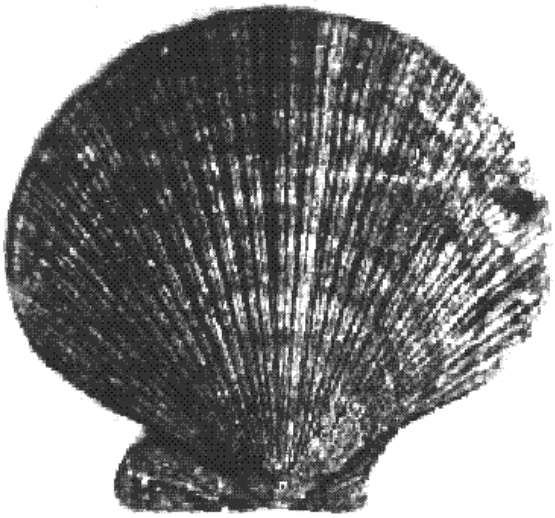

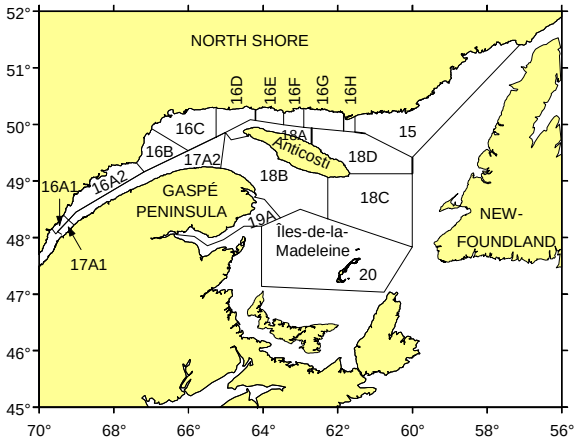

Figure 1. Scallop management units in Quebec.

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, Iceland scallops at about age 8. The sexes are separate, and fertilization takes place externally. The spawning season is short and varies from location to location. Larval development takes nearly five weeks. Scallops are sedentary and live in aggregations known as "beds".

In Quebec, commercial harvesting began in the mid-1960s. This is an inshore fishery, taking both species without distinction. Catches are still 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 of the units off the North Shore and Anticosti Island are also governed by quotas. Since 1980, the North Shore has been the most productive scallop region in Quebec.

Summary

All management units

Scallops spawn in late summer, and the juveniles settle on the seabed in the fall. During the settling period, the young are very sensitive to any disturbance of the sediment by fishing gear. Also, the yield of meat by weight varies with the reproductive cycle and is lowest at spawning time. It is therefore recommended that scallop beds not be dragged from August through November, especially since yields are lower during the spawning season in any case.

The commercial scallop fishery in Quebec harvests two species: the sea scallop and the Iceland scallop. The occasional presence of both species in catches from the Lower North Shore, Chaleur Bay, and the Îles-de-la-Madeleine can sometimes complicate the interpretation of results. Landings are generally in the form of meat (and occasionally meat and roe) and whole scallops. Because of the mixed nature of these landings, conversion factors have to be used to record the catch and to monitor quotas. This approach can produce a bias in these measurements, as well as in the computation of the exploitation rate.

Îles-de-la-Madeleine

- From 1990 to 2000, the exploitation rate index for sea scallops around the Îles-de-la-Madeleine has ranged from 8% to 29%, and the stock has continued to decline. The current levels of exploitation threaten the conservation of the resource. In the absence of a moratorium, only a combination of measures can reverse this trend. The measures that have been enforced since 1998—the creation of a spawning refuge and a reduction of the fishing effort—must be continued for several years and possibly even strengthened. It is also urgent to impose a minimum catch size of 100 mm (about 30 muscles per pound). In the long term, all of these measures can successfully protect a minimum biomass of spawners on the seabed, increase spawning effort, and improve the yield per recruit. The arrival of new cohorts with above-normal abundance (like the 1997 cohort), along with any increase in the number of scallops seeded on aquacultural sites, will help to rebuild this stock.

Gaspé Peninsula

- In 2000, the Estuary was divided into two areas : 17A1 (west) and 17A2 (east). The Iceland scallop fishery at Île Rouge (area 17A1) began in 1999, and its yields were among the highest in Quebec. In 2000, the exploitation rate index for the bed as a whole (areas 16A1 and 17A1) fell by 50% compared with 1999. The resource in this bed is abundant, but caution is required, because the fishing ground is small. A moratorium on the issuing of new licences and a limit on the size of the catch were put in place in 2000 and should continue through 2002.
- To the north of the Gaspé Peninsula (area 17A2), the commercial indexes have been relatively stable since 1998. The status of the Iceland scallop in this area will remain stable provided that there is no increase in the fishing effort next year.
- To the south of Anticosti Island (areas 18B and 18C), landings and yields of Iceland scallop have fluctuated since 1991. The biomass is still abundant, but the scallops are small. The current level of exploitation does not seem to threaten the resource.
- In Chaleur Bay (area 19A), the fishery in 2000 targeted sea scallops for the most part, and Iceland scallops occasionally, as was the case in 1998 and 1999. In 2000, the commercial indexes for sea scallops were low, but similar to the average for 1990 to 1999. The abundance of sea scallops is low in this area, but the status of the stock appears stable. The imposition of a minimum catch size (100 mm) would protect the spawning effort and promote conservation of the resource.

