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Spanish Fishery of Greenland Halibut
(*Reinhardtius hippoglossoides*) in 1990-91

by

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INTRODUCTION

The catches of Greenland halibut in Subarea 2 and Div. 3K and 3L increased in 1990 to about 47000 t (BRODIE 1991) mostly due to the development of a deepwater fishery in the boundary of Div. 3L and 3M. The mayor participants in this fishery are Spain and Portugal and also some non-member countries such as Panamá.

The Spanish fleet is composed of bottom trawlers that fish at depths greater than 800 m. From the beginning of this fishery in (1990) until the early months of 1992, its skillfulness improved by adapting the fishing technology to work in deeper grounds. Finally it is managing to operate as deep as 1700 m in the first half of the present year.

The gathering information about the fishing activity and the sampling the catches has been carried out by 8 observers in 1990 and 23 in 1991 that have been on board of the Spanish commercial ships.

In this paper we present a first analysis of the information reported by those observers from the last two years.

FISHING AREA, FLEET AND CATCHES

The fishing area of the Spanish fleet is the boundary

between Divisions 3L and 3M (Fig. 1). In 1991 it extended also to Div. 3N although the activity there was only small.

Fishing depth goes usually from 800 m to 1500 m. For data processing and sampling design this range of depth is divided into three strata: depth ≤ 900 m, depth 900 - 1100 m and depth > 1100 m.

Table 1 summarize the number of ships with observers in 1990 - 91, classified according to the following categories of tonnage: GTR ≤ 600 , GTR 600 - 1000 and GTR > 1000 .

The catches of those ships appear in Table 2. The periods for which there is available information are May to December in 1990 and February to December in 1991, though in this last one, 99% of the sampling comes from the second half of the year.

It can be observed in table 2 that Greenland halibut is the target species and grenadiers are the most important by-catch. Those ones constituted around 3% of the total catch in 1990, increasing to 30% in 1991 and are mostly caught in Div. 3M.

EFFORT AND CATCH RATES

The catch rates (kg/h) from the onset of the fishery in May 1990 with the effort used at depth strata, month and Divisions are shown in Table 3 (a, b, c).

Although in 1990 fishing activities involved both divisions 3L and 3M, the effort of the fleet concentrated mostly in Div. 3L (Table 3a, b). Only in the deepest strata (> 1100 m) the effort was greater in Div. 3M.

In 1991 fishing area extended to Div. 3N but the catch rates obtained there were very low (Table 3c). This year the effort concentrates very much in the deepest strata of Div. 3M (Table 3b) while in the shallower ones it was greater again in Div. 3L.

In general catch rates are always greater in Div. 3L than in Div. 3M at any depth considered. About their monthly evolution, it seems from the results of those two years (Table 3a, b, c and Fig. 2) that a maximum is attained in both Divisions in winter.

However in 1990 high catch rates have been also obtained in June-July. Since the end of the summer and along the fall it can be observed a general decreasing trend, which reverse to increase again in winter.

All the depth strata show approximately the same monthly trends in Division 3L. However in Div. 3M the drop of catch rates along the second half of the year is fairly more evident in the shallowest strata (≤ 900 m). It could be related with a seasonal movement of fish into deeper waters.

Since the fleet includes ships of different tonnage and so different fishing power the trends in catch rates have been analysed considering the categories of ships indicated in table 1. Only is possible at the moment to do it for the second half of 1991 as previously the number of ships supplying information was not big enough to be compared.

Fig. 3 represents the monthly trends in the catch rates by categories of ships. It can be seen that the indicated drop from the end of the summer is mostly shown by the group of smaller tonnage since the greater ones have rather stable catch rates. This situation is similar in both Div. 3L and 3M although is more pronounced in the former.

The difference observed in the evolution of the catch rates by groups of ships is not related with the fact that they could use to fish preferentially in different depth strata. As it can be seen in table 4 the effort is distributed, regardless the tonnage groups, by all the depth strata.

From those results it seems evident that to properly assess the evolution of catch rates in this fishery it is necessary to find a standardizing method to take into account the characteristics of the fleet. However at the moment the series of data is too short to determine the most suitable one.

