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CAFSAC RES. DOC. NO. 77/15

Status of the cod stock in the Eastern Gulf of St. Lawrence

by

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INTRODUCTION

The cod of ICNAF Divisions 4RS and Subdivision 3Pn (Div. 3Pn4RS) are here considered to form one stock for management purposes. A major characteristic of this stock is a concentration off southwest Newfoundland in the winter and a movement towards the northern of the Gulf in the Spring. Cod stocks in other areas of the Northwest Atlantic have, in recent years, come under management on the basis of total allowable catches. It is the object of this paper to arrive at an estimate of the maximum sustainable yield and provide a basis for management.

THE FISHERY

The major fishing countries in this area in the period 1959-74 were Canada, France, Portugal and Spain. Average annual catches by five year periods from 1959-73 are shown in Figure 1, and catches by individual years in Table 1.

The Canadian fishery includes an inshore component using traps, gillnets, longlines and handlines. In the period 1970-74 the inshore component took about 60% of the total Canadian catch and was most productive in June, July and August. The offshore fishery as a whole is most productive in February, March and April (Table 2).

A detailed account of the fishery is given in Wiles and May (1968).

PRODUCTION MODEL

Where a statistically significant relationship exists between effort and catch rate, a "Schaefer type" production curve can be constructed.

Catch Rates and Effort

The monthly catches of cod per hour fished in Division 4R by Canadian (Newfoundland) otter trawlers of tonnage class 151-500 and by

Portugese otter trawlers of tonnage class 901-1800 were abstracted from the ICNAF Statistical Bulletins for 1959-74. Monthly catch rates for each series were adjusted separately by seasonality factors to make them comparable to the catch rate in February, and a yearly catch rate derived by averaging the monthly adjusted catch rates. Effort was estimated by dividing the total catch by all countries in each year by the yearly catch.

RESULTS

In the Canadian series, a significant arithmetic relationship was found between catch rate and effort using a moving average of 4 years. The Portugese series showed a significant arithmetic relationship using moving averages of 3, 4 and 5 years.

Schaefer plots were constructed for these significant relationships. The estimates of maximum sustainable yield were:

	Moving Average	Slope	Intercept	MSY
Canadian Series	4	-.0141	2.1377	81
Portugese Series	3	-.0879	5.7334	93
	4	-.0859	5.5795	91
	5	-.0925	5.5531	83

The maximum sustainable yield is therefore in the neighbourhood of 85,000 tons annually. The plot of the production curve of the Portugese series with 5-year moving average is shown in Figure 2. The catch and effort points for the years 1959-74 are included in this figure. Figure 3 shows the Canadian series with 4-year moving average. In general, catches have not been excessively high in relation to the average long-term yield. In each figure the values for 1973 and 1974 are, however, below the curve. The implication is that the stock is somewhat depressed. Although final statis-

tics are not available, the catch estimated for 1975 was about 62,000 tons. Using Canadian catch rates, the point for 1975 is included in Figure 3.

DISCUSSION

Attempts to manage cod stocks in other areas of the Northwest Atlantic have met with something less than unqualified success. The total allowable catches (TACs) set by ICNAF for 1974, 1975 and 1976 for the whole of the area excluding the Gulf of St. Lawrence (Divisions 3Pn, 4RST) amounted to about 1.2, 1.0 and 0.6 million tons. This decline implies a decrease in the abundance of cod stocks. While some of this decline may have been caused by lower than average recruitment, there may well have been instances of overexploitation by the fishery. It is becoming clear that it is prudent to manage these fisheries at a level less than that of MSY or that of maximum yield-per-recruit.

For the 3Pn4RS cod stock, the MSY is about 85,000 tons annually. In the long term, therefore, the greatest average catch would be at this level assuming average recruitment. Given variable recruitment, catches maintained at a level of 85,000 tons might at some period reduce the stock size to such a low level that the catch per effort would be reduced to an unacceptable value. Furthermore, the spawning stock size could be reduced to a point where the numbers of new entrants to the stock would also be diminished. In this situation, it might be expected that the stock would decline still further.

Annual catches somewhat less than MSY, even when the stock is at the average level of abundance, would tend to make the stock more resilient to reduced recruitment. In addition, catch rates would be larger and the catches themselves would be composed of larger fish.

