

INSTITUTE OF MARINE RESEARCH, BERGEN

CRUISE REPORT

VESSEL: G.O.SARS
 DEPARTURE: Kristiansund 25. July 1989
 ARRIVAL: Tromsø, 20. August
 AREA: The Norwegian Sea
 PURPOSE: Investigations in The Norwegian Sea
 Investigations on capelin in the area Jan
 Mayen - Iceland - Greenland.
 Hydrography. Sections Svinøy - NW and
 Gimsøy - NW.
 CO₂-analysis of sea water.

INTRODUCTION

Fig. 1 shows cruise tracks and stations. The cruise started with the section Svinøy-NW, and then the vessel continued north, roughly along the 0° meridian, then west along 71°00'N towards Jan Mayen. The area between 71°00'N and 68°30'N was covered with 30 nautical miles distance between the cruise tracks, from the ice edge in the west until we reached relatively warm water in the east. The vessel returned east along 67°30'N until 05°00'E, then NNE to the outermost station of the Gimsøy section, and then in to the coast along the section.

The last six days of the cruise were spent on herring investigations in the area Vesterålen-Lofoten. The tracks for this last part of the cruise are shown in Fig. 2.

The following settings were used for the echo sounder and integration system:

Echo sounder:	EK 400/38B
Transducer:	4.5 degrees, ceramic
Transmitter effect:	4440 kw
Receiver gain	65.2 dB (20 log R - 20 dB)
Bandwidth	3.3 khz
Pulse length	1.0 ms
Source level	
+ voltage response	147.3 dB
Instrument constant	0.64
Depth range	0-250 and 250-500 m
Integration	Nord-10 computer

The instrument constant refers to calibration on a standard copper ball 3. August 1989.

The integrator values are averages over 5 nautical miles. Based on catches from the trawl stations and the characteristics of the paper recordings, integrator values were assigned to the categories "capelin", "blue whiting", "herring", "bottom mix" and "plankton". Sonar was used periodically during the cruise. For pelagic trawling, a capelin trawl of 16 x 16 fathoms ("Harstad trawl") with an inner net of 3.5 mm mesh size was used. During the passage from Iceland to Norway a "firkløver" trawl with an opening somewhat smaller than the capelin trawl, but with the same mesh dimension, was used. Trawling was done to identify registrations and to supply samples.

Hydrographical stations were taken to 1000 m. or to the bottom, in case of shallower waters. Several deep stations were taken down to 2500 m. Water for CO₂-analysis was sampled at 4 stations.

HYDROGRAPHY

In Fig. 3 is shown temperature in a section along 71°00'N between 0° and the ice edge at 14°00'W. Compared to previous years, this section shows relatively high temperatures in the surface layer down to about 100 m depth. This is because the cold water from the East Greenland Current had not spread eastwards into the Jan Mayen Current, so that water masses of temperatures below 0° C in the upper layers had a comparatively low volume. Underneath the cold arctic water in the upper layers, the East Greenland Current carries somewhat warmer water (intermediate water). This water too had a low volume and was relatively cold, up to about 0.7° C.

Fig. 4 shows the temperature distribution in a section along 68°00'N. Here as well the water from the East Greenland Current had little occurrence towards the east. Especially the relatively warm intermediate water had little volume..

Fig. 5. shows the temperature distribution at the surface. Although the ice edge was found far east, the ice free area did not show very low temperatures at the surface.

Fig. 6 shows the temperature distribution at 50 m depth. The map shows relatively high temperatures in the eastern part. This is due to a westerly distribution of water from the Norwegian Sea. The temperature distribution indicates little transport of water from the East Greenland Current to the Jan Mayen current and the East Iceland current. Compared to 1986, when there were much capelin in the area, there was a significantly reduced distribution of intermediate water warmer than 0° C.

CAPELIN

Capelin was found over a small area around 68°30' - 69°00'N and 13° - 14°W (Fig. 7). It was also in this area that Norwegian and Faeroese purse seiners were fishing at the time. The capelin was found in small schools, at depths of about 40 to 300 meters. The general impression was that only small quantities of capelin were present in the area. Length frequencies and age distribution for capelin are given in Fig. 8.

BLUE WHITING

Blue whiting was recorded along the cruise lines in the Norwegian Sea, confined in the east by the continental slope. To the west, the registrations reached 03 00'W at 71°00'N and 07°00'W at 67°30'N. The blue whiting was recorded in a scattering layer, with typical integrator values in the range 20 - 100. It was difficult to get samples - the "Harstad" trawl as well as the "Firkløver" trawl was tried - but only occasionally did we get more than 20 specimens. Length frequencies and age distribution are given in Fig. 9.

HERRING

Herring was not found along the cruise lines in the Norwegian Sea. Trawling was done frequently in the upper 20 m in order to catch herring that were too close to the surface to be recorded by the echo sounder, but no herring were caught.

The distribution of herring in the Vesterålen-Lofoten area is shown in Fig. 10. In Vestfjorden the herring was found in a dense scattering layer at 200 - 250 m during daytime (Fig. 11), 10-100 m above the bottom. It lifted during the night, but only seldom came up to 100 m. (Fig. 12). Sometimes it could also be found in dense schools, but at the same depths. The temperature at 200-250 m depth was around 7°C, and at the surface around 14°C. Considerable quantities of fish were found just below the herring recordings - mostly saithe, according to our trawl samples.

On the western side of Lofoten, herring was recorded in schools in the uppermost 100 m during the night (Fig.13), and during the day in schools or a dense scattering layer near the bottom, down to about 200 m. In this area the temperature was 7-8°C at 200 m depth, and variable 10-14°C at the surface.

In the entire area, the herring had a uniform size: 31.0 to 33.5 cm, and samples showed that about 90 % were from the 1983 year class. The exception was a sample from position 68°14'N, 12°14'E. In this sample 50% of the specimens were above 36.0 cm.

An estimate has been made of the number and biomass of herring in the area, based upon integrator values and trawl samples. The result is shown in Table 1. Length frequencies and age distribution for the herring is shown in Fig. 14.

Table 1. Acoustic estimate of herring based on data from "G.O.Sars"
 14-20 August 1989 in the area Vestfjorden-Røstbanken-Vesterålen.
 (TS = $20.0 \cdot \log L - 71.9$)

Age	1	2	3	4	5	6	7
Number (millions)	9	17	9	221	133	3923	36
Weight (1000 tonnes)	1	4	1	65	41	1322	14
Age	8	9	10	11	12	13	14
Number (millions)	0	0	22	0	15	9	1
Weight (1000 tonnes)	0	0	10	0	7	4	1

During the daily scrutinizing of integrator values and echogrammes, it was relatively simple to separate herring echoes from those of other species and from the bottom. Due to the recording conditions - dense schools and recordings at large depths - it is assumed that the integrator values were too low, and that the estimate is an underestimate. In addition some herring was reported from fjords, that were not covered by our cruise. The present estimate must therefore be considered a minimum estimate for the herring stock in the area.

