-President of Research, University of Victoria

6. Health Break (10:15 – 10:30)

(Rideau Canal Atrium)

Refreshments provided by REFORMAR.

7. Advancing Coordination Across Key Challenge Areas (10:30 – 11:30)

(Plenary – Room 205/206)

- ORCA Council Challenge Area Champions

1. Align Efforts, Plans, and Funding Around Shared Priorities
   - Ariane Plourde, Institut des sciences de la mer de Rimouski
2. Advance the Sharing of Infrastructure
   - Guy Levesque, Canada Foundation for Innovation
3. Science in Support of Public Policy, Regulation, and Decision-making
   - David Scott, Polar Knowledge Canada
4. Encourage Innovation and the Commercialization of Knowledge and Technology
   - Scott McLean, Ocean Technology Alliance of Canada
5. Work Towards a Cohesive Voice for the Ocean Science Community in International Fora
   - Mark Abrahams, Memorial University of Newfoundland
6. Communicate Ocean Science and Technology
   - Helen Burt, University of British Columbia

8. Keynote Speakers (11:30 – 12:00)

(Plenary – Room 205/206)

- Craig McLean, Acting Chief Scientist and Assistant Administrator for Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration
- Sigi Gruber, Head of the Marine Resources Unit, Directorate General for Research & Innovation, European Commission

9. Lunch and Atrium Sessions (12:00 – 1:30)

Ocean science and technology kiosks in the Rideau Canal Atrium.

10. Sessions 1 (1:30 – 2:30)

(Rooms 201, 202, 203 & 204)

First block of sessions taking place in the various break-out rooms. See Session Schedule for session room assignments.

11. Health Break (2:30 – 3:00)

(Rideau Canal Atrium)

Refreshments provided by REFORMAR.

12. Sessions 2 (3:00 – 4:00)

(Rooms 201, 202, 203 & 204)

Second block of sessions taking place in the various break-out rooms. See Session Schedule for session room assignments.

13. Health Break (4:00 – 4:15)

14. Sessions 3 (4:15 – 5:15)

(Rooms 201, 202, 203, 204 & 205/206)

Third block of sessions taking place in the various break-out rooms. See Session Schedule for session room assignments.

15. End of Day 1 (5:15 – 5:30)

(Rooms 201, 202, 203, 204 & 205/206)

16. Reception (5:45 – 7:30)

(Rideau Canal Atrium)

Refreshments provided by the Canada Foundation for Innovation.

Day 2

1. Registration (7:45 – 8:45)

(Rideau Canal Atrium)

2. Welcome to Day 2 (8:45 – 9:00)

(Plenary – Room 205/206)

Co-Chairs of the ORCA Council

- Arran McPherson, Acting Assistant Deputy Minister, Ecosystem and Oceans Science, Fisheries and Oceans Canada
- David Castle, Vice-President of Research, University of Victoria

3. Keynote Speaker (9:00 – 9:45)

(Plenary – Room 205/206)

- Geoff Green, Founder and President, Students on Ice

4. Keynote Speaker (9:45 – 10:15)

(Plenary – Room 205/206)

- Natan Obed, President, Inuit Tapiriit Kanatami

5. Health Break (10:15– 10:30)

(Rideau Canal Atrium)

Refreshments provided by REFORMAR.

6. Sessions 4 (10:30 – 11:30)

(Rooms 201, 202, 203 & 204)

Fourth block of sessions taking place in the various break-out rooms. See Session Schedule for session room assignments.

7. Sessions 5 (11:30 – 12:30)

(Rooms 201, 202, 203, 204 & 205/206)

Fifth block of sessions taking place in the various break-out rooms. See Session Schedule for session room assignments.

8. Lunch and Atrium Sessions (12:30 – 1:30)

Ocean science and technology kiosks in the Rideau Canal Atrium.

9. Taking the Community Pulse (1:30 – 2:00)

(Plenary – Room 205/206)

ORCA Community of Practice Leaders

- Paul Snelgrove, Memorial University of Newfoundland
- Jessica Stigant, Oceans Networks Canada
- Jean-Éric Tremblay, Université Laval

This session includes an interactive component.

10. Sessions 6 – Special Panels (2:00 – 3:00)

(Rooms 201, 202, 203, 204 & 205/206)

Sixth block of sessions taking place in the various break-out rooms, dedicated to panels who will guide the discussions on outcomes for each Challenge Area.

11. Health Break (3:00 – 3:30)

12. Special Panel Reporting (3:30 – 4:45)

(Plenary – Room 205/206)

The six Special Panels report back to the Community.

13. Closing Remarks and Next Steps (4:45 – 5:00)

(Plenary – Room 205/206)

Co-Chairs of the ORCA Council

- Arran McPherson, Acting Assistant Deputy Minister, Ecosystems and Oceans Science, Fisheries and Oceans Canada
- David Castle, Vice-President of Research, University of Victoria

