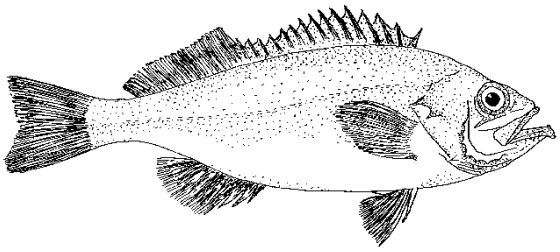

Unit 1 Redfish – 2003 Update

Background

Redfish, also know as ocean perch, belong to a group of fish that are commercially harvested in both the Atlantic and Pacific Oceans. They occur on both sides of the Atlantic Ocean in cool waters (3 to 8 °C) along the slopes of fishing banks and in deep channels in depths of 100 m to 700 m. In the west Atlantic, redfish range from Baffin Island in the north to waters off New Jersey in the south.

Three species of redfish occur in the northwest Atlantic (Sebastes mentella, S. fasciatus and S. marinus [=S. norvegicus]). They are very similar and are nearly impossible to distinguish by their appearance. They are not separated in the fishery and are managed together.

The Gulf redfish stock (Unit 1) was redefined in 1993 to take its winter migration in the Cabot Strait area into account. Nonetheless, uncertainty remains about the amount of exchange between Unit 1 and Unit 2 farther east. The results of the Science Strategic Funding Project on Redfish (1996–1999) have shown that S. mentella in Units 1 and 2 are not genetically differentiated from each other, like the S. fasciatus found in these two units.

However, there are clear genetic differences between S. mentella and S. fasciatus in Units 1 and 2 combined and redfish in adjacent units. A "hybrid" is also found in these two units, but not elsewhere.

From 1995 to 1999, redfish stock assessments in Units 1, 2 and 3 and Division 3O were reviewed annually at zonal meetings. In 2001, Unit 3 redfish were again assessed regionally and the status of other stocks was updated. Stocks were not assessed in 2002. New studies were launched in 2002 to obtain more information on the discrimination of redfish in Units 1 and 2. Three complementary approaches were selected: genetic analyses, trace otolith elements and morphometric geometry. The findings of this research will not be available until fall 2004. In the meantime, it was agreed that only a single regional update of the status of Unit 1 redfish stock would be conducted in 2003.

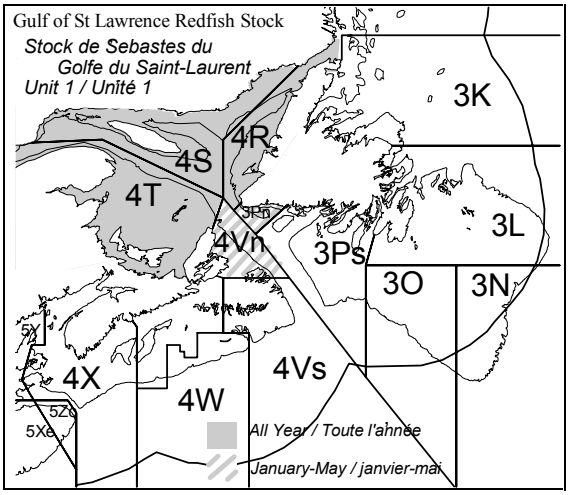

Figure 1. Map of the Gulf of St. Lawrence and nearby regions showing Divisions 4RST and Subdivisions 3Pn4Vn.

Summary

- Preliminary statistics indicate that index fishery landings, systematic survey landings and bycatch totalled 838 t in 2003, down 30% from 2002, mainly as a result of a reduction in fishing effort in the index fishery. The annual Total Allowable Catch (TAC) is 2,000 t, of which only an average of 53% has been harvested since 1999.
- In the index fishery, the catch per unit effort (CPUE) of bottom trawlers has remained relatively stable since 1999. The CPUE of large trawlers were lower than that observed in the commercial trawl fishery in the early 1990s, while the CPUE of smaller trawlers were similar. Although individuals longer than 30 cm still accounted for a large part of index fishery catches in 2003 (81%), their contribution was not as great as in previous years, when it averaged 86%.
- DFO's research survey conducted aboard the *CCGS Alfred Needler* indicates that the stock's abundance level has been low, but stable since the mid-1990s. In 2003, the biomass index doubled as a result of the large redfish

catch at the mouth of the St. Lawrence Estuary, where high redfish catches are unusual for this survey. In the sentinel fisheries, the July survey's biomass index has been decreasing since 1999. The GEAC grid survey index has been stable for the same period.

