Comparative Field Trial Assessments of Oyster (*Crassostrea virginica*) Survival in MSX-Infected Areas

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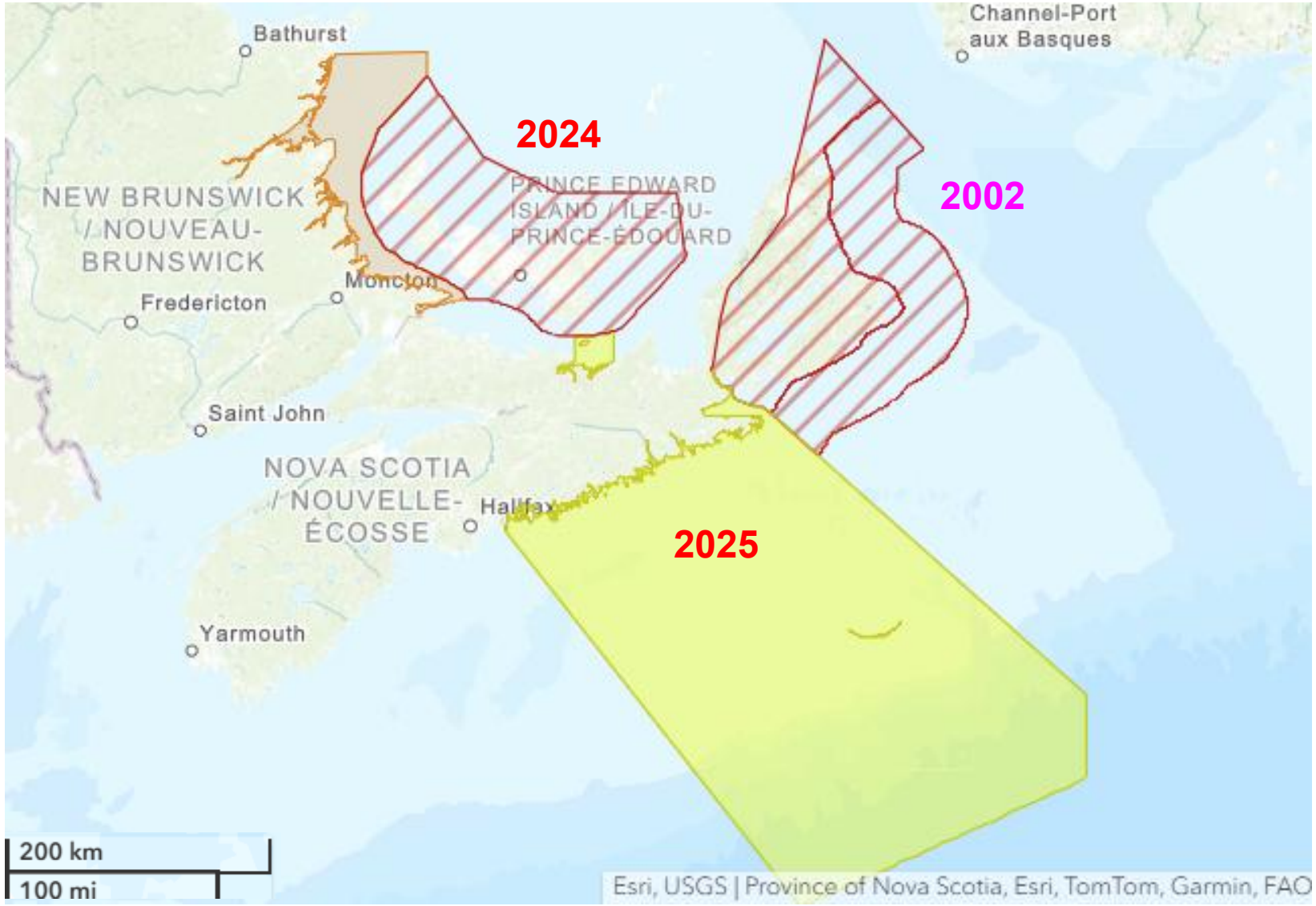
Distribution of MSX & Dermo



