Pathways for strengthening shellfish safety through First Nations-led collaboration in British Columbia, Canada

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Shellfish in British Columbia





Shellfish is important

- BC shellfish production: ~9,500 tons worth ~$36 million
- Supports coastal jobs and livelihoods
- First Nations have harvested and cultivated shellfish for thousands of years (clam gardens on Quadra ~3,500 years old)
- Marine foods historically supplied ~90% of protein in coastal diets
- Shellfish remain important for food security, culture and intergenerational knowledge

Safe harvest depends on environmental conditions



01

HABs and biotoxins

Harmful algae can produce toxins that accumulate in shellfish and cause poisoning (PSP, DSP, ASP, etc)

02

Contamination

Bacteria and viruses can make shellfish unsafe to eat.

03

Changing ocean

Shifting conditions can alter the timing, distribution and severity of seafood-safety risks.

WATCH: Supporting First Nations in their work to protect seafood safety, security, and sovereignty.

Photo by Will Duguid, Cowichan Bay

How shellfish safety is managed in Canada

Federal government led and coordinated
Canadian Shellfish Sanitation Program



Agency	Role
Environment and Climate Change Canada	Assesses sanitary water quality
Canadian Food Inspection Agency	Monitors shellfish biotoxins; recommends closures and reopenings
Fisheries and Oceans Canada	Implements and enforces harvest closures and reopenings

WATCH: Supporting First Nations in their work to protect seafood safety, security, and sovereignty.

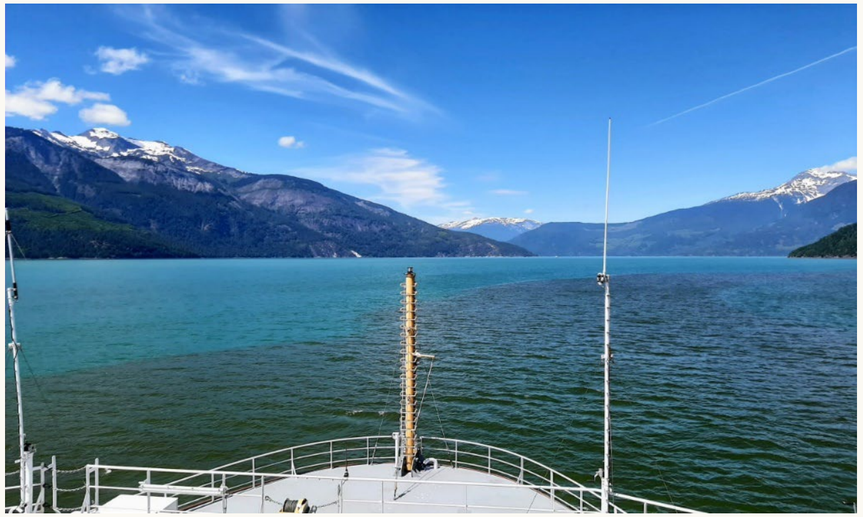
History of HABs in Canada

Productive waters – shellfish poisoning documented among the world's longest recorded histories (Vancouver, 1793).

- 1940s: Shellfish toxin monitoring established; paralytic shellfish poisoning closures recorded annually since then (Taylor and Harrison, 2002).
- 1990s: Monitoring for amnesic shellfish poisoning began; closures occur on the west coast.
- 2010s: Diarrhetic shellfish poisoning even triggered monitoring for DSP (cell counts associated with event in report Esenkulova and Haigh, 2012).



Gonyaulax spp, June 2018, Mill Bay



Heterocapsa triquetra, June 2021, Bute Inlet



Noctiluca, Salt Spring island

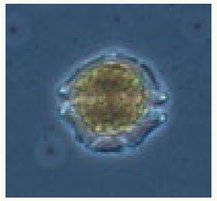
Photos by Esenkulova and Bahrey

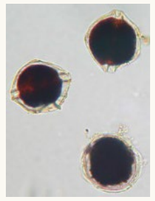
Harmful Algae Negatively Impacting Shellfish Aquaculture in British Columbia

Paralytic Shellfish Poisoning (PSP)

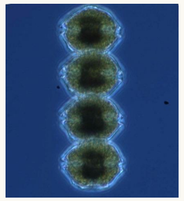
In BC, PSP toxins are produced by dinoflagellates in the *Alexandrium* genus, most particularly by *A. catenella* and *A. tamarense*.
PSP closures are common in summer, but may occur in winter due to re-suspension of cysts.

