



ASSESSMENT OF QUEBEC COASTAL WATERS WHELK STOCKS IN 2005

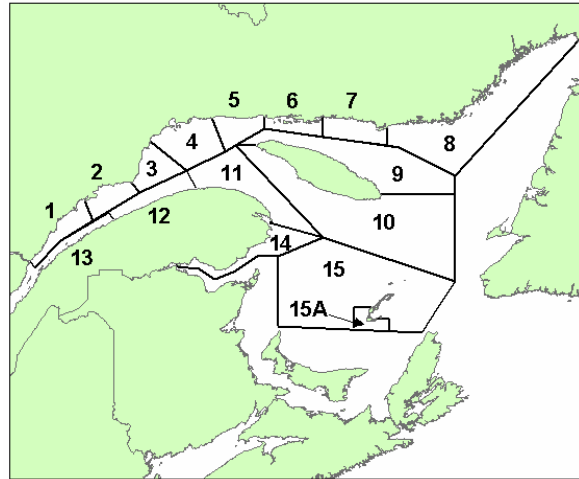


Figure 1. Whelk management areas in Quebec.

Context

Whelk commercial fishery began in 1984 in the Estuary and Gulf of St. Lawrence. In the 1990s and at the beginning of the 2000s, it expanded to North Shore. Since 2003, there has been an accelerated development of the fishery in the Magdalen Islands. Whelk fishery is an inshore activity that is practiced using conical or pyramid-type traps. Quebec waters are divided into 15 fishing areas. The fishery is currently regulated in all areas by controlling the number of licenses, the number and size of traps as well as the minimal size of unloaded whelks (70 mm). Quotas on landings are also in place in areas 1, 2, and 15A. Fishery follow-up is made on an annual basis in order to identify perceptible changes in the status of the resource; the preceding formal review of whelk stocks goes back to 5 years however. The main indicators used for stock follow-up are landings, fishing effort, catches per unit of fishing effort and demographic structure.

SUMMARY

- In 2005, ninety-nine (99) of the 264 fishing license holders fished whelk.
- Whelk landings in 2005 were 28% down on the North Shore, 80% and 127% up in the sectors of the Lower St. Lawrence-Gaspé Peninsula and the Magdalen Islands, respectively, compared to the average of the 2001-2004 series.
- In spite of the minimum catch size of 70 mm imposed for all the fishing areas, nearly 30% of whelks smaller than the legal size were observed in the landings from areas 1, 2, and 8. We recommend the maintenance of this size in all areas. Moreover, we recommend the use of fishing gears that minimize pre-recruit capture in order to reduce and even eliminate incidental mortality due to fishing.

- Based on the significant drop in landings and catch rates observed in several fishing areas, fishing effort and exploitation rates would be too high in these areas. We recommend a direct control of the actual fishing effort in all fishing areas.
- For areas 4, 5, 7, 8, 11, 12, and 13, we recommend a reduction of the fishing effort so that it does not exceed the lowest level observed since 2003. However, in the most critical areas (1, 2, 3, and 6), the effort must be below this level. For area 15, including sub-area 15A, the total effort must not be higher than that of 2005.

BACKGROUND

The waved whelk, (*Buccinum undatum*), is a gastropod mollusc that is found along the western Atlantic coast from New Jersey to Labrador, including the Estuary and Gulf of St. Lawrence. It is very common in cold waters, from the tidal level to depths of 30 metres or more. Whelk is a necrophagous predator, feeding mainly on invertebrates such as polychaetes, molluscs and echinoderms. In the St. Lawrence, whelk grows slowly but can reach a size of 110 mm. According to the literature, its life span is approximately 15 years.

Size at maturity varies between the sexes and from one area to another. It is generally greater for females than for males. The general average sizes at maturity for all the fishing areas studied are 69.5 mm for males and 71.6 mm for females.

