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Status of the cod stock on Flemish Cap

by

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Introduction

The cod catch in this area declined from an average of 42,000 tons during 1965-69 to about 25,000 tons annually since 1973, largely due to the poor recruitment of the 1969, 1970 and 1971 year-classes. (See Com. Doc. 78/VI/9). On the basis of a general production analysis of the stock in 1976 (Res. Doc. 76/VI/33), the stock was considered by the Assessments Subcommittee not to be in a condition to support a catch at the MSY level (about 40,000 tons), and the TAC subsequently adopted by the Commission for 1977 was 25,000 tons. In 1977, the Subcommittee advised the Commission that, because the exceptionally strong 1973 year-class (shown by Soviet surveys in the area) would enter the fishery in 1978, a TAC in 1978 of 40,000 tons would be appropriate.

General Production Model

The catch and hourly effort data of Portuguese OT (side), tonnage class 6, were used to derive standard catch rates for the entire cod fishery for the years 1962-1976 (Table 1). These catch rates were then applied to the total catch by all countries to derive yearly estimates of total effort expended for the same period (Table 2). The regression of the standard catch rates against total effort using a 2-year moving average produced the relationships

$$(1) C/HR = -0.0522 \text{ EFFORT} + 2.9694$$

with an R value of 0.75, having 12 degrees of freedom (Fig. 1). The resultant Schaefer type yield curve is shown in Fig. 2. Fishing effort of 28,000 hours is required to produce MSY at 42,000 tons under equilibrium conditions, while effort of 2/3 MSY effort, that is 18,700 hours, would produce a yield of 37,000 tons.

$$(2) C/HR = -3.5885 \text{ LOG EFFORT} + 6.5917$$

with an R value of 0.82, having 12 degrees of freedom. The resultant yield curve is shown in Fig. 3. Effort MSY = 25,000 hours; MSY = 39,400 tons; 2/3 effort MSY = 16,700 hours; yield at 2/3 effort MSY = 36,800 tons.

Discussion

The yield curves indicate that, at effort 2/3 MSY and based on the 1976 point, the catch in 1977 might have been estimated to be 15-18,000 tons and at effort MSY to be 22-26,000 tons.

The age composition of the commercial catch in 1977 was largely composed of the 1973 and 1972 year-classes. The catch in 1978 and probably 1979 will depend heavily on the sizes of these two year-classes and particularly on the size of the 1973 year-class.

Research vessel surveys carried out in the January-February periods of 1977 and 1978 gave the following results:

Year	Ship	Number of tows (≤ 200 fm)	Total wt cod (1b)	Av. catch/tow (1b)
1977	A. T. Cameron	33	6015	182
1978	Gadus Atlantica	98	26221	268

The biomass of cod in 1978 may be as much as 50% higher than in 1977.

Preliminary catch and effort data for 1977 supplied by Portugal indicates that the catch/day fished by OT (side) tonnage class 6 was 14.88 tons. In 1975 and 1976 the average number of hours fished per day for this category vessel was 15.2 tons. The catch per hour in 1977 is therefore estimated at 0.978.

The catch in 1977 was about 25,000 tons, and therefore the effort expended was about 25,500 hours. This 1977 point on the yield curves implies a catch of 15-19,000 tons in 1978 if fishing at 2/3 effort MSY and 25-28,000 tons if fishing at effort MSY.

Conclusions

The catch of cod in Division 3M in 1977 was composed very largely of the 1973 and 1972 year-classes. While the biomass improved in 1977, the yield curves constructed in this paper indicate that a TAC of 40,000 tons in 1978 was probably optimistic with respect to fishing at effort MSY.

Table 1. Catch, hours fished and catch of cod per hour by Portuguese OT (Side), tonnage class 1000-2000 in ICNAF Division 3M.

<u>Year</u>	<u>Catch</u>	<u>Hours</u>	<u>Catch/Hour</u>
1962	2,032	1,799	1.13
1963	7,028	2,307	3.05
1964	3,508	1,249	2.81
1965	1,480	1,115	1.33
1966	6,914	4,409	1.57
1967	10,333	5,576	1.85
1968	9,989	6,423	1.56
1969	6,652	3,016	2.21
1970	8,170	6,236	1.31
1971	3,673	3,939	0.933
1972	22,064	23,962	0.921
1973	7,701	8,970	0.859
1974	5,715	4,472	1.28
1975	3,274	7,181	0.456
1976	4,584	4,887	0.938

Table 2. Catch per hour (Portuguese OT), total catch and total effort expended in the 3M cod fishery.

