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Some characteristics of the roundnose grenadier fisheries in ICNAF Subareas 0 + 1 and 2 + 3

by

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Introduction

The collection of data concerning commercial grenadier species has been initiated by the Canadian Fisheries and Marine Service in St. John's, Newfoundland. Although population parameters have not yet been identified, some general trends in catch and effort are available allowing for the construction of a preliminary general production assessment by the Schaefer yield model (Schaefer, 1954). Catch and effort trends are also examined along with some observations from limited commercial and research length frequencies. The discussion includes some suggestions and recommendations on sampling procedures.

Materials and Methods

Catch and Effort

Catch per hour fished was calculated for both Subareas 0 + 1 and 2 + 3 using tonnage class 7 otter (stern) trawlers as a standard from 1967 to 1976. This tonnage class consistently accounted for greater than 80% of the total grenadier catch in both areas. The percent of the catch used in effort calculation ranged from 20 to 100 and was nearly always more than 35. Grenadier catches were taken from ICNAF Statistical Bulletins (1967-76) using Tables 4 and 5 in later years to identify the grenadier catch recorded as other groundfish. In earlier years, grenadier catches were extracted from entries of other groundfish where the former reasonably approximated ($\pm$ 10%) the latter. The grenadier catch was always >50% of the total for all species combined. Effort was calculated by dividing the total grenadier catch by the CPUE for each year. Catch per hour fished was based on data which inherently account for the seasonality of the fisheries (i.e. second half) and the ICNAF Divisions exhibiting highest prosecution.

General Production

The effort data accumulated by the above method were then applied to the Schaefer general production model. Running averages of effort were not used due to the scarcity of information available. The catch and effort data for 1971 in Subareas 2 + 3 were the only entries not used, allowing for a reasonable r value for the regression of catch per effort against effort.

Length Frequency Data

Commercial length frequencies using total length in 3 cm groups were supplied by Denmark and GDR for 1974. Canadian research and commercial frequencies for 1976 and 1977 use the partial length measurement suggested by Jensen (1976) taken to the nearest centimetre. A discard frequency of grenadier, from a catch of witch, measured as total length in 1 cm groups has been applied to Jensen's conversion to partial lengths. Length frequency figures are arranged by type and by various length measurements used.

Results

Subareas 0 + 1

Figure 1 presents catch and effort compiled over the nine years including and prior to 1976. Catches fluctuated between 3,000 tons in 1969 and 12,000 tons in 1974. A total allowable catch of 10,000 tons in 1975 has no reflection on the catch or catch per hour fished. Effort remained relatively stable while the catch dropped to 5,000 tons compared to 12,000 tons the year before. However, in 1976 the catch rate improved again towards the 1974 level (1.80 tons per hour vs. 1.89) generating a catch two-thirds of that in 1974. Investigations into the seasonality of the fishery and monthly catch rates for these three years did not elucidate this shift.

Calculations attained using the general production model are presented in Figures 2 and 3. The exercise indicates a maximum sustainable yield of approximately 8,000 m t. Effort at MSY is 5,000 hours for tonnage class 7 otter (stern) trawlers.

Commercial frequencies from Denmark and GDR for 1974 (Fig. 7) show little more than the size range occurring in commercial catches at that time. Results of a recent research cruise to Statistical Area 0 in 1977 revealed no indication of recruitment prospects from survey depths of 425 to 830 metres (Fig. 9).

Subareas 2 + 3

Ten years of catch and effort data for this fishery are analyzed in Figure 4. Apparently, there have been periods of high and low fishing intensity as reflected in the effort calculation. Catch per hour fished has experienced only slight fluctuations over the past seven years ranging between 1.5 and 2.0 tons per hour and averaging 1.74 tons. The 32,000 ton TAC in 1974 may have stimulated fishing effort for that year after declining for the previous two years, but did not have a proportionate effect on the catch as catch per hour dropped to 1.43 tons. The two following years, 1975 and 1976, suggest an initial slight increase and subsequent levelling off of catch rates.

The general production analysis is illustrated in Figures 5 and 6. Using nine out of ten co-ordinates in the analysis, a MSY of roughly 32,000 tons and 31,000 fishing hours for the vessel standard are indicated.

Length frequency data are, again, very limited for interpretive purposes. Size ranges of commercial fish are indicated in Figures 8 and 9 and a discard of grenadier in a catch of witch (Fig. 8) shows the by-catch consists of commercial-sized fish. Research frequencies for Canada in 1977 suggest smaller fish in 3L than in 2J but this may be due, to some degree, to the depth restriciton of the former. No size classes of recruitment potential were identified from captures in the lined research gear.

Discussion and Conclusions

Subareas 0 + 1

Effort over the eight year period has remained fairly stable around 5,000 hours fished. The trends in catch and catch per unit effort probably represent the relative fluctuations in the fishable biomass or, at least, their availability due to environmental factors. The general trend in CPUE, despite the ups and downs, is a slow decrease while catches have been averaging 7,000 m t over this span of years. The MSY indicated by the general production model is 8,000 m t and what little research length frequencies do exist, show no immediate prospects for good recruitment. In a seemingly stable situation, the present TAC of 8,000 m t should be continued in 1979.

