

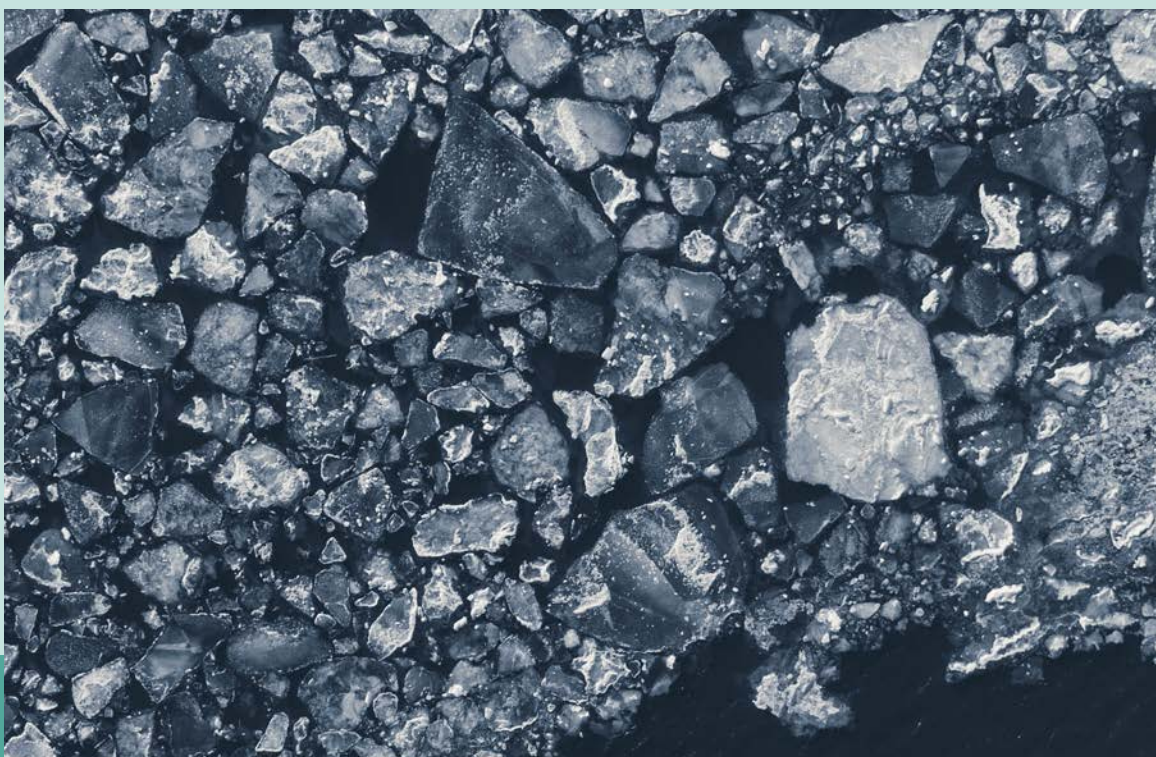
CIOOS

CANADIAN INTEGRATED OCEAN
OBSERVING SYSTEM



SIOOC

SYSTÈME INTÉGRÉ D'OBSERVATION
DES OCÉANS DU CANADA



CIOOS Annual Report

2020 - 2021



Introduction

An effective, coordinated approach to ocean observing, accompanied by high quality and properly managed data, is required to understand, utilize, protect and sustainably manage this resource.

The importance of the ocean is well-established, as it plays a fundamental role in the global climate system and in supporting communities, jobs and livelihoods, food security, human health, biodiversity, economic prosperity and way of life.

Canada's ocean community collects large volumes of data, but until recently there was no mechanism to integrate data from diverse sources, and no formal coordination and collaboration mechanism for the ocean community to advance as a nation. Consequently, the lack of a national integrated ocean observing system for Canada has led to fragmented and isolated data, inaccessible and undiscoverable for reuse.