Year	Catch/hour	Catch	Effort	Effort (2-yr. moving average)
1962	1.13	16,175	14,314	
1963	3.05	38,216	12,530	13,422
1964	2.81	47,819	17,017	14,774
1965	1.33	60,313	45,348	31,183
1966	1.57	33,834	21,550	33,449
1967	1.85	42,163	22,791	22,171
1968	1.56	40,385	25,888	24,340
1969	2.21	31,845	14,410	20,149
1970	1.31	26,529	20,251	17,331
1971	0.933	33,692	36,111	28,181
1972	0.921	57,691	62,640	49,376
1973	0.859	22,900	26,659	44,650
1974	1.28	24,941	19,485	23,072
1975	0.456	22,375	49,068	34,277
1976	0.938	22,266	23,738	36,403

Table 3. Effort expended in the Flemish Cap cod fishery in 1975 and 1976 by Portuguese OT (side) class 6.

Month	Catch	Days fished	Hours fished	Catch	Days fished	Hours fished
Jan	-	-	-	-	-	-
Feb	4	1	8	-	-	-
Mar	105	8	117	-	-	-
Apr	2	1	4	-	-	-
May	-	-	-	-	-	-
Jun	95	8	68	-	-	-
Jul	541	216	2705	2	1	17
Aug	1529	191	3058	1206	75	1204
Sep	725	55	1036	1187	75	1321
Oct	118	3	37	1675	84	1503
Nov	60	2	29	329	26	455
Dec	95	24	119	185	23	387
Total	3274	509	7181	4584	284	4887

