



ASSESSMENT OF QUEBEC COASTAL WATERS WHELK STOCKS IN 2008

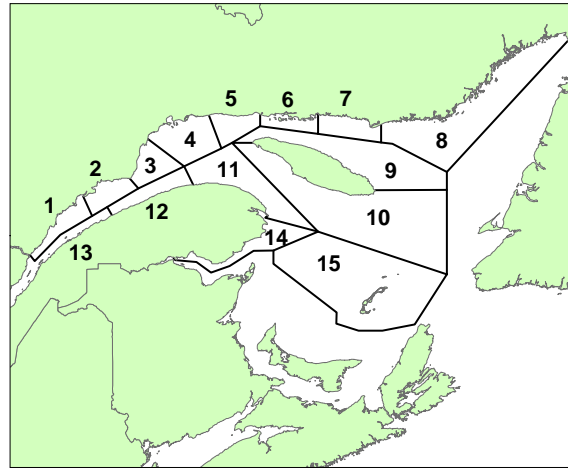


Figure 1. Whelk management areas in Quebec.

Context

The whelk commercial fishery began in the Estuary and Gulf of St. Lawrence in the 1940s. In the early 1990s it expanded to the North Shore. Since 2003, there has been an accelerated development of the fishery in the Îles-de-la-Madeleine. The 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 regulated in all areas by controlling the number of licenses, the number and size of traps as well as the minimal legal size of 70 mm. Quotas on landings are also in place in areas 1, 2, 10 and 15. Resource assessments are now done every three years and the last stock review goes back to 2005. The main indicators used for stock follow-ups are landings, fishing effort, catches per unit of fishing effort and demographic structure.

SUMMARY

- In 2008, whelk landings totalled 1,139 t in Quebec. More than half the landings (53%) were from the North Shore, 31% from the Îles-de-la-Madeleine and 16% from the Gaspé Peninsula – Lower St. Lawrence. Landings dropped by 50% on the North Shore, increased by 40% in the Gaspé Peninsula and dropped by 11% in the Îles-de-la-Madeleine compared to the 2001-2007 average. These variations can be explained in large part by changes in the fishing effort due to socioeconomic factors.
- In areas where the fishing effort has remained the same since 2006 (areas 1, 4, 5, 6, 12, 13 and 15), catches per unit effort (CPUE) were more stable or slightly higher. It appears that the fishing pressure in these areas is actually consistent with the available biomass.

In recent years, the effort deployed in all the areas has only represented between 34 and 45% of the licences issued.

- In 2008, the mean size of landed whelk was generally higher in most areas. The proportion of whelk in the landings measuring less than the legal limit was lower everywhere, except in areas 1, 2 and 8, which accounted for 15-43% of whelk smaller than 70 mm.
- It is recommended to directly control the fishing effort in all areas in order to reduce the potential effort. It is also recommended that the preventive TAC in area 1 be reduced to 55% of the 2008 value, which represents a drop equal to the CPUE difference between 2001 and 2004. It is suggested that minimal legal size of 70 mm be maintained in all areas. In addition, it is recommended that selective fishing gear be used along with methods to help handle sub-legal size whelk on board vessels in order to reduce, even eliminate, mortality caused by the fishery.

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 120-130 mm shell height. According to the literature, its life span is approximately 15 years.

Size at maturity varies between the sexes and from one fishing area to another. It is generally greater for females than for males. The mean size at which 50% of individuals are sexually mature is 69.5 mm for males and 71.6 mm for females for all the fishing areas studied.

Whelk fertilization takes place internally. On the North Shore, the mating season occurs in May and June. The eggs are laid two to three weeks after mating, mostly in June and July. Eggs are enclosed in chitin capsules that are clumped together in masses of several centimetres and attached to the substrate. There is no planktonic larval stage. In the Estuary and Northern Gulf of St. Lawrence, juveniles emerge from the capsules after five to eight months of development.

Adults lead a sedentary life, spending most of their time immobile and half buried in sediments. Evidence suggests that this behaviour, together with the absence of a larval phase, limits mixing with adjoining populations and the possibility to rapidly recolonize overexploited sites. Furthermore, whelk can move quite fast (15 cm/min) covering several dozen meters when food or predators are present.

