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Climate Change Canada

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SHELLFISH HARVEST AREA WATER QUALITY

CANADIAN ENVIRONMENTAL
SUSTAINABILITY INDICATORS



Canada 

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS SHELLFISH HARVEST AREA WATER QUALITY

February 2023

Table of contents

Shellfish harvest area water quality	5
Key results	5
Regional shellfish harvest area water quality	6
Key results	6
Shellfish harvest area bacteriological water quality	7
Key results	7
About the indicators	8
What the indicators measure	8
Why these indicators are important	8
Related initiatives	8
Related indicators	8
Data sources and methods	9
Data sources	9
Methods	10
Caveats and limitations	12
Resources	13
References	13
Related information	13
Annex	14
Annex A. Data tables for the figures presented in this document	14

List of Figures

Figure 1. Percentage of shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021	5
Figure 2. Percentage of regional shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021	6
Figure 3. Percentage of shellfish harvest area sites with safe bacteriological levels, Canada, 2010 to 2021	7
Figure 4. Shellfish harvest water monitoring areas, Canada, 2010 to 2021	10

List of Tables

Table 1: Shellfish harvest area water classifications	11
Table A.1. Data for Figure 1. Percentage of shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021.....	14
Table A.2. Data for Figure 2. Percentage of regional shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021	14
Table A.3. Data for Figure 3. Percentage of shellfish harvest area sites with safe bacteriological levels, Canada, 2010 to 2021	15