Subareas 2 + 3

In this situation the catch per unit of effort has remained reasonably constant for the past seven years indicating a fairly stable biomass. Fluctuations in catch are due to changes in fishing intensity. The 1977 TAC was increased to 35,000 m t from the 32,000 level in effect from 1974 through 1976 based on a range of sustainable yield from 31,800 to 40,800 tons (Borrman, 1976). The MSY indicated here is roughly 32,000 tons and, again, nothing is known of recruitment prospects. In this situation it is hard to realize what pressures the fishery can withstand. At any rate, with no idea of recruitment, and indications of a fairly stable biomass, the TAC for 1979 should not exceed that set for 1978 of 35,000 m t.

General

Length measurements of grenadiers for use in analytical models of the fishery are capable of yielding spurious results. The problem of broken and regenerated tails in roundnose grenadier is widely recognized. In data collection at the St. John's Biological Station it has been seen that, most often, over 50% of the total catch of grenadier have broken or regenerated tails. Sometimes it is quite difficult to tell whether the tails are regenerated or not. Total lengths taken without compensation for this problem can result in misinterpretation of data. Even when ages are used in analyses, these are often adjusted on the basis of age-length keys and, if not corrected for length, can produce unreliable results.

Jensen, in 1976, presented partial length measurements as a solution to this problem. He suggests measuring the roundnose grenadier from the tip of the snout to the beginning of the anal fin, measured to the nearest half centimetre below and reported in one-half centimetre groups. It has been practice to measure total length in 3 cm groups. Jensen's method,when expressed in centimetres and converted to total length, comprises roughly 3.5 cm groupings. Further comparative measurements over a more complete size range is necessary to form a relationship with a lower Y intercept. Nevertheless, it is strongly urged that this system of measurement be adopted and measurements recorded in no greater than centimetre groups.

References

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Jensen, J. M. 1976. Length measurement of roundnose grenadier (Macrourus rupestris). Intern. Comm. Northw. Atlant. Fish. Res. Doc. 76/VI/93, 2 pp.

