

Northwest Atlantic



Fisheries Organization

Serial No. 2871

NAFO SCR Doc. 97/39

SCIENTIFIC COUNCIL MEETING - JUNE 1997

Biomass and Abundance of Demersal Fish Stocks off West Greenland Estimated from  
the Greenland Trawl Survey, 1988-1996.

by

Jens Jacob Engelstoft

Greenland Institute of Natural Resources  
Box 570, 3900 Nuuk Greenland

and

Ole Jørgensen

Greenland Institute of Natural Resources  
Pilestræde 52, DK 1016 København K Denmark

**Introduction**

Since 1988 the Greenland Institute of Natural Resources annually conducted a bottom trawl survey off West Greenland. The main purpose of the survey is to evaluate the biomass and abundance of Northern shrimp (*Pandalus borealis*), but data on most fish species have been recorded. This paper presents biomass and abundance estimates together with length frequencies of cod, Greenland halibut, redfish and other economical and ecological important species from the survey area.

**Materials and methods.**

The survey covers the offshore areas at West Greenland between 59°00'N and 72°30'N from the 3-mile limit to the 600 m depth contour line and the inshore area Disko Bay (Figure 1 and Table 1). The survey area is divided into NAFO Divisions, which were further subdivided into three depth strata (0-200, 201- 400 and 401- 600 m) on basis of depth contour lines. The area surveyed has, however, changed throughout the years. From 1988 to 1990 the survey area included Div. 1AN to 1D. In 1991 the Div. 1AN was not covered. In 1992 the survey area was extended to include Div. 1AN to 1F and Disko Bay (Div. 1AX), and this area is now surveyed annually. The survey was originally designed as a shrimp survey and sampling of fish data was not complete in the period 1988-1991. Since 1992 the sampling of fish has improved and the survey is now considered as a combined groundfish/shrimp survey. The survey period was July to September.

The survey is designed as a stratified-random trawl survey where hauls are allocated to the depth strata proportionally to the strata size. A minimum of two hauls per stratum is always planned. Due to lack of information of the bottom topography Div. 1AN and Disko Bay are considered as two single strata. During 1988-1996 1564 successful hauls were carried out. The number of valid hauls by year and stratum is listed in Table 2.

The surveys have been conducted by trawlers of the same size throughout the years. Since 1991 the 722 GRT stern trawler M/Tr 'Påmiut' has been used. The trawl is a Skjervoy 3000/20 with bobbin gear and double bag. The mesh size in the codend was 40mm from 1988 to 1992. From 1993 the mesh size in the codend has been 20 mm. The changes of mesh size did not influence the catchability of fish except for redfish abundance. Abundance estimates for redfish before 1993 are therefore adjusted in according to Bech 1994. The trawl doors in use are of the type 'Perfect', except for the 1989 survey where 'BMV' doors were used. The wing spread is estimated by use of Scanmar equipment.

The standard trawling time offshore is 60 minutes at a mean towing speed of 2.5 knots. In Disko Bay (1AX) the trawling time is 30 min. The trawling operations are performed during day time only. After each haul the catch was sorted by species or lowest taxonomic level and weighed to 0.1 kg and the number recorded. Fish were measured as total length to 1 cm below. The catches of redfish consisted almost exclusively of specimens <20 cm. Due to difficulties in identification of species all redfish were classified as *Sebastes sp.*

Stratified abundance and biomass estimates were calculated from catch-per-tow data using the stratum areas as weighting factor (Cochran, 1977). The coefficient of catchability was set arbitrarily at 1.0, implying that estimates are merely indices of abundance and biomass. Confidence intervals (CI) were set at the 95% level of significance of the stratified mean.

Otoliths for age determination of Greenland halibut were sampled in Disko Bay, Div. 1A, 1B and 1C. The otoliths were soaked in water and read in transparent light. Data from Div. 1A, 1B and 1C were pooled. Age distributions were estimated using age/length keys and surveys length frequencies pooled in 3 cm groups.

Catch per unit effort (CPUE) for Greenland halibut was calculated as catch in numbers per yearclass per hour.

## Results.

### Greenland halibut (*Reinhardtius hippoglossoides*).

Greenland halibut was found in all divisions, but it was most common in Div. 1AN-1C, especially in Div. 1BN. In 1996 the abundance and biomass was estimated to 603 mill. individuals and 22819 tons (Tables 3 and 4). The estimates are the largest in the time series and a significantly increase (95% level) on 100% and 86% compared to the 270 mill individuals and 12000 tons estimated in 1995. The abundance and biomass estimates in the period 1992-1995 have been relatively stable with 270-345 mill individuals and 11000-14000 tons. The increase in abundance and biomass a between 1995 and 1996 was mainly seen in the nursery areas (Div. 1BN and Disko Bay) but also in Div. 1AN.

In 1996 the length the length distribution was totally dominated by 10-13 cm fish (Figure 2). Further, a small mode around 18 cm was seen. These two modes have been seen in all surveys in the time series, although the number of fish and the relative strength of the modes have varied between years.

In 1996 the ages ranged between 1 and 11 years but the length distributions in all Divisions were dominated by age 1, especially in Div 1A and 1B and Disko Bay (Figure 3).

The CPUE (number per age per hour) of age 1 (1995 year class) was estimated at 650 and 480 specimens in 1996 in the offshore nursery area (Div. 1AS, 1BN and 1BS) and in the Disko Bay, respectively. The estimate was the largest in the time series in both areas. Year class two was also estimated to be relatively large, 100 specimens per hour offshore and 230 specimens per hour in Disko Bay (Figure 4). The figure offshore was to some extent driven by one large catch. If this haul is excluded from the analysis the mean catch per hour was 467,75 and 21 specimens of age 1 to 3, respectively. The CPUE of age 1 was thus still the largest in the time series.

### Redfish (*Sebastes sp.*)

Redfish was found in all the survey area, but was usually most common in Div. 1BN, 1BS and 1C. In 1996 the abundance and biomass was estimated to 2.4 billion individuals and 23000 tons, respectively (Table 5 and 6). The 1996 estimate was larger than the 1995 estimate (1.1 billion individuals and 12000 tons) but at the same level as in the period 1992-1995 (1.1-2.9 billion individuals and 12-31000 tons).

In 1996 the length ranged between 4 and 25 cm, but the catches comprised almost exclusively of species <20 cm as in the previous years (Figure 5) The length distribution was dominated by one clear mode at 7 cm, and a small mode was seen at 12 cm, probably corresponding to age 1 and 2 (Nederaas 1990).

### American plaice (*Hipplogossoides platessoides*)

American plaice was mainly found in Div. 1A-1D. In 1996 the abundance and biomass estimated to 30 mill. individuals and 1642 tons (Table 7 and 8). The abundance and biomass estimates for American plaice has varied without any significant trend between 9 and 48 millions individuals and 656 and 1951 tons. In 1996 the length ranged between 5 and 35 cm (Figure 6). Clear modes at 10-12 and 15-20 cm were seen in 1996.

