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Assessment of Redfish in Divisions 3LN

by

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INTRODUCTION

The simple general production model has been used to assess the 3LN redfish stock in the past. The lack of catch rate data for certain years prevents attempts at lagging the data to help take into account the non instantaneous response of the fishery. The Robson (1966) estimate of relative fishing power of different vessel categories was used in 1978 to take advantage of a greater amount of the catch rate data base. For this assessment the simple general production model is employed using an update of the effort standard used in 1978. Also included are catch trends and research and commercial frequencies.

MATERIALS AND METHODS

Landings and CPUE were tabulated from ICNAF Summary Document (revised January 1980) and effort was determined from catches in which 50% or greater of the total fish caught was redfish. The standard vessel category used in the Robson method was USSR tonnage class 7. An attempt was made to lag the data by running averages of the effort but the variation explained by regressions of the lagged effort and CPUE was extremely poor. Commercial and research length frequencies for both sexes have been plotted.

RESULTS AND DISCUSSION

The recent trend of high catches of redfish from Division 3L relative to Division 3N apparently did not occur in 1978 where 52% of the total landed catch was from 3L.

The proportion redfish caught by the standard relative to the total reported catch increased from 13% in 1977 to 40% in 1978 (Table 1). For other years the proportion caught varies significantly, which could result in some vias in the catch rate if other vessel catches were assumed to fish similarly. Further, other vessel categories have not fished consistantly on this stock. To overcome these problems multiple regression was used to include as much of the available CPUE data as possible giving an effort standard which might better reflect the overall pattern of fishing in Divisions 3LN. The power coefficients for various vessel categories and months fished were calculated and the multiple R value of 0.748 ($P<.001$) suggest the assumptions of the model have been met (Table 2). The CPUE of the various vessel categories were adjusted to the standard by the powers and used to calculate the total effort.

Trends in catch, CPUE and effort (from 1957-78) are shown in Fig. 1. Since 1974 the trends in catch mainly reflect the introduction of TAC's which have been reduced from 28,000 t in 1974 to 16,000 t in 1978. Catch rates, however, have remained relatively stable over the same years averaging about 1.25 t per hour. Effort declined from 22286 hours in 1974 to 11806 hours in 1978.

Regression of CPUE on effort for the years 1957 to 1978 was attempted using lagged and unlagged effort data. The best regression was that based on year by year calculations (Fig. 2). The variation explained by the regression for this standard ($r = -0.46$) is similar to other tried standards and was rather low.

The yield curve indicates an MSY of 35,600 t and the yield at 2/3 effort MSY would be 32,000 t at equilibrium (Fig. 3). Since 1974 the yield has been slightly below the yield curve but on a straight line through the 2/3 effort MSY. Thus the recent catch rate levels indicate the stock is in a reasonably healthy condition (McKone 1979, Valdis et al 1979) and if effort were increased to 2/3 effort MSY the equilibrium yield would be caught.

Research length frequencies were collected in Division 3L and Division 3N during random stratified biomass surveys in 1978 and 1979 (Fig. 4, 5). Both surveys were able to cover Division 3L adequately but Div. 3N had relatively poor coverage in 1978 relative to 1979. Catch per tow length frequencies of redfish from Div. 3L in 1978 and 1979 cover a wide range of sizes (20 cm to 40 cm for both sexes) with a relatively high proportion of the sample being sizes above 33 cm which are fish older than 20 years (Fig. 4). A relatively high catch rate of redfish in Div. 3L in the 22-27 cm length groups was sampled in 1979 compared to the catch rate of dominant length group ranging from 29-33 cm length for both sexes in 1978. The Div. 3L part of the stock appears to be in a healthy condition.

Catch per tow length frequencies from Div. 3N cannot be interpreted as clearly because sampling in 1978 was disproportionately greater in the deeper depths (where longer redfish are expected) than in 1979. Nevertheless the catch rate of large redfish (32-42 cm) for both sexes indicates that the stock still has high numbers of relatively old fish (20+ years old). Additionally the high catch rate of small redfish (19-27 cm) from 1979 sampling indicates that several good year-classes are entering the fishery. Combining the catch per tow for 1978 and 1979 would give high catch rates over a broad range of size classes indicating the portion of the stock in Div. 3N continues to be in good condition.

