Fisheries and Oceans Canada | Pêches et Océans Canada
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Quebec Region

Canadian Science Advisory Secretariat
Science Advisory Report 2025/017

STOCK ASSESSMENT OF WHELK (*BUCCINUM UNDATUM*) IN QUEBEC'S COASTAL WATERS IN 2024

CONTEXT

The Fishery Management Branch of Fisheries and Oceans Canada (DFO) has requested Science advice on the status of whelk (*Buccinum undatum*) stocks in Areas 1 to 15 for the 2025–2027 fishing seasons.

This Science Advisory Report is from the February 7, 2025, regional peer review on the Quebec Coastal Waters Whelk (*Buccinum undatum*) Stock Assessment in 2024. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- The average catch per unit of effort (CPUE) for 2022–2024 is below the historical average (2002–2021) in Areas 1 (-24%), 2 (-40%), 3 (-54%), 4 (-16%), 5 (-29%), 6 (-34%) and 8 (La Romaine: -49% and Blanc-Sablon: -25%) on the North Shore; in Areas 12 (-60%) and 13 (-50%) in the Gaspé Peninsula–Lower St. Lawrence; and in Area 15 (-28%) in the Magdalen Islands.
- Stock status is uncertain in Areas 10 and 14, where there is no fishing, and in Areas 7, 9 and 11, where fishing effort is sporadic and low.

Trends

- The CPUE trend has been downward for at least six years in all fishing areas in Quebec.
- The densities of legal-size whelk and recruits observed during the biennial research survey conducted in 2024 in Areas 1 and 2 on the Upper North Shore are lower than those of the 2022 survey and are among the lowest values in the historical series (2005–2024).

Ecosystem and Climate Change Considerations

- The seabed of fishing sites in the Estuary and Gulf of St. Lawrence, mostly in the 10–30 m range, are experiencing an increase in water temperature and in the abundance of crustacean predators such as lobster and rock crab. However, these ecosystem changes and their effects on whelk stock productivity have not been quantified.

Stock Advice

- The status of exploited stocks is worrying. These stocks do not appear to be able to sustain the fishing effort of recent years, and TACs should be adjusted accordingly.

- The very low abundance of recruits observed since 2017 in research surveys in Areas 1 and 2 on the Upper North Shore poses a risk to stock sustainability in the coming years.
- Because whelk populations are susceptible to local depletion, the breeding season should be protected. This could be achieved by establishing refuge areas within each fishing area or by implementing other strategies to protect the resource.

Other Management Questions

- As indicated in the 2022 Science Advisory Report, management measures should be adjusted in Areas 4 and 5 to better align with the T_{50} (90 mm) to ensure the sustainability of the resource.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

The assessment approach was adopted in the 2012 stock assessment (Brulotte 2012).

Assessment Type

Full assessment

Most Recent Assessment Date

1. Last Full Assessment: 2022 (DFO 2022 and Gianasi 2023)
2. Last Interim-Year Update: N/A

Assessment Approach

1. Broad category: Data-poor
2. Specific category: Index-based (including fishery-dependent and fishery-independent indices

Stock Structure Assumption

- Stock structure remains unknown. However, the absence of a planktonic larval phase limits exchanges with adjacent populations and restricts the ability to recolonize overexploited sites. As a result, this species is particularly vulnerable to local depletion (Brulotte 2012; Gianasi 2023).

Reference Points

- Limit Reference Point (LRP): N/A
- Upper Stock Reference (USR): N/A
- Removal Reference (RR): N/A
- Target Reference Point(TRP): N/A

Data

- Landings: 1949–2024 (total landings in Quebec), 1993–2024 (landings by fishing area)

- Commercial fishing effort: 2002–2024
- Biennial research survey in fishing areas 1 and 2: 2005–2024
- Dockside sampling to determine the size structure of land whelks: 1987–2024

