Northwest Atlantic Fisheries Organization

Serial No.N1527

NAFO SCS Doc. 88/21

SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1988

German Democratic Research Report for 1987

by

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Introduction

In 1987 the total catch within the NAFO Convention area was 27 734.5 t (Table 1). This corresponds to an increase of 5 % compared to 1986 (26 372.0 t). Compared to the previous year the increase of the catch was above all obtained by increasing the catch of Greenland halibut (increase 75 %) and redfish (increase 50 %). Herewith an insignificant decrease of catches of fish species traditionally caught (roundnose grenadier and mackerel respectively with a decrease of 2 % and 5 % respectively compared to the previous year) was substituted.

Increasing catches of the fish species Greenland halibut and redfish were a characteristical sign of improved fishing conditions. The increase was caused by better utilization of the time funds (first operation of a new type of vessel, operation of an auxiliary vessel) and by increasing quota (Greenland halibut) as well as by their variable catchability on the basis of licence conditions. Consequently the increase of catches is not conditioned by the fish stock.

As the main fish species the mackerel of the US shelf (1986: 72 %) made up 67 % of the total GDR catch in the Convention area. Roundnose grenadier and Greenland halibut (16 % and 12 % respectively of the total GDR catch) are - as in 1986 - the main fish species in the Convention area next to mackerel. These three fish species supported the fishery in the NAFO area with a portion of 95 % (96 % in 1986) (Tables 1 and 2). Fisheries had been performed within the Subareas 2, 3, 5 and

* Introduction and Subareas 2+3 by P. Ernst; Subareas 5+6 by R. Eggers.

6. Subarea 6 dominates with a great portion of mackerel making up 58 % of the total GDR catch within the Convention area, followed by Subarea 3 (roundnose grenadier directed fishery) with a portion of 23 % and by Subarea 2 (Greenland halibut directed fishery) and Subarea 5 (mackerel directed fishery) with portions of 10 % and 9 % respectively (Table 2).

Subareas 2 and 3

A. Status of fishery

Subareas 2 and 3 have to be analyzed together because of licence conditions and overlapping fisheries on the target fish species roundnose grenadier and Greenland halibut.

Within the whole area exclusively bottom trawling had been performed. As a new catching unit the vessel FVS IV (national type designation) had been operated. This type is a stern trawler (1492 BRT) performing propulsion capacity of 2400 HP (FAO Code 101). FVS IV is a fishing and processing vessel operating together with the traditional type FVS I (FAO Code 101) within the Subareas 2 and 3.

The timing of the fisheries had been performed in dependence on licence conditions according to table 3.

1. Redfish directed fishery

- Region NAFO 3L (12 - 25 August)

Fishing within the Division 3L was as much expensive concerning materials as in the year before and depended considerably on wheather conditions and currents. Fisheries were performed on the general position 48°N; 48°50'W in main fishing depths from 310 to 360 m. The most favourable time of fishing was in the afternoon. At night fishing was ineffective and characterized by large proportions of by-catch. Mean catch per fishing day was 11,4 t at catch per hour of 1.2 t. Redfish made up 85 % of the catch.

- Region NAFO 2+3K (9 - 19 October)

Fishing within the region 2+3K was mainly concentrated in the area 51°00' - 51°40'N; 50°20' - 50°30'W. The main fishing depths were between 480 and 550 m. At the beginning of the fishery very good catches had been obtained which continually decreased during the course of fishing. On the average 20.6 t per fishing day and 1.7 t per trawling hour respective-

ly had been obtained. Redfish made up 97 % of the catch. Fishing activities were stopped because of the expiration of the licensed period of fishing.

2. Greenland halibut directed fishery

- Region NAFO 2J + 3K,L (12 - 31 August)

Fishing started traditionally within the area of the Funk-Island in fishing depths from 470 to 570 m. Fishing was vehemently hampered by Canadian gill nets because their positions were not always known or unreliably characterized. Therefore fishing changed to Division 2J and continued within the area of the general position 53°N; 53°30'W. Fishing depths also were between 470 and 570 m. Catch per unit effort was 9.6 t per fishing day and 0.6 t per trawling hour respectively with Greenland halibut making up 95 % of the catch. Fish species of the by-catch were roundnose grenadier, ray and redfish.