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

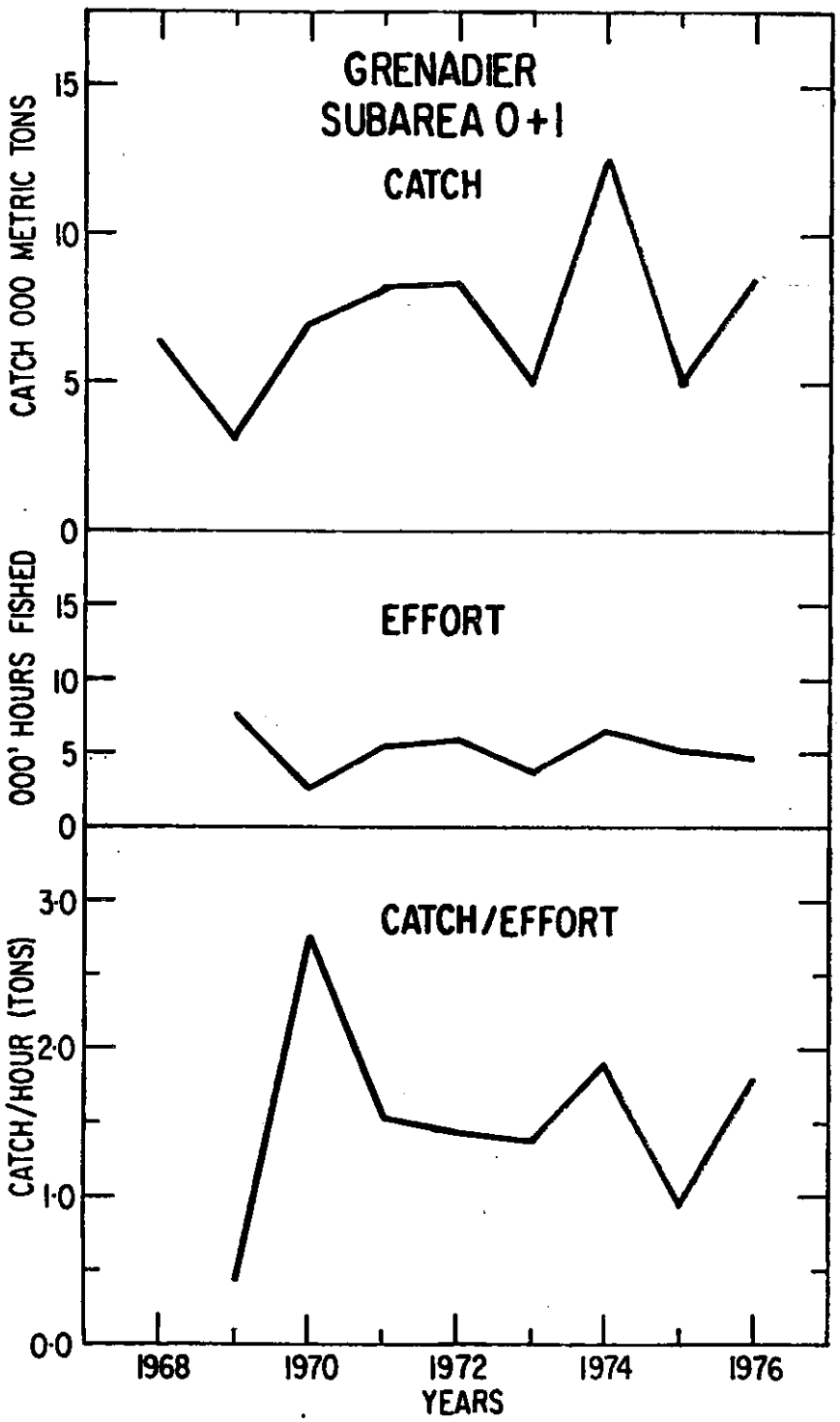

Fig. 1. Trends in catch, effort and catch per unit effort in tonnage class 7 otter trawl (side) units.

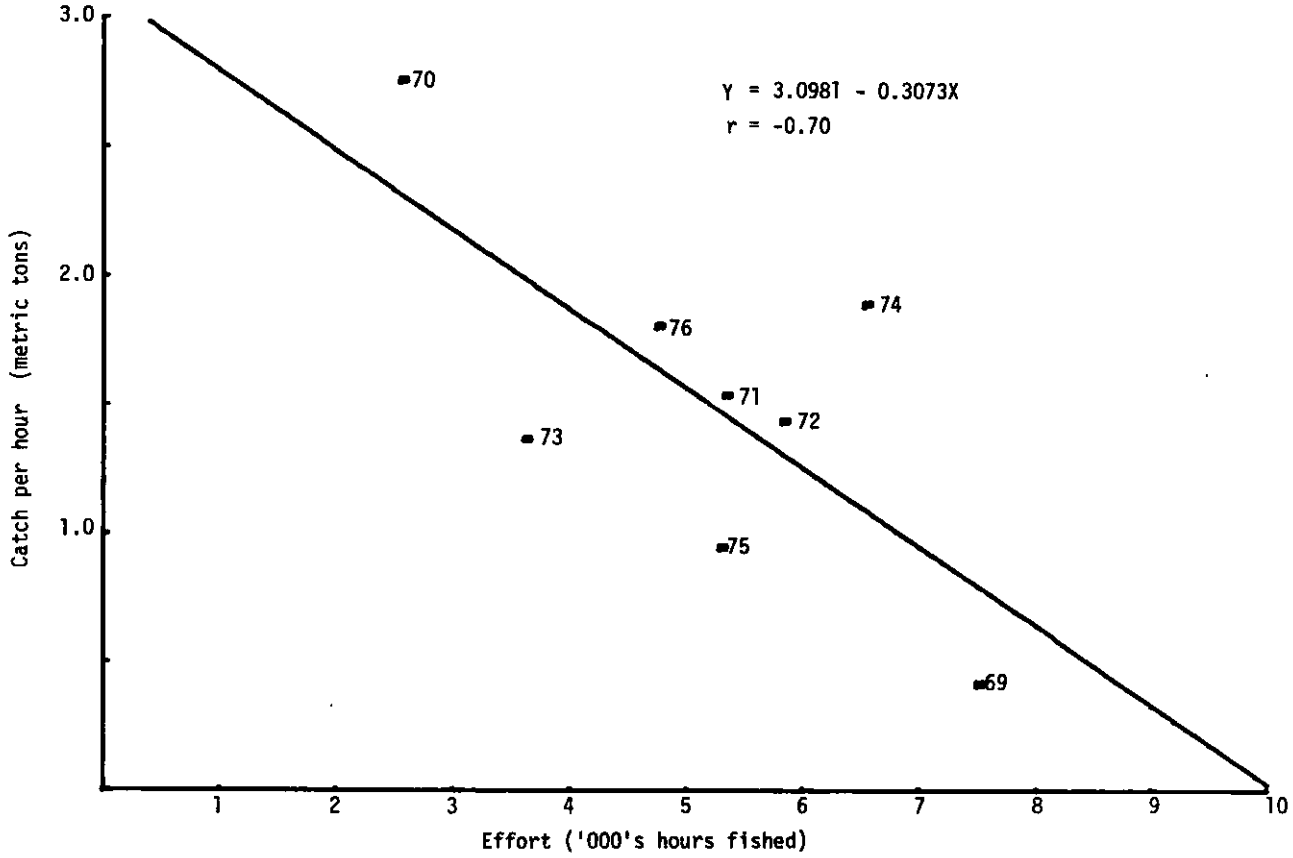

Fig. 2. Regression of CPUE against f - Subareas 0 + 1.

