International Commission for the Northwest Atlantic Fisheries

Serial No. 5414

ICNAF Res. Doc. 79/VI/72
(Revised)

ANNUAL MEETING - JUNE 1979

Assessment of Redfish in Divisions 3LN

by

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INTRODUCTION

The assessment of the 3LN redfish stock has been carried out in the past using the simple Schaefer production model (Schaefer 1954). The paper includes an update of the previous assessment using the same effort standard and an assessment using a new effort standard. Also included is an update of catch and effort trends by both effort standards as well as research and commercial length frequencies.

MATERIALS AND METHODS

As was discussed by McKone (1978) much of the redfish catch in 3LN is not reported as resulting from a redfish directed fishery. Thus as in the past effort was determined from catches which contain greater than 50%. As in the past, Poland-USSR vessels of tonnage class 7 were used as the standard for determining catch per unit effort (hours). The second effort standard was derrived following the method outlined by Gavaris (1979).

The regression of catch per unit effort upon effort for both standards were done in four ways:

1. Each year treated separately.
2. Six year running averages.
3. Eight year running averages and
4. Ten year running averages.

Correlation coefficients were calculated from regression to determine the joint properties of the two variables. The regressions indicating the best correlation were used to formulate the general production parabola (Schaefer, 1954).

Canadian research length frequencies by Division and depth range are compared for 1977-78 as well as summaries for the whole of Div. 3LN. Numbers per thousand at age are included for 1977 research surveys. Some comparisons of 1977 and 1978 commercial (Canada, Newfoundland) catches are made based upon the limited data available.

RESULTS AND DISCUSSION

Again in 1977 the catch in Div. 3L is very high compared with that in Div. 3N, accounting for 82% of the total. Bottom trawl catches represent 61% of the total catch which represents 63% of the combined bottom, midwater trawl catch. The remaining 4% was caught near shore by set gillnets.

Table 1 shows the fluctuations in the percent of the total catch represented by the standard used in previous assessments to determine catch per unit effort (Poland-USSR tonnage class 7). The proportion varies throughout the years from 2-89% and thus reliability may fluctuate similarly. To overcome these problems stepwise multiple linear regression was used in the second analysis to incorporate

as much of the available CPUE data into a model as possible and derive a new effort standard which might better represent the overall pattern of fishing in Div. 3LN. Table 2 outlines the power coefficients for various vessel categories and months. The regression procedure produced a multiple R value of $0.748 > (P < 0.001)$ with the assumptions of the model are met.

Fig. 1 shows the trends in catch for Div. 3LN and the trends in effort and catch per unit effort for the new standard from 1957-1977. Fig. 2 outlines the effort and catch per unit effort from the standard used in previous years from 1962 to 1977. It can be seen that since 1974 when quota regulation was instituted, the catch per unit effort remains relatively stable in Fig. 1 at about 1.25 tons per hour fished, while from Fig. 2 fluctuations are greater and an increasing catch rate has occurred from 1.5 tons per hour in 1975 to 1.8 tons per hour in 1977. Effort, however, has declined over the same period using either standard. Fig. 3 and 4 illustrate the regression of catch per unit effort on effort for the period 1957 to 1977 for the new and previously used standards, respectively. In Fig. 4 the years 1964, 1967, 1968, and 1974 are not included because of a lack of effort data. Only the best regressions have been included which, for both standards, is that based upon year by year calculations. Thus, it was not possible to build a lag time into the model used. The correlation coefficients are rather low, $r = -0.46$ for the new effort standard, and $r = -0.56$ for the previously used effort standard.

Fig. 5 and 6 illustrate the general production parabolas generated from the year by year regressions. Fig. 5, based on the new effort standard, indicates an MSY of 35,600 metric tons and the yield at 2/3 effort MSY would be 32,000 metric tons. Updating the parabola for the previously used standard, Fig. 6 indicates the stock at equilibrium will yield an MSY of 30,000 metric tons, while the yield at 2/3 effort MSY will be 27,000 metric tons. Based on the yield at 2/3 effort, both methods of calculating effort indicate a significant increase over the present 1979 TAC level of 18,000 metric tons. Using either effort standard, Fig. 5 and 6 indicate that the Div. 3LN redfish stock is in a very health condition.

The 1978 research length frequencies were collected during a random-stratified biomass survey as were those in 1977 (Fig. 7-8). The length of both males and females increased with depth in Div. 3LN. Lengths vary greatly in the two Divisions but in the shallower depth ranges there is good evidence of future recruitment for the stock. Fig. 9 illustrates the commercial length frequencies for Div. 3L for 1978. The most predominant lengths caught for both sexes were 29-39 cm but in the midwater trawl catch there is an additional peak at 24 cm. The trend from April to December tends to shift towards the lower end of the size range caught.

CONCLUSION

Some caution must be given in interpreting these results. In both models presented the correlation coefficients between CPUE and effort are low indicating a poor fit to the model. In evaluating the new effort standard a number of alternates were tried without success. The major problem in any attempt at calculating an effort standard is the lack of information because no vessel category has fished in Div. 3LN consistently throughout the years. When running averages of standard effort were attempted, the correlation coefficients did not improve from the unlagged effort standard. Thus, the use of unlagged effort results in MSY estimates provided in this paper being too high.

REFERENCES

Gavaris, C. 1979. Flemish Cap redfish assessment. *ICNAF Res. Doc.* 79/VI/62, Serial No. 5403.