The period of fishing conformed that the climax of fishing (feeding concentrations) was already past.

- Region NAFO 2GH (13 November - 24 December)

Fishing started within the area 55°50' - 56°10'N and shifted lateron to the area around the general position 56°18'N; 56°33'W. Fishing depths were between 1050 and 1300 m. As during previous years catches per fishing day were discontinuous between 3.3 and 9.1 t. Along with the increasing immigration of Greenland halibut into the fishing area (see NAFO Res. Doc. 87/75) catch per unit effort increased continually during fishing and amounted to 11.8 t per fishing day (FVS I) and 12.6 t per fishing day (FVS IV) respectively at the end of the fishing period. Herewith it has to be considered that it was only possible to trawl mostly in one direction (from northwest to southeast) because of long-lasting periods of bad wheather conditions and extreme currents. By this the efficient time of fishing was considerably reduced. Fishing came to an end on 25 December for reasons concerning fishing tactics (Residual quota fishing within the regions 2J and 3K,L and hampering by bad wheather conditions).

- Region 2J + 3K,L (25 December - 29 December)

Fishing was performed within the area of the general position 52°50'N; 51°33'W in fishing depths from 900 to 1100 m. Here also it was only possible to trawl in one direction (north-south) because of unfavourable conditions of currents and

wheather. On the average 11.2 effective fishing hours per day had been characteristical for fishing activities. The mean catch per fishing day was 12.7 t (FVS I) and 14.8 t (FVS IV) respectively with Greenland halibut making up ca. 50 % of the catch. By-catches consisted of roundnose grenadier (ca. 14 %), witch (ca. 13 %), ray (ca. 16 %), redfish and cod.

3. Roundnose grenadier directed fishery (NAFO 2 + 3)

On 17 August 1987 fishing started at the general position 51°N; 50°W (NAFO 3K). Fishing depths were between 1100 and 1500 m. The fishing was characterized by frequent changing of positions because of bad wheather conditions and by fast fishing out of concentrations suitable for fisheries. From 27 October until the end of the roundnose grenadier directed fishery (14 November 1987) the general position 50°48'W was exclusively fished within depth ranges from 1100 to 1300 m. Herewith the amount of halibut decreased at a simultaneous increase of the catch of unit effort (Table 4). This trend corresponds to the results in previous years. Compared with 1986 there were differences in fishing performance in 1987 because of the differences in local distribution of concentrations. As in October 1986 fishing was mainly performed within the area of position 50°48'N; 49°42'W and from the end of October onward at the northern edge and at the outer edge of this position respectively, fishing was contradictory in 1987. Because of reasons referring to licences roundnose grenadier directed fishery ceased on 14 November 1987.

B. Special Research Studies

1. Environment

No data

2. Biological studies

Redfish (Sebastes mentella TRAV.)

Biological data are only available from NAFO Division 3L (August). The range of total lengths was 22 - 51 cm (L_t), the range of main lengths was 27 - 39 cm (L_t). The mean length was 33 cm (L_t). According to the length spectrum single fish weights alternated between 220 and 1600 g.

Greenland halibut (Reinhardtius hippoglossoides WALB.)

Sampling materials were collected onboard of processing vessels for analysis ashore and aboard. The sampling program was car-

ried out during the roundnose grenadier and Greenland halibut directed fishery within the period from 21 October to 22 December 1987. The results of the analysis were processed according to NAFO requirements and are available at the NAFO secretariate. The GDR catch given in number/age groups (NAFO 2H) is presented on Table 5.

For this period investigations on maturity distribution showed the following relation of males to females as 55 to 45 on the average (according to SOROKIN and GRIGORYEV, 1968) given in %:

	Stage of maturity			
	1	2	3	4
♂♂	8.2	58.6	33.0	0.2
♀♀	10.6	67.3	15.0	7.1

Within the period of investigations mean lengths increased along with increasing depths according to the following trend review. In the same way the relation of sexes was shifting in favour of the males:

depth (m)	mean length (L_t cm) ♂♂	♀♀	♂ + ♀
900- 999	52.08	53.52	52.76
1000-1099	53.82	55.09	54.39
1100-1199	52.62	59.31	56.13
1200-1299	53.26	56.62	54.77
1300-1399	55.29	62.72	59.16

period	relation of sexes (%) ♂♂	♀♀	mean weight of single fish (♂ + ♀ in kg)	mean length (L_t in cm) ♂♂	♀♀
15-17 Nov.	50	50	-	52.07	52.42
18-20 Nov.	53	47	1.38	53.23	57.00
21-23 Nov.	57	43	1.47	53.27	55.06
26-29 Nov.	57	43	2.01	54.32	58.56
30- 2 Dec.	51	49	1.92	53.96	57.58
3- 5 Dec.	57	43	1.54	52.69	55.35
6- 8 Dec.	59	41	1.22	50.41	52.64

As observed and described in previous years the increase of males during fishing performance, and the decrease of mean length and mean weight connected herewith could be caused by the emigration of the large mature females to spawning areas in the NAFO Division 0B.

Roundnose grenadier (Coryphaenoides rupestris GUNN.)

During the roundnose grenadier directed fishery a sampling scheme had been performed on processing vessels from 19 August to 1 September and from 25 October to 9 November 1987. The results of the analysis of length and age had been processed according to NAFO requirements and are available at the NAFO Secretariat .

Summarising length distribution can be represented as follows:

period	total range of length (cm L_t)	main range of length (cm L_t)	mean length (cm L_t)
August	35-73	47-53	51.70
Oct./Nov.	29-84	39-54	48.72

The decrease of mean length during the fishing season occurred simultaneously with an increase of the amount of small males. The relation of sexes had been analyzed as follows:

period	Portion ♂ (%) ♂	Portion ♀ (%) ♀
August	54 (39-63)	46 (37-61)
Oct./Nov.	62 (56-69)	38 (31-44)

The distribution of maturity (62 % at maturity stage I, 37 % at maturity stage II, 1 % at maturity stage III) shows the large portion of juveniles (99 %) during the period of investigation.

Analysis of the maturity distribution according to depth levels showed the following results:

fishing depth (m)	stage of maturity ♂♂ + ♀♀ 1	2	3
1000-1100	67.5	32.0	0.5
1100-1200	73.0	26.0	1.0
1200-1300	50.7	48.7	0.6

Subareas 5 and 6

A. Status of fishery

Mackerel (Scomber scombrus L.)

In contrast to the previous year the fishing season for mackerel 1986/1987 already started on 3 December 1986. In the beginning only one fishing and processing vessel (FAO-Code 101) was operated but then in the course of fishing the fleet increased. From January onward four fishing vessels operated on the quota. Only on 19 December after strong NW winds and water temperatures cooling down to ca. 9°C first concentrations of mackerel had been located off New York at 40°15'N, 73°30'W after intensive investigations covering a large area. The mackerel being very fugative retired short-timely beyond the 20 sm limit (in dependence of the wind).

This instable situation lasted till 17 January 1987. Later on significant indications occurred outside of 20 sm mostly at night. During the third decade of January the success of fishing was very inconstant because of a period of bad wheather conditions. During the first half of February favourable fishing possibilities in the south could not be exploited sufficiently because of closed areas. Significant indications at night mostly vanished during daytime. Additionally by-catch problems occurred on the southern positions. During the second half of February the fishing situation was very unsufficient due to insignificant indications. It was not possible to find out sufficient fishing opportunities within the whole fishing area concerning all depth ranges between 38°30' and 35°55'N. In the beginning of March fishing operations were concentrated in the south of 36°N, where indications occurred only during night-time. Fishing was complicated due to partially large by-catch.

From the second decade of March up to the midth of April fishing was limited to a small area between 38 and 39°N. South of this area no indications of mackerels occurred. Within this area there were only very limited short-time fishing possibilities due to bad wheather conditions and eastern winds. The indications could only be effectively fished at night, because at daytime they occurred closely to the bottom.

From the end of the first decade of April onward fishing improved to a certain extent whereby fisheries at night obtained better results. From April onward mackerels moved into deeper layers so that their indications beyond depths of 50 fathoms could not longer be observed. Therefore fishing shifted to a limit of 50 fathoms, and in northeastern direction to Block Canyon. Fishing at daytime was scarcely possible. At night the period of fishing

decreased. The portion of by-catch was different. It was not always possible to avoid pilot whales. Along with increasing water temperatures (13 - 14°C) the portion of dogfish increased significantly. As from the 9 May 1987 no concentrations of mackerel could be located any longer within the area west of 70°W.