***Alexandrium* sp.**

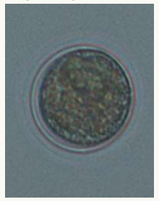




A. catenella



***Alexandrium* sp. cyst**

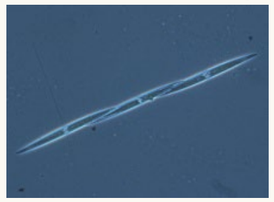


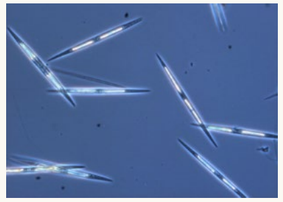
20-50 µm

Amnesic Shellfish Poisoning (ASP)

ASP toxins are produced by diatom species in the *Pseudo-nitzschia* genus. Among more than 30 taxa, only 12 species are potential toxin producers. Identification to the species level cannot be done under light microscopy.

***Pseudo-nitzschia* sp.**



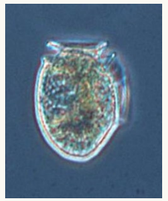


40-175 µm

Diarrhetic Shellfish Poisoning (DSP)

DSP toxins are produced by dinoflagellate species in the *Dinophysis* genus. In BC, the most common species that are known to produce DSP toxins are *Dinophysis acuminata*, *D. acuta*, *D. fortii*, and *D. norvegica*.

D. acuminata



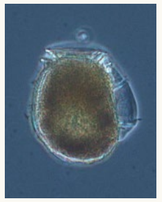
38-58 µm

D. acuta



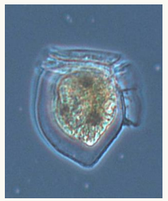
54-94 µm

D. fortii



62-66 µm

D. norvegica



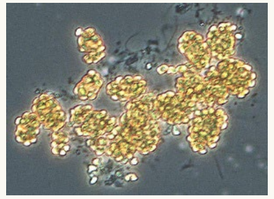
48-67 µm

Algae Causing Other Harmful Effects

Algae that may negatively impact shellfish. Blooms of these algae may cause smothering or low dissolved oxygen. *Heterosigma akashiwo*, *Cochlodinium fulvescens*, and *Dictyocha* spp. produce toxins that might harm shellfish. *Myronecta rubra* can make shellfish unappetizing.

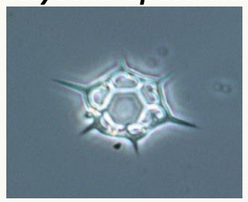
Heterosigma akashiwo





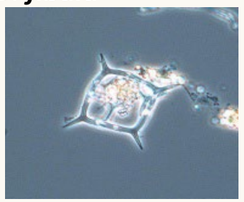
15-40 µm 25-50 µm

Dictyocha speculum



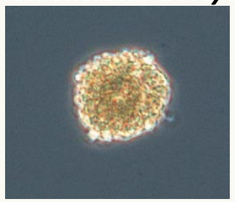
25-50 µm

D. fibula



25-65 µm

Non-skeletal *Dictyocha*



Cochlodinium fulvescens





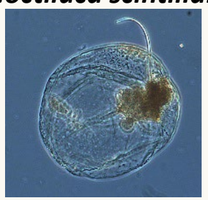
25-40 µm 18-37 µm

Karenia mikimotoi



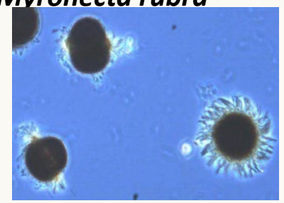
200-2000 µm

Noctiluca scintillans



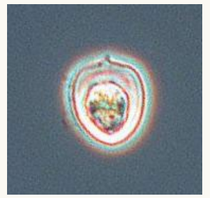
25-50 µm

Myronecta rubra



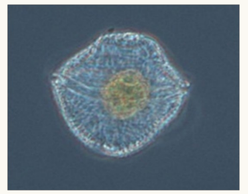
Potentially toxic species found in BC that cause shellfish poisoning with venerupin (*Prorocentrum minimum*) and yessotoxin (*Protoceratium reticulatum*) in other parts of the world.

P. minimum



10-20 µm

P. reticulatum



28-53 µm

Funding provided by: Fisheries and Oceans Canada, Aquaculture Collaborative Research and Development Program

Produced by: Nicky Haigh and Svetlana Esenkulova of Microthalassia Consultants Inc. and Dr. Chris Pearce and Laurie Keddy of Fisheries and Oceans Canada

Note: All algae cells preserved with Lugol's iodine.