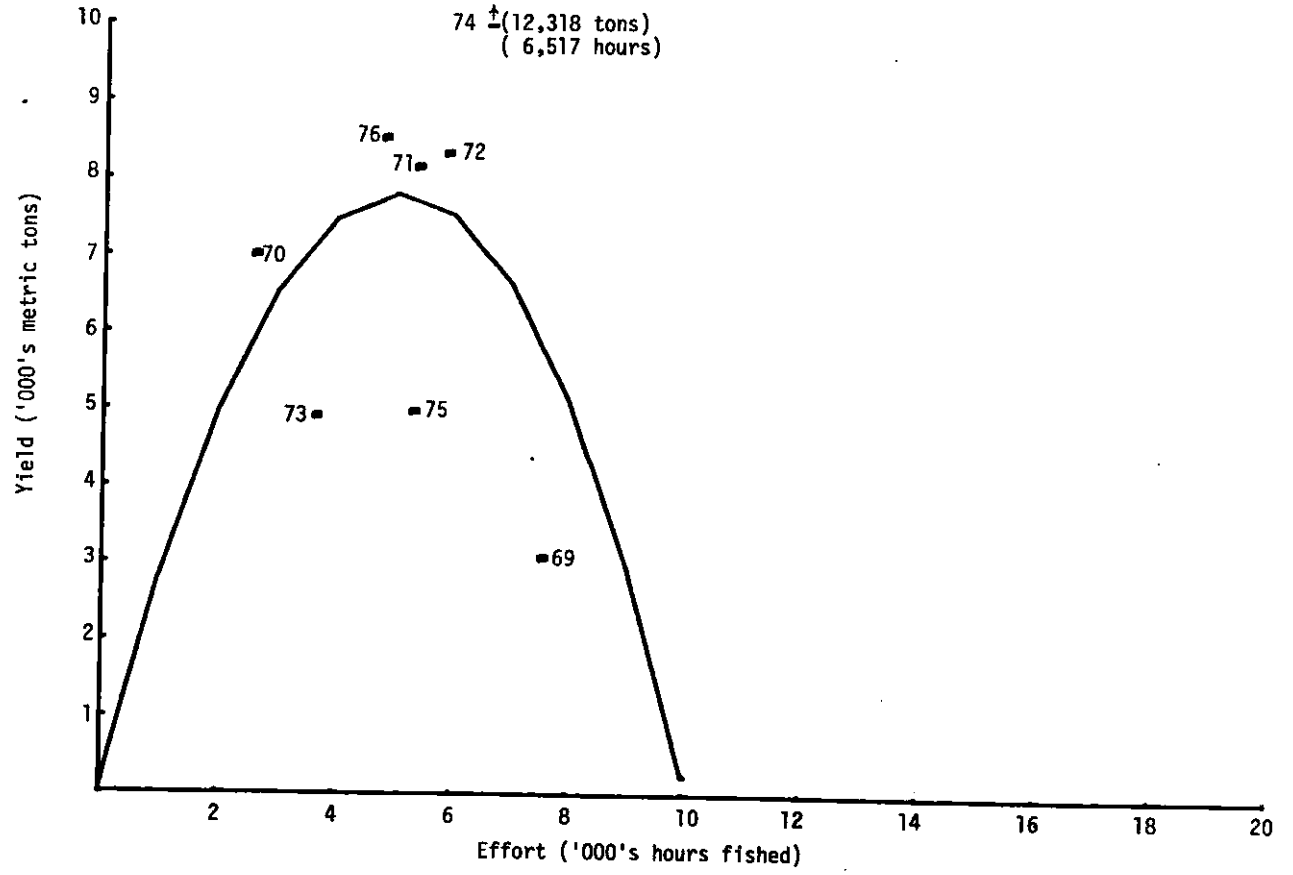

Fig. 3. General production parabola - Subareas 0 + 1.

