Northwest Atlantic Fisheries Organization

Serial No. N2094

NAFO SCR Doc. 92/43

SCIENTIFIC COUNCIL MEETING - JUNE 1992

Survey Biomass of fishes in the Disko Bay area West Greenland - September 1991

by

S.A. Pedersen and K.H. Nygård

Greenland Fisheries Research Institute, Tagensvej 135, 1.
DK-2200 Copenhagen N, Denmark

1. Introduction

A stratified-random shrimp trawl survey was conducted in September 1991 in the inshore areas of Disko Bay and Vaigat off West Greenland, NAFO Division 1A (Fig. 1). This survey was an extension of the 1991 offshore shrimp trawl survey initiated in July 1988 by Greenland Fisheries Research Institute (Carlsson and Kanneworff, 1991). The scope of the survey was to assess the trawlable biomass of shrimps and the by-caught fish species, and to collect biological samples for estimation of the size composition of the inshore shrimp stock component and the by-caught fish species. This paper presents estimates of biomass and size frequency distributions of the most important fish species by-caught during the survey.

2. Materials and Methods

Survey design

A full description of the survey design, haul positions and the basis for the stratification scheme in 9 subareas is given in Carlsson et al.(1992) (this meeting), therefore only a summary is given here.

The survey was carried out in the inshore area inside the 3-mile limit of Disko Bay and Vaigat between 68°42'N and 70°38'N in depths between 150m and 550m (Fig. 1).

The 722 GRT stern trawler "M/TR Paamiut" was used during the survey. "M/TR Paamiut" is a sistership and of the same size as trawlers used since 1988 in Greenland trawl surveys (M/TR Sisimiut and M/TR Manitsoq). Same vessel and equipment was used during the previous offshore shrimp survey in the Davis Strait.

The trawl used was a Skjervoy 3300/20 with bobbin gear and a double-bag with 44 mm mesh size in the codend. The trawl doors used were of the "Perfect" type, and the wing spread was estimated by use of SCANMAR equipment to an average of 27.7 m.

The duration of the hauls was held as close as possible to 30 minutes. In order to minimize the influence of vertical migration of shrimp the trawl operations were carried out only at day time (0900-1900 UTC).

Biomass and size compositions

The mean biomass with standard deviation by stratum of Greenland halibut, redfish, cod and other mixed fish species was calculated by means of the swept area method and assuming a catchability coefficient of 1.0. From most of the hauls the dominating fish species were length measured to the nearest centimetre below. The length compositions of the dominating fish species in each haul were weighted by effort and stratum area and pooled.

3. Results

A list of fish species by-caught during the survey is given in Table 1. In general Polar cod and Greenland halibut were the most dominating fish species in the catches follow by Eelpouts, skates and redfish. Other fish species occurred with less and variable weights in the catches. The mean biomass with standard deviation by stratum of Greenland halibut, redfish, cod and mixed fish species containing all other fish species are given in table 2. The higest density (biomass divided by stratum area) of Greenland halibut is observed in stratum area 7, 6 and 2 in the eastern part of Disko Bay. The higest density of redfish is observed in stratum area 1, 4 and 3 in western and outer part of Disko Bay. Cod is only observed in stratum area 1 and 4 and only few specimens were caught. The higest density of other mixed fish species mainly Polar cod is observed in stratum area 3, 2, 8, 6 and 4. The total estimated biomass (in tonnes) and confidence intervals (%) for the whole survey area are given in the table below:

Species	Biomass t	C.V.
Greenland halibut	2,122	38%
Redfish	215	50%
Cod	6	147%
Mixed fish	3,809	26%
Total	6,152	

Length frequency distributions of Greenland halibut by stratum area are shown in Fig. 2. There is three marked peaks in the distributions from most of the strata at about 12 cm, 19 cm and 26 cm. Length frequency distributions for the whole survey area of Greenland halibut, redfish, eelpouts, long rough dab and polar cod are shown in Fig. 3. For redfish the length frequency distribution shows marked peaks at 7 cm, 10 cm, 13 cm and 19 cm. For eelpouts the length frequency distribution shows marked peaks at about 13 cm and 18 cm, for both long rough dab and polar cod there are peaks at about 11 cm.