North Shore

- Since 1998, landings from area 16A1 (the northern portion of the Île Rouge bed) have grown. In 2000, the abundance indexes for this areas were high, and the exploitation rate index for this bed fell by 50% compared with 1999. The resource in this bed is abundant, but caution will be required, because the fishing ground is small. A moratorium on the issuing of new licences and a limit on the size of the catch were put place in 2000 and should continue through 2002.
- There are few fishers in areas 16A2, 16B, 16C and 16D; the fishing effort in these areas is relatively low and varies from year to year. The commercial indexes from these areas do not indicate any major changes compared with past years. But the information on these areas is only partial and is not sufficient to

draw any conclusions about the status of the resource.

- Since the early 1990s, Iceland scallops have been less abundant in the Mingan Islands (area 16E), and the quotas have been revised downward, but since 1998, recruitment seems to have stabilized. The high abundance of prerecruits in the 2000 research survey indicates that the biomass could start to increase in 2005. However, until such a recovery is observed, it is recommended that the *status quo* be maintained.
- Near Baie Johan-Beetz (area 16F), there has been a gradual decline in the commercial indexes since 1994 along with a drop in the quotas. The downtrend in the indexes has become less steep, however, since 1998. The results of the exploratory survey to be conducted in this area in summer 2001 should allow the potential of this stock to be determined. Consequently, the level of the catch in 2001 should not exceed that for 2000.
- In 2000, the quotas at Anticosti Island (area 18A) rose by 5%, and the yields and the exploitation rate index remained stable. Current harvesting levels do not seem to be having any negative impact on the resource.
- Near Natashquan (area 16G), Iceland scallops are abundant, but small, which is why fishers have gradually moved away from this area. The information on this area is only partial, however, and not sufficient to draw any conclusions about the status of the resource.
- For several years, the commercial indexes for the Lower North Shore (areas 16H and 15) have not indicated any major changes from earlier years. The information on these areas is only partial, however, and not sufficient to draw any conclusions about the status of the resource.

Biological context

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 is found along the north shore of the Gulf, around Anticosti Island, and off the north coast of the Gaspé Peninsula, but is virtually absent from the southern part of the Gulf. In contrast, the sea scallop is found primarily in the southern Gulf, including the Îles-de-la-Madeleine and Chaleur Bay, and occasionally along the Lower North Shore. The scallops are sedentary and live in aggregations known as “beds”. This aspect of their biology should be considered when conservation strategies and harvesting scenarios are being developed.

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.

In scallops, the sexes are separate and eggs are fertilized externally. 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. Sea scallops spawn in August in Chaleur Bay and in late August around the Îles-de-la-Madeleine.

Larval development takes about 5 weeks, from fertilization until settlement on the bottom. During this time, the larvae are dispersed throughout the water column. The juvenile scallops generally attach themselves to the seabed in proximity to the adults. The

scallop beds are generally found in areas where currents cause the larvae to be retained, but a good substrate is needed to ensure successful attachment. During the settlement period, the juveniles are very sensitive to disturbance of the sediment by fishing gear, so to protect the spawning effort, 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 over the reproductive 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

The impossibility of visually distinguishing the muscle of the two species complicates analysis of fishing statistics. However, the two species are not distributed uniformly in the Gulf of St. Lawrence, and catches in any one sector usually consist of just one species.

Catches are generally landed as meat (muscle), but occasionally as meat and roe (muscle and gonad tissue). Since the late 1990s, however, landings in the shell have assumed growing importance. Because of the mixed nature of these landings, conversion factors have to be used to record the catch and to monitor quotas. This approach can produce a bias in these measurements, as well as in the computation of exploitation rates.

In 2000, Quebec waters were divided into 18 fishing areas grouped into three sectors : the Îles-de-la-Madeleine (area 20), the Gaspé Peninsula (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 still been fished very little, if at all. In 2000, 82 regular fishing licences and 10 exploratory licences were issued. A separate management plan was established 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-type 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 fishing capacity and effectiveness.

Landings in the Îles-de-la-Madeleine have fluctuated widely since the commercial fishery began there (Figure 2). The sea scallop stocks in this sector collapsed in 1971. Landings in the North Shore sector rose rapidly from 1984 to 1990. There has been a levelling-off of catches since 1991, owing to the introduction of individual quotas on the Middle North Shore.