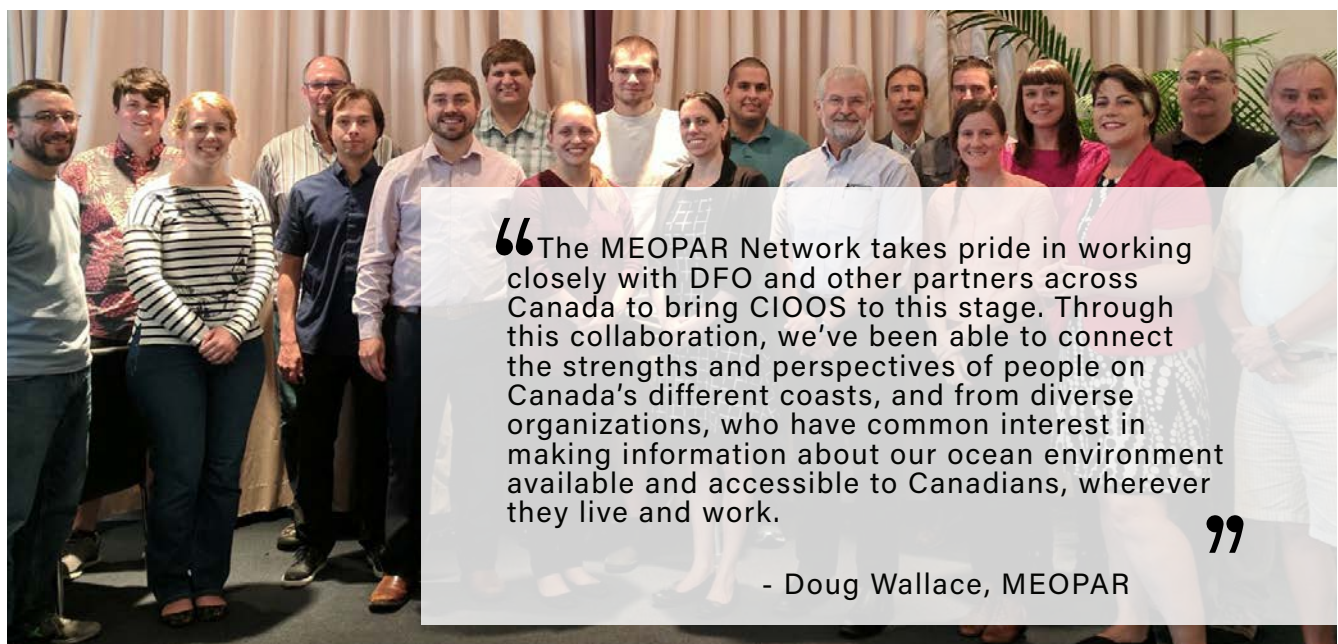
To address the issue, members of the ocean science community, led by Fisheries and Oceans Canada (DFO) and the Marine

Environmental Observation, Prediction and Response Network (MEOPAR) developed and launched the Canadian Integrated Ocean Observing System (CIOOS) in 2019.

This first public annual report recounts the tremendous achievements of CIOOS in 2020-2021, building on its inaugural year of 2019-2020.

We hope you enjoy reading this report and develop a clear understanding of CIOOS' activities.

Finally, we'd like to congratulate and thank all the CIOOS teams and partners, who have shown incredible resilience and adaptation in this time of a pandemic. We're looking ahead at the next year with a lot of confidence and energy!



“The MEOPAR Network takes pride in working closely with DFO and other partners across Canada to bring CIOOS to this stage. Through this collaboration, we've been able to connect the strengths and perspectives of people on Canada's different coasts, and from diverse organizations, who have common interest in making information about our ocean environment available and accessible to Canadians, wherever they live and work.

”

- Doug Wallace, MEOPAR



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About Us

Launched by Fisheries and Oceans Canada (DFO) and the Marine Environmental Observation Prediction and Response network (MEOPAR) in 2019, the Canadian Integrated Ocean Observing System (CIOOS) brings together the various elements of ocean observing in Canada to offer all Canadians fully integrated system for sustained access to data and knowledge about our oceans.

CIOOS also contributes to global efforts to better understand the ocean, marine issues, and interactions with other earth systems.

CIOOS is a maturing system and is the result of a successful collaboration between various institutional and non-governmental partners

located in the Pacific, the St. Lawrence, and the Atlantic. These regions represent three Regional Associations (RAs) who work closely with their local oceanographic communities and organizations to meet end-user needs, and to support ocean observations that are essential to effective ocean management.