### Spotted wolffish (*Anarhichas minor*)

Spotted wolffish was evenly distributed in the survey area. In 1996 the abundance and biomass was estimated to 0.5 mill. individuals and 657 tons (Table 9 and 10). The abundance and biomass has varied through the time series without any significant trend with highest abundance estimates in 1994 (1.3 mill.) and lowest in 1993 (0.3 mill.). No length data were available for this species.

### Atlantic wolffish (*Anarhichas lupus*)

Atlantic wolffish was mainly caught south of 68°00'N. In 1996 the abundance and biomass was estimated to 2.2 mill. individuals and 375 tons (Table 11 and 12). The abundance and biomass has varied through the time series without any significant trend with highest estimates in 1994 (6.7 mill. individuals and 977 tons) and lowest in 1993 (1.0 million individuals and 228 tons). In 1996 the length ranged between 5 and 50 cm (Figure 7). The length showed a dominance of small fish <35cm but without any clear modes.

### Cod (*Gadus morhua*)

Cod was mainly caught south of 68°00'N. In 1996 the abundance and biomass was estimated to 0.3 mill. and 112 tons (Table 13 and 14). The biomass of cod has been estimated to 4,000-7,000 tons in 1988-1990. In 1992 the biomass decreased with over 95% to only 250 tons and 0.5 mill. individuals and has remained at this low since. The length of cod has ranged between 15 and 60 cm, but in 1996 the range was between 25 cm and 42 cm (Fig. 8).

### Starry skate (*Raja radiata*)

The biomass are mainly distributed in Div. 1A-1D. In 1996 the abundance and biomass was estimated to 15 mill. and 2646 tons. The abundance and biomass of starry skate has increased (statistically insignificant) from a level about 6-10 mill. and 7-1200 tons in 1991-1993 to a level of 13-16 mill. individuals and 2260-2460 tons in 1994-1996 (Table 15 and 16). No length data were available for this species.

## Discussion

The survey was originally designed as a shrimp survey. The fish data are incomplete and the survey did not cover the same area in the period 1988-1991. Direct comparison was hence only possible for the

period 1992-1996. The main purpose of the survey is to evaluate the biomass of northern shrimp and most effort is concentrated in the areas and depths where the commercial shrimp trawling taking place, especially on the northern slopes of the grand bank Store Hellefiskebanke (67°50N 55°00W) and in the inshore area Disko Bay, whereas Div. 1E-1F are more sparsely covered. As Store Hellefiskebanke and Disko Bay are important nursery areas for Greenland halibut and redfish as well as other important species (Smidt 1969; Tåning 1949) it renders, that the abundance and biomasses estimates of the survey reflects the juvenile stock situation of these species.

Apart from an annually fishery of about 5.500 tons Greenland halibut, no fishing effort has in recent years been directed towards groundfish at West Greenland, but an extensive shrimp fishing on traditional fishing grounds is suspected to have a negative effect on the survival rates of recruits. The fishable part of all ground fish stocks seemes to have been severely depleted in recent years which was also noticed by Rätz 1996; Ogawa et al. 1994 and Yokawa et al. 1995. The low biomass and abundance of cod, American plaice, wolffish and stary skate presented in this paper supports this general picture. The survey results do however indicate a continued recruitment of Greenland halibut and redfish.

#### References

- Bech, G. Biomass and abundance of Greenland halibut and redfish from a bottom trawl survey in NAFO Subarea 1 in 1993. NAFO SCR Doc. 94/9
- Cochran, W. G. 1977. Sampling Techniques, Third edition, Wiley & Sons.
- Ogawa, M., K. Yokawa and O. Jørgensen 1994. Results of a Stratified Random Trawl Survey off West Greenland in 1993. NAFO SCR Doc. 94/31, Ser. No N2399:1-12.
- Nedreaas, K. 1980. Age determination of Northeast Atlantic *Sebastes* species. J. Cons. int.Mer. 47: 47: 208-230.
- Smidt, E.L.B., 1969. The Greenland Halibut *Reinhardtius hippoglossoides* (Walb.), Biology and Exploitation in the Greenland Waters. Meddelelser fra Danmarks Fiskeri- og Havundersøgelser, N.S.,6: 79-148.
- Rätz, H.J., 1996. Status of the Demersal Fish Assamblage and Near Bottom Temperature off West Greenland, 1982-95 (Divisions 1B-1F, 0-400 m) NAFO SCR Doc. 96/4.
- Tåning, Å.V. 1949. On the breeding places and abundance of the redfish (*Sebastes*) in the North Atlantic. *Ibid.* Journ. Cons. Vol.16 No.1: 85-96.
- Yokawa, K., H. Shimizu, O. Jørgensen and H. Yamada. 1995. Results of a statified random bottom trawl survey off West Greenland in 1994. NAFO SCR Doc. 95/23, Ser. No. N2531:1-12

Table 1 Specification of strata. IAX=Disko Bay.

Stratum					depth (m)	area (km <sup>2</sup> )
	south	north	east	west		
1AN	6930'N	7300'N	5000'W	6300'W	1-200	
-	6930'N	7300'N	5000'W	6300'W	200-400	41129
-	6930'N	7300'N	5000'W	6300'W	400-600	-
1AS	6850'N	6930'N	5000'W	5700'W	1-200	4681
-	6850'N	6930'N	5000'W	5700'W	200-400	7474
-	6850'N	6930'N	5000'W	5700'W	400-600	640
1AX	6850'N	7030'N	5000'W	5300'W		9364
1BN	6700'N	6850'N	5000'W	5700'W	1-200	16093
-	6700'N	6850'N	5000'W	5700'W	200-400	17370
-	6700'N	6850'N	5000'W	5700'W	400-600	4133
1BS	6615'N	6700'N	5000'W	5700'W	1-200	7722
-	6615'N	6700'N	5000'W	5700'W	200-400	1682
-	6615'N	6700'N	5000'W	5700'W	400-600	1243
1C	6415'N	6615'N	5000'W	5700'W	1-200	17916
-	6415'N	6615'N	5000'W	5700'W	200-400	5314
-	6415'N	6615'N	5000'W	5700'W	400-600	3366
1D	6230'N	6415'N	5000'W	5500'W	1-200	8921
-	6230'N	6415'N	5000'W	5500'W	200-400	3562
-	6230'N	6415'N	5000'W	5500'W	400-600	903
1E	6045'N	6230'N	4800'W	5300'W	1-200	7871
-	6230'N	6415'N	5000'W	5500'W	400-600	903
1E	6045'N	6230'N	4800'W	5300'W	1-200	7871
-	6045'N	6230'N	4800'W	5300'W	200-400	2000
-	6045'N	6230'N	4800'W	5300'W	400-600	329
1F	5900'N	6045'N	4400'W	5000'W	1-200	8808
-	5900'N	6045'N	4400'W	5000'W	200-400	3330
-	5900'N	6045'N	4400'W	5000'W	400-600	1211
Total West						165698