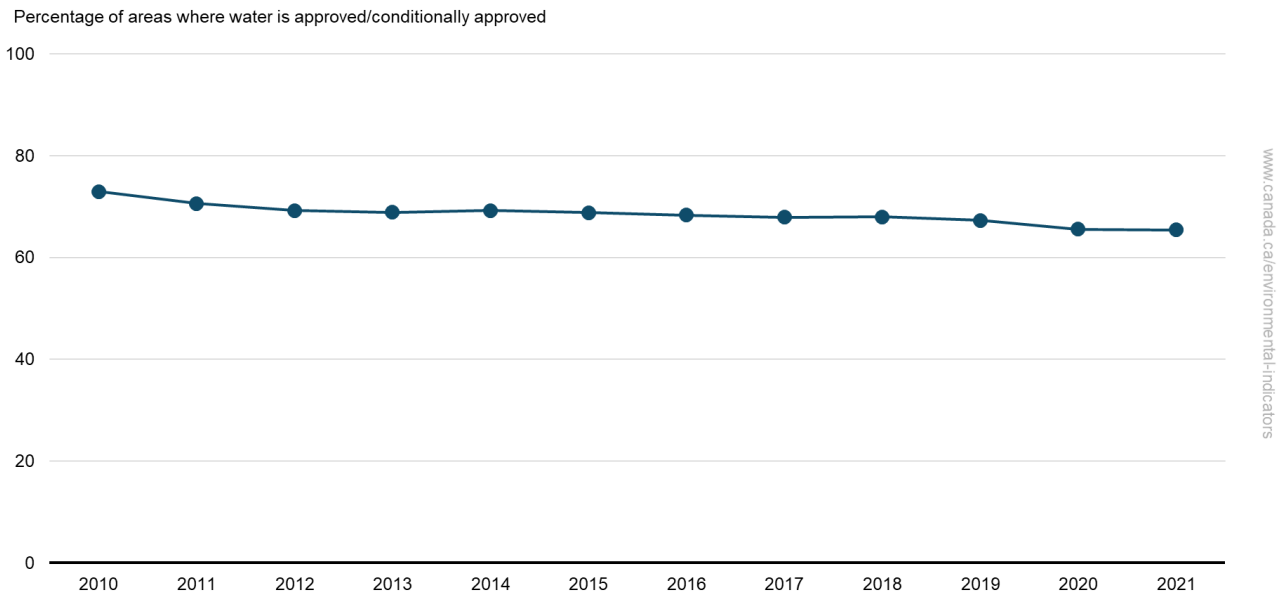
Shellfish harvest area water quality

Most bivalve shellfish (such as mussels, oysters, clams and scallops) are filter feeders that accumulate contaminants, such as bacteria and pollutants, from their surroundings. When contaminants have the potential to make shellfish unsafe to eat, harvest areas are closed to ensure food safety. Water classification recommendations are made based on bacterial levels measured in water samples and pollution concerns identified through shoreline surveys. The proportion of shellfish harvest areas where the water is classified as approved or conditionally approved is a partial measure of the quality of marine coastal water.

Key results

- In 2021, the water in 65% of Canada's monitored shellfish harvest areas was classified as approved or conditionally approved. This proportion has declined slightly since 2010.

Figure 1. Percentage of shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021



[Data for Figure 1](#)

Note: Shellfish harvest area water quality classifications for human consumption are based on contamination by fecal coliform bacteria (microorganisms that originate from human and animal waste), potential pollution sources and other considerations. Refer to [Table 1](#) in the Data sources and methods for more information on the classification definitions based on fecal coliform bacteria levels.

Source: Environment and Climate Change Canada (2022) [Shellfish Water Classification Program](#).

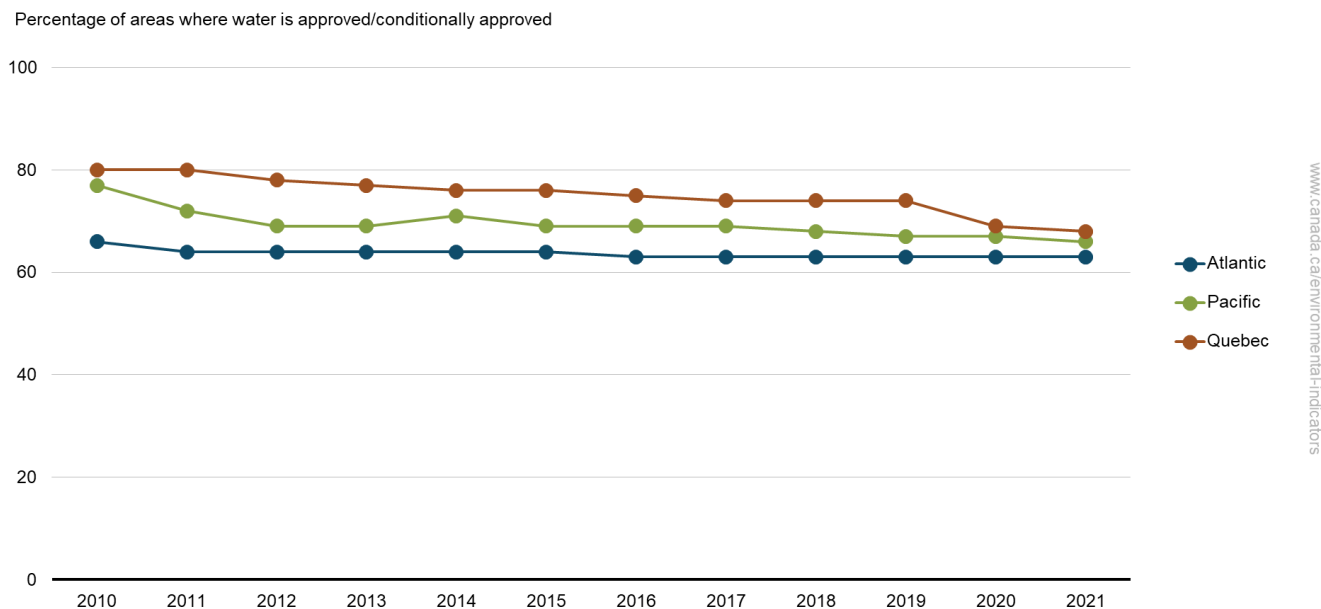
Shellfish may be harvested from areas where the water quality is classified as approved with appropriate permits where applicable. Harvesting shellfish from areas where the water quality is classified as restricted is not permitted except with a licence under the *Management of Contaminated Fisheries Regulations*. Shellfish harvested from areas where the water is classified as restricted 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 water quality

