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International Council for the  
Exploration of the Sea



C.M. 1968/H:15

REPORT ON THE JOINT MEETING OF ICELANDIC, NORWEGIAN AND  
SOVIET INVESTIGATORS ON THE ATLANTO-SCANDIAN HERRING  
DISTRIBUTION IN RELATION TO OCEANOGRAPHIC CONDITIONS  
HELD AT SEYÐISFJÖRDUR JULY 5-6 1968.

Introduction.

This year investigations started in early May and throughout the month two Icelandic and four Soviet vessels investigated the area from  $63^{\circ}$  to  $70^{\circ}$ N between  $10^{\circ}$ W and  $10^{\circ}$ E. In June the Icelandic research vessel "Árni Friðriksson" investigated the area to the east and northeast of Iceland, southwest of Bear Island and during the period June 26 to July 3 standard hydrographic sections were taken off northeast and north Iceland as far east as  $10^{\circ}$ W and to  $68^{\circ}$ N. On the 10th of June the Norwegian research ship "Johan Hjort" joined the investigations and covered an area between Lofoten-Bear Island and Jan Mayen. In the beginning of June four Soviet research vessels the "Fridtjof Nansen", "Academician Knipovich", "Professor Somov" and "Tunets" started observations and covered an area from the Faroes in the south up to  $76^{\circ}30'$ N and between Norway-Iceland and Jan Mayen until June 20th.

Throughout the cruises, hydrographic, phytoplankton, zooplankton and herring investigations were carried out.

Reports and charts on temperature, plankton and herring distribution were prepared by three respective committees and during a final session discussed and accepted.

Mr. H. Vilhjálmsson convened the joint meeting.

Hydrography (Chairman: V. Penin).

Ice. - Due to extremely unfavourable ice conditions in North Icelandic waters in the spring of 1968 the annual Icelandic hydro-biological survey of May-June to this area was delayed until the end of June. Compared with earlier years the eastward extension of the drift ice north of Iceland was abnormally great or greater than in any year since 1918. Further more, the drift ice extended farther south along the eastcoast of Iceland than previously of observed in this century.

Ice conditions were also unfavourable off Jan Mayen in the middle of June. Roughly speaking, the ice limit was at that time observed on a line extending from latitude  $75^{\circ}00'N$ ; longitude  $00^{\circ}00'$  east to 25 miles southeast of Jan Mayen, from thereon to  $68^{\circ}00'N$ ;  $12^{\circ}00'W$ , at which point it bent more or less straight toward the West Iceland peninsula (see Fig. 1).

Temperature. - The main temperature features in the Norwegian, Greenland and Iceland Seas in June 1968 were as follows:

a) The waters of the Norwegian Current in the Faroe-Shetland Channel area were characterized by low temperatures with deviations of  $-0.6^{\circ}C$  in the 0-200 m layer.

b) Along the eastern branch of the Norwegian Current on all standard sections negative temperature anomalies of ca  $0.5^{\circ}$  were observed in the 0-200 m layer. It was noticed that the temperature anomalies along the eastern branch were fairly constant.

c) Compared with the eastern branch of the Norwegian Current, greater cooling was observed in the western one. Average temperature anomalies in the 0-200 m layer were up to  $-1^{\circ}$ .

d) In the middle branch of the Norwegian Current the temperature anomalies in the 0-200 m layer were also below normal, or from  $-0.1^{\circ}$  to  $-0.4^{\circ}$ .

e) The distribution of the temperature anomalies along the eastern and western branches of the Norwegian Current in the 200-500 m layer shows that cold transport was more intensive along the eastern branch whereas in the 0-200 m layer it was the opposite.

f) In the shelf area north of Iceland the temperature in June in the uppermost 100 m were 0-3° or ca 4° below normal. A weak Atlantic influx was observed in this area indicated by temperatures of 4° off Siglunes.

g) Remarkable conditions were found in the area between Iceland and Jan Mayen and east of Iceland in the East Icelandic Current. There the temperatures ranged from -1.8° to 0° in a wide area, much wider than in any previous investigation. The mean temperatures in the 0-200 m layer were about 1° below normal.

