



Oyster Shelf-life Study

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Report prepared by

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Dr. Gaitée Joshua

Introduction

Since the detection of MSX in PEI waters in June 2024, significant oyster mortality has been reported in both the aquaculture and wild fisheries sectors. This has led to reduced confidence among processors when purchasing from harvesters and growers, as well as concern about marketing oysters due to the risk of disappointing customers and damaging the reputation of the PEI oyster industry.

As a result, there was a clear need to determine whether oyster shelf life should be revised in the context of MSX-related mortality. The Aquaculture Alliance secured funding from the provincial government to engage independent institutions to assess the shelf life of oysters originating from MSX-affected waters.

Methodology

A contract was established between Canada's Smartest Kitchen (CSK), BioFoodTech (BFT), and Onda to conduct this study. Since PCR testing and histopathology are invasive techniques requiring oysters to be sacrificed, samples were intentionally collected from areas with very high MSX prevalence to maximize the likelihood of infection in the test population. These were compared with oysters collected from areas with very low or no detectable MSX prevalence (controls).

The study was conducted in two phases.

Phase 1

Sample Categories

Two primary sample categories were defined:

1. **Oysters from bays with high MSX prevalence**
 - Cultured oysters from Foxley River
 - Wild oysters from Mill River
2. **Oysters from bays with low or no MSX prevalence (controls)**
 - Cultured oysters from St. Peter's Bay

Note: Wild oysters were not available for the control group.

The samples were received on October 16, 2025, and microbiological testing began on October 17, 2025. Organoleptic testing commenced following clearance from BFT. PCR analysis was conducted on 30 samples on October 16 and an additional 30 samples on November 14, 2025.

Phase 1, post-study testing indicated a decrease in MSX prevalence across all sample types. Therefore, sample sizes were increased in Phase 2 to improve statistical robustness. Additionally, a subset of samples was retained for potential histopathological analysis.

Phase 2 Overview

- Phase 2 began in mid-January.
- The study design largely replicated Phase 1.
- Sample sizes were increased, and the phase was divided into two subsets conducted simultaneously.

Subset 1: Processor-Selected High-Quality Oysters

Subset 1 followed the Phase 1 design using high-quality oysters provided by processors.

- A minimum of five oysters per sample were evaluated to calculate average quality scores.
- Each sample type was assessed independently over time to determine stability or deterioration.
- Photographic documentation was conducted, particularly during mortality assessments.

Subset 2: Lower-Quality Oysters

Subset 2 focused on oysters of visibly reduced quality, sourced from leases being returned by processors.

- A total of 400 oysters were included.
- Full organoleptic assessment was not required.
- Evaluation focused on appearance, aroma, and texture.
- Photographic documentation was considered essential.
- Each sample set was evaluated independently to assess stability or deterioration.

Special emphasis was placed on determining whether the odor of compromised oysters influenced the sensory quality of other oysters stored within the same container.

- **MSX Prevalence Considerations**

- In Phase 1, oysters were selected based on high MSX prevalence to maximize infection rates, without accounting for infection intensity. In Phase 2, infection intensity was also considered.
- Low-prevalence oysters continued to serve as controls to distinguish disease-related mortality from natural mortality or storage effects. This approach ensured comparison of MSX-infected and non-infected oysters under identical conditions.

Phase 2 Sample Groups

Subset 1

- High-prevalence cultured oysters
- High-prevalence wild oysters
- Low-prevalence cultured oysters grown in Murray River (PE 5T) and held in Boughton River

Subset 2

- High-prevalence cultured oysters lower/average quality,

Results and Discussion

Phase 2 started on January 16th, 2026. Sensory analysis was also carried out on oysters suffering high mortality.

During Phase 1, a decline in MSX prevalence was observed across all three sample types from the beginning to the end of the study. Although initial prevalence was high at all sites, the intensity of infection in individual oysters was generally low. This suggested that refrigeration may reduce MSX levels in oysters; however, this observation was inconclusive due to the limited sample size. Consequently, Phase 2 was conducted with an increased sample size to improve statistical reliability.

Mortality

During Phase 1, mortality remained low throughout the month-long trial, with only 11 out of 900 oysters observed gaping. However, meat quality declined gradually over time, with the most noticeable deterioration occurring by day 27.

In contrast, Phase 2 showed substantially higher mortality across several sample groups:

- **High-prevalence cultured oysters** grown in the Darnley Basin area, exhibited the highest mortality, reaching 13.5% within one day of arrival in the laboratory. MSX prevalence in this group was 94.7%, and all positive samples showed high infection intensity, as indicated by Cq values in the 20s. A strong foul odor was observed, rendering the samples unacceptable for continued study at Canada's Smartest Kitchen, as the high mortality on day 1 began to affect other samples stored in the same refrigeration unit. These samples were therefore discarded. This outcome is consistent with the high level of parasitic infection.
- **High-prevalence wild oysters** showed a gradual increase in mortality, from 1% initially to 2.3% in the second week. Mortality then increased sharply to 11.9% in the third week and further to 22.2% in the fourth week, before declining to 9.1% in the final observation period. MSX prevalence in this group was 58.3% at the start of the study and increased to 66.7% by the end. This sample had a broader range of parasitic infection in the oysters so chances of survival in this group were higher than the group with high parasitic infection in all the samples.
- **Low-prevalence cultured oysters** grown in Murray River (PE 5T) and held in Boughton River (PE 5K), exhibited minimal mortality, reaching only 5.3% by the fourth week. These oysters had low MSX prevalence, and infected individuals showed low infection intensity.

Subset 2

- High-prevalence cultured oysters identified by the processor as lower or average quality due to prior returns associated with mortality. These oysters exhibited high levels of parasitic infection, as inferred from low Cq values, and were therefore expected to perform

poorly in shelf-life assessments.

Although both this group and the high-prevalence cultured oysters in Subset 1 exhibited elevated MSX prevalence and high overall infection levels, differences in infection distribution were observed. The Subset 2 oysters demonstrated a broader range of infection intensities, whereas oysters in Subset 1 were more uniformly characterized by high infection levels. This variation likely contributed to the comparatively improved shelf life observed in Subset 2, as opposed to the more rapid deterioration seen in Subset 1.

Sensory Analysis

A comparison between oysters with a high level of MSX infestation (wild, high prevalence) and those with low MSX infestation (cultured, low prevalence) revealed only minor differences in appearance between the two groups, although appearance scores were slightly higher in oysters with low MSX infestation. Aroma declined over time in both groups; however, it remained consistently better in oysters with low MSX infestation.

Freshness exhibited an overall decline throughout the study period in both sample groups, but the rate of deterioration was more pronounced in oysters with high MSX infestation compared to those with low infestation.

Conclusion

The results suggest that oyster mortality is more closely associated with the intensity of parasitic infection rather than the overall prevalence of MSX within a given bay. Mortality increased progressively on a weekly basis in oysters with high MSX infestation, followed by a decline in week four, potentially reflecting the selective survival of individuals with greater resistance to the disease.