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Trawl Survey of Capelin Prerecruits in NAFO Divisions 3LNO in November 1983

by

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ABSTRACT

The paper presents results of a trawl survey of capelin larvae (0+) and yearlings (1+) in Divs. 3 LNO, made following the method used by Soviet and Norwegian scientists to assess the 0-group of commercial fishes in the Barents Sea. The results have proved that the method may be successfully utilized to assess the abundance of year classes of fish as larvae. Future surveys of capelin yearlings should cover also Div. 3K, where the majority of fish of this age group is distributed in some years. To estimate the abundance of yearlings it would be more appropriate to use a trawl-acoustic method due to capelin at this age starting to aggregate in shoals.

INTRODUCTION

Commonly yearlings (1+) and particularly two-year-olds (2+) constitute a considerable part of industrial catch of capelin in Divs. 2J, 3K in autumn. Therefore, an estimation of a relative abundance of year classes of fish at their first and second years of life is of particular importance in predicting the total allowable catch of capelin for more than one year period.

Prior to the present survey no direct researches were carried out to make a quantitative estimation of the aforesaid age groups of capelin in the Northwest Atlantic. Only fragmentary data are available on the distribution and size composition of capelin larvae and yearlings in the Gulf of Saint Lawrence and Grand Newfoundland Bank areas (Hodder & Winters, 1972; Carscadden, 1977; Poletaev, 1979; Bakanev, 1981). Due to different fishing gears and sampling techni-

que applied the data available are not comparable and a quantitative estimate of capelin abundance at early developmental stages is not obtainable.

The present paper considers results of a directed survey of capelin prerecruits conducted in November 1983, a first attempt is made at estimating the index of abundance of larval capelin of the 1983 year class.

MATERIAL and METHODS

A trawl survey of prerecruits was carried out in Divs. 3LNO from 6 to 20 November, 1983. A young fish trawl (18 x 15 m^2) was used similar to that applied by Soviet and Norwegian scientists in the surveys of larval capelin in the Barents Sea. A sampling technique was similar to that used in the 0-group surveys in the Barents Sea, i.e. in each haul depth intervals of 0-20 m, 20-40 m and 40-60 m were sampled in turn, each for 10 min. at a speed of 3 knots. The depth of sampling was checked using a fishing depth indicator. The distance between hauls was about 30-40 miles.

To study a daily distribution of capelin 8 hauls were made including six 20 min. hauls at depths 0-20 m and 40-60 m and two 30 min. hauls made following an ordinary method of sampling three depth intervals simultaneously.

Only those young fish were assessed which were caught in a codend, fish enmeshed in a netting of a trawl and wings were thoroughly removed after each haul.

The total length of larvae was measured with an accuracy of 1 mm, the fork length (to the end of the middle rays of the tail fin) of yearlings - with an accuracy of 0.5 cm.

The index of larvae abundance was calculated following a simple method used to calculate the abundance index for 0-group capelin in the Barents Sea by the formula:

$$T = A_s + K \cdot A_d$$

where A_s - area occupied by scattered concentrations of larvae (sq. miles);

A_d - area occupied by dense concentrations;

K - densities correlation coefficient, equal to 10.

A criterion of 1050 larvae per 1 mile haul, i.e. similar to that for Barents Sea capelin, was applied to divide scattered concentrations from dense ones (ANON., 1974).

RESULTS

Positions of fishing stations and results of sampling of capelin larvae and yearlings are shown in Figs. 1 and 2.

Two patches of concentrations with a higher density were found in the surveyed area (Fig. 1): one with a maximum density of 15 thou. larvae per 1 mile haul was distributed in the southern part of Div. 3L with water temperatures of 5-7°C at the depth 50 m (Fig. 3); the other was recorded in adjacent squares of Divs. 3L and 30, the maximum catch here contained 53 thou.larvae per 1 mile haul.

Results of fishing at a daily station in the depth intervals 0-20 m and 40-60 m evidenced that during the day the majority of larvae kept to deeper layers (Fig.4). Control fishing of the three depth intervals did not show any notable differences between catches in the day time and at night.