RESOURCE 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 Îles-de-la-Madeleine (Figure 1). Area 10 has not been exploited since 1997. A few harvesters visited areas 9 and 14 between 2002 and 2006, but there has been no harvesting since 2007. Since 2005, the minimal legal size is 70 mm everywhere in Quebec. There were 260 whelk fishing license holders in 2008; however, only 89

fishermen were active. The fishing season, which last six months in all fishing areas, extends from April-May to October-November. There are total allowable catches (TAC) in areas 1, 2, 10 and 15, of 491, 109, 227 and 450 t respectively. Since 2004, these preventive TAC have never been reached.

Whelk landings in Quebec peaked in 2003 (2,000 t) with the introduction of the fishery in the Îles-de-la-Madeleine (Figure 2). Landings then dropped in stages from 1,588 t in 2006 to 1,139 t in 2008. Landings in 2008 dropped by 30% compared to the 2001-2007 average. In 2008, 53% of the landings were from the North Shore, mainly areas 1, 5 and 6, whereas landings in the Îles-de-la-Madeleine represented 31% of the Quebec total (Table 1). The remaining portion came from the Lower St. Lawrence - Gaspé Peninsula area. In 2008, whelk landings dropped by 50% on the North Shore and increased by 40% in the Gaspé Peninsula compared to the 2001-2007 average. The fishery is still recent and developing in the Îles-de-la-Madeleine. However, landings in 2008 dropped by 11% compared to the 2003-2007 average.

Fishing effort reached a maximum value of 3,402 trips in 2003 (Figure 2). Since 2005, the total effort has dropped from 2,815 trips in 2006 to 1,905 trips in 2008. The 2008 effort dropped by 26% compared to the 2001-2007 average. In 2008, the fishing effort dropped by 46% on the North Shore and increased by 33% in the Gaspé Peninsula compared to the 2001-2007 average. In the Îles-de-la-Madeleine, the effort was stable between 2003 and 2008. The variations in landings observed in recent years are largely due to changes in fishing effort and are the result of socioeconomic factors rather than abundance fluctuations of the resource.

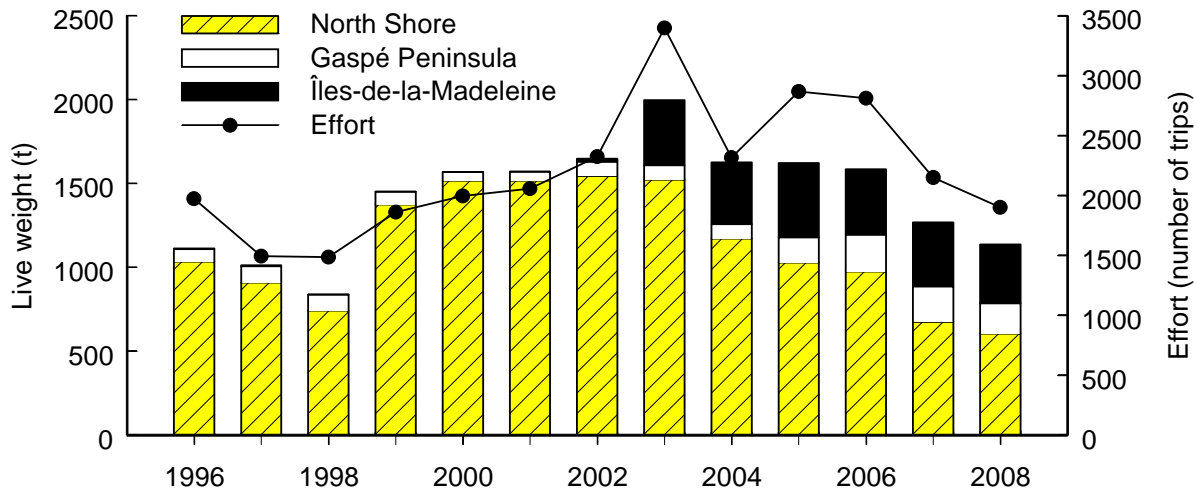


Figure 2. Whelk landings per region and total effort from 1996 to 2008.

