

Assessment of the Cod Stock in Subdivision 3Ps

by

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Abstract

Catch rates were standardized using a multiplicative model. Estimates of effort derived from the standardized catch rates were used with the reported catch to solve the non-equilibrium surplus production model. Indications are that the stock biomass is considerably lower than the MSY level, therefore the equilibrium yield does not apply. The non-equilibrium yield at 2/3 effort MSY for 1981 is 28,238 t.

Résumé

Les taux de capture ont été normalisés à l'aide d'un modèle multiplicateur. Les estimations de l'effort, déduites des taux de capture normalisés, furent utilisées parallèlement aux captures signalées afin de résoudre le modèle de production excédentaire en condition de non-équilibre. Selon certains indices, la biomasse du stock est beaucoup plus faible que le niveau de RMS; donc, le rendement d'équilibre ne s'applique pas. Le rendement de non-équilibre correspondant aux 2/3 de l'effort du RMS pour 1981 est de 28,238 t.

The sources of data and the method of analysis for this stock were similar to those of the 3Pn4RS cod stock.

The regression was significant and accounted for 58% of the variation (Table 1). CanN OT-4 and CanN OT-5 were selected as the standard for country-gear types and February for months. The resulting standardized catch rates are presented in Fig. 1 along with approximate 90% confidence intervals. The corresponding estimates of standardized effort are given in Table 2.

The observed yield and the yield predicted by the non-equilibrium model are shown in Fig. 2. Interpretation of the catch rates and Fig. 3 suggests that this stock had experienced some relatively heavy fishing pressure prior to 1959. High effort from 1959 to the late 1970's prevented the stock from recovering (Fig. 4, Fig. 5). There are indications that the stock has at least stabilized now and may be recovering. The estimated MSY and the average sustainable yield at 2/3 effort MSY are 69,960 t and 59,575 t respectively. The non-equilibrium catch for 1981 predicted by the model is 28,258 t.

Table 1. Analysis of variance for the cod stock in Subdivision 3Ps.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.764

MULTIPLE R SQUARED..... 0.584

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
TYPE 1	6	7.29204E1	1.21534E1	103.463
TYPE 2	5	1.41328E1	2.82656E0	24.062
TYPE 3	21	5.13761E1	2.44648E0	20.827
REGRESSION	32	1.33854E2	4.18294E0	35.609
RESIDUALS	811	9.52646E1	1.17465E-1	
TOTAL	843	2.29118E2		

Table 2. Historical catch and estimated catch-rate and effort using the specified standards.

YEAR	CATCH	CATCH RATE		EFFORT
		MEAN	STD ER	
1959	60170	0.483	0.033	124575
1960	72636	0.610	0.038	119075
1961	83620	0.672	0.036	124249
1962	52639	0.601	0.043	87585
1963	50051	0.672	0.051	74480
1964	53956	0.812	0.055	66366
1965	51400	0.850	0.060	60470
1966	65749	0.895	0.049	73462
1967	62393	0.683	0.040	91351
1968	77217	0.924	0.048	83568
1969	63103	0.893	0.048	70664
1970	76161	0.755	0.037	100875
1971	63967	0.671	0.034	95330
1972	44323	0.582	0.035	76156
1973	52641	0.488	0.029	107870
1974	46712	0.360	0.020	129755
1975	35373	0.387	0.028	91403
1976	37133	0.521	0.042	71136
1977	32376	0.435	0.051	74427
1978	26255	0.580		45267
1979	30347	0.648	0.105	46831
1980	28000	0.606	0.100	46204

