



Scallops in Quebec inshore waters

Background

There are two species of scallop in the Gulf of St. Lawrence: the sea scallop and the Iceland scallop. Sea scallops reach commercial size at about age 5, while Iceland scallops reach commercial size at around age 8. The sexes are separated, and fertilization takes place externally. The spawning season is short and varies from one location to another. Larval development takes nearly five weeks. Scallops are sedentary and live in aggregations called "beds."

Commercial harvesting in Quebec began in the mid-1960s. This inshore fishery harvests both species without distinction. Catches are landed mostly as meat (muscle), but the proportion landed in the shell has been growing since the late 1990s. The region is divided into 18 management units and has 82 regular fishing licences and 10 exploratory fishing licences. All of these units are managed by controlling fishing effort, but most North Shore and Anticosti Island units are also governed by quotas. The North Shore has been the most productive scallop region in Quebec since 1980.

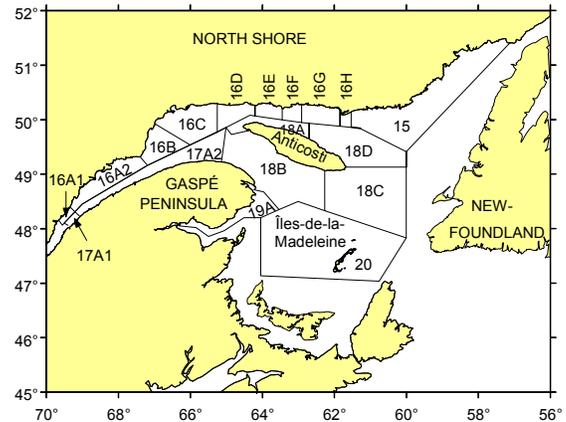


Figure 1. Scallop management units in Quebec.

Summary

All areas

Scallops spawn in late summer, and juveniles settle on the seabed in the fall. Meat weight yield varies according to the spawning cycle and is lowest during the spawning period. Consequently, juveniles are very sensitive to any disturbance of sediment by fishing gear during the settlement period. Therefore, it is recommended that scallop beds not be dragged from August to November.

Quebec scallop landings totalled 205 t in 2001, down 28 % from 2000; 70 % of landings were from the Mingan region (Areas 16E and 16F) and north of Anticosti Island (Area 18A).

Magdalen Islands

- In 2001, landings from traditional fishing grounds totalled 19 t, representing a 46 % drop from 2000. The decrease was offset by the harvest of a seeding site that yielded equivalent landings. Restrictive measures enforced in recent years, including the creation of

a spawning refuge, the gradual implementation of a minimum size limit of 100 mm and the reduction of the fishing effort, are intended to help with the recovery of declining wild stock. However, no sign of recovery has been noted thus far. In 2001, the abundance of scallops in fishing grounds and commercial yields remained very low. Consequently, current measures should be strengthened to prevent the stock's deterioration and help initiate a recovery.

Gaspé

- Gaspé landings plummeted by 72 %, reflecting the total absence of the fishery south of Anticosti Island (Areas 18B and 18C) and in the southern portion of the Île Rouge bed (Area 17A1), as well as the decrease in fishing effort in Chaleur Bay (Area 19A) in 2001. The low abundance of sea scallops and the decrease in the number of large scallops in commercial landings in Chaleur Bay (Area 19A) in 2001 are cause for concern. In order to favour the stock's recovery, it is recommended that the fishing effort in this area be decreased either through a reduction in the number of fishing days or the introduction of quotas.

North Shore

- In 2001, landings from the North Shore totalled 165 t, down 10 % from last year. Indices measuring the state of the resource were relatively stable for the North Shore in 2001, and it is recommended that the status quo be maintained for management measures in most of these areas. However, landings from north of Anticosti Island (Area 18A) increased by 61 t following a quota increase in 2001. The growing fishing effort in this area raises concern because it results in a decrease in the size of

scallops in commercial catches and an increase in the exploitation rate index. Reducing landings to 1999 and 2000 levels in the Area would be preferable to help increase scallop size and reverse the yield downtrend.

Biology

There are two indigenous species of scallops in Quebec: the sea scallop (*Placopecten magellanicus*) and the Iceland scallop (*Chlamys islandica*). In the Gulf of St. Lawrence, these two species are found mainly on gravel, shell or rocky bottoms, generally at depths of 20 to 60 metres. The Iceland scallop occurs along the North Shore, around Anticosti Island and off the north coast of the Gaspé Peninsula, but is virtually absent from the southern Gulf. In contrast, the sea scallop is found primarily in the southern Gulf, including the Magdalen Islands and Chaleur Bay, and occasionally along the Lower North Shore. Scallops are sedentary and live in aggregations known as "beds." This aspect of their biology must be taken into account when developing conservation strategies and harvesting scenarios.

Sea scallops grow in length more rapidly than Iceland scallops. Their growth rate varies from one area to another and is influenced by habitat quality and environmental conditions. In the Gulf of St. Lawrence, sea scallops reach commercial size at about age 5, and Iceland scallops at about age 8.