Appendix B – ORCA 2018 Speakers and Participants

Last Name	First Name	Affiliation
Abrahams	Mark	Memorial University of Newfoundland
Aikat	Peter B.	Global Affairs
Akoaksion	Fred	Inuvialuit Game Council
Arany	Jillian	Mi'kmaw Conservation Group
Archambault	Philippe	Québec-Océan, Université Laval
Armstrong	Jason	Ingenium - Canada's Museums of Science and Innovation
Azetsu-Scott	Kumiko	Fisheries and Oceans Canada
Baker	Krista	Fisheries and Oceans Canada
Bancroft	Douglas	Canadian Scientific Submersible Facility
Barker	Anne	National Research Council of Canada
Barry	Ailsa	Canadian Museum of Nature
Baum	Julia	University of Victoria
Beatty	Scott	MarineLabs
Béchard	Genevieve	Fisheries and Oceans Canada
Ben Essalah	Hachem	Fisheries and Oceans Canada
Bennett	John	Polar Knowledge Canada
Bensouda	Reda	
Bertino	Laura	Defence Research & Development Canada/DND
Best	Mairi	Ocean Observing and Research Infrastructures
Bibeault	Jean-François	Environment and Climate Change Canada
Bigué	Brigitte	Institut nordique du Québec - Université Laval
Black	CarolAnne	Contractor – AOO Blueprint Team
Blewett	Catherine	Fisheries and Oceans Canada
Bliss	Doug	Fisheries and Oceans Canada
Bonnet	Claudie	Réseau Québec maritime
Boston	Elizabeth	Natural Sciences and Engineering Research Council of Canada
Boucher	Sylvie	Canada Foundation for Innovation
Bouffard	Nadia	Fisheries and Oceans Canada
Braithwaite	Leah	ArcticNet
Brammer	Andrew	Fisheries and Oceans Canada
Brasfield	Ashley	Students on Ice Foundation
Brown	Craig	Nova Scotia Community College
Brunsting	Ray	Hakai Institute
Burke	Brian	Nunavut Fisheries Association
Burt	Helen	University of British Columbia
Burzynski	Dariusz	Innovation, Science and Economic Development Canada

Last Name	First Name	Affiliation
Casenave-Pere	Olivier	Naval Group Technologies Canada Inc.
Castle	David	University of Victoria
Caya	Alain	Environnement et Changement Climatique Canada
Chafe	Graham	Atlantic Salmon Federation
Charles	Anthony (Tony)	Saint Mary's University
Church	Ian	University of New Brunswick
Clarke	Keith	Fisheries and Oceans Canada
Clelland	Eric	Bamfield Marine Sciences Centre
Coates	Louisa	Natural Resources Canada
Cooke	Steven	Carleton University/CCEBCEM
Critchley	Jacques	Social Sciences & Humanities Research Council
Davidson	Fiona	University of Ottawa
Davison	Karen	Fisheries and Oceans Canada
Dawson	Jackie	University of Ottawa
De Lafontaine	Yves	Fisheries and Oceans Canada
Dewar	Heather	Students on Ice Foundation
Dewey	Richard	Ocean Networks Canada
deYoung	Brad	Memorial University of Newfoundland
Diamantopoulos	Viletta	Environment and Climate Change Canada
Dodds	Karen	MEOPAR
Donaghy	Tara	Fisheries and Oceans Canada
D'Souza	Kareina	Mi'kmaw Conservation Group
Dupuis	Britt	Fisheries and Oceans Canada
Durnford	Ed	Fisheries and Marine Institute of Memorial University
El Yousfi	Fatima	University of Ottawa
Enei	George	Environment and Climate Change Canada
Fissel	David	Ocean Technology Alliance of Canada
Fleming	Gordon	Maritime Way Scientific Ltd.
Forest	Alexandre	Amundsen Science
Fortier	Louis	Université Laval
Gale	Gordon	Ocean Technology Council of Nova Scotia
Geddes	Katie	National Oceanic and Atmospheric Administration
Giguère	Noémie	Technopole maritime du Québec
Gilbride	Neill	Fisheries and Oceans Canada
Glithero	Lisa	Canada C3
Gosselin	Serge	Fisheries and Oceans Canada
Gouldman	Carl	U.S. Integrated Ocean Observing System
Green	Geoff	Students on Ice Foundation
Greenan	Blair	Fisheries and Oceans Canada
Gruber	Sigi	European Commission
Haggarty	Dana	Fisheries and Oceans Canada
Halliday	William	Wildlife Conservation Society Canada
Hancyk	Jeremy	Rockland Scientific Inc.

Last Name	First Name	Affiliation
Hanlon	Jim	Centre for Ocean Ventures and Entrepreneurship (COVE)
Harrison	Peter	Queen's University
Heffernan	Peter	Marine Institute
Hemmingway	Christopher	Canadian Hydrographic Service
Hildebrand	Larry	World Maritime University
Hill	Ian	Dalhousie University
Hill	Paul	Dalhousie University
Hill	Philip	Natural Resources Canada
Hindle	Laird	Global Affairs Canada
Holland	Anton	NIVA Inc.
Houston	Kim	Fisheries and Oceans Canada
Iverson	Sara	Dalhousie University
Jackson	David	Canadian Ice Service (ECCC)
Jamieson	John	Memorial University of Newfoundland
Jayas	Digvir	University of Manitoba
Johnson	Neville	Fisheries and Oceans Canada
Johnson	Greg	RBR
Kavanagh	Sana	Mi'kmaw Conservation Group, The Confederacy of Mainland Mi'kmaq
Kelly	Brianne	WWF-Canada
Kemp	Debbie	Defence Research & Development Canada/DND
Klopotovskaya	Yanina	Defence Research & Development Canada/DND
Knox	Thomas	MacArtney Canada
Koizumi	Catherine	Association de gestion halieutique autochtone Mi'gmaq et Malécite (AGHAMM)
Laflamme	Jean	CIDCO
Lapointe	Erik	Reformar
Latendresse	Patricia	Canada Foundation for Innovation
Laverdure	Louise	Fisheries and Oceans Canada
Lebel	Daniel	Natural Resources Canada - Geological Survey of Canada
Leclair	Alain	Polar Knowldedge Canada
Leclerc	Yoss	Logistro Consulting International
Lennon	Keith	Fisheries and Oceans Canada
Leslie	Stefan	MEOPAR
Levesque	Guy	Canada Foundation for Innovation
Levesque	Keith	Fisheries and Oceans Canada
Lewis	Sara	Fisheries and Oceans Canada
Li	Alexander	Innovation, Science and Economic Development Canada
Lincoln	Richard	Atlantic Canada Opportunities Agency
Locke	Stephen	Natural Resources Canada
Longtin	Caroline	Fisheries and Oceans Canada
Macdonald	Steve	Fisheries and Oceans Canada
Magee	Angélique	Natural Resources Canada