ASSESSMENT

Stock status and trend in Fishing Area 1

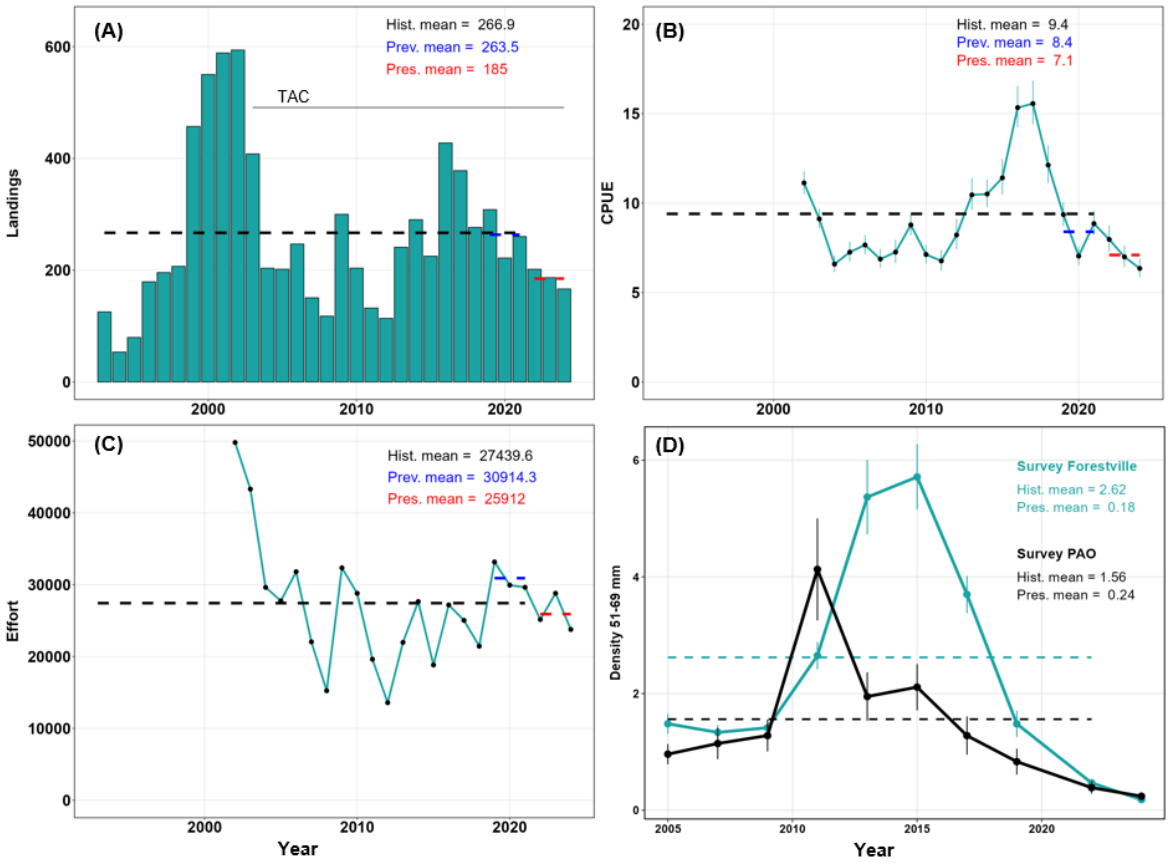

Figure 1. Status of whelk stock in Area 1. A) Annual landings (bars, tonnes) and total allowable catch (TAC, solid line, tonnes), (B) catch per unit effort (CPUE, kg/trap, mean ± confidence interval) from the commercial fishery, (C) Effort (number of traps hauled) from the commercial fishery, and (D) density (number/100 m^2, mean ± standard error) of pre-commercial size whelk (51–69 mm) in the research survey at Forestville and Pointe-aux-Outardes (PAO). For figures A to C, the black dotted lines represent the historical mean ("Hist. mean."), the mean for the previous assessment period is in blue ("Prev. mean"), and the mean for the present assessment is in red ("Pres. mean"). As for Figure D, the dotted lines indicate the historical mean for research surveys at Forestville (green line) and Pointe-aux-Outardes (black line).

Landings

Landings exceeded 500 t between 2000 and 2002 before gradually declining to 114 t in 2012. Between 2013 and 2016, they rose to a peak of 427 t. Since then, landings have been declining. Average landings for the 2022–2024 period were 185 t, below the historical mean (-30%, 1993–2021). A preventive TAC of 491 t, implemented in 2003, has never been reached (Figure 1A).

