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Trial Deepwater Longline Fishery in the Davis Strait, May-June 1992

by

J. Boje

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

and

N.-R. Hareide

Møre and Romsdal Research Foundation, Section MRFH
Sjømannveien 27, Ålesund, Norway

Introduction.

A longline trial fishery for deepwater fish resources in NAFO Divisions 1D and 1E in the Davis Strait, was carried out in May-June 1992 by a Norwegian longliner 'Skarheim'. The trial fishery is part of a cooperation between Møre and Romsdal Research Foundation and Greenland Fisheries Research Institute, and was supported by the Norwegian Government. The aim of the fishery was to survey the unexploited fish resources at the deeper waters, i.e. at depths to 2000 meters, mainly focusing on Greenland halibut (*Reinhardtius hippoglossoides* Walbaum) and roughhead grenadier (*Macrourus berglax* Lacepede 1801). The fishery was a continuation of trial longline fisheries in the Davis Strait conducted since 1989 (Nielsen 1990, Jørgensen & Boje 1992). At lower depths at the continental slopes in Division 1E, some effort was spent on a fishery for Cusk (*Brosme brosme*).

Materials and methods.

The longliner was equipped with Mustad autolinesystem EMS-D. The main line was a 7 mm (diam.) Dyrkorn polyester line. Gangions were Mustad No 14, 50 cm length and connected to the main line by double quicksnap swivels. Mustad No 12/0 E-Z baiter hooks were used and hookspacing were 140 cm. Squids were used as bait. The linesettings were distributed in the depths range 300-2200 meters, with the bulk of the settings in the range 1000-1600 meters in Div. 1D. The lower limit at 2200 m was connected to difficulties in operating with longlines below these depths. In Div. 1E 10 settings were carried out at lower depths in the range 300-1300 meters. The locations of the linesettings are shown in Figure 1. Numbers of settings and numbers of hooks per division and depth stratum is given in Table 1.

All fish were length measured to the nearest centimeter below (total length) and weights and sex were recorded length stratified for each division.

Results.

Total effort was 52 linesettings with a total of 140,107 hooks (Table 1). Most effort were put to the depths range 1000-1600 m in Div. 1D with 32 linesetting including about 88,000 hooks. The effort at the lower depth strata in Div. 1E was directed towards Cusk.

In Table 2 is summarized catches per unit of effort of selected species for the total fishery. Greenland halibut and roughhead grenadier predominates the catches, while of less important commercial species blue hake *Antimora rostrata*, skates and the northern wolffish (*A. denticulatus*) account for considerable parts of the catches.

Apart from the slopes in Div. 1E, Greenland halibut appeared in all catches. The lengths range from 20 cm to 110 cm. The length distributions in the catches changes rather abrupt by depth as shown in Figure 2. At depths less than 1200 m lengths of about 45 cm predominates the catches, while lengths of about 80 cm predominates catches in deeper waters. Catches at depths less than 1200 m are constituted by males, while the peak at 80 cm are composed of females.

For roughhead grenadier a similar trend appears as for Greenland halibut (Figure 3). Lengths ranges from 8 to 43 cm (snout-to-anal-fin-length), with a peak at about 16-20 cm at depths less than 1400 m and two maxima at depths more than 1400 m. While the unimodal catch distributions at depths below 1400 m are composed of both males and females, the catches in the depth stratum 1400-1600 m are composed of one mode at about 18 cm of mainly males and a mode at about 30 cm of females.

For both Greenland halibut and roughhead grenadier catch per unit of effort seem to increase by depth. In Fig. 4 is shown the log-transformed CPUE values by depth strata. A comparison of the variances of the residual means (by variance ratio distribution (F)), excluding mean values based on single linesettings (>1800 m for both species and 400-599m and 600-799m for roughhead grenadier), showed that there were no significant differences at the 95% level. Therefore an ANOVA were carried out (model: $\log(\text{cpue}) = \text{depth stratum}$), excluding the same depth strata as mentioned above. $\log(\text{cpue})$ increases significantly by depth (at the 99% level) for Greenland halibut, while for roughhead grenadier the trend is not significant (at the 95% level).

Discussion.

Assuming that Greenland halibut is fully recruited to longline gear at lengths of about 50 cm, a remarkable shift in the size composition in the stock occurs at depths of about 1200 m. The shift seems to be related to the abundance of males and females, the former distributed at lower depths and the latter distributed at the deeper waters. The size composition of each of the two sexes are within a narrow length range, with males having a peak at 45 cm and females at 80 cm and no intermediate peaks are observed. The catch distributions are very similar to previous longline catches in the same area in November 1989 (Nielsen 1990), and in August 1991 (Jørgensen & Boje 1992). No conclusions will be drawn here on the size distribution of the sexes but the overall trend of an increasing size by depths is in accordance with the assumed migration pattern of Greenland halibut in the Davis Strait (Riget & Boje 1989).