The cold tongue covered about 240 miles of the Langanes-Jan Mayen section and it was divided into two branches east of Iceland, one extending SE towards the Faroe Islands, and other one extending along the east coast of Iceland as far south as Hornafjörður (in early June). Between these branches a tongue of warm water was observed with temperatures up to 7°. The distribution of the 0° - isotherm at 50 m depth in June indicates the boundaries of the cold tongue (Fig. 2). Its southern boundary east of Iceland was located at 65°00'N, compared with the normal position at 68°30'N, and its eastern boundary was located at ca 7°00'W. Even more noteworthy is the location of the western boundary of the cold tongue, i.e. the Icelandic coast from Skjálfandi in the north to Reyðarfjörður in the southeast.

Thus the low temperatures, and salinities, observed in this area since 1964 still prevail in 1968 indicating an increasing proportion of Polar water in the Arctic water of the East Icelandic Current.

h) East of the cold tongue, at about 04°00' to 06°00'W, temperatures of 3° were found at 20 m in May increasing to 5° in June. A characteristic feature is an indistinct frontal zone in this area between 65°00' and 69°00'N.

1) It can be concluded that the increased cold transport by the East Icelandic Current and the decreased heat transport by Norwegian Current caused great negative temperature anomalies in the Norwegian Greenland and Iceland Seas in June 1968. Thus 1968 belongs to one of the coldest years in this area.

j) The conditions in the East Icelandic Current here mentioned are in agreement with conditions observed by several authors and summarized by Arthur J. Lee in 1967 (ICNAF Red Book 1967, Part IV). "During the decade 1956-1965, cyclonic activity was above normal in middle latitudes to the south of the Icelandic low. The Greenland high on the other hand intensified and there was an anomalous Ne wind over the NW Atlantic. This meteorological situation brought about the recent trends in sea surface temperatures observed on the North Atlantic weather ships and it has been remarkable in its persistence. In most months of the year there was a high degree of type tendency during the period 1956-1965 and it is thought that feed-back from the ocean is responsible."

Plankton (Chairman: G. Sv. Jónsson)

In order to estimate the phytoplankton density the Icelandic and Norwegian ships used Secchi disc readings. Samples were also taken from different depths by means of water bottles by all ships. The Russian research vessels also estimated the phytoplankton and its qualitative composition was analysed from Juday net hauls. On the Icelandic research vessel measurements of primary production with the  $C^{14}$  technique were carried out.

The Icelandic and the Soviet vessels used a Hensen net in the 50-0 m level but the Norwegians a Juday net (77 cm in diameter).

The Russians also used a Juday net for plankton at greater depths.

Phytoplankton. - In May no blooming was observed except for the area around  $69^{\circ}00'N$  between  $4^{\circ}00'W$  and  $2^{\circ}00'E$ . Also a small area between  $67^{\circ}00'$  and  $68^{\circ}00'N$  east of  $3^{\circ}00'E$  showed some blooming.

In June mass development of phytoplankton was registered on the sections Langanes-Jan Mayen, on the Faroe-Shetland Ridge, in the Faroe-Shetland Channel and in the western part of the section along  $60^{\circ}35'N$  (up to  $2^{\circ}W$ ).

Blooming at the section along  $69^{\circ}20'N$  was observed in its western part up to  $4^{\circ}W$ . At the sections along  $67^{\circ}30'N$  and  $65^{\circ}45'N$  blooming was registered on the stations in the Atlantic waters also. Despite the fact that phytoplankton was practically absent in the

section area along  $71^{\circ}10'$  and also in the eastern part of the section along  $69^{\circ}20'N$  it was detected in zooplankton stomachs in great quantities. This means that the blooming in Atlantic waters was over not long ago and that phytoplankton development took place later in 1968 than in 1966 and 1967.

Noteworthy is the absence of Coscinodiscus spp. and Peridinea in the Norwegian Sea which have been amply represented in previous years.

Zooplankton. - The highest densities of zooplankton observed in the central part of the Norwegian Sea and also between  $5^{\circ}$  and  $12^{\circ}00'E$  north of  $70^{\circ}00'N$ . The lowest densities were located in the waters E and NE of Iceland. The same can be said about the area to the north of Iceland.

