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Abundance and Distribution of O-group Redfish (Sebastes mentella Travin) in the Irminger Sea in 1984

by

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Abstract

In the present report the results of the O-group redfish (Sebastes mentella Travin) survey in the Irminger Sea are given. The trawling survey was carried out from 24 August to 12 September 1984, in the area between 56°30'N to 62°30'N. The hauls of 30-min duration at a towing speed of 3.5 knots were made at 100, 50 and 10 m depths using the IYGPT trawl. The results are indicative of uneven distribution of the young redfish ranging from 28 to 67 mm in length. The main aggregations were recorded northward of 61°N and westward of the Reykjanes Ridge at the water temperatures of 4 to 8°C. The total abundance of the O-group redfish amounts to 6.5×10^8 specimens.

Introduction

The studies of the pelagic larvae of Sebastes from the Eastern Atlantic waters were initiated in 1904, after Schmidt discovered a great number of larvae in May and June 1903 in the Danmark Strait (1904). Later on, Jensen (1922), Taning (1949), Magnússon (1962), Zakharov (1963), Magnússon et al.(1965), Kotthaus (1965) and other investigators published numerous papers dealing with the distribution, abundance and drifting of larval redfish in the Jceland and Greenland waters.

Considerable aggregations of larval redfish found in the Irminger Sea during the investigations carried out by Kotthaus

(1961), Henderson (1962), Magnússon (1968) and other scientists indicated a massive spawning of the redfish in the pelagial of that area.

As these waters can be inhabited by S.viviparus, S.marinus and S.mentella, many attempts have been made to identify the younger stages of these species. First Tåning (1961) succeeded in differentiation between the larvae of S.viviparus and the other redfish species. Later Magnússon J.V. and Magnússon J. (1977) described various developmental stages of the pelagic larvae of S.marinus and S.mentella from the Iceland and Irminger Sea waters based on the analysis of the growth and principal external characteristics. However, since the pelagic S.marinus have never been captured in the open waters of the eastern Irminger Sea above large depths, J.Magnússon (1983) suggested, against the conventional opinion, that S.marinus do not spawn in the above-mentioned area, and that the bulk of the larval aggregations in the Irminger Sea is mainly represented by the larvae of the "oceanic stock" of S.mentella (a term from NAFO SOS Doc. 83/VI/6).

Untill 1982, no directed fishing for the redfish had been conducted in the pelagial of the Irminger Sea. In 1982 the Soviet vessels began commercial fishing for the "oceanic stock" of the redfish outside the 200-mile economic zones of Iceland and Greenland. Simultaneously with the development of the fishery in the Irminger Sea special surveys aimed at studying the areas and dates of spawning, the abundance and distribution of the larvae, their feeding, the oceanographic conditions during the spawning, and at assessment of relative and absolute abundance of the redfish spawning stock were conducted (Noskov, Romanchenko, 1983; Noskov et al., 1984).

In the fall of 1984, a trawling survey of the 0-group redfish was carried out in the Irminger Sea on the SRTM-K-8072 "60 Let VLKSM" which continued the previous investigations. Previously the studies of the distribution pattern, the abundance and growth rate of the redfish, as well as the identification of the young fish of genus Sebastes in the areas of Iceland and Greenland were executed by the Icelandic scientists (Vilhjalmsson and

Friegeirsson, 1976; Magnússon, 1981; Vilhjalmsson and Magnússon, 1981). Usually, these studies were executed within the limits of the economic zones, with some stations occupied in the "open" waters of the Irminger Sea to the south of 60°N.

In the present report the results of the survey concerning the distribution and abundance of 0-group redfish, and the hydrological conditions outside the 200-mile economic zones in August-September 1984 are given.

