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Composition of Bottom Trawl Catches at Different  
Depths off the Flemish Pass in 1989-1993

by

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ABSTRACT

Analysis for Russian bottom trawl catches taken at 100-800m depths in May-July 1989-1993 and in September-October 1991-1993 indicated a minor portion of halibut to be 11% and that of *Sebastes marinus* - 51.8% up to 800m depth. Skate constituted 26.8% from catches taken at 201-300m depths.

Halibut below 50 cm long from the depths above 901-1000m and *Sebastes mentella* of 30 cm long - up to 800m depth were predominant in catches. Mean length of these fish species grew with an increase in fishing depth.

According to NAFO statistics in 1990-1992 the roundnose grenadier by-catches, taken by vessels from Spain and Portugal during Greenland halibut fishery in the Flemish Pass area (Divs. 3L, 3M, 3N), made up on the average 13-14% (the highest - 25% - in Div. 3M).

INTRODUCTION

Deep water fishery on halibut in non-traditional area - Flemish Pass has been developed since 1990. This area includes the eastern part of Div. 3L, western part of Div. 3M and northern part of Div. 3N outside 200-mile zone of Canada. At present fishery on halibut with grenadier by-catch is conducted at 800-1700m depths mainly by Spain, Portugal and to a small extent - by the Faroes and other countries.

By NAFO data 47 thou.t of halibut (Brodie, 1991) were caught in Divs. 2+3KL in 1990, 75 thou.t (Brodie, Baird, 1992) - in 1991 and 63 thou.t (Bowering et al., 1993) - in 1992. About 90% of catch were taken from the Flemish Pass area. According to Bowering (Bowering et al., 1993) the total halibut catch, taken in Subarea 3 outside 200-mile zone, constituted 35.5, 54.2 and 56.2 thou.t in 1990, 1991 and 1992, respectively. By other data in 1992 the halibut catch from Divs. 3L and 3M made up 40.0 thou.t (Anon., 1993). By-catches of other deep water fish, for instance, *Sebastes marinus* and grenadier, vertical inhabitation ranges of which are similar, are common during halibut fishery. The paper aims at studying of composition of catches from different depths off the Flemish Pass.

MATERIALS AND METHODS

Results from bottom fish stocks trawl surveys for 1989-1993, annually conducted in May-July, and those from separate research hauls in September-October 1991-1992, have been used in the paper. Bottom trawl catches were calculated per 1 hr of trawling and distributed along 100m depth ranges. Methods for surveys was previously given in detail (Bulatova, Chumakov, 1986). The Flemish Pass area was conventionally limited by us from 46° to 48° 20'N between 46° and 48°W. All the obtained in that area were included. Length frequencies of halibut are smoothed in the figures. Smoothing was done by the following formula:

$$B = \frac{a + 2b + c}{4}$$

where:

a, b, c - previous, average and subsequent members of length-frequencies;  
B - calculated one.

## RESULTS

Hauls were performed by Russian vessels with a bottom trawl only up to 800m depth (Table 1), and, probably, therefore no roundnose grenadier were nearly found in catches, and roughhead grenadier by-catch has reached on the average 1.4% (501-600m depths).

Relative amount of halibut in catches was minor - about 1% (501-600m depths). *Sebastes marinus* was numerous in catches; fish were distributed up to 800m depth where it constituted 51.8% of the total catch. Flounders and cod occurred in small depths. Essential quantities of skates were found in catches at all depths surveyed - to 26.8% - from 201 to 300m depth (Table 1). Some bottom hauls were done at 300-1200m depths during trawl surveys off the Flemish Pass in September-October 1991-1992 (Table 2). Greenland halibut occurred in catches from all the depths covered, with its relative numbers growing with an increase in fishing depth. Roundnose grenadier were found in catches from 801 to 900m depth. By-catch of other fish was minor, except for *Sebastes marinus* from 301-400m depths (Table 4 gives as "other fish").

Fishery on halibut has been mainly conducted by the vessels from Spain, Portugal and Faroes in the Flemish Pass area since 1990. The analysis of NAFO statistics for 1992 indicates the roundnose grenadier (*Coryphaenoides rupestris*) by-catch to be the highest among other fish from catches taken by these countries in Divs. 3L, 3M and 3N and to be on the average 13-14% (Table 3). Compared to other divisions the grenadier by-catch was the highest in Div. 3M.

In 1990, when fishery on halibut was initiated in the Flemish-Pass area by Spanish vessels, the roundnose grenadier by-catch did not exceed, on the average, 3.8% (Table 4) because of a small fishing depth. In 1991 its by-catch on the average made up 18.7%, with the highest one being 25% in Div. 3M. Roughhead grenadier (*Macrourus berglax*) constituted a minor by-catch (3.8%).