LENGTH DISTRIBUTION IN CATCHES

Both modal size and range of length are greater in Div. 3M than 3L (Fig. 4). The smallest fish are found in Div. 3N. Size of

fish also increases with depth in every Division considered, as it was already described in other areas (ZILANOV et al. 1976; BOWERING 1982, etc.) and show similar distributions since the onset of this fishery in 1990.

Females Greenland halibut are found to reach greater size than males and their proportion clearly increase with depth (Fig. 5). This is observed in all the area and during all the period here considered.

Comparing those length distributions with the ones from other Divisions (Subareas 0 and 2) (BOWERING, 1984; CHUMAKOV and SAVVATIMSKY, 1990; ATKINSON et al. 1982), it can be seen that they are similar if we take into account the deepest strata. The assumption that in the southern areas are mainly distributed the smallest immature fish (CHUMAKOV, 1982; BOWERING and BRODIE, 1991) is probably explainable because previous observations come in fact from much shallower depths.

BIOLOGICAL CHARACTERISTICS OF CATCHES

In terms of number, immature Greenland halibut dominate in catches as the size of 50% maturity in this area is found to be between 67 - 73 cm in females (JUNQUERA and ZAMARRO 1992). Some spawning activity is detected all year round but the peak proportion was observed in July - August. As it is reported from other areas (RIGET and BOJE 1989) females are found to be more abundant than males and this is more pronounced in deeper waters and by the last months of the year (table 5).

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TABLE 1.- Number of vessels with observers by categories of tonnage.

TONNAGE GROUP	1990	1991
GROUP A (GTR <= 600)	1	9
GROUP B (GTR 600-1000)	2	7
GROUP C (GTR >= 1000)	5	7
TOTAL:	8	23

TABLE 2.- Catches (tons) of the principal species by Divisions in 1990 - 1991.

SPECIES	1990			1991			
	DIVISION			DIVISION			
	3L	3M	TOTAL	3L	3M	3N	TOTAL
Greenland halibut	3467.2	1288.0	4755.2	2845.7	3546.9	29.7	6422.0
Roughhead grenadier	29.6	51.8	81.4	91.9	143.7	0.1	235.7
Roundnose grenadier	11.9	30.8	42.7	244.9	1392.6	0.5	1637.1
Grenadiers	14.9	2.7	17.6	27.8	475.5	0.2	5035.0

		DIVISION 3L												TOTAL
DEPTH STRATA		J	F	M	A	M	J	J	A	S	O	N	D	(hours)
A	1990:					925	774	1189	711	645	536	555	656	
						(191.3)	(160.3)	(27.8)	(0.3)	(133)	(407.9)	(733.6)	(420.5)	2064.7
	1991:			231				354	267	237	118	38	240	
				(5)				(13.3)	(885.3)	(596.2)	(104.2)	(42)	(198.4)	1949.4
	1992:	357												
		(11.3)												
B	1990:					1042	840	1174	436	603	513	391	663	
						(56.4)	(112.8)	(339)	(28.6)	(276.8)	(297.7)	(250.8)	(355.2)	1765.2
	1991:	692		293	280	320		313	301	245	276	314	389	
		(57.9)		(35)	(135)	(55)		(187.3)	(599.6)	(682.8)	(1072.2)	(751.6)	(558.3)	4134.7
	1992:	389												
		(5.3)												
C	1990:					579	1184	773	513	453	413	497		
						(3.2)	(63.8)	(158)	(516.6)	(523.5)	(267.1)	(165.3)	1761.3	
	1991:	865		487				207	318	274	258	236	221	
		(63.8)		(4)				(9.2)	(259.1)	(596.9)	(620.5)	(632.7)	(468.9)	3228.1
	1992:													

(a)