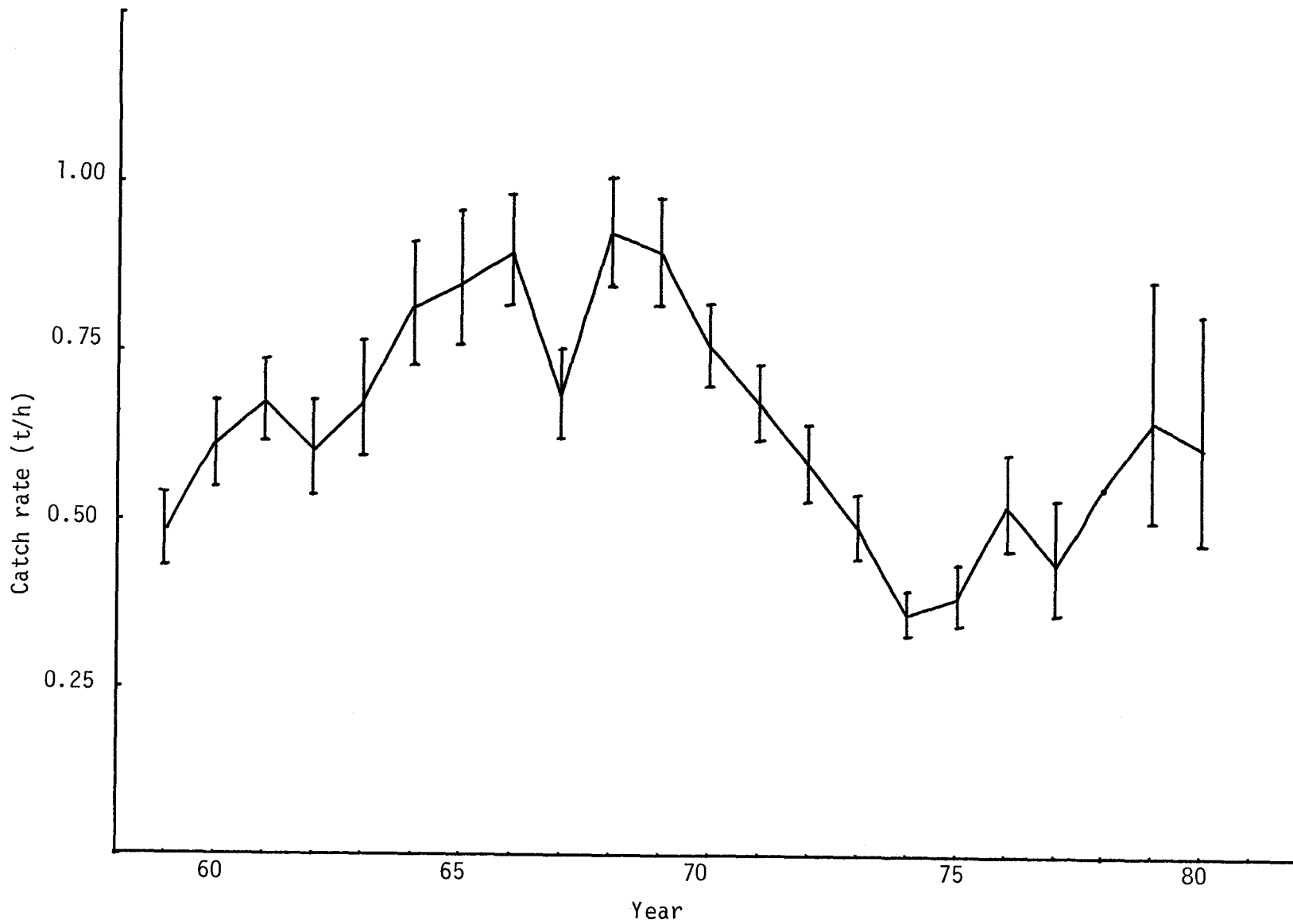


Fig. 1. Standardized catch rates and approximate 90% confidence intervals using CanN OT-4 and CanN OT-5 during February as the standard.

