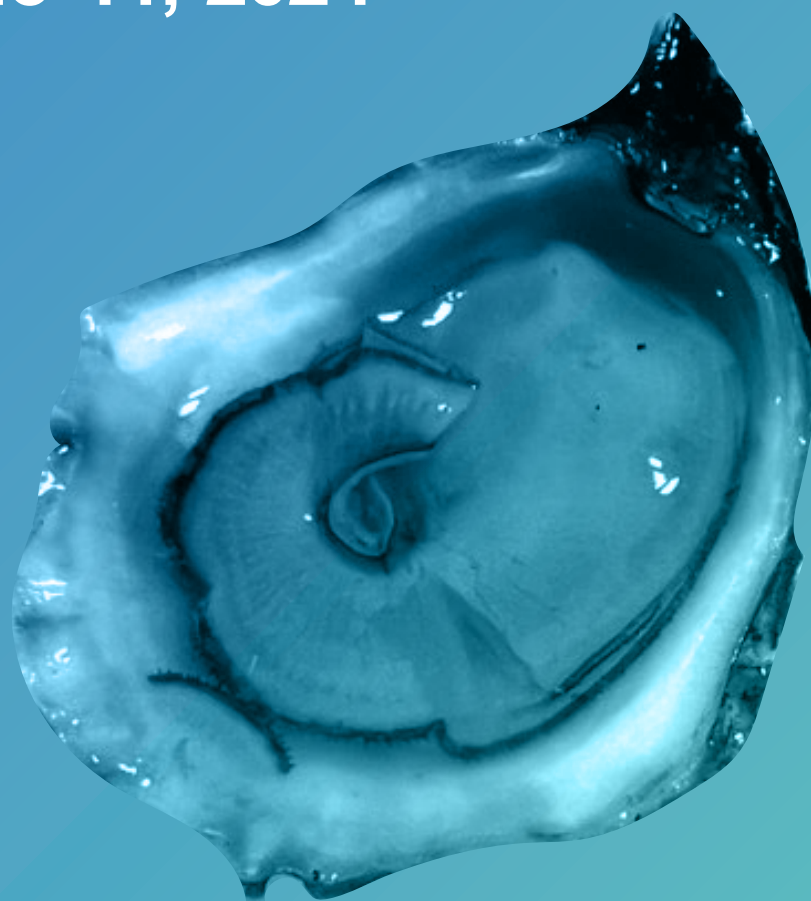


MSX

Science Summit

November 13-14, 2024



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MSX Science Summit – Summary

November 13-14, 2024

Charlottetown, Prince Edward Island

In recognition of the urgency to better understand transmission, impacts and mitigation of multinucleate sphere unknown (MSX) disease in oysters, Fisheries and Oceans Canada (DFO) and the Province of Prince Edward Island (P.E.I.) collaborated to host a scientific summit with experts and knowledge holders from federal government departments, provincial governments, industry associations, academia, and Indigenous organizations. The summit occurred from November 13-14, 2024 in Charlottetown, P.E.I. and was co-chaired by DFO and the Province of P.E.I. The event included approximately 70 participants over two days, both in-person and online.

The objectives of the summit were generally to characterize the current state of scientific knowledge on MSX. This included identifying critical knowledge gaps to ensure a common understanding of needs for future research on MSX disease dynamics and mitigation of spread and impacts, and outlining data and study design considerations that would thus contribute to lessening the impacts of MSX on the region's oyster industry.

Summit participants emphasized the seriousness and urgency of the situation unfolding in P.E.I. since the first detection of MSX this past summer. Remarks throughout the first day by elected federal and provincial officials underscored the importance of this issue with potentially significant socioeconomic implications. A recurring message included the need for strong collaboration, open communication and a coordinated approach to ensure successful response and recovery.

The summit unfolded through a series of presentations, panel discussions and exchanges in plenary. Throughout the course of the summit, presentations were provided on topics including: the current state of MSX in P.E.I., ongoing work by the Province of P.E.I. to monitor and understand MSX disease dynamics by monitoring oyster mortalities in Bedeque Bay (P.E.I.), background information on what is known of the MSX life cycle, some lessons learned from MSX incidence and research in the Bras d'Or Lakes in Nova Scotia, research in United States (U.S.) jurisdictions (predominantly on the East Coast) on MSX monitoring and mitigation and a summary of a workshop facilitated in August by the Prince Edward Island Aquaculture Alliance (PEIAA) that provided additional information on industry research needs and priorities.