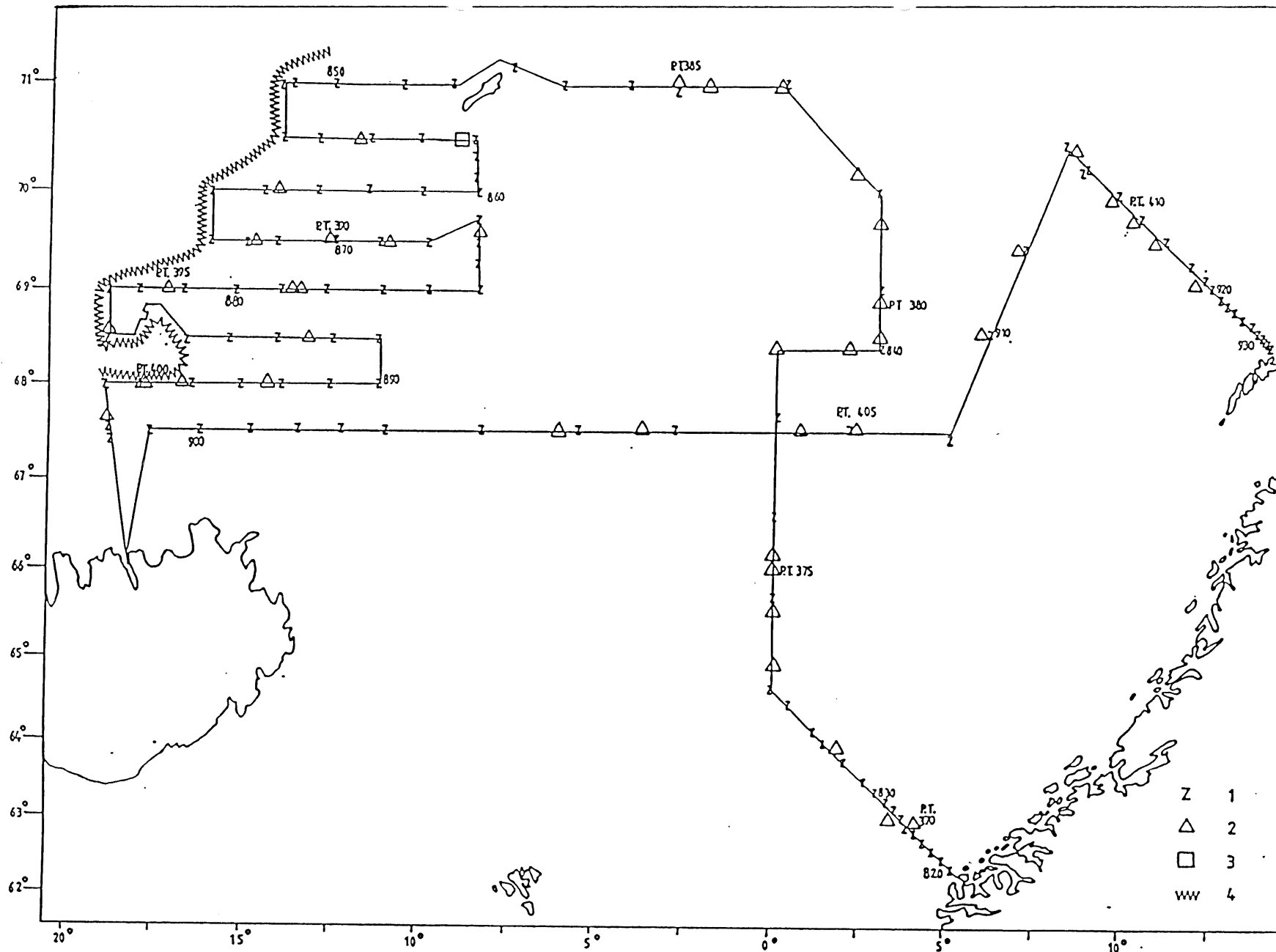


Figure 1. "G.O.Sars" 25 July - 14 August 1989. Survey tracks and stations. 1) CTD-sonde, 2) pelagic trawl station, 3) bottom trawl station, 4) ice edge.