		DIVISION 3M												TOTAL
DEPTH STRATA		J	F	M	A	M	J	J	A	S	O	N	D	(hours)
A	1990:								642	58	54	208	190	
									(4.25)	(303)	(180.6)	(30.8)	(13.7)	523.3
	1991:			418	465	360		483	99	34	36	5	64	
				(6)	(20)	(125)		(2)	(143.4)	(328.9)	(47.5)	(100.1)	(14.4)	387.1
B	1990:					1387	959	670	445	340	187	176		
						(55.2)	(24.2)	(111)	(225.1)	(181.6)	(251.9)	(172.2)	1026	
	1991:	492	443	542	394	319		269	204	223	205	181	167	
		(4.8)	(125)	(185)	(185)	(105)		(160.7)	(253.1)	(623.5)	(384.4)	(184.1)	(55)	2535.6
C	1990:					1226	776	591	355	320	314	231		
						(140.9)	(55.8)	(94.4)	(597.4)	(523.1)	(495.8)	(147.7)	1965.3	
	1991:		545	552	442	325		266	246	227	190	153	136	
			(40)	(190)	(80)	(70)		(597.2)	(1493.5)	(1602.4)	(2360.8)	(2964.1)	(512.8)	9910.8

(b)

		DIVISION 3N												TOTAL
DEPTH STRATA		J	F	M	A	M	J	J	A	S	O	N	D	(hours)
A	1991:								27	21	42	53		
									(180)	(485.2)	(203.6)	(26.5)	895.3	
B	1991:								17	2	450			
									(2)	(38.8)	(6.3)	47.1		
C	1991:									179				
										(9.4)	9.4			

(c)

TABLE 3.- Monthly catch rates (Kg/h) by depth strata in Divisions 3L (a), 3M (b) and 3N (c). Hours fishing within brackets. A: Depth <=900 m, B: depth 900-1100 m, C: depth >=1100 m.

DIVISION 3L				DIVISION 3M			
	<=900 m	900-1100 m	>=1000 m		<=900 m	900-1100 m	>=1100 m
JULY	A: -	-	-	JULY	A: -	-	-
	B: 18.3	130.5	39.9		B: 1.8	99.9	677.4
	C: 9.3	131.2	9.2		C: 4.5	139.4	275.2
AUG.	A: 189.2	12.3	12.3	AUG.	A: 48.1	182.3	165.6
	B: 520.8	281.0	197.4		B: 89.6	321.6	1705.6
	C: 397.7	476.3	278.3		C: 10.9	403.5	446.6
SEPT.	A: 95.8	60.0	19.1	SEPT.	A: 13.4	75.8	430.1
	B: 194.8	247.2	476.7		B: 232.8	148.5	1750.8
	C: 399.8	520.1	261.7		C: 90.6	762.9	215
OCT.	A: -	-	-	OCT.	A: 8.3	-	497.5
	B: 39.9	293.5	273.3		B: 33.8	85.2	1810.8
	C: 38.0	954.4	502.7		C: 5.4	231.4	946.7
NOV.	A: 6.1	4.7	6.0	NOV.	A: -	5.8	434.2
	B: 149.5	171.2	72.4		B: 100.1	66.1	1560.1
	C: 13.1	817.9	595.3		C: -	88.7	799.9
DEC.	A: -	-	9.2	DEC.	A: -	-	213.8
	B: 75.8	-	-		B: 14.4	29.4	178.5
	C: -	243.5	217.8		C: -	32.6	173.7
TOTAL (A)	291.1	77.0	46.6	TOTAL (A)	69.8	263.9	1741.2
(B)	999.1	1123.4	1059.7	(B)	472.5	750.7	7683.2
(C)	857.9	3143.4	1860.5	(C)	225.9	1658.5	2857.1

TABLE 4.- Monthly effort (hours) by depth strata, group of vessels and Division in 1991.
(A: GTR <= 600, B: GTR 600-1000, C: GTR >=1000).

TABLE 5.- Percentage of females in the second half of 1991.