- Fish whose size varies between 30 cm and 40 cm dominate all survey catches The fish mainly belong to the 1980 year-class. In addition, juveniles measuring less than 15 cm, who belong to the 1996, 1998 and 1999 year-classes, have also been found in all surveys conducted since 1998. Their numbers seem lower that those of the 1988 year-class, which quickly disappeared from the scientific survey of the *CCGS Alfred Needler* in the early 1990s. Furthermore, the 1996 and 1998 year-classes were not observed in survey catches from 2001 to 2003.
- Although biomass remains stable, it has been low since 1995, and there is no sign of strong juvenile year-classes in the stock. Overall, the prognosis for this stock remains poor for the foreseeable future.
- Questions remain as to the mixing of Unit 1 and Unit 2 stocks. The presence of two species in the Gulf that are impossible to distinguish in the commercial fishery raises further uncertainty as to the stock's dynamics.

The fishery

Landings (in thousands of tonnes)

Year	70–76 Avg.	77–94 Avg.	1999	2000	2001	2002	2003[1]
TAC	-	-	2[2]	2[2]	2[2]	2[2]	2[2]
Can.	78.6	38.8	1.1	1.1	1.1	1.2	0.8
Others	3.3	0	0	0	0	0	0
Total	81.9	38.8	1.1	1.1	1.1	1.2	0.8

[1] *Provisional data*
[2] *Index fishery and redfish industry surveys*

The redfish fishery in the Gulf of St. Lawrence has been characterized by two periods of high harvesting: the first at the beginning of the 1970s and the second in the 1990s (Figure 2). Both periods are closely linked to the recruitment of strong year-classes. In the early 1990s, landings dropped rapidly from 60,000 t in 1993 to 19,500 t in 1994. The TAC for Unit 1 redfish was set at 60,000 t in 1993 and reduced to 30,000 t in 1994. The directed redfish fishery in Unit 1 was closed in 1995 as a result of low stock abundance and the lack of recruitment.

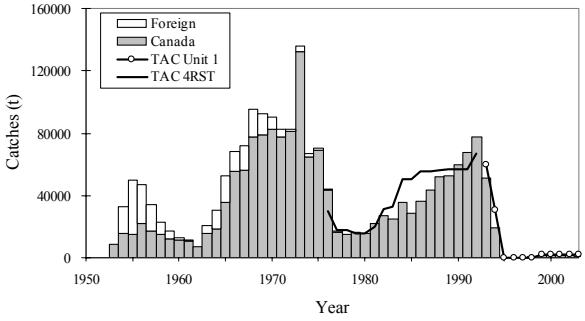

Figure 2. Landings and TAC (tonnes).

The Redfish Industry Survey (RIS) program was established in 1998 and has two components: the index fishery, which is intended to gather data on trawlers catch per unit effort (CPUE), and (systematic) scientific surveys for developing a new abundance index. The total allowable catch for RIS purposes was 1,000 t in 1998 and has been 2,000 t since 1999.

Preliminary statistics indicate that index fishery landings, systematic survey landings and bycatch totalled 838 t in 2003, down 30% from 2002 levels, mainly as a result of a reduction in fishing effort in the index fishery. Although the annual TAC is 2,000 t, an average of only 53% of the TAC has been reached since 1999.

Resource status

Index fishery

An index fishery was established in 1999 to gather up-to-date data on the catch rates of commercial fishers and compare them with historical data. Trawlers longer than 100 feet and shorter than 65 feet participated in fishing activities in conditions simulating a small-scale commercial fishery. Indexed fishing trips were conducted in the summer and fall of 1999–2003 in Divisions 4RST using bottom trawls similar to the gear used in the fishery prior to 1994. Most of the fishing activity took place from mid-June to July along both slopes of the Laurentian Channel, southeast of Anticosti Island. As in previous years, most of the vessels stopped fishing in early August because of the decline in their catch rates. Some fishing activity was conducted in the fall in Division 4R. In 2003, the number of trips made by large trawlers was down, accounting for the drop in landings from 2002.

Bottom trawlers' standardized catch per unit effort (CPUE) have remained relatively unchanged since 1999 (Figures 3 and 4). The CPUE of large trawlers were lower than that of the commercial bottom-trawl fishery in the early 1990s, while the CPUE of small trawlers remain were similar.

