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Canadian Atlantic Fisheries Scientific Advisory Committee

CAFSAC Research Document 86/52

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Comite scientifique consultatif des pêches canadiennes dans l'Atlantique

CSCPCA Document de reoherohe $86 / 52$

The NAFO Division 30 Redfish
by

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#### Abstract

In 1985, Canada only oaught about 1\% of its allocation from this stock while 55\% of the foreign allocation was taken. There are indications that the biomass of redfish in this area has not changed greatly over the period of the fishery. Therefore, apparant changes in catch rates may be more reflective of variations in other parameters than atock size. The few commercial frequencies available for 1985 indicate that fish $20-30 \mathrm{~cm}$ predominated in the catches.


## Résumé

En 1985, les pêcheurs canadiens n'ont atteint que $1 \%$ environ du total de leurs prises admissibles de ce stock de poisson, tandis que les pêcheurs étrangers ont atteint $55 \%$ de leur quota. Il semble que la biomasse de sébaste dans cette region n'a pas beaucoup changé au cours de la période de pêche. Par conséquent, les différences marquées dans les taux de prise decoulent probablement plus des changements touchant d'autres paramètres que la taille du stock. Selon les quelques donnees sur les fréquences commerciales disponibles pour 1985, les prises étaient surtout composés de poissons de 20 à 30 cm .

## Introduction

Nominal catches have ranged between 7000 and $18,000 \mathrm{t}$ over the past 10 years (Table 1, Fig. 1). The TAC's have not been achieved since their inception in 1974. In 1985, preliminary data suggest that only $37 \%$ of the TAC of $20,000 \mathrm{t}$ was caught. Canada only took about $1 \%$ of its allocation while about $55 \%$ of the foreign allocation was caught. As in past years, the USSR dominated this fishery (Table 1). There has been a shift in the pattern of fishing for redfish in this area with the majority of the catches in 1984 and 1985 being taken in the second half of the year (Table 2).

## Methods and Results

Catch and effort data from ICNAF/NAFO Statistical Bulletins for the period 1959-1984 were combined with preliminary Canadian data for 1985. Only data where redfish comprised $>50 \%$ of the total catch were used. These were analysed using a multiplicative model (Gavaris 1980) to derive a standardized catch rate series. Those country-gear-TC and months with less than 5 data points were deleted as were all catches and effort of less than 10 units in order to eliminate potential biases. The parameter estimates and final groupings used are shown in Table 3 while the regression results are in Tables 4 and 5. Figures 2 and 3 show the standardized effort and catch rate from 1959 to 1985 . The catch rates have been showing a steady increase since the early 1970's but effort has been steadily declining over the same period.There are no effort data available for 1968.

A general production analysis was done on the standardized oatch rate and effort data using unlagged effort data and with the effort data lagged 6, 8 and 10 years (Gulland 1961). All regressions were significant. The results of each were checked for serial correlation by determining if a significant correlation existed between the standardized residuals and these same residuals shifted ahead by 1 year (Draper and Smith 1982). This was done because use of the Durbin Watson statistic often gives inconclusive results. It was anticipated that serial correlation would exist for the unlagged data but would diminish or disappear with application of an appropriate lag period. This was not the case as indicated:

| LAG | df | $r$ |
| :---: | :---: | :---: |
| nil | 23 | 0.217 |
| 6 | 18 | 0.065 |
| 8 | 16 | 0.267 |
| 10 | 14 | 0.118 |

These results were unexpected and did not follow trends seen in the examination of other data sets. They suggest that the effort being exerted is having only a minimum effect on the stock and that the biomass levels have not changed significantly. If this is the case, then the significant relationships observed between catch rate and effort may only be fortuitous.

The few commercial frequencies available (Fig. 4) indicate fish $20-30 \mathrm{~cm}$ predominating. This is in keeping with historic trends which show smaller fish
taken from this stook than from neighboring areas. This trend results from the fact that, due to bad bottom, the larger fish, which are found in deeper water, are not caught. Also, this indicates that the fishery is conducted in the same area each year.

There are no research data available for this stock.

## Conclusions

The catch rates have shown a continuing increase for a number of years and this would suggest that the stock is in good condition. The bad bottom in the area insures a reserve of mature fish. The results of the analyses of serial correlation would suggest that the present fishing pressure is not having much effect on the stock. In this regard it should be reiterated that the TAC's have never been achieved. The results of these analyses also bring into question the validity of the use of the general production model for this stock under the present conditions. There is no evidence to suggest a change in the TAC from the present level of $20,000 \mathrm{t}$ which was first established in 1978 based upon the results of an unlagged general production analysis.