Key unknowns highlighted during the summit

Presenters, panelists and participants spoke of several key unknowns and areas where there is higher uncertainty in the science of MSX. These areas include:



- **Identification and role of an intermediate host**

There has been considerable research effort to-date in attempt to identify an intermediate host for MSX involved in transmission of the disease to/between oysters. There are varying perspectives as to whether this is a top research priority; however many recognize that this topic remains important and that a better understanding of the MSX life cycle could ultimately lead to a better understanding of disease dynamics resulting in more predictable outcomes as well as more effective control and mitigation measures.

- **Factors that promote resistance to MSX and genetic markers or traits that could help identify resistance**

It was discussed that much of the American experience with MSX resistance, including the use of broodstock programs and hatcheries to provide resistant seed, has focused on propagating progenies of survivors from large-scale mortality events in order to reduce future oyster mortality. There is still a gap in understanding what causes resistance (i.e., immune response) and if there are genetic markers or traits that could be used to find oyster populations that are likely to show resistance. This could result in better planning for broodstock and hatchery programs that use selective breeding.

- **The use of broodstock development and hatchery practices as a mitigation measure and trade-offs that can occur with programs that select for MSX resistance**

Broodstock development programs and hatcheries are being used in other jurisdictions as part of an overall MSX mitigation strategy. Participants highlighted knowledge needs on the use of broodstock programs and impacts of selective breeding programs such as the use of triploids, etc., on local oyster populations.

- **The role environmental factors play in the extent of MSX infection and mortality**

There is some information known about how temperature and salinity can impact MSX, however additional work for the local ecosystems context, including locally adapted oyster populations and effects of microclimates, will provide useful information going forward.

- **The extent to which lessons learned from the experiences in U.S. jurisdictions (for example, Connecticut, Virginia) and in Nova Scotia will be transferable to P.E.I. and other areas in Atlantic Canada**

There is a lot to learn from the research and practices employed in other jurisdictions. However, key questions remain as to how local climate could influence disease dynamics going forward and whether some of the cyclical aspects observed in the U.S. (for example, several years between outbreaks) will also be observed in Canada.

Key research areas highlighted during the summit



Building on these points, there were many ideas for research directions and potential projects presented that could help to address the key unknowns identified. Some of the major research themes included:

- **Research on MSX resistance**

Research on MSX resistance will be important, including the need for a better understanding of heritability of MSX resistance, correlations between genetic markers and/or traits and different phenotypes including other physiological and stress responses in oysters, and how to best select for traits that result in resistance. A clear understanding of outcomes of resistance will also be important (for example, prolonged resistance to MSX, ability to grow to market size before significant health effects, etc.).

- **Use of field trials**

Field experiments can help advance our understanding of how environmental conditions and seasonal changes impact MSX disease dynamics such as infections, transmission and mortality rates. This type of research may also contribute to resistance work, could identify other possible mitigation strategies, and provide information about key areas where increased monitoring and surveillance may be required.

- **Non-lethal sampling**

Understanding ways in which non-lethal sampling of oysters might help advance research and other forms of monitoring and surveillance will be important and can complement lethal sampling.

- **Testing methodologies for use in non-regulatory decision making**

Testing for regulatory decision-making (for example when confirming the presence of MSX) requires specific methodologies and are done through the DFO's ISO-certified National Aquatic Animal Health Laboratory System. This System remains very important for instances where a case definition of disease must be met for regulatory purposes. As we move forward with MSX response and recovery, stakeholders may seek to use other types and methodologies of testing for different purposes, such as rapid detection and trying to understand links between MSX prevalence (as seen by tests like qPCR, sequencing, etc.) and mortality. For these types of research and management purposes, standardization will be key for data/information sharing and further work on rapid or portable detection methods may be useful.

Collaboration and information sharing

Participants spoke ardently about the need for collaboration and information sharing to advance research on MSX, without too much duplication of work, and to encourage and foster a culture of communication and cooperation.



Participant suggestions included:

- Creation of a forum where researchers could indicate their interests, expertise and availability to participate in MSX related activities. This could help connect researchers to each other as well as to other knowledge holders and stakeholders.
- Collaboration with U.S. jurisdictions where oysters with MSX resistance are being used as a key mitigation strategy against MSX, in order to develop genetic marker research.
- More discussion on how to share data and enhance data availability (recognizing that privacy laws may govern data collected by certain entities).
- Sharing of protocols and procedures related to sample gathering, data collection and testing to increase interoperability of data as well as development of common terminology.

This section of the summit was mainly focused on idea generation as opposed to mechanisms for implementation of the various ideas. Participants emphasized the importance of identifying committed, long-term funding sources to support this work and the need for time to ensure coordination and organization in advance of calls associated with funding opportunities.

