

International Commission for



the Northwest Atlantic Fisheries

Serial No. 5038  
(D.c.3)

ICNAF Res.Doc. 77/VI/18

ANNUAL MEETING - JUNE 1977

An update of the assessment of redfish from Subarea 2 + Div. 3K, Div. 3M, Div. 3LN, and Div. 3O

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INTRODUCTION

In 1975 the status of redfish stocks in Subarea 2 + Div. 3K and Div. 3M was summarized by Parsons et. al. and similarly in 1976, the status of stocks in Div. 3LN and 3O was summarized by Parsons and Parsons. Both used the Schaefer (1954) yield model to estimate levels of sustainable yield. This analysis is an update of the assessments to include up to 1975 data.

MATERIALS AND METHODS

Entries for redfish landings where redfish represented more than 50% of the total fish caught were selected from the ICNAF Statistical Bulletins for the pertinent years and tabulated by country and vessel tonnage class for each month. Thus, by far, the greatest number of catches considered to be main species redfish are in fact reported as by-catch. However, these catches are considered to be redfish directed effort in this assessment and are used to compute standardized effort in each of the ICNAF areas.

Since the fisheries in each of the ICNAF areas are prosecuted in different ways, namely by different gears, vessel category and time of year, estimates of fishing effort have been standardized according to the individual stocks following the methods of Parsons et. al. 1975 and Parsons and Parsons 1976. For Subarea 2 + Div. 3K effort was standardized on the basis of vessel tonnage category. The catch per day fished of vessels in tonnage categories 4, 5 and 6 were corrected to class 7 and the resultant summed to give the total number of standard days for the entire fleet.

The total effort was estimated by dividing the catch per standard day fished into the total catches of all countries.

In Div. 3M during the early years (1956-71) catches per day of tonnage class 4 was selected as the standard unit by dividing the catch per day for this class of vessel into the total catch. An examination of the years in which vessels of class 4 and 7 both fished in Div. 3M suggested a conversion factor of 0.33 was more appropriate for 1972 to 1975 when most of the tonnage class 4 vessels had dropped out of the fishery. The total effort was estimated from the catches per standard day fished and the total catch of redfish for all countries.

Catches in Div. 3LN were most commonly taken by USSR and Poland tonnage class 7 before 1970 but since then almost exclusively by the USSR. In the absence of sufficient data it was assumed these vessels regardless of the proportional representation by the two countries are similar in effective fishing intensity. The standard catch per hour by USSR-Poland class 7 was divided into the total catches of all countries to estimate total effort.

Prior to 1970 the catch per unit effort for Div. 3O was expressed in terms of Canada (N) tonnage class 4 trawler hours. Due to the absence of the tonnage class 4 fishing in later years, 1970-1975, the USSR class 7 vessel was used by an adjustment of 0.81 to calculate the catch per unit effort. The annual effort for all trawlers thus was estimated by dividing the total standard catch per hour into the total catches of redfish by all countries.

## ASSESSMENTS

### Subarea 2 - Division 3K

The inception of the fishery in the northern Newfoundland-Labrador area resulted in a second-year peak of 187,000 metric tons in 1959 (Fig. 1). Subsequent declines levelled off at approximately 20,000 tons during 1962 - 63 but rose again to 56,000 tons in 1964. The next 4 years witnessed steady declines to a low of slightly less than 20,000 tons in 1968. Catches during the period 1968 to 1972 remained relatively constant at this level. 1973 landings increased to 39,000 tons but dropped again to 30,000 tons in 1974 and 26,000 tons in 1975. Effort, as a product of catch and catch per unit of effort, approximates the trend of the historical catches. After initial expected fluctuations, catch rates (catch per standard day fished) stabilized at a level between 12 and 17 tons per day from 1966 to 1974.

The standard for effort (vessels 2,000 tons) for 1975 was based on Polish vessels only. These vessels show a lower catch per unit effort than those of countries used for catch rate calculations for earlier years i.e. FRG and USSR. Also in 1975 the USSR reported catches by vessels of 1,000-2,000 tons for the first time. As these were again, the only vessels reporting directed redfishing for this category and had very low catch rates, the effort picture was further complicated. Finally, vessels from 500 to 1,000 tons contributed more proportionately to the total redfish catch than the previous two years and their low 1975 catch rates combined with these other aberrant occurrences resulted in a catch rate slightly higher than 5 metric tons per standard day fished. Thus the plotting of the 1975 point would be obviously spurious and they have been omitted from figures 1 and 2. Also the main species redfish catch in 1975 represented only 5% of the total redfish catch.

Recent commercial sampling for a variety of countries show considerable inconsistencies over a five year period (Fig. 3). The latest figure for Canada (N) approximates more closely the pattern shown in 1973 and '74 for USSR and Poland rather than the apparently higher proportion of relatively small fish (22 to 30 cm.) evident in 1975 USSR data. An examination of the individual monthly frequencies used to construct Fig. 3 and 5 reveals inconsistent and unaccountable differences for all countries. Midwater trawl catches for Canada (N), 1976 (Fig. 4), show the extremes of sampling information but peaks in the low 30 and 40 cm range are evident for both 2J and 3K. The association of relative proportions of peaks with area and/or depth proved inconclusive.

1976 USSR research data compared to that of FRG for 1974 and 1975 (Fig. 5) corroborate the existence of a wide range of length-age groups. The proportion of larger fish is higher in 3K in 1976 than '75 but this cannot be credited to depth differences. Accompanying age frequencies for the above (Fig. 6) show the 1960 to 1964 year classes dominant throughout. However, for deeper depths there is a higher proportion of fish of the late 1950's - early 1960's, especially with the USSR data.

Since irregularities exist in 1975 catch-effort data and length frequencies are inconclusive, There remains little to base any change in allowable catch for the coming year. The estimates of MSY for this stock range from 40,000 to 45,000 metric tons per year. T.A.C.'s have been set at 30,000 tons to alleviate the depressed condition of the stock in recent years (Fig. 2). As the trends in catch and catch-effort have, more or less, stabilized over the past decade it is recommended the T.A.C. remain at the 1974-77 level of 30,000 metric tons.

### ii) Division 3M

A directed fishery for redfish in 3M started in the late 50's and increased to reach a peak of 54,000 in tons in 1958 (Fig. 7). Total landings dropped dramatically in the early 60's but showed some resurgence in 1964 and 65 and again dropped to an average of 4,400 in tons during the late 60's. A substantial increase occurred from a low of 3,000 M tons in 1970 to a high of 42,000 M tons in 1972. In 1974 the T.A.C. was set at 40,000 M tons whilst the total catch was 34,000 M tons. From the general production model (Fig. 8) assessment 1974 the M.S.Y. was estimated to be nearer 15,000 M tons and the long term average catch is 18,000 M tons, thus the T.A.C. was reduced to 16,000M tons to approximate the sustainable yield. The catch for 1975 was 16,000 M tons.

Catch per unit effort (days fished) in the early years declined as the catches declined but increased only slightly when the catch greatly increased in 1965 (Fig. 7). From 1966-71 catches per unit effort was low but increased sharply in 1972 to a high of 7.81 and again dropping to level off in 1974-75 to approximately 5.46. Trends in fishing effort are similar to catch trends in later years, thus a dramatic increase in effort to 5,370 in 1972 resulted in increased catches. Similarly increased effort in 1974 after a drop in 1973 resulted in increased catch. The T.A.C. was significantly reduced in 1975 causing a reduction in effort but the catch per unit effort remained the same as 1974.

Yield parabolas fitted to figure 8 estimate the M.S.Y. to be between 13,000 and 17,000 M tons. High catches in the late 50's, 1965 and 1972-74 were much higher than the sustainable level while catches in the late 60's and early 70's were below the sustainable yield level. In 1975, the yield was slightly higher than would be expected at the level of effort employed.

Commercial length frequencies from USSR mainly for 1973-74 and 1976 indicate the 1963 yearclass is contributing heavily to the commercial catches (Fig. 9). Canadian commercial catches in 1975 show some indication of the 1963 yearclass but the major contribution to the fishing is from yearclasses which are from the late 30's early 40's (Fig. 10). Additional Canadian (N) commercial catches from 1976 show an increasing contribution of the 1963 yearclass but yearclasses from the late 30's and early 40's also contribute heavily to some of the catches. From 1976 Canadian midwater trawl catches there is an indication that either the season or the position fished affect the proportion of the different yearclasses caught. Research samples from a 1977 A.T. Cameron trip, however, do not show any spatial differences other than possible with depth (Fig. 11). The 1972 yearclass of mentella redfish as well as 1963 were evident in high numbers in research samples. Moreover there is evidence of the 1972 yearclass in Canadian commercial catches in August 1976 (Fig. 10). These estimates may be low because of the practice of culling the catches before returning to port and or a large number of the small fish passing through the mesh of the nets. Finally the research samples indicate the depth at which the marinus and mentella species were most commonly caught during the trip. However, the marinus category includes all those of doubtful type (species).

The prospects for the 3M fishery look good if the 1963 yearclass is large and the 1972 yearclass increases in the fishing over the next few years. The 1975 yield from the stock was near the M.S.Y. and the 1977 T.A.C.

#### Division 3LN.

Landings from Divs. 3LN have fluctuated irregularly from year to year but the landings do show an overall trend of increasing to reach a peak of 34,000 M tons in 1971 and again in 1973 (Fig. 12). The long term average catch is 23,000 M tons. Catches in 1974 (22,000) and 1975 (18,000) have decreased which reflect the implementation of quotas (28,000 in 1974 and 20,000 for 1975 and 76) and in both years are a few thousand tons less than the quota. Catch per unit effort from this fishery has been intermittent because of fluctuations in the numbers and category of vessels over the years (Fig. 12). Most recent is the switch in 1974 to a 80% midwater trawl fishery and a switch back in 1975 to a 89% bottom trawl fishery. The catch per hour, however, has remained relatively high over the years and has increased from 1.396 tons in 1973 to 1.503 tons in 1975.

