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An Assessment of Redfish in Division 3Ø

by

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ABSTRACT

The condition of the redfish stock in Div. 3Ø appeared to be stable based on the standardized catch rates throughout the 1970's. An equilibrium surplus production model, fitted to the catch and standardized effort from 1959 to 1980, indicated a yield at 2/3 effort MSY of 17,000 MT. The recent catch rates have been above those expected at equilibrium. The catch at length for 1978-80 showed the fishery to be based on mainly small fish.

RESUME

Les taux de capture normalisés des années 1970 indiquent que l'état du stock de sébastes de la division 3Ø semble stable. Un modèle de production excédentaire en état d'équilibre, adapté aux prises et à l'effort de 1959 à 1980, donne un rendement de 17 000 t au 2/3 de l'effort de RMS. Les taux de capture récents ont dépassé ceux anticipés en état d'équilibre. Les prises par longueur de 1978 à 1980 démontrent que la pêche dépend en grande partie de poissons de petite taille.

INTRODUCTION

Catches of redfish in Div. 3Ø have been generally below the TAC since 1977. The 1979 catch of almost 18,000 MT was the highest catch since 1971 and was followed by an estimated catch of only 8000 MT in 1980. Although large redfish have been located at the greater depths during research surveys, these depths are rather difficult to fish due to rough bottom (McKone 1978). Consequently, the fishery is chiefly dependent on the smaller sized redfish found at shallower depths.

The data used to evaluate the status of the Div. 3Ø redfish stock were the CPUE series, the catch and standardized effort applied to an equilibrium general production model and an estimate of the catch at length for 1978-80.

MATERIALS AND METHODS

ESTIMATION OF CPUE

Redfish directed effort was defined as the effort associated with those catches where redfish comprised 50% or more of the total catch. Data for all country-vessel types that have been among the main prosecuters of the fishery were used in the multiplicative model developed by Gavaris, S. (1980). The regression was weighted by effort. The chosen standard was Can(N) otter trawl vessels, tonnage classes 4 and 5, for the month of June, for which the average coefficient of variation was 10% (Table 1). The results from the multiplicative model were highly significant explaining 93% of the variation in catch rates with the normality assumptions satisfactorily met (Table 2).

CATCH AT LENGTH

Samples of the length composition of the commercial catch in 1979 for Canada and the USSR are shown in Fig. 1a and 1b respectively and for Canada in 1980 in Fig. 2. These frequencies, along with those for 1978 presented in a previous assessment (McKone and Gavaris 1979), formed the basis for the catch-at-length calculations for 1978-80. While based on very limited sampling, the catch at length (Fig. 3) permitted a between years comparison of the actual abundance of a length group. A rough estimate of the accuracy of the catch-at-length vectors was obtained by comparing the reported catch with the catch calculated from the catch at length and the weight/length relationship.

RESULTS AND DISCUSSION

CPUE

The catch rate series suggested a stable condition for the stock during the 1970's. The 1980 catch rate, although only a preliminary figure based on 12% of the total redfish catch caught by Newfoundland vessels only, represented about the average condition for this stock over the 1970's.

GENERAL PRODUCTION MODEL

An equilibrium model was fit using the catch and standardized effort data shown in Table 1. The assumption that the stock approached an equilibrium condition appeared to be not unreasonable considering the stability in the

catch rates and that the stock had only once been fished above the present TAC back in 1965. Some results of the model follow:

	MSY Effort	2/3 Effort MSY
Yield (MT)	19,200	17,000
Effort (Hrs)	31,000	26,000
CPUE	0.62	0.67

The equilibrium yield curve is shown in Fig. 4. Present catch rates are above those expected at the equilibrium level. These results compared quite closely with those in last year's assessment report where a nonequilibrium model was used (Gavaris, C. 1980).

CATCH AT LENGTH

The commercial length frequencies showed the bulk of the catch to be made up of small fish between 20 and 30 cm long. The Canadian commercial catch in 1980 appeared to consist of somewhat larger fish than in 1979.

The catch calculated from the catch at length and the weight/length relationship differed from the reported catch by 5, 3 and 10% for 1978, 1979 and 1980 respectively, being an overestimate in all years. The largest errors occurred in 1978 and 1980 when only Canadian frequencies were used. Canadian length frequencies did not appear to be representative of the entire catch in these instances. The catch of larger fish in Div. 3Ø in 1980 was probably not characteristic of the fishery in general. There was some evidence in the catch-at-length vectors of a progression of the modal length with time, indicating that the fishery is being sustained by a relatively few good year-classes.

