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Investigations of the Georges Bank Atlantic Saury, *Scomberesox saurus* (Walb.), in November-December 1979

by

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Abstract

The Atlantic saury are the abundant pelagic species widely distributed in the Northwest Atlantic. The Soviet investigations showed that the fishery of this species on Georges Bank and adjacent areas is quite realistic. The research activities performed in 1979 have ascertained that in November the saury concentrations showing positive response to artificial light sources were found in the central part of Georges Bank above 30-72 m depths at the temperature 12.0-13.2°C. Over the area of 1 382 sq. miles the saury biomass was 10.3 thous. tons. The density of aggregations is high enough to enable fishing operations.

Introduction

The Atlantic saury are one of the most abundant pelagic fishes found everywhere in the Atlantic waters. From the Soviet investigations carried out in the Northwest Atlantic it appears that in the fall-winter period the saury form commercial aggregations over Georges Bank. The reported annual catches of this species are 4 thous. tons (Azizova, 1973; Zolotova, Feodorova, 1977; Nesterov, 1979).

Materials and Methods

The present paper is based on the materials obtained during the SRTM-1246 PROGNOZ cruise. The observations were made at light

stations. The fishing for saury was conducted with regard for their ability to positively respond to artificial light. Fish concentrations were formed in the light fields produced by the lamps of PKN-1500 type, 1500 kW. The saury were found and counted by means of the searchlight used in the Pacific saury fishery (3 kW). The fishing gears used at light stations were dip nets (5 mm mesh size), a side trap (10 mm mesh size) and drift nets (18.20 mm mesh size).

A total of 700 fish specimens were examined during the investigations and the survey covered the area of 1 382 sq. miles. 108 BT casts and 103 light stations were made. At each station the abundance of fish and their behaviour in the light field were recorded.

The saury counts were made at a maximum possible ship speed within the light beam 5 m wide. This width was determined visually when PKN-1500 lamps were used, and established by fixing the lamp when a searchlight was used. On the sea surface a 5 m wide light patch produced by the searchlight acquired a rectangular shape with district outline. The searchlight beam was drawn nearer the ship hull and lowered at a maximum possible angle so as to provide for counting in a calm zone off the foredeck. Then a distance between the light patch on the sea surface and the observer standing in the wheel-house or on the bridge does not exceed 10-15 m.

When saury were not numerous the counts were made throughout the night in order to gain representative results. When the concentrations were large 5-minute intervals were made every 15, 10 and 5 minutes of counting (with increasing density of aggregations). The data were summed by observation hour. From the observation time (counts per hour) and the distance covered during this time the saury occurence was calculated in specimens per mile.

The data were charted according to adopted occurence scale where the distribution can be depicted using isolines. In cases

when the interpolation presented difficulties or the obtained data indicated a mixed character of the saury distribution the zones of equal occurences were applied to describe the distribution.

The saury biomass was estimated by area of equal occurences between isolines or by their zone square measured using a planimeter. As a numerical occurence value, either a tabular estimate of the geometrical mean selected from the range of a given class is used in the calculations or, given a small number of observations, a calculated value of the geographical mean for the occurence frequency of the specimens grouped in the same class.

The saury biomass was estimated from the formula: $N=kN_1$ where N is the saury stocks, sp., and N_1 is the saury numbers at the surface; k is a conditional coefficient showing the proportion of fish on the surface and taken by the observer as a part of the total. During the November survey the coefficient value was assumed to be 1-5.

To estimate the fish biomass the value of 97.9 g was taken as the mean weight of one specimen.

Results

In November 1979, the survey covered the area between 39°47'-41°00N and 65°13'-71°41'W. Saury were common throughout the area within the surface temperature range of 12.0-16.3° (Fig. 1). No saury were recorded outside the shelf where the water temperature was 19.5°. In November, the fish were associated with the water mass formed as a result of interaction between the Labrador Current and inshore waters. At light stations north of Black Canyon the saury abundance did not exceed three tens of specimens.

