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West Greenland Groundfish Biomasses Estimated from a
Stratified-random Trawl Survey in 1988

by

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Introduction

A stratified-random trawl survey was carried out at West Greenland jointly by Japan Marine Fishery Resource Research Center (JAMARC) and the Greenland Fisheries Research Institute part of a joint program between the Trawling Company of the Greenland Home Rule (GTC) and JAMARC. The joint program started in 1987 when the survey was carried out in July/August, while the 1988 survey took place in September/October. The purposes of the survey were to estimate groundfish biomasses and to collect information on the distribution, size composition, and biology of major species off West Greenland as well as on hydrography. In 1988, the main interest was put upon Greenland halibut because this species was considered to be one of the most important fishery resources at deeper waters off West Greenland and because the biological knowledge about the stock is limited. The survey design (stratification, trawling procedures, gears, etc.) is almost the same as in 1987 (Yamada et al., 1988), except for some modifications in the extent of the survey area and the depth range (0-1000 m of NAFO Divisions 1A-1F south of 70° Latitude in 1987; 200-1500 m of NAFO Divisions 1A-1D south of 73° Latitude in 1988).

Materials and Methods

The survey covered the NAFO Divisions 1A (south of 73° N), 1B, 1C, and 1D outside the 3-mile limit at the depths between 200 m (Division 1A north of 70° N) or 400 m and 1500 m. Each division was subdivided into three depth zones by the 500 and 1000 m isobaths and Division 1A was further bisected by the 70° N latitudinal line, i.e., 15 strata in all. A total of 120 trawl positions were randomly selected and allocated in proportion to the area

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of each stratum, but with a minimum of two planned trawl stations per stratum except for the deepest stratum in Division 1B, where no trawl station was allocated due to the negligible area (Table 1).

The survey was carried out by the Japanese R/V Shinkai Maru, a 3,393 tons stern trawler having an overall length of 100 meters and 5,000 hp. The trawl gear used was designed for rough sea bottom topography, having a ground rope rigged through rubber tires. The net length, hand rope length, head rope length, and ground rope length were 63 m, 99 m (usually in the waters shallower than 1000 m depth, or 94 m in the waters deeper than 1000 m), 54 m, 66 m respectively. The net was equipped with a 140 mm mesh codend with a 30 mm mesh liner. Trawling was carried out during daytime only. Duration of a tow was 30 minutes at a speed of about 3.5 knots. For each haul, height of the net opening was recorded by Net Recorder (Furuno Electric Co., Ltd.). The distance between wing tips (DW in m) was calculated by the following equation:

$$DW = (NL/(NL+HL)) \times DT,$$

where DT is distance between trawl doors, HL is hand rope length and NL is net length; thus the parameter was 0.40 when HL was 94 m or 0.39 when HL was 99 m. DT was estimated by the following equation which was obtained from the 1987 survey (Yamada et al., 1988):

$$DT = 10.9 + 13.0 \ln(WL),$$

where WL is warp length. The catch at each haul was sorted into species and weighed to the nearest 0.1 kg.

Biomass estimates were obtained by applying the swept area method taking the catchability coefficient of all species as 1.0. The coefficient of variation (CV in %) was calculated as:

$$CV = \text{standard error of estimate} \times 100 / \text{estimated biomass}.$$

Results and Discussion

A total of 109 successful hauls were made, which gives a mean coverage of 651 square km per haul (Table 1). Eleven stations were abandoned due to rough bottom or severely damaged gear. One extra haul was carried out in the depth zone 1001-1500 m of Division 1D.

Table 2 shows the biomass estimates of each species or species category. Greenland halibut was the most abundant species (63,000 tons, CV=5%), which occupied 46% of the total biomass. This value was higher than 1987 survey (58,400 tons; Yamada et al., 1988) although survey area was considerably different. Yatsu and Jørgensen (1989 MS) compare the results on Greenland halibut from two surveys in detail.

The biomass for roundnose grenadier was 45,700 tons (CV=19%), which was a little higher than the estimate from the 1987 survey (43,600 tons). This figure must be considerably underestimated because this species is known from the depths between 350 and 2500 m, and possibly even deeper (Atkinson et al., 1982). The nominal annual catches of this species in Subarea 1 were 68 to 9657 tons in 1968-1977 (Atkinson et al., 1982).