Whelk fertilization takes place internally. On the North Shore, the mating season runs from May until July, and the eggs would be laid two to three weeks after mating. Eggs are enclosed in chitin capsules that are clumped together in masses of several centimetres and attached to a substrate. In the Estuary and Northern Gulf of St. Lawrence, the young emerge from the capsules after five to eight months of development. The absence of a planktonic larval stage limits the whelk's capacity for dispersal, thus reducing the possibilities of a quick recolonization of overfished sites.

Adults lead a sedentary life, spending most of their time immobile and half buried in sediments. Evidences suggest that this behaviour, together with the absence of a larval phase, limits mixing with adjoining populations. However, whelk can move quite far when food or predators are present.

ASSESSMENT

There are 15 whelk management areas in Québec waters. Areas 1 to 8 are along the North Shore, areas 9 and 10 along Anticosti Island, areas 11 to 14 along the Lower St. Lawrence and the Gaspé Peninsula, and area 15 along the Magdalen Islands (Figure 1). Until 2004, there has been no commercial fishery in areas 9 and 10 (around Anticosti Island). In 2005, however, some fishermen visited zone 9. Whelk fishery is an inshore activity that is practiced using conical or pyramid-type traps. This fishery is regulated by controlling fishing effort, both by the number of licenses issued and by the number and size of traps. There were 264 whelk fishing license holders in 2005; however, less than half of them (99 fishermen) were active. From 2000 to 2005, the minimum catch size increased from 65 mm to 70 mm in all fishing areas. The fishing season, which last six months in all fishing areas, extends from April-May to November-October.

Whelk landings peaked in 2003 with 2,000 tons. Since this time, landings dropped to 1,614 tons in 2005, a decline of almost 6% compared to the average for 2001-2004 (Figure 2). In 2005,

64% of the whelk landings came from the North Shore, mainly from areas 5 and 6 (Table 1). Since 2003, the landings from the Magdalen Islands have cornered a considerable share of the Quebec's market, representing 27% of the provincial total in 2005. The remaining portion of landings came from the Gaspé Peninsula. To date, landing fluctuations have usually reflected fishing effort rather than changes in resource abundance. In 2005, whelk landings were 28% down on the North Shore, 80% up in the Lower St. Lawrence-Gaspé Peninsula sector, and 127% up in the Magdalen Islands, compared to the average of the 2001-2004 series. In the Magdalen Islands, this fishery is rather recent (2002) and is still under development. The Magdalen Islands landings were respectively 388, 369, and 442 tons from 2003 to 2005. This last year, most of the landings (314 tons) came from area 15, as opposed to the two previous years where landings from this area were only 60 tons approximately.

Fishing effort, expressed in number of trips, reached a maximum value in 2003 with 3,402 trips. In 2004, it dropped to 2,319 trips, and then went up to 2,828 trips in 2005 (Figure 2). Total effort increased by 12% compared to the average from 2001 to 2004. In 2005, however, the effort decreased from 9% to 35% in six areas of the North Shore and the Gaspé Peninsula.