CONCLUSIONS

It is felt that a proper management of the cod stock in Divisions 3Pn 4RS would be to limit catches to a level lower than MSY. Fishing effort in 1973 and 1974 indicates that the stock at present is somewhat smaller than the average condition in 1959-74. The estimated catch and effort in 1975 would tend to confirm this. It is felt that an appropriate total catch in 1976 would be not more than 70,000 tons.

REFERENCES

Wiles, M. and A. W. May. 1968. Biology and Fishery of the West Newfoundland Cod Stock. Intern. Comm. Northw. Atlant. Fish. Res. Bull. No. 5, p. 5-43.

Table 1. Catches of cod by year, by country in ICNAF Divisions 3Pn, 4R and 4S. (Thousands of metric tons).

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Canada	49,740	41,983	37,447	36,758	37,364	50,569	50,437	48,222	35,336	30,852
France	3,776	18,335	15,637	13,712	17,105	26,369	16,536	30,514	24,458	13,328
Portugal	12,435	14,610	13,729	11,251	8,545	7,585	1.330	18,291	18,134	9,634
Spain	8,783	8,469	1,685	2,772	6,318	5,002	2,837	8,435	5,877	1,964
TOTAL ALL COUNTRIES	74,746	84,234	68,929	65,085	79,312	89,671	71,140	105,465	83,810	58,237

	1973	1974	1975*
Canada	28,569	34,171	25.771
France	17,642	16,634	17,155
Portugal	15,984	10,925	12,816
Spain	1,017	1,507	— ?
			1672
TOTAL ALL COUNTRIES	65,805	66,436	57,414

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Table 2. Percentage of the cod catches in Divisions 3Pn 4RS taken by month by inshore and offshore gears during the period 1970-74

Month	Canadian Inshore (%)	Total Offshore (%)
January	3	11
February	3	37
March	6	14
April	6	16
May	6	7
June	18	3
July	28	3
August	15	2
September	7	2
October	4	2
November	2	1
December	2	1
Unknown	-	3
Average Catch (metric tons)	20,300	55,700

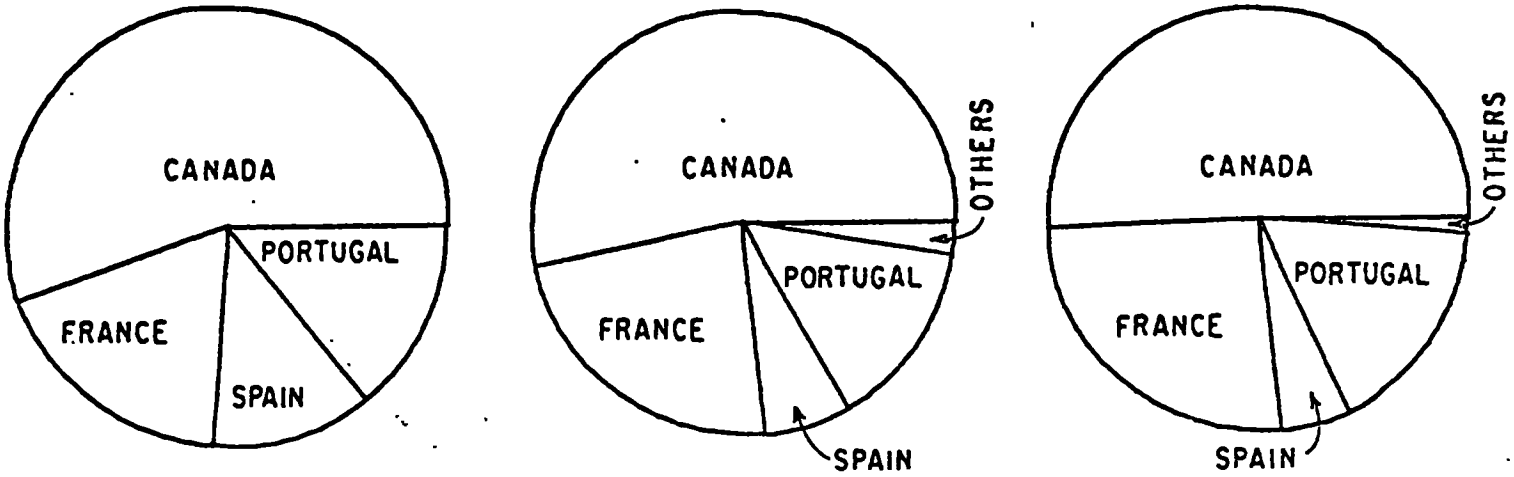

Fig. 1. Average annual catches of cod by five year periods in Divisions 3Pn 4RS during the period 1959-73. The sections ascribed to the various countries are in proportion to catches. The average catch for each five year period is also shown.