The RAs actively engage with regional partners to integrate and to provide open access to reliable and high-quality data, indispensable to supporting evidence-based decision making.



Fisheries and Oceans Canada
Pêches et Océans Canada





Vision & Mission

Our Vision

“Our vision is to offer all Canadians a fully integrated and sustained online ocean observing system by maximizing access to data and information.”

Our Mission

“Our mission is to improve national coordination and collaboration between diverse ocean data sources as well as improve the access and discoverability of information for better decision making. We provide support for a wide variety of economic sectors and research efforts to understand, monitor, and manage activities in the marine and coastal environments.”

”



Governance

The need for an integrated ocean observing system in Canada has been long acknowledged among the ocean science community.

Since its launch, CIOOS has engaged with data providers and users across the country, and worked cooperatively to develop and offer data management, dissemination and interoperability services, through a variety of data tools tailored to meet end-user needs.

Development of technical capacity and strategic direction has been influenced by an impressive wealth of expertise from across Canada, from numerous experts whose input is encouraged under the CIOOS governance structure.

CIOOS is comprised of three Regional

Associations (RAs), one Data Stewardship Node (DSN) and one National Web Presence (NWP), as well as three thematic committees (Technical, Communications and Scientific). Strategic oversight is provided by the Executive Committee. Each part of CIOOS is composed of leading experts from our partner organizations.

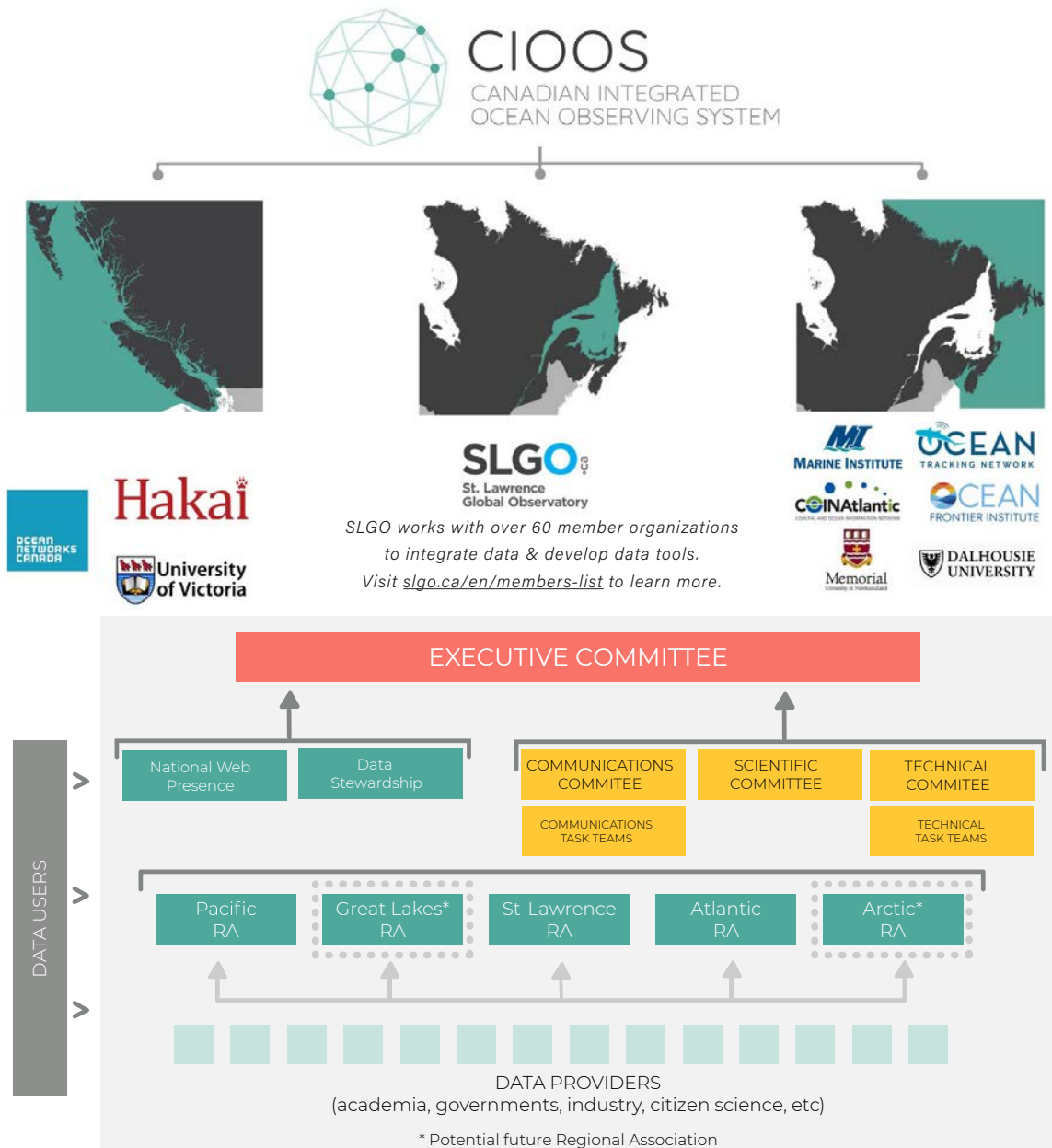
The RAs are each led by an Executive Director and include a staff of data technicians and engagement officers. Regional Oversight Committees provide regional guidance.





