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Quebec Region

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Science Advisory Report 2024/025

ASSESSMENT OF THE ÎLES-DE-LA-MADELEINE ATLANTIC SURFCLAM STOCK IN 2023

DFO Quebec Region.

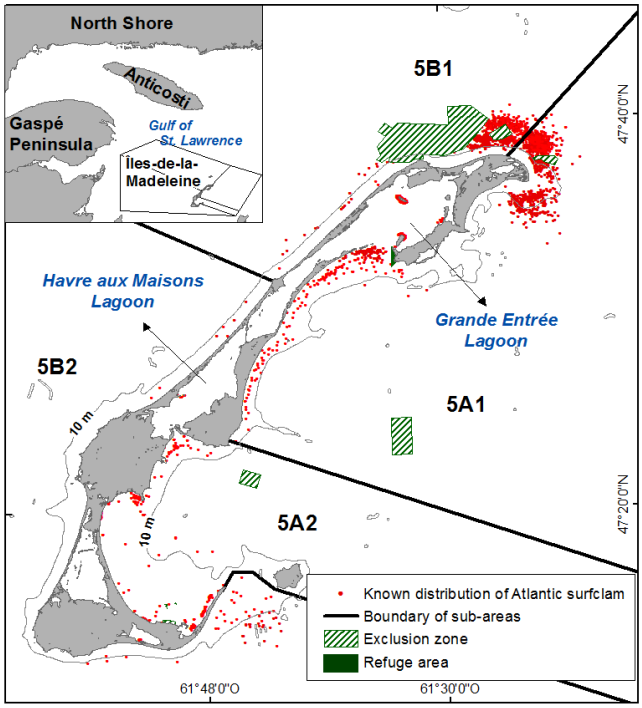

Figure 1. Management sub-areas (5A1, 5A2, 5B1 and 5B2) and known distribution of the Atlantic Surfclam in the Îles-de-la-Madeleine (red dots).

Context:

*In Quebec, the Atlantic Surfclam (*Spisula solidissima*) fishery is conducted exclusively in the Îles-de-la-Madeleine. The fishery is conducted with a hydraulic dredge in coastal area or by using hand tools, on foot or while diving in the lagoons or along the coast. Hand tools are used in both recreational and commercial fisheries. Magdalen Islanders have been hand digging for clams for a very long time, whereas the dredge fishery started in the late 1990s.*

The Îles-de-la-Madeleine Atlantic Surfclam stock is assessed every three years, with exception, and the last review was conducted in 2019. The indicators used to monitor these stocks are landings, fishing effort, catch per unit effort, size structure and the percentage of known beds that have been dredged.

This Science Advisory Report is from the February 29, 2024, regional peer review on the Stock Assessment of Atlantic Surfclam of the Magdalen Islands. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- The Atlantic Surfclam fishery in the Îles-de-la-Madeleine is conducted with hydraulic dredges in sub-areas 5A1 and 5B1 or using hand tools, on foot or while diving, in about 10 shellfish areas located in lagoons or near coasts.

Hydraulic dredge fishery

- Three beds are currently known in sub-areas 5A1 and 5B1. The Chenal de la Grande-Entrée (CGE) and East beds are located in sub-area 5A1, and the North bed straddles sub-areas 5A1 and 5B1. Since 2012, harvesting has been mainly focused on the North bed, but resumed on the CGE bed in 2019.
- Over the past three years (2021–2023), the number of active harvesters has fluctuated between two and four, whereas it was between three and four for 2018–2020.
- Total allowable catches (TACs) have not been reached in sub-areas 5A1 and 5B1 since 2019, and average landings for 2021–2023 (177 t) are below the historical average (193 t, 2002–2020). The drop in landings is partly due to the decline in the number of active fisherman.
- When harvesting resumed on the CGE bed in 2019, the non-standardized catch per unit effort (CPUE) was high (347 kg/h·m). Although the average for the last three years (232 kg/h·m) is above the historical average (176 kg/h·m, 2002–2020), it shows a downward trend. For the North bed, CPUE was high in 2021 (330 kg/ h·m), but has been falling since. The average 2021–2023 (215 kg/h·m) is slightly below the historical average (233 kg/h·m, 2002–2020).
- Landed surfclam sizes remain stable and over 130 mm in all sampled beds.
- In recent years, the dredged area has decreased on the North bed, but it has increased on the CGE bed, with the resumption of harvesting in 2019. The proportion dredged of the known surface area of the North bed has varied between 2% and 3%, and that of the CGE bed between 7% and 10% between 2021 and 2023.
- Since 2002, fishing effort is sporadic and low in sub-areas 5A2 and 5B2; stock status is therefore unknown in these two sub-areas.
- Declining landings and CPUEs in recent years suggest that harvesting rates may be too high in sub-areas 5A1 and 5B1, despite shifting some of the fishing effort between the harvested beds (CGE and North).

Hand digging

- Commercial and recreational clam digging by divers and shore harvesters is well-developed in the Îles-de-la-Madeleine. However, the extent of manual recreational harvesting is not well known.
- Reported commercial landings from hand digging vary with fishing effort. Between 2021 and 2023, average landings for diving (37 t) and hand digging (14 t) remained above their historical averages (2002–2020) of 22 t and 11 t, respectively.
- For dive harvesting, CPUEs in the two most harvested areas are relatively stable (46 kg/h in A-09.5) or increasing (72 kg/h in A-12.1) compared with their historical averages (2005–

2020) of 54 and 69 kg/h·m, respectively. The average size of surfclams landed has also been stable at about 130 mm in 2021–2023.

- For shore harvesting, CPUEs in A-09.5 and A-17.1 have increased to 33 and 26 kg/h (2021–2023), compared with their respective historical averages of 26 and 21 kg/h (2005–2020). The average size of surfclams landed has been around 120 mm for the last three years.
- The number of inactive licences relative to the number of licences issued (latent effort) is still high for both dive (88%) and shore (69%) harvesting. It is unclear whether the resource in the shellfish areas could support the deployment of the total fishing effort.
- Based on this information, hand harvesting could be maintained at the current level. Any measures that will help better document hand digging fishery are desirable.

BACKGROUND

Biology

The Atlantic Surfclam, *Spisula solidissima*, is a filter feeding mollusc bivalve that lives along the Atlantic coast of North America, from Gaspé Bay in the Gulf of St. Lawrence to Cape Hatteras, in North Carolina. Surfclam habitat extends from the upper infralittoral zone to a depth of 30 to 60 m depending on the region. The Surfclam is a sedentary species living in aggregations called “beds”.