MATERIALS AND METHODS

The trawling survey of the 0-group redfish was carried out from 24 August to 12 September 1984 on the SRTM-K-8072 "60 Let VLKSM" according to the standard grid of stations (fig. 1), which covered the Irminger Sea area between 56°30'N and 62°30'N. The surveyed square exceeded 66 thous. sq. miles. At each station the hauls were made and the water temperature measured. The hauling was made both during the daytime and at night using the IYGPT trawl with 10 mm mesh in the codend. Stepped hauls were made at 100, 50 and 10 m depths. 30-min hauls were made at the towing speed of 3.5 knots. The depth recorder "IGEK" was used to control the required depth. BT casts were made in the 0-200 m layer. Each catch was analysed for the total number of the 0-group redfish, and 200 sp. at most were measured to obtain the standard length. The total abundance of the 0-group fish was derived from the formula:

$$N = \frac{Q \cdot \bar{x}}{K \cdot q} \qquad (1)$$

where N is the total abundance of the 0-group redfish;

Q is the surveyed area, sq. mi.;

$\bar{x}$ is the mean number of 0-group fish per hauling;

q is the square hauled with the trawl (0.0104 sq.mi.);

K is the catchability coefficient (conditionally taken as 1).

HYDROLOGICAL CONDITIONS

In August-September 1984 the interaction of the water masses of the Irminger current and relatively cold waters of the eastern Greenland was observed in the investigation area. The interaction zone stretched along the western slope of the Reykjanes Ridge and

was most clearly pronounced at the intermediate depths (100 m and deeper) (figs. 2, 3 and 4). In the eastern part of the area the advection of the warm waters (7-11°C) of the North Atlantic water massive was recorded. Those inflows could be observed in the upper 50 m layer along the Reykjanes Ridge to its western slopes (figs. 2 and 3). The outflow of the cold water masses with the temperature of about 4°C was observed on the west. The inflow of the cold waters intensified with depth (above 100-150 m) (fig.4). In August-September 1984 the zone of seasonal thermocline was recorded in the 50-75 m layer between 62°30'N and 56°30'N and in the 50-100 m layer between 59°N and 56°30'N.

SIZE COMPOSITION OF 0-GROUP REDFISH

In August-September 1984 considerable differences were revealed between the sizes of the 0-group redfish. In the catches the 0-group redfish were represented by the specimens with the standard length ranging from 28 mm (Station 54, 59°00N,32°58'W) to 67 mm (Station 82, 57°00N, 35°59'W). The mean length was 46.9 mm (fig. 5). The mean length of the 0-group redfish increased from north to south (fig. 6). The smallest specimens were primarily from the area northward of 60°N (mean length: 33 to 50 mm) and above the Reykjanes Ridge (mean length: 38 to 40 mm). The young redfish were larger (mean length: 41 to 59 mm) to the south of 60°N.

As reported by Vilhjalmsson and Magnússon (1981), the mean length of the 0-group redfish from the Irminger Sea was 41.0 mm in August 1981, which is markedly below that recorded in August-September 1984. This difference can be evidently attributed to the fact that the survey carried out in 1984 was more extensive in time (till 12 September) and space (to 56°30'N).

DISTRIBUTION AND ABUNDANCE OF 0-GROUP REDFISH

The distribution of the Irminger Sea 0-group redfish is uneven. The highest frequency of occurrence observed was westward of the frontal zone. Relatively dense aggregations were recorded in the area to the north of 61°N (fig. 7) where the water temperatures ranged from 5 to 8°C (at 50 m depth). The number of

the youngs in the catches fluctuated from individual specimens to 7 942 sp. per hauling, and seldom (7 Stations) exceeded 50 sp. per hauling (fig. 7). Above the Reykjanes Ridge the young redfish were caught only at two Stations. The abundance of the 0-group redfish reduced from north to south. The density of the youngs was highest at the Stations having the following positions: 62°29'N -31°54'W (531 sp.) and 62°N-31°W (7 942 sp.). The total abundance of the 0-group redfish amounted to 6.5×10^8 sp. in August-September 1984.