Scallops have separate sexes and are broadcast spawners. The spawning period is short and does not occur at the same time throughout the Gulf. Spawning along the North Shore and around Anticosti Island occurs between mid-July and late August, depending on the area. Sea scallops spawn in August in Chaleur Bay and in late August around the Magdalen Islands.

Larval development takes about five weeks, from fertilization to settlement on the seabed. During this time, the larvae are dispersed throughout the water column. Juvenile scallops generally attach themselves to the seabed in proximity to the adults. Scallop beds are generally found in areas where currents cause the larvae to be retained, but a good substrate is needed to ensure the successful attachment of juveniles. During the settlement period, juveniles are very sensitive to disturbance of the sediment by fishing gear. In order to protect the spawning effort and ensure settlement, it is recommended that scallop beds not be dragged from August through November.

The meat weight yielded by a scallop of a given size varies according to the spawning cycle. Meat weight peaks in spring (before the spawning season begins), drops to its lowest point during the summer spawning season and starts rising again in the fall.

The fishery

Quebec's commercial fishery harvests both the Iceland scallop and sea scallop without distinction. The impossibility of visually distinguishing the muscle of the two species complicates fishing statistic analysis. 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.

Catches are generally landed as meat (muscle), but occasionally as meat and roe (muscle and gonad tissue). However, since the late 1990s, landings in the shell have been on the rise. Because of the mixed nature of landings, conversion factors have to be used to quantify the catch and monitor quotas. This approach can produce a bias in these measurements, as well as in the calculation of the exploitation rate.

In 2001, Quebec waters were divided into 18 fishing areas grouped into three sectors: the Magdalen Islands (Area 20), the Gaspé (Areas 17A1, 17A2, 18B, 18C, 19A) and the North Shore (Areas 16A1, 16A2, 16B, 16C, 16D, 16E, 16F, 16G, 16H, 15, 18A, 18D) (Figure 1). Areas 16D and 18D have seen little, if any, fishing to date. In 2001, 82 regular licences and 10 exploratory licences were issued. Separate management plans were developed for each area, based on the following factors: vessel length, drag size, fishing season and hours, and individual and overall quotas.

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 significant increase in fishing effort, primarily as a result of the fleet's increased capacity and efficiency.

Landings in the Magdalen Islands have fluctuated a great deal since the commercial fishery began (Figure 2). Sea scallop stocks in the Magdalen Islands collapsed in 1971. 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.

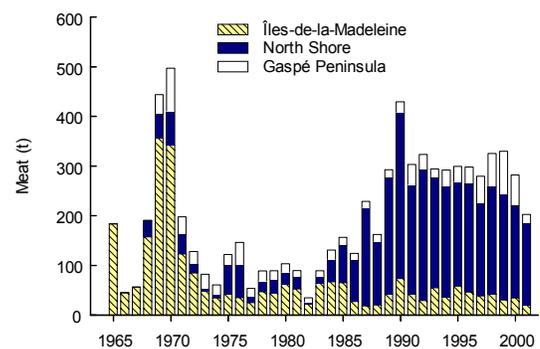


Figure 2. Scallop landings in Quebec.

In 2001, landings totalled more than 205 t of meat and came from (in descending order) the North Shore (81 %), the Gaspé (10 %)

and the Magdalen Islands (9%). The assessment of the status of scallop populations is essentially based on an analysis of commercial indices. In Areas 20 and 16E, it is also based on indices measured in research surveys. Furthermore, a partial exploratory survey was conducted in Area 16F in conjunction with fishers in 2000 and 2001.

Sometimes, the assessment of the status of populations in certain areas depends entirely on data supplied by the fishing industry (logbooks and purchase receipts). Comparison of these data with those from the sampling program conducted at sea occasionally raises doubts about the reliability of indices that are based on logbooks. Given the relative inaccuracy of the logbooks, the value of advice based solely on their data might be questionable.

The following sections present more detailed information on scallops taken in the Magdalen Islands and the Gaspé and on the North Shore. Since it is not possible to provide advice for each of the small beds scattered along the Quebec coast, this stock review is organized according to management units.

Magdalen Islands (Area 20)

The Magdalen Islands comprise a number of concentrations of scallops, namely the fishing grounds of Étang du Nord (Pointe du Ouest), Dix-Milles, Chaîne de la Passe, Sud Ouest, Île Brion and Banc de l'Est (Figure 3). In 2001, 23 licences were issued. The fishery was open from April 9 to July 28 in Sub-areas 20A and 20B; Sub-area 20E was closed to fishing for the entire year. The rest of the sector was open from April 1 to October 31 and from December 12, 2001 to January 12, 2002.

Scallop landings in the Magdalen Islands consist mainly of sea scallops. In 2001,

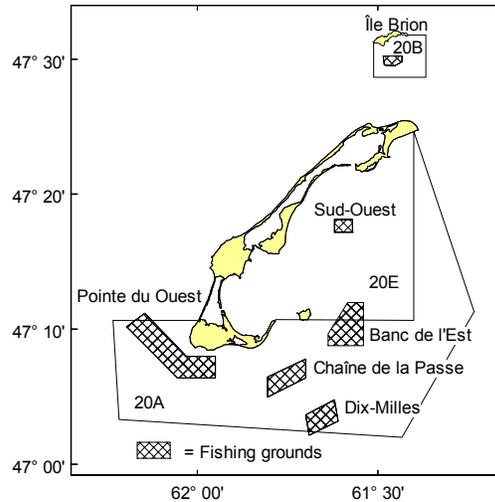


Figure 3. Sub-areas and main scallop fishing grounds in the Magdalen Islands.