According to the literature, Atlantic Surfclam reach sexual maturity at six years of age. In the Îles-de-la-Madeleine, shell length (measured in the largest axis of the shells) reaches 76 mm in four or five years and 90 mm in five or six years. The Surfclam can live more than 30 years with a maximum shell length of about 225 mm. The maximum size observed in the Îles-de-la-Madeleine is 184 mm.

The sexes are separate and the Surfclam does not exhibit sexual dimorphism. In the Îles-de-la-Madeleine, the gonads are fully mature by mid-May. Spawning takes place mainly in July and August. The gametes are released into the water, where the oocytes are fertilized. The larvae are pelagic and the duration of the larval phase is dependent on water temperature; about 35 days at 14°C. After metamorphosis, juveniles settle on the bottom of the ocean and begin their benthic life stage.

Description of the Fishery

In the Îles-de-la-Madeleine, the Atlantic Surfclam fishery is conducted with a hydraulic dredge in Area 5 or by using hand tools, on foot or by diving in the lagoons or along the coast (Figure 1). From 2002 to 2013, the minimum legal size was 76 mm, but it has been increased to 90 mm since 2014 for every harvesting method. Also, Atlantic Surfclam harvesting is prohibited in shellfish area A-08.4 (refuge area) and in the exclusion zones, most of which were established in 2011 to protect lobster habitat (Figure 1).

Hydraulic dredge fishery

The commercial Atlantic Surfclam dredge fishery began in the 1990s. A management plan was established in 2001 and monitoring of this fishery began in 2002, following the introduction of logbooks.

In Quebec, the commercial dredge fishery is restricted to Area 5 of the Îles-de-la-Madeleine, which has been subdivided into four sub-areas since 2011: 5A1, 5A2, 5B1 and 5B2 (Figure 1).

The boundaries of sub-areas 5A1 and 5B1 were slightly modified in the northern part of the Islands in 2013.

There are four commercial dredge fishery licences. Harvesting is permitted from the start of April until the end of December. The fishery is closed in July and August in sub-areas 5A1, 5A2 and 5B1 during the spawning period. Fishermen are entitled to use only one dredge whose maximum width is 2.13 m, and whose rods must be at least 3.175 cm apart. Since 2013, the TAC was 125 t in 5A1, 55 t in 5A2 and 113 t in 5B1 and fishing effort was limited to 12 days in 5B2.

From 2002 to 2014, landings were estimated based on the number of landed baskets multiplied by the estimated weight of one basket, 54 kg/basket from 2002 to 2011 and 66 kg/basket from 2012 to 2014. Since 2015, all landings must be weighed at the dock.

Three beds were delineated based on fishing positions. The Chenal de la Grande-Entrée (CGE) and East beds are located in 5A1, whereas the North bed overlaps sub-areas 5A1 and 5B1 (Figure 2).

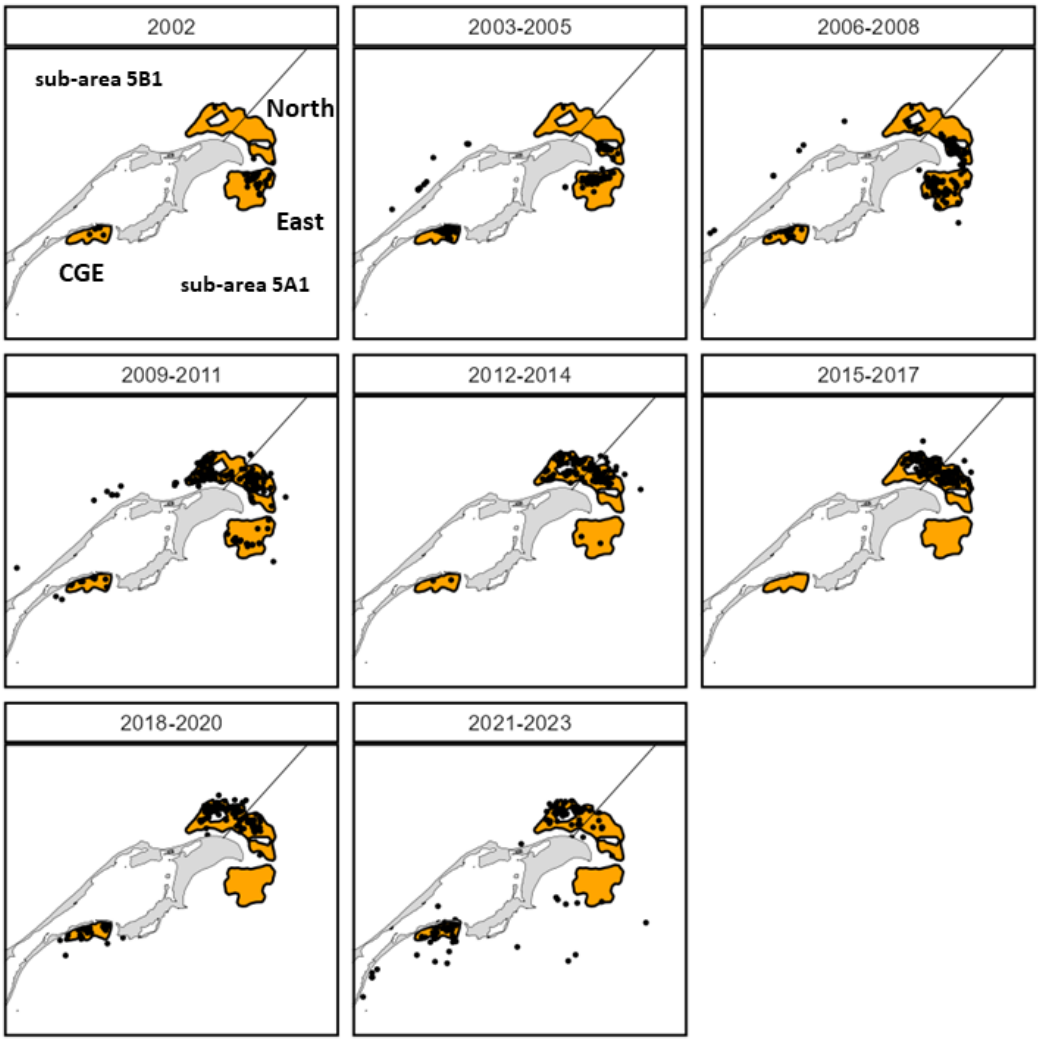

Figure 2. Commercial dredge fishing positions (black dots) for Atlantic surfclams in the CGE, East and North beds (orange polygons) in the Îles-de-la-Madeleine. Data from logbooks.