Estimated effort remained relatively stable during the 60's and early 70's fluctuating from a high of 24,192 hrs. in 1962 to a low of 10,642 hrs. in 1970 (Fig. 12). A dramatic increase in effort occurred in 1971 to a high of 32,016 hrs. which is reflected in an increased catch to 34,353 tons. Since 1971 the effort has decreased which is reflected in the catch as a response to the setting of quotas but the catch per unit effort of the standard vessel has slightly increased which may suggest the stocks remain in good shape.

A Schaefer yield parabola (Fig. 13) estimates the M.S.Y. to be about 20,000 tons. Catches have been substantially above the M.S.Y. level during 1971 to 73. The T.A.C. for 1974 froze the catch at the 1972 level and the 1975 T.A.C. lowered the catch to the M.S.Y. level which was maintained for 1976. The 1977 T.A.C. was decreased to 16,000 tons to compensate for the heavy fishing which took place in the early 70's. The estimate for 1975 is an indication that with the amount of effort expected to give a catch equal to the M.S.Y. level by the model in fact gives 2,000 tons less.

No commercial or research sampling data have been reported for 1972 to 1975. The last data reported was length frequencies by Japan 1971 (Parsons and Parsons 1975). Examination of the limited Canadian (N) commercial length frequencies for 1976 reveal a broad size range of redfish caught by midwater trawl or otter trawl (Fig. 14). Larger fish both male and female dominate the catches deeper than 200 fathoms (May, June, July) whilst smaller fish were caught at shallower depths irrespective of date and gear type. Thus there appears to be some sign of young fish in shallower depths. In 1976 USSR otter trawl research survey catches in Div. 3L show a dominance of the 31-33 cm fish caught in 173-213 fathoms (Fig. 14) similar to commercial catches by Canada with both midwater and bottom trawl. Canadian (1976) research line surveys from 150 to 300 fathoms caught a wide range of fish size, including some small fish from 5 cm to 20 cm.

Thus from these frequencies there is evidence of 3 dominant length classes namely males of 24 cm, 32 cm and 38 cm and females of 26 cm, 33 cm and 42 cm. In summary, in view of the lack of sampling data the T.A.C. should not be increased above 16,000 tons at the present time until better data becomes available.

#### Division 30

Total landings have fluctuated from 6,000 to 22,000 M tons with peaks in 1965, 1967 and 1971 (Fig. 16). From 1971 catches have declined to 9,000 M tons in 1973 and increased under quota regulations of 16,000 tons to 13,000 tons in 1974 and 15,000 M tons in 1975. Catch per standard hour fished declined during the early 60's to a low of 0.4 tons per hour in 1965 (Fig. 16). Subsequently catch per standard hour has increased to a high of 1.209 tons in 1974 but declined slightly in 1975 to 1.109 tons per hour.

Effort shows an increase with increasing catch during the 60's and early 70's (Fig. 16). The effort however, increased at a greater rate than the catch for 1965. Since 1971 when effort declined, the catch declined and the reverse holds true for 1974 where 10855 standard hrs. fished and 1975 where 13625 standard hours fished. Thus the decline in catch appears to have been the result of decreased effort prior to 1974 rather than decreased abundance and the increased catch after 1974 the result of quota regulations.

The Schaefer yield parabola for 30 is the most simplified application. The model does not include any lag time for response of the stock to changes in fishery pressure and thus over-estimate the M.S.Y. at 19,000 M tons which is greater than the long term average catch of 12240 M tons. The 1975 point, as does the greatest majority, the points falls above the line in the region which indicates the stock may be under-exploited.

No recent research length frequencies have been available but in 1972 USSR exploratory sexed length frequency samples for May, showed a predominance of 22-26 cm males and 24-27 cm females. These compared favourably with 1973 France (SP) non-sexed length frequencies which were predominantly between 21-26 cm in length. Canadian (N) 1976 commercial length frequencies indicate no great shift in the predominant lengths from those of the earlier USSR and France samples (Fig. 18). The major contribution to the fishery in 1976 is coming from 22-27 cm males and 23-28 cm females.

The 30 fishery does not seem to be in bad shape although there is no new evidence which would indicate a change in the T.A.C.

#### References

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- Parsons, L.S. and D.G. Parsons 1975. An evaluation of the status of ICNAF division 3P, 30 and 3LN redfish. ICNAF Res. Bull. 11: 5-16.
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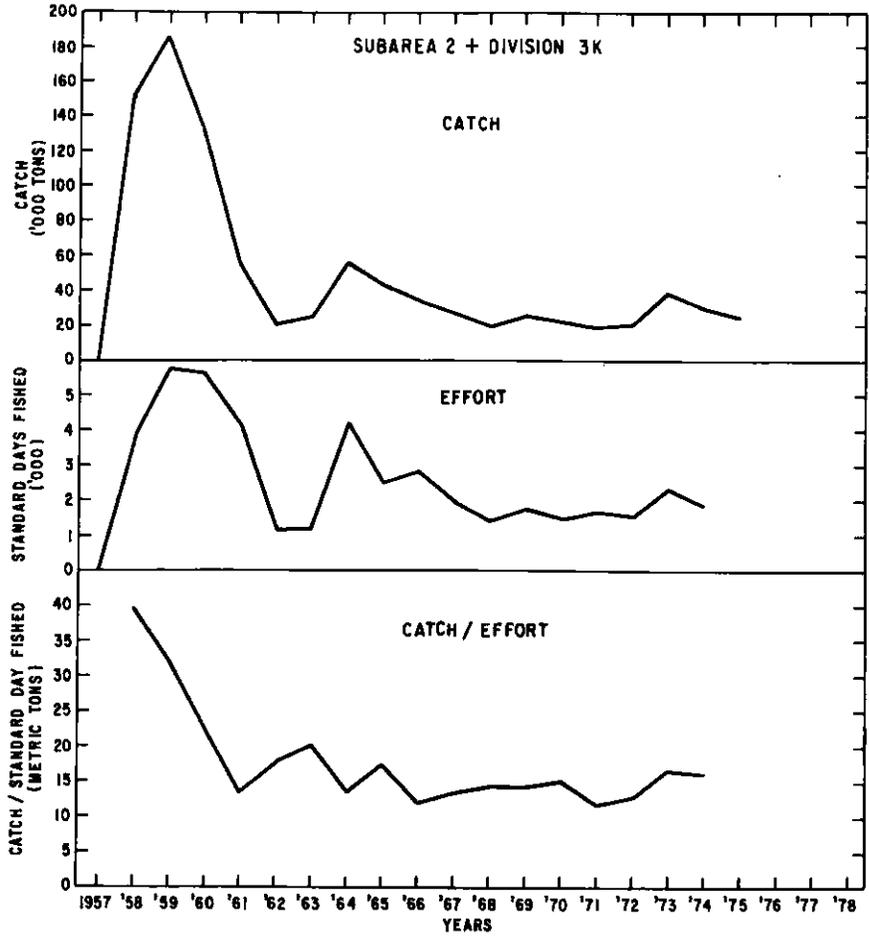


Fig. 1

Trends in nominal redfish catch, effort and catch per unit effort in standardized trawler units following the method of Parsons *et. al.* 1976 with 1973-1975 added for Subarea 2 + Div. 3K.

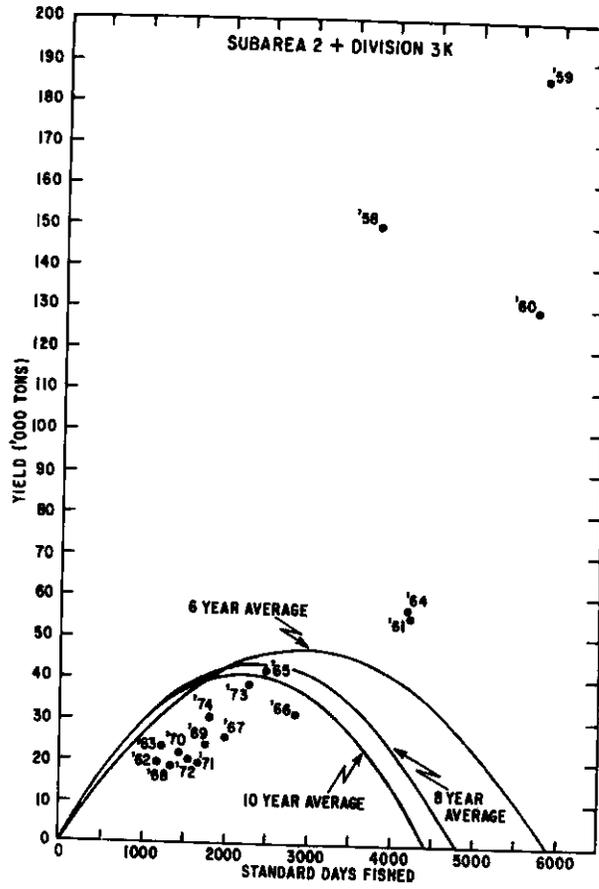


Fig. 2

Yield curves for redfish Subarea 2 + Div. 3K derived from catch per unit effort using 6 year, 8 year and 10 year running averages of standard days fished from Parsons *et. al.* 1976 extended to include 1973-1975.