In 2000, scallop landings in Quebec totalled over 278 t of meat, coming, in descending order, from the North Shore (65%), the Gaspé Peninsula (22%), and the Îles-de-la-Madeleine (13%). The assessment of the status of the scallop populations is based essentially on an analysis of commercial indexes. In areas 20, 16A1, 17A1, and 16E, it is also based on indexes measured in research surveys. Also, in 2000, exploratory surveys were conducted in co-operation with the fishers themselves.

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

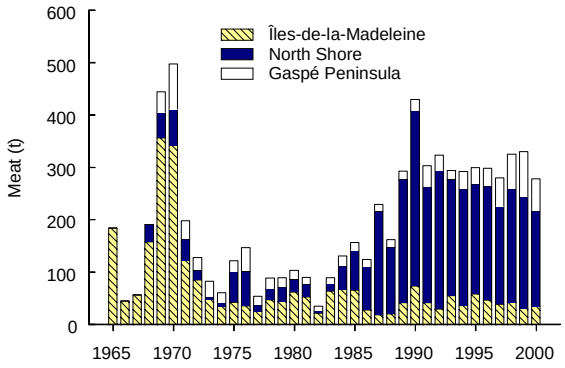

Figure 2. Scallop landings in Quebec.

The following sections present more detailed information on the scallops taken in the Îles-de-la-Madeleine, Gaspé Peninsula, and North Shore sectors. Since it is not possible to provide advice for each of the small beds scattered along the Quebec coast, this review of the stocks is organized according to management units.

Îles-de-la-Madeleine (area 20)

The Îles-de-la-Madeleine sector comprises several concentrations of scallops: 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 2000, 23 licences were issued in this sector. The fishery was open from April 10 to July 29 in sub-areas 20A and 20B and from April 1 to October 31 throughout the rest of this sector, except for sub-area 20E, which was closed to fishing for the entire year.

Scallop catches in the Îles-de-la-Madeleine usually consist over 95% of sea scallops, with the balance being Iceland scallops. In 2000, however, the proportion of Iceland scallops in the landings rose to nearly 17%. Landings totalled 35.5 t, which was 14% higher than in 1999 but 22% lower than the average for the past ten years (Figure 4). Fishing effort was down 21% from 1999. Commercial yields have been stable since 1996, but low, and much lower than the value obtained in 1968. In 2000, the commercial catch per unit effort was 0.77 kg/h m.

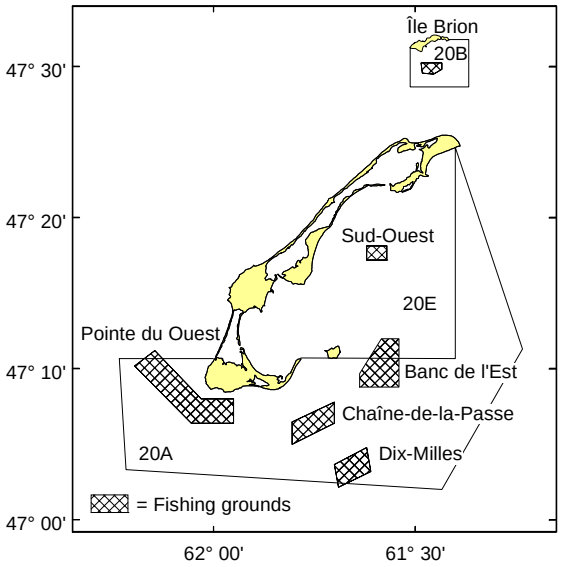

Figure 3. Sub-areas and principal scallop-fishing grounds in the Îles-de-la-Madeleine sector.

The abundance of prerecruits (scallops smaller than 70 mm), as measured in research surveys, peaked in 1992, because of the presence of the 1988 and 1989 cohorts. It then fell gradually until 1996 (Figures 5 and 6). From 1997 to 1999, the prerecruit abundance index increased with the emergence of the 1995 and 1996 cohorts, which are concentrated chiefly in the Étang-du-Nord bed. In 2000, with the arrival of the 1997 cohort, prerecruits were almost as abundant as at their 1992 peak. This cohort too was concentrated chiefly in the Étang-du-Nord bed.

The variations in the abundance index of recruits (scallops ≥ 70 mm) are similar to those for prerecruits, but with a two-year lag, corresponding to the time needed for prerecruits to reach recruitment size. In 2000, the abundance of recruits estimated after fishing also increased.

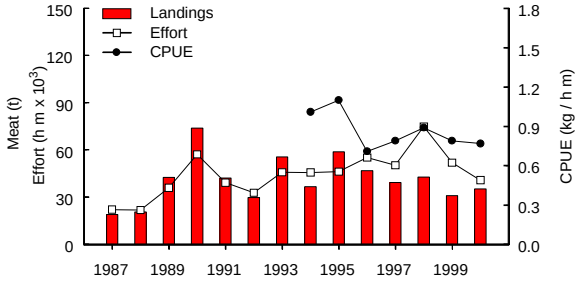

Figure 4. Scallop landings, fishing effort (by standardized fishing hour per metre of drag width) and catch per unit effort for the Îles-de-la-Madeleine sector.