Catch per unit effort

CPUE fell from 11 to 7 kg/trap from 2002 to 2004 (Figure 1B). Until 2012, CPUE was fairly stable, fluctuating between 7 and 9 kg/trap. Between 2013 and 2017, CPUE increased to 15 kg/trap. Since 2017, there has been a strong downward trend. The average CPUE for the 2022–2024 period is 7 kg/trap, below the historical mean (-24%, 2002–2021).

Effort

Fishing effort fell sharply between 2002 and 2012, from 50,721 to 13,575 traps hauled (Figure 1C). It then increased until 2019, reaching a peak of 32,964 traps hauled before declining. For the 2022–2024 period, the mean effort was 25,912 traps hauled, which is close to the historical mean (Figure 1C).

Recruitment

Densities of pre-commercial size whelk (51–69 mm) in the Forestville sector research survey increased between 2005 and 2015, reaching a maximum of 5.7 whelk/100 m2. Since 2015, densities have been declining sharply. In the Pointe-aux-Outardes sector, where fishing is sporadic, densities reached a maximum of 4.2 whelk/100 m2 in 2013, but the trend has been downward ever since. In 2024, densities reached the lowest level in the historical series (2005–2024), at 0.2 whelk/100 m2 in both locations (Figure 1D).

Stock status and trend in Fishing Area 2

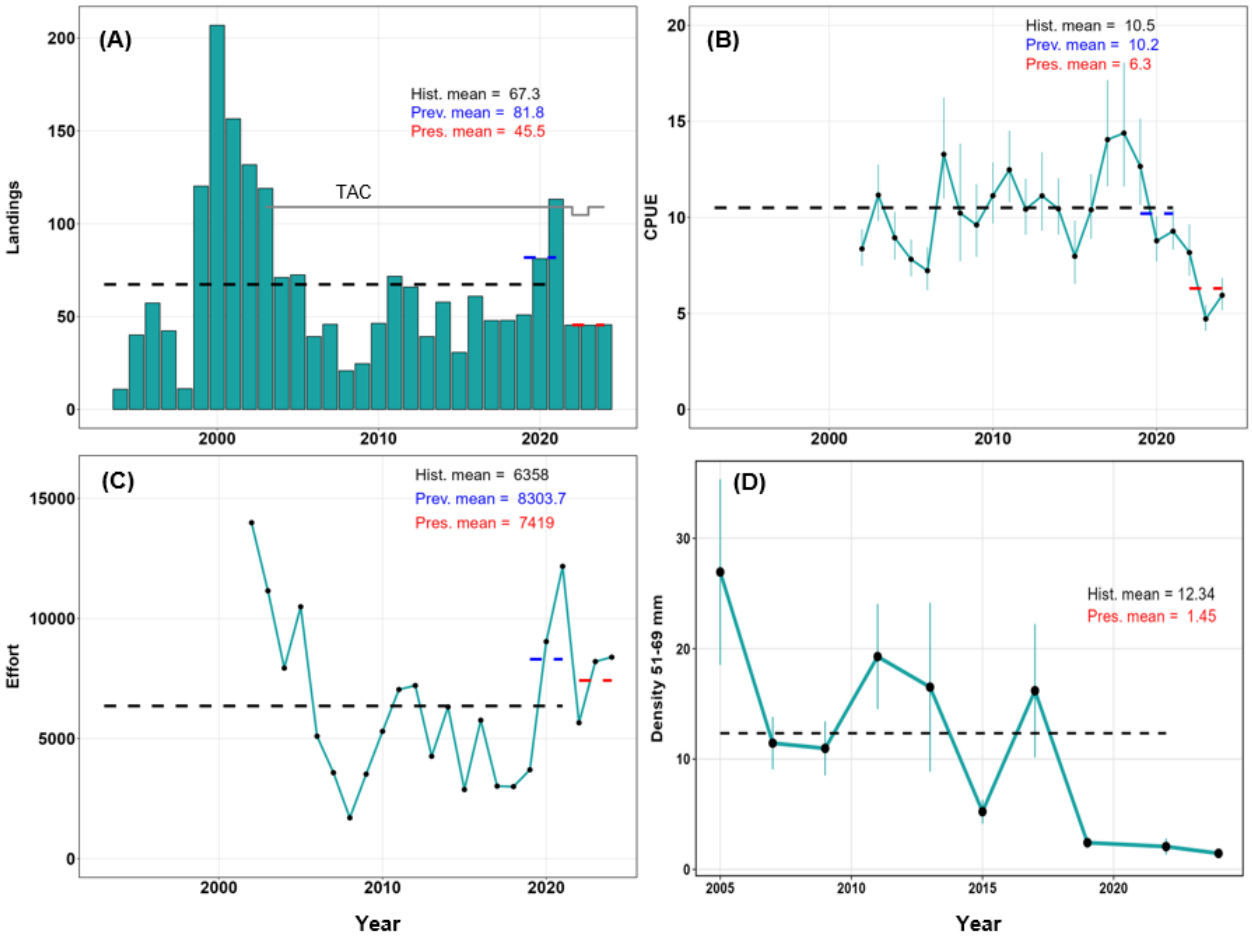

Figure 2. Status of whelk stock in Area 2. A) Annual landings (bars, tonnes) and total allowable catch (TAC, solid line, tonnes), (B) catch per unit effort (CPUE, kg/trap, mean ± confidence interval) from the commercial fishery, (C) Effort (number of traps hauled) from the commercial fishery, and (D) density (number/100 m^2, mean ± standard error) of pre-commercial size whelk (51–69 mm) in the Baie-Comeau research survey. The black dotted lines represent the historical mean ("Hist. mean"), the mean for the last assessment period is in blue ("Prev. mean") and the mean for the present assessment is in red ("Pres. mean").

Landings

After exceeding 200 t in 2000, landings gradually declined to 21 t in 2008. Between 2009 and 2018, they increased and stabilized at around 50 t. In 2021, a second peak of 133 t was recorded, but landings have been declining ever since. Average landings over the last three years were 45 t, below the historical mean (-32%, 1993–2021). A TAC of 109 t was implemented in 2003 and was exceeded by 4 t (3.8%) in 2021 (Figure 2A).

Catch per unit effort

CPUE fluctuated between 7 and 12 kg/trap from 2002 to 2016 (Figure 2B). Thereafter, it increased, reaching a maximum of 15 kg/trap in 2018. Since 2019, there has been a strong downward trend. The mean CPUE for the 2022–2024 period is 6 kg/trap and is below the historical mean (-40%, 2002–2021).

Effort

Fishing effort fell sharply between 2002 and 2008, from 14,731 to 1,700 traps hauled (Figure 2C). It then increased until 2021, reaching a peak of 12,173 traps hauled before declining. For the 2022–2024 period, the mean effort was 7,419 traps hauled, which is close to the historical mean (Figure 2C).

Recruitment

Densities of pre-commercial whelk (51–69 mm) in the research survey were high in 2005 but have declined significantly since then. In 2024, mean density reached the lowest level in the historical series, at 1.4 whelk/100 m2 (Figure 1D).