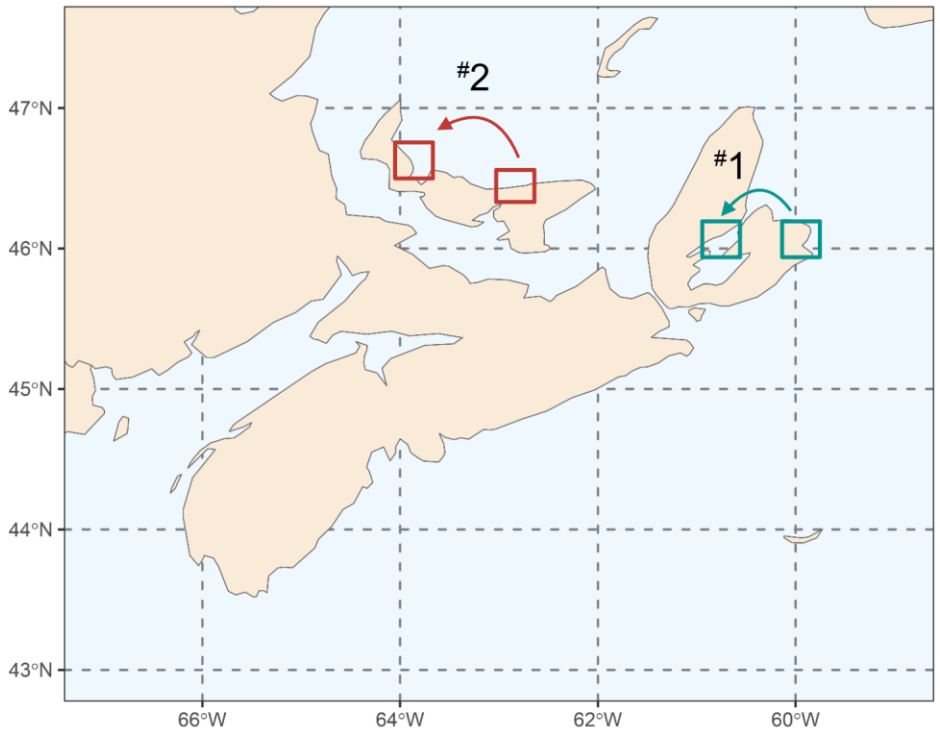
Regulated Areas

- Declared Infected Areas for Multinucleate sphere X unknown (MSX)
- Perkinsus marinus (Dermo) Regulated Areas
- Multinucleate sphere X unknown (MSX) and Perkinsus marinus (Dermo) Regulated Areas

Cape Breton is a useful study location to help us learn more about MSX!

CFIA Movement Control Map

Project Overview



#1: Transplant of oysters from MacDonald's Pond, NS to Nyanza Bay, NS.

#2: Transplant of oysters from Savage Harbour, PE to Bideford River, PE.

Measure/Determine:

- Oyster Survival & Growth
- MSX Prevalence
- Environmental Parameters (temperature, oxygen, turbidity, fluorescence, salinity)
- Genotype Associated with MSX Resistance