Last Name	First Name	Affiliation
Malavoy	Sophie	UQAM
Maltais	Louis	Canadian Hydrographic Service
Maurice	Jeffrey	Nunvaut Tunngavik Inc.
McCallum	Barry	Fisheries and Oceans Canada
McGregor	Verna	
McLean	Scott	Ocean Networks Canada
McLean	Craig	National Oceanic and Atmospheric Administration
McPherson	Arran	Fisheries and Oceans Canada
Molloy	Sue	Glas Ocean Electric
Moore	Wayne	Fisheries and Oceans Canada
Moorman	David	Canada Foundation for Innovation
Moran	Kate	Ocean Networks Canada
Morton	Kes	Pisces Research Project Management
Munro	Geoff	Trestle Networks Inc
Murray	Heather	Canadian Network for Ocean Education (CaNOE)
Myers	Paul	University of Alberta
Nadeau-O'Shea	Colombe	HackerNest
Naud	Jason	Ministère de l'Économie, de la Science et de l'Innovation du Québec
Near	Anthony	Transport Canada
Newman	Candace	Natural Resources Canada
Nguyen	Vivian	Natural Resources Canada
Nichols	Jacqueline	Cellula Robotics Ltd.
Niemi	Andrea	Fisheries and Oceans Canada
Nightingale	John	Ocean Wise
O'Reilly	Jordan	Transport Canada
Obed	Natan	Inuit Tapiriit Kanatami
Palmer	Andrew	MacArtney Canada Ltd
Paquet	Mary	Students on Ice Foundation
Paul	Ken	Atlantic Policy Congress of First Nations Chiefs Secretariat
Pedersen	Eric	Fisheries and Oceans Canada
Peterson	Eric	Hakai Institute / Tula Foundation
Picard	André	National Film Board of Canada
Pirenne	Benoit	Ocean Networks Canada
Plante	Steve	Réseau Québec Maritime
Plourde	Ariane	ISMER-UQAR
Point	Jordan	First Nations Fisheries Council
Prelovec	Lucija	Ingenium - Canada's Museums of Science and Innovation
Rangeley	Robert	Oceana Canada
Redican	Anthony	Fisheries and Oceans Canada
Rice	Jake	Fisheries and Oceans Canada
Robert	Katleen	Fisheries and Marine Institute of Memorial University
Robineau	Brigitte	Québec-Océan

Last Name	First Name	Affiliation
Rodrigue	Mattie	National Oceanic and Atmospheric Administration
Ross	Tetjana	Fisheries and Oceans Canada
Roy	Sylvie	Natural Sciences and Engineering Research Council of Canada
Rytwinski	Trina	Carleton University CCEBCEM
Sanfaçon	Richard	Reformar
Saper	Ron	Carleton University
Schaefer	Terry	National Oceanic and Atmospheric Administration
Scott	David	Polar Knowledge Canada
Sharp	Rawni	Natural Sciences and Engineering Research Council of Canada
Siegel	Eric	RBR Ltd.
Smith	Darlene	Fisheries and Oceans Canada
Smith	Gregory	Environment and Climate Change Canada
Snelgrove	Paul	Memorial University of Newfoundland
Somayajula	Niru	Sensor Technology Ltd
Stalker	Janet	Ocean School / Ocean Frontier Institute
Ste-Marie	Anne-Sophie	Observatoire global du Saint-Laurent / St. Lawrence Global Observatory
Stewart	Andrew	Fisheries and Oceans Canada
Stigant	Jessica	Ocean Networks Canada
Stockermans	Desirée	Ocean Sonics Ltd
Stockhausen	Jeff	National Research Council of Canada
St-Onge	Guillaume	Réseau Québec Maritime
Strugariu	Daniel	European Commission
Sumaila	Rashid	University of British Columbia
Surch	Matthew	Canadian Coast Guard
Syliboy	Alanna	The Confederacy Of Mainland Mikmaq
Tagoona	Kendra	Inuit Tapiriit Kanatami
Taillefer	Martin	Maritime Way Scientific Ltd.
Takeda	Tabitha	Transport Canada
Taylor	Fraser	Geomatics and Cartographic Research Centre
Thomas	Mary Ellen	Nunavut Research Institute
Thompson	Susan	Fisheries and Oceans Canada
Tibbetts	Robert	U.S. Embassy
Townsend	Brendal	Ocean Tracking Network
Tremblay	Jean-Eric	Québec-Océan & Université Laval
Tremblay	Claude	Fisheries and Oceans Canada
Trounce	Krista	Vancouver Fraser Port Authority
Van Zyll de Jong	Michael	University of New Brunswick Saint John
Vassell	Joshua	Transport Canada
Veniot	Anne	Fisheries and Oceans Canada
Verge	Darrin	ROMOR
Vezina	Alain	Fisheries and Oceans Canada

Last Name	First Name	Affiliation
Virc	Stephen	Fisheries and Oceans Canada
Vogt	Kate	Environment and Climate Change Canada
Vollrath	Jennifer	Fisheries and Oceans Canada
von Mirbach	Martin	Wildlife Conservation Society Canada
Vornbrock	Jennifer	University of Victoria
Walkusz	Wojciech	Fisheries and Oceans Canada
Wallace	Katie	Natural Sciences and Engineering Research Council of Canada
Wallace	Douglas	MEOPAR
Watson	Lynda	Global Affairs
Watson-Wright	Wendy	Ocean Frontier Institute
Wells	Nadine	Fisheries and Oceans Canada
Wheatley	Michelle	Fisheries and Oceans Canada
Whoriskey	Fred	Dalhousie University
Wilson	Kevin	M2Océan
Winsor	Fraser	National Research Council of Canada
Wong	Janson	Lower Fraser Fisheries Alliance
Woodford	Wendy	Fisheries and Oceans Canada
Wright	Jody	Clear Seas Centre for Responsible Marine Shipping
Yurk	Harald	Fisheries and Oceans Canada
Zohar	Sandra	Canada Foundation for Innovation