4. Discussion

The total fish biomass in the survey area of about 6,100 tons as estimated from the by-catch data can be compared with the total shrimp biomass of about 44,800 tons (+/- 45%) estimated from the shrimp catches during the same survey (Carlsson et al., 1992). From this comparison it is seen that the total estimated fish biomass is only about 12 % of total estimated biomass (fish+shrimp). It should however be kept in mind that the little is known about the shrimp trawl catchability for most of the fish species. Polar cod and redfish are more pelagic or semipelagic fish species and they are not caught representatively by a shrimp trawl. Escapement is an other unknown factor. The biomass estimates of the fish species are therefore not absolut values both can be regarded as indices and will be compared with survey biomass estimated obtained in the years to come.

According to Smidt (1969) Greenland halibut is most frequent on grounds with rich stocks of deep sea prawns (Pandalus borealis), and it is an important fish species in by-catch from the prawn fishery. Small Greenland halibut have long been known to occur in rich quantities on nursery grounds in the Disko Bay and in several fjords of South Greenland at depths between 200-600 m (Jensen, 1935; Smidt, 1969; Riget and Boje, 1988). The stock of I-group Greenland halibut is very dense on the localities west of Disko compared with other localities, and the vast shallow areas (about 200-250 m in depth) northwest, west and southwest of Disko can be regarded as very important nursery grounds from where the older stocks in the fjords of Disko Bay, Umanak district, and more northern districts are recruited.

The by-catch data presented in this paper confirm that the nursery grounds for Greenland halibut coincide with the distribution area for shrimp (Pandalus borealis) in the Disko Bay area.

The biomass estimate of 2,100 tons of Greenland halibut in the Disko Bay area can be compared with a biomass of about 5,000 tons of Greenland halibut estimated from the offshore shrimp trawl survey in 1991 (Kanneworff and Pedersen, 1992). The three marked peaks in the length distributions of Greenland halibut found in the Disko Bay survey at about 12 cm, 19 cm and 26 cm were also observed during the offshore shrimp trawl survey in 1991 (Kanneworff and Pedersen, 1992) and these peaks represents I, II and III group Greenland halibut. Similarly the biomass estimate of 215 tons of redfish in the Disko Bay area can be compared with a biomass of about 25,200 tons of redfish estimated from the offshore shrimp trawl survey in 1991 (Pedersen and Kanneworff, 1992). It is seen that the Disko Bay area is unimportant as nursery ground for redfish whereas it is very important as nursery ground for Greenland halibut. The marked peak in the length distributions of redfish found in the Disko Bay survey at 7 cm were also observed during the offshore shrimp trawl survey in 1991 and this peak represent I-group redfish of a large 1990 yearclass recruited to West Greenland from the breeding areas in the Irminger Sea (Pedersen and Kanneworff, 1992).

5. References

Carlsson, D.M. and P. Kanneworff, 1991. Report on Stratified-random Trawl Surveys for Shrimp (*Pandalus borealis*) in NAFO Subarea 0+1 in July-August 1990 and Comparison with Earlier Surveys. NAFO SCR Doc. 91/70.

Carlsson, D.M., P. Kanneworff and K.H. Nygård, 1992. Report on a Stratified-random Trawl Survey for Shrimp (*Pandalus borealis*) in Inshore Areas off West Greenland, NAFO Subarea 1 in 1991. NAFO SCR Doc. 92/55, Serial No. N2108.

Jensen, A.S., 1935. The Greenland halibut (*Reinhardtius hippoglossoides*), its development and migrations. K. DanskeVidensk. Selsk. Skr., 9 Rk., 6(4):1-32.