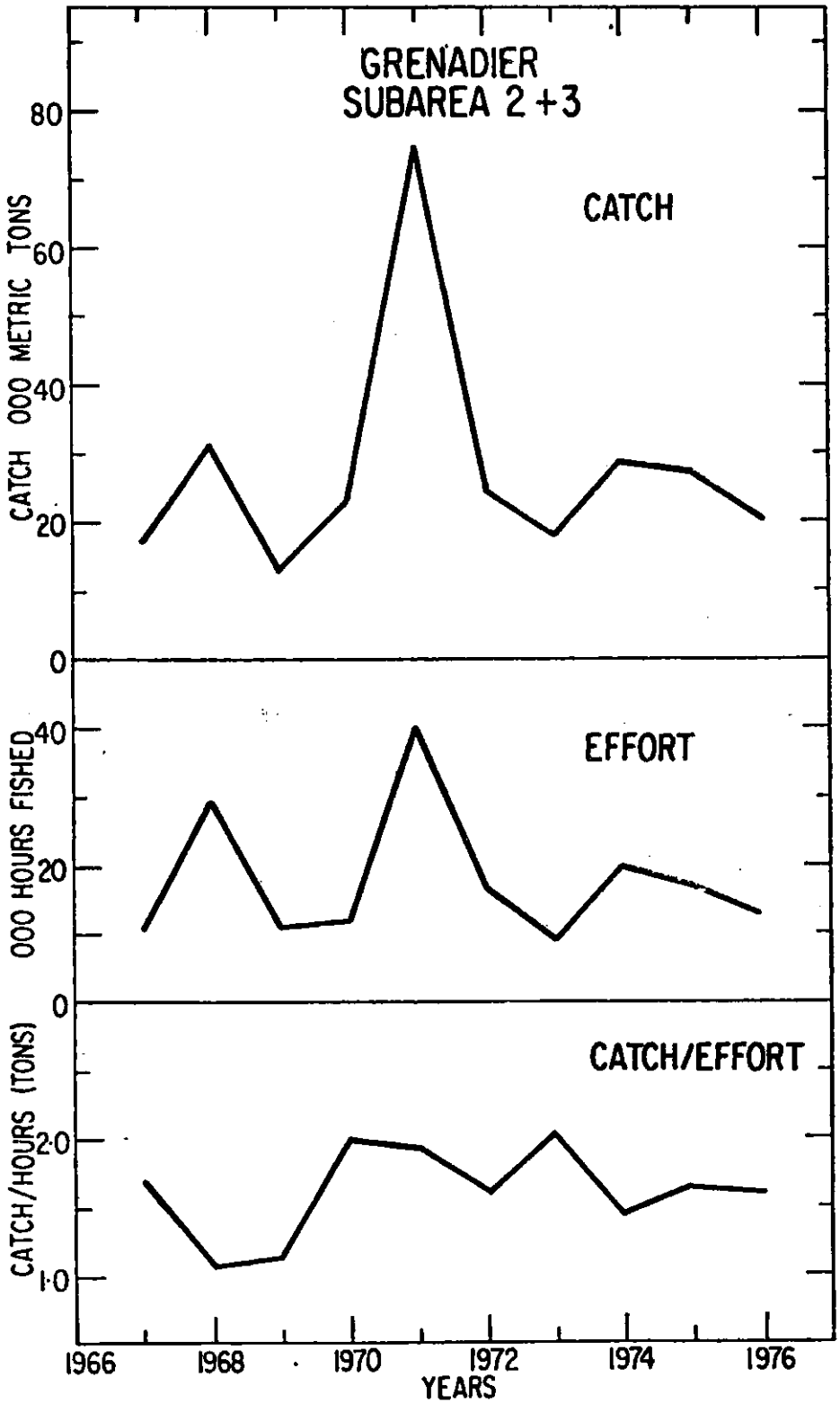

Fig. 4. Trends in catch, effort and catch per unit effort in tonnage class 7 otter trawl (side) units.