CONCLUSIONS

The catch rates indicated that the stock was in a stable condition. The general production model suggested a yield at MSY and 2/3 the effort at MSY of 19,000 and 17,000 MT respectively. The present catch rates were above those expected at equilibrium.

REFERENCES

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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.

McKone, W. D. 1978. Division 3Ø redfish assessment. CAFSAC Res. Doc. 78/20.

McKone, W. D. and C. A. Gavaris. 1979. Redfish assessment Division 3Ø. CAFSAC Res. Doc. 79/34.

Table 1. Historical catches of redfish in Division 30. Mean catch rates and standard error of the standard (CanN OT, TC 4 and 5, June) for years 1959-80. Average C.V. is 0.10.

Year	Catch (mt)	CPUE (c/hr)	Std. error	Effort (hours)
1959	9268	1.457	0.139	6361
1960	5030	1.254	0.144	4011
1961	11,394	1.237	0.119	9211
1962	7557	0.649	0.048	11,644
1963	9194	0.994	0.091	9250
1964	20,232	0.789	0.056	25,643
1965	22,438	0.594	0.045	37,774
1966	15,305	1.019	0.322	15,020
1967	19,037	1.284	0.270	14,826
1968[1]	6445	0.950	-	
1969	15,878	0.860	0.077	18,463
1970	13,192	0.748	0.055	17,636
1971	19,792	0.939	0.080	21,078
1972	16,117	0.718	0.067	22,447
1973	8797	1.009	0.098	8718
1974	13,124	0.955	0.089	13,742
1975	15,110	0.905	0.094	16,696
1976	15,348	1.187	0.085	12,930
1977	10,850	1.093	0.080	9927
1978	6860	0.946	0.078	7252
1979[2]	17,737	1.381	0.099	12,844
1980[2]	8049	0.985	0.120	8172

[1]catch rate for 1968 is interpolated

[2]preliminary statistics

Table 2. Results of the regression of the multiplicative model. Type 1, 2 and 3 variables represent country-tonnage class-gear category, months and years respectively, Redfish, Division 30.

Multiple R.....0.964
Multiple R Squared.....0.929

Analysis of Variance

Source of variation	DF	Sums of squares	Mean squares	F-Value
Type 1	7	$4.87863^{E}1$	$6.96947^{E}0$	160.356
Type 2	7	$4.70726^{E}0$	$6.72466^{E-}1$	15.472
Type 3	20	$9.15115^{E}0$	$4.57557^{E-}1$	10.528
Regression	34	$1.80977^{E}2$	$5.32284^{E}0$	122.470
Residuals	316	$1.37341^{E}1$	$4.34625^{E-}2$	
Total	350	$1.94711^{E}2$		