McKone, W. D. 1978. Assessment of Div. 3LN redfish. *ICNAF Res. Doc.* 78/VI/46, Serial No. 5208.

Schaefer, M. B. 1954. Some aspects of the dynamics of populations important to management of the commercial marine fisheries. *Bull. Inter-Amer. trop. Tuna Comm.* 1: 26-56.

Table 1. Relationship between catch by standard (Poland-USSR class 7) and total catch of 3LN redfish.

Year:	Catch by Standard (mt):	Total Catch (mt):	Percent:
1957	17372	21083	82
1958	11900	21069	56
1959	18825	44585	42
1960	2304	28010	8
1961	2069	23175	9
1962	2229	21434	10
1963	1279	21097	6
1964'		17600	
1965	970	13493	7
1966	2701	16974	16
1967'		27188	
1968		17643	
1969	20493	23069	89
1970	3822	14388	27
1971	9691	34353	28
1972	22596	28933	78
1973	627	33297	2
1974'		22286	
1975	8314	17871	47
1976	5257	20512	26
1977	2076	16262	13

' effort data not available

Table 2. Power coefficients of fishing vessel types and months

Fishing Vessels:	Powers:	Months:	
USSR 70T	1	March	1.429
USSR 60T	0.463	April	1.710
USSR 50T	0.477	All others	1
USSR 40T	0.188		
Can(N) 50T	0.690		
Can(N) 40T	0.558		
Can(N) 30T	0.285		
Can MQ 40T	0.466		
Can MQ 50T	0.604		
USSR 7MT	1.795		
USSR 5MT	2.825		
Jap. 70T	1.589		
Pol 70T	0.630		

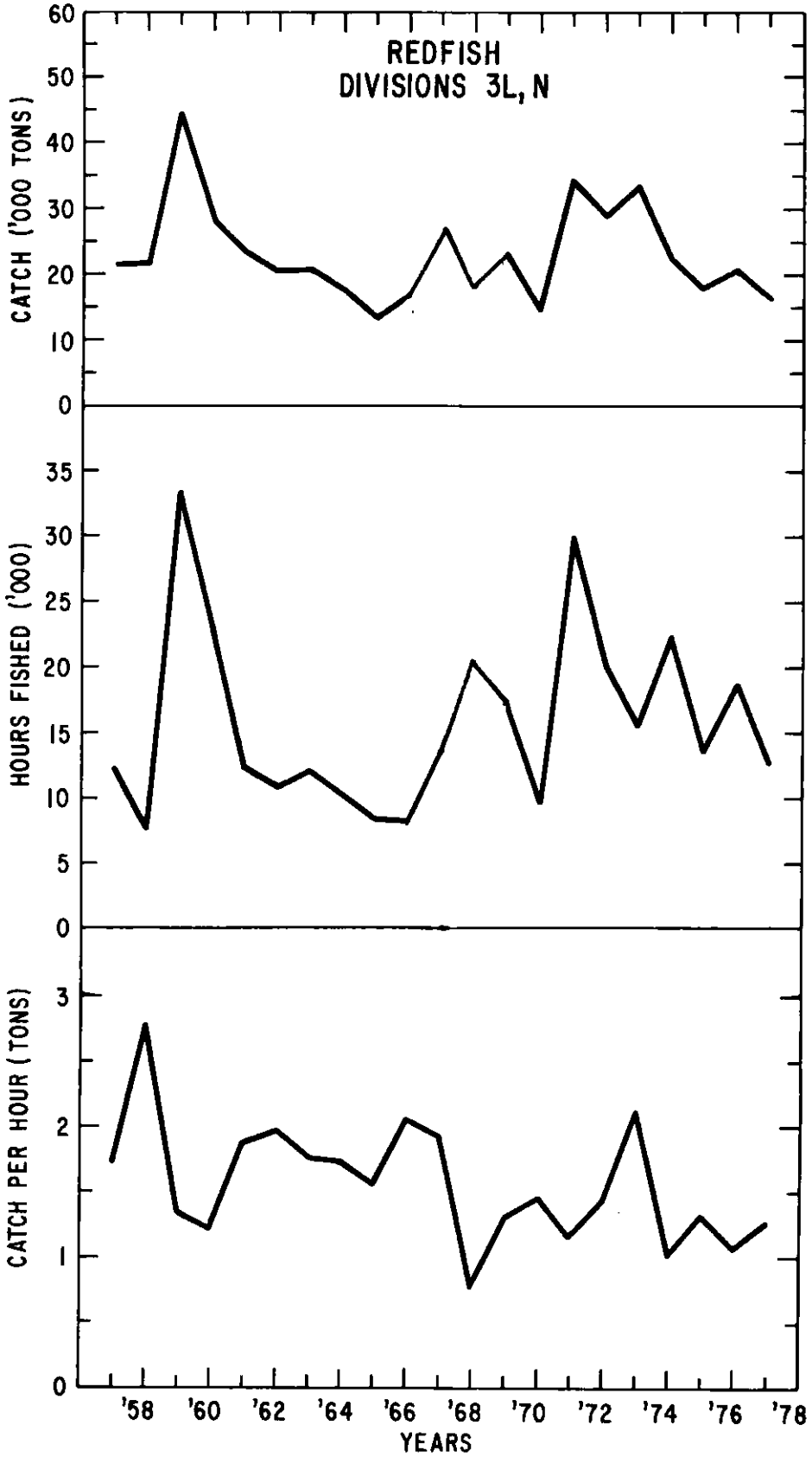

Fig. 1. Trends in nominal catch effort and catch per unit effort based on the new model as described in the text.