Key results

- On the Quebec coast, the water quality in 68% of all monitored shellfish harvest areas was classified as approved or conditionally approved, compared to 66% on the Pacific coast and 63% on the Atlantic coast
- Since 2010, the percentage of shellfish harvest areas where the water quality was classified as approved on the Quebec coast has gradually declined, with a more noticeable decline from 2019 to 2020
- Along the Atlantic and Pacific coasts, the percentage of areas where the water quality was classified as approved has been relatively stable since 2012

Figure 2. Percentage of regional shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021



[Data for Figure 2](#)

Note: Shellfish harvest area water quality classification for human consumption is partially based on contamination by fecal coliform bacteria (microorganisms that originate from human and animal waste), potential pollution sources and other considerations. 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). Refer to Table 1 in the Data sources and methods for more information on the classification definitions based on fecal coliform bacteria levels and [Figure 4](#) for information on the locations of monitoring areas.

Source: Environment and Climate Change Canada (2022) [Shellfish Water Classification Program](#).

The decline in the percentage of harvest areas where the water quality is classified as approved or conditionally approved along the Quebec coast is mainly due to improved knowledge such as new potential sources of pollution or extent of harvesting activity in a given area, or lack thereof.

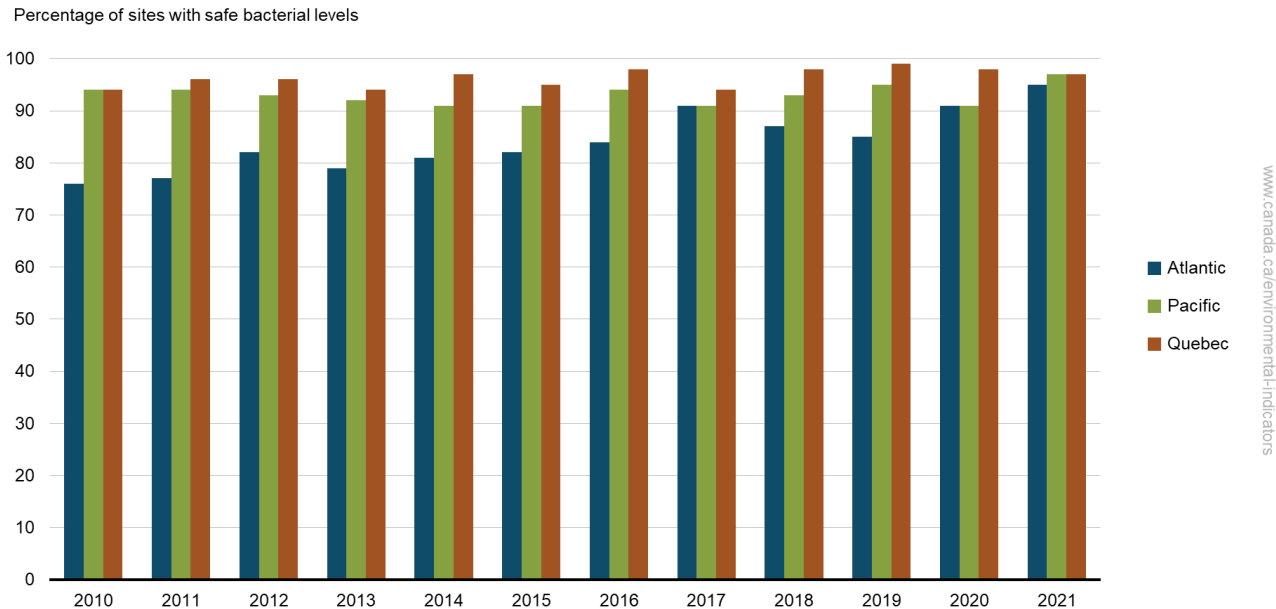
Shellfish harvest area bacteriological water quality

