



Scallops of the inshore waters of Quebec's North Shore in 2003

Background

There are two species of scallops in the Gulf of St. Lawrence: the sea scallop and the Iceland scallop. Sea scallops reach commercial size at about age 6, while Iceland scallops reach commercial size at around age 8. Both species have separate sexes and are broadcast spawners. The spawning season is short and varies from one location to another. Larval development occurs in the water column over a period of nearly five weeks, after which the juveniles settle on the bottom. Scallops are sedentary and live in aggregations called "beds".

The commercial fishery on the North Shore began in the late 1960s. It is an inshore fishery that targets mainly Iceland scallop. Catches are landed mostly as meat (muscle), but the proportion landed in the shell has been growing since the late 1990s. The North Shore region is divided into 12 management units with 50 permanent fishing licences and 10 exploratory licences. All of these units are managed by controlling fishing effort, but most of them are governed by quotas as well. The North Shore region has posted the largest scallop landings in Quebec since 1985.

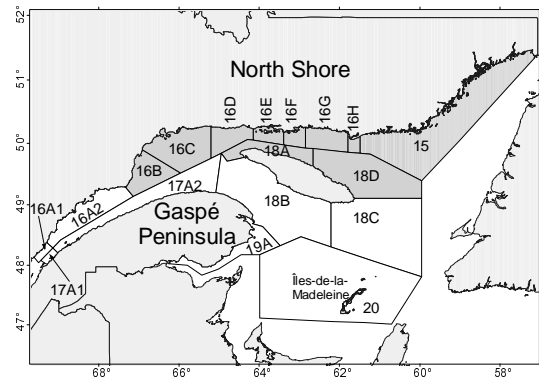


Figure 1. Scallop management units in Quebec (the grey zones are those covered in this scientific advice).

Summary

Scallops generally spawn in late summer, and the juveniles settle on the seabed in the fall. Meat yield (weight) varies over the reproductive cycle and is lowest during the spawning season. Subsequently, during the settlement period, the juveniles are very sensitive to any disturbance of the sediment by fishing gear. For these reasons, it is recommended that scallop beds not be dragged during the period from August to November.

In 2003, Quebec scallop landings totalled 157.1 t of meat, up 4.4% over 2002; 74% of landings came from the North Shore sector, at 116.8 t, up 14% over the level recorded a year earlier.

16E

- The landings and CPUEs recorded since 1998 have been stable and show that the stock can support the present level of exploitation. Based on current knowledge, it is recommended that the TAC be maintained at the 2003 level. The present scientific advice, which has been prepared in response to a

request from Fisheries Management sector to evaluate the effect of allowing two additional scallopers to participate in the fishery, indicates that this would require that all the individual quotas be reduced so as to maintain the exploitation rate at the 2003 level.

16F

- Landings have been fairly steady since 1996, and the CPUE estimated from logbook data is comparable to that seen over the past four years, which suggests that the main scallop bed is capable of sustaining the present exploitation level. Consequently, we recommend that there be no increase in fishing effort on the main bed.

18A

- In 2003, the low landings and low fishing effort did not help to reverse the downtrend in yields. In spite of this, it is recommended that the TAC be maintained at the 2003 level.

15, 16B, 16C, 16D, 16G, 16H, 18D

- There are few active fishers in areas 15, 16B, 16C, 16D, 16G, 16H and 18D, and fishing effort is not very high and varies from year to year. Based on the commercial indices there are no major changes to report for these areas from previous years. Nonetheless, the information available is incomplete, thus precluding an assessment of the state of the resource.

Biology

There are two indigenous species of scallops in Quebec: the sea scallop (*Placopecten magellanicus*) and the Iceland scallop (*Chlamys islandica*). These two species are found mainly on gravel, shell or

rocky bottoms, generally at depths of 20 to 60 metres. Whereas the Iceland scallop occurs all along the North Shore and around Anticosti Island, the sea scallop may occasionally be found on the Lower North Shore. Scallops are sedentary and live in aggregations called "beds". This aspect of their biology must be taken into account when scallop conservation strategies and fishing plans are being developed.

