Environment and Climate Change Canada
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SHELLFISH HARVEST AREA QUALITY

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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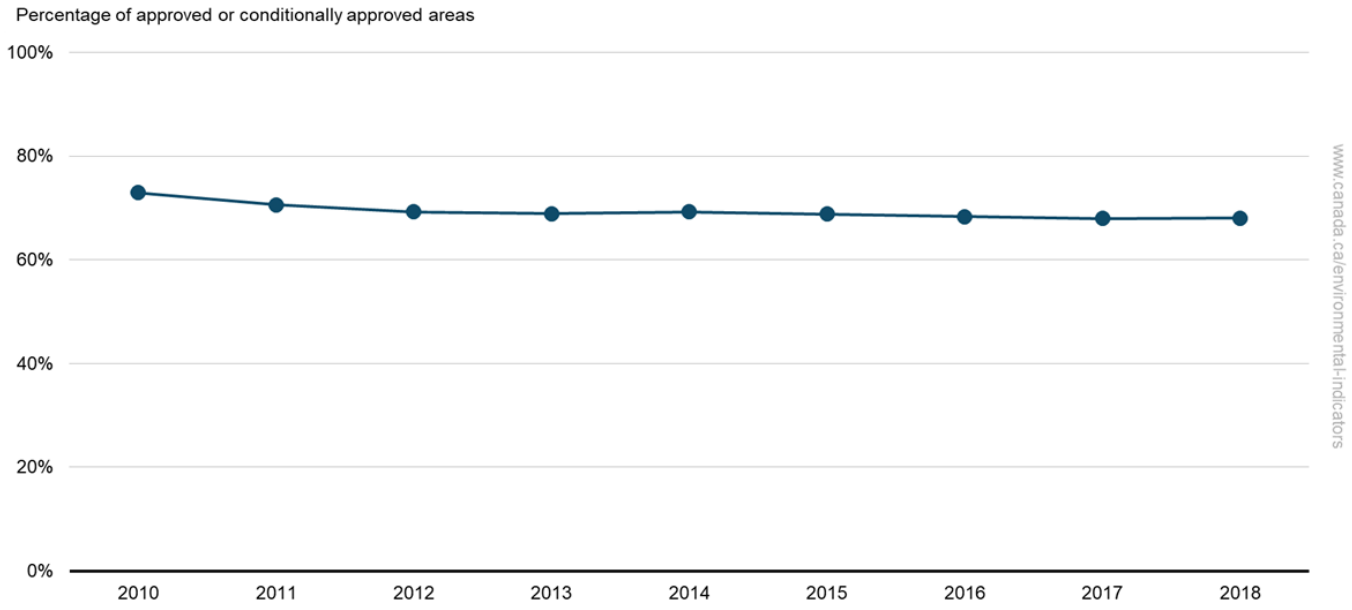
Shellfish harvest area quality

Most bivalve shellfish (such as mussels, oysters, clams and scallops) are filter feeders that accumulate contaminants, such as bacteria or pollutants, from their surroundings. When contaminants have the potential to make shellfish unsafe to eat, harvest areas are closed to ensure food safety. The proportion of harvest area classified as approved or conditionally approved for harvest for human consumption is a partial measure of the quality of marine coastal water.

Key results

- In 2018, 68% of Canada's classified shellfish harvest areas were classified as approved or conditionally approved for harvest for human consumption. This has remained relatively consistent since 2010

Figure 1. Status of shellfish harvest areas, Canada, 2010 to 2018



Data for Figure 1

Note: Shellfish harvest area classifications for human consumption are partially based on contamination by fecal coliform bacteria. These are microorganisms that originate from human and animal waste. Refer to Table 1 for more information on the classification definitions based on fecal coliform bacteria levels. Other factors considered when classifying sites are the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

The percentage of approved or conditionally approved shellfish harvest areas has remained consistent in recent years. This is because few new shellfish harvest area classification requests were accepted in recent years and they were prioritized where shellfish are present and harvest interest is high.