The biomasses for Sebastes mentella and S. marinus were 5,700 tons (CV=42%) and 200 tons (CV=27%) respectively. Considerably lower values for redfishes can be attributed to the exclusion of shallower area in this survey. A sharp

decrease of biomass estimates for Atlantic cod (427,600 tons in 1987 survey to 100 tons in present survey) and shrimp (11,000 to 2,100 tons) is apparently the same effect as for redfish.

Figs. 2 and 3 show the distribution of roundnose grenadier and beaked redfish, respectively. The distribution and biology of Greenland halibut appear in Yatsu and Jørgensen (1989 MS).

References

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Table 1. Area (km²), percentage relative to total area, and number of trawl stations (successfully trawled stations in parentheses) of each stratum.

NAFO Division		Depth zone			Total
		(201-)* 401-600 m	601-1000 m	1001-1500 m	
1A North (70-73 N)	Area	10,491	2,667	972	14,130
	%	14.8	3.8	1.4	19.9
	No. of st.	18(16)	5(4)	2(1)	25(21)
1A South	Area	1,683	793	1,271	3,747
	%	2.4	1.1	1.8	5.3
	No. of st.	3(1)	2(2)	2(2)	7(5)
1B	Area	5,120	2,649	23	7,792
	%	7.2	3.7	0.0	11.0
	No. of st.	8(7)	4(4)	0(0)	12(11)
1C	Area	3,131	17,611	603	21,345
	%	4.4	24.8	0.8	30.1
	No. of st.	5(5)	29(29)	2(2)	36(36)
1D	Area	888	5,451	17,643	23,982
	%	1.3	7.7	24.9	33.8
	No. of st.	2(0)	9(7)	29(29)	40(36)
Total	Area	21,313	29,171	20,512	70,996
	%	30.0	41.1	28.9	100.0
	No. of st.	36(29)	49(46)	35(34)	120(109)

*: Only NAFO 1A North includes depth zone 201-600 m.

Table 2. Biomass estimates and coefficient of variation (CV) by species category.

Species	Scientific name	Biomass (ton)	CV(%)
Greenland halibut	<u>Reinhardtius hippoglossoides</u>	63,000	5
Roundnose grenadier	<u>Coryphaenoides rupestris</u>	45,700	19
Beaked redfish	<u>Sebastes mentella</u>	5,700	42
Greenland shark	<u>Somniosus microcephalus</u>	3,700	47
Roughhead grenadier	<u>Macrourus berglax</u>	2,800	8
Other fish		2,700	14
Dogfish	Squalidae	2,200	16
Shrimp	<u>Pandalus borealis</u>	2,100	29
Skates	Rajidae	1,900	14
Other codfishes	Gadiformes	1,700	12
Octopus	Octopoda	1,400	24
Northern catfish	<u>Anarchias denticulatus</u>	1,100	21
Halibut	<u>Hippoglossus hippoglossus</u>	1,000	30
Spiny eel	Notacanthidae	1,000	13
Eels	Anguilliformes	400	7
Snailfishes	Liparidae	300	11
Alpines	Psychrolutidae	200	23
Sculpins	Zoarcidae	200	23
Squids	Teuthoidea+Sepioidea	200	11
Golden redfish	<u>Sebastes marinus</u>	200	27
Arctic cod	<u>Boreogadus saida</u>	100	34
American plaice	<u>Hippoglossoides platessoides</u>	100	16
Other shrimps		100	13
Atlantic cod	<u>Gadus morhua</u>	100	80
Other crustacea		100	34
Spotted catfish	<u>Anarchias minor</u>	100	62
Sculpins	Cottidae	+	23
Other mollusks		+	21
Blue ling	<u>Molva</u>	+	56
Hagfish	<u>Myxine</u>	+	25
Cusk	<u>Brosme brosme</u>	+	98
Lumpsuchers	Cyclopterydae	+	98
Pricklebacks	Stichaeidae	+	23
Poachers	Agonidae	+	30
Blue whiting	<u>Micromesistius poutassou</u>	+	89
Total		138,100	8