In August-September 1984 there existed a correlation between the distribution of the youngs and the system of currents in the Irminger Sea (fig. 8) (Hensen and Herman, NAFO SOS Doc. 83/VI/6). Directed surveys conducted during the spawning periods of 1982 and 1983 showed that the main concentrations of the larvae had kept to 55°-57°N above the Reykjanes Ridge (fig. 9) (Noskov et al., 1984). As is evident from the data contained in the first report of the joint NAFO/ICES Study Group on the redfish stocks (NAFO SOS Doc. 83/VI/6), the velocity of the current originating off the southern Greenland and reaching Iceland approximates 8 mi. per day. Similar data on the drifting velocity of the youngs (about 10 mi. per day) were obtained by Zakharov and Tchekhova in 1972 (from Marty, 1980). If the current velocity is assumed to be 10 mi. per day on average, the extent of the passive migration of the larval and young redfish from June to August constitutes over 600 miles. The absence of significant aggregations of the young redfish above the Reykjanes Ridge, and the increase of the 0-group abundance in the northern part of the survey area are indicative of the fact that the grown larvae and fry of S.mentella are being drifted from the spawning grounds in the north-western direction to the Western Iceland by the waters of the Irminger current .

SUMMARY

In August-September 1984, the 0-group redfish was characterized by uneven distribution in the open part of the Irminger Sea. The young redfish were most frequently observed westward of the frontal zone. The 0-group was actually absent above the Reykjanes

Ridge. Most dense aggregations were observed to the north of 61°N, with the aggregation density being markedly reduced southwards. The catches contained the specimens with the standard length of the body ranging from 28 to 67 mm, 47 mm on average. The smallest specimens found were from the areas with a high redfish density, and the mean length increased from north to south. The total abundance of the 0-group redfish constituted 6.5 x 10^8 sp. in 1984.

The analysis of the data on the size and age composition and the rate of maturation of the redfish from various regions off Iceland and East and West Greenland, as well as of the data on the larval and young redfish drift against the system of currents makes it possible to suggest the existence of a single stock of S.mentella, which spawn in the open part of the Irminger Sea. The young redfish drift to the area of Iceland, then along the East and West Greenland and, probably, to Labrador. On attainment of sexual maturity, S.mentella migrate to the central part of the Irminger Sea for spawning.

The final solution of the question on identification of the redfish from the above-mentioned areas can be achieved provided that a more thorough study of the distribution of the young S.mentella is initiated. It would have been desirable to begin such a study in August in the Irminger Sea moving to West Iceland, East and West Greenland and, probably, to Labrador.

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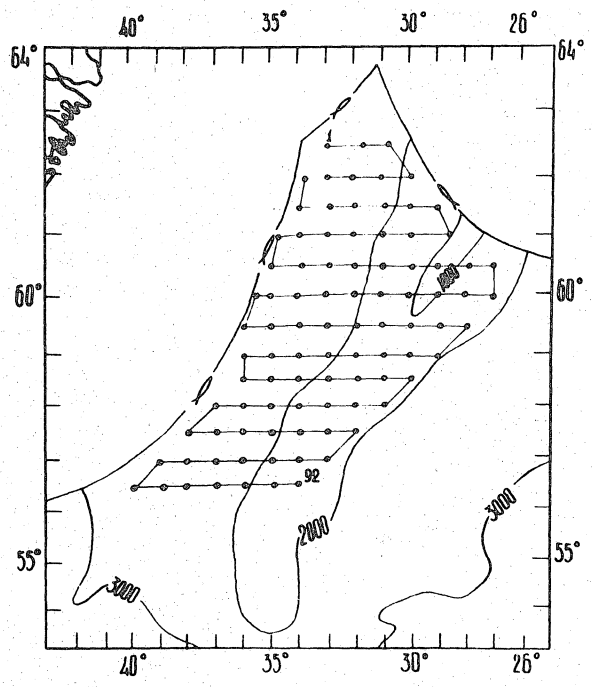

Fig. 1. The area of 0-group Sebastes mentella survey in the Irminger Sea in August-September 1984.