Each CIOOS region has pooled talent, resources, experiences and efforts to create this national ocean observing system for the benefit of all Canadians.

Below is a schematic showing the regional organisations and the overall governance structure of CIOOS. Governance is driven from the bottom-up: data users and data providers provide insights to RAs, who in turn work collaboratively in an array of structures. Complimentarily, top-down guidance and oversight is managed by the CIOOS Executive Committee which includes representatives of DFO and MEOPAR as funders.





Executive Team

The Executive Committee, with representatives from across the regions, ensures a clear and transparent decision-making process.



**Keith
Lennon**

Fisheries and Oceans
Canada

Director, Ocean
Science for Fisheries
and Oceans Canada



**Doug
Wallace**

MEOPAR

Scientific Director,
Meopar



**Denis
D'Amours**

Executive Director
CIOOS Pacific
Ocean Networks
Canada



**Andréane
Bastien**

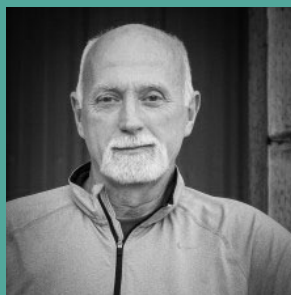
Executive Director
St. Lawrence Global
Observatory



**Shayla
Fitzsimmons**

Executive Director
CIOOS Atlantic

Dalhousie University



**Eric
Peterson**

Data Stewardship
Node

Founder, Tula Foun-
dation and Hakai
Institute



**Anne-Sophie
Ste-Marie**

National Web
Presence

Manager, St. Lawrence
Global Observatory



Committees

Each committee of CIOOS is comprised of leading experts from our partner organizations.



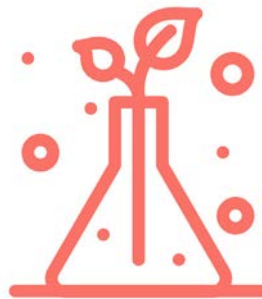
Communications Committee

Chair:

Ève Morin Desrosiers,
SLGO

Mandate:

- » Provide national coordination of communications activities
- » Initiate and monitor completion of essential national communications
- » Produce a bi-annual Communication Plan
- » Provide guidance for messaging



Science Committee

Co-Chairs:

Jennifer Jackson, Hakai
Richard Dewey, ONC

Mandate:

- » Provide national coordination on data priorities, data integrity, and data use
- » Recommend standards for new Essential Ocean Variables that interface with the Global Ocean Observing System (GOOS)
- » Establish QA/QC protocols



Technical Committee

Co-Chairs:

Ray Brunsting, Hakai
Mike Smit, Dalhousie University

Mandate:

- » Provide oversight and coordination of technical aspects
- » Initiate, coordinate, and monitor all technical task teams
- » Liaise between the Executive Committee and CIOOS technical community



Successes & Developments

Since its beginning in 2019, CIOOS has achieved incredible results through a dynamic and trailblazing collaboration of working groups composed of Canada's ocean experts.

