

STOCK STATUS REPORT

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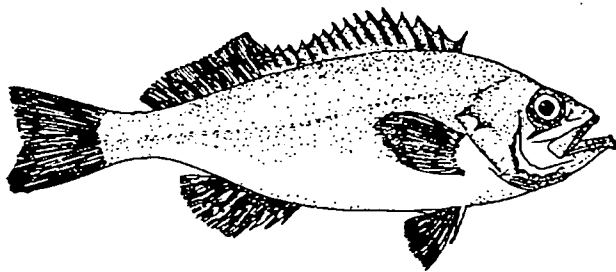
DFO, Atlantic Fisheries Stock Status Report 96/88

October 1996

STATUS OF REDFISH STOCKS IN THE NORTHWEST ATLANTIC: REDFISH IN UNITS 1, 2, AND 3, AND IN DIVISION 30

Table of Content

REDFISH OVERVIEW	1
UNIT 1 REDFISH	4
UNIT 2 REDFISH	7
UNIT 3 REDFISH	10
DIVISION 30 REDFISH	13



REDFISH OVERVIEW

Redfish, also known as ocean perch or rosefish, belongs to a group of fish that are commercially exploited 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 deep channels in depths of 100-700 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 are present in the northwest Atlantic (*Sebastes mentella*, *S. fasciatus* and *S. marinus* (= *S. norvegicus*)). These three species are similar and are nearly impossible to distinguish by their appearance. They are not separated in the fishery, and they are managed together. Except for the area of the Flemish Cap, *S. marinus* is relatively uncommon, but there is a geographic cline for *S. mentella* and *S. fasciatus*, *S. mentella* being the only species in the far north (Davis Strait) and *S. fasciatus* being the only species in the south (Gulf of Maine). In the intermediate areas, a mixture of the two is found, with *S. mentella* generally distributed deeper than *S. fasciatus*. The exception to this

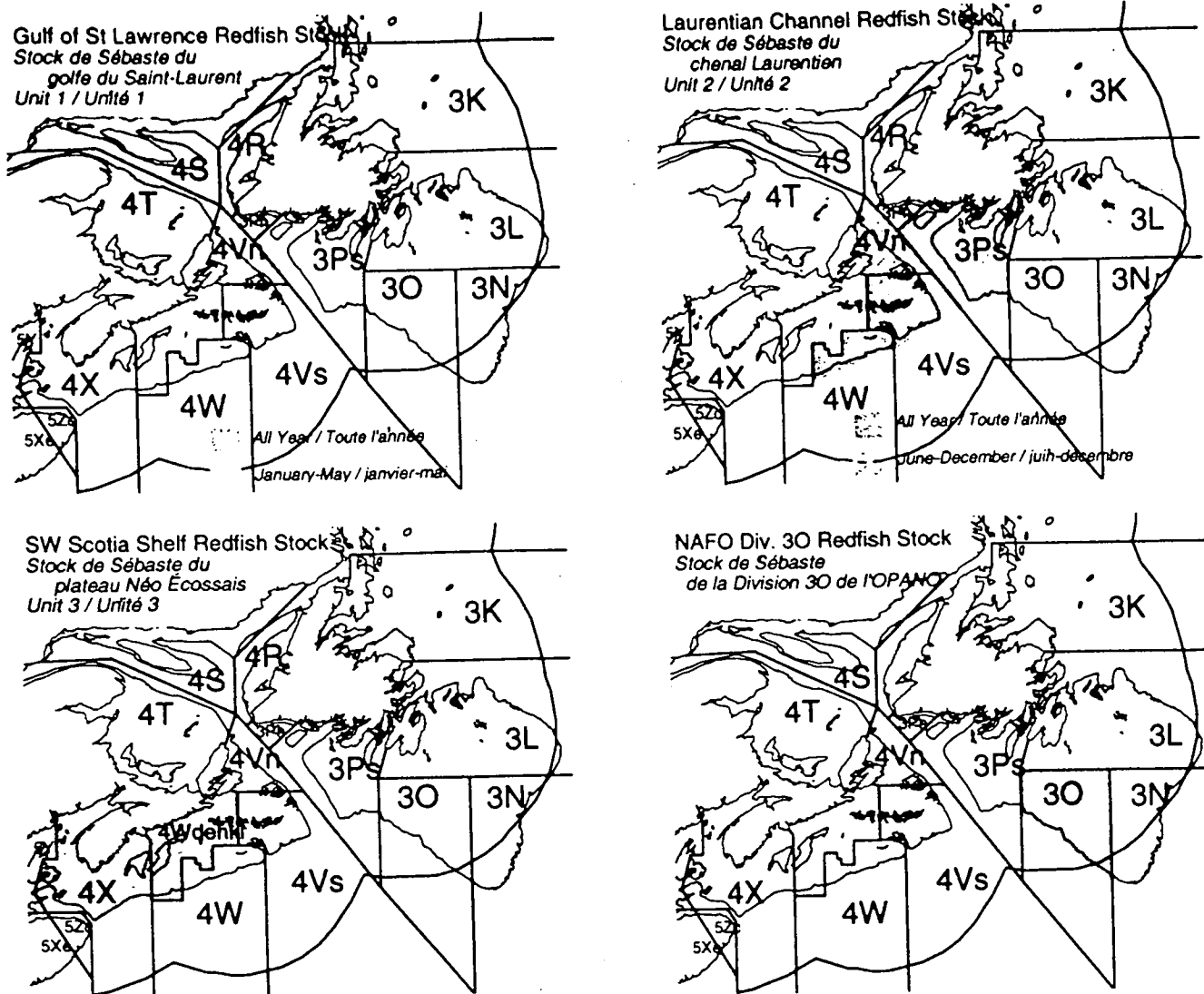


Figure 1. Maps showing the stock areas for the four management units assessed in this report.

general trend is the Gulf of St. Lawrence where *S. mentella* dominates.

Redfish are slow growing and long lived. Specimens have been aged to at least 80 years. *S. fasciatus* reaches a smaller size at age than *S. mentella*. Growth is usually faster in southern areas than in northern areas, and females grow faster than males. On average, redfish take approximately 8 to 10 years to reach commercial size (25 cm or 10 inches).

Based on previously published information (Ni and Sandeman 1984), the average length at which 50% of female redfish on the continental slopes in divisions 3O, 3P, 4R, 4S, 4T, 4V, 4W and 4X are

mature is about 27 cm (10.5 inches), ranging from 24.4 cm (9.6 inches) in 4W to 29.6 cm (11.7 inches) in 3P.

Unlike many other fish species, fertilization in redfish is internal and females bear live young. Mating occurs in the fall and females carry the developing young until the spring when they are released from April to July. In all areas examined, *Sebastes mentella* release their young a month earlier than *S. fasciatus*.