Kanneworff, P. and S.A. Pedersen, 1992. Survey Biomass of Greenland halibut (*Reinhardtius hippoglossoides*) off West Greenland (NAFO Subarea 0+1), July-August 1988-91. NAFO SCR Doc. 92/45, Serial No. N2096.

Pedersen, S.A. and P. Kanneworff, 1992. Survey Biomass of Redfish (*Sebastes sp.*) off West Greenland (NAFO Subarea 0+1), July-August 1988-91. NAFO SCR Doc. 92/44, Serial No. N2095.

Riget, F. and J. Boje, 1988. Distribution and Abundance of Young Greenland Halibut (*Reinhardtius hippoglossoides*) in West Greenland Waters. NAFO Sci. Coun. Studies, 12: 7-12.

Smidt, E.L.B., 1969. The Greenland Halibut, *Reinhardtius hippoglossoides* (Walb.), Biology and Exploitation in Greenland Waters. Medd. Danm. Fiskeri- og Havundersøg., N.S.,6: 79-148.

Table 1 List of fish species by-caught during the shrimp trawl survey in the Disko Bay area.

Anarhichas. minor
Anarhichas sp.
Artediellus sp.
Benthosema glaciala
Boreogadus saida
Careproctus reinhardti
Cottunculus microps
Cuclopterus lumpus
Eumesogrammus praecisus
Eumicrotremus spinosus
Gadus morhua
Hippoglossoides platessoides
Icelus sp.
Leptagonus decagonus
Liparis sp.
Lycodes sp.
Mallotus villosus
Raja radiata
Reinhardtius hippoglossoides
Sebastes sp.
Stichaeidae + Lumpenidae
Triglops sp.

Table 2 Calculated biomass of Greenland halibut, redfish, cod and other mixed fish species by stratum.

BIOMASS OF GREENLAND HALIBUT IN STRATA

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	51.2	5	62.1	27.8	12	160
AREA 2	566	180.2	3	135.0	78.0	44	314
AREA 3	1124	247.3	4	179.1	89.5	58	471
AREA 4	1834	353.5	8	272.1	96.2	3	839
AREA 5	612	124.4	4	33.6	16.8	94	168
AREA 6	1014	358.8	5	721.6	322.7	10	1649
AREA 7	1447	689.7	6	447.9	182.8	55	1241
AREA 8	652	40.4	5	46.7	20.9	1	108
AREA 9	1296	76.6	4	121.8	60.9	0	257

BIOMASS OF REDFISH IN STRATA

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	53.6	5	87.2	39.0	3	206
AREA 2	566	6.3	2	4.9	3.5	3	10
AREA 3	1124	27.1	4	37.3	18.7	2	82
AREA 4	1834	65.7	8	72.4	25.6	14	198
AREA 5	612	13.1	4	1.7	0.9	11	15
AREA 6	1014	14.5	5	28.6	12.8	0	66
AREA 7	1447	21.7	6	11.3	4.6	7	39
AREA 8	652	12.3	5	27.5	12.3	0	61
AREA 9	1296	0.3	5	0.7	0.3	0	2

Table 2 (Continued) Calculated biomass of Greenland halibut, redfish, cod and other mixed fish species by stratum.

BIOMASS OF COD IN STRATA

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	2.1	6	5.1	2.1	0	12
AREA 2	566	0.0	3	0.0	0.0	0	0
AREA 3	1124	0.0	4	0.0	0.0	0	0
AREA 4	1834	3.8	8	10.6	3.8	0	30
AREA 5	612	0.0	4	0.0	0.0	0	0
AREA 6	1014	0.0	5	0.0	0.0	0	0
AREA 7	1447	0.0	6	0.0	0.0	0	0
AREA 8	652	0.0	5	0.0	0.0	0	0
AREA 9	1296	0.0	5	0.0	0.0	0	0