Iceland scallops made up around 11% of landings. In 2001, landings for both scallop species combined totalled 19 t, down 46% from 2000 (Figure 4). The fishing effort decreased by 38% overall from 2000, but fishing effort for the Étang du Nord bed was similar to the previous year's. Generally, commercial yields have been low since 1996 (≤ 1 kg/h m) and well below 1968 levels (2.8 kg/h m). Commercial landings per unit effort (logbooks) were 0.77 kg/h m in 2001.

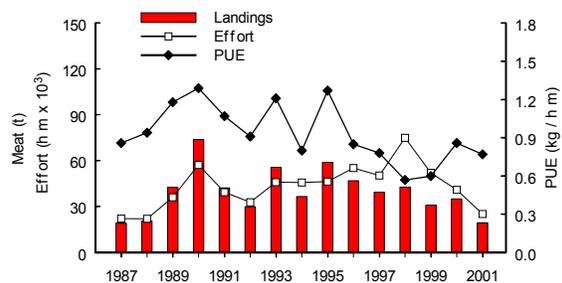


Figure 4. Scallop landings, fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort based on logbooks in the Magdalen Islands.

The abundance of prerecruits (< 70 mm), as measured in research surveys, peaked in 1992 because of the presence of the 1988 and 1989 cohorts, and then fell gradually

until 1996 (Figures 5 and 6). With the arrival of the 1997 cohort concentrated in the Étang du Nord bed, prerecruits were almost as abundant in 2000 as during their peak in 1992. However, the 2001 research survey indicates that the 1997 cohort has decreased.

In 2001, the minimum size limit was increased from 70 mm to 85 mm and prerecruits are now defined as sea scallops smaller than 85 mm. Prerecruit density estimated using the 2001 survey includes scallops measuring between 70 mm and 85 mm; these scallops account for 22 % of

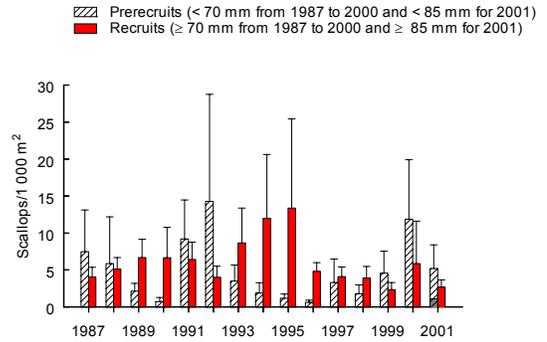


Figure 5. Density (± 2 standard errors) of sea scallops sampled in research surveys in the Magdalen Islands. The darker bar of prerecruits in 2001 corresponds to the portion of scallops whose size ranges between 70 mm and 85 mm.