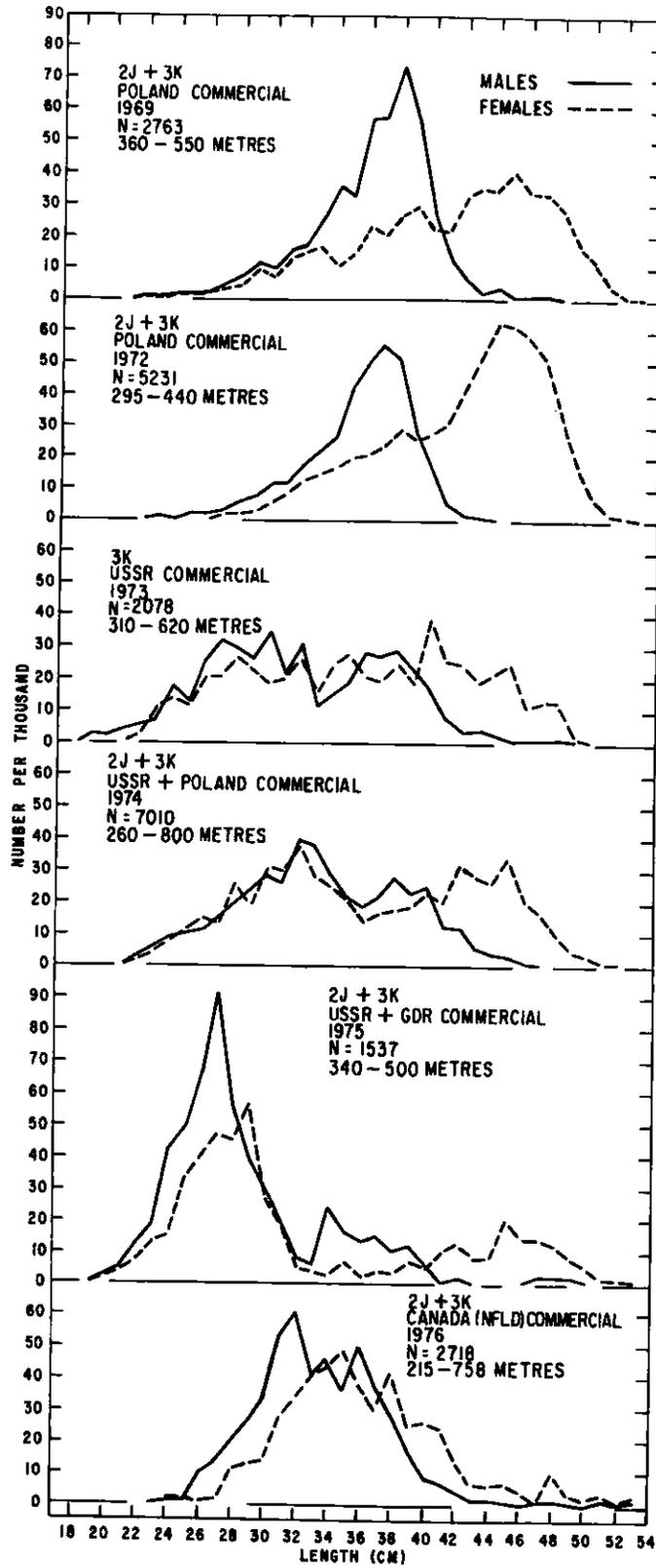


Fig. 3

Commercial bottom trawl length frequencies for USSR, Poland, GDR and Canada from Div. 2J + Div. 3K, 1963 to 1976.

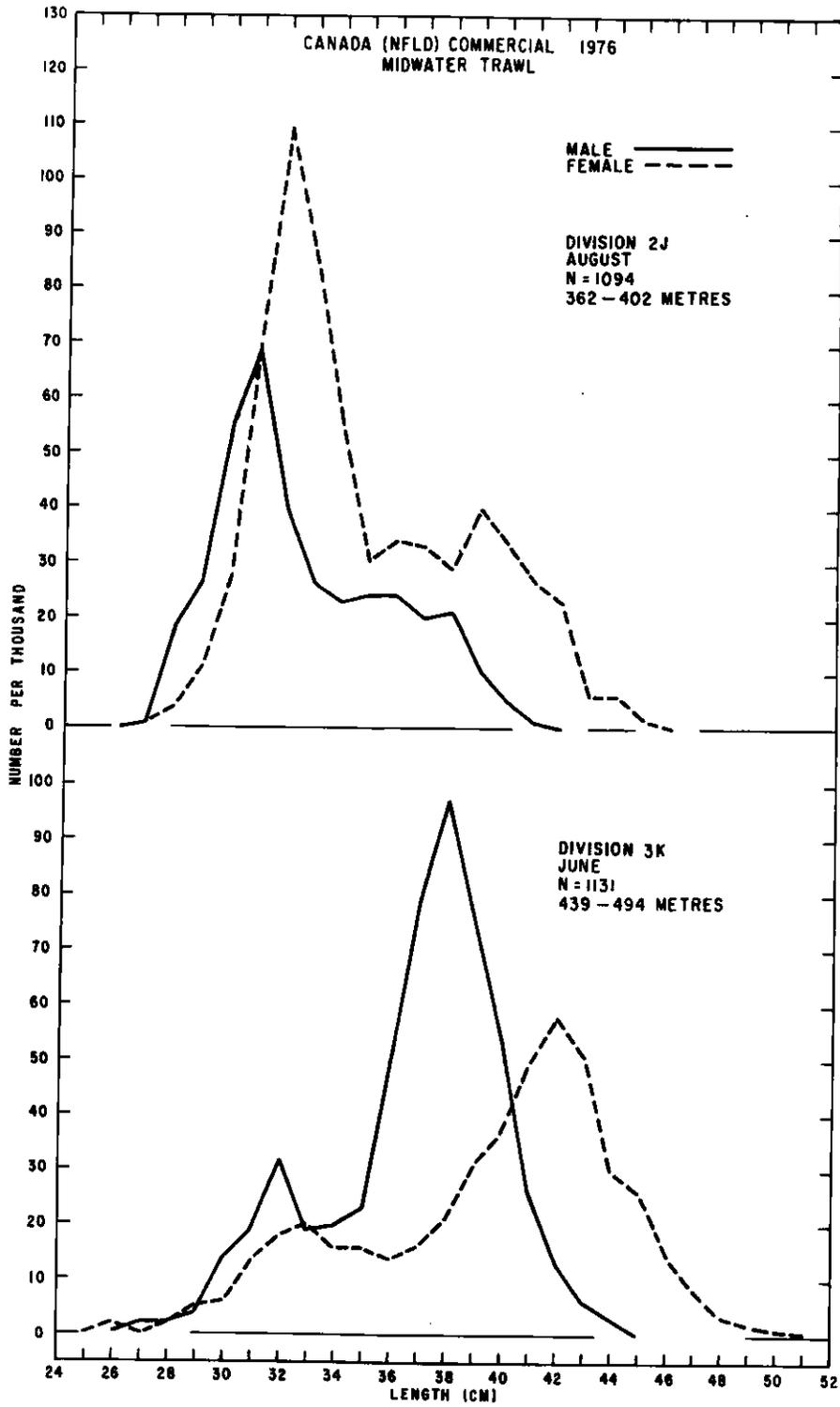


Fig. 4.  
Canadian commercial midwater trawl length frequencies from Div. 2J and Div. 3K, 1976.

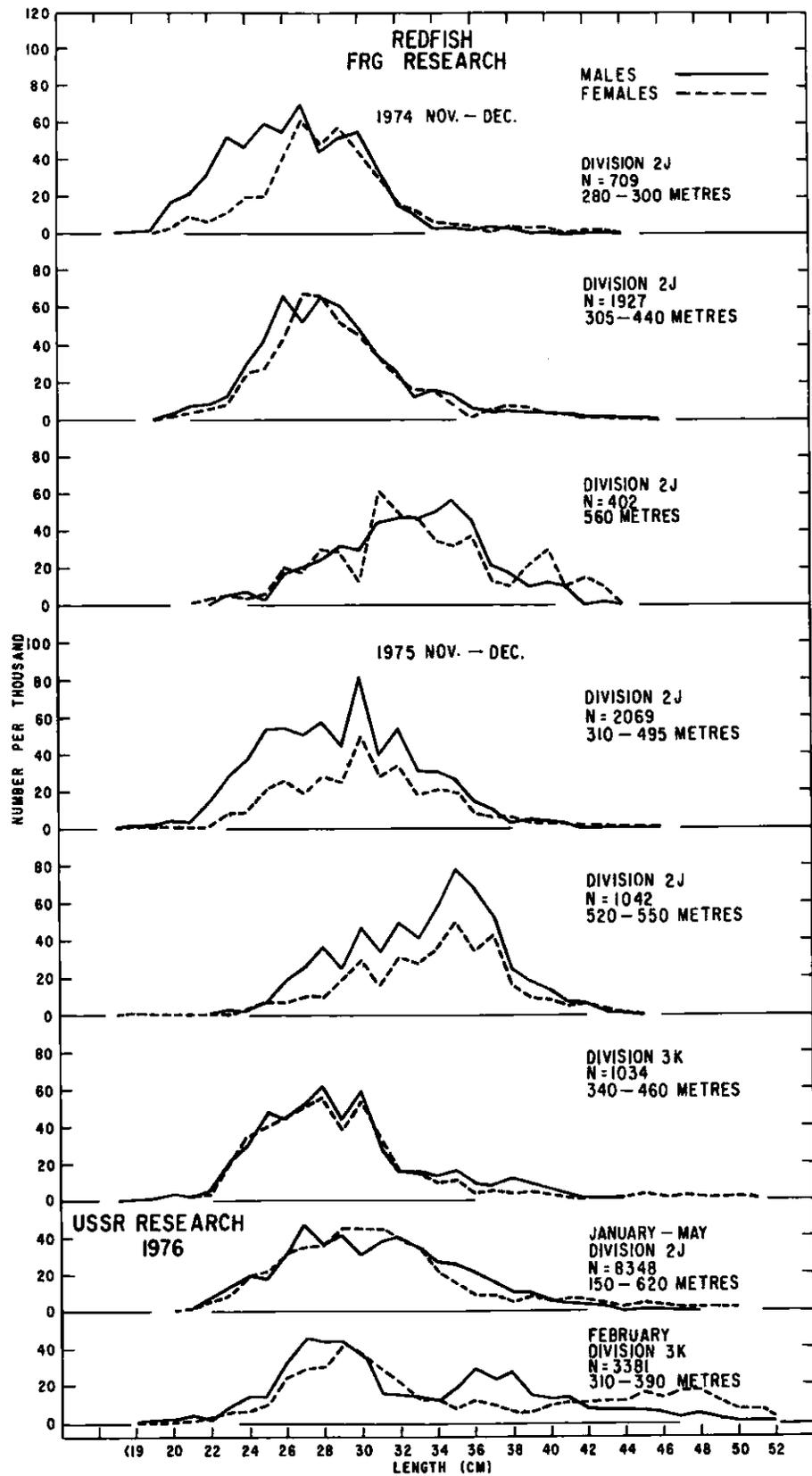


Fig. 5

Research otter trawl length frequencies for FRG and USSR from Div. 2J and Div. 3K, 1974 to 1976.

