



ASSESSMENT OF THE ÎLES-DE-LA-MADELEINE ATLANTIC SURFLCLAM STOCK IN 2018



S. Brulotte, DFO Québec region, 2012.

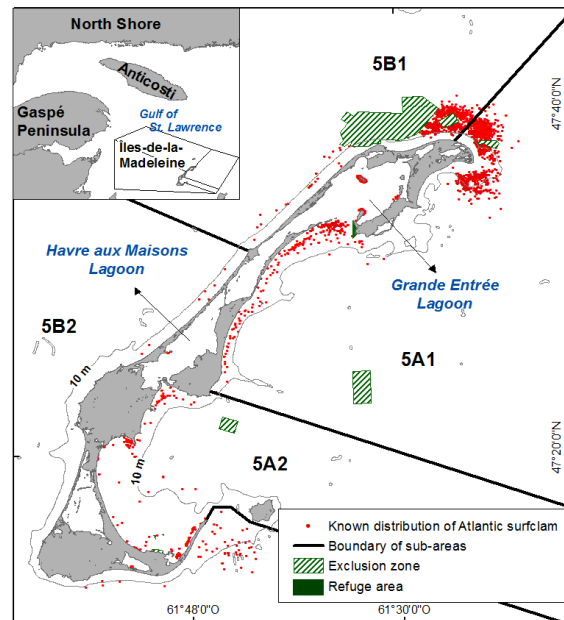


Figure 1. Management sub-areas (5A1, 5A2, 5B1 and 5B2) and known distribution of the Atlantic Surfclam in the Îles-de-la-Madeleine.

Context:

In Québec, 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 and the last review was conducted in 2016. 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 28, 2019 Stock assessment of Atlantic Surfclam of the Îles-de-la-Madeleine. 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 were delineated in 5A1 and 5B1. The CGE and East beds are located in 5A1 and the North bed straddles sub-areas 5A1 and 5B1. Since 2009, harvesting has been focused on the North bed, whose known area is gradually increasing.
- Since 2013, the total allowable catches (TACs) have been reached in 5A1 (125 t) and 5B1 (113 t) and fishing effort is stable. The average size of landed clams has been over 130 mm for several years. The proportion of this bed dredged annually has ranged from 4.5% to 6.7% since 2010.
- Since 2002, fishing effort is sporadic and low in sub-areas 5A2 and 5B2; the clam stock status is therefore unknown in these two sub-areas.
- Yields and size structures in recent years have been stable on the North bed and the area dredged remains around 6%. Based on existing information, current landing levels could be maintained in sub-areas 5A1 and 5B1.
- The lack of information on recruitment for all beds is a source of uncertainty about the stock status.

Hand digging

- Commercial and recreational hand 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 hand digging landings vary with fishing effort. The averages for the last three years are 160 days and 42 t by diving and 113 days and 9 t for shore harvesters.
- Unreported hand harvesting is about 60 t per year, mainly for recreational harvesting.
- In one of the main exploited areas, A-12.1, the dive harvesting CPUE has been stable since 2016 and is at the 2005–2017 mean. The CPUE in A-09.5 has been fluctuating around its mean since 2014. Since 2008, the average size of landed clams has generally been around 131 mm in the sampled areas.
- The shore harvesting CPUE varies from area to area. In A-09.5, it is rather stable and was near the 2005–2017 mean in 2017 and 2018. The average size of surf clams landed is small compared with that of surf clams harvested by other methods. The average size over the last three years ranged from 111 mm to 120 mm, depending on the area.
- Based on this information, hand harvesting could be maintained at the current level. Any measures that will help better document hand digging are desirable.

BACKGROUND

The Atlantic Surfclam, *Spisula solidissima*, is a filter feeding bivalve mollusc 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 of more or less importance called “beds”.

According to the literature, Atlantic Surfclam reach sexual maturity at four 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 ovules are fertilized. The larvae are pelagic. The duration of the larval phase is dependent on water temperature; about 35 days at 14°C. After metamorphosis, juveniles settle to the bottom and begin their benthic life stage.