Appendix C – Session Abstracts

ORCA 2018: Session Information	
Challenge Area	Align Efforts, Plans, and Funding Around Shared Priorities
Session ID	1A
Session Title	The Canadian Ocean Science funding Seascape, Canada's Granting Councils and Agencies
Session Leader	ORCA Secretariat
Additional Speakers	Elizabeth Boston, Mathematical, Environmental and Physical Sciences (NSERC) Jacques Critchley, Research Grants & Partnerships (SSHRC) Sandra Zohar, Canada Foundation for Innovation
Abstract	The **Natural Sciences and Engineering Research Council of Canada** (NSERC) supports university students in their advanced studies, promotes and supports discovery research, and fosters innovation by encouraging Canadian companies to participate and invest in postsecondary research projects. We will present an overview of NSERC programs supporting Ocean science and technology research, as well as funding trends over the last few years. Collaborative initiatives and networks will be highlighted, as well as opportunities for future national and international collaboration. **The Social Science and Humanities Research Council of Canada** (SSHRC) is Canada's federal funding agency that promotes and supports postsecondary- based research and research training in the humanities and social sciences through grants, fellowships and scholarships. Across Canada and around the world, universities and colleges are changing, adapting and actively seeking to shape the evolving nature and scope of scientific research. Within the universities and outside, more researchers and research users of all stripes find that cross-sectoral collaborations, inter-agency and inter-departmental collaborations are increasingly essential to success and are, arguably, the new normal. SSHRC's current strategic plan, "Advancing Knowledge for Canada's Future" (2016-2020) addresses these challenges and opportunities with three strategic objectives: 1. Enabling excellence in a changing research environment 2. Creating opportunities for research and training through collaborative initiatives 3. Connecting social sciences and humanities research with Canadians These objectives align very well with the challenge to align efforts with shared priorities and we will emphasize the particular contribution that social science and social science funding can bring to ORCA. The **Canada Foundation for Innovation** (CFI) has invested close to $370 M in the past 20 years to support leading-edge ocean research infrastructure for over 250 projects. This investment also includes over $123 M for the operating and maintenance (O&M) of national research facilities awarded Major Science Initiatives (MSI) funds. The session will provide an overview of key CFI investments in infrastructure and O&M costs of ocean research projects and facilities, highlighting collaborations and networks (national and international). It will conclude with an update on the 2018 Federal Budget and the current suite of CFI funds.

ORCA 2018: Session Information	
Challenge Area	Align Efforts, Plans, and Funding Around Shared Priorities
Session ID	1B
Session Title	Canada's Science Enterprise Centres: Partnering for Tomorrow's Innovations
Session Leader	Anthony Redican – Fisheries and Oceans Canada
Additional Speakers	Anne Veniot – Fisheries and Oceans Canada Steve MacDonald
Abstract	As part of the Government of Canada's investments in marine and freshwater science, Fisheries and Oceans Canada (DFO) established multi-partner Science Enterprise Centres (SECs) at two DFO Facilities: the Gulf Fisheries Centre in Moncton, New Brunswick and the Centre for Aquaculture and Environmental Research (CAER) in West Vancouver, British Columbia. These Science Enterprise Centres are becoming innovative, collaborative research hubs fostering partnerships between the scientific and academic communities, Indigenous peoples, business groups, government partners, non-government organizations and the public. When fully operational, the Science Enterprise Centres will be comprehensive, multi-purpose facilities and their objectives will be to establish world-class, innovative, multi-partner collaborations that advance priorities and deliver expanding science knowledge to Canadians. This session will outline the goals and progress to date in establishing collaboration, outreach and governance models at both the Atlantic and Pacific SECs, including challenges that have been encountered and opportunities for further collaboration. The session will also include a discussion on current barriers to collaboration with a goal to identifying potential innovative solutions to move past these barriers.

ORCA 2018: Session Information	
Challenge Area	Align Efforts, Plans, and Funding Around Shared Priorities
Session ID	1C
Session Title	Networking the networks: fostering collaboration and coordination among ocean research and management networks to meet Canadian and international priorities
Session Leader	Sara Iverson, Ocean Tracking Network
Additional Speakers	Fred Whoriskey, Ocean Tracking Network Leah Braithwaite, ArcticNet Sana Kavanagh, Mi'kmaw Conservation Group
Abstract	To provide evidence on which to base complex science, policy and management strategies for oceans and aquatic resources, nations are turning to large multi-disciplinary networks that unite researchers from the natural and social sciences and draw on academia, industry, government, indigenous groups and local communities. Canada has invested in a number of world-class ocean networks that provide integrated knowledge about key interests and greatly build on existing strengths. These networks – even when pan-Canadian or globally reaching – address specialized and well- defined problems and collect different types of data. Yet they may also overlap: in geographic areas, equipment used, and in analytical approaches that would benefit immensely – and provide new insights into big problems – from better collaborations and new alignments among the networks. The Canadian Council of Academies acknowledged the importance and strengths of Canada's ocean networks, but also emphasized the need to better coordinate investments of public resources to benefit Canada and Canadians by moving knowledge into policy and management. The aim of this ORCA session is to provide examples of Canada's existing ocean networks, and to share thoughts on opportunities for better alignment and coordination of these networks. We bring together a panel of representatives from three ocean-centered networks who will provide brief perspectives on the benefits obtained from their networking activities, but also the challenges and lessons learned in attempting to reach out beyond their networks both nationally and internationally, in moving knowledge into policy and management spheres, and especially in helping to identify new opportunities for synergies and integration among networks. An open forum with the general audience will provide an opportunity to identify additional examples of networking successes and challenges, discuss ways to increase alignment, collaboration and coordination among networks nationally and internationally, and identify initiatives that fill gaps in priority areas of ocean research and management.

