Developments in Testing and Analysis of Shellfish Diseases

MSX and Dermo Project Updates - Year 1
10th November 2025


onda





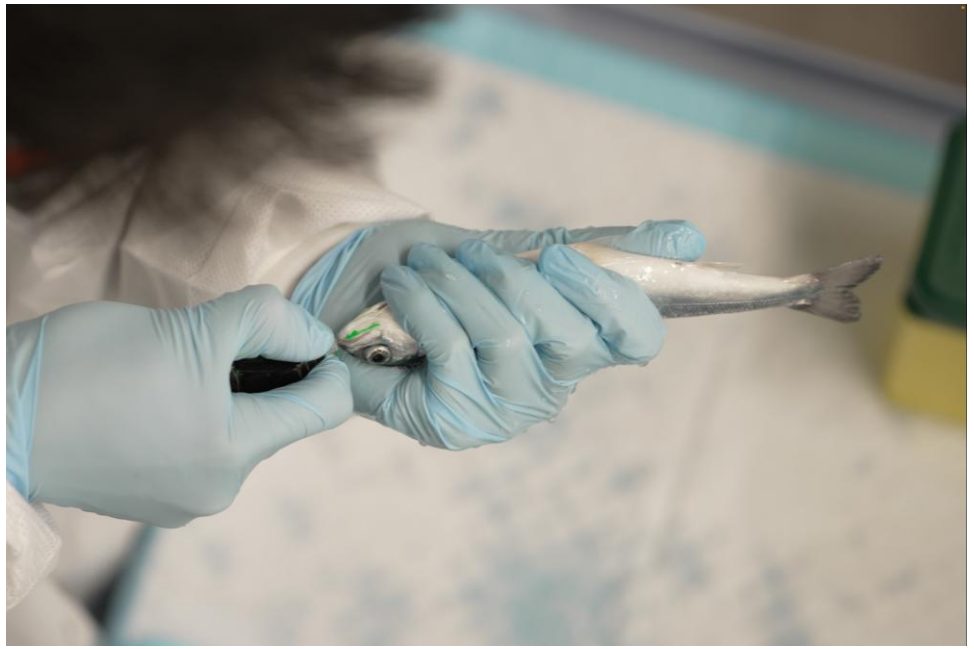







Research Team

- 65 team members
- 10 PhD
- 16 MSc
- 3 BVSc
- 182 publications
- Canada, Brazil, India, Australia, Bangladesh, China, Denkmark, Netherlands, Germany, Indonesia, Israel, Norway, South Korea, Vietnam



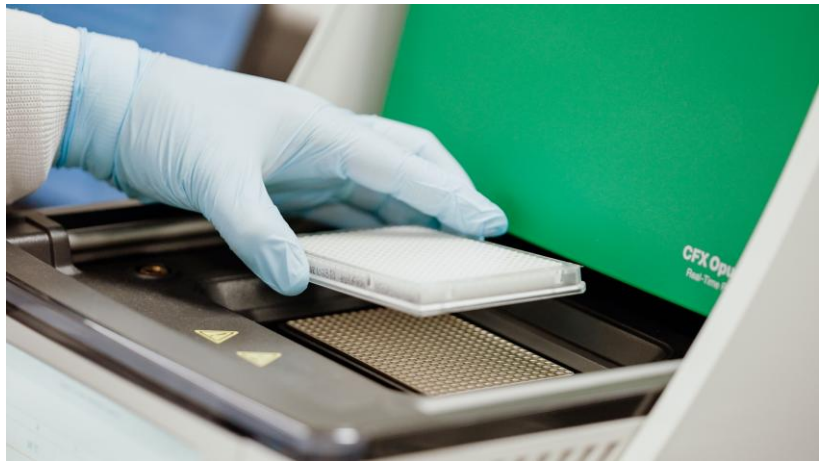
Lab Technologies

- Custom qPCR build-outs
- mRNA/Protein expression
- Microbiome
- Drug screening
- Probiotic characterization
- Parasite culture
- Acute toxicology assays
- Disinfection/Effluent validations
- Proof-of-concept trials

Analytical Services for Oysters

qPCR-based screening

- Surveillance tests for *H. nelsoni* (MSX) and *P. marinus* (Dermo)
- Test validated under MIQE modified VICH GL2 protocol
- Over 13,000 samples tested in 2025; +30 sample types