ASSESSMENT

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 while 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 90 mm since 2014 for every harvesting method. Also, Atlantic Surfclam harvesting is prohibited in shellfish area A-08.4 (refuge area) and exclusion zones, most of which were established in 2011 to protect lobster habitat (Figure 1).

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 information taken from logbooks and purchase slips. Size structures and average size are from Surfclam samples measured at landing by the DFO commercial catch sampling program. The georeferenced positions of the dredge fishery are based on data from logbooks dating back to 2002 and At-Sea Observer Program data dating back to 2005. CPUEs for dredging have been standardized to reflect the harvesting month and fisherman. For manual harvesting, a selection of experienced harvesters is made before calculating the average annual CPUE per shellfish area. The reference period used varies between indicators and types of harvesting depending on the historical series available. For average sizes, the reference period is now 2014-2017, since the legal minimum size was increased in 2014.

Hydraulic dredge fishery

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

In Québec, 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.

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There are four commercial dredge fishery licenses. 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 Surfclam 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. From 2013 to 2018, 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 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 clams landed must be weighed at dockside point of landing.

Three beds (CGE, East and North) were delineated based on fishing positions. The CGE and East beds are located in 5A1 and the North bed straddles sub-areas 5A1 and 5B1 (Figure 2).

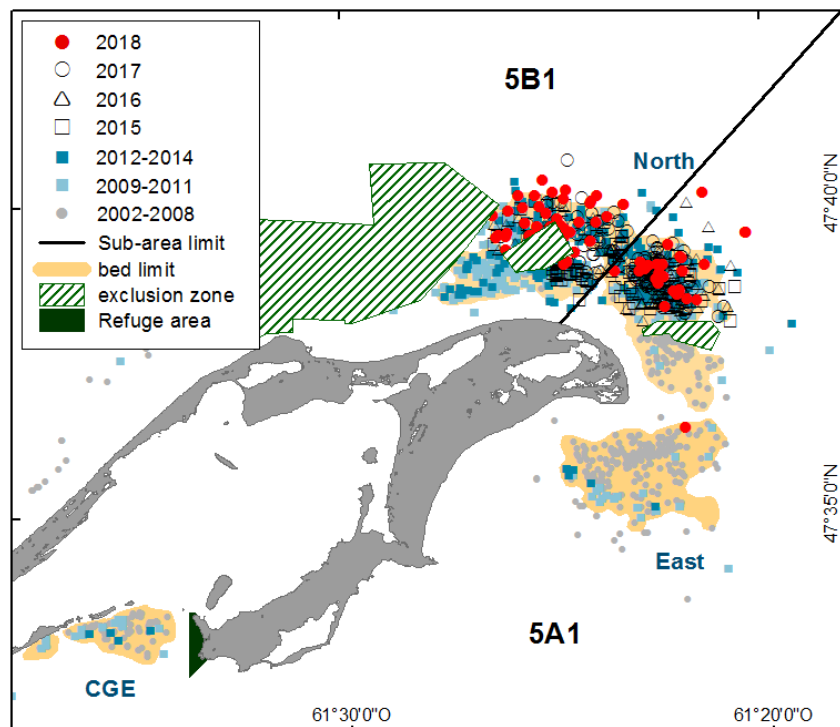


Figure 2. Delimitation of beds and location of commercial Atlantic Surfclam dredge fishery for sub-areas 5A1 and 5B1 of the Îles-de-la-Madeleine from 2002 to 2018.

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. Since 2009, the dredge fishery is conducted mainly in the North bed.

Atlantic Surfclam landings in sub-area 5A1 have ranged from 102 to 132 t throughout the years (Table 1 and Figure 4). Since 2013, the TAC has generally been reached. In 2018, 120 t were landed and the average of the three previous years was 122 t. Fishing effort in subarea 5A1 was higher (50-65 days) at the beginning of harvesting (Table 1). Since 2011, the effort has been 26 days at most. In 2018, the effort was 21 days, 46% below the 2002-2017 baseline average.