ORCA 2018: Session Information	
Challenge Area	Advance the Sharing of Infrastructure
Session ID	2A
Session Title	Coordinated and Collaborative Ocean Observation
Session Leader	Brad deYoung – Memorial University of Newfoundland
Additional Speakers	Keith Lennon – Fisheries and Oceans Canada Carl Gouldman – U.S. Integrated Ocean Observing System (IOOS)
Abstract	This session will review and discuss the benefits and challenges of coordinated and collaborative ocean observing. To improve our stewardship of the ocean, and prepare for, or avoid future hazards, we need better ocean observations and understanding. We have many ocean observation activities and much infrastructure in Canada, and these are loosely-aligned and many are not sustainable. On a national scale, our programs need coordination to bring together the data from many sources: buoys measuring wind and waves, ships surveying fish stocks, and satellites providing the view from above. Our investment in ocean observing will only payoff with better coordination and collaboration. Ocean issues cut across regions and national borders and require an integrative, ambitious approach that is fit for the intended purpose. We will begin with the Atlantic Ocean BluePrint an international initiative to lay out the principles and plans for sustained ocean observing in the North and South Atlantic. We will learn from the development of the US IOOS program which has been in operation for almost a decade. The discussion of the challenges and benefits will lead to a review of the present state of Canadian ocean observing and plans for the Canadian Integrated Ocean Observing System being led by Fisheries and Oceans Canada.

ORCA 2018: Session Information	
Challenge Area	Advance the Sharing of Infrastructure
Session ID	2B
Session Title	Increasing Vessel Capacity for Canadian At-Sea Research – Part 1: Collaborative Initiatives
Session Leader	Douglas Wallace, MEOPAR
Additional Speakers	Guy Levesque, Canada Foundation for Innovation (CFI) Keith Levesque, Fisheries and Oceans Canada (DFO) Jennifer Vollrath, Fisheries and Oceans Canada (DFO) Louis Fortier, Amundsen Science, ArcticNet Doug Bancroft, Canadian Scientific Submersible Facility (CSSF)
Abstract	The session will focus on research vessel capacity across Canada, with a special focus on vessels that can support multidisciplinary research and complex deployments in Canada's Arctic and offshore. The panelists will briefly define the existing situation and prognosis; identify plans and opportunities for new approaches to increasing research vessel capacity, and suggest the next concrete steps that need to be taken. New approaches will include plans for purpose-built research icebreaker capacity, modular infrastructure to allow use of a range of platforms and vessels and opportunities associated with Canada's new Arctic and Offshore Patrol Ships. The session is linked directly with the follow-on session which will be focussed on cooperative approaches to the sharing and operation of large ocean infrastructure.

ORCA 2018: Session Information	
Challenge Area	Advance the Sharing of Infrastructure
Session ID	2C
Session Title	Increasing Vessel Capacity for Canadian At-Sea Research – Part 2: Strategic Approaches
Session Leaders	Keith Levesque, Fisheries and Oceans Canada Jennifer Vollrath, Fisheries and Oceans Canada
Additional Speakers	Alexandre Forest, Amundsen Science
Abstract	Research vessels are a critical component of ocean research infrastructure. In Canada, new and increasing demands for scientific observations and advice are coinciding with declining infrastructure capacity. This situation stresses the need for a national-level mechanism to better coordinate access to existing research vessels across ocean research organizations and for a shared strategic vision for the operation of current and new infrastructure. Infrastructure coordination and sharing is not new – key examples of how ocean science communities have come together to pool resources and work collaboratively will be presented. The US National Oceanic and Atmospheric Administration (NOAA) has developed an online tool for allocating and scheduling its research vessels in a way that maximizes use across all NOAA sectors and with its scientific collaborators. In Europe, strategies such as the international Arctic Research Icebreakers (ARICE) and EUROFLEETS consortia have been developed to address the challenges of coordinating transnational activities and scarce ocean science resources. In Canada, the scientific deployment of the research icebreaker CCGS Amundsen is managed by the independent organization Amundsen Science that allows researchers from all horizons to access the ship. Fisheries and Oceans Canada is currently developing an online application to coordinate access to and facilitate the sharing of Canadian marine research infrastructures for both governmental and academic researchers and will offer efficiency and transparency in the process for submitting and evaluating applications for ship time. Information on the rationale and functionalities of the application will be provided. This session will delve into additional questions regarding the current model of funding, sharing and operating research vessels in Canada and what is required to take a strategic approach to fruition.

ORCA 2018: Session Information	
Challenge Area	Advance the Sharing of Infrastructure
Session ID	2D
Session Title	Infrastructure for the Future
Session Leader	Brad deYoung – Memorial University of Newfoundland
Additional Speakers	Richard Dewey – Ocean Networks Canada (ONC) Blair Greenan – Fisheries and Oceans Canada David Fissel - ASL Environmental Sciences
Abstract	Our ability to make ocean measurements has greatly expanded over the past several decades. We have many new platforms to reach the ocean and sensors that can now reach beyond temperature and salinity to chlorophyll, nutrients and other biogeochemical and biological properties. We now face the challenge of having to decide which properties to measure and how best to deploy the range of technology available to us. In Canada, we also must work to better share the systems that we do have that are spread across the geography and the institutions that we have from the governmental, private to academic sector. In this session we will review some of our present capability for fixed and mobile measurements, consider some of the sensors present under development and the opportunities for the future. We will consider the regional networks (ONC, Ocean Tracking Network, Saint Lawrence Global Observatory, and HF radar), mobile platforms (Gliders, Argo, BioArgo, Autonomous Underwater Vehicles) and sensor technologies (gas, nutrient, pH). We will review some of the approaches to infrastructure sharing such as the ROPOS facility, and Ocean Gliders Canada. The discussion will focus on strategies for improved collaboration and sharing. How can we get better value from the intellectual and financial investments that we have made in ocean technology? What are the key gaps in ocean observation and how should they be addressed? How can we develop more effective cross-sectoral partnerships between academia and the industry and government sectors?