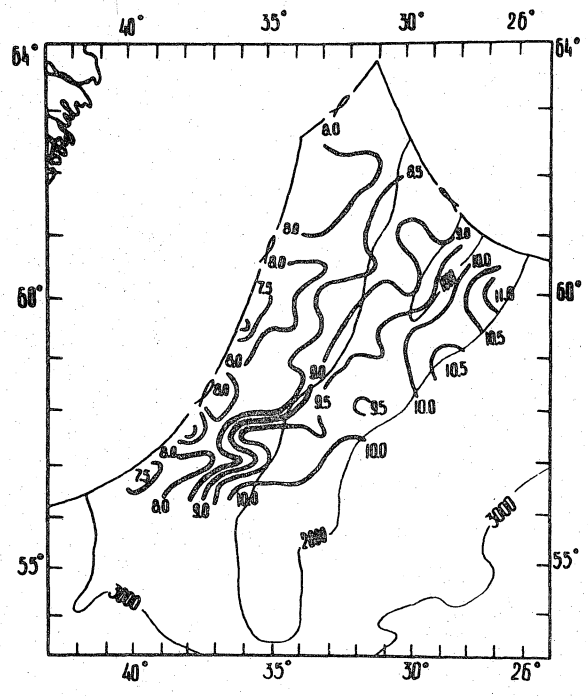

Fig. 2. Water temperature at 0 m, August-September 1984.

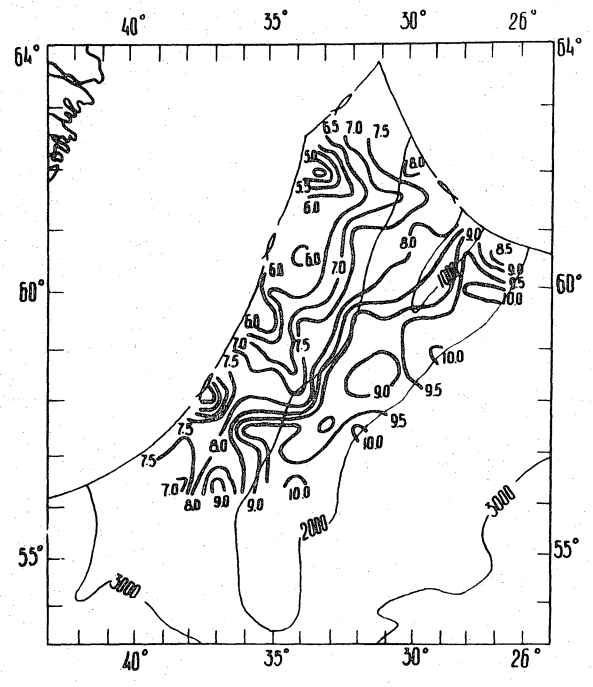

Fig. 3. Water temperature at 50 m depth, August-September 1984.