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Data Integration

Data integration is at the core of CIOOS. Activities are on a continuum which includes data management, storage, integration and dissemination which allows for development of value-added products and services.

The benefits of integrated ocean observing systems are well-demonstrated in other countries. Addressing fragmented and isolated data, that which is inaccessible and undiscoverable, provides the data and information necessary for Canadians to realize opportunities which bolster ocean safety, the economy, and the environment.

Collaboration

An integrated, national ocean observing system for Canada requires a consultative approach to determine high-level design and objectives informed by existing knowledge and expertise, and must be implemented collaboratively with strong regional, national and international partners.

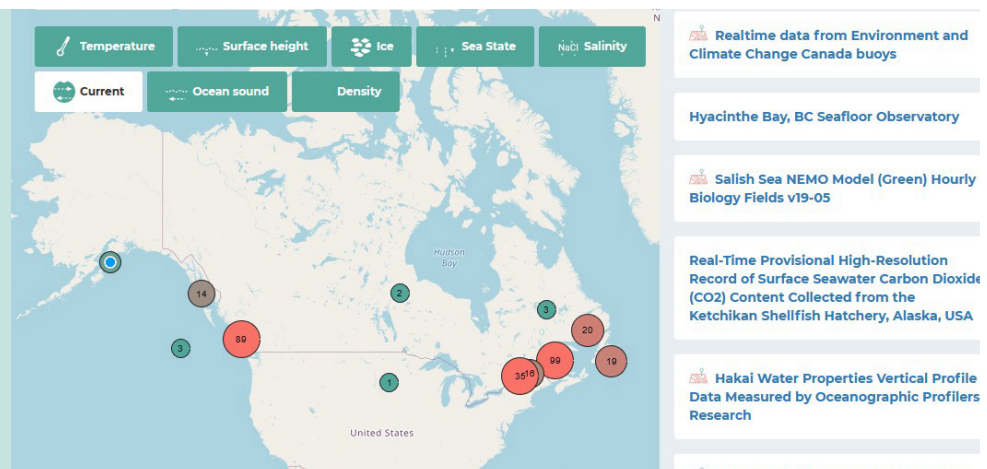
To this end, each Regional Association is closely connected to the needs of regional partners, which influences the orientation of CIOOS as a national system.

For example, outreach and engagement activities in 2019-2020 identified the need for integration and sharing biological data, which impacted the priority of implementing biological data standards within CIOOS.



Building on these successes, CIOOS is ready to mature into a fully operational system.

CIOOS Asset Map



Multidisciplinary Data to Understand our Ocean

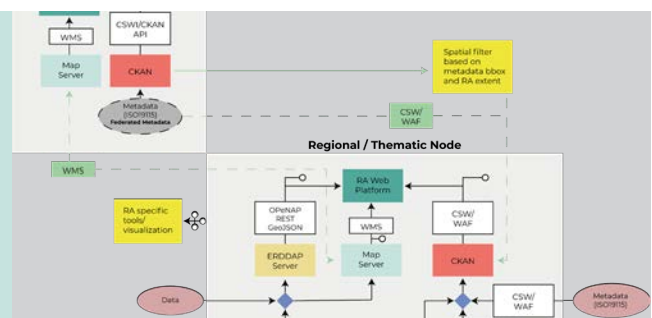
CIOOS implements the best practices to manage, integrate and share data, with particular focus on physical, biogeochemical and biodiversity data based on the 31 variables identified as essential to monitor our oceans by the Global Ocean Observing System (GOOS).

Cyberinfrastructure & Data Standards



A Connected Cyberinfrastructure

CIOOS launched three regional Data Catalogues as well as a national Catalogue to allow easy and fast discoverability of coastal and ocean data across Canada.



International Data Standards Development

CIOOS experts participated in multiple meetings and two code-sprints in collaboration with the United States Integrated Ocean Observing System (US IOOS).