For the past several years, an abundance index for 5-year-old recruits has been estimated from the corresponding index for 3-year-old prerecruits (Figure 7). This index can be used to project abundance of recruits to the fishery two years in advance. This index, which has proven reliable so far, indicates that recruitment will be slightly higher in 2001, and increase substantially in 2002, when the 1997 cohort enters the fishery.

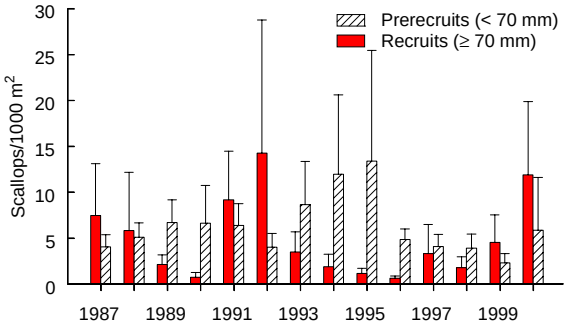

Figure 5. Density (± 2 standard errors) of sea scallops sampled in research surveys in the Îles-de-la-Madeleine sector.

One of the major concerns in recent years has been this stock's ability to renew itself. It is even reasonable to suppose that if the gradual decrease in the abundance of spawners continues, it will have an impact on reproductive success. In 1998, intensive fishing of large spawners on the Banc de l'Est and low collection rates for spats raised a great deal of concern. However, in 1999 and 2000, the number of spats determined from collector samples was greater than the average for the past ten years, despite the very low abundance of spawners on the sea bed.

The production of sea scallop eggs from all of the traditional fishing grounds in the Îles-de-la-Madeleine sector, including those of artificially seeded scallops, has been estimated. Even when the refuge area is taken into account, the current spawning effort seems to be about 6% of that in 1966, when this fishery first opened.

Outlook

Abundance of the scallop stocks in the traditional Îles-de-la-Madeleine fishing beds was still very low in 2000. From 1990 to 2000, the exploitation rate index for sea scallops has ranged from 8% to 29%, and the stock has continued to decline.

This level of exploitation threatens the conservation of the resource. In the absence of a moratorium, only a combination of strict measures can reverse this trend. The measures that have been enforced since 1998—the creation of a spawning refuge and a reduction in the fishing effort—must be continued for several years and possibly even strengthened. It is also urgent to impose a minimum catch size of 100 mm (about 30 muscles per pound). In the long term, all of these measures can successfully protect a minimum biomass of spawners on the seabed, increase spawning effort, and improve the yield per recruit. The arrival of new cohorts with above-normal abundance (like the 1997 cohort), along with any increase in the number of scallops seeded on aquacultural sites, will help to rebuild this stock.