ORCA 2018: Session Information Template	
Challenge Area	Advance the Sharing of Infrastructure
Session ID	2E
Session Title	Pan-Canadian Issues in Data Management
Session Leader	David Castle, University of Victoria
Additional Speakers	Fred Whoriskey, Ocean Tracking Network Benoit Pirenne, Ocean Networks Canada Geoff Munro, Trestle Networks
Abstract:	Ocean science increasingly relies on sophisticated sensing technologies producing large volumes of data that needs to be standardized, quality controlled, discoverable, and accessible. This panel first considers the Canadian context for research data management (through the lens of Research Data Canada) before exploring east and west coast-based initiatives (Ocean Tracking Network and Ocean Networks Canada), and then concluding with a discussion of federal science (Government of Canada Science Network). The major thematic elements covered in this session will include the case for harmonized national approaches to ocean data management, coordination and communication aspects of research data management, international standards and Canadian leadership, and the potential for university-industry-government partnership in ocean data science.

ORCA 2018: Session Information	
Challenge Area	Science in Support of Public Policy, Regulation and Decision-making
Session ID	3A
Session Title	Government of Canada Priorities Requiring Ocean Science and Technology Advice
Session Leader	Andrew Brammer, Fisheries and Oceans Canada
Additional Speakers	Alain Leclair, Polar Knowledge Canada Candace Newman, Natural Resources Canada Jean-François Bibeault, Environment and Climate Change Canada Wayne Moore, Fisheries and Oceans Canada
Abstract	A key requirement for the successful fostering of more effective collaboration across the entirety of the Canadian ocean science ecosystem will be to improve the overall alignment between the products of research programming produced by ocean science practitioners, and the information and advice required by managers and policy-makers in support of regulations and decision-making. In this session, federal departments who make use of ocean science and technology research products will discuss priority areas whose successful advancement will be underpinned by the availability of supporting ocean science and technology advice.

ORCA 2018: Session Information Template	
Challenge Area	Science in Support of Public Policy, Regulation and Decision-making
Session ID	3B
Session Title	Arctic Ocean Science: Forward Looking Requirements
Session Leader	David Scott, Polar Knowledge Canada
Additional Speakers	Brian Burke, Nunavut Fisheries Association Peter Harrison, Queen's University David Jackson, Canadian Ice Service, Environment and Climate Change Canada
Abstract:	As the climate warms and open water in the Arctic Ocean becomes more prevalent, new challenges emerge, and the policy and regulatory environments need to keep pace. This session explores the emerging knowledge gaps, the policy questions, and research requirements and challenges for the Arctic ocean, from the perspectives of northerners and other Arctic ocean knowledge experts. Trends in the current fisheries in the western and eastern regions of our Arctic will be examined, and key questions identified. Issues related to potential future activities in the Central Arctic Ocean will be highlighted and assessed, and key knowledge gaps explored. Changing sea ice dynamics that influence harvesting and safe seasonal transportation will be highlighted, and linked to current and possible future challenges.

ORCA 2018: Session Information	
Challenge Area	Science in Support of Public Policy, Regulation and Decision-making
Session ID	3C
Session Title	Integrating Seabed Geoscience into Marine Spatial Planning
Session Leader	Philip Hill, Natural Resources Canada (NRCan)
Additional Speakers	Stephen Locke, NRCan Craig Brown, Nova Scotia Community College
Abstract	Understanding the geological characteristics of the seabed and underlying strata provides important framework information for marine spatial planning. Typically based on morphological analysis of multibeam sonar bathymetry models and backscatter data, the geological characterization of the seafloor provides information on the composition, structure, stability and sensitivity of the seafloor. Geological mapping contributes to cumulative effects management by providing evidence of the physical processes that shape the seafloor and the natural pathways for sediment and contaminants, from source to final deposition. Integrating geological information into marine spatial planning and issues management requires a culture of collaboration that is presently only partially developed at the local level, but is not systematically supported by public policy. This session will bring together geological, physical and biological oceanographers, as well as ocean managers to discuss the issues related to integrating seabed geological mapping into marine spatial planning initiatives.

ORCA 2018: Session Information	
Challenge Area	Science in Support of Public Policy, Regulation and Decision-making
Session ID	3D
Session Title	Better Decisions by Linking Natural and Social Sciences
Session Leader	Anthony (Tony) Charles, St- Mary's University
Additional Speakers	Ken Paul, Atlantic Policy Congress of First Nations Chiefs
Abstract	Everyone would agree that decisions about the ocean, its uses and its future cannot be made without knowledge both of natural sciences and of the human dimensions (economic, social, cultural, institutional, legal, and other aspects). Yet the federal government has very little capability at present to provide the knowledge needed on the human dimensions of the ocean. Fortunately, Canadian educational institutions are strong in those areas, as are many Indigenous and NGO organizations. The logical conclusion is that transdisciplinary research partnerships are needed that bring all the players together. Some success stories of this approach will be described, such as the past Ocean Management Research Network and the current OceanCanada Partnership and Community Conservation Research Network. Also to be discussed are the challenges in initiating and sustaining linkages of natural sciences and social sciences, as well as the role of the humanities, and the role of Indigenous, local and ocean user knowledge sources. Key needs for the future will be explored. Experiences and ideas from those attending the session will be welcomed.