Key results

In 2021, fecal coliform levels below the threshold of 43 most probable number (MPN¹) per 100 mL were found in:

- 97% of all samples collected from the Quebec coast
- 97% of all samples collected from the Pacific coast
- 95% of all samples collected from the Atlantic coast

Figure 3. Percentage of shellfish harvest area sites with safe bacteriological levels, Canada, 2010 to 2021



[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 suggest that shellfish harvested in the area could be hazardous for human consumption. Fecal coliform MPN measures the potential of disease-causing bacteria to be present in significant concentrations. It is one of the factors considered when classifying the water in a shellfish harvest area. As such, the microbial water quality may not demonstrate similar trends to the percentage of areas where the water is classified as approved or conditionally approved.

Source: Environment and Climate Change Canada (2022) [Shellfish Water Classification Program](#).

Fecal coliform are bacteria that originate from human and animal waste. The presence of fecal coliform in water reflects the extent of sanitary pollution² and their concentration is one of the criteria used to classify the water quality in shellfish harvest areas. When high fecal coliform levels are detected, it suggests that the consumption of shellfish harvested in the area could be hazardous to human health; this would result in the water being classified as restricted and the shellfish harvesting area would be closed.

Sampling in shellfish harvesting areas that have had long standing water classification of restricted or prohibited, often due to a known pollution source, is sometimes stopped. With some exceptions, areas where the water is classified as prohibited are not sampled. Sample sites may also be moved to focus on areas where the water is classified as approved, rather than on areas where it is already known to be restricted. As a result, a meaningful comparison of the percentage of monitoring sites with fecal coliform levels below 43 MPN per 100 mL between years cannot be made.

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.

About the indicators

What the indicators measure

If unsafe bacterial levels are measured in water samples or if shoreline surveys identify pollution concerns, Environment and Climate Change Canada makes water classification recommendations to its [Canadian Shellfish Sanitation Program](#) partners. Fisheries and Oceans Canada opens or closes shellfish harvest areas based on those recommendations. While elements of program operations and implementation have some impact on the results, the indicators track the proportion of shellfish harvest areas that have their water quality classified as 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 these indicators are important

The fecal coliform levels in marine waters of shellfish harvest areas are monitored to ensure that shellfish are safe for human consumption. The indicators provide a measure of the quality of, and the extent of bacterial contamination in, marine coastal waters where shellfish might be harvested.

Related initiatives

These indicators support the measurement of progress towards the following [2022 to 2026 Federal Sustainable Development Strategy](#) long-term goal: Conserve and protect Canada's Oceans.

In addition, the indicators contribute to the [Sustainable Development Goals of the 2030 Agenda for Sustainable Development](#). They are linked to Goal 14: Life below water.

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 water quality in shellfish harvest areas.

Data sources and methods

Data sources

Water sampling and classification analysis for the indicators are conducted under Environment and Climate Change Canada's [Shellfish Water Classification Program](#).

Data are available for all regions from 2010 to 2021. They represent the classified shellfish harvest areas along the Atlantic, Quebec and Pacific coasts where harvesting is active, or prohibited.

Water [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 water classification data 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.