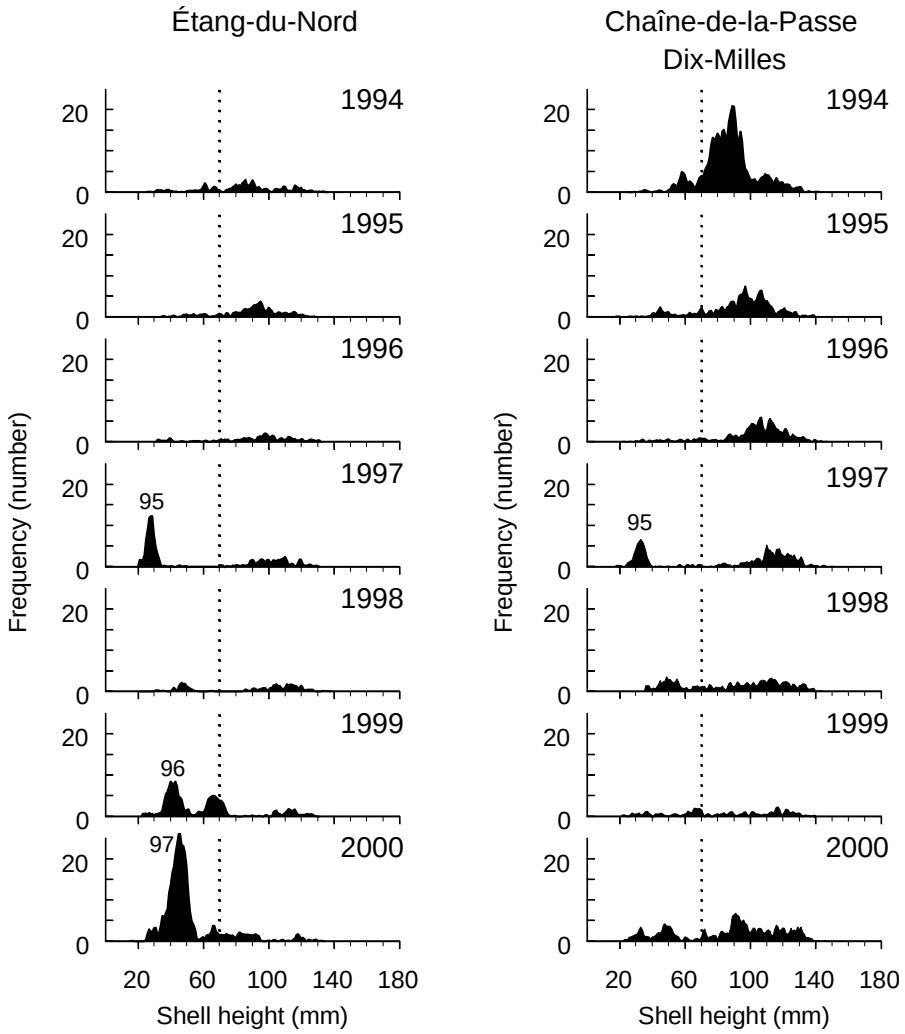

Figure 6. Size structures of sea scallops sampled in research surveys in the Îles-de-la-Madeleine sector. The number shown above certain modes represents the year of birth of these dominant cohorts. The dotted line separates the prerecruits (< 70 mm) from the recruits (≥ 70 mm).

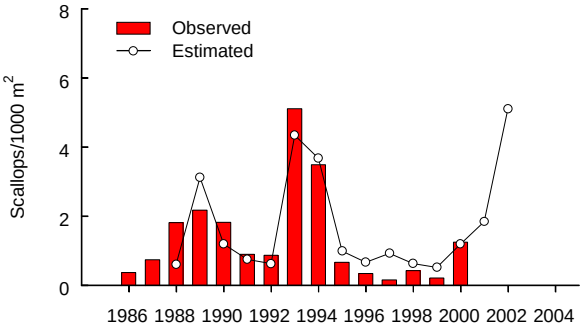

Figure 7. Density of 5-year-old recruits: values observed in research surveys and values estimated from numbers of 3-year-old prerecruits observed in research surveys 2 years earlier.

Gaspé Peninsula (areas 17A1, 17A2, 18B, and 19A)

The Gaspé sector includes three fishing grounds: the St. Lawrence Estuary (areas 17A1 and 17A2), Anticosti Island (areas 18B and 18C), and Chaleur Bay (area 19A). In 2000, area 17A was divided into two sub-areas : 17A1 (the western portion) and 17A2 (the eastern portion). Since 1998, scallop fishers from area 18B have had access to area 18C. In 2000, there was one fishing licence in sub-areas 17A1 and 17A2 while

there were two in area 18B and six in area 19A. There was a fishing season in each of these areas, and for areas 17A1, 17A2 and 18B, quotas were imposed.

Most of the landings in the Gaspé sector come from the waters of Chaleur Bay (area 19A) and Anticosti Island (areas 18B and 18C). In Chaleur Bay, the scallop fishery targets mainly sea scallops, and occasionally Iceland scallops, as it did in 1998 and 1999. Around Anticosti Island and in the St. Lawrence Estuary, Iceland scallops are harvested. Landings from the Gaspé sector have been growing steadily since 1993, and in 1999 they reached an all-time high of about 80 t of meat (Figure 8). In 2000, landings fell by 50% in Chaleur Bay, but remained relatively stable in the Estuary and at Anticosti Island. Total landings for the Gaspé sector were down 27% compared with 1999.

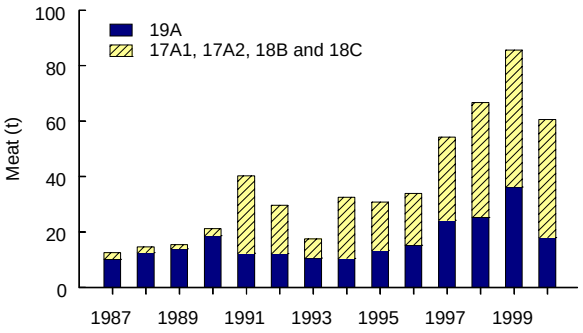

Figure 8. Scallop landings for the Gaspé sector.

The Iceland scallop fishery opened in 1999 in the southern portion of the Île Rouge bed (area 17A1). This bed extends northward into area 16A1. In 2000, landings and fishing effort in area 17A1 were stable compared with 1999 (Table 1). The catch per unit effort was very high: 28.5 kg/h m, among the highest in Quebec waters. However, the scallops were small. Their modal size was around 80 mm. In spring 2000, a research survey was conducted on the Île Rouge bed (areas 16A1 and 17A1), and the abundance indexes for Iceland scallop recruits and prerecruits were very high.

To the north of the Gaspé Peninsula (area 17A2), the commercial indexes have been relatively stable since 1998 (Table 1).

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

For some years now, the areas south of Anticosti Island (areas 18B and 18C) have contributed substantially to the Gaspé catch. The fishery in these areas is still in the development stage. Since 1991, landings and yields of Iceland scallops in these areas have been variable (Figure 8 and 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 probably responsible for this increase. The size structure and mortality index (percentage of clackers) have remained relatively stable since 1996.