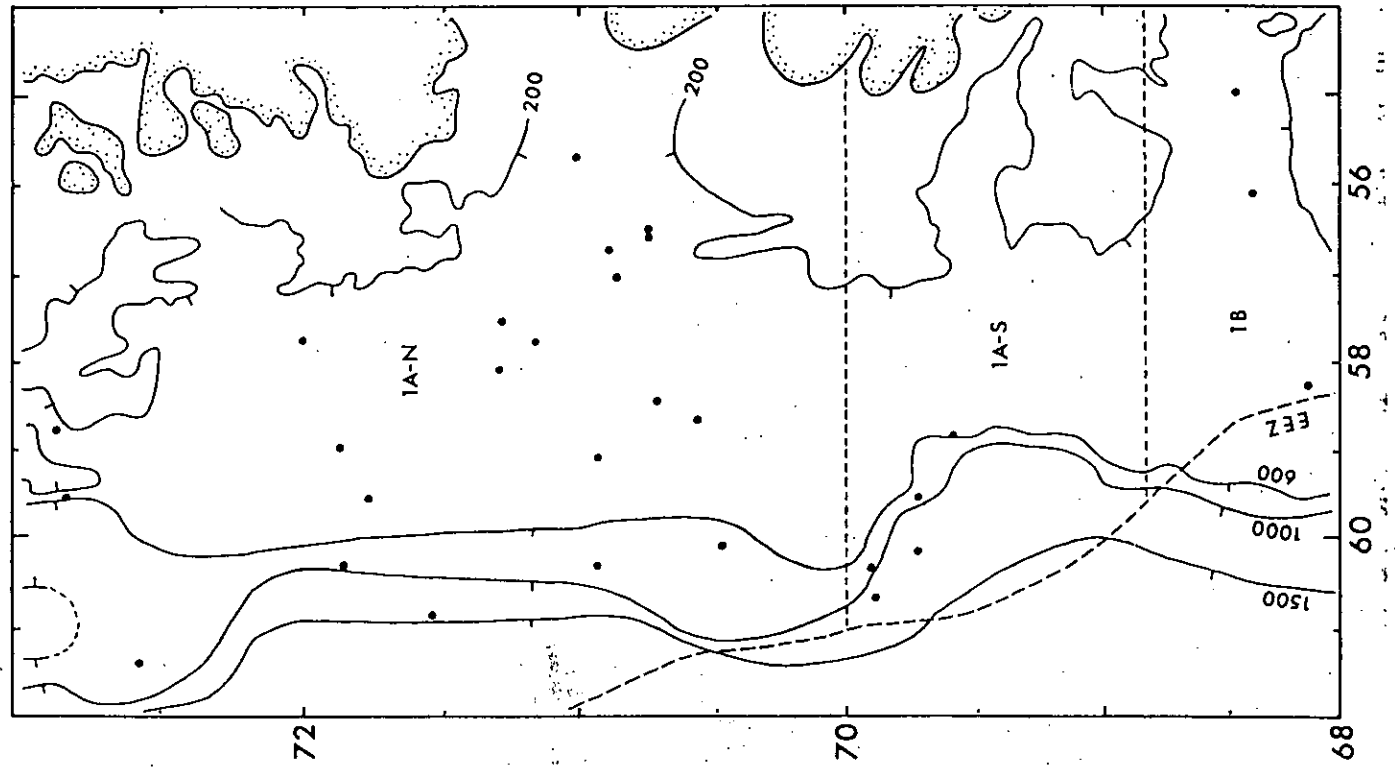
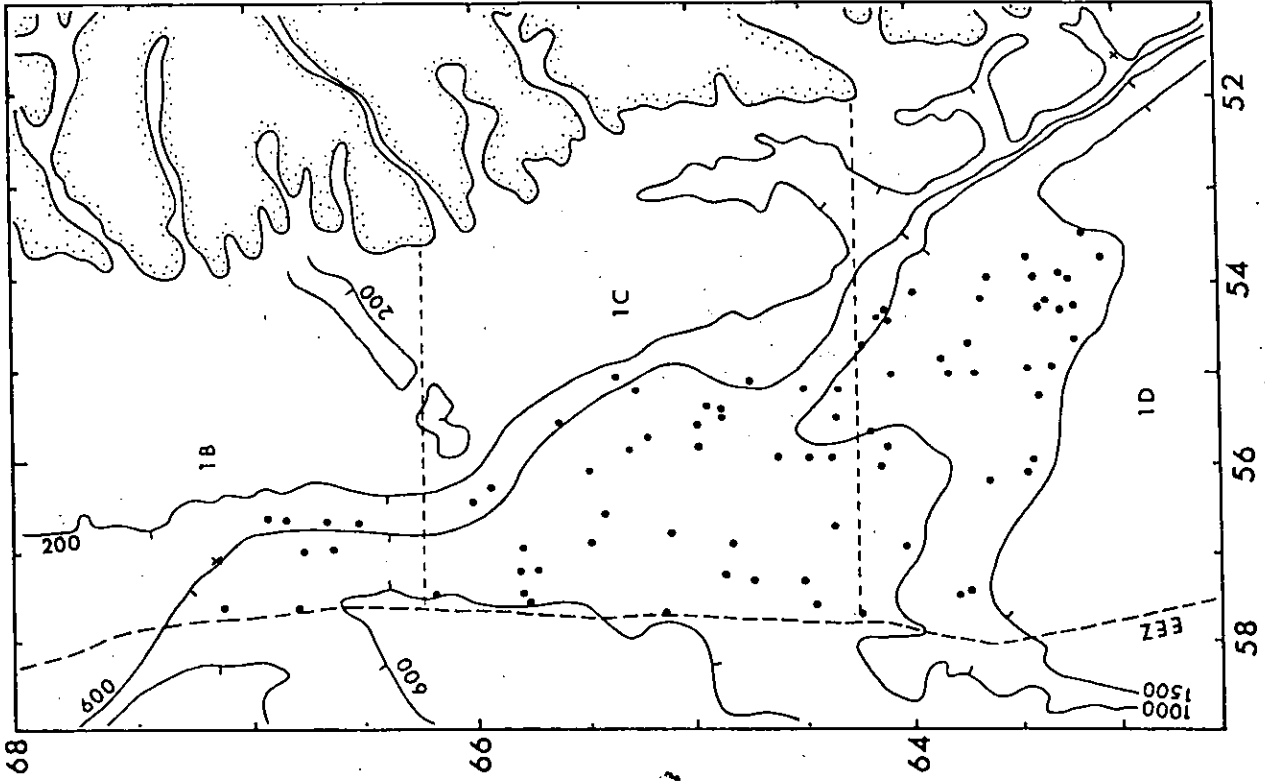