Stock status and trend in Fishing Areas 3 to 15

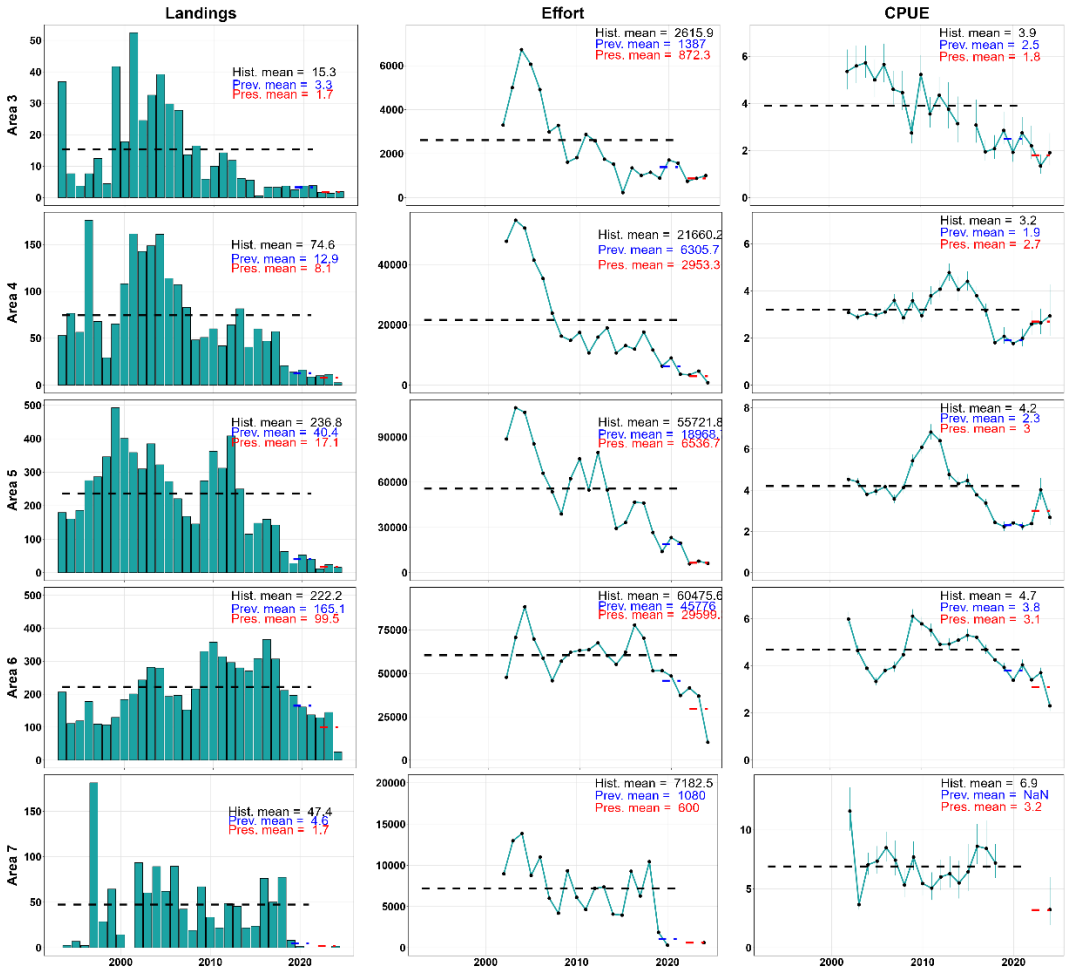

Figure 3. Status of whelk stocks in Areas 3 to 7. Commercial landings (tonnes), effort (number of traps hauled) and catch per unit effort (CPUE, kg/trap, mean ± confidence interval). The black dotted lines represent the historical mean ("Hist. mean"), the mean for the previous assessment period is in blue ("Prev. mean") and the mean for the present assessment is in red ("Pres. mean").