Hand digging

There is a long history of harvesting Atlantic Surfclam by hand along the shores of the Îles-de-la-Madeleine and in its lagoons during the summer. Clams are hand harvested in about 10 shellfish areas, but more intensively in areas A-09.1, A-09.5 (mainly islets B and C), A-12.1, A-16.1.2, A-16.2.1.1 (open for harvesting since 2007), A-17.1 and A-17.4 (Figure 3). According to logbook data, on warm summer days, there may be more than 40 harvesters on one bed.

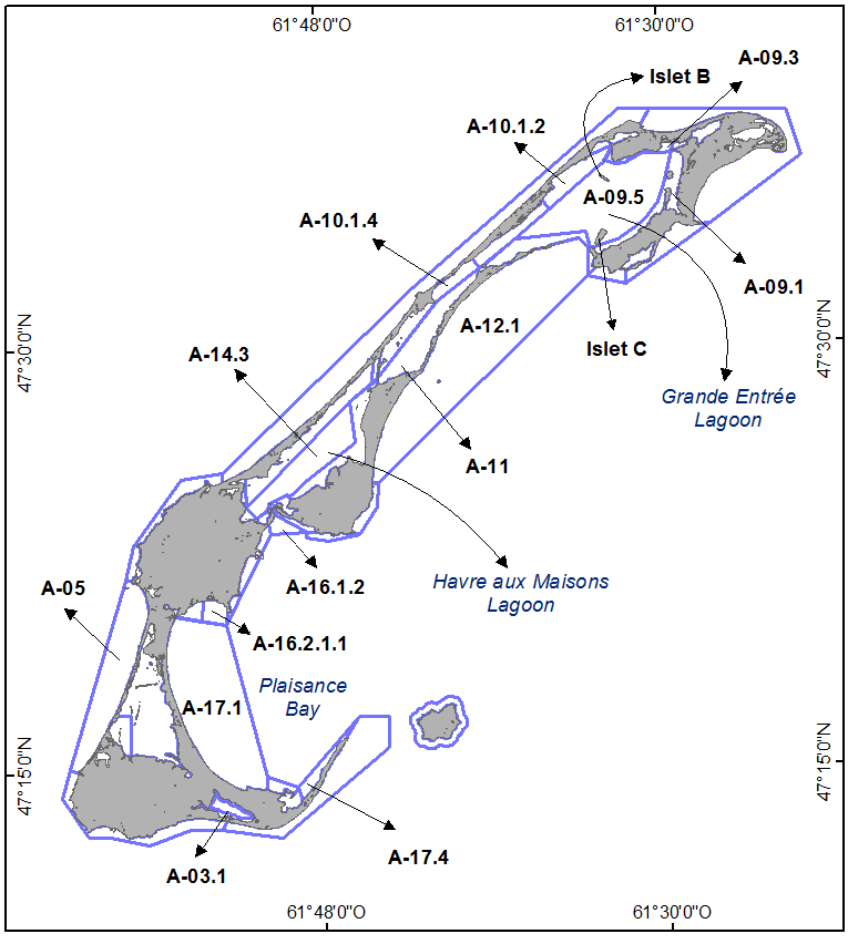

Figure 3. The location of the main shellfish harvesting areas where the Atlantic Surfclam is hand collected in the Îles-de-la-Madeleine.

An initial management plan was established in 2005 to regulate commercial and recreational hand digging (hand tools) of Atlantic Surfclam in the Îles-de-la-Madeleine. Any harvester wishing to collect more than 300 clams per day or earn an income from them must obtain a commercial licence, regardless of whether the harvesting is done on foot or by diving. From 120 to 155 licences are issued annually. However, there are between 19 and 43 active harvesters annually. Commercial and recreational hand harvesting is regulated by a fishing season of nearly 12 months, from mid-January to the end of December, and by a minimum legal size of 90 mm. Commercial harvesters are required to complete a logbook for each day of activity. In addition, each commercial diver is limited to daily landings of 680 kg.

ASSESSMENT

Data sources

Commercial fishery indicators, i.e. landings (t of live weight), fishing effort (number of days-fishers) and CPUE (km/h·m for dredging or kg/h for hand digging), are compiled from logbooks and purchase slips. During the 2019 and 2024 peer reviews, it was agreed to use non-standardized CPUE given the low number of fisherman for hydraulic dredging and the low number of experienced fisherman for commercial hand digging. The size of landed Surfclams are taken from subsamples at the dock by the DFO commercial catch sampling program.

The surface area dredged annually per bed is calculated based on the fishing effort composed by the number of hours of dredging multiplied by the dredge width in metres (h·m) and the mean dredging speed (estimated at 1.52 km/h or 0.82 knot/h). An exploitation rate index is estimated based on the ratio of the annually dredged bed surface area to the known total surface area of the same bed.

Hydraulic dredge fishery

The four dredge licences were used every year until 2019. Between 2020 and 2023, the number of active licences varied between two and four. In 2023, only two licences were used.

In sub-area 5A1, the TAC (125 t) was reached between 2002 and 2019. However, it has not been reached since then, and landings have varied between 66 and 120 t since 2020 (Table 1 and Figure 4). In 2023, landings reached the lowest value (66 t) in the series since 2002. The drop in landings could be attributed in part to the decline in the number of active fisherman in recent years. Fishing effort in sub-area 5A1 was higher (50–65 days) when harvesting began. From 2013 to 2020, effort has not exceeded 33 days. Between 2021 and 2023, it varied between 20 and 33 days (Table 1).

Prior to 2008, harvesting in sub-area 5B1 was sporadic. Harvesting of the North bed located in sub-area 5B1 began in 2008 (Figure 2). In general, the TAC (113 t) was reached between 2013 and 2019. However, since 2020, the TAC has not been reached, and landings have varied between 65 and 97 t (Table 1 and Figure 4). In 2023, landings also reached the lowest value (65 t) since 2008. The drop in landings could also be attributed to the decline in the number of active fisherman in recent years. Fishing effort in 5B1 was higher (28–53 days) in the early years (2009–2011). From 2012 to 2019, it has not exceeded 27 days. In the last three years, it has varied between 17 and 27 days (Table 1).