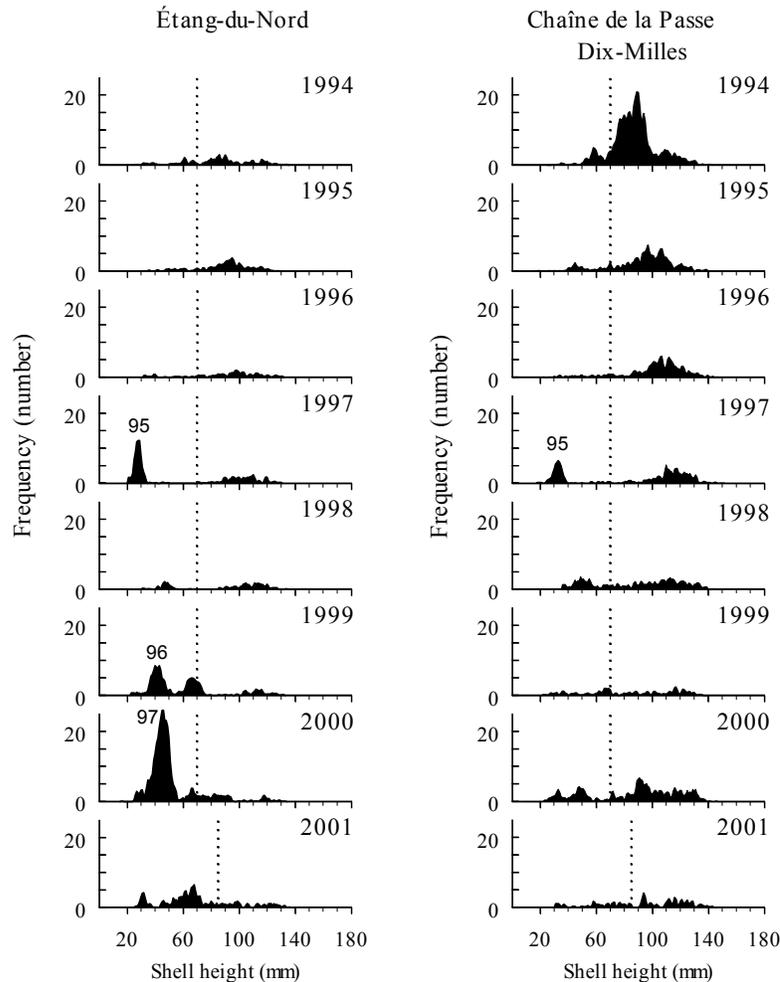


Figure 6. Size structures of sea scallops sampled in research surveys in the Magdalen Islands. The number shown above certain modes represents the year of birth of these dominant cohorts. The dotted line separates the prerecruits (< 85 mm) from the recruits (≥ 85 mm) in 2001; in previous years, the dividing line was 70 mm. The 2001 survey covers the fishing grounds of Étang du Nord and Chaîne de la Passe. The size structures represented correspond to scallops in these fishing grounds only.

the total number of prerecruits (Figure 5).

One of the major concerns in recent years has been the stock's ability to renew itself. It is even reasonable to suppose that if the abundance of spawners continues to gradually decrease, the stock's reproductive success will be affected. In 2001, there were no large scallops in commercial landings from the traditional fishing grounds of Chaîne de la Passe and Dix-Milles. Few spawners were present in these fishing grounds, and fishing was especially concentrated on scallops that had recently reached catch size.

Outlook

The abundance of scallop stocks in the traditional fishing beds of the Magdalen Islands was still very low in 2001. From 1990 to 2001, the exploitation rate index for sea scallops ranged between 8 % and 29 %, and the stock has continued to decline. This level of exploitation threatens the conservation of the resource. Since 1998, a series of measures intended to reverse the downtrend have been enforced, i.e. the creation of a spawning refuge, the reduction in fishing effort and the gradual implementation of a minimum size limit that will reach 100 mm in 2003. Despite these efforts, there have been no visible signs of improvement in the state of the resource. Yields remain low and recruitment is non-existent. The protective measures that have been enforced for the last few years have not been sufficient to help prevent the collapse of wild stock. Consequently, current measures should be strengthened to stop the stock from deteriorating and help initiate a recovery.

Gaspé (Areas 17A1, 17A2, 18B, 18C and 19A)

The Gaspé is comprised of three fishing sectors: the St. Lawrence Estuary (17A1, 17A2), Anticosti Island (18B and 18C) and Chaleur Bay (19A). Since 1998, scallop fishers from Area 18B have had access to Area 18C. In 2001, there was one fishing licence in Areas 17A1 and 17A2, two in Area 18B and six in Area 19A. Each of these areas had its own fishing season, and quotas were set in Areas 17A1, 17A2 and 18B.

Gaspé landings plummeted by 72 % from 2000 levels (Figure 7). In 2001, landings came solely from Chaleur Bay (Area 19A) and the St. Lawrence Estuary on the north coast of the Gaspé Peninsula (Area 17A2); in previous years, landings had come mainly from Chaleur Bay (Area 19A) and Anticosti Island (Areas 18B and 18C). In Chaleur Bay, the fishery targets mainly sea scallops and occasionally Iceland scallops, as was the case in 1998 and 1999. Iceland scallops are harvested around Anticosti Island and in the St. Lawrence Estuary. Gaspé landings increased steadily between 1993 and 1999, when they reached an all-time high of about 80 t of meat. Gaspé landings have been decreasing since 1999 and totalled 21 t in 2001.

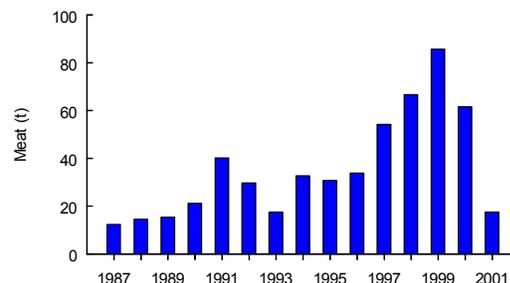


Figure 7. Scallop landings for Areas 17A1, 17A2, 18B, 18C and 19A in the Gaspé.

In the St. Lawrence Estuary, the Île Rouge Iceland scallop bed overlaps the boundary

between two fishing areas (Area 17A of the Gaspé and Area 16A1 of the North Shore). Landings from this bed increased in 1998 and 1999. The Iceland scallop fishery began in 1999 in the southern part of the Île Rouge bed (Area 17A1). In 2000, quotas were set at 13.6 t of meat; they were reached in the northern (Area 16A1) and southern (Area 17A1) parts of the bed. No fishing took place in the southern part of the Île Rouge bed (Area 17A1) in 2001.

North of the Gaspé Peninsula (Area 17A2), landings and fishing effort have been increasing since 1999. In 2001, landings rose by 45 %. Yields also increased (Table 1), despite a 39 % increase in the fishing effort.

Table 1. Catch per unit effort (kg of meat per hour of fishing and metre of drag width) estimated from commercial samples.