Days fished in 1975 + 1976 = 793

Hours fished in 1975 + 1976 = 12068

Number of hours fished per day in 1975 and 1976 = 15.22

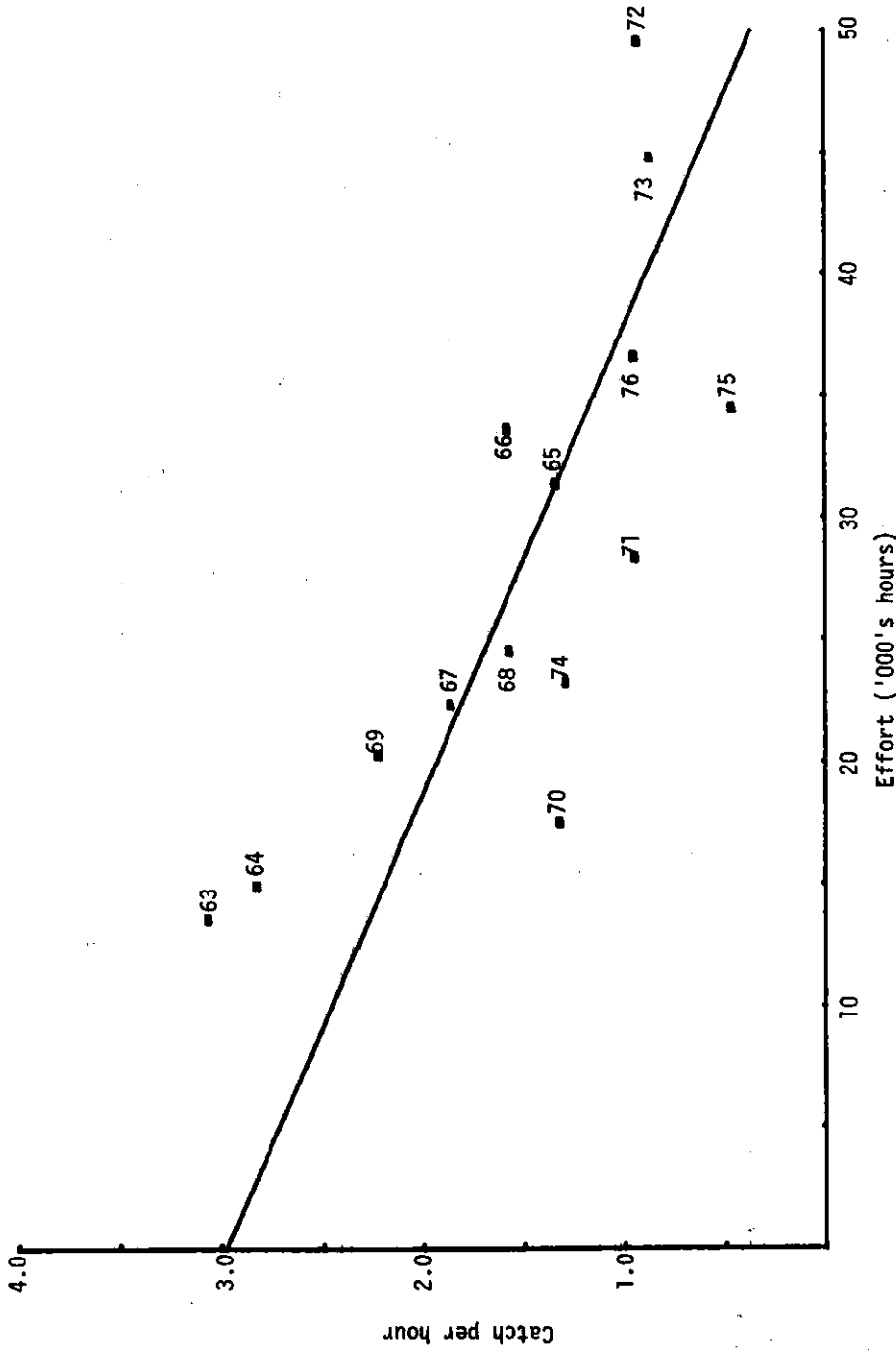


Fig. 1. Relationship of catch per hour and effort (2-year moving average) expended in the cod fishery in ICNAF Division 3M, 1963-76.

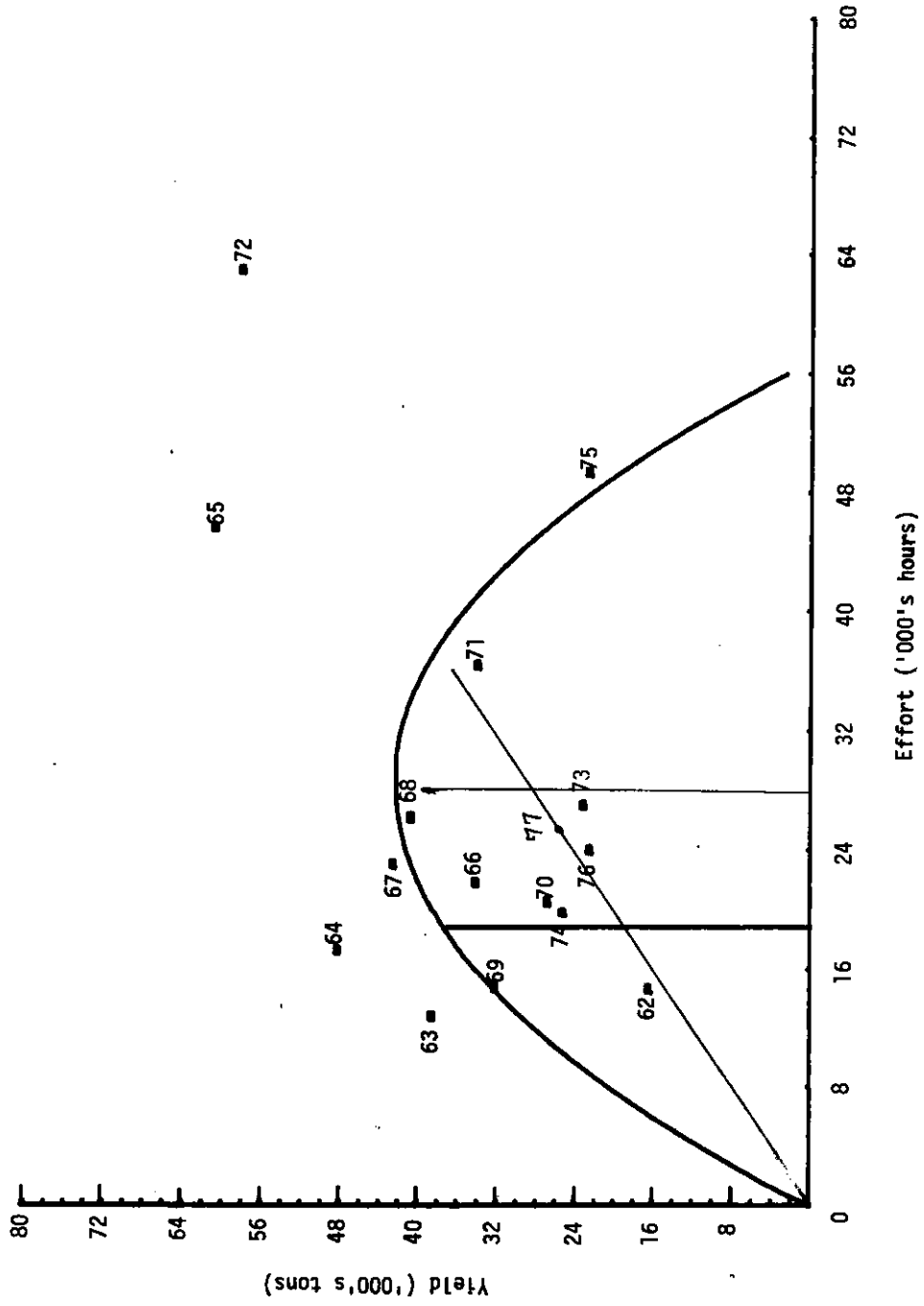


Fig. 2. Yield curve, Division 3M cod. (Based on arithmetic regression C/HR on effort)