Prior to 2008, harvesting in sub-area 5B1 was sporadic. Harvesting of the North bed part located in sub-area 5B1 began in 2008 (Figure 2). The TAC (113 t) has been reached or slightly

exceeded since 2013. Landings from 5B1 ranged from 97 to 129 t from 2010 to 2018 (Table 1 and Figure 3). In 2018, 110 t were landed and the average of the three previous years was 113 t. When the fishery starts, fishing effort was higher, but has remained between 18 and 26 days since 2012 (Table 1). In 2018, the effort was 23 days, 10% below the 2008-2017 reference average.

Table 1. Landings (t) and fishing effort (number of days) by subarea (5A1 and 5B2) and average catch per unit effort standardized (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 bed		East bed		North bed	
	Landings	Effort	Landings	Effort	CPUE	Size	CPUE	Size	CPUE	Size
2002	108	65	-	-	82	-	153	-	-	-
2003	115	64	-	-	87	-	138	-	-	-
2004	112	64	-	-	-	-	114	110	159	-
2005	107	31	(18)	(12)	-	-	208	102	207	(115)
2006	108	55	-	-	108	122	-	115	151	(112)
2007	119	62	(6)	(4)	-	127	123	126	108	(116)
2008	120	42	32	13	-	-	137	121	193	-
2009	110	43	160	53	158	-	132	125	197	(121)
2010	124	34	97	28	-	-	-	-	238	(123)
2011	102	25	123	36	-	-	-	-	222	(127)
2012	107	16	129	24	-	127	-	-	305	(130)
2013	132	21	115	20	-	-	-	-	292	(131)
2014	130	23	115	18	-	-	-	133	276	132
2015	126	26	115	19	-	-	-	-	253	134
2016	123	22	118	18	-	-	-	-	273	137
2017	123	25	111	26	-	-	-	-	250	134
2018	120	21	110	23	-	-	-	-	270	137
Ref. ¹	117	39	112	26	109	-	144	-	223	134
Diff. ²	+3%	-46%	-1%	-10%	-	-	-	-	+21%	+2%
Avg. ³	122	23	113	22	-	-	-	-	264	136

¹ Average whose period changes according to the variable; the values in brackets are not included in the calculation of the reference average.

² Difference between the 2018 value and the reference average.

³ Average of the three previous years (2016-2018).

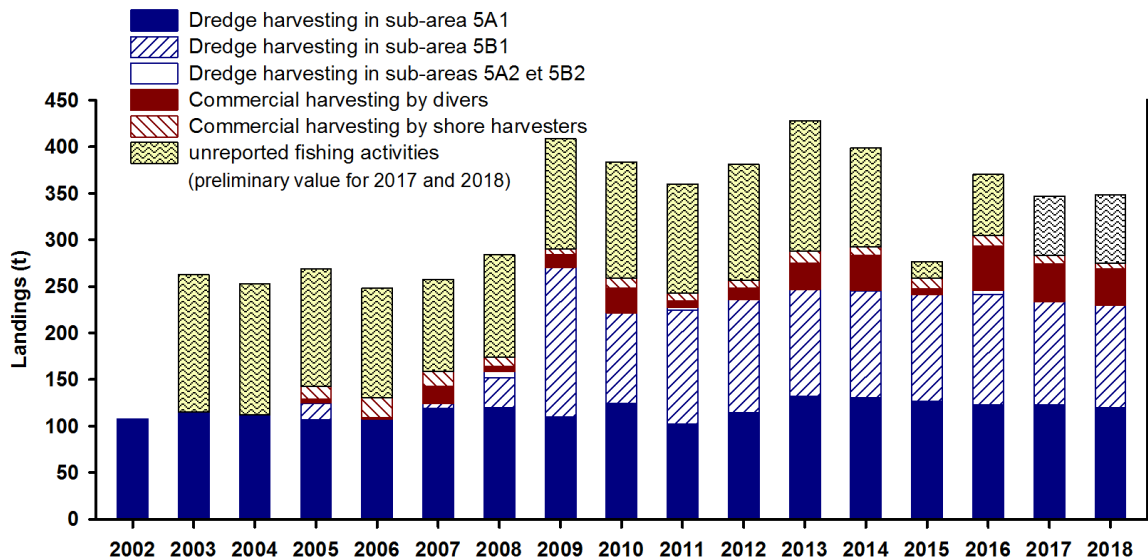


Figure 3. Annual landings (t) of Atlantic Surfclam by sub-area and harvesting method in the Îles-de-la-Madeleine