ORCA 2018: Session Information	
Challenge Area	Encourage Innovation and Commercialisation of Knowledge and Technology
Session ID	4A
Session Title	Opportunities for Collaboration among Ocean Technology Organizations and Initiatives
Session Leader	Scott McLean, Ocean Technology Alliance of Canada
Additional Speakers	Jim Hanlon, Centre for Ocean Ventures Enterprise Michelle Wheatley, Fisheries and Oceans Canada
Abstract	This session will look at some of the major new initiatives in Canada that will provide significant opportunities for collaboration in the ocean technology sector nationally. Session speakers will provide a 10-15 minute overview of these new initiatives and where there are opportunities for collaboration between industry, academic and government organizations. Session speakers and Topics: • Scott McLean: The Ocean Technology Alliance Canada • Jim Hanlon: Canada's Ocean Supercluster • Michelle Wheatley: The Oceans Protection Plan After the presentations and Q&A, there will be a round table discussion.

ORCA 2018: Session Information	
Challenge Area	Encourage Innovation and Commercialisation of Knowledge and Technology
Session ID	4B
Session Title	National Challenges in Marine Technology Development
Session Leader	David Fissel, Director, Ocean Technology Alliance of Canada
Additional Speakers	Dr. David Murrin; National Research Council of Canada (NRC) Dr. Greg Johnson, RBR Limited Martin Taillefer, Maritime Way Scientific
Abstract	This session will address the challenges in marine technology development in Canada. Specifically, this session will seek to arrive at better understandings of some of the issues which can be addressed to enhance the commercialization of ocean knowledge and technology in Canada. Specific aspects of this topic include improved communication and coordination mechanisms among Canadian Ocean S&T enterprises. The session will seek to identify, within the broader Canadian Ocean S&T community, of national challenges to be addressed and new marine technologies to be developed and tested through science-engineering cooperation. The speakers, and their topics, are: • David Fissel: An Overview of the Priorities for New Marine Technologies based on an earlier study by the Canadian Council of Academies with updates based on more recent studies. • David Murrin: How present and future NRC programs align with Canadian Ocean Science, Engineering and Technology Development • Greg Johnson and Martin Taillefer: Challenges for technology development by Canadian Ocean Science and Technology (S&T) SME's; how can improved collaboration and coordination of ocean S&T benefit technology development? The panel discussion will be followed by a Q&A session from the audience.

ORCA 2018: Session Information	
Challenge Area	Encourage Innovation and Commercialisation of Knowledge and Technology
Session ID	4C
Session Title	Ocean technology Opportunities for Canada
Session Leaders	Gordon Gale, Executive Director, Ocean Technology Council of Nova Scotia Noémie Giguère, Executive Director, Technopole maritime du Québec
Additional Speakers	Dr Sue Malloy, GlasOcean Jeff Stockhausen, National Research Council of Canada
Abstract	Ocean Technology should be regarded as an overarching or horizontal sector. Ocean Tech is inherent in a number of classical vertical sectors such as marine defence and security, ocean observation, marine energy (both renewables and extractive), marine transportation, marine tourism, capture fisheries and aquaculture. As such a number of specific supply chains can be identified in these vertical sectors; Offshore oil and subsea, defence surveillance, Ocean Science, Shipbuilding and onboard systems, biotechnology, and fisheries and aquaculture. Key target market geographic regions and key market trends and demand drivers will be identified. This session will include a series of presentations, followed by a round-table discussion.

ORCA 2018: Session Information	
Challenge Area	Work Towards a Cohesive Voice for the Ocean Science Community in International Fora
Session ID	5A
Session Title	Horizon 2020 - the European Union Framework Programme for Research and Innovation - an Ocean of Opportunity for Collaboration
Session Leader	Sigi Gruber, Head of Marine resources Unit, Bioeconomy Directorate, Research and Innovation, European Commission
Additional Speakers	N/A
Abstract	This session will illustrate why Canadian researchers, ocean stakeholders, representatives from the public and private sector should engage in collaborative endeavours with Europe and globally thanks to the Horizon 2020 Programme (the European Union's biggest Research and Innovation Framework Programme with nearly EUR 80 billion of funding available over 7 years). The Canada - European Union - United States Atlantic Ocean Research Alliance (AORA), established by the Galway Statement on Atlantic Ocean Cooperation, provides a framework for creating opportunities across and along the Atlantic Ocean. Don’t miss your chance to discover and engage in the discussion!

ORCA 2018: Session Information	
Challenge Area	Work towards a cohesive voice for the ocean science community in international fora
Session ID	5B
Session Title	Breaking down the silo mentality is key to advancing the goals of the United Nations Decade of Ocean Sciences
Session Leader	Wendy Watson-Wright, CEO of the Ocean Frontier Institute
Additional Speakers	Moderator: Arran McPherson, ADM, Ecosystems and Oceans Science, Fisheries and Oceans Canada Panelists: • Brad deYoung, Robert A. Bartlett Professor of Oceanography at Memorial University of Newfoundland in St. John's, NL • Peter Heffernan, Chief Executive, Marine Institute, Galway, Ireland • Catherine Lambert Koizumi, Executive Director, Mi'gmaq Maliseet Aboriginal Fisheries Management Association, Gesgapegiag, QC
Abstract	During the 72nd United Nations General Assembly — held in 2017— it was proclaimed that years 2021 to 2030 would be the Decade of Ocean Sciences for Sustainable Development. The intent of the proclamation is to reverse the decline in ocean health by identifying actions that will ensure marine environments are developed in a sustainable way. Key to achieving the UN's objectives for the decade is applying solutions in a collaborative and global manner. This session will examine three ways in which an integrated and cooperative approach is effectively resolving challenges to our ocean: 1) how transnational partners are uniting to examine the large-scale and cumulative stressors on the ocean 2) how researchers are embracing new approaches to developing and coordinating observation technologies at sea and in the process, generating more value from the observations they make 3) how engagement with Indigenous stakeholders and the use of traditional knowledge can help understand ocean changes and identify solutions that generate community benefits. The session will include an overview of the objectives the United Nations expects to achieve during the Decade of Ocean Sciences for Sustainable Development as well as an interactive audience discussion on the various solutions that could be applied.