Compare Surface vs. Bottom Culture

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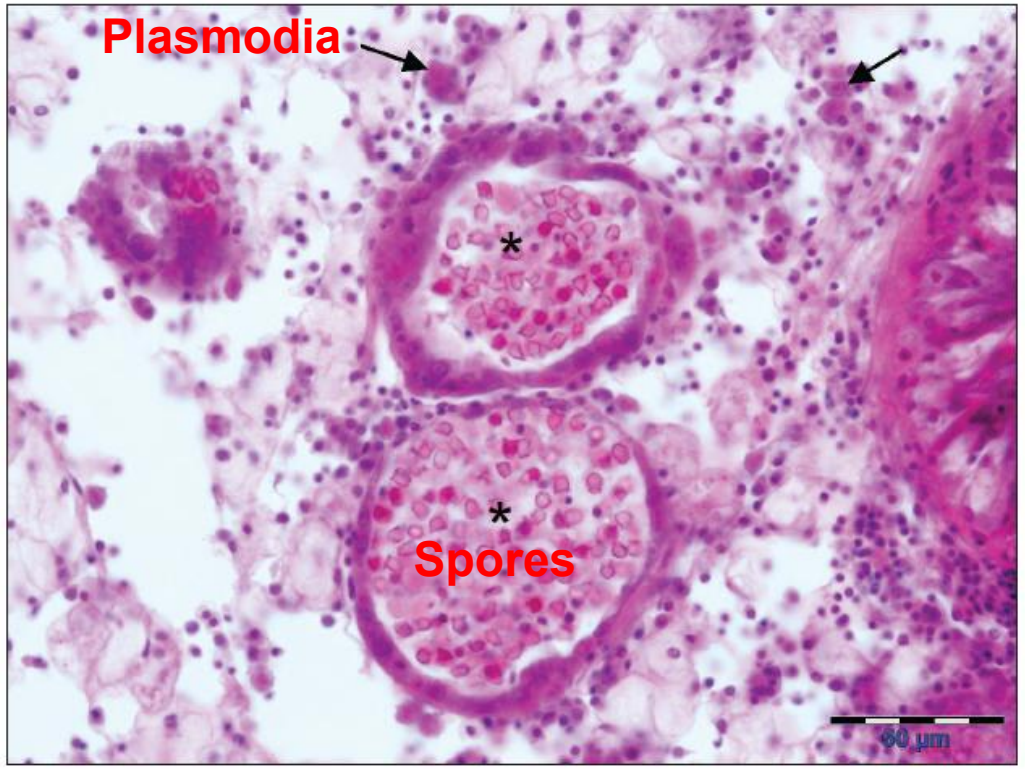
General Procedures at Each Site

- Initially, collect tissue samples for PCR and histology from oysters at each site to screen for *Haplosporidium nelsoni* (MSX)
  - Plus, potentially *Perkinsus marinus* (Dermo) and *H. costale* (SSO).
  - Tissues will also be collected from mortalities when possible.
- Anesthetize and non-lethally sample gill tissue from oysters that will be deployed.
  - Used to later genotype oysters.



(Collins et al., 2018)

General Procedures at Each Site

- Measure the length of each oyster before it is placed in an individual compartment within a custom oyster bag.
  - Length of all mortalities and survivors at the end of the trial will be used to calculate individual growth.
  - Oyster bags will be deployed within floating or submerged cages.
- Continually collect data on water temperature, oxygen saturation, turbidity, fluorescence and salinity.
- Monitor mortality regularly until September.