In December, the survey was conducted between 39°08'-41°13'N and 65°16'-69°32'W. Over the central part of Georges Bank the highest saury abundance at light stations amounted to thousands of specimens at the temperature of 11.2-11,6°. In other areas

(Fig. 2), with the water temperatures ranging from 10.8 to 21.5°C, either no saury were observed at all or their numbers were as low as twenty or thirty specimens. Greater dispersion and lower abundance of saury can be related to intensive intermixing of the waters of different origin and the resulting drop of temperature.

In the late ten-day period of November a survey of the saury abundance was conducted over the southwest Georges Bank covering the shelf and its slope (Fig. 3). From the observations it was apparent that in the given period saury prevailed over the 30-80 m depths at the water temperatures of 12.3-12.7°C (Fig. 4). Recorded occurence of the fish in this area is 400 specimens per mile within the 5 m wide band (Fig. 3). Further north the saury occurence used to decrease to 10 specimens, and at the temperature below 10.7° no fish was found at all. Further south saury occured individually at temperatures 14.9-15.2°. As is evident from the survey results, the saury biomass in the area of 1 382 sq. miles approximates 10.3 thous. tons. The in situ saury distribution on Georges Bank is not uniform. In November, the fish was scattered over the greater part of the area; they did not form aggregations and occured individually. In separate regions small saury schools were found amounting to several hundred specimens. Besides, saury patches of about several hundred meters in longest dimension were recorded.

In November, the saury length ranged from 28 to 40 cm (33.8 cm mean length), and the weight from 60 to 180 g (97.5 g mean weight). The fish in maturity stages II and III were prevalent in the catches; the condition factor and stomach filling were 2.14 and 1.3 respectively.

In December, the saury length was 29-38 cm (31.1 cm mean length), weight - 66-140 g (78.2 g mean weight). The bulk of the fish were in maturity stages II and III; the mean condition factor and stomach filling were 2.43 and 2.01 respectively. Sex ratio was approximately 1:1.

In November the response of saury to artificial light-sources was mainly positive. Shortly after switching on the lamps, the fish would form a school in the illuminated zone, keeping initially to shady edges of the light field. Then the school would grow more and more dense, the number of fish attracted by the light increasing. The schools of 1.5-2 thous. specimens move in the light zone along the ship side. The fish in a large school that occupied the entire light field kept to the same site manoeuvring so as to stay within the limits of the illuminated spot. At light stations longer than usual vertical density of the school would be 30 m deep representing a perfect target for the echo-sounder. As the light was switched, the school would move to a new illuminated zone. Unlike scattered fish, saury that form small natural schools show a better response to light and better ability to aggregate in the light field.

In December, the response of saury to the light was less pronounced. The numbers of the fish aggregated in the illuminated zone would not exceed several hundred specimens. The school would restlessly move along the ship side leaving the light field from time to time. The school would scatter, and concentrate again in 5-10 minutes, as more fish were attracted by light. The directed movement of the fish towards new light spots was feebly pronounced. The saury concentrations were most intensively formed during new moon, cloudy and foggy weather before moonrise and after moonset. At some light stations dolphins hindered formation of the saury concentrations hunting for the fish.

Discussion

During the research activities conducted in November-December 1979, the program of the Northwest Atlantic saury studies initiated in 1969-1974 was continued. The results of the 1979 cruise indicated that this species annually forms aggregations on Georges Bank in the fall period. The data of visual surveys of saury abundance show that the density of aggregations is high enough to conduct a directed fishery. So, in 1973, the

saury density values were estimated at 1 000–5 000 kg/km^2, and in 1979, these values ranged from 450 to 2 300 kg/km^2. The way the saury behave in light fields allows to suggest that modern fishing gears would be quite effective. The comparison of the saury aggregation density by year showed very close values, this being an indirect index of stability of the saury stock state. In spite of relative accuracy of the survey methods the results are indicative of high saury abundance in the Northwest Atlantic. This allows to be optimistic about the prospective fishing for the Atlantic saury.

References

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Table 1. Results of visual survey of saury abundance on Georges Bank conducted on 21-27 November 1979.