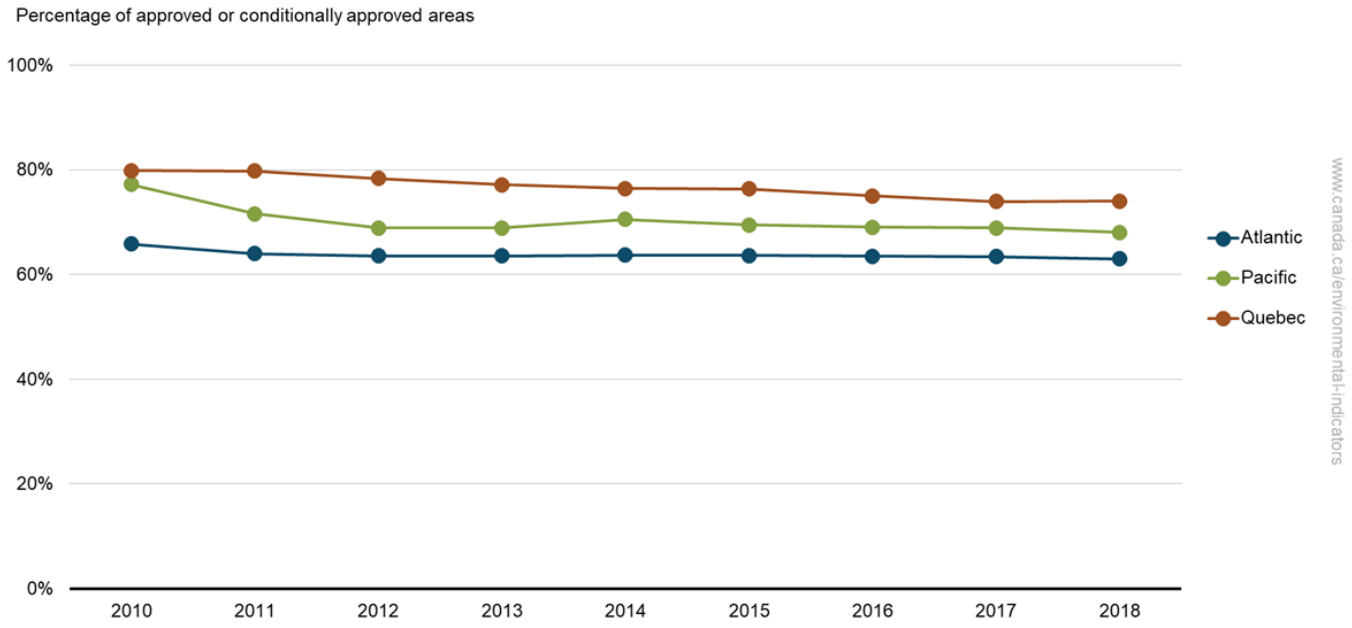
Shellfish can be harvested from areas classified as approved with appropriate permits. If bacterial levels are high enough to create health concerns, areas may be classified as restricted or prohibited. Harvesting shellfish from restricted areas is not permitted except with a licence under the *Management of Contaminated Fisheries Regulations*. Shellfish harvested from restricted areas must undergo a decontamination process before they can be safely consumed. See Table 1 for more information regarding the classification definitions.

Regional shellfish harvest area quality

Key results

- On the Quebec coast, 74% of all classified shellfish harvest areas were classified as approved or conditionally approved for harvest for human consumption, compared to 69% on the Pacific coast and 63% on the Atlantic coast
- Since 2010, the percentage of approved areas on the Quebec coast appears to have gradually declined
- Approved areas along the Atlantic and Pacific coasts have been relatively stable since 2012

Figure 2. Status of regional shellfish harvest areas, Canada, 2010 to 2018



Data for Figure 2

Note: Shellfish harvest area classifications for human consumption are partially based on contamination by fecal coliform bacteria. These are microorganisms that originate from human and animal waste. Refer to Table 1 for more information on the classification definitions based on fecal coliform bacteria levels. Other factors considered when classifying sites are the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters. For more information regarding the location of shellfish harvest areas, see Location of monitoring stations.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

The decline in the percentage of approved or conditionally approved areas along the Quebec coast is due to site closures (including for reasons associated with supporting conservation outcomes) and changes in the monitoring of some sites. Some areas previously classified as approved have been designated as prohibited due to the impact of municipal wastewater treatment plants.