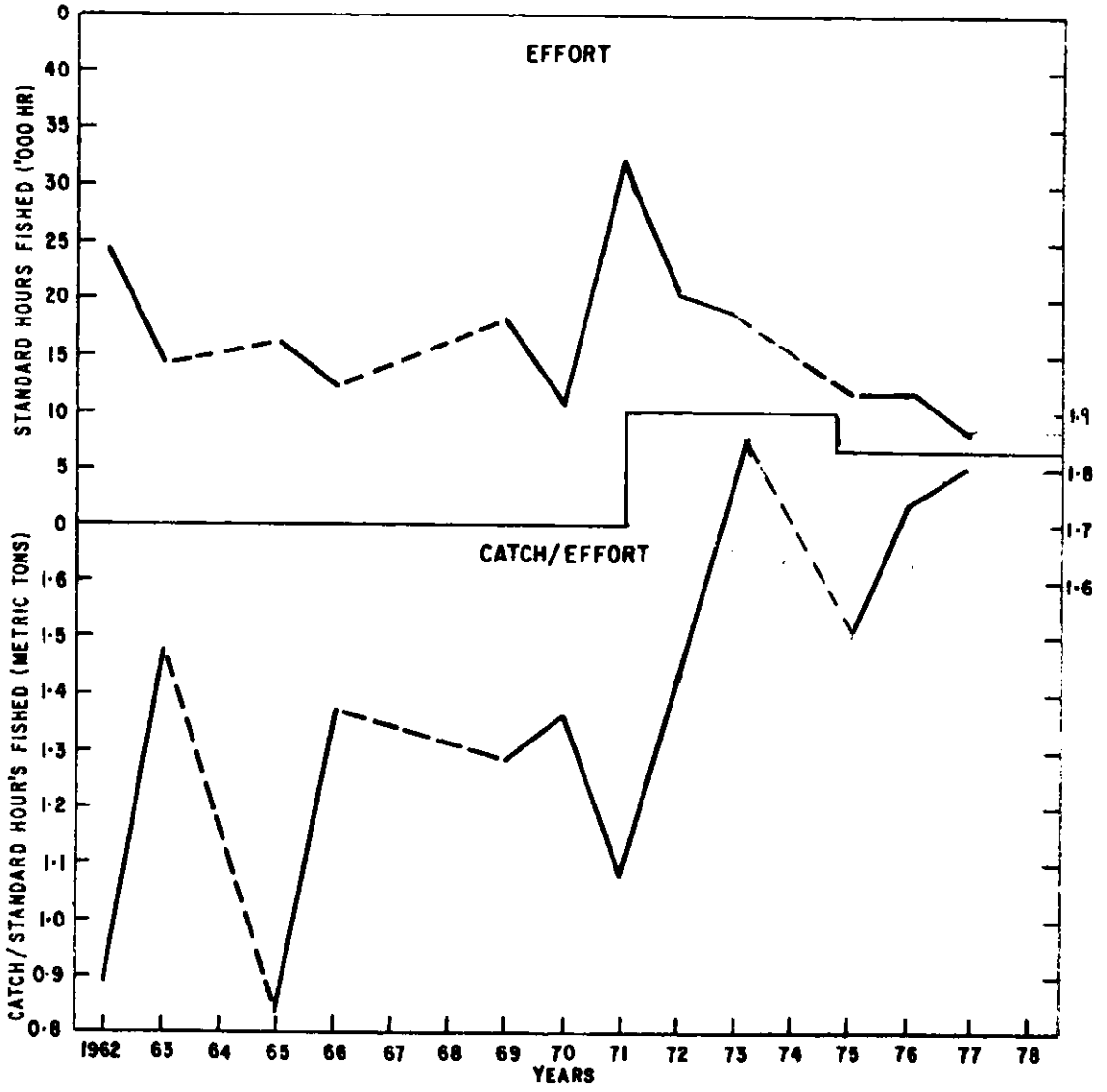

Fig. 2. Trends in effort and catch per unit effort based on Poland-USSR tonnage class 7 bottom trawl vessels.