Recruitment success in redfish is extremely variable, and significant year-classes have been observed only at 5 to 12 year intervals.

In addition to being found near the bottom, redfish are often distributed well up in the water column. Fisheries take place using both bottom and mid-water trawls.

At present, there are eight (8) redfish management areas in the Northwest Atlantic: Subarea 2 + Division 3K, Divisions 3LN, Division 3O, Division 3M (Flemish Cap), Unit 1 (Gulf of St. Lawrence), Unit 2 (Laurentian Channel), Unit 3 (Scotian Shelf) and Gulf of Maine (Subarea 5). Except for the Flemish Cap and the Gulf of Maine, Canada has prosecuted redfish fisheries in these different management areas to varying degrees since the late 1940s. The most commonly fished areas have been Subarea 2 + Division 3K, as well as Units 1, 2 and 3.

Assessment and management strategies employed for redfish stocks have been the same as those applied to other groundfish. Reference levels were based on $F_{0.1}$ (12% exploitation rate) and F_{MAX} (24%) or MSY (maximum sustainable yield) and $2/3$ the effort at MSY .

Minimum sizes have been established at 22 cm in Division 3O in 1995. In 1996, minimum sizes were set at 25 cm in Unit 2, and 22 cm elsewhere.

Because of its biology, the pattern of recruitment, and the presence of two or three species currently indistinguishable on a routine basis, management strategies and tools developed for other groundfish are not easy to apply and may not be appropriate for redfish. There is a need to develop new approaches, specific to redfish, to better understand and manage these stocks.

In recent years, with the decline of other groundfish, more sectors of industry have shown a renewed interest in redfish. This was particularly so in the Gulf of St. Lawrence (Unit 1), off Newfoundland's south coast (Unit 2) and in the Scotian Shelf area (Unit 3). Although Division 3O has been traditionally avoided because of small fish, interest in fishing this area increased as well.

Industry has expressed a great deal of concern about the status of these redfish resources. Questions of stock structure, recruitment, assessment, and management approaches have been identified by stakeholders as the major issues. This has led to the establishment of a joint DFO/Industry

Multidisciplinary Research Programme on redfishes in these areas.

What follows includes information specific to four redfish stocks (Units 1, 2, 3, and Division 3O - Figure 1). It was prepared at a meeting of a zonal working group of redfish scientists held in Moncton during September 30 - October 4 1996. Redfish assessments were updated following the completion of the 1996 summer groundfish surveys on the Scotian Shelf (conducted by the Maritimes Region), in the Laurentian Channel (Newfoundland Region) and the Gulf of Saint Lawrence (Laurentian Region).

For further information

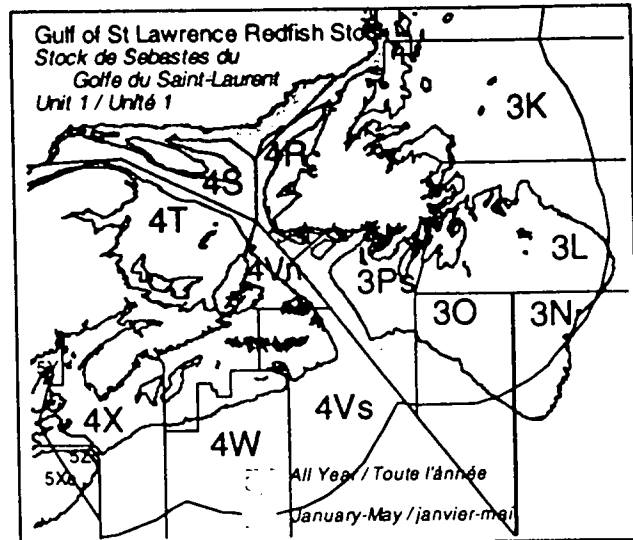
Ni, I-H., and E.J. Sandeman. 1984. Size at maturity of northwest Atlantic redfishes (*Sebastes*). *Can. J. Fish. Aquat. Sci* 41:1753-1762.

UNIT 1 REDFISH

Background

Unit 1 represents a relatively new management unit. Redfish in the Gulf of St. Lawrence were previously managed as NAFO divisions 4RST only. In 1991, based on a detailed examination of available data, a recommendation was made to modify the management units to consider the winter migration of redfish to the Cabot Strait area. Thus 3Pn4Vn-Jan. to May, were included with 4RST to constitute the Unit 1 stock.

The new management units were put in place beginning in 1993. The quota for Unit 1 in that year was 60,000 t. The directed redfish fishery in Unit 1 was closed in 1995 due to low stock abundance and the absence of significant recruitment since the early 1980.



The Fishery

The redfish fishery in the Gulf of St. Lawrence has been characterized by two periods of high exploitation; the first one at the beginning of the 1970s and the second in the 1990s (Figure 2). These two periods are closely linked to the recruitment of strong year-classes. Following these peaks, landings dropped rapidly. For the most recent years, landings have decreased from 77,000 t in 1992 (old management units) to about 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 due to low stock abundance.

Landings (thousand tonnes)

Year	70-76 Avg.	77-91 Avg.	1992	1993 ¹	1994 ¹	1995 ¹	1996
TAC	-	-	-	60	30	0	0
Can.	79	35	78	51	19	0	0
Others	3	0	0	0	0	0	0
Totals	82	35	78	51	19	0	0

¹Provisional

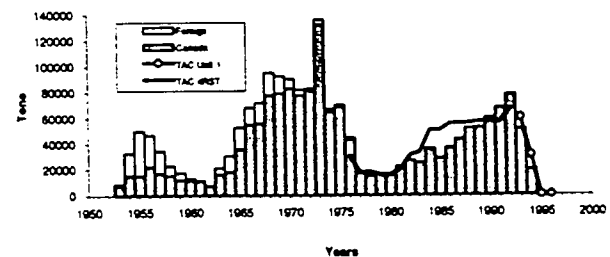


Figure 2. Landings and TACs in tons.

Catch per unit of effort (CPUE) of large trawlers (tonnage classes 4 and 5) using bottom trawls from May to October (the period when this gear was principally used) decreased by 45 % since 1990 when the best catch rates were observed for the 1990 to 1994 period (Figure 3).

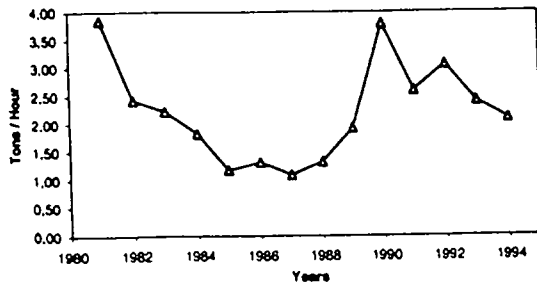


Figure 3. Commercial fisheries catch rates for bottom trawl (May-Oct.) in tons per hour.

