



NOVA SCOTIA SPECIES SPOTLIGHT: FARMED AMERICAN OYSTER (*Crassostrea virginica*)

FISHERY

Oyster cultivation in Nova Scotia is represented by 58 license holders operating 132 approved lease sites totaling 2,205.95 hectares.*

In 2021, 492 t of oysters were produced in Nova Scotia, representing 2.84% of total Canadian production.

Oyster cultivation is performed mostly by suspended culture methods where oysters are kept in a cage or mesh bag in tidal or intertidal waters.

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BIOLOGY

The American oyster is a bivalve mollusc which means it has a two-part hinged shell with soft internal parts. Shells are held together by an adductor muscle, and other internal parts that support respiration, digestion, and reproduction.

The outside of oyster shells can appear a mixture of brown, gray, green, and white, whereas the inside of the shell is off white. Each shell half is different in shape; the upper shell is flat, and the bottom shell cupped to accommodate the internal parts. Oyster can grow to more than 15 cm in length.

The appearance, shape, and growth rate of oysters is influenced by the conditions under which the oyster is grown, such as substrate, density in cages, water temperatures, ocean currents, and food availability. They can live up to 20 years, but it takes 3 years to produce a cocktail size, and from 4 to 7 years for small or large sized oysters.

Optimal growth takes place in warm water at around 25 °C, usually from May to November in the Maritimes. Growth stops when water temperatures drop below 4 °C.

Oysters and other bivalve molluscs (e.g., clams, mussel, scallops) are filter feeders, meaning they rely on systems to capture particles from the water as food, primarily phytoplankton.

LIFE CYCLE

Oysters spawn in early summer, or as triggered when water temperatures increase to around 20 °C and by other environmental factors. During spawning, females can release over 100 M eggs and males will release even more sperm. Fertilization takes place in the water column.

Within 48 hrs of fertilization, eggs develop into larvae possessing a shell and internal organs for respiration and digestion. After 3 weeks in the planktonic stage, oyster larvae, known as spat, measure from 2 to 4 mm in length and seek out substrate to attach to, such as shells, rock, plant material, or metal. Spat are the seed oysters used for cultivation, and may be captured from the wild or sourced from hatcheries.

Spat develop into juveniles, measuring from 15 to 45 mm in length after 8 to 12 months. Juvenile oysters grow into adults (cocktail) after an additional 12 months.

During the winter, oysters do not feed at all, and may be submerged to protect oysters from surface ice, in a process known as overwintering.

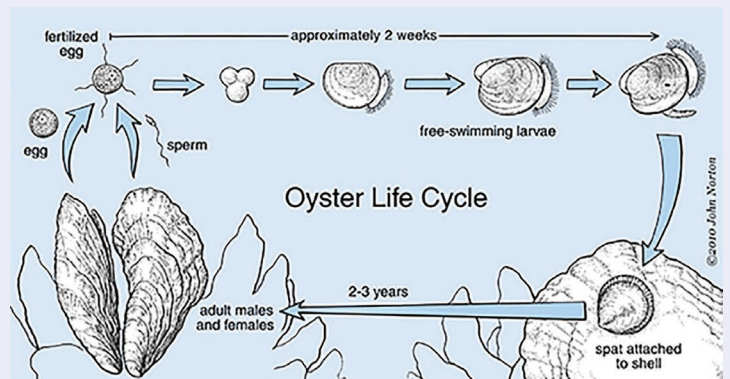


Figure. Oyster life cycle

MANAGEMENT AND CONSERVATION

All oyster 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 outlines in the farm management plan.



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OYSTER LABELLING

	Terminology	Description
Common Name	English: Atlantic Oyster, Oyster French: Huître Américaine, Huître	Accepted common names for <i>Crassostrea virginica</i>
Production Method	Farmed	Cultivated in an aquaculture lease area
Certifications	<u>Best Aquaculture Practices (BAP)</u> Aquaculture Stewardship Council (ASC)	Production standards for the governance, environmental impact, and social responsibility of aquaculture operations throughout the supply chain
Production Claims	Organic	Aquaculture products that comply to the Canadian Organic Aquaculture Standard
Process Description	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 mollusc from the shell
	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
Grading	Fancy Shape	The length does not exceed 1.5x its greatest width and they are not abnormally, flat, thin-lipped or malformed. Do not vary by more than 2.5 mm in length if prepackaged
	Choice Shape	The length does not exceed 1.75x its greatest width, and they are not abnormally flat, thin-lipped or malformed. Do not vary by more than 2.5 mm in length if prepackaged
	Standard Shape	The length of each oyster does not exceed 2x its greatest width, and they are not abnormally flat, thin-lipped or malformed
	Commercial Shape	Do not meet the requirements of Fancy, Choice, or Standard
Size	Cocktail	2.5 – 3.0"
	Small	3.0 – 3.5"
	Large	> 3.5"

