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On Status of the Pelagic Redfish Aggregations in NAFO Division 1F

by

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Abstract

The issue of the pelagic redfish fishery in NAFO Div.1F will be considered at the NAFO Annual Meeting in September 2001. A precedent for conducting the fishery on this species inhabiting the zones of regulation of two adjacent regional organizations – NAFO and NEAFC – arose for the first time in the world practice. In the year 2000, the international catch of pelagic redfish in Div.1F constituted >8 000 tons. The increased fishery for pelagic redfish in the area, the unclear status of the stock and the associated absence of common measures for the stock management required a settlement of the problem within the NAFO/NEAFC agreement.

The paper aims at studying the conditions of formation of pelagic redfish aggregations in the Irminger Sea to the west of 42°W. Based on the results obtained the advice for management of pelagic redfish fishery in Div.1F was provided.

The analysis was carried out using fisheries information, data on biological status of redfish and information on the oceanographic regime of Div.1F. Data were collected during 23 Russian research or research and scouting cruises, as well as during 3 international trawl-acoustic surveys. The pelagic redfish aggregations in Div.1F were established to be a part of the total commercial stock of redfish of the Irminger Sea with common reproductive and feeding areas, common life and migration cycles, and with absence of spatial and temporal isolation. The formation of considerable commercial aggregations of pelagic redfish in Div.1F has an irregular pattern and occurs due to a seasonal redistribution of the redfish aggregations from the traditional feeding area into the Irminger Sea. The reason of the redistribution is a variation in the oceanographic conditions related to an enhanced advection of the Atlantic water and to an increase in the heat content of waters in the upper layer. Based on the criterion of the redfish common stock in Div.1F and in the Irminger Sea, common measures for management and regulation, applied by NEAFC and NEAFC Contracting Parties in respect to the pelagic redfish stock in the Irminger Sea, are suggested.

Introduction

Issue of the pelagic redfish fishery in Div.1F of the NAFO Regulatory Area will be considered at the NAFO Annual Meeting in September 2001. A precedent for conducting the fishery on this species inhabiting the zones of regulation of two adjacent regional organisations –NAFO and NEAFC – has arisen for the first time in the world practice. In the year 2000, the international catch of pelagic redfish in Div. 1F constituted above 8000 tonnes. The increased pelagic redfish fishery conducted in the area, unclear status of the stock and associated absence of common measures for the stock management condition a necessity of settling this problem within NAFO/NEAFC agreement.

The paper is aimed at studying the conditions of formation of pelagic redfish aggregations in the Irminger Sea west of 42°W. Based on the results obtained the advice for management of pelagic redfish fishery in Div.1F was provided.

The oceanographic conditions of the area are determined by the North Atlantic currents (North Atlantic Current, Irminger Current, East- and West-Greenland Current and Labrador Current), which form a cyclonic gyre over the Irminger and Labrador basins west of the Reykjanes Ridge (Figure 1). The dwelling area of the redfish in the Irminger Sea and adjacent waters of the Labrador Sea covers both shelf areas and continental slopes of the East Greenland and Iceland, and pelagic layers of the open sea. In the Irminger Sea some specific features in seasonal distribution of the redfish aggregations are observed. In spring, in April-May, the main aggregations of the spawning redfish are always dwell in the open sea over the western slopes of the Reykjanes Ridge in the depth range from 250 to 850 m (Figure 2, 3). Trawl-acoustic surveys showed that feeding aggregations of the redfish were observed between 53°-64°N and 28°-50°W over the area larger than 250 000 miles² (Figure 2). Boundaries, location and density of the aggregations in 0-500 m layer vary from year to year in dependence on water masses properties. The redfish aggregations are mainly distributed in the Subarctic Water within the Sub-Polar Gyre in depths from 150 to 850 m.

During 1980-2000, 23 Russian complex research cruises as well as 3 international trawl-acoustic surveys were conducted in Div. 1F. Results of the Russian fishery in this area are given in Table 1 and Figure 4. Data from Russian trawl-acoustic surveys of 1982-1991 showed that the maximum aggregations of the feeding redfish were observed in the 200-mile zone of the East Greenland and were found east of 42° W. Since 1994, a shift of the main redfish aggregations towards west to the Labrador Sea has been observed (Figure 5). The main reason for that was a change in oceanographic conditions in the Irminger Sea, in the traditional feeding area, which has started in the mid-90's (Figure 5a).