The decline in the percentage of approved or conditionally approved areas in the Pacific region from 2010 to 2013 is likely due to the expansion of prohibited areas and subsequent reduction in approved areas around wastewater outfalls, floathomes and marinas.

Results reported in the Quebec and Pacific regions prior to 2009 and 2010 cannot be compared to those from subsequent years because:

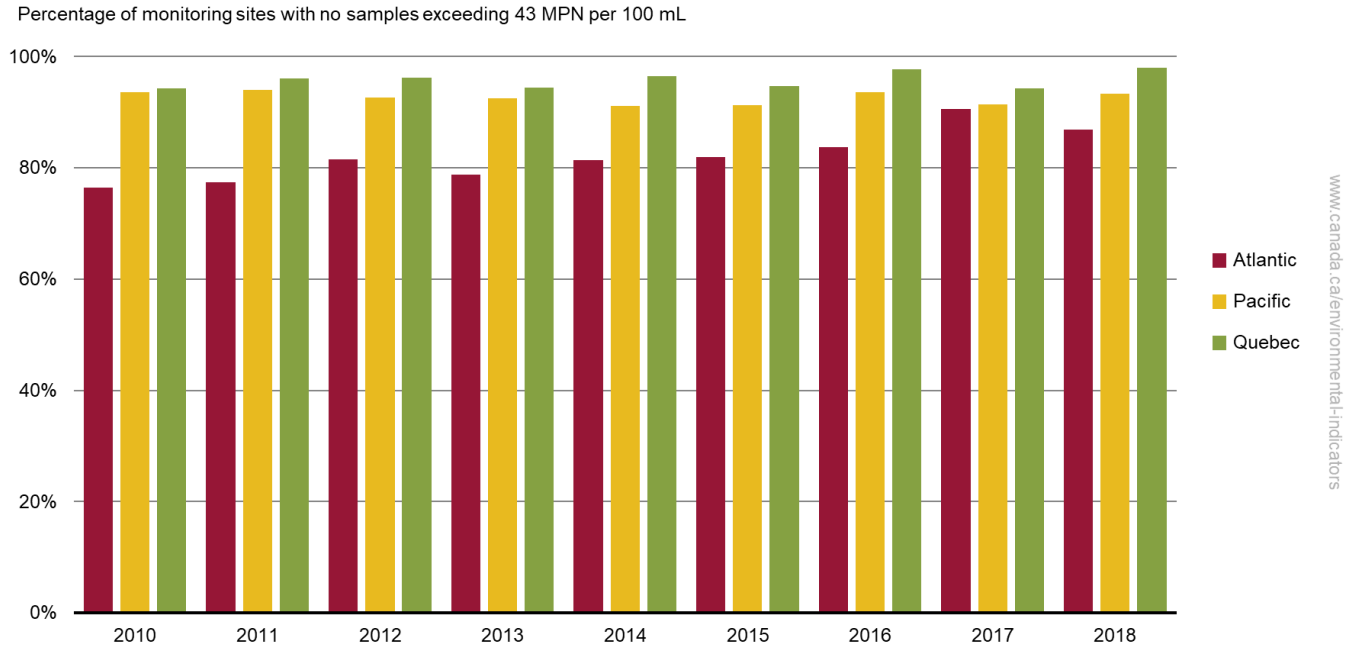
- in 2009, the total shellfish area for Quebec increased significantly
- in 2010, changes were made to the classification methods in the Pacific

Shellfish harvest area bacteriological water quality

Key results

- In 2018, fecal coliform levels below the threshold of 43 most probable number (MPN[1]) per 100 mL were found in:
  - 98% of all samples collected from the Quebec coast
  - 93% of all samples collected from the Pacific coast
  - 87% of all samples collected from the Atlantic coast

Figure 3. Bacteriological status of shellfish harvest areas, Canada, 2010 to 2018



Data for Figure 3

Note: A fecal coliform level of 43 MPN per 100 mL was used as the threshold as samples with fecal coliform concentrations above this level are likely to influence the classification of the shellfish harvest area. Fecal coliform MPN measures the potential of disease-causing bacteria to be present in significant concentrations. It is only one of the factors considered when classifying a shellfish harvest area. Other factors include the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters. As such, the microbial water quality may not demonstrate similar trends to the percentage of areas classified as approved or conditionally approved.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