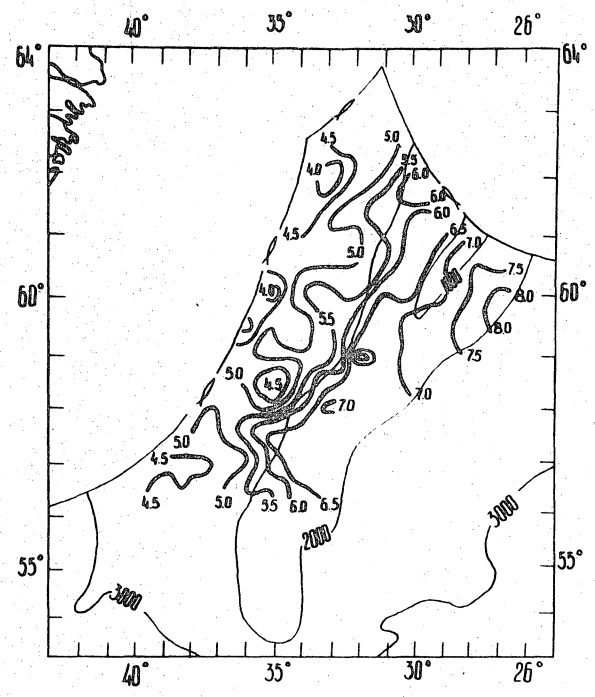

Fig. 4. Water temperature at 100 m depth, August-September 1984.

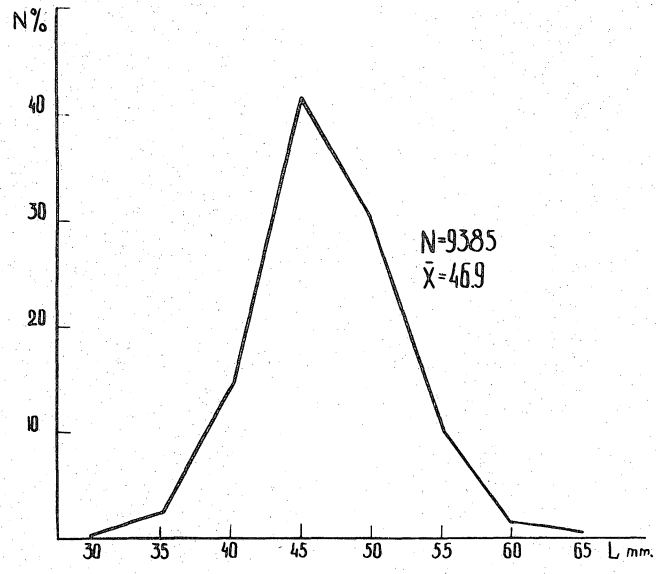

Fig. 5. Length of 0-group Sebastes mentella from the Irminger Sea in August-September 1984.

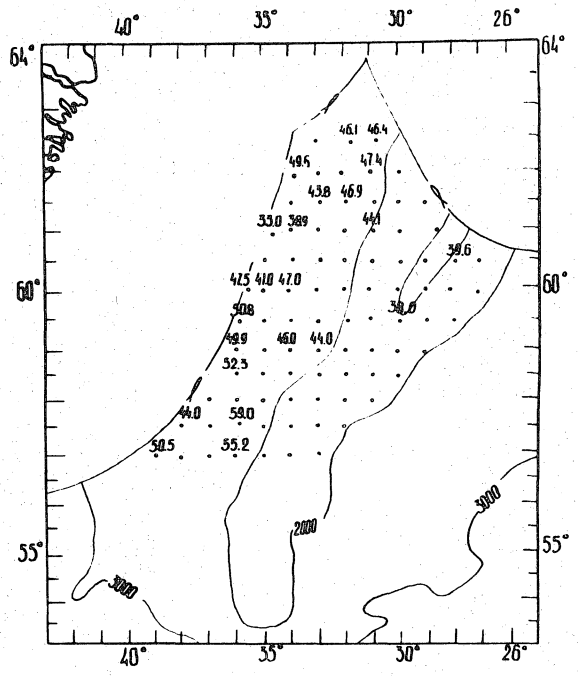

Fig. 6. Mean length of 0-group Sebastes mentella from the Irminger Sea in 1984.