Analysis for length composition of Greenland halibut from catches in May-July 1989-1993 shows only the small fish 29.4-41.7 cm long to be distributed over the depths to 800m. Mean length of both the males and females grew with an increase in fishing depth. In September-October 1991-1992 specimens of halibut were larger in catches, mean length of males made up 47.1cm and 53.8cm for females at 1101-1200m depths (Table 5, Figs. 1 and 2).

In May-July 1989-1993 mean length of *Sebastes marinus* has also increased with a fishing depth (Table 6).

The increase in fish length depending on depth has been noted by most researchers. According to the data from Canadian surveys in Divs. 3K, 3L and 3M the mean weight of halibut at age 7-10 has grown from 1 to 4kg with an increase in fishing depth from 750 to 1500m. Mean weight of roundnose grenadier and *Sebastes marinus* has also increased (Brodie et al., 1992). Spanish surveys in Divs. 3LM showed a growth in Greenland halibut length and a rise in a portion of mature females with a fishing depth (Tunquera, Zamarro, 1992).

Thus, the Greenland halibut above 50 cm long are fished with a bottom trawl off the Flemish Pass below 901-100m and *Sebastes mentella* over 30cm long - below 701-800m. Small fish are distributed in lower depths.

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Table 1. Composition of bottom trawl catches by depth intervals of research surveys in Flemish Pass area, May-July 1989-1993.

| Fish species: Percentage catch composition within depth interval (m) |   |      |      |      |      |      |      |
|--|---|------|------|------|------|------|------|
| or groups  | : 101-200: 201-300: 301-400: 401-500: 501-600: 601-700: 701-800 |      |      |      |      |      |      |
| Greenland halibut  | : 5,1   | 8,8  | 5,0  | 8,7  | 11,1 | 4,2  | 14,8 |
| Roughhead grenadier  | : -   | 0,3  | 0,2  | 0,5  | 1,4  | 0,6  | -    |
| Beaked redfish   | : -   | 7,7  | 38,5 | 44,3 | 48,1 | 61,8 | 51,8 |
| Northern wolffish  | : -   | 0,2  | 0,1  | 0,3  | 1,4  | 0,6  | -    |
| Spotted wolffish   | : -   | 0,6  | 0,7  | 0,8  | +    | 0,1  | 0,9  |
| Atlantic wolffish  | : 0,5   | 2,3  | 1,7  | 0,2  | -    | -    | -    |
| Rajiformes   | : 12,7  | 26,8 | 6,4  | 2,7  | 11,7 | 12,6 | 13,9 |
| Atlantic cod   | : 21,5  | 31,9 | 22,7 | 13,2 | 3,5  | -    | -    |
| Witch flounder   | : 0,1   | 1,9  | 0,9  | 1,9  | 2,3  | 1,9  | 6,1  |
| American plaice  | : 59,8  | 16,2 | 7,2  | 3,3  | 3,4  | 4,4  | -    |
| Medusa   | : -   | 3,3  | 16,4 | 24,1 | 16,8 | 13,8 | 12,5 |
| Other fishes   | : 0,3   | -    | 0,1  | -    | 0,2  | +    | -    |
| Mean catch (kg/hr)   | : 146   | 114  | 208  | 199  | 221  | 450  | 320  |
| Number of tows   | : 10  | 32   | 61   | 34   | 22   | 18   | 2    |

Table 2 . Composition of bottom trawl catches by depth intervals of research surveys in Flemish Pass area. Sent. - Oct. 1991 - 1992.

| Fish species or groups | Percentage catch composition within depth interval (m) |         |         |          |           |           |
|------------------------|--|---------|---------|----------|-----------|-----------|
|                        | 301-400  | 701-800 | 801-900 | 901-1000 | 1001-1100 | 1101-1200 |
| Greenland halibut      | 12,4   | 95,5    | 80,0    | 62,4     | 64,6      | 80,6      |
| Roundnose grenadier    | -  | -       | 3,2     | 34,2     | 5,2       | 19,4      |
| Roughhead grenadier    | -  | +       | 4,2     | 3,4      | 19,8      | -         |
| Other fishes           | 87,6   | +       | 12,6    | -        | 10,4      | -         |
| Mean catch (kg/hr)     | 445  | 39      | 47      | 205      | 96        | 126       |
| Number of tows         | 1  | 1       | 2       | 2        | 1         | 2         |

Table 3 . Catch of Greenland halibut and Roundnose grenadier (t) and mean catch of Roundnose grenadier (% in brackets) in 1992. (Provisional Nominal Catches in the Northwest Atlantic, 1992. NAFO SCS 93/22. Ser. No. N2250).