Fig. 1. Stratification scheme and trawl stations off West Greenland in 1988. Solid circles: succeeded stations; cross: trawled without success.

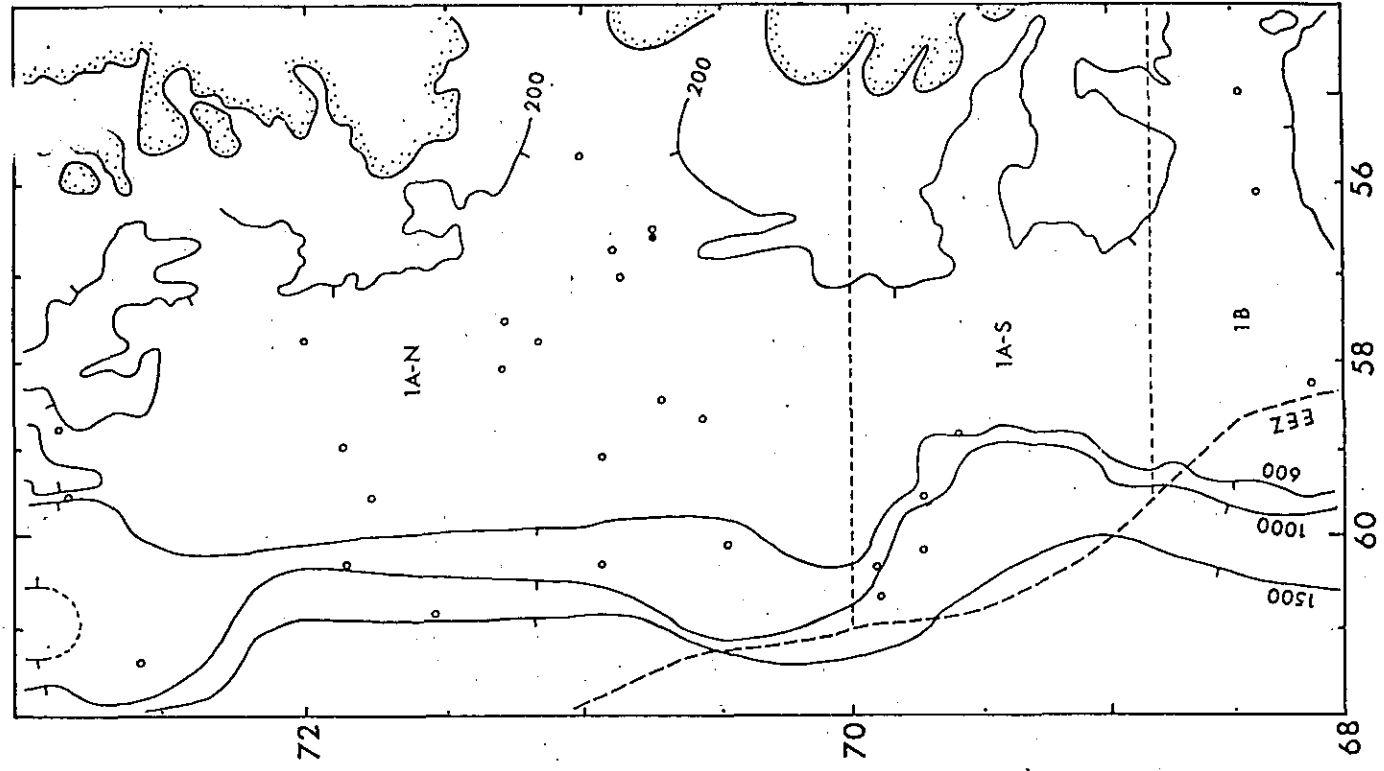
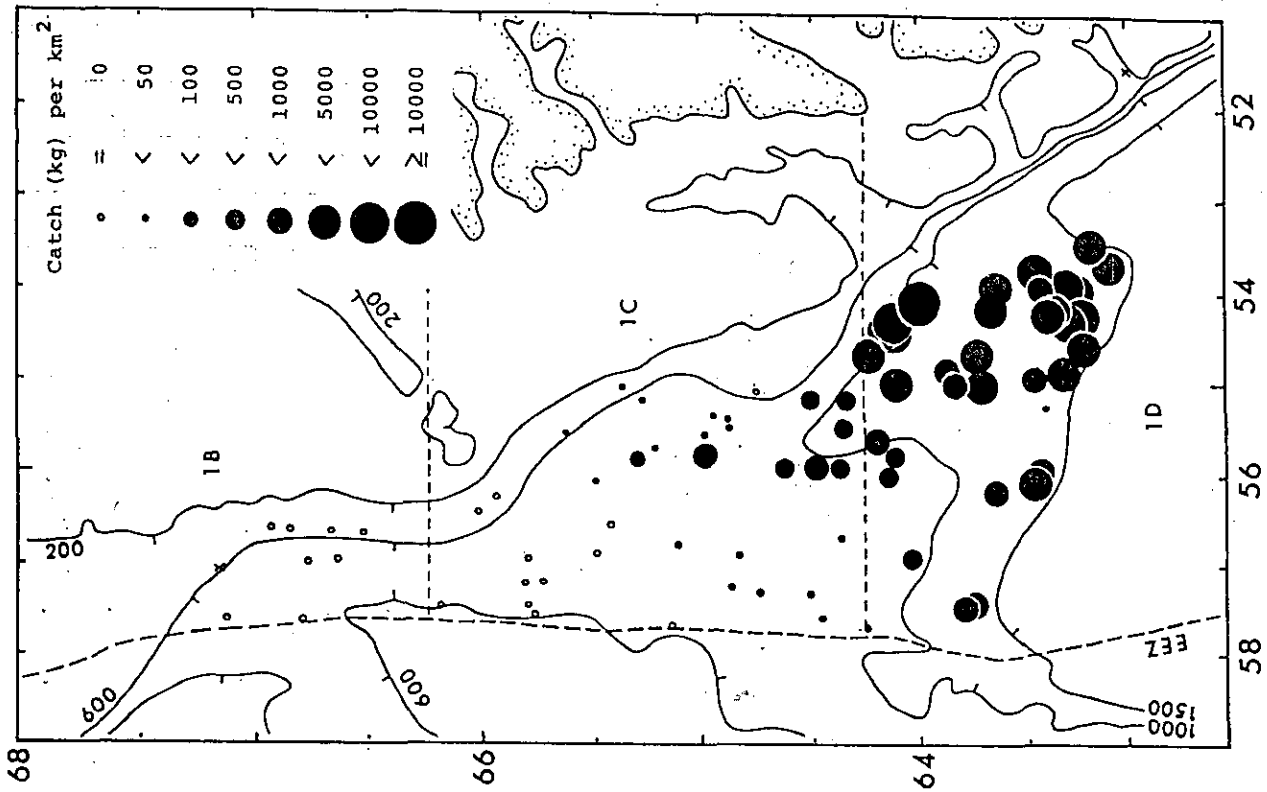