From 1994 to 1999, landings in area 19A rose steadily (Figure 8). In 1998 and 1999, the increased landings were due to the redirection of fishing effort toward Iceland scallops. In 2000, landings totalled 18 t, down 51% from 1999. The fishing effort in the 2000 season was similar to that for the past ten years. The catch per unit effort was up 76% compared with 1999, but still

similar to that for 1994 to 1999 (Table 1). The average size of the sea scallops harvested has been stable since 1998 (Figure 9). The prerecruitment index measured from commercial samples (scallops < 70 mm) has remained low.

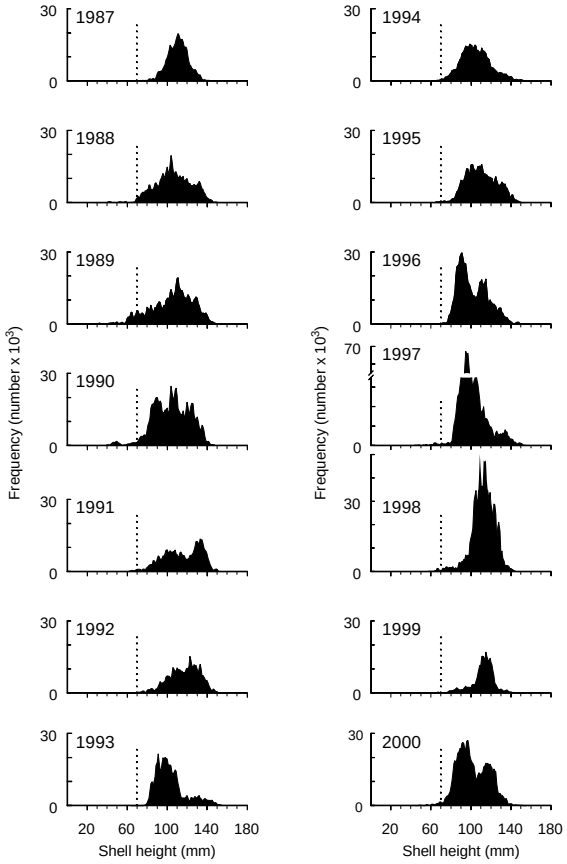

Figure 9. Size structures of sea scallops from area 19A, based on commercial sampling. The dotted line separates the prerecruits (< 70 mm) from the recruits (≥ 70 mm).

Outlook

The reason that scallop landings grew so steadily in the Gaspé sector from 1993 to 1999 was the development of an Iceland scallop fishery along the south shore of Anticosti Island, in Chaleur Bay, and in the Île Rouge bed in the St. Lawrence Estuary. The decrease in landings in the Gaspé sector in 2000 was essentially due to lower landings in Chaleur Bay.

In the southern portion of the Île Rouge bed (area 17A1), exploitation remained stable in 2000. But for the bed as a whole (areas 16A1 and 17A1), the exploitation rate index dropped by 50% from 1999. The resource in this bed is abundant, but caution will be required, because the fishing ground is small. A moratorium on the issuing of new licences and a limit on the size of the catch were put place in 2000 and should continue through 2002. To the north of the Gaspé Peninsula, (area 17A2), the status of the Iceland scallop will remain stable provided that there is no increase in fishing effort next year.

Landings and yields in areas 18B and 18C, which are under development, have been variable for several years. The biomass is still abundant, but the scallops are small. The current level of harvesting does not seem to be threatening the resource.

In 2000, the commercial indexes for sea scallops in Chaleur Bay (area 19A) were low, but still close to the average for 1990 to 1999. The abundance of sea scallops is low in this area, but the status of the stock appears stable. The imposition of a minimum catch size (100 mm) would protect the spawning effort and promote conservation of the resource.

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 sector is divided into 12 different fishing areas, located between the mouth of the Saguenay River and Blanc-Sablon. In 2000, area 16A was divided into two sub-areas, 16A1 (the western portion) and 16A2 (the eastern portion). Landings on the North Shore totalled about 182 t of meat in 2000, down 15% from 1999. 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 Islands 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 29.0 t in 2000 and consisted entirely of Iceland scallops (Figure 10). These areas are harvested by only five fishers. Fishing effort is low and is controlled by the number of licences issued. Also, quotas are in place for areas 16A1, 16A2 and 16C.

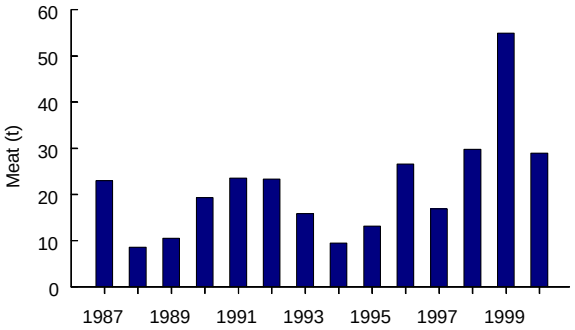

Figure 10. Scallop landings from areas 16A1, 16A2, 16B and 16C.