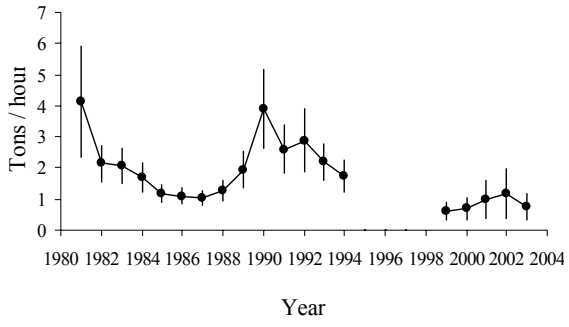

Figure 3. Standardized catch rates (CPUE) of vessels > 100 feet using bottom trawls between May and October in the commercial fishery (1981–1994) and on indexed fishing trips (1999–2003).

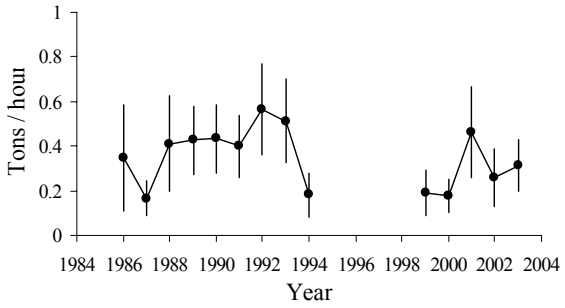

Figure 4. Standardized catch rates (CPUE) of vessels < 65 feet using bottom trawls between May and October in the commercial fishery (1986–1994) and on indexed fishing trips (1999–2003).

Individuals longer than 30 cm continued to be well represented in index fishery landings in 2003 (81%), but their numbers were slightly lower than in previous years, when they averaged 86% of the catch (Figure 5). The size of the redfish caught indicates that they are mainly from the 1980 year-class, which had fuelled the fishery in the early 1990s. Subsequent year-classes have contributed little to the catches.

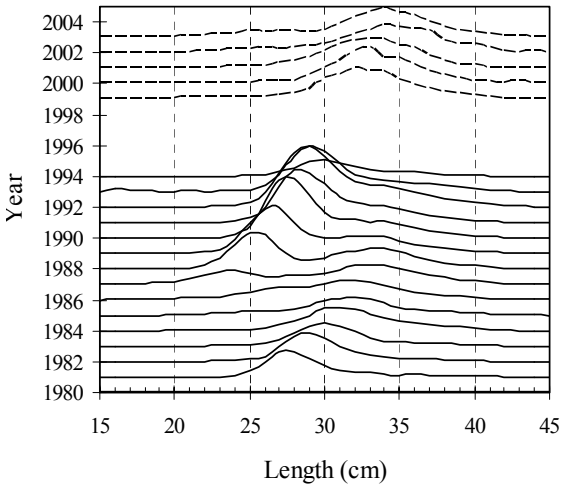

Figure 5. Annual commercial catch (in number) at length. For 1999–2003, the frequencies are in percentages because of the low catches in the index fishery.

Scientific surveys

Stratified-random research surveys have been conducted in the northern Gulf of St. Lawrence and the St. Lawrence Estuary since 1990 aboard the Department's research vessel, the *CCGS Alfred Needler*, which is equipped with a shrimp trawl.

Sentinel surveys targeting 4RS3Pn cod have been conducted by small trawlers since August 1995. Nine of the surveys were carried out in summer (July–August 1995 and July 1996–2003) and eight in the fall (November 1995 and October 1996–2002). However, the fall surveys were conducted when the migration of Unit 1 redfish toward the mouth of the Gulf might have started.

The purpose of the systematic surveys conducted by the Groundfish Enterprise Allocation Council (GEAC) is to describe the distribution of the redfish in the Gulf of St. Lawrence and at the mouth of the Gulf and to obtain an abundance index. A systematic grid-sampling plan is used, in which the same GEAC fishing vessel has sampled the same stations at the end of June every year since 1998.