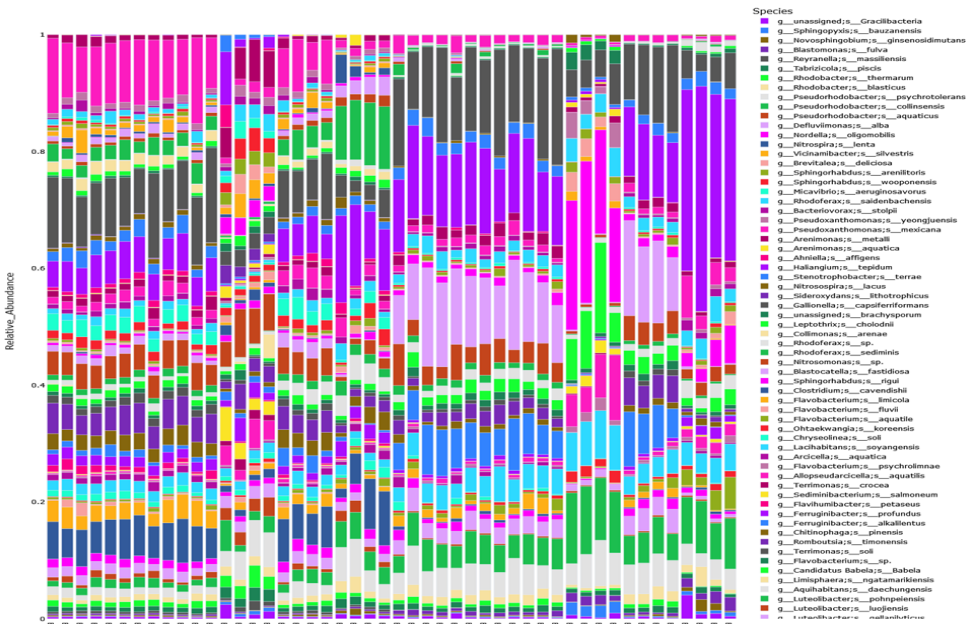


Functional Support

- Gene expression (qPCR or RNA-seq)
- Proteomics
- Bacterial Community Assessment

Treatment Systems

- Water quality analysis (basic)
- Parasite bioassays
- Disinfection, effluent, or depuration validations



MSX Rapid Detection Kits

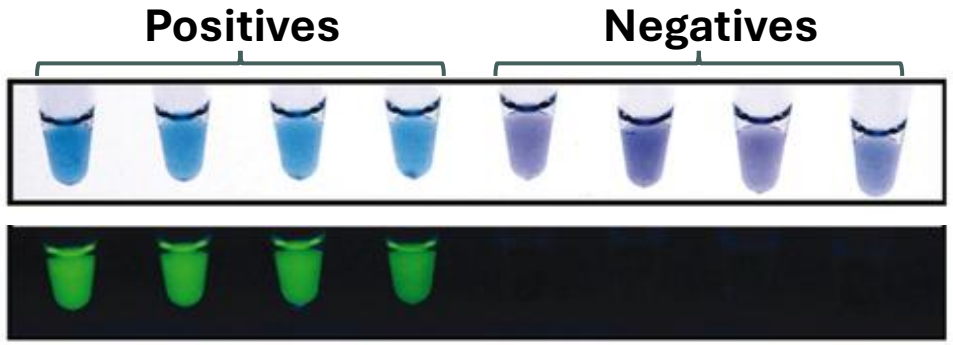
Onda are presently validating other methods for identifying MSX DNA in a variety of sample types to improve accessibility for research and screening

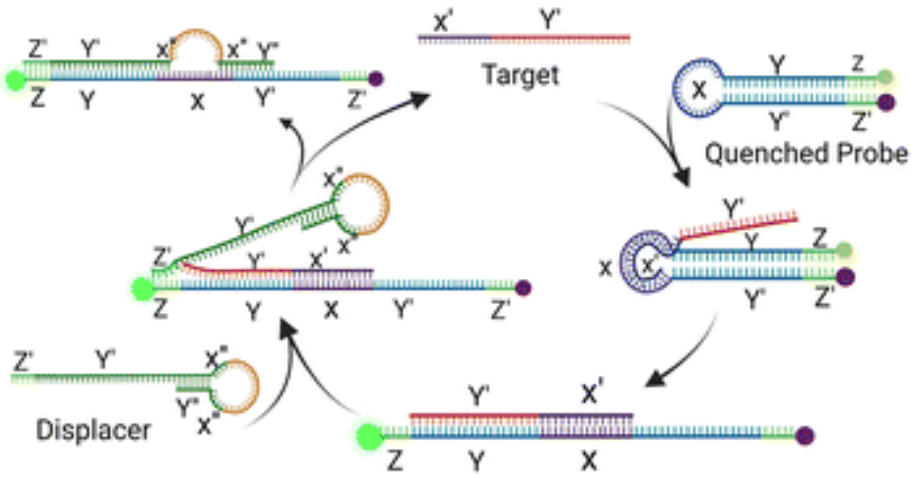
Test is enzyme-free, doesn't require heating, results in <20 mins