	J	A	S	O	N	D	TOTAL
Div. 3L:	62	58	68	70	72	73	67
Div. 3M:	67	66	70	73	75	73	71

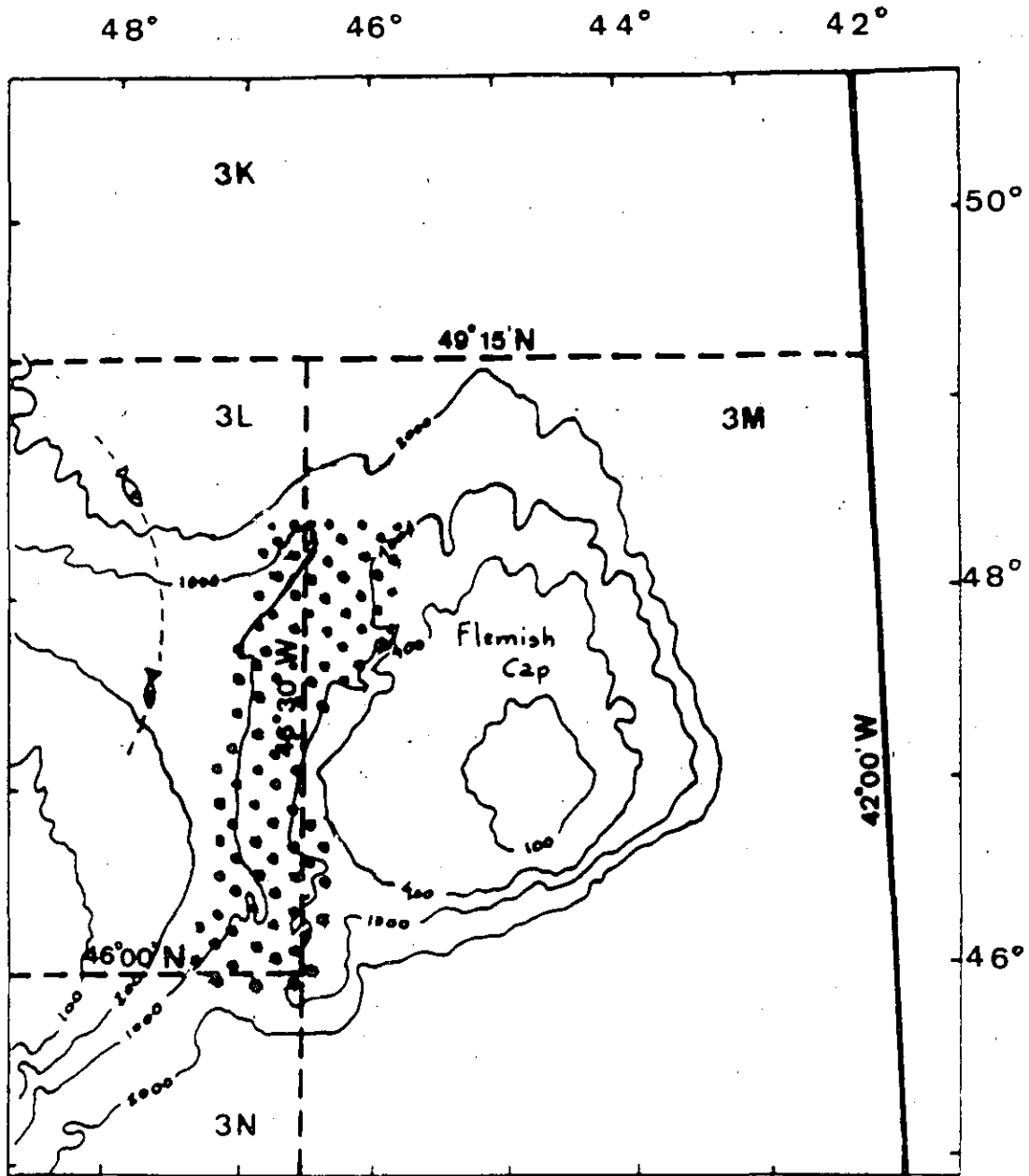
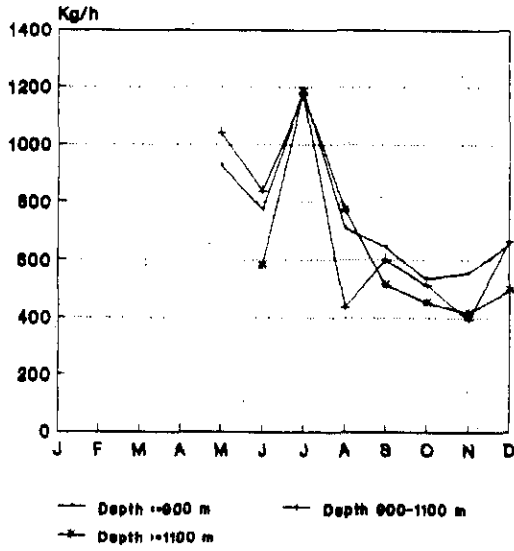
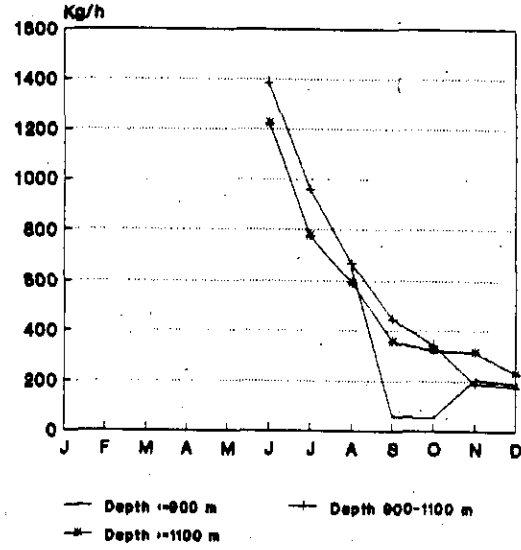