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. In 2000, because of the imposition of an individual quota, landings fell by 69% compared with 1999. The catch per unit effort was very high (Table 2) and similar to that in area 17A1. In spring 2000, a research survey was conducted on the Île Rouge bed (areas 16A1 and 17A1), and the abundance indexes for Iceland scallop recruits and prerecruits were found to be very high.

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

*logbooks

In area 16A2, landings vary greatly, in relation to fishing effort. The catch per unit effort in 2000 was 4.9 kg/h m (Table 2).

From 1995 to 1999, there were few official landings in area 16B. In 2000, landings were slightly higher, but still 22% lower than the average for the past ten years. However, yields (as determined from logbooks) were up 45% compared with 1999 (Table 2).

In area 16C as well, landings vary greatly from year to year. In 2000, yields (as determined from logbooks) were 6.4 kg/h m (Table 2), which was 42% higher than in 1999. The size structures of commercial samples showed a predominance of small scallops, with a modal size of about 78 mm.

Outlook

Since 1998, landings from area 16A1 (the northern portion of the Île Rouge bed) have become substantial. In 2000, the abundance indexes for this area were very high, and the exploitation rate index for the bed as a whole (areas 16A1 and 17A1) fell by 50% compared with 1999. The resource in this bed is abundant, but caution is required, because the fishing ground is small. A

moratorium on the issuing of new licences and a limit on the size of the catch were put in place in 2000 and should continue through 2002.

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. The commercial indexes from these areas do not indicate any major changes compared with past years. But the information on these areas is only partial and is 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, and four to area 16G, while 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 a seasonal basis. Landings of Iceland scallops in the fishing areas along the Middle North Shore have increased sharply since the early 1980s. This is the most productive scallop region in Quebec, as well as the most strictly managed.

Fishing effort has declined substantially in these areas since 1990. The reasons include the imposition of individual quotas in 1991, the shortening of the fishing season in all these 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 in these areas reached an all-time high of nearly 300 t in 1990 (Figure 11). In 1991, landings fell off sharply, especially in areas 16E and 16F. Since then, landings have followed the upward and downward fluctuations in quotas, except in area 16G, where landings have been more variable. In 2000, landings in this sector totalled nearly 148 t of meat, with the largest landings coming from areas 16E and 18A.

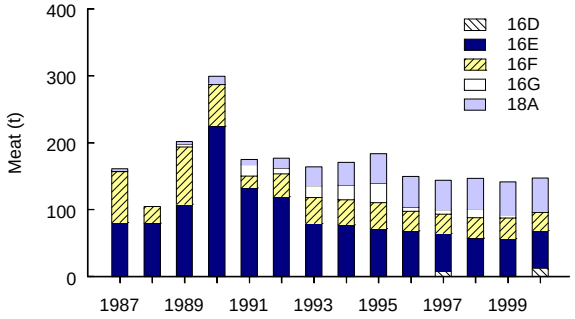

Figure 11. Scallop landings from areas 16D, 16E, 16F, 16G and 18A.

Since 1996, landings and yields in area 16D have been low, because of the sporadic fishing effort in this area (Figure 11). In area 16E, the quota of 57.2 t of meat has been met from 1998 through 2000 (Figure 12). This quota was lower than the 1997 quota, however, having been reduced in response to the sharp drop in yields between 1993 and 1998. In 2000, the catch per unit effort, stabilized since 1998, was about 9.0 kg/h m (Table 3). The average size of the scallops landed has been stable since 1992, at about 88 mm. The research indexes showed a major increase in the abundance of Iceland scallop prerecruits in the Mingan Islands in 2000 and a stability in the abundance of recruits compared with the research surveys conducted in previous years.

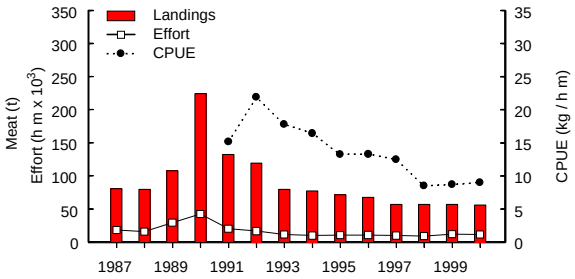

Figure 12. Scallop landings, fishing effort (by standardized fishing hour per metre of drag width), and catch per unit effort estimated from commercial samples in area 16E.

In area 16F, the quota was reduced to 27.6 t of meat in 2000 (Figure 11). This decrease was in response to a continuing decline in the commercial indexes from 1994 to 1999. In 2000, the quota was met, and there was a drop in fishing effort compared with 1999, similar to the decline in landings. The catch per unit effort seems to have stabilized in 2000 at 6.4 kg/h m (Table 3). The average size of the scallops landed has also stabilized, at about 80 mm.