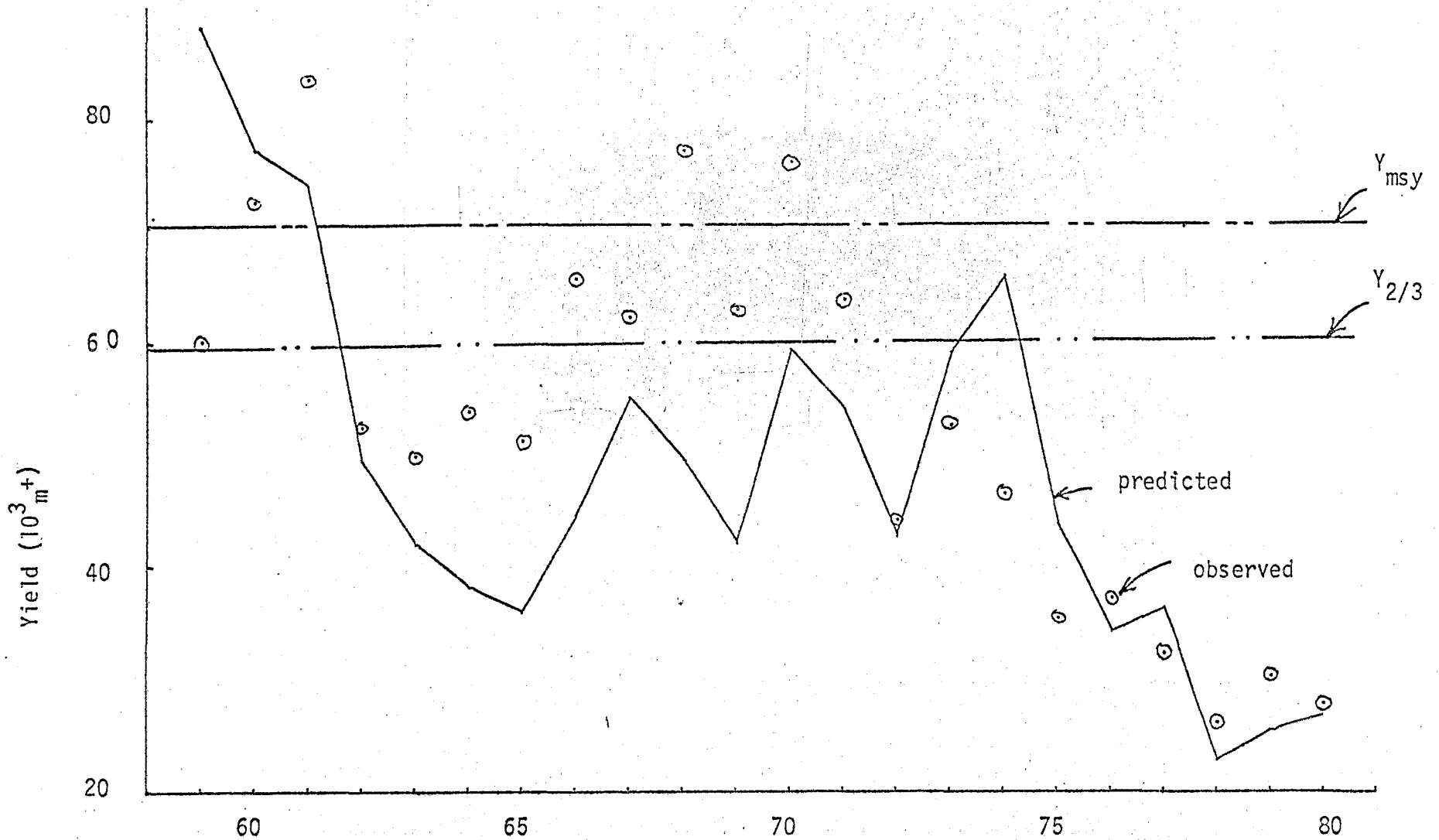


Fig. 2. Predicted and observed values of the dependent variable, yield. The MSY and sustained yield at 2/3 effort MSY are shown.

