



# NOVA SCOTIA SPECIES SPOTLIGHT: FARMED BLUE MUSSELS (*Mytilus edulis*)

## FISHERY

Blue mussel cultivation in Nova Scotia is represented by 29 license holders operating 67 approved lease sites totaling 1,610.80 hectares.\*

In 2021, 1,275 t of mussels were grown in Nova Scotia, representing 5.65% of total Canadian production.

Production is performed primarily by suspended rope culture using mesh socks.

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## BIOLOGY

The blue mussel is a bivalve mollusc which means it's a two-part hinged shell with soft internal parts. The internal parts support active inhalation and exhalation of water, and the capture of solid particles.

Mussels thrive in either sub-tidal or intertidal waters. They are highly versatile due to their tolerance to a wide range of water salinity and temperature, including withstanding freezing conditions.

Mussels, including other bivalve molluscs (e.g., clams, oyster, scallops) filter water and collect phytoplankton as food. They can live from 18 to 24 years in the wild, but typically takes up to 3 years to produce a market size mussel using culture techniques.

As juveniles, mussels may detach from substrates to settle elsewhere, but as adults, mussels are permanently settled, or sessile. They have separate sexes, with females appearing orange, and males appearing white.

## LIFE CYCLE

Mussels spawn from late spring to early summer, however the exact time varies by food availability, water temperatures, and other environmental factors. Mussels begin to spawn when they are 1 to 2 years old. Each female can produce from 5 to 40 million eggs, and fertilization takes place in the water column.

Within five hours, mussel larvae begin feeding on phytoplankton. Larvae grow for 3 to 4 weeks before developing into spat (veliger larvae) and seek out somewhere to settle.

Spat, whether captured in the wild or raised in a hatchery, is used to seed aquaculture lines. Mussel spat secrete byssal threads to attach to solid substrates. Spat measure approximately 1 mm when collected in the wild and grow to 5 to 15 mm before declumping, grading, and transferring into socks.

Socks are stored for a short period to allow the development of byssal threads and the attachment of spat to the sock. Socks are then suspended from longline ropes and left for 18 to 24 months until mussels reach market size.

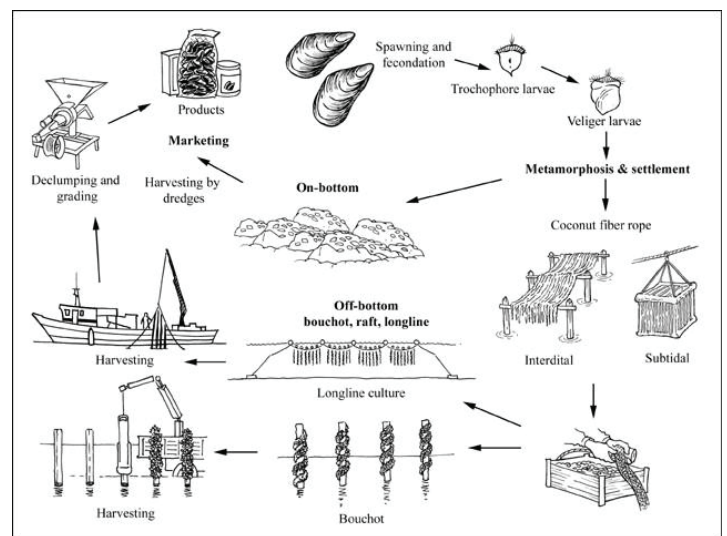


Figure 1. Example production cycle of farmed mussels. FAO, 2023

## MANAGEMENT AND CONSERVATION

All mussel farms in NS must develop and implement a farm management plan meeting the requirements outlined by the NS Department of Fisheries & Aquaculture.

Producers are required to indicate stocking levels, procedures for shellfish health management such as wildlife interactions, biosecurity risks, and disease management measures, farm operation details including waste management, supply storage and disposal, retrieving loose gear, and maintain records to verify adherence to the procedures outlined in the farm management plan.