Further development of anomalous conditions in the sea surface layer in 1997-1999 led to redistribution of water masses in the area and to a considerable shift of the main redfish aggregations from the traditional feeding area south-westwards (Figure 5).

Such peculiarities of the redfish distribution were observed earlier as well, but boundaries of the feeding area stayed within ICES areas. In the survey period prior to 1989, fishable aggregations of the redfish were mainly distributed in the northern area. However, the decrease of the Atlantic waters transport in the subsequent years (1990, 1992 and 1993) resulted in lower temperature and salinity in the layer of the redfish distribution and entailed redistribution of the main redfish aggregations southwards. The most extensive studies of the redfish distribution in Div.1 F were carried out in the course of international trawl-acoustic surveys in 1996, 1999 (Figure 6, 7). The trawl-acoustic survey of 1999 showed the considerable increase of the redfish aggregations' density in the southwestern direction. Although the area was surveyed up to 54°N, 48°30'W, the boundaries of 0-densities of the redfish distribution were not found.

Based on the results of the investigations it was found that pelagic aggregations of the redfish in NAFO Div. 1F are a part of the common fishable stock of the Irminger Sea redfish with the common reproductive and feeding areas, common life and migration cycles without spatial and temporal isolation. Formation of considerable fishable aggregations of the pelagic redfish in Div. 1F has irregular pattern and occurs due to seasonal redistribution of the redfish aggregations from the traditional feeding area to the Irminger Sea. The reason for the redistribution is the change in the oceanographic conditions related to an enhanced advection of the Atlantic waters and the temperature increase in the depth of 0-200 m. Based on the criterion of the redfish common stock in Div. 1 F and in the Irminger Sea, common measures for management and regulation, applied by NEAFC and NEAFC Contracting Parties in respect to the pelagic redfish stock in the Irminger Sea, are suggested.

Table 1. Results from the Russian fishery conducted in NAFO Div.1F, 1980-2000.

Year	Month	Total catch, t	No. of vessels/ fishing days	Catch per vessels/ fishing days, t	Catch per traw-ling hour, t	No. of vessels
1980*	Jun, Nov	4,5	7	0,6	0,1	2
1982*	May-Dec	29,2	3,2	9,1	0,7	3
1983*	Jul	0,6	0,4	0,6	0,5	1
1989*	May-Jun	7,4	2	3,7	0,4	2
1990	Jun-Jul	384,9	27,7	13,9	1,2	6
1991	Jun-Jul	458,3	31	14,5	0,9	2
1992*	Jun-July	15,4	4	3,9	0,3	2
1999	Sep	446,0	73	6,2	0,5	9
2000	Jul-Oct	5259,0	239	19,0	0,9	10
Total		6605,3				

* Results from the operations by research and research/scouting vessels.