| Country                | Division or Subarea |                 |                |                 |                 |
|------------------------|---------------------|-----------------|----------------|-----------------|-----------------|
|                        | 3L                  | 3M              | 3N             | 3LMN            | 3 total         |
| Spain                  | 25389<br>(8,4)      | 10236<br>(24,5) | 3866<br>(8,7)  | 39491<br>(12,6) | 39491<br>(12,6) |
| Portugal               | 2513<br>(15,4)      | 5517<br>(18,5)  | 3987<br>(11,8) | 12017<br>(15,6) | 12539<br>(16,0) |
| Faroe islands          | 157<br>(0,0)        | 499<br>(0,2)    | -              | 656<br>(0,2)    | 656<br>(0,2)    |
| Summary catch          | 28059<br>(9,0)      | 16252<br>(21,7) | 7853<br>(10,3) | 52164<br>(13,1) | 52686<br>(13,2) |
| Catch of all countries | 29982<br>(9,0)      | 16262<br>(21,7) | 7916<br>(10,2) | 54160<br>(13,0) | 58624<br>(14,1) |

Table 4 . Spanish catch composition (t and % in brackets) in Division 3L,3M, 1990,1991 (Junquera, Iglesias, 1992)

| Species             | 1990             |                  |                  | 1991             |                  |                  |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                     | 3L               | 3M               | total            | 3L               | 3M               | total            |
| Greenland halibut   | 3467.2<br>(98.5) | 1288,0<br>(93.8) | 4755,2<br>(97.1) | 2845.7<br>(88.6) | 3546.9<br>(63.8) | 6392.6<br>(72.9) |
| Roughhead grenadier | 29,6<br>(0,8)    | 51,8<br>(3,8)    | 81,4<br>(1,7)    | 91,9<br>(2,9)    | 143,7<br>(2,6)   | 235,6<br>(2,7)   |
| Roundnose grenadier | 11,9<br>(0,3)    | 30,8<br>(2,2)    | 42,7<br>(0,9)    | 244,9<br>(7,6)   | 1392,6<br>(25,0) | 1537,5<br>(18,7) |
| Grenadiers          | 14,9<br>(0,4)    | 2,7<br>(0,2)     | 17,6<br>(0,4)    | 27,8<br>(0,9)    | 475,5<br>(8,6)   | 503,3<br>(5,7)   |

Table 5 . Mean length of males and females Greenland halibut in Flemish Pass area.

| Time of survey        | Depth. m  | Males           |                | Females         |                |
|-----------------------|-----------|-----------------|----------------|-----------------|----------------|
|                       |           | mean length, cm | number of fish | mean length, cm | number of fish |
| May-July 1989-1993    | 101-200   | 32.1±1.2        | 40             | 33.5±0.9        | 63             |
|                       | 201-300   | 33.1±0.5        | 182            | 33.6±0.5        | 208            |
|                       | 301-400   | 29.4±0.4        | 317            | 31.8±0.5        | 323            |
|                       | 401-500   | 31.3±0.4        | 301            | 34.5±0.5        | 360            |
|                       | 501-600   | 34.3±0.4        | 275            | 38.6±0.5        | 259            |
|                       | 601-700   | 31.2±0.4        | 207            | 36.5±0.5        | 220            |
|                       | 701-800   | 38.1±0.7        | 36             | 41.7±0.7        | 41             |
| Sent.- okt. 1991-1992 | 304-400   | 36.8±0.6        | 86             | 37.1±0.8        | 89             |
|                       | 701-800   | 42.1±1.6        | 14             | 47.0±1.3        | 28             |
|                       | 801-900   | 44.1±0.8        | 57             | 48.1±0.9        | 82             |
|                       | 901-1000  | 49.2±0.8        | 67             | 57.7±1.2        | 110            |
|                       | 1001-1100 | 44.6±1.1        | 20             | 53.4±2.6        | 24             |
|                       | 1101-1200 | 47.1±0.7        | 42             | 53.8±0.9        | 102            |

Table 6. Mean length of males and females Beaked redfish in Flemish Pass area. May-July 1989-1993.

| Depth. m | Males           |                | Females         |                |
|----------|-----------------|----------------|-----------------|----------------|
|          | mean length, cm | number of fish | mean length, cm | number of fish |
| 201-300  | 22.5+1.7        | 16             | 21.6+2.4        | 13             |
| 301-400  | 22.6+0.1        | 1592           | 22.0+0.1        | 1639           |
| 401-500  | 22.1+0.1        | 1066           | 24.4+0.2        | 936            |
| 501-600  | 26.6+0.2        | 1056           | 27.9+0.2        | 947            |
| 601-700  | 26.7+0.2        | 888            | 27.8+0.2        | 825            |
| 701-800  | 29.7+0.4        | 109            | 29.8+0.4        | 100            |