The total area of larvae occurrence was about 60 thou.sq.miles. Some larvae were surely distributed in the western part of Divs.3L and 30 and were not assessed by the survey. Scattered concentrations of larvae occupied the area of 38.2 thou.sq.miles and dense ones that of 21.6 thou.sq.miles. The formula to calculate the abundance index with these values substituted will be as follows:

$$T = A_s + KA_d = 38.2 + 10 \cdot 21.6 = 254.2$$

Densest concentrations of juvenile capelin (1+) were recorded in southernmost part of the surveyed area and were evidently distributed in bulk in Div.3K and not covered by the survey. A peak catch value there was 29 thou.individuals per 1 mile haul. In contrast to larvae,concentrations formed by juvenile capelin were well recorded by acoustic instruments, Daily movements of fish in this period were more pronounced, therefore, a combined trawl-acoustic method should be applied in the quantitative assessment.

Fig.5 shows the size composition of larvae. Their length varied from 29 mm to 65 mm. The greatest mean length of larvae of 49 mm was recorded in Div.3N.

Length frequency distribution of juvenile capelin included individuals 7.5-11.5 cm long, those with the length of 9-10 cm prevailing.

In contrast to larvae juvenile capelin occurred in waters of the Labrador origin with lower temperatures of 0° to 3°C at 50 m.

DISCUSSION

Results of the trawl survey evidenced that a young fish trawl (trawl with a 5 mm mesh liner in the codend) and sampling technique used in 0-group surveys in the Barents Sea may be successfully applied to estimate the strength of year classes of capelin in the first year of life on the Grand Newfoundland Bank. Later on, when conducting such surveys special work should be done with the use of acoustic instruments aimed at obtaining a criterion to divide scattered concentrations of capelin from dense ones in this area.

If to cover the whole distribution area of juvenile capelin, this method may also be used to estimate the strength of year classes of fish in the second year of life. However, in this period capelin form dense concentrations and are able to avoid fishing gears, therefore, it would be reasonable to apply a trawl-acoustic method to survey fish. These researches are to be part of the total autumn survey assessing industrial capelin concentrations in Divs. 2J, 3K, because in some years juvenile capelin occur in quantity in these areas as well. These researches are feasible, when efforts of two countries are combined - Canada and the USSR.

The densest concentrations of capelin larvae were recorded in two water masses of different origins. A southerly concentration was distributed in warm waters of the Atlantic origin, entering the area of the Grand Newfoundland Bank from south-west, northerly concentration - in warm waters of shallows. Juvenile capelin kept to colder waters of the Labrador origin.

Experimental fishing to study a vertical distribution of larvae during the day showed that the bulk of them was distributed in near bottom layers (40-60 m). This peculiarity should be kept in mind when conducting future researches.

References

ANON., 1974. Report of the Meeting to Consider Young Fish Surveys. ICES C.M. 1974/F:11.

Bakanev V.S., 1981 MS. Results of Soviet investigations on capelin in Northwest Atlantic in 1980. NAFO SCR Doc. 81/II/10: 1-10.

Carscadden J.E., 1977 MS. Observations on larval capelin (Mallotus villosus) in ICNAF Division 3L. ICNAF Res.Doc. 77/16,10 p.

Hodder V.M. and G.H.Winters, 1972. Distribution and size of larval herring and capelin, southern Gulf of St.Lawrence and southwestern Gulf of St. Lawrence and southwestern Newfoundland, November 1969 and 1970. Fish.Res.Bd.Canada, Tech.Rep. No.315, 25 p.

Poletaev V.A., 1979 MS. Investigations on larvae and prerecruits of capelin in the Northwest Atlantic in September 1978, ICNAF Res,Doc. 79/VI/105:1-5.