Abundance classes, sp/mile	Occurence values, sp/mi	Square of fish concentrations, sq./miles	Saury counts from the surface sp. 10^3 (N)
1) 0.1 - 5	1.45	650	349
2) 5 - 10	9.0	350	1 167
3) 10 - 15	10.0	50	185
4) 30 - 35	33.28	125	1 542
5) 50 - 60	58.25	105	2 267
6) > 100	420	102	15 756
		1 382	21 066
		$(21 + 105) \cdot 10^6$	
		P_m - 97.9 g	
		Biomass 2.1 + 10.3 thous. tons	

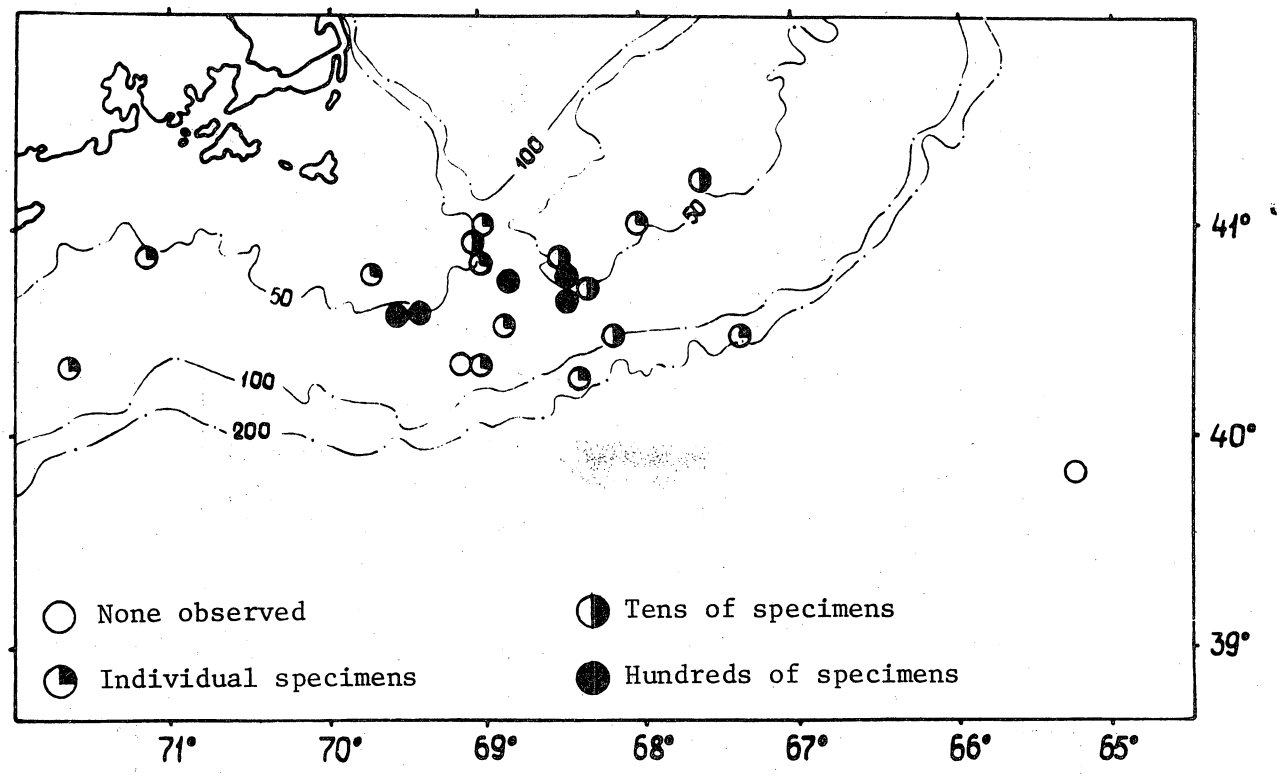

Fig. 1. Quantitative saury distribution at light stations in November 1979.