Sampling at monitoring sites is targeted to approved and conditionally approved areas to ensure they remain safe for shellfish harvesting. Due to program resource constraints, sampling of harvesting areas that have had a long standing restricted or prohibited classifications, often due to a known pollution source, is sometimes stopped. Alternatively, the sample site that used to be in a restricted area will be moved to the new boundary (between the restricted and approved area) where water quality would be expected to be better in order to ensure the new boundary is adequate and does not need to be expanded further. As such, comparison of the percentage of monitoring sites with fecal coliform levels below 43 MPN per 100 mL between years should not be made.

Fecal coliform are bacteria that originate from human and animal waste. The presence of fecal coliform in water reflects the extent of sanitary pollution[2] and their concentration is one of the criteria used to classify shellfish harvest areas. When high fecal coliform levels are detected, it suggests that the consumption of shellfish

[1] The most probable number (MPN) is a statistical estimate of the number of bacteria per unit volume.

[2] Types of pollution that release fecal coliform to the environment, such as wastewater discharge or agricultural runoff.

harvested in the area could be hazardous to human health; this would result in the closure of the site and harvest in these areas would be restricted.

About the indicator

What the indicator measures

If unsafe bacterial levels are measured in water samples or if shoreline surveys identify pollution concerns, Environment and Climate Change Canada makes classification recommendations to its Canadian Shellfish Sanitation Program partners. Fisheries and Oceans Canada opens or closes harvest areas based on those recommendations. The indicator tracks the proportion of harvest areas that is classified approved or conditionally approved and the proportion of samples with fecal coliform levels less than 43 most probable number (MPN) per 100 mL as a coarse measure of the quality of marine coastal water.

Why this indicator is important

The fecal coliform levels in marine waters of shellfish harvest areas are monitored to ensure that shellfish are safe for human consumption. The indicator reflects the quality of, and the extent of bacterial contamination in, marine coastal waters where shellfish are harvested.

Healthy coasts and oceans

This indicator supports the measurement of progress towards the following 2019 to 2022 Federal Sustainable Development Strategy long-term goal: Coasts and oceans support healthy, resilient and productive ecosystems.

Related indicators

The Monitoring disposal at sea indicator reports on the number of disposal sites that show no evidence of pollution in order to determine whether marine disposal site activities have an environmental impact.

The Marine pollution spills indicator reports on oil spills along Canada's coasts that are detected through surveillance. This type of marine pollution could affect shellfish harvest areas.

Data sources and methods

Data sources

Sampling and classification analysis for this indicator are conducted under Environment and Climate Change Canada's Shellfish Water Classification Program.

Data are available for all regions from 2010 to 2018. They represent the classified shellfish harvest areas along the Atlantic, Quebec and Pacific coasts where harvesting is active, or prohibited due to poor water quality or nearby pollution sources.

Classification and sampling data of the shellfish harvest areas can be found on the Open Government Portal.

More information

Due to changes in the Shellfish Water Classification Program, shellfish harvest area classification data from prior to 2010 are not included.

Shellfish Water Classification Program

The Shellfish Water Classification Program is part of the Canadian Shellfish Sanitation Program, a food safety program led by the Canadian Food Inspection Agency in partnership with Environment and Climate Change Canada and Fisheries and Oceans Canada.