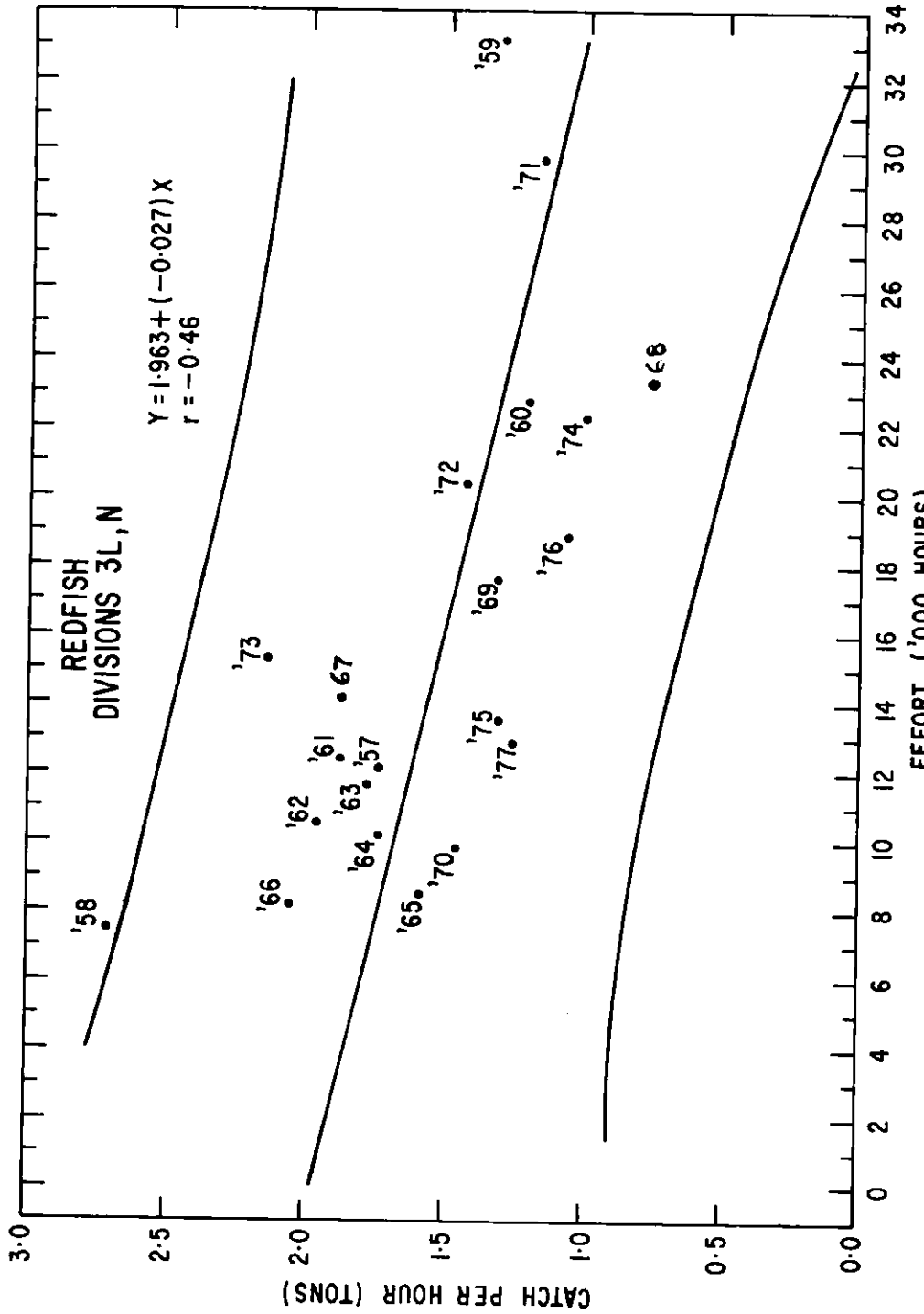

Fig. 3. Least squares regression of catch per standard hour fished on effort based on the new model.