Sea scallops grow in length more rapidly than Iceland scallops, at a rate that varies from one area to another and is influenced by habitat quality and environmental conditions. In the Gulf of St. Lawrence, Iceland scallops reach commercial size (70 mm) at about age 8, while sea scallops reach commercial size (95 mm) at about age 6.

Scallops have separate sexes and are broadcast spawners. The spawning period is short and does not occur at the same time throughout the Gulf. Along the North Shore and around Anticosti Island, spawning occurs between mid-July and late August, depending on the area.

Larval development takes about five weeks, from fertilization to settlement on the seabed. During this period, the larvae are dispersed throughout the water column. Juvenile scallops generally attach themselves to the seabed near adults. Scallop beds are usually found in areas where the currents favour larval retention, but a good substrate is needed for successful juvenile attachment to the bottom. During the settlement period, juveniles are very sensitive to disturbance of the sediment by fishing gear. To ensure more successful settlement of juvenile scallops, it is recommended that scallop beds not be dragged during the period from August through November.

The meat weight yielded by a scallop of a given size varies over the reproductive cycle. Meat weight peaks in spring just before gonad development, drops to its

lowest point during the summer spawning period, and starts rising again in the fall.

The fishery

In the Gulf of St. Lawrence, the scallop fishery is an inshore fishery. The Digby drag is widely used. Over the years, there has been a substantial increase in fishing effort, primarily as a result of the fleet's increased capacity and efficiency.

The commercial fishery harvests both Iceland scallops and sea scallops without distinction. Catches are generally landed as meat (muscle). The difficulty of visually distinguishing the meat of the two species complicates the analysis of fishing statistics. However, the two species are not distributed uniformly in the Gulf of St. Lawrence, and catches in any one area usually consist of just one species. On the Upper North Shore and the Middle North Shore, landings are made up almost exclusively of Iceland scallops, whereas on the Lower North Shore both species are present and landings may be mixed.

Since the late 1990s, landings in the shell have been on the rise. Because of the mixed nature of the landings, conversion factors have to be applied to quantify the catch and to monitor quotas. This can cause a bias in these measurements, as well as in the calculated exploitation rate.

The North Shore is subdivided into 12 fishing areas, located between the mouth of the Saguenay River and Blanc-Sablon (areas 16A1, 16A2, 16B, 16C, 16D, 16E, 16F, 16G, 16H, 15, 18A, 18D) (Figure 1). Areas 16A1 and 16A2 are not covered in this assessment. Areas 16D and 18D have seen little if any fishing to date. In 2003, there were 50 regular licences and 10 exploratory licences on the North Shore. Separate management plans were developed for each area, based on the following factors: vessel length (< 15.2 m), drag size (< 7.31 m), fishing season and

hours and individual and overall quotas (Table 1).

Landings on the North Shore rose rapidly from 1984 to 1990. Catches have levelled off since 1991, owing to the introduction of individual quotas on the Middle North Shore. In 2003, North Shore landings amounted to about 116.8 t of meat, up 14% over 2002 (Figure 2). Since the late 1980s, scallop landings on the North Shore have accounted for more than 65% of Quebec's total catch. Most of these landings were made around the Mingan Archipelago and Anticosti Island (areas 16E, 16F and 18A).

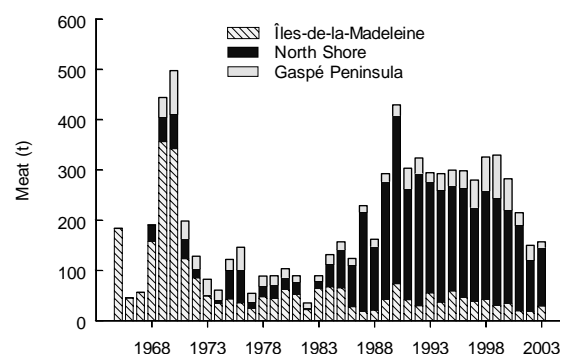


Figure 2. Scallop landings in Quebec.