Resource Status

Since 1990, stratified-random groundfish surveys have been conducted in 4RST in August-September on the Alfred Needler (Figure 4). The biomass index from these surveys has been declining since 1990 and remained at a low level in 1996, representing only 10 % of the index level of 1990. The decline of the biomass index coincided with the decline of the commercial fishery CPUE.

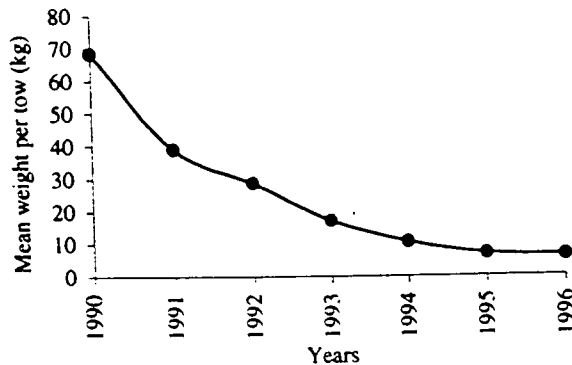


Figure 4. Research vessel survey biomass index.

During the period of decline, the distribution of redfish became more restricted and concentrations are now found only in the Cabot Strait area (Figure 5).

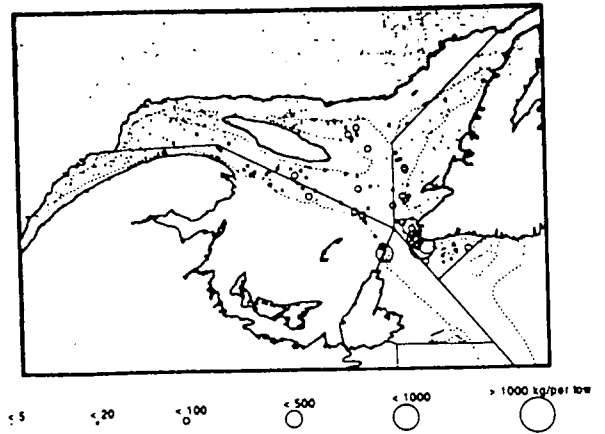


Figure 5. Redfish catch distribution on research vessel survey in August 1996.

Numbers at length from the summer surveys (Figure 6) for the period 1990 to 1995 indicate the presence of only two important modes, corresponding to the 1980 and 1988 year-classes each. The 1980 year-class dominated the fishery catches in the late 1980s and at the beginning of the 1990s. Surveys indicate that the 1988 year-class declined rapidly after 1991. After 1994, it has almost disappeared from survey catches, for reasons that remain unclear, prior to contributing to the commercial catches.

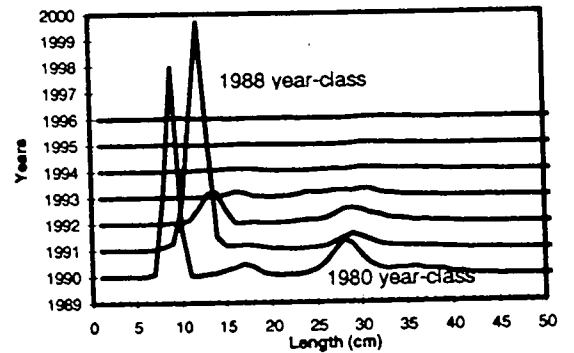


Figure 6. Number at length from the summer research vessel survey (1990-1996).

Length frequencies from the most recent surveys (1995 and 1996) are presented in Figure 7 to illustrate more clearly the size composition. These size compositions show the presence of small fish that were born in 1993 and 1994. These year-classes are very weak in comparison to the 1988 year class which was observed in the surveys at the beginning of the 1990s (see figure above).

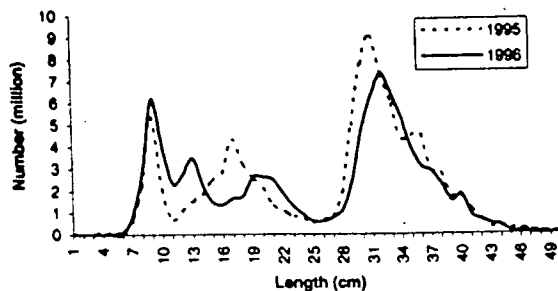


Figure 7. Number at length from the summer research vessel survey in 1995 and 1996.

Winter surveys have been conducted in 3P4V in 1994 to 1996 to study the distribution of groundfish. Redfish were found primarily on the north side of the Laurentian Channel. Length frequencies from these surveys showed similar modes compared to the summer survey.

Five Sentinel surveys targeting 4RS3Pn cod have been conducted by small otter trawlers since December 1994. Two of these surveys were conducted about the same time of year in 1995 and 1996 (August and July, respectively) when Unit 1 redfish should have been distributed within Divisions 4RST. The 1996 biomass index was about double that of 1995, in contrast to the slight decline indicated by research vessel surveys. Although length-frequency data for 1996 sentinel survey are incomplete, those that are available imply that the increase in catch rate resulted from an increase in catchability of fish in the 30-40 cm range. This could arise from inter-annual variation in estimates. However, there are informations that some survey participants made gear changes in 1996 to improve fishing efficiency in deeper water where redfish are mainly found. This could be sufficient to account for the increase in catch rate between years. Further years of data collected in a consistent manner are required before these Sentinel surveys can be interpreted in relation to stock biomass.

Further differences between sentinel and research vessel survey results were that the small fish observed in the research vessel survey were poorly represented in the sentinel surveys and the absolute values of catch rates were much lower in the research survey series. The reason for the former is as yet unexplained, but the lower overall catch rates result from a combination of shorter effective tow length as well as gear and survey design differences.

Industry perspectives

With the closure of the Unit 1 fishery in 1995, fisherman involved in this fishery have little information to express their view on the state of the stock. That is why some mentioned the need to have more surveys conducted by the Industry to provide more information on the stock and the distribution patterns of Unit 1 redfish. Discussions are ongoing regarding these proposals.

Outlook

The abundance index from the summer survey is still at low level and decreased slightly between 1995 and 1996. At this time, there is no sign of any significant incoming recruitment and therefore the stock will remain at a low level for the foreseeable future.

For further information

Morin, B., 1996. The status of redfish in Unit 1 (Gulf of St. Lawrence). DFO Atl. Fish. Res. Doc. 96/112.