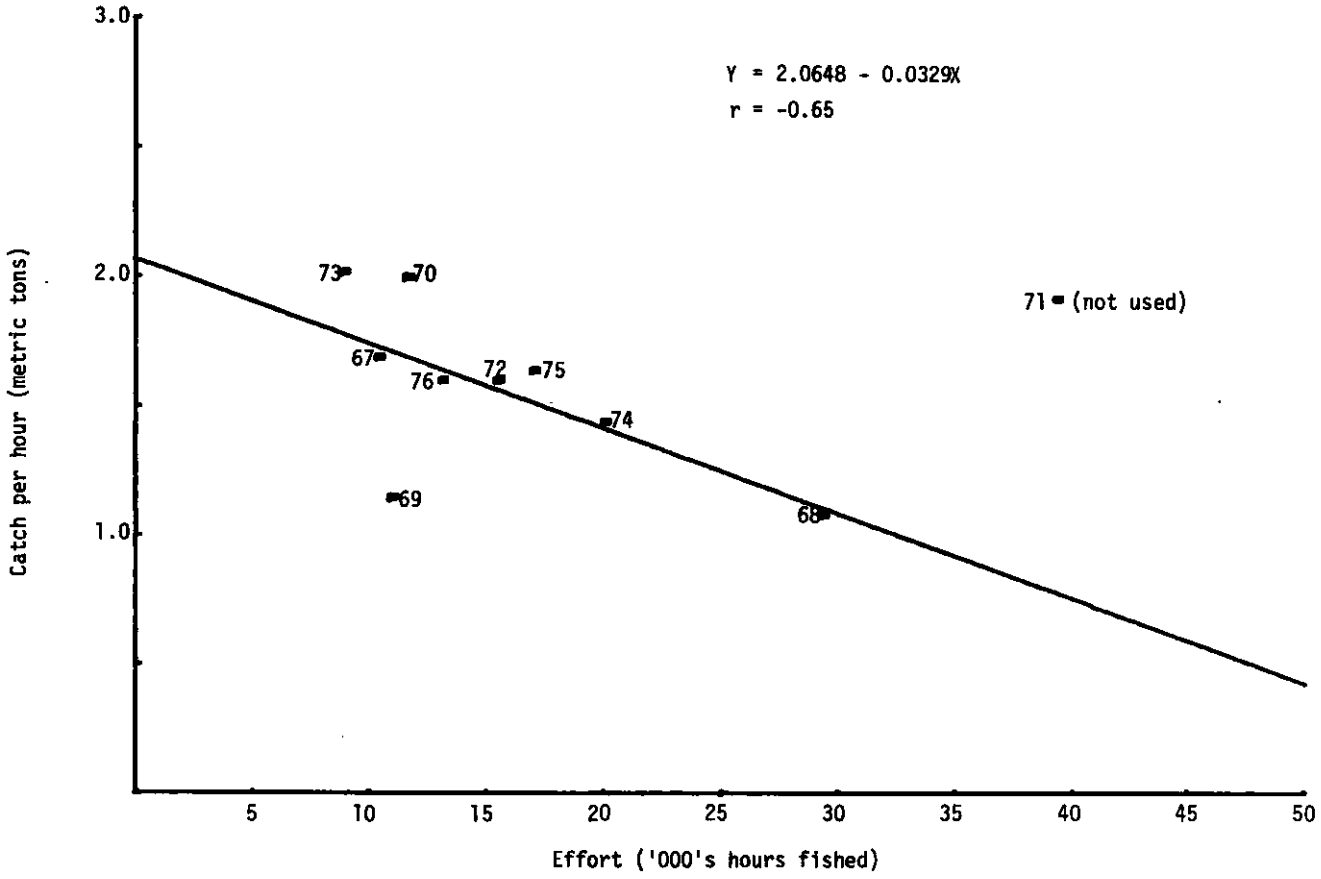

Fig. 5. Regression of CPUE against f - Subareas 2 + 3

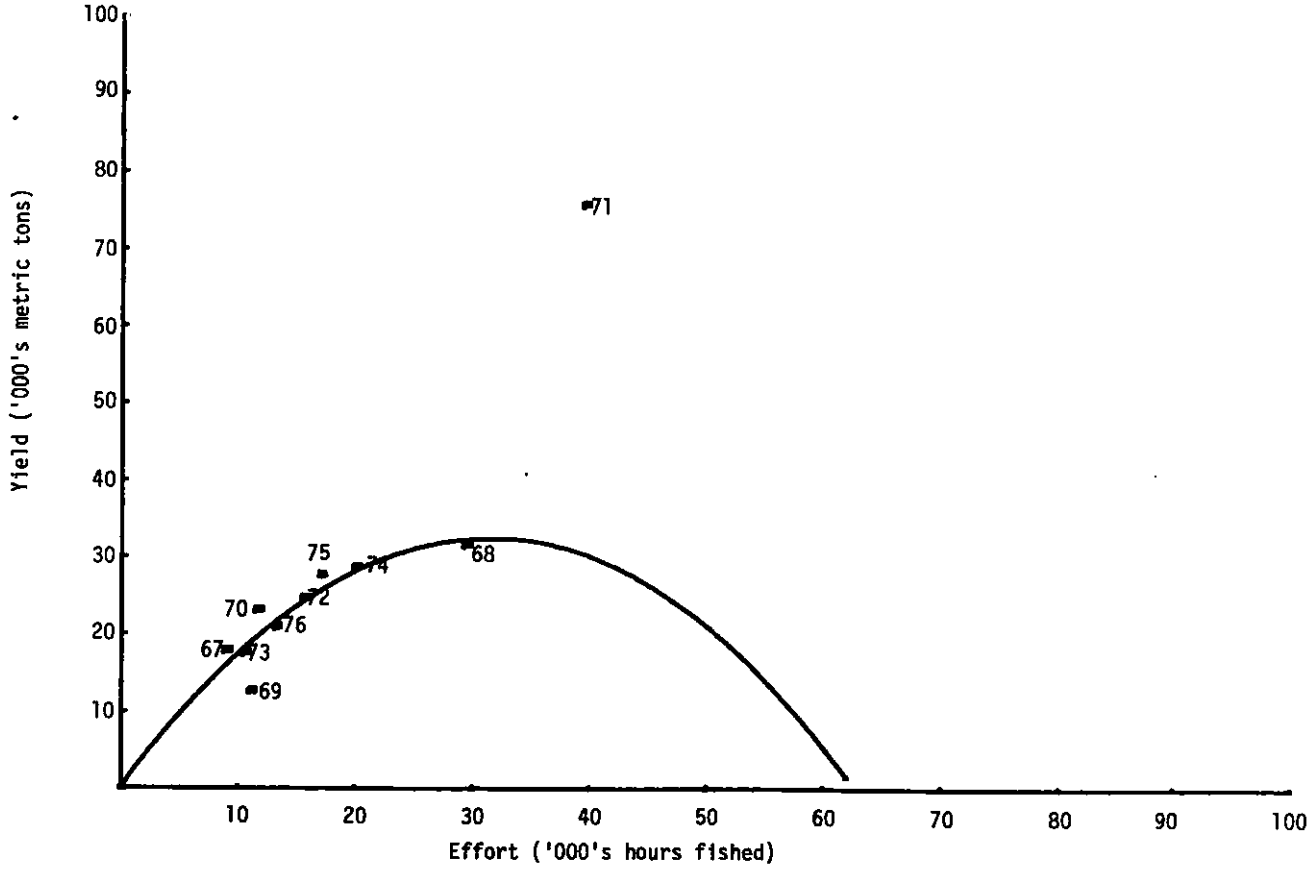