Fig. 1 - Fishing area in 1990 - 91. (Depth in meters).

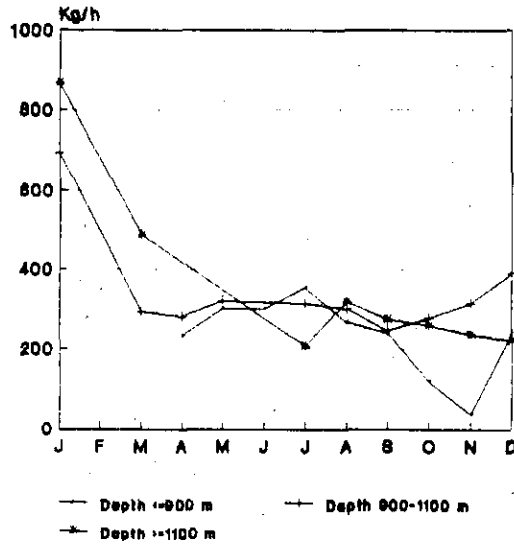
1990 DIVISION 3L



1990 DIVISION 3M



1991 DIVISION 3L



1991 DIVISION 3M

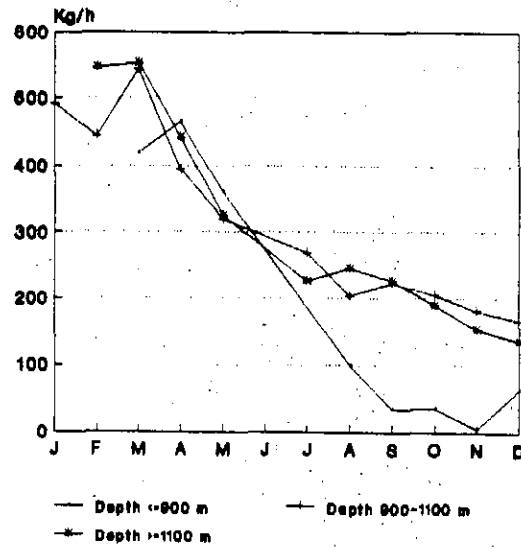
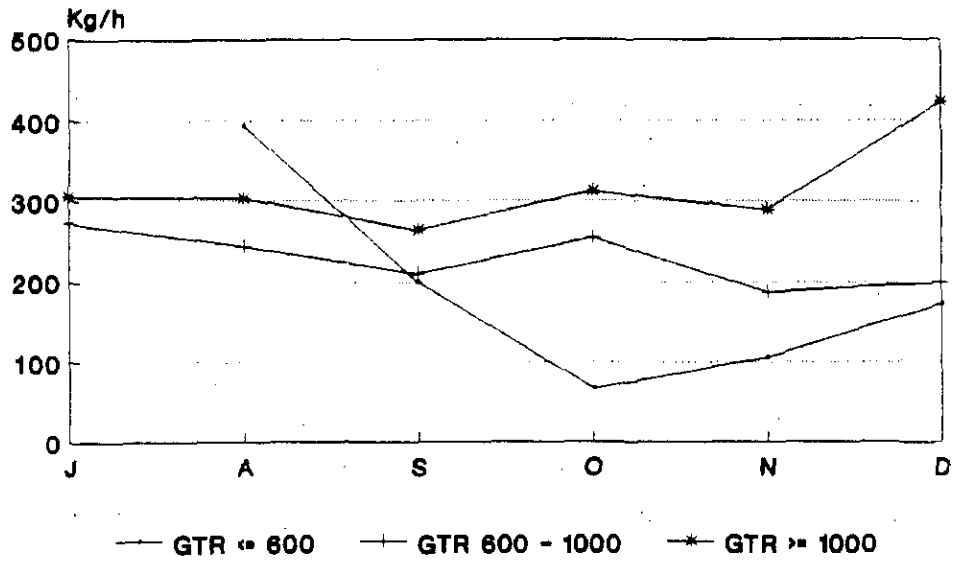