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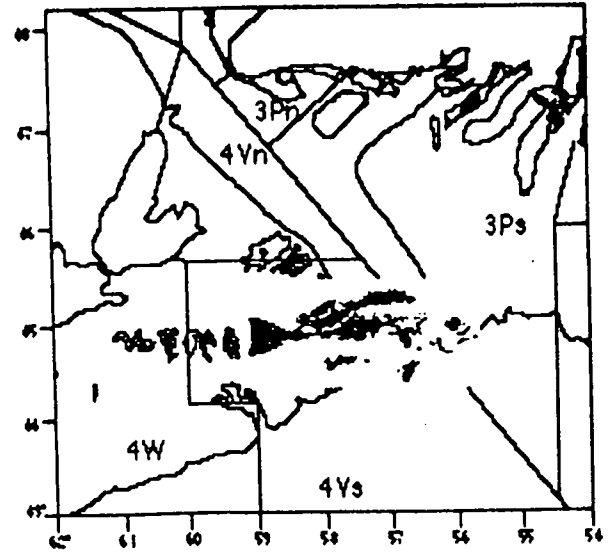
UNIT 2 REDFISH

Background

The Unit 2 management unit for redfish was implemented in 1993. The resource in this area (NAFO 3Ps4Vs, 3Pn4Vn-June to Dec., 4W_n) was previously managed separately as a 3P stock and part of a 4VWX stock. The change was recommended in 1991, based on a detailed examination of available data that suggested that a realignment in the existing management units was warranted to better represent what was known about redfish in these areas.

The first quota for Unit 2 in 1993 was 28,000 t. Since then TACs have been reduced successively to 10,000 t for 1996 as a conservation measure. In 1995 area/season closures were implemented to (i) minimize possible overlaps with Unit 1 redfish given a lack of understanding of redfish migration patterns and (ii) allow for a period when peak spawning of females is likely to occur. A small fish protocol at 25 cm (10 inches) was imposed for 1996 aimed at protecting the 1988 year-class as it appears this may be the major contributor to the fishable population in the near future given the current exploitation pattern in the fishery.

The implementation of this new management unit in 1993 resulted in a change in the fishing pattern from that generally in place under the old 3P, 4RST and 4VWX units. There was a 10,000 t increase from the 1992 catch of about 17,000 t and this was almost totally accounted for by landings from 3Pn during October to December. Based on information presented to the Fisheries Oceanography Committee of DFO, Science in March, 1994 these catches were probably of Unit 1 redfish which moved into the area earlier in 1993. Although relatively large catches did not occur in these adjacent subdivisions in 1994, possible overlaps with Unit 1 fish in 3Pn/4Vn during November and December, were cause for concern, given that this Unit is at a very low level (under moratorium in 1995 and 1996) and subsequently in 1995 and again in 1996 3Pn/4Vn was closed in November and December.



The Fishery

From 1960 to 1968, landings were about 20,000 t, increased to an average of 43,000 t up to 1975 mainly due to increases by foreign fleets, then subsequently declined to the lowest on record in 1984 at 8,100 t. Catches then steadily increased to 27,000 t in 1993 and have declined subsequently to 12,000 t in 1995 matching reductions in TACs (Figure 8). Up to mid-September 1996, about 7,000 t of a 10,000 t TAC had been taken.

Landings (thousand metric tons)

Year	70-76 Avg.	77-90 Avg.	1992	1993 ¹	1994 ¹	1995 ¹	1996 ¹
TAC	-	-	-	28	25	14	10
Can.	17	16	17	27	24	12	7 ²
Others	15	1	2	0	0	0	0 ²
Totals	32	17	17	27	24	12	7 ²

¹ Provisional

² to September 11, 1996

Since declaration of the 200 mile limit in 1977, catches have been primarily by Canadian fleets. Maritimes vessels have generally accounted for the majority of landings from subdivisions 4Vs and 4Vn while Newfoundland vessels concentrated in subdivisions 3Ps and 3Pn.

For 1996, most of the 7,000 t catch to date had been taken in the first quarter. About 2,500 t of this had been taken in statistical area 3Psd, adjacent to Burgeo Bank with high catch rates relative to the recent past. Sampling of the fishery in 1995 suggests the majority of the catch was comprised of

fish between 28 cm (11 inches) to 33 cm (13 inches), the bulk of which is likely the early 1980s year-class. In 1994 and to a greater extent in 1995, the sampling shows that the 1988 year-class was present in the catches.

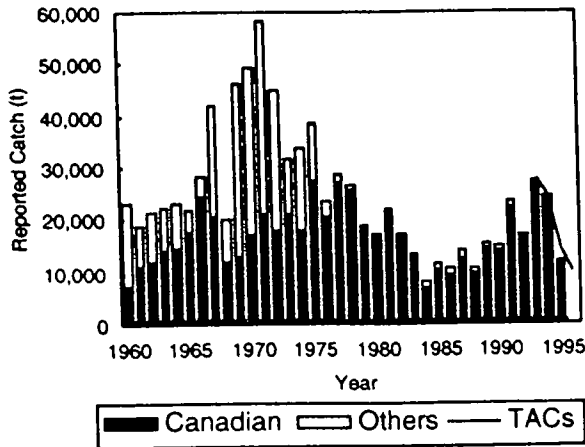


Figure 8. Reported catches and TACs (in tons).

The standardized commercial catch rate series (Figure 9) shows a steady increase from 1960 to 1966 followed by a decrease to a low rate in 1979. The rate increased again until 1983 to about the same magnitude of the 1960 catch rate.

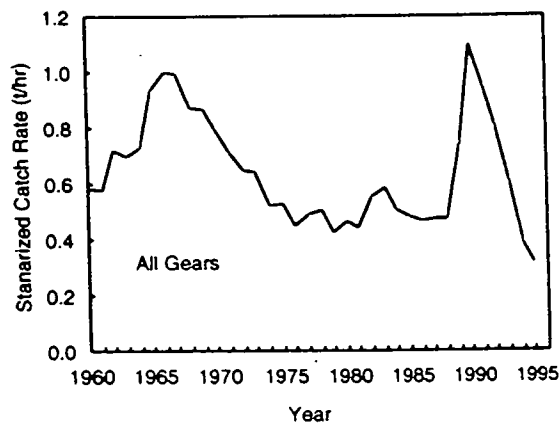


Figure 9. Standardized commercial catch rates of vessels directing towards redfish in Unit 2 (in tons per hour).

From 1983 to 1985, catch rates declined to about the level of 1979. Large increases occurred in 1989 and again in 1990 to the highest rate observed in the time series. Over the next five years, catch rate declined sharply to the lowest rate on record in 1995.

Resource Status

Indices of Stock Size

The standardized commercial catch rate series generally shows fluctuations which are coincident with the passage of strong year-classes through the fishery.