Table 2. Nombres of valid hauls, <sup>1988</sup>1992-1996. IAX=Disko Bay.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Total
1988	23	14	*	25	5	7	4	*	*	78
1989	37	11	*	60	13	21	2	*	*	144
1990	28	20	*	69	17	35	21	*	*	190
1991	*	11	47	54	17	11	9	*	*	149
1992	32	16	44	42	8	18	19	11	11	201
1993	23	13	32	44	10	21	16	14	14	216
1994	28	19	30	52	10	24	10	10	9	192
1995	17	11	37	53	13	29	15	14	11	200
1996	22	12	36	52	11	29	12	9	11	194

Table 3 Greenland halibut (*Reinhardtius hippoglossoides*). Abundance indices (x1000) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1988	103500	2697		110900	7572	2140	194	*	*	(251263)	26
1989	*	*	*	*	*	*	*	*	*	*	*
1990	21730	1290	*	58310	4920	950	297			(83070)	24
1991	*	508	25980	58710	2972	1308	1821	*	*	(91300)	25
1992	31920	4100	68690	235900	1599	1230	568	594	0	344556	27
1993	28170	14290	35240	174100	10230	4295	3910	3517	427	274161	32
1994	21780	24490	43760	170500	12050	20720	133	397	559	296644	27
1995	18900	11320	83220	111100	22830	14320	5651	201	339	267875	21
1996	118100	2049	111500	326500	13530	18700	11790	129	355	602732	22

Table 4 Greenland halibut (*Reinhardtius hippoglossoides*). Biomass indices (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1988	9334	1012	*	5955	1416	1009	85	*	*	(18810)	25
1989	1342	294	*	1364	85	333	*	*	*	*	*
1990	2543	251	*	4384	278	271	174	*	*	(7901)	19
1991	*	5	2147	1705	88	286	70	*	*	(4301)	19
1992	2980	161	3802	4715	377	270	70	46	0	12422	19
1993	2558	252	2364	3617	757	587	449	121	44	10649	23
1994	2069	849	2488	4407	1799	1786	99	11	27	13534	26
1995	1627	168	5053	2305	949	1178	459	6	46	11791	19
1996	4363	41	8047	7204	508	1575	959	8	114	22819	21

Table 5 Redfish (*Sebastes sp.*). Abundance indices (1000) for West Greenland with 95% confidence limits in per cent of the stratified mean.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1992	7647	45740	6227	1032000	205200	55770	29050	5386	6528	1393925	33
1993	9222	28290	5838	408100	22430	173300	189900	660000	248500	1145834	29
1994	48530	89130	12470	1747000	357800	291200	102300	12740	118900	2780507	26
1995	56920	23260	10430	604800	55970	216300	95150	4592	5163	1072621	22
1996	2452	3956	5493	1980000	66080	118500	67390	10740	63060	2448154	29

Table 6 Redfish (*Sebastes sp.*). Biomass indices (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1989	554	164	*	5110	2381	2307	2180	*	*	(12690)	30
1990	882	1908	*	7373	471	1753	710	*	*	(13077)	19
1991	*	13	242	7261	408	1091	1421	*	*	(10437)	23
1992	279	490	330	13970	2928	1419	837	76	279	20609	28
1993	309	701	270	6904	330	1327	2232	652	1119	13843	31
1994	1604	2138	451	17303	2912	4063	883	200	1519	30623	45
1995	1225	231	569	4178	1012	2618	1982	256	68	12139	22
1996	40	61	495	14879	1727	3015	2161	284	1964	22108	27

Table 7 American plaice (*Hipplogossoides platessoides*). Abundance indices (1000) for West-Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1991	*	460	535	3630	506	3659	3412	*	*	(12204)	43
1992	1297	421	1569	1618	629	1820	1267	683	112	9415	25
1993	1577	315	1071	3477	964	2147	1817	497	725	12589	23
1994	3272	1493	3181	20950	7001	10420	819	441	694	48269	27
1995	1068	283	1733	6365	1193	2812	3863	589	572	18478	23
1996	2174	607	8072	5776	2602	4599	4732	251	751	29564	21

Table 8 American plaice (*Hipplogossoides platessoides*). Biomass indices (tonss) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1989	38	53	*	151	111	392	64	*	*	(810)	29
1990	0	0	*	120	48	145	364	*	*	(677)	40
1991	*	5	89	118	58	160	380	*	*	(194)	64
1992	52	11	126	84	53	140	118	65	7	656	26
1993	68	25	71	97	36	101	137	47	32	614	28
1994	140	96	285	599	343	316	66	32	74	1951	23
1995	82	17	264	211	61	97	167	35	17	951	20
1996	158	48	715	264	95	158	161	12	30	1642	20

Table 9 Spottet wolffish (*Anarhichas minor*). Abundance indices (1000) for West Greenland with 95% confidence limits in per cent of the stratified mean.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1992	49	31	9	49	28	50	28	39	60	343	22
1993	61	21	14	47	41	41	29	32	33	287	23
1994	113	193	16	318	57	427	35	13	80	1253	23
1995	176	38	7	60	52	46	34	47	35	495	19
1996	177	23	6	145	52	34	34	0	41	512	22

Table 10 Spottet wolffish (*Anarhichas minor*). Biomass indices (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1992	11	65	35	85	9	37	26	11	273	552	35
1993	40	8	67	45	18	44	4	<1	187	413	58
1994	213	105	15	81	55	164	56	12	4	705	20
1995	65	20	14	51	19	29	20	20	196	433	32
1996	267	<1	9	255	25	7	34	0	60	657	23

Table 11 Atlantic wolffish (*Anarhichas lupus*). Abundance indices (1000) for West Greenland with 95% confidence limits in per cent of the stratified mean.

Year	IAN	IAS	IAX	IBN	IBS	IC	ID	IE	IF	Westgr.	CI
1992	0	17	4	39	2	203	107	291	213	1133	37
1993	17	12	6	33	43	233	240	231	205	1020	28
1994	17	35	16	512	263	2129	518	598	2628	6717	38
1995	15	0	0	120	120	365	123	626	261	1630	31
1996	0	41	6	119	134	391	361	430	725	2207	30

Table 12 Atlantic wolffish (*Anarhichas lupus*). Biomass indices (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean.

Year	IAN	IAS	IAX	IBN	IBS	IC	ID	IE	IF	Westgr.	CI
1992	0	5	<1	9	51	34	24	62	71	257	34
1993	7	1	1	3	3	31	45	21	116	228	36
1994	<1	9	6	77	59	237	45	107	436	977	41
1995	<1	0	0	33	10	35	36	153	40	307	35
1996	0	<1	4	21	52	46	56	76	120	375	29

Table 13 Cod (*Gadus morhua*). Abundance indices (1000) for West Greenland with 95% confidence limits in per cent of the stratified mean. (.) incomplete coverage of survey area.

Year	IAN	IAS	IAX	IBN	IBS	IC	ID	IE	IF	Westgr.	CI
1991	*	0	11	7	32	429	78	*	*	(528)	73
1992	0	0	4	16	33	242	242	0	9	547	45
1993	0	0	0	0	0	54	36	205	12	308	67
1994	9	0	0	0	54	98	0	7	0	167	43
1995	0	0	0	33	17	504	42	20	46	662	58
1996	0	0	0	0	0	47	78	66	108	298	40

Table 14 Cod (*Gadus morhua*). Biomass indices (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean. (.) incomplete coverage of survey area.