The present longline fishery and previous fisheries (Jørgensen & Boje 1992, Nielsen 1990), indicate that a substantially part of the Greenland halibut stock, composed of fish larger than about 70 cm, is not covered by the trawl surveys, on which biomass estimates at present for Subarea 0+1 are based. A comparison of the selectivity in trawl and longline showed that trawl only restrains about 10% of the fish larger than 70 cm (Jørgensen & Boje 1992). Further, the depths which the larger fish inhabits, >1400 m, are not covered by the surveys. Therefore, the biomass estimates obtained by the trawl surveys must be considered underestimated.

References.

Jørgensen, O.A. & J.Boje (1992). A comparison of the selectivity in trawl and long-line fishery for Greenland halibut. NAFO SCR Doc. 92/53.
 Nielsen, J.R. (1990). Longline fishery for Greenland halibut in the Davis Strait, November 1989. NAFO SCR Doc. 90/38.
 Riget, F. & J.Boje (1989). Fishery and some biological aspects of Greenland halibut (*Reinhardtius hippoglossoides*) in West Greenland waters. NAFO Sci. Coun. Studies, 13: 41-52.

Table 1. Numbers of linesettings and hooks (in brackets) by depth and division.

Depth stratum	Division 1D	Division 1E	Divisions 1DE
200-399 m	2 (5620)	2 (3952)	4 (9572)
400-599 m	2 (5538)	3 (8204)	5 (13742)
600-799 m	0	1 (2740)	1 (2740)
800-999 m	4 (11431)	2 (5567)	6 (16998)
1000-1199 m	7 (17020)	0	7 (17020)
1200-1399 m	15 (38724)	2 (3907)	17 (42631)
1400-1599 m	10 (31924)	0	10 (31924)
1600-1799 m	0	0	0
1800-1999 m	1 (4310)	0	1 (4310)
2000-2199 m	1 (1170)	0	1 (1170)
Totals	42 (115737)	10 (24370)	52 (140107)

Table 2. Summarize of catches per 1000 hooks by species.

Species	Catch per 1000 hooks (kg)
Greenland halibut	122
Roughhead grenadier	57
Blue hake (<i>Antimora rostrata</i>)	16
Cusk (<i>Brosme brosme</i>)	4
Atlantic halibut	4
Skates	15
Black dogfish (<i>Centroscyllium fabricii</i>)	4
Northern wolffish (<i>Anarhichas denticulatus</i>)	12

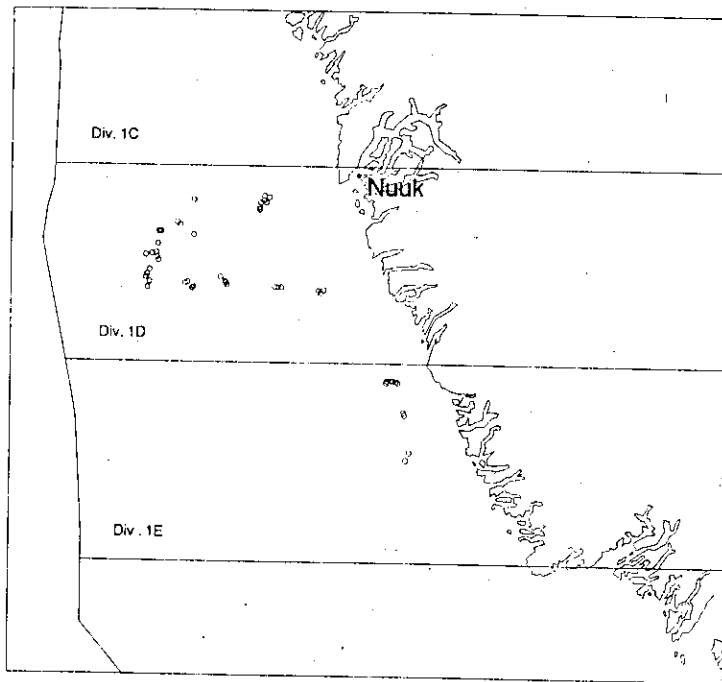


Figure 1. Map showing the distribution of the linesettings within Divisions 1DE.