Successive large increases in catch rates in 1989 and 1990 can be partly attributed to recruitment to the fishery of a relatively strong year-class of the early 1980s but the magnitude of the increases and decreases over this short period of time is unlikely to reflect changes in abundance of this stock.

Four series of stratified-random groundfish surveys are available, three of which have limited value in determining the status of the Unit 2 resource because each does not cover the entire area where the resource occurs. This makes it difficult to interpret apparent trends over time because they may not be reflective of changes occurring throughout the entire management unit but may reflect movement into and out of the surveyed areas.

The most valuable information comes from surveys conducted in subdivisions 3Ps, 3Pn, 4Vs and 4Vn during the summer from 1994-1996. Although there are only three years of surveys, they are considered a better indicator of relative stock size since they cover most of Unit 2, and are conducted at a time when redfish in this area are considered to be well separated from Unit 1 fish.

The biomass index (thousands of metric tons) from these surveys is as follows:

	1994	1995	1996
Index	239	209	196

The summer survey results suggest that stock size remained stable between 1995 and 1996, slightly below the 1994 level.

The length compositions from these surveys (Figure 10) were dominated by two modes, the peaks of which were 21-22 cm (8-9 inches) and 31-33 cm (12-13 inches) in 1996. Relatively few redfish smaller than 17 cm (7 inches) were observed in the last two surveys. Also, the estimated abundance index of the 1988 year-class in 1996 is substantially less than the estimate of this year-class from the 1995 survey. However, this decline may prove to

reflect no more than interannual variation in the survey estimates rather than an actual decline in abundance. Parallels should not be drawn with the disappearance of this year-class in Unit 1.

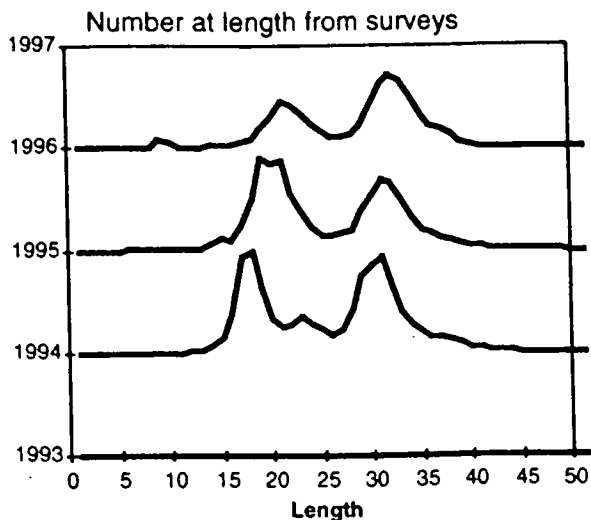


Figure 10. Number at length of redfish from research surveys in Unit 2.

Industry Perspectives

Because of the change in fishing pattern that resulted from the implementation in 1995 of seasonal closures in April-May (for all of Unit 2) and November-December (for 3Pn and 4Vn), the major stakeholders in the fishery could not relate their past experiences to the current.

To date, the 1996 fishery has been conducted primarily in areas 3Psd and 4Vsc. One stakeholder has reported a substantial increase in catch rates compared to 1995 (at 1.4 t per hour, about a 230% increase from 1995). This catch rate was the result of the detection of a relatively large body of fish in 3Psd during the first quarter of the year. Fish were large in this area and the small fish protocol was not restrictive. One other stakeholder also experienced similar catch rates and fish sizes but was concerned about the recent recurrence of the parasite problem based on company production records.

Outlook

It is currently not possible to provide an estimate of the absolute size of this stock. It is also not possible to estimate actual fishing mortality rates.

Application of selectivity information to the catch-at-length from the 1996 summer survey (which covers the main stock area) enables estimation of an exploitable biomass index. The ratio of catch to this exploitable biomass, suggests that a catch of 10,000 t in 1997 would generate an exploitation rate of about 10%. It must be cautioned however, that the survey results are only minimal estimates of biomass so the actual exploitation rate is likely to be lower than estimated above.

Current commercial catches are composed primarily of the early 1980s year-class(es) which have been fished for about seven years. The next anticipated pulse of recruitment (the 1988 year-class) was partly exploited in 1995. If a management objective is still to protect this year-class, the small fish protocol should be increased from the current level of 25 cm to 27 cm.

There are no signs of good recruitment subsequent to the 1988 year-class.

For Further Information

Power, D., D.B. Atkinson, D. Orr and W.B. Brodie. 1996. Redfish in Unit 2 (Laurentian Channel Management Unit). DFO Atl. Fish. Res. Doc. 96/113.

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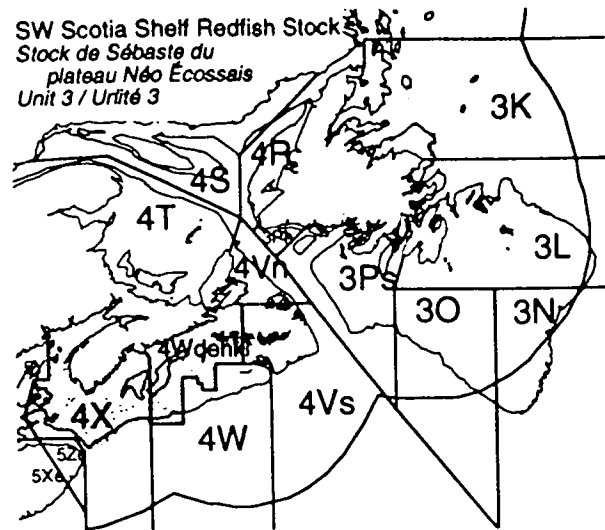
UNIT 3 REDFISH

Background

The Unit 3 management area for redfish was first implemented in the 1993 Groundfish Management Plan with a quota of 10,000 t. Redfish in this area were previously managed as part of a larger 4VWX management area.

Redfish in Unit 3 are primarily caught in the basins and at the edge of the Scotian Shelf by otter trawlers using 90 mm mesh. Regulations limit the bycatch in NAFO division 4X of other groundfish species to 10 % by weight of redfish caught and the bycatch in NAFO divisions 4VW to 2 % by weight each of cod and haddock.

Starting in 1995, the Scotia-Fundy summer groundfish survey, which is the primary source of population and size composition data for this stock was enhanced to include redfish species identification techniques and extended to 400 fathom in order to cover redfish habitat at the shelf edge previously not covered by the survey. Although it is premature to use results from these enhancements, the size composition of fish taken there will likely explain some of the difference between the survey and the commercial fishing results in the area.