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## SEAFOOD LABELLING

	Terminology	Description
<b>Common Name</b>	<b>English:</b> Blue Mussel, Mussel, Atlantic Bay Mussel <b>French:</b> Moule, Moule Bleue	Accepted common names for <i>Mytilus edulis</i>
<b>Production Method</b>	Farmed	Cultivated in an aquaculture lease area
<b>Certifications</b>	Best Aquaculture Practices (BAP)	Production standards for the governance, environmental impact, and social responsibility of aquaculture operations throughout the supply chain
	Aquaculture Stewardship Council (ASC)	
<b>Production Claims</b>	Organic	Aquaculture products that comply to the <b>Canadian Organic Aquaculture Standard</b>
<b>Process Description</b>	Relaying	The transfer of shellfish from marginally contaminated areas to approved areas for natural biological cleaning using the ambient environment
	Shucking	The process of separating the edible portion of the mollusk from the shell
	Debyssing	The process of removing byssal threads
	Conditioning	The process of storing bivalve mollusks in seawater tanks or natural sites with the intention to remove mud, sand, and slime
	Depuration	The process of using a controlled, aquatic environment to reduce the level of microbiological contamination in live shellfish

## PROCESSING/HANDLING

### Processing Yield

Cooked Meats: **10 - 25%**

### Primary Products

Live (fresh/modified atmosphere),  
Whole (frozen), Cooked meats (frozen)

### Secondary Products

Smoked meats, Canned meats

### By-Products

Shell, Dead or Broken mussels

### Process Flow

**Live:** Harvest » (Relay/Depuration) »  
Washing/declumping/debyssing/grading  
» Conditioning/Storage » Packaging »  
Labelling » Storage » Transportation

**Processed:** Harvest » (Relay/Depuration) »  
Washing/declumping/debyssing/grading »  
Conditioning/Storage » Cooking » Chilling  
» Shucking » Packaging » Labelling »  
Storage » Transportation

### Post-Harvest Processes Impacting Quality

- Mussels are vulnerable to water pollution and toxin-producing algae, and the consumption of raw or undercooked bivalve molluscs therefore presents a risk for foodborne illness. The Canadian Shellfish Sanitation Program outlines the requirements for production of bivalve mollusks with the goal to minimize health risks associated with consumption of contaminated shellfish. Relay and depuration practices must proceed as permitted by the Canadian Food Inspection Agency (CFIA).

- Product chilling (optimal range is 0 to 8 °C)
- Environmental exposure (mussels should be protected from direct sunlight, wind, and dramatic changes in environmental conditions)
- Storage (high-quality water for wet storage, and consistent temperatures and humidities in dry storage)
- Gentle handling (avoiding excessive compaction, vibration)
- Sorting (ensuring consistent product specifications, removal of defects)
- Thermal processing (cooking and chilling procedures on meat quality and yield)



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## CHEMICAL COMPOSITION

	Proportion (g / 100 g)	
	Raw	Cooked
<b>Moisture</b>	80.60	61.20
<b>Protein</b>	11.90	23.80
<b>Fat</b>	2.24	4.48
<b>Carbohydrate</b>	3.69	7.39
<b>Ash</b>	1.59	3.18

USDA Nutritional Database ID, 15164 (Raw), 15165 (Cooked)

## STORAGE

Wet storage of live mussels requires high-quality water. Daily monitoring of live mussels in wet storage should be completed to ensure mussels are maintained in an optimal condition for the live market.

In dry storage, live mussels should be kept in open containers, and chilled from 0 to 4 °C. Exposure to warm temperatures will drive fluid loss and a shortened shelf life. The shelf life of mussels is twice as long when stored at 0 °C, compared to 5 °C.

Freezing live mussel in-shell is not recommended due to yield loss upon thawing. Cooked meats should be protected by packaging or glaze prior to freezing to prevent dehydration. Cooked meats have a frozen shelf life of nearly 3 months when stored at -20 °C, compared to 9 months at -30 °C.