Fig. 2 - Monthly trends in catch rates (kg/h) in Divisions 3L and 3M by depth strata (1990 - 91).

DIVISION 3L



DIVISION 3M

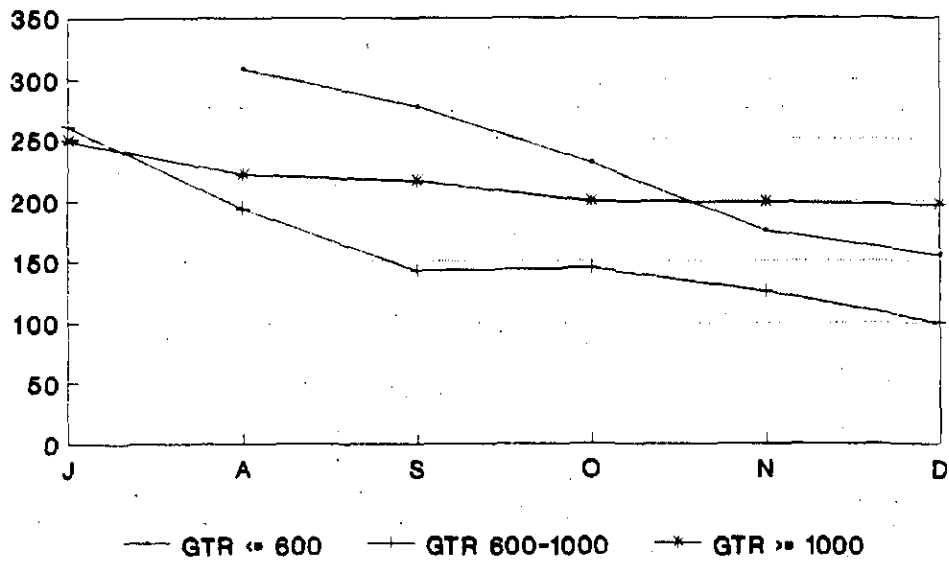
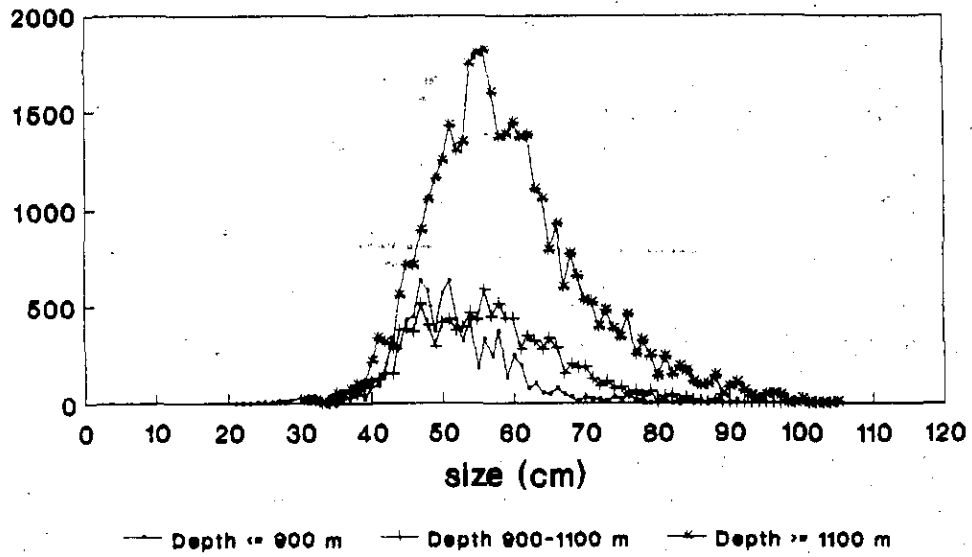


Fig. 3 - Monthly evolution of the catch rates (kg/h) by vessel categories (grouped by tonnage) in the second half of 1991.