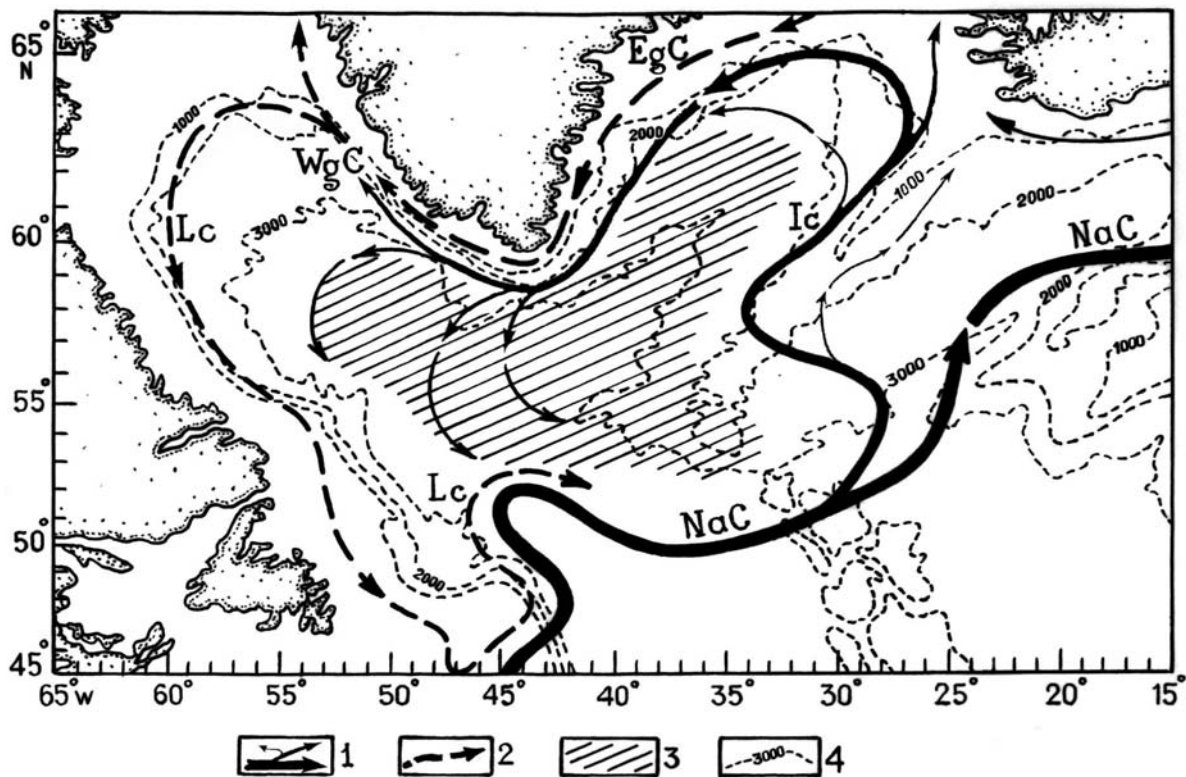


Figure 1. Scheme of the North Atlantic Currents:
 Warm currents (1): NaC - North Atlantic; IC - Irminger;
 Cold currents (2): EgC - East Greenland; WgC - West Greenland;
 LC - Labrador; boundary of Subpolar Cyclonic Gyre (3); isobathes (4).