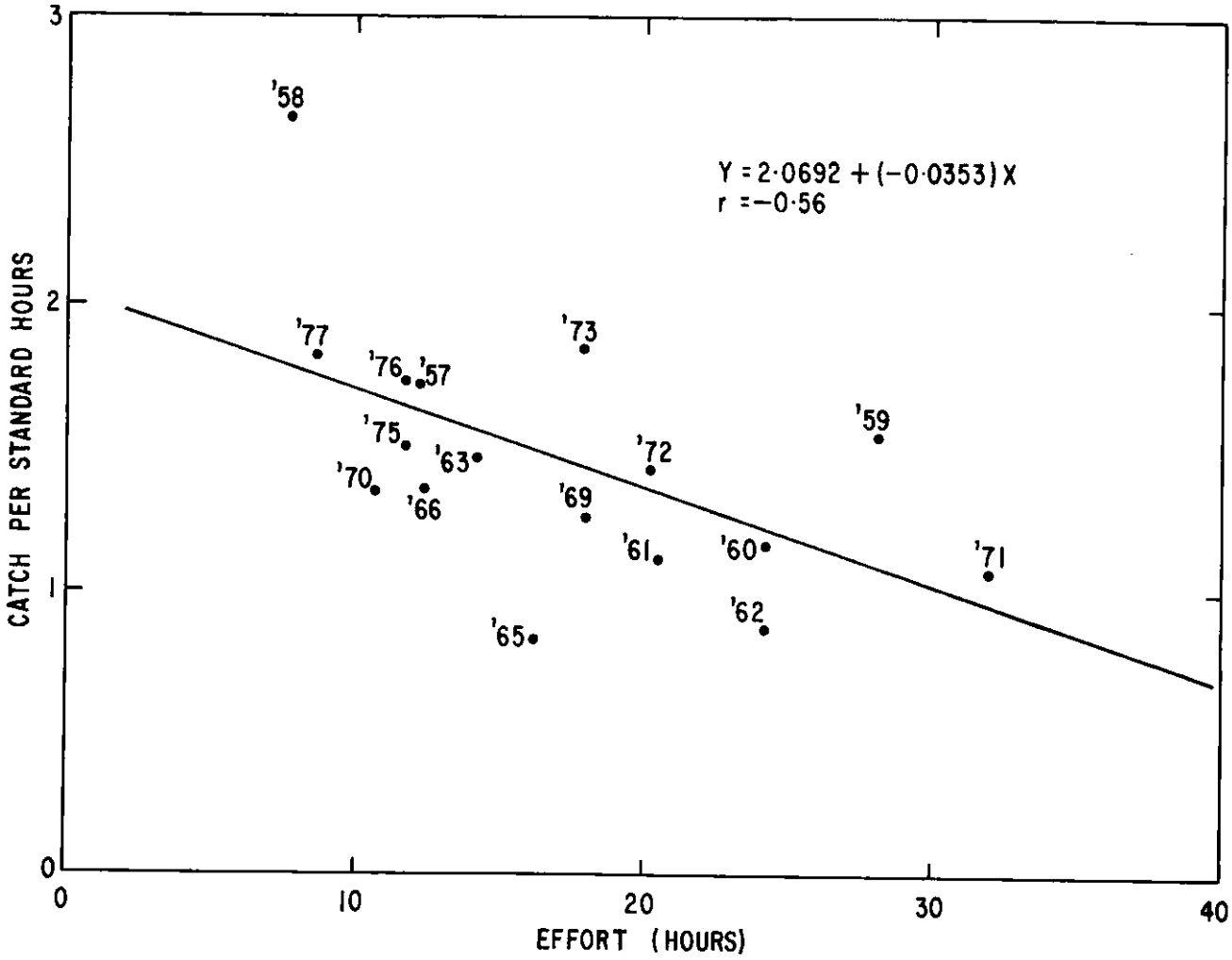

Fig. 4. Least squares regression of catch per standard hour fished on effort based on Poland-USSR bottom trawl vessel.

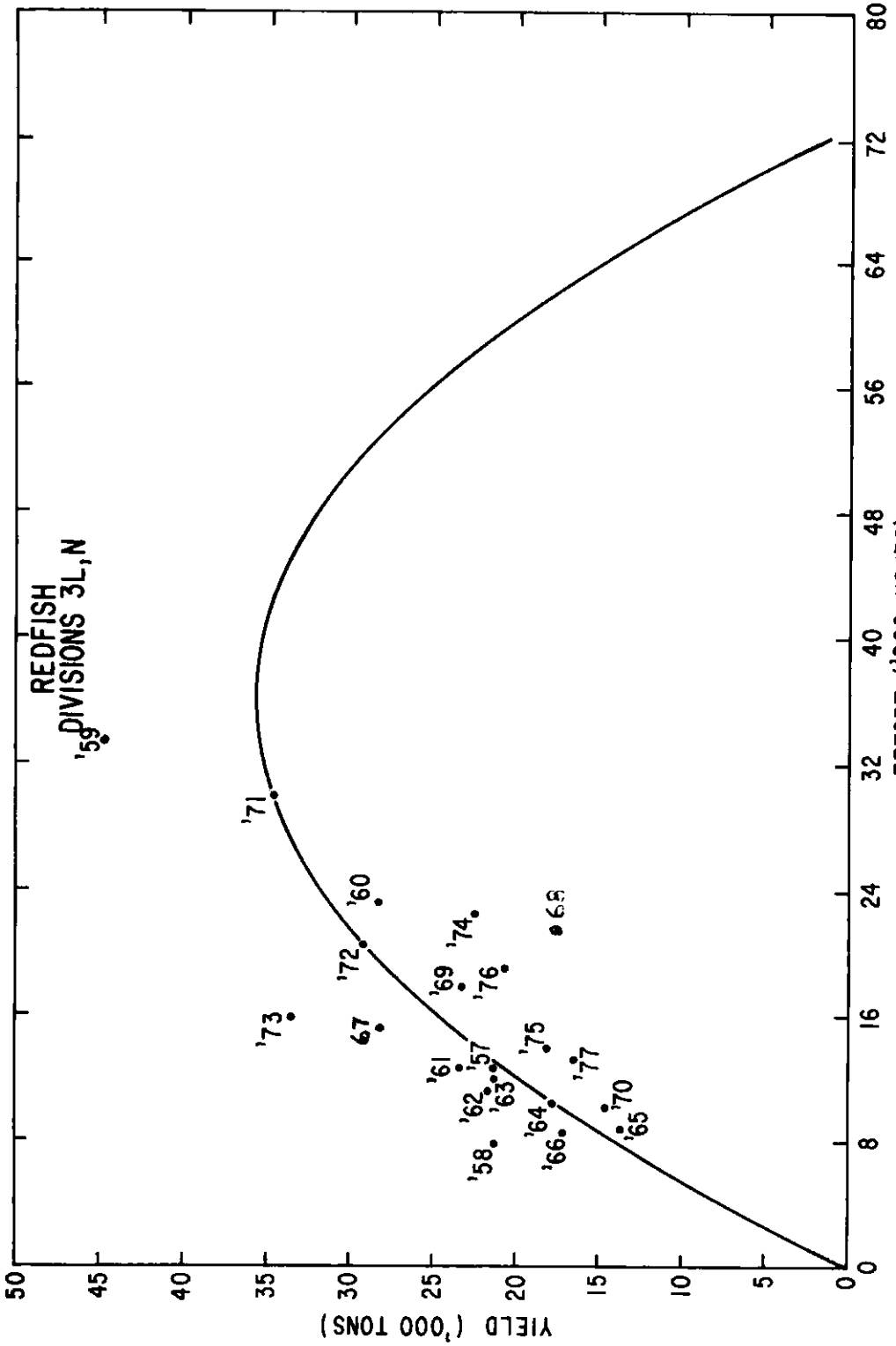

Fig. 5. Simple yield curve derived from the regression of catch per standard hour fished versus the unlagged effort based on new model.