Regional Updates

In addition to the tremendous work our experts have been doing as part of national committees, they are also advancing data integration, tool development and partnerships in their respective regions. Highlights include:

CIOOS Pacific

- Release of Baynes Sound Ocean Monitor, an aquaculture dashboard: Explore local historical and real-time marine conditions to understand past events and to inform today's strategic decisions for shellfish aquaculture in the region
- Pursue engagement with emerging ocean observation initiatives in the region (COAST)
- Engagement with first nations, scientific and industry partners
- Integration of data from DFO, ECCC, PRIMED, UBC, ONC and Hakai

St. Lawrence Global Observatory

- Migration of SLGO cyberinfrastructure to the cloud and increased security measures.
- Data management training series: focused on biodiversity data following the OBIS and Darwin Core standards, the series also informs how to integrate and share data with SLGO and CIOOS.
- Two new visualisation tools developed. Visit slgo.ca/en/data-tools to know more.
- Release of the new edition of SLGO's data management guide
- 55 new datasets integrated and 17 new partner organizations

CIOOS Atlantic

- Data integrated from 8 different organizations
- CIOOS Atlantic Discussion Series: a three-part Discussion Series to explore Indigenous data needs and data sharing approaches, including where our goals may align and how we could collaborate to advance our shared ocean observing goals.
- Data Connector Series: an exclusive three-part workshop to explore how data sharing drives coastal and marine collaboration and innovation within industry and across ocean sectors. Hosted by CIOOS Atlantic in partnership with the Ocean Super Cluster (OSC).



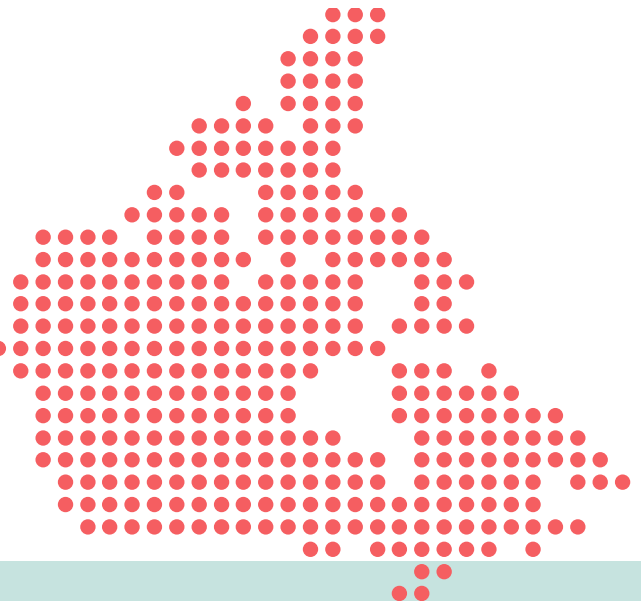
For more information about the tremendous work occurring in the regions, please contact us.
CIOOS Pacific: info@cioospacific.ca - SLGO: info@slgo.ca - CIOOS Atlantic: info@cioosatantic.ca



On the importance of Engagement & Communication

Establishing a national system such as CIOOS requires strong regional adhesion and participation, as well as national coherence and a coordinated approach.

From the start, CIOOS made sure to develop generally unified while regionally adaptable communication approaches.



» *Ad in the Journal of Ocean Technology, Vol. 15, No.3, 2020*

“

CIOOS' national and regional data platforms facilitate multidisciplinary knowledge exchange between a network of contributors and users of coastal and ocean data.

» *Value Statement from CIOOS' Communication Plan*

Template Slide Deck

More than one hundred slides on data management, governance, case studies, and more have been made accessible to all regions to help CIOOS communicate consistently across the country.

CIOOS' First Communication Plan

Includes communication objectives, guidelines and key messages, and general and sector-specific value statements. A brand guide was also developed.

Ads & Pamphlets

CIOOS placed six ads in the Journal of Ocean Technology, who kindly donated the ad space. CIOOS also developed six two-page pamphlets.



Testimonies



Doug Wallace, MEOPAR

CIOOS is designed to function the way that Canadians function best: our ocean spaces have enormous diversity, but CIOOS's de-centralized, multisectoral structure allows us to work cooperatively across the country, coordinate our expertise and share information efficiently.



Tamara Fraser, Aquatic Biologist, Salish Sea Initiative, IOS - DFO

I found using the CIOOS download interface to be highly intuitive and easy to use. I downloaded data quickly and received exactly what I requested. Compared to other processes I had used previously to try to access similar data, it was a walk in the park.