Promega

Ongoing: qPCR benchmarking experiment

- Specificity
- Sensitivity
- Accuracy/Precision
- Robustness



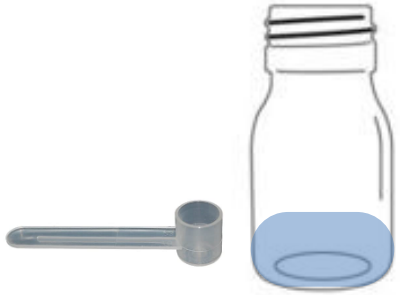


Sample collection Options

Each collection method has a distinct protocol depending on type and downstream processing

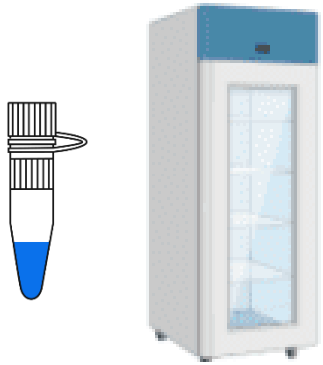
FTA Cards

Sand/Sediment



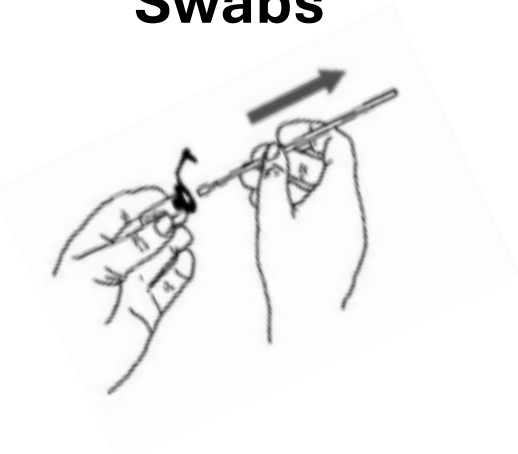
eDNA/Water

Tissue stabilization



Wastewater

Swabs



Aquatic Containment

Challenge Models

Breeding support, health surveillance, and other services for Pacific Oysters (*C. gigas, C. sikamea*) and Eastern Oyster (*C. virginica*)

Oyster Challenge Models

- Ostreid Herpes Virus (OsHV-1)
- *Vibrio aestuarianus*
- Thermal Tolerance
- MSX???

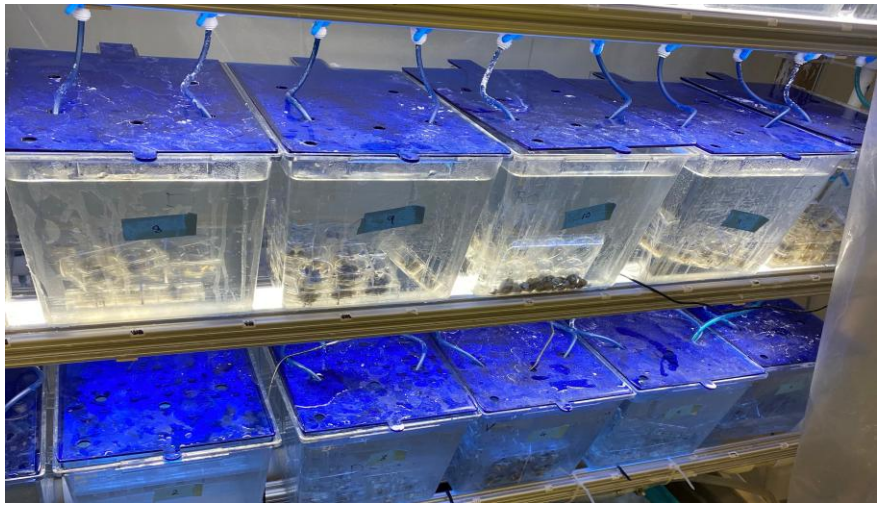
Food Safety Models

- *Vibrio parahaemolyticus*
- *Escheria coli*
- *Salmonella* spp.
- *Enterobacter* sp.

Disinfection Models

- *Coxsackievirus*
- *Giardia spp.*
- phage *ΦX174*
- Bacillus spp.