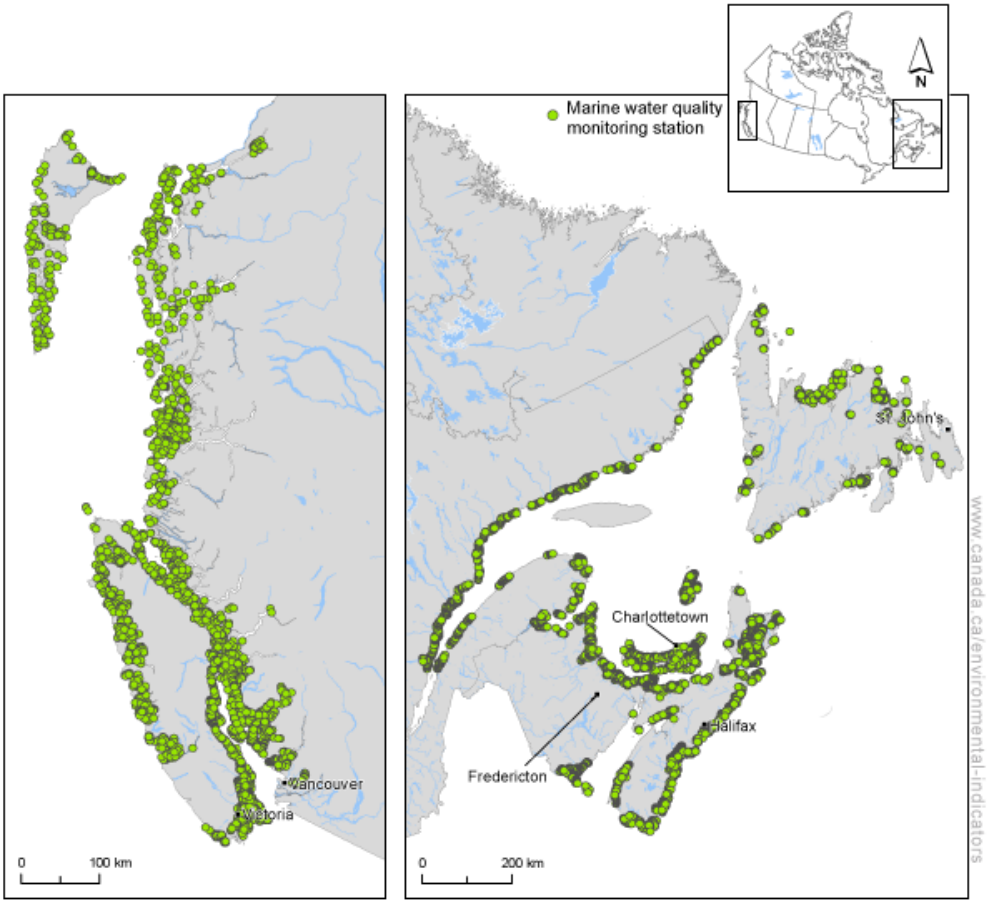
The Shellfish Water Classification Program collects information through site surveys and bacteriological monitoring. Sampling to monitor for fecal coliform bacteria is conducted under varied environmental conditions to ensure that microbiological contamination does not exceed the appropriate guidelines.

That information is the basis for the classification of each area.

Location of monitoring stations

Monitoring is performed along the coast of the Pacific region (British Columbia), Atlantic region (New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island), and Quebec (banks along the St. Lawrence River and the Gulf of St. Lawrence). The following map identifies the different monitoring stations from which data were collected.

Figure 4. Shellfish harvest area monitoring stations, Canada, 2010 to 2018



Note: While this map represents data collection sites from 2010 to 2018, many of these locations are not currently active. Many monitoring sites have not been sampled in recent years due to harvest site closures, the presence of nearby contamination sites, or resource limitations.
Source: Environment and Climate Change Canada (2011) Shellfish Water Classification Program.

Methods

The indicator is the proportion of shellfish harvest areas that is classified as approved or conditionally approved for harvest and the proportion of samples collected with fecal coliform most probable number (MPN) less than 43 per 100 mL. Unless the data suggests that there is a food safety risk, monitored harvest areas that are classified as approved are generally safe for harvest. The status of the harvest area should always be confirmed prior to harvesting.

More information

Site classifications

Shellfish harvesting is prohibited in unclassified shellfish harvesting areas. Interested harvesters must send a written classification request to the Regional Interdepartmental Shellfish Committee (RISC) to access resources in unclassified areas. If accepted, RISC will direct the appropriate authorities to proceed with the classification process. Harvesting will only be permitted if it is classified as approved or conditionally approved, or with a depuration[3] permit for restricted areas.

Site surveys

Site surveys are conducted for each area. They identify actual and potential sources of sanitary pollution and evaluate the meteorological and hydrographic factors that can affect the distribution of microbiological contamination.