Denis Blondeau, SMS Tanker Agency Inc.

As a shipping agent, I take care of bringing to the loading and unloading docks foreign boats that are sailing for the first time on our St. Lawrence River and that have no knowledge of Canadian regulations and navigation conditions. I am using the data from SLGO to corroborate other sources in order to paint an accurate picture of the situation. I send to the captains of the boats a document in which we find the water levels and temperatures as well as the ice cover. This makes it possible, for example, to determine how ships will load and unload their cargoes.



"Our partnership with CIOOS Pacific allows us to leverage their experience and expertise to develop standardized marine energy specific measurements and derived variables. Adopting frameworks and practices they have established for oceanographic data helps streamline a unified approach to marine energy data collection and distribution that the sector needs. The partnership also increases the visibility of our data by providing the tools and infrastructure to host and distribute historical and live data sets for access by the marine energy community for research and development across ocean sectors. The implementation of these standards and increased accessibility of data will benefit the broader marine energy sector."

Brad Buckham, PhD, PEng

Co-Director PRIMED
Professor, Mechanical Engineering
University of Victoria

Barry Kent, BBA

Research Assistant

"As a firefighter for the City of Longueuil and owner of a water safety training school, I am using Marine Conditions developed by the St. Lawrence Global Observatory twice a day. I am verifying the water level and temperature in the morning and in the evening to validate our data. This allows me to plan our rescue operations in case of an incident on the St. Lawrence river. The water temperature gives me an idea of the intervention time to avoid hypothermia. The water level allows me to ensure the safety of our rescue team."

André Fillion,

Lieutenant-instructor,
Fire Safety Services,
City of Longueuil, Québec

"The high profile presence of CIOOS and the balanced, standardized approach it takes to the management and sourcing of ocean data has had a positive influence on the willingness of organizations to share data. In the limited time that CIOOS has been operational, the idea of making data available to others has gone from being practically unheard of in some sectors, to now being a logical part of data management discussions. The Marine Institute is extremely pleased to be a part of the CIOOS Atlantic partnership that has contributed to significant expansion of the SmartAtlantic Ocean Observing System - maximizing the value of, and investment in data is long overdue."

Bill Carter,

Director, Centre for Applied Ocean Technology, Marine Institute

"CIOOS Atlantic Staff are friendly, knowledgeable and are willing to help support the partnership in any way they can."

Danielle Dempsey,

Centre for Marine Applied Research



Paving the Way Forward

CIOOS is well-positioned to capitalize on the successes of its first two years and evolve from a nascent state to a rapidly maturing system.

Since its inception in 2019, CIOOS has achieved its initial goals of:

- demonstrating the feasibility of making ocean observing from various sources FAIR compliant and accessible on an open access web-based platform;
- advancing the demonstration of the utility of CIOOS;
- engaging a broad array of stakeholders;
- identifying the main challenges to furthering the development of a made-in-Canada ocean observing system.