Since 2002, fishing effort is sporadic and low in sub-areas 5A2 and 5B2; stock assessments can therefore only be performed in sub-areas 5A1 and 5B1.

Harvesting of the CGE bed began in the 1990s, mainly due to its proximity to the wharf. Between 2002 and 2012, CPUEs varied between 85 and 255 kg/h·m (Table 1 and Figure 5). From 2013 to 2018, there was no fishing in this bed, which benefited population recovery and recruitment. In 2019, harvesting resumed in CGE, and the CPUE was high (347 kg/h·m). However, the average CPUE reached 232 kg/h·m between 2021 and 2023 and shows a downward trend (Table 1 and Figure 5).

Exploitation of the 5A1 North bed began in 2004–2005; it expanded from 2008 to 2009 after it was discovered that the North bed extended to 5B1 (Figure 2). CPUEs consequently increased from 234 to 383 kg/h·m between 2009 and 2012 (Table 1 and Figure 5). CPUE fluctuated between 239 and 355 kg/h·m between 2013 and 2020. High CPUE levels in the North bed since 2012 have likely been caused, at least in part, by the harvesting of new sections of the bed in

successive years (Figure 3). Between 2021 and 2023, the average CPUE was 215 kg/h·m and is slightly below the historical average (233 kg/h·m).

The East bed was primarily harvested from 2002 to 2010. Since then, harvesting has been sporadic. The CPUEs for this bed were approximately 114–204 kg/h·m between 2002 and 2023 (Table 1 and Figure 5).

Table 1. Landings (t) and fishing effort (number of days) by sub-area (5A1 and 5B2) and average non-standardized catch per unit effort (CPUE, kg/ h·m) and average size (mm) at landing by beds (CGE, East and North) for the commercial Atlantic Surfclam dredge fishery in the Îles-de-la-Madeleine.

Year	5A1		5B1		CGE		Est		Nord	
	Landings	Effort	Landings	Effort	CPUE	Size	CPUE	Size	CPUE	Size
2002	108	65	-	-	117	-	129	104	-	-
2003	115	64	-	-	109	107	114	98	-	-
2004	112	64	-	-	85	-	94	109	155	-
2005	107	31	18	12	114	-	164	101	203	114
2006	108	55	-	-	109	-	133	115	132	111
2007	119	62	6	4	120	122	109	125	85	116
2008	120	42	32	13	138	126	130	121	132	-
2009	110	43	160	53	197	-	123	125	234	120
2010	124	34	97	28	186	-	185	-	242	122
2011	102	25	123	36	203	-	-	-	280	126
2012	107	16	129	24	255	126	-	-	383	130
2013	132	21	115	20	-	-	-	-	355	130
2014	130	23	115	18	-	-	197	133	327	132
2015	126	26	115	19	-	-	-	-	255	133
2016	123	22	118	18	-	-	-	-	297	137
2017	123	25	111	26	-	-	-	-	276	134
2018	120	21	110	23	-	-	-	-	272	136
2019	134	33	104	23	347	138	-	-	239	135
2020	86	23	88	20	305	121	-	-	289	130
2021	120	33	97	27	299	133	204	-	330	130
2022	95	23	88	25	244	131	133	123	171	132
2023	66	20	65	17	153	136	-	-	145	135

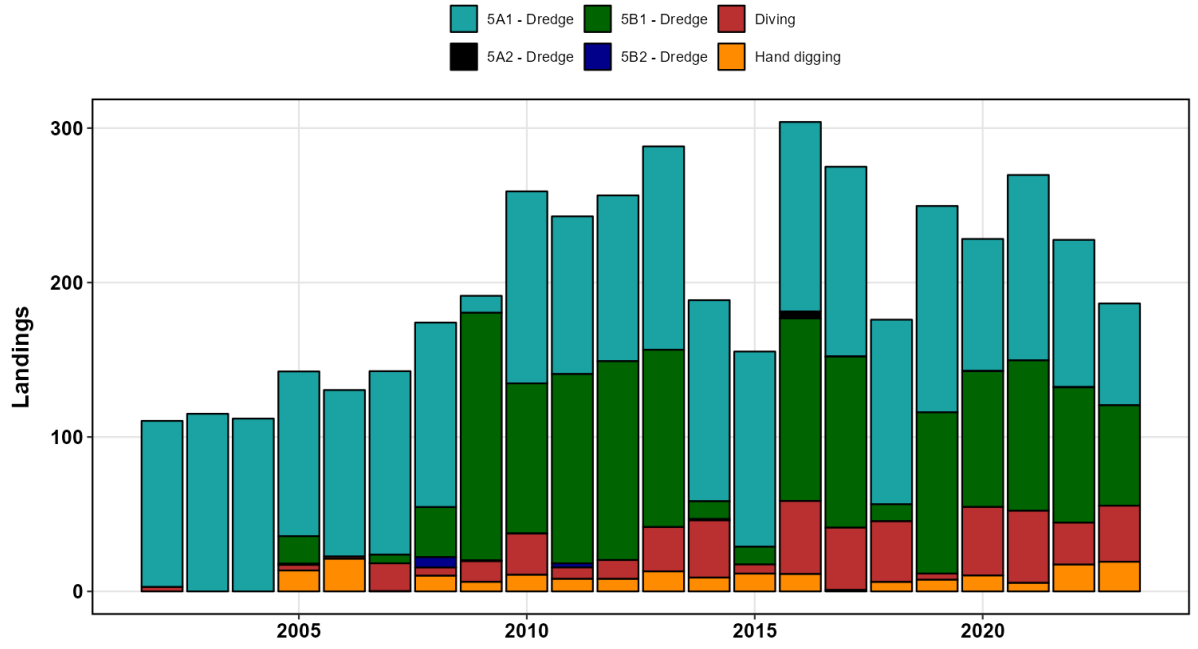

Figure 4. Annual landings (t) of Atlantic Surfclam for the hydraulic dredge fishery (sub-areas 5A1, 5A2, 5B1 and 5B2), by diving and hand digging in the Îles-de-la-Madeleine.