B. Special research studies

1. Environment

The beginning of the season had been delayed due to water temperatures being not optimal for fishing operations (only gradually decreasing from 12 - 15°C to 7 - 9°C from the midth of December onward and again rising in January).

Due to unfavourable wheather conditions (strong wind forces, eastern winds) indications occurred only for a short time and were rather restricted. They often shifted to areas within the 20 sm limit.

2. Biological studies

Atlantic mackerel (Scomber scombrus L.)

Within the first and the second quarter biological sampling material had been collected aboard the processing vessels for further treatment ashore. The results of these analysis were summarized and represented on table 6 (length distribution) and 7 (age distribution). The length-age distribution is available at the NAFO secretariate according to the guiding rule.

REFERENCES

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Table 1: G.D.R. nominal catches (tons) of species in the NAFO-area for 1986 and 1987

Species	1986	1987
Cod	8.5	32.1
Redfish	706.1	1074.5
Roundnose grenadier	4569.4	4464.2
Greenland halibut	1866.3	3266.2
American plaice	-	1.0
NW-atlantic eelpouts	1.2	-
Seabase	0.1	-
Skates and rays, n.e.i.	202.1	176.1
Greenland shark	-	1.6
Menhadens n.e.i.	11.1	-
Catfish	-	2.9
Baird's smoothhead	9.3	18.8
Atlantic mackerel	18904.5	18489.2
Alewife	14.9	26.4
Witch	6.8	56.4
Long-finned squid	2.1	0.4
Silver hake	12.9	1.9
Cat. - requiem sharks	38.0	1.6
Liverpol sharks	0.1	-
Tuna-like fishes n.e.i.	0.4	-
Scup	10.0	-
Atl. butterfish	3.7	0.2
Red and White Halles	-	84.7
Atlantic halibut	-	0.7
Marine fishes n.e.i.	4.5	35.6
Total	26372.0	27734.5

Table 2: G.D.R. nominal catches (tons) of species by Divisions of Subareas 2, 3, and 6 for 1987

	2H	2J	2	3K	3L	3	3Ze	5Zw	5	6A	6B	6C	6
Cod	-	3.9	3.9	19.1	9.1	28.2	-	-	-	-	-	-	-
Redfish	0.8	16.3	17.1	361.0	696.4	1057.4	-	-	-	-	-	-	-
Roundnose grenadier	218.6	58.6	277.2	4154.7	32.3	4187.0	-	-	-	-	-	-	-
Greenland halibut	1849.2	454.8	2304.0	919.3	42.9	962.2	-	-	-	-	-	-	-
American plaice	0.8	0.1	0.9	0.1	-	0.1	-	-	-	-	-	-	-
Skates and rays,n.e.i.	37.1	66.9	104.0	54.0	18.1	72.1	-	-	-	-	-	-	-
Greenland shark	1.1	0.5	1.6	-	-	-	-	-	-	-	-	-	-
Catfish	1.8	-	1.8	-	1.1	1.1	-	-	-	-	-	-	-
Baird's smoothhead	2.7	3.7	6.4	9.5	2.9	12.4	-	-	-	-	-	-	-
Atlantic mackerel	-	-	-	-	-	-	126.9	2421.4	2548.3	3966.2	8960.4	3014.3	15940.9
Alewife	-	-	-	-	-	-	-	5.1	5.1	10.2	5.9	5.2	21.3
Witch	-	52.9	52.9	1.2	2.3	3.5	-	-	-	-	-	-	-
Long-finned squid	-	-	-	-	-	-	-	0.4	0.4	-	-	-	-
Silver hake	-	-	-	-	-	-	-	1.7	1.7	0.2	-	-	0.2
Cat.-requiem sharks	-	-	-	1.6	-	1.6	-	-	-	-	-	-	-
Red and White Hakes	0.2	0.1	0.3	84.4	-	84.4	-	-	-	-	-	-	-
Atlantic halibut	0.6	-	0.6	0.1	-	0.1	-	-	-	-	-	-	-
Marine fishes n.e.i.	-	-	-	-	-	-	-	22.7	22.7	7.6	3.5	1.8	12.9
Total	2112.9	857.8	2770.7	5605.0	805.1	6410.1	126.9	2451.4	2578.3	3984.3	8969.8	3021.3	15975.4