Three (3) types of surveys are conducted:

- Comprehensive surveys are conducted when a new area is established and no historical data are available or where significant changes have occurred to pollution status of the area
- Annual review surveys are conducted to reassess existing areas. This is to ensure that no significant change has occurred in the area and that the current classification is still appropriate
- Re-evaluation surveys update the classification of an area by requiring an in depth assessment every three years. A re-evaluation survey may be required within one year depending on the outcome of an annual review

The surveys are paired with bacteriological monitoring and may include a shoreline pollution source investigation.

Bacteriological monitoring

Bacteriological monitoring is conducted to determine the extent of microbiological contamination in marine waters. It is conducted throughout the year and under various environmental conditions to ensure that seasonal factors are considered.

Based on the results, the classification of an area will be recommended by Environment and Climate Change Canada for regulatory implementation by Fisheries and Oceans Canada. Definitions of the different classifications are provided in the table below.

Table 1: Shellfish harvest area classifications

Classification	Definition	Guideline
Approved	Shellfish can be harvested from these areas. The area is not contaminated with fecal material, pathogenic microorganisms, or poisonous or deleterious substances to the extent that consumption of the shellfish might be hazardous.	The median fecal coliform most probable number (MPN) does not exceed 14/100 mL, and no more than 10% of the samples may exceed a fecal coliform MPN of 43/100 mL; or the geometric mean fecal coliform MPN does not exceed 14/100 mL, and the estimated 90th percentile of fecal coliform MPNs does not exceed 43/100 mL.[4]

[3] Depuration is the process of using a controlled aquatic environment to reduce the level of microbiological contamination in live shellfish.

[4] A threshold of 43 MPN per 100 mL is used as pollution events that can signficantly increase fecal coliform levels in an area are usually infrequent.

Classification	Definition	Guideline
Conditionally approved	The area meets the approved classification criteria for a defined period.	The site meets the approved requirements for a defined period, but is subject to intermittent pollution and fails to meet them at predictable or controllable times. When approved requirements are not met, the site is placed in closed status.
Restricted	The area exceeds the standard for the approved classification to the extent that consumption of the shellfish might be hazardous. Shellfish harvest in the area is not permitted, except by special licence requiring that the shellfish go through a purification process prior to consumption.	The site fails to meet the approved requirements, but it is not contaminated enough to be classified as prohibited.
Conditionally restricted	The area meets, at a minimum, the restricted classification criteria for a defined period.	The site meets the restricted criteria but is subject to intermittent pollution and fails to meet restricted criteria at predictable or controllable times. When restricted criteria are not met, the site is placed in closed status.
Prohibited	Shellfish are not permitted to be harvested from prohibited areas for any purpose, with the exception of licensed and regulated harvest for seed, spat and bait and for scientific purposes.	The site is located near pollution sources and shellfish decontamination cannot be performed adequately due to the degree of contamination.

For more information, consult the Canadian Shellfish Sanitation Program Manual.

Recent changes

Due to the addition of the Magdalen Islands in Quebec and changes in the monitoring program in 2010, data regarding the classification of shellfish harvest areas from previous years were excluded.

The indicator now includes the results of bacteriological sampling (fecal coliform) in shellfish harvest areas from 2010 to 2018.

Caveats and limitations

This indicator looks at shellfish harvest area classification based on the measured concentrations and potential for microbiological contamination. It does not provide an analysis, nor does it account for chemical or biotoxin contamination.

Classification boundaries are defined with respect to a variety of factors. Therefore, they are frequently modified and small changes in the monitored area occur over time.

Areas may be classified as prohibited even if routine monitoring indicates that bacteria levels are approved for harvesting. That includes buffer zones around current and potential pollution sources and wharves as a precautionary measure. In addition, areas with bacteria levels less than 43 MPN per 100 mL may be prohibited from harvest if shellfish are contaminated with biotoxins that cause shellfish poisoning or chemical contaminants.

Closure boundaries are drawn for enforcement purposes and may exceed the boundary of the potential pollution and often any shellfish resources within it.

The main objective of the bacteriological contamination monitoring in shellfish harvest areas is to ensure that approved shellfish harvested areas remain safe. Most highly contaminated areas are not monitored for bacteriological contamination as they are under standing closures to prohibit harvesting. Therefore, the indicator may not provide a complete picture of the bacteriological quality of marine waters.