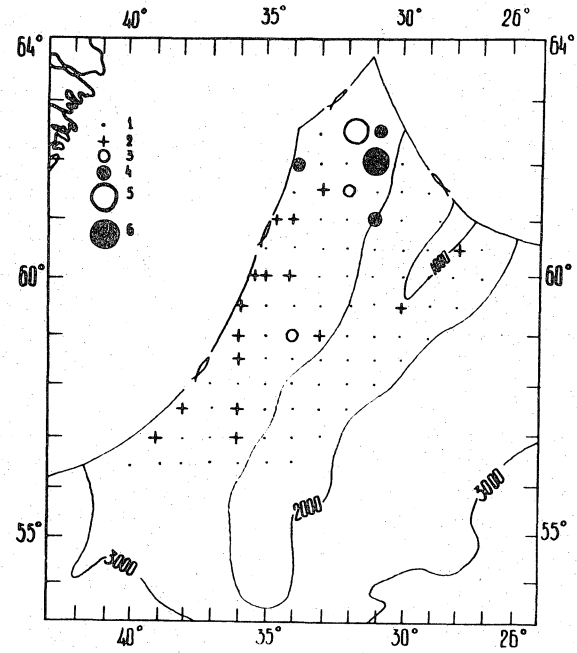

Fig. 7. Distribution and abundance of 0-group Sebastes mentella in the Irminger Sea in August-September 1984.

1-0	4-101-500
2-1-50	5-501-1000
3-51-100	6-1001-7942 sp. per hauling

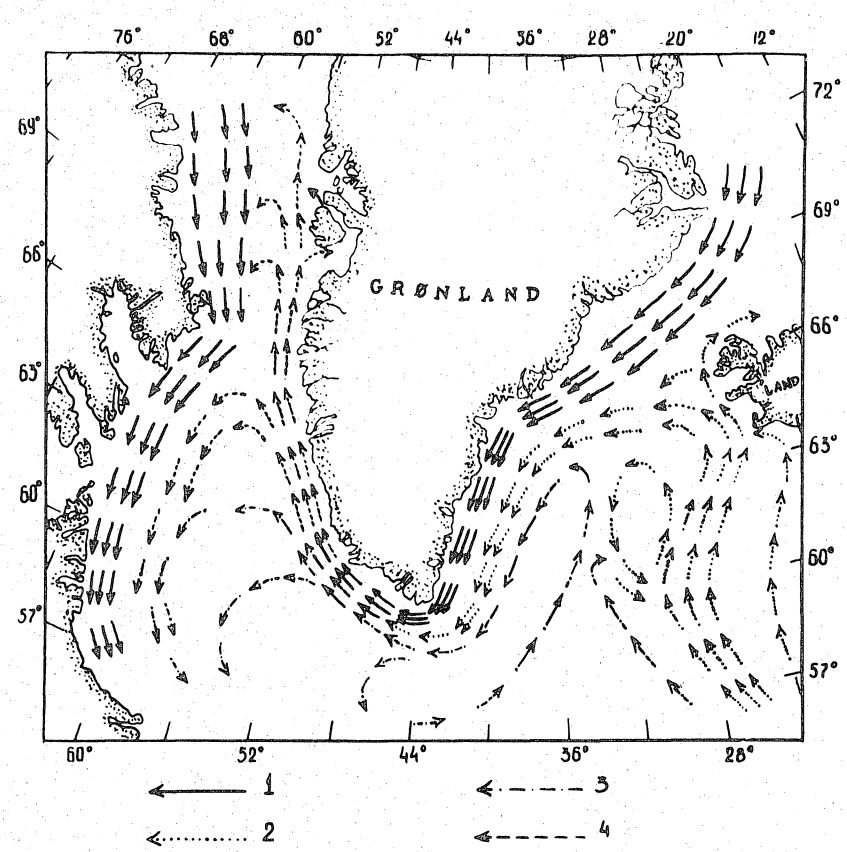

Fig. 8. Surface currents in the Greenland waters (from Hensen and Herman):