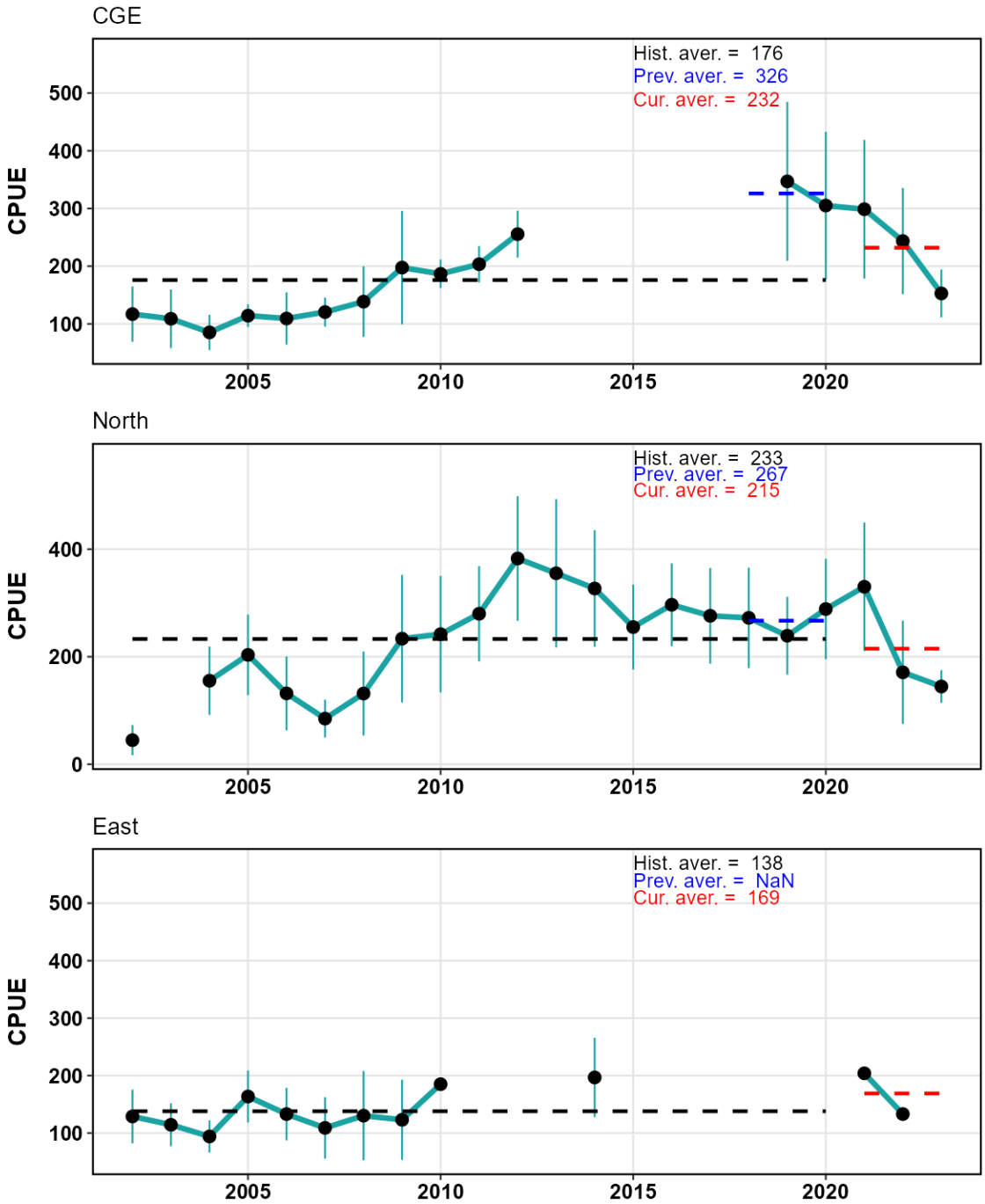

Figure 5. Average annual non-standardized catch per unit effort (CPUE ± standard deviation in kg/h·m) for the CGE, East and North beds during the commercial Atlantic Surfclam dredge fishery in the Îles-de-la-Madeleine. The dotted lines represent the historical average (2002-2020, hist. aver.), the average for the previous period (2018-2020, prev. aver.) and the average for the current assessment (2021-2023, cur. aver.).

In 2023, the surface area of all known beds in the Îles-de-la-Madeleine was estimated at 40.5 km^2 based on fishing positions recorded in logbooks (Table 2). The surface area of the CGE and East beds have slightly increased since 2009, from 4.1 to 5.4 km^2 and 10.7 to

14.1 km^2 respectively, whereas the known surface area of the North bed has continued to expand, from 10 km^2 in 2009 to 21 km^2 in 2020.

From 2002 to 2008, this exploitation index was relatively high, with values reaching between 9% and 13% on several occasions on the CGE and East beds (Table 2). Exploitation of the North bed has intensified since 2009, and the estimated dredged area has varied between 5% and 7% of its known area from 2009 to 2019. In recent years, the dredged area has decreased on the North bed, but has increased on the CGE bed, with the resumption of harvesting on this bed in 2019. The dredged proportion of the known surface area of the North bed has varied between 2% and 3%, and that of the CGE bed between 7% and 10% between 2021 and 2023 (Table 2).

Table 2. Dredged percentage (%) of the known area of each bed (CGE, East and North) estimated from the area dredged annually during the commercial Atlantic Surfclam dragging fishery in the Îles-de-la-Madeleine.

Year	CGE		East		North - 5A1		North - 5B1		North - total	
	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%
2002	0.1	3.3	1.1	10.4	-	-	-	-	-	-
2003	0.5	12.7	1.1	9.6	-	-	-	-	-	-
2004	0.4	11.2	1.1	10.3	-	-	-	-	-	-
2005	0.05	1.2	0.4	3.3	0.5	4.4	-	-	0.5	2.4
2006	0.4	9.0	0.1	0.8	0.9	7.7	-	-	0.9	4.1
2007	0.1	1.9	1.1	10.1	0.6	5.2	-	-	0.6	2.8
2008	0.1	2.9	1.1	10.1	0.2	1.9	0.3	2.8	0.5	2.4
2009	0.3	6.3	0.7	6.3	0.3	3.0	1.3	12.6	1.6	7.5
2010	0.04	0.9	0.03	0.3	0.8	6.6	0.6	5.9	1.3	6.3
2011	0.04	1.1	-	-	0.5	4.5	0.8	7.9	1.3	6.1
2012	0.03	0.9	-	-	0.4	3.7	0.5	5.4	1.0	4.5
2013	-	-	-	-	0.5	4.7	0.6	6.2	1.2	5.4
2014	-	-	0.04	0.4	0.7	6.0	0.6	5.6	1.2	5.8
2015	-	-	-	-	0.8	6.9	0.6	6.5	1.4	6.7
2016	-	-	-	-	0.7	5.9	0.6	5.6	1.2	5.8
2017	-	-	-	-	0.7	6.0	0.7	6.8	1.4	6.4
2018	-	-	-	-	0.7	5.9	0.7	6.7	1.4	6.3
2019	0.2	4.6	-	-	0.6	5.3	0.6	6.5	1.3	5.8
2020	0.4	8.5	-	-	0.1	0.5	0.5	5.0	0.6	2.6
2021	0.5	9.0	-	-	0.2	1.8	0.4	4.3	0.6	3.0
2022	0.5	10.0	0.1	0.4	0.0	0.3	0.6	6.4	0.7	3.1
2023	0.4	7.5	-	-	0.0	0.2	0.5	4.7	0.5	2.3