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The CGE and East beds were mainly harvested from 2002 to 2010 (Figure 2). Since then, the exploitation of these beds has been sporadic. The CPUEs on these two beds ranged from 100 to 130 kg/h·m (Table 1).

Exploitation of the 5A1 North bed began in 2002; it expanded from 2008 to 2009 after it was discovered that the North bed extended to 5B1 (Figure 2). CPUEs consequently increased and, since 2012, have remained above the 2004–2017 reference mean (Table 1 and Figure 4). In 2018, the CPUE was 270 kg/h·m, or 21% higher than the reference mean. The mean for the last three years was 264 kg/h·m, about double the values observed in the CGE and East beds. High CPUE levels in the North bed since 2012 have likely been caused in some measure by the harvesting of new sections of the bed in successive years (Figure 2).

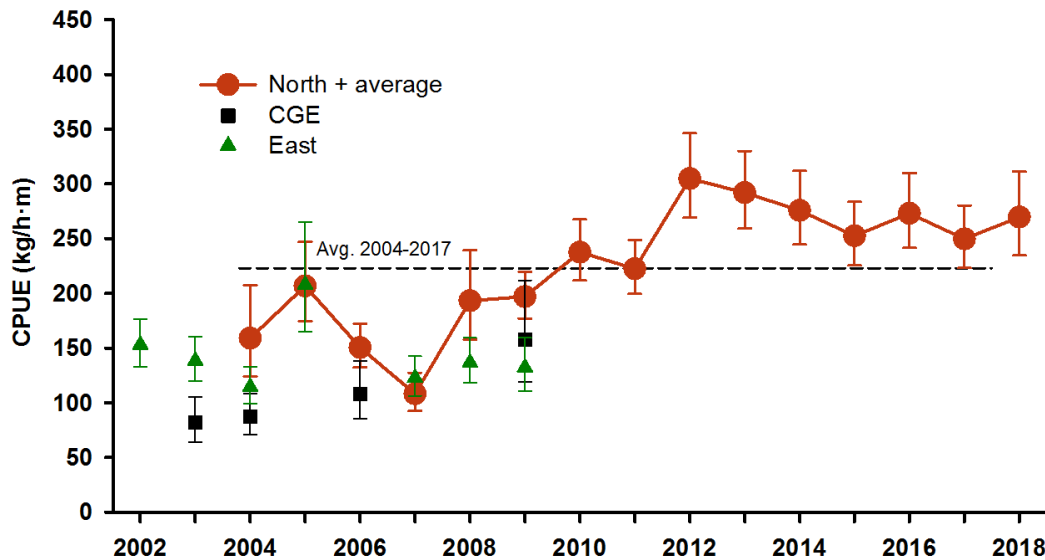


Figure 4. Average annual catch per unit effort standardized (CPUE \pm 95% confidence interval) by beds and reference average (ref. 2004-2017) for the entire North bed exploited by the commercial Atlantic Surfclam dredge fishery in the Îles-de-la-Madeleine.

In 2018, the surface area of all known beds in the Îles-de-la-Madeleine was estimated at 36.5 km² based on fishing vessel positions recorded in logbooks and under the At-Sea Observer Program (Table 2). The surface area of the CGE and East beds has not changed since 2008, whereas the known surface area of the North bed has continued to expand, from 10 km² in 2009 to 21.5 km² in 2018.

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

From 2002 to 2008, this exploitation index repeatedly reached between 9% and 13% in the CGE and East beds (Table 2). Nevertheless, CPUEs remained fairly stable during that period, generally similar to their respective reference means (Table 1 and Figure 4).