The Fishery

Landings (thousands of tons)

Year	70-79 avg	80-89 avg	90	91	92	93 ²	94 ²	95 ²	96 ³
TAC						10.0	10.0	10.0	10.0
Canada	4.1	4.4	2.2	1.9	2.1	5.1	5.2	4.9	3.0
Foreign	5.7 ¹	0.5	0.1	0.1	0.1	0.2	+	+	+
Total	9.7	4.9	2.3	2.0	2.2	5.2	5.2	4.9	3.0

¹ 1970-79 foreign landings exclude up to 4,420 t/yr on average not assignable to statistical unit area

² Provisional

³ Provisional to the end of July 1996.

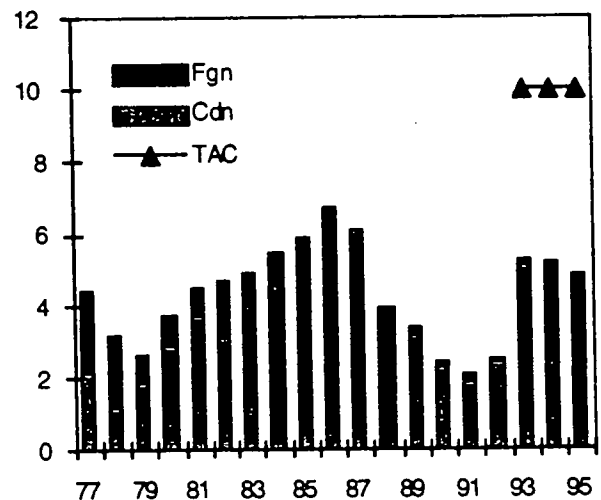


Figure 11. Canadian, foreign landings and (in thousands of tons)

Redfish landings from Unit 3 (Figure 11) gradually increased from the late 1970s, peaking at almost 7,000 t in 1986, followed by a decline to about

2,000 t in 1991. Provisional catches for 1995 were about 4,900 t, slightly less than 1993 and 1994 but well below the 10,000 t TAC. In 1995, the highest landings were in May as opposed to July which was generally the peak month during the period 1991 to 1994. The provisional catch for January through July 1996 was about 3,000 t, somewhat less than for the same time period in 1995.

In 1995, small otter trawlers (less than 65 ft), fishing primarily in the basins, took most of the reported catch (Figure 12). Large otter trawlers (greater than 65 ft) fishing in the basins and at the edge of the shelf, took only a small portion of their allocation citing conflict with fixed gear and bycatch of other groundfish on traditional redfish grounds as major problems. In 1996, the redfish allocation to vessels less than 65 feet was included in the ITQ management program for this fleet component.

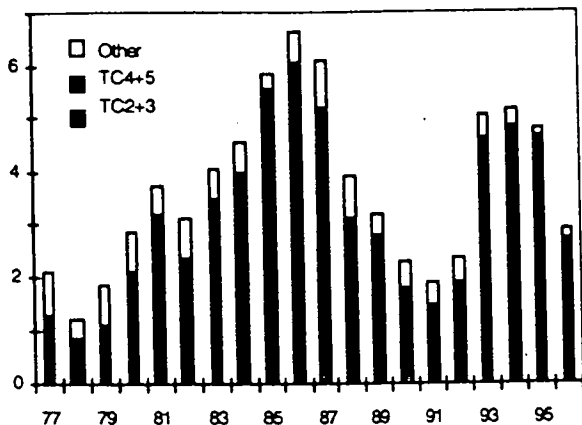


Figure 12.. Canadian landings by vessel type (in thousands of tons)

Reports that small fish were being landed from an area north and east of Brown's Bank for use as lobster bait, which had started in 1994, continued again in 1995. In late May of 1995, at industry's request, a portion of area 4Xo known as the 'Bowtie' was closed to all otter trawlers. Test fishing and gear mesh trials were employed, but it was not possible to demonstrate that the small fish could be avoided as in 1994. Therefore this closure remained in place to the end of 1995 and into 1996. During 1995, the proportions of small redfish taken from other areas of Unit 3 were substantially less than from 4Xo (Figure 13).

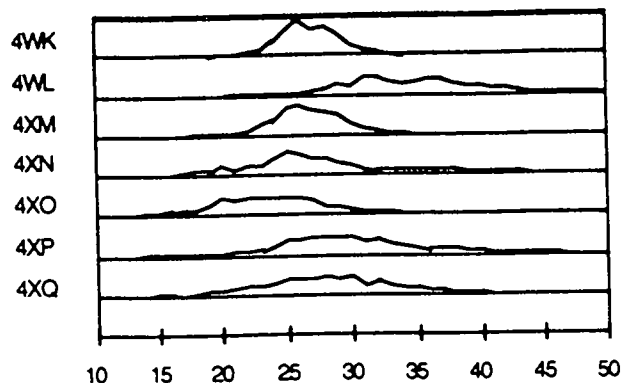


Figure 13. Commercial size composition (cm) by area for 1995 (%).

Unit 3 redfish landings have traditionally had a high proportion of fish in the 20-25 cm range and port samples for the period 1984 to 1993 indicate that catches of fish less than this size were rare. As no firm criteria to define small redfish for management purposes in 1995, DFO Science used a minimum size of 20 cm to examine the issue and in 1996, DFO Operations used 22 cm as the minimum size for its Conservation Harvesting Plans (CHP). Percentages by number of redfish landings under these sizes were:

	1994	1995	1996 (to July)
% less than 20 cm	8	10	7
% less than 22 cm	15	18	15

In addition to bycatch limits, a number of areas were closed to redfish fishing in 1995. Catch statistics for 1995 indicated that pollock accounted for most of the bycatch in Unit 3 (Figure 14). The highest rates for all species combined were in the west (4Xpq), but neither industry nor management consider the situation there to be a problem because most of bycatch consisted of legal sized fish and was

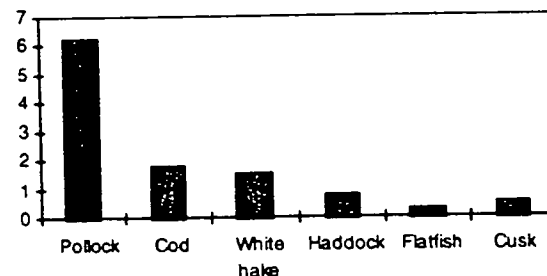


Figure 14. Bycatch by species for 1995 (%).

Resource Status

The increase in catches for 1993 and 1994, compared to 1992, resulted from an increase in fishing effort, reflecting decreased fishing opportunities for more valuable species, and not an increase in redfish abundance. The many changes in this fishery make commercial catch rates impossible to interpret in the context of redfish abundance.