Year	17A1	17A2	18B	18C	19A
1991					
1992					
1993				1.20	
1994			4.80		1.29
1995					
1996		3.79	0.63		1.22
1997		2.64	5.04		1.66
1998		3.48	6.70	4.90	0.99
1999	24.58	3.29		19.54	0.71
2000	28.48	4.61		42.33	1.24
2001		4.99			0.97

No fishing activities took place south of Anticosti Island (Areas 18B and 18C) in 2001. In recent years, these areas have contributed substantially to the Gaspé catch. The fishery in these areas is still at the development stage. Since 1991, landings and yields of Iceland scallops have varied (Table 1). In 2000, landings and fishing effort decreased by 25 % and 65 %, respectively, compared with 1999, but yields were up by 115 % compared with that same year. The use of a new type of offshore drag is likely the reason for this increase. The size structure and mortality index

(percentage of cluckers) have remained relatively stable since 1996.

From 1994 to 1999, landings in Chaleur Bay (Area 19A) rose steadily, reaching nearly 37 t in 1999. In 1998 and 1999, the increase in landings was due to the redirection of fishing effort toward Iceland scallop. Since 2000, landings have been decreasing, and the fishery is once again concentrating on the sea scallop. In 2001, landings totalled 13 t, down 26 % from 2000 levels; fishing effort decreased by 32 %. The average size of sea scallops decreased, and large scallops were less abundant in commercial landings (Figure 8). Catch per unit effort also decreased by 22 % compared with 2000 (Table 1).

Outlook

The steady increase in Gaspé scallop landings between 1993 and 1999 is attributable to the development of an Iceland scallop fishery along the south shore of Anticosti Island, in Chaleur Bay and around Île Rouge. The decrease in landings in the Gaspé in 2000 was essentially due to lower landings in Chaleur Bay. In 2001, the significant decrease in Gaspé landings reflects the complete absence of fishing activity on the southern coast of Anticosti Island (Areas 18B and 18C) and around Île Rouge in the St. Lawrence Estuary (Area 17A1), as well as a drop in fishing effort in Chaleur Bay (Area 19A).

Exploitation of the Île Rouge bed in the St. Lawrence Estuary began a few years ago, and the series of commercial indices available covers only a short period. Consequently, it is difficult to interpret the decrease in indices observed in 2001 in the northern portion of the bed (16A1) because the drop may correspond either to a decrease in the abundance of the resource or to multiyear variations. Therefore, the status of the resource cannot be assessed for the time

being. It is recommended that the catch level and moratorium on the issuing of new permits be maintained beyond 2002 for the entire Île Rouge bed (Areas 17A1 and 16A1).

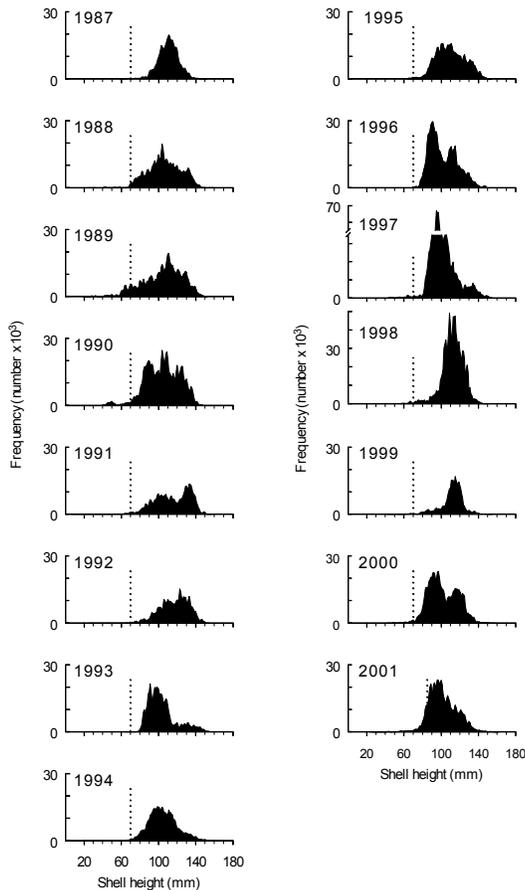


Figure 8. Size structures of sea scallops from Area 19A based on the commercial sampling. The dotted line separates the prerecruits (< 70 mm) from the recruits (\geq 70 mm) until 2000. In 2001, the dotted line is at 85 mm in accordance with the new minimum size limit.

North of the Gaspé Peninsula (Area 17A2), fishing effort and landings increased in 2001. These increases do not appear to have had a negative effect on the resource because commercial yields were up slightly. The current status of the stock does not seem to be of concern.

Landings and yields south of Anticosti Island (Areas 18B and 18C) have varied since 1991 and are mainly related to fishing effort there. Biomass remains abundant, but the scallops are small, with a modal size of approximately 75 mm. The state of the resource in these areas is not of concern given the current weak fishing effort.

Commercial scallop landings in Chaleur Bay (Area 19A) are generally very low. The low abundance of sea scallops and the lack of large scallops in commercial landings in 2001 are troubling indicators of the status of the resource. In order to promote the stock's recovery, it is recommended that fishing effort in Area 19A be decreased, either by reducing the number of fishing days (ideally by shortening the fishing season to avoid the spawning period and not drag beds at the time juveniles settle on the seabed) or by introducing quotas. The gradual introduction of a minimum size limit of 100 mm in 2003 will help protect the stock's spawning potential and promote conservation of the resource. Likewise, any measure helping to increase spawning potential such as protecting the spawning and juvenile settlement periods or creating a spawning refuge should have a positive impact on the stock's status and commercial landings.