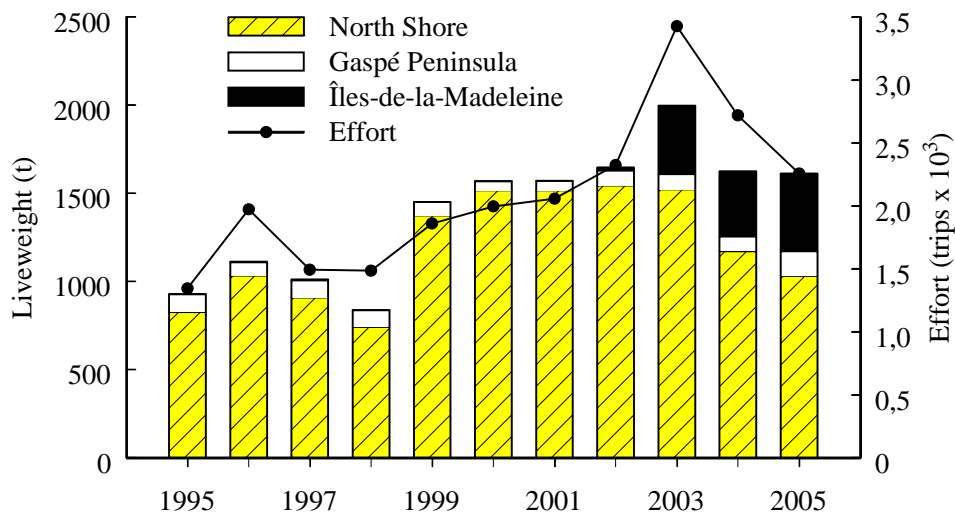


Figure 2. Whelk landings (tons) and total effort (number of trips) by area.

Catches per unit of effort (CPUEs), derived from logbooks, are below 8 kg per trap, except in areas 15 and 15A where the yields are approximately 20 kg per trap (Table 2). In 2005, CPUEs respectively dropped by 24%, 31%, 11%, and 21% in areas 1, 2, 3 and 6 compared to the average from 2001 to 2004. CPUE variations in areas 4, 5 and 7, though negative, are however lower than 10%. The trend in CPUEs from the other areas is positive. In the Magdalen Islands, CPUEs for sub-area 15A are down by 20% compared to the average from 2002 to 2004. The increase in CPUEs for area 15 is due to the exploitation of a virgin sector.

Table 1. Whelk landings (tons) by fishing area.

Sector	Area	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
North Shore												
	1	100	182	200	210	457	550	589	594	408	208	202
	2	63	62	42	11	120	207	157	132	119	66	72
	3	6	8	14	5	42	18	52	25	33	39	30
	4	86	195	68	29	65	108	162	143	149	161	118
	5	273	303	286	349	493	401	359	310	385	322	272
	6	182	195	109	108	130	184	201	243	282	279	193
	7	7	3	181	29	64	14		93	60	89	-
	8	113	86	10	4	5	37	0	6	90	7	62
	9											-
Gaspé Peninsula												
	11	56	52	56	49	36	28	18	29	25	24	44
	12	23	18	21	27	20	15	12	32	34	39	72
	13	21	6	20	18	21	8	24	23	27	22	24
	14		1	1	1				1	0	0	
Magdalen Islands												
	15	2	2	5		0			8	55	66	314
	15A								11	333	303	128
Quebec		932	1114	1013	840	1453	1571	1573	1650	2000	1628	1614

Table 2. Catches per unit of effort (kg of live weight/trap) of whelks per fishing area, based on logbooks.

Sector	Area	2001	2002	2003	2004	2005
North Shore						
	1	12,6	11,7	9,2	7,0	7,7
	2	10,4	8,3	10,9	7,6	6,4
	3	5,5	4,8	5,2	5,1	4,6
	4	4,3	2,9	2,8	2,8	3,0
	5	3,6	3,5	3,5	3,1	3,2
	6	4,5	5,4	4,2	3,7	3,5
	7		10,0	4,4	6,6	6,7
	8		3,9	3,4	2,9	4,2
	9					4,6
Gaspé Peninsula						
	10					
	11	2,0	2,3	1,8	2,8	2,9
	12	2,6	2,8	2,6	3,1	3,3
	13	4,4	4,9	3,3	3,9	4,3
	14					
Magdalen Island						
	15		8,3	20,4	16,2	24,0
	15A		15,6	20,7	19,5	16,1

The size structures of whelks measured at landing generally ranged from 45 mm to 110 mm in 2005 (Figure 3). For the same fishing area, sampled whelk size structure and average size were relatively stable from 2001 to 2005 (Table 3). The type of sampling (based on landing or on total capture before sorting) has little effect on the resulting size structures. In 2005, the average size remained lower than 80 mm in areas 1, 2, and 8 of the North Shore and in area 13 of the Gaspé Peninsula.