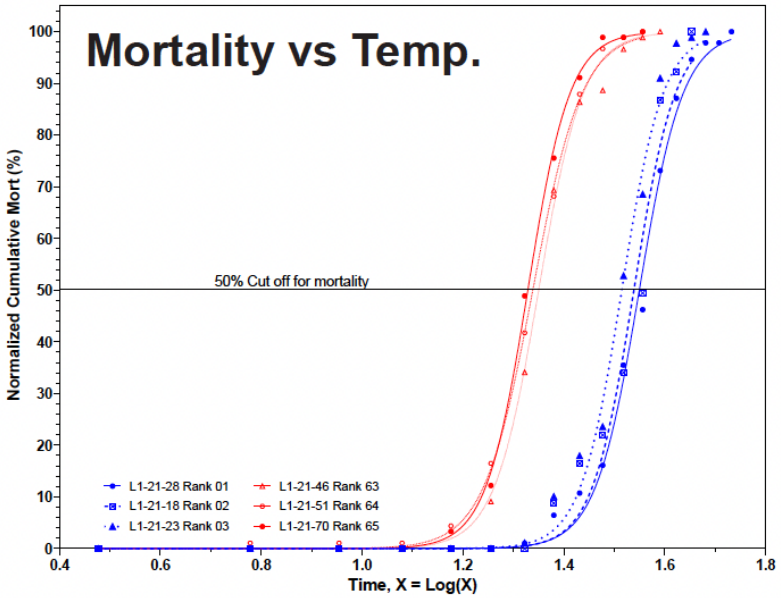



Oyster Challenge Models

Breeding studies can test and select for tolerance or resistance

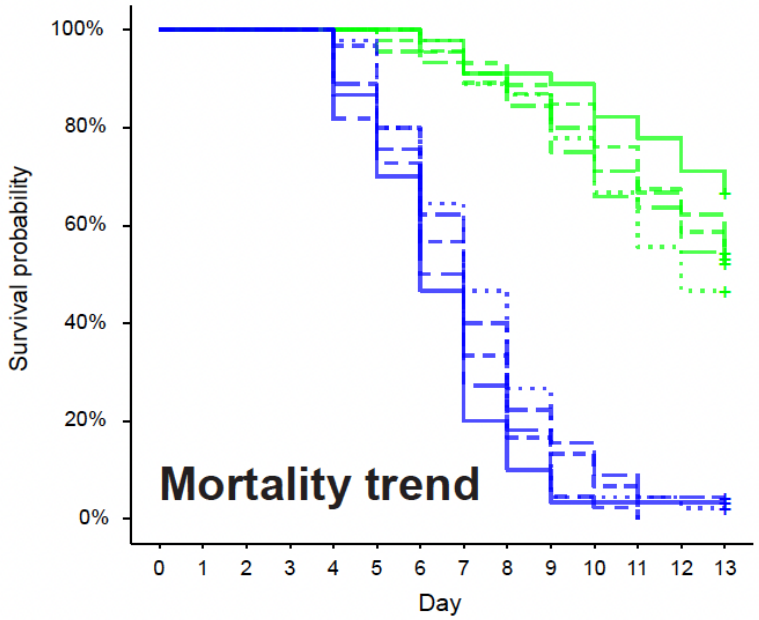
- Mortality comparisons between families
- Pathogen transmission (naïve cohabitant studies, eDNA/eRNA)
- Secondary traits and compensation mechanisms