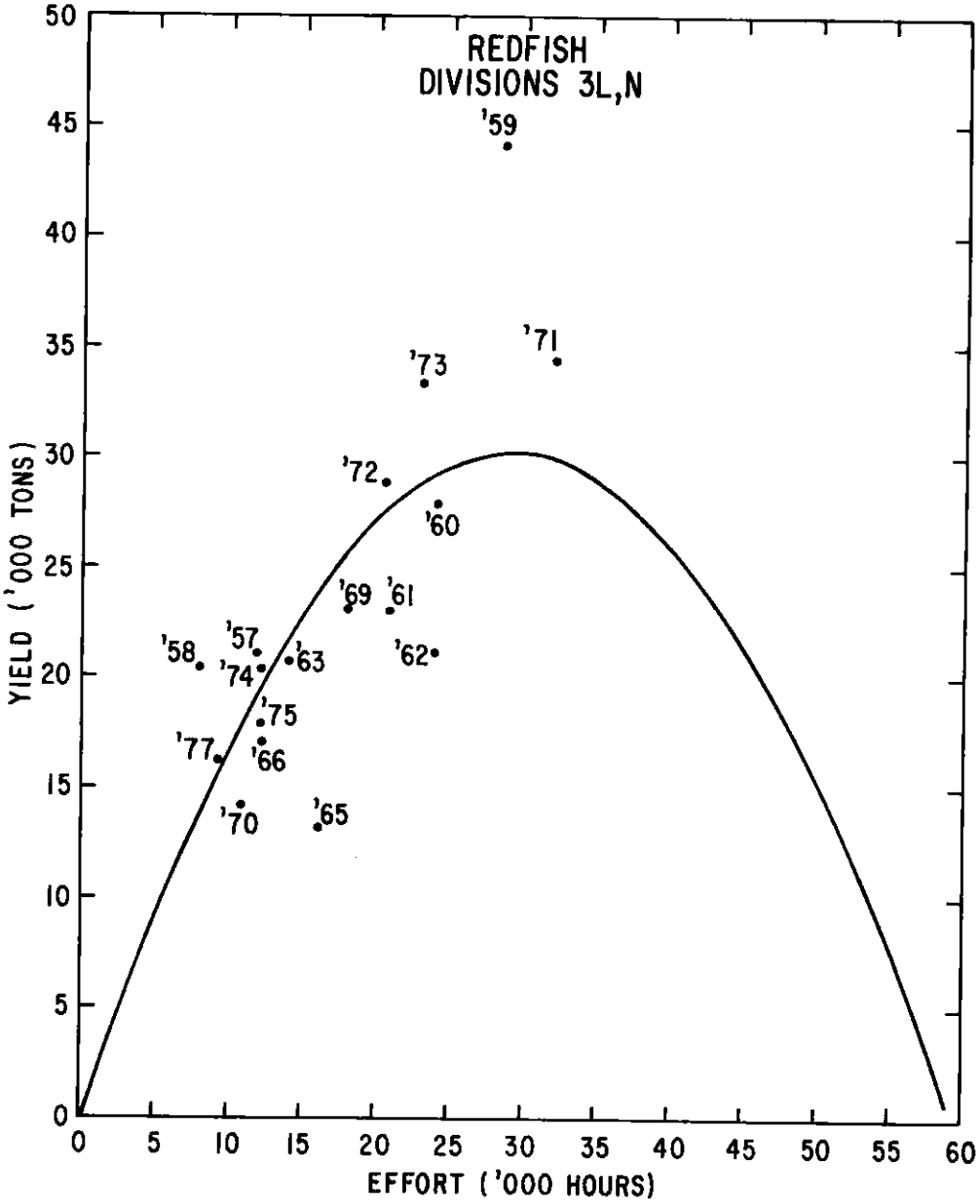

Fig. 6. Simple yield curve derived from the regression of catch per standard hour fished versus the unlagged effort based on Poland-USSR tonnage class 7 bottom trawl vessels.