BIOMASS OF MIXED FISH IN STRATA

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	186.6	6	238.3	97.3	16	625
AREA 2	566	310.0	3	128.6	74.3	205	454
AREA 3	1124	1082.3	4	799.8	399.9	231	2142
AREA 4	1834	731.6	8	495.2	175.1	349	1784
AREA 5	612	190.1	4	61.5	30.8	136	277
AREA 6	1014	449.6	5	188.8	84.4	183	716
AREA 7	1447	380.5	6	255.2	104.2	138	828
AREA 8	652	300.4	5	202.5	90.5	75	628
AREA 9	1296	178.3	5	158.0	70.7	0	375

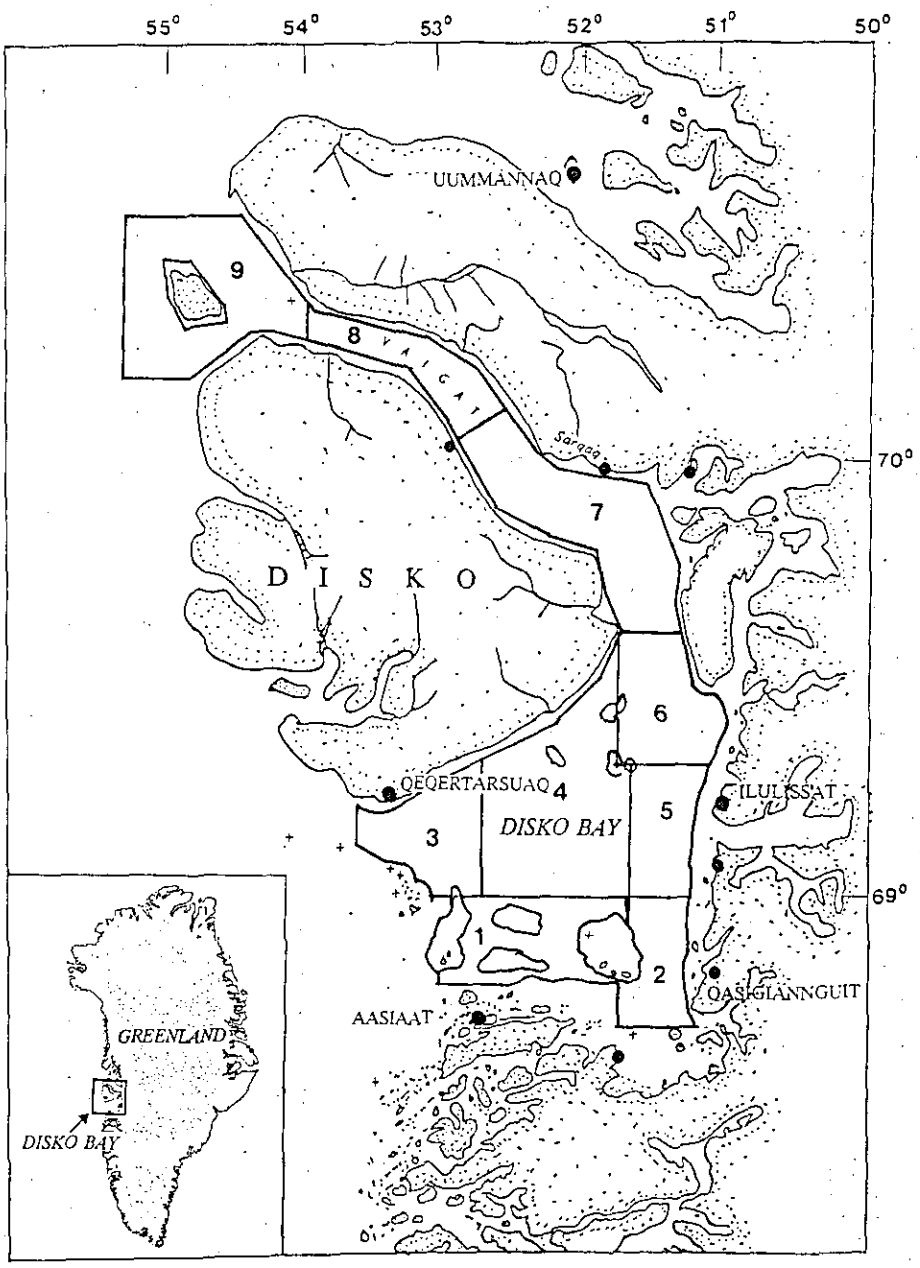


Fig. 1 The Disko Bay area and stratification area 1-9 used during the shrimp trawl survey in September 1991.