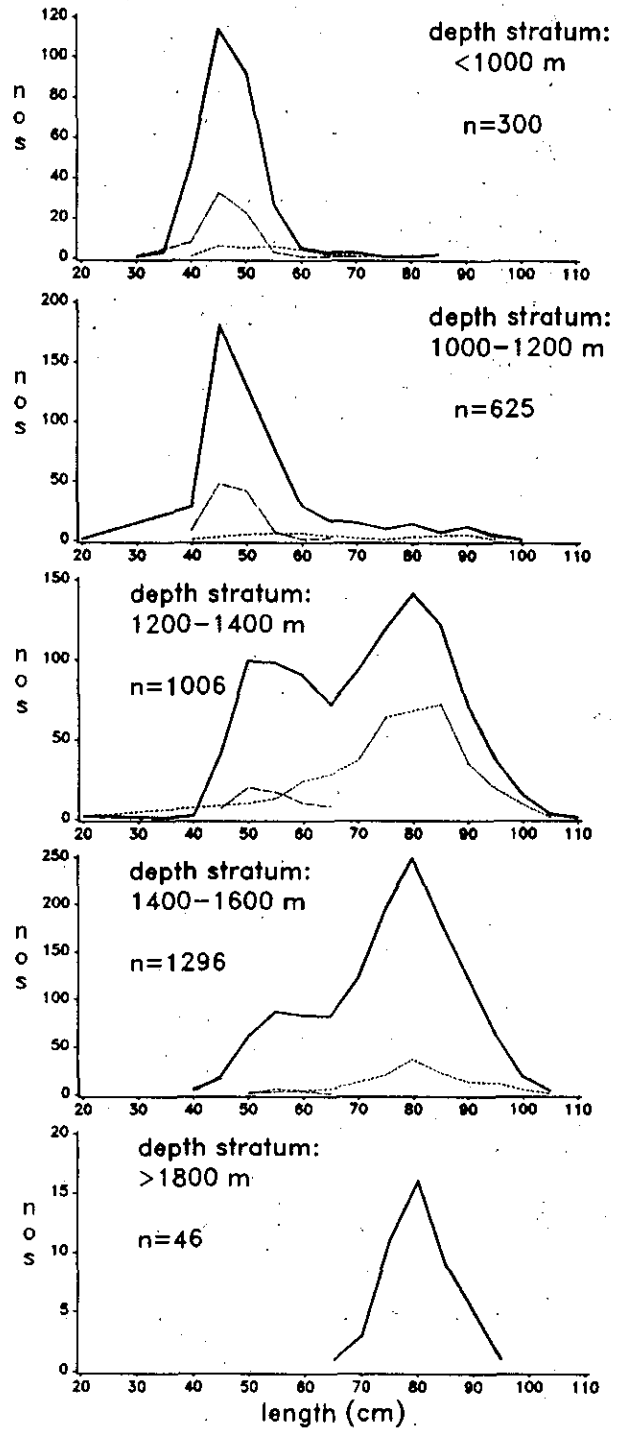


Figure 2. Length frequencies of catches of Greenland halibut by depth. Males are shown by dashed line and females are shown by dotted lines.