Table 1. Whelk landings (t) per fishing area from 1996 to 2008.

Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Moy. ¹
North Shore														
1	182	200	210	457	550	589	594	408	208	202	247	151	118	343
2	62	42	11	120	207	157	132	119	66	72	39	46	21	90
3	8	14	5	42	18	52	25	33	39	30	28	14	16	31
4	195	68	29	65	108	162	143	149	161	114	107	83	48	131
5	303	286	349	493	401	359	310	385	322	272	221	168	146	291
6	195	109	108	130	184	201	243	282	279	193	196	152	216	221
7	3	181	29	64	14		93	60	89	62	90	42	19	73
8	86	10	4	5	37	0.2	6	90	7	62	47	21	24	33
9										22	1			
Gaspé Peninsula – Lower St. Lawrence														
11	52	56	49	36	28	18	29	25	24	44	34	7	3	26
12	18	21	27	20	15	12	32	34	39	84	150	127	108	68
13	6	20	18	21	8	24	23	27	22	24	34	77	67	33
14	1	1	1				1	0.1	0.3					
Îles-de-la-Madeleine														
15	2	5		0.1			20	388	369	443	392	382	352	395
Quebec														
	1,114	1,013	840	1,453	1,571	1,573	1,650	2,000	1,628	1,623	1,588	1,269	1,139	1,619

¹ 2001-2007 average, except for area 15 where the 2003-2007 average was calculated.

Since 2006, catches per unit effort (CPUE), determined from logbooks, have been relatively stable or slightly increasing in areas 1, 4, 5, 6, 12, 13 and 15, where the fishing effort has been sustained. In 2008, CPUE were less than 8 kg per trap, except in areas 2 and 15 where the performance was around 12 and 21 kg per trap respectively (Table 2). However, the CPUE in 2008 on the North Shore dropped by 8 and 28% in areas 1, 3, 4 and 7, they increased by 35% in area 2 and were stable in areas 5, 6 and 8 compared with the 2001-2007 average. In the Gaspé Peninsula they increased by more than 30% in areas 12 and 13 and dropped by 45% in area 11. Finally, in the Îles-de-la-Madeleine (area 15), the CPUE remained stable in 2008 compared with the 2003-2007 average. This stability in CPUE in area 15 was provided by the regular exploitation of new beds.

CPUE stability in recent years, in areas where the fishing effort has been sustained, could be linked to the current low fishing pressure. Nevertheless, the potential effort is still very high in several areas. In recent years, the fishing effort deployed in all the areas, expressed in the number of active fishing licences, only represented between 34 and 45% of the licences issued.

The size (shell height) of whelk measured at landing was between 34 and 120 mm in 2008 (Figure 3). In each fishing area, the mean size of sampled whelk was relatively stable between 2007 and 2008 and generally above the 2004-2007 average (Table 3).

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

Area	2001	2002	2003	2004	2005	2006	2007	2008	Average ¹
North Shore									
1	12.6	11.7	9.2	7.0	7.7	7.7	6.8	7.4	9.0
2	10.4	8.3	10.9	7.6	6.5	6.6	10.9	11.9	8.8
3	5.5	4.8	5.2	5.1	4.3	5.6	4.1	4.2	4.9
4	4.3	2.9	2.8	2.8	3.0	2.9	3.5	2.9	3.2
5	3.6	3.5	3.5	3.1	3.2	3.4	3.1	3.4	3.3
6	4.5	5.4	4.2	3.7	3.5	3.6	3.8	4.4	4.1
7		10.0	4.4	6.6	6.7	7.5	6.8	5.0	7.0
8		3.9	3.4	2.9	4.2	3.1	4.5	3.7	3.6
9					4.6	1.8			
Gaspé Peninsula – Lower St. Lawrence									
11	2.0	2.3	1.8	2.8	2.9	3.3	2.8	1.4	2.5
12	2.6	2.8	2.6	3.1	3.3	3.9	4.2	4.2	3.2
13	4.4	4.9	3.3	3.9	4.3	5.0	6.2	6.2	4.6
14									
Îles-de-la-Madeleine									
15		10.6	22.1	19.4	22.7	21.4	20.9	20.6	21.3

¹ 2001-2007 average, except for area 15 where the 2003-2007 average was calculated.