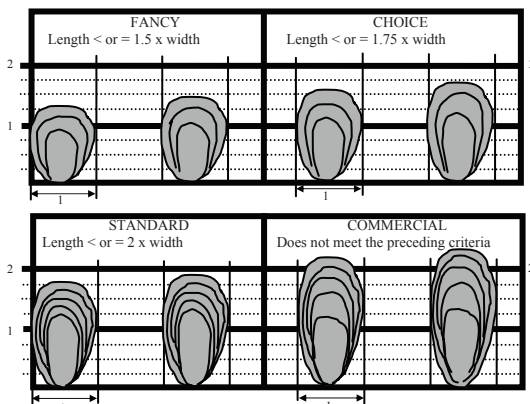


Figure 2. Grades of Oysters

CHEMICAL COMPOSITION

	Proportion (g / 100 g)		
	Raw	Cooked	Canned
Moisture	86.20	82.00	85.10
Protein	5.22	7.00	7.06
Fat	1.55	2.12	2.47
Carbohydrate	5.53	7.28	3.91
Ash	1.50	1.65	1.42

USDA Nutritional Database ID, 15245 (Raw), 15246 (Cooked), 15170 (canned)



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PROCESSING AND HANDLING

Processing Yields

Raw Meat yield = **5 – 20 %**

Primary Products

Live

Secondary Products

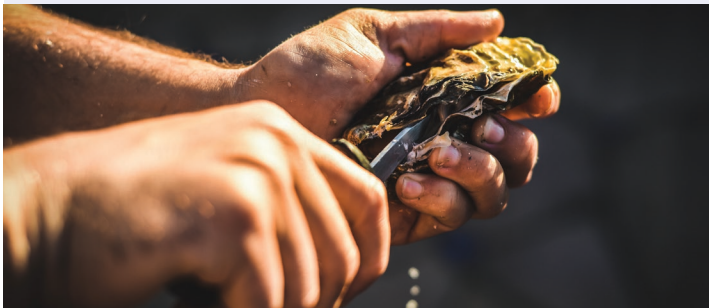
Meats, whole, half-shell (Frozen)

By-Products

Shells, Mortalities

Primary Processing Flow

Receiving » Washing » Sorting » Packaging » Storage
» Transportation



Post-harvest processes impacting quality

- Oysters are vulnerable to water pollution and toxin-producing algae, and the consumption of raw or undercooked bivalve mollusc therefore presents a risk for foodborne illness. The Canadian Shellfish Sanitation Program outlines the requirements for production of bivalve mollusc 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 (process and speed of reducing internal temperature)
- Gentle handling (avoid damaging to edges of shell, excess vibration)
- Washing and Cleaning (removal of fouling organisms and foreign material)
- Sorting (ensuring consistent product specification, detection of dead or spoiled product)
- Cooking/freezing/thawing (practices impacting overall meat yield)

STORAGE

Live oysters in wet or dry storage should be kept from 2 to 10 °C. Temperatures approaching 0 °C and submersion in fresh water can kill a live oyster, so storage directly in ice should be avoided. Temperature fluctuations should be prevented as much as possible.

In wet storage, oysters can survive indefinitely if constantly circulating high-quality seawater. Water quality should be monitored daily.

In dry storage, oysters can survive for over 3 weeks. They should be stored in open containers, and with their cup on the bottom. Cooler temperatures will help retain the liquor, slow the growth of bacteria, and extend the shelf life.

Frozen shucked oyster meats should be glazed or packaged in a manner to protect against dehydration. Frozen shucked oyster meats will keep in optimal condition for 6 months at -30 °C. At higher storage temperatures, fluid loss and reduced meat yield will take place quicker, and reduce the overall frozen shelf life.

KEY FOOD SAFETY AND QUALITY CONCERNS

Oysters are vulnerable to various microbial and chemical hazards found in the harvest growing area, including:

1. Bacterial pathogens (*Salmonella* spp., *E. coli*) – contamination from human or industrial sources
2. Viruses (norovirus, hepatitis) – contamination from human sources
3. Naturally occurring bacterial pathogens (*Vibrio* spp.) – contamination from natural marine bacteria
4. Marine Biotoxins – contamination by naturally occurring toxin-producing diatoms and dinoflagellates.
 - a. Paralytic Shellfish Poisoning (PSP)
 - b. Diarrhoeic Shellfish Poisoning (DSP)
 - c. Amnesic Shellfish Poisoning (ASP)
 - d. Azaspiracid Shellfish Poisoning (AZP)
5. Chemical contaminants (heavy metals) – contamination from industrial activity



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Gaped oysters may or may not be acceptable for consumption. If they close when gently tapped, they are ok to consumer, but if the shell remains open, this is an indication that the oyster is dead and should be discarded.

Alternatively, some oysters die and remain shut. Oysters quality can be assessed by sound. When tapping on an oyster, it should sound solid and not hollow. Hollow sounding oysters may have lost their liquor or died, and should be discarded.

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