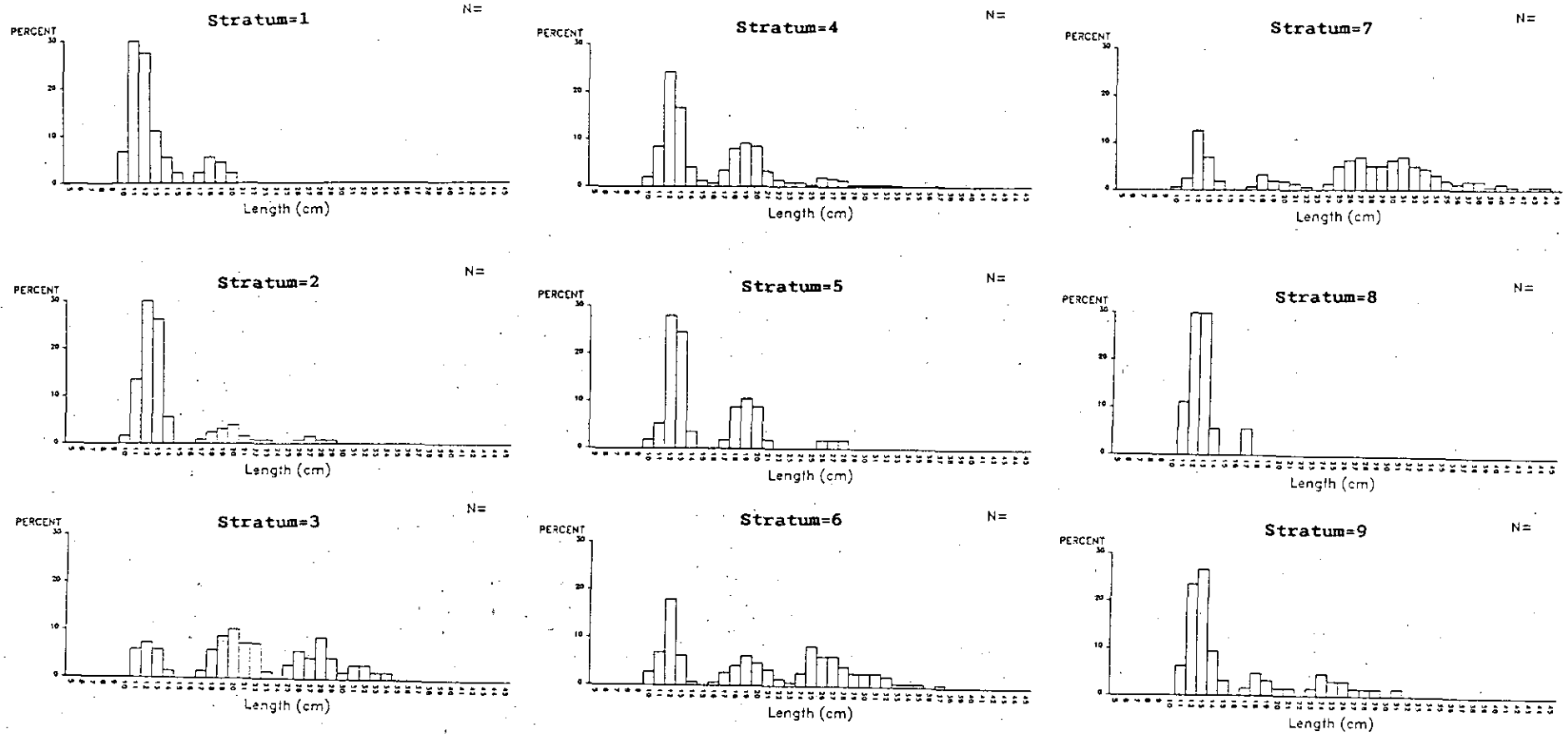
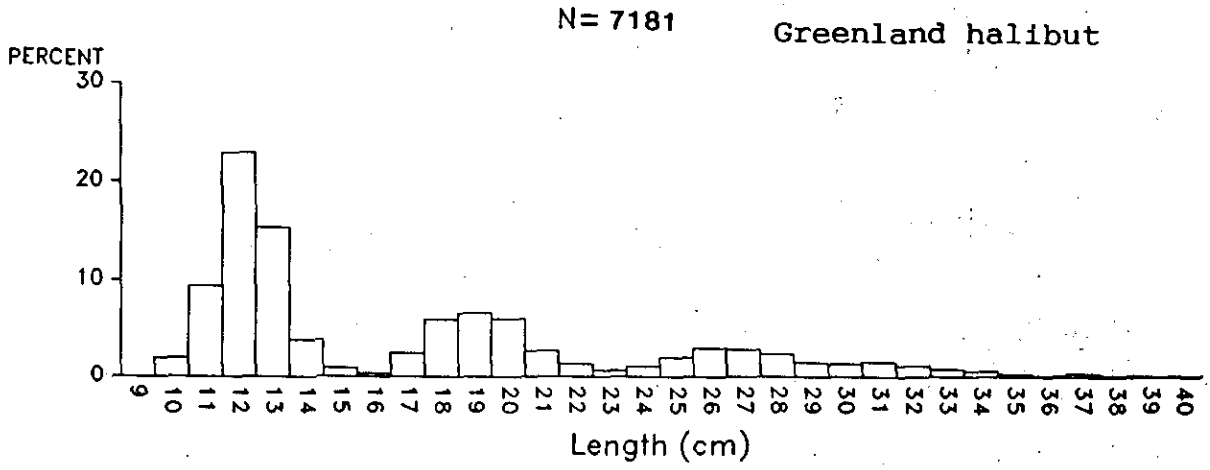