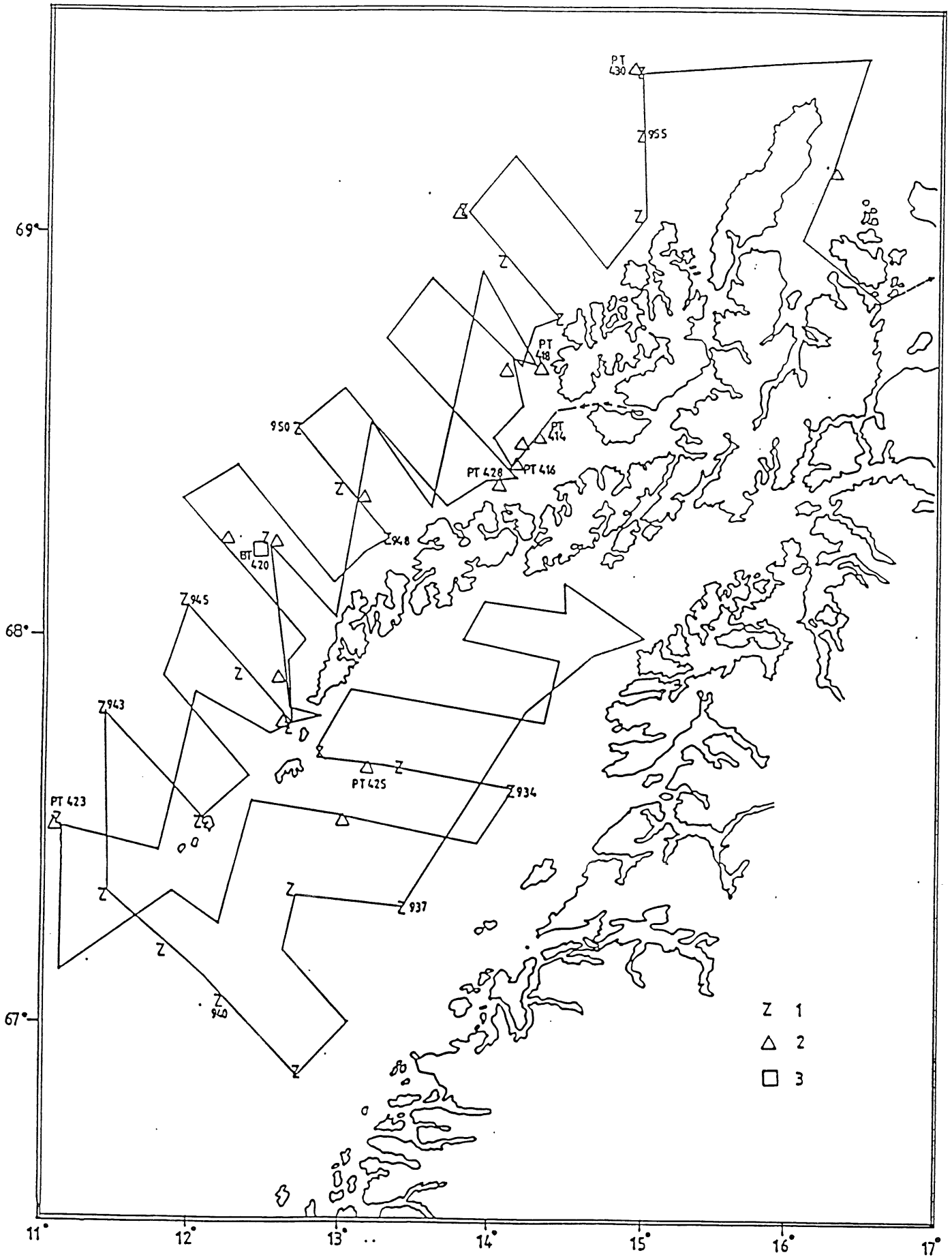


Figure 2. "G.O.Sars" 14 - 20 August 1989. Survey tracks and stations.
 1) CTD-sonde, 2) pelagic trawl station, 3) bottom trawl station.

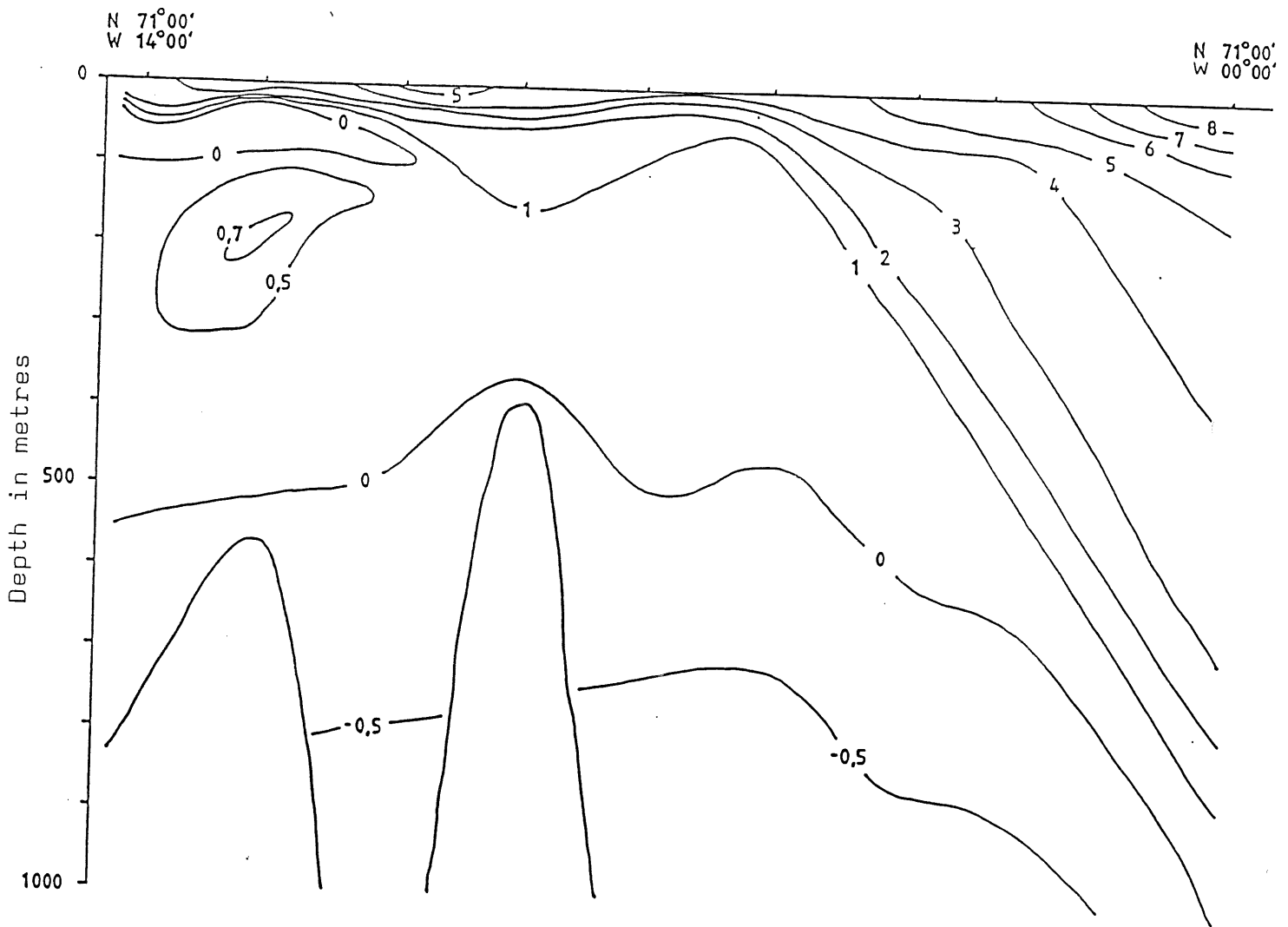


Figure 3. "G.O.Sars" 25 July - 14 August 1989. Temperatures ($^{\circ}\text{C}$) in a section along $71^{\circ}00'\text{N}$.