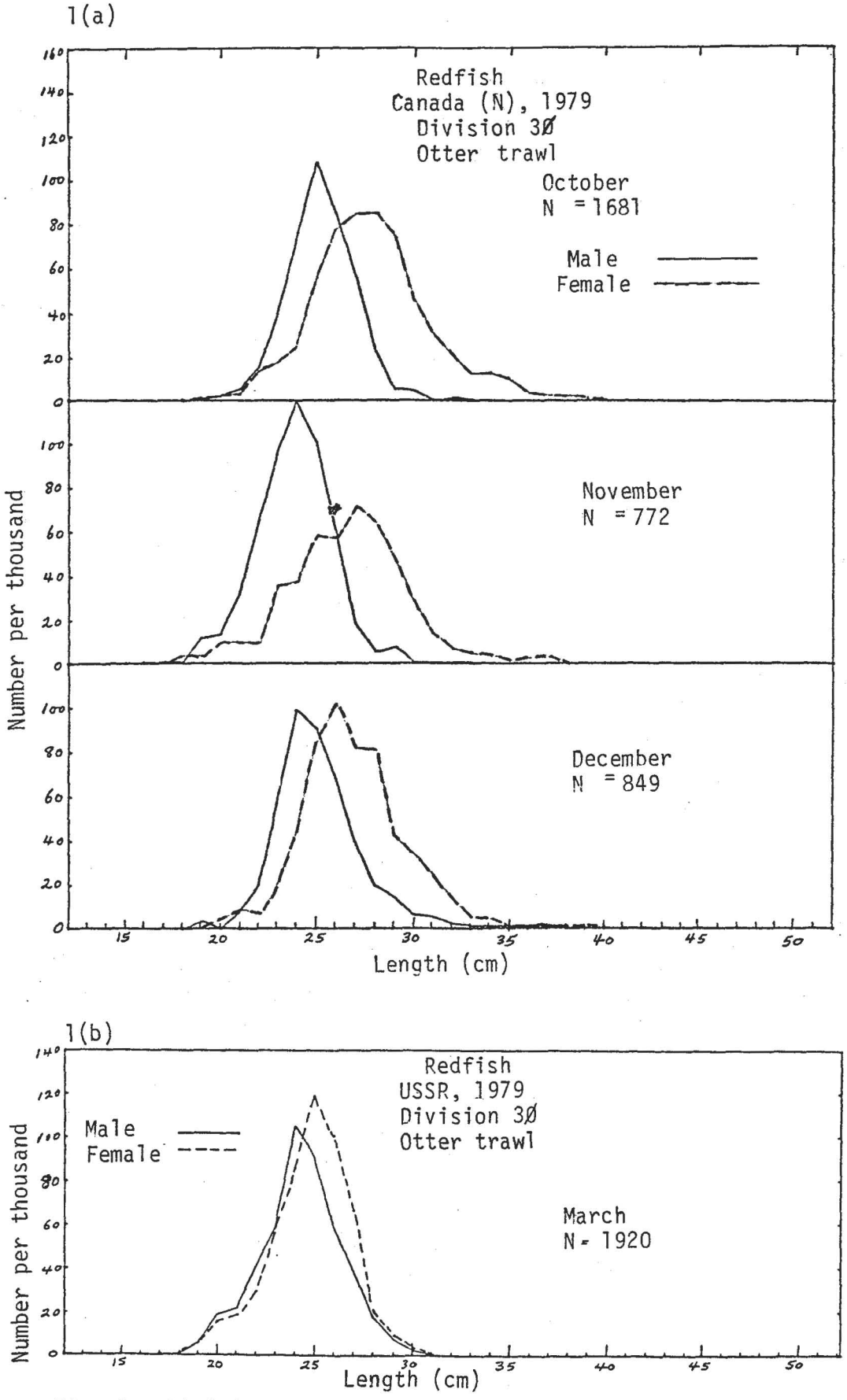

Fig. 1. Division 3Ø redfish length frequencies as sampled from a) Canadian and b) USSR commercial otter trawl vessels in 1979.