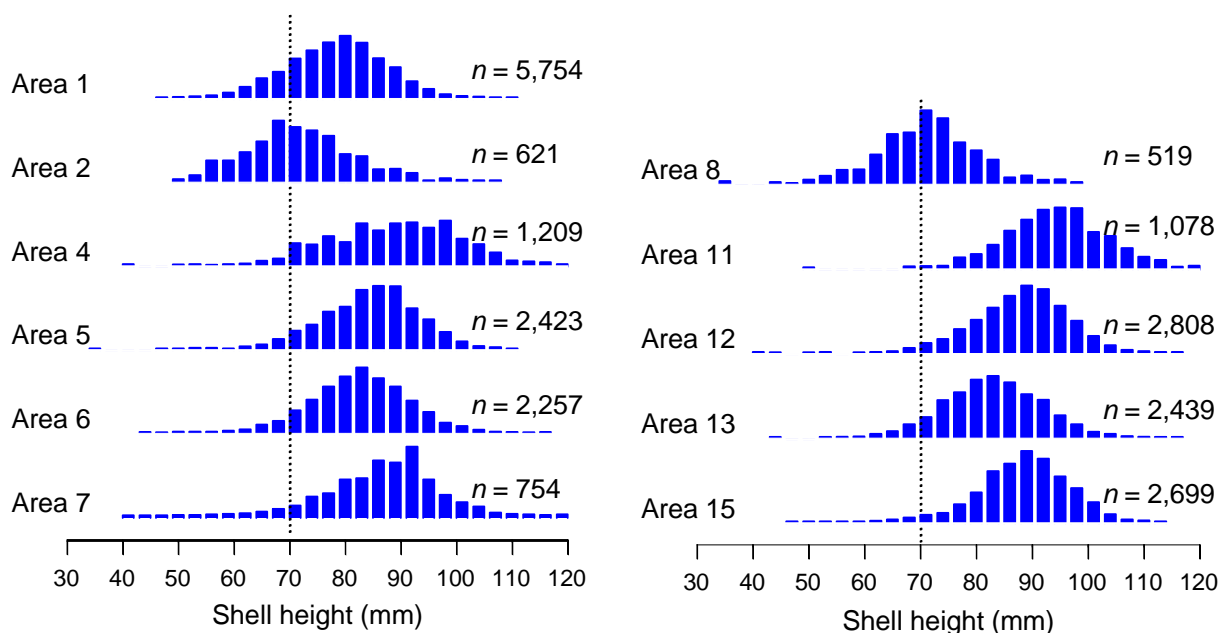


Figure 3. Whelk size structures, measured at landing, per fishing area in 2008. The vertical dotted line indicates the minimum legal size of 70 mm.

Table 3. Mean size (mm) of landed whelk per fishing area from 2004 to 2008.

Area	2004	2005	2006	2007	2008	Average ¹
North Shore						
1	72.9	74.4	76.6	79.1	78.4	75.8
2	72.4	74.0	71.5	74.1	71.8	73.0
3	86.5					
4	86.7	87.4	82.5	88.3	88.8	86.2
5	81.1	80.4	79.8	84.9	84.6	81.5
6	80.6	82.8	86.6	85.3	82.6	83.8
7	81.6	81.0	83.7	82.0	86.8	82.1
8		77.4	76.4	75.7	71.1	76.5
9		76.4	90.6			
Gaspé Peninsula – Lower St. Lawrence						
11	83.3	86.3	85.8	90.1	94.3	86.4
12	84.8	87.6	85.5	85.4	88.0	85.8
13	69.7	76.8	80.3	87.1	83.0	78.5
14	72.4					
Îles-de-la-Madeleine						
15	81.8	82.0	82.9	80.7	88.4	81.9

¹ 2004-2007 average.