The assessment of the state of scallop populations is based mainly on an analysis of commercial indices. For the Iceland scallop beds in the Mingan sector (Area 16E), it also incorporates indices derived from the research surveys that are carried out periodically. In addition, exploratory surveys were conducted in areas 16F, 16H and 15 in 2003.

Areas 16B, 16C and 16D

Landings from these areas, which correspond roughly to the Upper North Shore, totalled 330 kg in 2003 and consisted entirely of Iceland scallops (Figure 3). Areas 16B and 16C are harvested by four fishers, and all of the Mid North Shore scallop fishers have access to Area 16D. Fishing effort is low and is

Table 1. Management measures for scallop in 2003.

Area	Number of licences	Quota (t meat)	Season (day/month)	Daily schedule	Coverage for dockside weighing	Coverage by at-sea observers	Type of quota
15	33 + 10 ¹		01/04 to 31/12		100%		
16B	2		01/04 to 15/11				competitive
16C	2	17.3	14/05 to 30/10		100%	10%	competitive
16D	²	22.2	03/05 to 29/11		100%		competitive
16E	7	57.2	05/05 to 29/06	4 am – 9 pm	100%	10%	IQ ³
16F	9	27.6	11/08 to 11/09 (A) ⁴ 30/06 to 02/08 (B) ⁴	4 am – 9 pm	100%	10%	IQ
16G	4	35.9	30/04 to 26/11		100%		competitive
16H	8	30.9	05/08 to 30/10 (A) 30/04 to 30/10		100%		IQ
18A	9	50.9	05/05 to 10/08 (A) 03/08 to 06/10 (B)	4 am – 9 pm	100%	10%	IQ
18D			02/05 to 30/10		100%		

¹ = Exploratory licence for Iceland scallops

² = Open to fishers residing between Sept-Îles and Pointe Parent, on an experimental basis.

³ = Individual quota

⁴ = Group of fishers A and B

controlled by the number of licences issued and by quotas in areas 16C and 16D.

In 2003, there was no fishing in Area 16C and limited fishing effort in Area 16B. Landings in these areas vary widely and depend on the intensity of fishing effort. Landings in Area 16B amounted to 200 kg in 2003. Fishing yields (based on logbooks) were estimated at 1.16 kg/h m, a decrease of 79% compared with the average for the past 10 years (Table 2). Only one vessel fished this area commercially in 2003, and no samples of its catch were taken.

Along the shoreline from the Manitu River to the Île aux Perroquets lighthouse (Area 16D), landings totalled 112 kg in 2003, compared with 104 kg in 2002. Since 1996, landings and yields have been low, because of the sporadic nature of the fishing effort in this area. In 2003, catch per unit effort as estimated from logbooks was 0.76 kg/h m (Table 2). There was no commercial catch sampling.

Outlook

There are few active fishers in areas 16B, 16C and 16D, and fishing effort is low and varies from year to year. The information

available about these areas is incomplete and insufficient to permit assessment of the state of the resource.

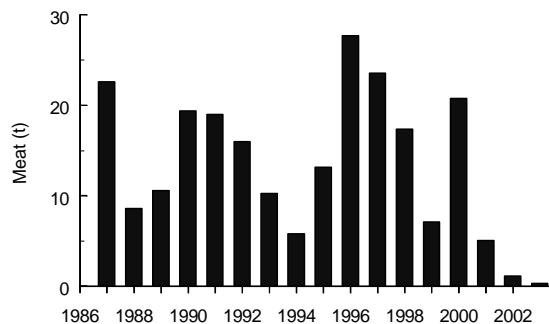


Figure 3. Scallop landings from areas 16B, 16C and 16D.