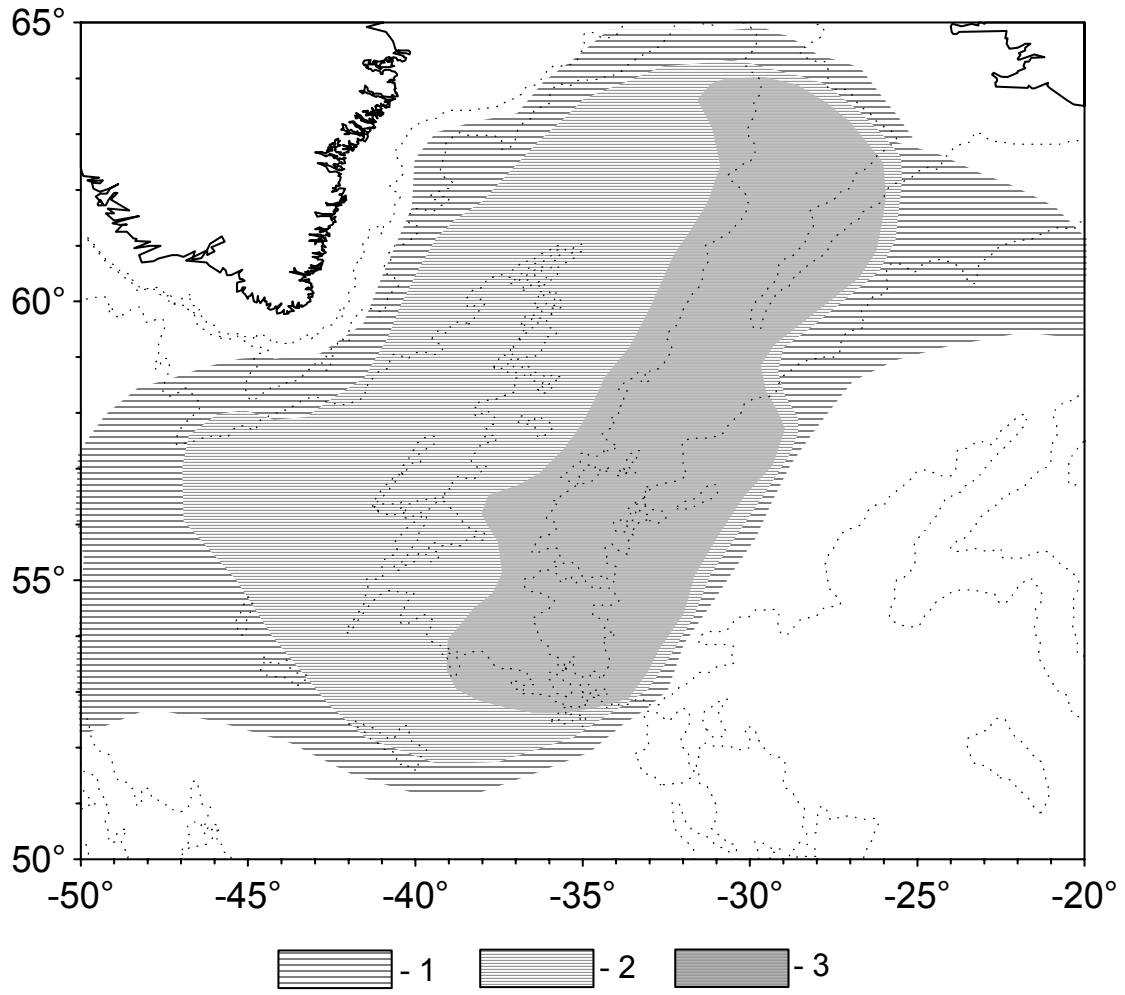


Figure 2. Area of redfish, its distribution during feeding (2) and extrusion of larvae (3).