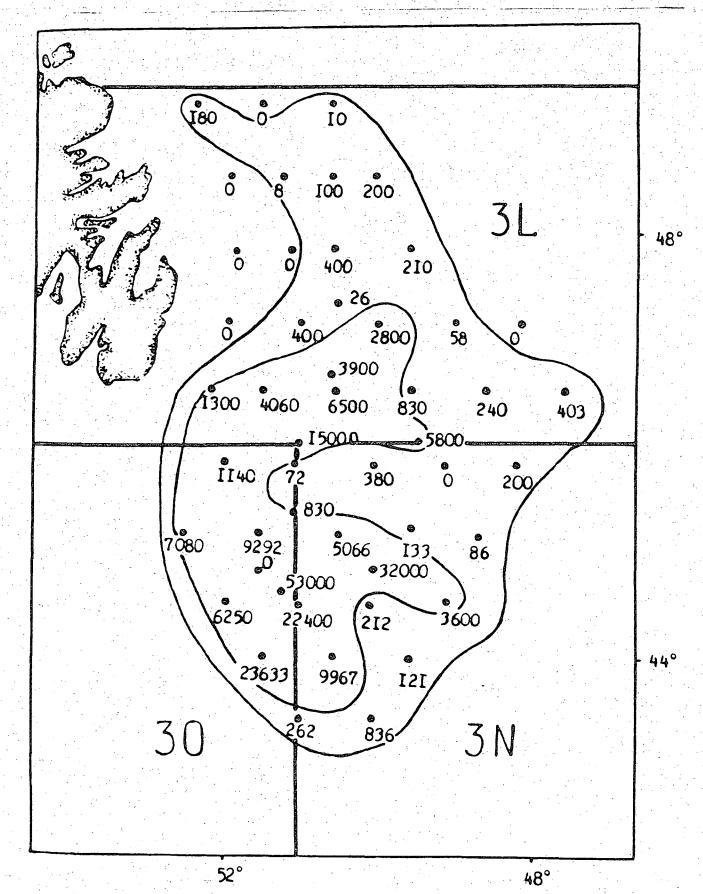

Fig. 1 Positions of fishing stations and number of capelin larvae per 1 mile haul.

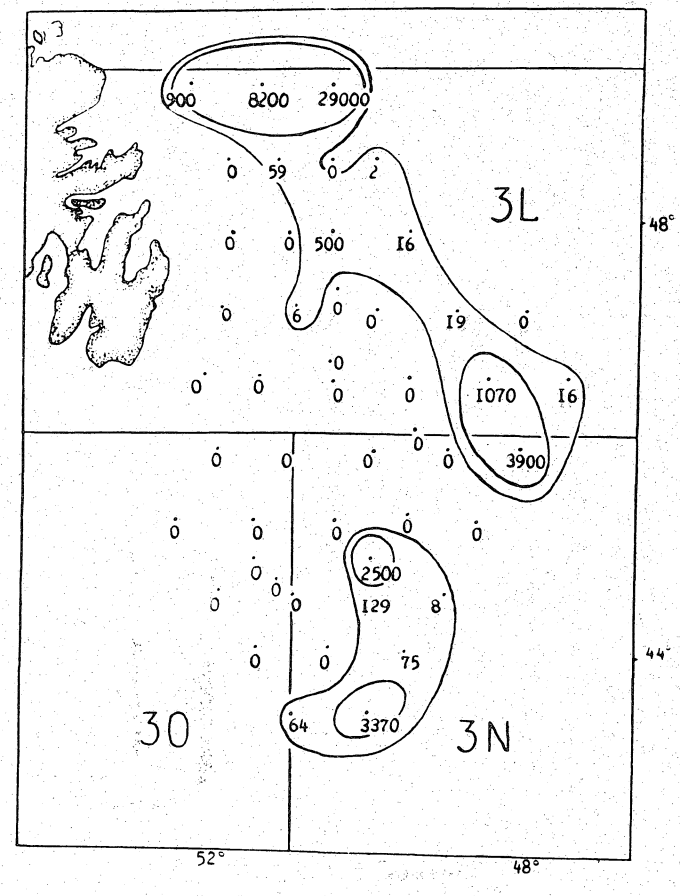

Fig. 2 Number of capelin yearlings per 1 mile haul.