Canadian commercial bottom trawl length frequencies from Div. 3L covering most months of the fishery indicate the major size classes are between 28 and 48 cm for both sexes (Fig. 6). Differences in the proportion at size from the different months is mainly a result of the depth fished rather than seasonal shifts.

Canadian commercial bottom trawl length frequencies from Div. 3N covering most months indicate the fishery is mainly on the smaller size classes from 23-30 cm for both sexes which frequent shallower depths of the range frequented by redfish species (Fig. 7). The size classes are mainly a reflection of the difficulty of fishing in deeper waters where the bottom is very convoluted. There is some indication from the July sample that the commercial fleet would catch larger fish if they fished deeper than 300 meters.

Canadian commercial midwater length frequencies from Div. 3L fishing at similar depths indicate that larger numbers of 25-35 cm redfish from both sexes were caught in July than in November where 35-45 cm redfish dominated (Fig. 8). Redfish caught by both bottom and midwater trawls span the same size classes, although it cannot be assumed that both gears harvest the same size classes proportionately.

USSR commercial bottom trawl length frequencies from Div. 3N for January and March are mainly of smaller redfish (21-27 cm) generally found in shallower depths (Fig. 9).

In summary some caution should be given in interpreting the general production model because of the poor fit, and the use of unlagged effort for a long lived species such as redfish could over estimate MSY. Catch rates, however, have remained relatively stable over the last few years. The TAC was decreased from 28,000 t in 1974 to 16,000 t for 1977 and 1978 because it was thought the high catches from the early 70's exceeded the F_{MSY} for the stock. Recently, because of the evidence of young size classes, the TAC's for 1978 and 1980 were increased to 18,000 t and 25,000 t respectively. The effect of these increases is not known as yet and historically catches have not averaged 25,000 t. Research length frequencies from Div. 3LN do indicate relatively high catch rates of a broad number of size ranges including relatively old fish. Thus until these inequities are solved the TAC should not be advanced beyond the 1980 level.

REFERENCES

McKone, W.D. 1979. Assessment of redfish in Division 3LN ICNAF Res. Doc. 79/VI/72. Serial No. 5414

Valdis, E., J.A. Rosalis and R. Dominquez. 1979. An assessment of Divisions 3LN redfish using a production model ICNAF Res. Doc. 79/VI/61. Serial No. 5402.

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	16516	13
1978	4848	12043	40
1979*		13596	

* Provisional

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		

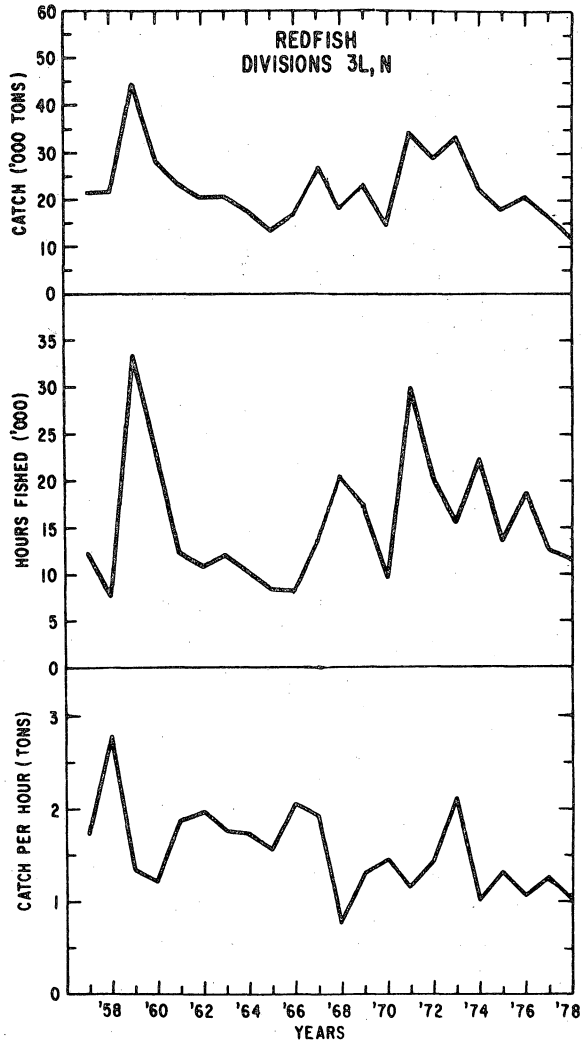

Fig. 1. Trends in nominal catch effort and catch per unit effort.