Cape Breton Transplant

MacDonald's Pond

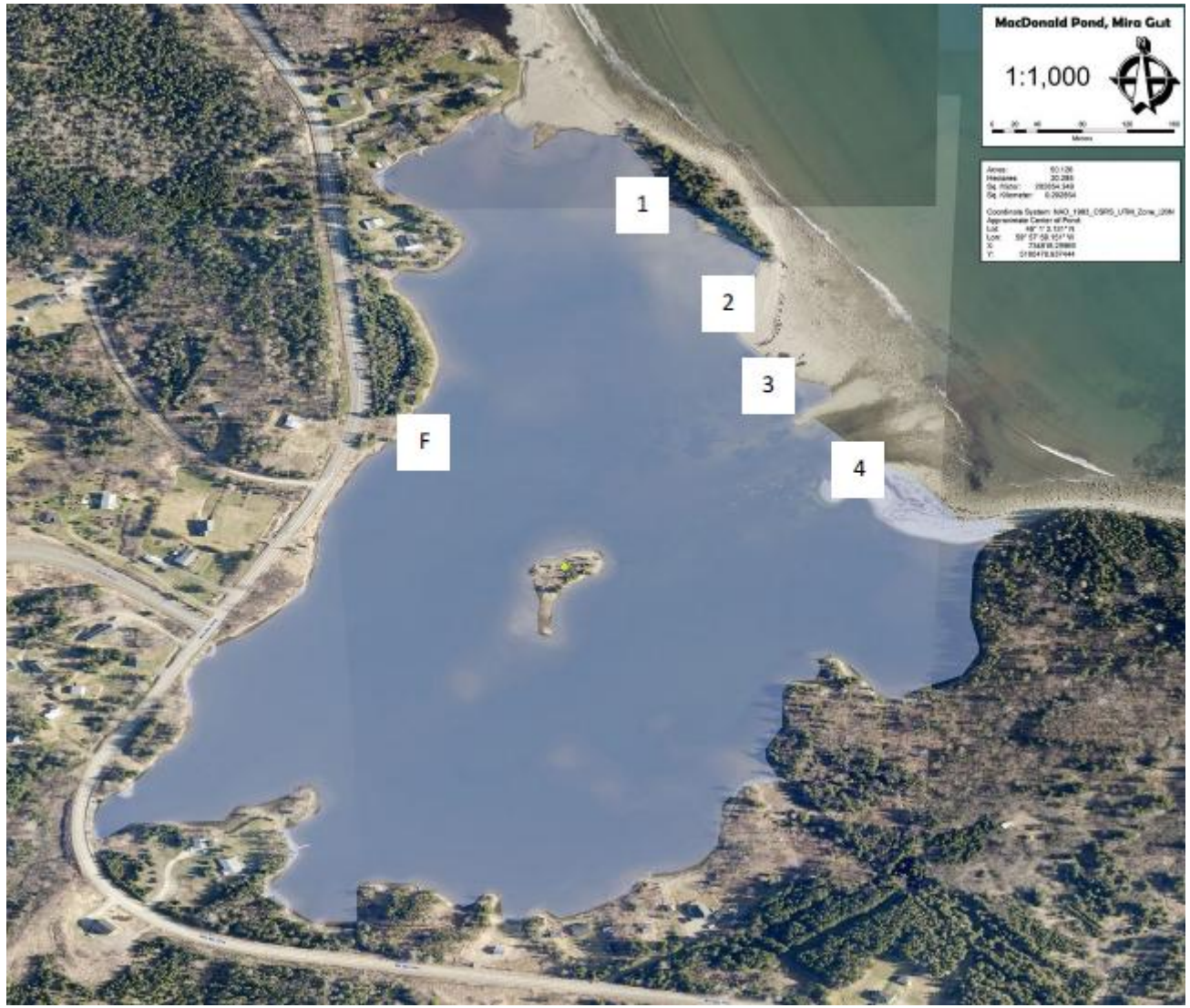


Figure 2.1 (Beresford, 2019)

High MSX Prevalence, But Low Oyster Mortality

H. nelsoni Prevalence - 2010

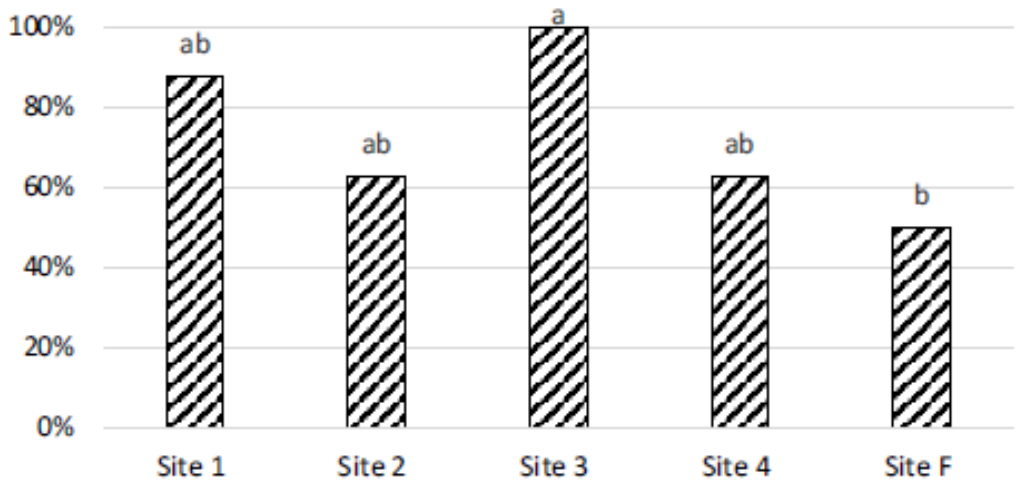
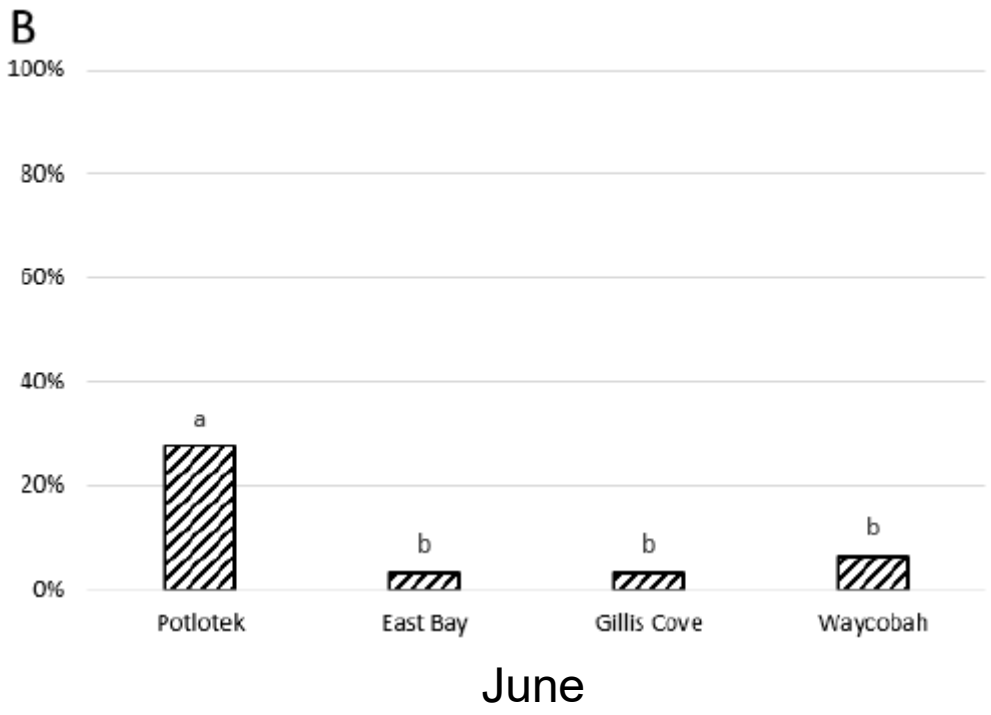