Fig. 2 Length frequency distributions of Greenland halibut by stratum in the Disko Bay area.



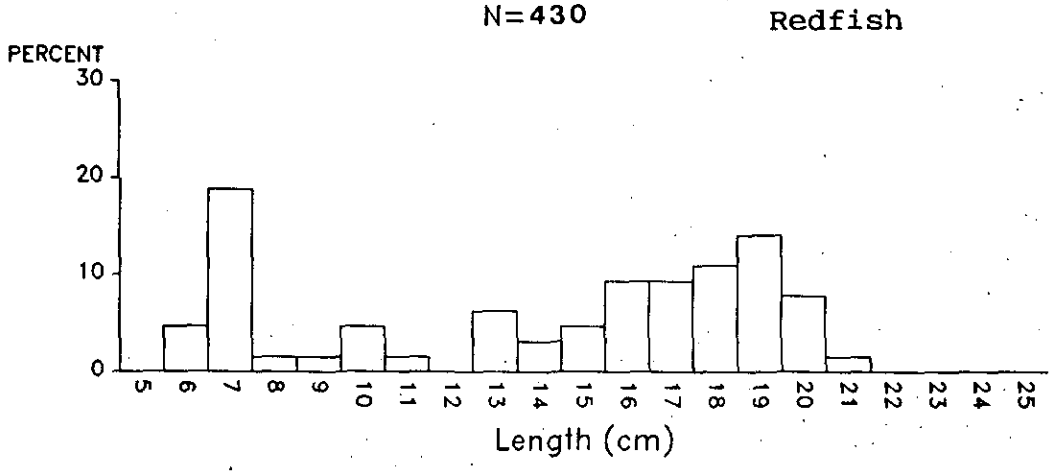


Fig. 3 Length frequency distributions of Greenland halibut and redfish in the Disko Bay area.