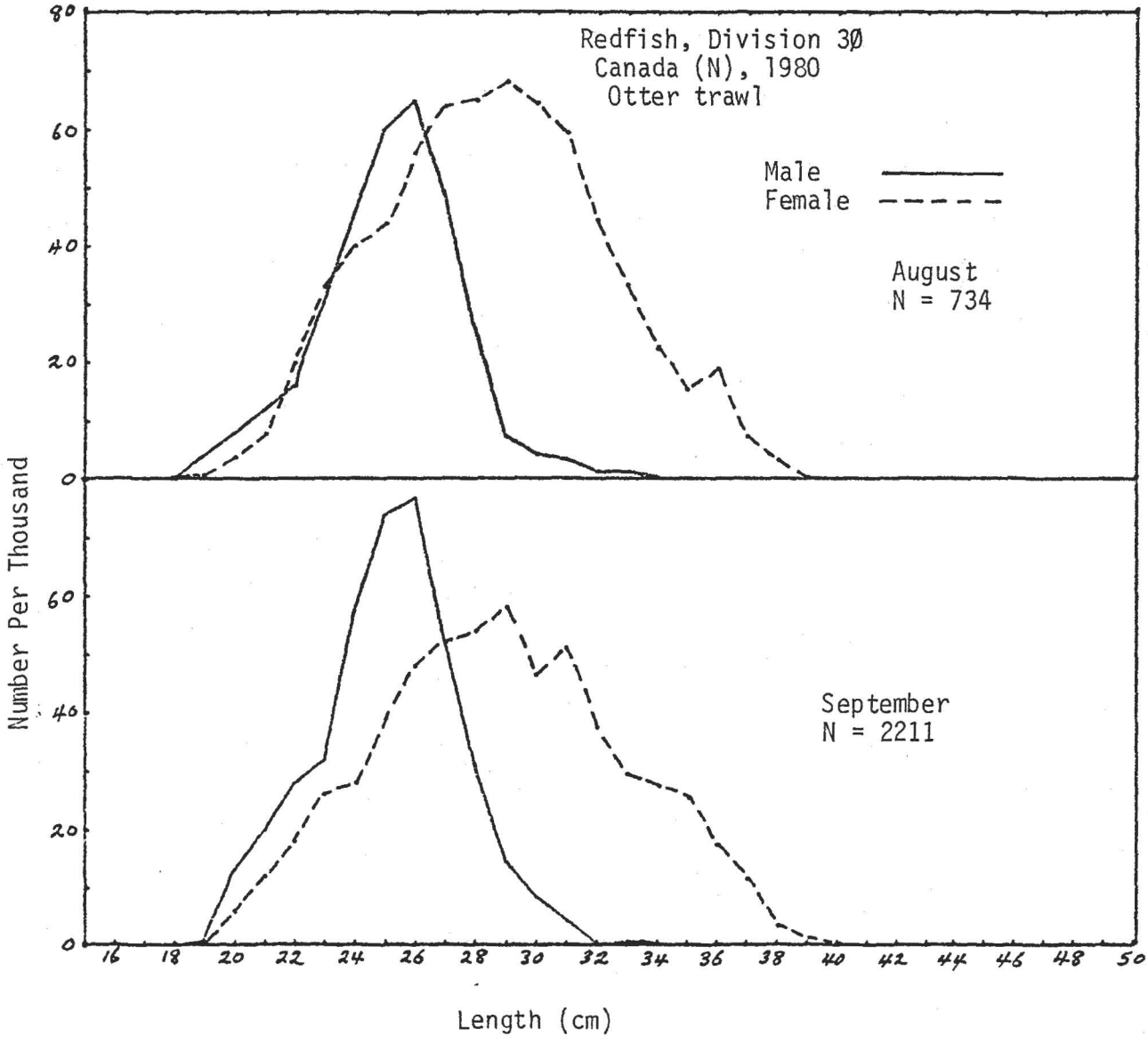

Fig. 2. Division 3Ø redfish length frequencies as sampled from Canadian commercial otter trawl vessels in 1979.

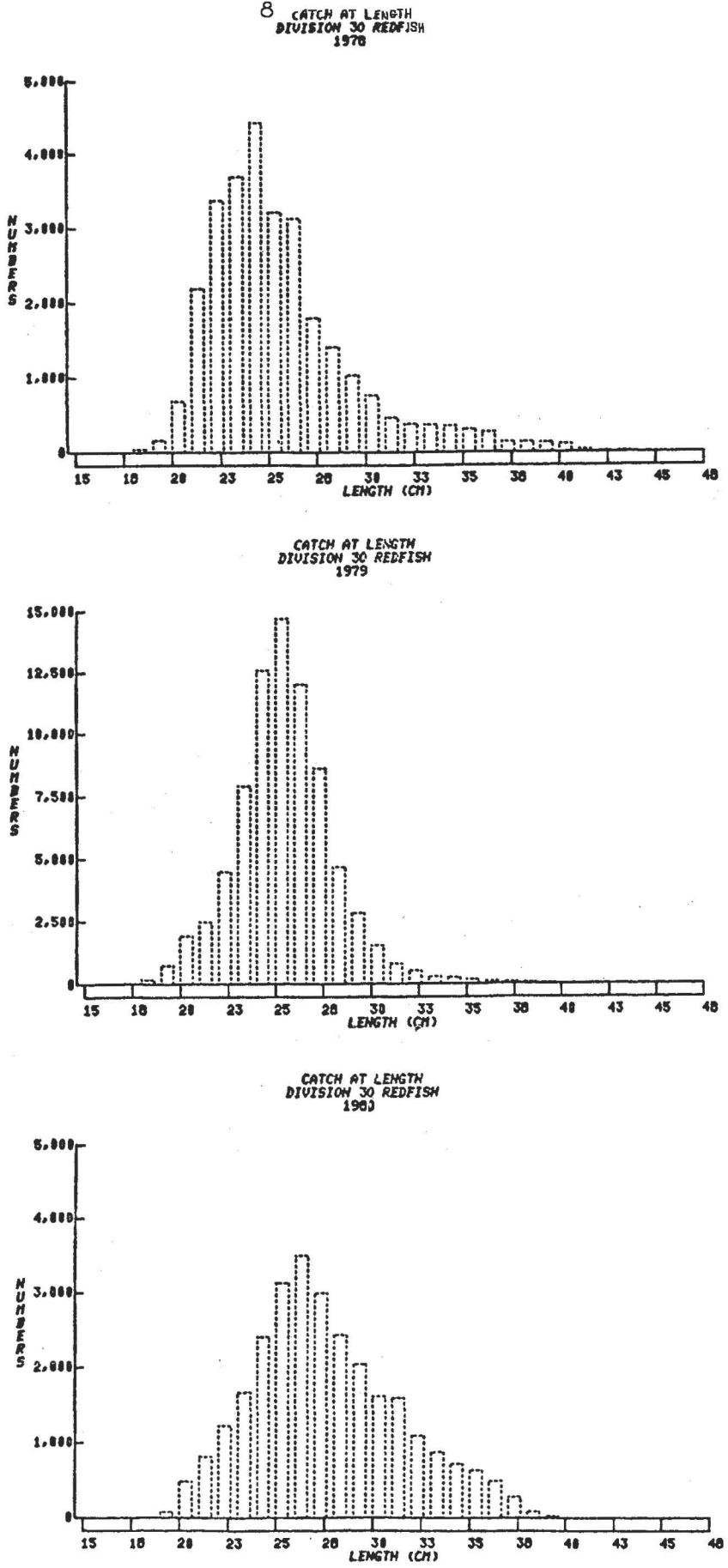

Fig. 3. Numbers of redfish caught at length in 1978 to 1980 Division 3Ø.