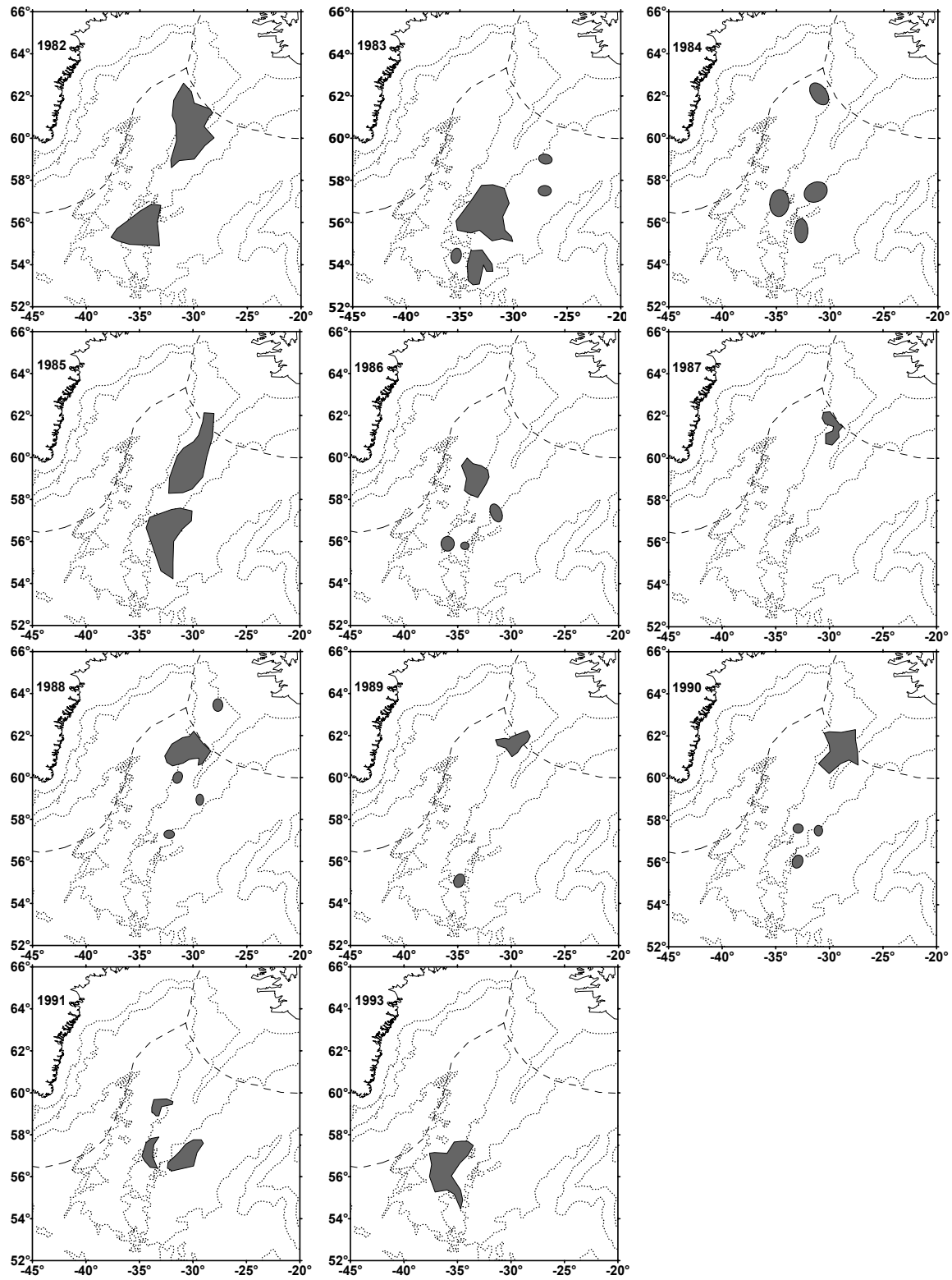


Figure 3. Sites of the most abundant extrusion of redfish larvae in the Irminger Sea during the spring ichthyoplankton surveys.