North bed exploitation intensified as of 2009 and its index has varied from 4.5% to 7.5% (Table 2). This index was 6.3% in 2018 and the mean for the last three years was 6.2%. In 2018, the percentage dredged in the 5A1 North bed (5.9%) was slightly lower than that in 5B1 (6.7%).

Tableau 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		Total
			5A1	5B1	
2002	3.3	10.4	-	-	-
2003	12.7	9.6	-	-	-
2004	11.2	10.3	-	-	-
2005	1.2	3.3	4.4	-	2.4
2006	9.0	0.8	7.7	-	4.1
2007	1.9	10.1	5.2	-	2.8
2008	2.9	10.1	1.9	2.8	2.4
2009	6.3	6.3	3.0	12.6	7.5
2010	0.9	0.3	6.6	5.9	6.3
2011	1.1	-	4.5	7.9	6.1
2012	0.9	-	3.7	5.4	4.5
2013	-	-	4.7	6.2	5.4
2014	-	0.4	6.0	5.6	5.8
2015	-	-	6.9	6.5	6.7
2016	-	-	5.9	5.6	5.8
2017	-	-	6.0	6.8	6.4
2018	-	-	5.9	6.7	6.3
Surface area (km²)	4	11	11.5	10	21.5
Ref. 2002-2017	4.7	6.2	5.1	6.5	5.1
Difference¹	-	-	+16%	+3%	+24%
2016-2018 Average	-	-	6.0	6.4	6.2

¹ Difference between the 2018 value and the reference level.

The increase in 2014 of the legal minimum size to 90 mm has had little effect on average sizes, as since 2010, landed Surfclam are generally over 100 mm in size. Since 2010, the average size of landed clams from the North bed has been greater than 120 mm (Table 1). Since 2015, the average size has been stable, ranging from 124 to 137 mm. However, the longer-term trend is upward, with an average size of 127, 132 and 136 mm in 2010-2012, 2013-2015 and 2016-2018, respectively.

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 5). According to an annual census conducted by volunteers, and based on information recorded in logbooks, on warm summer days, there may be more than 40 harvesters on one bed.

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 harvest more than 300 clams per day or earn an income from them must obtain a commercial license, regardless of whether the harvesting is done on foot or by diving. From 121 to 155 licenses are issued annually. However, there are between 19 and 46 active harvesters every year. 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.