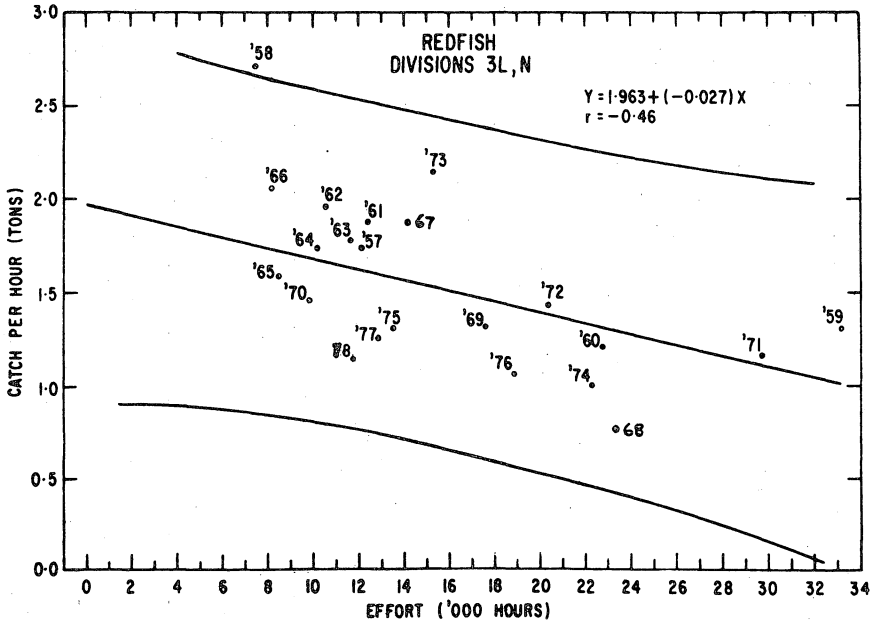

Fig. 2. Least squares regression of catch per standard hour fished on effort.

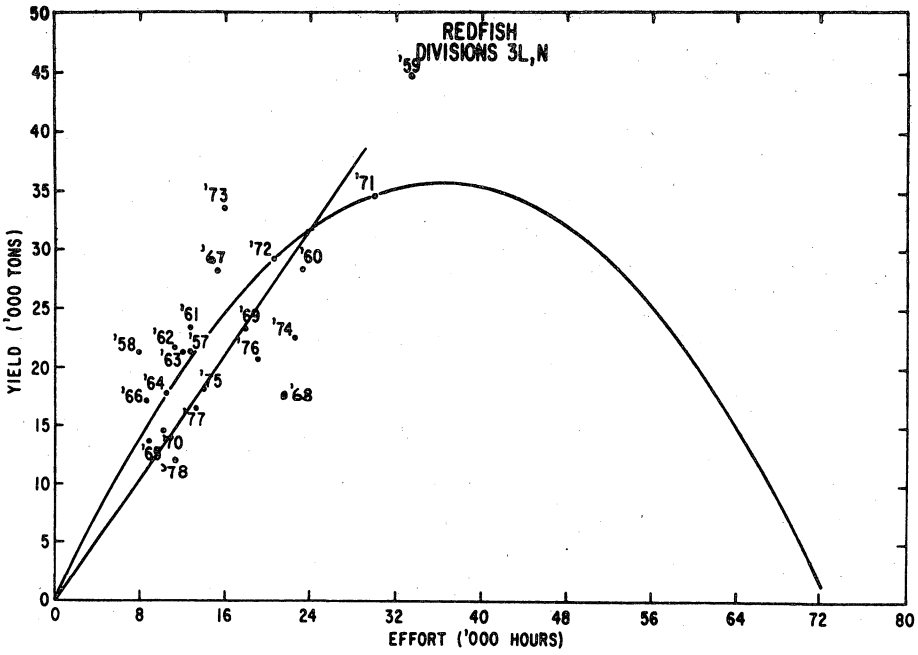

Fig. 3. Simple yield curve derived from the regression of catch per standard hour fished versus the unlagged effort.