Since a minimum size of 70 mm was imposed in 2005 in all areas, the proportion of sub-legal size whelk in the landings has been dropping (Table 4). In 2008, this proportion was less than 7% in most of the areas, except for area 1, 2 and 8 that accounted for 15 and 43% of whelk smaller than 70 mm.

Table 4. Proportion (%) of whelk smaller than the minimum legal size (70 mm) in the commercial landings per fishing area from 2004 to 2008.

Area	2004	2005	2006	2007	2008
North Shore					
1	38.3	28.7	18.6	8.4	15.1
2	43.4	29.9	41.5	26.7	42.6
3	2.2				
4	6.3	3.5	13.8	3.9	3.4
5	14.0	11.4	14.9	6.3	4.2
6	12.6	10.3	6.3	4.2	6.2
7	8.6	8.8	3.6	8.9	5.3
8		26.9	26.4	27.4	39.7
9		3.8	0.7		
Gaspé Peninsula – Lower St. Lawrence					
11	10.2	3.2	4.9	2.0	0.4
12	10.8	3.3	4.1	3.2	1.7
13	47.6	16.0	9.2	0.9	5.5
14					
Îles-de-la-Madeleine					
15	7.7	8.1	4.0	7.4	2.1

Two research surveys were conducted in 2005 and 2007 in the Forestville, Pointe-aux-Outardes and Baie-Comeau sectors in the Upper North Shore (area 1 and 2). The surveys were made using a Digby scallop dredge and the baskets were doubled with 19 mm Vexar™ meshing. More than 99% of the whelk harvested belonged to the *Buccinum undatum* (waved whelk) species. Only a few *Buccinum totteni* and *Buccinum glaciale* were found at Forestville and Pointe-aux-Outardes. The relative densities of the harvested waved whelk, all sizes confounded, varied between 0 and 1.18 whelk/m² according to the stations. The mean density of legal size whelk in the Forestville, Pointe-aux-Outardes and Baie-Comeau sectors was 0.03, 0.02 and 0.08 individual/m² in 2005 and 0.03, 0.03 and 0.07 individual/m² in 2007 respectively. These relative densities were similar in both survey years. The size of harvested whelk varied between 12 and 105 mm in 2005 and between 10 and 112 mm in 2007 (Figure 4). The pre-recruits were relatively abundant in the three sectors.