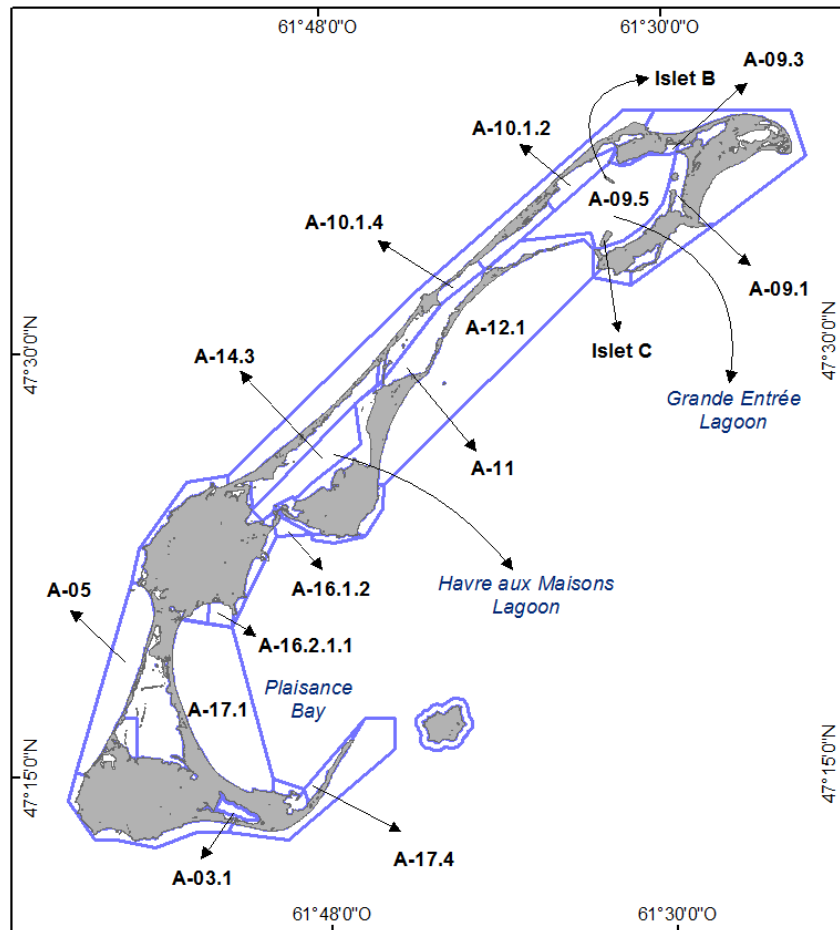


Figure 5. The location of the main shellfish areas where the Atlantic Surfclam is hand harvested in the Îles-de-la-Madeleine.

Commercial hand digging landings vary annually and depend on the fishing effort (Table 3 and Figure 3). The effort and landing means for the last three years were, respectively, 160 days and 42 t for dive harvesting and 113 days and 9 t for shore harvesting. Based on estimated unreported fishing activities, hand digging removals (other than in the reported commercial harvest), which involve mainly the recreational harvest, likely amount to about 60 t per year (Figure 3).

Lack of information precludes 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-16.2.1.1 and A-17.4 for shore harvesting.

Clams harvested by divers

In A-12.1, CPUEs for commercial dive harvesting (hand digging) were higher (> 80 kg/h) from 2007 to 2009 and remained below 74 kg/h thereafter (Table 3 and Figure 6). The lowest value, 37.8 kg/h, was observed in 2015. Over the last three years, the CPUE mean was 67.8 kg/h, very near the 2005–2017 reference mean (68.9 kg/h). CPUEs observed in A-09.5 are comparable to those of A-12.1. They have been varying around the reference mean since 2014, including a 2016–2018 mean of 61.8 kg/h (Table 3 and Figure 6).

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Since 2008, the average size of clams landed has typically been around 131 mm in the sampled areas (Table 3). In A-12.1, the average size over the last three years was 136 mm.

Tableau 3. Landings (t), fishing effort (number of days), average catch per unit effort (kg/h), and average size (mm) at landing by harvest type 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		A-16.2.1.1	Land.	Effort	A-09.5		A-16.2.1.1		A-17.4	
			CPUE	Size	CPUE	Size	Size			CPUE	Size	CPUE	Size	CPUE	Size
2005	3.6	19	-	102	52.2	(127)	-	13.6	114	34.7	(89)	-	-	-	-
2006	1.5	11	-	103	-	(131)	-	21.1	189	31.1	(94)	-	-	-	-
2007	18.0	67	-	-	84.4	(129)	(134)	16.2	159	31.2	(97)	28.8	(118)	-	-
2008	5.3	21	-	-	131.9	(136)	-	10.1	92	34.9	(98)	28.1	(115)	-	-
2009	13.4	40	-	124	98.5	(134)	-	6.2	65	31.6	(93)	25.5	-	-	-
2010	26.7	140	39.6	-	60.6	(133)	-	10.7	142	19.8	(99)	-	-	-	-
2011	7.4	38	-	125	56.4	(132)	-	8.1	83	22.7	(95)	13.2	-	-	-
2012	12.2	61	-	-	58.0	(131)	-	8.1	98	18.5	(107)	19.7	(93)	-	-
2013	28.7	130	58.3	-	64.8	(129)	-	13.0	132	22.5	-	-	(94)	10.8	-
2014	37.2	150	60.7	-	52.4	144	-	8.9	106	21.2	-	-	101	11.5	104
2015	5.9	45	65.3	-	37.8	-	-	11.5	140	21.1	109	15.9	110	11.0	107
2016	47.3	157	56.8	-	69.2	146	131	11.2	141	20.9	120	18.4	117	16.9	111
2017	40.4	166	48.5	-	60.5	131	131	9.0	116	25.2	-	12.9	114	12.9	-
2018	39.3	157	80.0	-	73.7	132	135	6.1	82	25.9	108	12.6	104	16.5	111
Ref. ¹	17.9	80	54.9	-	68.9	140	131	11.4	121	25.8	114	20.3	111	12.6	107
Diff. ²	+120	+95%	+46%	-	+7%	-6%	+3%	-47%	-32%	0%	-6%	-38%	-6%	+30	+3%
Avg. ³	42.3	160	61.8	-	67.8	136	132	8.8	113	24.0	114	14.6	111	15.4	111