Survey estimates of population (Figure 15) are highly variable between years but show no trend over time. The population appears to have been

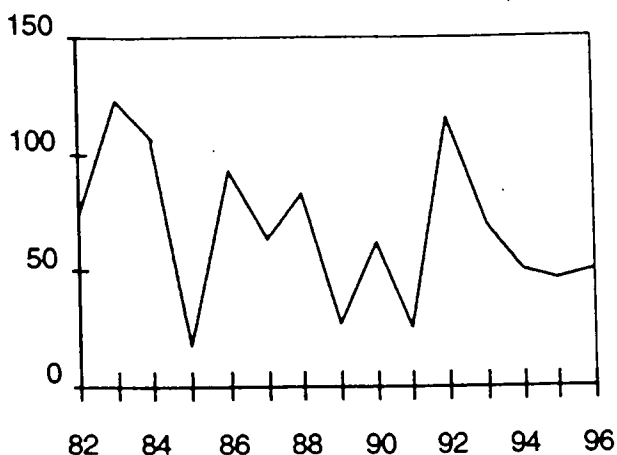


Figure 15. Biomass index from summer survey (in thousands of tons)

In recent years, there has been some evidence that there are more small fish, particularly in the area north and east of Beauséjour's bank (Figure 16).

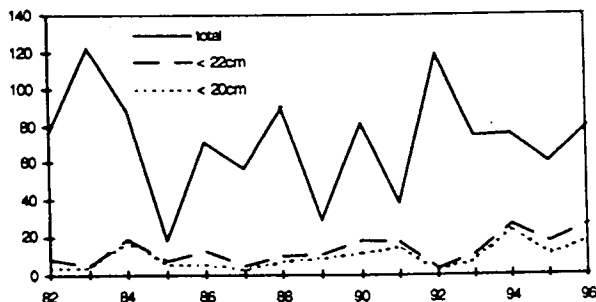


Figure 16. Survey numbers per tow by size class.

Recent catches compared to survey biomass estimates indicate an exploitation rate of 7 to 9 percent [and are likely conservative].

Industry Perspective

Large otter trawlers operators note increasing difficulty in fishing for redfish due to conflicts with fixed gear and to bycatch levels. Small trawler captains in Southwest Nova Scotia claim that gear conflicts and bycatch are not as important as closed areas in constraining their operations. Some operators are directing for small fish while others are advocating that small fish should be avoided and prefer gear based solutions for small fish as opposed to closed areas.

Outlook

Research vessel surveys indicate stability in the population biomass and suggest some improvement in recruitment in recent years. There is, as yet, no indication that this recruitment will result in a marked increase in the biomass but, combined with the low exploitation rates which currently prevail, should result in fishing and stock conditions in 1997 being very much the same as in recent years. Catches of 10,000 t in 1997 would be consistent with an exploitation of 15% which is considered to approximate fishing at $F_{0.1}$ given that the survey biomass estimate is conservative and in the size range exploited by the fishery.

For Further Information

- Branton, R. 1996 Update on the Status of Unit 3 redfish: 1996. DFO Atl. Fish. Res. Doc. 96/114.
- Annand, C., Hansen, J. 1996. Management Activities for 1995 and early 1996 Scotia Fundy Region. DFO Atl. Fish. Res. Doc. 96/34.

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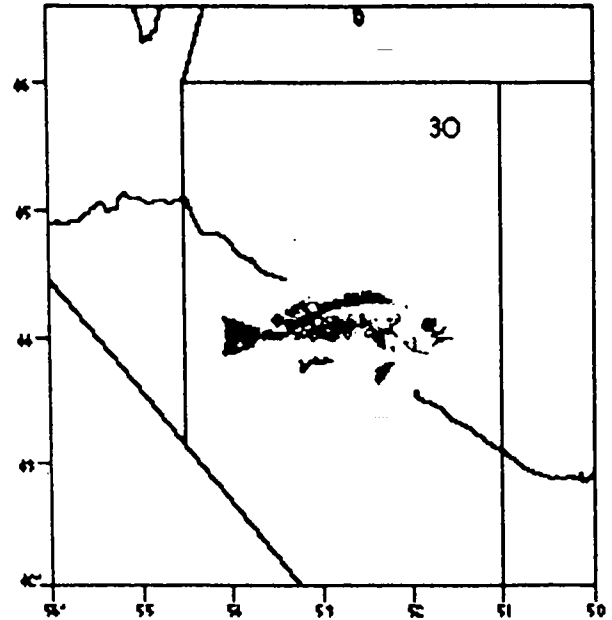
DIVISION 30 REDFISH

Background

Traditionally, Canadian industry has not had a great deal of interest in redfish in this area because of the relatively small sizes of fish found in the areas with trawlable bottom. Recently, because of declines in other groundfish resources, and most recently because of developing markets for small redfish for lobster bait, there has been some increased interest in fishing in this area.

About 10% of the stock area lies outside Canada's 200 mile limit.

The first quota was put in place for Division 30 redfish in 1974 at 16,000 t.



The Fishery

Nominal catches have ranged between 3,000 and 35,000 t since 1959 (Figure 17). Up to 1986, catches averaged 13,000 t, increased to 27,000 t in 1987 with a further increase to 35,000 t in 1988. In 1988, Canadian surveillance estimated that unreported catches were about 23,500 t. Catches declined to 13,000 t in 1989 (with a reduction in estimated catch to only 2,200 t), and were about this amount annually through to 1993. The 1994 catch of about 5,400 t represented an 11,000 t reduction from 1993. Catches declined further to only about 3,000 t in 1994 and 1995. The TAC was reduced from 14,000 t in 1993 to 10,000 t beginning in 1994. This TAC level was carried over to 1995 and 1996.

Landings (thousand metric tons)

Year	70-76 Avg.	77-90 Avg.	1992	1993 ¹	1994 ¹	1995 ¹	1996
TAC	-	-	14	14	10	10	10
Can.	1	1	1	.7	2	.1	.4 ²
Others	13	14	14	15	4	3	.5 ²
Totals	14	15	15	16	6	3	.9 ²

¹ Provisional

² To September 1996

Russia predominated in this fishery until 1993, but had much lower catches in 1994 and 1995. Cuba has not participated in the fishery in this area since 1993. Portugal, which began fishing in the area in 1992, took 2,900 t in 1994 and about 2,500 t in

1995. Russia, Cuba and Japan fished throughout the stock area after extension of jurisdiction through agreements with Canada. Other non-Canadian catches including those of Portugal were taken in the limited stock area outside 200 miles.

Canada, which has had limited interest in a fishery in this area because of the small sizes of redfish encountered, landed less than 200 t annually from 1983-1991, took 1,600 t in 1994, but their catches declined to only about 100 t in 1995. Canadian catches have increased again in 1996, with about 400 t being reported to September.