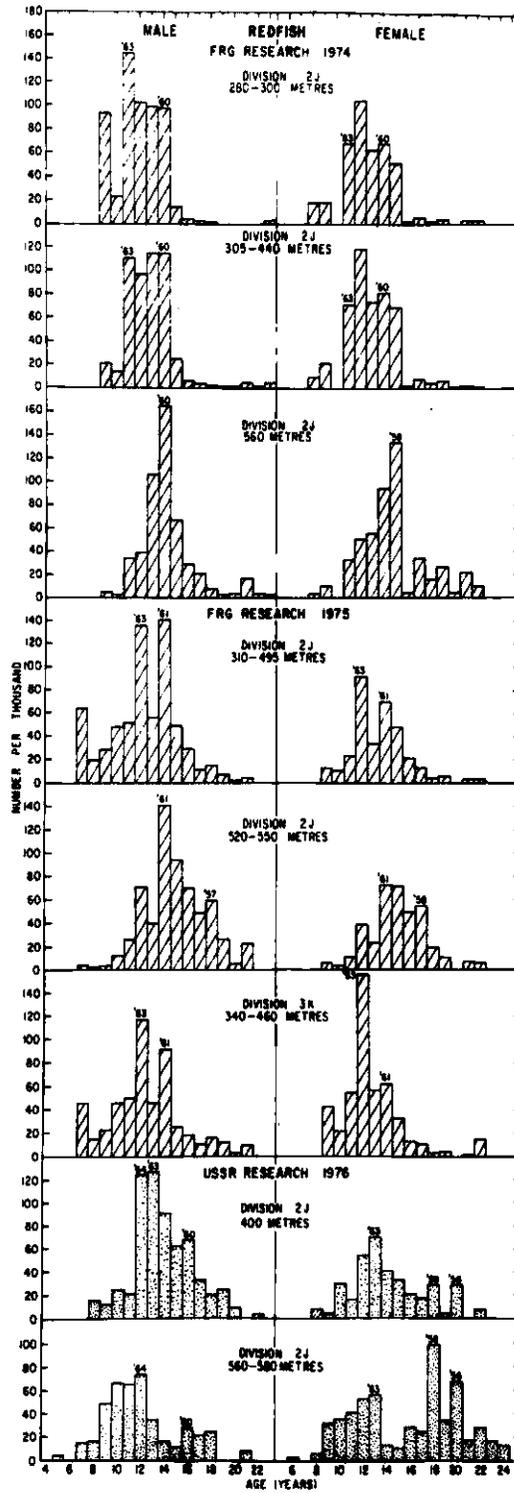


Fig. 6

Age distribution of redfish (*mentella*) by scales from FRG research fishing 1974-75 and USSR research fishing 1976 in Subarea 2 + Div. 3K.

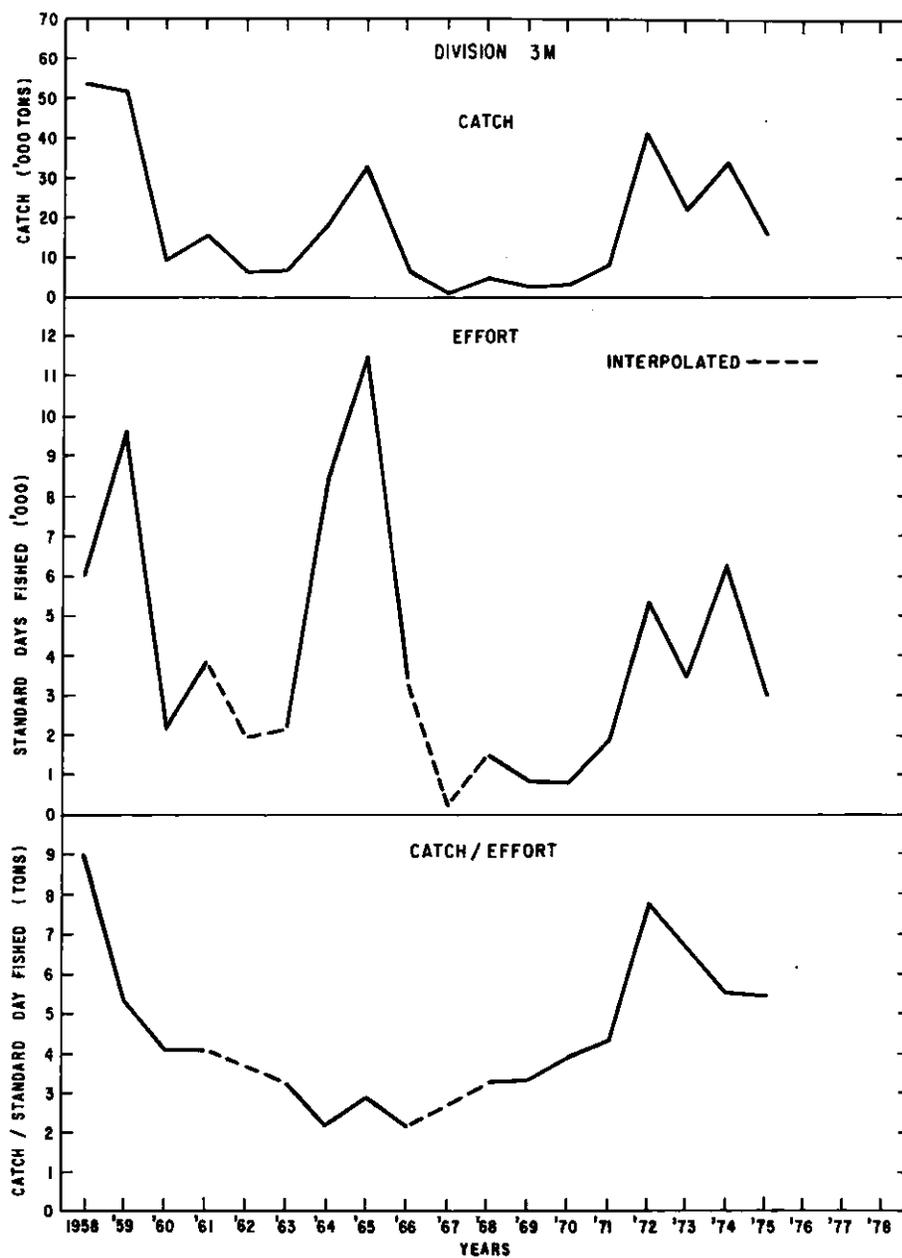


Fig. 7. Trends in nominal reefish catch, effort and catch per unit effort in standardized trawler units following the method of Parsons *et. al.* 1976 with 1973-1975 added for Div. 3M.