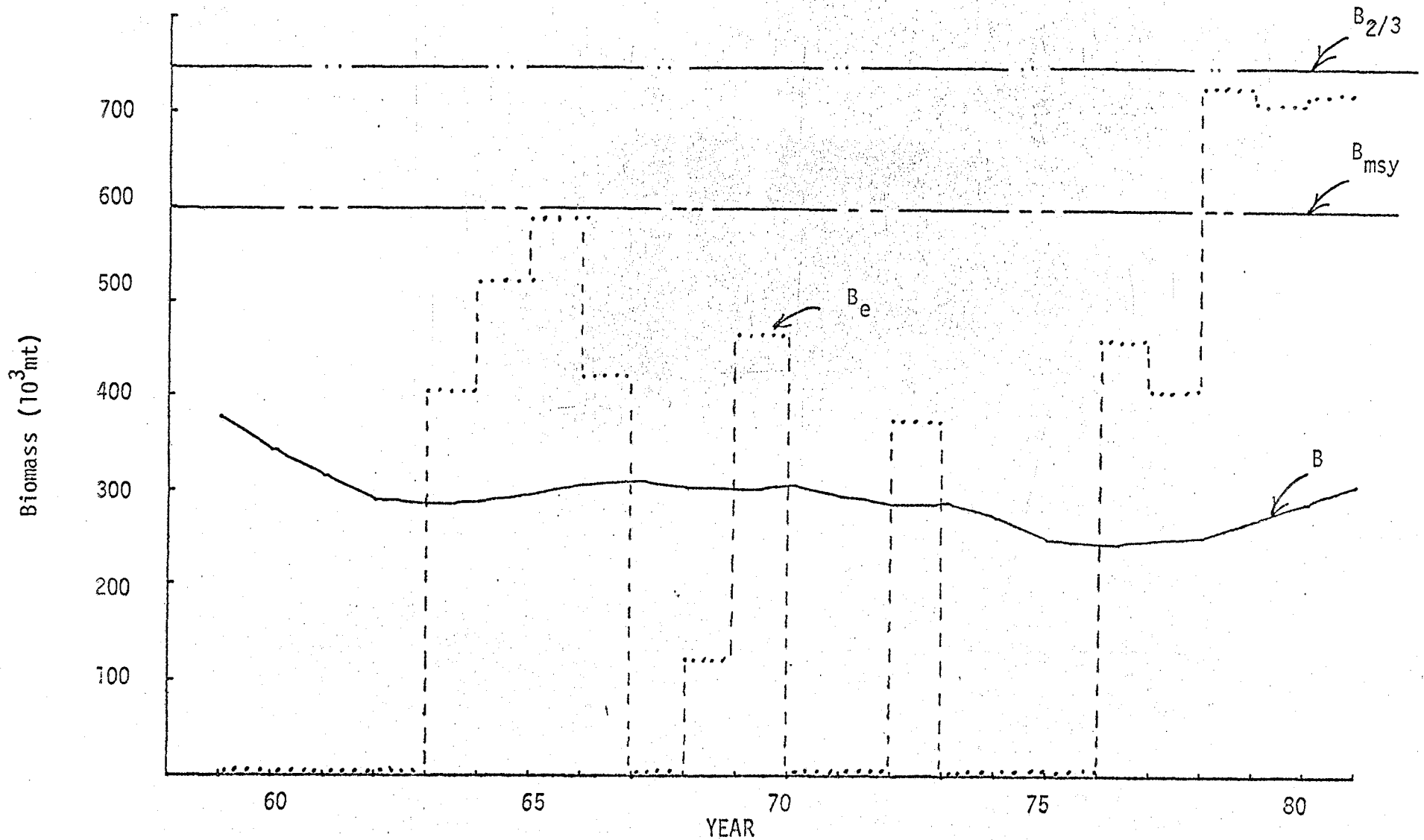


Fig. 3. The biomass at the beginning of each year, B , and the equilibrium biomass for the fishing effort applied during that year, B_e , are shown along with the biomass at MSY and at 2/3 effort MSY.