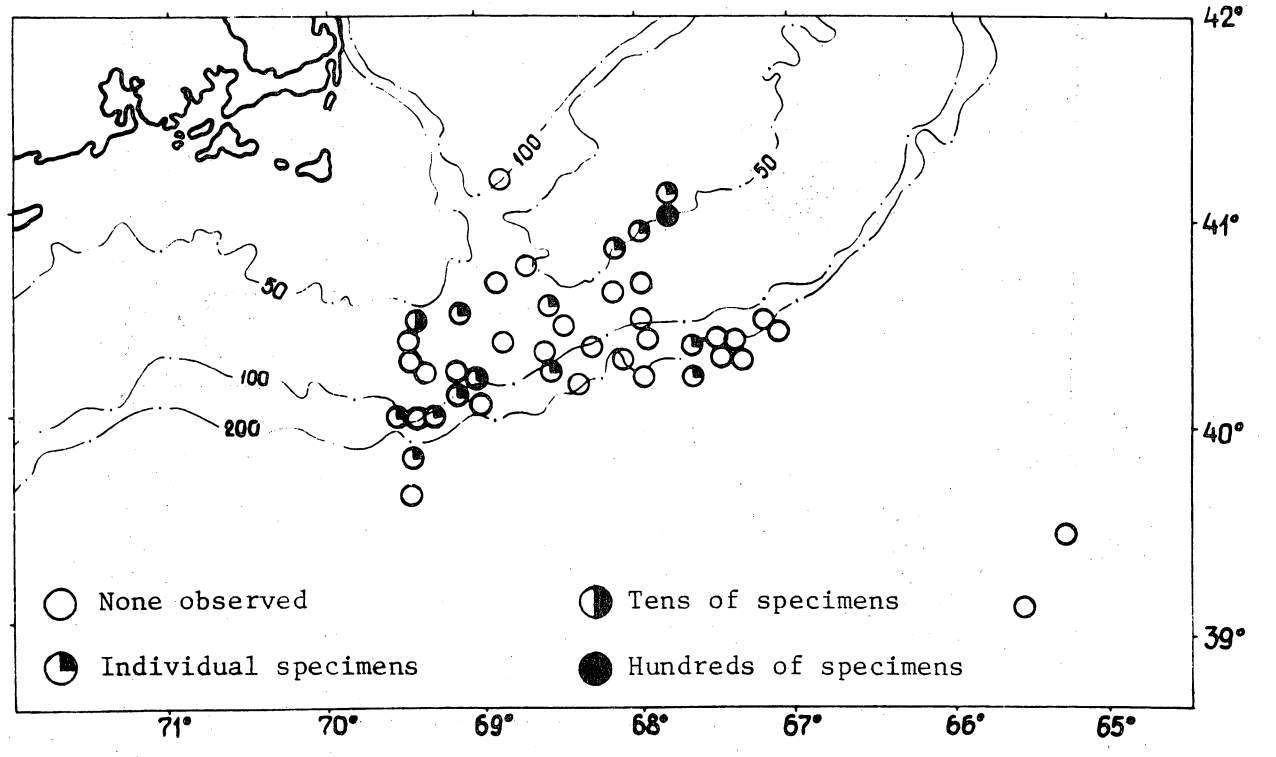

Fig. 2. Quantitative saury distribution at light stations in December 1979.