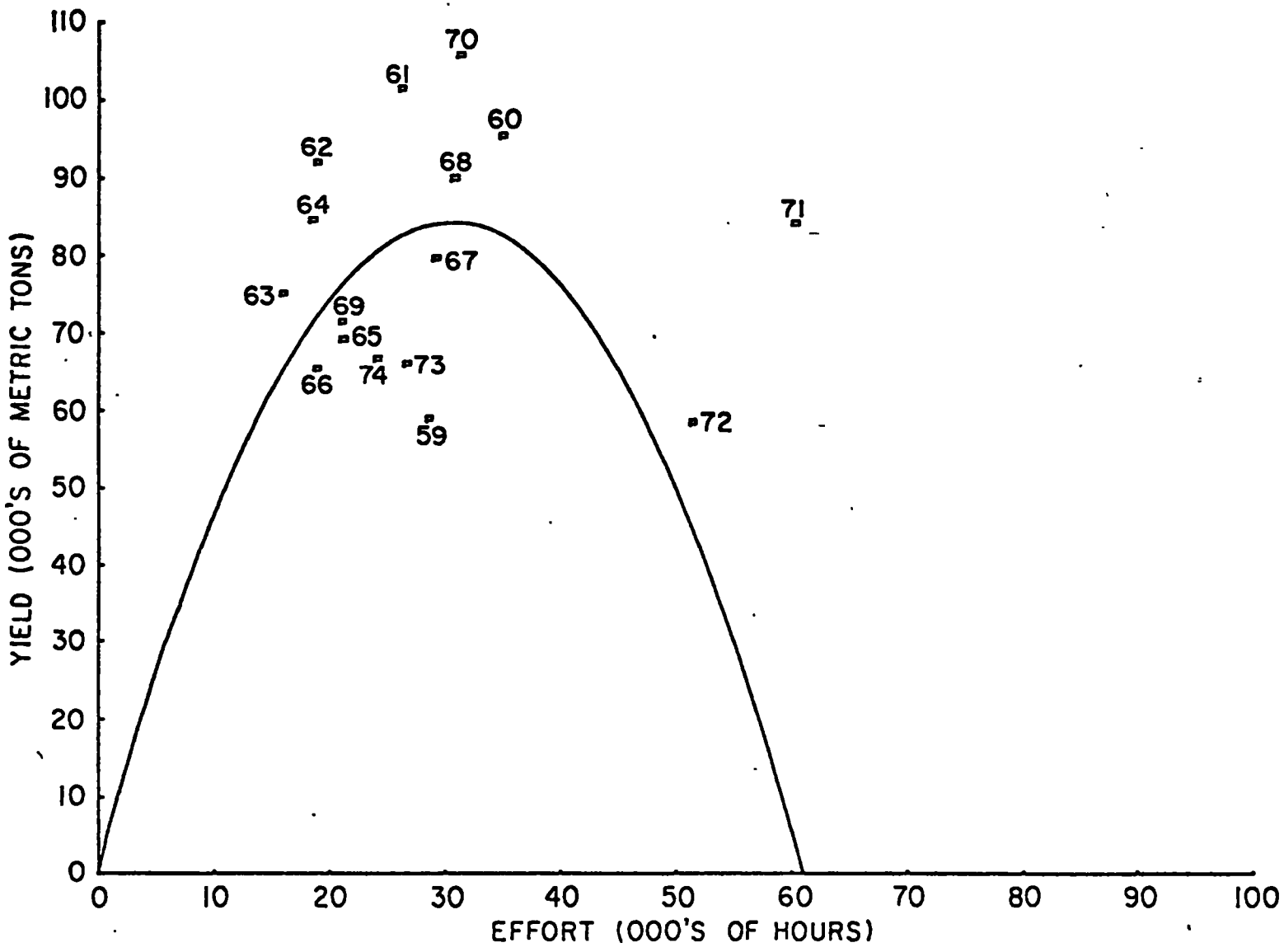

Fig. 2. Relationship between yield of cod and effort derived from statistics reported for the Portugese otter trawl fleet (tonnage class 901-1800) in Divisions 3Pn 4RS. The values for the years 1959 to 1974 are included.