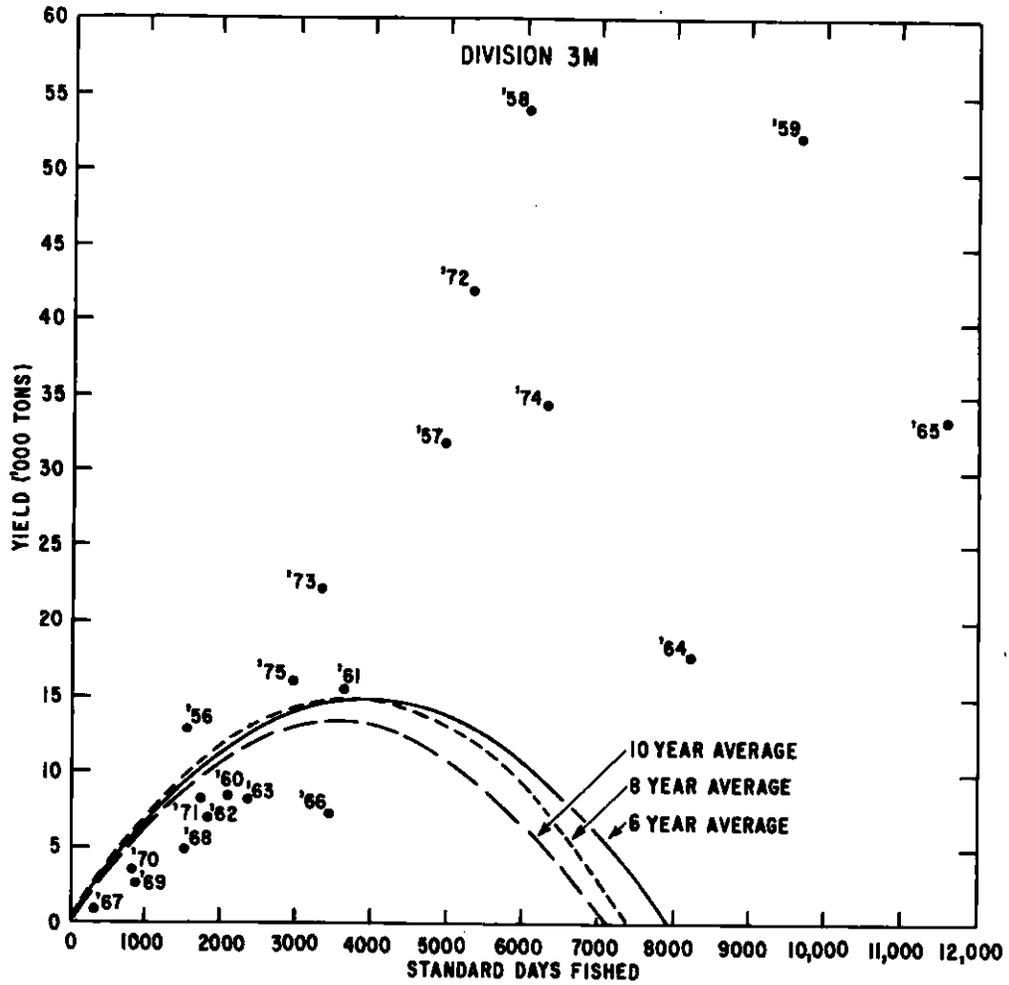


Fig. 8  
Yield curves for redfish Div. 3M derived from catch per unit effort using 6 year, 8 year and 10 year running averages of standard days fished from Parsons et. al. 1976 extended to include 1973-75.

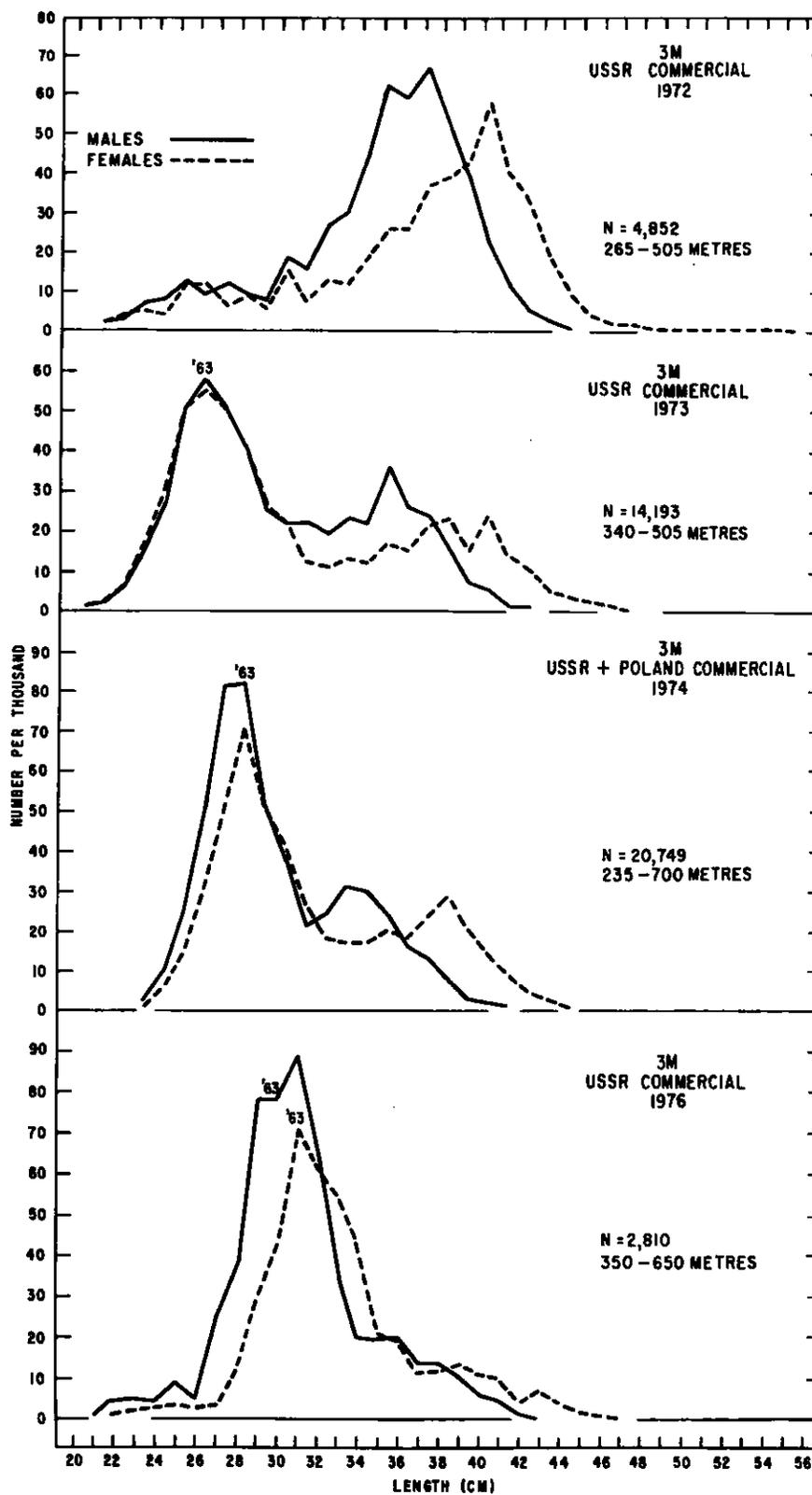


Fig. 9. Commercial otter trawl length frequencies of redfish mainly from USSR for Div. 3M between 1972 and 1975.

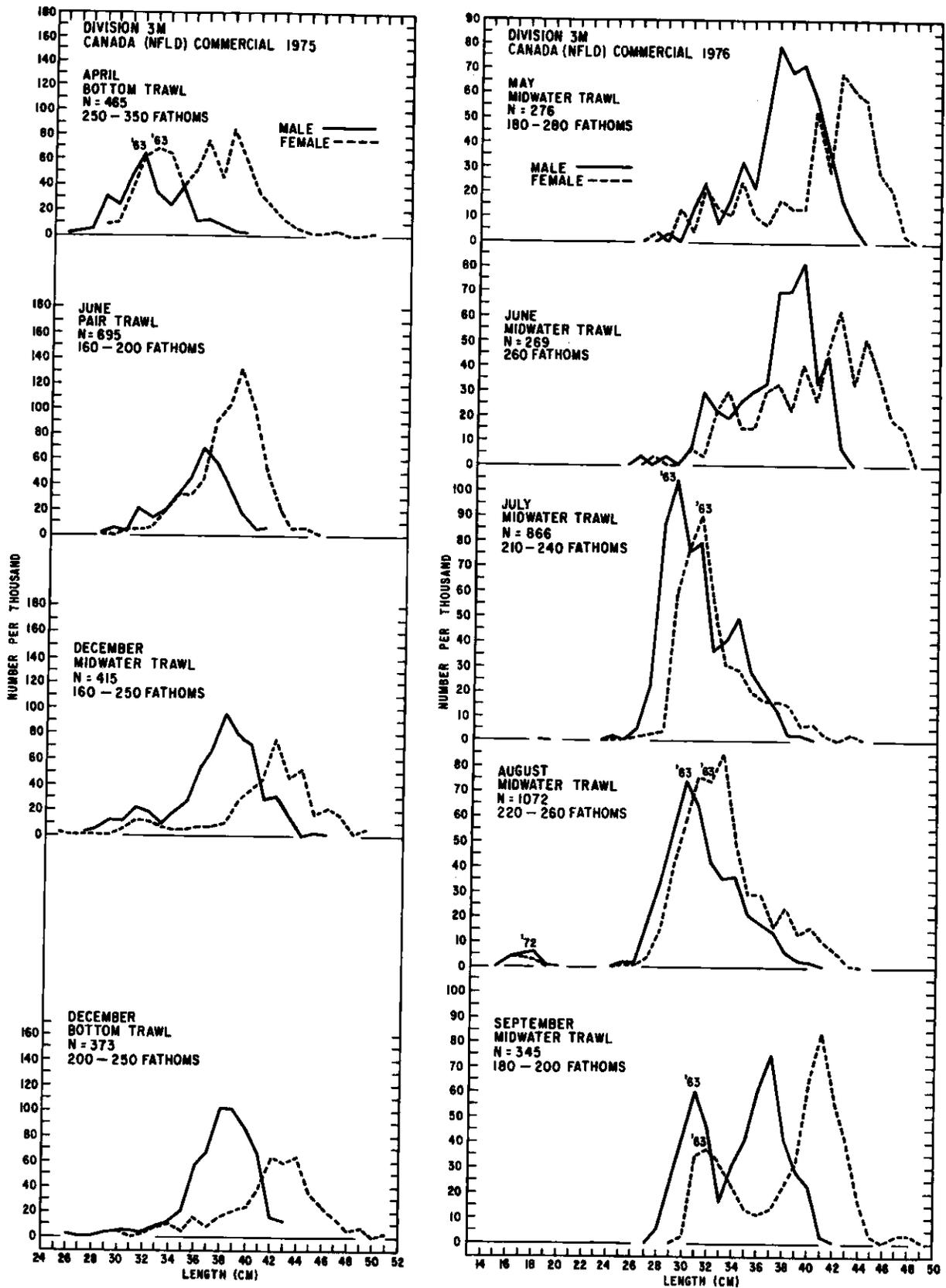


Fig. 10. Commercial midwater trawl and otter trawl length frequencies of redfish from Canada (N) for various months during 1975 and 1976, Div. 3M.