Fig. 6. General production parabola - Subareas 2 + 3.

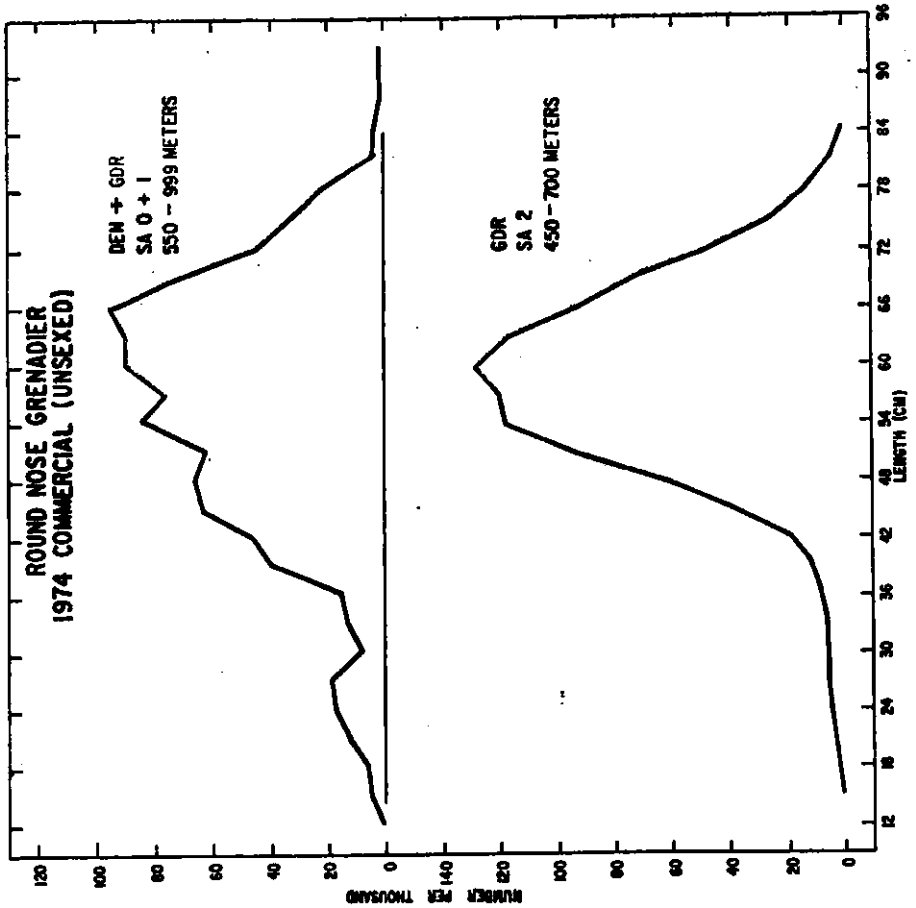

Fig. 7. Commercial length frequencies.