Figure 2.2 (Beresford, 2019)

H. nelsoni Prevalence Following Transfer to **Nyanza Bay** - 2016



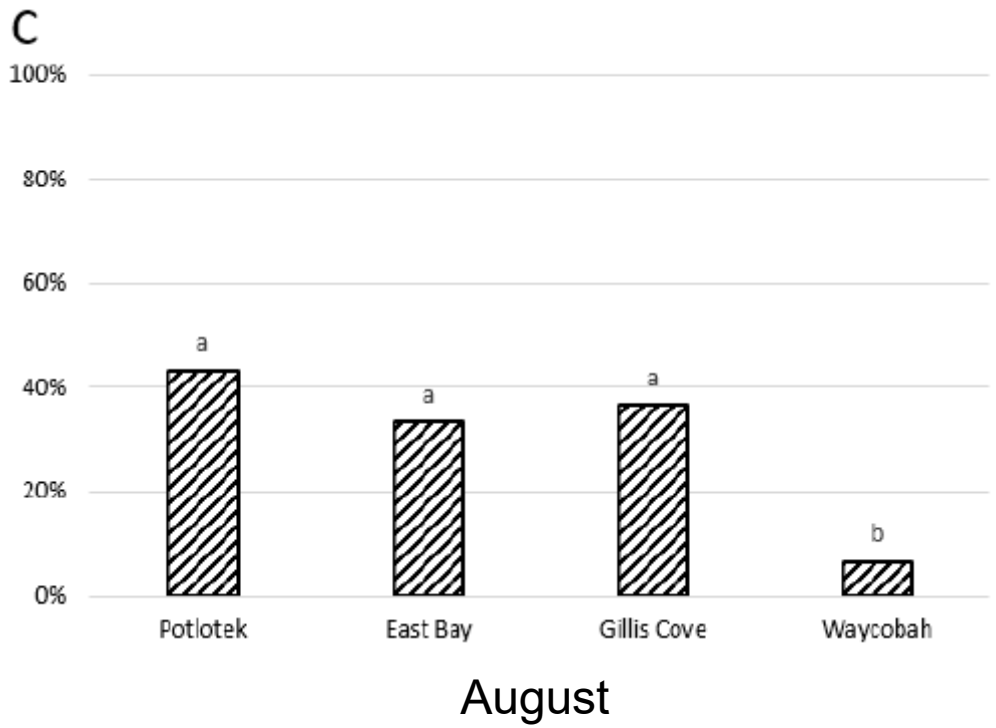


Figure 5.2 (Beresford, 2019)