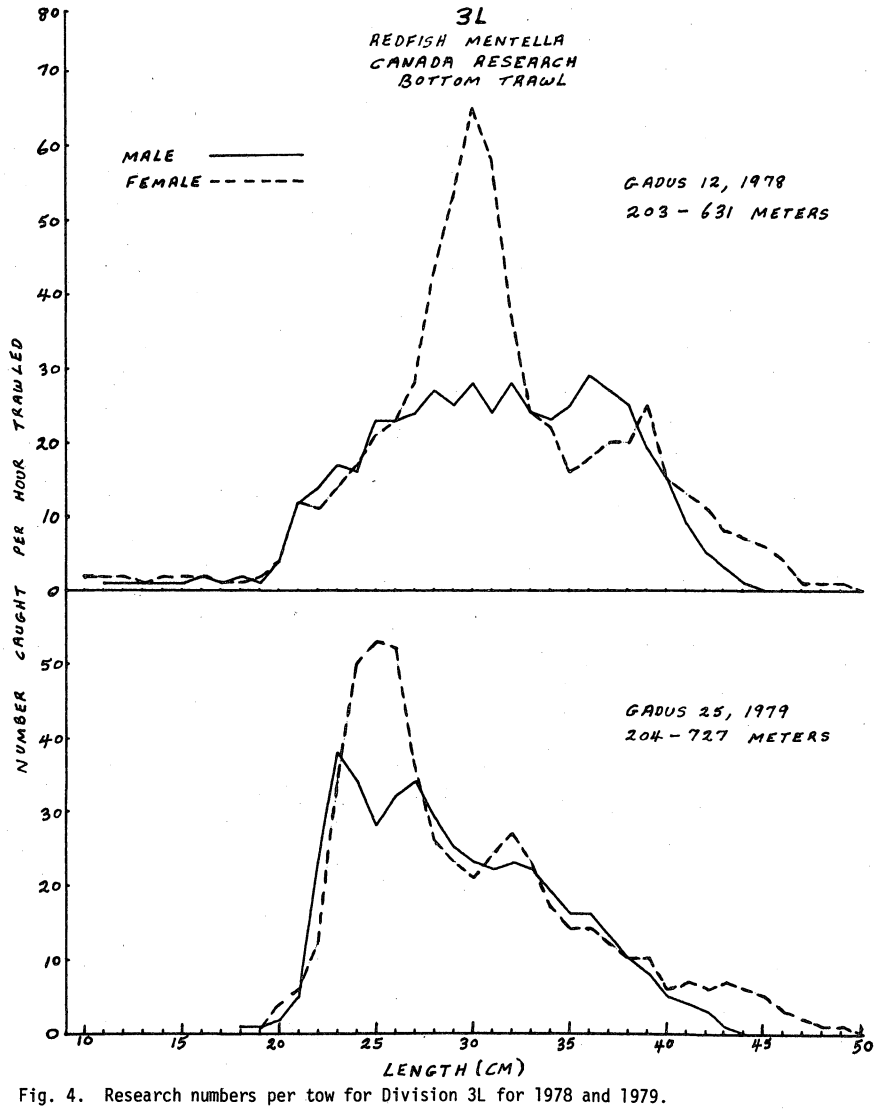

Fig. 4. Research numbers per tow for Division 3L for 1978 and 1979.