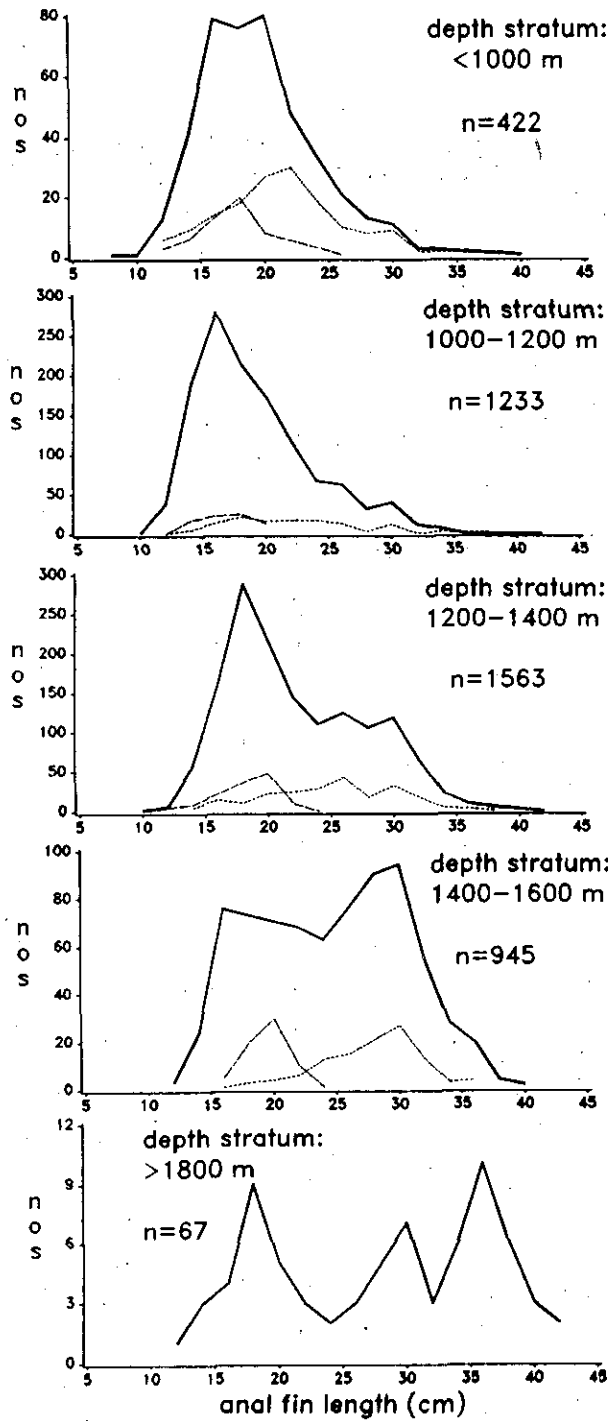


Figure 3. Length frequencies of catches of roughhead grenadier by depth. Males are shown by dashed line and females are shown by dotted lines.

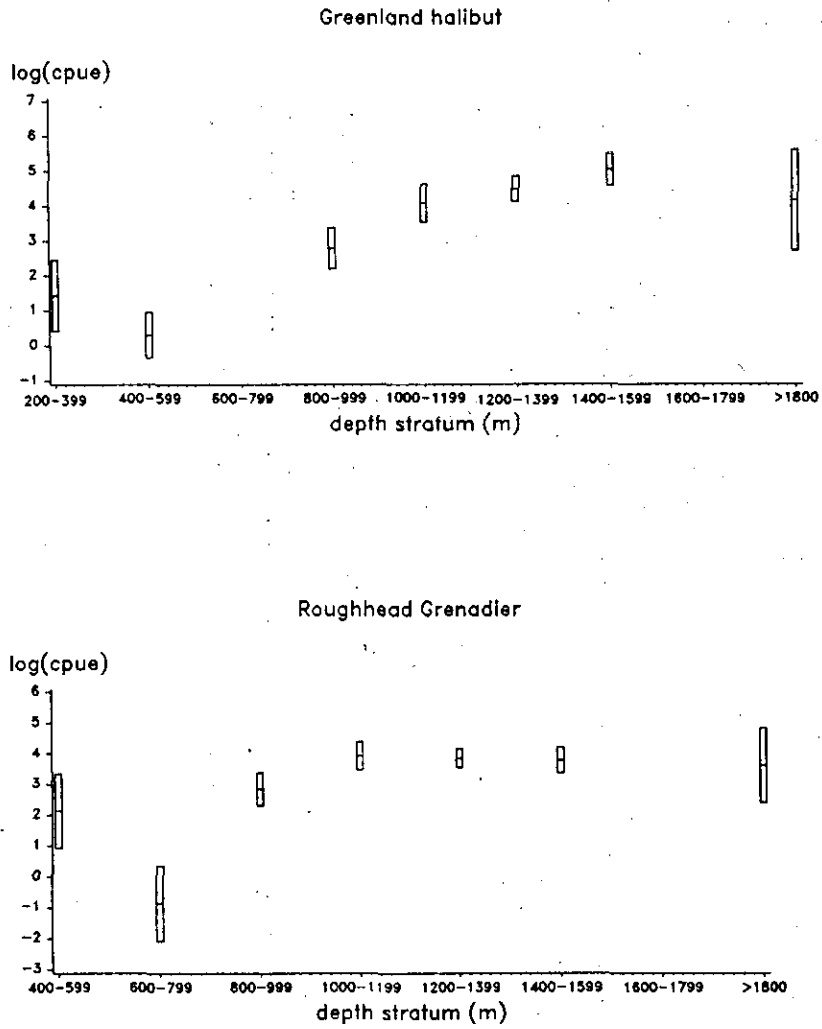


Figure 4. Catch per unit of effort (log-transformed) of Greenland halibut and roughhead grenadier by depth, with 95% confidence limits of the mean values given.