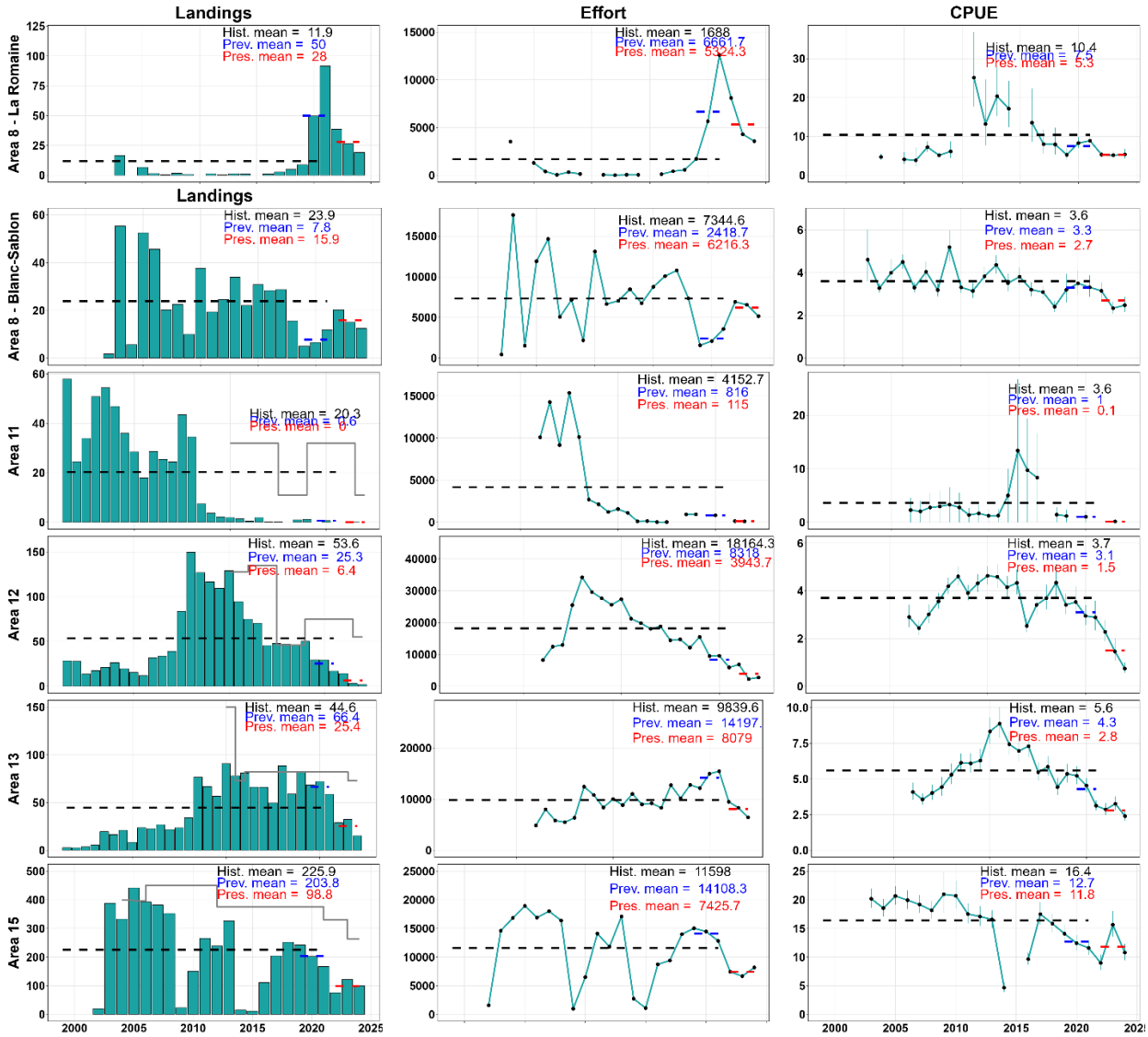

Figure 4. Status of whelk stocks in Areas 8 to 15. Commercial landings and total allowable catches (TAC in tonnes), effort (number of traps hauled) and catch per unit effort (CPUE, kg/trap, mean ± confidence interval). Area 8 fishing indicators are presented separately for Blanc-Sablon and La Romaine. The black dotted lines represent the historical mean ("Hist. mean"), the mean for the previous assessment period is in blue ("Prev. mean") and the mean for the present assessment is in red ("Pres. mean").

Landings

Landings peaked between 2002 and 2007 in Areas 3, 4, 5, 7, 11 and 15, before gradually declining until 2024. In Areas 6, 12 and 13, landings peaked between 2010 and 2020 and have been declining ever since. In Area 8, landings were relatively high in the Blanc-Sablon region between 2002 and 2017, before declining. In contrast, they were very low in the La Romaine area but rose sharply between 2018 and 2020. Since then, they have been declining (Figures 3 and 4). There was no fishing in Areas 9, 10 and 14 (2022–2024), 7 (2022 and 2023), and 11 (2024). Moreover, landings were very low in Areas 7 (2024) and 11 (2022 and 2023). Mean landings in the last three years are below the historical mean (1993–2024) in Areas 3, 4, 5, 6, 7, 11, 12, 13, 15 and Blanc-Sablon (Area 8), while they are above the mean in La Romaine

(Area 8). In areas managed by a total allowable catch (TAC), this was not reached in Areas 11, 12, 13 and 15 (Figures 3 and 4).