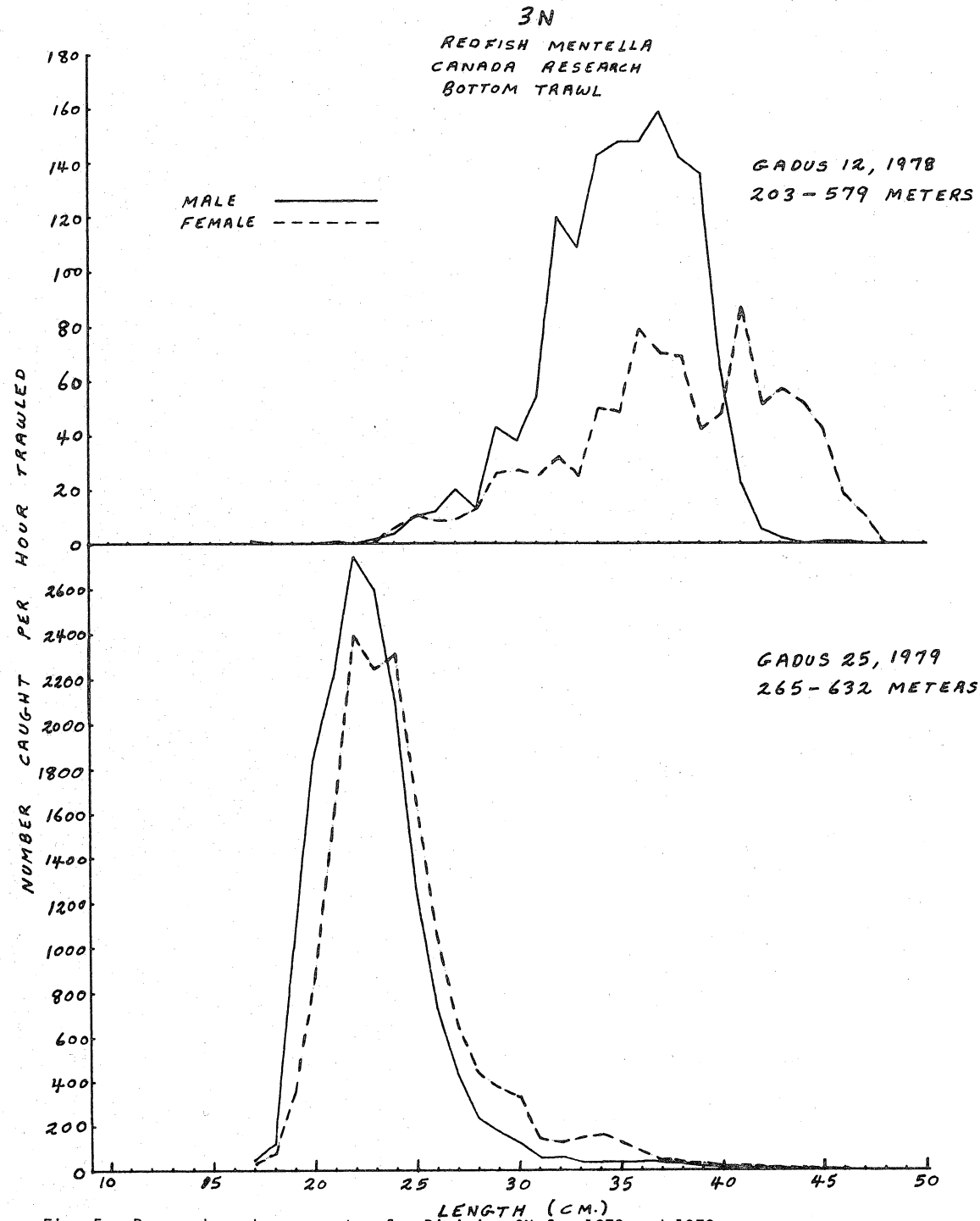

Fig. 5. Research numbers per tow for Division 3N for 1978 and 1979.