Next steps

The summit focused largely on science gaps related to harvester and aquaculture needs and uncertainties. However, it was acknowledged that there are broader ecological questions that will be important as we move forward with mitigating impacts from MSX. For example, the possibility of large-scale, bay area impacts due to oyster mortality which could affect multiple trophic levels. This larger topic could be considered for future discussions.

The contributions by guest presenters and panelists were the catalyst for engaged participation. This summit will hopefully be an initial step in fostering a network of researchers and collaborators that will continue to exchange and engage in MSX research in the region.

List of participants

Alphabetical order, after co-chairs. Participants attended either in person or online.

Matthew Hardy (co-chair), Fisheries and Oceans Canada

Kim Gill (co-chair), Prince Edward Island Department of Fisheries, Tourism, Sport and Culture

Jennifer Acheson, New Brunswick Department of Agriculture, Aquaculture and Fisheries

Janelle Arsenault, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture

Rod Beresford, Cape Breton University

Lydia Bienlien, State of Connecticut

Jeff Bishop, Aquaculture Association of Nova Scotia



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Ginevra Brocca, University of Prince Edward Island
Ellen Careen, Fisheries and Oceans Canada
Ryan Carnegie, Virginia Institute of Marine Sciences
Fraser Clark, Dalhousie University
Jeff Clements, Fisheries and Oceans Canada
Luc Comeau, Fisheries and Oceans Canada
Lori Cuddy, Fisheries and Oceans Canada
Roland Cusack, Aquatic Vets Limited
Delphine Ditlecadet, Fisheries and Oceans Canada
Khalil Eslamloo, Centre of Marine Applied Research
Nathaniel Feindel, Nova Scotia Department of Fisheries and Aquaculture
Britta Fiander, Genome Atlantic
Lillian Figueiredo, Onda
Kaitlin Fitzpatrick, Canadian Food Inspection Agency
Jesse Fortune, Bill Stanley Oyster Company
Jessica Fry, Atlantic Aqua Farms
Nellie Gagné, Fisheries and Oceans Canada
David Groman, University of Prince Edward Island
Larry Hammell, University of Prince Edward Island
Leighanne Hawkins, New Brunswick Department of Agriculture, Aquaculture and Fisheries
Tiago Hori, Atlantic Aqua Farms
Ryan Horricks, Centre of Marine Applied Research
Eric Ignatz, Dalhousie University
Kristopher Jackson, Atlantic Canada Opportunities Agency
Gaitée Joshua, Prince Edward Island Aquaculture Alliance
Jesse Kerr, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture
Michele Koughan, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture
Stephen Lewis, Atlantic Canada Opportunities Agency
Leah Lewis-McCrea, Centre of Marine Applied Research
Bob MacLeod, Prince Edward Island Shellfish Association
Lynn MacVicar, Canadian Food Inspection Agency
Martin Mallet, Les Huîtres Mallet
Atef Mansour, Fisheries and Oceans Canada
Thierry Marcoux, Fisheries and Oceans Canada
Danielle Martin, Canadian Food Inspection Agency
Francois Martin, Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
Emily McGurk, Rutgers University
Arran McPherson, Fisheries and Oceans Canada
Jim Meade, Fisheries and Oceans Canada
Jolene Millar, Prince Edward Island Shellfish Association
Christine Miller, Canadian Food Inspection Agency
Chris Mills, Fisheries and Oceans Canada



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David Nanang, Canadian Food Inspection Agency
Ben Normand, Canadian Aquaculture Industry Alliance
Martin O'Brien, Cascumpec Bay Oyster Co.
Marc Ouellette, Fisheries and Oceans Canada
Edward Parker, Fisheries and Oceans Canada
Victoria Pedersen, Canadian Food Inspection Agency
Guy Perry, Bideford Hatchery
Aaron Ramsay, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture
Melissa Rommens, Sustain Aqua
Sarah Rooney, Fisheries and Oceans Canada
Tirosh Shapira, Onda
Hannah Sharpe, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture
Katherine Shaw, Fisheries and Oceans Canada
Rémi Sonier, Fisheries and Oceans Canada
Ivan Stefanov, Fisheries and Oceans Canada
Sarah Stewart-Clark, Dalhousie University
Erica Stuart, Fisheries and Oceans Canada
Amanda Swim, Nova Scotia Department of Fisheries and Aquaculture
Peter Sykes, New Brunswick Department of Agriculture, Aquaculture and Fisheries
Peter Warris, Prince Edward Island Aquaculture Alliance
Daryl Whelan, Government of Newfoundland and Labrador
Danielle Williams, Canadian Food Inspection Agency
Amanda Winegardner, Fisheries and Oceans Canada
Jill Wood, Prince Edward Island Department of Fisheries, Tourism, Sport and Culture
Amanda Xuereb, Université Laval