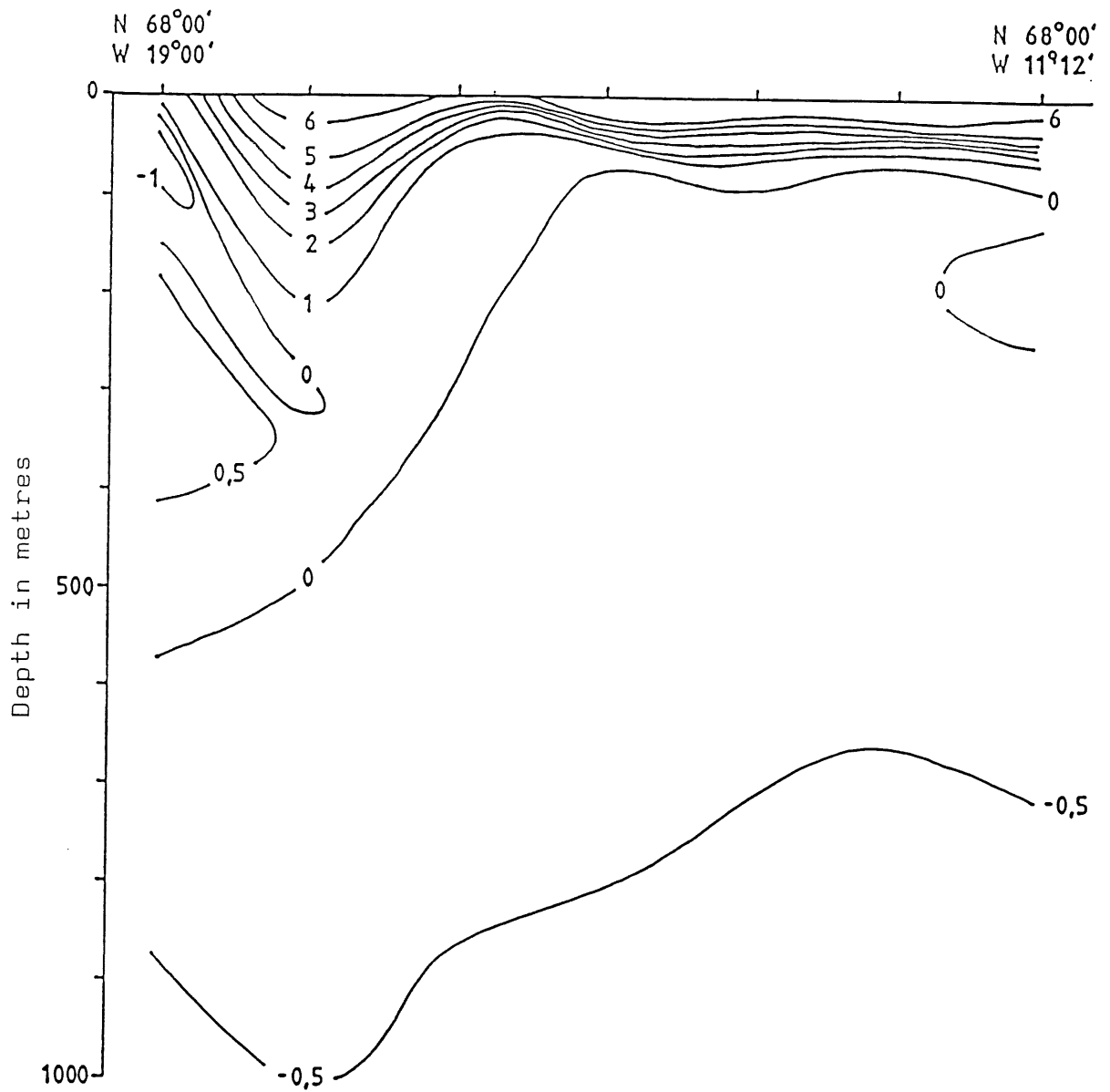


Figure 4. "G.O.Sars" 25 July - 14 August 1989. Temperatures ($^{\circ}\text{C}$) in a section along $68^{\circ}00'\text{N}$.

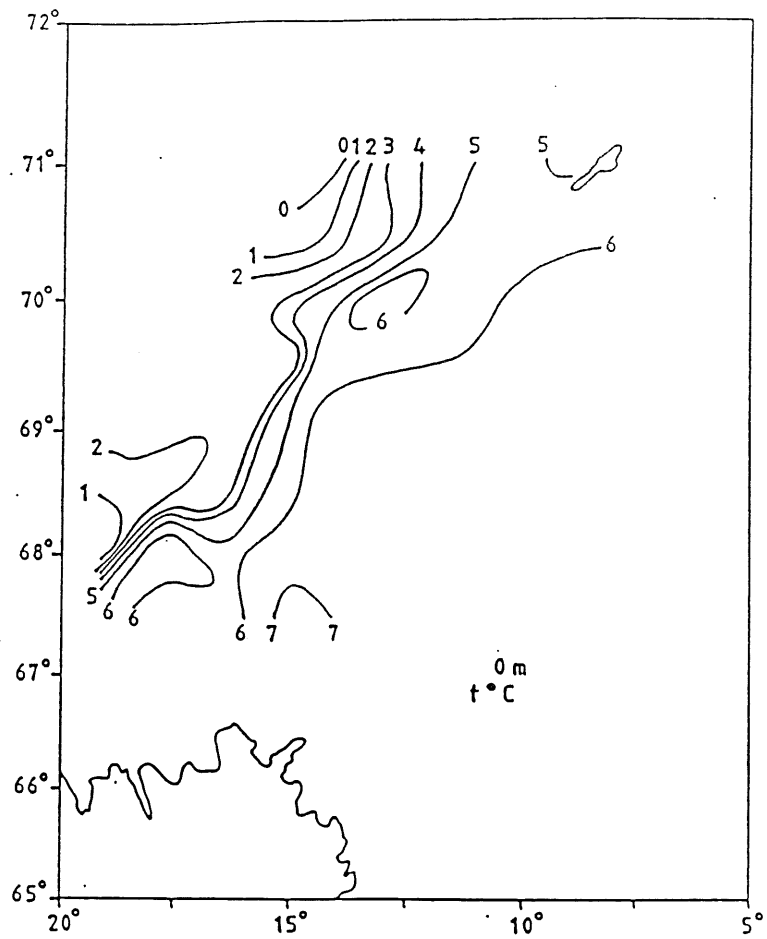


Figure 5. "G.O.Sars" 25 July - 14 August 1989. Temperatures ($^{\circ}\text{C}$) at the surface.