Temperature Tolerance

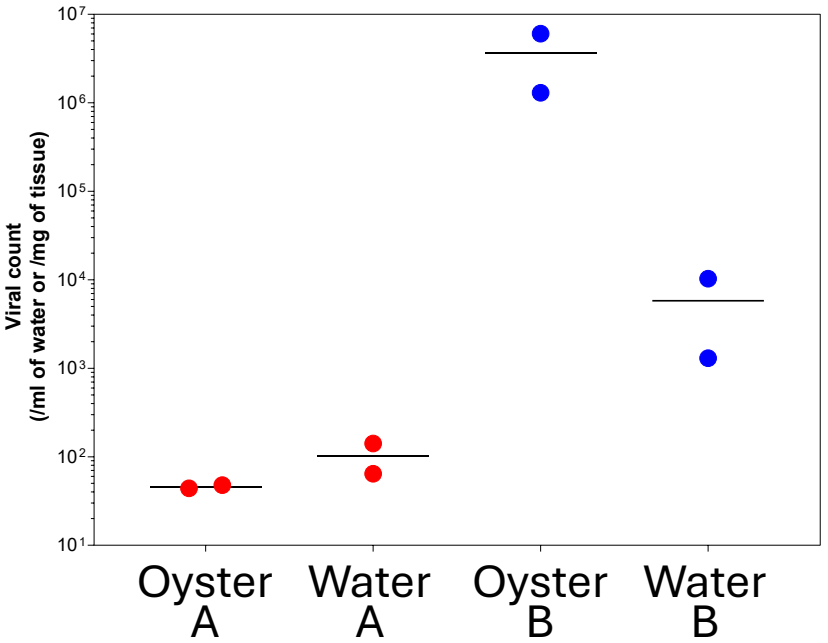


LT_{50} Analysis

OsHV-1 Tolerance



OsHV-1 Resistance



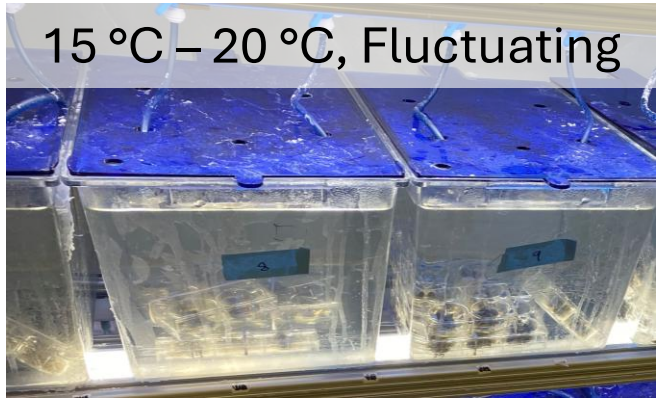
MSX Model Development – Experiment 1

Primary Goals

1. Develop a reliable route of MSX infection in the laboratory
2. Determine other biota, environmental samples, or infrastructure that are positive for MSX

Cage, Line,
Empty shell,
Sediment, Algae

Cheese-cloth +
perforated cover



Naïve oysters

MSX Model Development – Experiment 1

What else is positive for MSX?

red = positive
yellow = inconclusive

Animals

- Snail
- Snail shell swab
- Starfish
- **Jellyfish**
- Barnacles
- Scallops
- Crab - tissue
- Tunicate
- Mussel
- Razor clam

Plants/Algae

- Sea lettuce
- Rockweed
- **Eelgrass**
- Grass Kelp
- **Brown seaweed**
- **Unknown algae 1**
- Unknown algae 2
- Unknown algae 3

Infrastructure

- **Cage - swab**
- Cage – direct extraction
- Rope swab
- Bungee cord swab

Environment

- Sediment
- **Water**
- Empty shell
- Bird – feather, feces

Bedeque Bay

Boughton

MSX Model Development – Experiment 1

Date	Sampling Area	Description of Study Event	No. Oysters Tested	qPCR Results
09 July 2025	Savage Harbour	Naïve Oysters stocked into study system	20	MSX Not Detected
16 July 2025	Boughton	First exposure to "MSX Material"	26	MSX detected in 50% (13) of sampled oysters, water, cage material, plants, algae, and jelly fish
24 July 2025	Bedeque	Second Exposure to "MSX Material"	0	MSX Not Detected in water, plants, animals, shells, or debris
06 Aug 2025	Boughton	Third Exposure to "MSX Material	30	MSX detected in 53.3% of sampled oysters, but not in water or other materials
14 Aug 2025	Onda	Enzyme-digested MSX-positive oyster material	0	MSX-positive tissue treated with enzyme (e.g. lipase, amylase) cocktails prior to immersion or injection
20 Aug 2025	Boughton	Fourth Exposure to "MSX Material	6	MSX detected in 16.7% (1 of 6) oysters

MSX Model Development – Experiment 1

Date	Sampling Area	DPIC	Description of Study Event	No. Oysters Tested	qPCR Results
09 July 2025	Savage Harbour	-7	Naïve Oysters stocked into study system	20	MSX Not Detected
30 July 2025	Study Racks	15	Sampled Oysters across the rack system	21	MSX Not Detected
03 Sep 2025		50		60	MSX Not Detected
17 Sep 2025		64		63	MSX detected in 81% of oysters, independent of enzyme treatments (Cq = 33.6 – 37.0)
01 Oct 2025		78		61	MSX Not Detected. Low level detections observed (Cq = 36.92 – 38.29) with 16 inconclusive oysters (26.2%) and 3 of 21 water samples (14.3%)

Enzyme treatments were used in immersion experiments (4 hr immersion) in concentrated enzyme digests, or directly injected in experiments with enzyme-treated MSX-positive oyster homogenate

DPIC = Days Post Initial Challenge with MSX

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