The increase in 2014 of the legal minimum size to 90 mm has had little effect on average landed sizes. Since 2010, the average size of landed clams from all beds has been greater than 120 mm (Table 1 and Figure 6). Over the past three years, average clam sizes have been 133 mm (CGE), 124 mm (East) and 132 mm (North). No Surfclam below legal size have been landed since 2016.

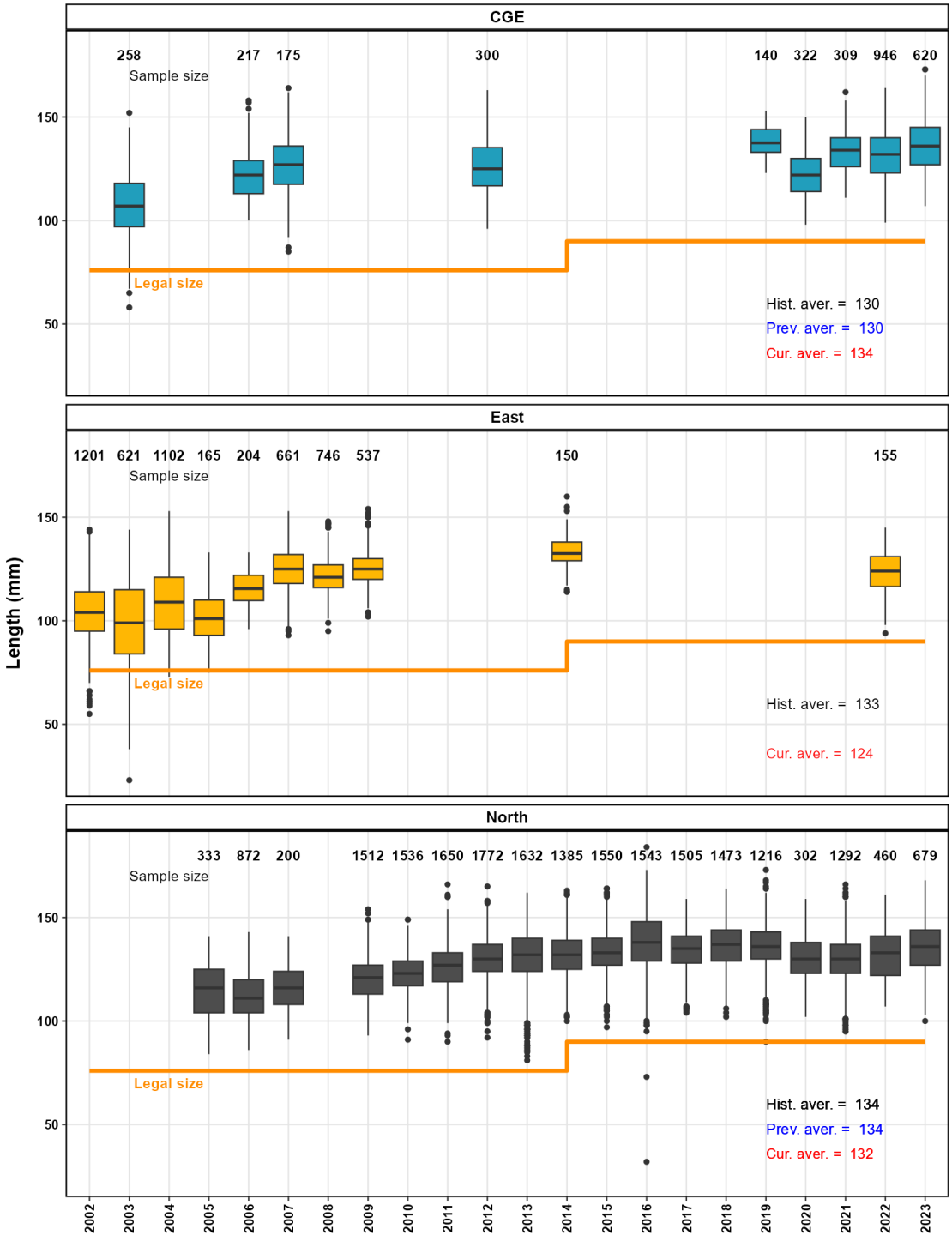

Figure 6. Size structure of Atlantic surfclams landed by bed (CGE, East and North) and number of surfclams measured (values at the top of graph) during the Îles-de-la-Madeleine commercial dredge fishery. Box and whisker plot: The line inside the box represents the median, the box extends from percentiles 25 to 75, the whiskers extend from percentiles 5 to 95, and the black dots represent extreme values. The historical average size (hist. aver.), the average size from the previous assessment (prev. aver.) the average size for the current assessment (cur. aver.) are presented.

Hand digging

Commercial hand digging landings vary annually and depend on the fishing effort (Table 3 and Figure 4). Overall, there has been an increase in landings from dive harvesting since 2008. Average effort and landing for the last three years were, 90 days and 37 t, respectively. Effort and landings for hand digging are more variable and they were 128 days and 14 t for the last three years (Table 3).

The lack of information hindered an accurate status assessment for each bed harvested by hand digging. Commercial harvesting indicators (CPUE and average size) are calculated only for the main shellfish areas exploited, namely A-09.5 and A-12.1 for dive harvesting, and A-09.5, A-17.1, A-17.4 and A-16.2.1.1 for shore harvesting (Table 1).