LENGTH DISTRIBUTION 1990

Div. 3M



Div. 3L

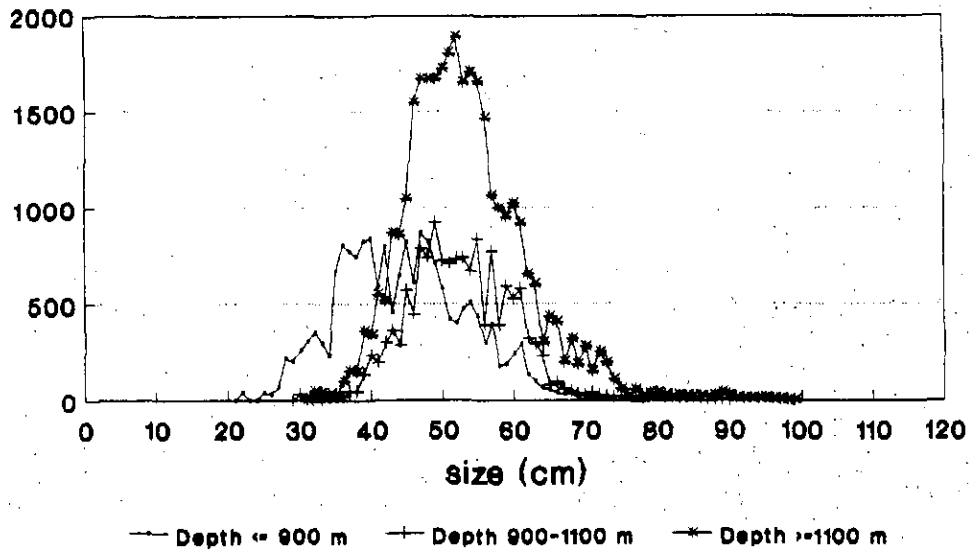
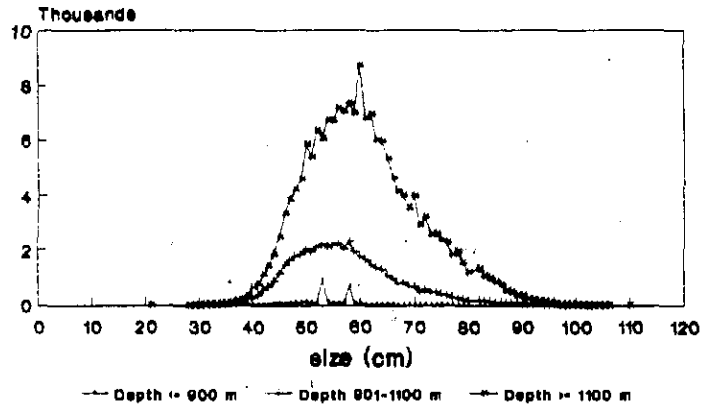


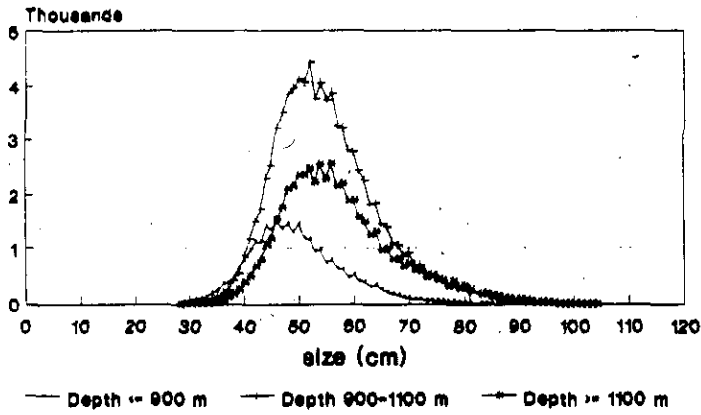
Fig. 4a - Length distributions of Greenland halibut in Div. 3L, and 3M in 1990 by depth strata.