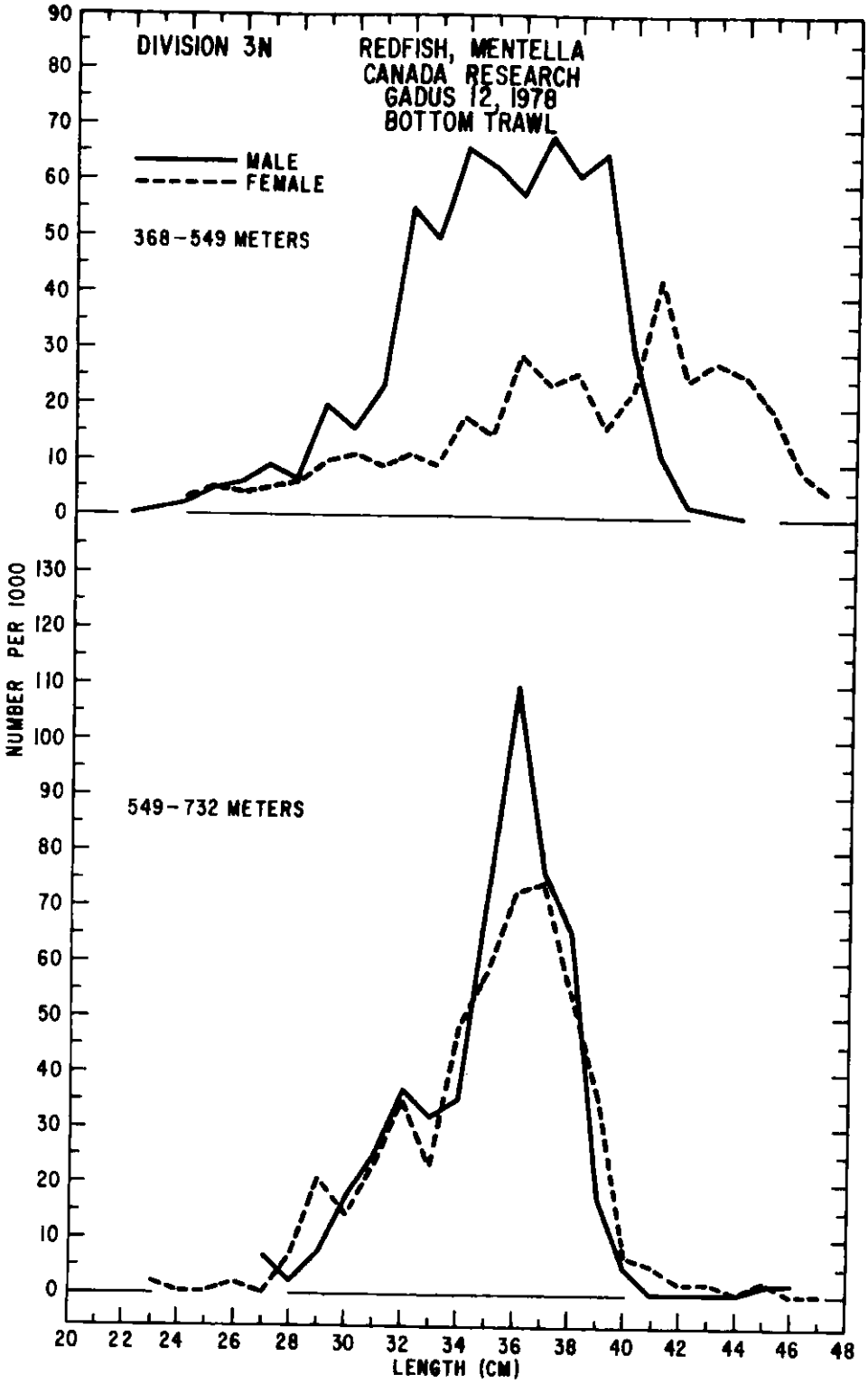

Fig. 7. Length frequencies from Canadian research sampling in 1978 in Div. 3N.