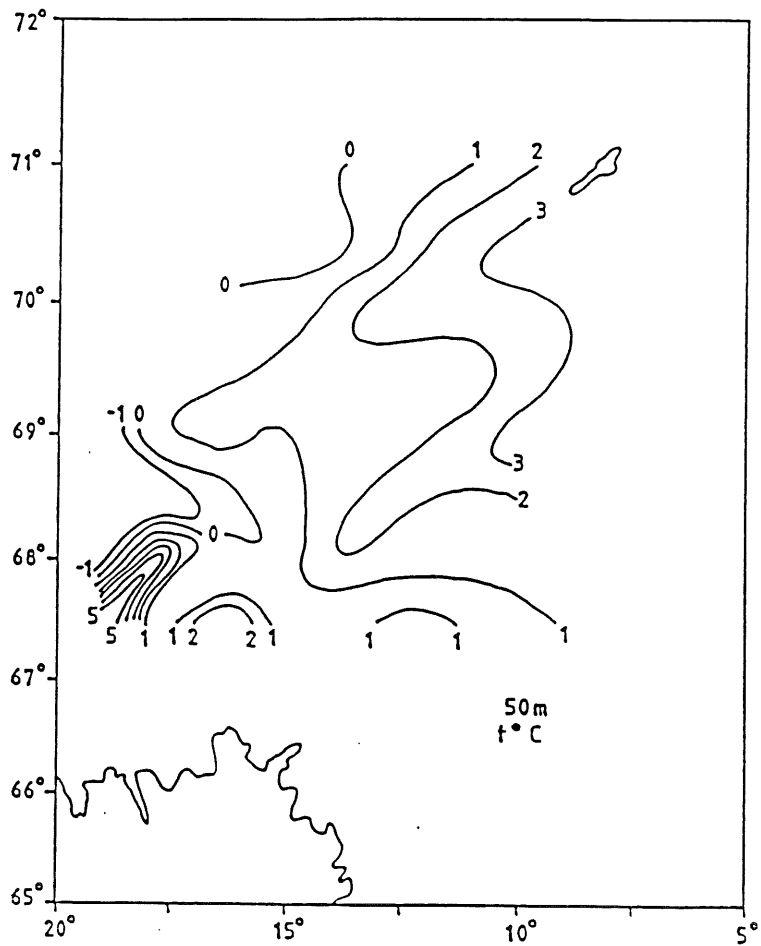


Figure 6. "G.O.Sars" 25 July - 14 August 1989. Temperatures ($^{\circ}\text{C}$) at 50 m.

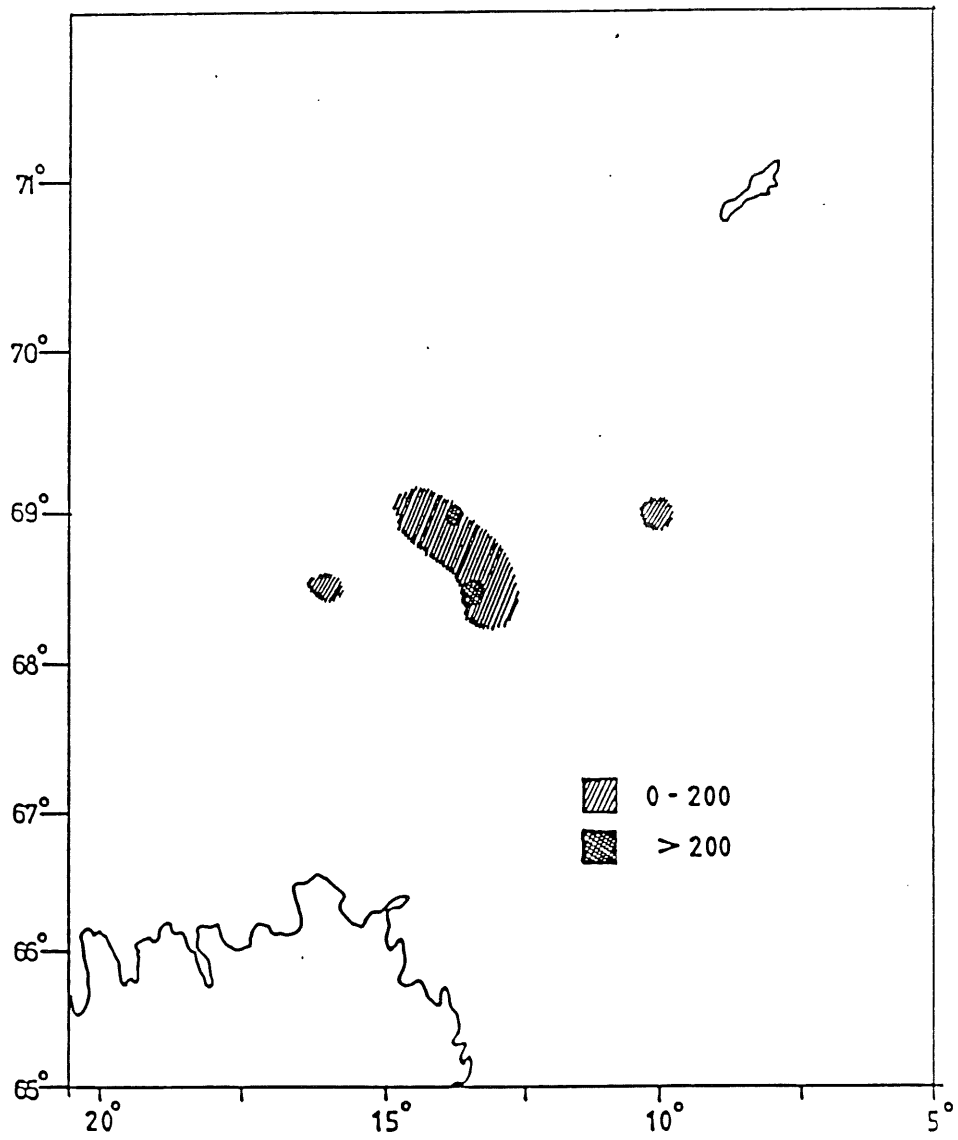


Figure 7. "G.O.Sars" 25 July - 14 August 1989. Distribution of capelin.