Clams harvested by divers

CPUEs for commercial dive harvesting in area A-12.1 have varied between 40 and 132 kg/h from 2007 to 2019. The average CPUE for the last three years is 72 kg/h and is above the historical average (69 kg/h, 2005–2020). The CPUE observed in the A-09.5 area is lower then that of area A-12.1. The average CPUE over the last three years (46 kg/h) is close to the historical average of 54 kg/h (Table 3 and Figure 7).

Since 2008, the average size of landed clams has typically been around 130 mm in the sampled areas (Table 3). The average size over the last three years is 130 mm in A-12.1 and 111 mm in A-09.5.

Shore harvesting

Prior to 2010, commercial CPUEs for manual hand digging in area A-09.5 was relatively high at around 30 kg/h (Table 3 and Figure 8). From 2010 to 2016, CPUE was stable, at around 17 kg/h, but it increased from 22 to 30 kg/h between 2017 and 2023. The average CPUE in the last three years is 33 kg/h and is above the historical average (26 kg/h).

In area A-17.1, CPUEs varied between 10 and 18 kg/h between 2006 and 2015, but has been rising since (Table 3 and Figure 8). In the last three years, the average CPUE was 26 kg/h and is above the historical CPUE (21 kg/h, 2005-2020).

The average size of the landed clams over the last three years ranges from 118 to 121 mm in the sampled areas.

Landings are very low in areas A-17.4 and A-16.2.1.1 (< 1 t), and it is not possible to assess the state of the resource.

Table 3. Landings (Land. t), fishing effort (number of days), average non-standardized catch per unit effort (CPUE, kg/h), and average size (mm) at landing by harvesting method and shellfish area for the Atlantic Surfclam commercial hand harvesting in the Îles-de-la-Madeleine.

Year	Divers						Shore harvesters									
	Land.	Effort	A-09.5		A-12.1		Land.	Effort	A-09.5		A-17.1		A-17.4		A.16.2.1.1	
			CPUE	Size	CPUE	Size			CPUE	Size	CPUE	Size	CPUE	Size	CPUE	Size
2005	4	19	55	102	52	125	14	114	35	81	6	-	7	-	-	-
2006	1	11	34	103	61	131	21	189	31	86	11	-	16	-	-	-
2007	18	67	-	-	84	128	16	159	28	88	16	-	-	-	29	118
2008	5	21	32	-	132	135	10	92	32	93	11	122	-	-	25	119
2009	13	40	-	-	97	133	6	65	27	96	12	115	-	-	25	-
2010	27	140	48	123	59	133	11	142	16	98	10	104	-	-	15	-
2011	7	38	-	-	56	132	8	83	19	91	13	-	-	-	-	-
2012	12	61	57	-	53	130	8	98	16	98	12	94	-	-	13	93
2013	29	130	70	124	67	128	13	132	20	94	18	104	17	-	17	94
2014	37	150	61	-	60	144	9	106	18	106	12	109	14	104	18	101
2015	6	45	65	-	40	-	12	140	18	-	15	121	10	107	18	110
2016	47	158	57	-	75	145	11	141	19	-	24	115	17	111	18	117
2017	40	166	47	-	65	130	9	116	22	108	22	119	13	-	16	113
2018	39	157	67	-	72	131	6	83	26	120	31	-	15	120	13	104
2019	40	151	57	119	74	128	8	91	29	-	32	124	13	107	14	109
2020	44	132	52	-	61	125	10	104	26	108	25	115	12	-	16	107
2021	47	118	35	-	59	129	5	60	27	-	-	117	17	104	-	110
2022	27	66	36	111	78	132	17	153	28	108	33	117	17	129	40	119
2023	36	88	69	-	78	129	19	172	30	-	31	120	14	-	30	125

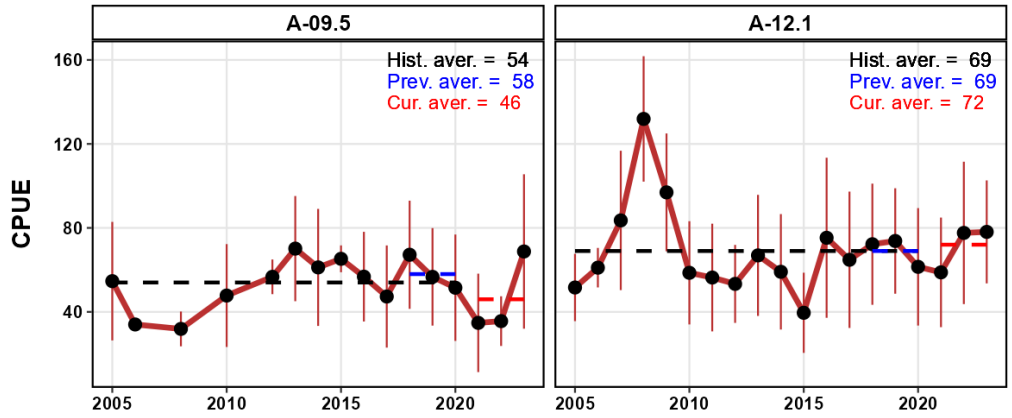

Figure 7. Average annual non-standardized catch per unit effort (CPUE ± standard deviation in kg/h) for shellfish areas A-09.5 and A-12.1 for the Atlantic Surfclam commercially hand harvested by divers in the Îles-de-la-Madeleine. The dotted lines represent the historical average (hist. aver., in black), the average for the previous assessment (prev. aver., in blue) and the average for the current assessment (cur. aver., in red).