Effort

Fishing effort has fallen sharply since 2002–2005 in Areas 3, 4, 5, 6, 7 and 11. Mean effort for the 2022–2024 period is among the lowest in the historical series (Figures 3 and 4). In Area 8, effort has varied considerably over the years in the Blanc-Sablon area, while it rose sharply in the La Romaine area between 2019 and 2021, before declining from 2022 onwards. In Area 13, fishing effort gradually increased until 2021, but has been declining since. In Area 15, effort remains highly variable. Average effort for the 2022–2024 period is below the historical mean (1993–2024) in all areas and in Blanc-Sablon (Area 8), while it is above the mean in the La Romaine area (Area 8).

Catch per unit effort (CPUE)

CPUE has varied by fishing area over the years. The trend has been downward since 2002–2004 in Areas 3, 7 and 15, and since 2005–2010 in Areas 4, 5, 6, 11, 12 and 13. In Area 8, CPUE was relatively stable until 2015 in the Blanc-Sablon area but has been declining since, while in the La Romaine area, CPUE has been declining since 2011. The mean CPUE in the last three years is below the historical mean (2002–2021) in Areas 3 (-54%), 4 (-16%), 5 (-29%), 6 (-34%), 7 (-54%), 8 (Blanc-Sablon: -25% and La Romaine: -49%) on the North Shore, in Areas 12 (-60%) and 13 (-50%) in the Gaspé Peninsula / Lower St. Lawrence region, and in Area 15 (-28%) in the Magdalen Islands region (Figures 3 and 4).

History of fisheries management and landings

Fisheries management

Whelk females are larger than males at sexual maturity. As a result, the minimum legal size (MLS) is based on the size of females. In 2022, the size at which 50% of females were sexually mature (T_{50}) was reassessed in certain areas, and increases were recommended in Areas 4, 5, 6, 7, 8, 12 and 13. However, in 2024, the MLS in Areas 4 and 5 remained below the T_{50} (Table 1).

In 2024, only 43 of 229 licences were active in Quebec. Thus, stocks may not be able to support the full potential fishing effort.

Table 1. Average size at which 50% of female whelks are sexually mature (T_{50}), minimum legal size (MLS) suggested during the 2022 peer review and MLS in 2024.

Fishing area	T_{50} (mm)	Suggested MLS (mm)	MLS in 2024 (mm)
1	69.9	70	70
2	62.0	70	70
3	-	80	80
4	89.7	90	85
5	92.8	90	85
6	85.7	85	85
7	-	85	85
8	80.2	80	80
12	79.5	80	80
13	76.0	80	80
15	74.6	75	75

Landings

From 1993 to 1998, annual landings ranged from 493 to 1,032 t, with the vast majority coming from the North Shore (Figure 5). They then increased to reach a peak of 2,000 t in 2003, coinciding with the start of the Magdalen Islands fishery. Landings then declined until 2008, mainly on the North Shore, before stabilizing. Between 2009 and 2016, Quebec landings fluctuated between 937 and 1,484 t but have been declining since 2016. In 2024, landings were 406 t, the lowest value since 1993, with 72% coming from the North Shore, 4% from the Gaspé Peninsula / Lower St. Lawrence and 24% from the Magdalen Islands (Figure 5).