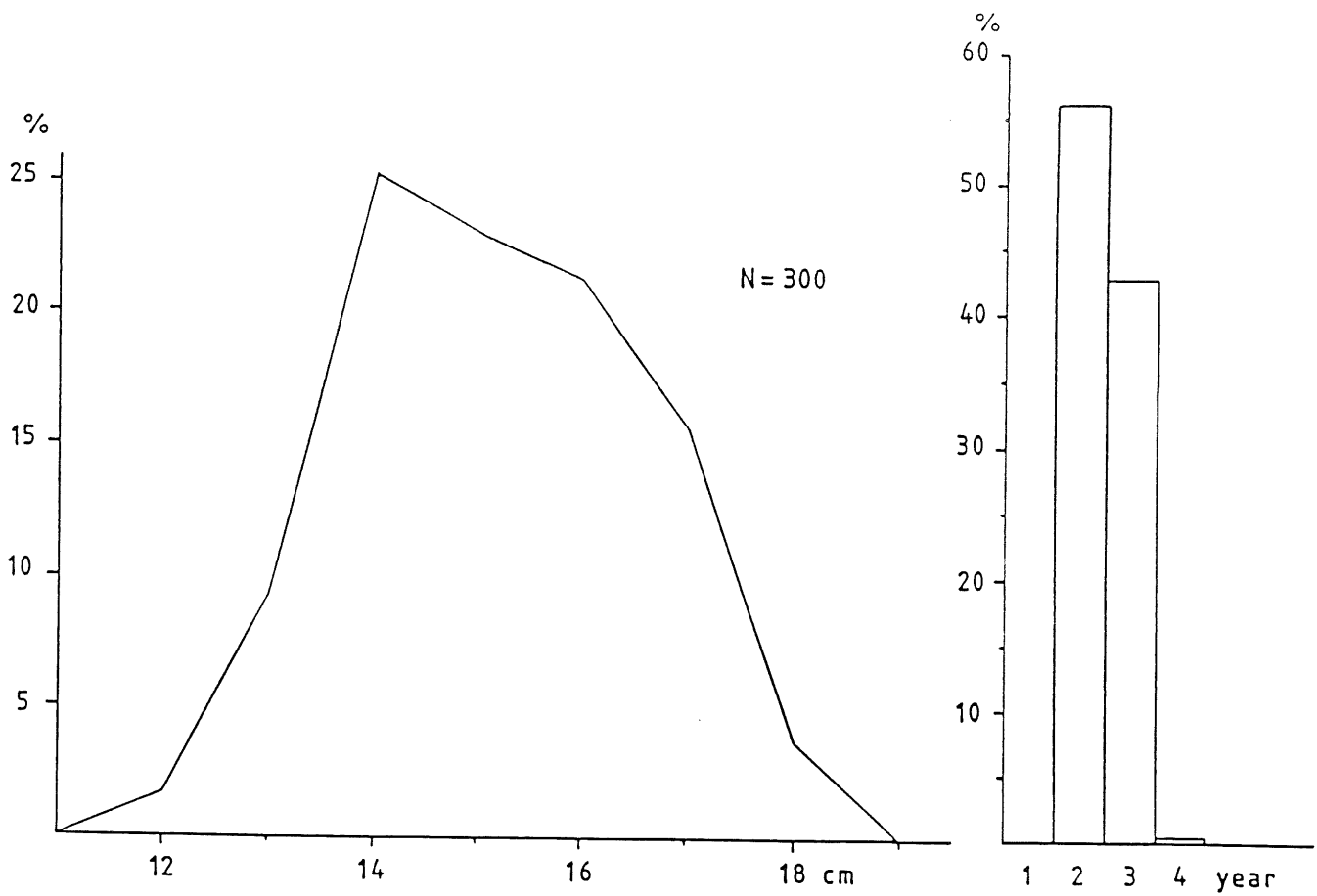


Figure 8. "G.O.Sars" 25 July - 14 August 1989. Length frequencies and age distribution of capelin.

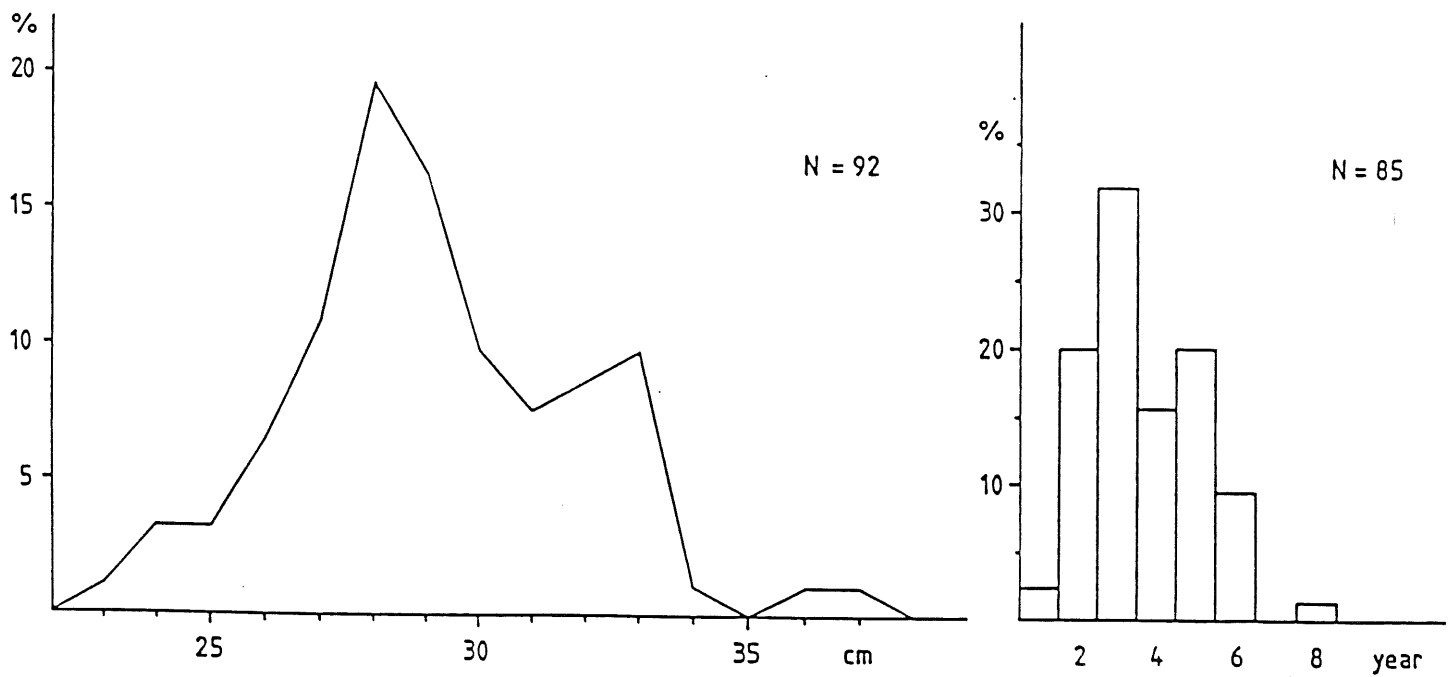


Figure 9. "G.O.Sars" 25 July - 14 August 1989. Length frequencies and age distribution for blue whiting.



Figure 10. "G.O.Sars" 14 - 20 August 1989. Distribution of herring.