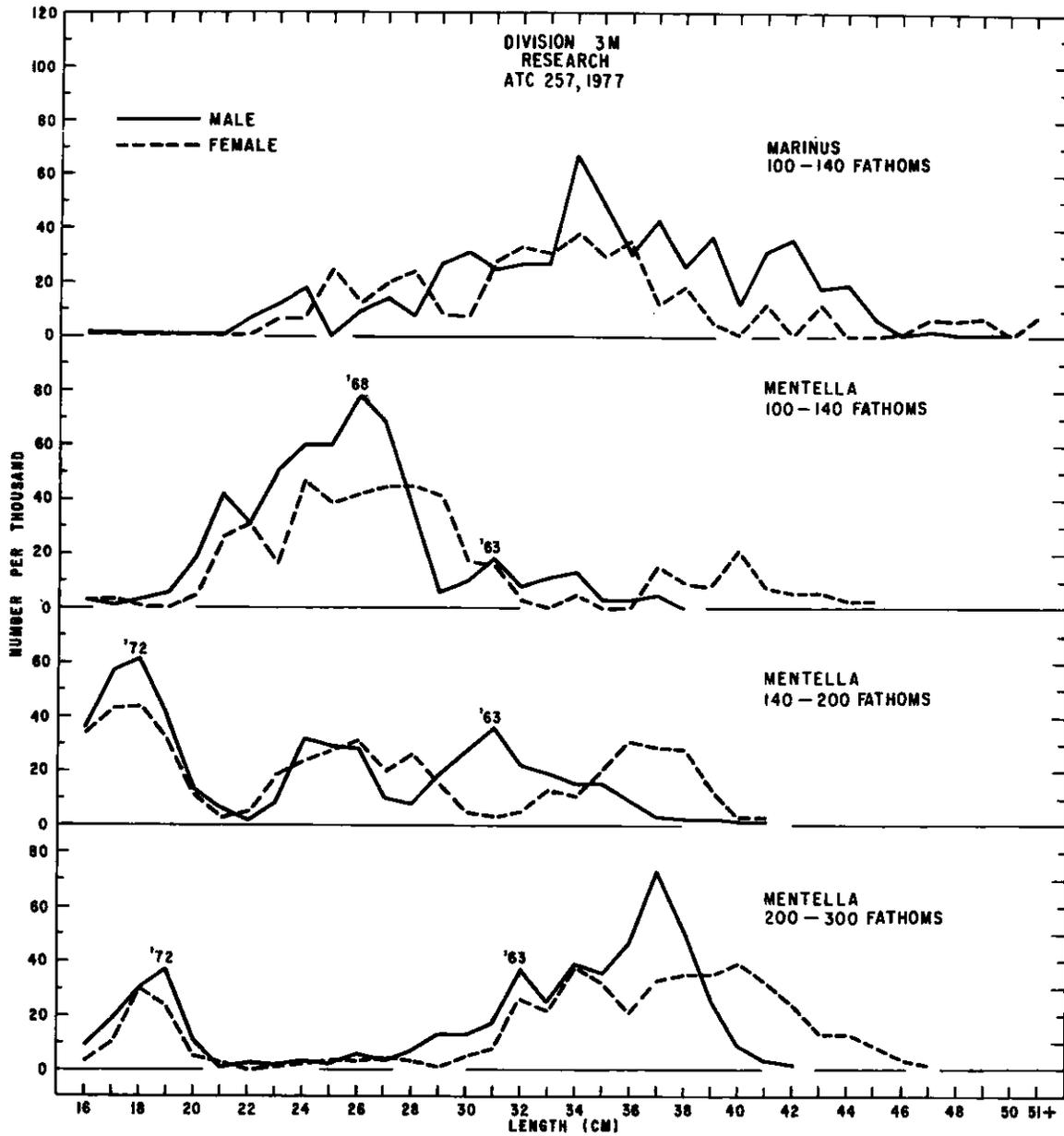


Fig. 11. Research bottom trawl length frequencies at various depths for redfish (marinus an mentella sp.) taken by the A.T. Cameron in Div. 3M during 1977.

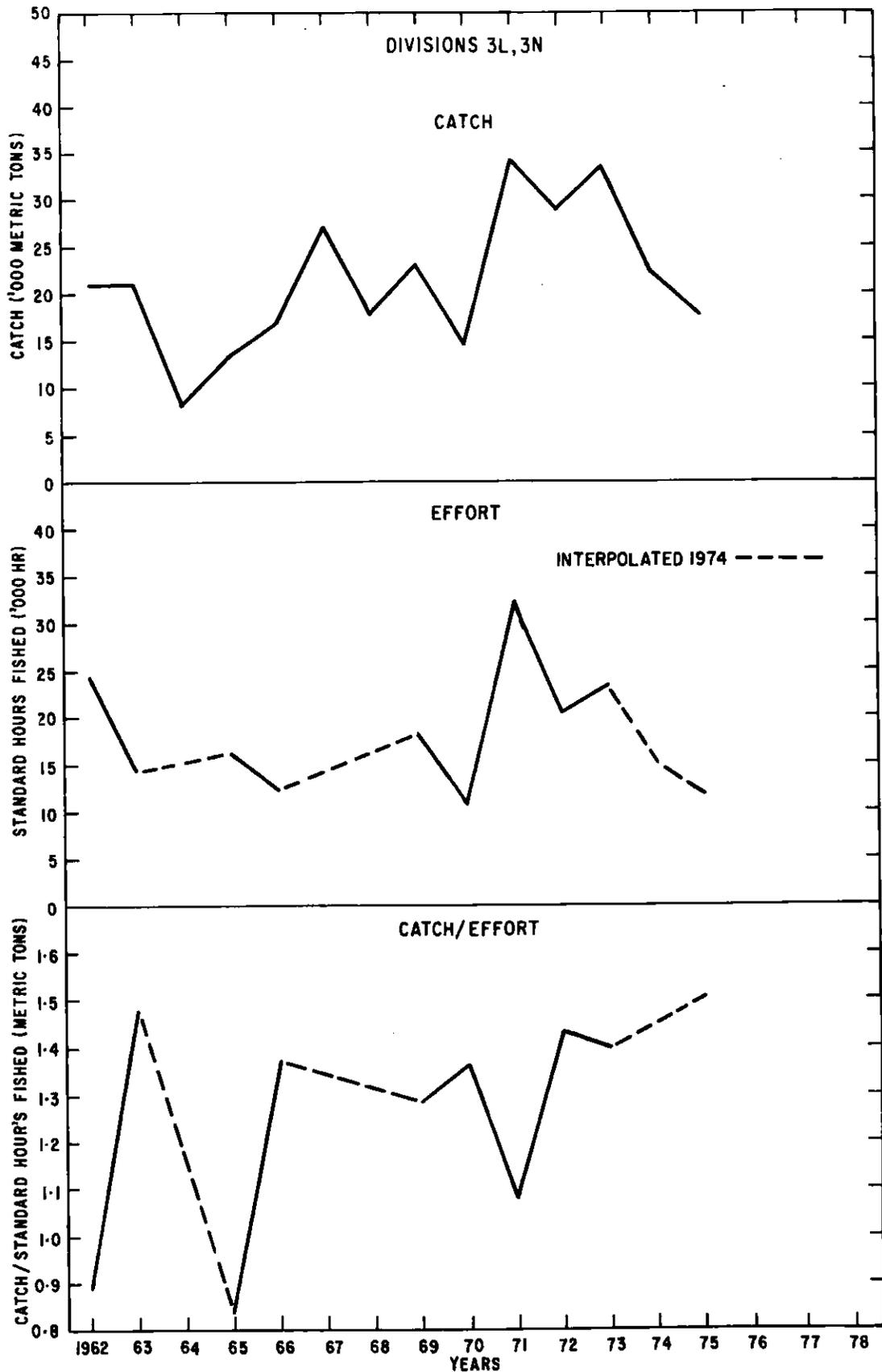


Figure 12. Trends in nominal redfish catch effort and catch per unit effort in standardized trawler units following the method of Parsons and Parsons 1975 with 1972-75 added for Div. 3LN.