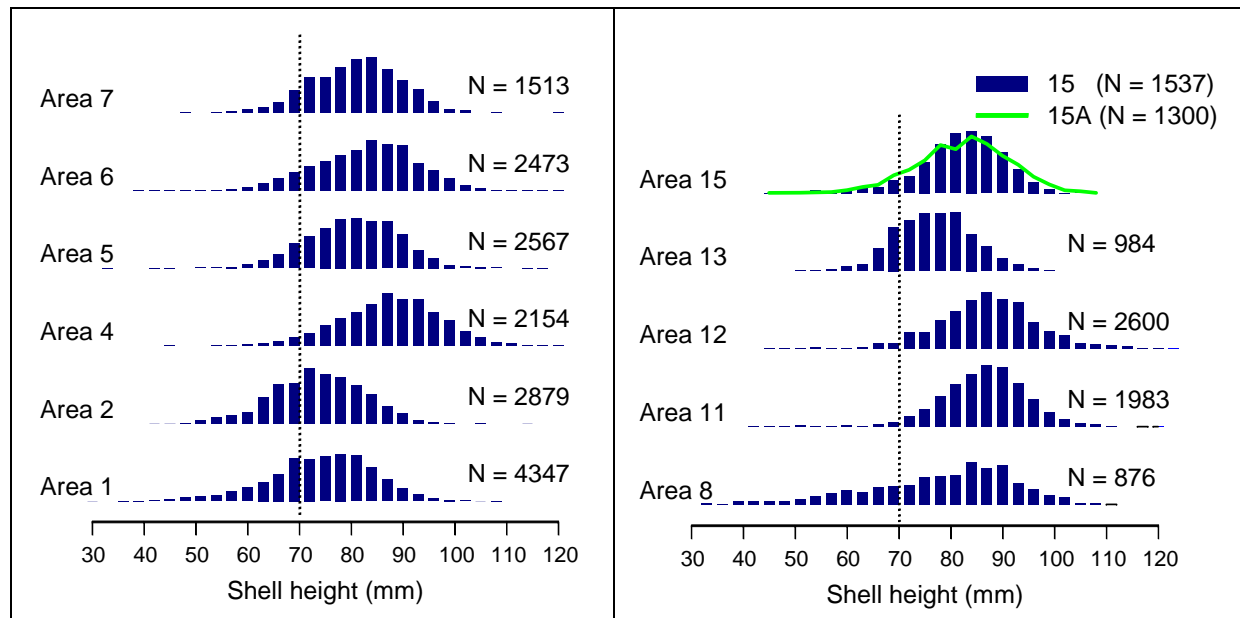


Figure 3. Whelk size structures, measured at landing, by fishing area in 2005. The vertical dotted line indicates the legal minimum catch size of 70 mm.

In spite of the minimum catch size of 70 mm imposed, there were still significant percentages of whelks of under-legal size that were unloaded in 2005 in some areas (Table 4). The percentages of these whelks were of more than 25% in areas 1, 2, and 8, slightly higher than 10% in areas 5, 6, and 13, and negligible in the other areas.

A research survey was carried out in 2005 in the Forestville, Pointe-aux-Outardes and Baie-Comeau sectors (areas 1 and 2). Whelk and associated species numbering was made at 74 stations using a Digby-type scallop drag whose panels were lined with 19-mm mesh opening Vexar. Almost all the whelks collected were *Buccinum undatum* (waved whelk). Only some *Buccinum totteni* and *Buccinum glaciale* individuals were observed. The densities of waved whelks collected ranged from 0 to 1.18 individuals/m². The average densities of whelks were respectively 0.07, 0.03, and 0.43 individuals/m² in the Forestville, Pointe-aux-Outardes and Baie-Comeau sectors. The size of the whelks captured ranged from 12 to 105 mm in shell height. An assessment of the whelk egg clusters was also made during this research survey. The presence of eggs was definitely more evident in the Pointe-aux-Outardes sector than in the two other sectors sampled. The results obtained would suggest a link between egg abundance and the density of whelks larger than 70 mm.