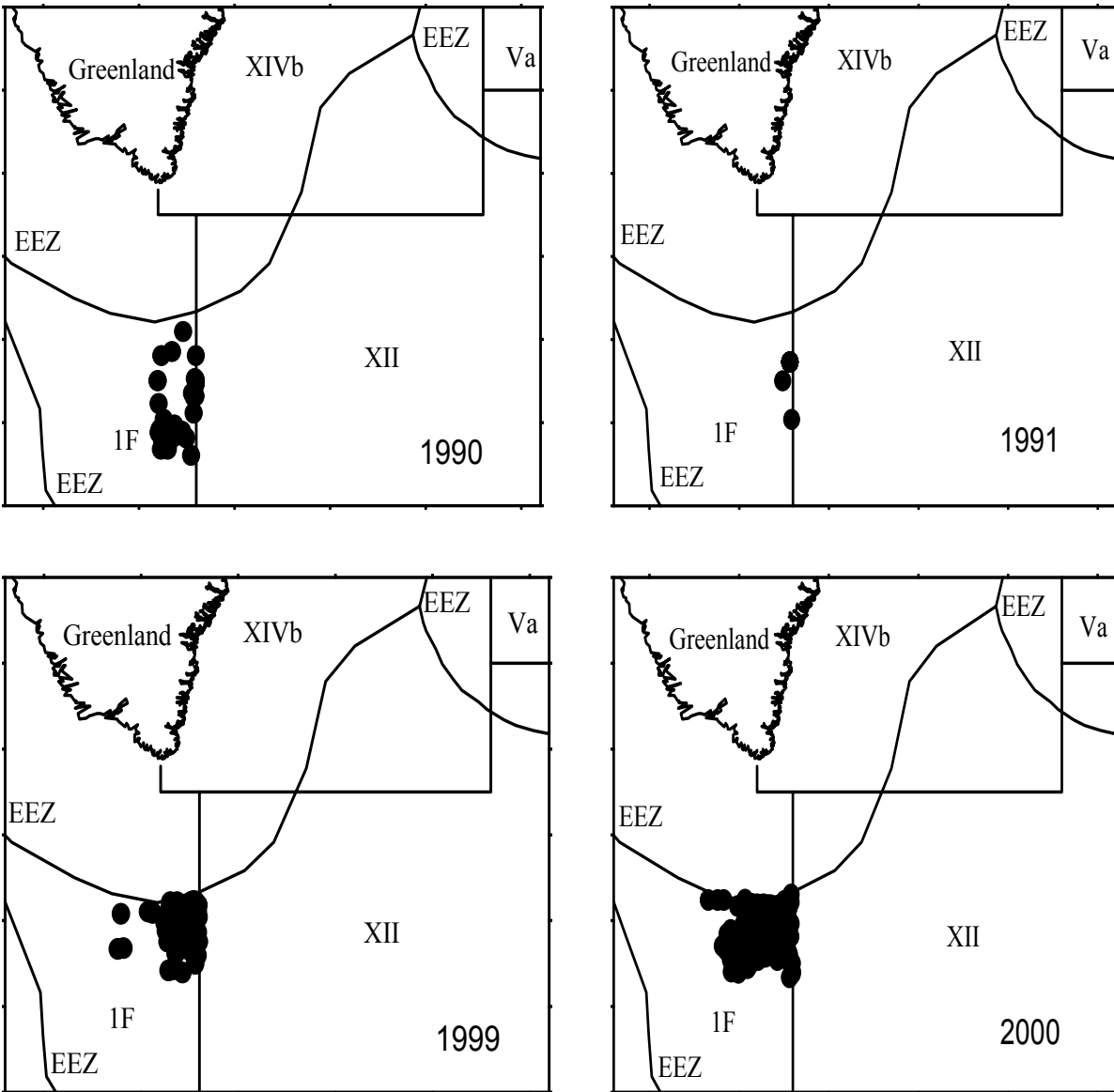
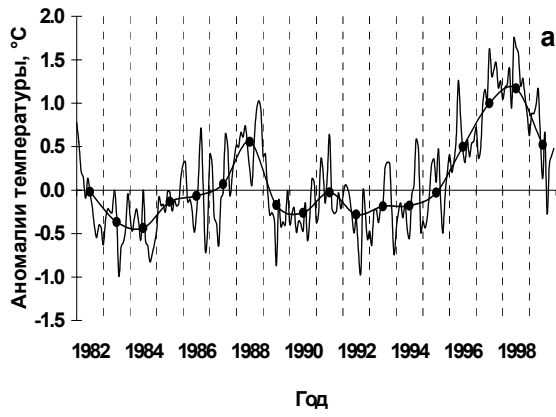
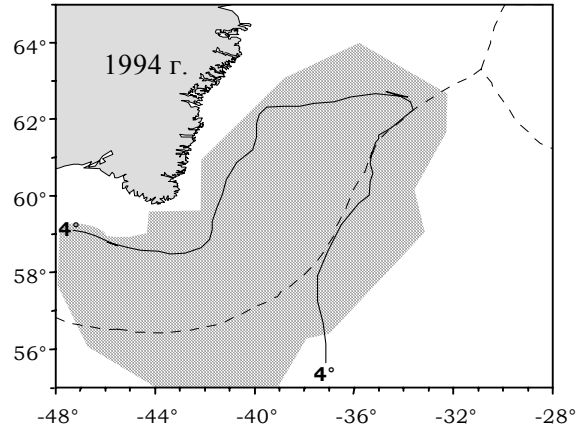


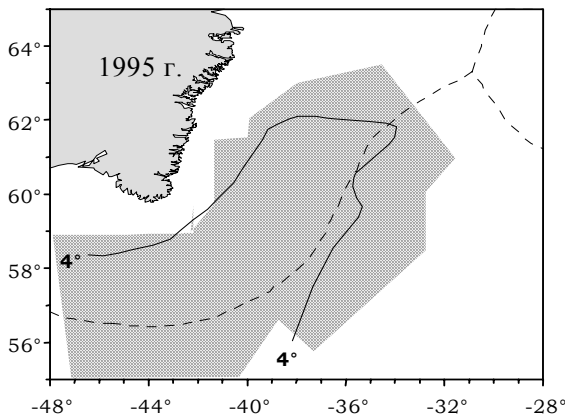
Figure 4. Location of the Russian fleet during the fishery for pelagic *Sebastes mentella* in the NAFO Div. 1F in 1990, 1991, 1999, 2000.