Areas 16E, 16F, 16G and 18A

Seven fishing licences have been issued for Area 16E, nine for areas 16F and 18A and four for Area 16G. Each of these areas is governed by a quota, and there are daily and seasonal restrictions on fishing effort. Iceland scallop landings from these four

Table 2. Catch per unit effort (kg of meat per hour of fishing and metre of drag width) estimated from logbooks.

Year	16B	16C	16D
1993	1.82	2.94	
1994	2.80	1.89	
1995	1.38	7.60	
1996	1.00	7.86	1.46
1997		5.28	2.66
1998	1.84	8.99	0.87
1999	1.32	4.48	0.79
2000	3.06	6.37	
2001	2.32	3.02	0.24
2002		8.00	3.43
2003	1.16		0.76

fishing areas along the Middle North Shore have risen substantially since the early 1980s. This is the most productive scallop region in Quebec; it is also the one with the strictest management measures.

Fishing effort decreased substantially in these areas in the 1990s as a result of the imposition of individual quotas in 1991, the shortening of the fishing seasons in all areas, and subdivision of the areas. The adjustment of quotas (upward or downward, depending on the area) has also affected the intensity of fishing effort.

The landed volume (meat) reached an all-time high of nearly 300 t in 1990 (Figure 4). In 1991, landings fell off sharply, especially in areas 16E and 16F. Since then, landings

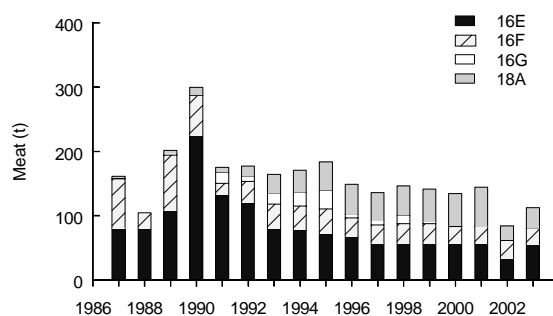


Figure 4. Scallop landings from areas 16E, 16F, 16G and 18A.

have fluctuated according to substantially the same pattern as the quotas. In 2003, the quotas were caught in areas 16E and 16F, but not in Area 18A. Landings on the Middle North Shore reached 113 t of meat in 2003, up 33% over 2002.

In Area 16E, landings totalled 55.6 t in 2003 (Figure 5). Excluding 2002, which was characterized by reduced fishing effort, fishing effort and the exploitation index have held steady since 1993. Catch per unit effort values have been stable since 1998. The modal size of scallops (Figure 6) and the average weight of dockside landings of meat are close to the average for the past ten years. In 2001, the indices derived from the research survey appeared to show a decline in the number of scallops potentially recruiting to the fishery in the short term; however, in 2003 pre-recruits measuring between 40 mm and 60 mm were observed (Figure 7). The 2003 research survey showed larger densities of commercial size scallops than the 2001 survey and densities similar to those seen in 1990 and in 1996 (Figure 8).

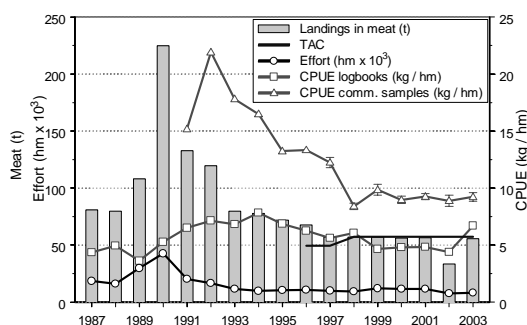


Figure 5. Scallop landings, total allowable catch (TAC), fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort, estimated from logbooks and commercial samples in Area 16E.