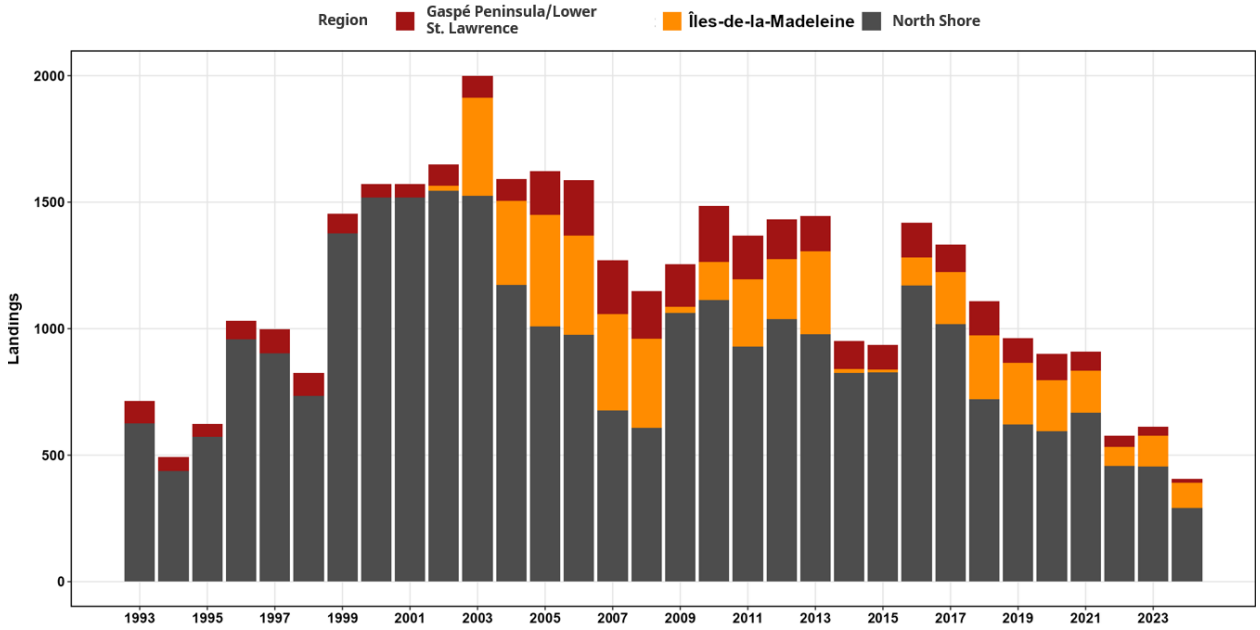

Figure 5. Annual landings (tonnes) by the commercial whelk fishery in various regions of Quebec.

Ecosystem and Climate Change Considerations

Environmental conditions, notably water temperature and acidification, can influence stock productivity and fishery performance. Higher-than-normal surface temperatures have been recorded in the Estuary and Gulf of St. Lawrence in recent years (Galbraith et al. 2024), and these changes could have a greater impact on stocks in the future as the climate continues to warm.

Whelk is a common cold-water species from the infralittoral zone (below the low-water mark) to depths of over 30 metres. High temperatures can lead to variations in growth rate, which can impact size at maturity and thus increase the species' vulnerability to fishing. They may also alter its distribution, notably by encouraging whelk to migrate to deeper waters, which could affect CPUE at traditional fishing sites.

Whelk can be important prey for species such as lobster (*Homarus americanus*) and rock crab (*Cancer irroratus*). In recent years, favourable environmental conditions have increased the relative abundance of lobster, which could potentially increase predation on juvenile and adult whelks.

SOURCES OF UNCERTAINTY

For almost all fishing areas, the absence of fishery-independent indicators such as those from research surveys means that whelk advisory reports depend on the quality of data from logbooks and commercial catch sampling.

Catch rates from the commercial fishery are often used to assess stocks when data are limited. However, these indicators can be influenced by various factors, such as fish harvesters' behaviour, technological advances and environmental variations. In addition, "hyperstability" can distort estimates by artificially maintaining high CPUEs despite a real decline in abundance. This can occur as fishing expands into new areas, masking the overall decline in the stock. To mitigate these biases, appropriate spatial management of fishing areas is essential.

The fact that whelk fishing is a complementary fishery in many areas means that fishing effort sometimes varies during the season and between years. The entry of less experienced fisherman or the departure of experienced fisherman can also affect fishing yields.

The minimum legal size (MLS)was increased in 2023 in Areas 4, 5, 6, 7 (from 80 to 85 mm), 8, 11, 12 and 14 (from 75 to 80 mm), as well as in 2024 in Area 13 (from 75 to 80 mm), which may partly explain the decrease in CPUE in recent years (2022–2024).

The lack of information on the impacts of fishing remains a concern, particularly with regard to the survival of juveniles discarded during sorting on fishing boats, as well as the number of juveniles caught and then released.

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SOURCES OF INFORMATION

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