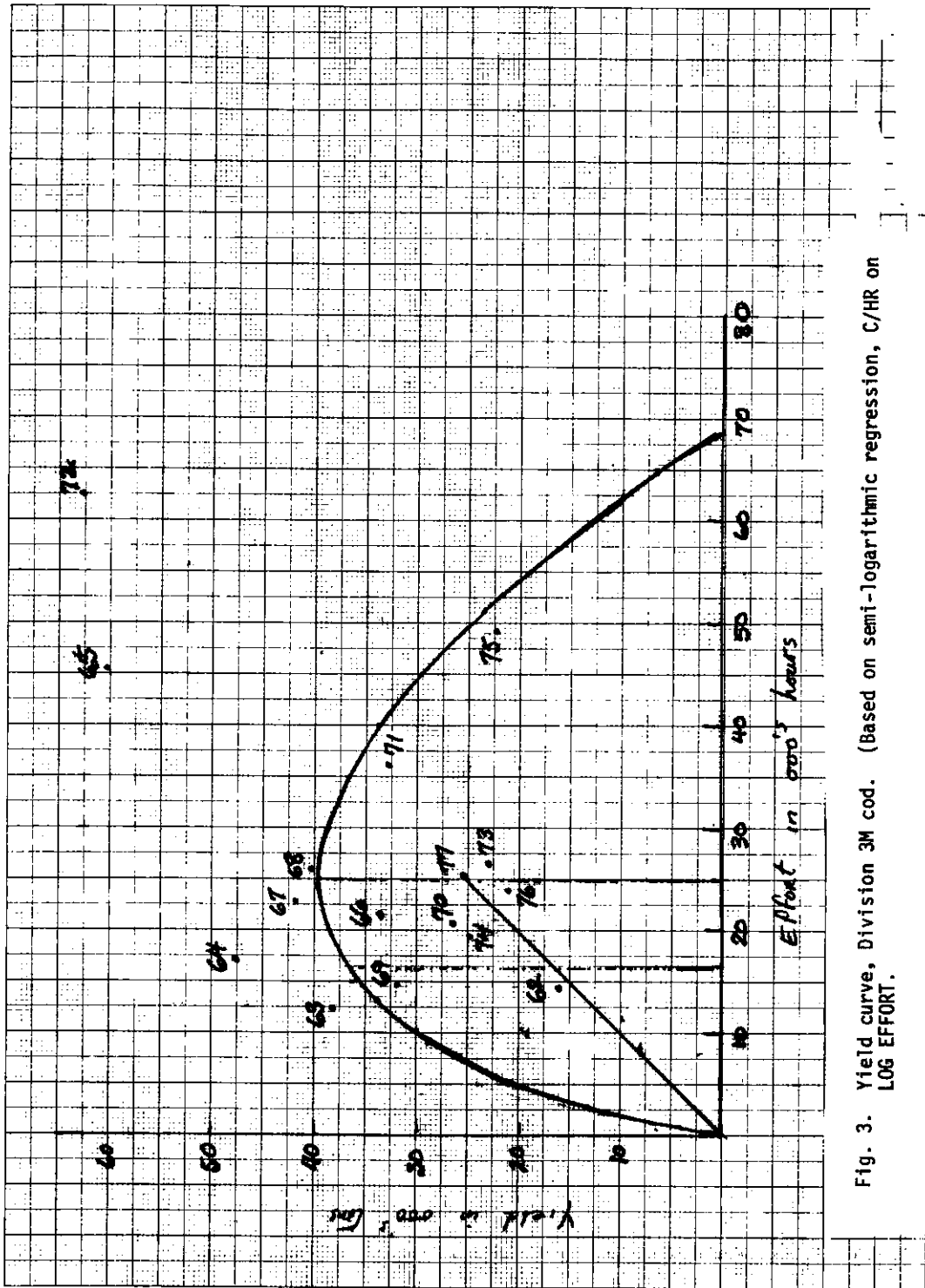


Fig. 3. Yield curve, Division 3M cod. (Based on semi-logarithmic regression, C/HR on LOG EFFORT.)