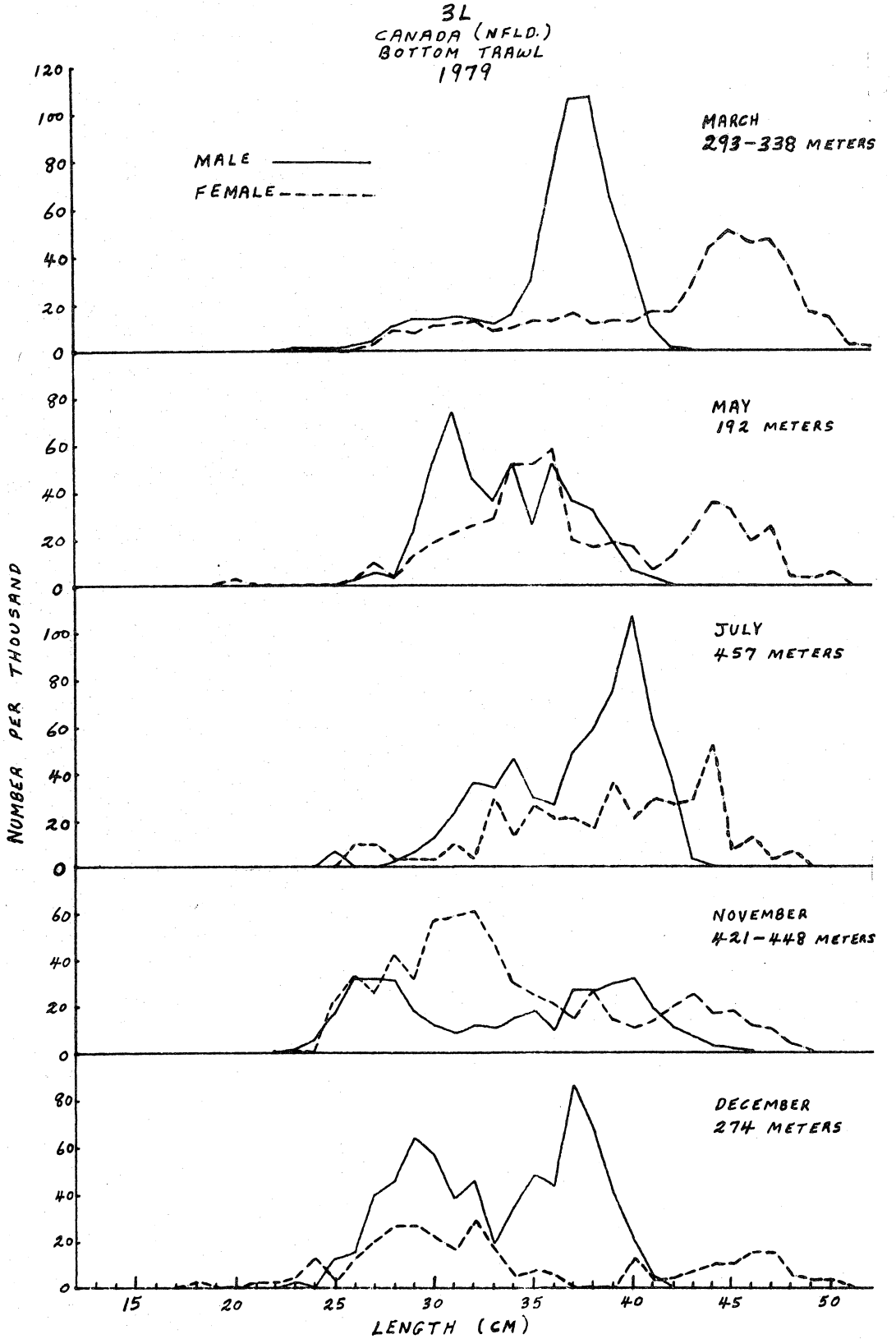

Fig. 6. Commercial length frequencies for a variety of months from Canada (N) bottom trawl samples in Division 3L for 1979.