Table 3. Whelk average size (mm) measured at dockside, based on landings or on capture before sorting, by fishing area.

Sector	Area	Landing		Capture							Landing	
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
North Shore												
	1	68,1		73,8	75,5	73,4	76,2	77,4	76,0	71,6	72,9	74,4
	2			73,3	66,7	74,3	64,9	73,8	72,4	74,3	72,4	73,9
	3				89,1	82,2	84,8	83,1	85,7		86,5	
	4	72,3	79,2	84,3	82,4	81,3	82,7	82,6	84,0	89,0	86,7	87,4
	5	76,9		78,5	80,8	78,0	79,7	81,7	79,9	82,9	81,1	80,4
	6	71,5	77,9	82,1	79,0	86,3	84,0	86,6	86,5	84,8	80,6	82,8
	7				76,2	78,0	84,9		79,6	82,7	81,6	81,0
	8	73,8	66,3	64,7	70,6	73,3	75,4		69,9	80,3		77,4
	9											79,4
Gaspé Peninsula												
	10											
	11	74,1	77,5	77,7	76,3	76,6	82,5	83,9	85,4	86,1	83,3	86,3
	12				76,4		84,0	85,2	84,1	86,7	84,8	87,6
	13	66,9	69,1	65,5	66,4	62,2		57,0	60,6	66,9	69,7	76,8
	14										72,4	
Magdalen Island												
	15								69,9	80,2	84,0	82,4
	15A										81,5	81,6

Work was also conducted in basins to measure whelk catchability and escape capacity. During all the tests made in the basins, 84% of the whelks entered through the opening located on the top of the trap, and 16% passed through the meshes. Some observations show that whelks can enter and move inside the trap, then escape through the main opening.

Other tests were made on the field to compare the performances of 11 conical trap models of 0.9 and 1.2 m in diameter, two of which being currently used for the commercial fishery in Quebec. Preliminary results indicate that in spite of their different format, there is no significant difference between the yields of the two conical trap models currently in use in the industry when they are not saturated. These traps capture few whelks of less than 52 mm. The results also show that it is possible to reduce the capture of less than 70 mm whelks without affecting the yield for legal size whelks by using an adequate mesh opening and by adding escape mechanisms.

Table 4. Percentage (%) of individuals of a size lower than the legal minimum catch size (69 mm for North Shore and 70 mm elsewhere in 2004, 70 mm in all areas in 2005) observed in whelk commercial landings in 2004 and 2005.

Sector	Area	2004	2005
North Shore	1	37,2	29,1
	2	39,9	31,3
	3	1,6	
	4	5,2	3,5
	5	12,0	11,4
	6	10,6	10,2
	7	7,2	8,8
	8		25,5
	9		3,8
Gaspé Peninsula	11	12,5	3,3
	12	14,4	3,4
	13	49,5	16,1
	14	32,6	
Magdalen Island	15	7,4	7,6
	15A	7,8	8,2

Sources of Uncertainty

Because of the absence of independent indicators, such as those from the research survey, the advices formulated for whelk are entirely dependent on the quality of data provided by commercial fishery. Data that are partial or not reflecting reality, for example a number of retrieved traps different from that registered in the logbook, could in some cases reverse indicator trends. Since whelk fishery is, for several fishermen, a complementary activity, the fishing effort is sometimes very variable during the season and from year to year. The arrival or departure of experienced fishermen or less experienced fishermen could significantly affect catch rates. Environmental conditions, such as water temperatures or abnormal climatic conditions, can also impact on fishery indicators. The cumulated effects of these sources of uncertainty could result in advices not completely aligned with the status of the resource.