¹ Reference average 2005-2017, except for the size where 2014-2017 is used; the values in brackets are not used in the calculation of the reference average.

² Difference between the 2018 value and the reference average

³ Average of the three previous years (2016-2018).

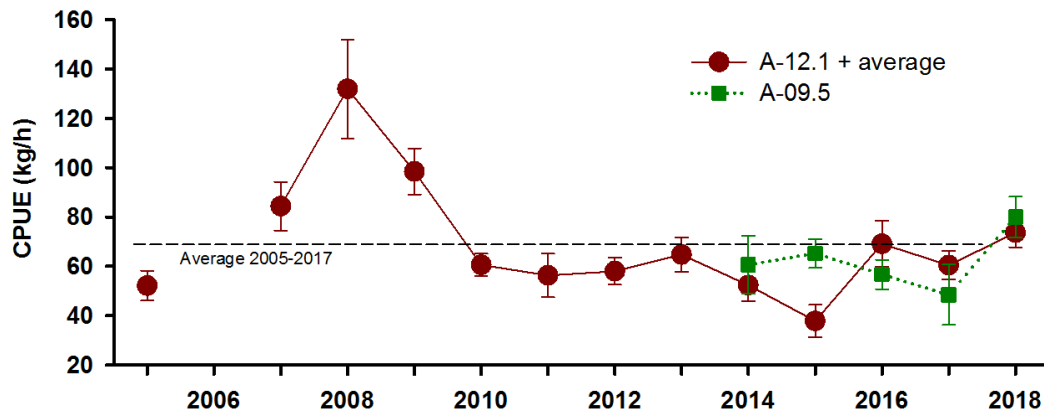


Figure 6. Average annual catch per unit effort (CPUE ± 95% confidence interval) by shellfish area for the Atlantic Surfclam commercially hand harvested by divers in the Îles-de-la-Madeleine.

Shore harvesting

Prior to 2010, commercial CPUEs for manual hand digging in shellfish area A-09.5 was above the 2005-2017 reference average of 25.8 kg/h (Table 3 and Figure 7). From 2010 to 2016, CPUE was stable, but below the reference average. In 2017 and 2018, CPUEs increased to 25-

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26 kg/h, similar to the reference average. In areas A-16.2.1.1.1 and A-17.4, CPUEs are lower (Table 3 and Figure 7). In 2018, they were 12.6 kg/h in A-16.2.1.1.1 and 16.5 kg/h in A-17.4.

The average landed clam size was smallest in this fishery (Table 3). However, the increase in minimum legal size to 90 mm in 2014 had a noticeable upward effect on the average size. The average size of the clams landed over the last three years ranges from 111 to 114 mm in the sampled areas.