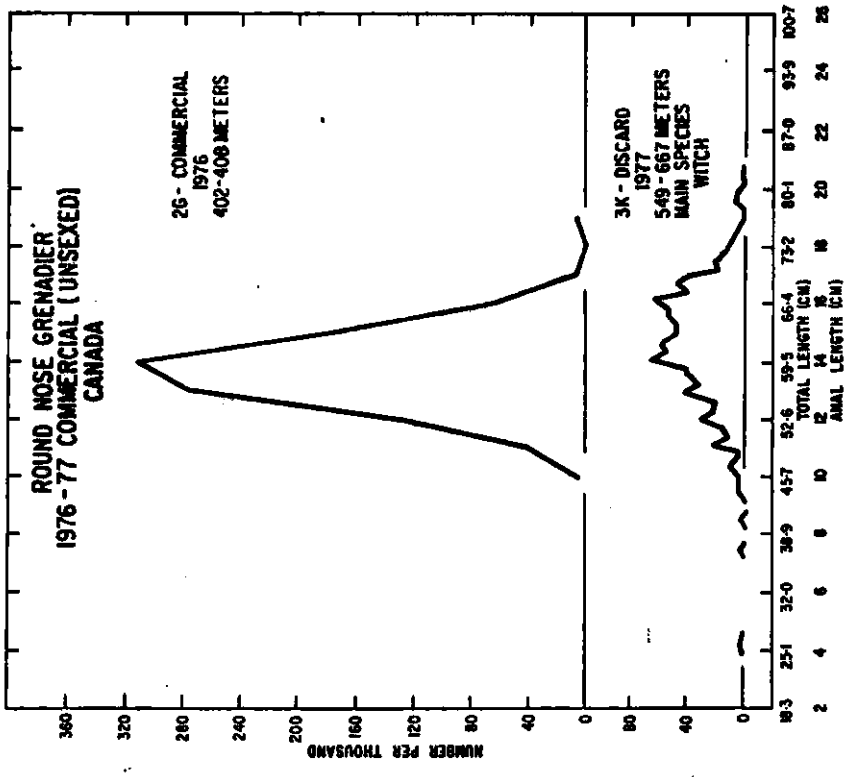

Fig. 8. Commercial length frequencies.

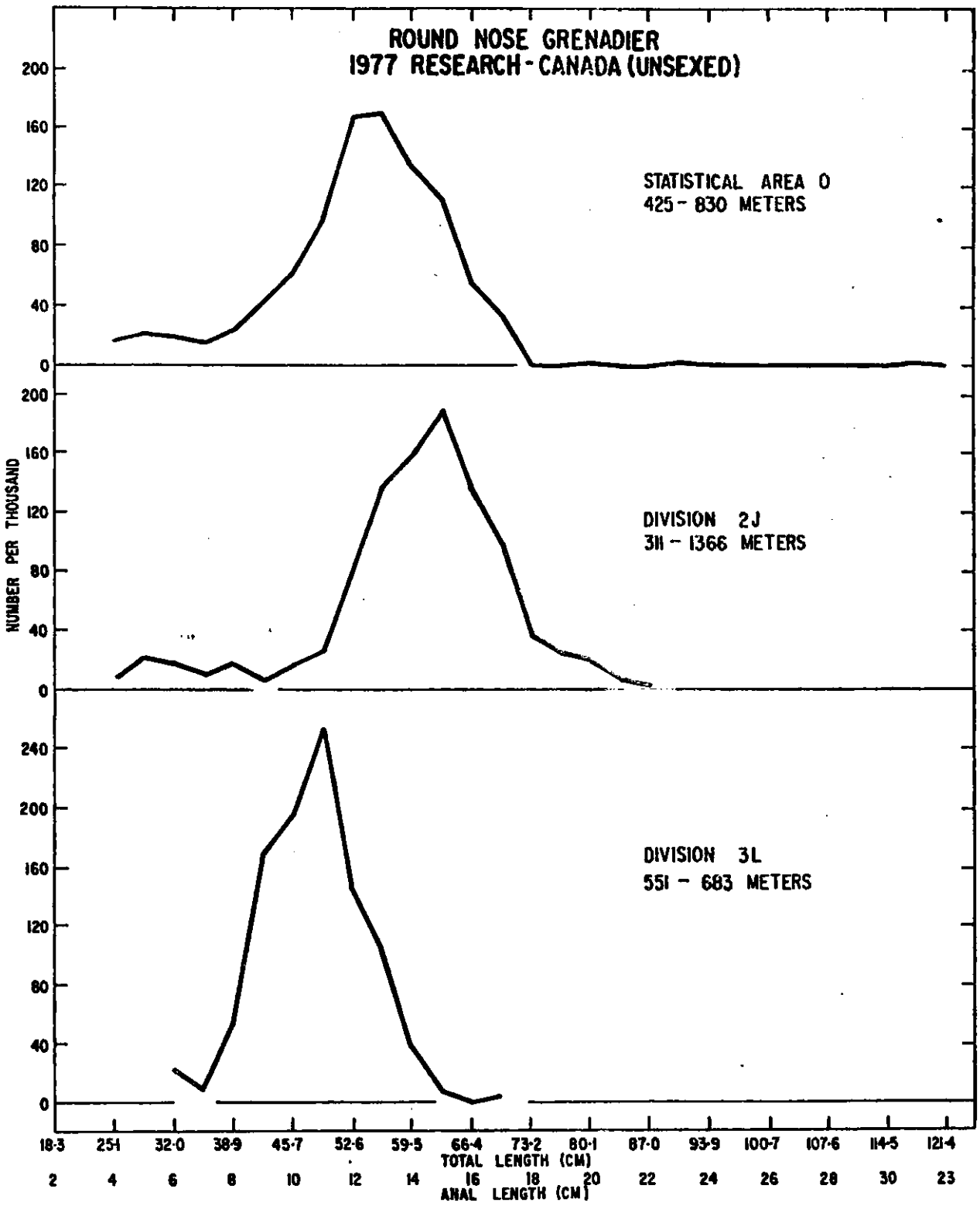

Fig. 9. Research length frequencies.