Oyster Mortality Following Transfer to **Nyanza Bay** - 2016

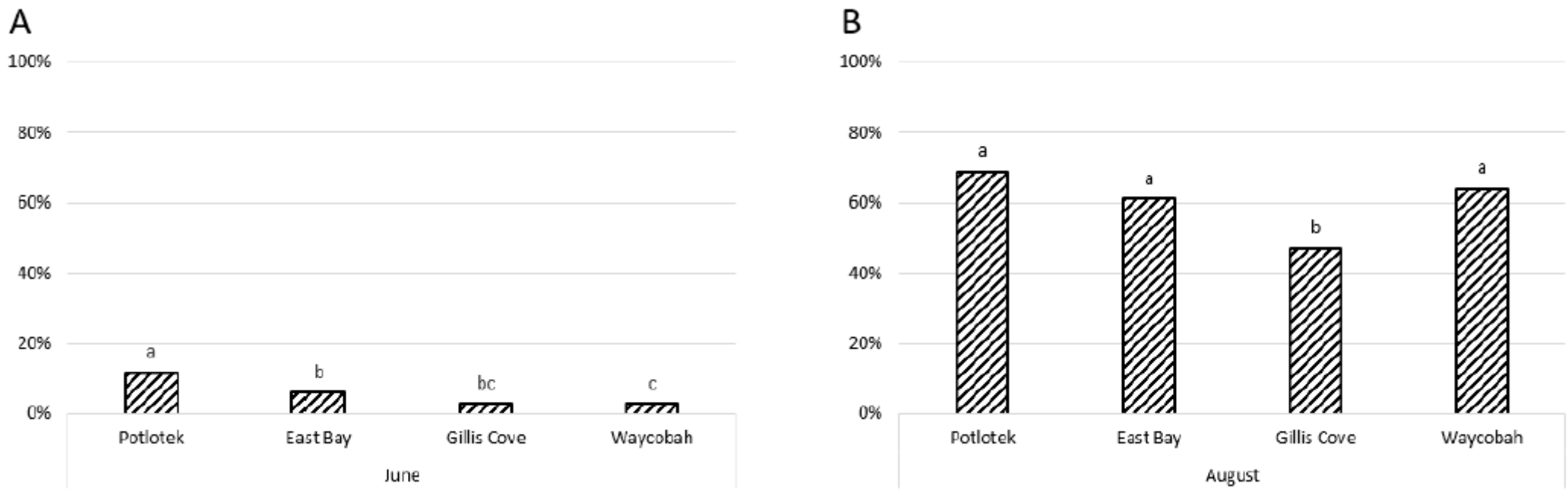


Figure 5.4 (Beresford, 2019)

Lower MSX Prevalence, But High Oyster Mortality

MacDonald's Pond Deployment

- Sampled 30 oysters for diagnostics.
  - 43.3% (13 oysters) tested positive for MSX via PCR.
  - Awaiting histology results.
- Non-lethally sampled 120 oysters and deployed them.
  - 60 oysters on the surface.
  - 60 oysters on the bottom.
- Loggers attached to surface and bottom cages collecting environmental data every 15 min.

May 21, 2025

No mortalities as of June 2

Nyanza Bay Deployment

May 22, 2025

No mortalities as of May 30

- Zero live oysters were found.
  - Unable to transfer any to MacDonald's Pond.
- Non-lethally sampled 180 oysters and deployed those with another 180 oysters sourced from MacDonald's Pond.
  - Split equally between the surface and bottom cages.
- Same environmental data loggers attached to each cage.

Questions to Address in Cape Breton

- Do oysters from MacDonald's Pond have genetic resistance to MSX?
  - Genotyping oysters using a 60K single nucleotide polymorphism (SNP) array.