On the whole it can be said that in May the overwintering generation dominated everywhere in the survey. In June the same situation still prevails while at the same time young stages of the spring generation were observed during the latter half of the month, especially south of  $69^{\circ}30'N$ .

C. finmarchicus predominated over the whole area but the spawning of the winter generation was considerably delayed as compared to previous years.

A peculiar feature of the year 1968 is the quantity and extended area of distribution of cold water species in the Norwegian Sea (Metridia longa, C. hyperboreus).

On the whole the biomass of zooplankton in the Norwegian Sea is considerably higher than last year (Fig. 3.), but it must be kept in mind that C. hyperboreus is now found in unusual quantities.

As a conclusion it can be said that biological spring is considerably later this year than in 1967.

#### Herring (Chairman: Yu. K. Benko).

In May Soviet and Icelandic vessels investigated the area from  $63^{\circ}$  to  $70^{\circ}N$  between  $10^{\circ}W$  and  $10^{\circ}E$ . On and around the middle of May the Icelandic expedition observed a few herring shoals in a restricted area around  $65^{\circ}20'N$  and  $2^{\circ}00'E$ . During the second half of May both Soviet and Icelandic vessels observed herring concentrations in the area from  $65^{\circ}$  to  $70^{\circ}N$  and between  $3^{\circ}30'W$  and  $5^{\circ}30'E$ .

The herring shoals were of a small size and during most of the day they were distributed at depths between 200-450 m. The shoals rarely came above 100 m. The distribution was rather scattered and no good patches were found. The herring slowly followed a northerly route and by the end of May having reached the latitude of  $70^{\circ}\text{N}$  between  $3^{\circ}$  and  $5^{\circ}\text{E}$  turned northeast. No herring shoals were located west of  $3^{\circ}30'\text{W}$  during the month.

In June the Icelandic, Norwegian and Soviet vessels registered herring in an area from  $70^{\circ}\text{N}$  to  $75^{\circ}\text{N}$  between  $2^{\circ}\text{E}$  and  $14^{\circ}\text{E}$ . Throughout the month the shoals followed a north-easterly then northerly route with an average speed of 10-14 n.m. per day and by the end of the month herring was observed from  $73^{\circ}$  to  $75^{\circ}\text{N}$  between  $8^{\circ}$  and  $15^{\circ}\text{E}$ . It may be noted that throughout the period of observation the herring concentrations kept chiefly to water masses with temperature from  $5^{\circ}$  to  $6^{\circ}\text{C}$  (Fig. 1). As the herring moved north and northeast the density and sizes of the shoals increased and during the first days of June a quite resultative herring fishery with purse seines was begun.

The vertical distribution was generally between 50-400 m, but as the time passed the herring had a tendency to a more shallow distribution.

At the end of June a definite movement of the herring shoals could not be detected but the trend was in a north easterly direction towards the Bear Island Shallows and by the beginning of July the fishing fleet was operating around  $74^{\circ}15'\text{N}$  and  $14^{\circ}\text{E}$ .

Although good catches were obtained during the last week of June, the herring shoals became progressively more unstable and on the whole stayed below 130 m all the time, showing irregular movements horizontally.

### Conclusions.

On the basis of the behaviour and distribution of the herring concentrations, oceanographic conditions and plankton distribution as observed in May-June 1968, the following was concluded:

1. On the whole the herring had a much more easterly distribution than in previous years. The shoals quickly migrated

to the northeast Norwegian Sea and by June 20 had nearly reached the latitude of Bear Island, whereas at the same time in June 1967 the herring were distributed considerably more to the south and west. In June this year in fact no herring concentrations were observed south of 70°N and to the west of the 0 meridian. At the present time the great majority of the adult stock of the Atlanto-Scandian herring seems to be assembled to the west and south west of Bear Island.