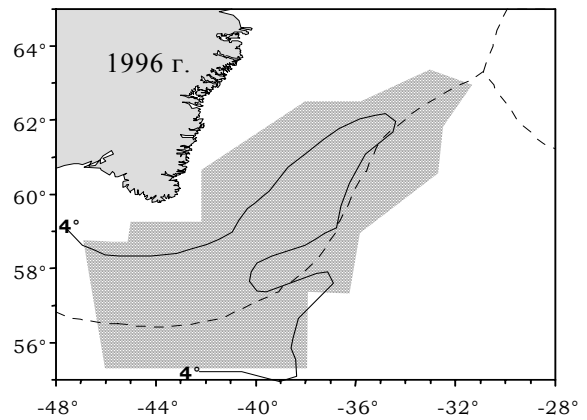
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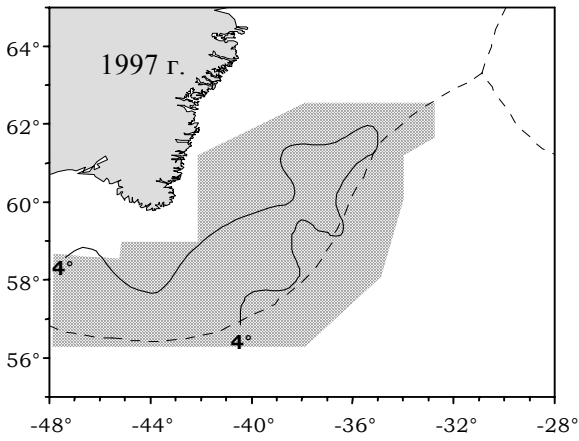
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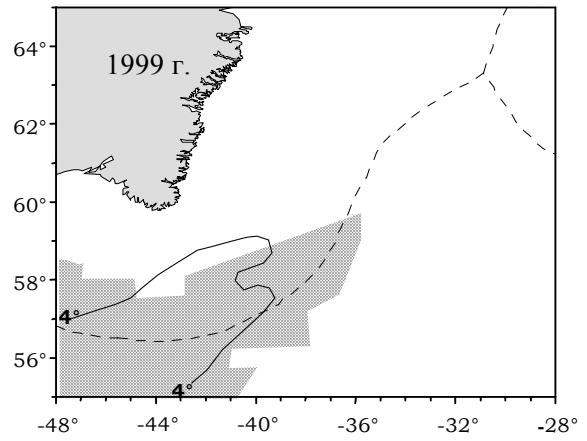
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Figure 5. Mean monthly and mean yearly (marked) anomalies of the sea surface temperatures over the feeding area (a). Aggregations of feeding redfish. $S_a > 10 \text{ m}^2/\text{nm}^2$ at 0-500m (shaded) and 4°C isotherms at 200m in the Irminger Sea, June-July 1994-1999 (b-f).