ORCA 2018: Session Information	
Challenge Area	Work towards a cohesive voice for the ocean science community in international fora
Session ID	5C
Session Title	Challenges and Opportunities for Canadian Engagement in International Ocean Science
Session Leader	Lynda Watson, Executive Director, Science Technology and Innovation, Global Affairs Canada
Additional Speakers	Panelists: • Nadia Bouffard, Director General, External Relations, Fisheries and Oceans Canada • Laird Hindle, Deputy Director, Development, Global Affairs Canada • Peter Aikat, Senior Innovation Officer, Science Technology and Innovation, Global Affairs Canada
Abstract	N/A

ORCA 2018: Session Information	
Challenge Area	Communicating Ocean Science and Technology
Session ID	6A
Session Title	ORCA's Community Platform for Facilitating Communication and Collaboration
Session Leader	Britt Dupuis, Fisheries and Oceans Canada, ORCA Secretariat
Additional Speakers	N/A
Abstract	The Oceans Research in Canada Alliance operates a new collaboration space which is the central hub for its Community of Practice and their activities. This SharePoint site has been designed to facilitate and support a highly collaborative and coordinated approach to ocean science and technology in Canada. It seeks to address several key challenges and barriers to coordination that have been identified by the community, by increasing transparency, communication and collaboration, in a way that is inclusive, flexible and resilient. This web-based platform is a living tool that can support and facilitate your activities as you work with your partners to advance ocean science and technology in your field. It is community owned and community driven. This limited access space that can help you collaborate on shared documents from your working group, find panelists for your meetings, consult the community on specific issues, identify potential research partners, plug in to upcoming events, and more. The vision is that this site will become the one-stop-shop for collaborative work in Canadian ocean science. While this site continues to evolve to meet the needs of the community, it is a free, highly collaborative and functional tool available to the community right now. This interactive session is your introduction and your chance to shape this tool for the future.

ORCA 2018: Session Information	
Challenge Area	Communicating Ocean Science and Technology
Session ID	6B
Session Title	*Making sense of science for Canadians* – improving science communication and engagement for greater research impact
Session Leader	Tara Donaghy, Fisheries and Oceans Canada, ORCA Secretariat
Additional Speakers	Sophie Malavoy, Director of Coeur des sciences – a scientific cultural centre Dariusz Burzinski, Manager, S&T Cluster, Innovation, Science and Economic Development Canada
Abstract	This session will focus on how the ORCA community can work together to improve the effectiveness and impact of our science communication with Canadians. Sophie Malavoy will share her observations and advice about how to overcome some of the common challenges faced by science professionals when communicating research results, uncertainties, and risk. Dariusz Burzynski will showcase existing and evolving efforts to bring together federal science and technology departments/agencies and professionals as a community in communicating federal science and connecting with Canadians. The second half of the session will include a group discussion on how this community can collaborate to improve how we share scientific knowledge and engage with Canadians. Questions to be addressed in the session include: • What are the barriers to communicating science with others? • Which tools/initiatives/best practices could we build on as a community to improve the effectiveness of our collective science communications? • How can this community support individual scientists in their efforts to help others better understand and act on research insights? • What are some 'quick-win' activities/initiatives over the next 12- 18 months that this community could endorse and/or engage in together? We all have a role to play – both individually and collectively - in ensuring that our science matters to Canadians. Please come and contribute your thoughts and expertise this discussion.

ORCA 2018: Session Information	
Challenge Area	Communicate Ocean Science and Technology
Session ID	6C
Session Title	A National Roadmap for Ocean Literacy: A Critical Pathway for Mobilizing Ocean Science Knowledge
Session Leaders	Tara Donaghy, Fisheries and Oceans Canada Janet Stalker, Ocean School Heather Murray, CaNOE
Additional Speakers	Lisa (Diz) Glithero, C3 Expedition and Students on Ice
Abstract	This session will focus on how to increase the effective communication of ocean science and technology knowledge and how to collaborate across specific sectors of influence to find new ways to advance understanding of oceans by the general public. You will have an opportunity to provide input on an initial *Ocean Literacy Roadmap* as we move forward on a national strategy for advancing ocean literacy in Canada. The concept of ocean literacy (OL) ties together the scientific, socio-economic, and cultural dimensions of the human relationship with the ocean, and is strongly linked to ocean-positive behaviours and informed decision-making. Strategically developing ocean literacy activities in Canada, and around the world, is essential for making progress towards almost all UN Sustainable Development Goal 14 targets and for establishing a sustainable human-ocean dynamic. DFO has supported the development of an initial "roadmap" for strategically advancing ocean literacy in Canada. This session will provide valuable feedback from the ocean science research and technology community and other subject matter experts to create a revised draft of the roadmap before it is shared publicly for a final round of broad consultation and revision. Questions to be addressed in the session include: • What motivates scientist participation in OL activities? • What are the barriers to scientist participation? • What incentives/pathways/solutions/actions would bolster the ocean science community's contribution to advancing ocean literacy in Canada? • What are effective ways for project organizers to get input from the ocean science community on this initiative? Come and contribute your thoughts and expertise to this collaborative project and help Canada keep pace with international efforts in ocean literacy and conservation as we prepare for the UN Decade of Ocean Science for Sustainable Development in 2021-30.