Landings in Area 16F totalled 25.8 t in 2003 and fishing effort has been stable since 2000 (Figure 9). Since harvesting began in this area, it has been concentrated in the

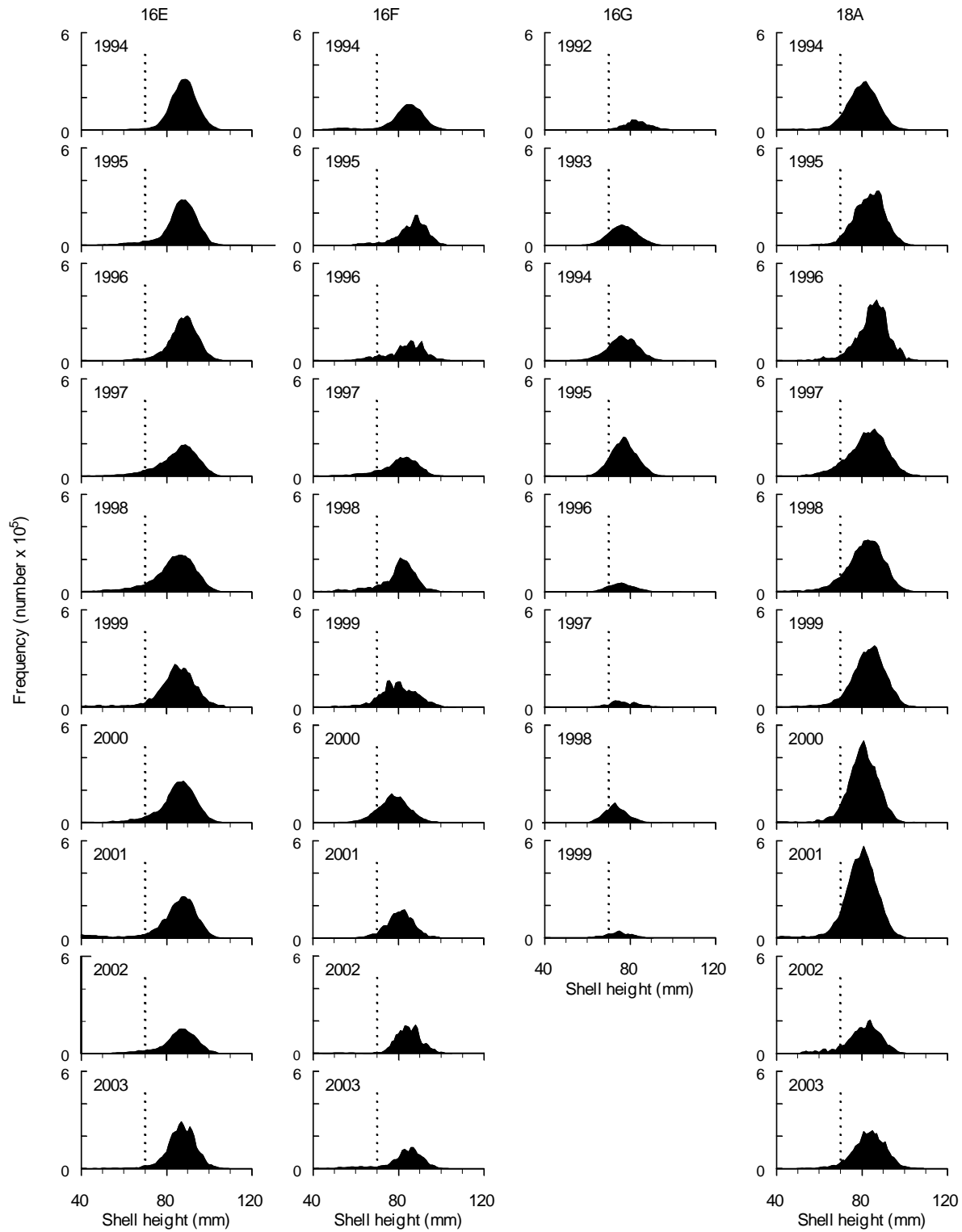


Figure 6. Size structure values for Iceland scallop in areas 16E, 16F, 16G and 18A based on commercial sampling data. The dotted line separates the pre-recruits (< 70 mm) from the recruits (≥ 70 mm).