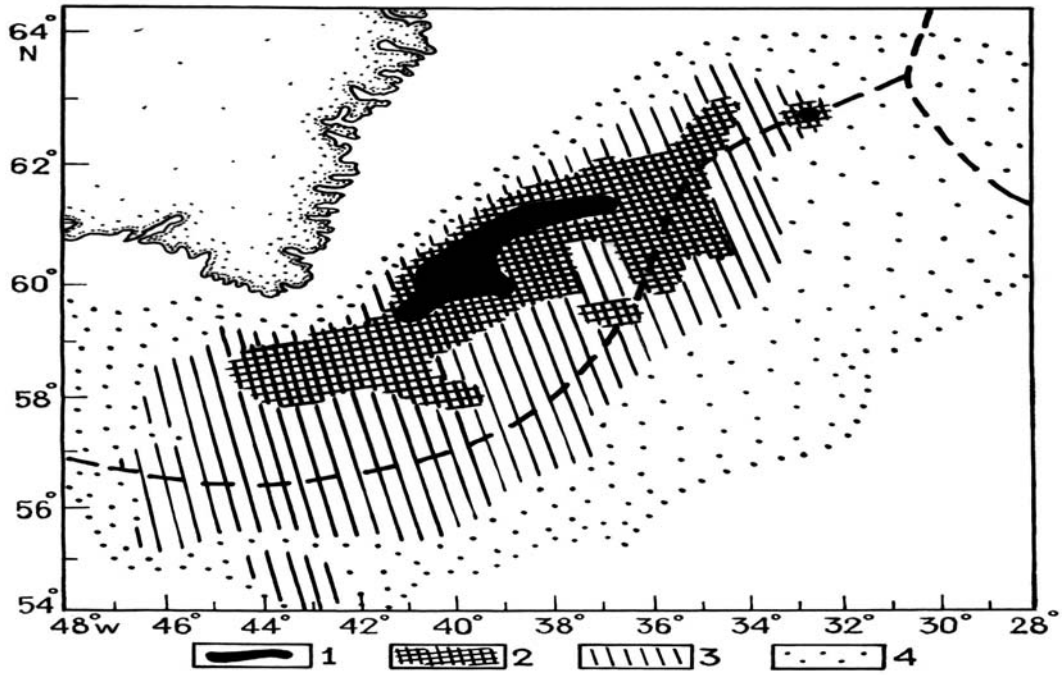


Figure 6. Distribution of redfish aggregation density (S_a ($m^2/mile^2$)) in June-July 1996: 1 - above 50; 2 - 25-50; 3 - 10-25; 4 - 0-10.

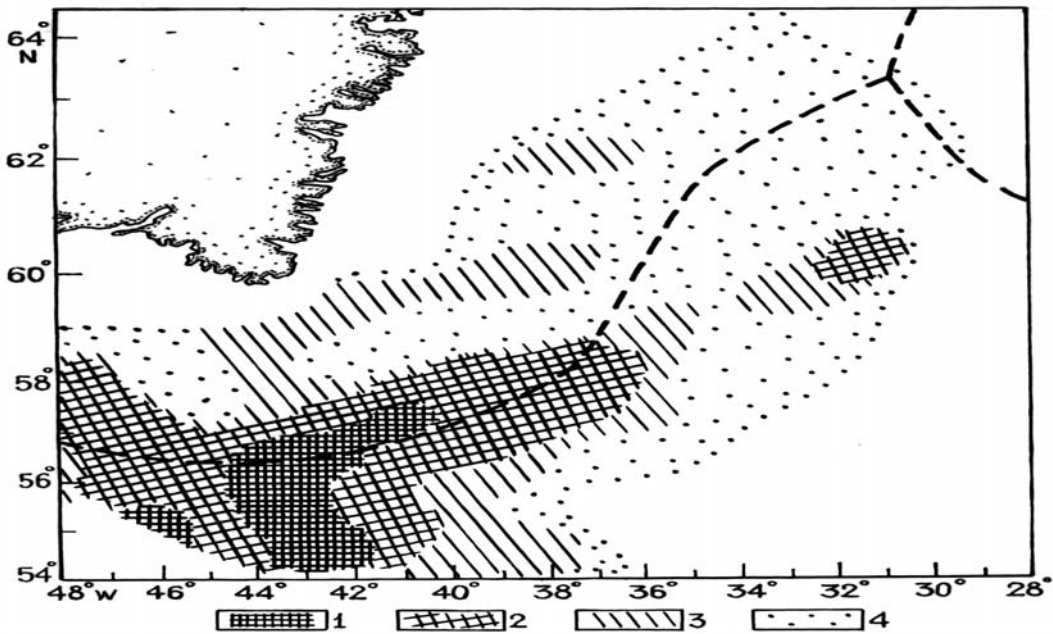


Figure 7. Distribution of redfish aggregation density (S_a ($m^2/mile^2$)) in June-July 1999: 1 - above 25; 2 - 10-25; 3 - 5-10; 4 - 0-5.