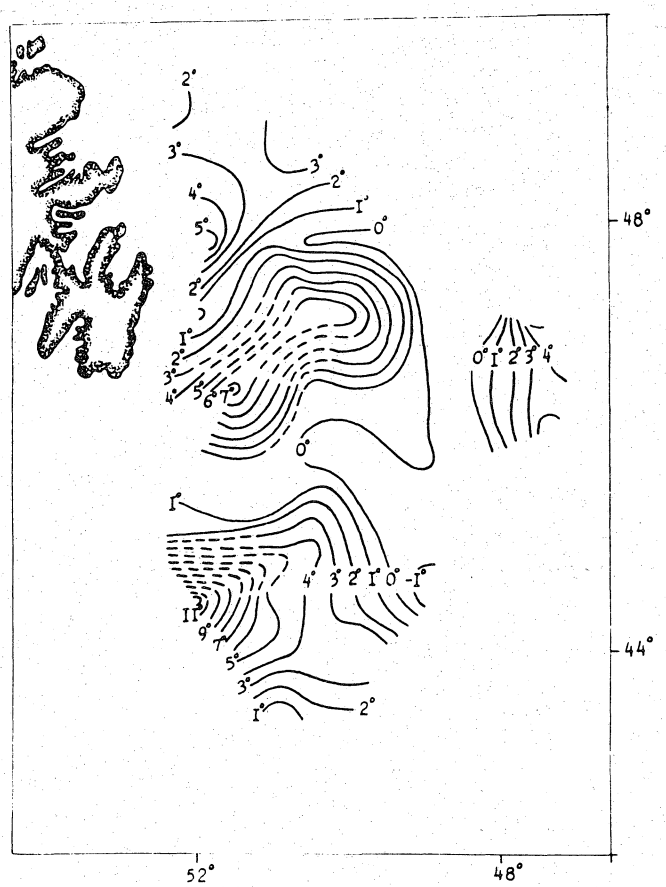

Fig. 3 Water temperatures at 50 m during trawl survey of prerecruits in November 1983.

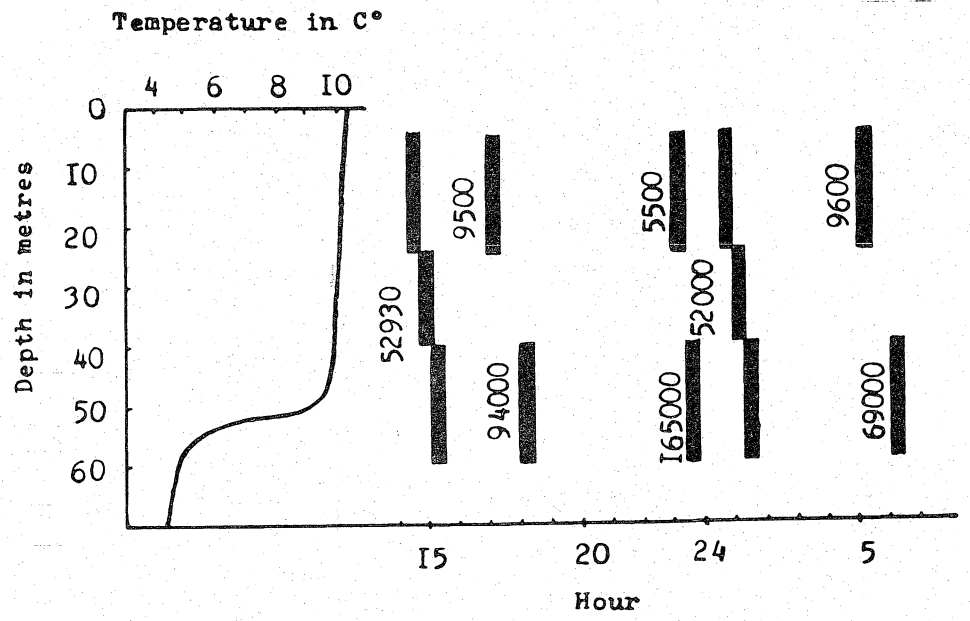

Fig. 4 Number of capelin larvae per 1 mile haul by depth intervals, caught during daily station.