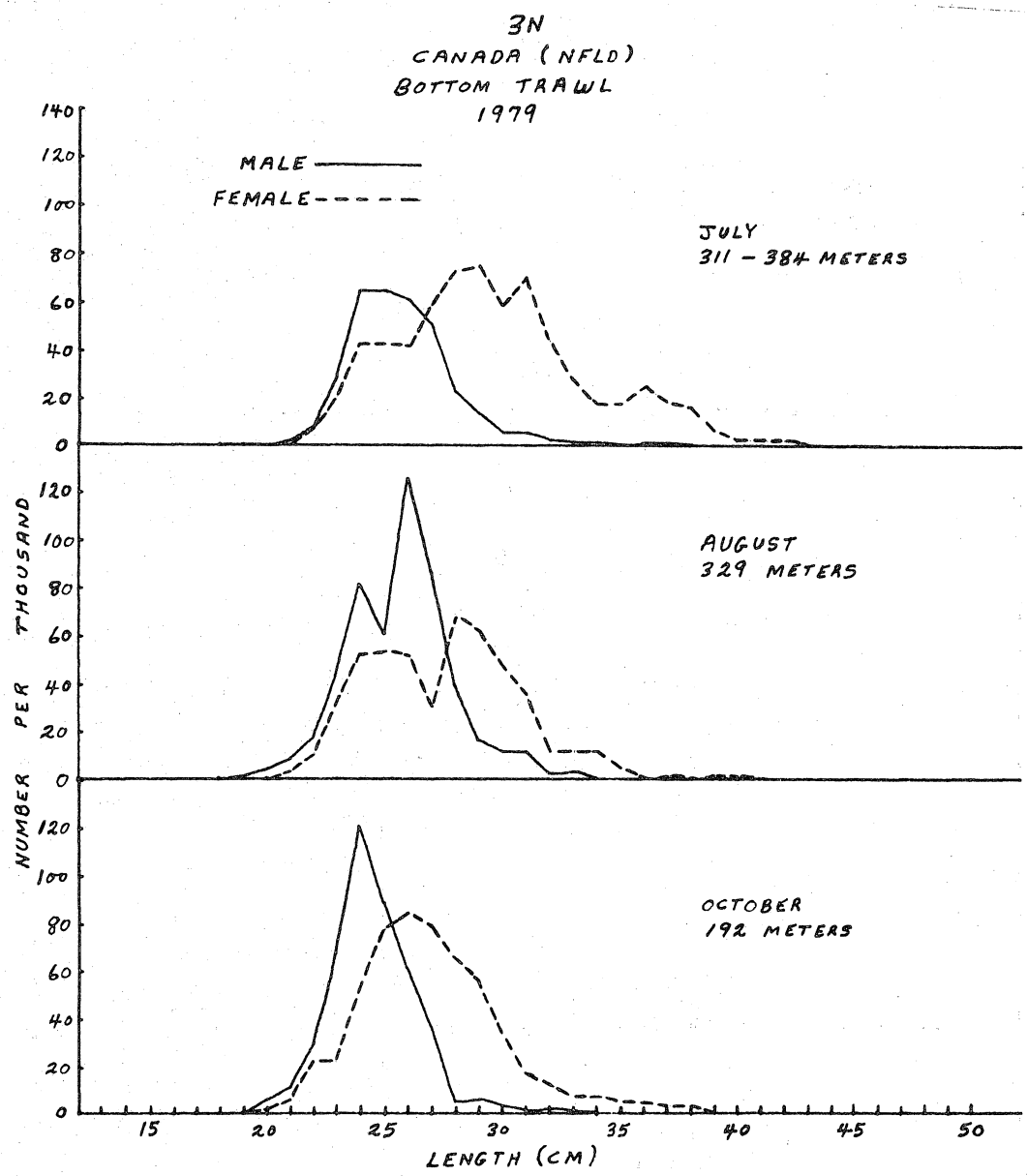

Fig. 7. Commercial length frequencies for a variety of months from Canada (N) midwater trawl samples in Division 3L for 1979