Year	IAN	IAS	IAX	IBN	IBS	IC	ID	IE	IF	Westgr.	CI
1988	0	0	*	35	0	1230	2613	*	*	(3879)	81
1989	44	0	*	73	0	41	1002	*	*	(1217)	51
1990	4	13	*	7	7	118	6825	*	*	(7004)	45
1991	*	0	7	1	2	188	53	*	*	(250)	58
1992	0	0	3	22	31	74	85	0	2	217	44
1993	0	0	0	0	0	24	8	87	4	122	69
1994	0	3	0	0	12	41	0	1	0	58	43
1995	0	0	0	3	2	158	22	2	5	190	67
1996	0	0	0	0	0	16	26	21	49	112	41



Table 15 Starry skate (*Raja radiata*). Abundance indices (1000) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1991	*	176	22	4028	890	876	1140	*	*	(7133)	53
1992	2600	387	710	3082	626	713	1404	177	21	9720	22
1993	1022	125	552	1872	608	1162	484	401	192	6419	20
1994	2406	636	1131	5065	2367	3279	621	308	72	15885	22
1995	3245	170	802	3147	1243	560	3181	804	89	13240	22
1996	5586	429	1842	4640	513	748	747	21	607	15134	24

Table 16 Starry skate (*Raja radiata*). Biomass (tons) for West Greenland with 95% confidence limits in per cent of the stratified mean. () incomplete coverage of survey area.

Year	1AN	1AS	1AX	1BN	1BS	1C	1D	1E	1F	Westgr.	CI
1989	220	38	*	257	110	202	44	*	*	(870)	24
1990	10	1	*	272	27	224	703	*	*	(1237)	48
1991	*	12	21	252	94	101	259	*	*	(739)	32
1992	404	106	115	310	100	57	152	43	5	1292	20
1993	83	19	147	276	89	147	123	27	17	927	28
1994	501	88	194	560	341	355	89	122	11	2260	26
1995	397	16	299	483	401	138	335	138	25	2232	22
1996	806	46	691	632	69	120	81	199	54	2646	27