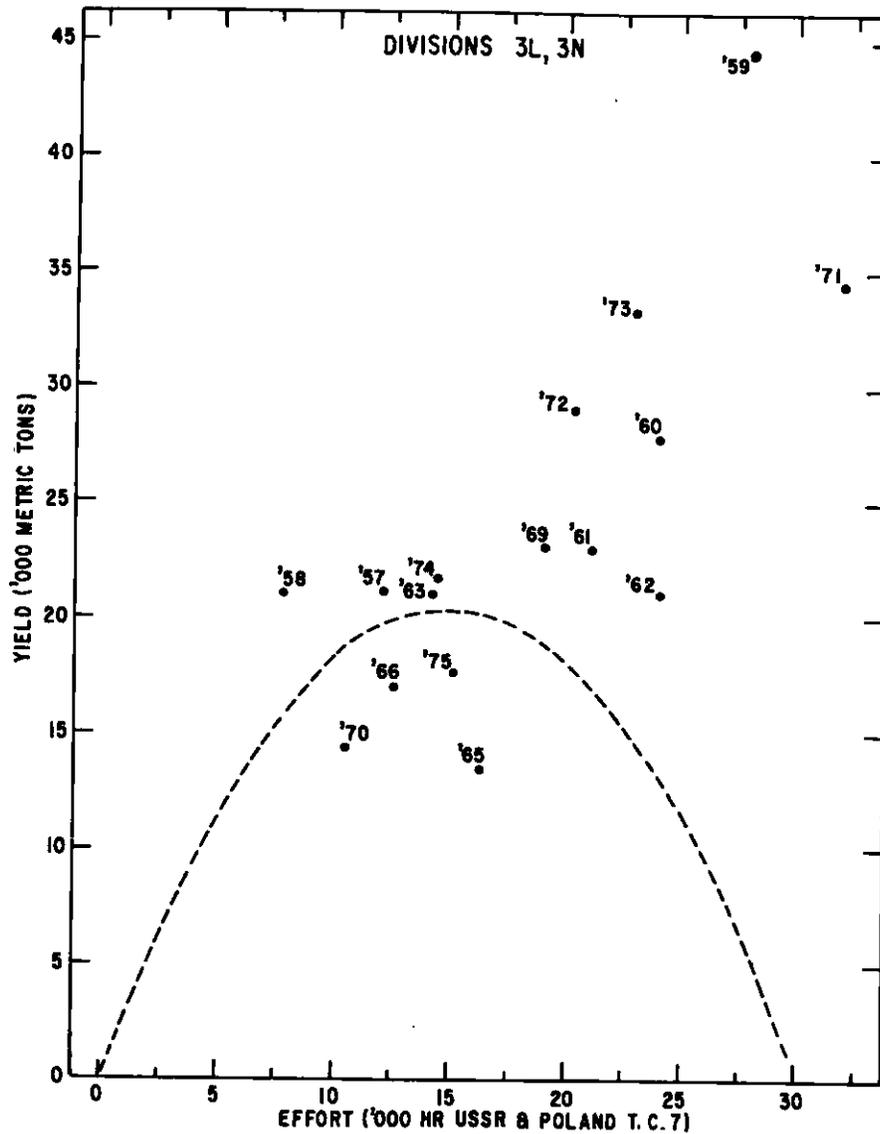


Fig. 13. Yield curves for redfish Div. 3LN derived from catch per unit effort for standard hours fished from Parsons and Parsons 1975 extended to include 1972-75.

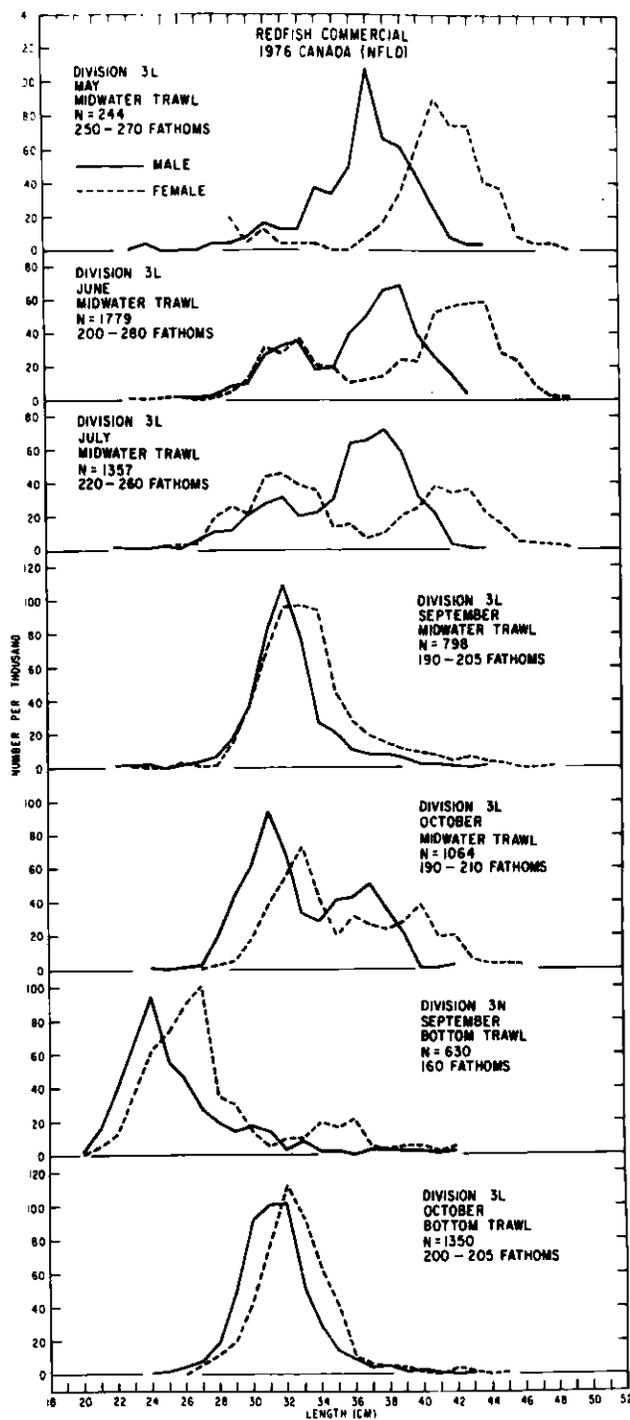


Fig. 14. Commercial midwater trawl and otter trawl length frequencies of redfish (mentella) landed by Canada (N) for various months and depth during 1976 in Div. 3LN.

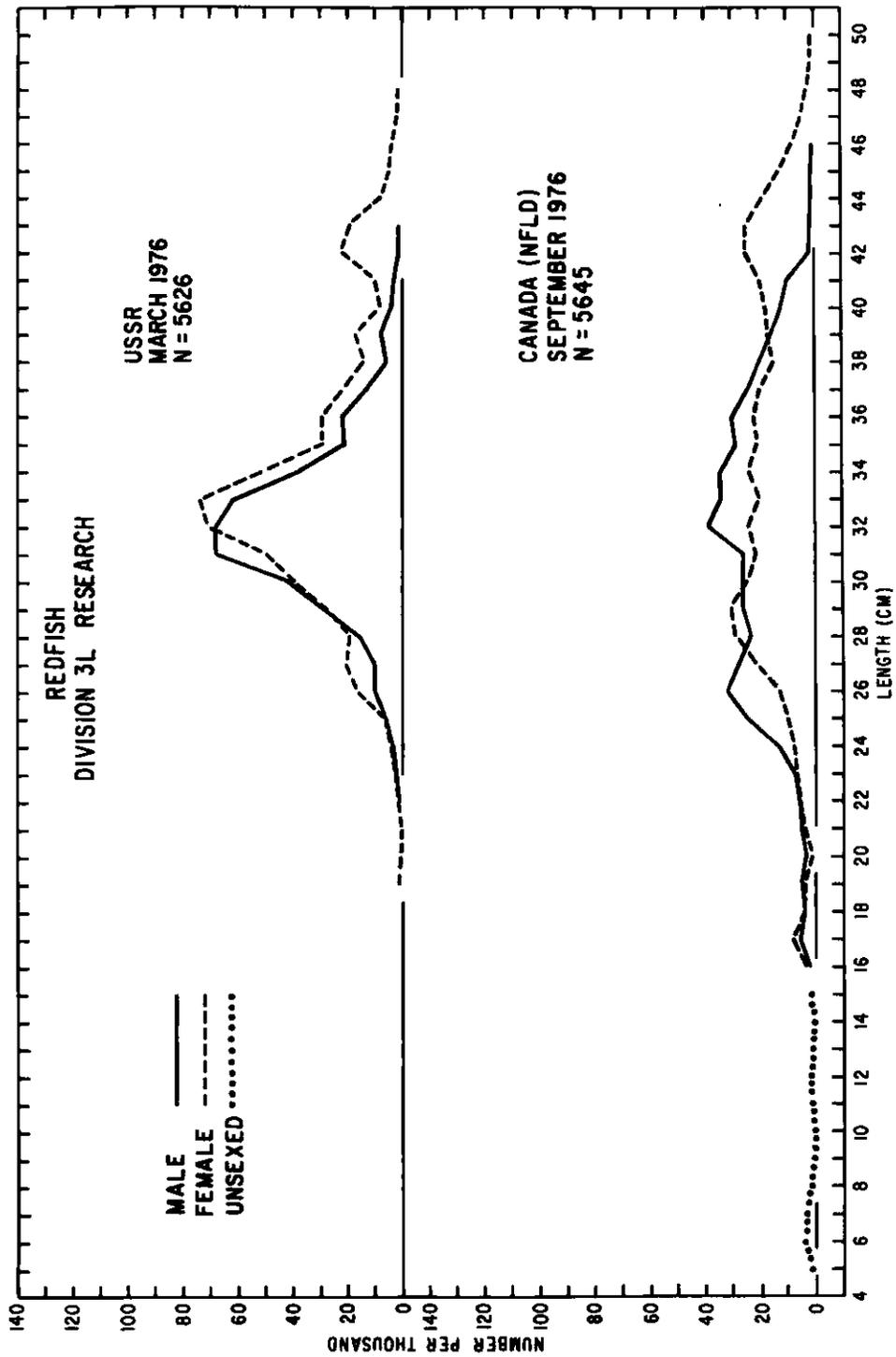


Fig. 15. Length frequencies of redfish (mentella) caught by the USSR and Canada during 1976 in Div. 3L.