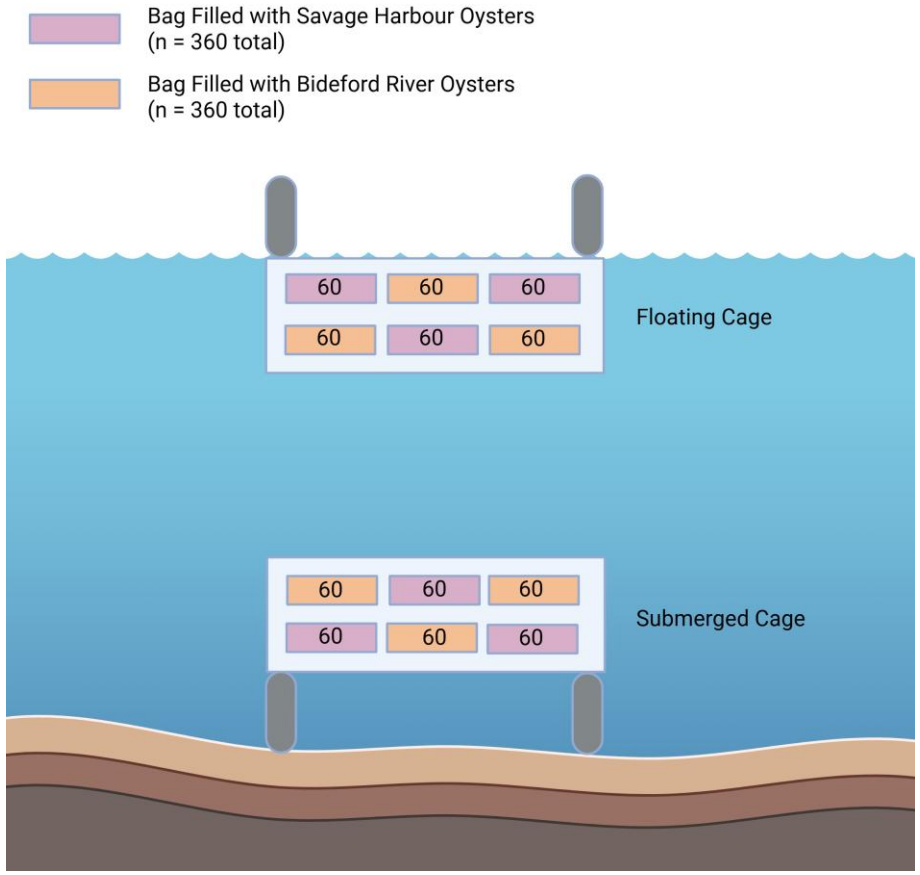
- Are there unique environmental conditions in MacDonald's Pond that limit pathogen virulence?
  - Environmental probes will continuously collect data on water temperature, oxygen, turbidity, fluorescence and salinity.

- Does culture depth impact survival?
  - Oyster cages will be deployed at the water surface and bottom in both Nyanza Bay and MacDonald's Pond.

Field Trial in Prince Edward Island

Bideford River Deployment

- Testing naïve (Savage Harbour) vs. pre-exposed (Bideford River) oysters.
- Planning to non-lethally sample and divide 360 oysters from each source among a floating and submerged cage.
- Will collect data on water temperature and salinity.
- Scheduled to deploy oysters starting on June 12.



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Questions to Address in PEI

- Do any oysters across PEI have genetic resistance to MSX? Does it make a difference if the oysters are naïve or previously exposed to MSX?
  - Genotyping oysters using a 60K single nucleotide polymorphism (SNP) array.

- Are there unique environmental conditions across PEI that limit pathogen virulence?
  - Environmental probes will continuously collect data on water temperature and salinity.

- Does culture depth impact survival?
  - Oyster cages will be deployed at the water surface and bottom in Bideford River.

Expected Project Outcomes

- Conduct genome-wide association study/studies (GWAS) to help identify if there are potential genetic markers of MSX disease resistance in Cape Breton and/or PEI.
  - Useful for the development of local breeding programs.

- Analyze environmental data to assess correlations between water parameters and *H. nelsoni* / MSX disease prevalence.
  - Helpful for farm site selection.

- Compare growth performance and survival of oysters reared at different depths.
  - Inform farm management practices.

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Questions?

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