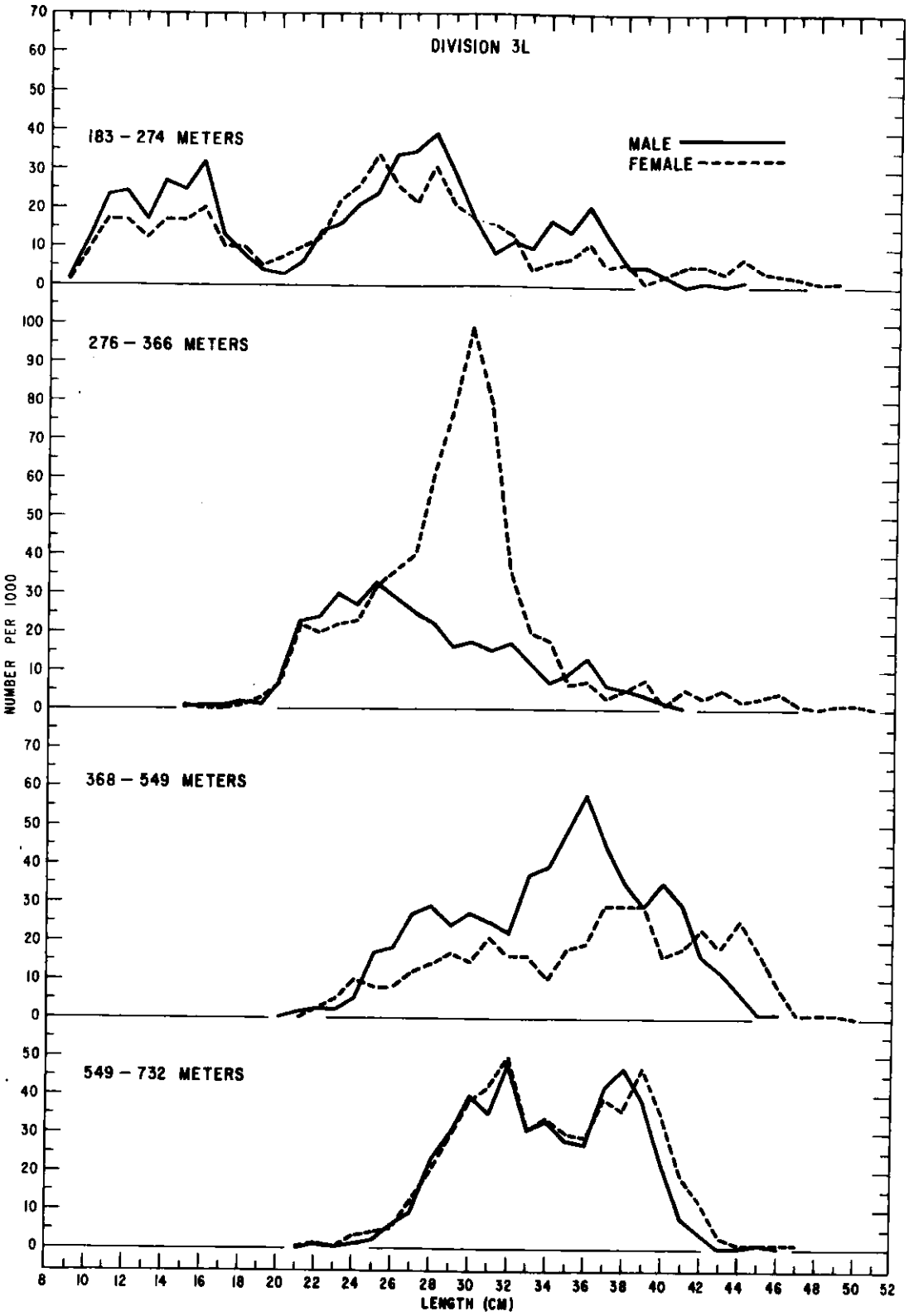

Fig. 8. Length frequencies from Canadian research sampling in 1978 in Div. 3L.

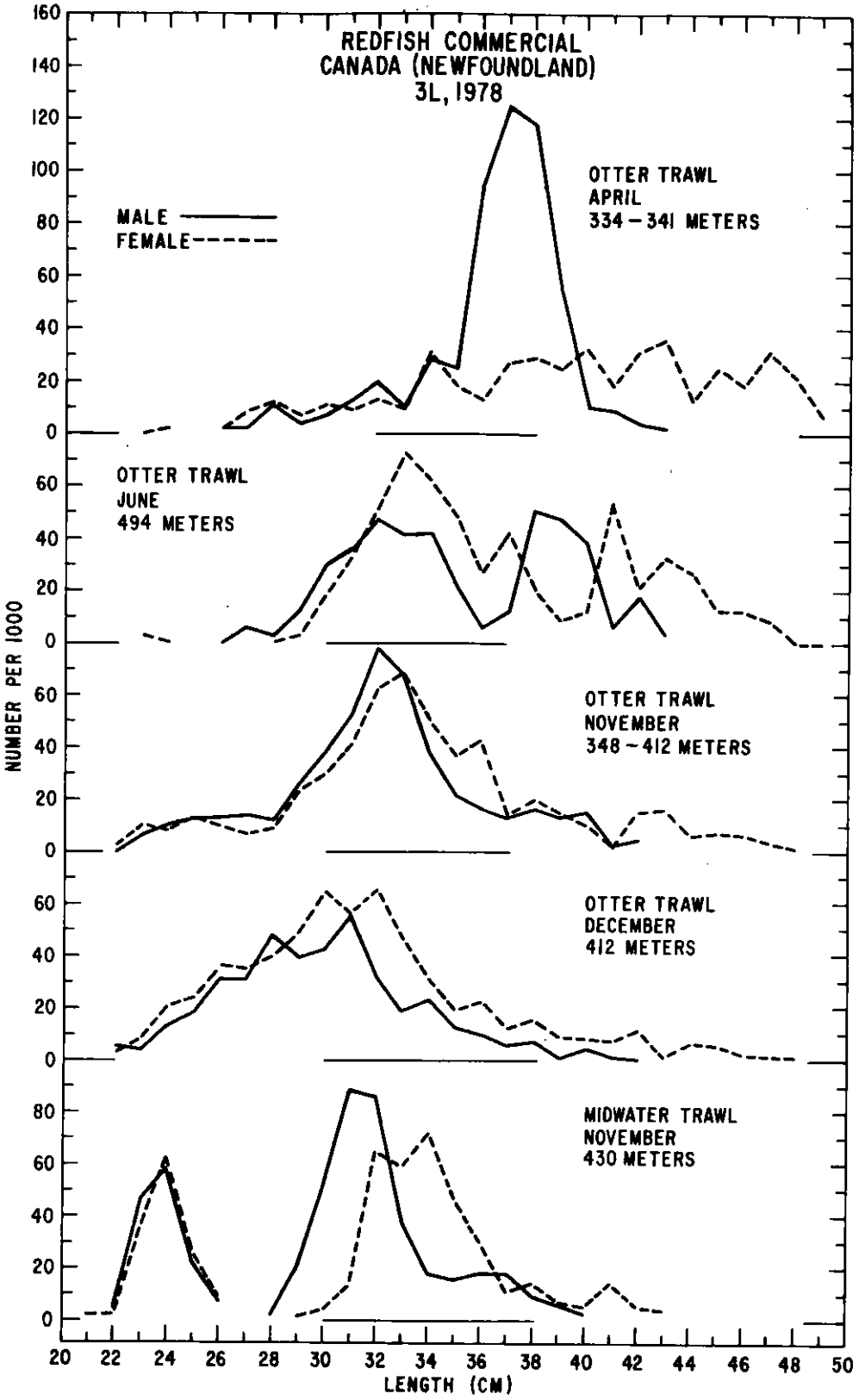

Fig. 9. Length frequencies from Can. comm. catch for both underwater and bottom trawl (1978).