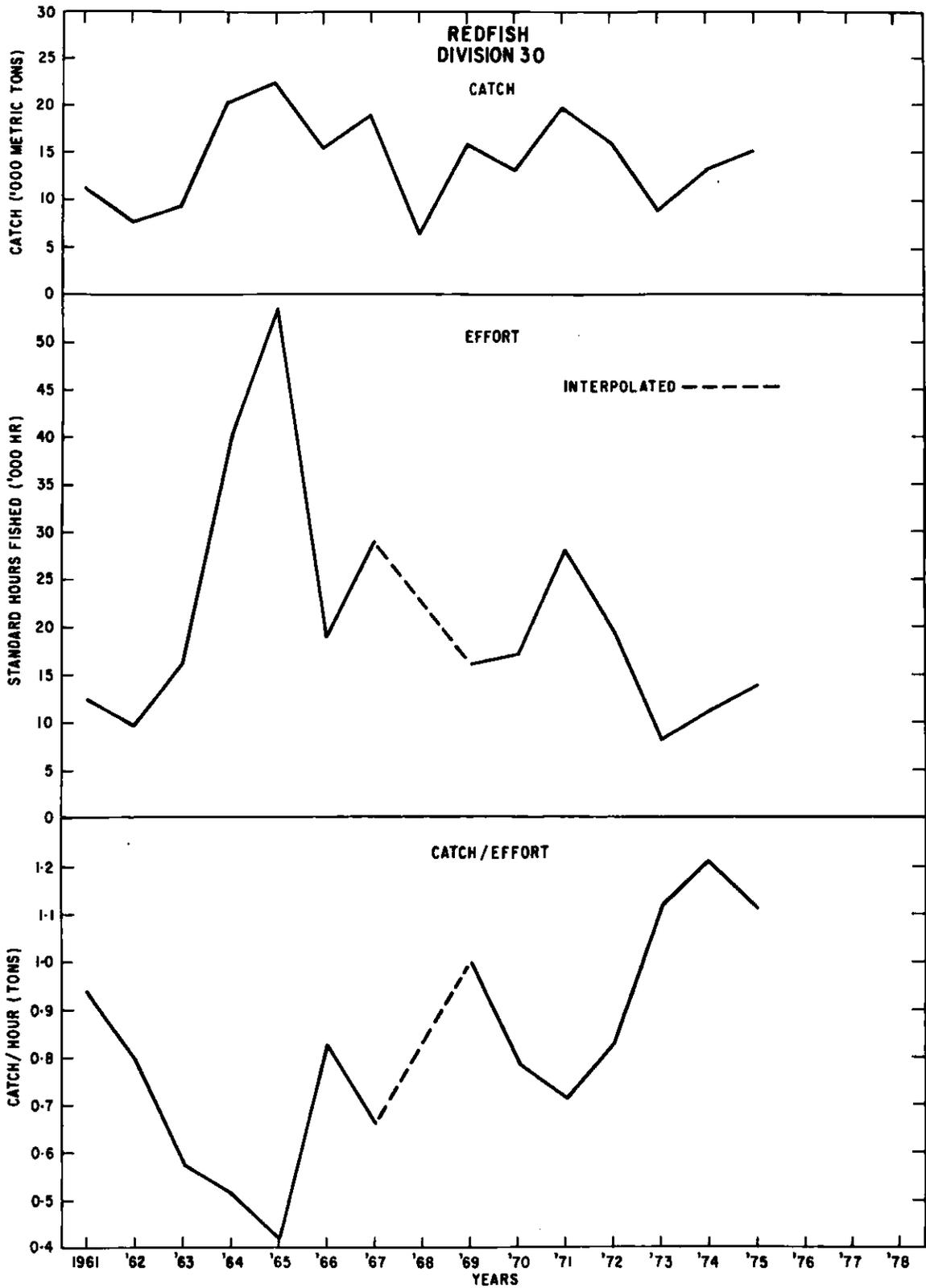


Fig. 16. Trends in nominal redfish catch, effort and catch per unit effort in standardized trawler units following the method of Parsons and Parsons 1975 with 1972-1975 added for Div. 30.

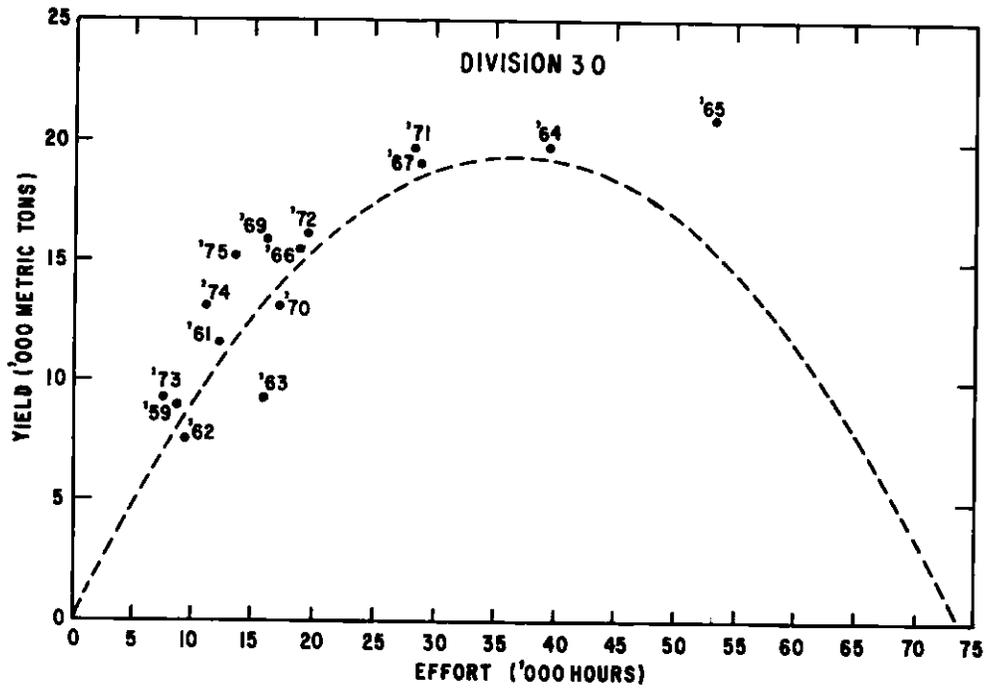


Fig. 17. Yield curves for redfish Div. 30 derived from catch per unit effort for standard hours fished from Parsons and Parsons 1975 extended to include 1972-1975.

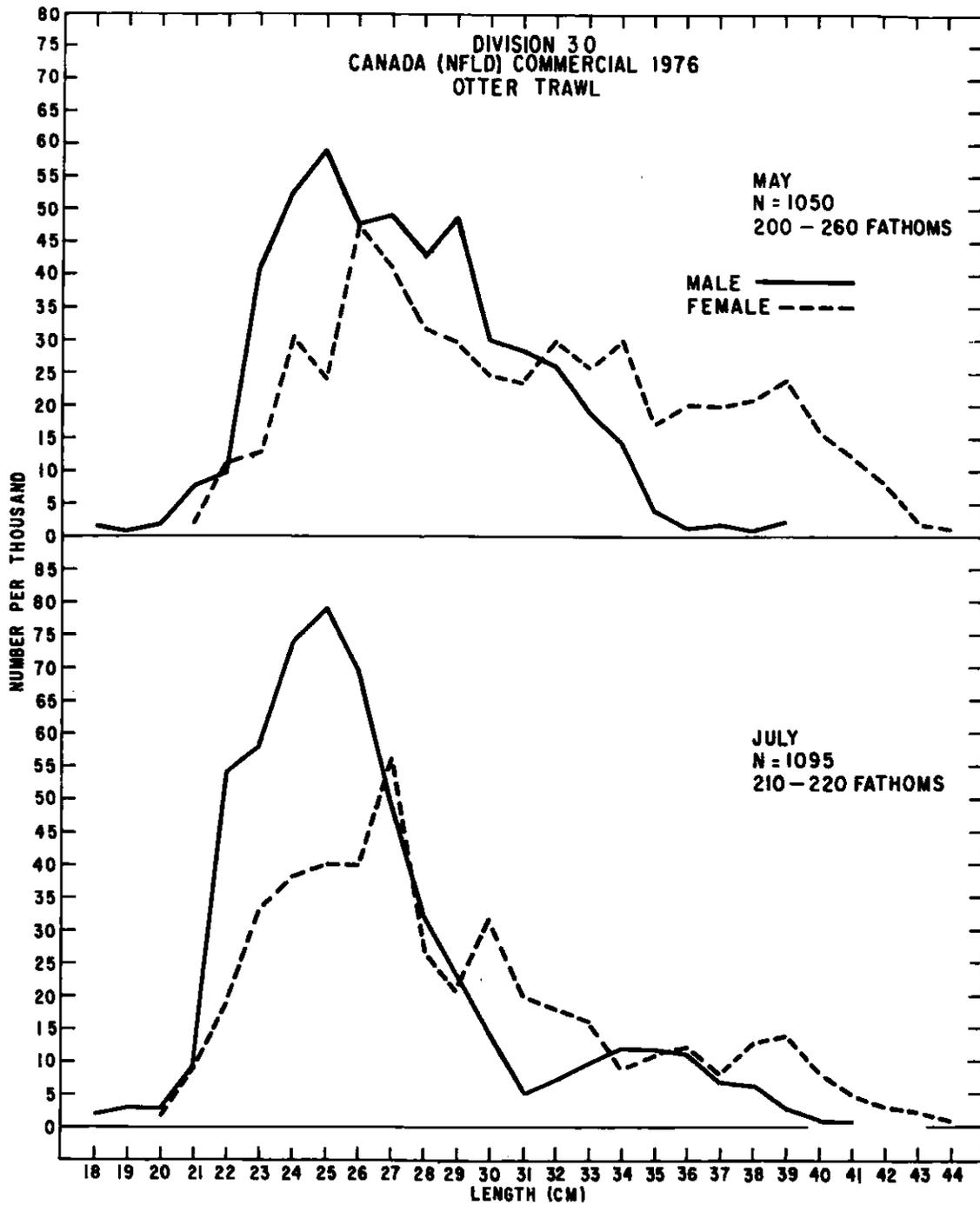


Fig. 18. Canadian (N) commercial bottom trawl length frequencies of redfish (mentella) caught 1976, Div. 30.