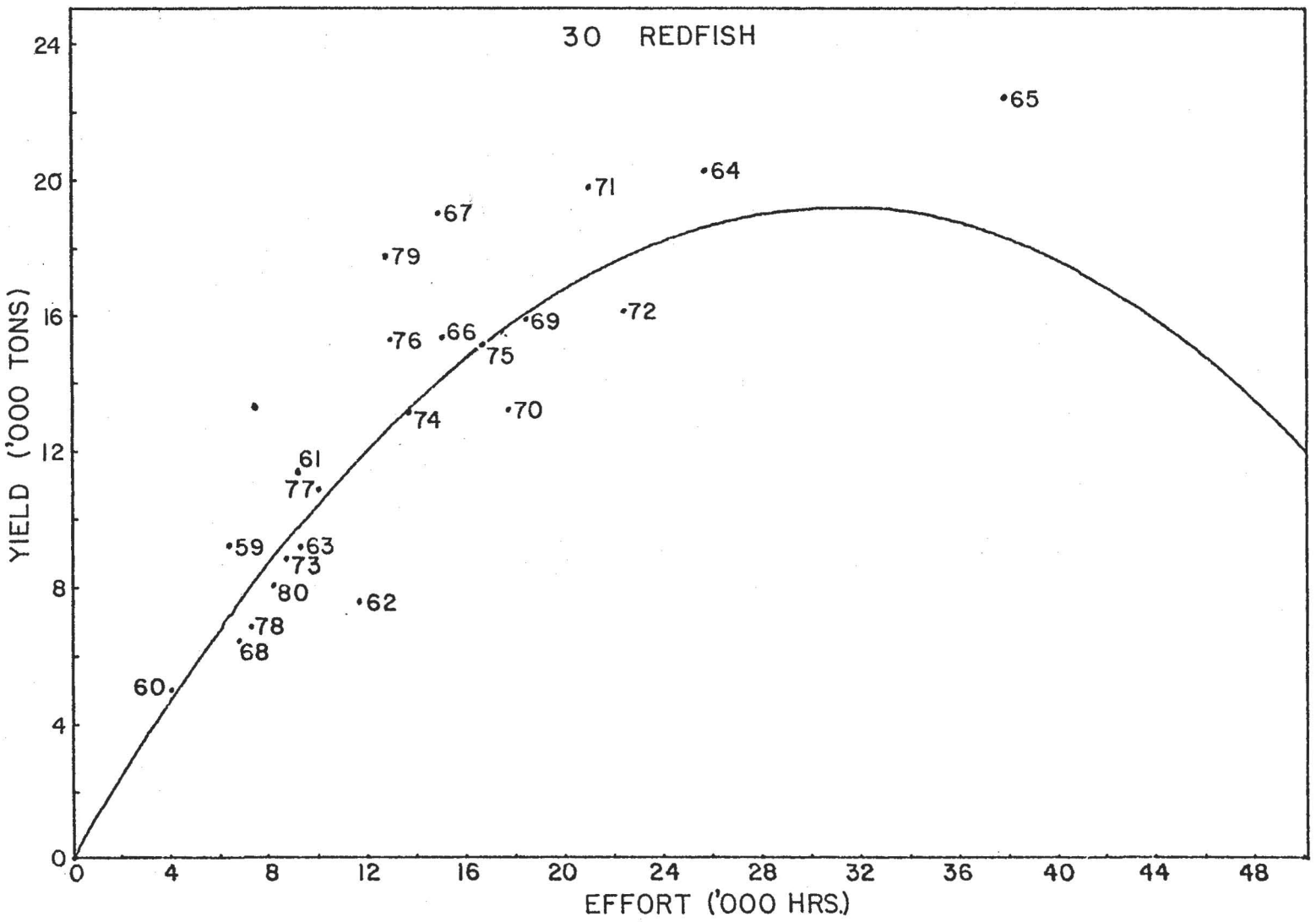

Fig. 4. Equilibrium yield curve for redfish in Division 3Ø plotted with yearly catch and standardized effort.