## References

Draper ,N. and H. Smith. 1982. Applied Regression analysis, Second Edition.John Wiley and Sons, Inc. New York.

Gavaris, S. 1980. Use of a multiplicative model to estimate catch rate and effort from commercial data. Can. J. Fish. Aquat. Sci. 37: 2272-2275.

Gulland, J.A. 1961. Fishing and stooks of fish at Iceland. U.K. Min. Agria. Fish. Food, Fish. Invest. (Ser. 2) 23(4):52p.

Table 1: Nominal catches ( $t$ ) of redfish in Division 30 by country and year.

| Country | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984* | 1985* |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Canada (M)+ | 34 | - | 610 | 655 | 381 | 1,557 | 565 | 417 | 47 | 4 | 29 | 47 |
| Canada (M) | 57 | 103 | 3,054 | 2,317 | 1,460 | 4,847 | 976 | 2,160 | 444 | 3 | 137 | 56 |
| France (M) | - | - | 1 | - | - | - | - | - | - | - | - | - |
| France (SP) | 31 | - | 15 | 2 | - | - | - | - | - | - | - | - |
| France | - | - | - | - | $\cdots$ | - | - | - | - | 2 | - | - |
| Japan | 44 | 7 | 4 | - | 3 | 2 | - | - | 496 | 1 | 1,258 | 429 |
| Portugal | - | - | 1 | - | - | 134 | 59 | - | 5 | - | - | - |
| Romania | - | - | - | - | - | 664 | - | - | - | - | - | - |
| Spain | - | - | - | - | 1 | 8 | - | - | - | - | 25 | - |
| UK | 13 | - | - | - | - | - | - | - | - | - | - | - |
| USSR | 12,747 | 15,000 | 11,683 | 7,376 | 4,647 | 8,008 | 14,219 | 8,659 | 8,717 | 5.670 | 7,262 | 5,905 |
| Cuba | - | - | - | 500 | 368 | 2,517 | 1,487 | 1,368 | 1,651 | 1,460 | 1,316 | 806 |
| USA | 198 | - | - | - | - | - | - | - | - | - | - | 104 |
| TOTRL | 13,124 | 15, 110 | 15,348 | 10,850 | 6,860 | 17,737 | 17,306 | 12,604 | 11,360 | 7,140 | 10,027 | 7,347 |

* Provisional.
+ Maritimes and Quebec were combined prior to 1979.

Table 2: Nominal catches (t) of redfish in Division 30 by month and year.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1974 | 1 | 12 | 585 | 1,523 | 3,380 | 1,678 | 1,298 | 218 | 26 | - | 1 | 4,402 | 13, 124 |
| 1975 | - | 2 | 1,926 | 1,313 | 2,186 | 3,680 | 723 | 897 | 3, 123 | 1,159 |  | 101 | 15, 110 |
| 1976 | 352 | 452 | 399 | 857 | 1,477 | 1,497 | 3,119 | 1,440 | 2,221 | 2,540 | 40 | 954 | 15,348 |
| 1977 | 553 | 36 | 1,047 | 1,736 | 987 | 1,865 | 1,580 | 1,113 | 1,032 | 828 | 63 | 10 | 10,850 |
| 1978 | 48 | 102 | 1,478 | 1,326 | 1,216 | 930 | 656 | 353 | 433 | 155 | 158 | 5 | 6,860 |
| 1979 | 35 | 844 | 2,464 | 2,072 | 87 | 1,997 | 739 | 692 | 1,235 | 1,320 | 3,594 | 2,658 | 17,737 |
| 1980 | 612 | 1,250 | 856 | 3,698 | 1,145 | 858 | 143 | 2,395 | 1,860 | 149 | 986 | 3,354 | 17,306 |
| 1981 | 991 | 3,735 | 1,444 | 1,601 | 621 | 1,467 | 773 | 584 | 510 | 873 | 5 | - | 12,604 |
| 1982 | - | 1 | 1,121 | 1,258 | 545 | 652 | 4,555 | 2,245 | 661 | 233 | 89 | - | 11,360 |
| 1983 | 254 | 355 | 2,904 | 1,227 | 71 | 156 | 576 | 938 | 319 | 1 | 73 | 266 | 7,140 |
| 1984* | 219 | 155 | 2 | 32 | 85 | 257 | 445 | 3,210 | 2,799 | 1,882 | 435 | 506 | 10,027 |
| 1985* | , | - | 453 | 190 | 4 | 84 | 213 | 2,243 | 2,579 | 244 | 20 | 1,316 | 7,347 |

* Provisional.