North Shore

Iceland scallops are fished along the entire north shore of the Gulf of St. Lawrence, while sea scallops are taken only along the Lower North Shore. The North Shore is subdivided into 12 fishing areas located between the mouth of the Saguenay River and Blanc Sablon. Landings on the North Shore totalled around 165 t of meat in 2001, down 10 % from 2000. Since the late 1980s, scallop landings on the North Shore have always accounted for more than 65 % of the Quebec catch, with most of the landings coming from the waters around the Mingan

Archipelago and Anticosti Island (Areas 16E, 16F and 18A).

Areas 16A1, 16A2, 16B and 16C

Landings from these areas, which roughly constitute the Upper North Shore, totalled about 18 t in 2001 and consisted entirely of Iceland scallop (Figure 9). These areas are harvested by five fishers. Fishing effort is low and controlled by the number of licences issued and quotas in Areas 16A1, 16A2 and 16C.

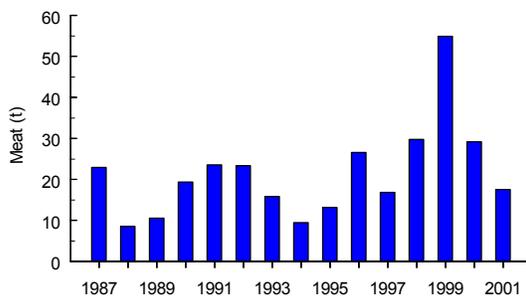


Figure 9. Scallop landings from Areas 16A1, 16A2, 16B and 16C.

The northern portion of the Île Rouge scallop bed, which is located in Area 16A1, has been harvested since 1998. This bed extends into Area 17A1. Only the northern portion of the bed was harvested in 2001. Catch per unit effort dropped by 51 % from 2000 (Table 2). The size structures of commercial samples indicated a drop in scallops' modal size, which decreased from 80 mm to 75 mm in 2001.

Landings in Area 16A2 vary greatly in relation to fishing effort. In 2001, catch per fishing effort was low and landings dropped by 72 % from 2000. Catch per unit effort in 2001 was 7.1 kg/h m, an increase of 45 % (Table 2).

From 1995 to 2001, there were few landings in Area 16B. In 2001, landings were lower than in 2000 and down approximately 38 %

compared with the 10-year average. Yields (as determined from logbooks) were down 24 % from 2000 (Table 2).

Landings in Area 16C also vary greatly from year to year. In 2001, landings plummeted by 40 % from 2000. Yields (as determined from logbooks) were 3.0 kg/h m (Table 2), down 53 % from 2000.

Table 2. Catch per unit effort (kg of meat per fishing hour and metre of drag width) based on commercial samples and logbooks.

Year	16A1	16A2	16B*	16C*
1991			4.16	2.78
1992			2.25	4.34
1993			1.82	2.94
1994			2.80	1.89
1995			1.38	7.60
1996			1.00	7.86
1997		4.57		5.28
1998			1.84	8.99
1999	18.99		1.32	4.48
2000	28.69	4.89	3.06	6.37
2001	14.14	7.08	2.32	3.02

* Logbooks

Outlook

In 1998 and 1999, landings from Area 16A1 (the northern portion of the Île Rouge bed) had become substantial. In 2000, quotas of 13.6 t of meat had been set and reached in the northern and southern (Area 17A1) portions of the bed. Only the northern portion of the Île Rouge bed (Area 16A1) was harvested in 2001. Abundance indices, scallop size and yields were down from 2000. However, the bed has only been recently harvested, and the series of available commercial indices is short. Consequently, it is difficult to interpret the decrease in indices because the drop corresponds either to a decrease in the resource or to multiyear variations. It is therefore impossible to assess the status of the resource at this time. As a precautionary

measure, it is recommended that the catch level and moratorium on the issuing of new licences be maintained for the entire bed.

There are few fishers in Areas 16A2, 16B and 16C; the fishing effort in these areas is relatively low and varies from year to year. Commercial indices from these areas do not indicate any major changes compared with previous years. However, the data are partial and not sufficient to draw any conclusions about the status of the resource.

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

Seven scallop fishers have access to Area 16E, nine to Areas 16F and 18A, four to Area 16G, and all of the Middle North Shore's scallop fishers have access to Area 16D. Each of these areas is subject to a quota, and fishing effort in these areas is controlled on both a daily and seasonal basis. Iceland scallop landings in the fishing areas along the Middle North Shore have increased sharply since the early 1980s. This is the most productive and strictly managed scallop region in Quebec.

Fishing effort has declined substantially since 1990 due to the imposition of individual quotas in 1991, the shortening of the fishing season in all areas and the subdivision of these areas. The adjustment of quotas (upward or downward depending on the area) has also affected the degree of effort.

The meat weight of scallops landed reached an all-time high of nearly 300 t in 1990 (Figure 10). In 1991, landings fell off sharply, especially in Areas 16E and 16F. Since then, landings have followed the same fluctuations as the quotas introduced, except in Area 16G, where landings have been fairly variable. In 2001, landings in this sector totalled nearly 145 t of meat, with the largest landings coming from Areas 18A and 16E.