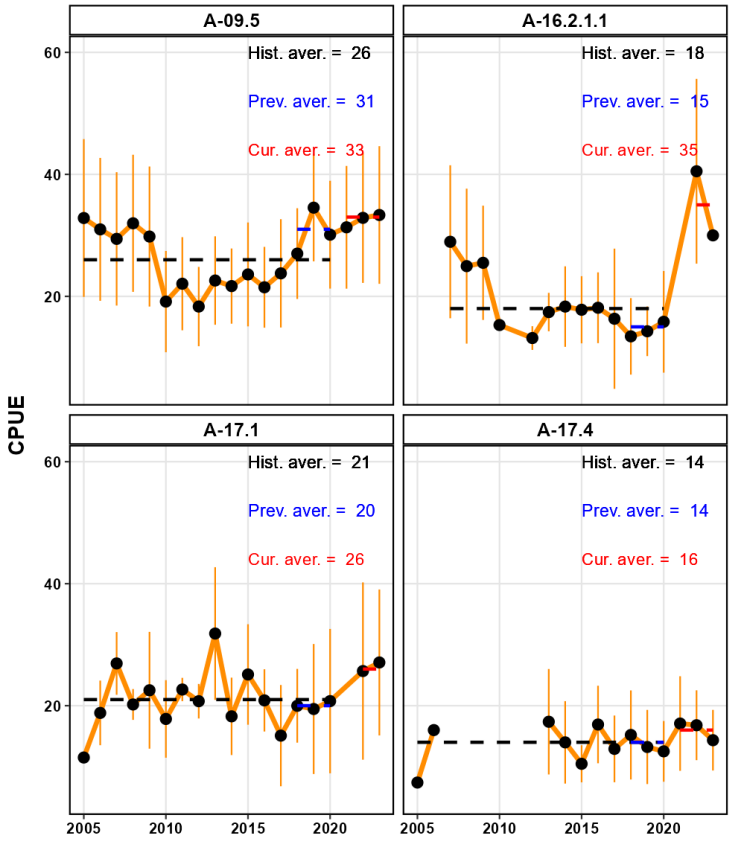

Figure 8. Non-standardized catch per unit effort (CPUE ± standard deviation in kg/h) by shellfish area for the Atlantic Surfclam commercially hand harvested by digging in the Îles-de-la-Madeleine. The dotted lines represent the historical average (hist. aver., in black), the average for the previous assessment (prev. aver., in blue) and the average for the current assessment (cur. aver., in red).

Sources of Uncertainty

Because there is no independent fishery indicator (i.e. research surveys), scientific advice on Atlantic Surfclam stock status is entirely dependent on the quality of data from the commercial fishery.

The movement of fisherman (and effort) between the three known beds and the exploration attempts to locate new beds over the years may avoid drops in CPUEs while the resource within each bed declines. It is therefore difficult to determine precisely whether there is a decline in the resource, and therefore, CPUEs should be interpreted with caution.

The lack of information on hand harvesting, which is mainly recreational, makes the conclusions for this fishery uncertain, given that unreported activities may hide relatively large catches. Moreover, as the territory is shared by dredge harvesting and hand digging and between commercial and recreational harvesters, it makes it difficult to obtain a comprehensive portrait of the situation.

The surface area of the beds was estimated from the dredge fishing positions. These areas therefore represent the exploited or exploitable portion of the beds. The actual surface area of the beds is unknown.

Lack of recruitment information on all beds, mainly dredged beds, is a source uncertainty. The low proportion of individuals between 90 and 100 mm in size structures on the North bed since 2010 may indicate a different site of recruitment or or an absence of these small clams. Given that actual harvesting may have been targeting the same cohorts over several years, the gradual increase in average size may reflect the growth of the size (and weight) of these cohorts.

The Atlantic Surfclam is a relatively warm-water species and the Îles-de-la-Madeleine are at the northern boundary of its distribution range. For several years, average surface and bottom temperatures (0 to 30 m) around the Iles-de-la-Madeleine in August and September have been warmer than average. Global warming should benefit this population, for instance, by allowing its distribution range to reach deeper waters (25 to 35 m), and by increasing stock productivity.

CONCLUSIONS AND ADVICE

Hydraulic dredge fishery

Since 2019, TACs for the hydraulic dredge fishery in sub-areas 5A1 and 5B1 have not been reached. The drop in landings is partly attributable to the decline in the number of active fisherman. The decline in landings and CPUE in recent years suggests that removal rates may be too high in sub-areas 5A1 and 5B1, despite the movement of fisherman between different beds (CGE and North).

Hand digging

Whereas the scope of recreational harvesting is not well known, reported commercial landings vary and depend on the fishing effort.

For dive harvesting, CPUEs in the two most heavily harvested areas (A-09.5 and A-12.1) are stable or slightly above historical averages. For shore harvesting, CPUEs in A-09.5 and A-17.1 increased compared with their respective historical averages. The average size of landed surfclams is around 130 mm for dive harvesting and around 120 mm for shore harvesting. Based on available information, shore harvesting could be maintained at current levels.

However, any measures that can reduce latent effort and help better document recreational harvesting are desirable.

OTHER CONSIDERATIONS

Hydraulic dredging, which features mechanized fishing gear consisting of a sturdy metal frame, uses water jets to dislodge species buried in the seabed and capture them in the cage. The penetrating action of this gear into the substrate can modify the physical characteristics of the marine environment and impact benthic fauna. The direct and indirect effects of dredging on molluscs include repeated disturbance, displacement of organisms, shell breakage and significant habitat modification. These effects could ultimately lead to high levels of mortality, especially for the more vulnerable juveniles.

Current management measures prohibit hydraulic dredging during the surfclam spawning period (July and August) to protect the spawning population, but it is permitted in September and October, when the larvae settle on the seabed. Thus, the effect of dredging during the larval settling period can lead to high levels of mortality and consequent recruitment declines. The lack of knowledge about the impact of hydraulic dredging on the different life stages of Atlantic surfclams calls for caution regarding harvesting during this critical period for young surfclams.

The recommended conservation measures are designed to ensure the sustainability of each bed and allow them to renew themselves. A significant decrease in the density of each bed could compromise the Îles-de-la-Madeleine stock reproductive success.

In the lack of information on the level of recruitment to the population, any initiatives aimed at maintaining or even increasing the recruitment in each shellfish area should have a positive impact on the resource conservation. Two measures have already been taken in this regard, namely increasing the minimum legal size to 90 mm to increase the proportion of clams that can reproduce before being harvested, and halting the dredge fishery during the reproduction period and juveniles deposition on the bottom. The creation of refuge areas is another way to protect the reproductive potential of this population. A better knowledge of the size at which Atlantic Surfclams are sexually mature in the Îles-de-la-Madeleine and the demographic structure of the clams found in refuge zone A-08.4 and in harvested areas would be an asset in the management of this resource.

ASSESSMENT SCHEDULE

The Îles-de-la-Madeleine Surfclam is currently assessed and managed on a three-year cycle. Indicators for this fishery have been fairly stable for several years, mainly for dredging fishery. At this time, no updates are recommended during interim years.

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SOURCES OF INFORMATION

This Science Advisory Report is from the February 29, 2024, regional peer review on the Stock Assessment of Atlantic Surfclam of the Magdalen Islands. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

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