Table 3: Parameter estimates from the analysis of catch/effort for redfish in Division 30 using a multiplicative model.

| Country-Gear-TC | Estimate | Month | Estimate |
| :---: | :---: | :---: | :---: |
| FR(SP) OTB 4 | -0.826 | Apr. | -0.509 |
| USSR OTB 4 | -0.778 | Jan. |  |
|  |  | Feb. | -0.266 |
| CAN (M) OTB 4 | -0.398 | Oct. |  |
|  |  | Nov. |  |
| CAN (N) OTB 5 | -0.132 |  |  |
|  |  | Mar. |  |
| CAN (N) OTB 4 |  | May | -0.145 |
| CAN(MQ) OTB 4 | 0.000 | Jul. |  |
| CAN(M) OTB 5 |  | Dec. |  |
| JPN OTB 6 | 0.294 | Jun. |  |
|  |  | Aug. | 0.000 |
| POL OTB 7 | 0.439 | Sep. |  |
| JPN OTB 7 | 0.716 |  |  |
| CUBA OTM 7 |  |  |  |
| CUBA OTB 7 | 0.877 |  |  |
| USSR OTB 7 |  |  |  |

Table 4: Regression of multiplicative madel for redfish in Division 30.

```
multiple \(r\).
```

multiple $r$ squared.....0.713
analysis of variance

| source of <br> variation |  | df | sums of <br> squares |  | meari <br> squares |
| ---: | ---: | ---: | ---: | :--- | ---: |
|  |  |  |  |  |  |
| intercept |  |  |  |  |  |

Table 5: The predicted catch rate for redfish in Division 30.

| year | total catch |  | rate s.e. | effort |
| :---: | :---: | :---: | :---: | :---: |
| 1959 | 9268 | 0.945 | 0.128 | 9809 |
| 1960 | 5030 | 0.959 | 0.259 | 5245 |
| 1961 | 11394 | 1. 104 | 0. 197 | 10324 |
| 1962 | 7557 | 0.911 | 6. 121 | 8293 |
| 1963 | 9194 | 0.998 | 0.137 | 9215 |
| 1964 | 20232 | 0.838 | 0.139 | 24137 |
| 1965 | 22438 | 0.620 | 0.192 | 36206 |
| 1966 | 15305 | 0.860 | 0.292 | 17789 |
| 1967 | 19037 | 1.323 | 0.240 | 14386 |
| 1969 | 15878 | 0.735 | 0.103 | 21603 |
| 1976 | 13192 | 0.757 | 0.099 | 17422 |
| 1971 | 19792 | 0.957 | 0.116 | 20674 |
| 1972 | 16117 | 0.733 | 0.085 | 21975 |
| 1973 | 8797 | 1.062 | 0.156 | 8285 |
| 1974 | 13124 | 0.704 | 0.101 | 18649 |
| 1975 | 15110 | 0.684 | 0.117 | 22100 |
| 1976 | 15348 | 1.050 | 0.104 | 14615 |
| 1977 | 10850 | 0.934 | 0.088 | 11611 |
| 1978 | 6860 | 0.865 | 0.086 | 7926 |
| 1979 | 17737 | 1.368 | 0.122 | 12965 |
| 1980 | 17306 | 1.114 | 0.108 | 15528 |
| 1981 | 12684 | 1.366 | 0.136 | 9229 |
| 1982 | 11360 | 1.381 | 6. 149 | 8229 |
| 1983 | 7140 | 1. 172 | 0.147 | 6695 |
| 1984 | 10027 | 1.200 | 0.129 | 8357 |
| 1985 | 7347 | 1.857 | 0.519 | 3957 |

average c.v. for the mean: 0. 149


Fig. 1: Nominal catches of redfish from Division 30, 1959-1985. (1984 and 1985 are provisional)


Fig. 2: Standardized effort for redfish in Division 30, 1959-1985. (1984 and 1985 are provisional)


Fig. 3: Standardized CFUE (t/hr) for redfish in Division 30, 1959-1985. (1984 and 1985 Provisional)


Fig. 4: Commercial frequencies from the foreign oter trawl fisheries for redfish in Division 30, 1985 (sea sampling).