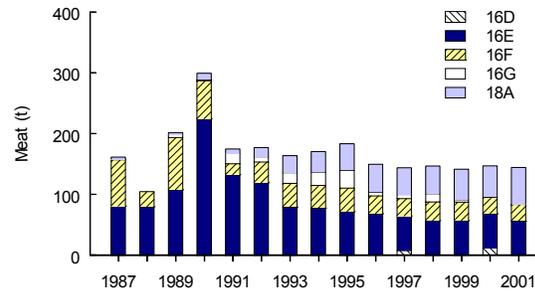


Figure 10. Scallop landings from Areas 16D, 16E, 16F, 16G and 18A on the Middle North Shore.

Since 1996, landings and yields in Area 16D have been low because of the sporadic fishing effort in the area (Figure 10). In Area 16E, the quota of 57.2 t of meat was met between 1998 and 2001 (Figure 10). However, this quota is lower than the 1997 quota, having been reduced in response to the sharp drop in yields between 1993 and 1998 (Figure 11). Catch per unit effort, which has been stable since 1998, was 9.3 kg/h m (Table 3) in 2001. The average size of landed scallops has been stable since 1992 at about 88 mm. Since 2000, research indices have shown a significant increase in the abundance of Iceland scallop prerecruits in the Mingan Archipelago and a stability in the abundance of recruits compared with research surveys conducted in previous years. The 2001 research survey indicated a strong abundance of scallops smaller than 40 mm, suggesting that biomass could increase in a few years. However, the survey also showed that recruitment to the fishery in the short term could be low because of the low abundance of scallops measuring between 40 mm and 70 mm.

In Area 16F, the quota was reduced to 27.5 t of meat in 2000 (Figure 10) in response to a continuing decline in commercial indices between 1994 and 1999. In 2001, the quota was met, and fishing effort dropped by 31%. Catch per unit effort increased to 9.2 kg/h m in 2001 (Table 3). The modal size of landed scallops rose from 78 mm to

83 mm. A partial exploratory survey conducted in 2000 and 2001 suggests that the resource is especially concentrated in a few beds of limited size in Area 16F.

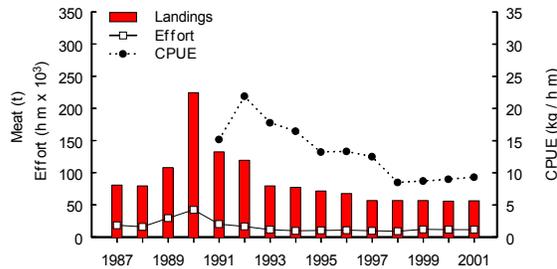


Figure 11. Scallop landings, fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort estimated from commercial samples in Area 16E.

Landings, effort and yield have varied somewhat in Area 16G (Figure 10 and Table 3). In 2001, landings totalled less than 0.1 t of meat. The average size of Iceland scallops in the area is very small (75 mm), which explains the lack of interest in harvesting them.

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

Year	16E	16F	16G	18A
1991	15.18	16.94	8.21	14.23
1992	21.92	14.97	6.33	
1993	17.81	14.78	8.55	10.09
1994	16.49	9.62	9.48	9.81
1995	13.26	9.11	5.95	10.37
1996	13.34	8.55	4.41	8.39
1997	12.51	9.96	2.52	7.08
1998	8.52	7.43	5.53	7.76
1999	8.72	5.43	1.70	8.11
2000	8.99	6.43		7.47
2001	9.33	9.16		6.97

Landings in Area 18A have been on the rise since 1991 (Figure 12). A 15 % quota increase in 2001 resulted in landings of 60.8 t, making this Quebec’s most productive area. Yields were 7.0 kg/h m and relatively stable compared with last year, but were down 25 % compared with the 10-year

average (Table 3). The size structures of scallop landings were stable between 1996 and 1999, with a modal size of around 88 mm. Since then, the modal size has dropped to 81 mm. Fishing effort and the exploitation rate index have been rising gradually over the last 10 years. In 2001, the exploitation rate jumped from 7 % to 9 %.

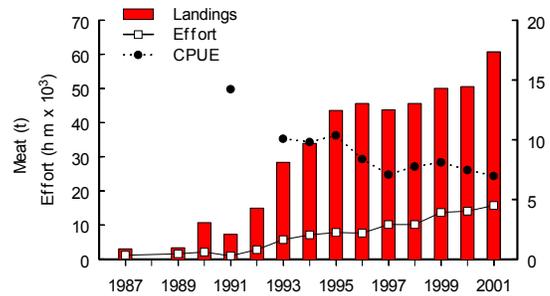


Figure 12. Scallop landings, fishing effort (standardized fishing hour for a metre of drag width) and catch per unit effort estimated from commercial samples in Area 18A.

Outlook

It is currently impossible to determine the exact status of the fishery in each management unit, especially since Areas 16D and 16G are still relatively unexplored. The reduction in fishing effort since the adoption of individual quotas in 1991 and the establishment of a greater number of fishing areas have helped to spread the harvesting effort over a larger territory.