## KEY FOOD SAFETY AND QUALITY CONCERNS

Mussels are vulnerable to various microbial and chemical hazards found in the harvest growing area, such as:

- Bacterial pathogens (*Salmonella* spp., *E. coli*)** – contamination from human or industrial sources
- Viruses (norovirus, hepatitis)** – contamination from human sources
- Naturally occurring bacterial pathogens (*Vibrio* spp.)** – contamination from natural marine bacteria

- Marine Biotoxins** – contamination by naturally occurring toxin-producing diatoms and dinoflagellates.
  - Paralytic Shellfish Poisoning (PSP)
  - Diarrhoeic Shellfish Poisoning (DSP)
  - Amnesic Shellfish Poisoning (ASP)
  - Neurologic Shellfish Poisoning (NSP)
  - Azaspiracid Shellfish Poisoning (AZP)
- Chemical contaminants (heavy metals)** – contamination from industrial activity

Mussels should be monitored for indicators of spawning from late spring to summer. Spawning mussels will appear veiny, expel an orange liquid, develop offensive odours, and overall have a shorter shelf life.

Seasonal variation in meat condition and yield in mussels is related directly to spawning activity. Meat yields peak in the summer right before spawning. After spawning, meat yields drop, and overall condition worsens.

Mussels may develop fouled shells (tubeworms, barnacles), broken shells, or possess other extraneous matter from the growth area. Proper washing, sorting, and grading must be completed to ensure a consistently high-quality mussel is produced.

Mussels that are alive and in good condition will close shut in response to touch. Mussels in poor condition will remain open, or gape, in response to touch or extended chilled storage. The shelf life of mussels is reached when 10% of mussels in a lot gape during storage.

## REFERENCES

- CFIA. 2019. Marine biotoxins in bivalve shellfish: Paralytic shellfish poisoning, amnesic shellfish poisoning and diarrhetic shellfish poisoning. Canadian Food Inspection Agency. <https://inspection.canada.ca/food-safety-for-consumers/fact-sheets/specific-products-and-risks/fish-and-seafood/toxins-in-shellfish/eng/1332275144981/1332275222849>
- CFIA. 2022. Canadian Shellfish Sanitation Program manual. Canadian Food Inspection Agency. <https://inspection.canada.ca/food-guidance-by-commodity/fish/canadian-shellfish-sanitation-program/eng/1527251566006/1527251566942>



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DFO. 1988. A guide to longline mussel culture in Newfoundland. Aquaculture in Newfoundland - Publication No. 1. Fisheries and Oceans Canada. <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/106772.pdf>

DFO. 2003. Profile of the Blue Mussel (*Mytilus edulis*) – Gulf Region. Fisheries and Oceans Canada. <https://waves-vagues.dfo-mpo.gc.ca/Library/270029-e.pdf>

DFO. 2017. Farmed Mussels. Fisheries and Oceans Canada. <https://www.dfo-mpo.gc.ca/aquaculture/sector-secteur/species-especes/mussels-moules-eng.htm>

FAO and WHO. 2020. Code of Practice for Fish and Fishery Products. Rome. <https://doi.org/10.4060/cb0658en>

FAO. 2023. *Mytilus edulis*. Cultured Aquatic Species Information Programme. Text by Gouilletquer, P. Fisheries and Aquaculture Division [online]. Rome. [Cited Monday, January 30th 2023]. [https://www.fao.org/fishery/en/culturedspecies/mytilus\\_edulis/en](https://www.fao.org/fishery/en/culturedspecies/mytilus_edulis/en)

Joint FAO/WHO Codex Alimentarius Commission. Standard for Live and Raw Bivalve Molluscs. CXS 292-2008 revision 2015. Codex Standard. <https://www.fao.org/fao-who-codexalimentarius/codex-texts/list-standards/tr/>

Newell. C. 1990. Guide to mussel quality control. Sea Grant Marine Advisory Program. Maine. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2008-newell-seed-collection-strategies-for-maine-mussel-raft-culture.pdf>

NOAA. 2023. Blue Mussel. National Oceanic and Atmospheric Administration. <https://www.fisheries.noaa.gov/species/blue-mussel>

Waterman, J.J. 2001. Processing Mussels, Cockles and Whelks. Torry Advisory Note No. 13. Food and Agriculture Organization. <https://www.fao.org/3/x5894e/x5894e00.htm>

Zagata, C.; C. Young; J. Sountis and M. Kuehl 2008. “*Mytilus edulis*” (On-line), Animal Diversity Web. Accessed January 30, 2023 at [https://animaldiversity.org/accounts/Mytilus\\_edulis/](https://animaldiversity.org/accounts/Mytilus_edulis/)