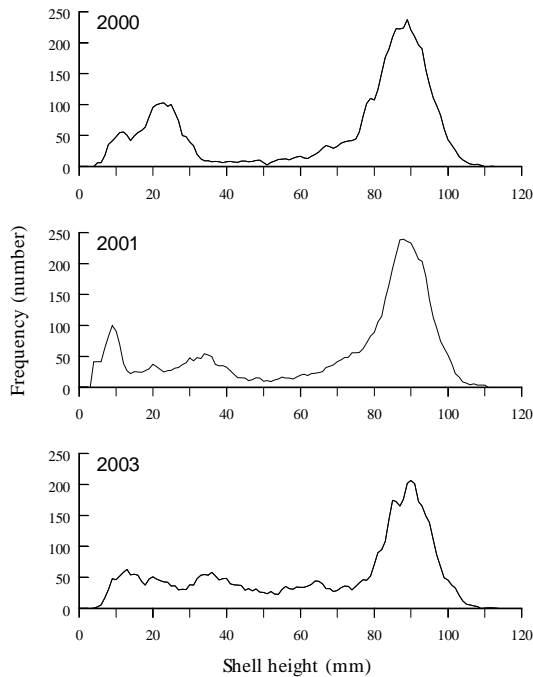


Figure 7. Size structure values for Iceland scallop sampled outside the Mingan Archipelago (Area 16E) during the research surveys of 2000, 2001 and 2003.

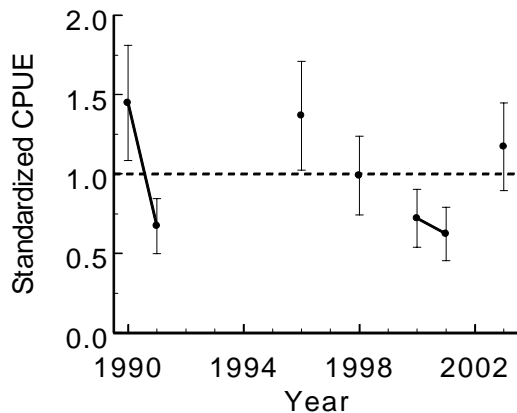


Figure 8. Standardized catch per unit effort index (\pm standard deviation) based on research surveys in the Mingan sector (Area 16E). The dotted line represents the average for the 1990–2003 series.

middle of the area. The exploratory survey conducted in 2003 shows that there are two beds located away from the central bed that are barely exploited. The catch per unit

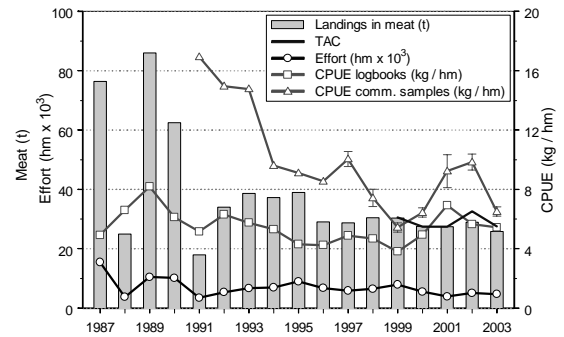


Figure 9. Scallop landings, total allowable catch (TAC), fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort, estimated from logbooks and commercial sampling data for Area 16F.

effort estimated from logbook data is similar to that for last year and higher than the average for the past 10 years. However, the catch per unit effort value derived from commercial sampling indicates a decline in 2003, which could be explained by the change in the fishing period. The modal size of the scallops is similar to the 2002 figure of 87 mm and higher than the average for the past 10 years. Landed meat weight was higher than in previous years.

Landings, fishing effort and yields tend to be variable near Natashquan in Area 16G (Table 3). Following two years in which there was no fishing in this area, the landings totalled 490 kg of meat in 2003.