There are few fishers in Area 16D, and the fishing effort in the area is relatively low and varies from year to year. Commercial indices from the area do not indicate any major changes from previous years. However, the data are partial and are not sufficient to draw any conclusions about the status of the resource.

Since the early 1990s, the abundance of Iceland scallops in the Mingan Archipelago (Area 16E) has decreased and quotas have been revised downward. However,

recruitment seems to have stabilized since 1998. The high abundance of prerecruits smaller than 40 mm in the 2001 research survey suggests that the biomass could start increasing in a few years. However, the low abundance of scallops measuring between 40 mm and 70 mm suggests that recruitment to the fishery in the short term could also be low. Until a recovery materializes, it is recommended that the status quo be maintained.

In the Île à la Chasse region (Area 16F), there has been a gradual decline in commercial indices since 1994, as well as a drop in quotas. Since the introduction of quotas in 2000, commercial indices have stabilized. In 2001, the indices were on the rise, indicating the stability of the state of the resource. Consequently, the current exploitation level seems to sustain the conservation of the resource.

Near Natashquan (Area 16G), Iceland scallops are abundant but small, which may help explain why fishers have gradually moved away from this area. However, the data are partial and insufficient to draw any conclusions about the status of the resource.

Since 1999, quotas in Area 18A have been increased substantially every year and were increased by 15 % in 2001. Landings also rose, making Area 18A Quebec’s most productive area. The rapid increase in landings and growing fishing effort are of concern because they result in a decrease in scallop size and catch per unit effort. The stock may not be able to sustain the current exploitation level without having a negative impact on the status of the resource. Consequently, reducing landings to 1999 and 2000 levels would be preferable to help increase scallop size and reverse the yield downtrend.

Areas 16H and 15

In 2001, there were eight scallop fishing licences in Area 16H, and 33 permanent licences and 10 exploratory licences that allowed access to Area 15. Before 1992, most of the scallops landed on the Lower North Shore consisted of sea scallops. Iceland scallop landings from Areas 16H and 15 increased from 1992 to 1998. Since 1998, landings of the two scallop species have plummeted on the Lower North Shore, totalling only 2.8 t in 2001 (Figure 13).

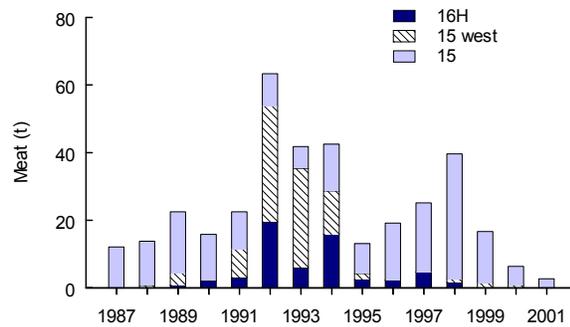


Figure 13. Scallop landings in Areas 16H and 15 on the Lower North Shore.

No landings have been made in Area 16H since 1998. From 1994 to 1998, landings in Area 16H plummeted from 15.9 t to 1.7 t. The stability of yields (logbooks) from Area 16H does not account for the sharp drop in landings since 1993 (Table 4).

Table 4. Catch per unit effort (kg of meat per hour of fishing and metre of drag width) estimated from logbooks.

Year	16H	15	
		west	east
1991	5.64	4.51	0.67
1992	4.15	2.91	1.00
1993	2.58	2.75	1.14
1994	3.27	2.20	1.49
1995	2.15	1.40	1.12
1996	2.27		1.09
1997	2.64		1.42
1998	2.66	1.86	2.10
1999		3.63	2.16
2000		3.24	3.80
2001			1.71

Landings in Area 15 soared from 8.7 t to 36.9 t between 1995 and 1998. Landings and fishing effort have dropped sharply since 1998. In 1999, Area 16I was included in Area 15 (west of the current Area 15). In 2001, landings, which totalled 2.8 t, came from the eastern sector of Area 15 and consisted mostly of sea scallops. Yields dropped by 81 % from 2000 levels (Table 4).

Outlook

For a number of years, commercial indices for Iceland scallops along the Lower North Shore (Areas 16H and 15) have not shown any major changes from previous years. However, the data is partial and not sufficient to draw any conclusions about the status of the resource.

The state of our knowledge of sea scallops on the Lower North Shore (Area 15) precludes any assessment of the status of the resource. The biological characteristics of the sea scallop, its contagious distribution and the mass mortalities observed in past years and again in 2001 at certain fishing locations make the species highly vulnerable to overfishing. For the time being, it would be inappropriate to step up fishing effort directed at sea scallops in Area 15.

The decrease in landings of both scallop species on the Lower North Shore could reflect fishers' lack of interest owing either to the drop in scallops' market price or to their obtaining temporary fishing licences for other species.

Conservation measures

The conservation measures recommended for scallops are intended to protect the sustainability of each bed in order to ensure the species' survival. Any approach designed to boost spawning potential, whether by leaving more adults on the

seabed or by creating refuge areas, would have a positive impact on conservation of the resource. Moreover, because the number of eggs that a female scallop produces is proportional to its size, 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 spawning potential and stirs up sediment, which disrupts the settlement of juveniles. A halt in fishing during the spawning and settlement seasons (August through November) would limit dragging damage to the substrate and favour the survival of young scallops.

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