CONCLUSION AND ADVICE

Whelk is a sedentary species that breeds by copulation. Development of whelk continues on the egg-laying site, and there is no larval stage to help dispersing the young. These biological characteristics make the whelk vulnerable to local overfishing.

To limit this risk, a minimum catch size of 70 mm was recommended. This theoretical goal was reached in 2005 in all areas. Additional measures were also adopted to ensure compliance with this minimal size, to help managing fishing effort and avoiding local overexploitation of the resource. For example, fishing season was reduced to 6 months in all areas, and a total allowable catch (TAC) was set up in areas 1 and 2 in 2000 and in sub-area 15A in 2004.

These conservation measures contributed to a better protection of the reproductive potential but were not sufficient to increase yields and ensure the sustainability of each local population.

In spite of the minimum catch size of 70 mm imposed for all the fishing areas, nearly 30% of whelks smaller than the legal size were observed in the landings from areas 1, 2, and 8. We recommend the maintenance of this size in all areas. Moreover, we recommend the use of fishing gears that minimize pre-recruit capture in order to reduce and even eliminate the incidental mortality due to fishing.

Based on the significant drop in landings and catch rates observed in several fishing areas, fishing effort and exploitation rates would be too high in these areas. We recommend a direct control of the actual fishing effort in all fishing areas. This approach, instead of fixing quotas on landings, is preferable because the data available on whelk will not allow us to establish and adjust total allowable catch (TAC) on a regular basis. The control of the fishing effort could be made, for example, by limiting the number of trips and the number of trap-days.

For areas 4, 5, 7, 8, 11, 12, and 13, we recommend a reduction of the fishing effort so that it does not exceed the lowest level observed since 2003. However, in the most critical areas (1, 2, 3, and 6), the effort must be below this level. For area 15, including sub-area 15A, the total effort must not be higher than that of 2005.

SOURCES OF INFORMATION

Gendron, L. 1992. Determination of the size at sexual maturity of the waved whelk *Buccinum undatum* Linnaeus, 1758, in the Gulf of St. Lawrence, as a basis for the establishment of a minimum catchable size. J. Shellfish Res. 11 : 1-7.

Gendron, L. 1991. Gestion de l'exploitation du buccin *Buccinum undatum* au Québec : détermination d'une taille minimale de capture. Rapp. tech. can. sci. halieut. aquat. 1833, 40 p.

Martel, A., D. H. Larrivée and J. H. Himmelman. 1986. Behaviour and timings of copulation and egg-laying in the neogastropod *Buccinum undatum* L. J. Exp. Mar. Biol. Ecol. 96 : 27-42.

Martel, A., D. H. Larrivée, K. R. Klein and J. H. Himmelman. 1986. Reproductive cycle and seasonal feeding activity of the neogastropod *Buccinum undatum*. Mar. Biol. 92 : 211-221.

FOR MORE INFORMATION

Contact : Michel Giguère
Institut Maurice-Lamontagne
850, route de la Mer
C.P. 1000
Mont-Joli, Québec
G5H 3Z4

Tel. : (418) 775-0622

Fax : (418) 775-0740

E-mail : giquerem@dfo-mpo.gc.ca

This report is available from the:

Regional Advisory Process (RAP) Office
Quebec Region
Fisheries and Oceans Canada
Maurice Lamontagne Institute
P.O. Box 1000
Mont-Joli
Quebec, Canada
G5H 3Z4

Telephone: (418) 775-0825

Fax: (418) 775-0740

E-Mail: Bras@dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1480-4913 (Printed)

© Her Majesty the Queen in Right of Canada, 2006

La version française est disponible à l'adresse ci-dessus.



CORRECT CITATION FOR THIS PUBLICATION:

DFO, 2006. Assessment of Quebec coastal waters whelk stocks in 2005. DFO Can. Sci. Advis.
Sec. Sci. Advis. Rep. 2006/001.