MICROTHALASSIA

Fisheries and Oceans Canada | Pêches et Océans Canada

THE WATCH PROGRAM

We All Take Care of the Harvest



First Nations were voicing concerns about seafood safety and changing ocean conditions

WATCH Started under First Nation Health Authority in 2020

Transitioned to Island Marine Aquatic working Group (IMAWG) in 2025

More info:

WATCH web-page https://imawg.ca/watch-program-3/

We All Take Care of the Harvest (WATCH)—a new chapter in collaborative seafood safety in coastal British Columbia, Canada. PICES Press, Vol. 34, No. 2, p. 4.

From IMAWG strategic plan “Rooted in the wisdom of our ancestors and guided by the enduring strength of the cedar, we honour the sacred connection between land, water, and all living beings.”

Artwork: 2026–2029 IMAWG Vision graphic, Qaamina (2025)

WHY THE WATCH PROGRAM

Three things program focuses on

01

Safety

Access to harmful algae, biotoxins in water and shellfish monitoring; risk information

02

Security

Helping address barriers to harvesting traditional marine foods

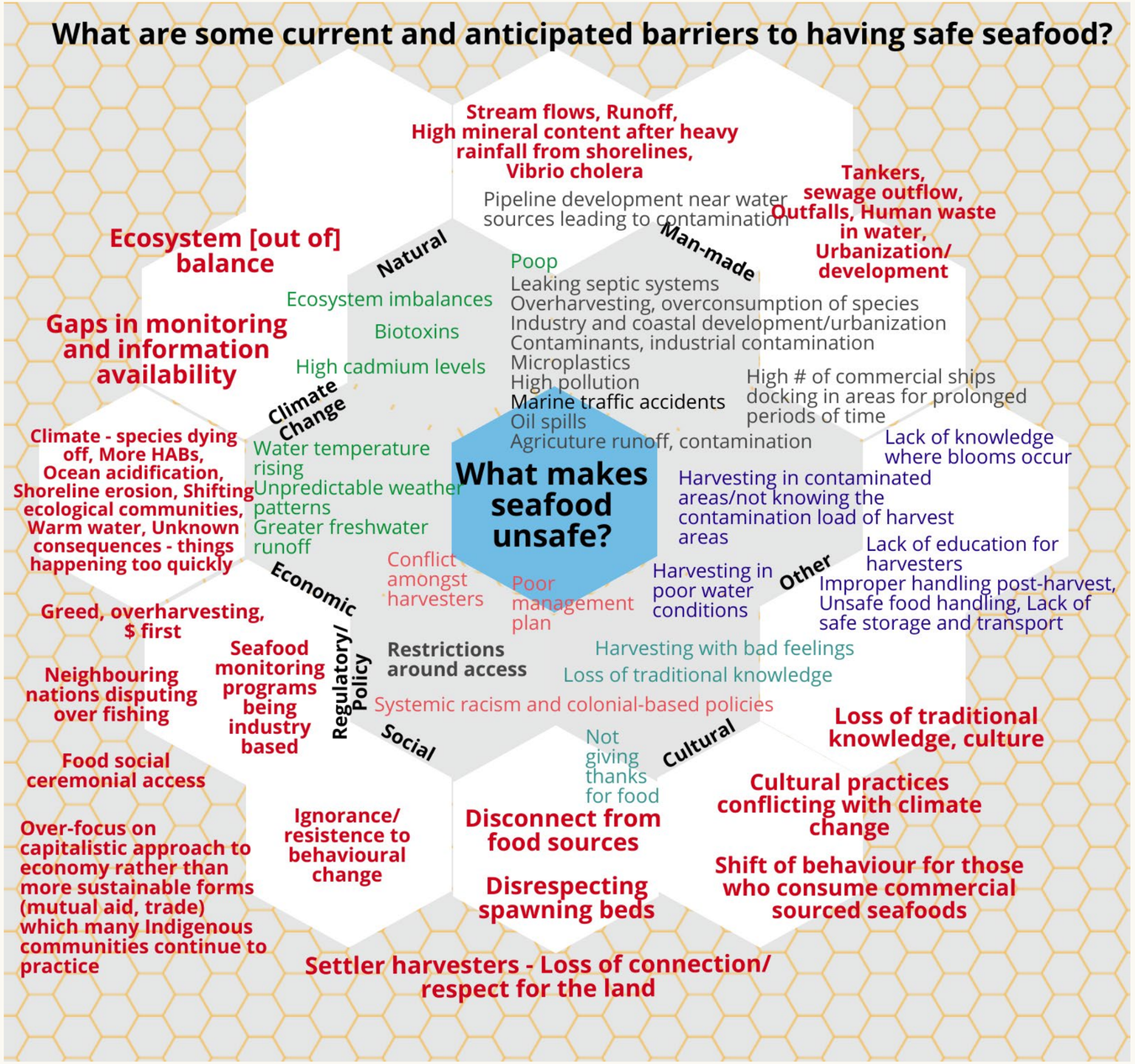
03

Sovereignty

Supporting First Nations' stewardship and participation in decisions affecting their food systems

Supporting First Nations in their work to protect seafood safety, security, and sovereignty.

First Nation workshop – learning together



Interconnected pressures: pollution, climate change and ecosystem disruption.

Barriers to safe access: monitoring gaps, limited information and industry-focused policies.

Safety, culture and sovereignty are linked: harvesting access, traditional knowledge and relationships with marine foods.

Insights from Community and Partner Engagement

Gaps and barriers

1. **Monitoring coverage:** important harvest areas and preferred species overlooked; closures prolonged by missing samples.
2. **Testing access:** limited laboratory capacity, transport challenges and delayed results.
3. **Information access:** unclear sampling coverage, inaccessible results and confusing closure notices.
4. **Unequal access:** commercial priorities dominate; reopening areas can be costly and complex.
5. **Limited First Nations involvement:** community priorities and Indigenous knowledge insufficiently reflected.
6. **Fragmented responsibilities:** weak connections between research, monitoring, management and remediation.
7. **Limited continuity and preparedness:** sustained staffing, funding and analysis of changing risks needed.
8. **Food and cultural impacts:** uncertain access disrupts harvesting, food sharing and intergenerational knowledge.
9. **Health knowledge gaps:** limited understanding of repeated toxin exposure and underreported illness.

Monitoring coverage example

Scale vs. Capacity: Over ~27,000 km of BC coastline leaves vast remote areas completely unmonitored.