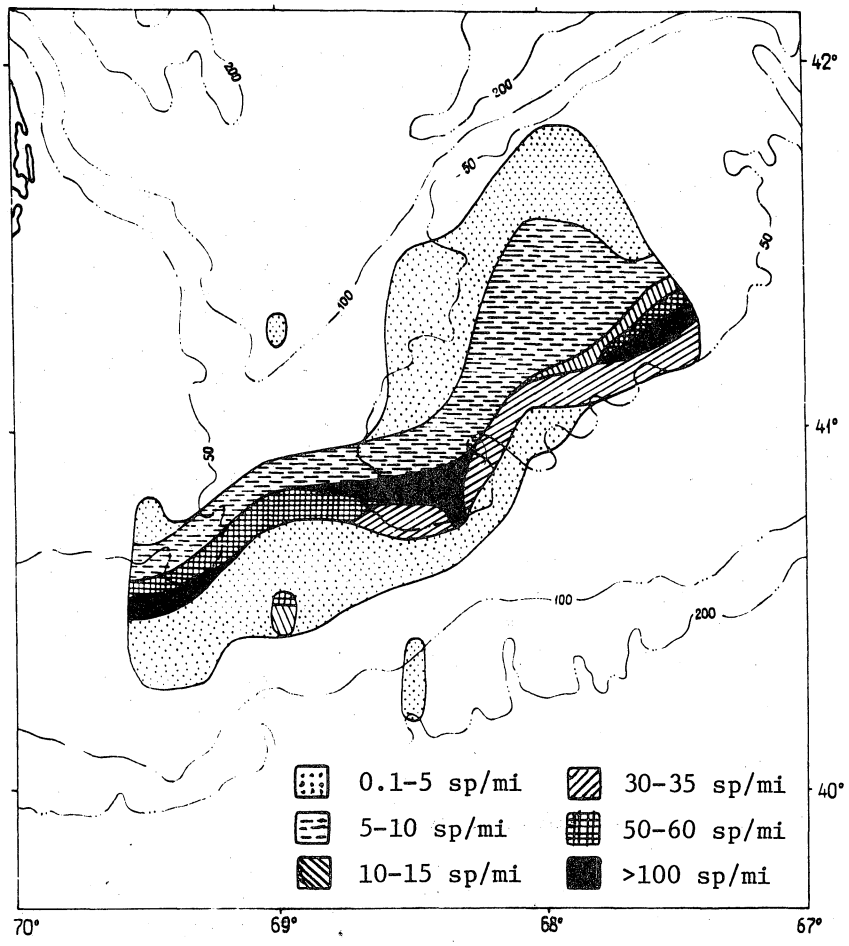

Fig. 3. Quantitative saury distribution on Georges Bank during 21-27 November 1979.

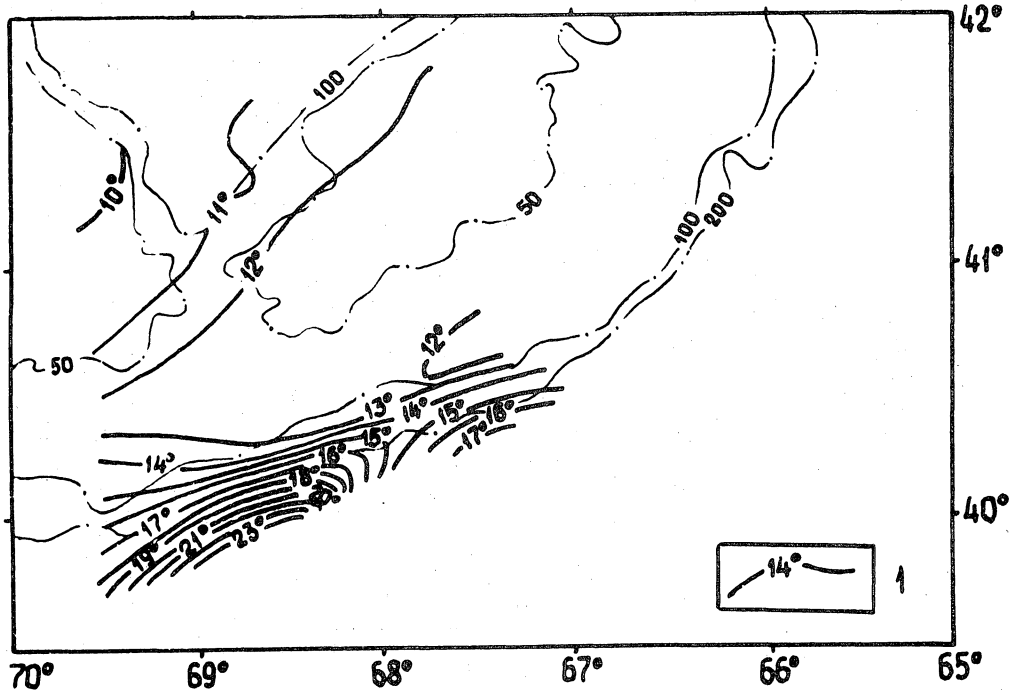

Fig. 4. The surface water temperature on Georges Bank during 21-24 November 1979. Water temperatures are in degrees celsius.