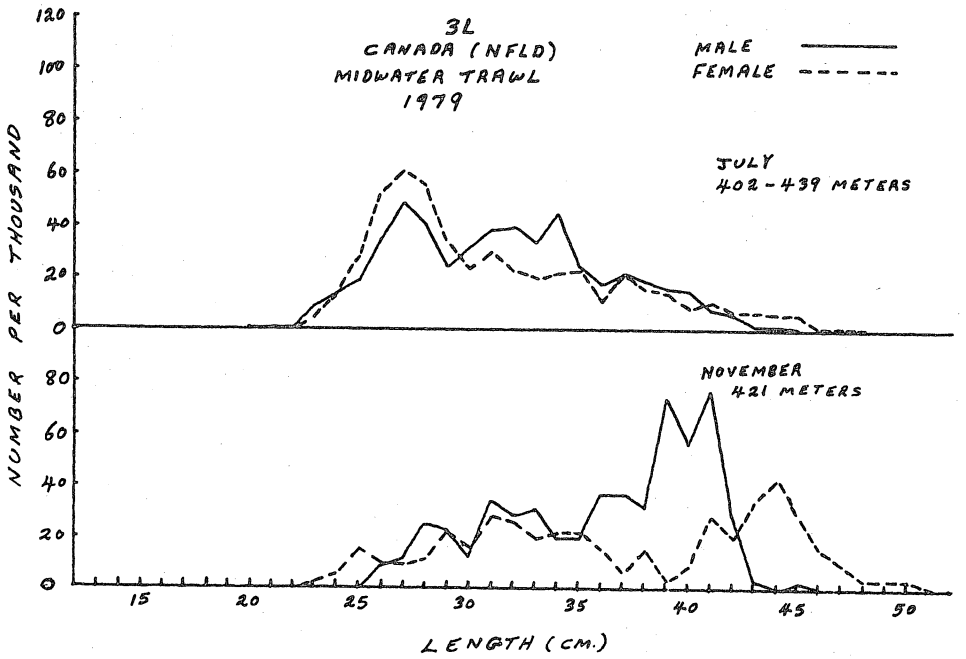

Fig. 8. Commercial length frequencies for July and November for Canada (N) midwater trawl samples in Division 3L for 1979.

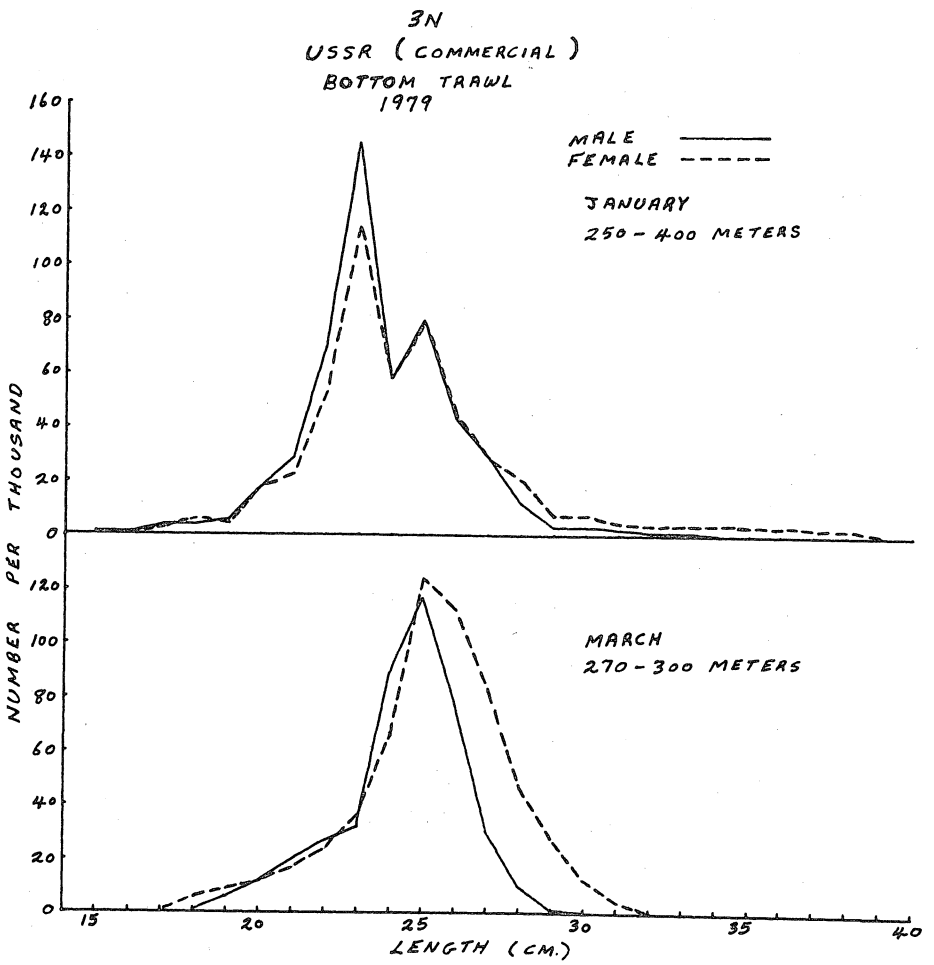

Fig. 9. Commercial length frequencies for January and March from USSR bottom trawl samples in Division 3N for 1979.