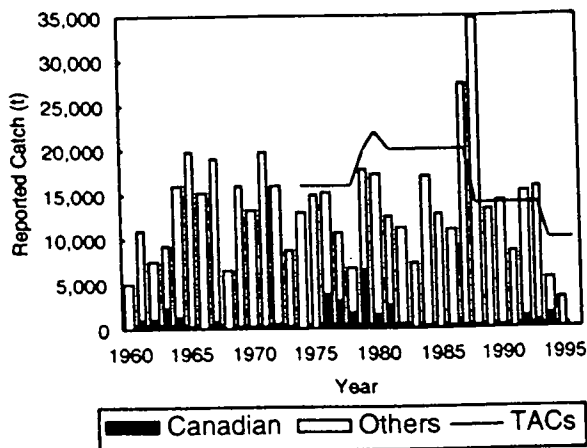


Figure 17. Reported catches and TACs of redfish from Division 30 (in tons).

The fishery has occurred primarily in the second and third quarters of the year since 1983. The predominant means of capture from the mid-1970s to the early 1980s was the bottom otter trawl. Since 1984, there has been an increase in the use of midwater trawls although bottom trawl catches still dominate.

Length frequency information from the 1995 fishery indicated a mode at about 22 cm (9 inches) in the Canadian and Japanese catches. Catches by Portugal, on the other hand, were bimodal with peaks at about 29 cm (11 inches) and 38 cm (15 inches). These fish were much larger than the 'traditional' small sizes taken in Division 30. Whereas Canada and Japan fished in depths from about 175-380 m (95-208 fathoms), Portugal fished as deep as 800 m (440 fathoms). It is likely that the larger fish taken by Portugal were from deeper water, although they also reported that their catches

were taken close to Division 3N and this may also account, to some degree, for the differences.

A standardized catch rate index (Figure 18) using Canadian data only, and based on effort in hours fished, shows much inter-annual variability over the 1959-1995 period but without any discernible trend with time. These catch rates have fluctuated particularly widely in recent years, dropping dramatically between 1990 and 1992, increasing very significantly from 1993 to 1994 then declining steeply between 1994 and 1995.

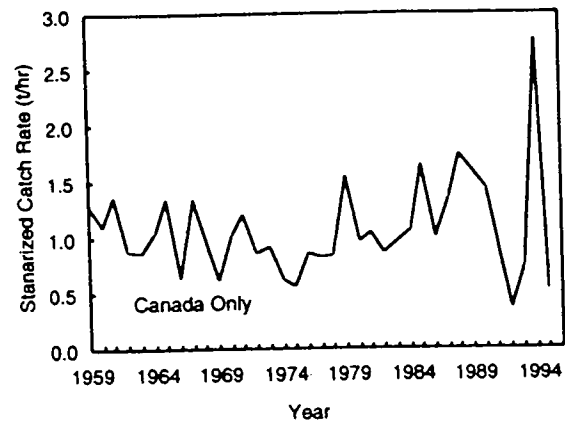


Figure 18. Standardized commercial catch rate index for Canadian vessels directing towards redfish in Division 30 (in tons per hour).

Previous analyses of catch rate data from foreign fleets fishing the area outside 200 miles have indicated declines in recent years.

Resource Status

Indices of Stock Size

Commercial catch rates by the Canadian fleet are not considered indicative of overall trends in the resource since Canada has not accounted for a major proportion of the reported catches from Division 30, and has only fished within the 200 mile limit. In particular, the recent dramatic fluctuations cannot be accounted for by the biology of redfish.

Stratified random groundfish surveys have been conducted in the spring and fall in Division 30 since 1991, with coverage to depths down to 730 m. Beginning in the fall of 1995, the survey gear was

changed from the Engel trawl to a Campelen shrimp trawl. This new gear has a similar catchability for large redfish, but a much greater catchability for very small redfish.

The spring survey index (Figure 19) increased steadily from 1992 through 1996. The fall survey index increased gradually from 1991 through 1993 but declined slightly in 1994 before increasing significantly in 1995.

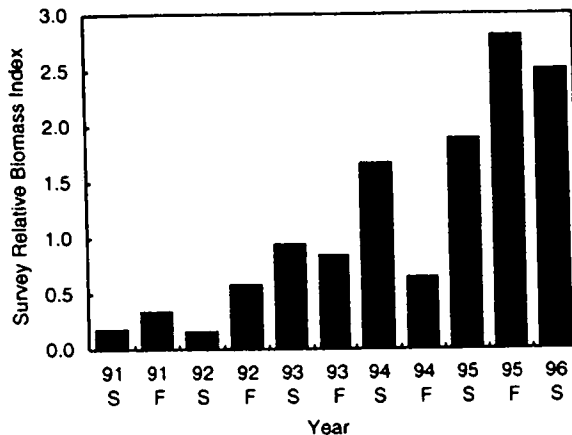


Figure 19. Research survey index for Division 30 redfish. S indicates spring surveys and F, fall surveys.

Stratum by stratum estimates indicate that the increases during the spring surveys occurred over a great deal of the area, although in the spring of 1996 only a few large sets were responsible for the observed increase.

Examination of the size distribution of the survey catches indicates only a narrow range of sizes caught in each year. Generally, fish smaller than about 10-12 cm (4-5 inches), and larger than about 25 cm (10 inches) are absent in survey catches. It is well documented that the survey gear can catch both larger and smaller redfish, and length frequencies from the commercial fishery generally reveal a higher proportion of fish greater than 25 cm (10 inches) than is found during these surveys. Therefore, it appears that fish sizes outside this range are unavailable to the gear in this area. The reasons for this are unknown, but may be related to distribution relative to trawlable bottom.

In all surveys, the biomass indices in strata outside 200 miles were low compared to those inside.

Outlook

Although research survey indices have shown an increasing trend in recent years, it is not possible to relate this to possible trends in overall stock size because of the restricted size range of fish taken during the surveys compared to the sizes believed to be present in the area. There are indications that larger fish do reside in the Division, but in generally untrawlable areas.

It is still not possible to describe overall trends in total stock size, or to estimate the current size of the fishable portion of the population. Nor is possible to determine **current fishing mortality rate**, or the possible fishing mortality rate generated by catching the TAC of 10,000 t in 1996. Based on stock stability in the past with average catches of about 15,000 t, and the recent increase in survey estimates of trawlable abundance indicating substantially improved recruitment, it is believed that catches at this level will not be harmful to the resource.

For Further Information

Power, D., D.B. Atkinson and W.B. Brodie. 1996. Division 30 redfish - status update. DFO Atl. Fish. Res. Doc. 96/115.

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