In Area 18A, the quota of 51 t was not attained for the second consecutive year, and landings amounted to only 30.9 t (Figure 10). Fishing effort rose in 2003 but was 17% below the average for the past 10 years. The remoteness of the beds from Anticosti Island and the low market price for scallops may explain fishers' lack of interest in harvesting this area over the past two years. Catch per unit effort estimated from logbooks has been stable since 1999, whereas the corresponding estimates obtained by at-sea samplers show a downward trend for the same period. The size structure values are roughly average.

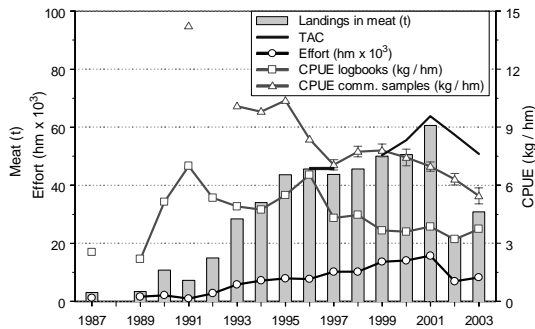


Figure 10. Scallop landings, total allowable catch (TAC), fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort, estimated from logbooks and commercial sampling data for Area 18A.

Outlook

At present, it is impossible to determine the status of the fishery in each of the management units of the Middle North Shore very precisely. The reduction that has occurred in fishing effort since individual quotas were adopted in 1991 and the creation of many fishing areas have allowed harvesting to be spread over a larger territory.

In Area 16E, catch per unit effort and fishing effort have stabilized since the 57.2 t quota was introduced in 1998. The abundance of small scallops in the research surveys of 2000 and 2001 was confirmed in the 2003 survey by the presence of scallops measuring between 40 mm and 60 mm; this finding suggests that the biomass may increase in a few years. Meanwhile, however, it is recommended that the status quo be maintained.

In the waters around Île à la Chasse (Area 16F), yields declined gradually from 1994 to 1999. Quotas have been reduced a number of times to reverse this downtrend and landings have held steady ever since. In 2003, aside from the increase in the catch per unit effort estimated from commercial

sampling, the commercial indices remained fairly similar to those in 2002, which is indicative of stock stability. In addition, the exploratory survey done in summer 2003 with the co-operation of fishers showed that there were two other beds in this area which are not exploited; these beds could be harvested although they are located in deeper water and contain slightly smaller scallops. Based on the results of this survey, it is recommended that fishing effort not be increased on the main bed.

Near Natashquan (Area 16G), landings, fishing effort and commercial yields are variable. Fishing effort was low in 2003. The average size of the Iceland scallops in this area is very small, and this could explain the fishers' lack of interest in it. The information available about the area is only partial and not sufficient to make any judgments about the state of the resource.

From 1999 to 2001, the quotas for Area 18A were increased substantially every year. Over this period, the rapid rise in landings and the steady growth in fishing effort were a source of concern, because of the attendant decline in the catch per unit effort. It was uncertain whether the stock would be able to sustain these harvesting levels and whether there would be adverse impacts on the resource. In 2002 and 2003, the quotas were reduced and they were not even attained. The lower landings and low fishing effort have still not reversed the downward trend in yields. The decrease in landings can be attributed mainly to the lack of interest in fishing this area because of the low market price for scallops and the higher operating costs there. In spite of the foregoing, it is recommended that the quota be maintained.

Areas 16H and 15

In 2003, there were eight scallop fishing licences for Area 16H and 33 permanent licences and 10 exploratory licences for Iceland scallop fishing in Area 15. Before

1992, most of the scallops landed on the Lower North Shore were sea scallops, but from 1992 to 1998, Iceland scallop landings from areas 16H and 15 increased. Since 1998, landings of the two scallop species have fallen on the Lower North Shore; they totalled only 1.8 t of meat in 2003 (Figure 11).