Fig. 2. Distribution of roundnose grenadier off West Greenland in September/October, 1988.

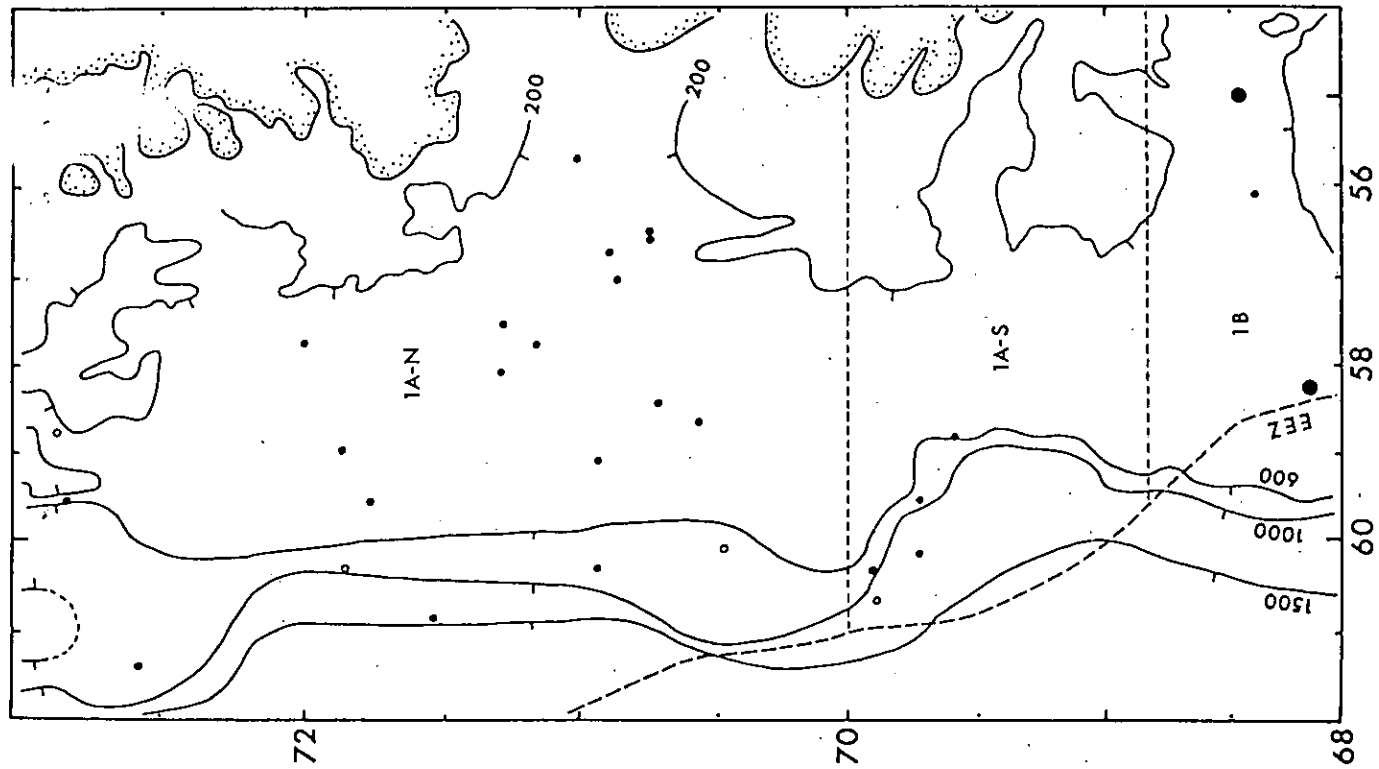