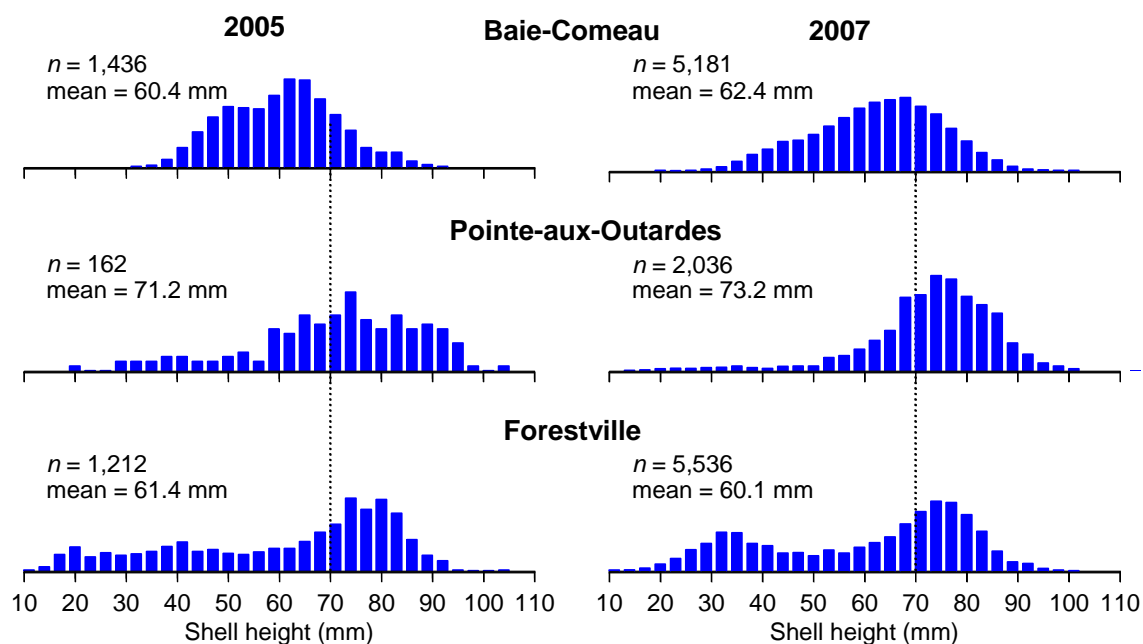


Figure 4. Size structures, number of individuals (n) and mean size of whelk harvested during the 2005 and 2007 research surveys on the Upper North Shore. The vertical dotted line indicates the minimum legal size of 70 mm.

An assessment of whelk egg deposits was also conducted during the two research surveys. The occurrence of eggs was definitely more evident in the Pointe-aux-Outardes and Baie-Comeau sectors than in Forestville. In 2008, the mean performance of egg masses was 0.01 g/m² in Forestville, 1.02 g/m² in Pointe-aux-Outardes and 0.4 g/m² at Baie-Comeau.

Sources of Uncertainty

Because of the absence of independent indicators for several fishing areas, such as those from the research surveys, the advices formulated for whelk are entirely dependent on the quality of data provided by the 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 affect indicator values and their 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, can also impact fishery indicators. Consequently, the resource's portrait could be different from our interpretation and recommendations not completely aligned with reality.

It should also be mentioned that effectiveness of the Digby dredge in collecting whelk and egg deposits during the research surveys was not verified. It is likely that whelk density was underestimated compared with the actual density on the sea-floor, and therefore the term "relative density" was used in the text. An estimate of the dredge's effectiveness will have to be made in order to increase the accuracy of the population assessments.

CONCLUSION AND ADVICE

Whelk is a sedentary species that attaches its eggs to the substrate during the egg-laying period. 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 legal size of 70 mm was introduced in 2005 and the fishing season was reduced to 6 months for all areas. In addition, a total allowable catch (TAC) was introduced in areas 1 and 2 in 2003 and in area 15 in 2004 and was adjusted in 2006. These conservation measures were adopted in order to better manage the fishing effort, to avoid overfishing and to better protect the reproductive potential.

In 2008, whelk landings totalled 1,139 t in Quebec. More than half of these landings (53%) were from the North Shore, 31% from the Îles-de-la-Madeleine and 16% from the Gaspé Peninsula – Lower St. Lawrence. Landings dropped by 50% on the North Shore, increased by 40% in the Gaspé Peninsula and dropped by 11% in the Îles-de-la-Madeleine compared with the 2001-2007 average. These variations can be explained in large part by changes in the fishing effort due to socioeconomic factors.

In areas where the fishing effort has been sustained since 2006 (areas 1, 4, 5, 6, 12, 13 and 15), catches per unit effort (CPUE) have been more stable or slightly higher. It appears that the fishing effort in these areas is currently in line with recruitment and available biomass. In recent years, the number of active licences in all the areas only represents between 34 and 45% of the licences issued.

The TAC that have been set in recent years, particularly in area 1, were too high for the available resource. It would not protect the resource in the event of a significant increase in terms of fishing effort. It is therefore suggested that the preventive TAC be reduced by 55% in area 1 to bring it back to a level closer to the landings of recent years. This reduction is of the same level as the CPUE between 2001 and 2004.

In 2008, the mean size of landed whelk was generally higher in most of the areas. Since 2006, the proportion of whelk under the legal size in the landings was lower in almost all areas except areas 1, 2 and 8, where landings still had between 15 and 43% of whelk smaller than 70 mm in 2008. It is recommended that the minimum legal size be maintained at 70 mm in all fishing

areas and to continue reducing, even eliminate, the number of sub-legal size whelk in the landings.

OTHER CONSIDERATIONS

The current selectivity of the traps does not permit the harvesting of only legal size whelk. Consequently, sorting is done on board the vessels. In order to limit incidence of mortality for sub-legal size whelk, it is important they are handled with care and released back into the water as soon as possible. It is recommended that selective fishing gear and methods for handling sub-legal size whelk on board vessels be developed and used.

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