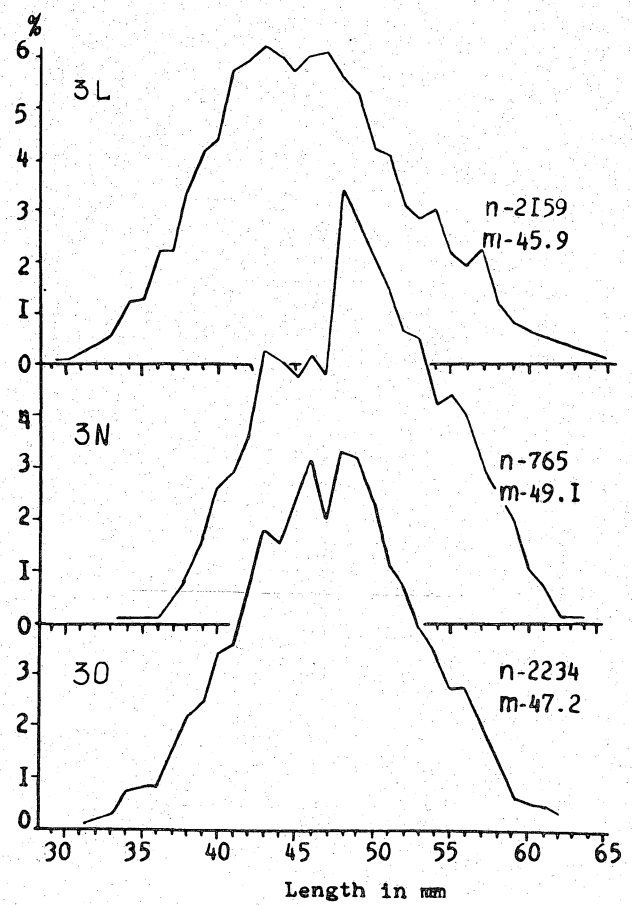

Fig. 5 Size composition of capelin larvae by areas.

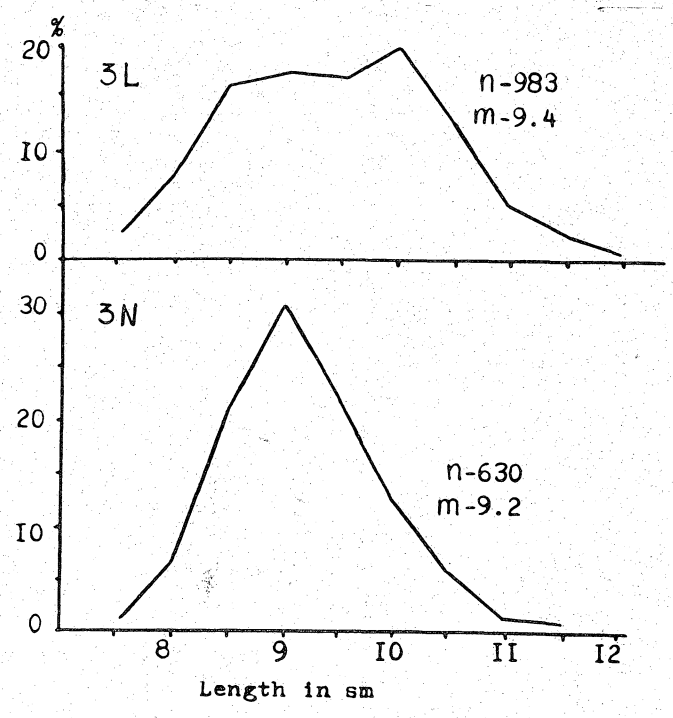

Fig. 6 Size composition of capelin yearlings in Divs. 3LN.