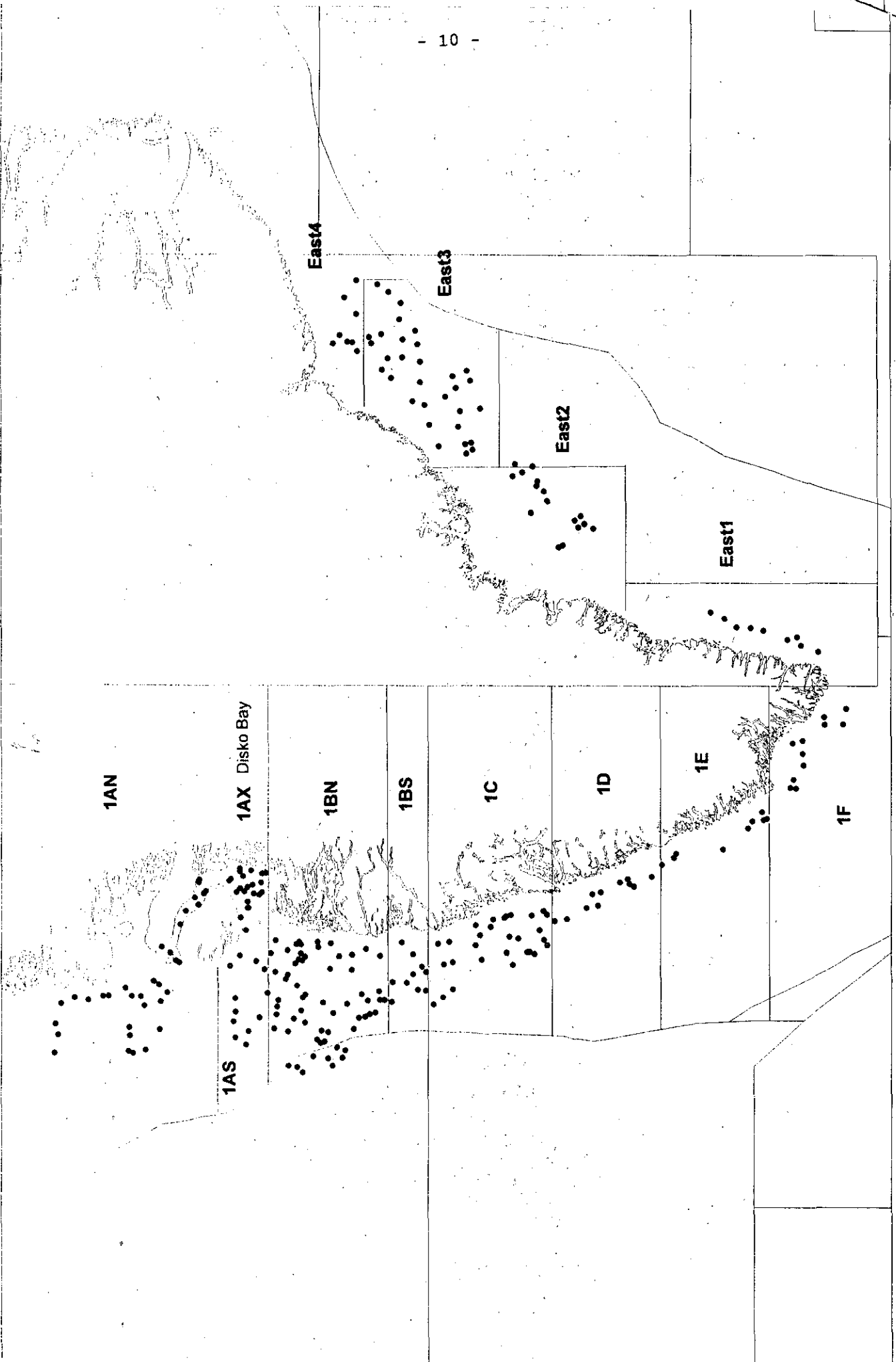


Figure 1. Haul distribution in 1996 trawl survey

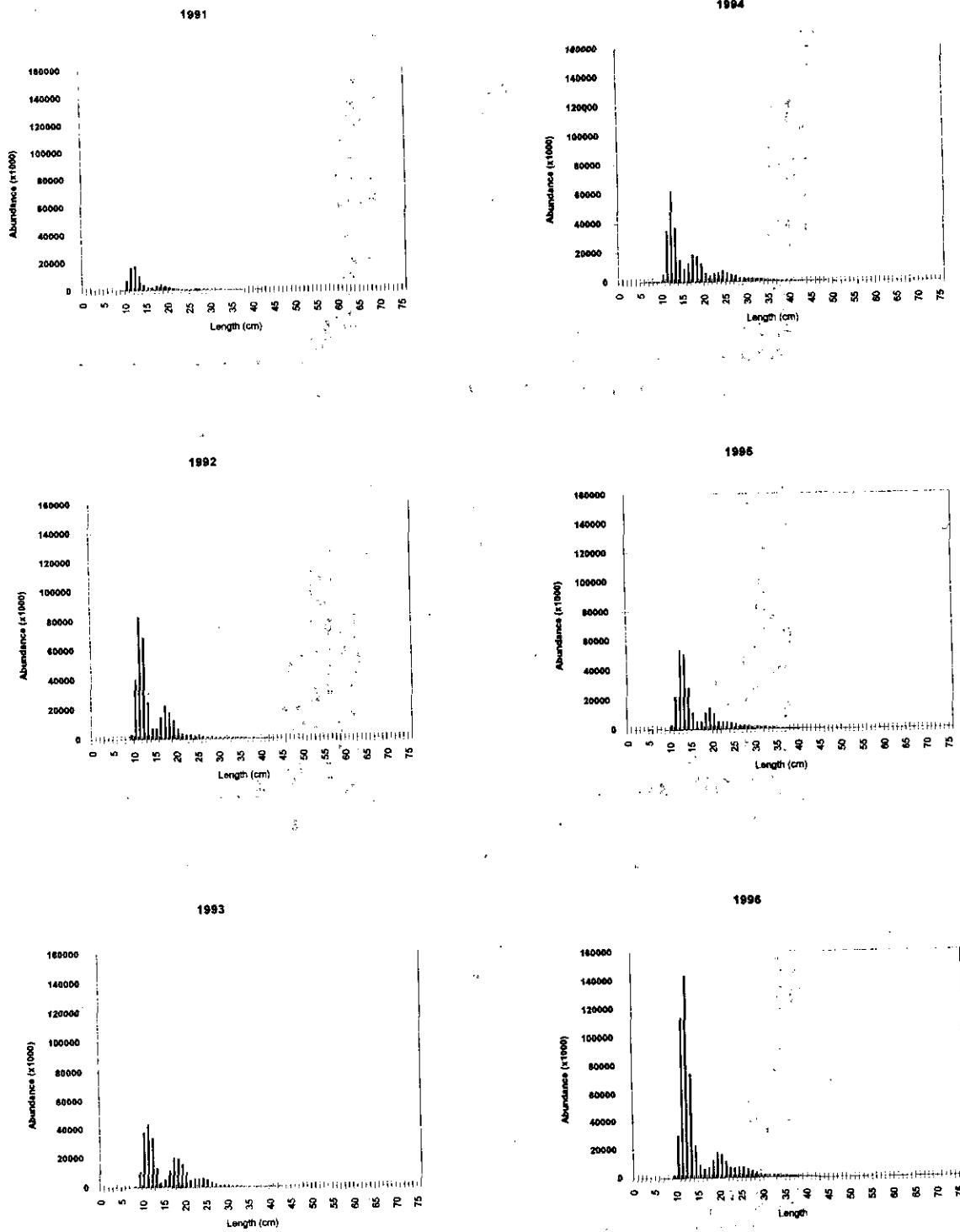


Figure 2. Greenland halibut (*Reinhardtius hippoglossoides*). Length frequencies for West Greenland, 1991-1996.

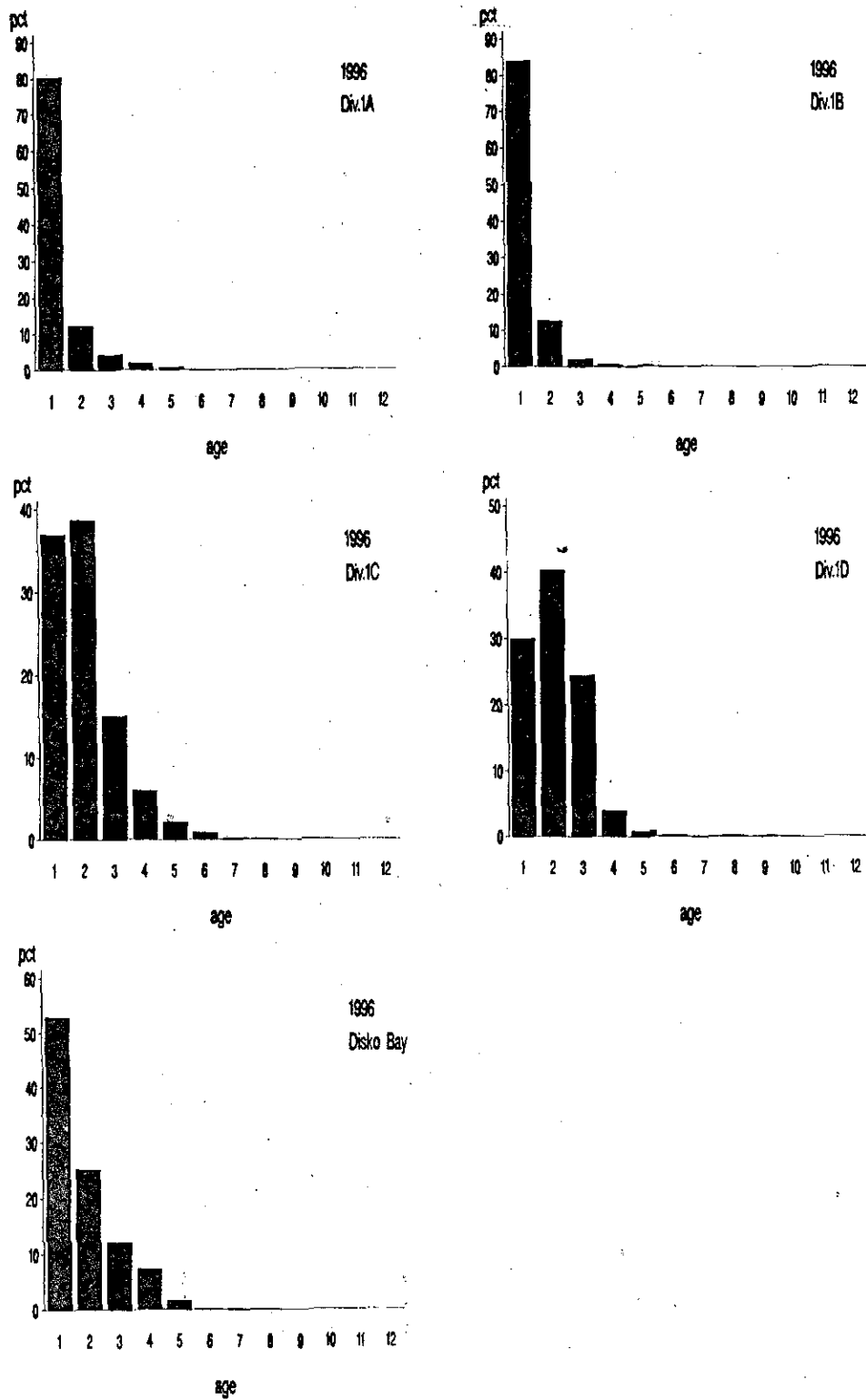
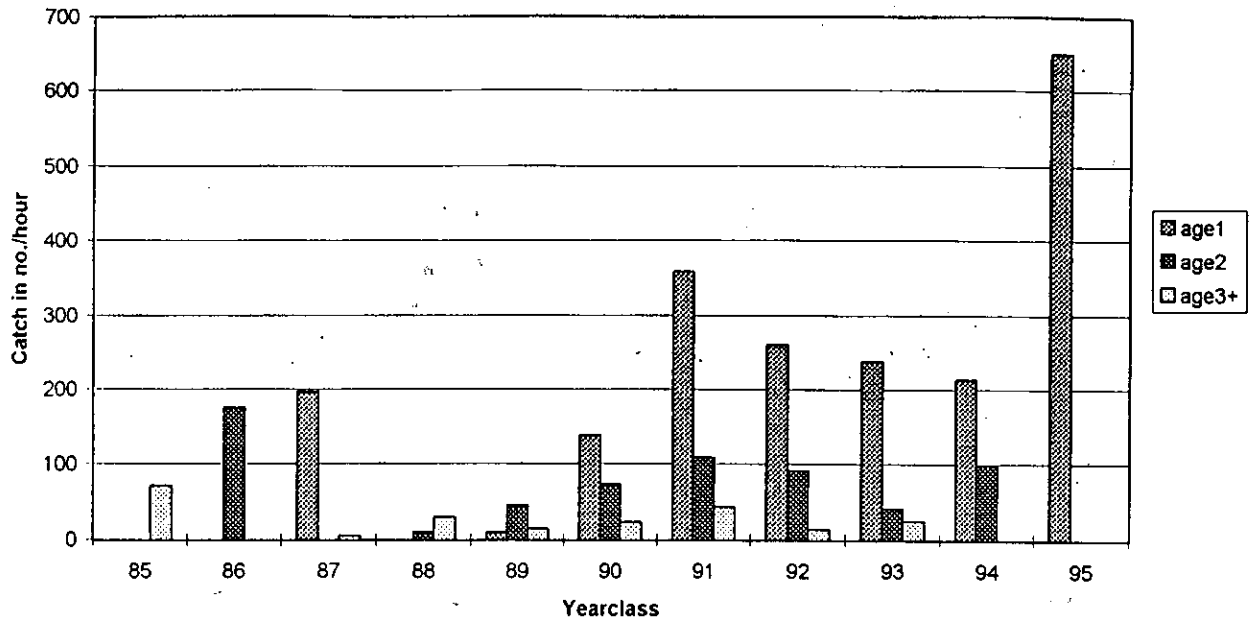