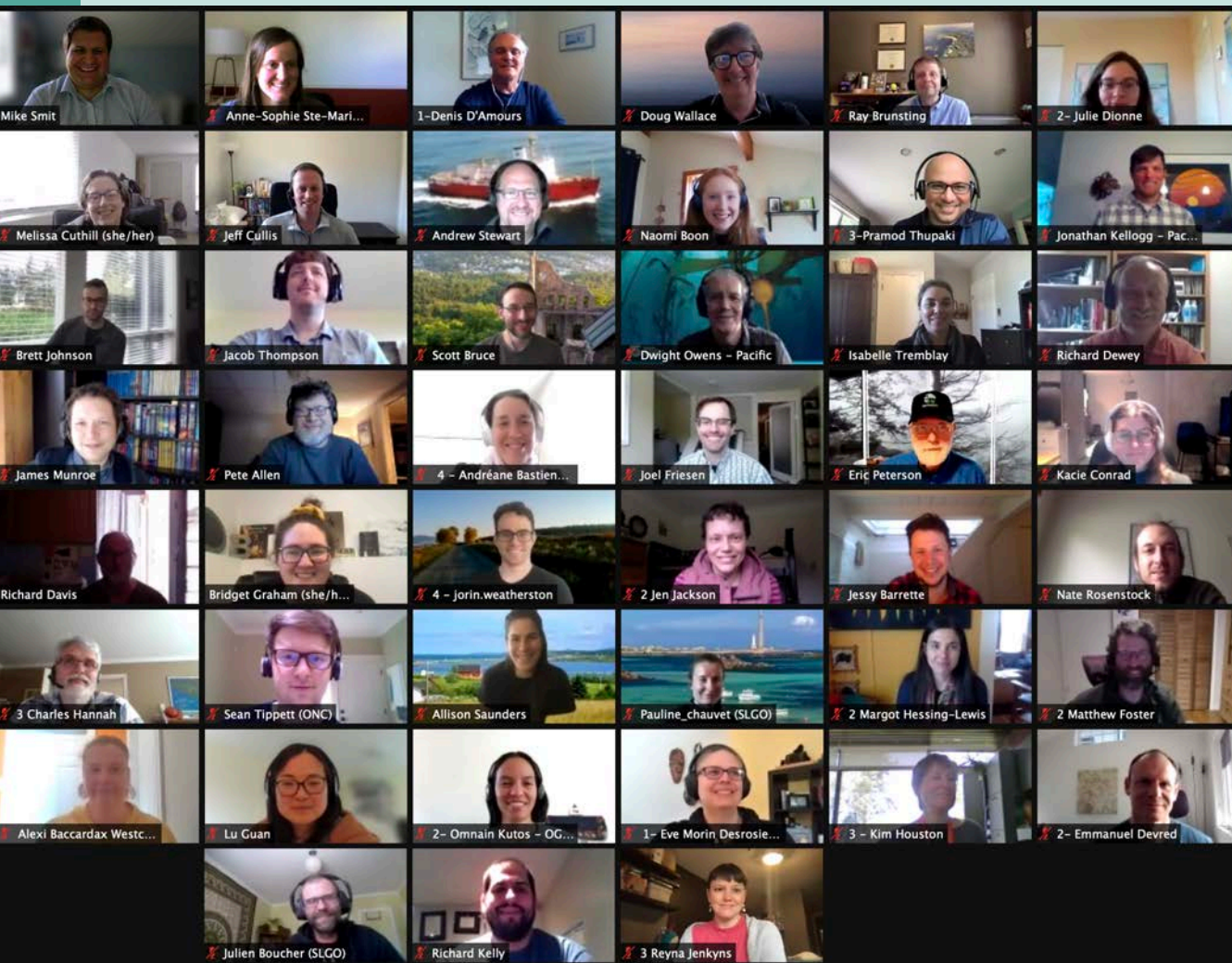
In the next year, CIOOS will advance its leading role in Canadian ocean observing with particular attention to the unique Canadian challenges and opportunities for the establishment and maintenance of a national ocean observing system:

- expanding data management for all types of ocean variables
- ongoing communication and outreach with regional data providers and users
- additional regional visualisation tools
- improvement of CIOOS' website homepage design, tailored by user testing and user feedback surveys

In the short term, CIOOS will publish its 5-year strategic plan (2021-2026), identify refined objectives and pave the way for a robust and daring action plan that is deeply embedded in CIOOS' core values.

Meaningful engagement, ongoing communication, promoting easy data access, supporting partner's work, and demonstrating value for all stakeholders will be key activities to ensure the growth of CIOOS is aligned with partner and user needs.

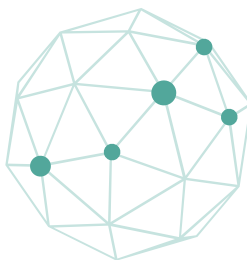




- Group photo, CIOOS Annual Face-to-Face meeting. This year, CIOOS F2F was held virtually as a series of four weekly meetings, one per committee: Executive Committee (this picture), Science Committee, Technical Committee and Communication Committee.

CIOOS

CANADIAN INTEGRATED OCEAN
OBSERVING SYSTEM



SIOOC

SYSTÈME INTÉGRÉ D'OBSERVATION
DES OCÉANS DU CANADA

Funding partners



Fisheries and Oceans Pêches et Océans
Canada Canada



Founding partners