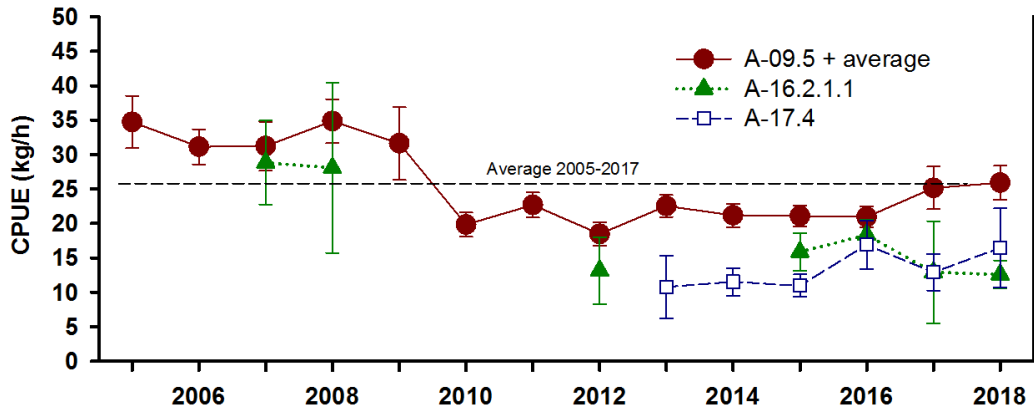


Figure 7. Average annual catch per unit effort (CPUE \pm 95% confidence interval) by shellfish area for the Atlantic Surfclam commercially hand harvested by digging in the Îles-de-la-Madeleine.

Sources of Uncertainty

Because there is no independent 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 lack of information on hand harvesting, which is mainly recreational, makes the conclusions for this fishery uncertain, given that unreported activities 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 of stock status uncertainty. The low proportion of individuals between 90 and 100 mm in North bed size structures since 2010 may reflect either a shift away from smaller-clam locations, 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 warm-water species and the Îles-de-la-Madeleine are at the northern boundary of its distribution range. For several years, the surface water layer of the Magdalen Shallows has had August and September mean temperatures similar to or higher than the 1985–2010 reference mean. In August and September 2018, surface layer and bottom temperatures (at about 0 to 30 m) around these islands were 1 to 2.5°C warmer than the reference mean. Global warming should benefit this population, for instance, by allowing its distribution range to reach deeper waters (25 to 35 m), and increasing stock productivity.

CONCLUSIONS AND ADVICE

Hydraulic dredge fishery

The hydraulic dredge fishery in the Îles-de-la-Madeleine has been conducted almost exclusively on the North bed since 2010. The total extent of the North bed is not yet known. TACs have been reached in sub-areas 5A1 and 5B1 and fishing effort is stable. Yields have been high and stable since 2015 on the North bed and the exploitation rate index has remained around 6%. However, the lack of information on recruitment and the possibility that high yields from the North bed may be based in part on the exploitation of pristine areas of the bed, and not only on the continued exploitation of the area being harvested, suggest caution. Taking into account all the information presented, the current landing levels could be maintained in sub-areas 5A1 and 5B1. In addition, it would be preferable to monitor future yields in order to avoid that the fishing effort deployed to reach the TAC (sub-areas 5A1 and 5B1) is not too high.

Hand digging

Hand digging is well developed in the Îles-de-la-Madeleine. Whereas the scope of recreational harvesting is not well known, reported commercial landings vary and depend on the fishing effort. In the main exploited areas, commercial dive harvesting CPUEs have been stable in recent years, remaining around their respective reference means. The commercial shore harvesting CPUE varies from area to area. In A-09.5, it is rather stable and was near the reference mean in 2017 and 2018.

Based on available information, hand harvesting could be maintained at the current level. Any measures that will help better document hand digging are desirable.

OTHER CONSIDERATIONS

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.

We should keep in mind that the surveys completed in 2012 of the beds that can be hand harvested, islets B and C in A-09.5 and A-16.2.1.1, show that nearly all these beds can be reached on foot. Also, the density figures obtained in 2012 in two of these beds were below those reported in 2007, which suggest they are under high fishing pressure from shore harvesters.

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 the interim years.

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SOURCES OF INFORMATION

This Science Advisory Report is from the February 28, 2019 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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THIS REPORT IS AVAILABLE FROM THE:

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ISSN 1919-5087

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Correct Citation for this Publication:

DFO. 2019. Assessment of the Îles-de-la-Madeleine Atlantic Surfclam stock in 2018. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/031.

Aussi disponible en français :

MPO. 2019. Évaluation du stock de mactre de l'Atlantique des Îles-de-la-Madeleine en 2018. Secr. can. de consult. sci. du MPO, Avis sci. 2019/031.