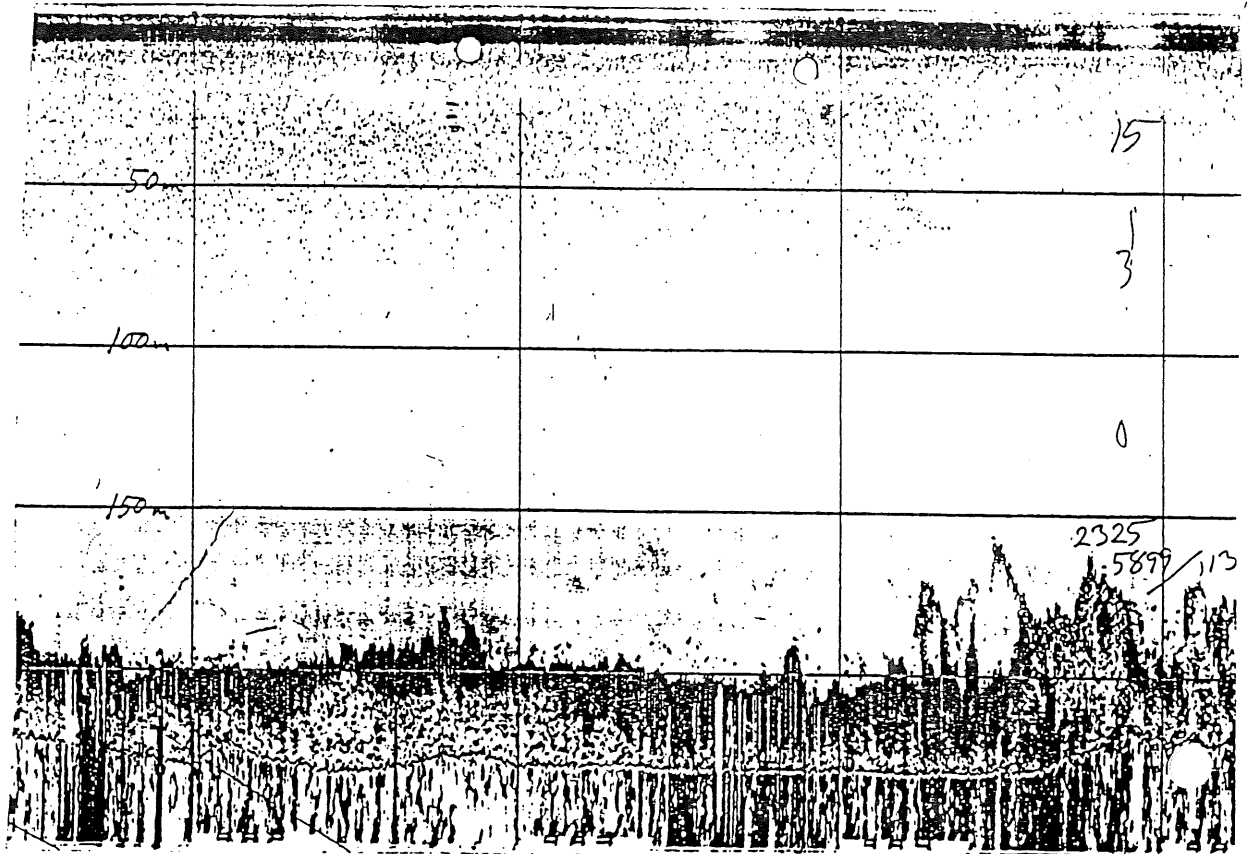


Figure 11. "G.O.Sars" 17 August 1989. Daytime recording of herring in the outer part of Vestfjorden.

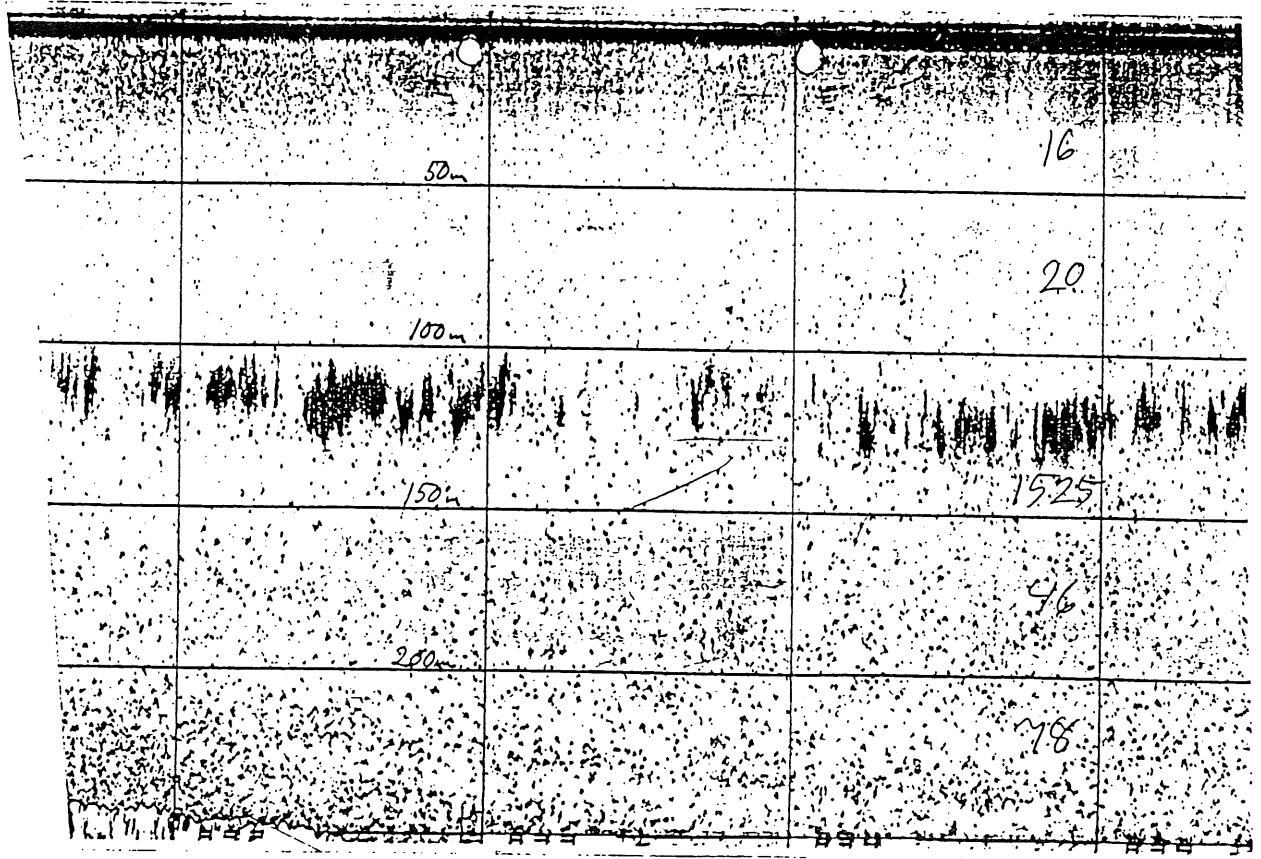


Figure 12. "G.O.Sars" 16 August 1989. Night recording of herring in the inner part of Vestfjorden.