Figure 3. The age distribution of Greenland Halibut (*Reinhardtius hippoglossoides*) in 1966.

### Offshore Recruitment



### Disko Bay Recruitment

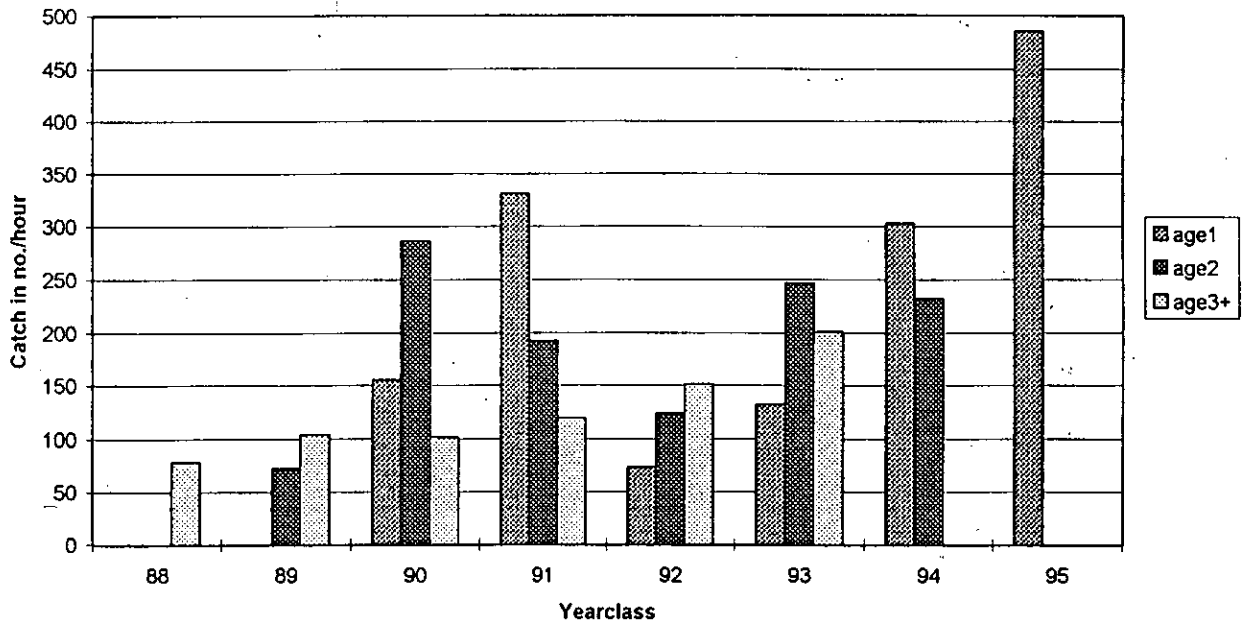


Figure 4 CPUE values (number/trawl hour) from the offshore survey area and inshore Disko Bay (Division 1AX).