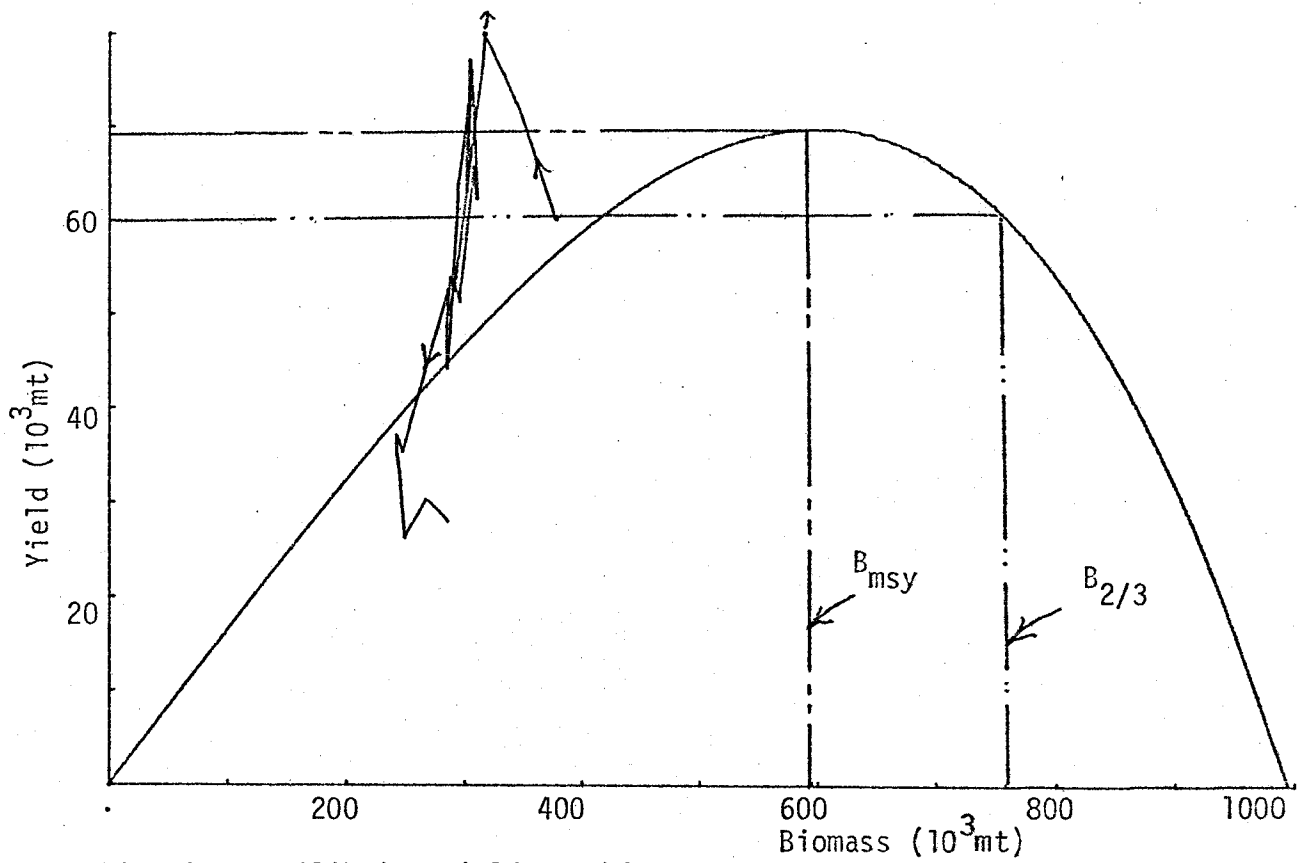


Fig. 4. Equilibrium yield vs. biomass