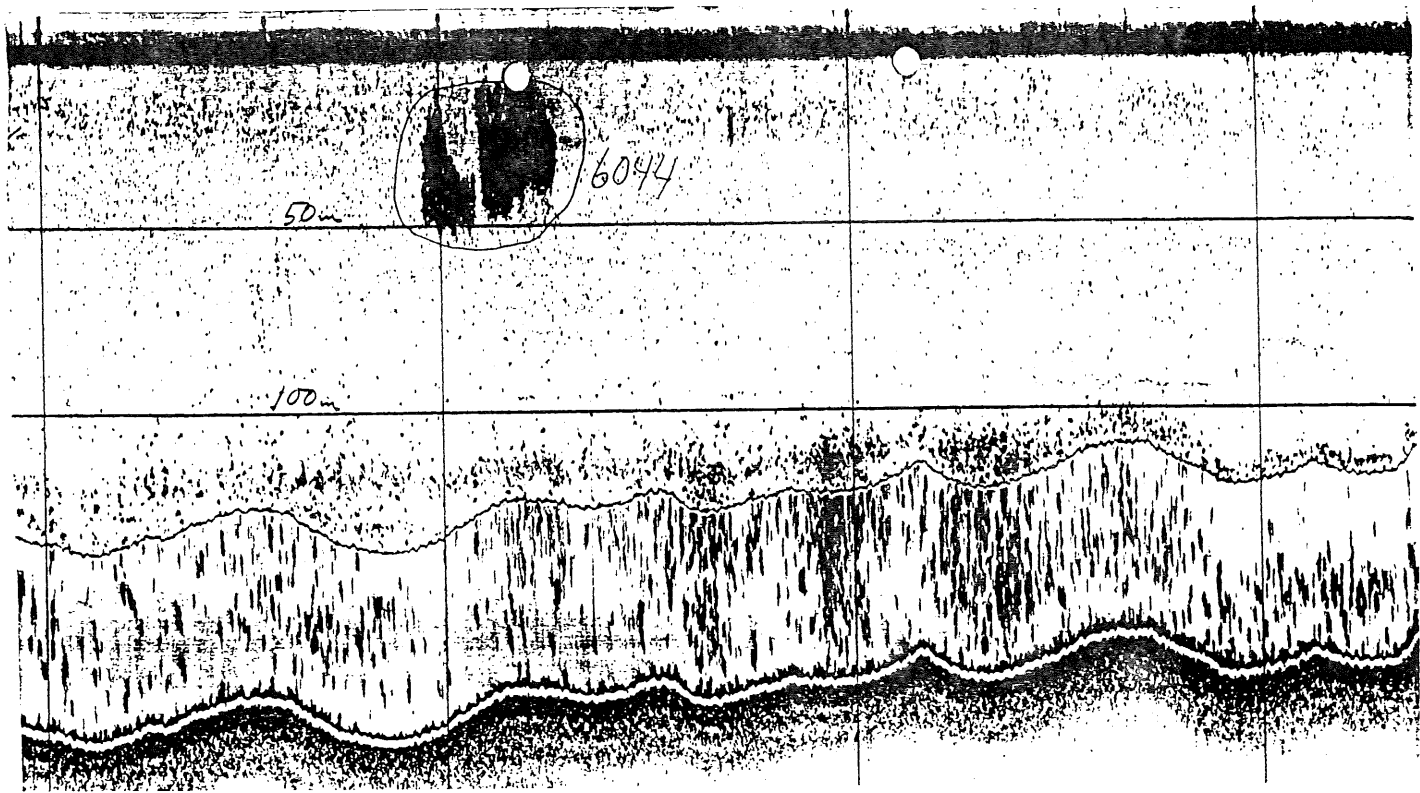


Figure 13. "G.O.Sars" 15 August 1989. Night recording of herring on the western side of Lofoten (west of Moskenes).

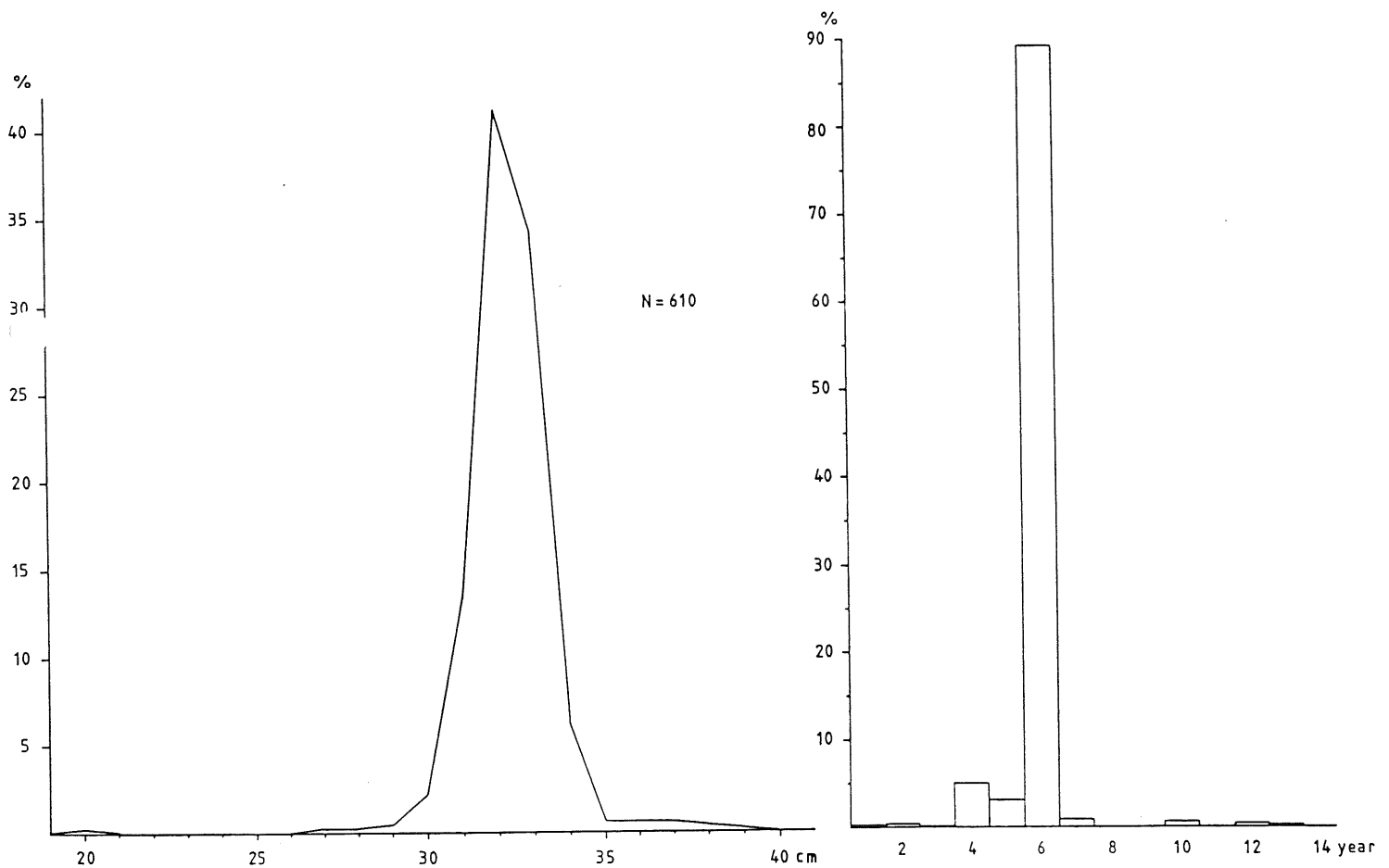


Figure 14. "G.O.Sars" 14 - 20 August 1989. Length frequencies and age distribution of herring.