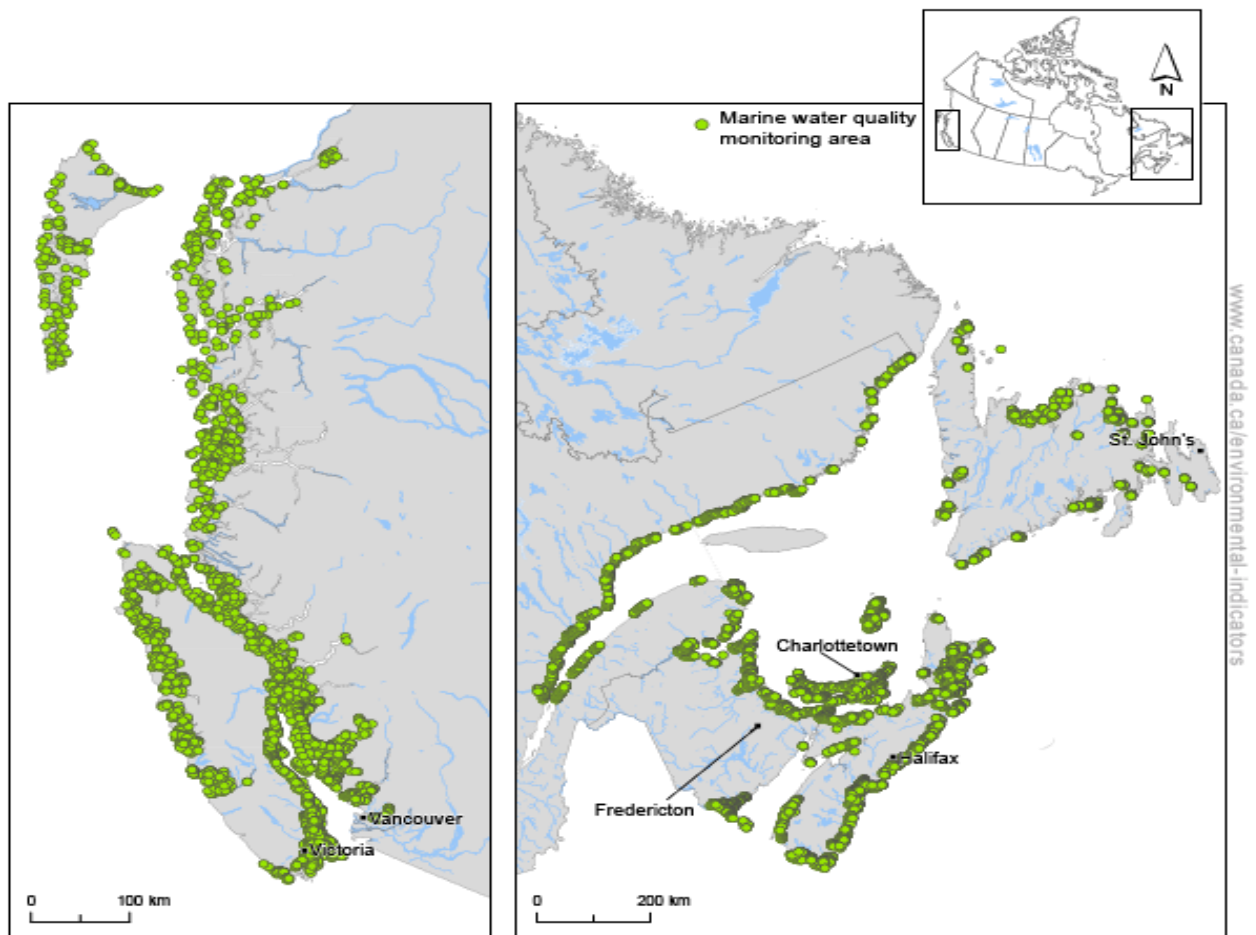
The Shellfish Water Classification Program collects information through area surveys and bacteriological monitoring. Sampling to monitor for fecal coliform bacteria is conducted under varied environmental conditions to ensure that microbiological contamination does not exceed the appropriate guidelines.

That information is the basis for the water 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 areas from which data were collected.

Figure 4. Shellfish harvest water monitoring areas, Canada, 2010 to 2021



Note: While this map represents data collection areas from 2010 to 2021, many of these locations are not currently active. Many water monitoring areas have not been sampled in recent years due to harvest area closures, the presence of nearby contamination sites, or resource limitations.