The Shellfish Water Classification Program conducts additional analysis on the results of the bacteriological water sampling that is not captured in the indicator. As such, it does not represent the complete bacteriological analysis.

Although Environment and Climate Change Canada assesses shellfish harvest areas to determine levels of microbiological contamination, those classifications do not reflect whether shellfish harvesting is authorized at a particular location. Areas classified as approved for harvesting may be closed temporarily due to significant weather events, sewage bypasses, or elevated biotoxin contamination as monitored by the Canadian Food Inspection Agency. For more information on the status of shellfish harvest areas, see Fisheries and Oceans Canada's Fishery Openings and Closures and Shellfish Harvesting Map.

Resources

References

Canadian Food Inspection Agency (2020) Canadian Shellfish Sanitation Program Manual. Retrieved on July 3, 2020.

Related information

Canadian Shellfish Sanitation Program

Fishery Openings and Closures

Management of Contaminated Fisheries Regulations

Monitoring Marine Water Quality

Shellfish Harvesting Map

Annex

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Status of shellfish harvest areas, Canada, 2010 to 2018

Year	Approved or conditionally approved shellfish harvest areas (percentage)	Total harvest area (square kilometres)
2010	73	15 426
2011	71	14 625
2012	69	14 981
2013	69	15 026
2014	69	15 061
2015	69	14 920
2016	68	14 931
2017	68	14 885
2018	68	14 839

Note: Shellfish harvest area classifications for human consumption are partially based on contamination by fecal coliform bacteria. These are microorganisms that originate from human and animal waste. Refer to Table 1 for more information on the classification definitions based on fecal coliform bacteria levels. Other factors considered when classifying sites are the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

Table A.2. Data for Figure 2. Status of regional shellfish harvest areas, Canada, 2010 to 2018

Year	Atlantic (percentage of approved or conditionally approved areas)	Atlantic (square kilometres)	Quebec (percentage of approved or conditionally approved areas)	Quebec (square kilometres)	Pacific (percentage of approved or conditionally approved areas)	Pacific (square kilometres)
2010	66	6 683	80	4 120	77	4 623
2011	64	6 343	80	4 126	72	4 156
2012	64	6 424	78	4 144	69	4 413
2013	64	6 426	77	4 197	69	4 403
2014	64	6 433	76	4 197	71	4 431
2015	64	6 435	76	4 152	69	4 333
2016	63	6 441	75	4 211	69	4 279
2017	63	6 432	74	4 210	69	4 243
2018	63	6 434	74	4 211	68	4 194

Note: Shellfish harvest area classifications for human consumption are partially based on contamination by fecal coliform bacteria. These are microorganisms that originate from human and animal waste. Refer to Table 1 for more information on the classification definitions based on fecal coliform bacteria levels. Other factors considered when classifying sites are the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters. For more information regarding the location of shellfish harvest areas, see Location of monitoring stations.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

Table A.3. Data for Figure 3. Bacteriological status of shellfish harvest areas, Canada, 2010 to 2018

Year	Atlantic (Percentage of monitoring sites with no samples exceeding 43 MPN per 100 mL)	Pacific (Percentage of monitoring sites with no samples exceeding 43 MPN per 100 mL)	Quebec (Percentage of monitoring sites with no samples exceeding 43 MPN per 100 mL)
2010	76	94	94
2011	77	94	96
2012	82	93	96
2013	79	92	94
2014	81	91	97
2015	82	91	95
2016	84	94	98
2017	91	91	94
2018	87	93	98

Note: A fecal coliform level of 43 MPN per 100 mL was used as the threshold as samples with fecal coliform concentrations above this level are likely to influence the classification of the shellfish harvest area. Fecal coliform MPN measures the potential of disease-causing bacteria to be present in significant concentrations. It is only one of the factors considered when classifying a shellfish harvest area. Other factors include the presence of potential pollution sources which require standing closures, biotoxins and chemicals in marine waters. As such, the microbial water quality may not demonstrate similar trends to the percentage of areas classified as approved/conditionally approved.
Source: Environment and Climate Change Canada (2020) Shellfish Water Classification Program.

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