Mismatched Priorities: Monitoring is limited, uneven, and poorly aligned with Indigenous FSC harvesting locations and preferred species.

Precautionary Safety Standard: Under CSSP policy, safety cannot be assumed. “No data" = "high toxicity risk."

The Monitoring Gap in Practice:

- Not just remote areas: WATCH analysis across four First Nations territories (2016–2022) revealed only 31–67% of management subareas had biotoxin testing (Brennan, 2023).

- Administrative Closures: Sampling gaps cause prolonged harvest closures regardless of actual bloom toxicity. Example: Gunboat Passage was closed in March 2022 because biotoxin samples stopped being submitted, remained closed for ~4 years until January 2026.

Potential directions and solutions

- **Expand community monitoring:**
  - First Nations sample collection linked to federal testing and agreed harvest access. Recent examples of FN community collecting and shipping shellfish under agreements with the Canadian Food Inspection Agency.
  - In USA Tribals in some states have co-management roles. Community sampling supports federal testing
- **Improve information sharing:** accessible results, clear closure explanations and timely communication.
- **Strengthen First Nations participation:** community involvement in priorities, program design and decisions.
- **Respect First Nations data governance:** community authority over information use and sharing.
- **Connect research with practice:** combine community observations and long-term environmental records.
- **Support lasting capacity:** sustained funding, trained staff and ongoing technical support.
- **Restore harvest areas:** investigate pollution sources and coordinate remediation with clear targets.
- **Improve exposure assessments:** account for community diets and harvesting practices.
- **Learn across borders:** share experience with decentralized testing, Tribal co-management and restoration.

Sharing knowledge through WATCH



WATCH pre-PICES gathering - Oct 22, 23 in Nanaimo. Co-hosted by WATCH and Snuneymuxw First Nations.

PICES S-HAB USA members Vera Trainer and Misty Peacock gave keynote presentations and shared knowledge with Canadian First Nations, Government (DFO, CFIA, BCDDC) Academia (UBC, SFU, UVIC, VIU) representatives.

Presentation and discussion highlights will be shared in PICES Press.

Thank you

Summary:

We All Take Care of the Harvest (WATCH) is focused on seafood safety, security, and sovereignty.

We have accumulated a lot of data on regional gaps, barriers, and potential directions and solutions.

If you are interested in partnering or developing a paper, let us know.

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Artwork by Kaia James
student of Qwam Qwum Stuwixwulh School