2. Hydrographic investigations show that 1968 is an extremely cold year especially as regards the western half of the Norwegian Sea. This fact together with deteriorating feeding conditions in that part of the Norwegian Sea are thought to be the main cause of such an easterly distribution.
3. Since the situation in 1968 resembles both physically and biologically that of the recent cold years in particular 1967 it is thought that the herring stock will be distributed over the area west of Bear Island for the coming months and not show a more westerly distribution until after mid August with the onset of the migration to the overwintering grounds off East Iceland.

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Fig. 1

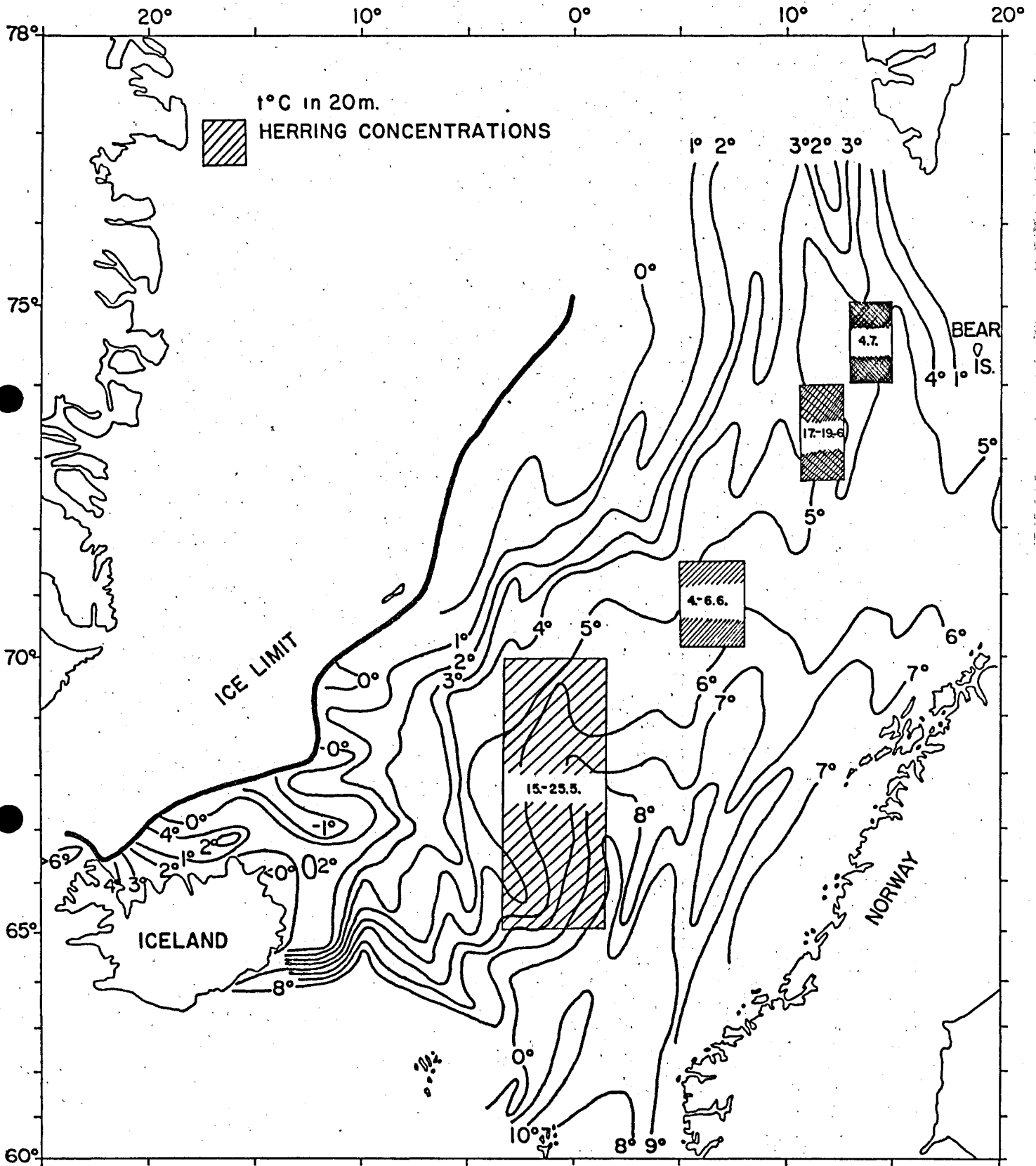




Fig. 2

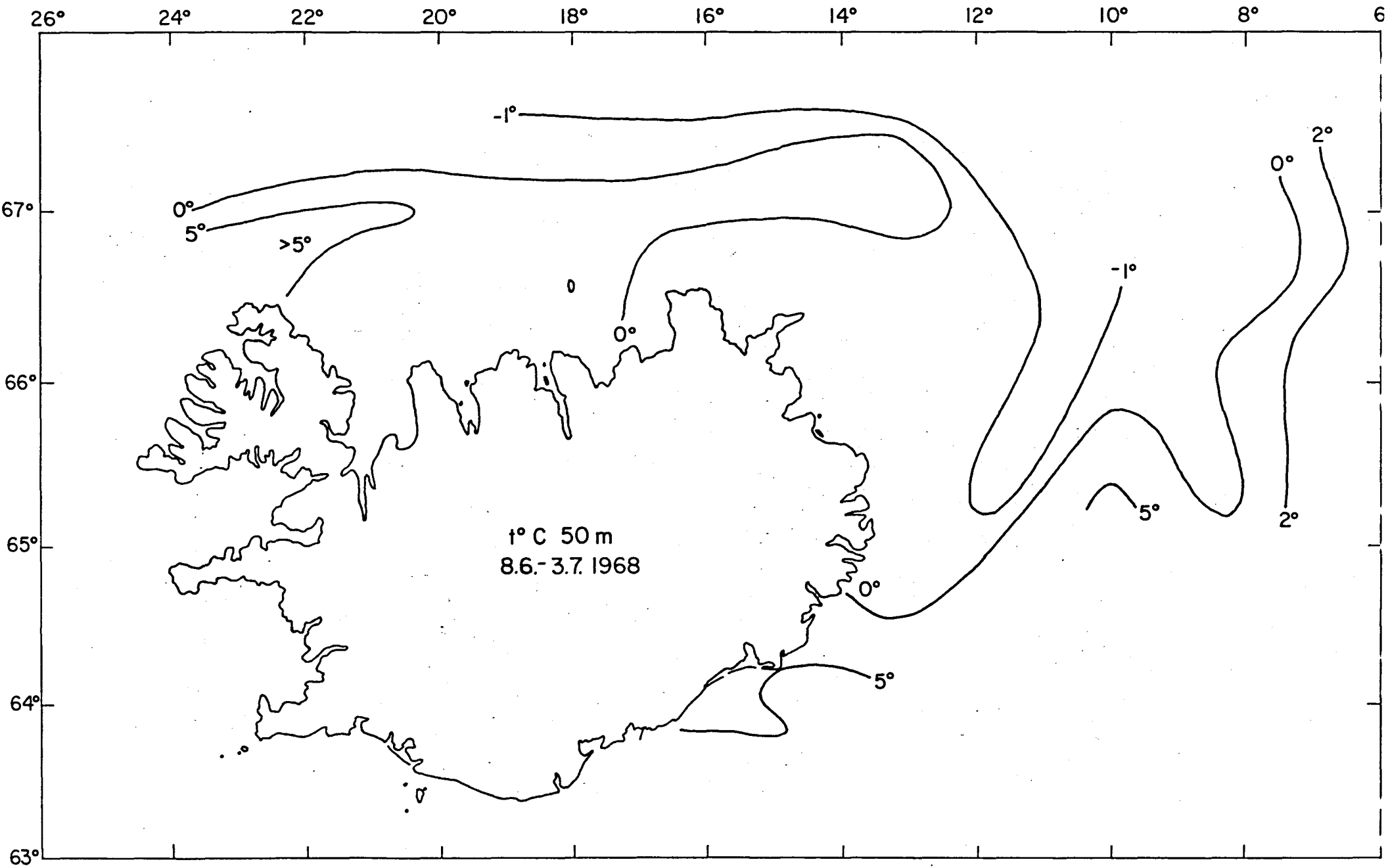


Fig. 3