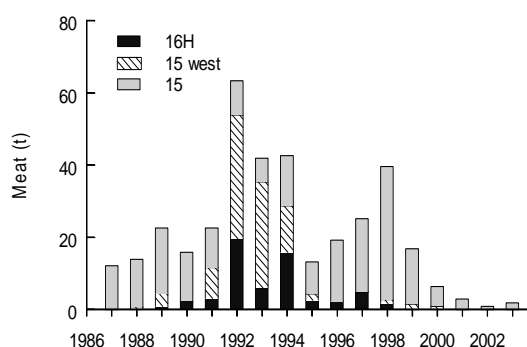


Figure 11. Scallop landings from areas 16H and 15 on the Lower North Shore.

In Area 16H, no scallops have been landed since 1998. From 1994 to 1998, landings for this area fell from 15.9 t to 1.7 t. The stability of the yields (based on logbooks) for Area 16H since 1993 does not explain the decline in landings since that year (Table 3).

Table 3. Catch per unit effort (kg of meat per hour of fishing and metre of drag width), estimated from logbooks.

Year	16G	16H	15	
			west	east
1993	3.16	2.58	2.75	1.14
1994	3.01	3.27	2.20	1.49
1995	2.63	2.15	1.40	1.12
1996	1.92	2.27		1.09
1997	1.58	2.64		1.42
1998	2.64	2.66	1.86	2.10
1999	3.76		3.63	2.16
2000	2.40		3.24	3.80
2001	1.45			1.64
2002				1.31
2003	3.63			1.64

In Area 15, landings and fishing effort have fallen substantially since 1998. From 1995 to 1998, landings in this area increased to 36.9 t from 8.7 t, but since 1999, they have declined. In 1999, Area 16I was included in Area 15 (west of the current Area 15). In 2003, landings totalled 1.8 t of meat, up 117% over 2002; however, this figure is 86% lower than the average for the past 10 years. Yields rose 25% compared with the 2002 level (Figure 11 and Table 3).

In fall 2003, an Iceland scallop survey was conducted on the Lower North Shore between Natashquan and Blanc-Sablon. It was done under the Fisheries Science Collaborative Program (FSCP) and with the co-operation of the Regroupement of Fishermen's Association Lower North Shore. The results show that Iceland scallops are distributed all along the Lower North Shore at depths of 20 to 45 fathoms, but they are present in low densities. The highest densities were observed off Kegaska and Blanc-Sablon.

Outlook

Landings on the Lower North Shore (areas 16H and 15) have been declining steadily for several years. The information about these areas is incomplete and precludes assessment of the state of the resource.

The decrease in landings of both scallop species on the Lower North Shore in recent years could reflect fishers' lack of interest in fishing there owing to the drop in market price for scallops or to the fact that the fishers have obtained temporary licences for other species.

The sporadic recruitment patterns of both scallop species and the recurrent mass mortalities of sea scallops on the Lower North Shore suggest that the number of fishing licences may be too high relative to the productive capacity of the stocks. It is therefore recommended that the potential fishing effort on the Lower North Shore be reduced.

Conservation measures

The conservation measures recommended for scallops are intended to protect each bed's ability to replenish itself and thus ensure its sustainability. Any approach designed to boost reproductive potential, whether by leaving more adults on the seabed or by creating refuge areas for spawners, would have a positive impact on conservation of the resource. Moreover, because the number of eggs that a female scallop produces is roughly proportional to its size cubed, allowing the population to age would result in a net gain in productivity, with the side benefit of increasing the yield per recruit, and hence commercial profitability.

Scallops spawn in late summer, and juveniles settle on the seabed in the fall. Dragging the beds with fishing gear at this time of year reduces reproductive potential and stirs up the sediment, which can interfere with successful settlement of juveniles. A halt in fishing during the spawning and settlement periods (August through November) would limit the adverse effects of dragging on the substrate and favour the survival of young scallops.

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