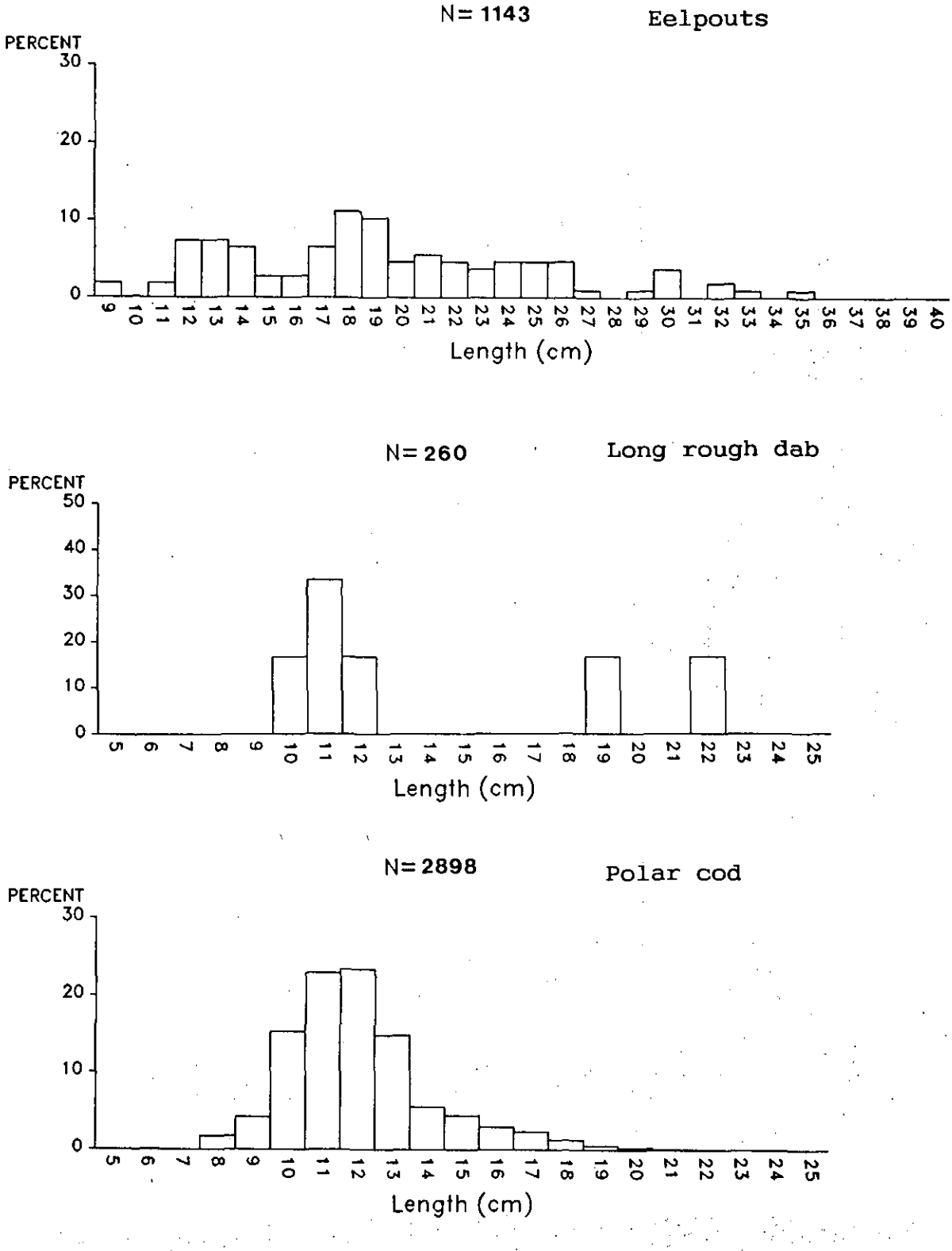


Fig. 3 (Continued) Length frequency distributions of Eelpouts, Long rough dab and Polar cod in the Disko Bay area.