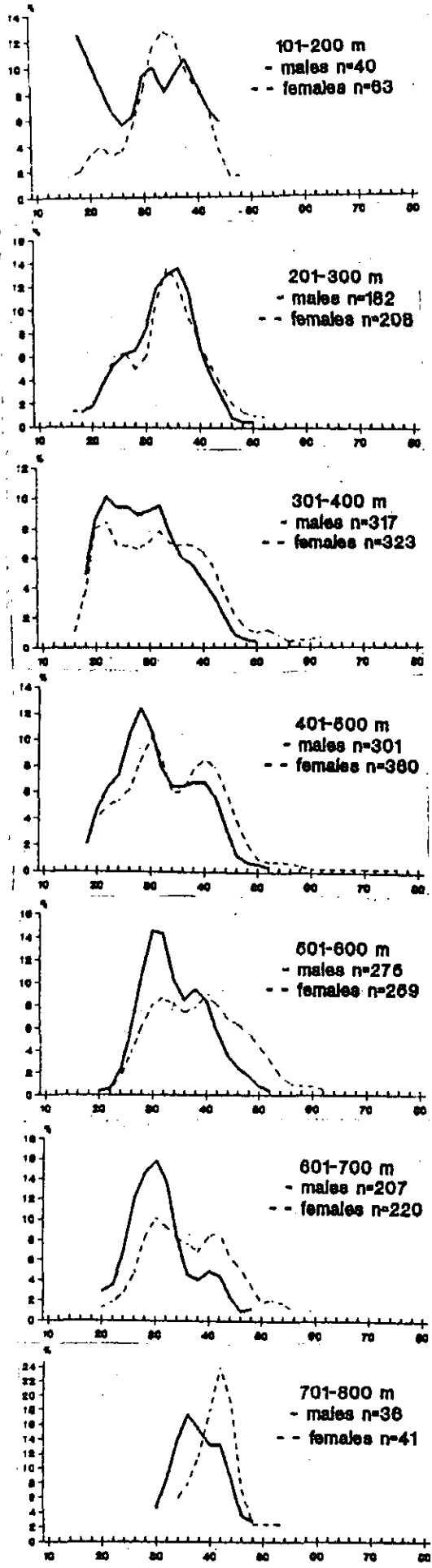


Fig. 1. Length distribution of Greenland halibut by depth in Flemish Pass area in May - July in 1989 - 1993 (bottom trawl).

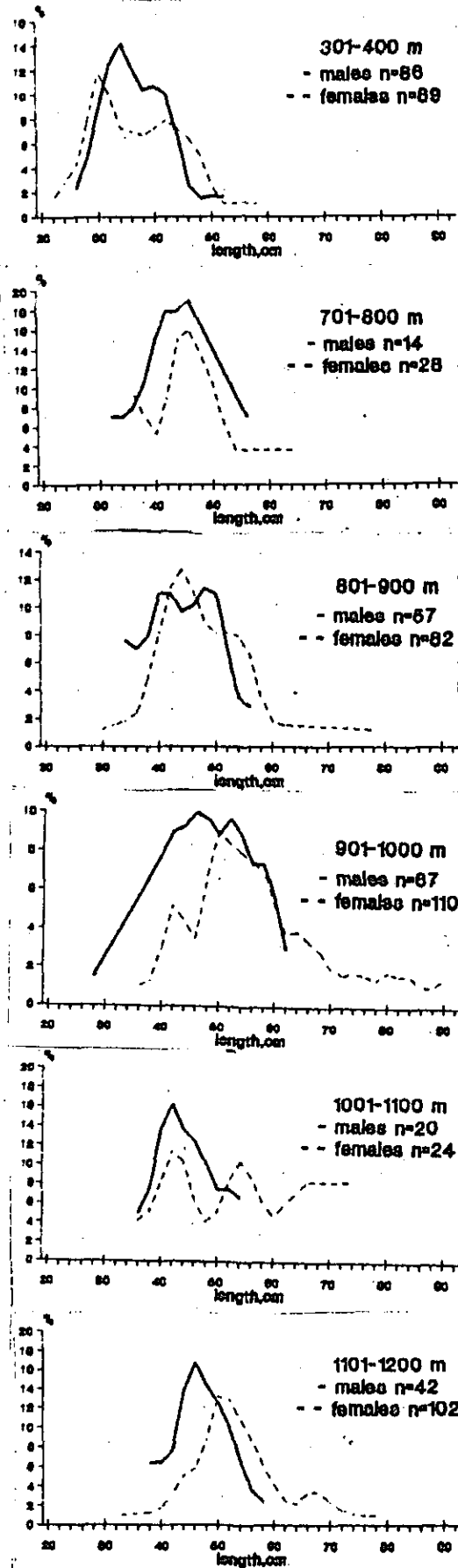


Fig. 2 . Length distribution of Greenland halibut by depth in Flemish Pass area in Sent. - Oct. in 1991 - 1992 (bottom trawl).