Source: Environment and Climate Change Canada (2011) [Shellfish Water Classification Program](https://www.ec.gc.ca/shellfish/).

Methods

The indicators are the proportion of shellfish harvest areas that have their water classified as approved or conditionally approved 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 areas that have their water classified as approved are generally safe for harvest from that standpoint. The status of a harvest area should always be confirmed prior to harvesting.

More information

Area classifications

Shellfish harvesting is prohibited in areas where the water is unclassified. Interested harvesters must send a written classification request to the Regional Interdepartmental Shellfish Committee (the Committee) to access resources in unclassified areas. If accepted, the Committee will direct the appropriate authorities to proceed with the classification process. Harvesting might be permitted if the

area has the water classified as approved or conditionally approved, or with a depuration³ permit for areas where the water is classified as restricted.

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 sanitary conditions 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 water classification is still appropriate
- Re-evaluation surveys update the water classification of an area by requiring an in depth assessment every 3 years. A re-evaluation survey may be required within 1 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 water 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 water classifications are provided in the table below.

Table 1: Shellfish harvest area water 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
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

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 significantly increase fecal coliform levels in an area are usually infrequent.

Classification	Definition	Guideline
		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](#).

Caveats and limitations

This indicator looks at shellfish harvest area water 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.

The waters in areas may be classified as prohibited even if routine monitoring indicates that bacteria levels are approved. 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 classified as prohibited 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 monitoring water quality in shellfish harvest areas is to ensure that the shellfish remain safe for human consumption. Highly contaminated areas are typically not monitored as they are already closed to harvesting. Therefore, the indicator does 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 of the water, those classifications do not reflect whether shellfish harvesting is authorized at a particular location. Areas where the water is classified as approved 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 (2022) [Canadian Shellfish Sanitation Program Manual](#). Retrieved on October 31, 2022.

Related information

[Canadian Shellfish Sanitation Program](#)

[Fishery Openings and Closures](#)

[*Management of Contaminated Fisheries Regulations*](#)

[Shellfish Harvesting Map](#)

[Shellfish Water Classification Program](#)

Annex

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

Table A.1. Data for Figure 1. Percentage of shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021

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
2019	67	14 776
2020	66	14 310
2021	65	14 288

Note: Shellfish harvest area water quality classifications for human consumption are partially based on contamination by fecal coliform bacteria (microorganisms that originate from human and animal waste), potential pollution sources and other considerations. Refer to [Table 1](#) in the Data sources and methods for more information on the classification definitions based on fecal coliform bacteria levels.

Source: Environment and Climate Change Canada (2022) [Shellfish Water Classification Program](#).

Table A.2. Data for Figure 2. Percentage of regional shellfish harvest areas where the water quality was classified as approved or conditionally approved, Canada, 2010 to 2021

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

2019	63	6 435	74	4 260	67	4 081
2020	63	6 403	69	3 844	67	4 063
2021	63	6 403	68	3 835	66	4 050

Note: Shellfish harvest area water quality classifications for human consumption are partially based on contamination by fecal coliform bacteria (microorganisms that originate from human and animal waste), potential pollution sources and other considerations. 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). Refer to [Table 1](#) in the Data sources and methods for more information on the classification definitions based on fecal coliform bacteria levels and [Figure 4](#) for information on the locations of monitoring areas.

Source: Environment and Climate Change Canada (2022) [Shellfish Water Classification Program](#).

Table A.3. Data for Figure 3. Percentage of shellfish harvest area sites with safe bacteriological levels, Canada, 2010 to 2021

Year	Atlantic (percentage of monitoring areas with no samples exceeding 43 MPN per 100 mL)	Pacific (percentage of monitoring areas with no samples exceeding 43 MPN per 100 mL)	Quebec (percentage of monitoring areas 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
2019	85	95	99
2020	91	91	98
2021	95	97	97

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 one of the factors considered when classifying a shellfish harvest area. 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 (2022) [Shellfish Water Classification Program](#).

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