LENGTH DISTRIBUTION 1991

Div. 3M



Div. 3L



Div. 3N

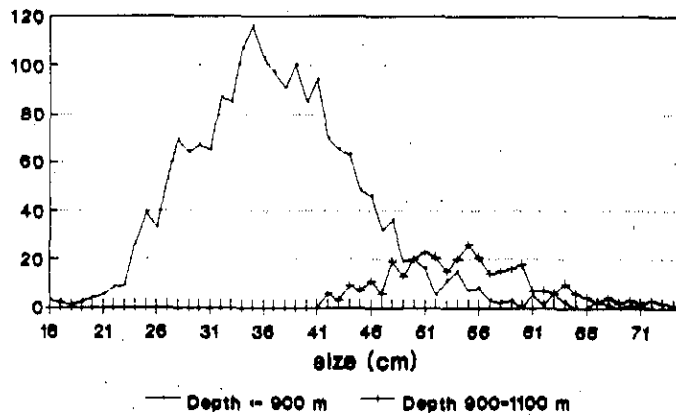
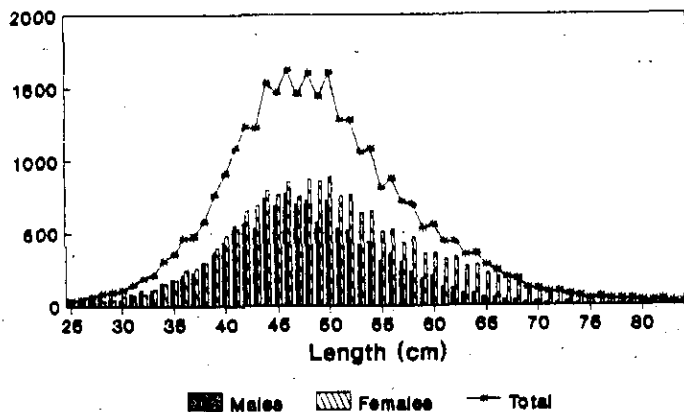


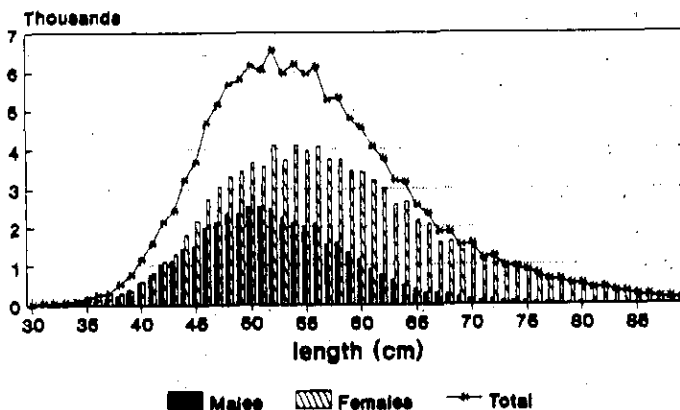
Fig. 4b - Length distributions of Greenland halibut in Div. 3L, 3M and 3N in 1991 by depth strata.

LENGTH DISTRIBUTION Div. 3LM

Depth < 900 m



Depth 900-1100 m



Depth >1100 m

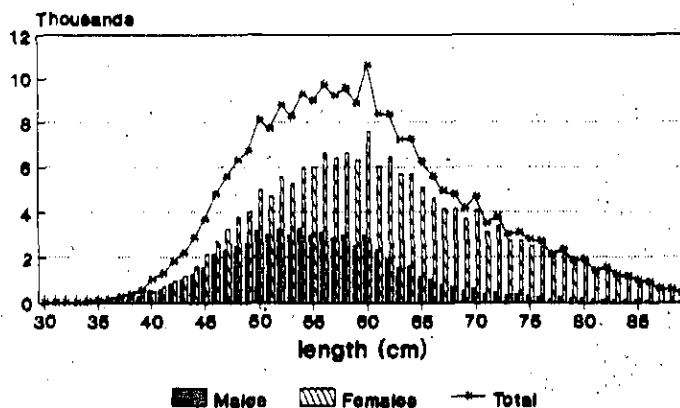


Fig. 5 - Length distributions of Greenland halibut by sexes and depth strata in 1990 - 91.