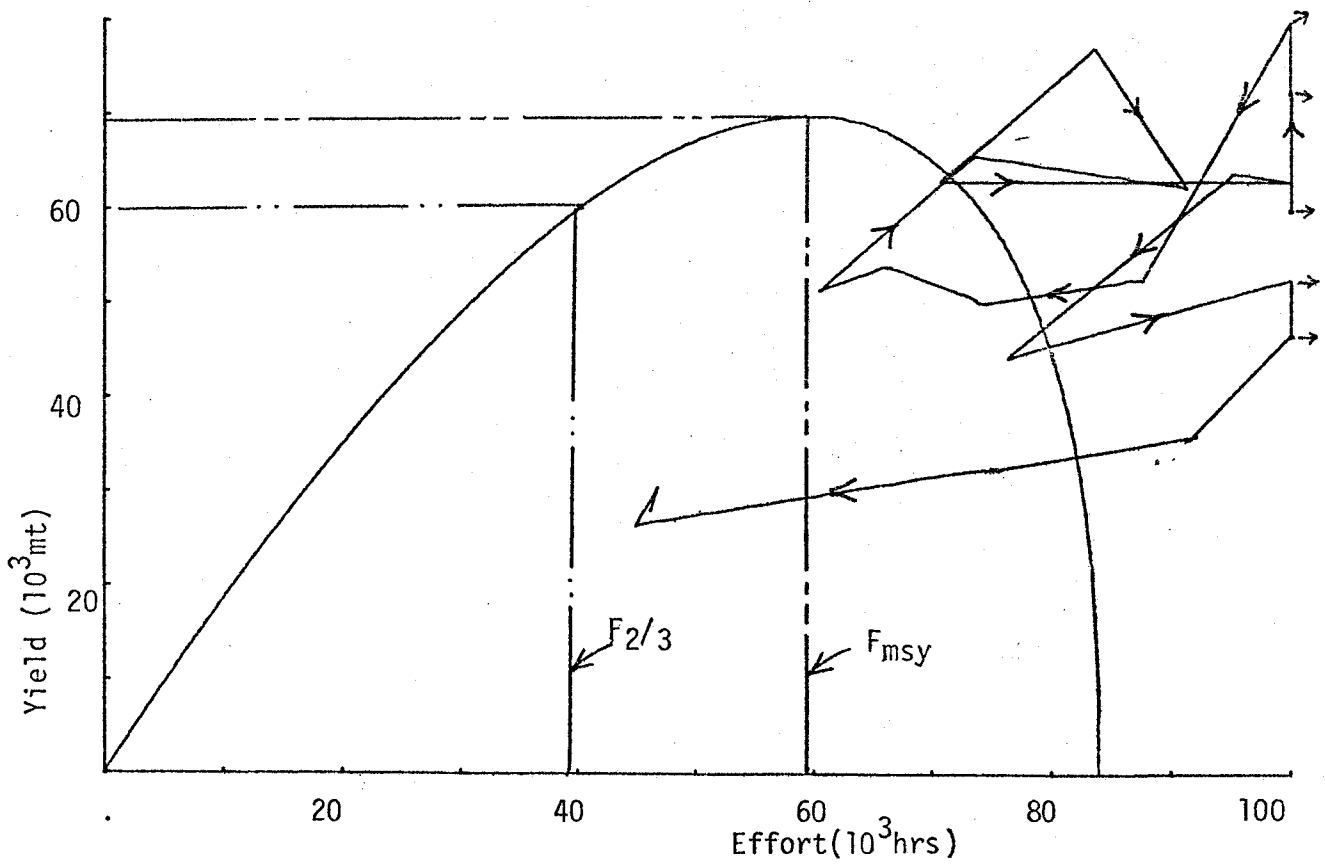


Fig. 5. Equilibrium yield vs. effort.