DFO's research survey indicates that the biomass index dropped steadily from 1990 to 1995 and stabilized at a low level from 1996 to 2002 (Figure 6). A comparison to the 1984–1989 *CCGS Lady Hammond* index series showed that abundance peaked in 1988 and that it has been declining ever since. In 2003, the biomass index doubled as a result of the large redfish catch (1.6 t) at the mouth of the St. Lawrence Estuary, where high redfish catches are unusual for this survey. This catch also had a major impact on the range of the confidence interval of the 2003 estimates.

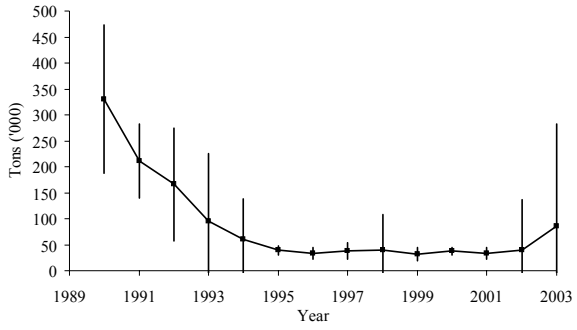

Figure 6. Minimum trawlable biomass index for DFO's scientific survey (in thousands of tonnes).

Both of the sentinel fisheries surveys indicate that abundance was relatively stable from 1995 to 1999 (Figure 7). The July survey's biomass index has been decreasing since 1999. Biomass indices from the fall sentinel surveys were significantly lower than those from the three summer surveys. The difference could be attributed to the combined effect of movement of redfish in the Cabot Strait area and changes in the seasonal availability of redfish to bottom trawls.

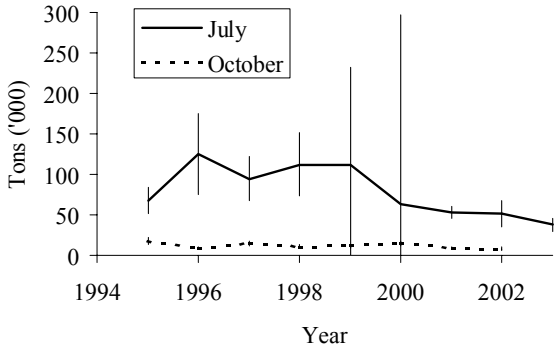

Figure 7. Minimum trawlable biomass indices for sentinel fisheries surveys (in thousands of tonnes).

Catch rates in the systematic GEAC survey decreased from 1998 to 1999, but have remained relatively stable since then (Figure 8). Geostatistical tools were used to correct day/night effects on the catch rates and significantly decrease the variability of the estimates.

During the period of decline in the early 1990s, the distribution of redfish became more restricted and concentrations are now mainly found in the Cabot Strait area in

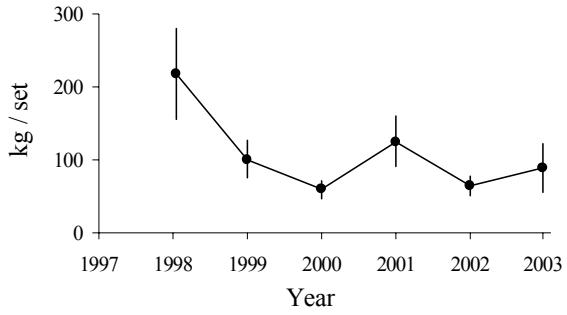

Figure 8. Redfish mean catch rates (kg/tow) observed on GEAC grid surveys between 1998 and 2003 in 4RST, as estimated by geostatistical analysis. The catch rates were corrected for day/night catchability differences.

Division 4R and Subdivision 3Pn (considered part of Unit 2) in August.

A compilation of numbers per length-class observed in DFO surveys from 1990 to 2003 indicates the presence of two important modes at the beginning of the 1990s, corresponding to the 1980 and 1988 year-classes (Figure 9). The 1980 year-class dominated commercial fishery catches in the late 1980s and early 1990s. The 1988 year-class declined rapidly after 1991 and has almost disappeared from scientific survey catches before reaching adult size.