Table 3: Timetable of the fishery of the G.D.R. in the NAFO-Subareas 2 and 3 in 1987

Period	Type of trawler	Regions of NAFO	Species directed fishery	Days on ground
12. 8.-31. 8.	FVS I	2J+3K,L	Greenland halibut	29
12. 8.-25. 8.	FVS IV	3L,N	redfish	46
17. 8.-14.11.	FVS I+IV	2+3	grenadier	455
9.10.-19.10.	FVS I	2+3K	redfish	17
13.11.-24.12.	FVS I+IV	2G,H	Greenland halibut	165
25.12.-29.12.	FVS IV	2J+3K,L	Greenland halibut	13
22.12.-29.12.	FVS I	2+3K	Greenland halibut redfish grenadier	14

Table 4: Catch per day on ground and catch composition (%) during the roundnose grenadier directed fishery (NAFO 2+3)

Period	Catch per day on ground (t)	RNG	GHL	RED	OTHER
17.8.-23.8.	9.9	79	20	-	1
24.8.-30.8.	11.2	74	14	11	1
31.8.-6.9.	9.0	79	14	4	3
7.9.-13.9.	6.9	78	17	-	5
14.9.-20.9.	12.0	83	15	-	2
29.9.-5.10.	9.5	80	19	-	1
6.10.-12.10.	5.3	73	24	-	3
13.10.-19.10.	8.6	70	25	-	5
20.10.-26.10.	9.0	69	24	3	4
27.10.-2.11.	13.1	79	18	-	3
3.11.-9.11.	15.4	85	12	-	3
10.11.-14.11.	14.2	84	15	-	1

RNG Roundnose grenadier
GHL Greenland halibut
RED Redfish

Table 5: C.D.R. Greenland halibut catch by numbers in 1987 (NAFO 2H)

Age group	numbers
3	1 367
4	13 671
5	64 256
6	95 700
7	373 231
8	397 839
9	159 956
10	103 903
11	68 357
12	38 280
13	15 039
14	8 203
15	4 101
16	4 101
17	4 101
18	4 101
19	2 734
20	4 101
21	-
22	2 734
23	1 367

Table 6: Length distribution (fork length in %o) of Atlantic mackerel in catches taken by commercial pelagic trawls, NAFO-Div. 5Zw, 6A, 6B, 6C, January - May 1987

NAFO-Div.	5Zw		6A	6B				6C	
month	IV	V	I	I	II	III	IV	II	III
length group (cm)									
19			15						
20								40	
21					3			120	
22			5	6	1			80	
23		10						10	
24		10	30		2		9	20	
25	10	30	15	10	2			30	
26				19	10				7
27	10	20	5	42	17		9		13
28	30	30	56	39	25	7	55		13
29		129	10	6	17	3	18	10	7
30	59	307	10	10	19	10	100		10
31	228	277	61	35	45	27	145	140	47
32	238	79	86	129	112	117	200	160	130
33	208	69	253	232	221	240	164	220	233
34	79		212	261	255	310	209	110	207
35	79		136	106	132	170	36		187
36	10	30	30	52	52	57	18	30	70
37	10		5	32	49	23	27	10	40
38	30	10	35	3	12	13	9	10	13
39	10				5	3			10
40				6	7	3			7
41			10	3	10	10			7
42			5	3	6	3			
43			20		1	3		10	
44					1				
Total	1000	1001	999	997	1001	999	999	1000	1001
No. of fish measured	101	101	198	310	1201	300	110	100	300
Mean length (mm)	320	309	334	334	340	344	327	301	342

Table 7: Age distribution (%o) of Atlantic mackerel (commercial, frozen), NAFO-Div. 6B, 6C, February and March 1987

NAFO-Div.	age / month	2	3	4	5	6	7	8	9	10	11	12+
6B	II	26	79	372	418	66	5	6	3	9	-	17
6B	III	177	104	357	324	26	2	-	5	5	-	-
6C	II	22	50	400	421	61	10	22	-	11	-	-
6C	III	24	56	364	440	79	14	12	12	-	-	-