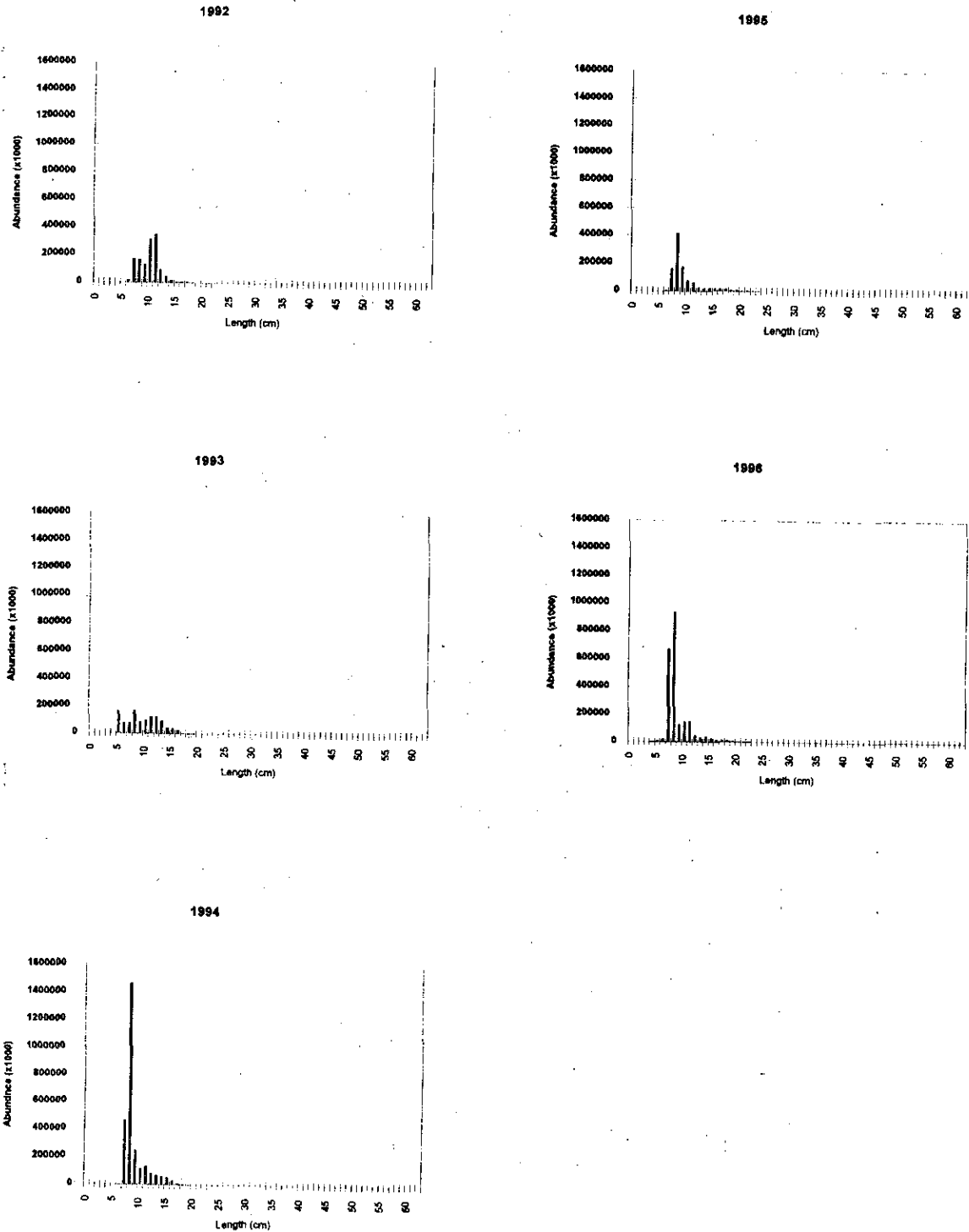


Figure 5. Redfish (*Sebastes sp.*). Length frequencies for West Greenland, 1992-1996.

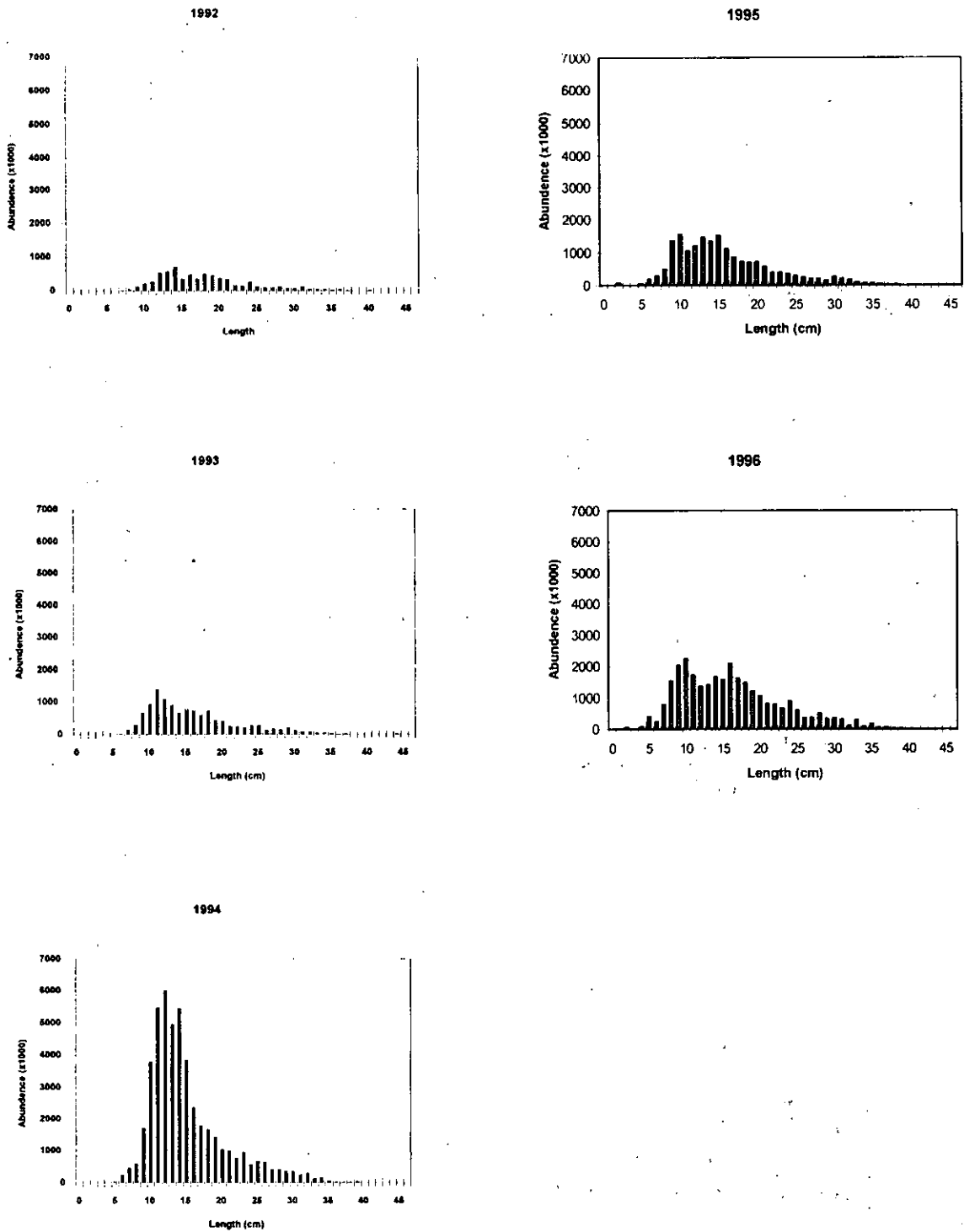


Figure 6. American plaice (*Hippoglossoides platessoides*). Length frequencies for West Greenland, 1992-1996.