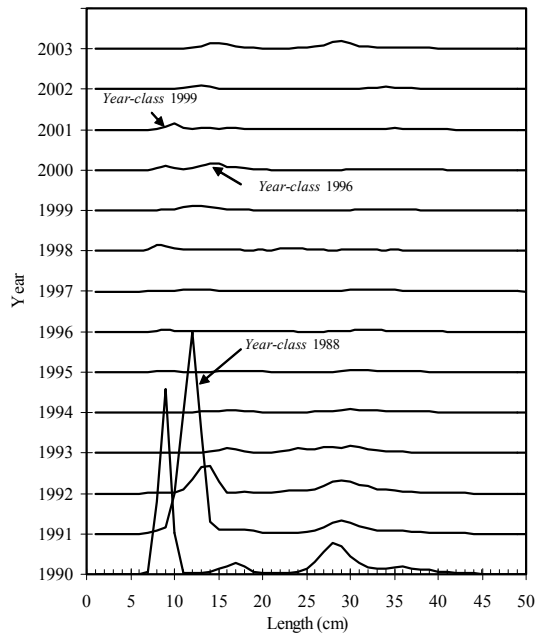

Figure 9. Length distributions for DFO's scientific survey (1990–2003).

Fish whose size ranges from 30 cm to 40 cm dominate all survey catches made in recent years and belong mainly to the 1980 year-class. Juveniles measuring less than 15 cm, belonging to the 1996, 1998 and 1999 year-classes, have also been found in surveys since 1998, though in much lower numbers than the 1988 year-class at the same age. In addition, the 1996 and 1998 year-classes were not observed in survey catches from 2001 to 2003. The mode observed in 2003, ranging in size from 25 cm to 30 cm in the DFO survey is due to a high catch at the mouth of the St. Lawrence Estuary. Anal fin ray counts of these new year-classes in 1999 and 2000 indicate that, like the 1988 year-class, most of the fish were *S. fasciatus*.

Sources of uncertainty

Sources of uncertainty regarding the mixing of stocks and the identification of redfish species, raised in the last area update in 2001, are still pertinent for Unit 1 redfish:

"The results of genetic studies presented at the 1999 workshop on the Multidisciplinary Program on Redfish indicated that, while redfish from Units 1 and 2 could be easily separated from adjacent areas, there were no differences in the genetic profile of populations in Units 1 and 2 for both species of redfish that occur there. In addition, there is a 'hybrid' form found in both areas that has not been seen elsewhere.

These studies imply that interbreeding among redfish in Units 1 and 2 occurs at a rate sufficient to render the populations genetically indistinguishable. Although this rate could be low, these require careful consideration and clarification in at least two aspects of management. Because of the winter mixing and lack of characteristics for separation of redfish from the two Units, it would not be possible to allocate the relative impact of late fall and winter fisheries in 3Pn and Cabot Strait to Unit 1 and 2 stocks. Therefore, conservation of both Units requires continuation of current closures in

3Pn and 4Vn from October to December to prevent significant exploitation of redfish during the mixing period. More fundamentally, the lack of genetic differentiation of redfish from the two Units, and similarly of past production of strong year-classes, raises questions about the degree to which they should be managed as separate units of production. This is a particularly important consideration, because the only known spawning biomass of S. mentella is still the remnants of the 1980 year-class in the two Units, which is still represented in landings. The long-term impact of the Unit 2 redfish fishery on future recruitment to both Units is not known.

Finally, due to the disappearance of the 1988 year-class, identified as S. fasciatus, it is uncertain if the 1996, 1998 and 1999 year-classes will survive and contribute to the adult population, considering that they were also identified as mainly S. fasciatus."

Outlook

Biomass has stabilized at a low level since 1995 and there is no sign of strong year-classes of juveniles. Overall, the prognosis for the stock remains poor for the foreseeable future.

For more Information

Contact: Bernard Morin
Maurice Lamontagne Institute
850 Route de la Mer
Mont-Joli, Québec
G5H 3Z4

Tel: (418) 775-0695
Fax: (418) 775-0679
E-Mail: MorinB@dfo-mpo.gc.ca

References

DFO, 2001. Update on the Status of Redfish Stocks in the Northwest Atlantic: Redfish in Units 1 and 2 and in Division 3O. DFO – Science, Stock Status Report A1-01 (2001).

This report is available from the:

Regional Science Advisory Bureau
Quebec Region
Fisheries and Oceans Canada
Maurice Lamontagne Institute
P.O. Box 1000, Mont-Joli
Quebec, Canada
G5H 3Z4

Phone Number : 418-775-0766
Fax Number : 418-775-0542
E-Mail address : Bras@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1480-4913 (Printed)

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

Correct citation for this publication

DFO, 2004. Unit 1 Redfish – 2003 Update. DFO Can. Sci. Advis. Sec. Stock Status Rep. 2004/015.