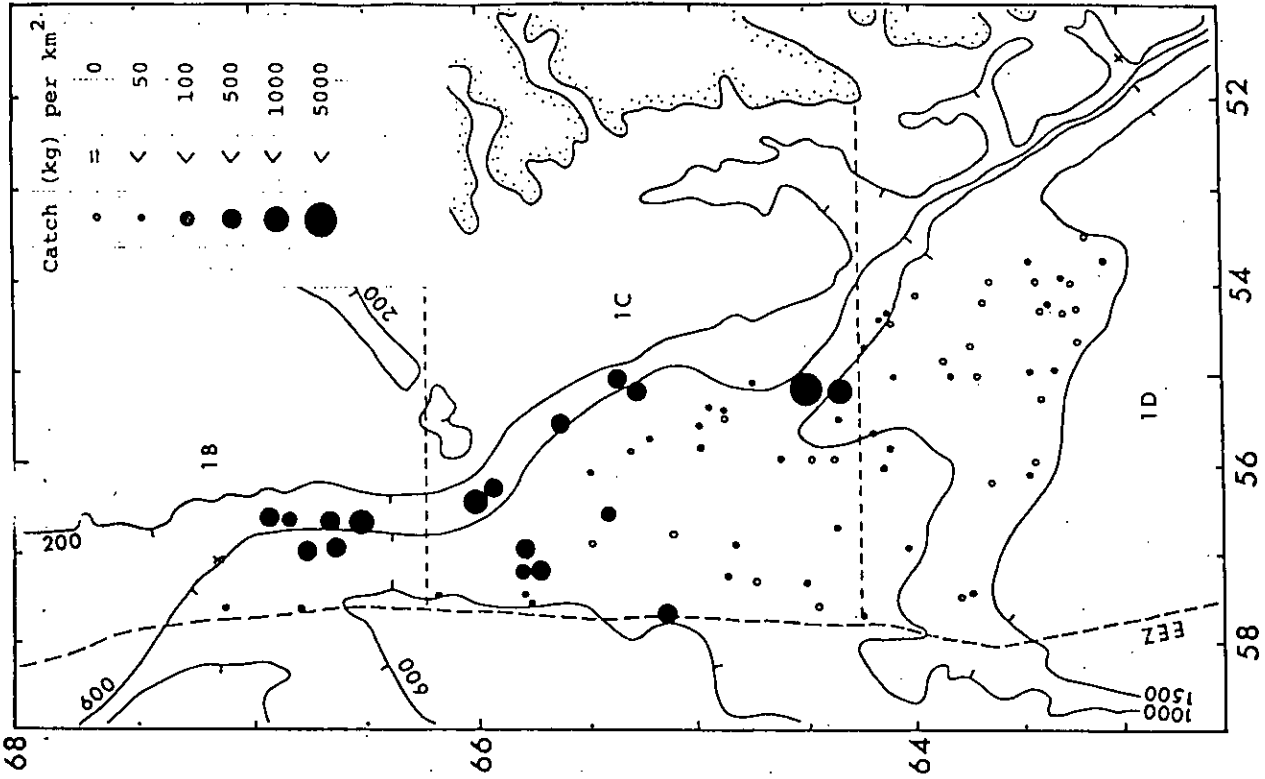


Fig. 3. Distribution of beaked redfish off West Greenland in September/October, 1988.