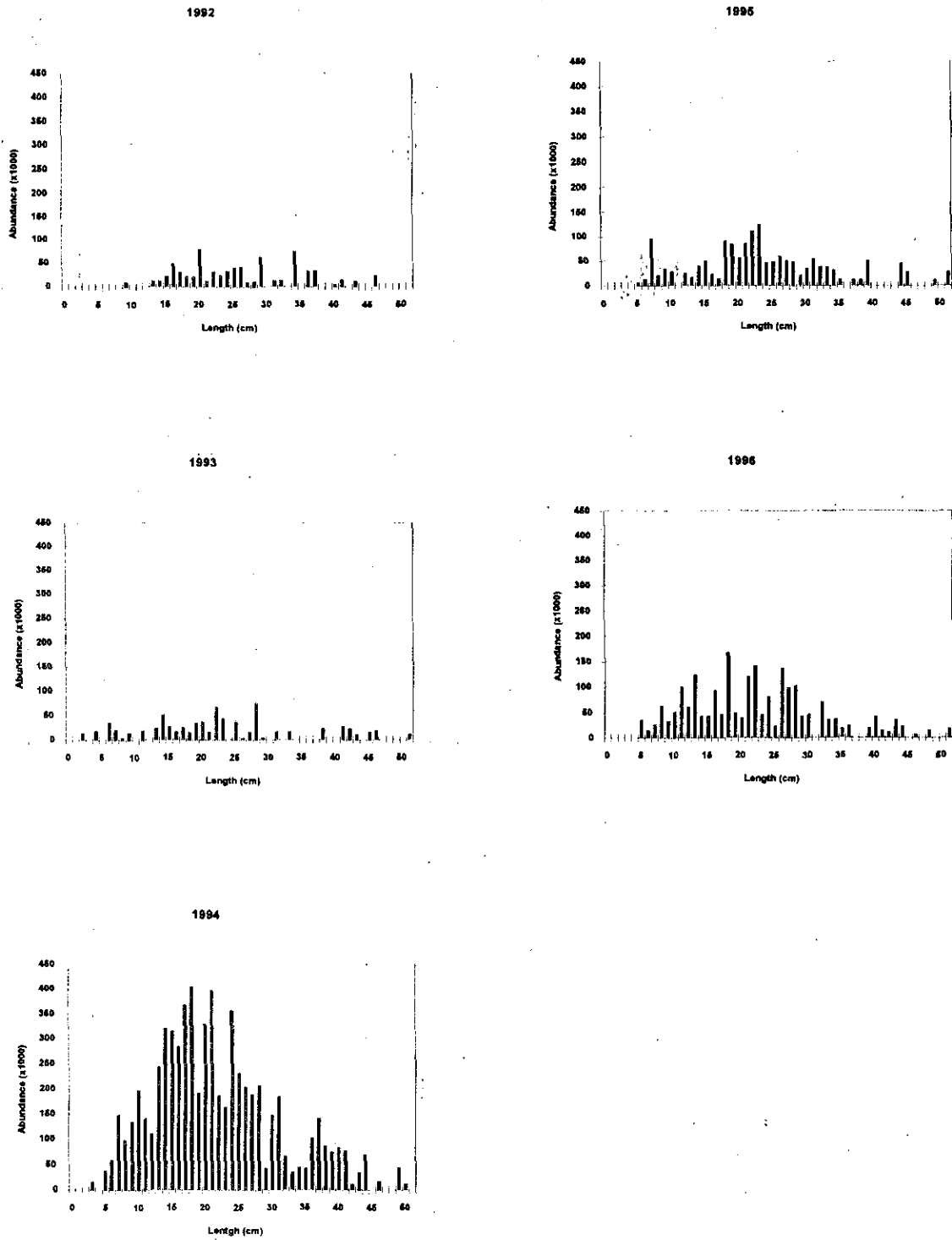


Figure 7. Atlantic wolffish (*Anarhichas lupus*). Length frequencies for West Greenland 1992-1996.



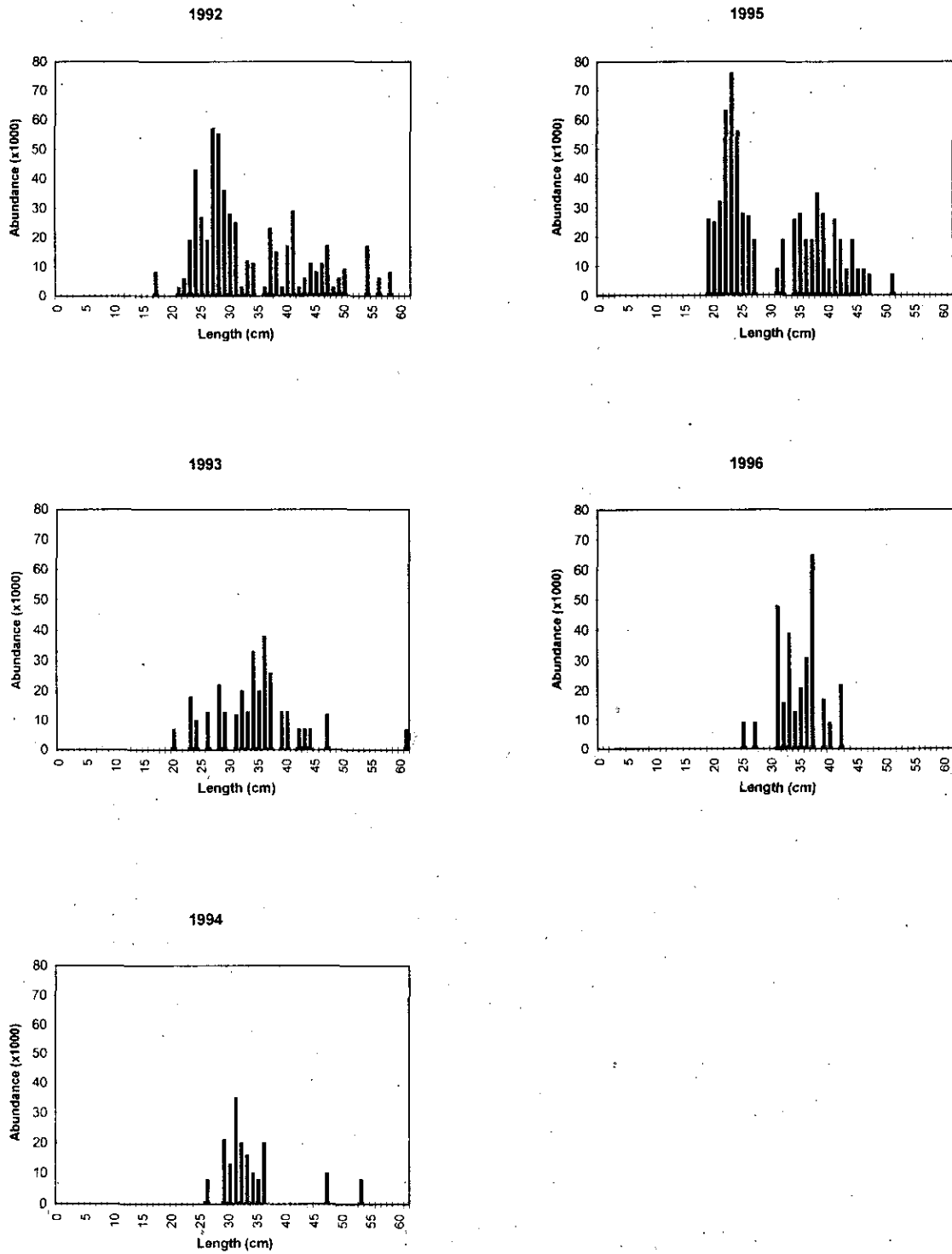


Figure 8. Cod (*Gadus mohua*). Length frequencies for West Greenland, 1992-1996.