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

In area 16G, landings, effort, and yield have been somewhat variable (Figure 11 and Table 3). In 2000, landings totalled 0.5 t of meat. The average size of the Iceland scallops in this area is very small (75 mm), which explains the lack of interest in harvesting them.

In area 18A, landings were on the rise from 1997 to 1999 (Figure 11). Despite a rise in the quotas in 2000, landings this year remained similar to those in 1999: 50.6 t of meat. Yields, which have been stable since 1997, were 7.5 kg/h m in 2000 (Table 3). These yields are, however, 21% lower than the average for the past ten years. The size structure of scallop landings in this area has remained fairly stable since 1996, but in 2000, the modal size was smaller than that for the past five years.

Outlook

Currently, it is impossible to determine the exact status of the fishery in each of the management units, especially since areas 16D and 16G are still relatively unexplored. The reduced 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 out over a larger territory.

There are few fishers in area 16D; the fishing effort in this area is relatively low and varies from year to year. The commercial indexes from this area do not indicate any major changes compared with past years. But the information on this area is only partial and is not sufficient to draw any conclusions about the status of the resource.

Since the early 1990s, the abundance of the Iceland scallop in the Mingan Islands (area 16E) has diminished, and quotas have been revised downward. But since 1998, recruitment seems to have stabilized. The high abundance of prerecruits in the 2000 research survey suggests that the biomass could start increasing in 2005. However, until such a recovery materializes, it is recommended that the *status quo* be maintained.

Near Baie Johan-Beetz (area 16F), there has been a gradual decline in the commercial indexes since 1994, as well as a drop in the quotas. The downtrend in the indexes has been less sharp, however, since 1998. The results of the exploratory survey to be conducted in summer 2001 will allow the stock's potential to be assessed. Consequently, the 2001 catch should not exceed the 2000 catch.

Near Natashquan (area 16G), Iceland scallops are abundant, but small, which is why fishers have gradually moved away from this area. The information on this area

is only partial, however, and not sufficient to draw any conclusions about the status of the resource.

The quotas at Anticosti Island (area 18A) were raised by 5% in 2000. Yields and the exploitation rate index have remained stable over the past year. Current harvesting levels do not seem to be having any negative impact on the resource.

Areas 16H and 15

In 2000, there were eight licences to take scallops in area 16H and 34 regular licences and 10 exploratory licences that allowed access to area 15. Area 16I was included in area 15 in 1999. Before 1992, most of the scallops landed on the Lower North Shore were sea scallops (Figure 13). Over the years 1992 to 1998, landings of Iceland scallops from area 16H and the western and eastern ends of area 15 took on growing importance.

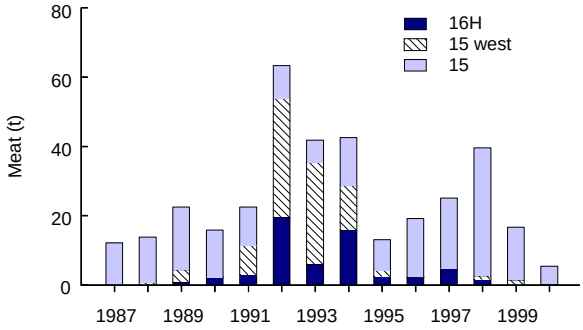

Figure 13. Scallop landings in areas 16H and 15.

In 2000, there was no landing in area 16H. The reason for the sharp drop in landings in this area since 1993 (Table 4) is not that yields (as measured from logbooks) were static, but rather that the fishers were less interested, because of the small size of these scallops. From 1995 to 1998, landings in area 15 rose from 8.7 t to 36.9 t, but since 1999, landings in this area have declined. In 2000, they totalled 5.2 t of meat, down 68% from 1999. This decline in landings is due to decreased effort, because the yields (as measured from logbooks) have been fairly stable.

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		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		2.79	4.36

Outlook

For several years, the commercial indexes for Iceland scallops along the Lower North Shore (areas 16H and 15) have not shown any major changes compared with preceding years. But the information on these areas is only partial and is not sufficient to draw any conclusions about the status of the resource.

The state of our knowledge of the sea scallop of the Lower North Shore precludes any assessment of the status of this resource. The biological characteristics of this species, its contagious distribution, and the mass mortalities seen at some fishing locations in the past make it highly vulnerable to overfishing. For the time being, it would be inappropriate to step up the fishing effort directed at sea scallops in area 15.

Conservation measures

The conservation measures recommended for scallops are intended to protect the sustainability of each bed. Any approach

designed to boost spawning potential, whether by leaving more adults on the bottom 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 the juveniles settle to the bottom in the fall. Dragging the beds with fishing gear at this time of year reduces spawning potential and stirs up sediment, which disrupts the settling of the juveniles. A halt in fishing during the spawning and settling seasons (August through November) would limit dragging damage to the substrate and favour survival of the young scallops.

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