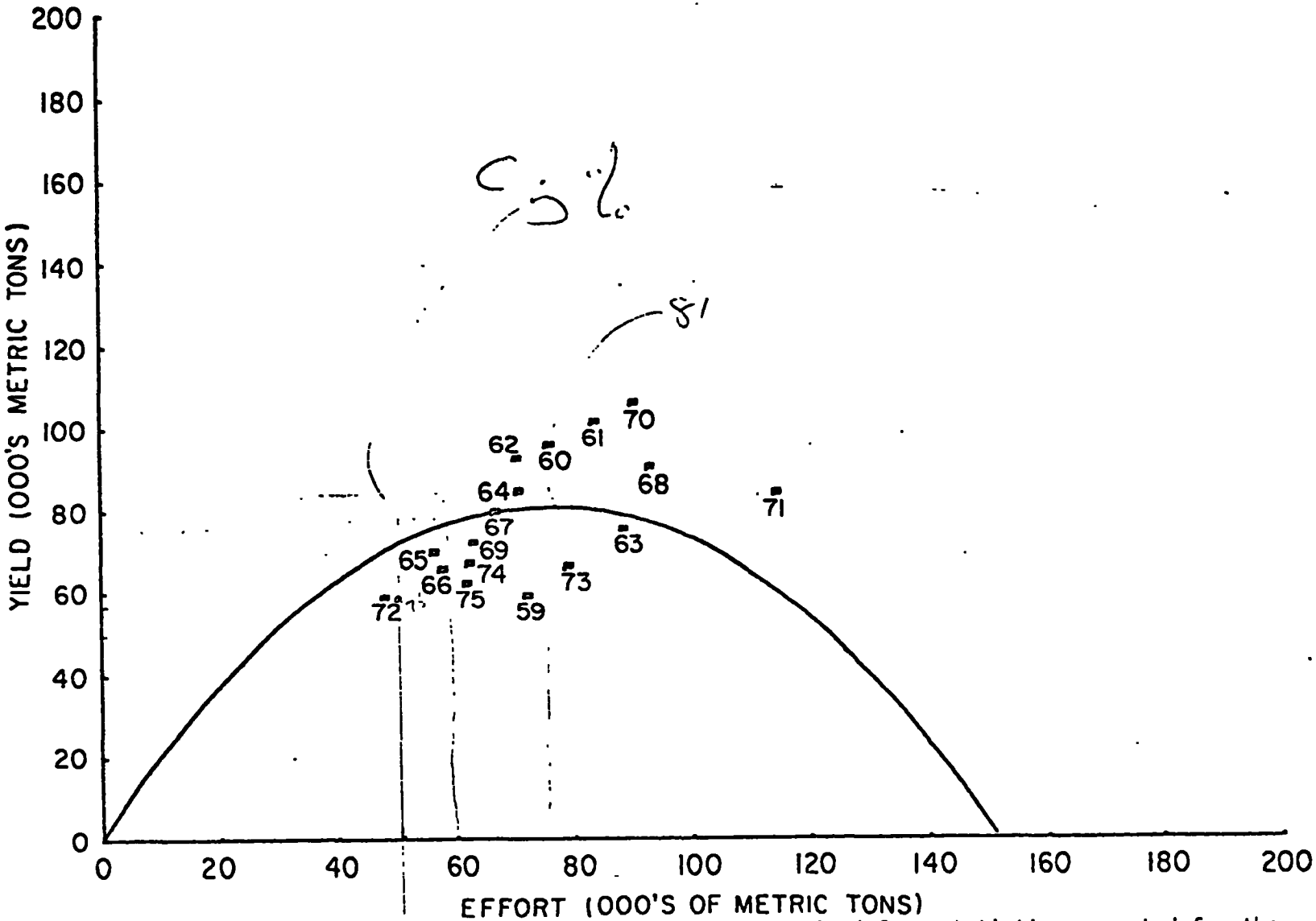

Fig. 3. Relationship between yield of cod and effort derived from statistics reported for the Canadian (Newfoundland) otter trawl fleet (tonnage class 151-500) in Divisions 3Pn 4RS. The values for the years 1959 to 1975 are included. The value for 1975 is an estimate