1 - Polar current

2 - Irminger current

3 - Subarctic water masses

4 - West-Greenland current

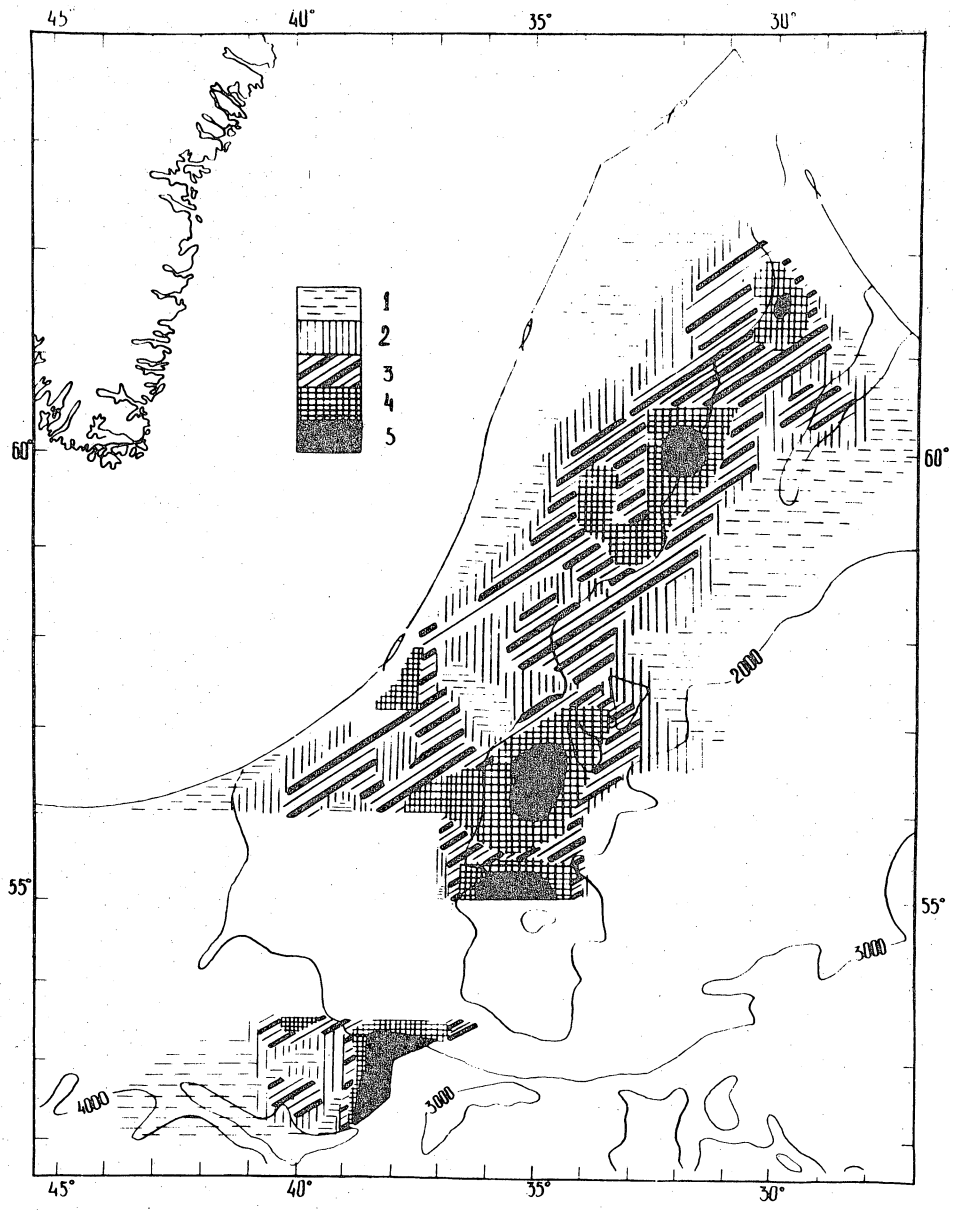

Fig. 9. Distribution and abundance of larval Sebastes mentella in spring 1982.

1-10	4-51-100
2-11-25	5-101 and more
3-26-50	sp. under m^2